U.P. CO-OPERATIVE SUGAR FACTORIES FEDERATION LTD.
9-A, RANA PRATAP MARG, LUCKNOW
Telephone: (0522) 2200183 **Fax: (0522) 2627994 (0522) 2628310**
Email: upsugarfed@yahoo.co.in **Website: www.upsugarfed.org**

COMPETITIVE e-bidding
FOR

Online e-tenders are invited for Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh.

e-bid REFERENCE	239/UPF/GM(Pro.Fin)/GajraulaMill/2024
e-Bid Submission/Download Start Date	23-01-2024 from 18:55 hrs
Pre-Bid meeting	06-02-2024 at 11:00 am
LAST DATE AND TIME FOR SUBMISSION OF e-Bids	21-02-2024 UPTO 18:55 hrs
DATE AND TIME OF OPENING OF ON-LINE TECHNICAL e-Bids	22-02-2024 AT 11:00 am
DATE AND TIME OF OPENING OF ON-LINE FINANCIAL e-Bids	27-02-2024 AT 11:00 am
PLACE OF OPENING OF e-Bids	U.P.Co-operative Sugar Factories Federation Ltd. 9-A, Rana Pratap Marg, Lucknow
ADDRESS FOR COMMUNICATION	U.P. Co-operative Sugar Factories Federation Ltd. 9-A, Rana Pratap Marg, Lucknow
e-Bid E.M.D	Rs. 4,40,00,000/- (Rs Four Crore forty lakhs Only).

This Document Contains 576 Pages

It will be the responsibility of the e-Bidders to check U.P. Government e-Procurement website http://etender.up.nic.in and upsugarfed.org, for any amendment through corrigendum in the e-tender document. In case of any amendment, e-Bidders will have to incorporate the amendments in their e-Bids accordingly.

e-tender Document Processing /Cost : Rs **35000.00+GST**

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UTTAR PRADESH CO-OPERATIVE SUGAR FACTORIES FEDERATION LTD.
9-A, RANA PRATAP MARG, LUCKNOW
Telephone: (0522) 2200183 **Fax: (0522) 2627994**
(0522) 2628310 **Email: upsugarfed@yahoo.co.in**
238/UPF/GM(Pro.Fin)/GajraulaMill/2024 Date : 23/01/2024

E-Tender Notice

Online e-tenders are invited for Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh.

1	Name of The Department	U.P. Co-operative Sugar Factories Federation Ltd. 9A, Rana Pratap Marg, Lucknow-226001
2	Procedure for obtaining and submission of bid documents	Tender form is to be downloaded from e-tender portal http://etender.up.nic.in and website www.upsugarfed.org
3	Bid EMD	Rs. 4,40,00,000/- (Rupees Four Crores Forty lakhs) through RTGS/NEFT by any Nationalised Bank/ Scheduled Bank in favour of UP Co-operative sugar factories federation ltd. payable at Lucknow. **Name of Benificary**:- U.P.Coop. Sugar Factories Federation Ltd. **Bank Account No.**:- **53012823858** **IFS Code No** :- SBIN0060284 **Name of Bank Branch**:- **VidhanSabha Marg,Lucknow.**
4	e-Bid Submission/Download Start Date	23-01-2024 from 18:55 hrs
6	Pre-Bid meeting	06-02-2024 at 11:00 am
7	Last Date And Time For Submission Of E-Bids	21-02-2024 UPTO 18:55 hrs
8	Date And Time Of Opening Of On-Line Technical E-Bids	22-02-2024 AT 11:00 am
9	Date And Time Of Opening Of On-Line Financial E-Bids	27-02-2024 AT 11:00 am

The details of submission of e-bids along with eligibility, date & time, opening of Technical/Financial bids, EMD, experience and other terms & conditions will be available on e-tender portal http://etender.up.nic.in and on Federation's website www.upsugarfed.org.The tender fee is Rs. 35000/- (Rupees Thirty Five thousand) + GST only Non refundable and required EMD will be deposited before opening of Technical bid. The detailed terms and conditions are given in e-tender document. E-Tender without E.M.D. & e-bid document fee shall be rejected. Bidder who have already submitted E.M.D. for this tender need not to deposit again, however, e-bid document fee for this tender should be deposited by all participating bidders. The Federation reserves the right to cancel bids or the e-bidding process without assigning any reason thereof. The decision of Federation will be final & binding upon bidders.

(Ramakant Pandey)
Managing Director

Scope of Work

The Uttar Pradesh Co-operative Sugar Factories Federation Ltd., Lucknow on behalf of The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh invites Online e-tenders are invited for Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh. under scope of work given in e-tender document. The main features are as follows:

(A) i) Designing, procuring, manufacturing, supply, erection & commissioning and performance on EPC basis (Operation & Maintenance three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning in accordance with the terms and conditions, technical specifications etc. as detailed under **'Draft Agreement for Supply'**.

ii) Sugar Mill will be designed to use ground water only for start up of the operation as make up water and effluent discharge limit & Air pollution norms will be in the accordance with CPCB/SPCB/NGT norms, applicable at the time of erection and commissioning of the plant.

(B) To carry out the activities of Erection and commissioning of the Sugar Plant in accordance with the terms & conditions as detailed under **'Draft Agreement for Erection and Commissioning'.**

(C) i) All civil works such as layout of plant, foundations, dismantling, levelling/ filling and shifting of waste to a designated place shall be in scope of supplier including factory building, boundary and roofing etc. except non plant building in accordance with the terms & conditions as detailed under **'Draft Agreement for Civil works'.**

ii) All necessary civil works including foundations, structural, earth work, etc. required for installation of the proposed sugar plant equipment, associated systems and electrical distribution system will be in the scope of the Supplier. The Supplier to arrange for local statutory requirements/approvals for civil structures / buildings.

iii) All drains, toilet/washroom in technical block and other areas in factory campus shall be in scope of supplier.

(D) To carry out complete repair & maintenance of plant & machinery of New 4900 TCD Sugar Mill. Work will also include Operation & Maintenance three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh in accordance with the terms & conditions as detailed under **'Draft Agreement for Operation & Maintenance**.'

INVITATION FOR e-Bid

Online e-tenders are invited for Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh.

1. **Bidders are advised to study the tender Document carefully. Submission of e-Bid against this tender shall be deemed to have been done after careful study and examination of the procedures, terms and conditions of the tender Document with full understanding of its implications.**
2. **The e-Bid prepared in accordance with the procedures enumerated in ITB Clause 15 of Section-I should be submitted through e-Procurement website http://etender.up.nic.in.**
3. **The tender document is available at e-Procurement website http://etender.up.nic.in or Federation's website www.upsugarfed.org in from 23-01-2024 after 18:55 hrs. Interested bidders may view, download the e-Bid document, seek clarification and submit their e-Bid online up to the date and time mentioned in the table below:**

(a)	Date of publication of e-tender notice & availability of Tender Document	Tender Notice has been published over e-Procurement website http://etender.up.nic.in and Federation's website www.upsugarfed.org, and tender Document will be available from 23-01-2024 after 18:55 hrs from the above sites.
(b)	Availability of tender document on website	23-01-2024from 18:55 hrs at e-Procurement web site http://etender.up.nic.in and website www.upsugarfed.org
(c)	e-Bid Submission/Download Start Date	23-01-2024 from 18:55 hrs
(d)	Pre-Bid meeting	06-02-2024 at 11:00 am
(e)	LAST DATE AND TIME FOR SUBMISSION OF E-Bids	21-02-2024 UPTO 18:55 hrs
(f)	DATE AND TIME OF OPENING OF ON-LINE TECHNICAL E-Bids	22-02-2024 AT 11:00 am
	DATE AND TIME OF OPENING OF ON-LINE FINANCIAL E-Bids	27-02-2024 AT 11:00 am
(g)	Venue of opening of technical & financial e-Bids	U.P. Co-operative Sugar Factories Federation Ltd., 9-A, Rana Pratap Marg, Lucknow. 226001
(h)	Contact officer	Vinod Kumar, G.M. (Technical)- 7880888809 Joy Roy, GM (Project)- 7017401714 Ankur Verma, A.O. (Project Finance)- 9450155435 R. S. Ojha, A.E.(Electrical)-8960009090
(i)	Cost of e-Bid document	Rs 35000/- (Rupees Thirty Five Thousand) Only. (Non-refundable)+GST 18%
(j)	e-Bid E.M.D	Rs 4,40,00,000/- (Rupees Four Crore forty lakhs) only

4. The bidders need to submit the proof of submission of cost of e-Bid document fee and E.M.D. as stated in the above table **through RTGS/NEFT by any Nationalised Bank/**

Scheduled Bank in favour of UP Co-operative sugar factories federation ltd. payable at Lucknow.

5. The companies/firms who are registered at e-Procurement portal for e-tendering with UP Electronics Corporation Ltd, 10 Ashok Marg, Lucknow-226002, would only be eligible for participating in this e-tender as well as in e-tendering system of U.P. Govt. departments. All companies/firms who have not registered themselves with UPLC Ltd ,Lucknow for e-tendering till date can get their registration done for participating in this e-tender and other e-tenders of U.P.Govt. Departments. The companies/firms, who are not having digital signature, can also get their digital signature. The companies/firms may contact the officials on phone numbers (0522) 4130303 Extn 305 & 307, 09721451211, for their Registration/Digital Signature Certificate related queries. The registration fee may also be deposited through RTGS. The details of RTGS are as under:

M/s U.P. Electronics Corporation Ltd,
Punjab National Bank
Ashok Marg, Lucknow
A/C No. 7177002100000669
IFS code- PUNB0717700

For E-Tendering Enquiry Please Contact Following Persons

01. Sri Rritvik Saxena	-	09415526023	Federation
02. Sri Vipul Srivastava	-	07800001845	Federation

SECTION I : INSTRUCTIONS TO BIDDERS (ITB)

(A) THE BID DOCUMENT

1-Cost of e-Bid

a) The bidder shall bear all costs associated with the preparation and submission of its e-Bid and U.P. Co-operative Sugar Factories Federation Ltd, Lucknow hereinafter referred to as "the Purchaser", will in no case be responsible or liable for these costs, regardless of the conduct or outcome of the e-Bid process.

b) This tender document is available on the web site http://etender.up.nic.in and www.upsugarfed.org to enable the bidders to view, download the e-Bid document and submit e-Bids online up to the last date and time mentioned in e-Tender notice/e-tender document against this e-Tender. The bidders shall have to pay e-Tender document fee of Rs 35,000.00 (Rupees Thirty Five Thousand) only + GST through R.T.G.S. drawn on any nationalized bank/ **Scheduled Bank** payable in favour of U.P. Co-operative Sugar Factories Federation Ltd, Payable at Lucknow. The scanned copy of the R.T.G.S. must be enclosed along with the e-Bid. This e-tender document fee of Rs. 35000.00+ GST will be non-refundable.

2-Contents of e-Bid Document

2.1 The goods required to be supplied; e-Bid procedure and contract terms and conditions are prescribed in the e-Bid document. The e-Bid document includes:
Invitation for e-Bid

Section I	: Instruction to bidders (ITB);
Section II	: Conditions of E-tender/ Contract (CC),
Section III	: Technical e-Bid;
Section IV	: Financial e-Bid;

2.2 The bidder is expected to examine all instructions, forms, terms and specifications in the e-Bid document. Failure to furnish all information required as per the e-Bid document or submission of e-Bid not responsive to the e-Bid document in every respect will be at the bidder's risk and may result in rejection of the said e-Bid.

3-Clarification of e-Bid Document

A prospective bidder requiring any clarification of the e-Bid document may raise his/her point of clarification through Bid Management Window after successfully login to the e-Procurement website http://etender.up.nic.in. The bidder may seek clarification by posting query in the relevant window after clicking "Seek Clarification" option in the view e-tender details window for e-tender which can be selected through my tender option of e-Bid submission menu. The clarification will be replied back by the Purchaser through the e-Procurement website which can be read by the bidder through the "Clarification" option under Bid Submission menu. The Purchaser may also respond to clarifications raised by the prospective bidders on Purchaser's e-mail address upsugarfed@yahoo.co.in.

4. Amendment of e-Bid Document

4.1 At any time prior to the deadline for submission of e-Bid, the Purchaser may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the e-Bid document by amendments. Such amendments shall be uploaded on the e-Procurement website http://etender.up.nic.in through corrigendum and shall form an integral part of e-Bid document. The relevant clauses of the e-Bid document shall be treated as amended accordingly.

4.2 It shall be the sole responsibility of the prospective bidders to check the web site http://etender.up.nic.in and www.upsugarfed.org, upsugcorp.com and upcane.gov.in from time to time for any amendment in the e-tender document. In case of failure to get the amendments, if any, the Purchaser shall not be responsible for it.

4.3 In order to allow prospective e-Bidders a reasonable time to take the amendment into account in preparing their e-Bids, the Purchaser, at his discretion, may extend the deadline for the submission of e-Bids. Such extensions shall be uploaded on the e-Procurement website http://etender.up.nic.in and web sites www.upsugarfed.org, upsugcorp.com and upcane.gov.in

(B) PREPARATION OF e-Bid

5 Language of e-Bid

5.1 The e-Bid prepared by the bidder, as well as all correspondence and documents relating to the e-Bid exchanged by the bidder and the Purchaser shall be written either in English or Hindi language. The correspondence and documents in Hindi must be accompanied by embedded/separate Hindi font files. Only English numerals shall be used in the e-Bid.

6 Documents Constituting the e-Bid

6.1 The e-Bid prepared by the bidder shall comprise the following components:

(a) **Technical e-Bid** - Technical e-Bid will comprise of :

(i) **Fee Details** includes copies of e-tender document processing/Cost and e-Bid Earnest Money Deposit furnished in accordance with ITB Clause 12 in PDF format.

(ii) **Qualification Details** – includes copies of required documents as per ITB Clauses 10 and 11 in PDF format justifying that the bidder is qualified to perform the contract if his/her bid is accepted and that the bidder has financial, technical and production capability necessary to perform the contract and meets the criteria outlined in the Qualification Requirement and Technical Specification and fulfill all the conditions of the Contract and that the goods and ancillary services to be supplied by the bidder conform to the e-Bid document and Technical Specifications.

(iii) **e-Bid Form** – includes copy of filled in e-Bid Form as per Section-III(A) of e-tender document in PDF format justifying that the bidder is complying with all the conditions of the Contract and Technical Specifications of the e-Bid Document as no deviation will be acceptable to the Purchaser.

(iv) **Technical Specification Details** – includes copy of filled in Technical Specifications as per Section-III(C) of e-tender document in PDF format.

(b) **Financial e-Bid** – Financial e-Bid will comprise of :

(i) **e-Bid Form** – includes copy of filled in e-Bid Form as per Section-IV (A) of e-tender document in PDF format.

(ii) **Price Schedule/BOQ** – includes Price Schedule/BOQ in XLS format to be filled in after downloading from the e-Procurement website for this e-tender.

7-e-Bid Form

7.1 The bidder shall complete the e-Bid Form and the appropriate Price Schedule/BOQ furnished in the e-Bid document, including the goods to be supplied, their quantities and prices in the format given in the e-Bid document.

8 e-Bid Price

8.1 The bidder shall quote separately in the downloaded spread sheet file for the price of Supply, erection and commissioning, civil and operation & maintenance of described period of gravity flow type sugar plant of 4900 TCD on 22 hrs. basis including construction of foundation & Factory Buildings on EPC basis for production of sulphurless refined sugar at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh.

8.2 The price is F.O.R Destination including all duties and other taxes.
The rate of Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh is inclusive of basic rate, GST and all other duties and taxes, packing and Forwarding, Loading and unloading charges, transit insurance, transportation charges and other relevant expenses.

8.3 Prices quoted by the bidder shall be fixed during the whole Contract period and not subject to variation on any account subject to ITB Clause 25.1. E-Bid submitted with an adjustable price quotation unless asked for shall be treated as non-responsive and rejected.

9 e-Bid Currencies
Prices shall be quoted in Indian Rupees only.

10 Documents Establishing bidder's Qualification

10.1 Pursuant to ITB Clause 6, the bidder shall furnish, as part of its Technical e-Bid, documents establishing the bidder's qualification to perform the Contract if its e-Bid is accepted. The documentary evidence should be submitted by the bidder electronically in the PDF format and hard copy at the time of technical bid opening.

10.2 The documentary evidence of bidder's qualification to perform the Contract if its e-Bid is accepted shall be as per Qualification Requirements specified in Section III (F) of e-tender document.

11 Documents Establishing Goods' Conformity to e-Bid Documents

11.1 Pursuant to ITB Clause 6, the bidder shall furnish, as part of its e-Bid, documents establishing the conformity to the e-Bid documents of all goods and services which the bidder proposes to supply under the contract. The documentary evidence should be in the PDF file format.

12 e-Bid Earnest Money Deposit (EMD)

12.1 Pursuant to ITB Clause 6, the bidder shall furnish a EMD of Rs. 4,40,00,000.00 (Rs four Crores forty lakhs only), as part of e-Bid, as described below in form of R.T.G.S./NEFT from any nationalized bank/Scheduled Bank in favour of U.P. Co-operative Sugar Factories Federation Ltd., Lucknow. The scanned copy of the R.T.G.S./NEFT for e-Bid EMD as below must be submitted along with the e-Bid. No Interest on EMD will be paid. E.M.D details are as below:-

(A) The technical bid should accompany with R.T.G.S./NEFT of nationalized bank/ **Scheduled Bank** in favour of U.P. Cooperative Sugar Factories Federation Ltd. payable at Lucknow for an amount of Rs 4,10,00,000/- (Rs four Crores ten lakhs only) as EMD for **Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh.**

(B) The bidder should accompany with R.T.G.S./NEFT of nationalized Bank/ **Scheduled Bank** in favour of U.P. Cooperative Sugar Factories Federation Ltd. payable at Lucknow for an amount of Rs 30,00,000/- (Rs Thirty lakhs only) as EMD for **operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh,** in favour of U. P. Cooperative Sugar Factories Federation Ltd. payable at Lucknow

EMD furnished by all unsuccessful bidders will be returned to them (except successful and L2 bidder) without any interest whatsoever at earliest but not later than 30 days of issue of LOI to successful bidder. EMD of L2 will be refunded, without any interest after execution of Agreement with successful bidder.

12.2 The e-Bid E.M.D is required to protect the Purchaser against the risk of bidder's conduct which would warrant the EMD's forfeiture, pursuant to ITB Clause 12.7.

12.3 The e-Bid E.M.D shall be in Indian Rupees and shall R.T.G.S./NEFT payable in favour of U.P. Co-operative Sugar Factories Federation Ltd at Lucknow.

12.4 Any e-Bid not secured in accordance with ITB Clauses 12.1 and 12.3 above shall be treated as non-responsive and rejected by the Purchaser.

12.4 <u>Forfeiture of EMD:</u>

EMD of a tenderer will be forfeited, if the tenderer withdraws or amends his tender or impairs or derogates from the tender in any respect after expiry of the deadline for the receipt of tender but within the period of validity of his tender. Further, if the

successful tenderer fails to furnish the required performance security FDR/Bank Guarantee within the specified period, his EMD will be forfeited.

12.5 Refund of EMD:

EMD of the successful bidder for Supply, erection and commissioning i.e. Rs 4,10,00,000/- (Rs four Crores ten lakhs only) will be returned, without any interest whatsoever, after receipt of performance security FDR/ Bank Guarantee from the successful bidder/seller as called in this contract.

EMD of the successful bidder, Rs 30,00,000/- (Rs Thirty lakhs only) will be returned, without any interest whatsoever, after receipt of contractual obligation Bank Guarantee of Rs.50 Lacs from the successful bidder / seller's request.

13 Period of Validity of e-Bid

13.1 e-Bid shall remain valid upto (120) days from the opening of financial bid. after date of e-Bid opening prescribed by the Purchaser, pursuant to ITB Clause 16. An e-Bid valid for a shorter period shall be rejected by the Purchaser as non-responsive.

13.2 In exceptional circumstances, the Purchaser may solicit the bidder's consent to an extension of the period of e-Bid validity. The request and the response thereto shall be made in writing. A bidder may refuse the request without forfeiting its e-Bid security. A bidder granting the request will not be required nor permitted to modify its e-Bid.

14 Format and Signing of e-Bid

14.1 The bidder shall prepare one electronic copy each of the Technical e-Bid and Financial e-Bid separately.

14.2 The e-Bid document shall be digitally signed, at the time of uploading, by the bidder or a person or persons duly authorized to bind the bidder to the Contract. The letter authorization shall be indicated by a scanned copy of written power-of-attorney accompanying the e-Bid. All the pages/ documents of the e-Bid that are to be uploaded shall be digitally signed by the person authorized to sign the e-Bid.

15. Submission of e-Bid

The Bid Submission module of e-Procurement website http://etender.up.nic.in enables the bidders to submit the e-Bid online in response to this e-tender published by the Purchaser. Bid Submission can be done only on website http://etender.up.nic.in and from the Bid Submission start date and time till the Bid Submission end date and time given in the e-tender. Bidders should start the Bid Submission process well in advance so that they can submit their e-Bid in time. The bidders should submit their e-Bid considering the server time displayed in the e-Procurement website. This server time is the time by which the e-Bid submission activity will be allowed till the permissible time on the last/end date of submission indicated in the e-tender schedule. Once the e-Bid submission date and time is over, the bidders cannot submit their e-Bid. For delay in submission of e-Bid due to any reasons, the bidders shall only be held responsible.

The bidders have to follow the following instructions for submission of their e-Bid:

15.1 For participating in e-Bid through the e-tendering system, it is necessary for the bidders to be the registered users of the e-Procurement website http:// etender.up.nic.in. The bidders must obtain a User Login Id and Password by registering themselves with U.P. Electronics

Corporation Limited, Lucknow if they have not done so previously for registration. Refer to details given in Invitation for e-Bid Clause 10.

15.2 In addition to the normal registration, the bidder has to register with his/her **Digital Signature Certificate (DSC)** in the e-tendering system and subsequently he/she will be allowed to carry out his/her e-Bid submission activities. Registering the Digital Signature Certificate (DSC) is one time activity. Before proceeding to register his/her DSC, the bidder should first log on to the e-tendering system using the User Login option on the home page with the Login Id and Password with which he/ she has registered as per clause 15.1 above.

For successful registration of DSC on e-Procurement website http://etender.up.nic.in the bidder must ensure that he/she should possess Class-2/ Class-3 DSC issued by any certifying authorities approved by Controller of Certifying Authorities, Government of India, as the e-Procurement website http:// etender.up.nic.in is presently accepting DSCs issued by these authorities only. The bidder can obtain User Login Id and perform DSC registration exercise as described in clauses 15.1 and 15.2 above even before e-Bid submission date starts. The Purchaser shall not be held responsible if the bidder tries to submit his/her e-Bid at the last moment before end date of submission but could not submit due to DSC registration problem.

15.3 The bidder can search for active tenders through "Search Active tenders" link, select a tender in which he/she is interested in and then move it to 'My Tenders' folder using the options available in the e-Bid Submission menu. After selecting and viewing the tender, for which the bidder intends to e-Bid, from "My Tenders" folder, the bidder can place his/her e-Bid by clicking "Pay Offline" option available at the end of the view tender details form. Before this, the bidder should download the e-tender document and Price Schedule/Bill of Quantity (BOQ) and study them carefully. The bidder should keep all the documents ready as per the requirements of e-tender document in the PDF format except the Price Schedule/Bill of Quantity (BOQ) which should be in the XLS format (Excel sheet).

15.4 Next the bidder should upload the Technical e-Bid documents for Fee details (e-tender fee and EMD), Qualification details as per "ITB Clause 10 or 21", e-Bid Form as per "Section-III(A)" and Technical Specification details as per "Section-III(C):Technical Specifications" and Financial e-Bid documents as per "Section-IV(A):e-Bid Form" and "Section-IV(B):Price Schedule/BOQ" of e-tender document. Before uploading, the bidder has to select the relevant Digital Signature Certificate. He may be prompted to enter the Digital Signature Certificate password, if necessary. For uploading, the bidder should click "Browse" button against each document label in Technical and Financial schedules/packets and then upload the relevant PDF/XLS files already prepared and stored in the bidder's computer. The required documents for each document label of Technical (Fee details, Qualification details, e-Bid Form and Technical Specification details) and financial (e-Bid Form and Price Schedule/BOQ) schedules/packets can be clubbed together to make single different files for each label.

15.5 The bidder should click "Encrypt" next for successfully encrypting and uploading of required documents. During the above process, the e-Bid documents are digitally signed using the DSC of the bidder and then the documents are encrypted/locked electronically with the DSC's of the bid openers to ensure that the e-Bid documents are protected, stored and opened by concerned bid openers only.

15.6 After successful submission of e-Bid document, a page giving the summary of e-Bid submission will be displayed confirming end of e-Bid submission process. The bidder can take a printout of the bid summary using the "Print" option available in the window as an acknowledgement for future reference.

15.7 Purchaser reserves the right to cancel any or all e-Bids without assigning any reason.

16- Deadline for Submission of e-Bid

16.1 e-Bid (Technical and Financial) must be submitted by the bidders at e-Procurement website http://etender.up.nic.in not later than time 21-02-2024 upto 18.55 hrs (as the server time displayed in the e-Procurement website).

16.2 The Purchaser may, at its discretion, extend this deadline for submission of e-Bid by amending the e-Bid document in accordance with ITB Clause 4, in which case all rights and obligations of the Purchaser and bidders previously subject to the deadline will thereafter be subject to the deadline as extended.

17 Late e-Bid

17.1 The server time indicated in the Bid Management window on the e-Procurement website http://etender.up.nic.in will be the time by which the e-Bid submission activity will be allowed till the permissible date and time scheduled in the e-tender. Once the e-Bid submission date and time is over, the bidder cannot submit his/her e-Bid. Bidder has to start the Bid Submission well in advance so that the submission process passes off smoothly. The bidder will only be held responsible if his/her e-Bid is not submitted in time due to any of his/her problems/faults, for whatsoever reason, during e-Bid submission process.

18 Withdrawal and Resubmission of e-Bid

18.1 At any point of time, a bidder can withdraw his/her e-Bid submitted online before the bid submission end date and time. For withdrawing, the bidder should first log in using his/ her Login Id and Password and subsequently by his/her Digital Signature Certificate on the e-Procurement website http://etender.up.nic.in. The bidder should then select "My Bids" option in the Bid Submission menu. The page listing all the bids submitted by the bidder will be displayed. Click "View" to see the details of the e-Bid to be withdrawn. After selecting the "Bid Withdrawal" option, the bidder has to click "Yes" to the message "Do you want to withdraw this bid?" displayed in the Bid Information window for the selected bid. The bidder also has to enter the bid Withdrawing reasons and upload the letter giving the reasons for withdrawing before clicking the ”Submit" button. The bidder has to confirm again by pressing "Ok" button before finally withdrawing his/her selected e-Bid.

18.2 The bidder has to request the Purchaser with a letter, attaching the proof of withdrawal and submission of e-Bid EMD in the office of Purchaser, to return back the e-Bid security/EMD as per the manual procedure.

18.3 No e-Bid may be withdrawn in the interval between the deadline for submission of e-Bids and the expiration of period of e-Bid validity. Withdrawal of an e-Bid during this interval may result in the bidder’s forfeiture of his/her e-Bid E.M.D, pursuant to ITB Clause 12.7.

18.4 The bidder can re-submit his/her e-Bid as and when required till the e-Bid submission end date and time. The e-Bid submitted earlier will be replaced by the new one. The payment made by the bidder earlier will be used for revised e-Bid and the new e-Bid submission

summary generated after the successful submission of the revised e-Bid will be considered for evaluation purposes. For resubmission, the bidder should first log in using his/her Login Id and Password and subsequently by his/her Digital Signature Certificate on the e-Procurement website http://etender.up.nic.in. The bidder should then select "My Bids" option in the Bid Submission menu. The page listing all the bids submitted by the bidder will be displayed. Click "View" to see the details of the e-Bid to be resubmitted. After selecting the "Bid Resubmission" option, click "Encrypt & Upload" to upload the revised e-Bid documents by following the methodology provided in clauses 15.4 to 15.7.

18.5 The bidders can submit their revised e-Bids as many times as possible by uploading their e-Bid documents within the scheduled date & time for submission of e-Bids.

18.6 No e-Bid can be resubmitted subsequently after the deadline for submission of e-Bids.

(C) e-Bid OPENING AND EVALUATION OF e-Bid

19(A) Opening of Technical e-Bid by the Purchaser

19.A-1 The Purchaser will open all technical e-Bids, in the presence of bidders' representatives who choose to attend at 11:00 hrs on 22-02-2024 at U.P. Co-operative Sugar Factories Federation Ltd, 9-A, Rana Pratap Marg, Lucknow. The bidder's representatives who are present shall sign a register evidencing their attendance. In the event of the specified date of e-Bid opening being declared a holiday for the Purchaser, the e-Bids shall be opened at the appointed time and place on the next working day.

19.A-2 The bidder's names and the presence or absence of requisite e-Bid security and such other details as the Purchaser at its discretion may consider appropriate, will be announced at the opening. The name of such bidders not meeting the Technical Specifications and qualification requirement shall be notified subsequently.

19.A-3 The Purchaser will prepare minutes of the e-Bid opening.

19 A-4 Managing Director reserves the right to postpone the date and time of opening of Technical & Financial E-Bid in unavoidable circumstances and all the bidders will be informed.

19(B) Opening of Financial e-Bid

19 B-1 After evaluation of technical e-Bid, the Purchaser shall notify those bidders whose technical e-Bids were considered non-responsive to the Conditions of the Contract and not meeting the technical specifications and Qualification Requirements indicating that their financial e-Bids will not be opened. The Purchaser will simultaneously notify the bidders, whose technical e-Bids were considered acceptable to the Purchaser. The notification may be sent by letter, fax or by e-mail.

B-2 The financial e-Bids of technically qualified bidders shall be opened on 27-02-2024 at 11.00 hrs in the presence of bidders who choose to attend the bid opening.

B-3 The Purchaser will prepare the minutes of the e-Bid opening.

20 Clarification of e-Bid

20.1 During evaluation of e-Bid, the Purchaser may, at its discretion, ask the bidder for a clarification of his/her e-Bid. The request for clarification and the response shall be in writing.

21 Evaluation of technical e-Bid and Evaluation Criteria

The Purchaser will examine the e-Bid to determine that they are complete, whether they meet all the conditions of the Contract, that required e-tender fee, e-Bid EMD and other

required documents have been furnished, that the documents have been properly digitally signed, and whether the e-Bids are generally in order. Any e-Bid or e-Bids not fulfilling these requirements shall be rejected.

21.1 The bidders shall submit the scanned copies of following as documentary proof for evaluation of their technical e-Bids and hard copies at the time of technical bid opening.

21.2 The bidder shall submit required documentary proof, failing which the bid shall be rejected.

21.3 The bidder shall submit the copies of the detail of E.M.D. and tender fees details.

21.4 The bidder shall submit the copies of the Authorization letter by the competent authorities for the authorized person.

21.5 Bidder Bidder's may be any one of the following:- Company (registered as per Indian Companies Act) or Group of Companies (Companies owned by the promoters of a Single Industrial Group and the Companies must be registered as per Indian Companies Act) or Limited Liability Partnership – LLP (registered as per Limited Liability Partnership Act, 2008) or Partnership Firm (registered as per Indian Partnership Act, 1932) or Firm.

21.6 The bidder shall submit the copies of registration certificate of industries and labour department of the state.

21.7 The Bidder during the last ten years (not before 2013-2014 season), must have successfully Supplied, erected and commissioned

A. At least one complete sugar plant of minimum installed capacity of 5000 TCD for 22 hrs on EPC basis,

or

at least two complete sugar plant of minimum installed capacity of 3500 TCD for 22 hrs on EPC basis,

or

have expanded atleast three complete sugar plants with minimum enhancement in capacity of 2000 TCD or more on EPC basis,

B. along with, at least one high pressure boilers (Min pressure 67 ata).

C. In addition to above, the bidder must have successfully Supplied, Erected & Commissioned:-

atleast one sulphurless refined sugar plant in any or own sugar mill

or

converted process from plantation white sugar production to sulphurless refined sugar production in atleast two sugar mills.

D. The executed plant/plants must have given satisfactory performance for minimum two crushing seasons after commissioning in India. RT8(C) report must be provided for technical bid with performance certificate of the client.

The bidder must submit the period of previous execution of EPC project from client.

21.8 The average turnover of the bidder during the last five financial years should be not less than Rs. 180 crores.

The bidder will submit the certificate dully certified by Chartered Accountant for proof of average turnover with last 5 year Audited balance sheet.

If Audited balance sheet for FY 2022-23 is available then 5 year will be taken as FY 2018-19, 2019-20, 2020-21, 2021-22 and 2022-23.

If Audited balance sheet for FY 2022-23 is not available then 5 year will be taken as FY 2017-18, 2018-19, 2019-20, 2020-21 and 2021-22.

*Turnover from operations of Sugar Mills will not be included in calculating average annual financial turnover.

21.9 The Bank Credit worthiness of the Bidder shall be atleast Rs.180 crores duly issued by the Bank (Nationalized) not earlier than 3 months from the bidding date, as per proforma below:

TO WHOM IT MAY CONCERN

This is to certify that M/s……..having its registered office at…….is maintaining……..account in our bank at……..Branch. The average monthly transaction in this account is Rs…… (in words). M/s…… is also availing credit facility from this bank upto the limit of Rs……(in words).

It is further certified that M/s…… is valuable customer of our bank and it's credit worthiness can be treated good upto a sum of Rs……Crores.

Signature of Bank Manager
Manager ID No.
Seal of Bank
Credit facilities given by bank for operations of Sugar Mills will not be included in calculating credit worthiness

21.10 Networth of the Bidder should be positive duly certified by the Chartered Accountant and supported by relevant Balance Sheets.

21.11 The bidder shall submit the copies of the last submitted Income Tax Return for the financial year 2017-18/2018-19, 2019-20, 2020-21 and 2021-22/2022-23 & copy of PAN card (copy self attested).

21.12 The bidder shall submit the copies PAN, TAN, GSTIN, certificates in true copies / photocopies duly attested by authorised signatory

21.13 The bidder shall submit the documentary proof of the Status of the company along with name & contact details of Directors/Partners along with documents.

21.14 The e-Bids found to be not responsive to and not fulfilling all the conditions of the contract and not meeting Technical Specifications and Qualification Requirements to the satisfaction of Purchaser shall be rejected and may not be subsequently made responsive by the bidder by correction of the non-conformity. The e-Bids of bidders mentioning any of their conditions which are not mentioned in the e-tender document or are not in conformity with the conditions of the contract shall be rejected.

21.15 It shall be the discretion of the Purchaser to decide as to whether an e-Bid fulfils the evaluation criterion mentioned in this e-tender or not.

21.16 The bidders are advised not to mix financial bid documents with the PDF documents submitted for technical bid. The e-Bids of the bidders having financial bid document in the technical bid will out rightly be rejected.

22 Financial Evaluation and Comparison of e-Bid

22.1 The Purchaser will evaluate and compare the financial rates of (Total price) quoted in the price schedule/BOQ of e-Bids of those bidders whose technical e-Bids are found responsive as per the conditions of the e-tender only for those items of the bidders which have been technically accepted by the Purchaser.

22.2 No additional payments shall be made for completion of any contractual obligation beyond the quoted prices. If the supplier does not accept the correction of errors if any, its e-Bid shall be rejected and its e-Bid security may be forfeited.

22.3 No weightage/preference shall be given to the bidder quoting any higher technical specifications against the technical specifications of the items asked in the e-tender.

22.4 The Purchaser's evaluation of a Financial bid shall be based on FOR rate quoted by the bidder including the cost of **Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh.** The bidder shall quote such price to include all costs as well as duties and taxes paid, payable on components and raw material incorporated or to be incorporated in the goods, and GST on the finished goods, if payable and price of incidental services, freight, insurance, loading and unloading expenses, transportation expenses and other relevant costs incidental to the delivery of the goods to their final destination.

22.5 The Financial Bids will be opened by Tender Evaluation committee (TEC) in the presence of Bidders" representatives (only one) who choose to attend the Financial Bid opening on

date and time to be communicated to all the technically qualified Bidders. The Bidder's representatives who are present shall sign a register evidencing their attendance.

a) The name of Bidder, Bid Prices etc shall be announced at the meeting. The commercial quotes of the lowest Bidder shall be notified as L-1. The Quantity offered by the L-1 shall be first taken into consideration.
b) In case L-1 offers to supply the complete order quantity and is assessed to have the adequate capacity to supply the complete order quantity as per the delivery schedule by the Tender Evaluation committee (TEC) then L-1 shall be contracted to execute the complete supply order.
c) In case, agreement is not executed with L-1 then Federation may award contract to L-2, if not, the tender shall be cancelled & Bids shall be invited again L-1 shall however be blacklisted from participating in any future bidding and legal action may be taken by the Federation.

23. **Contacting the Purchaser**

23.1 Subject to ITB Clause 20, no bidder shall contact the Purchaser on any matter relating to his/her e-Bid, from the time of the e-Bid opening to the time the Contract is awarded. If the bidder wishes to bring additional information to the notice of the Purchaser, he/she can do so in writing.

23.2 Any effort by a bidder to influence the Purchaser in its decisions on e-Bid evaluation, e-Bid comparison or contract award may result in rejection of the bidder's e-Bid.

(D) AWARD OF CONTRACT

24 Award Criteria

24.1 The Purchaser will determine to its satisfaction whether the bidder(s) that is selected as having submitted the lowest rate (L-1) evaluated responsive bid meets the criteria specified in ITB Clause 10.2, and is qualified to perform the contract satisfactorily.

24.2 Subject to ITB Clause 26, the Purchaser will award the contract to the lowest rate (L-1) evaluated successful Bidder whose bid has been determined to be responsive to all the conditions of the contract and meeting the Technical specification and qualification requirement of the Bidding Document.

24.3 After awarding contract to L-1, agreements as per document will be executed within 15 days of issue of Letter of Intent (LOI). Draft agreements regarding supply, Erection & Commissioning and Civil Constructions are enclosed in the bid form. After issue of LOI and before execution of agreement, if considered necessary, amendments in draft agreements will be made.

25 Purchaser's right to vary Quantities at the Time of Award

25.1 The Purchaser reserves the right at the time of Contract award to increase or decrease the quantity of goods and services originally specified in the Schedule of Requirements without any change in unit price or other terms and conditions, depending upon the requirement of end-customer. The purchaser may also increase or decrease the quantity even after award of contract up to the validity period of E-bid.

25.2 If any taxes/duties are increased/ decreased by the Government during the contract period, the same shall be adjusted mutually after submitting the proof by the successful bidder to

the Purchaser i.e if there is any decrease in any duty or tax the purchaser shall have right to deduct from the contract price, amount equivalent to the decrease in the duty or tax.

26 Purchaser's right to accept any e-Bid and to reject any or all e-Bids

26.1 The Purchaser reserves the right to accept or reject any e-Bid, and to annul the e-Bid process and reject all e-Bids at any time prior to contract award, without thereby incurring any liability to the affected bidder or bidders.

27-Notification of Award

27.1 The Purchaser will notify the successful bidder in writing by letter/e-mail/fax, that its e-Bid has been accepted. Normally it will be informed within 30 days after opening of E-commercial/financial bid except in unavoidable circumstances.

27.2 The notification of award will constitute the formation of the Contract.

28-Signing of Contract

As the purchaser notifies the successful bidder that its e-bid has been accepted, the purchaser will inform to the bidder accordingly.

SECTION II :CONDITIONS OF E-Tender/ CONTRACT (CC)

Online e-tenders are invited for Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of sulphurless refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning of the plant at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh.

Pre Conditions to be fulfilled by the eligible Bidder's

1. Bidder's may be any one of the following:- Company (registered as per Indian Companies Act) or Group of Companies (Companies owned by the promoters of a Single Industrial Group and the Companies must be registered as per Indian Companies Act) or Limited Liability Partnership – LLP (registered as per Limited Liability Partnership Act, 2008) or Partnership Firm (registered as per Indian Partnership Act, 1932) or Firm.

2. The Bidder during the last ten years (not before 2013-2014 season), must have successfully Supplied, erected and commissioned

   A. At least one complete sugar plant of minimum installed capacity of 5000 TCD for 22 hrs on EPC basis,

      or

      at least two complete sugar plant of minimum installed capacity of 3500 TCD for 22 hrs on EPC basis,

      or

      have expanded atleast three complete sugar plants with minimum enhancement in capacity of 2000 TCD or more on EPC basis,

   B. along with, at least one high pressure boilers (Min pressure 67 ata).

   C. In addition to above, the bidder must have successfully Supplied, Erected & Commissioned:-

      atleast one sulphurless refined sugar plant in any or own sugar mill

      or

      converted process from plantation white sugar production to sulphurless refined sugar production in atleast two sugar mills.

   D. The executed plant/plants must have given satisfactory performance for minimum two crushing seasons after commissioning in India. RT8(C) report must be provided for technical bid with performance certificate of the client. The bidder must submit the period of previous execution of EPC project from client.

3. Bidder blacklisted firms with U.P. Cooperative Sugar Factories Federation, Lucknow/NCDC /NFCSF and by any Central/State Government organisations are not eligible.

4. The average turnover of the bidder during the last five financial years should be not less than Rs. 180 crores.
   The bidder will submit the certificate dully certified by Chartered Accountant for proof of average turnover with last 5 year Audited balance sheet.
   If Audited balance sheet for FY 2022-23 is available then 5 year will be taken as FY 2018-19, 2019-20, 2020-21, 2021-22 and 2022-23.

   If Audited balance sheet for FY 2022-23 is not available then 5 year will be taken as FY 2017-18, 2018-19, 2019-20, 2020-21 and 2021-22.
5. The bank credit worthiness of the bidder should be atleast Rs. 180 crores duly certified by banker as per performa given in technical Bid which should not be earlier than 3 months from the date of bidding.
6. Networth of the Bidder should be positive duly certified by the Chartered Accountant and supported with relevant Balance Sheets.
7. EMD as mentioned in clause 12.1 of ITB.
8. All required documents as per tender document for technical bid evaluation.
9. A Bidder may be disqualified if the information provided does not meet any one of the above criteria and conditions mentioned in Clause 26.
10. Before quoting, the bidders should be acquainted themselves with the local conditions of the project site, rules and regulations of Central and State Government Acts governing the construction and operation of the sugar plant along with its supply, erection and commissioning.
11. The Contract price will be fixed. There shall be no increase/escalation of total contract price for the successful commissioning of the project and completion of operation and maintenance period.
12. Bids for supply of machinery, erection, commissiong alongwith Civil Construction of buildings and foundations etc on EPC basis, Operation and Maintenance shall only be considered. The e-bid exclusively for supply of machinery only or civil construction of buildings and foundations or without the bid for erection-cum-commissioning or without the bid for operation and maintenance shall not be considered.
13. The information given in the bid documents and the plans and drawings forming part thereof is merely intended as general information without any undertaking on the part of the Purchaser as to their accuracy and without obligation relative thereto upon the purchaser. Before submitting bid, the bidders are advised to inspect the site of work and the environments and be well acquainted with the actual working and other prevalent conditions, facilities available, rules and regulations of Central and State Government Act governing the construction and operation of the sugar plant etc. No claim will be entertained later on the grounds of lack of knowledge.
14. The Plant & Machinery should be ready for commissioning within the period 16 months from the date of agreement with easy operation of each equipment w.r.t. approach etc.
15. Clients' LOI and performance certificate duly signed by Chief Executives officer (with current/working mobile number) for jobs completed in time, successful performance and parameters achieved for the turnkey projects in last ten years. Names & latest telephone number of the CEO must be mentioned below signatures.

16. Valid PAN, TAN, GST registration no., certificates in true copies / photocopies duly attested by authorised signatory.
17. Power of Attorney or Authority Letter of the person who has signed the tender documents.

TO WHOM IT MAY CONCERN

This is to certify that M/s …… having its registered office at …… is maintaining current A/c in our bank at …….. Branch. The average monthly transaction in this account is Rs. …….. (in words). M/s …… is also availing credit facility from this bank upto the limit of Rs. ……. (in word).

It is further certified that M/s ……. Is valuable customer of our bank and it's credit worthiness can be treated good upto a sum of Rs. ……. Crores.

Signature of Bank Manager
Manager ID No
Seal of Bank

Signature of the representative
Of the machinery Seller
Name and address of the Bidder
(Seal)

Date _____

2. If the bidder deliberately gives wrong information in the bid specially wrong performance certificate of successful execution of his earlier work, the purchaser reserves the right to reject such bid at any stage or to cancel the contract, if awarded and forfeit Earnest money / Security Deposits.

3. Disqualification

Notwithstanding anything to the contrary contained in this Technical and Financial Bid documents and without prejudice to any of the rights or remedies of the UP Coop. Sugar Factories Federation Ltd., the UP Coop. Sugar Factories Federation Ltd. at any stage of the process and its participation in the process and/or its TECHNICAL & FINANCIAL BID and subsequent submissions be dropped from further consideration for any of the reasons including without limitations those listed below:

a) Bidder blacklisted with U.P. Cooperative Sugar Factories Federation, Lucknow and by any Central/State Government organisations are not eligible; or

b) Failure to comply with other material requirement of this Technical & Financial Bid; or

c) UP Coop. Sugar Factories Federation Ltd. is not satisfied with credit worthiness/ownership structure of the Prospective Bidder; or

d) Failure to comply with the reasonable requests of UP Coop. Sugar Factories Federation Ltd. in relation to the EPC Process; or

e) If it is discovered at any time that the Prospective Bidder is subject matter of winding up or insolvency or other proceedings of similar nature; or

f) Any information regarding the Prospective Bidder which becomes known to UP Coop. Sugar Factories Federation Ltd. and which is detrimental to proposed process and/or the interests of UP Coop. Sugar Factories Federation Ltd.; or

g) Initiation or existence of any legal proceedings, including Arbritation, by or against the Prospective Bidder in respect of UP Coop. Sugar Factories Federation Ltd.,/UP State Sugar Corporation Ltd. which proceeding may be prejudiced by the participation of the Bidder in the short listing of Prospective Bidder; or

h) Any restrictions or limitations have been put on the Prospective Bidder pursuant to any regulatory or statutory guidelines to participate in the process; or

i) The Prospective Bidder has been convicted for an offence under any legislation designed to protect the members of the public from financial loss due to dishonesty, incompetence or malpractice; or

j) The Prospective Bidder has been disqualified from participating in the such EPC of Sugar either by Government of India or any of the State Governments/ Union Territory Governments; Mere pendency of an appeal against the order of disqualification, if any, passed by Government of India or any of the State Governments/ Union Territory Governments will have no effect on the disqualification of Prospective Bidder; or

k) If information becomes known after the Prospective Bidder has been qualified at any stage to proceed with the process, which would have entitled UP Coop. Sugar Factories Federation Ltd. to reject or disqualify the relevant Prospective Bidder, at that time, or at any time, such information becomes known to the UP Coop. Sugar Factories Federation Ltd..

UP Coop. Sugar Factories Federation Ltd.'s determination that one or more of the events specified above have occurred shall be final and conclusive.

All pages of the Bid document including drawing shall be initialed with seal at the lower right hand corner or signed with seal wherever required in the Bid documents by the Bidder or by a person holding power of attorney authorizing him to sign on behalf of the Bidder before submission of tender. All signatures in Bid documents shall be dated as well.

4. DECLARATION

(to be submitted on Tenderers letter head)

To
The Managing Director
UP Co-operative Sugar Factories Federation Ltd.
9-A, Rana Pratap Marg
Lucknow, Uttar Pradesh

Ref: Date:

This has reference to your Tender Notice. Accordingly we are submitting our offer. I/We declare that I/We have gone through and carefully examined the scope of supply, terms and conditions, technical specifications and other details enclosed with this agreement. We hereby confirm that the scope of supply & the other technical details of our offer conform strictly to your technical specifications. We have enclosed all technical details, drawings & other information as required in your requisition.

Authorized signature with

Co. Rubber Stamp.

We have read and understood the above terms & conditions of this tender and hereby agree to abide by them and the same are acceptable to us.

Date:

Place:

SECTION III(A): e- bid FORM

e-bid Ref. No Date: ……..

To:

The Managing Director,
U.P. Co-operative Sugar Factories federation Ltd,
9-A, Rana Pratap Marg Lucknow (U.P)-226001

Dear Sir,

Having examined the e-Bid Documents, we, the undersigned, offer to deliver. ..... (Description of Goods and Services) in conformity with the said e-Bid (Section II) of the e-Bid Document and will **Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh** from our manufacturing works/units as per specifications given in bid-document to your factory. The particulars of our organization such as legal status, details of experience and past performance, capability statement and the required e-Bid EMD for Rs. 4,40,00,000/- (Four Crore forty lakhs only) in the form of R.T.G.S./NEFT in favour of U.P.Co-operative Sugar Factories Federation Ltd, Lucknow, is furnished with this e-Bid from.

We further undertake, if our e-Bid is accepted, to deliver the Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of sulphurless refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning of the plant at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt.

Amroha, Uttar Pradesh. in accordance with the delivery schedule specified in the Schedule of Requirements.

We agree to abide by this e-Bid for the e-Bid validity period specified in Clause 13.1 of the ITB and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

Until a formal contract is prepared and executed, this e-Bid, together with your written acceptance thereof and your notification of award shall constitute a binding contract between us. All the terms and conditions of the e-tender Document are acceptable to us.

We undertake that, in competing for (and, if the award is made to us, in executing) the above contract, we will strictly observe the laws against fraud and corruption in force in India namely "Prevention of Corruption Act 1998".

We understand that you are not bound to accept the lowest or any e-Bid you may receive.

Dated this.....day of……20.....

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Signature (in the capacity of)

Duly authorized to sign e-Bid for and on behalf of.....

SECTION III (B) : SCHEDULE OF REQUIREMENTS

Item Code	**Brief Description**	**Destination**	**Completion Time**	**e-Bid E.M.D.**
Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh as per technical specification given in the bid-document.		The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh	Within 16 month from the date of agreement.	1- For Supply, erection and commissioning Rs. 4,10,00,000/- 2- for Operation & Maintenance Rs 30,00,000/-

SECTION III (C) TECHNICAL SPECIFICATIONS

SECTION III(D)-1 DRAFT AGREEMENT FOR SUPPLY
ON NON JUDICIAL STAMP PAPER (VALUE Rs.100)

THIS AGREEMENT MADE on the day of …….. between The Kisan Sahakari Chini Mills Ltd., Gajraula , Distt. Amroha, Uttar Pradesh hereinafter referred to as the 'Purchaser' which expression shall, unless repugnant to the subject or context include their successors and assignees represented by authorized representatives of the purchasers of the One Part and ....., a company registered under the Companies Act, 1956, having its registered office at ....., and work place of business at ....., hereinafter referred to as the "Seller" which expression shall unless repugnant to the subject or context include their legal representatives, administrators, successors or permitted assignees represented by Shri .....of the Seller, of the other part.

WHEREAS the Bid of the 'Seller' contained in their bid document dated ..... as modified after subsequent techno commercial discussion with the 'Purchaser' in the meeting of the State Level Advisory Committee/High Power Purchase Committee, held on .....in association with their Consultants Messrs National Federation of Cooperative Sugar Factories Limited, New Delhi (hereinafter referred as the NFCSF) to design, procure, manufacturing, supply erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh.

..... has been accepted by the Purchaser and the Seller has been awarded the Letter of Intent dated..... for Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of sulphurless refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning of the plant at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh according to specifications etc. given in bid document.

AND WHEREAS the contract price hereinafter mentioned is based on the Seller's undertaking to design, prepare general arrangement layout, manufacture, procure and deliver the Machinery and Equipment for Purchaser's Sugar Plant & Performance including trials by …….. so as to enable the erection contractor of the purchaser to commission the sugar machinery and by …… in which time is the essence of the contract and if the seller fails to do so, the Seller shall pay liquidated damages as hereinafter provided, as per terms of the Agreement, subject to the Purchaser fulfilling their obligation on time except under Force Majeure conditions.

NOW THEREFORE, the parties hereto have agreed on the following terms for procuring, manufacturing, supplying the said Machinery and Equipment & performance and other matters connected therewith referred to herein.

1.0 DEFINITION

(a) Site: Site shall mean the sugar mill located at The Kisan Sahakari Chini Mills Ltd., Gajraula, Distt. Amroha where Modernisation and Expansion of Sugar Mill on EPC basis is to be done.

(b) Machinery and Equipment
The Machinery and Equipment shall mean the machinery and equipment for the sugar plant with the Specifications as specified in Annexure – B-1 & Annexure B-2 forming part of this Agreement.

(c) Contract Price
The Contract Price shall mean the price defined in Clause 3 hereof together with all increases or decreases thereto under this Agreement.

(d) Commissioning
The commissioning shall mean assuring of designing, manufacturing, procuring and supply of all Machinery and Equipment including supervision of Civil Works and erection of Machinery and Equipments as per specifications are completed to the entire satisfaction of the Purchaser. All the trials viz water, steam and vacuum trials have been conducted to the entire satisfaction of the Purchaser and the Sugar Mill is ready for commercial production.

(e) Effective Date/Zero date
The Effective Date/Zero Date shall mean the date of signing the agreement.

(f) Erection Contractor
Erection Contractor shall mean with whom Erection and Commissioning agreement of the Sugar Plant has been executed.

(g) Civil Contractor
Civil Contractor shall mean with whom agreement of Civil Works for the purpose of Sugar Plant has been executed.

(h) Operationa and Maintenance Contractor
Operation and Maintenance Contractor shall mean with whom agreement of Operation and Maintenance for of Sugar Plant and has been executed.

2.0 SCOPE OF WORK

2.1 The Scope of work shall include design, engineering, manufacture, procurement, supply of the Machinery and Equipment, associated systems and, electrical distribution system required for the Purchaser's Sugar Plant as detailed in **Annexure – B-1 & Annexure B-2**, annexed to and forming part of this Agreement in conformity with the specifications according to the progressive delivery schedules to be drawn up by the seller and approved by the Purchaser or an agency duly authorized by the purchaser which will enable Purchaser's Erection Contractor to make the Machinery and Equipment ready for commissioning and commercial production within the time provided in this Agreement. The Machinery and Equipment shall be suitable for crushing per day of 4900 tonnes capacity per day (22 hrs) and the plant should be capable for generation of 12 MW of electricity/power. The Machinery and Equipment shall produce sulphurless refined sugar

by sulphurless refined sugar process. The machinery and equipment supplied will be for achieving the guaranteed performance parameters specified for each section and steam & power consumption.

2.2 The seller shall also need to complete all associated electrical, mechanical, DCS system, instrumentation work including all control rooms required for installation, commissioning entire equipment and proving performance at site along with provisions for expandable upto ultimate capacity within 16 months from the date of agreeemnt. In designing factor building and engineering layout criteria shall be attached to local wind direction mainly during crushing season. The specification of the plant and machinery, wherever not mentioned in these specification shall be according to guidelines / specifications designed and finalized by technical Committee of Govt. of India in November, 2003.

2.3 The Seller will be responsible for providing an efficient, reliable and state of art technology equipments and machinery to produce sulphurless refined sugar. The specifications in this section, attempt to define the scope and specifications. However, the onus of providing the appropriate equipment and auxiliaries for successful commissioning, performance proving and operation entirely rests with the Seller.

2.4 The scope of work for the equipment, associated systems covered under the specifications will also be included:-

a) Design, layout, engineering, supply, fabrication, manufacture, assembly, shop testing and inspection at manufacturer's works.

b) Providing materials and equipment for testing at shop / site, as required.

c) All spare parts & lubricants required for the commissioning.

d) Special tools and tackles required for operation and maintenance, inspection, and repair of the equipment / systems offered.

e) The specifications are intended to cover the design, engineering, manufacture /procure, supply, erection, testing and commissioning of entire sugar plant equipment, associated systems, electrical distribution system, necessary piping /supports / valves / instruments, DCS based control & instrumentation system, necessary structures and supervision of civil works.

f) Supplies and services shall be rendered in conformity with proven engineering principles, taking into account the current state of the art technology. The requirements of the contract must be fulfilled in its entirety.

g) The supplies within the scope shall be rendered inclusive of all appliances and interconnecting arrangements, necessary for installation of all accessories and for satisfactory operation, maintenance and repair.

h) The scope of supply shall include all necessary work and supply of equipment and material whether mentioned in these specifications or not, but which are necessary for the satisfactory, reliable, safe operation, maintenance and required for achieving guaranteed performance parameters.

2.5 Any equipment, devices or material, if not included in this EPC bid, but found necessary for the safe and satisfactory functioning of the unit under this EPC bid, shall be supplied by the Supplier at no extra cost to the purchaser as though, such equipment, material or work were originally specified and formed part of the scope of work.

2.6 Layout plant and Design and drawing of machinery foundation, factory building and all other related civil works shall be in scope of seller. Seller should provide above mentioned design/drawings duly signed by authorized person to Purchaser & Inspection Agency for vetting and approval

2.7 Seller shall do all civil work to be done by Civil Contractor including all machinery foundations and structural factory buildings shall be in scope of supplier including factory building boundary and Galvanised sheets roofing along with transparent sheets, louvers etc. as per I.S. specifications except non plant machinery.

2.8 Seller shall be fully responsible for all erection and Commissioning works to be done by Erection Contractor so that required performance parameters can be achieved.

2.9 The Purchaser shall arrange all statutory requirements / approvals for civil structures / buildings from authorized / Govt. and other Agencies for construction and operation of Sugar Mill except those provided in Clause 2.10 below. Puchaser will submit required application and will deposit prescribed fees with the relevant authority. Besides those mentioned in clause 2.11 here under the seller may provide a list to the Purchaser for the items where necessary approvals/NOCs are required to be taken. This list shall be provided by the Seller within 2 months of the signing of the Letter of Intent. The Seller shall provide all required drawings and technical specifications for these approvals. However requesite fee will be deposited by sugar mill.

2.10 The Seller will;

2.10.1 Arrange all inspection certificate related to IBR from authorities/Boiler Directorates. All legal formalities and deposition of fees will be done by the purchaser.

2.10.2 Arrange inspections and approvals for commissioning of plant electrical from Local authorities and Chief Electrical Inspector. All legal formalities and deposition of fees will be done by the purchaser.

2.10.3 Arrange inspections and approvals/NOCs from the fire and other department. All legal formalities and deposition of fees will be done by the purchaser.

2.10.4 Approvals from CPCB/SPCB to operate the Sugar Mill, Boiler and turbine. All legal formalities and deposition of fees will be done by the purchaser.

2.11 Scope of work will also include:

2.11.1 Preparation and submission of drawings, Manuals & other documents as specified in Annexure- B-5.

2.11.2 Preparation of HMBD design calculations and detailed drawings.

2.11.3 Preparation of CPM/PERT diagram.

2.11.4 Preparation of manufacturing drawings.

2.11.5 Preparation of quality assurance and inspection plans and implementation schedule.

2.11.6 Preparation of schedule for site testing and commissioning including system auditing.

2.11.7 Manpower for water, steam and vacuum trial will be arranged by the seller. Manpower for Commissioning of all the equipments and machinery will be provided by the seller.

2.12 Inspection & Review Meetings – Seller will make arrangements for periodical and final inspection as required by Purchaser & Inspection Agency of all major equipment at own or sub-contractor's works. Seller will also attend the periodical review meetings at site or at agreed locations.

2.13 The performance of the plant & machinery shall have to be demonstrated as per details given in this Agreement.

2.14 While preparing the delivery schedule, the Seller shall ensure that the machinery and equipment are delivered in sequence of priority for erection so that the items which are to be first erected as per erection schedule shall be generally sent first and with the same order of priority. The progress of delivery shall be maintained thereafter accordingly. The said monthly delivery schedule shall also indicate the approximate value of the major equipments. The seller may send some critical items before the due date of delivery with the consent of PURCHASER. However, if the delivery of any of the item as per delivery schedule is delayed, the delivery of the subsequent items shall not be held up on this account. The format of delivery schedule shall be followed by the Seller.

2.15 The capacity and efficiency of the Machinery and Equipment shall be deemed to be fulfilled if (i) within not less than one month from the start of the crushing operations on any seven consecutive full working days, an average of 4900 tonnes/22 hours crush of sugarcane on each day has been achieved; (ii) during the same three consecutive full working days the milling plant has given fairly an average reduced mill extraction of 95% plus (Mittal formula) at maceration of upto 270% on fibre; (iii) The plant while producing refined sugar of any grade from L-30, M-30, S-30, shall achieve an average reduced boiling house recovery (Gundu Rao formula) of 90%+(on b-heavy) & 92%+(on c-heavy); (iv) The steam generating plant shall give an average thermal efficiency of 70% (IS code 13980-1995) on G.C.V. of bagasse having 49%(+/- 0.5%) moisture; (v) every unit including those in the boiling house has performed according to the capacity and efficiency stipulated in the Agreement including Annexures.

2.16 Provided further that in case the Purchaser requires any addition/reduction in items of the Machinery and Equipment or ask for any major changes in the specifications annexed to and forming part of this Agreement within two months from the date of signing this Agreement, the Seller hereby agree to make such supplies, additions, modifications, alterations or changes and Purchaser shall bear the reasonable cost on mutually agreed basis. If Seller suggest any reduction in items of Machinery and Equipment which will not affect the performance of Sugar Mill, the same can be reduced after approval from Purchaser and Inspection Agency and the Seller will reduce the price from the Contract Price as per clause 3.1(iii)

2.17 On the request of Seller the Purchaser may consider for change of make with consultation of National Federation, New Delhi.

2.18 The Seller shall furnish price break up, monthly billing schedule and monthly fund requirement statement towards supply of machinery and equipment within 30 days from the date of signing of this Agreement.

2.19 An indicative list of plant & machinery to be retained is enclosed as Annexure B-12. This is an indicative list for Seller's reference, Plant & machineries to be retained/ used in expanded Sugar Mill will be finanlised after suggestions given by Seller and accepted by Purchaser/Inspection Agency. Seller shall provide all the foundations design / drawing for

retained machinery and equipments to be utilized/ retained, if the location of retained machinery is to be changed. The Seller will provide list of plant & machinery with detailed specifications to be retained with suggestions if any for approval of Purchaser within 45 days of signing of this Agreement.

The Purchaser & Inspection Agency shall unless they have objection approve the same in writing and despatch their approval/comments to the Sellers within 07 days of its receipt. If corrections are sought by Purchaser & Inspection Agency the Sellers shall incorporate the same and submit 6 copies for the final approval and implementation within 07 days of the receipt of the latter's comments.

2.20 The Seller shall do the necessary repair and maintenance of the approved retained machinery and equipment before commissioning of the plant as per suggestions given by Seller and accepted by Purchaser/Inspection Agency. All material, consumables/spare & machinery parts / store materials etc. required for normal and major repairing and maintenance of old usable plant & machinery to be retained upto the date of start of commercial production shall be supplied by Seller and will in scope of work of Seller.

2.21 The Seller shall use the retained machinery and equipment from old plant as approved by Purchaser (refer clause 2.20) and shall give performance of the whole plant including the retained machinery treating the same as integral part of the plant.

2.22 The foundation, staging, stairs and structures and platform for the retained machinery shall be provided by the Seller. All DB's, MCC, Cables, Starters and other electricals are to be provided by the Seller. All inter connecting piping/valves/tanks/strainers etc. for Juice, water, MOL, SO2, steam, exhaust, vapour, massecuite, molasses etc. is to be provided by the Seller for shifted/retained machinery / equipment.

2.23 Sugar Plant is to be commissioned on the desired date finalized by the Purchaser without any price escalation. The price and date of delivery & Commissioning of the Sugar Plant is not changable. No time extention will be granted except force majeure.

2.24 Seller shall be solely responsible for designing, procuring, manufacturing, supplying, supervising the Erection and Commissioning, all the civil works of Sugar Plant(boiler, turbine, mill house, boiling house) performance thereof.

2.25 The Sugar Plant shall be gravity type for production of sulphurless refined sugar(maximum 60 ICUMSA sugar)

2.26 Special tools and tackles required for operation and maintenance, inspection, and repair of the equipment / systems offered.

2.27 1st filling of lubricants, painting, lagging, cladding of new and retained machinery shall be of sellers scope of work.

2.28 Approch platforms for every station/ equipment, ladders, insulation will be in the scope of seller. Every station working should be trouble free with proper approach.

3.0 **CONTRACT PRICE**

3.1 The Seller agrees to design, procure, manufacture, supply, supervise Erection and Commissioning and supervise Civil constructions of complete machinery and equipment specified in Annexures B-1 to B-13 annexed to this Agreement along with supervision of Civil works and do other works herein mentioned at a total price of Rs..... lakhs (Rupees .....) only (hereinafter referred to as the 'Contract Price)' subject to terms and conditions, hereinafter, provided.

The Contract price offered will be "F.O.R. Destination i.e. site price" of gravity Sugar and according to the specifications and details given in Annexures B-1, B-2 and B-3 and includes Ex-works (Ex-tenderers or their sub-contractors workshop or place of supply loaded on trucks including packing and forwarding charges) price, necessary facilities, freight to site, all taxes and duties viz. GST, Customs Duties and other leviable taxes/duties (presently in practice) and insurance as per the break-up given below:

Sl.No.	Particulars	Amount (in lakhs)
(i)	Basic Price Ex-works (Ex-Seller or their sub-seller/contractors workshop or place of supply) price of all Machinery and Equipment inclusive of packing and forwarding charges, Handling & Freight charges, all type of insurance on FOR basis for aforesaid mentioned Project:	
(ii)	GST	
(iii)	Total Contract Price	
	(Rupees .....in words)	

3.2 It is to be clearly understood that the total contract price is Rs..... (Rupees .....) only as per 3.1(iii) and shall also include the cost of the following:

a) Foundation bolts and packing plates.

b) Cost of all other items, which are necessary for completing the supply of the Machinery and Equipment as per scope of supply. Necessary facilities including first filling of lubricants including flushing oils. It shall include oils and greases and also oil used for centrifugal Machines and transformer oil. It also includes paints required for final painting at site as per colour scheme to be given by the Purchaser. It shall include one coat of primer before dispatch of machinery and equipment to the site. Paints for inner side surfaces of all the machinery and equipment also to be Painted (Primer) before dispatch including GST and other taxes and duties etc.

c) All taxes, duties and octroi paid by the Seller or their sub-contractors on raw materials, components and other materials for their own manufacture of finished equipment or part of finished equipment.

d) Customs duty on imported raw materials and finished goods.

e) Freight and Insurance costs.

Note:

Purchaser shall be entitled for the GST credit benefits wherever legally permissible as per applicable GST provisions from time to time. Sellers shall ensure, in time, the requisites from their end to this effect.

3.3 The total price offered at 3.1(iii) above is inclusive of the total amount in respect of GST, Customs and other taxes and duties and applicable cesses which shall be payable by the purchasers. The goods will be sent duly insured by a Insurance Companies regulated by

IRA as mentioned in clause 4.0. Any increase or decrease in taxes or duties will be made applicable to both the Purchaser & Supplier subject to the authenticated proof. Any positive/ negative impact of GST/ new imposition of taxes, duties, levies, cess etc. will be to the account of the Purchaser from the date of implementation of GST/new imposition.

3.4 All the above details of taxes, duties and special excise duties actually paid by the Sellers shall be shown separately for own manufactured items and for bought out items in each invoice/bills to be submitted by the Sellers. The amount shown in Seller's bill for payment of all such taxes, sur-charges and duties will be computed on the basis of relevant statutory provisions in force on the date of despatch and shall be the actual amount as paid by the Sellers. The Sellers shall furnish to the Purchasers with their bills gate pass in support of duty and special excise duty paid.

3.5 The Sellers shall within one month from the date of finalisation of this Agreement furnish the Purchasers with an indication of the approximate incidence of GST, special excise duties, custom duty, local taxes, tax in relation to goods supplied in execution of the contract and any other taxes or duties and octroi etc.payable by the Purchasers under the contract based on the rates prevailing on the date of Agreement.

3.6 PROVIDED ALWAYS THAT the Purchaser or their authorised representatives shall be shown all original documents and accounting records in support of GST, applicable taxes and duties, customs duties on imported components and original bills of the sub-vendors for satisfying that the taxes as aforesaid has actually been paid to the sub-vendors including taxes and duties charged in bills.

3.7 PROVIDED that not later than 30 days of the date of signing of this Agreement, the Seller shall furnish to the Purchaser a statement for price breakup in the form of Annexure B-6 to this agreement as per which the purchaser shall pay to Seller.

3.8 On the basis of price break-up given by Seller in Annexure B-6, the Seller shall provide month wise fund requirement in the proforma to be provided by Purchaser after receipt of price break-up from the seller.

3.9 The sale of Machinery and Equipment under this Agreement shall be governed by Sales of Goods Act and all necessary forms required for the concessional GST purposes including way bills, if applicable shall be exchanged between the Purchaser and Seller.

3.10 The total Contract Price at 3.1 (v) above is inclusive of the total amount in respect of GST, Customs duties, special excise duties, local taxes and any other taxes, duties, and levies, Entry Tax/octroi etc. (at the destination point only) imposed by law leviable on the Machinery and Equipment supplied to the Purchaser on the Machinery and Equipment dispatched from Seller's works and/or on finished bought out items supplied directly to the Site from sub-sellers/contractors works. All the above details of taxes, duties and special excise duties actually paid by the Seller shall be shown separately for own manufactured items and for bought out items and claimed by the Seller from the Purchaser in each invoice/bills to be submitted by the Seller.

The amount shown in Seller's bill for payment of all such taxes, surcharges and duties will be computed on the basis of relevant statutory provisions in force on the date of dispatch and shall be the actual amount as paid by the Seller.

Any increase or decrease in taxes or duties will be made applicable to both the Purchaser & Supplier subject to the authenticated proof. Any positive/ negative impact of GST/ new imposition of taxes, duties, levies, cess etc will be to the account of the Purchaser from the date of implementation of GST/new imposition.

The sale of machinery and equipment under this Agreement shall be governed by the Sale of Goods Act. Necessary forms including way bills, if any under GST laws required for the tax purposes shall be furnished by the Purchaser to the Seller within prescribed time. In the event of PURCHASER's inability to provide the aforesaid forms within the prescribed period, the PURCHASER shall pay the differential Tax, Penalty and Interest to the SELLER, in case levied.

4.0 INSURANCE

The Contract Price mentioned in clause 3.1(iii) is inclusive of the charges for comprehensive transit risk, insurance charges of all Machinery and Equipment, other consumables, directly despatched to the Purchaser's sugar plant site from Seller/sub-contractors or sub-suppliers from respective places of manufacture and despatch and the transit insurance policy in respect thereof shall be arranged by the Seller at such premium rates with such insurance company as may be approved by the Purchaser and kept in full force till the actual date of commissioning and performance trial of the said Sugar Plant. All insurance charges in this respect shall be borne by Seller.

If any consignment is received at the place of destination in damaged condition or is lost in transit, the representative of the Erection Contractor will take open delivery from the carriers and will give suitable remarks in the delivery book maintained by the Station Master or other carriers about the loss or breakage in transit. The representative of the Seller shall lodge claims with the Railways or other carriers on behalf of the Seller in time with a copy to the Sellers Head Office to enable them to lodge claim with the insurance company. All realisation of claims from the carrier/railway and insurance company, whether in the name of the Seller or the Purchaser, shall be to the account of the Seller. The Seller shall supply the replacement of Machinery and Equipment, goods or parts lost or damaged in transit, free of cost delivered at 'site' to the Purchaser within the time so as to adhere to the date of commissioning i.e. by 11months from the Effective Date.

5.0 **DELIVERY**

5.1 The Seller agree to supply the said Machinery and Equipment detailed in **Annexures B-1 & B-2** of this agreement and other appendices annexed to and forming part of this Agreement, so that the supply of Machinery and Equipment shall be completed in all respects and to the satisfaction of the Purchaser so as to enable the commissioning of plant by **(16 months from date of agreement)** in which respect Time Is The Essence of the contract and subject to the term and conditions of this Agreement. The Seller is aware that the Purchaser intend to get the said equipment installed erected and commissioned by 16 months from the date of agreement to the satisfaction of the Purchaser and also that the Purchaser intend to entrust the work of erection and commissioning of the said machinery and equipments to any person, firm or company of the Purchaser's choice and the Seller hereby agree to oversee the workmanship of the erection contractor to be engaged by the Purchaser, so that the said equipment function properly when erected by the erection contractor. The Seller shall for such purpose depute their qualified engineers,

and the cost of such overseeing, including the expenses on staff deputed for the purposes are included in the Basic Price.

5.2 The Seller shall be bound and hereby agree to supply the Machinery and Equipment in conformity with the drawings, diagrams and layouts as described in the enclosed Annexures etc. and in accordance with various terms and conditions of the this Agreement.

5.3 The Seller shall submit regularly and punctually to the Purchaser, with a copy to Inspection Agency, the monthly progress report in terms of the progress made in connection with items detailed in Annexures of this Agreement. Example: The progress of placement of orders for long delivery and bought items and shifting of Machinery and Equipment, submission of drawings and approving of design drawings of machinery foundations submitted by the civil contract (appointed by the purchaser) for the execution of the civil works (by the civil contractors appointed by the Purchaser). This report should be submitted before 10th of every month from the date of signing of this Agreement. This report should also mention clearly if the progress made is satisfactory and suggestions further to realise the targets mentioned at clause 5.1 above.

5.4 The Seller shall prepare and submit to the Purchaser/Inspection Agency in consultation with the Purchaser regarding Schedule of Submission of drawings, manuals & other documents,

a) General layout of Sugar Plant (Building) including all allied units,
b) Engineering layout plan to facilitate the purchasers' architect to commence his duties of designing, estimating the cost of related civil works for the timely execution of the latter.
c) A time schedule for construction of foundations in the sequence required for the erection of the Machinery and Equipment to ensure commissioning of Machinery and Equipment by the erection contractor.

5.5 The Seller shall place orders and furnish to the Purchasers un-priced purchase orders and the order acceptance copies from respective sub-vendors for supply progressively of the following long delivery items before claiming the IInd instalment of advance and shall keep the Purchaser informed about the same.

(a) Complete boiler plant with mountings and auxiliaries.
(b) Mill and fibrizer
(c) Gear boxes for mill drive.
(d) Centrifugals
(e) Turbo Alternator set.
(f) High tension motors for fibrizer & mill drive – Thyristor Panels.
(g) Diesel Generating set.
(h) H.T. panels and transformers (H.T.)
(i) Boiler

5.6 The Seller shall deliver the 1000 kVA diesel generator set as specified in this Agreement within three months from the date of signing of this Agreement. The Civil Contractor of Purchaser shall provide necessary foundations for the same before fifteen days of its erection for which the foundation drawing shall be supplied by the Seller to the Purchaser

within one month from the date of signing of this Agreement. The load data etc. should be furnished by Seller to the Architect (of Purchaser) for vetting the foundation drawings for the said diesel set.

5.7 The Seller shall provide to the Purchaser detailed civil drawings, structural drawings, design calculations along with load data and coordinate drawings of main machinery etc. for the purpose of design and construction of machinery foundations in the manner specified in Clause 1.7 & 1.8 of Annexure B-5 so that construction of machinery foundations according to schedule referred to therein are completed by Civil Contractor to ensure commissioning of the sugar plant preferably within 16 months from date of agreement.

5.8 Even though this agreement provides that the property in the goods, equipment or machinery shall pass to the Purchaser immediately upon delivery of such goods to the Purchaser or their duly authorized agent, the Seller shall nevertheless provide necessary after sales service to the Purchaser for the said machinery when erected in conformity with the specifications laid down in Annexures B-1 & B-2 annexed, and for such purpose the Seller shall from time to time and as occasion shall arise give to the erection contractor instructions for the satisfactory erection and commissioning of the said equipments. The Seller shall supervise and if needed rectify free of cost any defects noticed at site so as to achieve guaranteed performance of the said equipments as laid down in Annexure B-7 annexed.

5.9 The said Machinery and Equipment on arrival at the Site shall be unpacked and got inspected, checked-up and verified by the PURCHASER'S erection contractor who shall, for such purpose act as agent of the Purchaser. A copy of such inspection/verification report shall be sent to the Seller who shall counter check the said report with the invoice and submit a copy of the inspection/verification report to the Purchaser establishing that the supplies have been made according to the Seller's invoice.

5.10 The checking of the machinery foundations shall be done jointly by the Seller and the Purchaser at Sugar Plant site.

6.0 DISPATCH OF MACHINERY AND EQUIPMENT

6.1 Seller agree to start the supply of Machinery and Equipments and construction of foundations and buildings specified in accordance with Clause 2 and Annexure forming part of this Agreement from effective date, so that the supply of Machinery and Equipment and construction of foundations and buildings is completed by 16 months from the date of agreement and commissioning of Machinery and Equipment effected i.e. the Sugar Plant is made ready for commercial production from the Effective Date in which respect time is the essence of the contract, subject to the terms and conditions of this Agreement.

5.2 The Seller shall submit regularly and punctually to the Purchaser, the monthly progress report in terms of the progress made in connection with items detailed in Annexures B-1 & B-2. Example: The progress of placement of orders for long delivery and bought out items, submission of drawings and approving of design drawings of machinery foundations (by Purchaser Civil Consultant/architect) submitted by the Seller's architect, (appointed by the

Seller) for the execution of the civil works (by the civil contractors) should be submitted before 10th of every month from the date of signing of the agreement. This report should also mention clearly if the progress made is satisfactory and suggestions further to realize the targets mentioned at clause 6.1 above.

5.3 The seller shall prepare and submit following to the purchaser in consultation with the Purchaser within one month of the date of signing of this Agreement,

a) Finalise the General lay out including all allied units, engineering layout to facilitate the suppliers architect to commence his duties of designing, for the timely execution of the later subjected to purchaser's approval.

b) A time schedule for construction of foundations in the sequence required for the erection of the Machinery and Equipment to ensure commissioning of Machinery and Equipment by the erection contractor.

5.4 The seller shall place orders and furnish to the purchasers the order acceptance copies from respective sub-vendors in case of bought out items for supply progressively of long delivery items, subject to the approval of purchaser, before claiming the IInd installment of advance and shall keep the purchaser informed about the same.

5.5 The Seller shall provide to the purchaser load data, coordinating drawings etc. along with foundation drawing to purchaser for the purpose of approval of design and construction of machinery foundations to enable the Purchaser to inspect/check machinery foundations according to schedule referred to therein to ensure commissioning of the sugar plant by 16 months from the date of agreement.

6.6 The foundation drawings of machinery equipments prepared by the civil consultant of the Seller shall be vetted by the Purchaser before execution.

6.7 The checking of the machinery foundations shall be done jointly by the seller and the purchaser at sugar plant site.

6.8 The Sellers shall supervise the erection, commissioning & performance work to be carried out by the Erection Contractor to the satisfaction of Purchasers. Since time is the essence of the contract, Seller shall ensure that erection work is completed by Erection Contractor in such a manner that Machinery & Equipment is commissioned by 16 months from the agreement.

7.0 VISIT TO WORKSHOP AND INSPECTION

7.1 The quality and design features and workmanship of the Machinery and Equipment shall be strictly as per Annexures B-1 to B-12 and Standard engineering practices. The Purchaser shall have the right to appoint any technical consultant to visit the place of manufacture, assembly of the Machinery and also Purchaser's Plant Site and inspect the same. The Seller and their sub-contractors for bought out items shall offer the Machinery and Equipment for inspection during the course of manufacture as well as before dispatch. Scheduled visits may be fixed by the Inspection Agency in case of major suppliers. The Seller shall give at least 3 days clear notice telegraphically/by email followed by

conformation letter to their Inspection Agency before the dispatch of the machinery to the site in case of inspection before dispatch. In case the Inspection agency feels that the inspection will be delayed before dispatch, they will accordingly send a certificate to the Seller with an instruction to dispatch the material attaching the certificate itself. Such materials will be inspected at Site. The Seller shall supply the necessary details of designs with calculations and drawings wherever required by the Inspection Agency for the verification of the details of specification and for the purpose of inspection as incorporated in the Agreement. The Purchaser or their Inspection Agency shall send the Seller within two months of signing of the Agreement, the list of items of machinery and equipment requiring inspection before dispatch. The Purchaser or their inspection agency shall have the right to reject any material or assemblies or sub-assemblies if these are not of the specified quality and workmanship on the grounds that they cannot be rectified.

7.2 The Purchaser or their nominee shall be within their rights to bring to the notice of the Seller any deviations observed from the specifications including the Annexures B-1 & B-2 or standard engineering practices and the Seller shall be required to rectify such defects and deviations, if any, at their own cost. Such inspection by the Purchaser or their nominees shall not absolve the Seller from their responsibility of supplying the Machinery and Equipment in accordance with the Annexures B-1 to B-13 and terms of the Agreement. Seller shall provide free of cost the necessary facilities to the Inspection agency for proper inspection and testing of the equipment at Seller's or his sub-contractors works.

Provided that in case of any major change in procedure, the Inspection Agency shall give sufficient advance intimation to the Seller.

The Seller shall also provide inspection facilities normally available at the plant site for machinery inspection.

7.3 The Seller or their sub-contractors shall also convince the Purchaser and/or their Inspection Agency that adequate provisions have been made (1) to carry-out instructions of the Purchaser and/or the Inspection Agency fully and with promptitude (2) to ensure that parts or materials required to be inspected are not used before inspection; and (3) to prevent rejected materials or parts from being used.

7.4 Where parts, assemblies or sub-assemblies not approved/passed by the Inspection Agency have been rectified or altered, such parts, assemblies or sub-assemblies shall be segregated for separate inspection and approval before being incorporated in the Machinery and Equipment.

7.5 The Purchaser or their Inspection Agency shall have the right to give their inspection mark on all items inspected by them.

8.0 **TRIALS**

8.1 As soon as the machinery and equipment is ready for commissioning after completion of the supply of machinery and equipment and erection by the erection contractor of the Purchaser to the satisfaction of the Purchaser, the erection contractor of the Purchaser

shall notify in writing to the Purchaser and Seller specifying the date and time, at least **7 days** before the contractor intends to carry out, steam and water trials. steam, water, vacuum trial. Boiler fuel will be provided by the mill.

PROVIDED THAT the water, steam and vacuum trials shall be conducted by the Purchasers Erection Contractor under the supervision of the Seller for a period of **5 days** before the commissioning of the Machinery and Equipments after complete delivery by the Seller and erection by the Erection Contractor to the entire satisfaction of the Purchaser.

After the delivery of the machinery and equipment is completed by the Seller and its erection is completed by the Erection Contractor under the supervision of the Seller, the Seller shall issue a certificate to the Purchaser that they have supplied the machinery and equipment as per Annexure I to X at the contract price mentioned in Clause 3 hereinabove. The said certificate should indicate price break-up as per Clause 3.1 (i) to 3.1 (iii). The Bank Guarantees given by the Seller towards timely delivery shall not be released till the said certificate is given to the complete satisfaction of Purchaser subject to other terms and conditions of this Agreement.

8.2 After the said steam, water and vacuum trials have been completed to the entire satisfaction of the Purchaser and on their furnishing a certificate to the effect that all the machinery and equipment mentioned in Annexure B-1 to B-13 have been inspected and approved by the Inspection Agency, delivered, erected and commissioned by the PURCHASER'S erection contractor under the supervision of the Seller and as per detailed parts list of material referred to above according to the terms and conditions of this Agreement, The Seller's guarantee given in pursuance of Clause 17.2 shall be deemed to have been fulfilled.

8.3 If the tests are being unreasonably delayed by the Seller, the Purchaser through a notice require the Seller to make the tests within 30 days of receipt of such a notice from Purchaser. The Seller shall then make the test on such day within that period as notified by the Purchaser and to that effect notify the Purchaser in writing.

If the Seller fails to make the tests within 30 days after receipt of the notice, the Purchaser may himself proceed with the tests. The tests so made by the Purchaser shall be at the risk and cost of the Seller and the cost thereof shall be deducted from the contract price. The tests shall then be deemed to have been made in the presence of the seller and the results of the tests shall be accepted as accurate.

9.0 PERFORMANCE TRIAL AND GUARANTEE:

9.1 The Seller hereby guarantee:

(a) That all the Machinery and Equipment are supplied as specified in Annexure B-1 to B-12 of this Agreement.

(b) That all the machinery and equipment will be brand new of latest design and first class material and workmanship. Any part found defective within thirty six months from the date of commissioning of the Sugar Plant, shall be replaced or

satisfactorily rectified by the seller free of charge, should such defect be due to either faulty design, workmanship or use of defective material.

(c) Entire Machinery and Equipment shall perform to establish the parameters detailed, under Annexure-B-7 and B-8 to this Agreement for guaranteeing the same the Seller shall issue to the purchaser bank guarantees as detailed at clause17.1.(iv).

9.2 To get the above performance guarantee released, the Seller shall conduct the Performance trial before the end of second crushing season. The Purchaser shall give 20 days clear notice to the Seller for witnessing the Performance Trial. The Performance Trial should be conducted in the presence of authorised representative of:

(a) Purchaser
(b) Seller
(c) National Federation of Cooperative Sugar Factories Limited, New Delhi
(d) National Sugar Institute Kanpur
(e) U.P. Co-operative Sugar Factories Federation Ltd, Lucknow

The above said committee would tabulate the results achieved during the trial period of seven consecutive days for the Machinery and Equipment indicating clearly whether performance has been achieved or not (reference format is given under Annexure-IX and X to this Agreement) .

9.3 If the trials referred to in clause 9.2 are completed according to Clause 9.1(c) and to the satisfaction of the representatives mentioned above, or in their absence to the satisfaction of Committee constituted of persons mutually agreed upon by the Purchaser and the Seller, a certificate to that effect shall be issued by the Purchaser to the Seller. On furnishing of such a certificate by the Purchaser, the Machinery and Equipment shall be deemed to have achieved the guaranteed performance and performance guarantees provided by the seller under clause 17.1(iv) of this Agreement shall be released to the Seller.

9.4 The Performance Trial shall be conducted before end of the second crushing season after rectification of all the defects/problems faced during the first season

If the duration of the first crushing season after commissioning of the Sugar Plant turning out to be less than 45 calendar days, the same shall not be deemed as the “First Season” for the purposes of fulfillment of the obligations under the performance guarantee and in such an event, the subsequent two seasons shall be deemed as “First Season” and “Second Season” respectively for the said purposes.

9.5 If the Purchaser fail to make necessary arrangements including the supply of cane even in the second crushing season after the date of commissioning, the Machinery and Equipment will be deemed to have been taken over by the Purchaser and the Performance Trial will be presumed to have been performed in accordance with the standards laid down in this Agreement.

9.6 The capacity and efficiency of the Sugar Plant shall be deemed to have been fulfilled if after one month from the start of crushing operation, the aforesaid performance is achieved on each day during seven consecutive days with all the items of Machinery and Equipment of Sugar Plant working as per capacities and efficiencies stipulated in Annexure B-5 to this Agreement.

Note: Achievement of all performance parameters as given in Annexure-B-5 to this Agreement are essential for final approval of Performance Trial.

10.0 DAMAGE TO PERSONS

During and until the commissioning of the machinery and equipment the Sellers shall be fully responsible for any loss or damage to persons and property resulting from any cause whatsoever connected with the supervision of erection work and the Sellers shall provide at his own cost, for his persons visiting the site/working at the site insurance for death or bodily injury suffered by them.

In every case in which by virtue of the provisions of the Workmen's Compensation Act 1923, the Purchaser are obliged to pay compensation to a workman employed by the Sellers or by any of their sub-contractors in the execution of the work, the Purchaser will recover from the Sellers the compensation so paid, and without prejudice to the rights of the Purchaser under any Section of the said Act, the Purchaser shall be at liberty to recover such amount or any part thereof by deducting it from the sum due to the Seller whether under this contract or otherwise, or realize the same from the Seller as arrear of land revenue..

The Purchaser shall not be bound to contest any claim made against it under any Section of the said Act, except on the written request of the Seller and upon their giving to the Purchaser, full security for all costs for which the Purchaser might become liable in consequence of contesting the claim.

11.0 PURCHASER'S RESPONSIBILITY

(a) The Purchaser shall provide suitable space for storing all Machinery and Equipment within 100 meters of the Sugar Plant, free of charge, to the Seller.

(b) The details of essential fabrication works to be done at Sugar Plant site shall be furnished by the seller to the purchaser/Inspection Agency well in advance, the Purchaser will, on the request of Seller, provide suitable area for site fabrication of items.

(c) The Purchaser shall provide a separate electricity connection of at least 100 KVA capacity for site fabrication, in accordance with above, for which a separate energy meter will be installed by the Purchaser so that the Seller notwithstanding any thing contained in clause / OCG of this Agreement, pays to the Purchaser the actual cost of electricity consumed for site fabrication purpose.

(d) The Purchaser shall provide at their own cost to the seller adequate water supply at factory site.

(f) The Purchaser shall provide, free of cost, sufficient electricity for start up of Machinery and Equipment including free of cost electricity for trial and commissioning for the Sugar Plant. For this Seller will install 1000 kVA DG sets and the cost of HS Diesel will be borne by the purchaser.

(g) The Purchaser shall pay the required statutory inspection and other fees and charges payable under the provisions of any Act or Regulations in respect of the installation, operation or use of Machinery and Equipment and get the approval thereof. The Purchaser shall also be responsible to submit the desired application timely to the concerned authorities and to obtain the desired certificate/approvals.

(h) To provide motorable approach road from the main road to the site with culverts where ever required which will be constructed by Civil Contractor.

(i) To arrange free of cost fuels for boilers required for Performance Trial and commissioning.

(j) The Purchaser shall arrange adequate supply of cane at the cane carrier during the Performance Trial.

(k) Accommodation as available at site shall be provided by Purchaser to Seller staff free of charge. In case of insufficient residential accommodation with mills, Seller has to arrange of his own for which no compensation will be given by Purchaser. Seller has to arrange for medical facility for his staff at site, for which no compensation will be given by the Purchaser.
The electricity will be provided for staff Quarters to Seller on payment basis and water will be provided at the cost of Purchaser. Staff of Seller should not misuse the electricity and water.
All other arrangements for food etc will be made by the Seller.

(l) The Purchaser will timely approve or give comments for revision on various drawings, schedules etc. which are to be submitted by the Seller as per provisions of this Agreement and AnnexureB-5

12.0 **SELLER'S RESPONSIBILITIES** :

(a) Will provide tentative layout, General layout, engineering layout, material flow diagram, price break-up, billing schedule, delivery time schedule, detailed civil drawings, structural drawings, design calculations along with load data and coordinate drawings of main machinery, manuals and other documents of the plant & machinery to be supplied by the Seller as per schedule given in Annexure B-5. All types of tools and tackle for erection work will be in scope of seller.

(b) Within 30 (Thirty) days of the signing of this agreement the Seller shall indicate the equipment wise break-up prices for major items of the Machinery and Equipment. The monthly fund requirement schedule and quarterly billing schedule should also be submitted within 30 (Thirty) days of signing of this Agreement.

(c) Within 2 (Two) months from the date of receipt of first advance payment, the Sellers shall handover the list of basic tools, tackles and stores needed for the maintenance of the Machinery and Equipment.

(d) The Seller undertake to handover within 30 days from the date of issue of LOI, a time schedule of deliveries relating to major equipment and erection work by the erection contractor of the Purchaser which if adhered to, will enable completion of erection and putting into operation the Machinery and Equipment by 16 months from the date of agreement.

The delivery schedule shall be finalized with the approval of the Purchasers within one month of date of issue of LOI.

Once finalized the delivery schedules shall be reviewed jointly by the Purchaser, Seller and if required, the same may be amended without affecting the scheduled date of commissioning i.e. by 16 months from the agreement Date by the Purchaser.

PROVIDED FURTHER that if before the time of review any extension of time is granted by the Purchaser, as per “Force Majeure” clause, the same shall be taken into account.

(e) The Seller undertake to hand over to the Purchaser six copies of the drawings and maintenance manuals with description and detailed instructions as per Annexure attached herein.

(f) Within one month of signing of this Agreement a tentative MS Project Chart comprising Seller’s scope shall be finalized with the mutual consultation between the Purchaser and the Seller within two months after signing of this Agreement. Thereafter, before the end of every three months, necessary details shall be furnished by the Seller to the Purchasers for the preparation of revised MS Project net work.

(g) The deliveries of materials shall be accompanied with clear detailed packing lists in duplicate, noting therein-gross weight of the packages as well as the net weight, wherever possible. However, in case of /stainless steel tubes, net weight must be provided.

(h) All pipelines excepting steam and water upto 10” dia, should be provided with flanges as required to facilitate, easy dismantling whenever cleaning is necessitated. The fabrication of steam lines are to be as per IBR.

(i) Good quality jointings shall be used at all flanged points commensurate with the pressure as well as the materials to be handled.

(j) Railings and staircases for Machinery and Equipment as per the specifications and as per Factories Act shall be provided at all the required places at no extra cost.

(k) Boiler refractory work: The Seller shall have to provide all necessary refractories, both ordinary and special inclusive of standard and special fire bricks, fire cement, fire clay, asbestos ropes, asbestos sheets, etc. for boiler chimney and hot air ducts. The duct between the boiler and chimney and the entire boiler work will also be the Seller's responsibility.

(l) Seller will submit for approval within time all the drawings, schedules etc. as mentioned in various clauses of this Agreement and as per Annexure__. He will make necessary changes/amendments in drawings, schedules etc. as per comments/suggestions of Purchaser so that the plant can be commissioned within time.

(m) All spare parts will be in the scope of seller for three complete crushing season and two off-season after commissioning of plant excluding consumables like lubricants (after first filling), packing,jointing, nickel screen (after initial sets), grader screen (after initial sets), lime, all types of chemicals, sugar packing bags, packing material,roller arcing electrode.

(n) Manpower for erection & commissioning will be in the scope of seller.

(o) The seller shall provide at their own cost adequate technical staff and labour, including skilled and un-skilled for steam and water trials.

(p) The seller shall operate & maintain the plant for three crushing season and two off-season, after commissioning of plant. The season less than 45 days will not be termed as complete crushing season and this will be treated as zero season.

13.0 **PATENT**

The Seller shall hold and save the Purchaser, its officers, agents, servants and employees harmless from liability of any nature whatsoever or kind including costs and expenses for or on account of any copyright or uncopy right, composition, article or manufactured or used in the performance of this Agreement including their use by the Purchaser unless otherwise specifically stipulated in this Agreement.

In the event of any claim or demand being made or action being brought against the Purchaser for infringement of patent in respect of any machine, plant used or supplied by the Seller under this Agreement or in respect of any method of using or working by the Purchasers or such machine, plant or thing, the Seller will indemnify the Purchaser against such claims or demand and all costs and expenses arising from or incurred by reason or such claim or demand.

PROVIDED THAT the Purchaser shall notify in writing the Seller immediately if any claim is made and that they shall be at liberty, if they so desire, with the assistance of the Purchaser if required, but at the Seller's own expenses, to conduct all negotiations, for the settlement of the same, or any litigation that may arise therefrom, and

PROVIDED THAT no such machine, plant or thing shall be used by the Purchaser for any purpose or in any manner Agreement other than that for which they have been supplied by the Seller as specified in this Agreement.

14.0 **FORCE MAJEURE**

14.1 **Definition**

(a) The right of the Seller to proceed with the work shall not be terminated as provided in Clause 30 because of any delay in the completion of the work due to unforeseen causes beyond the control and without the fault or negligence of the Seller or their sub-contractors including (but not restricted to) Act of God or Public enemy, action of Govt. in its sovereign capacity, floods, epidemics, quarantine, strike, lock-outs, fires, explosions, accident, stoppage in the supply of power, civil commotion, riots, etc. In the event of any of the aforesaid contingencies, unusual or extra ordinarily prolonged, the Purchaser will be promptly kept informed by the Seller by Fax/ E-mail followed by confirmation in writing with documentary proof within 15 days of the commencement and completion of Force Majeure circumstances. This Force Majeure clause shall also apply to major sub-contractors of Seller.

(b) Force Majeure shall not include (i) any event which is caused by the negligence or intentional action of a Party or such Party's Sub- Consultant or agents or employees, nor (ii) any event which a diligent Party could reasonably have been expected to both (A) take into account at the time of the conclusion of this Agreement, and (B) avoid or overcome in the carrying out of its obligations hereunder.

(c) Force Majeure shall not include insufficiency of funds or failure to make any payment required hereunder.

14.2 Measures to be taken

(a) A Party affected by an event of Force Majeure shall take all reasonable measures to remove such Party's inability to fulfill its obligations hereunder with a minimum of delay.

(b) A Party affected by an event of Force Majeure shall notify the other Party of such event as soon as possible, and in any event not later than 14 (fourteen) days following the occurrence of such event, providing evidence of the nature and cause of such event, and shall similarly give notice of the restoration of normal conditions as soon as possible.

(c) The Parties shall take all reasonable measures to minimize the consequences of any event of Force Majeure.

14.3 Extension of time

No time extension will be given except force majeure.

15.0 **TERMS OF PAYMENT**

15.1 The Purchasers shall pay the contract price in the following manner:

15.1.1 Rs._____ paid as first advance being 10% of the contract price alongwith applicable taxes and duties thereon on/after signing of this Agreement

against furnishing an Bank Guarantee of 10% of the contract price of Rs. _____/- (Rupees _____only) by the Seller as per format annexed herewith as Annexure___ and valid till completion of supplies. The advance given shall carry interest @ 12% per annum on reducing balance from the date of issue of cheque/bank draft till the progressive adjustment in the bills.

15.1.2 Rs. _____/- (Rupees _____only) paid as second advance being 10% of the Contract Price alongwith applicable taxes and duties thereon on written request after utlization of first advance fulfilling the following contractual obligations by the Sellers. The advance given shall carry interest @ 12% per annum on reducing balance from the date of issue of cheque/bank draft till the progressive adjustment in the bills. However, if the seller fulfills his contractual obligations, the release of above advance can be preponed accordingly.

a) Furnishing the Bank Guarantee amounting Rs. _____/- (Rupees _____only) for the first & second advance as per format annexed herewith as Annexure___ and valid till completion of supplies.
b) Placing orders of the items as mentioned in clause 5.5 and handing over order acceptance copies to the Sugar mill.
c) Statement showing the detailed price breakup of the contract price as per clause 1.1
d) The proof of order acceptance by the Parties for supplying long delivery items should indicate clearly the items of order placed on them with major technical specifications, agreed date of delivery and should also confirm that the said items are for the Sugar mill. The above proof need not contain the commercial aspects of the items concerned.
e) Complying all other contractual obligations which have become due upto that time.
f) In the event of non-submission of the timely delivery guarantee by Seller to the Mills as per tender, the Mill shall deduct 10% of the gross amount.

All the above instalments of advance payment shall be utilised by the Seller for the purpose of procurement of materials/equipment required for the said Machinery and Equipment only. The seller shall produce a utilisation certificate of the first advance, for placement of orders of all bought out items as envisaged in clause 5.4. They shall also furnish the proof and confirmation by the sub suppliers of seller with details mentioned as above, in respect of bought out items.

The Bank Guarantees referred to above from sub-clause 15.1.1 to 15.1.2 shall be automatically adjusted and get reduced with the progress of delivery of material to the

extent of total value of Machinery and Equipment dispatched by the Seller upto that time.

15.1.3 After adjusting proportionate amount of advances and interest due there upon as per clause 15.1.1 & 15.1.2 and other debits if any from the bill, balance amount will be paid for each bill. The payment will be made for own manufactured and bought out items on receipt of material at site subject to the Seller complying with all contractual obligations which have become due upto that time, operable against memorandum of payment accompanied by the following documents to be presented by the Seller in support of actual dispatch of machinery/ equipment of the plant, duly endorsed in favour of the Sugar mill:

a) Photocopy of inspection report of the inspection agency in respect of items which are required to be inspected before dispatch.
b) Original invoices, dispatch list and photocopy duly attested by the Seller) of Railway Receipt/goods receipt to be presented by the Seller against full part of the machinery supplied. In every invoice, the Seller shall give reference of the detailed billing list against each items of Machinery and Equipment supplied. Seller will also submit Manufacturer's test certificate if required as per terms of this Agreement. Seller will also submit certificate of insurance of the goods dispatched.
   Photocopy bills for GST, invoices and gate pass showing the actual amount of GST paid on all bills so as to ensure that the Purchaser gets the applicable GST credit.
c) However, the Purchaser and Seller by mutual consent may agree to make alternative financial arrangement for retiring documents through bank. Any wharfage or demurrage attributable to the Seller shall be borne and payable by the Seller and shall be the resposnibiltiy of the Seller only. In case the machinery is transported by road, the same shall be transported through approved transporters and duly insured. Provided further that the Seller shall not charge any escalation in any bill for the base price of any consignment.

15.1.4 If the Purchaser fail to make payments during the period this Agreement remains in force, for materials already inspected and received at site, the Seller shall be entitled to payment of interest at @ 12% per annum of such aforementioned materials/equipment (after duly adjusting the proportionate payment of advances, proportionate amount of interest due on advance paid, retetntion amount towards warranty and deducting the proportionate amount of un-furnished bank guarantees for timely delivery of machinery and equipoment and performance of machinery and equipment) after the expiry of 45 (Forty Five) days from the actual date of receipt till such time financial arrangements

are made by the Purchaser. However the purchaser will not be held responsible for default in making timely payment due to delay in disbursement of loan.

The Seller shall provide all relevant records, documents to the Purchaser/Inspection Agency and make necessary arrangement for their physical verification to establish that such Machinery and Equipment have actually been despatched/kept ready for despatch after due inspection and acceptance. However, the Seller shall not be entitled to payment of any interest, if the Seller diverts the Machinery and Equipment after inspection and if there is any delay in despatching the Machinery and Equipment after the same is ready for despatch due to no fault of the Purchaser.

15.1.5 The Seller shall not sell or divert any material, sub-assemblies, Machinery and Equipment meant for the Sugar Plant of the Purchaser, after the same have been inspected by the Purchaser, or authorised representative of the Purchaser, under any circumstances, without prior written consent of the Purchaser as per terms of this Agreement.

15.1.6 All bank charges for retiring the documents through any means for payment of the contract price shall be borne by the Purchaser. The seller, however, shall furnish the relevance/ proof of such bank charges incurred by them.

16.0 **PENALTIES/Liquidated damages:**

16.1 Liquidated damages for delay in delivery:

To secure the contractual obligations under this Agreement, the Seller shall be liable to pay the following penalties, if the Seller,

Fail to deliver any or all the Machinery & Equipment with errection and Commissioning within the time specified in this Agreement, they shall pay liquidated damages for delay by an amount equal to 1/2% (Half per cent) per week or part thereof on the unsupplied machinery and equipment or the part which has not been executed by the Seller, of the contract price but not exceeding 10% (Ten per cent) of the Total contract price.

For this Timely Delivery Bank Guarantee will be provided by the Seller, within 30 days from the date of agreement, for 10% (Ten per cent) of contract price mentioned at 3.1v amounting to Rs. ..... lakhs (Rupees .....) only. This guarantee shall be against timely delivery of Machinery and Equipment and will be and reduced with the progress of supply of Machinery and Equipment. This guarantee shall be valid upto 60 days (sixty days) after the scheduled date of completion of supply & commissioning of entire Machinery and Equipment.

17.0 **BANK GUARANTEE/FDR/SECURITY**

17.1 To secure the contractual obligations as per this Agreement ,the Seller at their own cost shall furnish to the Purchaser, the following four bank guarantees, in favour of Purchaser, by a Nationalised. All the guarantees shall be in the formats enclosed as Annexures B-9, B-10 to this Agreement.

(i) **Bank Guarantee for 1st Advance** – A bank guarantee for receiving the first advance of 10% of contract price mentioned in Clause 3.1(iii) amounting to Rs. ..... lakhs (Rupees .....) only. This guarantee will be automatically adjusted and reduced with the progress of supply of Machinery and Equipment.

(ii) **Bank Guarantee for 2nd Advance** – A bank guarantee for receiving the second advance and on fulfilling the obligation mentioned in Clause 15.1.2 (a), (b), (c), (d), (e) and (f) for 10% of contract price mentioned in Clause 3.1(iii) amounting to Rs.....lakhs (Rupees .....) only. This guarantee will be automatically adjusted and reduced with the progress of supply of Machinery and Equipment.

(iii) **Timely Delivery Bank Guarantee** – A bank guarantee, within 30 days of signing of agreement, for 10% (Ten per cent) of Total contract price mentioned amounting to Rs..... lakhs (Rupees .....) only. This guarantee shall be valid upto 60 days (sixty days) after the scheduled date of completion of supply & commissioning of entire Machinery and Equipment, and will be returned after 60 days of successfull commissioning date after deduction of any penalty on account of late delivery, if any.

(iv) **Performance Security FDR/Bank Guarantee** – The Performance Security will be equivalent to 5 % (Five percent) of the value of the Total contract price (including GST) of all civil work, supply, erection & comissioning of project rounded to the nearest multiple of hundred in form of F.D.R. (Auto Renewed)/ Bank Guarantee pledged in the name of Sugar Mill.

Performance Security FDR/Bank Guarantee is to be furnished by a specified date (within days days from the date of agreement) and it will remain valid for a period of 30 (thirty) days beyond the date of completion of all contractual obligations of the supplier, including warranty obligations.

Forfeiture of Performance Security FDR/Bank Guarantee:

Performance security FDR/ Bank Guarantee is to be forfeited and Amount credited to Sugar Mill Account in the event of a breach of contract by the seller and project is not commissioned and got performance trial with in specified time mentioned in Tender Document/Agreement.

Return of Performance Security FDR/ Bank Guarantee:

Performance Security FDR/ Bank Guarantee will be returned to the supplier without any interest, whatsoever, after it duly performs and complete the contract in all respects under the contract including performance trial and warranty obligations.

17.2 **SECURITY MONEY**

Security money will be 5% of the Contract price (excluding GST). This security money will be deducted on pro-rata basis from every bill.

This Security Money will be refunded in two part as mention below:

1. 60% of security Money deducted as mentioned above will be returned to seller/successful bidder, after successful commissioning date on request.
2. Rest 40% of security money will be returned after 30 days from the date of end of 3rd crushing season. (crop days less than 45 days will not be considered as complete crushing season)

17.3 If the Seller shall abandon this contract or otherwise fail to supply and deliver the Machinery and Equipment within the scheduled period or any extension thereof granted by the Purchaser, or if the work or any part thereof is taken out of the Seller's hands under Clause 13.0 and in any such case the Seller shall refund to the Purchaser within 30 days of demand such part of the advance payments thereunder made to them. The Purchaser shall have the right to proceed in any manner, as deemed fit, to protect their interest.

17.4 The bank guarantee or guarantees required to be furnished by the seller under the provision hereof to secure the timely delivery and establishment of performance parameters of the Machinery and Equipment supplied by them or for any other purpose under the provisions hereof shall be in the format is given in Annexures B-9 to B-11 to this Agreement, which formats shall invariably include the provision that the decision of the Purchaser as to whether there has been any loss or damage or default and or negligence on the part of the Seller will be final and binding on the guarantor, that the right of the Purchaser shall not be affected or suspended by reason of the fact that any dispute or disputes have been raised by the Seller with regard to their liability or that proceedings are pending before any tribunal, arbitrator(s) or court with regard thereto or in connection therewith, that the guarantor shall pay to the Purchaser the sum under the guarantee(s) without demur on first demand and without requiring the Purchaser to invoke any legal remedy that may be available to them, that it shall not be open to the guarantor to know the reasons of or to investigate or to go into the merits of the demand or to question or to challenge the demand or to know any facts affecting the demand or to require proof of the liability of the seller before paying the amount demanded by the Purchaser under the guarantee(s). In case of invocation of any bank guarantee/s the Purchaser represented by the General Manager of the _____ shall have the full and total rights. The invocation need to be countersigned by Managing Director,U.P. Cooperative Sugar Factories Federation Limited, Lucknow (U.P.).

17.5 The Bank guarantee or guarantees required to be furnished by the Sellers under the provisions hereof to secure the timely delivery or performance of the Sugar Plant and Machinery and Equipment to be supplied by the Seller or for any other purpose under the

provisions hereof shall be for such period as may cover the period of complete supply and establishment of performance parameters respectively as stipulated under this Agreement. If, however, the period of Agreement is extended due to force majeure or Seller not fulfilling their obligations under this Agreement or for any other reasons whatsoever, Seller shall have such guarantees extended upto the corresponding extended period. Failure of the Sellers to do so will amount to a breach of this Agreement and in no case the extension of the period of this Agreement shall be construed as waiver of the right of the Purchasers to enforce the guarantee.

17.6 If the purchaser desires to get extended validity period of guarantees due to non-fulfillment of any clause of this Agreement, then the Seller has to get extended the validity of Bank Guarantee till the period as desired by the Purchaser.

17.7 All guarantees will be irrevocable except with the written consent of the Purchaser.

17.8 Bank Guarantees submitted by the sellers will be got verified from the issuing Bank after acceptance.

18.0 **PACKING MATERIALS**

18.1 Since the cost of packing materials will be borne by the Purchaser, all containers (including packing cases, boxes, tins, drums and wrapping etc.) in which machinery and equipment and stores will be supplied shall be considered non-returnable to the Seller. Transit Insurance for all machine and equipment will be in scope of seller.

19.0 **EXCESS MATERIALS** :

To expedite, their contractual obligations the Seller may dispatch the materials such as, structural steel, plates, piping, valves, fittings, consumables, cables and wires, hardware, insulation materials, refractory bricks, lubricants, paints etc. more than actually required for completion of work as per this Agreement. Such materials if are found surplus after the completion of work and commissioning the Machinery and Equipment and final inspection by the Inspection Agency shall be treated as the property of the Seller and shall be taken back by them without the approval of the Purchaser.

Any shortages in scope of supply of the Seller shall be made good by Seller free of cost, in time so as to adhere to the date of commissioning.

20 SETTLEMENT OF DISPUTES

20.1 Amicable settlement

The Parties shall use their best efforts to settle amicably all disputes arising out of or in connection with this Agreement or the interpretation thereof.

20.2 Dispute resolution

20.2.1 Any dispute, difference or controversy of whatever nature howsoever arising under or out of or in relation to this Agreement (including its interpretation) between the Parties, and so notified in writing by either Party to the other Party (the “Dispute”) shall, in the first instance, be attempted to be resolved amicably in accordance with the conciliation procedure set forth in Clause 20.3.

20.2.2 The Parties agree to use their best efforts for resolving all Disputes arising under or in respect of this Agreement promptly, equitably and in good faith, and further agree to

provide each other with reasonable access during normal business hours to all non-privileged records, information and data pertaining to any Dispute.

20.3 Conciliation

In the event of any Dispute between the Parties, either Party may call upon, Managing Director, U.P. Cooperative Sugar Factories Federation Limited,, Lucknow and upon such reference, the said persons shall meet no later than 10 (ten) days from the date of reference to discuss and attempt to amicably resolve the Dispute. If such meeting does not take place within the 10 (ten) day period or the Dispute is not amicably settled within 15 (fifteen) days of the meeting or the Dispute is not resolved as evidenced by the signing of written terms of settlement within 30 (thirty) days of the notice in writing referred to in Clause 20.2.1 or such longer period as may be mutually agreed by the Parties, either Party may refer the Dispute to arbitration in accordance with the provisions of Clause 21.

21.0 **ARBITRATION** :

Solely for the purposes of settlement of any dispute arising between the parties out of this agreement, the contractor shall be treated as an agent of the mill and any dispute arising out and between the parties to this agreement shall be referred to arbitration to the Registrar in accordance with Section 70 of the UP Cooperative Societies Act, 1965.

22.0 **TRANSFERABILITY OF THE CONTRACT** :

The Sellers shall not transfer their rights and obligations arising out of or in relation to this Agreement except with the prior written consent of the Purchaser.

23.0 **NEGLIGENCE OF THE SELLERS** :

If the Sellers shall neglect to design, prepare engineering layout, manufacture or supply the Machinery and Equipment or to Supervise erection and commissioning or to Supervise civil Constructions works, the same with due diligence and expedition or refuse or neglect to comply with any reasonable orders given to them in writing by the Purchaser in connection therewith, the Purchaser may give notice in writing to the Seller to make good within a reasonably specified time, the failure, neglect or contravention complained of, and if the Sellers still without reasonable cause fail to comply with the notice within the time specified in the notice (to be reckoned from the date of receipt of notice by the Sellers) the Purchaser may take over the work of manufacture, supply, supervision of the erection, supervision of the commissioning of equipment and supervision of civil construction works as a whole or in part out of the Seller's hands and/or may give it to another person on contract at a reasonable price and are entitled to recover any excess cost thus incurred by the Purchasers or make it good from any bills or dues of the Seller pertaining to this Agreement or recover such amount from the Seller in any lawful manner.

24.0 **WARRANTY** :

24.1 For a period of three complete crushing seasons and two off-seasons after successful commissioning of plant & machinery or 36 months from the date of successful commissioning whichever is later. The net crop days of crushing season less than 45 days

will not be termed as coplete crushing season and will be termed as zero season. The Seller shal remain liable to rectify/ replace any machinery & equipment or parts thereof, such as may be found to be defective or below the rated capacity.

24.2 If it becomes necessary for the Seller to replace or renew any defective part of the machinery under this clause, the provisions of the first paragraph of this clause shall apply to the parts of the Machinery and Equipment so replaced or renewed until the expiration of six months from the date of such replacement or renewal or until the end of the aforesaid warranty period of three crushing seasons, whichever is later.

24.3 The rectification or new parts will be delivered F.O.R. Purchaser factory site. The Seller shall also bear the cost of rectification/replacement carried-out on their behalf by Purchaser as mentioned above at the sugar factory site. At the end of the warranty period, Seller's liability shall cease. In respect of Machinery and Equipment not covered by the first paragraph of this clause, the Purchaser shall be entitled to the benefit of any guarantee given to the Seller by the original supplier of the manufacturer of such plant and machinery. However, in case of diesel set the warranty period shall be reckoned from the actual date of commissioning of the said equipment.

24.4 The responsibility of the Seller for rectification/replacement under this clause shall extend to the actual cost of rectification/replacement of the defective items of Machinery and Equipment and shall not in any way be deemed to be limited to the amount of the performance guarantee. At the expiry of the warranty period, the FDR/Bank Guarantee furnished by the Seller against the Performance Security shall be invoked if the Purchaser has incurred the cost of repairs/replacement of any of the Machinery and Equipment during the Warranty period and shall recover the said cost from the amount of the Bank Guarantee and refund the balance if any to the Seller. In case there are no costs incurred by the Purchaser, the Bank Guarantee shall be returned to the Seller after 90 days of expiry of the warranty period.

24.5 The SELLER's obligations under 24.1 to 24.4 shall cease forthwith:

(a) If the PURCHASER has not operated the Machinery and Equipment according with the conditions of operation or due to negligence of PURCHASER.
(b) If the PURCHASER has not notified the SELLER in writing as soon as any defect occurred.
(c) If the Machinery and Equipment is spoilt or becomes defective for reason not attributable to SELLER, such as due to PURCHASER's fault or due to fire, flood, earthquake, other Acts of God and natural hazards, accidents and damage from other Equipment of the PURCHASER.
(d) In cases of normal wear and tear.

24.6 The PURCHASER's exclusive remedy and the SELLER's sole obligations shall be those stated herein. There are no other warranties whether expressed or implied.

24.7 The Warranty shall not apply to any machinery or equipment in Power Evacuation System and any other items supplied by the PURCHASER in its scope.

24.8 The Sellers shall provide one supervisor for the following stations at their own expense for the first crushing season in order to assist the Purchasers in the working and maintenance of these stations of the sugar plant (i) boiler, (ii) all instruments, (iii) centrifugals.

25.0 **FOREIGN EXCHANGE** :

Any foreign exchange required for import of raw materials or equipment shall be arranged by the Sellers. Non-availability of foreign exchange shall not entitle the Sellers any extension of time.

26.0 **GENERAL LIGHTING**:

Materials for General lighting for the factory premises shall be supplied by the Seller for their Scope of supply as per Annexure – B-1 to B-12.

27.0 Unless otherwise specifically agreed, any concession shown by the parties to the Agreement to one another shall not prejudice their individual rights under this Agreement.

28.0 POWER TO CLOSE WORK

If at any time after signing this Agreement ,the Purchaser shall, in order to comply with any directives of the Government of Uttar Pradesh not require the whole or any part of the work relating to designing, preparing engineering lay out, manufacturing, procuring, supplying of the proposed said plant under the terms of this Agreement, to be carried out, the Purchaser shall give notice in writing of the fact to the Sellers who shall have no claim to any payment by way of compensation or otherwise on account of any profit or advantage which they might have derived from the execution of the said work in full but which they could not derive in consequence of the giving up of the work before completion. The Sellers shall be paid at contract rates for the full amount of work, any labour and material collected at site or arrangement made for execution of the work which could not be utilised either fully or partially on the work on account of the giving up of work as aforesaid. Where partial utilisation of material and arrangements as aforesaid has been made, the payment will be made in proportion to the value of the work done to the satisfaction of the Purchaser to the value of the whole work covered by the contract.

In the event of the closing of the work as above the Sellers undertake to refund within 60 days all outstanding unutilised and unadjusted amount of the advance payment, if any, thereafter with interest at the lending rate of banks prevailing at that time.

29.0 **Termination of Contract**

The Purchaser reserves the right to terminate the whole or part of this Contract due to any or all the following conditions :

29.1 If the Seller assigns the contract, or sub-let the whole of the Contract without the consent of the Purchaser and Sellers has failed or refused to take remedial steps, or the Purchaser shall certify that the Sellers:

a) Has abandoned the contract, or
b) has without reasonable excuse suspended performance of the contract for 30 days after receiving from the Purchaser written notice to proceed, or
c) Despite previous warnings in writing from the Purchaser is not manufacturing/supplying/erecting the Plant and equipment in accordance with the Contract, or is failing to proceed with due diligence or is neglecting to carry out his obligations so as to affect adversely the Performance of the Contract.

29.2 The Purchaser may give 21 days' notice to the Sellers of its intention to proceed in accordance with the provisions of this Clause. Upon the expiry of such notice the Purchaser may without prejudice to any other remedy under the contract and without affecting the rights and powers conferred by the contract on the Purchaser, terminate the Contract. Upon such termination the Purchaser shall be entitled to itself complete the Plant and equipment, in which event the Sellers shall deliver the Plant and equipment in its then state to the Purchaser or as the Purchaser may direct, at the Sellers's expense.

29.3 As soon as practicable after the Purchaser has terminated the Contract the Purchaser shall, by or after reference to the Parties and after making such enquiries as he thinks fit, determine the amount then due to the Sellers as at the date of termination and certify the amount thereof. The amount so certified is herein called 'Termination Value'.

29.4 Payment and termination - The Purchaser shall not be liable to make any further payments to the Sellers untill the costs of completing the Plant and equipment or obtaining substitute Plant and equipment elsewhere and all other expenses incurred by the Purchaser have been ascertained and the amount payable certified by the Purchaser (hereinafter referred to as 'the Cost of Completion'). If the Cost of Completion when added to the total amounts already paid to the Contract as at the date of termination exceeds the total amount which the Purchaser certifies would have been payable to the Sellers under the Contract on completion the Purchaser shall certify such excess and the Sellers shall upon demand pay to the Purchaser the amount of such excess. Any such excess shall be deemed a debt due by the Sellers to the Purchaser and shall be recoverable accordingly. If there is no such excess the Sellers shall be entitled to be paid the difference (if any) between the Termination Value and the total of all payments received by the Sellers as at the date of termination.

29.5 If the Purchaser have any information that the Seller has become bankrupt or insolvent, or have a receiving order made against him, or compound with his creditors, or commence to be wind up, not being a members' voluntary winding up for the purpose or amalgamation or reconstruction, or have an administration order made against him or carry on his business under an administrator or a receiver or manager for the benefit of his creditors or any of them, the Purchaser may be entitled to:

a) To terminate the Contract forthwith by 21 days' notice to the Sellers or to the receiver, manager, administrator or liquidator or to any person in whom the contract may become vested, or

b) To give such receiver, manager, administrator or liquidator or other person the option of carrying out the Contract subject to his providing a guarantee for the due and faithful performance of the Contract up to an amount to be agreed.

30.0 **INDEMNIFICATION**

Notwithstanding anything in this Agreement to the contrary, it is agreed that neither the SELLER nor the PURCHASER shall be held liable to the other party for any loss of production, loss of profit, loss of use or any other indirect or consequential damages.

31.0 **SELLER AND PURCHASER TO INFORM THEMSELVES FULLY** :

The Seller and purchaser shall be deemed to have noted that time is the essence of the contract and have carefully examined and satisfied themselves as to the terms and conditions, specifications, schedule, appendix and drawings, etc. mentioned in Annexure B-1 to B-13 and appendices attached to this agreement.
This Agreement including the Annexures, formats and appendices annexed hereto, has been executed in two original, one remains with the Purchaser and the second will remain with the Seller. By signing this Agreement, both the Parties, Purchaser and the Seller agree to abide by its clauses, any alterations, amendments or changes in this Agreement or its Annexure etc.

32 SUB - CONTRACTS :

The Seller has right to sub-contract any part of the contract to sub-contrators.
Provided that nothing contained in this clause shall be deemed, however, to create any contractual relations between the sub contractors of the one part and the Purchaser of the other part and shall not absolve the Seller from their ultimate responsibility for purpose of this Agreement.

34 **DEATH, BANKRUPTCY**

If the Sellers shall die or commit any act of Bankruptcy, or commence to be wound up except for reconstruction purpose or carry on its business under a receiver, the executors, successors, or other representatives in law of the estate of the sellers or any such receiver, liquidator, or any person in whom the contract may become vested shall forthwith give notice thereof in writing to the Purchaser and shall take all reasonable steps to prevent stoppage of the execution of this Agreement have option of carrying out the Agreement subject to his or their providing such guarantee as may be required by the Purchaser but not exceeding the value of the plant, for the time being remain unexecuted. In the event of stoppages of the manufactures of the plant the period of the option under this clause shall be fourteen days only.

Provided that, should be above option not be exercised, this Agreement may be determined by the Purchasers by notice in writing to the Sellers and the Purchaser may exercise the same power which they could exercise and will have the same rights which they could have under the clause 23 if the work has been taken out of the Sellers hands under that clause.

35.0 **OFFICIAL NOTICES AND INSTRUCTIONS**

35.1 Any official notices and instructions given by either party of this Agreement to the other party shall be in writing, and any such notice or instruction shall be deemed to have been

duly given if delivered in person to the authorized representative or mailed by Regd. Post to the address of such representative.

36.0 The High Court of judicature at Lucknow and courts subordinates there to at Lucknow (U.P.) shall alone have jurisdictions to exclusion of all other courts subject to the arbitration proceedings under clause 21 of this Agreement.

37.0 This Agreement consists of pages as below:

SL. NO.	PARTICULARS
Annexure B-1	Technical Specifications for supply, erection & commissioning of gravity flow type sugar plant
Annexure B-2	Misc. Clarifications & Elucidations
Annexure B-3 a-b	Approved list of supplier of complete sugar plants / critical & important equipments
Annexure B-4 a,b,c	Revised Consolidated procedure for inspection of sugar and brand new machinery by officers of NFCSF
Annexure B-5	Schedule of Submission of drawings, manuals and other documents
Annexure B-6	Price breakup of various equipment for cash flow and delivery schedules
Annexure B-7	Performance parameters of sugar plant for 4900 TCD per 22 hrs. basis
Annexure B-8	Performance certificate
Annexure B-9	Draft of Bank Guarantee against first and second advance payment
Annexure B-10	Draft of Bank guarantee for timely delivery
Annexure B-11	Updated guidelines for Tests and Trials before start of crushing season of a new / expanded Sugar plant
Annexure B-12	Indicative list of plant & machinery to be retained

In witness whereof the parties hereunto have set their respective hands on the aforesaid date.

for and behalf of the PURCHASER : **for and behalf of the SELLER:**

GENERAL MANAGER,

Witness

1. 1.

2. 2.

Annexure-B-1

Technical specification for supply, erection and commissioning of sugar plant of 4900 TCD on 22 hr. basis alongwith 12 MW power turbine on EPC basis for Production of Refined sugar

Equipment List

S.No.	EQUIPMENT	QTY.
A.	**MILLING PLANT**	
1.	Cane Weighbridges (10 T-37Nos, 50 T-02No., 100 T-01No., HHC sets -30 Nos.)	01 Lot
2.	Cane Unloader 3 Motion 5T, Hydraulic grab type.	04
3.	Gantry And Structure For Cane Unloader	01
4.	Truck/ trolley Tripler 60 T cap. With 10 to 12 trips perhr	01
5.	Auxiliary cane carrier with ACVFD 60 Kw drive	01
6.	Cane Carrier- 2040 mm Wide, 50 Mtr. Horizontal Length With 200 mm Pitch Chain.	01
A	Drive-(100 KW) AC V.V.F.D With Planetary Gear Box	01
7.	Cane Rake Elevator 2040 mm. Wide, 229 Mm Block Type breaking strength 80,000 Kg. Chain	01
A	Drive – VVFD -75 KW AC V.V.F.D With Planetary Gear Box.	01
8.	Cane Belt Conveyor and Equalizer Drive- 30 HP, Ac, VVFD & 10 HP and Planetary Gear Box	01
9.	Electromagnetic Type Tramp Iron Separator	01
9.	Cane Chopper 42 Knives, Swing Ø1600 X 2040 mm Wide each.	01
a	Drive-300 Kw X 1440 rpm with helical gearbox , final RPM-300	01
10.	Cane Leveller 64 Knives, Swing Dia. 1600mm X 2040 Mm Wide	01
a	Drive-300kw X 600 Rpm, CACA , H.T.S.R.	02
11.	Swing Fibrizor,160 Hammer, Swing Ø 2200 X 2040 mm Wide	01
a	Drive 1000 K.W.X750 RPM.SPDP MOTOR H.T.S.R..(One spare motor) – (02 Nos.+01 Nos. Spare Motors).	03
12.	DCS, Auto Cane Feed Control	01
13.	Mill House Crane (35 T Grabs+ 5T)	01
a	Crane Gantry (64ton.Approx)	01
14.	3 Roller Mills With 1UFR Size 1020x2040	02

a	3 Roller Mills With GRPF for 1st mill & 4th mill	02
b	Spare Mill roller shaft with plain shell (02 Nos.)Crown Pinions (03 Nos.) & Trash Beam (01 No.)	01 Set
c	Mill Drive-700 Kw–5 Nos. & GRPF drive 300 Kw–2 Nos. A.C.VFD Motor (One spare motor & Drive)	07
d	Planetary Gear Box With Rope Coupling mill & GRPF drive	06
15	Imbibition System With Tanks, Gutters, Platform, Lubrication System, Hydraulic System & Water Cooling Piping Etc.	01 Lot
a	Rotary Screen With Drive Etc.	01
b	400 Cum./Hr.+ 50% Solid,12 M Head-Unscreened Juice Pump	03
c	350 Cum./Hr.D,75 M Head-Screened Juice Pump	02
d	Imbibition Juice Pumps, 180 Cum./Hr.+50%Solid,12 M Head.	02
e	Imbibition Water Pumps,120 Cum./Hr., 50 M Hd.	02
16.	Auto Imbibition System With Online Magnetic Flow Meter.	01
17.	Inter Rake Carrier, 229 Mm Pitch Block Type	03
a	Drive -40 K.W. X1440 Rpm & Planetary Gear Box +1 Spare drive	04
18.	Donnelly Chute	04
19.	Rubber Belt Conveyer for Bagasse With Drive	01
20.	Bagasse Elevator 2000 Mm Wide, 200 Mm Pitch Chain	01
a	Drive -75 K.W. X1440 RPM & Planetary Gear Box with Double Drive Arrangement.	02
20.	Recirculation & Conservation Of Water System	01
21.	Complete Bagasse handling System (MBC, RBC, Surplus bagasse conveyor Etc.) MBC with Double Drive System, Both side drive with Planetary Gear Box with Motor.	01 Lot
22.	Bagacillo cyclone with bagacillo line upto mud mixer with motor and reduction gear.	01 Lot
B.	**BOILER HOUSE & POWER PLANT**	
1.	One – 120 T/hr. capacity boiler, 67 ata, 490 deg. C; PRDS, de super heater, distribution header, HP pipes & ESP including R.O & D.M Plant	01 Lot

2.	One new TG Set of 12 MW. Bleed, cum backpressure with turbine accessories.	01 Lot
3.	Cabling in plant & All electrifications	01 Lot
4.	E. O. T. crane for power house	01
5.	Ash handling System	01 Lot
6.	D.G. Sets 1000 KW	02 Sets
7.	Boiler/T.G. Automation, control system	1 Lot
8.	Air conditioning equipment for mill boiler, power and boiling house	01 Lot
C.	**BOILING HOUSE**	
(i)	**RAW SUGAR**	
1.	Mass flow meter (400 T/hr.)	1 set
2.	Phosphoric acid storage tanks & dosing pumps (SS)	1 set
3.	Juice flow stabilization system	1 set
4.	Hot Juice Rotary Screen	1 set
5.	Auto pH control system	1 set
6.	Defecator (40 m^3/hr.)	1 set
7.	Defecated juice receiving tank (45 m^3)	1 set
8.	Defecated Juice pumps of 350 m^3 /hr. capacity with 75 mtrs head with VFD	2 Nos.
9.	Juice Clarifier of 444 type of 40 ft.dia.with accessories and clear juice pumps with pipelines and valves	1 set
10.	Flocculent tank, dosing pumps	1 set
11.	Rotary vacuum filter & Accessories (14' x 28') –Size with all accessories	2 Nos.
12.	MOL Station	1 set
13.	Raw Juice Heater-2x450 sq.m, 1x 430sq m. HAS	3 nos.
14.	Duplex Heater 250 m3 H S	3 Nos.
15.	Defecated Juice Heater 2 x 430 sq. m. HAS & 2 DCH	1 set
16.	DCH for Clear Juice	2 Nos.
17.	Evaporator set 8 bodies (6x3800 sq m HAS FFE + (2x1800 sq.m. + 2x800 sq. m. HAS of Roberts) – 1 set inclusive of 5 Nos. of spare bodies	10 Nos.
18.	Caustic Soda tank & pump & Chemical tank & Pumps	1 set
19.	Condensate tank with flash heat recovery system (Cigar)	1 set
20.	Syrup Extraction pumps	4 Nos.
21.	Syrup & Molasses storage tanks of 36 m^3 capacity	11 Nos.
22.	Molasses conditioners with DCH	3 Nos.
23.	Batch pans having capacity of 80 tons x 4 Nos with mechanical circulator + 60 tons x 2 Nos. with mechanical circulator	6 Nos.

24.	Single entry Condensers with tail pipe for 80 ton pans, 60 ton pans & two evaporator last bodies	8 Nos.
25.	A-60 T/hr. continuous pan with Condenser & all accessories and automation	1 No.
26.	B-35 T/hr. continuous pan with Condenser & all accessories and automation	1 No.
27.	C-25 T/hr. continuous pan with Condenser & all accessories and automation	1 No.
28.	Horizontal Receiving crystallizer – 6 Nos. of capacity (A-85x3, B-85x1 & C-85x2)	6 Nos.
29.	Mono Vertical crystallizer for B for 280 tons capacity with drives and accessories	1 set
30.	Mono Vertical crystallizer for C in parallel – 250 tons capacity with drives and accessories	2 sets
31.	Transfer and Liquidation pumps for B & C massecuites	4 sets
32.	02 Nos. of Seed Crystallizer (B seed & C Seed) of 50 T each & 3 Nos. of Vacuum Crystallizer of 70 T each.	5 Nos.
33.	Run off tanks for A, B & C molasses & Pumps	1 set
34.	Batch type Centrifugal machines with staging of 1750 kgs. /cycle capacity with AC VFD drive	4 Nos.
35.	Continuous Centrifugal machines of 1500 mm dia, complete with all accesories	8 Nos.
36.	Magma, Mingler, Melter (3 nos.) with pumps & motor, auto brix & temp. control	1 set
37.	IWP & motors with automation with a capacity of 3000 m^3/hr (3 Nos.) with ACVFD	3 Nos.
38.	Cooling towers – 3 cell type with individual cell capacity of 3500 m^3/hr. with accessories	1 set
39.	Final molasses Mass flow meter of 15 tons/hr. capacity	1 No.
40.	Centralized DCS control system	1 set
41.	Molasses storage tank 8000m3 capacity with mass flow meter	1 set
42.	Excess Condensate Cooling System complete in all respect	1 set
43.	Pug mills, transient heaters and pumps for centrifugal stations	1 set
44.	Overhead service water tanks	3 Nos.
45.	Coverings on all belt conveyors of bagasse & Sugar	1 Lot
46.	ETP- Decanter/centrifugal machines/filter press for sludge treatment, RO treatment at outlet	1 Lot
ii)	**REFINARY PLANT**	
1.	Raw sugar mingler with pumps, motors	1 set
2.	Raw sugar melter (30Cu.m)	1 set
3.	Vibro Screen	3 Nos.
4.	Dextran & Starch treatment Enzyme dosing tanks (HDPE – 1 cum capacity)	2 Nos.

5.	Dextran & Starch treatment Enzyme dosing pumps (Diaphram type) – VFD with Changeover switch for spare pumps (2 working & 2 Standby – 100 LPH)	4 Nos.
6.	Screened melt buffer tank with pumps & motors	1 set
7.	Melt Heater (DCH)	1 No.
8.	Lime sucrose proportioning device	1 set
	Auto pH control system	1 set
10.	Reaction tank & Cavitation aeration system	1 set
11.	Phospflotation clarifier	1 set
12.	Clear melt Pumps and motors	2 Nos.
13.	Lime Sucrate, Phosphoric acid, Flocculent	1 set
14.	Scum tank & pumps	1 set
15.	Deep bed filter with full automation	2 Nos.
16.	Clear Melt Heater (DCH)MOC : SS304	1 No.
17.	Double effect falling film evaporator (3 x 450 m^2 HAS) MOC : SS304	3 Nos.
18.	Thick liquor tanks & pumps MOC : SS410M	2 Nos.
19.	SS Vertical Liquor tanks	3 Nos.
20.	Run off tanks (2 nos.) & pumps (4 Nos.) MOC : SS304	1 set
21.	Refinery pans having 80 tons capacity with mechanical circulator MOC : MS	3 Nos.
22.	Dry Seed Crystallizers (60 T) MOC : MS	1 No.
23.	Receiving Crystallizers having 70 tons capacity MOC : MS	4 Nos.
24.	Vacuum crystallizer (65 Tons) MOC : MS	1 No.
25.	Molasses conditioners MOC : SS410M	2 Nos.
26.	Refinery condensers MOC : SS304	5 Nos.
27.	Batch type centrifugal machines having capacity of 1750 Kgs/charge. With SHWW system	3 Nos.
28.	Refined Sugar SS Hopper (1No. Receiving – Plane tray), 2 Nos - Multi tray) MOC : SS409	3 Nos.
29.	Refined Sugar Drier (FBD) with wet scrubber type sugar dust collector MOC : SS304	1 No.
30.	Refined Sugar Elevator with SS Buckets (35 T/hr)	2 Nos.
31.	Sugar Graders with 35 Ton/hr. (six decks)	2 Nos.
32.	Refined Sugar Silos – SS 409 (1- 250 T, 1 – 100 T & 1 – 50 T)	3 Nos.
33.	Packing Machine for1 kg. – 5 kg. packet (For retail market)	2 Nos.
34.	Sugar bags handling system with weighing & packing system (50 kg packaging bag)	1 set
35.	Sugar bags over head handling system with hood arrangement – Portable Stacker, belt conveyor etc up to Sugar Godown	1 Lot
36.	Staging, structure etc.	1 Lot
37.	Piping of various sizes	1 Lot
38.	Valves & Pumps of various sizes including Evaporator Isolation valves	1 Lot
39.	Instrumentation	1 Lot
40.	Paints	1 Lot

41.	cctv installation of complete plant with online monitering and storage facility	1 Lot

Note- Every equipment and system will be complete in all respect for trouble free working during cane crushing season to produce sulphurless refined sugar and to get desired result. In case of any despute, decision of UPCSFF/NFCSF will be final and bonding to all concerned WITH REGARD TO specifications of machinery equipments. Any minor modification may be done with approval of UPCSFF/NFCSF with regard to specifications in the interest of project.

GENERAL CONDITIONS FOR BIDDER'S SCOPE OF WORK:

1. All the machinery and equipment supplied should be brand new of latest design, fabricated as per ISI or equivalent Standard and tested for construction of first class material and workmanship along with material test certificates including bought out items according to technical specifications and as per given Engineering standards (of tender document) for construction material and latest design model. All equipment and machinery installation are with all accessories like pump, motor, reduction gear, pipelines, pug mills, magma mixer etc. to run the plant during crushing season as per required specifications and to get the desired results.
2. The work is to be executed as per the terms & conditions stipulated in the tender document and this Agreement.

   The bidder will provide HMBD of evaporator configuration and vapour bleeding arrangement to achieve steam consumption% cane 40%(+/-2%).
3. Scope of Supply includes all the necessary equipment/systems with structural staging, platforms, approach ladders, walkways, sheds, supports, electrical, s.s tubes, instrumentation etc. of each section/equipment, duly coated with protective paints both internally and externally and insulation as applicable and all civil works. This also includes other tools & tackles required for the fabrication, erection at site and adequate manpower quite conversant with the fabrication & erection work of such plant and machinery.
4. The complete plant SCADA system must have a Smart Client License of SCADA Software so that the SCADA screen showing complete process of sugar mill(real-time access to plant operations) can be viewed on a screen(minimum 5 individual screen) through static IP from any location.
5. All foundation bolts, foundation wedges, alignment packings, liners etc. are also included in the scope of supply.
6. After the finalization of the order, the Seller will prepare all civil foundations if any, structural and the detailed fabrication drawings and loading data of each and every plant & machinery, piping, electrical cabling, instrumentation, circuit drawing, layout drawing, isometric drawings, equipment layout drawings, elevation drawings for approval from Purchaser as well as by concerned Govt. Authority and shall be submitted well in advance to Purchaser for prior examination and approval thereof.
7. All shaft should be supplied with ultrasonic and Magnetic particle (MP) inspection tested with testing certificate.
8. Every shaft, gear & Pinion set, sprockets and each mill roller shell should be chemically tested with submission of test certificate of material composition as per IS standard.
9. All the consumables required for erection & commissioning like gas, all types of welding/ brazing or soldering rods, emery papers, grinding paste, hold lights, graphite, Kerosene Oil, Rustburg, back joints, steam packing etc. are also included in the scope of supply.
10. All types of tools & tackles like hoisting tools, chain blocks, pulleys, wire rope hooks, tube expanders, hydraulic pumps and all special tools etc. shall be arranged by Seller. All staff including engineers, technicians, skilled, unskilled workers, Khalasi required for loading/unloading, fabrication, erection, testing and trials etc. shall be arranged by Seller. The machinery & other equipment delivered at site should be properly stored at site. The transportation of machinery and equipment from the stored place to their respective position shall also be in the scope of Seller.
11. Technical services included in the scope of supply:
    a. Project In charge: Seller will retain a qualified, experienced and responsible project engineer/manager to supervise the installation and erection/ commissioning of the plant alongwith complete team at site.
    b. Training of the Purchaser's personnel: Seller shall arrange to train the Purchaser's personnel to operate the equipment/systems after three year/36 months warranty period.

12. All equipment including bought out items shall be offered for inspection to the authorized representative of Purchaser before dispatch.
13. The Seller shall prepare and submit to Purchaser the time schedule as per PERT/CPM chart. Seller should ensure that it will maintain the time schedule as per the chart. The equipment delivery shall strictly be in as per schedule given in the scope of work.
14. All materials of construction and fabrication shall be as per relevant ASME/ASA/AISI/ ASTM /ANSI /BS /IS/Standards and acceptable equivalent standards referred to in the Technical Specifications herein and in the tender document. They should also comply with standard and good engineering practices acceptable to the Purchaser and its expert consultant.
15. The Seller shall be fully responsible for any mishaps/casualty/fatal accidents of their employees during the contract period of project. Sugar mill shall not be responsible at all for such mishaps whatsoever. The Seller shall also be fully responsible for any mishaps/casualty/fatal accidents of Purchaser employees/machinery during erection and commissioning.
16. The layout for Installation of the equipment/system will be prepared by the Seller in consultation of Purchaser and will conform to various statutory requirements and gudielines of various Act/Statute/Rules and in order to provide working facility.
17. Painting – General
    a. All steel structures shall be given red oxide primer coating followed by appropriate final coating.
    b. Railings and staircases, wherever required as per the factory act., duly coated.

15. All designs with respect to civil, structures, tank foundations etc. should follow the standard code practice for earth quake resistant designs viz. as per IS 1893.

16. All dismantling, levelling/filling and shifting of waste to a designated placeif required shall be in scope of Seller. All required structural works etc. shall also be in the scope of seller.

17. Any other items or activities not specifically mentioned in the scope of work and equipment list and required for completion of project are deemed to be included in the scope of work.

18. Technical Specification of all equipment and machinery will be as per best standard of Industry. In case of any dispute, the decision of National Federation,New Delhi will be final.

19. In case crushing season 2024-25 starts with old mill, then there will not be any hindrance to start the crushing season 2024-25 in last week of october 2024.

ANNEXURE – B-1

A. MILLING PLANT

SCOPE OF WORK & TECHNICAL SPECIFICATION FOR MILLING PLANT AND MACHINERY FOR CRUSH RATE OF 4900 TCD/22 HRS. (223 TCH)

The Technical specifications of the Milling House Plant & Machinery propsed shall be as under :-

6.1 Weigh Bridges:

The weigh bridges will be pit less, fully automatic electronic, load cell type, along with digitized software control. These weigh bridges shall be required for cane weighment at gate as well as at cane purchase centres. The specifications of required weighbridges will be as under: -

S. No.	Capacity MT	Platform Size mtrs. x mtrs.	Least Count Kgs	No. of weigh bridges
1.	10	6 X 2.5	2	37 (Fully Electronic with 4 load cell)
2.	50	8X 3	5	2 (Fully Electronic with 6 load cell)
3.	100	17 X 3	10	1 (Fully Electronic with 8 load cell)

Out of the above weighing bridges 23 Nos. of 10 T capacity are for cane purchase centres. Weigh bridge units will be along with platforms, suitable compression type load cells, suitable junction boxes, digitizers, screened cables and standard weights for calibration (Contractor to give performance guarantee for three crushing seasons for trouble free operation). It shall be provided with data logging and printing system.

There shall also need of 30 Nos. of HHC machines (complete with drives).

- Inter-networking between weighment systems.
- Man less smart weighment system.
- One weigh bridge at token issue.
- Check Manual Weigh bridge

6.1.1 Cane Milling Plant

A) Cane Handling and Feeding Arrangement

(i) Cane Unloaders

Four Nos. of Cane un-loader with hydraulic grab each of three motion, having safe working load capacity 5T with minimum capacity of 3 T per lift. The crane shall be of 3 motion electrically operated overhead unloading crane conforming to class IV IS specifications and capable of 25 lifts per hour. The crane shall be complete with its accessories, RCC columns, attendant platform along the length of the gantry on both sides 2 Nos. ladders, etc. It shall be heavy-duty type and suitable for continuous outdoor working. All operations shall be electrically controlled from the operator's cabin. Cane un-loader motors of suitable capacity shall be of crane duty TEFC, S4 duty Class-IV, 1000 rpm, and 6 pole type with 900 starts per hour. The crane gantry span shall be 26 meters. The crane gantry shall be 50 meters in length with gantry columns 10 meters apart. Bridges shall be box type construction made of IS 2062 or equivalent gantry columns shall be L shape construction but the 4 no. end columns should have double L construction at 90 deg. End columns shall be provided with tie beam on each end. The structure of the gantry shall be of adequate strength to provide additional crane of identical specifications.

The design Code shall be as per standard norms and specification of civil engineering.

Hoisting, unloading drums trolley & bridge should be driven by hydraulic motors & power packs.Hydraulic drive system shall be provided for hoist & dehoist.
The height of the lift shall be 10 meters. All gear boxes shall be totally enclosed, dust proof, double helical type gear and shall be designed with a service factor of 2.0. All couplings shall be of flexible gear type / centrifugal type with periodically greasing arrangement. All brakes shall be of electro hydraulic thyristor operated type. Ratio of the pulley diameter (PCD) to wire rope diameter shall not be less than 20.

A suitable shed shall be provided over the structure of cane feeding area.

(iii) Auxiliary Cane carrier

One no. Auxiliary cane carrier of 3000 mm wide and loading length of 20 M with 15 deg. inclination with suitable elevation with Head on cutter to control cane feeding to main cane carrier shall be provided. Auxiliary carrier shall take unloaded cane from the truck tippler and feed main cane carrier with variable speed as per requirement of cane. Auxiliary carrier shall be located at the tail end side end of the cane carrier. The central axis of auxiliary carrier shall be either in line with the main cane carrier or perpendicular to it as per the suitability of the site location. It shall have six strands of chains of 200 mm pitch. The breaking strength of the chains shall be minimum 60,000 kgs. The cane carrier and its structure shall be of all steel construction, the slats 6 mm thick shall be as per IS : 8236 and fastened to chain by bolts and nylock nuts or by bolts and check nuts.

The tail portion of the auxiliary cane carrier shall be arranged below the ground level. Space of minimum 750 mm shall be left in the pit on either side of the carrier for

inspection and cleaning purpose. The carrier framework shall not be less than 8 mm thick and mild steel plate extending along the complete length of the carrier.
The other details shall be as provided for the Main Cane Carrier.

It shall be driven by **55 KW** with constant torque characteristics and operating speed range. The motor with AC variable frequency VFD panel shall be directly coupled to planetary gearbox to provide 3 to 10mtr. /minute variable speed.

(iv) Cane Carrier

Primary cane carrier shall be of **2040 mm wide** with a horizontal loading length of **45 mtrs.** The length of its inclined portion shall be such that it gives an inclination of 15 deg. for the Chopper. It shall have **three strands** of chains of **200 mm pitch** IS-8465. The breaking strength of the chains shall be minimum 60,000 kgs. The cane carrier and its structure shall be of all steel construction, the slats 6 mm thick shall be as per IS : 8236 and fastened to chain by bolts and nylock nuts or by bolts and check nuts.
The cane carrier shall be driven by **90 KW** TEFC, S1 dutymotor with constant torque characteristic and operating speed range electric drive. The driving motor with AC variable frequency panel shall be directly coupled to suitable size of planetary gear box to provide apron speed of 3 to 10 mtrs. /minute variable speed. One small screw compressor for cane carrier chain cleaning continuously to remove dissipate flying particles.

The horizontal portion of the carrier shall be arranged below the ground level in such a way so that the sloping side of the carrier is about 300 mm above the ground level. Space of minimum 750 mm shall be left in the pit on either side of the carrier for inspection and cleaning purpose. Arrangement for adjusting the clearance between tip of head on chopper and leveller knives and the slats in the cane carrier shall be provided in the inclined portion. The carrier frame work of mild steel plate extending along the complete length of the carrier shall not be less than 6mm thick except at the place of chopper and leveler where the thickness should be 10 mm for about 2500 mm length.

The frame work shall be adequately stiffened at the top and bottom by angle iron welded to the side plates. The side plates shall be bolted to and supported by rolled steel 250mm x80 mm channels or sections of equivalent strength and be provided with base plate of ample area reinforced by gusset plates .Two foundation bolt holes would be provided in each base plate. The columns in the immediate vicinity of the cane knife set shall be 350 mm x 90 mm double channels or sections of equivalent strength. All the column at drive end should be adequately braced by angle cross pieces of heavy section secured by gusset plate and bolts or by welding. Three longitudinal 150 mm ISMB runners with renewable 10 x 65 mm thick spring steel wear pads would be bolted on the top side of the cross pieces to support the cane carrier chain rollers. The distance between the adjacent supporting columns should not exceed 2.5 meters. The runners would be lowered slightly where the chain arrives at and leaves the runners. 8 mm x 75 mm spring steel flat iron should be tack welded/bolted on the side plates of the cane carrier so that cane carrier slats touch the flat iron only to avoid wearing on side plates. The return side of the apron can slide on the guide angle runners with 8 mm thick spring steel wear flat provided the slats are equipped with renewable spring steel wear pads or alternatively be supported on idler pulleys of 60 mm wide and 280 mm dia. with 75 mm dia. 45C8 shaft running in frictionless suitable roller bearings with grease cups shall be provided.

The carrier chain driven by means of cast steel sprockets having machine cut teeth at least 16 in number and mounted on minimum 280 mm central dia. head shaft of

45C8 quality or equivalent and shall run in 220 mm size anti-friction roller bearings with cast steel Plummer block. The columns under the head shaft and carrier drive shall be extra heavy section to withstand vibrations. At the non-driving end of the cane carrier, the chain shall be mounted on cast steel sprockets having machine cut teeth on minimum 200 mm central dia. tail shaft of 45 C8 quality or equivalent running in minimum 170 mm anti-friction roller bearing with sleeve incast steel housing with slide rails with tension bolts for tightening the chain.

The head and tail shaft shall be hot forged and ultrasonically tested. All the shafts shall be ultrasonically tested and proven flawless.

v) Rake Carrier with double drive arrangement

Rake type conveyor shall be of steel construction having suitable width trough to accommodate **2040 mm** rake width and of suitable length to suit feeding on the rubber belt conveyor. The inclination of the rake carrier shall be 45 deg. maximum and the boot having no horizontal portion at top.

The tail shaft centre of rake carrier shall be in line with head shaft centre of cane carrier. The rake carrier and its structure shall be of all steel construction with two strands block type forged chain of 229 mm pitch, having 80,000 kgs. Breaking strength having locking arrangement with nylock nuts or check nuts. Flights would be made out of 10 mm thick mild steel plate of suitable shape and profile and welded on box construction beams. These beams shall have suitable arrangement for fitting with the chain attachment at every fourth link with the help of bolts, nylock nuts or check nuts.

The rake carrier should have runners of channels angle iron with 10 mm spring steel wear flats or polymer liner with SS cladding and 10 mm thick mild steel bottom trough plate with stiffeners and should be supported on steel channel columns of adequate strength provided with rigid base plate. The columns should be adequately braced to avoid vibrations. The elevator chain shall be driven over two cast steel sprockets mounted on 250 mm central dia. head shaft of 45 C8 or equivalent quality running in minimum 200 mm size anti-friction roller bearings with cast steel robust plumber blocks secured to head shaft columns. The tail shaft of minimum 200 mm central diameter. 45 C8 or equivalent quality should have two cast steel sprockets having 16 machine cut teeth to guide the chains and would run in minimum 170 mm size anti-friction roller bearings with, cast steel Plummer blocks attached to the rake carrier boot.

The portion of the chain below the fibrizer shall be suitably covered to avoid damage due to prepared cane thrown by the fibrizer. A suitable online chain tightening arrangement shall also be provided.

Rake carrier drive shall have a constant torque characteristic over operating speed range. Two nos motors of **75 KW** TEFC, S1 dutywith AC variable frequency panel shall be directly coupled to the foot mounted planetary gear box to provide a linear speed of 10 to 33 meters/ minute of double drive arrangement.

iv) Rubber Belt Conveyor with Equalizer

One no. prepared cane belt conveyor of **2200 mm** effective width, 22 meter horizontal length shall be provided to receive the prepared cane from fibrized cane rake elevator & deliver it to first mill Donnelly chute. The belt conveyor shall be provided with suitable

supporting structure, walk way on both side ladder, platform around drive staging of equalizer. Belt Conveyor shall be driven by **30 KW** TEFC squirrel cage motor with VFD operating at 1440 rpm with foot mounted planetary gear box to provide 8 to 80 meter/minute linear speed of the belt.

The length of the belt conveyor shall be sufficient to cover the location of future zero mill along with Tramp Iron separator for the future expansion of the plant. The inclination of belt conveyor should not increase more than 10 deg. even with zero mill.

A suitable cane equalizer shall also be provided on the belt conveyor before the tramp iron separator. The equalizer shall have its independent drive comprising of **7.5 kW** rating motor and helical gear box of suitable ratio, So as to run equalize at 36 rpm at rated speed of motor.

v) Tramp Iron Separator

Electromagnetic type tramp iron separator shall be provided on the belt conveyor to pick up any iron piece up to a maximum weight of **30 Kg**. from a distance of 350 mm will be from top of belt a cane blanket of 300 mm thickness over the belt conveyor.

vi) Auto DCS Cane Feed Control System

One set DCS based automatic cane feeding device to ensure uniform feed rate to first mill with provision to change the feed rate at any time having a variation not more than +/- 5% of set rate. Primary cane carrier shall follow speed of secondary cane carrier/ cane rake carrier in a fixed ratio. Load of all cane preparation devices shall override the speed signal of each cane carrier. When load of any cane preparation device exceeds 80% of rated load, the speed of that cane carrier shall be proportionately reduced. If load exceeds 100% of rated loa d, that cane carrier will stop. It will restart automatically when overload condition on that cane preparation device becomes normal. These overload settings shall be adjustable from the control panel. The system shall have the following provisions.

Sensors:

For load sensing of cane preparatory devices such as chopper, leveller, fibrizer and 1st mill, suitable current transformers / two wire electronic analogue pressure transmitters with capacitance sensing technology with 4-20 Ma DC output and configurable for calibration to the required pressure ranges within the designed pressure span of the

transmitter. In addition to this level sensing of prepared cane at donnely chute may be considered as option.

Control Action:

The system should be provided with two control actions i.e. proportional and ON-OFF control actions. Proportional control as per the 1st mill load.ON-OFF control as per the high load settings of the cane preparatory devices and first mill.

Set Point:

Following settings are to be provided,

- **i)** For loads of various cane preparatory devices and 1st mill drives precision load setters of 1 K 10 Turns helipots with dial knobs.
- **ii)** For average height and feed rate precision 10 K 10 Turns helipots with dial knobs.

Visual Indication:

Coloured lamp indicators for the high set load values.

Carrier Speed Adjustments:

The speed of the cane carriers can be adjusted from zero to the rated RPM with the settings provided on the control panel at operator's console.

Indicators **:** Analogue load indicators (i.e. current or pressure indicators) and speed indicators .

Power Supply **:**230 V AC, 50 Hz

The device shall be capable to achieve performance even under extreme conditions of shock, vibration, humidity, electrical interference.

All electrical / electronic components used in the device shall confirm to the existing Indian specifications.

B) Cane Preparation Devices

i) Cane Chopper

One cane chopper set having not less than **42 knives** of forged and hard faced cutting edgesecured to cast steel hubs of IS:1030 grade 280–520 W mounted on a forged steel shaft of 220 mm dia. of 45 C8 quality. The dia. over the tips of knives shall not be less than 1600 mm. The knife shaft shall be supported at 180 mm bore, heavy duty self-aligning double row spherical

roller bearings with adopter sleeve in steel Plummer blocks. The knives shall be of special shock resisting steel having hard faced cutting edges, hardness 45 to 48 HRC and tennoed into the hubs eliminating the shear on the bolts which should be of EN8 steel or of equivalent strength with nylock nuts. The knives shall conform to IS: 8461. A suitable fly wheel of Cast Steel Hubs of IS:2062 GR. 250 E well balanced shall be provided at the outer end of the shaft. The knife raw should be six only.

One spare set of knives as well as tip shall be provided.

Cane chopper set shall be driven by a continuously rated IP-55, TEFC, CACA, S-1 duty with 110 % overload, slip ring motor of **300KW** and 600 R.P.M. synchronous speed at a total slip of 15 percent. It shall be directly coupled geared coupling to get final speed of 600 RPM capable of transmitting **300KW** continuously. Provision to be given for Cane chopper shall be driven both end.
The motor shall be complete with starter (current not exceeding 300% of FLC) and suitable buffer resistance. Provision for additional identical motor drive with load balancer on other end should be made for ultimate capacity.

The knife set shall be installed on the horizontal portion of the secondary cane carrier before leveller and clearance in between the slats and Knives tips shall be maintained as 800 mm The knife set shall be totally enclosed by suitably reinforced hood of 10 mm thick and mild steel plate attached to the cane carrier frame work and provided with suitable swing flaps and bolted doors at top of the hood to suit reverse rotation. Two no. of flywheel of CS/CI grade FG 260, IS-210 machined and well balanced shall be provided on the either ends of the shaft.

ii) SwingTypeCaneLeveller

One Swing type cane leveller set having not less than **64 knives** forged and hard faced cutting edge secured to cast steel hubs of IS:1030 Grade 280 – 520W mounted on a forged steel shaft of 300 mm diameter of 45 C8 quality. The dia. over the tips of knives shall be not less than 1600 mm. The knife shaft shall be supported at 220 mm bore, heavy duty self-aligning double row spherical roller bearings with adopter sleeve in steel Plummer blocks. The Swing type Leveller should have detachable knives made of special shock resistance alloy steel and secured through 50 mm dia. S.S. pins, the leveller shank and disc should have SS bushes to suit S.S. pins. The knives shall be of special shock resisting steel having hard faced cutting edges, hardness 45 to 48 HRC. The knives shall conform to IS. 8461. Two no. of suitable size fly wheel of CI/CS Hubs of IS:2062 GR. 250 E well balanced shall be provided at the outer end of the shaft.

Cane leveller set shall be driven by two nos. 300 kW x 02 Nos., TEFC, IP-55, 50 Hz and Class 'F' slipring induction motors of 600 R.P.M. synchronous speed at a total slip of 15 percent. It shall be directly coupled by geared couplings capable of transmitting 300 KW continuously for each drive.The motors shall be of CACA type having protection IP – 55/ IC611 complete with stator rotor starter panel. The motors shall be complete with starter (starting current not exceeding 300% of FLC) and suitable buffer resistance. The leveller knife set shall be installed on the inclined portion of the carrier and be provided with a suitable device for adjusting clearance in between the knives tip and slats from 250 to 300 mm. The knife set shall be totally enclosed by suitably reinforced hood of 10 mm thick and mild steel plate attached to th e cane carrier frame work and provided with suitable swing flaps and bolted doors at top of the hood.
There shall be arrangement for lifting motor & shaft of leveller & chopper, either from cane unloader or mill crane or separate M.S Guntry to be provided

iii) Swing Hammer type Fibrizer

Swing hammer type fibrizer shall be located at the head end of the primary cane carrier, to suit 2040 mm wide cane carrier having **160** hammers. Weight of each hammer shall not be less than 22 kg. The hammer shank shall be 30 mm thick minimum. Fibrizer should be capable of providing preparatory Index of more than 90+ measured by AldericReyner method.

The rotor shaft shall be heavy duty minimum 420 mm dia. at the hubs and 300 mm dia. at the bearing journals and shall be 45 C8 forged steel as per IS:1570. Anvil plate shall be pocketed design, having wrap angle of not less than 140-deg minimum. The base plate thickness of the anvil shall be minimum 36 mm. Hard facing on the anvil working surface shall be having minimum hardness 600 BHN. Anvil plate shall have provision for adjusting the anvil clearance. A suitable floating flap of 20 mm thick to be provided at the entry point of anvil. Rotor shall be supported on two heavy duty self-aligning double row spherical roller bearings. Bearing shall be mounted on shaft with adapter sleeve. Tip dia. of hammers shall have **2200 mm swing dia.** when running at 750 rpm.

The fibrizor should have detachable domite tips made of special shock resistance alloy steel and secured through 70 mm dia S.S. pins, the hammer shank and fibrizer disc should have SS304bushes to suit S.S. pins. of suitable size. One spare set of hammers with domite tips shall also be provided. The hammer shank and fibrizor disc shall have G.M./SS bushes to suit S.S. pins. 70 mm hubs shall be of cast steel M.S. Fabricated fitted on rotor shaft. Deflector plate of 20 mm thickness with 5 mm thick S.S. lining shall be provided.

The fibrizer rotor shall be completely covered by reinforced mild steel fabricated hood made out of 16 mm thick plate attached to the cane carrier frame work and will be complete with deflector plate, adjustable mild steel fabricated anvil plate, anvil suspension gear. Rotor bearing Plummer blocks shall be cast steel / M.S. fabricated pressure lubricating system for bearings shall be provided with 2 nos. pumps, 2 nos. coolers (one each as standby) oil reservoir, pressure gauge, piping, return line, needle valve fitting etc. with provision for auto start of standby pump.

The fibrizor shall be driven by two nos. **1000 kW.** 750 RPM, 11 KV HT TEFC/CACA, IP-55, , S-2 Duty, 50 Hz and Class F slipring induction motors with suitable bed frame and resilient flexible coupling shall be provided. The motors shall be of CACA type having protection IP – 55/ IC611 complete with stator rotor starter panel. Auto slip type stator rotor starter for above motors shall be provided. One spare motor for fibrizor of above specifications shall be provided. Provision for replacement with new higher capacity motor shall be provided for future expansion.

C) Mills

For having a crush rate of 4900 TCD on 22 hrs. basis, it is proposed to install 4 no., three roller mills of1020 mm diameter and 2040 mm long with GRPF on 1st and fourth Mills and 100 % size Under Feed Rollers on other mills with Donnelly type chutes on all the four mills. Mill to mill centre distance shall be 14 mtrs. All mills shall have provision for GRPF installation for which foundation should be provided.

i) Mill Rollers

Each mill roller shall be minimum nominal diameter of 1020 mm x 2040 mm length and journals of minimum510 mm diameter x 660 mm length and head stock centre distance of minimum 3200 mm.

Two Mill roller shafts with shell (Plain), three crown pinion and one trash beam shall be provided as spare.

The rollers shall be of coarse grain castiron having hardness 180 to 210 BHN.

The composition of the shell material shall conform to IS: 1985 and shall be:

Total carbon	-	3.20 to 3.6 percent.
Manganese	-	2.2 to 3.2 percent
Silicon	-	1.2 to 2.2 percent

Phosphorus - 0.5 per cent Max.

Sulphur - 0.15 percent Max.

The cast iron shell shall be hot shrunk on forged steel shaft of 45 C8 quality conforming to IS: 1570 or equivalent having a minimum tensile strength of 58 kg/mm$^{2.}$ All the shaft shall have square ends of 425 mm each side. Top roller shall be fitted with stationary flanges and juice rings in two halves. The bottom roller shall be provided with juice rings and removable guards to prevent entry of juice into the bearings. The cast steel **crown pinions** shall have minimum 550 mm face width and conform to IS :2708 Grade 3B having properly shaped teeth, keyed to roller shaft with suitable mild steel guards andoil troughs. All rollers shall be coated with surface roughening electrode.

All roller shell shall be provided with circumferential 'V' grooving. Chevron grooves shall be provided on the top & feed rollers and **Masschaert grooves** on the feed rollers only.

Messchaert groove scrapers shall be of spring steel secured on square shaft and supported on cast steel/fabricated steel blocks and provided with lever or another suitable adjusting device. Top roller of mill no. 1, 2 and 3 shall be of **full couch** type to provide better juice drainage.

Mill House gantry span should not be less than 26 mtrs.

ii) Head stocks

The **headstocks** shall be of cast steel as per IS: 1030grade 280/520 W. These will be of king/queen boltless type. Removable /gun metal/ wearing plates on feed side as well as discharge side and with lubricating arrangement between top roller bearings and wearing plates shall be provided. The top and side caps shall be of cast steel as per IS:1030 grade 280/560 W and shall be securely locked in position for quick assembly. Stainless steel strip of 8 mm thick shall be provided in the side roller bearing face of the head stock. The eccentricity between top roller bearing centre and hydraulic cap centre shall be kept suitably towards the feed side of the headstock, except in case of inclined headstock.

Top **caps** shall be made of cast steel and shall be securely locked in position for quick assembly. Top caps shall be secured to the headstocks through split type conical bushes and high tensile pins of tapered design fitted with steel liners. Forged steel **hydraulic ram** made of cast steel 40C8 grade material as per IS: 1570-1979 and shall be of **400 mm**

diameter fitted with gun metal sleeve shall be provided in top cap. Side cap made of cast steel shall be secured to headstocks with the help of pins and bush.

Material and its bearings shall be of cast steel with gun metal lined as per IS-318 and with water cooling arrangement. The side roller bearing shall be of cast steel housing with renewable gun metal liner as per IS: 318. All mill house equipments shall be designed for the ultimate crushing capacity of 7500 TCD.

iii) GRPF on 1st Mill & Last Mill

Groove Roller Pressure Feeder System suitable for 3 roller conventional 1st& Last mill shall be supplied.

The rollers shall be (identical with Mill Rollers) of nominal dia.1020 mm x 2040 mm length, running in heavy duty G.M liner bearings fitted in cast steel housing. The journal size shall be 510 mm dia. X 660 mm long. The underfeed roller shall be of TUFR with juice drainage arrangement with heavy duty scrapper minimum 100% of GRPF roller dia. driven through pinions from top roller.

The GRPF roller speed shall be about 30% higher than the mill roller speed.

The scope of supply shall include heavy fabricated base frame, pair of cast steel/ fabricated headstocks, pair of rollers, bearings, and a pair of crown pinion. GRPF shall be independently driven by 300 KW AC VFD motor, TEFC / CACA, S-1 duty, Class-IV, IP-55 through suitable planetary gear box having service factor of not less than 2.5 and rope less coupling etc.

The cast steel head stocks shall be supported on M.S. fabricated pedestals.

The pressure feeder roller shafts shall be of forged steel of 40C8 quality confirming to IS: 1570-1979 or equivalent having a minimum tensile strength of 58 kg/mm². In case of circumferential V groove pressure feeder, the pressure feeder rollers shall be interchangeable with mill rollers and shall be provided with 100% dia. Under feed roller with gear drives etc. One force feed lubricator shall be provided for each pressure feeder. One pressure chute shall be provided for each mill. This shall be fabricated out of 40 mm thick M.S. plate suitably reinforced and lined with 8 mm thick AISI-304 quality stainless steel plate. The chute shall have hard facing at finger tips. Pressure chute shall be designed to with stand a maximum pressure of 7 kg/cm² .Arrangement shall be provided for adjusting the pressure chute setting.

Lubrication for GRPF System shall be provided from centralized lubrication system.

iv) M.S. Fabricated Toothed Under Feed Roller (With Juice Drainage Arrangement)

Each mill shall have M.S. Fabricated Toothed under feed rollers. TUFR shall be having nominal diameter 100% of the mill roller. The shaft shall be 350 mm diameter of 45C8

quality confirming to IS: 1570 and supported by means of GM bush bearing of minimum 300 mm bore. The toothed under feed roller shall be run from top roller through gears to give surface speed of about 10% higher than the mill roller surface speed. It shall have arrangement to adjust the setting of axial direction by 25 mm (axis jointing centre line of under feeder and top roller).

All TUFR must be with juice drainage arrangement with Drilled holes on its pheriphery-1100 to 1200 nos. with heavy duty Scrapper arrangement with close setting with Top Roller.

v) Inter Rack Carriers between Mills

Rake type intermediate carrier, between the mills whose centre distance shall not be less than 12000 mm shall be provided. The width of the carrier trough shall be suitable to accommodate 2040 mm rake width and its cross section suitable for handling bagasse of 272.72 TCH crushing rate with imbibition up to 380% on fibre.

The rake carriers shall have runners of angle iron / channel with 8 mm spring steel wear flat and 8 mm mild steel bottom trough plate with stiffeners and be supported on steel channel column provided with rigid base plate. The columns shall be adequately braced wherever necessary.

Each rake carrier drive shall consist of the TEFC S-1 duty motor of **30 KW,** 1440 RPM with enclosed foot mounted planetary gear box reducer. The linear speed shall not be more than 30 m/minute.

The rake carrier chain shall be 229 mm pitch block type forged chain having breaking strength of minimum 80,000 kgs. driven over two cast steel sprockets having 14 No. machine cut teeth mounted on 220 mm central dia. head shaft of 40 C8 quality conforming to IS:1570 or equivalent and running in 180 mm size anti-friction self-aligning spherical roller bearing, cast steel bearings secured to head shaft columns. The tail shaft of 180 mm central dia. and of 45C8 quality or equivalent shall have two cast steel sprockets or drums to guide the chain and shall run in 160 mmsize anti-friction self-aligning spherical roller bearing, cast steel Plummer blocks attached to the elevator boot. Its bearing shall be outside the elevator trough. The tightening arrangement shallbe provided at the tail end facilitating online tightening facility. The angle of the rake carrier shall not be more than 45 deg. The rake carrier shall be designed for head end discharge of bagasse to the next mill Donnelly chute.

vi) Mill Drive

The mill shall be driven by a continuously rated 700 kW AC MV 11/6.6 kV VFD drive. The motor base speed shall be 1000 rpm and shall have constant torque characteristics in between 20 % to 100 % base speed and constant power characteristics between 100% to 110 % of base speed.
The specification of motors shall be as under:

- Quantity — 4 Nos. Working Motor+ Drive, 1 No. Spare Motor with ACVFD DRIVE
- Rating — 700 KW , 1000 rpm base speed, 3 phase, TEFC squirrel cage, AC induction motor - Suitable for application and MV 11 / 6.6 kV drive Duty Class IV.
- Protection — IP- 55/ IC 416 (TEFC/CACA).
- Ventilation — TEFC /CACA (Forced cooled type)
- Main Supply — Motor rated of 6.6 kV 3 ph, 50 Hz,

  With MV VFD 11 kV Input /6.6 kV Output Multi Cell PWM Inverter with Cell with Cell bypass Arrangement.
- Speed range — 20% to 110% of base speed.'
- Constant torque operation 20% to 110% of base speed.
- Maximum speed — 110%.
- Direction of operation — Bi directional operation.
- Mounting — Horizontal foot mounting.
- Class of Insulation — "F" but temp. rise limited to class "B".
- Designed ambient temp. — 50 deg. C.
- Efficiency — Typical power converter: 98 %
  Total drive system Drive+ motor > 95 %
- Internal 11/6.6 kV Input transformer of copper windings, forced-air cooling

The specifications of the VFD shall be as fallows -

MV VFD shall be of 11 kV Input & 6.6k V output. Each inverter cubicle shall be fabricated for 14/16 SWG. CRCS sheets, free standing, aestivated & painted with anticorrosive paints.

Overload duty shall be of class IV with a protection of IP - 41.Each drive shall be complete with all the salient features including protection for its drive.

The cubicle shall house all the switch gear & their protectors, controls, PWM topology , Cell modules with Faulty Cell Bypass arrangement, interlocking relays & filters etc.

All necessary meter indicators, enunciators, controls etc. shall be neatly arranged on cubicle front doors with neoprene gaskets on all edges of the panel.

Ventilation openings shall be provided at the top of the panel & on side covers by louvers suitably covered by wire mesh.

Drive shall have provision for bi-direction speed regulation & will be +/ - 1 % of the base speed by techno-feed back . The panel will have the facility to accept 4 - 20 m A signal for speed setting in local auto mode & to have control from PLC/DCS.

Each of the drives shall be provided Ammeter, Voltmeter with selector switch, speed indicators, KWH meters etc.

The pressure ventilation system with electric motor drive blower with filter shall be provided for panels. One common control desk with all the controls shall be provided for each motor to be controlled common desk.

The electrical installation for mill drive motor, PWM inverter panel etc. shall be complete in all respect.

The room (Air Conditioned), civil work shall be provided by purchaser.

vii) Planetary Gear Box with Ropeless couplings

Each mill shall be driven independently through planetary gear box and rope couplings/ rope less couplings.

The planetary gear box shall be of foot mounted design, ratio 1000: 4.0 for 800KW continuous rating with 2.5 minimum service factor. The shafts of the planetary gear box shall run in antifriction bearings. The gear box shall be complete with forced oil lubrication system, geared type input coupling and rope type output couplings, base plates etc.

viii) Mill Bearing Housings

The Bearing housing shall have water cooling arrangement. All top roller bearings shall be interchangeable. Similarly all feed side and discharge roller bearings shall be inter changeable by their respective bearings. Top roller top half bearing shall be of cast steel housing with gun metal lining as per I.S. 318. Bearing housing shall have water cooling arrangement. The bottom half shall be of gun metal liner. Side roller bearings shall be of cast steel housing with gun metal liner as per I.S. 318. The housing shall have water cooling arrangement. Juice sealing rings for bottom roller shall be provided.

ix) Trash Plate and scrappers

The mills shall be provided with cast steel **trash beam** as per IS:1030 grade 280 / 520W and supported on heavy steel brackets with pivoted journals fitted in the head stocks and adjustable by means of tie rods and fitted with removable cast steel trash plate as per IS:1030 grade 280/520 w , bolted by high tensile bolts and nuts. Top roller scrapers shall be of floating type. Scrapers for top and discharge rollers shall be of cast iron MOC.

x) Hydraulic Loading System

Each mill shall be provided with hydraulic loading system, consisting of hydro-pneumatic accumulator, one for each of the journal of the top roller, one extra as spare and accessories such as pumping set, receiver tank, gauges, remote control panel and roller movement indicator electronic type. The diameter of the hydraulic ram for top cap shall be minimum 400 mm. The hydraulic system shall be designed for an oil pressure of 280kg/cm^2g.

xi) Lubrication System

One centralized mill lubrication system having positive displacement pump at about 400 bar pressure having dual delivery lines made of SS 304 x 2mm thick (DIN standard) of 16mm diameter for main line on both sides of the mills with changeover valves, relief valves and distributors with delivery adjustment arrangement with feed line of 8mm diameter SS x 2mm thick provided to the bearings, complete with control panel pressure gauges and audio/video alarm with suitable timer arrangement for controlling pump operations suitable for grease lubrication system.

xii) Donnelly Chutes

Each mill shall be provided with Donnelly chute, fabricated out of 6 mm thick stainless steel plate of 409 grade with stiffeners and shall have arrangement to adjust the blanket thickness from top. The height of each chute shall be about 3 meter. Each Donnelly type chute shall have level sensors having ON/OFF control of intermediate rake carriers drives, sequencing interlock.

xiii) Ladders and Platforms

All the mills shall be high set so that no part of the juice tank pumps is situated below floor level. Access from mill **platform** to rake elevator drive platform with suitable cat **ladders**

shall be provided. All gangways and staircase shall have hand railings. All mill shall have a common gangway of width not less than 1000 mm with mild steel fabricated gratings and 4 nos. staircase (one for fibrizer side, one for bagasse elevator side and two from mill drive platform) along with the cross connection between each mill and on both sides of mills shall be provided. Access from mill platform to cane carrier drive platform and rake elevator drive platform with suitable mild steel fabricated staircase and hand rails shall be provided. Drive platform for all intermediate rake carriers shall be interconnected with mild steel fabricated gratings.

6.1.2) Mill House Juice Handling System

i) Juice trough

Juice trough located under the mills shall be made of 6 thick SS 409 M. The trough shall be bolted to the head stocks with stainless steel bolts and copper washers. Joint shall be suitably sealed to prevent any juice leakage. There is also option of strong and leak proof welding of trough with head stock.

All the mills shall be high set so that no part of the juice tank pumps are situated below floor level.

ii) Rotary Juice Screen:

For separating the cush–cush / fine bagacillo from the mixed juice, one no. Juice filtering rotary screen of the fallowing specification shall be provided.

1. Juice handling capacity	- 250 m^3/hr.
2. Juice loading per sq. mtrs. screen open area	- 105 m^3/hr. max
3. Drum circumferential speed.	- 1 to 1.5 mtrs. /sec. (RPM – not to exceed)
4. Drum size should not be less than	Dia. – 2.0 Mtrs., Length – 4.50 Mtrs.
5. Drive arrangement	Positive through transmission chain and chain wheels or directly coupled, minimum 7.5 HP with Planetary gearbox.
6. Material of construction	
a. Screen drum	Wedge wire screen of SS 304 welded type having slot width 0.45

	mm.
b. Support and thrust rollers	Of METALON /Polyuvethene/ Carbon steel case hardened supported on anti-friction bearings
c. All juice wetted parts like juice tray, splash guards, inlet feed box, drum shell at inlet and outlet, cush-cush, discharge chute.	SS 409 M
7. Water sparging system	For cleaning and sanitation, to spray hot water through jet nozzles during Operation with provision of auto on/off Pressure at nozzle header min 4 kg/cm2.

The Rotary Screen shall be mounted on suitable steel staging, having platforms around the drum at right angles to the mills so as to directly discharge the cush - cush in to the inter rake elevator in between mill no. one and two.

I. CONTROL PHILOSOPHY FOR OPERATION OF ROTARY SCREEN

a) Hot Water Sparging

The screen drum should be cleaned at regular intervals by spraying weighed hot water (80 to 85 ^{0}C) at adequate pressure (min.4 kg/cm2 at nozzle header) through spray nozzles. The hot water should be pumped by a separate high pressure Sparging pump. The starter panel of the pump should be provided with control circuit having timers to 'START' the pump at pre-set time intervals of every 5 to 10 minutes. The pump remains 'ON 'for about 30 to 60 seconds.

Alternatively

b) Screened Juice Sparging

The screen drum should be cleaned at regular intervals by spraying screened juice at adequate pressure (min. 4 kg/cm2 at nozzle header) through spray nozzles. The juice is tapped from screened juice pump delivery line and provided with a solenoid control valve, with control circuit to spray the juice at a pre-set interval for a set time period.

In this case, a separate pipe header is required for sanitizing the screen with either hot water (80 to 85 ^{0}C at 1.0 bar pressure from imbibition water system or with exhaust steam (125^0 C at 0.5 to 1.0 bar pressure) at least once in a shift for a period of one to two minutes

c) Caustic Soda Solution Cleaning

i. In order to clean accumulated scum of gummy, waxy matter, a spray of dilute caustic soda solution (about 20 %), approx. 300 to 500 litters, is applied on to the screen drum once in a week. Caustic soda solution pumped with the help of the same water-Sparging pump. It is necessary to stop the feed juice going to the screen, at this time. Dilute caustic soda solution should be allowed to react on the scum of gummy, waxy matter and later, hot water / screened juice should be sprayed to wash away the loosened scum as well as traces of caustic soda solution. The caustic soda solution is to be re circulated by installing a separate tank by installing a diverter and valve, so that this caustic soda solution does not add alkalinity to the juice.

ii. As an additional precaution, screen drum should be inspected and bagacillo, gummy, waxy matter accumulated & hardened in the screen slots over the period of time, should be thoroughly cleaned with brush & caustic soda dilute solution during the regular cleaning shut – down.

II. Juice tanks, gutters and Pumps

Juice from mill No.3 and 4 shall be collected in individual cylindrical whirler tank with conical bottom of 1500 mm dia. and 1200 mm height. The whirler tanks shall be made of 5 mm thick S S 409M connected to mill juice trough 5 m. m. thick SS 409 M gutterand juice shall be pumped through two No. (One as standby), chock-less pump with full bore discharge.

The juice from mill No. 2 and 1 shall be collected from individual mill juice trough to 5 mm SS 409 M gutters outside the mills and then connected to individual cylindrical whirler tank with conical bottom of 1500m.m. dia. height 450 mm more than the mill bed height. All whirler tanks shall be interconnected with gutter and flap at top level. Mill No.1 whirler tank shall be connected with 2 nos. unscreened pumps.

The juice from whirler tanks of mill number 3 and 4 shall be pumped (two nos.,one for each mill juice & One as standbyfor each mill juice) through individual choke-less pump capable of pumping 150 m3 per hour of juice having minimum 50% solids at 12 meters head to imbibition juice distribution through a suitable surplus feedback device installed above the level of gangway at the mills to ensure steady and uniform rate of imbibition. The juice from Mill No.1, shall be pumped through two No. (One as standby for unscreened juice of mill no.1 as well as of mill no. 2.), chock-less pump with full bore discharge and each capable of pumping 400 m3 per hour of juice having minimum 50% solids at 12 meters head to rotary screen. Similarly for Mill No.2, two no.(One as standby choke less pump with full bore discharge and each capable of pumping 400 m3 per hour of juice having minimum 50% solids at 12 meters head to rotary screen shall be provided. All the above pumps shall be designed to operate at about 960 rpm. The screened juice shall be collected in a 5 mm thick SS 409 M cylindrical tank / column of 200HL capacity. Two strained/ screened juice pumps (one as stand by) each of 350 m3/hr capacity and 75 mtrs. head shall be provided for pumping the screened juice to juice heaters through juice flow meter.

Thus there will be total 10 nos. different size of juice pumps in mill house. All juice pumps Viz. Imbibition, unscreened and screened juice pumps to have SS bodies and with / SS impellers and SS shafts. All the juice pumps should have delivery lines not less than 250 mm. All the juice pipe lines in mill house shall be of SS with long bends to avoid chocking in the pipe lines. Screened juice pipe from mill house to boiling house shall be of SS material.

III. Water Imbibition System

The system shall include two separate automatic control loops having various control system components as specified.

a) Imbibition water flow control system

Imbibition water flow will be controlled to maintain a fixed ratio of imbibition water to cane. The desired ratio will be fed through the DCS keyboard and the load on the penultimate mill or brix of Last Mill Juice will be measured. The flow of imbibition water will be regulated to maintain the ratio at various loads. If load of penultimate mill or brix of LMJ is below the minimum running level, imbibition water flow will stop.

Sensor	On-line brix measurement of LMJ with Coriolis density sensor with dual U tube design or single full bore straight tube design having following specifications.	
	Accuracy	+ or - 0.0005 gm/cc
	Ambient	0.001 % of nominal flow
	Temperature effect	rate per ^{o}C
	Power supply	85-230 VAC

	Housing	NEMA 4X

OR Load of penultimate mill with two wire electronic analogue pressure transmitter with capacitance sensing technology having 4 – 20 mA DC output or current transformer out-put for recorder and controller.

Controller : Microprocessor based multi loop DCS controller.

Control Valve: Suitable for controlling the flow of imbibition water continuously with proportional control.

OR

A.C. variable drive : Suitable for controlling the speed of the electric motor employedfor imbibition water pump.

b) Imbibition water temperature control system

- **Sensor :** Suitable RTD PT 100.
- **Transmitter:** Two wire electronic analogue type with 4-20 m A, DC output.
- **Controller :** Microprocessor based single loop indicating type.
- **Control Valve: Suitable** for controlling the flow of water in well designed and fabricated condensate - water Mixing Arrangement.

c) Hot water imbibition pumps

2 Nos. (1 as standby) Hot water imbibition pumps of **120 m^3 /hr** Capacity and 50 mtrs. Head shall be provided.

d) Online magnetic flow meter for maceration water DCS system

For the accurate weighment of imbibition water online magnetic flow-meter of 220 T/hrs.at 100℃ capacity shall be provided.

On line calibration facility for check weighment with tank of suitable capacity shall be provided for random checking of imbibition water delivered by mass flow meter without stopping the crushing.

6.1.3) Mill House Crane and Gantry

One new three motion electrically operated overhead mill house travelling crane conforming to class II IS specifications having one trolley of **30 tones** SWL capacity and one HOT crane having **5T** SWL capacity with independent trolley, complete with crane gantry shall be provided. The crane rail centre distance shall be to suit the mill house building span and length of travel for Mill house crane shall cover fibrizer to Mill drive end. The specifications for mill house crane shall be as under:

Height of lift	-	10 meters
Main hoist speed	-	02 meters/minute
Long travel speed	-	10 meters/minute
Cross travel speed	-	10 meters/minute
Main hoist motor	-	30 HP, TEFC sq. cage, S5 duty
Long travel motor	-	Not less than 5+5 HP slip ring TEFC sq. cage. S4 duty (Both end independent drive)
Cross travel motor	-	Not less than 7.5 HP slip ring TEFC S5 duty.

All the above motors shall be of crane duty. The bridge shall be of box type construction made of IS: 2062. Provision for the inching of lifting and lowering system shall be provided. The span of crane not less than 26 M.

6.1.4) Bagasse Handling System –

I. Rubber belt conveyor for Bagasse

One no. belt conveyor of suitable capacity having minimum width of 1800 mm effective width and length 8000 mm driven by suitable motor and speed reducing arrangement, to carry bagasse from last mill to bagasse elevator is to be provided. Belt conveyor shall suit to the crush rate of 4900TCD on 22 Hrs. Basis. Necessity and location of the bagasse rubber belt conveyor shall be as per the need of the plant layout.

II. Bagasse Elevator (With Double Drive Arrangement)

One steel slat or rake type bagasse elevator of all steel construction of 2000 mm effective width and suitable length (inclination not to exceed 45 deg. with the horizontal) to carry about 135 tonnes of bagasse per hour and driven by TEFC S-1 Duty electric motor of **55 KW** through foot mounted Planetary gear box to give a linear speed of 25 - 30 metres/minute shall be provided. It shall have two strands of chains of 200 mm. pitch. The breaking strength of chains shall be minimum 60,000 kgs. One more drive of same size/capacity to be provided opposite side of this drive for emergency use.
The elevator chain shall be driven over two cast steel of 45 C8 sprockets with machine cut teeth only mounted on 200mm dia.,head shaft running in 160 mm size anti-friction spherical roller bearings with suitable size sleeve and adopter etc. and secured in cast steel housings.

The tail shaft shall have two cast steel sprockets having machine cut teeth mounted on 180 mm central dia. Shaft running in 140 mm size anti-friction spherical roller bearings with suitable size sleeve and adopter etc. gun secured in cast steel housing with side rails and tension bolts for tightening the chain. The head and tail shaft shall be ultrasonically tested of 45 C8 quality. The trough side and bottom plate shall not be less than of 6 mm thick mild steel. The elevator shall be provided with horizontal section of suitable stretch as per the requirement of the layout.

Easy sliding screens shall be provided on the elevator for screening the bagacillo. The screening area shall not be less than 15 mt^2. Each screen shall have a blind portion for sliding it in the elevator portion for cleaning or changing the screens while working. Width of each screen shall not be more than 600 mm. The screen shall have punched conical holes having 6/8 mm dia. size on the surface facing the bagasse elevator. Platform and staircase shall be provided for approaching on both sides of the elevator. A suitable capacity bagacillo blower shall be provided to get the feed from the bagacillo chute placed below bagasse elevator. Bagacillo shall be blown to the vacuum filter through a suitable size bagacillo pipe.

III. Main Bagasse Carrier (With Double Drive Arrangement)

One main Bagasse carrier of double trough design and all steel construction of 2000 mm effective width shall be provided. Main Bagasse carrier shall be suitable to handle bagasse of 250 TCH crush rate. It should be able to carry about 135 tonnes bagasse per hour, driven by T.E.F.C S-1 Duty, electric motor of **75 KW** at 1440 rpm through foot mounted planetary speed reducer to give a linear speed of 25 - 30 meters/minute. It shall have two strands of

chains of 200 mm pitch. The breaking strength of each chains shall be minimum 60,000 Kgs.

One more drive of same size/capacity to be provided opposite side of this drive shaft for emergency use.
The main bagasse carrier shall have construction similar to bagasse elevator and to be supported on steel channel columns, provided with rigid base plate. The columns should be adequately braced. The conveyor should be covered(to protect bagasse from rain) shall be complete with all structure and feeding chute to boilers etc. and will have arrangement to feed bagasse to the boilers from return bagasse carrier. The individual chutes to each boiler should have slide operated diagonally cut doors operable from the working platform of the boilers having double pinion and rake type arrangements and stair case from boiler platform. Tail shaft and head Shaft MOC shall be 45 C8.

IV. Return Bagasse carrier

The return Bagasse conveying system shall consist the followings-
One no. troughed/ horizontal, double deck type belt conveyor of suitable width and length between sprocket centers of approximately 150 mtrs. shall be supplied with double drive. Top deck of belt conveyor no.1 shall receive bagasse from belt no.2 and deliver it to the bagasse yard at multi points with the help of plough arrangement. Bottom deck of the belt conveyor shall receive bagasse yard and deliver it on top deck of main bagasse carrier. The belt bagasse carrier shall be complete with structure staging and suitable drive so as to operate at approximate speed of 80 mtrs. /min.

Belt conveyor no.2 shall receive bagasse from bottom deck of main bagasse carrier after boiler feeding and shall deliver the same on top deck of bagasse conveyor no.1. Length between the sprocket centers will be approximately 26 mtrs. The Return bagasse conveyor system is to be provided to handle bagasse of 7500 TCD. The location of conveyor shall be as per the requirement of lay out.

V. Surplus Bagasse Carrier

One No. surplus bagasse rubber belt conveyor of minimum 1500 mm width and of 60 meters length with suitable drives and staging structure shall be provided for conveying excess bagasse from main bagasse carrier to the bagasse storage yard. Height should be as per approved layout.
All conveyors of bagasse shall be suitable covered.

6.1.5) Recirculation and conservation of Mill water

For water Conservation and recirculation system necessary arrangement, be provided for recirculation of cooling water from power turbine, Mill bearing, enclosed mill drive gear boxes, crystallizers, air compressor and sulphur burner etc. All equipments like M.S. fabricated collection tank of suitable capacity, 2 nos. pumping sets (one as standby) piping, valves etc. be installed at suitable location to collect the water from above said sources and pump to the water reservoir for recirculation. The water shall be pumped to raw water reservoir through spray nozzles installed on the reservoir itself to achieve the atmospheric cooling.

All the surplus condensate shall be cooled by a suitable size Two Stage Fanless FRP Cooling tower having forced cooling system to cool the condensation to atmospheric temp and reused in recirculation water used for process only.
The necessary scheme be got approved for the same from the factory/NFCSF

6.1.6) Mill Roller Turning Lathe Machine

A lathe machine for machining of the mill rollers is required to be installed in proposed mill house with in the range of mill crane at a suitable place. The technical specifications of the desired mill roller lathe machine shall be as given below –

1.	Bed Length	- 30 ft.
2.	Bed Width	- 36”
3.	Centre height	- 30”
4.	Spindle Hallow	- 4.5”
5.	Admit between centres	- 18 ft.
6.	Swing over bed	- 60”
7.	Effective length of gap	- 24”
8.	HP & RPM of motor	- 20, 1440

All the attachments of the lathe machines along with the desired tools shall be supplied with the lathe machines.

6.1.7) Size and level of Mill house

The floor level of all the houses shall not be less than 300 mm. above the existing factory floor level. The covered sizes of houses will not be less than as given below.

Mill house : Width-26 x length-114 x height 17 (In Mtrs.).

The length of mill house building shall cover from before fibrizer to after bagassilo blower.

Cane feeding area : Width – 26 X length – 55 (Mtrs.).

7.0 SCOPE OF WORK & TECHNICALSPECIFICATIONS OF BOILING HOUSE PLANT & MACHINERY FOR RAW SUGAR HOUSE

7.1Permeable

It shall be a **super gravity** flow plant and shall be provided with passenger lift and it shall be operative from ground floor to pan floor suitable to lift at least 600 kgs approx.

Two massecuite boiling scheme with A and B massecuite boiling for raw sugar productionand an additional Refinery massecuite boiling with back boiling process to control the molasses purity for refined sugar production shall be adopted Heavy shall be diverted to Molasses storage tank for the Production of Ethanol and Extra Neutral Alcohol during off season.

However, in Process House, the equipment required for three massecuite boiling shall be provided in the Pan station so that whenever required the total mixed juice will be utilized in process house to produce 100 % refined sugar of 60(MAX) ICUMSA on three massecuite boiling process.

The process of clarification adopted in Refinery shall be melt phospho flotation with double decolorization system to produce refined sugar of 60(MAX) ICUMSA. Overall steam consumption of boiling house in sugar plant for raw sugar & refinery process shall be around 40 % (+/- 2)on cane at 320% imbibition on fibre.

Minimum floor level of clarification and evaporation section shall be +9.50 meter from factory floor level (FFL) to facilitate gravity flow of juice, condensate and massecuite.

Boiling house span shall not be less than 26 meter

Live steam connection shall not be provided in boiling house except at sulphur furnace for start-up / emergency requirement. Butter fly valves shall be used in the system except for special duty like cutover valves, double beet valves, etc.

All the equipments and system shall be installed indoors except FFEs evaporator station.

Operating Parameters

Sl. No.	Units	Parameters
1.	Crushing rate	4900 TCD (223 TCH)
2.	M.J. % cane	116.50
3.	Fibre % cane	15.00
4.	Added water % fibre	320.00
5.	Filtrate return % cane	14.00
6.	Defecated juice % cane Defecated juice % cane entering the clarifier after DCH heating and vent loss	136.95 136.50
7.	Clear juice % cane Clear juice % cane entering the 1st body of quintuple	123.50 127.31
8.	Brix clear juice	12.50
9.	Brix syrup	67.00
10.	A Massecuite % cane	26.00
11.	B Massecuite % cane	10.00
12.	C Massecuite % cane	9.00
13.	R1 Massecuite % cane	27.00
14.	Exhaust pressure (Absolute)	2.40 kg/cm.^{2}
15.	RBHR	92.00 plus
16.	F.M. Purity	28-29
17.	B heavy molasses purity(if B heavy diverts for ethanol	50-52

System / Technology proposed to be adopted

I. Motorised Valves:

Exhaust steam / vapour valves shall be rubber seated right angle valves. Exhaust steam valves of FFE 1, vapour valves of Evaporator & juice heater station which are not approachable from main platform shall have **motorised operation** compatible to DCS. Main platform shall mean +9.50 meter from FFL. The number of motorised valves

required for these duty shall be decided by purchaser as per the site condition, For B continuous pan steam valve shall be of Butterfly type – auto control compatible to DCS

II. **Magnetic flow meters with indicating, integrating and recording facility**:

- Hot and cold water arrangement with auto control & Magnetic flow meter with indicating, integrating and recording facility with respect to level of clear juice in juice column.
- Magnetic flow meter with indicating, integrating and recording facility for hot water use in filter cake washing shall be provided
- All pans shall have individual magnetic flow meters in hot water line to pan feed headers.
- Magnetic flow meter with indicating, integrating and recording facility for hot water use in evaporator.
- Magnetic flow meter with indicating, integrating and recording facility in SHWW line to A-Centrifugal machines, continuous centrifugal machines separately for each duty.

- **A, B & C Continuous pans**

  - Flow meter with totaliser in hot water line to continuous pan shall be provided.
  - Condensate water flow indicator with integrator
  - Molasses quantity flow indicator with integrator

- Magnetic flow meter with indicating, integrating and recording facility for hot water use in magma melter.
- Magnetic flow meter with indicating, integrating and recording facility on tube well as per CPCB norms.
- Magnetic flow meter / venture meters with indicating, integrating and recording facility as per CPCB norms.

- **Vertical Crystallizer**

  - Diameter of vertical crystallizer shall be less than 3.6 mtr.
  - The crystallizer shall be driven by a high efficiency shaft mounted planetary gear drive to provide a stirrer speed of about 60 RPH for A massecuite and 40 RPH (0.33RPM) for B massecuite & 20 RPH for C massecuite.

- The Speed of the stirrer shall be 60 RPH for speed crystallizer and vacuum crystallizer
- The speed of the stirrer of vertical crystallizer for B and C massecuite shall be 20 RPH

- Magnetic flow meter with indicating, integrating and recording facility for hot water use in magma melter.
- Magnetic flow meter with indicating, integrating and recording facility on tube well as per CPCB norms.
- Magnetic flow meter/venture meters with indicating, integrating and recording facility as per CPCB norms.

III. On line conductivity measurement:

On line conductivity measurement with 3-way pneumatic dump valve should be provided in exhaust condensate water line to divert/drain water if sugar traces detected with automation in DCS to save boiler water contamination with alarm in control room.

IV. Juice heaters (vertical tubular &DCH)Evaporators and vapour pipes designs:

These shall be designed as per standard norms and evaporation rate, shall specify the design parameters. However minimum evaporation rate of the quintuple body shall be as per the best standards of sugar industry. Bidder will submit HMBD in technical bid.

V. Vibro screens

- Light and heavy filtrate
- MOL
- All Melt

VI. Batch Pans

- All batch pans shall have mechanical circulators of efficient design to enable the pan to work at low vapour pressure / temperature
- All pans of 80 tons capacity shall have 02 Nos massecuite discharge of 600 mm size each.
- All pans shall have down take not less than 40% and graining volume around 45 %.
- S/V ratio shall not be less than 7.00.

- Length of the batch pan tubes in pans shall not exceed 800 mm
- Batch pan shall have top mounted mechanical circulator which shall be provided with Bevel helical gear box with AC VFD drive. Specification shall be designed to ensure efficient working of pans at low temperature vapour. Design parameter shall be provided considering type of massecuite.
- Pans shall be complete in every respect with necessary fittings for satisfactory operation including the discharge valve of suitable capacity, various pipelines (vapour, syrup, high and low grade molasses, movement water, inter connecting cut over pipe lines etc.) key sampler, vacuum and atmosphere venting. Hot water meter cum recorder capable of measuring 15 m3/hr of hot water to be provided.

VII. Massecuite Handling System

- A, B, and C messecuite shall be generated for better quality of sugar and to control the loss of sugar in final molasses.
- Individual pugmills, magma mixers and run of tanks with pumps and motors, shall be provided.
- All massecuite under reference shall flow by gravity from pans to receiving crystallizers and to respective pugmills.
- B and C massecuite shall be pumped to respective vertical crystallizers but in case of any emergency / failure of pumps B and C Massecuite receiving crystallizers shall have the provision to flow directly to respective pugmills. The respective pumps shall be placed at the crystallizer level only.
- Band C Massecuite sealing system from B and C continuous pan shall also be placed alongside the U shape crystallizer for other Massecuites. The pumps shall be placed at the crystallizer platform level only.

VIII. Magnetic separator and dust catcher

- The system shall be designed to ensure the sugar free from any iron particles and shall meet the norms of standard laid down by Govt. of India. Magnetic separators shall be installed were ever required
- Dryer house shall be dust free. Zero tolerance limit shall be provided. Efficient sugar dust collection system in dryer house shall be provided.
- 1kg, 2kg and 5kg packaging system shall be provided

- Necessary infrastructure is to be provided in drier house for maintaining hygienic condition as per the norms of fssai.

IX. Surplus condensateCooling System

Suitable capacity condensate cooling system complete in all respect shall be consider condensate cooling shall take please in two stages so that temperature of the cool condensate shall be less than 30 deg. C.

X. Clarification, evaporation and juice heating system

Every vessel and system will be complete in all respect like connection pipelines, valves, condesate/juice pumps and motor with valves, tubes, insulation, working plateform etc. in order to make trouble free working during crushing season and to get desire results.

XI. Water Cooling System for mills and turbines

Separate cooling system for mills and power turbines shall be considered make up water shall be made from tube well water reservoir.

XII. Air compressor unit for boiling house instrument operation

This shall be independent of any other air compressor in the boiling house

XIII. Final molasses cooling system:

On line cooling system of efficient design.

XIV. Irrigation Management Plant

Proper irrigation management plant as per norms of CPCB with necessary grid piping, valves and pumps shall be provided.

XV. Rain Water Harvesting

Proper Rain Water Harvesting system for all the Sugar Godowns and main factory building as per the norms of CGWA.

USE OF MODERN TECHNOLOGY

- Steam saving devices
- Power saving
- Condensate flash recovery system

- Continuous Vacuum Pans and Batch pan with Mechanical Circulator helps in massecuite boiling at low vapour pressure and temperature
- Water management -Water management is important to conserve natural water source. As such, condensate cooling system and its reuse shall be introduced to minimize tube well water use so that effluent discharge be minimised.

  To achieve effluent discharge level as per limit prescribed by Effluent control board, necessary arrangement shall be provided for collection, cooling and recirculation of cooling water from power turbine, mill bearings, enclosed mill drive gear boxes, crystallisers, air compressor and sulphur burners etc.
- Pneumatic controls Pan discharge valves and cut over valves
- Use of VFD to reduce power consumption
- Use of shaft mounted high efficiency helical planetary drives for low power consumption.
- No use of any direct steam (7kgs/cm2) for Boiling house.
- Use of 1st vapour for pan washing, fourth vapour for molasses conditioners.
- Use of 4th vapour for DCH type sugar melter.
- 2nd effect condensate to be used in PHE by L.P steam to get 115 Degree Cfor sugar drying.

Brief Description of Modern Technologies In The Project

The following are **the modern technologies** incorporated in the process house to reduce internal steam and power consumption and pass on balance to generate more power and enhance the revenue generation by selling excess power to grid.

The use of modern equipments and advanced technology in Indian sugar industry has helped to a considerable extent in reducing the overall cost of production of sugar. The ultimate aim of this project is to minimize steam and power consumption and with production of good quality refined sugar of 60(MAX) ICUMSA.

- Steam saving devices - Direct contact heaters for juice heating. Direct contact heaters can operate at 1-2 deg. C approach temperature and this salient feature makes us use later effect vapours for juice heating. This also facilitate continuous operation without any need for periodic cleaning of juice heater. For efficient operation and control of these heaters, automation for temperature control shall be provided.

- Condensate flash recovery system - Generally condensate is collected individually from evaporators and pans and sent to overhead hot water tank. The recovery of heat from the condensate of evaporator, pans is very important for higher level of thermal efficiency of the system. The flash vapour is recovered from different calandria and fed to evaporator bodies at lower pressure. Flash recovery enable us to get reduction in steam consumption by 2 – 2.5 % on cane. It also helps in reducing power consumption and maintenance cost due to reduction in number of condensate pumps.

- Continuous vacuum pans – It maintains steady consumption of vapours thus eliminating the problem associated with vapour flow fluctuation. Accordingly there will not be any variation in functioning of evaporator station and boiler steam generation. This system automatically manages the steady conditions for development and uniform growth of crystals. This system allows the use of lower grade vapour and helps to improve the exhaustion of sugar from mother liquor resulting in low molasses purity.
- Water management is important to conserve natural water source. As such, condensate cooling system and its reuse shall be introduced to minimize tube well water use so that effluent discharge be minimized.

- To achieve effluent discharge level as per limit prescribed by CPCB, necessary arrangement shall be provided for collection, cooling and recirculation of cooling water from power turbine, mill bearings, enclosed mill drive gear boxes, pumps, crystallizers, air compressor and sulphur burners etc.

  Power house, mill house and boiling house system shall be independent of each other.

- **Mechanical circulator** in all the batch pans for massecuite boiling This shall provide better circulation of massecuite boiling at low vapour temperature results in reduction of sugar losses and steam consumption

- The system shall be designed by incorporating latest technology using distributed control system (DCS) incorporating variable frequency drive (VFD) for centralized control for achieving high efficiency, reduction in power consumption and better utilization of man power. Centrally control rooms shall be provided at Boiling House.

DCS Control system:

- The system shall be designed by incorporating latest technology using distributed control system (DCS) incorporating variable frequency drive(VFD) for centralized control for achieving high efficiency, reduction in power consumption and better utilization of man power.

  A **variable-frequency drive** (VFD) (also termed adjustable-frequency drive, variable-speed drive, AC drive, micro drive or inverter drive) is a type of adjustable-speed drive used in electro-mechanical drive systems to control AC motor speed and torque by varying motor input frequency and voltage. Use of VFD saves energy which implies saving in terms of money.
- A **distributed control system** (DCS) refers to a control system of a process plant and industrial process wherein control elements are not only located in central location (like the brain) but are also distributed throughout the system with each component sub-system controlled by one or more controllers so the intelligence is distributed across the sections of the plant. DCS follows hierarchy in its control philosophy with various function spread across.

- Distributed control systems (DCSs) are dedicated systems used to control manufacturing processes that are continuous or batch-oriented. DCSs are connected to sensors and actuators and use set point control to control the flow of material through the plant. The most common example is a set point control loop consisting of a pressure sensor, controller, and control valve. Pressure or flow measurements are transmitted to the controller, usually through the aid of a signal conditioning input/output (I/O) device. When the measured variable reaches a certain point, the controller instructs a valve or actuation device to open or close until the fluidic flow process reaches the desired set point. A typical DCS consists of functionally and/or geographically distributed digital controllers capable of executing from 1 to 256 or more regulatory control loops in one control box. The input/output devices (I/O) can be integral with the controller or located remotely via a field network. Today's controllers have extensive computational capabilities and, in addition to proportional, integral, and derivative (PID) control, can generally perform logic and sequential control. Modern DCSs also support neural networks and fuzzy application.

- DCSs are usually designed with redundant processors to enhance the reliability of the control system. Most systems come with displays and configuration software that enable the end-user to configure the control system without the need for performing low-level programming, allowing the user also to better focus on the application rather than the equipment. However, considerable system knowledge and skill is required to properly deploy the hardware, software, and applications. DCSs may employ one or more workstations and can be configured at the workstation or by an off-line personal computer. Local communication is handled by a control network with transmission over twisted -pair, coaxial, or fiber-optic cable. A server and/or applications processor may be included in the system for extra computational, data collection, and reporting capability. The system shall be compatible to centralised controlled DCS system.

System Design Basis:

- Butter fly valves shall be used in the system except for special duty like cutover valves, double beet valves, massecuite suction line etc.
- Exhaust steam / vapour valves shall be rubber seated right angle valves.
- For continuous pan steam valve shall be of Butterfly type – auto control compatible to DCS.
- Steam duty globe valve in steam vapour line and NRV shall be tested not less than 15 kg/cm 2.
- Pressure relief valves shall be butter fly valves compatible to DCS. All the equipments and system shall be installed indoor.
- Design of the FFE shall be proven one subjected to efficient operation in the Industry.
- Vertical continuous crystallisers shall have proper coverage. Operator shall have proper passage from boiling house to top of crystalliser and shall have safe operation conditions subject to Purchaser approval.
- All liquid pumps except for molasses shall be provided with suitable size SS- 304 strainers system in suction line to arrest foreign particles.
- All process – juice – water etc MS piping shall be heavy duty C–class. SS 304 piping having diameter 150 mm and above shall be minimum of schedule 20. Below 150 mm pipe, it shall be scheduled 10. Piping from mill house (Screened juice) pumps to the inlet of evaporator first body FFE (Falling film evaporator) shall

be of SS-304 grade minimum of schedule 20. All direct contact heaters (Juice and molasses DCH etc.), **Condensate flash tank (Cigar)** with inter connecting pipe lines and nipples shall be of SS-304 grade.

- Pipelines & fittings – all hot and cold water, juice, syrup, magma, molasses, massecuite and bled vapour, live steam, reduced pressure and exhaust steam pipeline shall be suitable for 4900 TCD and shall be designed so that velocities given below are not exceeding at 4900 TCD.

Water and juice	:	Suction 1.0 m/second Delivery 1.2 m/second.
Condensate	:	Suction 1.0 m/second Delivery 1.20 m/second
Syrup	:	Suction 0.5 m/second Delivery 1.0 m/second.
Molasses	:	Suction 0.3 m/second Delivery 0.5 m/second.
Massecuite/Magma	:	Suction 0.1 m/second Delivery 0.15 m/second
Superheated/ Saturated steam	:	30 m/second
Exhaust steam	:	30 m/second
Bled vapours	:	30 m/second
Compressed air/SO2	:	20 m/second

A maximum pressure drop of 1.0 kg/cm2 g.shall be allowed from boiler outlet to the inlet of power turbine.

No pressure drop is allowed in the exhaust steam pressure between Power turbine station and at the inlet of evaporator station. Exhaust steam pressure at FFE 1 (Evaporator station) shall be minimum 1.50 kg./cm^2.g to 2.00 kg./cm^2.g

- In the boiling house chequered plate flooring shall be provided. All gangways, passages, staircases, working platform and railings shall be convenient. Chequered plate thickness shall be minimum 5mm.

- All statutory requirement regarding staging platform staircases, safety devices etc. shall be observed at the design stage.
- All the Grit catchers in the sugar plant shall be 800 mm dia x 1000 mm height - shell 8 mm thick, bottom 10 mm thick. Cover plate 20 mm thick. Covers shall be hinged and cover holding bolts should be 25 mm dia. The bucket screen shall be made of 3 mm thick AISI 304 quality SS and should have sturdy handles for lifting.
- All S.S. tubes shall be of grade SS-304 conforming to alloy I.S. 13316 fully annealed.
- Shaft mounted high efficiency helical planetary drive shall be M.S. Fabricated / C.S. construction
- .
- Specification for Mechanical circulator with drive shall be as below:-
    - Drive – AC VFD (suitable)
    - Gear box - Planetary gear box/Bevel Helical
    - Material of construction:
    - Blades – Stainless steel 304
    - Hub - Cast Steel
    - Shaft – EN -8

- Specification of right angle, double beat valve and Butterfly valve are as follows:-

a) M.S. Fabricated right angle valve

- O/S Yoke type rising Spindle
- S.S. – 410 Spindle
- S.S. – 410 Body Seat
- Flap Seat of EPDM Rubber suitable for 160 deg. C.
- Double Thrust Bearing for Easy Operation
- Without Flange Ends
- **Motorised operation of 400 mm size and above,** No. of valves required shall be decided by client as per condition laid down in earlier mentioned in right up of design philosophy.

b) S.S. fabricated double Beat valve

- S.S. – 409 Body heavy duty
- S.S. – 410 spindle
- S.S. body seat with Casted Guide
- S.S. Flap fitted with EPDM rubber
- Flange ends as per Table 'D'
- Top and Side flanges of MS

c) Butterfly valve

Item : Centerline (RS) wafer type soft seated butterfly valve

Body : Gray cast iron BS EN 1561 Gr. EN-GJL-250 phosphate and painted upto 300 mm, and sg IRON BS EN 1563 Gr. EN GJS-15 phosphate and painted for size 350 mm and above.

Disc : SS 316 floating disc design

Seat : Grade EPDM field replicable with back metal strip

Stem : AISI type 410

Ends : Water type to get sandwiched between flanges as per ANSI B 16.5 # 150

Method of operations: Manual hand lever operated upto size 150 mm and worm gear wheel operated for size 200 mm and above.

Leakage rate	:	As per ANSI B 16.104 Class VI (100%) leak tight
Shut off	:	Pressure 10 barg
Hyd. Body	:	Test 1.5 x shut off pressure
Hyd. Seat	:	1.1 x shut off pressure

- All juice piping at mills upto evaporation station shall be of SS 304 grade.
- Syrup, Molasses and melt pumps shall be high flow type.
- Exhaust steam provision shall be provided for start-up of all heat transfer units like juice heaters including DCH, pans & cut over line washings etc. shall be provided with motorized valve wherever required and compatible to DCS.
- M.S fabricated pipe for vapour duty shall be of 8 mm thickness upto 800 mm size and 10 mm thickness above 800 mm.
- All MS fabricated pipes of any size for injection and spray system shall be made out of 12 mm thickness.

- All the MS fabricated pipes shall be duly braced.
- The level of automation in the total plant shall be to achieve high efficient operating performance and also to optimize the working strength.
- Exhaust steam pressure at the header FFE 1 shall be 2.5 ata at 125-127 deg.C.
- Vertical multi pass tubular juice heaters shall be designed to have juice velocity around 1.5 m/sec.
- Raw Juice heating by flashed condensate water &vapour, defecated juice heating, clear juice heating and pan boiling will be by bled vapours from multiple effect evaporators.
- Sugar melting will be by vapours from 1st level of quintuple effect evaporators. Pan and cut over washing and 2nd stage molasses conditioning shall be carried out by vapour form 1st body of quintuple.
- Melt concentrator I st effect heating by Quint 3 vapours.
- Melt heating before melt clarification, Melt heating after Deep bed filters and molasses conditioning will be from Melt concentrator 1st effect vapours.
- Condensate flash heat recovery system for steam saving up to 2.5 %.
- The stream shall be envisaged to make the boiling house including refinery plant not to consume more than 42 % on cane.
- Milk of lime preparation and pumping facilities with all accessories.
- Juice defecation system shall be suitably designed with auto pH control to get better quality clear juice with low turbidity.
- Quintuple effect evaporation system-falling film evaporators as first three effects, Robert's type as remaining two effects with automation and standby tandem of identical evaporator set for de-scaling.
- Vertical tube horizontal type continuous vacuum pans for 'B' massecuite boiling with automation of proven design.
- Supply tanks at pan floor to store syrup, melt and molasses.
- Mono vertical crystallizers shall have cooling shall be divided in three stages with counter current flow water to have proper control massecuite cooling as per requirement.
- Single entry multi jet condensers for evaporators and pans with automation.
- Direct contact type sugar melter to melt 'B' & 'C' seed with automation.

- Direct contact type molasses conditioners with Conventional tank & stirrer type molasses conditioners for molasses conditioning ('AH', 'BH', and 'CL' Molasses).
- Auto pH control system should ensure Defecated juice within ± 0.05 of the set value.
- Heating surface of Juice heaters, evaporators and pans shall be calculated on the basis of mean diameter and effective tube length with contact of heating steam/vapour.
- Continuous flow and brix measurement of syrup at the outlet of last effect evaporators.
- The following shall be the recommended vapour bleeding arrangements.
- 2.5 ata exhaust steam to 1st effect evaporator calandria and to super-heated wash water system.
- 2.5 ata exhaust steam to vertical tubular juice heaters for initial startup.
- Exhaust steam by pass arrangement to pans, to continue pan boiling during mill stoppage and in emergency.
- Exhaust steam arrangement to vertical tubular juice heaters for start-up.
- Hydraulic / pneumatic discharge system for batch pans.
- All crystallizers drive speed reduction units shall be through planetary gearbox.
- Water cooled crystallizers S/V ratio (m2/m3) shall be minimum 2.0 for C/B massecuite.
- Minimum vacuum at the last body of evaporator and pan body shall be 635 mm at mean sea level.
- Carbon steel plates shall be as per IS 2002 – 2006 Gr E 250, nozzle shall be as per IS 1234 – 2004 heavy class, all pipe lines other than SS409/SS304 shall be as per IS 1234 – 2004 heavy class.
- Where ever pumps & motors are provided it shall be one working and one standby irrespective of application.
- Juice heaters, evaporators and pans calandria tube specification shall be:

  Juice Heaters

  Tubes : 45 mm OD x 1.2/ (1.5 mm for VLJH thick) ERW SS Tubes, Gr04, CR18, Ni10 as per IS 13316 – 1992 (EQ to AISI -304)

Ligament of Tubes	:	Vapour line juice heaters – shall not be less than 15mm other heaters – shall not less than 12 mm

Evaporators

Falling Film	:	45 mm OD x 1.2 mm thick ERW SS tubes, Gr04,
Ligament of tubes	:	16mm
Evaporator tubes		CR18, Ni10 as per IS 13316 – 1992 (EQ to AISI – 304)
Roberts' Tubes	:	45 mm OD x 1.2 mm thick ERW SS tubes, Gr04, CR18, Ni10 as per IS 13316 – 1992 (EQ to AISI – 304)
Ligament of tubes	:	Shall not be less than 12 mm

Pans

Tubes	:	102 mm OD x 1.6 mm thick, 800 mm long, ERW SS tubes, Gr04, CR18, Ni10 as per IS 13316 – 1992 (EQ to AISI – 304)
Ligament of tubes	:	shall not be less than 16 mm

- Safety valve, drain valves where ever necessary, required individual strainers shall be provided for each suction line with isolation facility.
- All delivery lines except molasses, magma, massecuite and seed shall have stop valve and non-return valve.
- All molasses, magma, massecuite and dry seed pumps shall have only suction valve, delivery line shall not have valve & non-return valve.
- All the delivery lines shall have by pass line (recirculation) with valve.
- The right angle valves used in exhaust steam and vapour pipe lines shall have stainless steel internals and spindle. In evaporator station valves above 2 meter elevation from working platform shall be motorized valves subject to site condition and purchaser's approval.
- All valve spindle 75 mm onwards shall be SS material and triple strand thread.
- Twin screw pumps / positive displacement cavity pumps with SS internals for molasses and melt.

- Blow off pipes / vents drains etc., shall be extended beyond roof / factory buildings as per requirement.
- Safety valves, drain valves, steam traps, non-return valves etc, shall be provided in all steam lines & vapour lines where ever required.
- All safety precautions shall be inbuilt into the design of plant and machineries to ensure safe operations at all times.
- Insulation (lagging) & claddings shall follow standard practices as set out and materials used shall confirm to relevant Indian standard specifications. Surfaces in the sugar plant above 55℃ temperature should be effectively lagged (except where heat dissipation is desirable and the surfaces which become hot intermittently such as steam traps and relief valve outlet pipes, vents, blow down pipes etc.).
- 20% extra margin shall be considered while selecting pipe sizes for the respective materials at the rated velocity.
- For plant automation wherever required pumps drives shall be suitable for VFD application.
- Weight of any vessels, equipment and machinery or platform shall not be transmitted to building columns.
- 'B' & 'C' grain storing crystallizers shall be located at pan floor level and shall feed to respective continuous pans and to common cut over line.
- 'B' & 'C' massecuite receiving crystallizers shall be located at a level from where it can be flowed directly to respective pugmils by gravity.From the crystallisers. From the mono vertical crystallizers massecuite shall be flow by gravity to respective centrifugals pug mill/header.
- All required structural columns, staging, working platforms, staircases, ladders, walkways, chequered plates, hand rails, toe boards, supports, conveyor belts etc, required for the installation and operation. The platforms, stair treads, ladders, hand rails and toe boards shall be mild steel.
- Instrumentation and control shall be as per P & ID drawings AS PER Purchasers approval.
- NOTE: Except where otherwise specified all materials shall conform to the requirement of relevant specifications and Indian standards specified. Materials not specified but which are to be used shall comply with relevant Indian standards. In

the absence of such a standard specification for the material alternate may be considered after approval by CONSULTANT.

- **Instrumentation**

  The plant shall be designed for complete automation through DCS system.To achieves CPCB / SPCB / GOVT. Norms, 03 underground reservoirs (UGRs) shall be proposed as below:

- Cold water RCC UGR to store water from tube well to work as make up water anywhere in the factory. It will receive water only from tubewell. It shall be circulated through 1st over head cold water tank meant for tube well water only. The system / tube well and pumps for this duty / operation shall be centrally controlled and shall be compatible to DCS.
- Cooled Condensate RCC UGR for boiling house to receive water from surplus condensate cooling system, recirculation to 2nd over head cold water tank. Cold water line provision from cold water O/H tank to be given for cooled condensate UGR for initial filling & cold water required during long stoppages.
- Hot water RCC UGR for boiling house to receive excess hot condensate water from hot water O/H tank. The first provision of overflow of hot condensate from hot water O/H tank shall be provided to cooled condensate UGR after proper double stage cooling system. The second provision will be given to hot water UGR to store excess hot condensate even after filling cooled condensate UGR.
- One Hot water O/H tank shall be provided exclusively for Refinery section. Material of construction shall be SS 409.

Proposed MS fabricated Pneumatic control pan discharge valves and cut over valves list:

S.No.	Units
i.	A& C massecuites & all graining pans discharge valves (All batch pans)
ii.	Cut over valves in Batch pans, Seed , vacuum crystallisers

Proposed VFD's list:

Compatible to central DCS controls with change over switch for direct operation.

Sl. No.	Drive Units
i.	Screened juice pumps
ii.	Defecated Juice pumps
iii.	Clear juice pumps
iv.	Exhaust condensate pumps
v.	Cigar hot water circulation pumps
vi.	Light & heavy filtrate pumps
vii.	Grain pumps for B massecuite continuous pans
viii.	Phosphate slurry dosing pumps
ix.	MOL pumps
x.	Cane juice clarifier stirrer drive
xi.	Vacuum filter drum drives
xii.	Injection water pump -02 Nos.
xiii.	Ejector water pumps
xiv.	Mechanical circulators for batch pans for duties as per massecuite requirement
xv.	VFD's for various dosing systems.
xvi.	Cane juice clarifier stirrer drive

Proposed DCS indication and control compatibility points

Sl. No.	Units
i.	Screened Juice Flow rate indication and controls to stabilize the juice flow
ii.	Imbibition water flow rate indication and controls
iii.	Juice temperature at heaters , indication and controls
iv.	Defecated& clear Juice tank level indications and pump speed control
v.	Exhaust condensate receiver level and pump speed control
vi.	Auto control of lime dosing and pH control system
vii.	MOL pump speed controls Light & heavy filtrate tank level indication and pump speed control
viii.	Syrup tanks indication
ix.	Cigar level indication & Condensate pumps / condensate flash recovery system pumps operation and speed controls
x.	Molasses conditions DCH – Temperature & Level indication Molasses conditions Batch – Brix & Temperature indication with control operation
xi.	Pan supply tanks level indication
xii.	Sweet water tank level indication

xiii.	All batch and continuous pans including mechanical circulators
xiv.	Vacuum system / condenser controls
xv.	Injection water pump indication and control
xvi.	Exhaust & vapour pressure indication in lines & Safety valves controls – size 300 mm Butter Fly valve steam duty
xvii.	Temperature and pressure steam coming to boiling house
xviii.	8.0 ata flow
xix.	Minimum 2.5 ata flowflow at evaporator station
xx.	FFE vapour temperatures,,brix and level control
xxi.	Condensate temperature to mill and boiler
xxii.	Massecuite level in batch pan indication and controls
xxiii.	Melt and Molasses run – off tanks level indication at centrifugal station
xxiv.	Batch and continuous pans automation and DCS controls
xxv.	Tube well operation control with respect to level of water in reservoir Hot &cold water pump operation control with respect to level of water in overhead tanks.
xxvi.	Grain pumps for continuous pan operation and controls
xxvii.	All system indications of mills and boilers in boiling house control room
xxviii.	Exhaust steam header pressure indication
xxix.	Evaporator station vapour headers pressure indication including pressure relief valve control
xxx.	Control of hot water addition in clear juice collecting tower from clarifier with respect to level

- Shaft / flange mounted planetary gear boxes / drives shall be used on Crystallizers, pug mill and magma mixers, where ever applicable.

Proposed shaft mounted high efficiency helical planetary drive /helical gear boxes / geared motors list:

S.No.	Drive Units
I	**Shaft mounted planetary drives- All crystallizer and wherever required.**
i.	Vacuum crystallizers
ii.	Dry seed crystallizers
iii.	Massecuite receiving crystallizers
iv.	B& C vertical crystallizers
v.	B- massecuite sealing cum receiving crystallizer
vi.	Mechanical circulators in A, B & C-massecuite pans(All batch pans)– shall have top mounted mechanical circulator which shall be provided with Bevel

	helical gear box with AC VFD drive
vii.	Pugmills
II	**Helical gear box**
i.	Lime slacker
III	**Geared motors**
i.	Stirrer drive of juice Defecator
ii.	B & C sugar melter
iii.	Rorimelter
iv.	Brown sugar melter
v.	Koran type lime classifier
vi.	Screw lime grit conveyor
vii.	Molasses conditioners
viii.	Rori, dust & dry seed conveyor belts
ix.	Sugar & lime elevators
x.	Milk of lime storage tanks
xi.	Magma Minglers

7.2 Juice Weighment

7.2.1 On –line mass flow meter – 1 No.

Mass flow meter for ultimate capacity**:** 400 T/hr.

Pressure drop access the system shall not exceed 1 bar.

The filtrate from filter station shall be pumped to juice sulphiter

For the accurate weighment of juice online mass flow-meter having following specifications shall be considered.

Type	**:**	Coriolis Dual U Tube design or single full bore straight tube design.
Wetted Parts and Connection	**:**	Tube, Manifold, and Process flanges in 316 SS welded design, enclosure in SS 304 and should fullfill NACE standard.
Accuracy	**:**	$\pm$ 0.10% of mass flow rate
Ambient Temp. Effect	**:**	0.001 % of Nominal flow rate per℃
Repeatability	**:**	$\pm$ 0.05% of rate
Inaccuracy in Current output	**:**	None
Core processor	**:**	It should be microprocessor based with digital communication having meter diagnostic capabilities and multivariable

measurement with 4 wire system
between the sensor and transmitter.

Outputs	:	i) 4-20 mA for mass flow rate ii) 0-1000 Hz frequency for mass flow rate iii) Digital HART for remote configuration
Power Supply	:	85-250 VAC / 24 VDC
Electrical Connection	:	¾ inch NPT
Electrical Housing	:	NEMA 4X
Temperature Limits	:	0 to 204°C
Indication facilities	:	i) Flow rate in TPH ii) Current hour flow in tonnes iii) Last hour flow in tonnes iv) Separate display for measured liquid during check weighment.
Communication Ports	:	a) RS 232/RS 485 for PC Communication b) Centronic parallel port for printer

Mass flow meter shall include

i) Mass flow sensor
ii) Mass flow transmitter
iii) Interface cables
iv) Centralized computer, system with CPU Color monitors, key board, printers etc.
v) Jumbo display arrangement at mill and boiling house.

Online calibration facility for check weighment with tank of suitable capacity shall be provided for random checking of juice delivered by the mass flow meter without stopping the crushing and affecting the working performance of mass flow meter. The check weighment shall have arrangement for discharging the juice to the screened juice tank by gravity/ pump. The party shall furnish detailed calculations showing mass flow rate accuracy, pressure drop, velocity at 10 operating steps weight and measures certificate and stamping from regional weight and measures authorities shall be responsibility of the supplier.

The filtrate from filter station shall be pumped to Juice Defecator.

Suitable arrangement for preparation, storage and pumping of phosphoric acid solution shall be provided near screened juice tank in mill house. The tank shall be 3 mm thick construction SS-304 with stirrer, piping of PVC, two dosing pumps of suitable capacity and head with ACVFD drive.

Supply shall be complete in all respect and compatible for centralized control DCS system.

This mass flow meter of 400 cum. /hr. capacity shall be suitable for ultimate capacity of 7500 TCD.

7.3 Juice Flow Stabilisation System – 1 Set

Juice flow stabilization system for

Ultimate capacity	**:**	400 cu.m. / hr.
Control range	**:**	30% to 100%
Juice flow variation control	**:**	$\pm$ 5% of pre-set value

System is required to control screened juice flow rate to the process and to reduce aberration in juice flow quantity.

Whenever the level of juice in screened juice tank increases / decreases beyond a safe limit, an auto visual signal will be given to operator in mill house and boiling house for appropriate action. If the level of the screened juice tank is above the set point (upper limit) the carrier speed shall be reduced and is over rider to all parameter to prevent over flow of juice from tank. The system shall include necessary control units, including VFD at screened juice pumps / control valves, juice level indication in screened juice tank, flow indication at mills and boiling house flow recorder etc. and shall be compatible for centralized control DCS system

7.4 Juice Heating Station

Multi pass shell & tube type vertical as well as direct contact type heaters shall be employed for juice heating. Following scheme shall be adopted.

Juice & stage	Qty.	Type of heater	Heating media	Heating surface

Raw juice – 1st heating (VLJH)	1+1	Shell & tube type	Qnt.-5 vap.	450 m^2
Raw juice -2nd heating 3 set (2 working + 1 Standby) – New	2+1	(Battery type condensate heater)	Condensate	250 m^2
Raw juice – Final heating	1	Shell & tube type	Qnt. - 4 vap. / Qnt. 3rd vapour	430 m^2
Defecated juice – 1st heating	1+1	Shell & tube type	Qnt. – 4 vap.	430 m^2
Defecated juice –2nd heating	1	Direct contact	Qnt.-3 vap.	
Defecated juice – 3rd heating	1	Direct contact	Qnt.-2 vap.	
Clear juice – 1st heating	1	Direct contact	Qnt.-2 vap.	
Clear juice – 2nd heating	1	Direct contact	Qnt.- 1 vap	

The shell & tube type juice heaters shall have SS-304 tubes of 45 OD x 16 swg in VLJ heater x 5000 mm long sizes and 18 swg in rest of the vertical tubular juice heaters.

The direct contact juice heaters shall be of all SS-304 construction, complete in in-built entrainment separators, shall be designed with 25% extra margin but should work efficiently at existing crush rate.

7.5 Clarification Station

Hot Raw Juice Screening system:

Supply of totally closed construction Rotary Screen with staging structure for hot raw juice screening to be located near Juice Defecator.
Rotary Screen assembly fitted with 150 micron opening filtering media screen in stainless steel construction to handle hot raw juice.

Technical Data:

Particulars	Data
Drum/Screen diameter	2000 mm
Screen length	4800 mm long
Screening area	30.16 sq. mtr.
Opening	150 microns (0.15 mm)
Drive System	11.0 kW with VFD and DOL Bypass arrangement

	TEFC sq. cage S1 continuous duty electric motor with planetary type gear box and power transmission by heavy duty simplex chain and drive/driven sprockets.

The Hot Raw juice screening system shall be complete with timer operated automatic washing system by high head washing pump using clear juice and hot water periodically and caustic soda cleaning system with centralized electric control panel.

The filtering media screen shall be in SS 304 construction and all juice wetted parts shall be in stainless steel 409 construction.

One no. whirler type slurry preparation tank of suitable capacity with two nos. (One in operation, one as standby) slurry transfer pumps of suitable capacity shall be supplied to transfer the separated bagasse to mud tank / mills.

The equipment shall be complete with the required to and fro piping with valves for unscreened juice, screened juice, clear juice, hot water and caustic soda.

7.5.1 Juice defecators – 1 no

One set of continuous juice defecation unit in mild steel fabricated construction of 40m^3 capacity with 137.00% juice, retention time not less than 8 minutes and 2.0 meter working height of juice column above the gas distribution shall be supplied.

The juice defecator will consist of a reaction vessel and stack gas recovery tower.

The juice defecator shall have milk of lime proportioning unit complete with inter connecting piping.

The defecator shall have provisions for

- Pre liming
- Shock liming and
- Simultaneous liming

Defecated juice outlet shall be by overflow at a fixed height through peripheral gutter.

The reaction vessels will be provided with a stirrer. The stirrers shall be driven by a suitable HP, TEFC squirrel cage electric motor drive through a planetary gear box. The stirrer speed shall be around 16 rpm.

The vessel shall be complete with 200 dia sight & light glasses, continuous juice sampling device and other fittings and mountings.

Quick opening hinged manholes of 550 mm dia should be provided in the bottom cone, top cover and vessels for easy and quick cleaning of reaction vessel. Suitable number of hand-holes shall be provided in the recovery tower for cleaning of trays etc.

Defecated juice receiver

A 45 m^3 capacity, vertical cylindrical common Defecated juice receiving tank with conical bottom in mild steel fabricated construction complete with all fittings & mountings shall be provided.

Defecated juice pumps

Two (2) nos. one as standby, centrifugal pumps each of 350 m^3/hr, 75 m head, 1440 rpm with VFD. Defecated juice receiver level indication and pumps drive speed shall be compatible for centralized control DCS system.

Automatic lime dosing and pH control system

Lime dosing into Juice Defecator shall be automatically controlled based on pre-set ratio to juice flow. Lime flow will be measured to give feedback signal to the lime dosing control loop.

The volumetric flow of mixed juice from mass flow meter shall control lime dosing to pre-set ratio.

The control system shall be compatible for centralized control DCS system. The necessary control shall be made available with a remote / local selection switch.

7.5.2Milk of lime preparation station – one set

The milk of lime preparation unit shall consist of following :-

Lime elevator	1 set	1500 kg/hr, chain (roller chain) and steel bucket type with drive.
Lime slacker	1 set	1200 kg/hr, rotary drum type with drive.
Lime classifier	2 sets	Koran type with screw type grit remover with drives (one set standby)
Vibro screens	3 sets	Make SS – 304, Size 60 inch
Classified lime receiver /Tank	1 set	30 m^2 with stirrer, 16 rpm & drive

MOL pumps + grit catcher	2 nos.	12 m^3/hr with drive (one set standby) + VFD
Hydro clones	1 set	15 m^3 /hr Suitable for ultimate capacity
MOL storage tanks	2 nos.	Each of 30 m^3/hr with stirrer & drive
MOL pumps	2 nos.	12 m^3/hrwith drive (one set standby) + VFD
Grit washing trough	1 set	Suitable for ultimate capacity. This shall be of trouble free operation.

Lime elevator – One no.

One chain & bucket / slat bucket type lime elevator, 1500 kg/hr capacity to receive the lime from ground floor and deliver to the lime slacker's inlet box through closed chute. The lime slacker shall be placed at +5500 level above FFL.

The tail end of the elevator shall be below the ground level, and a feed hopper at the ground level shall be provided. The top of feed hopper shall be covered with bars to prevent accidental falling of any operator.

The sprocket shall be of cast Iron / cast steel.

Drive - Electric motor through shaft mounted planetary gear box.

Lime Slacker – One set

One no. mild steel welded construction lime slacker, revolving type with screens at the outlet of 1200 kg/hr. capacity complete with drive and running at 6 to 8 rpm.

The gear boxes shall either be helical enclosed or planetary type. Worm reducers are not acceptable.

Koran type Lime Classifier – One set

One no. mild steel welded construction Koran type Lime Classifier of 1200 kg /hr capacity complete screw type grit separator, and drives shall be supplied.

The gear boxes shall either be helical enclosed or planetary type. Worm reducers are not acceptable.

The classified milk of lime shall be delivered to the one MOL storage tank by gravity.

Hydro – cyclone and Vibro screens

Suitable designed hydro-clone and vibro screens of 15 cu meter for ultimate & 2 nos of vibro screens of SS-304 shall be provided for further separation of fine grits from milk of lime for ultimate capacity.

Milk of lime storage tanks – 3 nos.

Three numbers mild steel welded construction MOL tanks complete with drive and having 30 m3 capacity each.

One tank shall receive classified MOL from classifier. Two storage tanks shall receive screened & de-gritted MOL from **hydro –cyclone** through vibro screens.

The storage tanks to be made of 6 mm thick mild steel plates complete with stirrers. The stirrer drives shall include planetary gear box with motor or geared motor.

Separate gutters shall be provided over the two nos. de-gritted milk of lime storage tanks, one for the milk of lime coming from hydro-clone through vibro screens and other one for return milk of lime.

Milk of lime pumps – 4 nos.

Two (2) nos. (One standby) classified milk of lime pumps, each of 12 m^3/hr, suitable head to pump classified through hydro – clone and vibro screens shall be supplied. The pumps shall be complete with AC-VFD drives.

Two (2) nos. (One standby) milk of lime pumps, each of 12 m^3/hr, suitable head to pump de-gritted & screened MOL to the process shall be supplied. The pumps shall be complete with AC-VFD drives.

The casing and impeller of milk of lime pumps shall be of Ni-hard construction.

Complete independent 'To&Fro' pipe lines and return pipelines should be provided & from:

- Juice Defecators – lime proportioning device
- Weighed juice receiving tank
- Muddy juice tank and
- Condenser outlets

- Juice clarifier for maintaining pH of juice in clarifier during shut down

Grit washing Trough

A mild steel fabricated construction grit washing trough shall be supplied. All the grits from slacker, classifier, vibro screens and hydro clones shall be collected in this trough.

The grits shall be washed with water and only the washed water shall overflow to the injection channels. The washed grits shall be discharged through a manually controlled gate to a trolley for disposal.

7.6 Cane juice clarifier – 1 set

One no. 12200 mm dia. clarifier with four compartments, each compartment to have height of 1524 mm along with all accessories and inline mixture shall be provided.

Flash tank shall be suitable for ultimate capacity of 7500 TCD.

Clarifier shall have separate juice and mud outlet from each compartment.

The flocculating compartment complete with skimmer and feed well shall be installed separately.

Proper arrangement of flocculent / settling agent preparation and measured addition with dosing pumps with standby arrangement shall be provided for ultimate Capacity.

Clarifier shall be installed at +9500 mm from FFL on RCC structure.

The clarifier shall be made of mild steel plates having suitable thickness for 12200 mm size of clarifier.

The continuous clarifier shall be complete with mild steel flash tank and withdrawal boxes, 2 nos. for clear juice and one no. for mud with sleeves, telescope pipes and O-rings, hinge type squeezers, driving mechanism with variable speed drive head with motor consisting of sprocket, chain and drive guards, all inside and outside clear juice piping and mud piping, all valves and pipe fittings etc, and complete with peripheral walkway, angle iron bracket supporting angles, piping for railing, rail support etc; 4 manholes one for each compartment, each manhole to have platform, railing and access ladder; pumps tank with support, insulation material etc.

Mud liquidating pump of 80 m3/hr. and 20 m. head complete with drive motor shall be provided.

Two clear juice centrifugal pumps each of 350 m3 per hour and not less than 60m. head complete with drive motor and suitable column having (2 mx10 m) sight and light glasses shall be provided for pumping juice through clear juice heaters (DCH) to 1st body of Quintuple (FFE).

Provision of recirculation of juice in the clarifier shall be also provided. Arrangement of preparation and dosing of flocculent to be provided.

7.7 Rotary Cane Mud Vacuum Filters – 2 Sets

2 nos. each of 4.27m dia x 8.53m length (14' x 28').

Each rotary cane mud vacuum filter shall have nominal filtering area of 114m^2 totalling 228m2.

Rotary cane mud vacuum filters shall have bagacillo blowers, cyclone, mud mixer, vacuum pumps etc. conforming to standard specification shall be supplied.
The vacuum filters shall be installed on steel structural staging at +9500 mm level from the factory floor level.

The extraction of heavy as well as light filtrate shall be by gravity (barometric vacuum column). All the equipment including filtrate tank (one common for light & heavy filtrate), pumps etc. shall be above FFL.

The vacuum filters shall be complete with all accessories, auxiliaries, piping valves and fittings etc. so as to make the system complete for proper and satisfactory operation.
The arrangement shall be made to pump the light and heavy filtrate on 3 vibro screens (60" dia each) and the filtrate from the vibro screens shall be pumped to juice sulphiter absorption tower with standby pumps.

The screened bagacillo will be returned to the mud mixer by gravity.
The hot water temp. control system shall have provision to set the water temp. between 60 deg. C to 80 deg. C.

Magnetic flow meter with indicating, integrating and recording facility for hot water use in filter cake washing shall be provided.

Mud belt conveyor – 2 nos.

The mud receiving belt conveyor shall preferably be placed below the operating floor. The mud scrapped from the filter shall be delivered to the belt conveyor through a closed 5 mm thick MS fabricated chute.

The mud receiving belt conveyor shall transfer the mud to another inclined mud belt conveyor, which will discharge the mud in a mud bin.

Mud bins

The mid bin shall have a capacity to store 01 hourof mud. The mud bin shall have a power operated sealed door at the bottom. The bottom most level of the bin discharge door shall be minimum 2500 mm above FFL to accommodate tractor trolley with tractor.

7.8 Evaporation Station

7.8.1 Evaporator sets – 2 sets (one standby)

It is proposed to follow Quintuple effect evaporator system of following heating surfaces. The Robert body shall have a vapour space height between the top tube plate and bottom of the umbrella (cylindrical portion of the vapour space) not be less than 2.5 times the calendria height in case of 4^{th} body and 3 times the calendria height in case of 5^{th} body. Details as per **Annexure-I**

Unit	Type	Heating surface (m2)		Tube sizes
		Operating	Standby	OD x thk x Length
Quintupple-1	FFE	3800	3800	45 x 1.2 x 10000
Quintupple-2	FFE	3800	3800	45 x 1.2 x 10000
Quintupple-3	FFE	3800	3800	45 x 1.2 x 10000
Quintupple-4	Robert body	1800	1800	45 x 1.2 x 2000
Quintupple-5	Robert body	800	800	45 x 1.2 x 2000

The tubes shall be of stainless steel conforming to grade 304, I.S. 13316, fully annealed.

Magnetic flow meter with indicating, integrating and recording facility for hot water use in evaporator shall be provided.

7.8.2 Steam balance

Alternative arrangement of exhaust steam shall be provided for Pan washing.

a) Basic temperatures of juices at various stages of heating for calculation

Raw juice initial temperature	:	30.00 deg. C.
Raw juice temperature after 1st stage heating	:	38.00 deg. C
Raw juice temperature after 2nd stage heating	:	50.00 deg. C
Raw juice temperature after final stage heating	:	72.00 deg. C
Defecated juice temperature after 1st stage heating	:	78.00 deg. C.
Defecated juice temperature after 2nd stage heating	:	98.00 deg. C.
Defecated juice temperature after 3rd stage heating	:	102.00 deg. C.
Clear juice initial temperature	:	96.00 deg. C
Clear juice temperature after 1st stage heating	:	108.00 deg. C
Clear juice temperature after 2nd stage heating	:	116.00 deg. C

Automation at Evaporator Station:

One set of automation for each set shall be provided at evaporation station to control clear juice flow, exhaust steam flow and final brix at evaporation station without effecting pan working with centralised controlled DCS system.

The evaporator control shall be DCS based with temperature, pressure, level and brix control/monitoring.

Juice flow and recirculation system in FFE shall be monitored through magnetic flow meters as per standard practice and shall be compatible to centrally controlled DCS system.

Requirement of motorised valves is provided in design philosophy.

7.8.3 External save-all – 2 sets (one for each evaporator set)

A generously sized, efficient External Entrainment Separator shall be provided for each evaporator set. It shall be mounted on the out-going vapour pipelines from quintuple – 5 to VLJH and condenser.

7.8.4 Syrup Receiver – 2 sets (one for each evaporator set)

Vertical cylindrical vessels, each of 1200 mm dia, 2000 mm height each in mild steel construction complete with sight and light glasses, temp. & Pressure indicators, inlet outlet & vent connections with valves etc. shall be provided.

7.8.5Syrup extraction pumps – 4 nos. (one standby for each set)

Syrup extraction pumps each of 80 m3 capacity of 30 m head, 1440 rpm driven by suitable hp TEFC sq. cage AC motor shall be provided.

The 2 nos. pump shall be for each set (one standby) with separate syrup receivers.

7.8.6 Chemical System for cleaning (Rubber lined system)

Suitable arrangement for preparation of acid and caustic solution and their pumping to the evaporator bodies shall be provided. Recirculation arrangement also shall be provided. For open caustic soda boiling in Robert type bodies, exhaust connection with rubber seated right angle valves of suitable sizes and vapour outlet with suitable sizes valves to atmosphere from top of body shall be provided. Pipe shall be extended from outside the building.

Tanks	Quantity	Capacity	Type	Material of Construction
Chemical tank	1 No.	250 HL	Cylindrical Tank	Rubber lined MS construction
Caustic Soda Tank	1 No.	250 HL	Cylindrical Tank	Carbon Steel construction

Pumps	Quantity	Capacity	Type	Material of Construction		
				Casing	Impeller	Shaft
Chemical Pump	2 Nos.	100 m3/h, 22	Centrifugal type	CF8	Stainless steel	SS410

		m Head				
Caustic Soda pump	2 Nos.	100 m3/h, 22 m Head	Centrifugal type	Cast Iron	Stainless steel	SS410

7.9 Condensate Flash Recovery System

Flash vapours of all condensates except for condensate of last vessel of quintuple set is utilized.

Efficient condensate Flash Vessel of SS 304 Construction shall be provided. All interconnecting pipes shall be of SS-304 schedule 20 (min.)

Heat recovery from exhaust steam condensate through free flow plate type heat exchanger shall be done. By pass arrangement shall also be provided.

All condensate from different vessels and pans shall be collected in Condensate Flash Vessels.

Two plate type heat exchanger ((1 working & 1 standby) shall be provided to heat suitable condensate for superheated wash water operating on exhaust steam to maintain the final desired temperature of 115 deg. C of condensate for A centrifugals.

Arrangement shall be provided for heat exchange unit for hot air blower for sugar hopper using condensate of suitable temperature.

Suitable capacity inlet condensate receiving bottles, pumps (one operating and one standby), where required, for above operations with AC drive compatible for centralized control DCS system shall be provided.

Suitable arrangement of tank and pumps (One working & one standby) shall be made for back wash of plate heat exchangers (PHE).

7.10 Graining Station

7.10.1 Molasses conditioners for A heavy, B heavy, C Light molasses

The dilution cum heating shall be done in five High speed stirrer type on line Molasses conditioning unit complete with inter connecting pipes, valves and sampler shall be provided; one for A-heavy molasses, one for B-heavy and one for C-light molasses. Hot water from hot water O/H tank shall be used.

Vapour of Q2 body of quintuple shall be used for additional heating, if required. The stirrer shall be driven by AC motors through shaft mounted gear motors / planetary gear box with motors.

The conditioners shall ensure complete dissolution of grain nuclei.

These molasses conditioners shall be designed with following percentages of molasses.

A-heavy molasses - 15 percent on cane

B-heavy molasses - 8 percent on cane

C-light molasses - 4 percent on cane

Automatic control of temperature and brix system shall satisfy the following requirements:

i) Temp. of conditioned molasses - 70 deg. C

ii) Brix of conditioned molasses - 70 - 75°

Conditioned molasses shall contain no fine grains

7.10.2 Pan feed tanks for syrup, melt & molasses

The pan feed tanks shall be of vertical cylindrical vessels with conical bottom and closed up construction complete with insulation, lagging manholes at top, internal ladder, heating coil, inlet, outlet washout connections, sight & light glasses, level indicator etc.

Each tank will be 36 m^3capacity in mild steel fabricated construction. Following shall be the quantity and duty distribution.

Syrup	:	3 nos.
Melt	:	2 nos.
A- Light molasses	:	1 no.
A-Heavy molasses	;	2 nos.
B-Heavy molasses	:	2 nos.
C - Light molasses	:	1 no.

7.10.3 Sweet water tank with pumps

One M.S. sweet water tank of holding capacity of 75 m^3 with 2 nos. pump (one as stand by) each of 30 m^3 / hr. capacity with 30 m head shall be provided. The tank shall be made of min 10 mm thick mild steel plate duly braced.

The level indication system shall be compatible for centralized control DCS system.

7.10.4 B& C seed crystallizer – 70 T – Two nos.

B & C seed crystallizer shall be of Horizontal U-shaped type MS fabricated, open from top with sturdy ribbon type stirrer.

Cut over valve shall be M.S. fabricated with
Pneumatic control operation.

The crystallizer shall be driven by a high efficiency shaft mounted planetary gear drive to provide a stirrer speed of about 60 rph.It shall be installed on pan floor.
Cut over valves shall be operated from the pan floor.

7.10.5 Vacuum crystallizers

Horizontal cylindrical MS fabricated with heavily stiffened flat ends. Vacuum crystallizer, with paddle type stirrers, conforming to following specifications.

A-massecuite	:	70 T, 65T each 1 no.
B massecuite	:	70 T, 65T each 1 no.
C massecuite	:	70 T, 40T each 1 no.

The crystallizer shall be driven by a high efficiency shaft mounted planetary gear drive to provide a stirrer sped of about 60 rph.

7.10.6 Vacuum pans

1. Continuous Pans for A, B & C massecuite boiling with mechanical circulator with VFD especially in tightening zones

i)	A Continuous pan, capacity 60 Tons/hr	- 1 No.
ii)	B Continuous pan, capacity 35 Tons/hr	- 1 No.
iii)	C Continuous pan, capacity 25 Tons/hr	- 1 No

= pans for massecuite boiling /graining with mechanical circulator with VFD are required whenever either of continuous pan is under cleaning, details as below:-

i) 60 Ton/strike capacity for B graining - 1 No.

ii) 60 Ton/strike capacity for C graining - 1 No.

iii) 80 Ton/strike capacity for A graining - 1 Nos.

iv) 80 Ton/strike capacity for A/B/C – continuous Pans are under cleaning / water boiling - 3Nos..

Specifications of Batch pan:

Type	Low head rapid boiling calendria type
Capacity	60 Tons each with mechanical circulator
Heating Surface area Strike Volume ($m^2/m^{3)}$	7.2
Vapour space in the cylindrical portion above the strike level	2.5 m
Internal save all	Centrifugal type
Graining volume	45%
Down take diameter	45% maximum
Tube details :	
Material	Annealed stainless steel tubes, 304 grade
Outside diameter	102 mm
Thickness	16 SWG
Ligament of the tubes	16mm (minimum)
Placement of the tubes	For effective steam distribution arrangement

Specification of Continuous Pan

Specification of Continuous Pan

A-Continuous Pan Quantity – 1 No.

One continuous pan, capacity 60 tons/hr shall be provided for A-massecuite boiling.

Massecuite to be boiled capacity **:**~60 t/h

Type :One No. Mechanical circulator top mounted in tightening zone/ jigger tubes in tightening zone as per SRI design.

The vertical continuous pan, if erected outdoor, may have problems in operation /supervision during chilled winter. Dependent solely on automation is not possible.

The continuous pan is designed for the above given output rate of massecuite having sufficient Heating Surface Area.

Surface Area to volume ratio is about 10.5.

Pan calendria shall be divided into three separate modules, each with independent steam control, non-condensable gas and condensate outlets. Each module shall be capable of being isolated and operated on either vapour-1/vapour-2/vapour-3 independent of the modules.

Automation

System shall be compatible to central DCS

B-Continuous Pan Quantity – 1 No.

One continuous pan of capacity 35 tons/hr shall be provided for boiling B-massecuite,

Massecuite to be boiled : B

Capacity : 35 tons/hr

Type : One No. Mechanical circulator top mounted in tightening zone/ jigger tubes in tightening zone as per SRI design.

The continuous pan is designed for the above given output rate of massecuite having sufficient Heating Surface Area.

Surface Area to volume is about 10.5 m^2 / m^3, other specification and automation of continuous pan is similar to A-continuous pan. System shall be compatible to central DCS

C-continuous pan Quantity: 1 No.

One continuous pan, capacity 25tons/hr shall be provided for C-massecuite billing.

Massecuite to be boiled : C

Capacity : 25 tons/hr

Type : One No. Mechanical circulator top mounted in tightening zone/ jigger tubes in tightening zone as per SRI design.

Other specification and automation of continuous pan is similar to A-

continuous pan. System shall be compatible to central

All continuous massecuite pans shall be provided with the following:

- Condensate water flow indicator with integrator
- Level indicator in the seed magma storage crystallizer.
- Level indicator and molasses storage tank with low level annunciation.

Performance Parameters

➢	Crystal Growth	-	Double of the footing grain size.
➢	Exhaustibility	-	As per standard
➢	Frequency of water boiling	-	25 to 45 days.

The automation for continuous pan shall include the following controls:

- Feed control system for each compartment.
- Grain feed flow control to the 1st compartment.
- Steam flow control.
- Vacuum control system.
- Condensate measurement.

Pans shall be complete in every respect including sealing crystallizer with pumps, condensate collection with flash heat recovery system. Condensate from different pans shall be collected in condensate flash vessels with individual siphons.

System shall be compatible for centralised control DCS system.

GRAIN PUMPSFOR A,B& C MASSECUITE CONTINUOUS PAN Quantity-06 Nos. (TWO NOS. EACH FOR A, B & C PAN WITH STANDBY)

Helical rotor type pumps suitable for the duty, each of 12 m3/hr capacity, 30 m head driven by independent VFD through a planetary / helical gear box. The helical rotor shall be of stainless steel and stator shall be of erosion resistant material.
System shall be compatible for centralized control DCS system

'A','B'&Ç' massecuite sealing system

Massecuite sealing crystallizers will be separate for all three massecuites.
In case of A massecuite, 01 crystallizer of 65 Tons can be utilized and for B massecuite one crystallizer of 65 Tons and for C massecuite, one crystallizer of 45 Ton capacity can

be utilized. All these three crystallizers can be utilized from the existing plant.. Necessary pumping arrangement / gravity flow shall be made for its flow to the respective A, B & C receiving crystallizers.

The overflow outlet of the crystallizer shall be provided to facilitate movement of massecuite to the 'B & C' massecuite pumps for onward transfer to vertical crystallizer.

A clear space of 400mm shall be provided over the massecuite level.

The crystallizer shall be driven by a high efficiency shaft mounted planetary gear drive to provide a stirrer speed of about 60 rph.

The other feature /general specification of the crystallizer shall be similar to massecuite receiving crystallizers.

7.10.7Massecuite receiving crystallizers

Massecuite receiving crystallizer of horizontal U-shaped MS fabricated open top crystallizer with sturdy ribbon type stirrer of following specification shall be supplied:-

A massecuite	:	Air cooled	85 T each	3 nos.
B massecuite	:	Air cooled	85 T each	1 no.
C massecuite	:	Air cooled	85 T each	2 nos.

The crystallizer shall be driven by a high efficiency shaft mounted planetary gear drive to provide a stirrer speed of about 60 RPH for A massecuite, 40RPH for B massecuite and 20 RPH for C massecuite.

7.10.8Massecuite pumps

A massecuite shall flow by gravity from pans to receiving crystallizers and to pug mill of batch centrifugal machines. No pumps are required.

B & C massecuite shall be pumped to respective vertical crystallizers. But in case of emergency, B & C massecuite receiving crystallisers shall have the provision to flow directly to respective pugmills / system.

For B and C massecuites, following pumps shall be supplied.

B massecuit	:	Two nos.(1W & 1SB) pump for sealing cum receiving crystallizer to vertical crystallizer

e		Two nos. (1W & 1SB) separate pumps for 'B' massecuite liquidation from B-mono vertical to B-pug mill. Total 4 nos for B Massecuite Transfer of 45 T/hr - Rota Pumps with replaceble tips and driven by AC motor with planetary / Helical gear box.
C masssecuite	:	Two nos.(1w & 1SB) pump for sealing cum receiving crystallizer to vertical crystallizer Two nos. (1w & 1SB) separate pumps for 'C' massecuite liquidation from C- vertical to CFW pug mill. Total 4 nos for C Massecuite Transfer of 35 T/hr - Rota Pumps with replaceble tips and driven by AC motor with planetary / Helical gear box.

Independent pipeline from each pump shall deliver massecuite to its respective destination.

7.10.9 Vertical crystallizers

Vertical crystallizers for cooling & maturing of B & C massecuites to following specifications shall be supplied.

B massecuite	:	Mono vertical continuous	280 T/hr	1 no.
C massecuite	:	Twin vertical continuous in parallel	250 T/hr	1 no.

For 'B' massecuite, MS fabricated mono vertical crystallizer, with conical bottom water jacketed rise pipe and very sturdy stirrer.
For C massecuite, MS fabricated twin vessel in series type vertical crystallizer, with conical bottom and very sturdy stirrers.

Diameter of the vertical crystallizer shall be less than 3.6 meter
The bottom cone angle shall be 60 deg. from horizontal.
The crystallisers shall be driven by high efficiency shaft mounted planetary gear drive to provide a stirrer speed of about 20 RPH.
Necessary cooling surface to be provided in case of "B" massecuite cooling, so that the massecuite temperature is cooled from 65 deg C to 50 deg C when supplied with cooling water at 30 deg C. in 8 hours. For B vertical crystallizer- S/V ratio shall be 2.0.

In case of C massecuite, necessary cooling surface shall be provided so that the temperature of the massecuite is cooled from 65 deg.C to 40 deg.C in 24 hours, when supplied with cooling water at 30 deg.C. Provision in the design shall also be made for a maturing period of 4-5 hours in case of low-grade continuous crystallisers. The cooling surface (m^2) to volume (m^3) ratio shall be minimum 2. The heat exchange elements shall be tested at pressure of 6-kg/cm_2 g. suitable for continuous working. For C vertical crystallizer- S/V ratio shall be 2.0.

The design and arrangement should ensure

- The slow and uniform rate of cooling
- Uniform cooling across the cross section
- Plug flow of massecuite through the crystallizer
- Proper distribution of cooling and maturing zones.

Liquidation arrangement, cooling water & return piping shall be provided.
Independent cold water tanks with independent cold water circulation pumps (One operating & one standby) complete with drive, piping, valves, fittings etc shall be provided.
Common hot water receiving tank with independent pumps (one operating & one standby) complete with drive, piping, valves, fittings etc. shall be provided.

Provision will be made for re-circulation of hot water into the XLR's in case required.

The crystallizer shall be complete in every respect with necessary fittings for satisfactory operation.

Massecuite liquidation pumps

Four (4) nos., massecuite liquidation pumps, Two for 'B' massecuite, Two for C massecuite one pump each for individual vertical crystallisers, each of 45 T/hr capacity, suitable massecuite head sufficient to pump to overflow box of respective vertical crystallisers with replaceable tips and driven by AC motor through a planetary / helical gear box.

7.11 Vacuum Generating Station

7.11.1 Condensers

Each pan and each last vessel of evaporator sets shall be provided with a single water entry efficient condenser of all SS-304 construction. The tail pipe shall be of SS-304.

- Multi loop control system for minimizing the water consumption while maintaining the set vacuum and approach temp. of 10-12 deg. C shall be provided.
- Independent control with provisions for its operation from DCS shall be provided. The system shall be made available with a remote / local selection switch.
  Following data shall be indicated as well as recorded in digital as well as trends (graphics).

  - Inlet water temp
  - Tail water temp
  - Vapour temp
  - Vacuum (as set and as achieved)
  - Evaporation rate in pans

7.11.2 Ejectors

Three (3) nos. ejectors of all SS-304 construction shall be supplied primarily for following duties.

- Vacuum generation in vacuum crystallizers and assistance in vacuum generation in vacuum pans
- Nox gas removal in evaporator and heaters including DCH
- Assistance in Vacuum generation in pans /Standby

7.11.3 Injection and ejection water pumps

For vacuum pans & evaporators, three (3) nos. (two operating, one standby) vertical mixed flow type pumps, each of 3000 m^3/hr, 32 m head, maximum 960 rpm pumps, TEFC sq. cage AC motors with 2 nos. VFD drive shall be provided.

For ejectors, two (2) nos. (one operating, one standby), preferably vertical mixed flow type pumps, each of 450 m^3/hr, 32 m. head, maximum 960 rpm pumps, TEFC sq. cage AC motors with VFD shall be provided.

Separate water headers for condensers and ejectors shall be provided. Interconnection with isolation valve shall also be provided for emergency needs. Temp. pressure, vacuum indicators shall be provided at two places on each header. Transmitters for DCS shall be provided.

The delivery pipeline of each pumps shall be individually connected to the respective headers with tangential connection.

The pumps shall have CI casing, CF8 impeller and SS-410 shaft & SS-410 sleeves.
Suction strainer of stainless steel construction, NRV and isolation valves in the delivery lines shall be provided.

7.11.4 Cooling towers

An induced draft, mixed flow type cooling tower with two (2) cells, each of 3500 m^3/hr. capacity shall be provided.

Each shell shall have capacity to handle 3500 m^3/hr water to give cold water temp. within 5 deg. C of Wet Bulb temperature or at least minimum drop of 9-12 deg. C

The cells of cooling tower shall have induced draft fan with electric drive, RCC framework with extruded non-combustible PVC fills, splash bars supported on stainless steel grids, RCC louvers and polypropylene distribution nozzles.
The fan shall have lightweight aluminium alloy impellers and hub. The impellers / fan blades shall be detachable and must be securely locked into position for efficient and safe operations.
Horizontal vent spacing of fill would be in the ratio of 1: 1.5 and spacing of fills should not be less than 200 mm.
All nuts, bolts and washers to be made of 304 grade stainless steel.

Plant shall be super gravity.

7.12 Surplus Condensate Cooling System with Pumps

Suitable capacity cooling system with pumps and cylindrical RCC of suitable capacity for storage of cooled condensate shall be provided. Plant is to be designed on zero effluent discharge. Hot condensate shall be cooled to temperature less than 30 deg. C.
Common Cooling System With Pumps For Cooling Water From Mills And Turbines And Its Collection.
Efficient system is required to save any wastage on this account.

7.13 Massecuite Curing Station

7.13.1 Batch Type Centrifugal Machine
High grade fully automatic recycling with pneumatic controls centrifugal machines

Four(4) nos. batch type, high grade centrifugal machines, each of 1750 kg / charge, 20 cycles / hr, fully automatic recycling type centrifugal machines shall be supplied for single curing of Á' massecuite with 94 – 95 deg. brix. The brix of massecuite shall not be less than 94 deg. Massecuite to pugmill shall be provided by gravity.

Basket shall be SS DIN Standard 1.4462

Working screen – Brass, Backing screen – S.S. Backing screen, 4 mesh DOVEX R Type

Spindle- material specification – Forged steel as per IS 2004 CLASS IV

The machines will be driven by suitable power AC VFD. The machines shall be complete with all accessories, auxiliaries, including support, structure, platform pug mill with drive, super - heated wash water system, Air compressors, run-off tans, run-off pumps (1+1) with drive, incoming and control panels etc.

Structure, pug-mill, molasses gutters and all other accessories suitable for installation of one no. similar machines shall be provided for ultimate capacity.

'Auto – manual' switch shall be provided for manual operation in case of failure of control system. Necessary manual controls shall be provided.

Manually operated power actuated brakes shall also be provided for emergency.

Necessary arrangement in the panel shall be provided for tripping of the machine in case of high temperature on sensing through ETD, of the motors and excessive vibrations / wobbling.

Suitable interlocking arrangement shall be provided in panels so that not more than one machine start at a time.

Two plate type heat exchanger ((1 working & 1 standby) shall be provided to heat suitable condensate for super-heated wash water operating on exhaust steam to maintain the final desired temperature of 115 deg. C of condensate for A centrifugals.

Arrangement shall be provided for heat exchange unit for hot air blower for sugar hopper using condensate of suitable temperature.

7.13.1.1 Molasses Run-off Tanks

Two (2) sets of vertical cylindrical, 5 mm thick, MS construction, molasses run-off tanks each of 3 m^3 capacity, one for AH molasses and one for AL molasses shall be supplied. The tanks shall have level indication compatible to DCS.

7.13.1.2 Molasses Pumps

Two (2) sets of molasses run-off pumps for each duty, one operating and one standby, complete in all respect.

7.13.1.3 Pug Mill

The pug mills shall be made out of 8 mm thick mild steel plate and provided having paddle type stirring arrangement, driven by Ac electric motors through shaft mounted planetary gearbox.

7.13.2 Continuous Centrifugal Machines

C massecuite shall be double cured. A& B massecuites shall be single cured.
Following continuous centrifugal machines shall be supplied.

'C'– massecuites	03 nos.	1500 mm dia, 0.05 mm screen, with transient heaters.
CAW magma	01 no.	1500 mm dia, 0.06 mm screen,
'B' massecuite & common standby for B & 'CAW' magma	04 no.	1500 mm dia, 0.06 screens.

Magnetic flow meter with indicating, integrating and recording facility for hot water use in continuous centrifugal machines shall be provided.
Continuous Centrifugal Machines for 'C' fore worker shall be capable to cure 'C' massecuite of minimum 102 brix and 48 purity at a rate of 8-10 tonnes per hour and shall be having a minimum gravity factor of 2400.

Continuous Centrifugal Machines for 'B' single curing shall be capable to cure 'B' massecuite of minimum 94 to 96 brix and purity not exceeding 78 to 65.00 at a rate of 15 tonnes per hour.
Continuous Centrifugal Machines for 'CAW' magma curing shall be capable to cure 'CAW' magma at a rate of 15 tonnes per hour
B and CA magma and its liquidation shall flow to horizontal magma melter, pump transfer from magma mixture.

Each continuous centrifugal machine shall be complete with following:

a) Mild steel monitor casing designed to provide a sturdy support for all machine elements,
b) Basket of SS 304 make
c) Separate compartments for sugar and molasses,
d) Sight and light glasses for inspection,
e) Hinged doors for access to the sugar chamber,
f) Sugar sampler and
g) Water/steam washing arrangement,
h) Stainless steel accelerating cone, receiving cup etc.
i) Hot water, exhaust steam & Q1 vapour for washing arrangement with metering device to measure the wash water,

Massecuite feeding device shall be **provided with manual as well as pneumatic control valves.** It shall operate automatically with load and shall stop in case power failure.

Drive arrangement having motor pulley, V belts and bearings, Massecuite feeding devices etc.

The angle of basket shall be 30° for all low grade of massecuite / magma.
Large enclosed distribution header of suitable size, with water jacket, shall be provided for C massecuite. Pug-mills for B – massecuite & CAW shall be provided and shall be mounted over the machines, suitable transient heaters, with automatic temp control shall be provided for C massecuite. Arrangement between B - massecuite and CFW magma pugmill shall be provided to use common centrifugal machine for B- massecuite and CFW magma curing.

The machines shall be complete with all accessories, auxiliaries, including support, structure, and platform pug mill with drive.

Auto controlled temperature of wash water system for massecuite curing in continuous centrifugal machines shall be provided. Run-off tanks, run-off pumps (1+1) with drive, incoming and control panels etc shall be as per requirement.

The pug-mills for B massecuite& CAW magma shall be made out of 8 mm thick mild steel plate and provided having paddle type stirring arrangement, driven by Ac electric motors through shaft mounted planetary gearbox.

The complete centrifugal station shall be complete in all respects and shall have necessary accessories namely Air compressor 7 kg/cm² (g) with receiver and refrigeration dryer system to supply moisture free air for pneumatic control, Air compressor under reference shall have standby arrangement and shall have no connection with any other air compressor proposed in boiling house.

Approach ladder and platform to top feed headers and pugmill shall be provided.

Vapour from 1st vessel of quintuple shall be used in continuous centrifugal machines & transient heaters, where ever required. Live steam shall not be used. In fact, Live steam connection shall not be provided in boiling house.

Monorail with 5 tonnes capacity, with chain pulley block over the centrifugal machines / motorised- remote control system shall be provided.

Provision shall be made in lay out suitable for ultimate capacity of 7500 TCD.

7.13.2.1 Molasses Run-off tanks

Independent molasses run-off tanks with independent pumps shall be provided.
Three (3) nos., vertical cylindrical, 5 mm thick, MS construction, molasses run-off tanks each of 3 m^3 capacity, one each for B-heavy, C-light and final molasses shall be supplied.

7.13.2.2Molasses Pumps with motor

Two (2) sets of molasses run-off pumps for each duty, one operating and one standby, complete in all respect.

7.13.2.3Magma Mixers with drive

The machines shall discharge sugar directly into the corresponding magma mixers of suitable capacity and design.
Independent magma mixers for CF sugar (2 nos.), CA sugar and B sugar will be provided. 2 nos. magma mixer shall be provided for B single cured sugar to avoid longer size magma.
The shell of the magma mixers shall be of 6 mm thick mild steel plates having double beater paddles, coupled to electric drive through suitable shaft mounted planetary gearbox.

7.13.2.4 Magma Pumps with motor

Two (2) nos. magma pumps (or as per requirement) one operating and one standby, each of 20 cu.m./hr. capacity, 12 m massecuite head with replaceable tips and driven by AC motor through a planetary / helical gearbox shall be supplied for CF magma.

Two (2) nos. magma pumps, one operating and one standby, each of 20 cu.m. /hr. capacity, 12 m massecuite head with replaceable tips and driven by AC motor through a planetary / helical gearbox shall be supplied for A1/C1 magma.
B and CA magma and its liquidation shall flow to horizontal magma melter by gravity. The staging level / operating platform level of all the machines shall be suitable for this purpose.
Independent Pug mill for each duty and pipeline from each pump shall deliver the magma to its destination.

7.14 Magma and Sugar Melters

7.14.1 B & C magma melter - One no.

Horizontal continuous sugar melter in fabricated construction, of 35 T/hr. capacity with automation for brix and temperature control shall be provided. The melter shall have ribbon type stirrer supported on external roller bearings in CI plumber blocks. It shall be complete with all fittings, mountings etc.

Provision shall be made in sugar melter for its operation at two levels.

It shall be driven by an AC motor through a shaft mounted planetary gear box.

Magnetic flow meter with indicating, integrating and recording facility for hot water use in melter shall be provided.

It shall be placed adjacent to centrifugal machine and the magma shall be delivered to it by gravity.

Suitable size of vibro screens shall be installed in between melter and receiving tank.

One suitable capacity melt receiving tank shall also be provided.

Two nos. melt pumps (one standby) each having capacity of 40 m^3/hr at 30 m head driven by AC motor shall be provided.

7.14.2 Dirty (Brown) sugar melter – 1 no.

Vertical cylindrical sugar melter of 5 T/hr of sugar capacity, complete with planetary geared motor driven stirrer shall be provided.

One suitable capacity melt receiving tank shall also be provided.

Suitable size of vibro screens shall be installed in between melter and receiving tank.

Two nos. melt pumps (one standby) each having capacity of 20 m3/hr at 30 m head driven by AC motor shall be provided.

Suction side of all pumps shall be provided with strainers.

7.15 Process Automation – DCS

The process house automation in the boiling house including batch and continuous pans shall be achieved through DCS. Control room for centralised operation / control and housing the control panels shall be provided at a central point for easy approach with AC for maintaining desired temperature. It shall be fully equipped in all respect.

Compressed air, free from moisture, required for operation of pneumatic controls / automation system in boiling house with stand – by arrangement shall be provided for boiling house.

7.16 Final Molasses Handling & Storage System

7.16.1 Molasses Weighment, Unloading & Loading System

One magnetic type mass flow meter of capacity 15 tons/hr for final molasses weighment shall be provided.

7.16.2 Molasses Storage Tanks

One (1) No. molasses storage tanks each of **8000 m^3** with effective volume of 7200 m^3 capacity, mass flow meter,piping, valves, fittings, external cooling(spray & recirculation pump complete with motor, pump) shall be provided. Final molasses storage tanks shall be as per IS 5521-1980 specifications.

Six (6) Nos. molasses loading pumps for three (3) No. molasses storage tank complete with drive, piping, valves, fittings etc. shall be supplied.

One no. molasses loading tank capacity of 25 Cu.m, complete with support structure, platforms, railing, stairs etc. shall be supplied.

Three(03Nos.) pumps for each tank (09 nos.) for recirculation of molasses shall be provided. Proper MS coil inside the final molasses storage tanks for homogeneous molasses suction/circulation is required.

Arrangement of spraying water with 4 Nos. pumps sets–one common standby on all sides of tanks shall be provided with an arrangement of recovery of used water.

7.17 Miscellaneous

7.17.1 Overhead Service Water Tanks

Three rectangular overhead tanks of 8 mm thick mild steel plates with stiffeners and angle frame each having a capacity of 40 m^3 complete with valves, fittings, pipes shall be provided.

Bottom of the tanks shall be at least 6 meters above pan floor. The tanks shall be covered. Level indicators shall be provided, compatible to DCS.
Complete structure, platform around tanks, stairs / ladders etc. shall be provided.

Two parallel strainers with isolating valves shall be provided from overhead cold water tank to Mills, boiling house, Boiler & Power House for make up so that one will be standby for periodical cleaning.

All spent bearings and oil cooling water of boiling house shall be cooled to ambient temperature and collected in closed MS cylindrical tank of suitable capacity at proper place as per approved layout. Cooling system with 2 pumps (1W and 1 SB) & strainers shall be provided. The cooled water shall be reutilized for cooling purpose.

Two (2) nos. pumps (1 W &1 SB) and strainers with MS cylindrical tank for collection of recirculation water of suitable capacity shall be provided to transfer the spent cooling water to the proposed cooling system.

Hot &cold water distribution piping, valves, fittings etc. for the entire plant shall be provided.

7.17.2 Under Ground Hot and Cold Water Reservoirs

To achieve CPCB norms, 03 underground reservoirs shall be proposed as below:

- Cold water reservoir to store water from tube well to work as make up water anywhere in the factory. It will receive water only from tubewell. The system / tube well and pumps for this duty / operation shall be centrally controlled and shall be compatible to DCS.
- Cold water reservoir for boiling house to receive water from surplus condensate cooling system, recirculation to over head cold water tank and make up from cold water reservoir.
- Hot water reservoir for boiling house to receive condensate water from boiling house and recirculation to overhead hot water tank.

Above system shall be equipped with level sensors and compatible to centralised controlled DCS.

7.17.3 UGR and Service Water Pumps – Cold Water from Tube wells

UGR shall be of RCC of suitable capacity not less than 15, 00,000 litre.

Two (2) nos. water pumps each of 200 m^3/h, 50 m head, 1440 rpm, complete with AC-VFD drive, piping, valves, fittings etc. shall be provided tube well cold water UGR to transfer cold water to the required destination anywhere in the factory as make up to the system and automatically maintain set level in the UGR compatible to DCS.

7.17.4 UGR and Service Water Pumps – Cold Water from surplus condensate cooling system

UGR shall be of RCC of suitable capacity not less than 15, 00,000 litre.

Two (2) nos. water pumps each of 300 m^3/h, 50 m head, 1440 rpm, complete with AC-VFD drive, piping, valves, fittings etc. shall be provided at cold water UGR to transfer cold water to the overhead service water tank and automatically maintain set level in the tank and UGR compatible to DCS. Arrangement shall be made to make cold water UGR from surplus condensate cooling system before fresh water addition, with the approach to zero water use of fresh water.

7.17.5 UGR and Service Water Pumps – Hot Water (condensate)

UGR shall be of RCC of suitable capacity not less than 3, 50,000 litre

Two (2) nos. hot water pumps each of 200 m^3/h, 50 m head, 1440 rpm, complete with AC-VFD drive, piping, valves, fittings etc. shall be provided at hot water UGR to transfer hot water to the overhead service water tank in boiling house and automatically maintain set level in the tank compatible to DCS.

7.18 Effluent Treatment Plant

- Effluent treatment plant shall be installed as per Gazatte of India REGD. NO. D.L.-33004/99 dated 14.01.2016 and norms laid down by State and Central Pollution Control Board / Govt. Agencies. Necessary approvals/ formalities from Govt. agencies shall be the responsibility of supplier. On line monitoring system as per the norms of pollution Control Board shall be installed. Effluent treatment plant shall be installed for ultimate capacity of 7500 TCD.
  Decanter/centrifugal machines/filter press for sludge treatment, RO treatment at outlet, condensate polishing unit.

7.18.1 General Scheme and Process of Treatment:

Brief Treatment Scheme:

A: Preliminary Treatment

- Screen Chamber
- Oil & Grease Trap

B: Primary Treatment:

- Equalization Tank – Solids shall be kept in suspension by introducing diffused air.
- Primary Clarifier

C: Second Stage Biological Treatment

- Aeration Tank
- Secondary Clarifier

D: Tertiary Treatment – System shall follow CPCB norms.

- Multi – Grade Filter
- Activated Carbon Filter

E: Sludge Treatment:

- Sludge dewatering system

Above process specification shall be based on feasibility report and terms & conditions specified in environmental clearance obtained for the project for ultimate capacity.

Flow meters shall be provided to determine gross effluent quantity.

- Outlet of sugar house cooling tower over flow & boiler blow downs.
- At the outlet of R.O. reject.
- At the inlet and outlet of ETP.
- At the inlet of makeup water in sugar house cooling tower.

7.18.2 CPCB & SPCB NORMS

The water/ effluent management system shall be designed for achieving norms laid down by central and state pollution control board / Govt. norms vide Environment Act 1986 and Amendment Rules 2016 as details given below:

S. No.	Industry	Parameters	Standard
"4.	Sugar Industry	EFFLUENTS	All concentration values arein milligramme per litre except for pH
		pH	6.5-8.5
		Temperature	Ambient
		Total Suspended Solids (TSS), milligramme per litre	<30
		COD miligramme per litre	<250
		BOD [3 days at 27℃] milligramme per litre	<30
		Oil & Grease milligramme per litre	10
		Total Disolved Solids (TDS) milligramme per litre	2100
		Final waste water discharge limit	200 litre per tonne of cane crushed
		(Final treated effluent discharge restricted to 100 litre per tonne of cane crushed and water from spray pond	

		overflow or cooling tower blow down to be restricted to 100 litre per tonne of cane crushed and only single outlet point from unit is allowed).

4 (1) Treated effluent Irrigation protocol and waste water conservation or waste water management in Sugar industries.

(i) Loading rates for different soil textures

S. No.	Soil Texture	Loading rate in m3/Ha/Day
1)	Sandy	225 to 280
2)	Sandy loam	170 to 225
3)	Loam	110 to 170
4)	Clay loam	55 to 110
5)	Clay	35 to 55

In addition to action proposed for achieving CPCB norms, the following shall be considered for better water management:

- Mill House effluent De-oiling /De-greasing/De-sludging to recycle water in mill house.
- Spray pond effluent de-sludging and treatment before loading / sending it to final ETP. Presence of sulphur in it affects the working of ETP.
- RCC Storage tank to collect tube cleaning waste water for regulating controlled flow to ETP for efficient control of norms and flow. Sludge removal provision shall also be made.
- Pumps and other necessary arrangements /piping, valves for discharging treated discharge to designated points as per layout and site conditions shall be in scope of supplier.
- Lagoon of 15000 cu m capacity.

7.19 Fire Fighting System

Fire fighting system shall be installed as per the norms laid by state and central Govt. directives for 4900 TCD plant expandable to 7500 TCD. Necessary approvals/ formalities from Govt. agencies shall be the responsibility of supplier.

7.20 Bore well

One (01) no. bore well, each of 60 cu.m. per hr. with 50 meter head shall be installed along with necessary pipelines & valves. The existing two nos. of borewells will be hooked up with the new borewell. Start up and stoppage shall be centrally operated in addition to manual operation at site, compatible to DCS which is in supplier's scope. Magnetic flow meters for individual bore wells with indicating, integrating and recording facility shall be provided.

Piezometer with separate boring to measure the underground water level as per the directives of CGWA shall be provided and Clearance from CGWA also required.

7.21 Modern laboratory shall be established for analysis required to be carried out in sugar factory.

Well-equipped laboratory with a facility to analyse water, sugar house products which includes ICUMSA values including all special analysis, boiler water, condensate water, evaporator scaling and BOD, COD tastings for ETP plant etc.

7.22 Insulation & Lagging

Insulation and lagging of all equipment, pipes and fittings etc. of the sugar plant shall be supplied.

All the equipment and pipelines (including fittings as defined under Clause 6 of IS:7413 specifications), surfaces in the sugar plant above 55 deg. C temperature shall be effectively lagged (except where heat dissipation is desirable and the surfaces which become hot intermittently such as steam traps and relief valve outlet pipes, vents, blow-down pipes etc.)

Lagging of boiling house equipment & piping shall be from factory made mattresses of Bonded Mineral wool of readymade mattresses specifications. All lagging shall be cladded with minimum 22 gauge aluminium sheet cladding.

7.23 Air compressor unit for boiling house instrument operation

Suitable capacity air compressor unit with standby system along with arrangement for supplying of moisture free air with suitable filters of adequate capacity, air receiver with suitable relief valve for operating of instrument at suitable pressure separately for boiling house shall be provided. This is most important during sudden shutdown of plant.

7.24 Galvaume Sheet for Roofing, Ridges And Galvaume For Plant.

Galvaume sheets shall be of following specification:-

Total coated thickness (TCT)	=	0.65 mm
Weight	=	180 gm/m.^{2}
Galvaume Coating (GSM) (As per I.S. Code)	=	Aluminium 55%and zinc 43.5% and silicone 1.5%

7.25 Helical Planetary Drives

Shaft mounted high efficiency helical planetary devices shall be M.S. fabricated / CS construction.

7.26Sugar Godowns

Two (02) no. sugar godown each of 20000 tons storing capacity shall be provided.

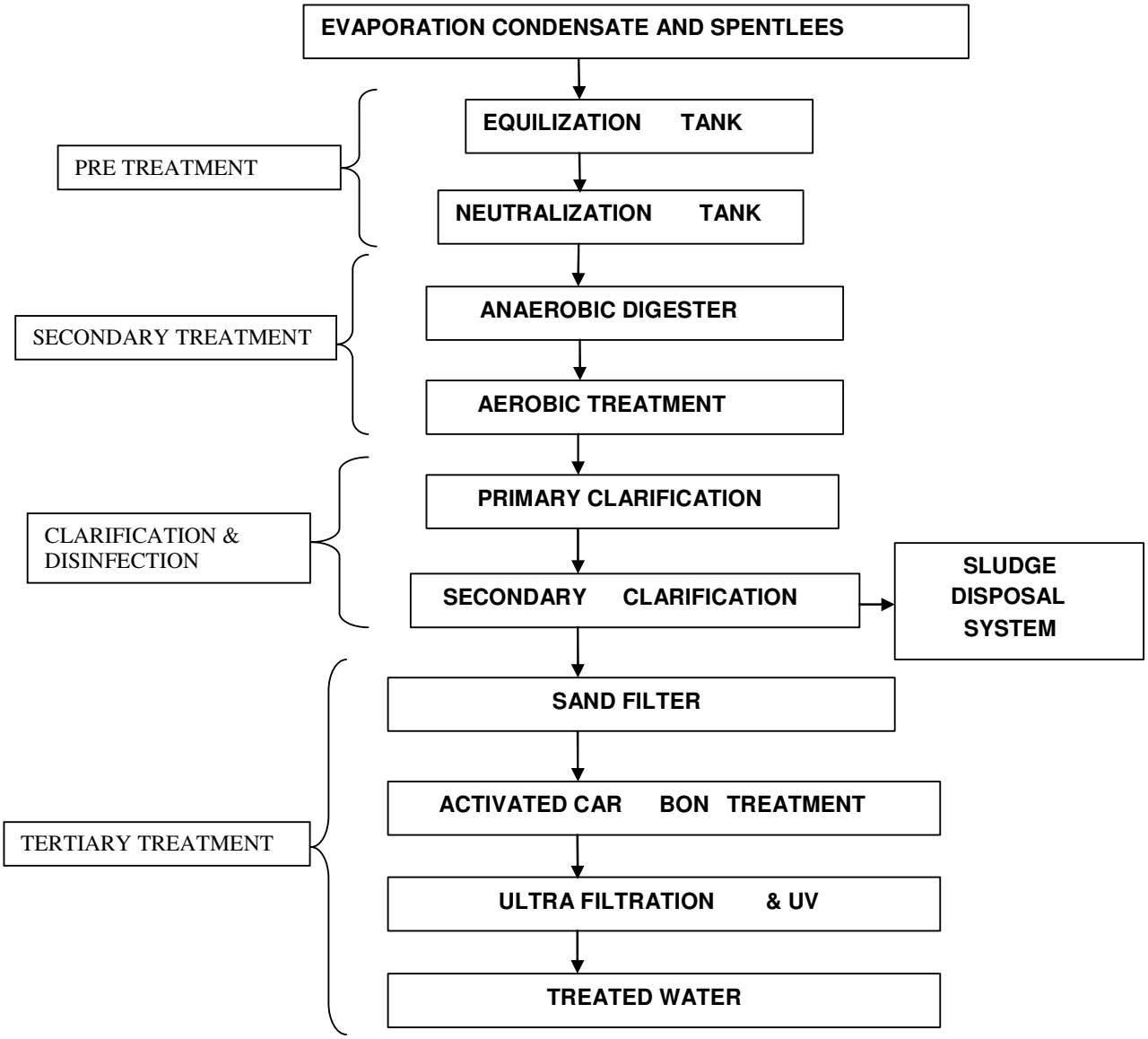
7.27Rain Water Harvesting

Rain water harvesting system shall be provided as per prescribed norms by Govt./ CPCB / SPCB.

7.28 Condensate Polishing Unit

Suppliers providing alternate technologies or deviating from below mentioned technology should provide all details to the Sugar mill and Inspection agency (NFCSF) well in advance.

TYPICAL PROCESS FLOW DIAGRAM FOR CONVENTIONAL TECHNOLOGY FOR CPU



(Supplier should provide cooling tower in order to cool the process condensate from 60^0C to the temperature of 35^0C or required temperature)

	EQUIPMENT LIST	
1	Evaporation condensate lifting pump with motors (Condensate + Spentlees)	Type- Self Priming, non clog, centrifugal Capacity- 30 M^3/hr Head- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill MOC-Shaft, Impeller- SS-316, Casing- CS Pump with motors – 1+1 Nos.
2	Lime /Soda ash tank	Capacity-1 M^3 MOC- HDPE, No. 1
3	Lime /Soda ash dosing pumps	Type - Self Priming, non clog, centrifugal Pump capacity - 0-50 LPH MOC - MOC-Shaft, Impeller- SS-304, Casing- CS Pump with motors – 1+1 Nos.
4	Nutrient tank	Capacity-1 M^3 MOC- HDPE, No. 1
5	Nutrient dosing pumps	Type – Electronic diaphragm operated Pump capacity - 0-50 LPH MOC – PP Pump with motors – 1+1 Nos.
6	Air Blower	Type - Twin Lobe Capacity- 1200 M^3/hr, Pressure 0.5 kg/cm^2 MOC – CI Nos. 1 + 1
7	Air grid with diffuser membrane	Type- Membrane Capacity- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill MOC- EPDM Type -Disc

		Nos. 1 lot
8	Poly dosing tank	Capacity-0.5 M^3 MOC- HDPE, No. 1
9	Poly dosing pumps	Type – Electronic diaphragm operated Pump capacity - 0-10 LPH MOC – PP Pump with motors – 1+1 Nos.
10	Primary Clarifier Mechanism for AT-1	Capacity - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Type - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill MOC - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Gear box & Motor- No. 1
11	Sludge pump for primary clarifier	Type - Self Priming, non clog, centrifugal or screw Pump capacity – 10 M^3/hr MOC-Shaft, Impeller- SS-304, Casing- CS Pump with motors – 1+1 Nos.
12	Secondary Clarifier Mechanism for AT-2	Size- To be Specified Drive- Centre Drive Gear Box & Motor- 1No. Scraping- MS Epoxy two scrapper arm with neoprene squeegees Make- To be specified Feed well- To be specified

13	Sludge pump for Secondary clarifier	Type- Self Priming, non clog, centrifugal or screw Pump capacity – 10 M^3/hr MOC-Shaft, Impeller- SS-304, Casing- CS Pump with - 1+1 Nos.
14	UASB digester feed pump	Type- Self Priming, non clog, centrifugal Pump capacity – 30 M^3/hr Head- To be specified MOC-Shaft, Impeller- SS-304, Casing- CS Pump with motors – 1+1 Nos.
15	Chlorine (Hypo chloride) dosing tank	Capacity-0.5 M^3 MOC- HDPE, 1 No.
16	Chlorine dosing pumps	Type – Electronic diaphragm operated Pump capacity - 0-10 LPH MOC – PP Pump with motors – 1+1 Nos.
17	Filter feed pump	Type- centrifugal Pump capacity - 30 M^3/hr MOC-Shaft, Impeller- SS-304, Casing- CS Pump with motors – 1+1 Nos.
18	Pressure Sand filter	Capacity- 30 M^3/hr Size- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill MOC- MSEP Piping size- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Media- Graded Sand and Gravels Valve type- Butterfly Valve size- As per standard capacity to meet the reqirement of 4900 TCD

		Gajraula Mill No. 1
19	Activated Carbon filter	Capacity- 30 M^3/hr Size- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill MOC- MSEP Piping size- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Media- Supporting media & Activated carbon Valve type- Butterfly Valve size- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill No. 1
20	Flare stack	No. 1 Type- Water seal type, manually ignited, MOC-SS-304 or MS with epoxy coated
21	Interconnecting Piping & Fittings	MOC- White CPVC Sch. 40 Accessories- Valves, Flanges, Reducers, Joints, Bends etc. Nos.- To be specified
22	Electrical & Equipments	Control Panel- 1No. Make- To be Specified Energy meter- 1 No. Cabling- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill
	ULTRA FILTRATION PLANT	

1	UF feed pump	Type - Centrifugal Pump capacity - 30 M^3/hr MOC-Shaft, Impeller- SS-304, Casing- CI Pump with motors – 1+1 Nos.
2	Basket filter	Capacity- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Size- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Media- 25 micron MOC of housing- SS-304 No. 1
3	Bag filter	Capacity - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Size - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Media - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill MOC– SS-304 No. 1

4	UF system	Feed flow - 30 M^3/hr Product flow – Min. 27 M^3/hr Recovery – 90-95% Module Type - Hollow fiber or suitable Nos. - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Membrane area - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Piping - 1 lot MOC - SS and CPVC Auto control valves - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Type - Pneumatically Actuated PRV - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill MOC - Cast Steel Skid - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill MOC - MS Powder coated No. of units - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill
5	CEB 1 Dosing system	Chemical - Caustic & Chlorine Pump capacity – 0-20 LPH Type - Mechanical diaphragm operated Tank capacity (M^3) – 200 Lits. MOC - HDPE No. 1

6	CEB 2 Dosing system	Chemical - Acid Pump capacity – 0-20 LPH Type - Mechanical diaphragm operated Tank capacity (M^3) – 200 Lits. MOC - HDPE No. 1
7	UF Backwash strainer	Capacity- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Size- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Media- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill MOC of housing - SS-304 Nos. - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill
8	UF backwash pump	Pump capacity – As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Pump type - Centrifugal MOC-Shaft, Impeller- SS-304 , Casing- CI Pump with motors - 1+1 Nos.
9	Ultra Violet treatment system	As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill
10	CIP system	Tank - 1 No. Tank capacity (M^3) - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Tank MOC - HDPE Pump capacity (M^3/hr) - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill

		MOC of Pump -Shaft, Impeller- SS-304 Casing- CI Pump with motors - 1+1 Nos. Micron filter - As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill MOC of housing – CPVC
11	Treated water pump	Type- centrifugal Pump capacity - 30 M^3/hr MOC-Shaft, Impeller- SS-304, Casing- CI Pump with motors – 1+1 Nos.
12	Instrumentation electrical and components	Mag flow meter -3 Nos.- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Rota meters -Nos.- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Level switch - Nos.- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Actuated valves -Nos.- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Temperature gauges -Nos.- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Pressure gauges -Nos.- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Sampling valves - Nos.- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Online pH meters -Nos.- As per standard capacity to meet the

		reqirement of 4900 TCD Gajraula Mill Online ORP meters -Nos.- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Conductivity meter inbuilt in control panel -Nos.- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill HPS & LPS -Nos.- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Solenoid valve for Auto flushing -Nos.- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill Solenoid valve for Auto Dumping -Nos.- As per standard capacity to meet the reqirement of 4900 TCD Gajraula Mill
13	Control panel	Control Panel - 1 No. Make - As per Approved list of supplier. Panel Type - Auto / Manual No. 1
14	Piping	MOC - White CPVC/SS-304 Pressure Rating - 20 Kg/cm2 Nos. - 1 Lot as per requirement
15	Electrical	Electric control panel (Micro processor based) - As per Approved list of supplier.Operation - Semi automatic PLC - As per Approved list of supplier. Cabling - As per Approved list of supplier. Cable Tray - As per Approved list of supplier.
16	Plant lightning – LED type	As per Approved list of supplier.
17	Motor covers	As per requirement

Note- Condensate Polishing Unit Civil work will be in scope of Party

8.0 TECHNICAL SPECIFICATIONS OF REFINED SUGAR PROCESS HOUSE EQUIPMENMTS

Cane Sugar Refining with Raw Sugar Melt Clarification process by Phospho-flotation to produce refined sugar of 60 ICUMSA.

8.1 Raw Sugar Specifications

- Pol % : 98 to 99
- Colour (ICUMSA) : 500 – 700
- Ash % : 0.5
- Starch (ppm) : < 100
- Dextran (ppm) : < 100
- Moisture % : ≤ 0.2
- Sediment (ppm) : ≤ 70

8.2 Refined Sugar (Sulphur less) Specifications

- Pol % : 99.8
- Colour (ICUMSA) : 40-60
- Ash % : ≤ 0.027
- Moisture % : ≤ 0.04
- Sediment (ppm) : ≤ 10
- Beverage Floc (ppm) : - ve

8.3 Description of process:

Raw Sugar is processed employing the processes of

- Melting,
- Melt clarification (Phospho flotation),
- Melt filtration (Multi Bed Filter),
- Crystallization
- Centrifugation

To produce refined sugar of above referred specifications.

The raw sugar is melted in hot water and screened before sending to clarification. In clarification, the Phospho flotation process is employed to get clear melt and scum will be sent to filter station in raw sugar house.

Clarified Melt is then passed through Multi Bed Filtration (MBF) to remove suspended particles from clarification.

Clarified melt is then passed through the Melt Concentrator (FEE) system and concentrated from 65° to 72 - 74° brix by 2nd body vapour of Quintuple evaporator set. This concentration of clarified liquor reduces steam consumption at Refined Massecuite boiling substantially.

In crystallization, refined massecuite boiling schemes depends upon the type, size and qty. of the crystal desired. Generally, in India Back boiling system is adopted. In back – boiling, the Run off from 1st massecuite is recirculated till the colour of refined sugar is 40 - 60 ICUMSA. Once it crosses, the back boiling is stopped and the runoff will be sent for raw massecuite boiling.

The refined massecuite from Pan, goes to closed O type crystallizers with insulationfor further crystallization and proper sizing of the crystal and goes to Centrifugal machine for separation of crystal and run offs.

The refined sugar from centrifugals is moist sugar and then dried in the long Grass Hopper length by Hot & Cold Air Blowers and through FBD system to keep the temperature of refined sugar around 40° C, this refined sugar is then sieved in Grader where different sizes of sugar obtained and sent to respective storage bins for bagging.

SCHEDULE OF EQUIPMENTS FOR REFINERY

The following are the equipments for Refined Sugar at 600 TPD capacity Plant:

Section	**Refined Sugar Process House**
a.	Melting,
b.	Melt clarification (Phosphotation),
c	Melt filtration (Multi Bed Filter),
d	Crystallization to produce refined sugar of above referred specifications.
e.	Refinery Centrifugals and Bagging System
f.	Piping, Insulation & Cladding

TECHNICAL SPECIFICATION

The system shall be compatible to PLC Control System.

8.4 Raw Sugar Melting & Screening

8.4.1 Raw Sugar Mingler / Magma Mixer — Quantity: 1 Unit

Raw Sugar shall be discharged to MS fabricated raw sugar mingler directly from A – Batch centrifugal machine or through Food grade belt conveyer as per site conditions. Raw Sugar magma of about 80 - 85° brix by using hot water and then shall flow by gravity to raw sugar melter. The capacity of magma mixer shall be suitable to magmize 18 TPH raw sugar magma.

8.4.2 Raw Sugar Melter — Quantity: 1 Unit

Raw Sugar magma is melted in MS fabricated horizontal cylindrical 3 compartments melter. The capacity of melter shall be 25 m3. Each compartment shall have stirrer for proper mixing. In melter, the melt overflows from one compartment to other. Suitable automation of Melt Brix and temperature should be provided. The melt brix is to be maintained 65° ± 2 and temperature around 70° C ± 2. The net volume of melter should be 30 M3. Vapour from 2nd body of Quintuple evaporator set should be used for melting.

8.4.3 Melt Pump — Quantity: 2 Unit

Capacity of each pump shall be 50 M3 / hr. and head 30 meter. Melt pump shall be centrifugal type, open impeller and material of construction Body – C.I., Internals - SS. Suitable motor shall be provided. One pump as working and one as standby.

8.4.4 Vibratory Screen for Melt — Quantity: 4 Unit

Melt from melter shall be screened in circular 3 – dimensional vibration screen. The mesh of screen should be 40 – 50. Handling capacity of screen should be 30 M3 / hr. the vibro screen should be installed above Screened Buffer Tank before sending for Clarification.

8.4.5 Dextran Treatment Enzyme Dosing Tank — Quantity: 1 Unit

Dextran Treatment Enzyme solution shall be prepared Chemical grade HDPE vertical cylindrical type tank with the help vigorous air agitation. The capacity of the tank shall be 1.0 M3.

8.4.6 Dextran Treatment Enzyme Dosing Pump — Quantity: 2 Unit

Dextran Treatment Enzyme Solution dosing pumps shall be of diaphragm type. For dosing of Dextran Treatment Enzyme variable frequency drive shall be provided with changeover switch so that same VFD can be used for standby pump. The capacity of each pump shall be 100 LPH.

8.4.7 Starch Treatment Enzyme Dosing Tank — Quantity: 1 Unit

Starch Treatment Enzyme solution shall be prepared Chemical grade HDPE vertical cylindrical type tank with the help vigorous air agitation. The capacity of the tank shall be 1.0 M3.

8.4.8 Starch Treatment Enzyme Dosing Pump Quantity: 2 Unit

Starch Treatment Enzyme Solution dosing pumps shall be of diaphragm type. For dosing of Starch Treatment Enzyme variable frequency drive shall be provided with changeover switch so that same VFD can be used for standby pump. The capacity of each pump shall be 100 LPH.

8.5 Melt Clarification System

8. 5.1 Screened Melt Buffer Tank Quantity: 1 Unit

Screened melt is collected in MS Fabricated vertical cylindrical type tank at ground floor. The capacity of the tank shall be 30 M3. Screened melt from Vibro Screens will fall by gravity in to this tank. Colour precipitant dosing connection should be provided at the entry of screened melt in to buffer tank.

8.5.2 Screened Melt Pump Quantity: 2 Unit

Screened melt from buffer tank is pumped to Melt Heater (DCH). Capacity of each pump shall be 50 M3 / hr. and head 30 meter. Screened Melt pump shall be centrifugal type, open impeller and material of construction Body – C.I., Internals - SS. Suitable motor with Variable Frequency drive shall also be provided. One pump as working and one as standby.

8.5.3 Melt Heater Quantity: 1 Unit

Melt heater shall be Direct Contact type (DCH). The heating media in the heater will be Vapour from 2nd / 3rd body of Quintuple evaporator set. The temperature of melt in the heater shall be maintained 70 to 85° C. the material of construction of DCH shall be SS 409 and thickness of about 4 mm. the DCH shall be equipped with suitable safety valve and sealing arrangement if working on 3rd body of Quintuple evaporator set.

8.5.4 Reaction Vessel with Cavitation Aeration System Quantity: 1 Unit

Hot melt shall enter in reaction vessel by gravity from DCH. One no. MS Fabricated reaction vessel shall be horizontal with three compartments where two compartment would be as reaction vessel and 3rd compartment would be as Cavitational aerator. In two compartment of reaction vessel, the total retention time would be 5 – 6 minutes of melt flow rate and in the 3rd compartment one minute retention time to be provided for aeration.
In reaction vessel suitable agitators alongwith and arrangement of Phosphoric Acid and Lime Sucrate dosing shall be provided. The cavitational aerator would have SS hollow Shaft with PP Disc and suitable number of nozzles at bottom shall be provided.

8.5.6 Froth Clarifier System Quantity: 1 Set

Melt after reaction and aeration shall enter in clarifier by gravity. Material of construction of Trayless clarifier system shall be MS. The clarifier shall have suitable gear box & drive. The capacity of the clarifier shall be 26 M3. The centre tube at the feed shall act as flocculator and from centre tube the flocculated melt enters in to the clarifier by overflow. The clarifier shall have scrapping arrangement from removing scum. Clarifier shall have

Clear melt withdrawal coil which will connected to weir box (MS Fabricated). The level of clarifier shall be maintained by operating telescopic valve provided in weir box. Flocculant dosing arrangement shall be given in between Aeration and clarifier for flocculation of scum.

8.5.7 Clear Melt Tank **Quantity: 1 Unit**

Clear melt is collected in MS Fabricated vertical cylindrical type tank at ground floor. Clear melt from clarifier will fall by gravity in to this tank. The capacity of the tank shall be 30 M3.

8.5.8 Clear Melt Pump **Quantity:2 Unit**

Clear melt from tank is pumped to Melt Filtration (MBF). Capacity of each pump shall be 50 M3 / hr. and head 40 meter. Clear Melt pump shall be centrifugal type, open impeller and material of construction Body – C.I., Internals - SS. Suitable motor with Variable Frequency drive shall also be provided. One pump as working and one as standby.

8.5.9 Scum Buffer Tank **Quantity: 1 Unit**

Scum from Melt clarifier is collected in MS Fabricated vertical cylindrical type tank. The capacity of the tank shall be 10 m^3..tank shall be provided stirrer, suitable motor and gear box.

8.5.10 Scum Pump **Quantity: 2 Unit**

Scum from buffer tank is pumped to filter station in raw sugar house. Capacity of each pump shall be 15 M3/hr. with 30 m head. Scum pump shall be of construction Body – C.I., Internals - SS. One pump as working and one as standby.

8.5.11 Phosphoric Acid Dosing Tank **Quantity: 1 Unit**

Phosphoric Acid solution shall be prepared Chemical grade HDPE vertical cylindrical type tank with the help vigorous air agitation. The capacity of the tank shall be 1.0 m^3.

8.5.12 Phosphoric Acid Dosing Pump **Quantity: 2 Unit**

Phosphoric Acid Solution dosing pumps shall be of diaphragm type. For dosing of phosphoric acid variable frequency drive shall be provided with changeover switch so that same VFD can be used for standby pump. The capacity of each pump shall be 100 LPH.

8.5.13 Colour Precipitant Dosing Tank **Quantity: 1 Unit**

Colour Precipitant solution shall be prepared Chemical grade HDPE vertical cylindrical type tank with the help vigorous air agitation. The capacity of the tank shall be 1.0 m^3.

8.5.14 Colour Precipitant Dosing Pump **Quantity: 2 Unit**

Colour Precipitant Solution dosing pumps shall be of diaphragm type. For dosing of Colour Precipitant variable frequency drive shall be provided with changeover switch so that same VFD can be used for standby pump. The capacity of each pump shall be 100 LPH.

8.5.15 Lime Sucrate Dosing Tank **Quantity: 2 Unit**

Two nos. Lime Sucrate vertical cylindrical type tank shall be provided. One no. is for preparation and other for dosing. The Material of construction of each tank shall be MS. The capacity of each tank shall be 5.0 m^3. Each tank shall be provided stirrer, suitable motor and gear box.

8.5.16 Lime Sucrate Dosing Pump **Quantity: 2 Unit**

Lime Sucrate dosing pumps shall be of Screw type. For dosing of Lime Sucrate variable frequency drive shall be provided with changeover switch so that same VFD can be used for standby pump. The capacity of each pump shall be 1200 LPH.

8.5.17 Flocculant Dosing Tank **Quantity: 2 Unit**

Two nos. Flocculant vertical cylindrical type tank shall be provided. One no. is for preparation and other for dosing. The Material of construction of each tank shall be MS. The capacity of each tank shall be 5.0 m^3. Each tank shall be provided stirrer, suitable motor and gear box.

8.5.18 Flocculant Dosing Pump **Quantity: 2 Unit**

Flocculant dosing pumps shall be of Screw type. For dosing of Flocculent variable frequency drive shall be provided with changeover switch so that same VFD can be used for standby pump. The capacity of each pump shall be 1200 LPH.

8.5.19 Automation **Quantity: 01 Set**

System shall be compatible to central DCS for complete automation of Melt Clarification
System. Following are the control areas:

- Flow control.
- Dosing control
- Temperature control
- pH measurement & control.

8.6 <u>Multi Bed Filtration (MBF)</u>

Clarified Melt from Clarification will pass through Multi Bed Filtration to trap suspended particle up to 5 micron which is escaping from Melt Clarification.

8.6.1 Multi Bed Filters (MBF) **Quantity: 2 Units**

Two nos. MS Fabricated Multi Bed Filters shall be provided. The capacity of each MBF shall be compatible to 25 M3/Hr. melt flow rate. Each MBF shall have 1st filled media.

8.6.2 Filtered Melt Tank **Quantity: 1 Unit**

Filtered Melt is collected in MS Fabricated vertical cylindrical type tank at ground floor. The capacity of the tank shall be 30 M3. Filtered Melt from MBF will fall by gravity in to this tank.

8.6.3 Filtered Melt Pump **Quantity: 2 Unit**

Filtered Melt from tank is pumped to Melt Safety Filter en route to Multi bed filter. Capacity of each pump shall be 50 M3 / hr. and head 40 meter. Filtered Melt pump shall be centrifugal type, open impeller and material of construction Body – C.I., Internals - SS. Suitable motor with Variable Frequency drive shall also be provided. One pump as working and one as standby.

8.6.4 Backwash Tank **Quantity: 1 Unit**

Backwash from MBF is collected in MS Fabricated vertical cylindrical type tank at ground floor. The capacity of the tank shall be 25 M3. Backwash from MBF will fall by gravity in to this tank.

8.6.5 Backwash Pump **Quantity: 2 Unit**

Backwash from tank is pumped to MBF. Capacity of each pump shall be 80 M3 / hr. and head 40 meter. Backwash pump shall be centrifugal type, open impeller and material of construction Body – C.I., Internals - SS. Suitable motor with Variable Frequency drive shall also be provided. One pump as working and one as standby.

8.6.6 Backwash Screening Tank **Quantity: 1 Unit**

Backwash screening tank of 1.5 m^3 capacity MS Fabricated vertical cylindrical type at MBF working floor. Backwash screening tank is fitted with screen with support of 20 mesh.

8.6.7 Air Blower **Quantity: 2 Unit**

Air Blower Capacity shall be 3.5 m^3/ min. and pressure 0.7 Kg / Cm^2. Air Blower shall be twin lube type and material of construction Body – C.I., Internals - SS. Suitable motor shall be provided. One Air Blower as working and one as standby.

8.6.8 Automation **Quantity: 01 Set**

System shall be compatible to central DCS for complete automation of Multi Bed Filtration.

Following are the control areas:

Feed control.

Pressure control

8.7.9 Sweet Water Tank **Quantity: 1 Unit**

Sweet Water tank of 40 M^3 capacity MS Fabricated vertical cylindrical type at ground floor.

8.7.10 Sweet Water Pump **Quantity: 2 Unit**

Sweet Water from tank is pumped to Melting section. Capacity of each pump shall be 50 M^3 / hr. and head 30 meter. Sweet Water pump shall be centrifugal type, open impeller

and material of construction Body – C.I., Internals - SS. Suitable motor shall be provided. One pump as working and one as standby.

8.8 MELT EVAPORATION

List of equipment in melt evaporation and crystallization section are given below and brief specification of each equipment is given in the subsequent paragraphs.

8.8.1 Melt Heater (Pre Heater) Quantity: 1Unit

One DCH/ PHE melt heater shall be provided to heat de-colorized melt from 60 deg. C to 85 deg. C by vapour from Q-3 body of quintuple. The material of construction shall be SS 304. DCH shall be designed for 30 % extra capacity.

Design duty condition of melt heater.

Type	:	DCH / PHE
Melt flow rate	:	45 m^3/h

8.8.2 Falling Film Evaporator Bodies (Melt Concentrator) Quantity: 1 set

Double effect falling film evaporator (FFE). Quintuple 3rd effect vapour of raw sugar factory evaporator shall be given as heating medium arrangement shall be provided for concentrating melt from about 60° Brix to 72° Brix for FFE, 1st effect of 500 m^2 & Vapour from FFE 1st effect will be given to FFE 2nd effect of 500 m^2. About 0.3 kg/cm^2 (a) pressure shall be maintained in the FFE 2nd effect. A common spare body of 500 m^2 HSA will be provided and material of construction shall be SS–409 m.
Double effect falling film type evaporator can be considered for this application.

Heating surface	:	500 m^2 & 500 m^2
Tube outside dia meter	:	45 mm
Tube wall thickness	:	18 SWG
MOC of Tube	:	SS 304
Length	:	10000 mm
Ligament	:	12 mm
Material	:	SS Annealed Conform to standard ASTM A 249

The system shall be equipped with suitable size, Melt Circulator pumps and melt transfer pumps with standby arrangements.
The condensate from double effect shall be sent to common condensate collection system (Condensate flash recovery tank).

8.8.3 Thick Liquor Pumps Quantity: 2 Unit

Provide two thick liquor pumps capacity 50 m^3/h and 30m head to transfer thick liquor to vertical storage tank, one working and one standby.

8.8.4 S.S. Vertical Liquor Tanks Quantity: 2 Unit

Three vertical cylindrical storage tanks each of 50 m^3 capacity shall be provided to store thick fine liquor. All tanks shall be fabricated with SS 409 material and located at pan floor.

8.8.5 Run Off Dilution Tanks (Molasses) **Quantity 3 Unit**

Vertical cylindrical storage tanks each of 50 m^3 capacity shall be provided to store thick fine liquor, R_1 Heavy and R_1 Light molasses tanks. All tanks shall be fabricated with MS material and located at pan floor.

8.8.6 Run Off Pumps **Quantity: 4 Unit**

Four run off pumps capacity 30m^3/h shall be provided to pump R_1 Heavy and R_1 Light molasses from vertical storage tanks to respective pan supply tanks (two working and two standby).

Type	:	Screw type
Capacity	:	30 m^3/hr
Head	:	30 m

8.9 PAN STATION:

8.9.1 Refinery Sugar Pans **Quantity 3 Unit**

Three refinery pans of capacity 80 tonnes shall be provided for refinery massecuite boiling. All refinery pans shall be fabricated with MS material. Distribution of pans for individual massecuite shall be as follows:

R_1 – massecuite	:	3 #

All the pans shall be provided with auto fine liquor / run off feeding arrangement and mechanical circulator with VFD, calendria type vacuum pans with central down take.

S / V ratio	:	7.0 m2 / m3
Down take dia meter	:	45% (maximum)

Tube shall be of annealed SS 304 grade.

Hydraulically / Pneumatically operated massecuite discharge valves of suitable size shall be provided for each pan.

Vapour space in the cylindrical portion shall be 2.5 mtrs. above the strike level in the pans.

The condensate from pans shall be sent to common condensate collection system (Condensate flash recovery tank).

8.9.2 Seed Crystallizer **Quantity 1 Unit**

One horizontal open seed, crystallizer of 60 tonnes capacity shall be provided to receive seed from grader through belt conveyors. The material shall be used as footing material for R1/R2 massecuite.

8.9.3 Run Off Dilution Tanks (Molasses conditioners) **Quantity 2 Unit**

Two dilution tanks for molasses (R1 H & R1 L) dilution tank shall be provided with auto control system of brix and temperature. Material of construction shall be SS 409.

8.9.4 Refinery Pans & Evaporator Condensers Quantity 5 Unit

Fiver single entry co-current condenser 3 # 80 tonnes pan and 1# double effect evaporator (FFE) & one for standby FFE shall be provided to condense vapour released from vacuum pans and double effect evaporator of suitable capacity.

8.10 Injection Water Pumps

The injection water pumps are considered in Raw sugar section.

8.11. Crystallizers Quantity 3 Unit

Four closed crystallizers of 85 tonnes capacity shall be provided to receive refined massecuite from batch pans.

Each crystallizers shall be horizontal cylindrical and closed and fabricated with MS material. The crystallizers shall be fitted with efficient stirrer of sturdy construction for continuous working:
Drives shall be shaft mounted high efficiency helical planetary drive /helical gear boxes.

Type	**:**	Horizontal rounded shape
Net Working capacity	**:**	85 tonnes each.

The system of crystallizer shall be arranged in such a way that the massecuite flow to the pug mills of the centrifugal machines by gravity without pumping.

8.11.1 Vacuum crystallizers Quantity:1 Unit

One No. vacuum crystallizers of 70 Tons capacity shall be provided.

Crystallizers shall be horizontal cylindrical and fabricated with MS material. The crystallizers shall be fitted with efficient stirrer of sturdy construction for continuous working. Drives shall be shaft mounted high efficiency helical planetary drive /helical gear boxes

8.12. Centrifugal Quantity 3 Unit

Three flat bottom fully automatic recycling batch type centrifugal machines capacity 1750 kg/charge and 20 charges per hour shall be provided for curing refinery massecuite. Both of the two machines shall be utilized for curing R1 massecuite. The centrifugal machines shall be driven by AC variable frequency drive motor.
R1 Heavy and R1 Light molasses run off tanks shall be of SS 409.

8.12.1 Superheated wash water system Quantity 1 Unit

Super-heated wash water equipment with tank, heating unit and temperature control unit to supply superheated hot water to all the batch centrifugal machines at a pressure of 6-7kg/cm2 at the nozzles. The capacity of the tank shall be 1 m3.

8.12.2 Superheated wash water pumps Quantity 2 Unit

The super-heated wash water pumps capacity 35 cum. m/hr. of suitable head shall be provided, one working and one standby.

8.13. REFINED SUGAR HANDLING SYSTEM

Sugar Conveying, Drying, Grading & Bagging Station

8.13.1 Sugar Hopper Conveyers

Following hopper conveyors shall be supplied. The plain tray hopper shall be placed below the centrifugal machines:

Plain tray type	One no., 2000 wide, minimum 300 mm inside height, 12 m effective length
Multi tray hopper	One no., 2000 wide, minimum 300 mm inside height, 12 m effective length
Fluidised bed sugar drier for ultimate capacity complete in all respect	One no., 2000 wide, minimum 300 mm inside height, 12 m effective length
Multi tray with rori separator	One no.,2000 wide, minimum 300 mm inside height, 12 m effective length

Two (2) nos. (One standby), twin lobe type cold air blowers complete with inlet strainers, AC motor drive through planetary gearbox, piping fittings etc. shall be provided.

8.13.2 Fluidized Bed Sugar Drier

One set of 2000 mm wide, fluidized bed sugar drier cum dust eliminator, complete with its hot and cold air forced draft blowers, induced draft blower, heat exchange for hot air, dry and wet cyclones, circulating water pumps with standby pump and other accessories and auxiliaries complete in all respect including sweet water pumps etc shall be supplied.

It shall be placed after 2nd multi tray hopper with hot air arrangement.

Hoppers and FBD system shall be so designed to achieve bagging sugar temperature 36-38 deg. C and shall be suitable for ultimate capacity.

8.13.3 Belt Conveyors for Lumps (Rori) – One Set

A set of belt conveyors, consisting of number of conveyors as required, each of 600 mm belt width complete with planetary gear drive, support structure as required, shall be supplied to transfer the lumps from last sugar hopper to the sugar melter.

8.13.4 Sugar Elevators (Belt driven)

Two (2) nos. steel cased, belt driven vertical sugar elevator, each of 25 T/hr. capacity complete in all respect with planetary gearbox, and drive motors shall be provided. Bucket shall be of SS- 304 grade.

The height of sugar elevators shall suit delivery of sugar to sugar graders placed above sugar bins.

8.13.5 Sugar Graders – 2 sets

Two (2) nos., one standby, Mugenson Sizer, of six decks each of 25 t/hr. capacity complete with distributor, drives for Distributor & Sizer /Grader, SS screens etc. shall be provided.

The sugar graders shall be placed above sugar bins with independent support structure.

The sizer / grader shall be complete with discharge chutes etc. in all respect.

8.13.6 Sugar Storage Bins – 3 Nos.

Three (3) nos. sugar bins each suitable for 12 hrs. holding capacity in MS construction complete in all respect shall be provide as per details below:

- 250 tons of net holding capacity for M Grade sugar
- 100 tons of net holding capacity for S Grade sugar
- 50 tons of net holding capacity for L Grade sugar

8.13.7 Belt Conveyors for Dry Seed – One Set

A set of belt conveyors, consisting of number of conveyors, each of 600 mm belt width complete with planetary gear drive, support structure as required, shall be supplied to transfer dry seed from graders to the dry seed magma above seed crystalliser on pan floor. Belts shall be of food grade.

8.13.8 Dust & Rori sugar melter – one no.

Vertical cylindrical sugar melter of 15 T/hr. of sugar capacity, complete with planetary gear box/ geared motor driven stirrer shall be provided.

It shall be placed adjacent to sugar grader. Sugar dust and rori from grades shall be delivered to it by gravity. Sugar lumps (Rori) from last hopper shall be delivered to the melter by a belt conveyor.

One suitable capacity melt receiving tank shall also be provided.

Suitable size of vibro screens shall be installed in between melter and receiving tank.

Two nos. melt pumps (one standby) each having capacity of 20 m^3/hr at 30 m head driven by AC motor shall be provided.

8.13.9 Automatic Sugar Weighing & Bag Filling Machines

Two (2) nos., electronic load cell type, duplex automatic or Four (4) nos. automatic sugar weighing sugar weighing machines each having capacity of 1000-1200 bags per hour of

50 Kg.and 300 bags for 100 kg. Both shall be installed at the bottom of each sugar bin with magnetic separators.

Suitable central control panel with MIMIC diagram shall be provided.

8.14 Sugar Bag Stitching Machines

Four (4) nos., double head, automatic bag stitching machines capable of stitching 350 / 700 bags of 100/ 50 kgs. per hour with 4 spare heads shall be supplied.

Each bag stitching machines shall have a 400 wide slat conveyor, capable of conveying 350 / 700 bags per hour of 100 kg/ 50 kg bags.

Each conveyor shall be drive by an AC motor through a planetary gearbox.

8.15. Sugar bags Packing Machine:

Two nos. of Sugar packing machine to pack 1 Kg & 5 kg to be provided to cater to the domestic branded sugar market.

The specification of the pacing machine is as follows:-

FORM FILL SEAL MACHINE - WITH FOUR HEAD INTELLIGENT ELECTRONIC WEIGH FILLER

Product	Sugar		
Quantities to be packed	1kg and 5kg (with the help of changed forming parts)		
Packing Material	Option A – Heat Sealable laminate films. Option B – Recyclable PE – PE laminates		
Pack Size Range	Minimum Pack Size – 100 mm W x 160 mm L. Maximum Pack Size - 400 mm W x 160 mm L		
Estimated output/Packing Speed	Quantity 1 Kg 5 Kg	Speed 45 – 50 PPM 20 – 25 PPM	Accuracy 0.5% SD under 2 Sigma 0.2% SD under 2 Sigma
Overall Efficiency	90 %		

TECHNICAL SPECIFICATIONS:-

BAGGING MACHINE:

- Intermittent motion machine with Belt draw arrangement.
- Higher seal time for horizontal sealing leading to better seal integrity
- Belt draw-off system for positive and accurate film pulling
- Motorized paper pulling
- Specially developed machine body for better rigidity
- Quick & Easy size changeover of formers without tools.
- Adjustable stroke of cross sealing jaws for optimum performance.

- Built in Jumbo reel attachment to hold up to 500 mm dia rolls to avoid frequent reel change.
- Less wear& tear of rubber belts with capability.
- PID Temperature controller for constant heat seal jaws.
- Precise loop control through motorized film unwinding.
- Web Tracking System
- Print Mark Scanner
- Static Charge Eliminator

BUILT IN ACCESSORIES

PRINT-MARK SCANNER ASSEMBLY:

Consisting of a print-mark scanner and its control mechanism. Complete with mounting brackets and adjusting wheel.

STATIC CHARGE ELIMINATOR:

Consisting of a high voltage power supply (11 KV) with ring or rod elements depending upon the application required for removal of electro-static charge on the packaging film.

BUILT IN SEALING MECHANISM:

SEALING SYSTEM FOR NON RECYCLABLE LAMINATE FILMS

Horizontal Sealing mechanism:

- Constant seal jaws
- Seal with 8 mm to 50 mm
- Non-Recyclable laminates
- Constant seal jaw mechanism suitable for serrated broad seal of 8~15 mm seal widths proposed for non -recyclable films.
- Easy tear off notch and perforated chain of packs possible for <100g packs.
- Former on FIN setting for Vertical seal to be used for inner layers sealing of the pack.

OPTIONAL SEALING SYSTEM

SEALING SYSTEM SUITABLE FOR RECYCLABLE PE LAMINATE FILMS

- Constant seal jaw with Air cooling system
- Single / Double band seal
- PE – PE laminates
- Auto Logic with easy settings
- Operator friendly system.
- Precision in accuracy
- Auto correction logic to offer repeat assured performance
- Built in Auto tare facility.
- Equipped with 50 sets of recipes/ preliminary programs

Proposal of Remote access for VFFS machines

SYSTEM PROPOSAL:

1. VFFS machine (HMI+PLC) : The Machine PLC programming port will be connected to remote monitoring unit being supplied by us.
2. Buyer to provide internet connection & will be accessed by our Engineer thru
3. remote PC at our end shown in above schematic layout.
4. Through the above set up Nichrome E& C Engineer will be able to get remote
5. access / connected with the machine software program.

BATTERY LIMITS /
BUYERS SCOPE:

Electrical Supply	Stabilized 415 VAC, 3 phase, 50 Hz, 4 wire. The proper earthing to be provided by the buyer. You should arrange supply through suitable electrical panel for the system. The cabling from Electrical panel to system offered by us will be in your scope.
Compressed Air	@30 cubic meter/hour @ 6 Kg/ cm2 thru suitable piping & control valve etc. for per set of integrated primary &secondary packing system.
Pre-dispatch trials	We will need sufficient quantity of product, film rolls for pre-dispatch system trials of the system at our factory. This material should be delivered on our factory address which will be communicated by us.
Printed film rolls	The pouch layout / key line drawing for panel printed film for primary pack will be provided by us and buyer is required to arrange the printed film for pre-dispatch trials as per the layout. This layout will be submitted after confirmation of the pouch width & pouch length by the buyer.
Product Feed	The tapping & feeding of Sugar by gravity at consistent federate from your silo to inlet of our system to be arranged by you.
General System Drawing	We will submit the final general Arrangement drawing showing connection point for the utilities in the scope of buyer for system on receipt of confirmed order.

Dust Collection System- To be provided by the buyer

8.16 Sugar bags handling system

Suitable sugar bags handling system for ultimate capacity shall be provided. This shall include sugar bags overhead belt conveyors with hood system, sugar elevators, stacks and re- claimers system, transfer of sugar bags in the warehouse and to sugar godowns as per layout. All conveyors of Sugar shall be suitable covered.

9.0 TECHNICAL SPECIFICATIONS FOR BOILER AND AUXILIARY SYSTEM.

Boiler –

A new boiler of 120 **T**/**hr**, 67 ata, 490℃(+/-5^0 C) is proposed. Selection of 67 ata pressure with 490℃(+/-5^0 C) boiler is opted due to the fact that this can easily generate 12 MW power along with steam requirement of boiling house in most technical way with optimum technical efficiency. Hence the pressure of 67 ata with 490℃ temp has been selected to make the project viable and profitable. The Boiler shall be complete with Auxiliaries and shall be suitable for burning of Bagasse. The Boiler shall be an outdoor unit, and shall be of natural circulation, balance draft, radiant furnace design, with spreader stoker furnace with travelling grate for continuous ash discharge and will be equipped with two stage super heaters and inter stage de-super heaters etc. The design parameters and specifications for the above Boiler shall be as under:

Continuous Rating	:	120 TPH
Peak Rating	:	132 TPH
Super heater outlet pressure	:	67ata.
Superheater outlet temperature	:	490 $\pm$ (+/-5^0 C)
Feed water inlet temperature	:	180℃
Design fuel	:	Bagasse
Boiler efficiency	:	71% with bagasse with 50% moisture.
Flue gas temperature	:	less than160 deg. C
Excess air % theoretical air not more than:		35 %.
Fuel	:	Bagasse with 47– 52 % moist.
GCV 50% (Kcal/kg)	:	2270
Moisture % cane	:	47% to 52%
Ambient temperature		Max. 50℃
Relative Humidity		70-90%
Seismic Zone & wind velocity		Local condition of western UP (Distt. Muzaffar Nagar).
Emission concentration at ESP outlet		Less than 50 mg/n M^3(As per pollution board

norms)

Standards to be followed	As per Gazatte of India REGD. NO. D.L. 33004/99 dated 27.06.2022

The following are the other technical parameters of boiler.

The boiler shall be designed with 50% moisture bagasse as base fuel to generate a base capacity of 120 TPH, (Peak 132 TPH), with steam outlet parameter of 67 ata of pressure, 490 +/- 5℃ temperature and with feed water inlet temperature of 110℃ heated to 180℃ when the feed water passes through HP heater.

The boiler will have a control range of 60% - 100% MCR load on bagasse. Boiler headers shall be constructed in accordance with IBR specifications with flanged ends to promote cleaning and inspection.

The boiler shall be provided with one steam and one water drum (optional) and the drums shall be of fusion welded type with manhole, doors fitted with crossbars, studs and nuts on each end. The steam drum of the boiler shall be provided with primary separators and secondary separators of S.S. construction to promote circulation and ensure high steam purity. The drum shall be provided with semi-ellipsoidal dish end. The steam drum shall be provided with internals of proven design and the internals shall be of bolted connection. The necessary nozzle connection for the steam outlet, safety valves, feed water inlets, down comers, continuous blow downs, level indicators, chemical dozing, sampling connection, drain and vents shall be provided on the drums. All nozzle connections shall be of welded type.

9.1.1 Furnace

Travelling grate Furnaces driven by VFD through planetary gear box with all accessories shall be provided. The furnace design shall be of seamless tubes, fully water cooled membranes, fin welded walls, or of any other proven design and they shall be adequately supported. The furnace shall be suitable to burn bagasse with 50-52% moisture with pre-heated air. The furnace design shall be to give continuous rating with bagasse firing even when furnace chambers are being cleaned.

The furnace design shall incorporate necessary man holes, peep holes, and openings for fuel distributor etc. The down comers, supply pipes and risers sizing shall be based on circulation calculation. The furnace shall be located at 6.0 meters level above F.F.L. on R.C.C. platform. The furnace shall be so designed that there will be no harm to any part

of the boiler due to the high temperature generated due to firing of low moisture bagasse and the heat generated is to be absorbed effectively by the suitably located boiler water tubes.

Travelling grate/ spreader stoker type furnaces with all accessories shall be provided with combustion chamber.

The combustion air from the FD fan, heated in the air heater to a temperature of not more than 160℃ shall be uniformly distributed under the grate. The hot secondary air for distribution and for meeting the over fire air requirement shall be supplied by the secondary air fan. The grate area shall be designed such that heat loading does not exceed permissible limit.

The furnace shall be located at 6.0 meters level above F.F.L. on R.C.C. Platform. Ash hoppers shall be provided below each furnace and boiler height shall be adjusted such that manually operated trolleys can be placed below the ash hoppers. Steel staging from ground level and M.S. operating platform at 4 m level, checkered plate shall also be provided.

The boiler bank design shall be of single pass inline arrangement and the tube spacing shall enable easy removal of the tube in case of any failure. There shall be adequate approach space to the tubes of the bank for easy maintenance. Baffle material is to be suitable for withstanding the gas temperature. Suitable number of soot blowers shall have to be provided to cover the entire surface of the bank.

9.1.2 Super Heater

The boiler shall be provided with super heater capable of superheating total steam generated by the boiler to a final steam temp of 490+/- 5 deg. C at 60 to 110% MCR and complete with inter-connected pipelines between the boiler and super heater, mountings such as safety valves – 02 Nos. with silencer, drain/air vent valves, pressure gauges etc. as per IBR. The super heated steam is envisaged from a minimum of two stages of super heaters with attemperator in between the stages.

The tube elements of the super heater shall be expanded into the steam drum at one end and butt welded/expanded to the manifold at the other end. The super heater manifold shall be fabricated from solid drawn seamless pipes. The manifold shall be supplied complete with branches for main steam take off safety valve, air release connection etc. A thermo well in the outlet manifold shall be provided to measure the temperature of

superheated steam. The super heater design should be such that the temperature of steam at super heater outlet shall not exceed 525 deg. C in any case.

Super heater system shall be of 2-stage design with inter-stage de-superheating, to achieve the rated final steam temperature.

A spray type attemperator or heat exchanger attemperator in between primary and secondary Bank coils of super heater to be provided to maintain automatically the temperature of the steam at super heater outlet @ 490 $\pm$ 5ºC for steam flow rate between 60 to 110 % MCR. The tube elements of the super heaters shall be constructed from seamless alloy steel. The selection of super heater coils shall be as per IBR Norms to suit for 67 ata pressure and 490 deg.C temperature.

9.1.3 Economizer

An integral economizer with adequate heating surface to give rise in temperature of feed water of not less than 60℃ less than saturated temperature of drum-water. The economizer shall be of bare tube (seamless) construction, in-line arrangement, and counter flow type designed for an inlet temperature of 180℃. Suitable number of soot blowers shall be located in the economizer for effective cleaning of the heat transfer areas. The economizers shall be complete with seamless inlet and outlet headers, with drains, coils, coil supports, soot blower, casing, ducting, provision for measuring inlet & outlet water temperature, supporting structures, inter-connecting piping, lagging, access galleries, stairs etc. The economizer shall be designed in accordance with the requirement of IBR.

9.1.4 Air Heater

Air heater with adequate heating surface to heat the air by flue gas required for combustion shall be provided. Considering the high moisture in the flue gases, suitable precautions shall be taken to prevent the tube corrosion of the inlet side of the air heater. Air heater shall be complete in all respect with ERW tubes, tube plates, supports dampers casing and ducting etc. The entry of cold air shall be distributed properly over the length of air heater to avoid condensation of moisture. Air heater shall be provided with flue gas by pass arrangement with leak proof damper. Air Heater shall be in two stages.

The air heater and economizer shall be designed so as to give final gas temperature within 160ºC. Air heater should give the air temperature of not less than 180º.

9.1.5 Bagasse Feeding Arrangements

Suitable no. of rotary feeders coupled to variable speed drive of positively infinitely variable type for regulating the quantity of bagasse to furnace shall be provided. The bagasse feeders shall have speed variation by ACVFD motors and maximum speed not to exceed 25 RPM.

Suitable bagasse storage bunker (bagasse silo) of minimum five minutes storage capacity for each feeder shall be provided.

The boilers shall have a control range of 60 – 110 % MCR load on bagasse. The bagasse from the sugar mill is to be conveyed at inlet of the feeding system through the conveyor. The bagasse feeding system rotary feeders with VFD inlet chutes, feeders, feed chutes and the distributor etc. shall be provided. The bagasse input to the boiler shall be regulated by the feeding system with suitable isolation gates. Feed chutes shall be designed to prevent choking of bagasse with necessary poking facilities. The distributor shall be of pneumatic type with provision to distribute the fuel uniformly across the furnace. Lead facing of the screw feeder shall be hard faced.

The firing system for the steam generator shall consist of spreader stoker with travelling grate with variable speed hydraulic / VFD drive for continuous ash discharge.

9.1.6 Draft System

The draft system for the steam generator shall be suitable to ensure producing a balanced draft with sub atmospheric pressure conditions in the furnace.

The system to comprise of –

- 2 x 65 % of the total required capacity each, I D fans with LT Motor CACA, IP-55, 750/1000 rpm. A.C motor, speed control from control room by remote and AC Variable Speed Drive and pneumatically/ electrically operated inlet guide vane/damper with necessary base frames, base plate, foundation bolts, supports, cover, couplings, lubrication system etc. Replaceable wear liners or hard facing will be provided for blades. The shaft of the fan shall conform to 45 C8 of IS:1570-1978. Renewable hard faced wear pads on the blades shall be incorporated in the impeller. The Fan rated speed shall not be more than 750 RPM. The impeller of the fan shall be fabricated out of minimum 5 mm thick nickel chrome alloy steel. Impeller design should be curved vane type high efficiency fan. Impeller shaft should be provided with support on both ends. Each fan

shall be provided with dampers at the inlet as well as at the outlet to control the flue gas quantity. The fan construction should be identical so as to have single spare impeller.

The ID fans shall be directly coupled to variable speed electrical drive digital type (variable frequency TEFC, CACA, IP-55, S-1 Duty, Class-V, 750 /1000 rpm. A.C motor, speed control from control room by remote) complete with control equipment, speedometer, operators control cubicle, DCS etc.

- 2 x 65% of the total required capacity each **FD fans** with LT motor CACA, IP-55, 1440 rpm. A.C motor, speed control from control room by remote and AC variable remote control for control room speed drive and pneumatically/ electrically operated inlet guide valve/damper with necessary base frames, base plate, foundation bolts, supports, cover, coupling etc. to supply primary air for combustion through air heater and shall be supplied to the furnace underneath the grate. The blades of fan rotor shall be fabricated out of minimum 5 mm thick mild steel plates. RPM of the FD fan shall be 1440.

  Both the FD fans shall be directly coupled to variable speed electrical drive digital type (variable frequency TEFC A.C motor) complete with control equipment, speedometer, operators control cubicle, DCS etc.

  The rotors of the ID & FD Fans shall be dynamically balanced. Fans are to be interlocked so that FD runs only when ID fan is running.

- 2 x 65% of the total required capacity each **SA fans** with AC variable speed drive CACA, IP-55, 1440 rpm. A.C motor, speed control from control room by remote and with inlet guide vane, with necessary base frames, base plate, foundation bolts, supports, covers, couplings, lubrication system etc. This will supply air into the furnace as a secondary air at high pressure through heat resisting nozzles for ensuring combustion completeness. The secondary air nozzles shall be installed in the furnace walls. From the same fan air shall be supplied to the pneumatic distributors to distribute the Bagasse on to the grate uniformly. The isolating/ controlling damper shall be provided at the fan suction and in the duct at a branching point. The suction of fan shall have provision for cold air as well as hot air from air heater with two separate dampers for hot air and cold air. The deliveries of both fans to be interconnected. Each fan to be coupled to the motor.

Both the SA fans shall be directly coupled to variable speed electrical drive digital type (variable frequency TEFC A.C motor) complete with control equipment, speedometer, operators control cubicle, DCS etc.

All air and flue gas ducting with required stiffeners, expansion joints, guide vanes for bends, dampers, insulation, cladding, supports, etc. The shaft material for the above fans shall be **45 C8** conforming to IS: 1570-1978.

Silencers for FD and SA fans to limit noise level to 90 DBA at 3.0 meter distance is to be provided.

9.1.7 H P Heaters

HP heater is to preheat the feed water from 110° to 180℃ in with inlet / outlet isolation valves, drain valves and fittings, level control valve, drain and vent lines to de-aerator. The HP heaters should be shell and tube type designed to improve the boiler plant efficiency. The heaters will be located downstream of the feed water pumps, with the feed water passing through the tubes of the heater. The feed water entering HP heater at about 110℃ will be heated to 180℃.The steam for heating in HP heater shall be bled from the TG set (bleed during operation of turbine) at 12.8 ata to be used as heating medium on the shell side in HP heater. The condensate of the heating steam in HP heater will be cascaded to the de-aerator. Connection shall also be provided to get 100 % of the required steam in HP heating from newly installed PRDS as an alternate option. A suitable by-pass arrangement shall be provided for by-passing the heater. All the valves for the feed water outlet and the by-pass shall be motor operated. The steam inlet line valve to both HP heaters shall also be DCS controlled motor operated. In case of high condensation in the heater shell, all the valves will close automatically to isolate the heater and ensure that there is no water induction into the turbine. The HP heater condensate level in the HP heater is to be controlled by a level control system. All the operational parts shall be DCS controlled.

9.1.8 Soot Blowers

Adequate soot blowers of retractable type complete with PRS, piping, drain and other accessories are to be provided in sufficient nos. at appropriate location for effective cleaning of super heater coils, bank tubes, economizer coil etc. motorised automatic retractable soot blower for super heater elements each covering half of the furnace width shall be provided. Additional two nos.(minimum) steam operated soot blower(s) shall

also be provided for the Economizer. Soot blowing sequential operation will be realized in DCS by data logging.

9.1.9 Chemical Dosing System

The boilers shall be provided with high pressure and low pressure dosing system. Each dosing system shall comprise of chemical proportioning tanks, two numbers positive displacement pumps with drives, motorized agitators, required interconnection piping, valves, fittings etc. The capacity of each tank shall be 400 litres and the system shall be located near feed water station on the ground floor.

9.1.10 Blow down System

One continuous blow down tank and one intermittent MS blow down tank as per IBR complete with all piping connected to the blow down tank within 10 meters outside the boiler house shall be provided for the boiler. The flash steam from the CBD tank shall be piped to the de-aerator and the outlet of the CBD tank shall be vented to the atmosphere. The design, material selection and manufacturing shall be in compliance to the requirement of the Indian Boiler Regulation Act.

9.1.11 De-aerator Tank

One De-aerator of suitable capacity at 110ºC to de-aerate the feed water to a level of oxygen content of less than 0.005 ppm shall be provided. The de-aerator is to be suitable to obtain a temperature from 85 to 110ºC by using exhaust at 2.5 ata on extraction from turbine or from the suitable PRDs from the boiler (87ata to 2.5 ata to be supplied with boiler). It shall be complete with all the fittings and mountings. The de-aerator water tank shall be of capacity suitable for 30 minutes for 110 % MCR generation capacity of the boiler. The de-aerator tank shall be supplied with platform around the Tank, Cat Ladder from GL and approach from boiler platform. The de aerator tank shall be installed at an appropriate height so as to provide positive head to the feed water pumps suction. Platform around the de -aerator shall be provided and shall have high and low level alarm along with gauge glass and 150 mm dia. dial type thermometer.

The following controls shall be provided with the De-aerator:

- De-aerator level control station consisting of 1 x 100% pneumatically operated control valve and 1 x 100% manual by pass valve including isolation valves for control valve.
- De-aerator pressure control station consisting of 1 x 100% pneumatically operated control valve and 1 x 100% manual by-pass valve including isolation valve for control valve.
- Feed water control station consisting of 1 x 100% motor operated and 1 x 50% pneumatically operated by-pass valve and 1 x 100% pneumatically operated control valve including manual isolation valves.

9.1.12 Boiler Feed Water Tank

One cylindrical closed mild steel tank shall be of 1000 HL capacity with inlet /outlet connection for condensate, treated water, chemical dosing arrangements, outlet connection for transfer pumps, overflow connection, air vent connection etc. High and low water level alarm shall be provided in the feed tank along with gauge glasses and 150 mm dia. size dial type thermometer.

Access ladder and platform around the tank shall be provided in the feed tank along with gauge glasses and also for the boiler working platform to de-aerator, feed water tank etc. is to be provided.

9.1.13 Boiler Feed Water Pumps

1 x 30% boiler capacity electric driven feed pump for start up with soft starter, motor, bed plate, coupling, ARC valve etc. shall be provided for any emergency use especially when TG set is not in operation and power supply is available through diesel set.

3 nos. x 65% boiler capacity boiler feed water pumps along with AC VFD drive soft starters, motors, bed plates, couplings, automatic circulation valves, lubrication system for pump and motor etc. etc. shall be provided. All integral piping and valves, thermal insulation and venting, foundation board, lifting and handling provisions and connecting flanges will be included. The system shall be complete in all respects.

2 nos. x 65% boiler capacity feed water transfer pumps with motors, bed plates, sole plates, couplings, piping, suction strainers, non-return valves for pumping the feed water from the feed water storage tank to the de-aerator shall be provided.

9.1.14 Boiler Feed Water Treatment Plant

A Reverse Osmosis membrane treatment plant with mixed bed resin having 50m^3/hr capacity along with piping etc., be provided. Two nos. treated water storage tanks of each having capacity of 2000 HL shall be procured. Three nos. pumps each of 60 $m.^3$/ hr and head of 75 meter to feed the treatment water from storage tanks to feed water tank. Existing water analysis shall be provided by purchaser.

9.1.15 Chimney

One RCC stack of suitable height as per Govt. rules & regulations for pollution norms are to be constructed with a minimum inside top dia. 3.8 mtrs. The air and flue gas ducting with required stiffener, expansion joints, guide vanes wherever required, dampers, insulations, cladding, over fire air nozzles and ducting supports etc. is to be provided.
Height of the boiler chimney should not be less than 70 meters and should be constructed so as to also comply with Central, State and Local Regulations. The Boiler refractory, insulation, inner and outer casing with all fixing material for boiler, ducting, piping, valves, fittings, the equipment etc., proper ladder with lightning arrester, Aviation Warning Lamps, etc. with suitable connection at the bottom shall be provided. Platform is to be provided with suitable size nipples and approach for stack monitoring as per norms of the pollution board.

9.1.16 Ash Handling Equipment

Ash from the furnace shall be handled by water impounded submerged belt conveyor and fed on to the main belt conveyor with cooling spray arrangement with water.

Submerged Front ash handling system:

- Submerged belt conveyor along with drive motor for discharging coarse ash from the front of the boiler up to elevation of +2.0m height located at one side of the furnace. (Further disposal of ash by client through trucks).
- Manual handling system below riddling hopper (The collection of ash is very minimum).

Dense Phase Fly Ash Handling system:

- Dense phase fly ash handling system for Economizer/Air Heater & ESP fly ash hoppers comprising of Carbon steel surge hoppers with bypass chute and manually operated isolation plate gate.

One no MS Silo. (having 8 hour storage capacity)

9.1.17 Instrumentation and Control System

The instrument control panel to be totally enclosed in a cubicle for dust free conditions by providing an exhaust fan on the panel. The control panel shall be properly wired, tubed

and connected to all field transmitters as per standard instrumentation practices. It is to be housed in A.C. room suitably sized, designed and constructed by seller.

A) The following instrumentation system are to be provided for measuring the various parameters.

i. Steam flow meter of integrating, indicating and recording (in data logger type)

ii. Feed water level indicating, integrating and recording (in data logger type).

iii. Drum water level indicating and recording (in data logger type).

iv. Super heater Pressure indicating and recording (in data logger type)

v. Multipoint temperature scanner interface with 'K/J' type thermocouple and universal temperature transmitters with linear output for each of the following points.

All these points to be connected to data logger for recording -

- Super heated steam temperature at final super heater outlet and primary super heater outlet.
- Feed water temperature at economizer inlet.
- Feed water temperature at economizer outlet.
- Feed water temperature at de-aerator at boiler outlet
- Flue gas temperature at economizer outlet.
- Flue gas temperature at air heater inlet.
- Flue gas temperature at air heater outlet.
- Flue gas temperature at I.D fan inlet.
- Air temperature at air heater inlet.
- Air temperature at air heater outlet.
- Furnace temperature.

vi) Draft gauges for---

F.D fan discharge.

I.D. fan suction.

Furnace.

Flue gas at boiler outlet.

Flue gas at economizer outlet.

Flue gas at air heater outlet.

Flue gas at fly ash arrestor outlet.

Air at air heater outlet.

vii) O_2analyzer with signal connection to data logger.

viii) Pressure gauges of size 250 mm diameter with S.S. siphon and isolation valve to be provided at boiler drum, super heater outlet steam and at fire door level for super heater outlet steam.

ix) Pressure gauges with S.S. siphon and isolation valve to be provided at economizer inlet, economizer outlet, at each feed water pump outlet and feed water pumps common header.

x) Microprocessor based minimum 24 channel data logger programmable to any type of inputs like current, mv, T/C and digital for recording the following parameters with 80 column dot matrix printer and relay output for 8 channels for annunciation.

a. Steam flow
b. Feed water flow
c. Super heater steam temperature at primary super heater outlet
d. Super heater steam temperature at secondary super heater outlet.
e. Super heater steam pressure at secondary (final) super heater outlet.
f. Drum level
g. De-aerator level
h. De-aerator pressure.
i. Furnace pressure
j. Air flow
k. Feed water temperature at economizer inlet
l. Feed water temperature at economizer outlet.
m. Fed water temperature at de-aerator inlet.
n. Flue gas temperature at boiler outlet.
o. Flue gas temperature at economizer outlet.
p. Flue gas temperature at aerator outlet.
q. Flue gas temperature at I.D. fan inlet.
r. Air temperature at air heater inlet.
s. Air temperature at air heater outlet.
t. For Furnace temperature.
u. Oxygen Analyzer

B) Microprocessor based Annunciation with electronic Hooter to be provided for the following.

a) Feed water tank level low.

b) De-aerator tank level low

c) De-aerator tank level high.

d) Drum water level low.

e) Drum water level high.

f) Super heater steam temperature high.

g) I.D. fan trip

h) F.D. fan trip

i) S.A. fan trip

j) Feed water pump trip

k) Bagasse feeder trip

l) Feed water transfer pump trip

C) The following auto controllers are to be provided with the boiler.

a) **Three element drum level control system:** Drum level shall be automatically controlled using the three element control philosophy to ensure quick response of the system. In case of drum level falls below minimum level, the feed water control valve will open fully. In case drum level rises above maximum level, the feed water control valve will close fully.

b) **De-aerator pressure and level control system:** De-aerator pressure shall be maintained by regulating the steam flow to the de-aerator so that temperature of boiler feed water is maintained at the desired set value. De-aerator level shall be controlled so as to balance the inflow and out- flow of feed water.

c) Cascaded super heater steam temperature control system based on measuring temperature at outlet of primary super heater header and final super heater header.

d)**Combustion control system:** This will be an integrated control loop for maintaining the steam pressure. According to the steam pressure the master controller will adjust speed of VFD to feed more or less fuel to the boiler and FD fan to control amount of primary air sent to the furnace respectively. To ensure that this adjustment is correct, the signal of O2 % in flue gases will be taken in the loop to make the final correction in the speed of FD fan.

e) **Furnace pressure control system:** ID fan speed shall be controlled to maintain draft inside the furnace to – 5mm WC.

D) Two air compressors (one as standby) shall be provided to supply oil and moisture free air through refrigeration dryer system, for pneumatically controlled instruments. Spare air filtering and drying system shall also be provided along with standby compressor set.

All the above mentioned indication, monitoring and control systems to be based on distributed control system (DCS). All control monitoring and interlock function will be provided for smooth functioning of the boilers. Comprehensive instrumentation and control equipment shall be provided for each system of the plant. The controls will be located in the central control room. Instrumentation will broadly cover the following functions:

- Local indication by gauges
- Remote indications through transmitters
- Interlocks for safety of personnel / equipment
- Closed loop control system using single loop controller/DCS
- Status indicators
- Alarm annunciation

Controls and interlocking will be through microprocessor based hardware. Actuation will be done generally through pneumatic actuators. Speed regulation of Turbine operation will be through Electro hydraulic systems.

The DCS shall be provided keeping in view the safety, reliability and availability for comprehensive presentation of plant operation status, trends and essential operation interacting facility.

Transmitters for the measurement and control will be of electronic type using solid state hardware. Field signal transmission will be 4-20 mA, two wire systems suitable for long distance transmission and compatibility with computer interface and ease conversion into voltage signals using simple resistor.

The control system will be designed to facilitate manual operation of the plant from the control panel. Necessary hardware indicators and recorders will be provided on the control panel located in the control room.

Closed loop control system will be provided for Boiler and TG and their auxiliaries with processor and sensor level redundancy.

All control valves and damper operations will be of pneumatic type with fast response and have ease of maintenance.

Apart from Basic instrumentation and automation, Turbine will be provided with (a) turbine speed control system, (b) Suitable vibration monitoring system and (c) condenser hot well level control system. Steam and water analysis comprising of the conductivity, silica, oxygen analyzer with complete calibration kit is to be provided.

9.1.18 COMPUTERIZED BOILER AUTOMATION: -

All the above mentioned indication, monitoring and control systems to be based on distributed control system (DCS). All control monitoring and interlock function will be provided for smooth functioning of the boilers. Comprehensive instrumentation and control equipment shall be provided for each system of the plant. The controls will be located in the central control room. Instrumentation will broadly cover the following functions:

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Transmission and compatibility with computer interface and ease conversion into voltage signals using simple resistor.

The control system will be designed to facilitate manual operation of the plant from the control panel. Necessary hardware indicators and recorders will be provided on the control panel located in the control room.

Closed loop control system will be provided for Boiler and TG and their auxiliaries with processor and sensor level redundancy.

All control valves and damper operations will be of pneumatic type with fast response and have ease of maintenance.

Apart from Basic instrumentation and automation, Turbine will be provided with (a) turbine speed control system, (b) Suitable vibration monitoring system and (c) condenser hot well level control system. Steam and water analysis comprising of the conductivity, silica, oxygen analyzer with complete calibration kit is to be provided.

9.1.19 Air Compressors

Two air compressors (one as stand by) with receivers are to be provided to supply oil and moisture free air through dryer for controlled instruments. These shall be complete in all respects such as dryer, piping, valves etc. The air pressure at the outlet of the dryers shall be 7-8 kg/cm^{2}g. The service air shall be tapped from the receiver directly by-passing the dryers. Proper arrangements are to be made for auto start of the standby compressor in case of shutdown of the running compressor.

9.1.20 Bagasse Storage And Handling System

Bagasse generated by the sugar mill to be collected in the storage yard. The belt conveyor to feed the bagasse to the boiler silos. The operation of the entire conveyor system shall be controlled from the control room. The conveyors whichis feeding bagasse to boiler silos will get the bagasse from mills conveyors and these conveyors to be located above the ground level.

The stored bagasse to be fed through the belt conveyor to the bagasse feeding station of the boiler and during shut down of mills, bagasse will be handled through a front end loader and dozer and a suitably designed conveyor system.

9.2 Steam Piping System

Boiler integral piping consisting of all interconnecting piping between the economizer inlet stop valve and the super heater outlet header etc. shall be provided. The piping shall be properly supported and provided with necessary tapping for instruments for measurement. Necessary supporting

materials, towers, etc. to support the piping shall be supplied. The correct location of hangers and supports shall be considered for the flexibility analysis. Suitable expansion loops, restraints and anchors shall be provided to limit the stresses within the allowable values.
The material for the piping and fitting shall be properly selected for various services in the boiler integral piping. All integral piping shall be provided with valves, fittings, drains and vents, safety valves, exhaust piping, start-up vent with silencer, blow down system etc. Proper sampling facility shall be provided for feed water, super heated steam and blow down water. The system for sampling shall be complete in all respects for monitoring the satisfactory performance of the boiler.

The outlet steam from the boiler to be conveyed through carbon steel main steam piping with necessary valves and gauges etc. to the turbo generator.

Adequate stop valves, non-return valves, drain valves, traps etc. shall be suitably placed in the piping and header. The piping shall be with necessary supports, hangers, etc. Steam flow meter shall be provided to measure the flow of steam from the Boiler.

- 1 No PRDS (from Main steam line) for Process steam requirement of 65 TPH at PRDS outlet
- 1 no PRDS for De-aerator steam requirement

Drain vent and other piping –

- Safety valve exhausts/ vents piping up to a safe elevation of 1m above roof.
- Boiler blow down piping up to blow down tank.
- Drain piping from individual drains to drain header and from drain header to blow down tank.
- Piping from blow down tank to nearest drain trench.
- Raw water quenching line to blow down tank from terminal point.
- HP heater drain& vent piping to de-aerator.
- HP heater emergency drain piping to nearest drain trench.
- HP and LP dosing system piping from dosing skid to steam drum and feed pump suction respectively.
- Target plates and temporary piping as required for steam blowing.
- Cooling water piping from one point near boiler first row column to sample coolers.
- Overflow piping from de-aerator to DM Water storage tank (Max. 75 Mtrs. Considered)
  Instrument air piping from terminal point to all equipment within boiler island requiring instrument.

9.3 Electricals

The boiler to be supplied with complete electrical accessories such as electric motors, starters, switches, MCC, earthing & cables etc. The supply to include the supply of power from 11 KV / 440 Volts to cogeneration auxiliaries and of sugar plant and running of the boiler. All power & control cables required for equipment are also included. The distribution transformers of suitable rating with switchgear and protection relay panel for the supply to the boiler auxiliaries and sugar plant shall be included in scope of supply

All motors shall be with IP 55 / IP 56 enclosures as applicable depending on area of installation and suitable for equipment/area as specified and supplied as a complete unit.

The terminal box of motor shall be complete with cable glands, lugs, complete with earthing material, starter, push button, MCC, all cabling, cabling trays etc.

In brief, the scope of supply to include Boiler furnace, Travelling Grate with Mechanical Drive Super heater, water walls, boiler bank, economizer, air pre heater etc.

The boiler shall also include:

- Forced draft fans, induced draft fans, secondary air fan etc. with drive
- Air and flue gas ducting, dampers, supports, expansion joints etc.
- Electrostatic precipitators with all electrical, hoppers, electrodes, structural, points etc.
- Feed water transfer pumps – 3 Nos. of 65% capacity each with drive and accessories
- Feed water pumps – 3 Nos. of 65% capacity with variable speed AC VVFD drive suitable for working pressure of 87ata. The pumps' working pressure shall be designed after controlling pressure drop at various stages.
- One small pump of 30% boiler capacity with variable speed AC VVFD LT motor drive for initial start up / for emergency use.
- Refractory and insulation as required for the boiler and auxiliaries
- Soot blowers for super heater, boiler bank tubes and economizer region.
- Boiler ash hoppers with supports
- Complete integral piping with supports
- Boiler supports, platforms, hand rails
- Main Steam header at various outlets and gate valves

- DCS for boiler control including Control Panel
- Field instruments, local gauges, transmitters, etc.
- Flow nozzles for feed water, spray water and main steam flow measurements.
- 1 No. de-aerator for condensate / feed water including supports, nozzles, controls, valves and fittings
- Foundation materials for Boilers and auxiliaries
- Fuel feeders for Bagasse with variable speed drives, chutes, supports and distributors for fuel (Bagasse) feeding into the furnace including silos for Bagasse storage above the distributors.
- Boiler external piping like feed water from feed pumps to economizer and from de-aerator to feed pumps, HP, LP dosing system along with valves and fittings, feed water piping inlet to de-aerator, cooling water and compressed air piping, and feed water transfer piping from transfer pump to de-aerator.
- Sample coolers and HP/LP dosing system
- Boiler drains, vents, CBD/IBD tanks
- MCC/PCC and power and control cables for boiler equipments' drives and control panels including the LT supply Transformer with switch gear with necessary protection relays, cables etc. The interconnection with power supply is included for the P.C.C.
- Variable frequency drives for FD Fan motors, ID fan motors, SA fan motors, fuel feeders and boiler feed pumps with drive motors
- Power capacitors for boiler MCC to maintain p.f. 0.90.
- Location push button stations
- Equipment earthing complete in all respects.
- Lubricants, first fill oils, special tools comprising of tube expanders, man drills, ratchets, grease guns, set of spanners, torque wrench for level gauges etc.
- Commissioning spares for 2 years

9.4 General

Supporting structure, steel work, platform, ladders, galleries, staircases with fabricated floor grating including complete roofs, side cladding above the drum operating floor level, along with cladding structure for protection against rain and other weather conditions is to

be provided. Proper support/ strengthening is to be provided to De-aerator and de-aerated water storage tank.

Boiler supporting steel work of welded construction from rolled steel section starting from finished floor level, foundation bolts and firing floor of MS construction.

All pipes / equipments mounted local gauges as required. All pressure test points with root isolating points, temperature test points complete with thermo wells and screw plugs, all flow primary elements including two pairs of root valves. Interconnecting cabling, cabling complete with cable trays and other accessories as required.

The boiler shall be manufactured in accordance with the requirements of Indian Boiler Rules and Regulations.

The boiler shall be provided with a steel supporting structure from rolled steel sections and designed with adequate strength for the loads imposed by the boiler and associated equipments.

The boiler shall be complete with necessary tubes, manifolds, integral pipe works, mountings and fittings with valves, gauges, high and low water alarm, maintenance tools consisting of expander, mandrells, ratchets two grease guns and a set of spanners, water gauges, chemical injection valves etc. The integral pipe work shall consists of blow-off bends, high and low pressure drains, water gauge piping, water and steam connections to the feed water regulator, piping from feed control valve to economiser inlet manifold, feed piping from economiser outlet manifold to the boiler steam drum, pressure gauge piping soot blower steam supply pipe works, safety valves escape pipe work etc. The boiler shall be provided with a three element type automatic feed water regulator of the electric/pneumatic controller type, which shall respond to momentary fluctuations in steam demand up to $\pm$ 5% of the rated MCR of the boiler. One hand operated control valve of cast steel (located such that its operator can see water level in gauge glass) capable of passing the required amount of water shall also be provided. The boiler shall have two water gauge glasses at the top drum independently connected.

Necessary mild steel ducting of 5 mm thick plate in case of air duct and 6 mm thick in case of gas duct with stiffeners shall be provided for the boiler, comprising of cold air ducting extending between the forced draft fan discharge and air inlet of air heater,

hot air ducting from the air heater outlet to the furnace , flue gas ducting from fly ash arrestor to the chimney. All ducts of mild steel and above the ground.

Necessary regulating and isolating dampers at suitable points shall be provided for the efficient operation and maintenance of boiler. All dampers will have an effective area not less than the specified for the ducts they control.

Suitable galleries and ladders with grating or open steel flooring for affording access to the essential levels of the boiler plant complete with hand railings, curb angles and supports shall be provided.

All supporting steel work, hangers, thrust brackets and castings for the furnace shall be provided for boiler. All refractory tiles and bricks, adequate quantity of high grade refractory cement, special shaped refractory tiles castable refractory bricks for furnace and high temperature zones shall be as per IS-8 quality. All necessary high grade insulating materials for the exposed portion of the boiler, steam and water drums, integral pipe work from the feed pumps to the boiler, steam piping, gas and hot air ducting shall also be supplied. Reinforcement with wire mesh and super coated with a hard setting material so as to protect the high grade lagging materials against damage shall also be provided.

9.5 Performance Parameters of Boiler:-

Steam pressure at super heater outlet (ata) : 67
S.H. steam temp.at super heater outlet (℃) : 490 (+/-) 5
Max. Continuous Rating (T/hr) : 120.0
Peak load at 110% of MCR for bagasse (T/hr) : 132.0
Boiler efficiency % (bagasse firing), Moisture (50 – 51%) : 71.0(calculated as per ASME PTC 4.0 Indirect Heat Loss method

9.6 Provision for future expansion from proposed 4900 TCD to 7500 TCD

Proposed 4900 TCD plant shall have provision for further expansion from 4900TCD to 7500 TCD. To meet the additional requirement of steam for 7500 TCD cane crushing capacity space shall be provided in the layout to install an additional boiler of suitable

capacity. Bagasse handling system shall be changed as per the requirement of additional boiler. A separate DPR shall be prepared for 7500 TCD cane crushing capacity in future.

10.0 TECHNICAL SPECIFICATIONS FOR POWER GENERATION, DISTRIBUTION & TRANSMISSION

10.1 Turbine Specifications –

It is proposed to install a new TG set of 12 MW. The new TG set to operate at a boiler steam pressure of 67 ata and temperature of 490 ± 5℃. The Turbine shall be multi stage impulse reaction, bleed cum back pressure type.

The turbine will be designed for the operation with inlet steam parameters of 62 ata and 480℃. The turbine will be designed to provide an back pressure steam at 2.5 ata up to 111.02 T/hr and bleed of 14.62 TPH (max.) at 12.8 Ata. for HP heater and ejector. Guarantee Turbine operating parameters such as inlet/ bleed/ extraction/ exhaust/ process steam parameters shall be as per HMBD. The uncontrolled extraction is considered for steam flow to HP heater. Back pressure steam to meet the requirement of sugar manufacturing process and de-aerator requirement

Turbine should have hydraulically operated servo motor control valves to minimise manual operation and quick re-alignment to varying load and input operating conditions to improve efficiency even at part load. The turbine shall have minimum six stages.
The following shall be the technical requirement for the new bleed cum back pressure turbine.

S.No	Description	Capacity
1.	Turbine Type.	Bleed cum back pressure.
2.	Boiler Steam parameters Pressure ata Temperature (℃)	67.00 490 ± 5℃
	Steam flow normal at Turbine stop valve (Season only)	111.02 TPH
3.	Steam pressure at turbine stop valve (ata)	62.0
	Steam temperature at turbine stop valve ℃	485 ± 5
4.	Extraction steam requirement	Season only
5	Bleed Pressure (ata)	12.8
	Temperature	Max. 259℃
	Flow TPH (Season Only))	14.62
6	Back Pressure	2.5
	Temperature deg. C	128
	Flow TPH (Season Only)	96.39

7.	Cooling water inlet temperature	30(℃)
8.	The economical steam rate required at percentage load (%)	20-100
9.	Power factor (lagging)	0.8
10.	Generation Voltage (KV)	11± 10%
11.	Ambient temperature for electrical equipment design (℃)	40
12.	Parallel Operation with grid	UPVNL Ltd.
13.	Grid Voltage (KV)	132
14.	Duty requirements	Continuous
15.	Atmospheric conditions (as prevalent in a sugar plant)	Dusty
16.	The maximum noise pressure level at 1.0 m distance for any equipment from the equipment surface shall be equal to or less than (db)	85
17.	System Frequency (Hz)	50 ± 5%

The turbine shall be designed for the operation in season operation performance at rated capacity shall be guaranteed.

The turbine shall be designed that it suffers no damage if exhaust pressure occasionally goes down to atmospheric pressure and/ or live steam temperature goes up to 505℃ and pressure 90ata. Turbine should have hydraulically operated servo motor control valves to minimise manual operation and quick re-alignment to varying load and input operating conditions to improve efficiency even at part load. The turbine shall have minimum ten stages.

The turbine shall be bleed cum back type. The bleed will be uncontrolled at 12.8ata pressure. The back pressure shall be at 2.5 ata which will meet the low pressure steam requirement of the sugar plant and de-aerating steam requirement of the power plant. The steam pressure and temperature required at the battery limit shall be 2.5 ata and 130℃. De-super heater required to reduce steam temperature of the extraction steam to 125℃ shall also be provided (if required). The bleed at 12.8atapressure from the turbine shall be utilized in HP heater for heating of the feed water from 110 to 180 deg. C. and back pressure steam at 2.5 ata pressure shall be utilised for de-aerator to heat the feed water from 98 to 110 deg. C and to fulfil the requirement of process. The turbine should

be capable to develop 12 MW power, even when steam pressure at inlet stop valve reduces to 60 ata & temperature to 470℃ with over load valves open.

The turbine shall be designed to bleed up to 15 TPH steam at 12.8/8 ata from turbine which will be utilised for HP heater and process. Total steam extraction of 96.39 TPH at back pressure 2.5 ata shall be there for process and de-aerator. The required de-super heaters to bring steam temperature of back pressure down to the required level of 125 deg C will be provided. It shall be designed for the total capacity of steam required for process from extraction of the turbine at 2.5 ata.

The turbine shall have solidly forged machine rotor with integral disks. The bladding shall be designed to resist all vibrations, thermal shocks and other loading that shall be experienced during service and system disturbances. The turbine shall be horizontal rotor, double pedestal, multistage, nozzle governed type and should have hydraulically operated servomotor control valves to minimize manual operation. It should respond to frequent variations in load and input operating conditions and ensure efficiency even at part load. The overall specific steam consumption at operative conditions shall not be more than 5.67 TPH/MWH during season.

All piping and components of soft seal system shall be sized for 150% of the calculated new clearance leakages.

The turbine shall be provided with liberally rated hydro dynamic thrust bearings (double pedestal). A pressure lubrication and control oil system shall be furnished for the turbo generator unit to supply oil at the required pressure to the steam turbine, gear box, generator and governing system.

The turbine shall be provided with remote access device and diagnosistic system.

10.2 Lubrication System –

The oil system shall include the following:

1 x 100% capacity, main oil pump driven by the turbine shaft / low speed gear shaft

2 x 100% capacity (one operating and other standby), AC motor driven auxiliary oil pump of centrifugal type arranged to cut in automatically if the oil pressure falls to pre-set value. This pump shall also meet the requirement of oil during the start-up and shut-down.

1 x 30% DC motor driven EOP.

Emergency gravity lube oil system comprising of hand operated oil pump, overhead tank with SS lining and complete inter-connecting SS oil piping.

2 x 100% capacity (1 working and 1 stand-by) water cooled oil coolers. The oil coolers shall be water cooled with a duplex arrangement and change-over valves to ease in maintenance. The coolers shall be of shell and tube type with SS 304; 2 x 100% duty oil filters arranged in such a way that it is possible to clean one oil filter while the other oil filter is in operation. Suitable full flow twin oil filters shall be used for the lube oil, downstream of the coolers and shall be piped in parallel arrangement with transfer valves. Differential pressure gauge with alarm shall be provided across the filters. The filters and the coolers shall be arranged with continuous flow transfer valves.

Oil storage and settling tank with adequate reservoir capacity, duplicate strainers, level indicators with float features and alarm contacts vent and oil mist eliminators The reservoir made of carbon steel conforming to IS-2062 and interior rust proof, necessary piping, connection, valves, fitting, level switches and level gauges shall be provided for the cooling system and the oil system.

Flow and temperature indication for oils for alternator bearings shall be provided.

A centrifugal type oil purifier shall be provided for the removal of water sediment and other oxidation products. The purifier shall be a separate complete package mounted on a skid, complete with drive motors, piping, valves and fittings. Its operations shall be independent of the oil system and feed to the purifier shall be from drain end of the reservoir.

One no. online dehumidifier shall be provided for moisture removal.

10.3 Reduction Gear Box

The turbine shall be coupled to a suitable double helical type enclosed reduction gear box of hardened and ground gears and pinions designed to transmit 12000 KW continuously at turbine rated speed and ambient temperature of 45 C with a service factor not less than **1.5.** The gear box shall be coupled to the alternator through suitable design flexible coupling capable of transmitting 12000 KW continuously. The gear box shall be designed as per relevant DIN/IS/BS/AGMA standards. Necessary cooling and lubrication arrangements for the gear box shall be provided. Gear box shall be mounted on foundation with a sole base plate.

The turbine shall be provided with barring gear driven by AC motors to rotate the turbine and generator after shut down to prevent thermal distortion of the rotor. The barring gear shall be capable of starting the rotor from rest and run it continuously at low speed. The barring gear shall be interlocked with the lubrication system to prevent its operation without lubrication.

10.4 Service and Potable Water System

To meet the service water requirement of the power plant, the sugar plant facility could be extended. Similarly for the potable water requirement of the power plant, the existing facility of the sugar plant is to be extended. RO plant of adequate capacity to be installed for treating the raw water to suite feed water quality (if required).

10.5 Live Steam, Medium Pressure and Low Pressure Steam System

The outlet steam from the boiler shall be conveyed through carbon steel main steam piping to a common steam header and from the header to the turbo generator. Adequate number of stop valves, non-return valves & isolating valves shall be suitably placed in the piping arrangement. The piping arrangement shall be complete with necessary hangers, supports etc. Steam flow meters to be provided, to measure the boiler steam flow.

10.6 Turbine Control systems

The turbine control shall be through centrally located distributed control system. The control system shall be provided with redundancy for key function by use of separate sensors & monitors.

Turbine monitoring board shall have the following:-

- Inlet steam and exhaust steam pressure& temperature gauge
- Uncontrolled extraction steam pressure & temperature gaug
- Controlled extraction steam pressure & temperature gauge.
- Lube oil pressure gauge
- Control oil pressure gauge
- Steam turbine/generator speed indicators

- Push button stop for steam turbine & generator
- Run light
- Push button for emergency shut off.

10.7 Turbine Supervisory systems

The system shall observe all critical parameters of the turbine continuously with following provisions:-

- Monitoring of winding & bearing temperature, vibrations continuously.
- Audio/visual alarm & trip signals
- Set point adjustable separately for winding & bearing
- Immense to noise signals, radiations, electromagnetic interference.
- Ultra sensitive& accurate sensors.
- Built safety fuse &fail safe logic
- Change over relay contract outputs to activate buzzer or trip theturbine/motor.

The specifications of the system components shall be as specified below:-

(1) Sensor	: PT100/Thermocouple & vibration.
(2) Accuracy	: ±0.25% of FS
(3) Display	: 3½ digits,7 segments for temperature & vibration.
(4) Scan Time	: 3 to 30 seconds adjustable.
(5) Auto/Manual selection	: Front panel switch
(6) Set points	: Adjustable with front trim-pots.
(7) Power supply	: 230/110 VAC;50 Hz.

Special maintenance tools for the turbine shall be supplied along with the turbine. The turbine shall be completed with a set of foundation bolts and levelling pads, isolating valve at steam inlet, isolating valve at extraction, extraction non-return valve, exhaust isolation valve, exhaust non-return valve and exhaust flow relief valve. Complete in all respect including valves, fittings, supports etc.

All piping required for effectively connecting the turbine with the sub-system within the battery limit shall be provided.

10.8 Generator

The alternator shall be complete with brushless exciter, base frame, couplings, water cooled radiator with inter connecting cables, etc. The alternator shall be provided with two pedestals (one at each end). The alternator shall be suitable for taking thyrister load (DC mode) of up to 40% of its rated full load. The efficiency of generator shall not be less than 96% at full load.

10.8.2 11 KV Vacuum circuit breaker incoming panel

VCB panel shall be single front draw-out execution floor mounting free standing suitable for 11 KV, ± 10% variation, 50 Hz frequency ± 5% variation, 3 phases 3 wire type supply system suitable for fault level 25 KA for 3 seconds. Panel earthing should be through NGR, suitable for 50º ambient temperature and relative humidity of 95%. Panel shall be indoor type. VCB shall be electrically operated type with spring charging voltage 240 V AC and closing and tripping coils suitable for 110 V DC. Panel bus bar shall be of electric grade aluminum EC – 91 E suitable for fault level 25 KA for 3 seconds. Panel shall have all necessary CTS, PTS, indicating lamps and other required equipments suitable for grid paralleling and operation of sugar factory. The breaker shall have suitable no. of auxiliary contacts for electrical interlocking with auxiliary power supply breaker etc.
Earthing Transformer considered for 11KV VCB panel Virtual Neutral .
Panel shall have interior illuminating lamp, space heater with thermostat suitable for 220 V AC, contactor for anti-pumping, trip circuit supervision relay, spring charging handle. Earthing trolley shall be provided to short incomer of breaker when breaker is taken out for maintenance. Panel shall be suitable for bottom cable/bus duct entry. Panel shall be suitable for extension on both sides to connect distribution panel.
Suitable mechanical inter-locking with castle lock shall be provided for interlocking of the main breaker with emergency power supply breaker of grid / DG set supply and Bus Coupler can be switched 'ON' only when one supply breaker is ON ; in addition to electrical interlocking. The scheme for interlocking shall be approved by purchaser.

10.8.3 Metering-cum-Synchronizing Panel

Panel shall be metal enclosed free standing floor mounting type shall be dust moisture and vermin proof simplex type with IP 52 degree of protection. Panel shall have all necessary metering, indication in annunciation, synchronizing equipments.

10.8.4. Annunciation

Minimum following annunciation shall be provided:

Under voltage relay operated, Over voltage relay operated, Reverse active power relay operated, Reverse reactive power relay operated, IDMT over current relay operated, Earth fault relay operated, Generator lock out relay operated, Turbine lock out relay operated, Loss of excitation relay with under voltage relay operated, Loss of excitation relay without under voltage relay operated, Negative phase sequence relay alarm, Negative phase sequence relay operated, Under frequency relay operated, Very under frequency relay operated, Over frequency relay operated, Df/Dt operated, Relay panel DC fail, Instantaneous over current relay operated, Metering and AVR PT fuse fail, Protection PT fuse fail, Excitation PT fuse fail, Winding temp. high, Over load relay operated, Generator bearing temp. high, Emergency trip push button operated, First rotor earth fault, Second rotor earth fault trip.

Annunciator shall have RS-485 communication port to communicate through Modbus communicate protocol. Panel shall have 16 channels temperature scanner suitable for PT 100 RTDS for generator winding and bearing, cold and hot air temperature.

Scanner shall have RS-485 communication port to communicate through Modbus communicate protocol.

Codes and Standards: Panel shall generally comply with relevant Indian Standard Specification and relevant codes and practices.

10.9 AVR & Excitation Panel

Field excitation system shall be fitted with suitable switching device with brushless generator for field excitation system such that field current is automatically cut off from circuit in the event of turbine/generator trip. Excitation system panel shall have DC ammeter, DC V meter, shunt field regulator for manual operation of excitor with auto/manual selector switch, suitable transformer indication lamps, fuses and field discharge resistance with necessary isolation facilities shall be provided.

There shall be 2 no. AVR panels (one operating and one standby) with auto/manual selector switch with independent primary and secondary modes complete with all accessories, over voltage relay, suitable volt meter and fine voltage adjustment device, automatic power factor regulation facility suitable for gird paralleling.

AVR shall have motorised auto potential meter, facility for enabling remote raise/lower of voltage, AVR priming, short circuit maintenance features, compounding features, auto PF controlling features, follow-up features, diode failure detector for exciter rotating diodes, over and under excitation limiter. Panel shall have following meter, alternator volt meter, exciter volt meter, exciter ammeter, null meter and power factor meter etc. Both independent AVRs and Excitation panel shall be suitable for paralleling with grid as well as with other TG sets.

10.10 Protection relay panel

Protection relay panel shall be same in construction and other features for metering panel. Relay panel shall have minimum following protective relays:
Under voltage relay, over voltage relay with timer, reverse active power relay, reverse reactive power relay, voltage control 3 element type over current relay, earth fault relay, differential relay, generator lockout relay, turbine lockout relay, loss of excitation relay, auxiliary relay for loss of excitation relay, under voltage relay, negative phase sequence relay, four stage frequency relay with one df/dt, DC supply supervision relay, instantaneous over current relay, master tripping relay with timers, voltage balance relays for metering and protection PTS, instantaneous over voltage relay for excitation PT fuse fail sensing, overload relay, first rotor earth fault, second rotor earth fault relay, voltage surge relay, trip coil supervision relay, unit lockout relay.

Relay panel shall have necessary meters, switches, potentio meters etc. Differential relay shall be supplied with 3 nos. stablising registers and 3 nos. metrosil surge diverters.

Relay shall be preferably electro mechanical type or solid state electronic type numeric relays also can be considered. The relays shall conform to IS-3231 specification.
Necessary protection arrangement shall be provided so that any variation in the grid does not effect the working of power generation.

10.11 NGR with control panel

NGR shall be suitable for 11 KV, 3 phase, 50 Hz supply system with fault level of 25 KA for 3 seconds. Panel shall be metal enclosed free standing floor mounting type and shall be dust moisture and vermin proof. Neutral grounding equipment shall be completely assembled, wired and connected to neutral bus tap through seal off bushings.

Resistor unit mounted on the grid rods shall be fixed and assembled in tires and fitted into sheet steel enclosure. Resistor shall be able to carry specified current for the period of time as specified with temperature rise not exceeding 375ºCover maximum ambient temperature. The resistor shall also be able to carry at least 10% of its rated current continuously.

An Isolator shall be provided on incoming side to isolate the resister from the main equipment. Isolator shall be provided on front of the panel. Isolating switch shall be single pole, knife type having rating of 125 times the rated current of resister. Switch shall have adequate sets of potential free auxiliary contacts for remote indication/alarm/trip signals. An external handle suitably insulated and lockable both in ON & OFF positions shall be provided for isolating switch.

NGR panel shall have all necessary metering protections and indications and ammeter for earth leakage current.

10.12 LAPT panel (Lightning Arrestor and Surge Protection)

LAPT panel shall be complete and shall house 11 KV search capacitors and class III discharge gapless lightning arrestors in sheet steel cubicles.

LAPT panel shall have all necessary metering CTS, PTS and meters for protection metering and AVR sensing. Panel shall be suitable to connect 11 KV HT cable from at the top of the panel for incoming and at the bottom for outgoing cable of the panel.

PTS in the panel shall be cast resin, non draw out type suitable for nominal operation connected from line to ground and for 1.73 times rated line to ground voltage under sustain emergency condition. The lightening arrestor and surge capacitors shall be located in separate compartments and shall be single pole connected between line and ground terminals. The arrestor shall be station class, hermetically sealed type and shall be suitable for generator protection.

10.13 Turbine control panel (Free standing type)

Turbine control panel shall be indoor type, desk profile type metal enclosed free standing floor mounting and shall be dust moisture and vermin proof. The control disk shall have ON/OFF push buttons (illuminating type), trip indicating lamp, ammeter, local/remote selector switch for air blower motor, vapor extractor motor, actuator motor, ALOP motor, barring gear motor, ACOP motor, emergency oil pump motor. Panel shall have all

necessary metering protections annunciations. Panel shall have temperature scanner for turbine and gear box bearings.

Enunciator shall have minimum following annunciation for:
Lube oil pressure low, lube oil pressure very low, control oil pressure low, differential pressure across filter high, control oil pressure very low, turbine speed high, high axial movement, Condenser low vacuum, turbine lock out relay operated, solenoid trip, turbine bearing temperature high, turbine bearing temperature very high, emergency trip, Enunciator shall be solid state microprocessor base type with taste, acknowledgment and reset push buttons.

10.14 Turbine auxiliaries MCC

415 V LT MCC/switch board for T.G. Set auxiliaries and Condenser shall be non-draw out type single front compartmentalized suitable for three phase, four wire, 415 V, 50 Hz supply system. MCC shall have switch fuse contactor, over load relay starters for various motors required for turbine lube systems and Condenser etc.

MCC shall be non-draw type, free standing floor mounting type suitable for indoor operation, cable entry shall be from top and shall have adequately rated incoming switch fuse unit and starters for outgoing feeders. All incoming cables for the panel should be top entry from cable tray.

MCC shall be constructed as per following IS codes:
IS-375 for bus bar clearances.
IS-2405 for current transformers
IS-4064 for switch fuse units
IS-9224 for fuses
IS-2959 for contactors
IS-3231 and 5544 for bimetallic over load relays with single phase preventer
IS-1248 for meters
IS-6875 for control switches & push buttons.

10.15 AC Distribution Board for Power House Auxiliaries (ACDB)

Panel shall be metal enclosed, wall mounting type, dust and moisture and vermin proof suitable for 230 V AC single phase 50 Hz supply system. Panel

shall be indoor type having 1 no. switch fuse incomer feeder and 15 nos. two pole MCB outgoing feeders for supply to various control panels.
The distribution transformers with switch gear and protections for supplying power to the cogeneration auxiliary's sugar plant and to mills through converters transformers etc. All feeders and bus couplers shall be carefully interlocked to prevent improper paralleling of different supply sources. The loads shall be distributed in a manner that transformers, for the distribution, bus coupler & converter duty are not overloaded under any abnormal condition.
The distribution panels conforming to the latest revision of IS:8623/IEC:439 will be of dust & vermin proof construction, sheet steel clad, totally enclosed floor mounted, self-standing type with both front and rear access for PCCs and front access for MCCs. All panels will be of single bus bar type with bottom cable entries. The MCCs shall be of compartmentalized design with cable alleys at the sides. PCCs shall have the cable chambers at the rear. The bus-bars shall be of electrolytic grade aluminium alloy, designed for 40℃ temperature rise over an ambient of 45℃. All panels shall have neutral bus, sized to carry half the phase current. All panels shall be designed for 50 kA for 1 sec.
The L.T. panels shall have breakers for ratings 800 A ACB. All breakers shall be of electrically operated draw-out type with spring charged motor operated closing mechanism. MCC feeders shall be of fuse switch/switch fuse + contactor + bi-metal / electronic, motor protection relay type, with ammeters of suppressed scale above 15 kW and indication lamps, suitable for remote operation bus ducts of suitable rating shall be provided for connection between the primary of the distribution transformers and the PCCs. The bus ducts shall be with copper conductors. The bus ducts shall be of non-segregated phase bus duct type interleaved design and shall be complete with flexible, bellows, vertical & horizontal bends, seal-off bushing, outdoor hoods, etc. for DCS. All motors shall be of squirrel cage type conforming to IS:325 / IEC:34, totally enclosed and fan cooled. Motors shall be of energy efficient type. The windings will be insulated by class 'F' insulation material and maximum rise shall be limited to 75℃ over an ambient of 45℃.Motors of rating less than 50 HP will be provided with DOL feeders in MCC. Higher sized motors may be provided with star/delta starter depending on application. Feed pump motors shall be provided with VFD for soft start. Motor feeders will be complete with contactor, over load relay and switch fuse units. Motors of higher ratings (above 75 HP) will be protected by motor protection relays.

10.16 DC batteries & battery charger

DC batteries shall be lead acid type conforming to Indian Standard Specification and Codes of practice. Each battery cell shall be 2 V connected in row and double tire formation for getting 110 V DC supply. Batteries shall be mounted teak wood rake complete with cell no. plates fixing nails and battery interconnectors. Batteries shall be suitable for ambient temperature 50ºC for satisfactory operation. Total 55 number cells are required for getting 110 V DC supply to various panels. Battery charger shall be rated for 110 V DC and suitable for maintenance free batteries. Battery charger panel shall have all necessary meters and lamps for indication purpose. Panel shall consist of two chargers, a float charger and float-cum-boost charger for trickle and boost charging of battery of specified rating. Charger shall have auto/manual operation mode and suitable for 415 V, 3 phase, 4 wire system. Battery charger rectifier shall be Silicon control bridge full wave type. Output voltage regulation shall be +/- 1% maximum from no load to full load. Ripple voltage shall be 3% of RMS voltage. Battery charger shall have following indications AC supply on FC, AC supply on FCBC, charger on FC, charger on FCBC, FCBC on float charging, FCBC on boost charging, phase fail and battery reverse polarity.

Following meters shall be provided. AC input V meter, DC V meter with selector switch, DC V meter and DC ammeter on load side, DC ammeter FC, DC ammeter battery.
Following annunciation shall be provided, FC fail, FCBC fail, DC voltage low, DC voltage high, overload FC, overload FCBC, mains failure, battery earth fault and rectifier failure.
Battery charger shall have following features and interlocks:

a) Float charger cannot be switched on when the boost charger is on under float mode.
b) Charger-1 is on and if charger-2 is made on in Float mode, charger-1 shall be tripped off automatically.
c) In case of ac main failure, battery shall supply the load on an automatic basis.
d) Rated output voltage shall be maintained during from charger to battery.
e) Interlock shall be provided such that when charger-2 is selected in boost mode, it will be disconnected from DC load
f) Normally the charger will work in float charging mode of FC.
g) In case any problem in float charger, automatically changeover will occur to float charging mode of FCBC.
h) After rectification of float charge of FC, manually it can be transferred to float charge of FC, from float mode of FCBC

i) In case of low Battery voltage, Battery should be connected to boost mode automatically and float charger of FC should feed the load.

j) After boost charging is over, battery tank shall be automatically connected to float charger of FC for trickle charging.

K) DC distribution panel shall be integral part of battery charger with following feeders: One number incoming feeder of adequate rating and 12 numbers outgoing feeders for supply of 110 V DC to various control panels.

10.17 11 KV & 415 V Power Distribution System

The electrical distribution system shall include 11KV cables/ Bus bar trunking/ tie trunking connecting the alternator breaker panel to alternator, 11 KV/433 distribution system, LT panel, Bus coupler panel, auxiliary panel, main and sub-lighting distribution board, motor control centers, all electric motors, starters, switches for all electric motors, power improving capacitors and their panel, all power, lighting and control cables including cables from DG to main LT panel in power house, earthy systems, electrical erection material etc. It will also include distribution boards, cables and lighting fixtures (without bulbs, tube lights and halogen lamps) for the lighting of the factory building, spray pond, cane carrier loading point etc.

The bus bar shall be made of electric grade (EC-91E) aluminium. The bus-bar trunking enclosure shall be fabricated out of 50 x 50 x 6 mm angle and folded covers of 2 mm thick aluminium sheets shall be provided on all four sides. The louvers shall be provided on side covers. The flexible copper connections at alternator ends and fixed connections at the breaker panel end shall be provided. The bus bar trunking shall be designed for continuous capacity at full load of transformer at 0.8 power factor at an ambient temperature of 50 deg.C. and the maximum temperature of the bus bar shall not exceed 85 deg.C. It shall be designed to withstand a symmetrical short Circuit current of 25/50 KA (RMS) for three seconds. The bus trunking shall also have a neutral bus bar of half the size of the phase bus. Provision shall be given for future expansion to 7500 TCD by installing similar equipment. Provision for suitable rating bus trunking, tie trunking etc. shall be given for the installation of bus coupler for 2nd TG set, VCB panel distribution transformer etc. for future expansion.

The entire electrical system shall confirms to the Indian Electricity Act & Rules.

10.18 Main distribution panel

This shall be designed for capacity of 4900 TCD (22 Hrs. basis) expandable to 7500 TCD at unity load factor. One main distribution panel board shall be provided along with suitable bus coupler so that the set can be work in parallel. Necessary equipments for parallel operation shall be provided. The panel shall be fabricated from 14 SWG cold rolled sheetsteel and shall be totally enclosed floor mountingtype, dust, damp and vermin proof. Louvers shall be provided in the panel for air circulation. The panel shall be designed for an ambient temperature of 50 deg.C. and the maximum operating temperature of the bus bar shall not exceed 85 deg. C.The panel shall be designed to withstand symmetrical short circuit current of 50 KA (RMS) for one second. The operating heights of the panels shall be 2000 mm. The panel doors compartment shall be interlocked in such a way that it shall not be possible to open them when the switch/circuit breaker is in closed on position. The bus bars provided in the panel shall be of aluminum EC-91E grade. The size of the neutral bus bar shall be half of that of phase bus bar. The earth bus bar shall be located at the bottom and shall be continuous throughout the length of the panel. Removable sheet steel gland plates shall be provided at the top of the panels for cable entry.. The panel shall have individual air circuit breaker or unit for outgoing feeders for motor control centers installed for cane preparation, mill drive, boilers and centrifugal. The panel shall also have individual switch fuse unit for outgoing feeders for all other motor control centers. The panel shall also have individual switch fuse unit for feeders for auxiliary panel, and electric oil pump for turbo set. The panel shall also have one bus section coupler consisting of 4000 amp. four pole air circuit breaker connected in such a way that some of the load can be transferred from the turboset supply and be fed from the emergency power supply. Coupler and emergency supply incomer breaker shall have four pole, 3 phase, air circuit breaker or neutral contactor including an ammeter, voltmeter with selector switches, indicating lamps etc.

One no. four pole air circuit breaker of min. 4000 amp.rating shall also be installed in the main distribution panel for feeding the emergency power supply from diesel set/state electricity grid. All these Air circuit breakers shall be interlocked with the alternator breaker panel such that only one source of power supply is fed to the bus bar at a time. The main distribution panel shall be fitted with spare ACB and switch fuse unit, one of each size subject to a maximum of three nos. and 2 nos. plugs and sockets, each of 63 amps. control supply of 230 VAC shall be obtained only through Phase & Neutral. Automatic Power factor correction panel with capacitors and incomer ACB of suitable capacity shall be installed near the main distribution panel for automatic improvement of power factor to a minimum of 0.90. Capacitors shall be APP double layer type suitable for sustaining for D.C. harmonics generated by thyrister drives.

The balance number of capacitors shall be installed at individual MCC's and across all motors rated above 125 KW with SF Units, contactor and ‘ON’ indication. The main

distribution panel shall have ammeter and ON and OFF indicating lamps for each outgoing feeder. Ammeter, voltmeter and 3 nos.indicating lamps shall be provided for incoming emergency supply breaker. All switches, air circuit breakers, in the outgoing feeders in the main distribution board shall be designed for a rating of 1.2 times the connected load to each feeder. Each outgoing feeder shall be housed in individual separate cubicle with door interlock. Necessary harmonics filters with suitable panel complete in all respect shall be provided for DC harmonics.

10.19 11 KV distribution panel

11 KV distribution panel shall have VCBS (Vacuum Circuit Breakers)/ SF6 for each outgoing feeders feeding to plant transformers, convertor transformers, 11 KV motors if any. All other features of the panel for metering rotection, relays and constructional features shall be same as 11 KV VCB incoming panel.

10.20 11 KV/ 433 V distribution transformers for plant load

Transformer shall be outdoor type, ground/platform mounting, oil immersed naturally cooled type (ONAN). Core type (Copper), double wound as per IS 2026 of suitable KVA rating. Suitable for 11 KV/433 V, 3 phases, HV delta connection and LV star connection with copper windings with vector group Dyn11. Transformer shall have HV terminal box suitable for terminating XLPE cables and LV terminal box suitable for bus bar ducting connection. Additional neutral will be brought out for earthing purpose for cable box/bus ducting arrangement. On HV side tapings on HV winding +/- 10% @ 2% shall be provided to maintain rated voltage on LV for constant KVA for HV variation. Tabs can be changed ON-OFF circuit with an external handle. Tab position indicators with locking arrangement on each step shall be provided. The loads shall be distributed in a manner that transformers, for the distribution, bus coupler & converter duty are not overloaded under any abnormal condition.

Transformer shall have following standard fittings:

Monogram plate, Conservator with sump & drain plug, Oil filling hole with flange & bolted cover, Prismatic Oil Level Gauge, Dehydrating Silica get Breather with oil seal, Thermometer pocket, Air Release plug, Inspection Cover, Lifting Lugs, Cover lifting Lugs, Jacking Lugs, Top Filter valve 32 mm , Drain cum Filter valve 32 mm, Earthing Boss, Off circuit switch, Storage & instruction plate, Skid type under base & Bi-directional plain Rollers.

Transformer shall have following accessories:

Top oil temperature indicator (Vapor pressure type) – Capillary tubing type with MRP/RSD and alarm and tip contacts, Double float Buchholz relay with alarm and trip contracts, Magnetic oil level gauge with low oil level alarm, winding temperature indicator with current transformer and heater coil, and alarm and trip contacts, marshalling box duly wired up from accessories to the box, Radiator shut off valves, pressure relief device.

10.21 Motor control centers

MCCs shall be of compartmentalized design with cable alleys at the sides. PCCs shall have the cable chambers at the rear. The bus bars shall be of electrolytic grade aluminium alloy, designed for 40°C temperature rise over an ambient of 45°C. All panels shall have neutral bus, sized to carry half the phase current. All panels shall be designed for 50 kA for 1 sec.

The L.T. panels shall have breakers for ratings 800 A ACB. All breakers shall be of electrically operated draw-out type with spring charged motor operated closing mechanism. MCC feeders shall be of fuse switch/switch fuse + contactor + bi-metal / electronic, motor protection relay type, with ammeters of suppressed scale above 15 kW and indication lamps, suitable for remote operation.

Bus ducts of suitable rating shall be provided for connection between the primary of the distribution transformers and the PCCs. The bus ducts shall be with Aluminium conductors. The bus ducts shall be of non-segregated phase bus duct type interleaved design and shall be complete with flexible, bellows, vertical & horizontal bends, seal-off bushing, outdoor hoods, etc. for DCS.

All motors shall be of squirrel cage type conforming to IS:325 / IEC:34, totally enclosed and fan cooled. Motors shall be of energy efficient type. The windings will be insulated by class 'F' insulation material and maximum rise in temperature shall be limited to 75°C at an ambient of 45°C.

Motors rating less than 50 HP will be provided with DOL feeders in MCC. Higher sized motors may be provided with star/delta starter depending on application. Feed pump motors shall be provided with soft starter. Motor feeders will be complete with contactor, over load relay and switch fuse units. Motors of higher ratings (above 75 HP) will be protected by motor protection relays.

MCC shall be provided with 1 No: incoming switch of 1.2 times the connected load excluding the standby equipment, an ammeter, a voltmeter with selector switch, 3 phase

energy meter and OFF and ON indicating lamps. Each MCC will have individual outgoing feeder for each motor connected to that MCC. For squirrel cage motors, each feeder shall have switch fuse unit, starter with over current protection, an ammeter and on indicating lamp. For slipring motors, each feeder shall have switch fuse unit, starter, an ammeter and on indicating lamp. In case of slip-ring motors rotor starters shall be provided and installed near individual motors. The MCC's shall also have feeders for connection of low loss power capacitors APP double layer type, each feeder having air break contactor with back up switch fuse unit, on indicating lamps, ammeter, ON-OFF push buttons. Each feeder in the MCC's shall be housed in separate individual compartments with door interlock.

Each MCC shall be 14/16 SWG cold rolled sheet steel fabricated cubicle type, floor mounted, dust, damp and vermin proof. Each MCC shall be expandable at both ends for additions of switches and starter for the motors if required at any stage. The bus bars shall be made of Electric Grade (EC-91E) aluminium. The earth bus bar shall be located at the bottom and shall be continuous throughout the length of each MCC. The operating height of each MCC shall be 1800 mm & max. Height shall be 2300 mm. Control supply of 230 VAC shall be obtained only through Phase & neutral. However, in centrifugal panels/ MCC 230 V A.C control supply shall be through control transformer.

Each MCC shall be designed to withstand symmetrical short circuit current of 35 KA (RMS) for one second. Each MCC shall be designed for an ambient temperature of 45 deg.C, the bus bar operating temperature at the ultimate capacity of 4900 TCD (in 22 hrs.) expandable to 7500 TCD shall not exceed 85 deg. C Removable sheet steel gland plates shall be provided in each MCC for cable entry.

Each MCC shall be provided with spare switches, one of each size subject to a maximum of three nos. and a plug with socket of 63 amps. All squirrel cage motors up to an including of 40 HP rating shall be controlled with D.O.L. starters. All other squirrel cage motors shall be controlled with air break automatic star delta starters.
Incomers for all MCC s shall be SFU / ACB with 1.3 times the capacity of connecting load excluding the standby load. Each slip ring motor shall be controlled with rotor starter installed near motor. Electrical inter-locking of the following electric motor (With arrangement for de-interlocking) shall be provided.

(a) Cane cutter, cane leveler, fibrizer, cane carrier motors so that if any of the cane preparatory device trips, the cane carrier drive shall also trip.

(b) Bagasse elevator, bagasse carrier and return bagasse carrier motors.

(c) Sugar elevator with grass hopper.

(d) All self discharging batch type centrifugal machines to be interlocked such that not more than 2 machines accelerate simultaneously.

In addition to these MCC's, one pedestal mounted push button operating station (with ON-OFF push buttons) shall be provided near each squirrel cage motor. Also stop push buttons at the ground floor shall also be provided for bagasse elevator, and return bagasse carrier.

10.22 Auxiliary panels

The auxiliary panel shall be provided with following outgoing feeders.

- 1 No: 160 amp switch fuse unit for tube well No: 1
- 1 No: 160 amp switch fuse unit for tube well No: 2
- 1 No: 300 amp SF unit for colony supply
- 1 No: 250 amp SF unit for workshop supply
- 1 No: 160 amp SF unit for factory lighting
- 1 No: 160 amp SF unit for street lighting
- 1 No; 63 amp plug and socket
- 1 No: 200 amp switch fuse unit for lighting auxiliary buildings
- 2 Nos: 160 amp switch fuse units as spare.

The auxiliary panel shall be with one incoming 1600 amps switch fuse unit.

One 3200 amps. 4 pole changeover switch shall also be provided for auxiliary panel so that it can be fed either from the turbo set supply or from the State Electricity grid/ DG set supply. Neutral bus bar shall also be provided in the auxiliary panel. Other construction details and fault level etc. of the auxiliary panel shall be the same as the main distribution panel. The auxiliary [panel shall be located in the power house. One ammeter with selector switch, one voltmeter and 'ON' indicating lamps shall be provided in the incomer. Each outgoing feeder shall have an ammeter and 'ON' indication.

10.23 Electric motors

All the electric motors up to 100 HP except ID Fan motors shall be squirrel cage TEFC enclosure induction motors. All the electric motors (except fibrizer and mill drive motors) shall be suitable for operation at 3 phase, 50 Hz, 415 volts, AC supply and shall conform to IEC:34 specifications. Fiberiser motor shall be of 11 KV and for mill drive motor it will be of 690V.

Motors for batch type centrifugal machines shall be suitable for S8 duty as per IS-4722 specifications and shall be designed for an ambient temperature of 50 deg.C and shall be fitted with ETDs in each phase for thermo-protection of motor windings.

Electric motors for cross travel and long travel of cane un-loader and mill house cranes shall be slip-ring TEFC enclosure suitable for S4 duty as per IS-4722 specifications. The electric motors for hoisting/de-hoisting of cane un-loader and mill house crane shall be squirrel cage TEFC enclosure suitable for S4 duty as per IS-4722 specifications.

10.24 Electric cables (11 KV, 1.1 KV grade)

All power, control and lighting electric cables for the entire electrical distribution system shall be supplied.

The power electric cables from the main distribution panel to each MCC and to auxiliary panel shall be suitable for the connected load at unity load factor excluding standby equipments. Suitable de-aerating factor for the cables shallbe considered as per the recommendations of cable manufacturers. All power and lighting cables shall be PVC insulated, armored, suitable for use at 1100 V and shall conform to IS-1554 (part I) specifications. All the control cables shall be of copper conductor. The minimum cross sectional area per core shall be 4 mm^2 for aluminum conductor and 2.5 mm^2 for copper conductor for power cables and 1.5 sq.mm. Copper conductors for control cables. All the power & lighting cables shall be 3. 1/2 core. All other cables from MCC to motors shall be 3 core.

All cable terminations shall be through crimping type cable lugs. Cable glands shall be provided at panels. All cable distribution/laying must be as per Indian Standard (overhead cable trays must be water proof / dust proof). All incoming cables for the panel should be top entry from cable tray.

10.25 Auto-Power factor correcting capacitors

Suitable number and rating low loss heavy duty power capacitors APP double layer type shall be supplied to improve the plant power factor to 0.95 , at 4900 TCD (22 Hrs. basis expandable to 7500 TCD) crushing capacity. The power capacitors shall conform to IS-2834 specifications. Suitable capacity capacitors shall be connected to main distribution panel through APFC panel. Capacitors shall also be connected to the motor control centers and across motors of rating 125 KW and above with SF unit, contactor and 'ON' indication.

Capacitors shall be connected to main distribution panel through auto power factor correction relay and capacitor switching shall be by contactors / thyristeried switching. If thyristeried switching is used capacitors shall be MPP type.

10.26 Factory lighting and lighting distribution panel

One main lighting distribution board and sub lighting distribution boards for the lighting system fitted with miniature circuit breakers for each circuit shall be provided for the new installed equipments and houses. The main DB shall be located in the power house the sub-distribution boards shall be evenly spread in the factory area to be illuminated. Each sub-distribution board shall also be fitted with 3 nos. Three-pin plug points. The main DB shall have SFU, ammeter with selector switch and voltmeter on incoming feeder, SFU/MCB, an ammeter for 14 nos. outgoing feeders. The wiring for complete lighting system shall be done with the help of PVC insulated and armored aluminum conductor cables run on walls, ceilings as required The lighting boards shall be sheet steel fabricated.

The scope of work under this section shall be to provide illumination in inside and outside new constructed factory building, cane yard, spray pump house / cooling tower with additional two flood lights for illuminating spray pond only, injection water pump house, Condenser house, cane preparation house, surrounding cane feeding area, E.T.P., I.D. fan house, bagasse yard and molasses tanks. The average illumination levels shall be 50 luxin cane yard, 200 lux in power house and 150 lux in other areas. The lighting system shall be designed for use of fluorescent tubes in combination with HPSV (sodium vapors) / HPMV (mercury vapor)/ LED light fixtures. Minimum four no. towers shall be provided at different suitable places (Cane yard, cane carrier area, bagasse yard,ETP etc.) each tower having flood lights in bulk.

The emergency light shall be provided at mill, power house, turbine, boiler & lab etc.
The high mast light shall be provided at Cane yard, ETP, Administrative block & Guest house/ colony entrance.

10.27 Air-conditioning and Ventilation System

The main plant DCS control room for Mills, boilers, turbo-generators and boiling house shall be air conditioned with split air conditioners and suitable exhaust fans to ensure effective ventilation and dust free atmosphere within the turbo generator complete building.

10.28 Plant Earthing

Earthing of all electrical installations shall be done as per IS-3043 specifications and the Indian Electricity Act and its rules and approved by the Electricity Authority of the Government.

All air circuit breakers shall conform to IS-2516 part I. All switch fuse units on cubicle switch boards shall conform to IS-4047 specifications. All switch fuse unit on Industrial Boards shall conform to IS-4064 Part I and Part II specifications. All ammeters and voltmeters shall be size 100 mm class 2.5% accuracy and shall confirm to IS-1248. All current transformers shall be class 1% accuracy and shall confirm to IS-2705. All contactor shall be of air brake type with at least 2 no. $\pm$ 2 auxiliary contacts and shall confirm to IS-2516(I).

10.29 Power House Crane

one no. electrical operated overhead travelling crane of 30 ton`s SWL capacity conforming to class ii of is specifications complete with rails, gantry, drives controls etc., shall be supplied. The crane rail centre shall cover powerhouse span and maintenance area. The crane shall be duly certified by the safety inspector fallowing the safety norms. Eot crane shall also have one separate trolley for hand operated 5 T SWL capacity.

10.30 Diesel Generating Set

Two No. D.G. sets of 1000 KW rating with 0.8 power factor shall be supplied long with its all accessories.

The diesel generating set shall be continuously rated comprising multiple cylinder diesel engine having necessary protections such as low lube oil pressure trip, high engine temperature trip, over speed trip etc. and shall be fitted with speed control knob speedometer, hour meter battery charging meter, oil pressure and temperature gauges, radiator etc. The diesel engine shall be coupled with suitable alternator capable of developing continuously the rated power at 3 phase, 4 wire, 50 Hz at normal voltage of 420 VAC (Alternator to be suitable for voltage range of 400-440 VAC) and conforming to IS-4722 specifications.

The alternator shall be fitted with minimum one ETD in each phase for thermo protection of the alternator windings. The alternator shall be designed for an ambient temperature of 45 deg. C. The alternator shall be self-excited and self-regulated. Both the diesel set each shall be complete with base frame, couplings, one M.S. fabricated, diesel service tank of 10 HL capacity, inter-connecting piping, D.C. storage battery and self-starting mechanism for starting of engine. One 2 mm thick for the back side and 1.6 mm thick for the other sides cold rolled sheet steel fabricated floor mounted, dust and vermin proof panel for the diesel set shall be provided.

The panel shall be fitted with air circuit breaker, over current relay, earth fault relay, reverse power relay, over voltage relay, reed type frequency meter, neutral isolating switch, three phase 4 wire unbalanced energy meters, KW meter, 3 phase power factor meter, 3 nos. ampere meters, one no. Voltmeter with selector switch, ON-OFF indicting lamps. The panel shall have neutral and phase bus bars of electric grade (EC-91E) aluminum and shall be designed to withstand symmetrical short circuit current of 35 KA (RMS) for one second.

The panel shall be designed for an ambient temperature of 45 deg. C, the operating temperature of the bus bars shall not exceed 85 deg. C. All the meters shall be class 1.5 per cent accuracy and shall conform to IS-1248 specifications. All the meters shall be square type of 100 mm sq. with 90 per cent deflection Interconnecting electrical cable 3½ core from the diesel set to the main distribution panel and to the auxiliary panel changeover switch shall be provided.

Necessary synchronizing panel with double voltmeter, double frequency meter, selector switch, lamps & synchroscope etc. shall be provided. Suitable bus coupler panel with ACB etc shall also be provided between the D.G. sets control panel to run separately and in synchronization connected suitably D.G. sets to Main Distribution board with interlocking.

Both D.G set shall be synchronized.
Both D.G set shall be of Eco friendly, green & silent operation

10.33 Plant Start up

The power house auxiliary loads shall be shared by the new DG set of 1000 KW -2nos after synchronisation. Once the new power plant TG set is ready to take up the loads, the 11 KV bus shall be energized by closing the breaker in dead bus mode and the distribution transformer connecting the DG sets shall be energized. Then, 415 V breaker of the distribution transformer shall be closed by synchronizing the TG supply with the running DG supply, thus avoiding interruption of supply to the auxiliary loads. Immediately, first couple of breaker supplying power to the auxiliary load from DG sets shall be tripped to avoid continuous paralleling of the existing both DG sets with the new TG set. Now, the system shall be paralleled with the grid by synchronizing the 11 kV tie-breaker.

10.34Safety Regulations

Statutory regulations on safety measures shall be strictly followed. Safety appliances, viz. fire extinguishers, sand buckets, earth rods, gloves, rubber mats, danger boards, safety regulation charts, etc. shall be procured and installed as per safety norms. Oil collection pits and soak pits for the transformers shall also be constructed.
All air circuit breakers shall conform to IS-2516 partI. All switch fuse units on cubicle switch boards shall conform to IS-4047 specifications. All switch fuse unit on Industrial Boards shall conform to IS-4064 Part I and Part II specifications. All ammeters and voltmeters shall be size 100 mm class 2.5% accuracy and shall confirm to IS-1248. All current transformers shall be class 1% accuracy and shall confirm to IS-2705. All contactor shall be of air break type with at least 2 no. $\pm$ 2 auxiliary contacts and shall confirm to IS-2516(I).

10.35 Provision for additional power for Expansion to 7500 TCD

For future further expansion from proposed 4900 TCD to 7500 TCD, provision shall be given for addition of Turbo generator set of desired capacity in a separate building. Space to accommodate additional power house for Turbo-generator set with power distribution system etc. for further expansion of plant shall be given in the proposed plant layout.

11.2.7 Lightening Arrester

Lightning arrestors rated 30 KV, 10 KA will be provided for transformer equipment protection and on terminating ends of the transmission lines. The lightning arrester will be heavy duty station class type, discharge class III, conforming to IEC specification 99-6. Arrestors will be complete with Insulating Base, self-contained discharge counters and suitable mill ammeters.

11.2.8 Isolators and Insulators

Isolators complete with earth switch (wherever necessary), galvanized steel base provided with holes, solid core type post insulators with adequate creep age distance conforming to IS:2544, blades made up of non-rusting material, operating mechanism (gang operated, manual/motor charging mechanism) will conform to IS:1818. They will be of centre post rotating horizontal double break type and consist of 3 poles. The isolators will have interlocks with circuit breaker and earth switch.

11.2.9 AC & DC Auxiliary supplies

Supplies of single and three phase for illumination, transformer tap-changer drives, breaker /disconnect switch motors, space heaters in cubicles and marshalling kiosks shall be arranged from reliable AC supply source.

11.2.10 Safety Earthing System

A safety earthing system consisting of a buried GI flat conductor/chemical earthing grid will be provided. The earthing system will be formed to limit the grid resistance to below 1 ohm. as per IS: 3043.

The buried earthing grid will be connected to earthing electrodes buried underground. Neutral point of generator transformer, non-current carrying parts of equipment, lightning arrestors, fence etc. will be earthed rigidly. The following factors will be considered for earthing system design.

a. Magnitude of fault current

b. Duration of fault
c. Soil resistivity
d. Resistivity of surface material
e. Shock duration
f. Material of Earth Conductor, and
g. Earth mat grid geometry.

11.2.11 Structures

The structures will be made up of hot-dip galvanized steel and designed to withstand forces during normal conditions (viz. wind loads & dead load of components) and abnormal conditions (viz. short circuit, earthquake etc.)

11.2.13 Safety Regulations

Statutory regulations on safety measures shall be strictly followed. Safety appliances, viz. fire extinguishers, sand buckets, earth rods, gloves, rubber mats, danger boards, safety regulation charts, etc. shall be procured and installed as per safety norms. Oil collection pits and soak pits for the transformers shall also be constructed.

11.0 INSTRUMENTATION& CONTROL SYSTEM (D C S)

Accurate measurements and control of various process parameters are very important for efficient operations and safety of particular equipments in Sugar Industry & Cogeneration Plant. In a proposed Sugar Plant with Cogeneration, a need based Automation & Control system required to ensure stable & efficient operations of various sections in the Plant i.e. Mill, Boiler, Power House, Water Treatment Plant, PRDS and Boiling House (Clarification, Evaporators & Pan Station).

High ended DCS System & controllers and operating stations should be designed, software development with supervisory control console, inter-connected through Ethernet so that the total information about the Plant operation can be assessed from any operating station at various sections(Mill, Boiler, Power Turbine, Clarification Section, Pan Station, Evaporator Station, administrative block, Technical block. However, the Engineering Station &Servers should be centralised with proper redundancy in communication and power backup with printer(2 Nos.) with proper and separate earthing in the panels and power back-up. All process parameters of different sections should be with dynamic mimic diagrams.

Provision should be made for centralised online UPS System, 15% extra AOs and AIs and 15% DIs & Dos. All field instruments (transmitters/controllers/ control valves should be as per standard instrument practice along with proper standby for boilers, instruments & control system. Centralised Engineering Station for DCS system should be air-conditioned with proper ducting to maintain the temperature of control room (24 deg. C). The system shall have the capability and facility for expansions through additions of stations, controllers, processors and processor IOs, IDs, AO &AI cards and Alarm & Event Display, Alarm Monitoring and Reporting. The supplier of Instruments & Control Systems has to provide trouble shooting & instruction manuals, training to the technical staff of Sugar Mills and will operate & maintain the instrument & control systems in all respects at least for three seasons free of cost and depute their Engineer, Programmer & Technician during the season for smooth functioning of the Control Systems.

12.1 Milling Section

12.1.1 Cane Carrier Speed Control

Cane carrier speed shall be controlled automatically, based on Donnelly chute level, to ensure uniform feeding of cane to first mill. Primary cane carrier shall follow speed of secondary cane carrier in a fixed ratio. Load of all cane preparation devices shall override the speed signal of each cane carrier. When load of any cane preparation device exceeds 70% of rated load, speed of that cane carrier shall be automatically proportionately reduced. If load exceed 100% of rated load, that cane carrier will stop. It will restart automatically when load on the cane preparation device fall below 100% of rated load. Cane carrier speed shall also be automatically controlled for maintain a set value of crush rate.

12.1.2 Speed Control of Mills

Load on first Mill will be measured and in case load increases above a set value, speed of cane carrier will be reduced to avoid overloading and jamming of first mill. Speed of first mill along with chute level will also be monitored and displayed. Normally first mill will run at a predetermined fixed speed. In case of load on mill increases beyond a set value, speed of mill will increase proportionally. Speed will reduce to pre-set value after overload is removed.

Speed, load and chute level of other three mills will also be monitored and displayed. Speed of these Mills will be controlled based on set point. Chute level and load on the mill

will give overriding signals, so as to ensure optimum loading of the mill under all feeding conditions. The operator will feed in the set point and speed will be controlled depending on load and level feedback signals. Proper inter-locking of all the DC & AC drives, Cane carrier, kicker, leveller and fibriser motors and all carrier drives for proper safety and reduced jamming.

12.1.3 Imbibition Water Flow Control & Temp. Control.

Imbibition water flow will be controlled to maintain a fixed ratio of imbibition water to cane. The desired ratio will be fed through the keyboard and the load on the third Mill will be measured. The flow of imbibition water will be regulated to maintain the ratio at various loads. If load of third Mill is below the minimum running load, imbibition water flow will stop. If third mill is bypassed, the system will automatically be controlled by second mill load through software program without any extra hardware cost. The level of the tank should also be monitored and controlled through VFD at pump and temperature of the maceration water is to be controlled between 70 – 90 deg. C.

DCS control system should include display of complete gimmick diagram of all the moving parts from cane carrier to bagasse carrier at milling station in motion. All the parameters like cane feed control speed control motor load amperage, levels of all the Donneley chutes, mill RPM, top roller lift indications, mix juice and imbibition water flow indications. Level in mix juice tank along with juice stabilisation system. All these parameters should be sensed and data logging and printing arrangement shall be provided. The entire display and control logging and printing system should be on DCS system and computerised control from air conditioned and dust proof control cabin.

12.2 Boiler Section

12.2.1 Drum Level Control

Drum level control of each boiler will be controlled by three element method. When boiler is running below 30% load, the control loop will automatically switch to single element control based on drum level. When drum level goes beyond these limits, an alarm shall be given to indicate “drum level high” or “low” as the case may be . In case drum level falls below minimum level, feed water control valve will open fully and “Drum lever very low” alarm will be given. In case drum level rises above maximum level, the feed water valve will open fully and “drum level very high” alary will be given. A standby three

element control system for drum level and feed water regulation should be provided which shall respond to the momentary fluctuations of the steam demand upto± 5% of the rated and CR of boiler in a separate instrument panel consisting of draft gauges, drum level pressure, temperature of steam and flue gas.

12.2.2 Auto Combustion Control of Boiler:-

This will be an integrated control loop for maintaining the steam pressure and improving combustion efficiency of boilers. The master controller will measure the steam pressure and speed of variable speed drive for bagasse feeders will be adjusted to maintain the required drive for bagasse feeders will be adjusted to maintain the required amount of primary air. To ensure that this arrangement is correct, the O2 signal from flue gases will be taken in the loop to make final correction to FD fan speed control by VFD, ID fan speed with VFD shall also be controlled to maintain a negative draft of 5 mm water column inside the furnace. Power Cylinders are to be fitted for complete opening and closure of the dampers at ID, FD and SA fans for remote control through DCS Systems. It will control the bagasse feeding, steam pressure & flue gas O_2 level etc.

12.2.3 De-aerator & HP Heater Pressure & Level Control System

This will be an integrated control loop for maintaining the temperature, pressure and level of the De-aerator and HP heater to maintain the required temperature, level & pressure in the tanks. De-aerator pressure shall be maintained by regulating the steam flow to the de-aerator so that temperature of boiler feed water is maintained at the desired set value. De-aerator level shall be controlled so as to balance the inflow and outflow of feed water.

12.2.4 Steam Temperature Control at Super Heater Outlet

Spraying feed water in the super heater system as per manufacturer's recommendations to control superheated steam temperature in close range to avoid any damage to turbine and consistent power output at rated efficiency of turbine.

Attemperator Temperature control should be provided through DCS. Following parameters are to be monitored.

1. Steam & Water flow with totalizer, super-heater pressure, temperature of various boiler parameters

a) Super heater steam at final super heater outlet and primary super-heater outlet. Feed water economiser inlet.

b) Feed water economiser inlet.

c) Feed water at economiser outlet.

d) Feed water at de-aerator inlet.

e) Flue gas temp. at boiler outlet

f) Flue gas temp. at economiser outlet.

g) Flue gas temp. at air heater outlet.

h) Flue gas temp. at KD fan inlet

i) Air temp. at ID fan inlet

j) Air temp. at air heater outlet

k) Furnace temperature**.**

All these parameters should be sensed and data logging and printing arrangement shall be provided. The entire display and control logging and printing system should be on DCS system and computerised control from air conditioned and dust proof control cabin

12.3 Steam Turbine

Following parameters are to be monitored and controlled through DCS System:-

a) Steam Flow at Turbine Control Valve

b) Steam pressure

c) Uncontrolled extraction (pressure& temperature)

d) Controlled pressure extraction

e) Vibration

f) Condensate operating pressure

g) Inlet temperature

h) Power factor

i) Cooling tower temperature

j) Remote control of cooling tower pumps

k) Uncontrolled extraction steam flow monitor & control

l) Pressure at different stages (oil & steam)

m) Ejector absolute pressure monitor & control.

All Gauges and indicators are to be provided in a separate panel near to the turbine with following parameters:

a) Steam Pressure Gauge

b) Steam Temp. gauge

c) Oil pressure gauge

d) Oil temp. gauge

e) Bearing temp. indicator for turbine

f) Bearing temp. indicator for gear box

g) Speedometer at stations.

h) Remote reading tachometer

i) Necessary oil pockets for the inlet live steam/ outlet exhaust steam

j) Steam flow meters

k) All essential tripping circuits to be provided as per turbine design parameters.

All these parameters should be sensed and data logging and printing arrangement shall be provided. The entire display and control logging and printing system should be on DCS system and computerised control from air conditioned and dust proof control cabin

12.4 Pressure Reducing & De-superheating Station

Pressure Reducing & De-superheating control valves shall be provided for controlling the temperature and pressure of the steam for Boiling House and to gain the additional steam for process. The quantity of live steam to the PRDS should be monitored with flow meter and totallizer.

12.5 Clarification and Evaporation Section

12.5.1 Juice Flow Stabilisation Control

Raw Juice from mill house shall be stablized to for consistent flow of juice to process section. The total juice flow to boiling house will be controlled as per a set point based onthe raw juice tank level and control with a mass flow meter and VFD driven pump. This set point will be automatically corrected according to the level in the raw juice tank, to take care of small changes in cane feeding rate. The control logic will be such as to ensure both high level and low level of juice in the tanks and actual set point will operate to maintain the tank level between 30% to 70% flow with flow variation of +/- 1.0%. In case of high or low level in juice tank, alarms will be generated to draw the attention of operator. If level of the tank is above the set point (upper limit),

then carrier speed should be reduced and is over rider to all parameters to prevent overflow from the raw juice tank.

12.5.2 Lime Control

Lime dosing to juice sulphiter shall be automatically controlled based on pre-set ratio to juice flow. The total lime slurry will be pumped to an overhead tank and overflow from this will be fed to a lime-proportioning unit. The required amount of lime will be diverted to the process and rest will be sent back to the lime storage tanks. Lime flow will be measured to give feedback signal to the lime dosing control loop to ensure correct amount of lime is added to juice. In case juice flow reduced below 5% of crushing rate, the lime dosing unit will close 90% to 100% depending on operator set value.

12.5.3 PH Control

PH of treated juice will be measured and signal given to control speed of sulphur dosing pump of film type sulphur furnace. Combustion temperature of film type burner will be measured and air vent valve will be adjusted to control temp. of sulphur burner.

12.5.4 Clarifier Juice flow Control

Treated juice flow to clarifier shall be stablised according to a fixed set point for the stable flow to the flash tank and clarifier. This will be achieved with tank, magnetic mass flow meter and VFD on the pump. The tank level will govern the flow output and it will maintain between 30% to 70% level. Alarms will be generated for both high and low level in treated juice tank.

12.6 Evaporator Control

Automatically in case level in clear juice tank goes above or below set values. This will be achieved with flow meter and VFD on the pump. Also, there will be provision of water connection to wash of the juice on the evaporator tube surfaces and complete the batch pans cycle if any if factory requires shutdown of 8-10 hrs.

Syrup brix at evaporator outlet shall be measured and displayed on the operator station screen and to ensure final brix of above 66% and with limit of 70%. As with steam economy measures, factory steam % cane will be sensitive to evaporator syrup brix and lower value below 64% solid Clear juice flow to evaporators shall be controlled as per fixed set point and adjusted will increase the vapour requirement at pan and also vapour requirement for raw juice heating will decrease.

Vapour Pressure control to work at the designed saturation temp. is essential. Vapour pressure of last effect will be regulated by controlling the flow of vapour to condenser. Also, there will be throttle valve between 3rd and 4th effect, 2nd and 3rd effect to ensure vapour pressure in all the effects.

Water flow to condenser of last vessel of evaporator set shall be controlled based on vacuum in last body. Condensate flow from evaporator to boiler section shall be measured and recorded in the operator station, to enable estimation of exhaust steam consumption in the process. Excess Exhaust steam to the 1st body will go to vapour line through control valve. Similarly, the excess inlet vapours of 2nd body will go to 3rd body vapour line and excess of 3rd body will go to 4th body through proper control valves in bypass lines.

12.7 Pan Station

12.7.1 Molasses conditioners

Regulating the steam flow into the vessels will control the temperatures of molasses at outlet of molasses conditioners. Measuring the conductivity of molasses and controlling the water flow control valve will control this brix of molasses at 72% solid is important to maintain the pan vapour consumption as per designed steam balance.

12.7.2 Vacuum Control

Condenser water flow for each batch pan shall be controlled to maintain its vacuum during the pan boiling cycle. Vaccum will be controlled with provided Regulating type Single Entry Water control valves.

All these parameters should be sensed and data logging and printing arrangement shall be provided. The entire display and control logging and printing system should be on DCS system and computerised control from air conditioned and dust proof control cabin. The water consumption at the cooling and condensing system should not be more than 1.8 T/TCH.

12.7.3 Feed Control

Feed of syrup or molasses for all continuous pans, based on the conductivity measurement in each cell to ensure boiling super-saturation and existing crystal growth of seed of grain.

Batch pan shall be automatically controlled to maintain desired super saturating level during pan boiling cycle. Feed of syrup/ molasses shall be controlled based on conductivity measurement of messecuite. The conductivity sensor shall be installed at the same level as the proof stick for proper co-relation between sensor reading and operator's checking.

There should be a separate spacious control room fully air conditioned (water cooled system) for providing the computerized control and monitoring and display centre for milling plant, boiler station, turbo alternator station, boiling house station, condensing and cooling system, pan station and centrifugal station etc.

12.8 Common Points

a) **Refinery Section pan will be of MS.**
b) **All new workshop machinery shall be provided (*as per details given in below)**
c) **All new Lab equipment's shall be provided**
d) **2/3 panel of common type /critical shall be in spare.**
e) **Electric motor 5/6 of common type /critical shall be in spare.**
f) **Consumables shall be provided.**
g) **Control panel celling height shall must be 2 feet high from panel top.**
h) **MBC shall be properly covered.**
i) **LAN cables shall be used in DCS.**
j) **Centralized air conditioning system shall be provided for panel room**

*WORKSHOP

Specification of workshop machineries:

To have affective preventive maintenance and timely repair and over hauling during off season of plant the fallowing detailed precession work shop machineries along with their standard accessories are proposed to be installed in the factory premises located work shop:

(i) Lathe machines - (3 Nos.)

S.No.	Particulars	Size	Size	Size
a)	Bed length	30 ft.	8 ft.	10 ft.
b)	Bed width	36"	16"	18"
c)	Height of Centre	34"	14"	16"
d)	Spindle Bone	4"	3"	4"
e)	Swinging gap	92"	42"	52"
f)	Swing over bed	68"	28"	32"
g)	No. of spindle speed	6 Nos.	6 Nos.	6 Nos.
h)	Admid between centre	294"	54"	72"
i)	Leading screw dia	3½"	1½"	1½"
j)	H.P. of motor	20 H.P.	2 H.P.	3 H.P.

Standard Accessories - Face Plate, Center Plate, Steady Rest, Follow Rest, Two More Taper Centre, Electric Motor with Panel Thread Dial, Indicator, Chip Tray Cover, Splash Guard & Spanner Set and other which is not mentioned here.

12.2 Radial Drilling Machines – (One No.)

All geared radial drilling machine complete with standard accessories and electrical having following specifications.

a)	Drilling Capacity mm	60
b)	Motor Power K.W.	3.7/5.5
c)	Taper In spindle M.T.	6
d)	No. of Spindle speeds & range	12 (18-1800 RPM)
e)	No. of Auto Feed	0.12-1.15 MM/REV
f)	Range of Feeds	6
g)	Drill Movement MM	1050
h)	Column sleeve dia MM	400
i)	Min. Drilling ratio MM	675
j)	Max. Drilling ratio MM	1950
k)	Max. Drilling radius MM	1600
l)	Min. Drilling radius MM	575
m)	Drilling Head Traverse MM	1020
n)	Max. Drilling Base Plate to Spindle MM	1500
o)	Min. Drilling Base Plate to Spindle MM	475
p)	Diameter of column Sleeve MM	350
q)	Quantity	One No.
r)	Accessories	Motor, Panel Board & limite switches
s)	Box Table (small size)	Included with machine
t)	Electro Hydraulic Clamping	Included with machine
u)	Coolant Pump	Included with machine
v)	Work light without bulb	Included with machine
w)	Self centring vice 125 mm	Included with machine
x)	End arm support	Included with machine
y)	First fill of oil	Included with machine

2.3 Pedestal Grinder Machine – (One No.)

a)	Wheel MM	250
b)	Motor H.P.	1
c)	Surface Speed RPM	2000

12.4 Shaping Machine – (One No.) :

Shaping machine with Cone Pulley, V. Belt Driven, Complete with Standard Accessories and with Electricals as per the following:-

a)	Length of RAM Stroke in MM	500
b)	Length of RAM without tool slide in MM	1524
c)	Length of RAM bearing in column in MM	902
d)	Width of RAM bearing in column in MM	305
e)	Length of cross slide MM	944

f)	Width of cross slide MM	382
g)	Tool slide traverse MM	152
h)	Horizontal traverse of table MM	660
i)	Vertical traverse of table MM	330
j)	Length and depth of table MM	735x459
k)	Motor Power HP	7.5
l)	Quantity No.	1

12.5 (a) Planner Machines – (One No.)

a)	Table length	3000 MM
b)	Table width	1000 MM
c)	Max. job height	1200 MM
d)	Max. job width	1200 MM
e)	Bed length	6000 MM
f)	Automatic lubrication to 'V'groov	
g)	Automatic lifting arrangement for easy and quick movement of cross slide.	
h)	Two tool post	
i)	With electric motor and panel	

12.6 Pedestal Drill Machine - (One No.)

a)	Drill capacity in steel	20 MM
b)	Tapping capacity in steel	M 12
c)	Morse taper in spindle	2
d)	Spindle traverse in MM	125
e)	Vertical adjustment to spindle head	425 MM
f)	Pillar diameter	76.2 MM
g)	Distance between centre of spindle and column front	200 MM
h)	Max. distance between spindle & table	300 MM
i)	Max. distance between spindle & base	600 MM
j)	Table working surface	370 MM dia with coolant gutter
k)	No of spindle speed	10
l)	Range of speed of spindle	100-142-210-310-450-600-852-1260-1860-2700
m)	Feed	Hand
n)	Drive motor	1 H.P., 1400 RPM

12.7 Power Saw – (One No.)

a)	Capacity of round box	200 MM
b)	Stroke	135
c)	Stroke per minute	100-120
d)	Blade size	14”- 16”
e)	Electric Motor	1 H.P., 1440 RPM

12.8 Welding Machine – (Two Nos.)

a)	Welding current	70 to 350 Amp.
b)	Open circuit voltage	60 – 68 Volts
c)	Load voltage	34 V.
d)	Input	2 phase, 50 cycle, AC Supply
e)	Cooling	Forced Air Cooled
f)	Confirm to	IS:1851/1997
g)	Welding current Regulation	Step less

12.9 Portable Welding Machine – (Two Nos.)

a)	Welding current	10-200A
b)	Working Voltage	220 V
c)	Insulation	H
d)	Cooling	Forced Air Cooled
e)	Technology	IGBT
f)	Features	Thermal Protection against over-heating, Forced Air Cool - for efficient cooling. User friendly controls – Adjustable arc force. Ready to Weld –holder, earth-clamp & cables.

Annexure – B-2

MISCELLANEOUS – CLARIFICATION AND ELUCIDATIONS

1.0 Reducing Valves

Suitable for ultimate capacity of 4900 TCD.
The following along with required for mill, boiler and turbo generator shall be supplied with the machinery items shall be compatible to DCS.

(i) Two automatic steam reducing valve each to reduce pressure of 50,000 kgs of steam per hour from 110 - 104 kg/cm ^{2} g. to 7- 8 kg/cm^{2}g. pressure with suitable automatic desuper-heating arrangement and regulating system to maintain a steady temperature of 175 deg. plus-minus 5 deg.C. of the reduced pressure steam. There shall be provision for adjusting the down steam pressure at any pre-set valve between 7 to 8 kg/cm^2 g the reduced de-superheated steam shall be connected to a receiver with two branches to supply 15,000 kgs.of steam per hour to centrifugals, sulphur burners, mills, clarification equipment and boiling house etc.

(ii) The second branch shall be provided with two automatic steam reducing valve to maintain a steady pressure of 1.5 - 2.0 kg/cm2 g. in the receiver for exhaust steam from the prime movers by injecting steam up to 40000 kgs per hour, in each, after reducing pressure from 7-8 kg/cm2g. Suitable automatic de-superheating arrangement and relating system to be provided to maintain a steady temperature of 130 deg. C. plus-minus 5 deg.C. in the exhaust steam receiver by automatic de-superheating of the entire exhaust and make-up steam The de-superheated steam coming out of the exhaust steam receiver shall be dry.
There shall be provision for adjusting the pressure in exhaust steam receiver at any pre-set valve between 1.5 to 2.0 kg/cm^2 g.

(iii) Two pressure pumps with electric drive of suitable capacity (one standby) for injecting water in the specified reduced pressure steam lines through pneumatically operated control valves shall be provided for de-superheating.

(iv) All the reducing valves shall be provided with pneumatically operated pressure controllers designed to maintain steady pressure with down steam flow rate variation from 10% to 100% of the rated capacity. With overriding control system. One electric driven air compressor with receiver and piping shall be provided for operation of the reducing valves and de-superheaters.
One steam flow meter shall be provided in the high pressure side of the reducing valve system at (b)(i) above .

(vi) One steam pressure recorder capable of recording pressure up to 2.5 kg/cm^2 g. shall be provided in the exhaust steam line near the Evaporator station. A dial thermometer of 150 mm dia and 0-300 deg.C range shall also be provided in the exhaust line. One temperature recorder to record the temperature upto 300 deg.C shall be provided in the exhaust line near the Evaporator station. The system shall be campateable to central control DCS.

(vii) Suitable bypass arrangements as per IBR for each automatic reducing valve to be provided for manual operation. Isolating valves shall be provided to isolate the automatic valve for repairs while working. Steam strainers at upstream side of each reducing valve shall also be provided.

2.0 Pipelines and Fittings

All hot and cold water,, juice, syrup, magma, molasses, massecuite and bled vapours, live steam, reduced pressure and exhaust steam pipe lines shall be suitable for 4900 TCD and all headers shall be designed for ultimate capacity. Various pipelines shall be designed so that velocities given below are not exceeded at 4900 TCD.

(i)	Water and juice	:	Suction 1.0 m/second Delivery 1.2 m/second.
(ii)	Condensate	:	Suction 1.0 m/second Delivery 1.20 m/second
(iii)	Syrup	:	Suction 0.5 m/second Delivery 1.0 m/second.
(iv)	Molasses	:	Suction 0.3 m/second Delivery 0.5 m/second.
(v)	Massecuite/ Magma	:	Suction 0.1 m/second Delivery 0.15 m/second
(vi)	Superheated/ Saturated steam	:	30 m/second
	Exhaust steam	:	30 m/second
	Bled vapours	:	30 m/second
(vii)	Compressed air/ SO2	:	20 m/second

(viii) A maximum pressure drop of 2.0 kg/cm^2 g. shall be allowed from boiler outlet to the inlet of power turbine and maximum pressure drop of 0.10 kg/cm^2 g shall be allowed from power turbine to the inlet of evaporator.

(ix) All pipelines, valves etc. shall be designed for 4900 TCD and not for ultimate capacity, but main exhaust header, inter connecting piping at evaporator and vapour piping to pans shall be designed for capacity of 4900 TCD for 22 hrs. basis.

Safety valves to be provided in the steam pipe lines wherever necessary. Blow off pipes shall extend beyond the roof/factory buildings safety valves in the exhaust and reduced pressure lines shall be butterfly type auto operated compatible to DCS. Suitable drains, valves, steam traps etc. shall be provided in all steam lines, where necessary. High pressure steam manifold of 500 mm shall be provided for ultimate capacity. It shall have additional provision of blind nipple for one additional boiler on incoming side one additional inputs for turbo alternator on outgoing side. It shall have flanged ends.

The pipes shall conform to specifications given below :

(i) Cast Iron Pipes and Fittings :

The pipes shall be class 'B' and shall conform to IS:1537-1976 specifications and integrally cast flanged joints or spun pipes with screwed ends on flanges as per IS:1536-1976 shall be used.

The pipe fittings shall be class 'B' and shall conform to IS:1538 (part I to XXIII) - 1976 specifications. Only flanged joints shall be used. One side of the flanges shall be machined in case all pipe fittings.

(ii) Mild Steel Pipes

All mild steel pipes and pipe fittings used for conveying of air, cold water, to water (except boiler feed water) oil (except oil for hydraulic accumulators), molasses, massecuite, juice, lime, syrup, noxious gases etc. shall conform to IS:1239(part I)-1976 and IS:1239 (part II)-1982 specifications. All juice from mills to inlet to evaporater shall be of SS grade 304 schedule 20 and syrup piping including imbibition juice piping shall be class `C' (heavy) and rest of the piping shall also be of class `C' class (heavey). The thickness of mild steel pipes having diameter more than 200 mm shall be 8 mm.

In case of all piping above 25 mm NB only flanged joints shall be used. All flanges to be as per IS:6392-1971 or to suit connecting prescribed valves.

(iii) Live steam, exhaust steam and boiler feed water piping:

These shall conform to I.B.R. wherever applicable. The thickness of exhaust and vapour steam piping shall be minimum 8 mm in case of 300 mm dia. and above.

The distance between two flanges in straight portion of pipes shall not exceed 6 metres except steam, vapour feed water pipe. In case of bends, flanges shall be provided atleast at one end. All steam expansion bellows shall be of stainless steel tested at 1.5 times the exhaust steam pressure.
Valves shall be provided in each branch line of juice heater,, reduced pressure steam lines, water separator, drain, steam trap etc.
All delivery lines of juice, water and syrup of centrifugal pumps shall have non-return valves except in case of unstrained imbibitions juice pump, lime and Mud pumps, Water connections to be provided at each station for cleaning.
All exhaust steam valves for evaporator and pans shall be right angle valves.
All bearing and oil cooling water to be collected in a masonry tank which shall not be more than 10 metres away from the factory building.

3.0 Supporting steel structure

(i) Necessary staging for all the machinery including supporting columns, integral floor structure, staircases, railings etc. shall be provided. Mills, mill drive, turbo generator, clarifier and lime slaker shall be on R.C.C. staging. Sulphur furnaces shall be on steel staging with R.C.C. flooring. Other machinery except those on floor level shall have its own supporting steel staging.
Pipelines, mill and power house cranes, condensers, flash tanks, cyclone separators can be supported on building columns. No weight of other machinery or platform shall be transmitted to building columns. Mills to have mild steel chequered or perforated or grating flooring. Centrifugals to have chequered plate floor. In the boiling house chequered plate flooring shall be provided. All gangways, passages, staircases,

working platform and railings shall be convenient. Chequerred plate thickness shall be minimum 6 mm.

End columns of pan staging to be similar to intermediate columns to take load of pans to be added.

A clear working platform of atleast 2.0 m. width shall be provided in working front of pans and evaporator bodies. Moving space between pans shall be 1000 mm and in evaporator bodies a distance of 750 mm shall be provided. In case of other units a clear working platform of atleast 1.2 m. width to be provided.

All statutary requirement regarding staging platform staircases, safety devices etc. shall be observed at the design stage.

4.0 General Material Specifications

i) Gun metal used for bushes and bearings shall conform to IS : 318-1965.

ii) White metal used for lining of bearings shall conform to IS : 25-1966.

iii) Phospher bronze castings shall conform to IS: 28-1975.

iv) The mill drive pinions shall be made of cast steel as per IS:2708-1973B Grade III and gear wheels as per IS:2708-1973 Grade II.

v) Cast iron flexible couplings shall conform to IS:2693-1964.

vi) Glass wool for vessels and piping shall conform to IS:3690-1974 type 2. Mineral wool shall conform to IS:5696-1970. The thickness shall be to suit the temperature and diameter of pipe.

vii) Sheet rubber shall conform to type 8 of IS:638-1965. Grades to suit the nature of work.

viii) Compressed asbestos fibre shall conform to IS:2712-1971.

ix) Cast iron sluice valves shall conform to IS:780-1969.

x) Gun metal valves (not used for live steam) shall be heavy duty and shall conform to IS:778-1971.

xi) Plummer blocks used for roller bearings shall conform to IS:4773-1968.

xii) The slide rails for electric motors, if of grey cast iron conform to grade 15 of IS:210-1962. The slide rails shall be as per IS:2968-1964.

xiii) Stirrer shaft for crystallizers, pugmills, magma mixer, lime tanks, sugar melter, juice sulphiter, molasses dilution tank etc. shall conform to 30 C8 of IS:1570-1979 or equivalent, except when mild steel fabricated pipes are used.

xiv) Mild steel plates shall conform to IS:2062-1969 in case of fabricated headstocks, side caps, mill bearings, gear beds, for mill drive and all fabricated parts subjected to steam pressure higher than 1.5 kg/cm2.

xv) Structural steel and mild steel plates conforming to IS:226-1975 or equivalent shall be used for the fabrication of rest of the machinery and equipment.

xvi) All S.S. tubes shall be of grade SS-304 conforming to alloy I.S. 13316 fully annealed after final drawing.

xvii) Shaft mounted high efficiency helical planetary drive shall be M.S. Fabricated / C.S. construction.

xviii) Specification of right angle, double beet valve and Butterfly valve are as follows:-

a) M.S. Fabricated right angle valve

- O/S Yoke type rising Spindle
- S.S. – 410 Spindle
- S.S. – 410 Body Seat

- Flap Seat of EPDM Rubber suitable for 160 deg. C.
- Double Thrust Bearing for Easy Operation
- Without Flange Ends

b) S.S. fabricated double Beat valve

- S.S. – 409 Body heavy duty
- S.S. – 410 spindle
- S.S. body seat with Casted Guide
- S.S. Flap fitted with EPDM rubber
- Flange ends as per Table 'D'

Top and Side flanges of MS

c) Butterfly valve

Item :Centerline (RS) wafer type soft seated butterfly valve

Body :Gray cast iron BS EN 1561 Gr. EN-GJL-250 phosphate and painted upto 300 mm, and sg IRON BS EN 1563 Gr. EN GJS-15 phosphate and painted for size 350 mm and above.

Disc :SS 316 floating disc design

Seat :Grade EPDM field replicable with back metal strip

Stem :AISI type 410

Ends : Water type to get sandwiched between flanges as per ANSI B 16.5 # 150

Method of operations : Manual hand lever operated upto size 150 mm and worm gear wheel operated for size 200 mm and above.

Leakage rate	:	As per ANSI B 16.104 Class VI (100%) leak tight
Shut off	:	Pressure 10 barg
Hyd. Body	:	Test 1.5 x sut off pressure
Hyd. Seat	:	1.1 x shut off pressure

5.0 General

The Plant and Machinery is to be according to the guide line specifications for 4900 TCD, plant finalised by the govt. Of India and should incorporate the fallowing

1) In designing factory building and engineering layout criterion should be attached to local wind direction to ensure the following. General layout of plant and machinery shall show equipment for ultimate capacity.
   - Effective natural ventilation of Power House.
   - Non contamination of circulating waters by acidic agents.
   - Statutory requirements of pollution preventions.
2) The factory floor levels as well as injection channels and cooling tower levels shall be decided to suit the topography at the Sugar Plant site.
3) Eves height of bagging house shall be to facilitate Sugar bins installation .
4) Plant and machinery to confirm to all State and Central laws.
5) All the cranes in the Sugar Plant (including cane unloader) should have box type bridge girders (and not lattice type). All the gear boxes installed on the cranes should be helical type having hardened and ground teeth, subjected to purchaser approval.
6) The O&M manuals, drawings, specifications etc. should be supplied by the Seller to the Purchaser 4 months before the scheduled date of commissioning of the Sugar Plant and should also include the following:

   i) List of Ball/Roller bearings fitted in the Sugar / power plant (equipment wise stating bearing Nos.)

ii) List of all electric motors installed in the Sugar Plant (equipment wise stating motor type, H.P., RPM etc.).

List of all VFD's installed in the sugar / power plant with specification.

List of all valves / NRVs installed in the sugar / power plant with specification stating duty.

iii) List of all Reduction gear boxes installed in the Sugar Plant (equipment wise stating gear box type, ratio, H.P., rating, service factor etc.)

iv) List of pumps installed in the Sugar Plant (pump type, duty, discharge, total head etc.)

v) List of all coupling bushes, oil seals etc. fitted in the Sugar Plant (stating size wise qty and equipment name where the part is fitted).

7) The Sellers shall not make the use of building columns and trusses for lifting weights of machinery during erection. Factory building structure should not be used as stating for any items of machinery and equipment (except mill and power house cranes & piping).

8) All the Grit catchers in the Sugar Plant should be 800 mm dia. x 1000 mm height – shell 8 mm thick, bottom 10 mm thick, cover plates 20 mm thick. Covers should be hinged and cover holding bolts should be 25 mm dia. The bucket screens should be made of 3 mm thick. AISI 304 quality S.S. and should have sturdy handles for lifting.

9) Condensate outlet pipes from various units to have sight glasses at eye level in addition to sight glasses in extracting columns. Test cocks should also be provided for taking out condensate samples.

10) Test cocks should be provided in condensate outlets of all units individually for testing water for sugar traces. All the condensate pumps delivery lines should have 50 mm NB connection with a valve to let out the water in the drain, as and when sugar traces are found in the condensate.

11) Size of Condensate Receivers for Juice heaters and Evaporators shall be not less than 400 mm dia x 1200 mm height – Shell 8 mm thick, bottom 10 mm thick. Size of syrup receiver shall not be less than 1200 mm dia x 2000 mm height – shell and bottom 10 mm thick.

12) The RPM of the motor of the condensate extraction pumps should not be more than 1500.

13) Heating surfaces of juice heaters evaproator bodies, pans and boilers shall be calculated on the basis of mean diam and effective tube length with contact of heating fluid.

14) All the pumps of juice, lime and syrup should be provided with suitable catchers in the suction side. Also, juice delivery lines should be provided with non-return valves.

15) All the centrifugal pumps should have stop and non-return valves in the delivery pipes.

16) Centrifugal pumps: The service water pumps, injection and spray water pumps, syrup pumps, melt pumps should be bronze fitted. Otherwise these and other (except at mill house) centrifugal pumps should conform to IS-5659 and IS-5120 specifications.

17) All the vapour line of the pans and last body of the evaporators should be provided with a manhole to enable accessibility inside the vapour lines for cleaning and painting purposes. One 100 m dia x 150 mm long nipple should be welded in the vapour pipe along with a blind flange to enable water filling of the vapour line.

18) The diameter of the pipes for filling water into bodies and calandrias of evaporator and pans should not be less than 100 mm size.

19) All the valves for massecuite and magma lines should be of rising spindle type only and shall have S.S. internals and S.S. spindle.

20) All massecuite, magma and molasses lines at crystalliser and centrifugal stations should be provided with suitable size steaming arrangements along with non-return valves. Vapour from 1st vessel of quintuple shall be used.

21) The sluice/right angle valves used in exhaust steam and vapour pipelines shall have stainless steel internals and S.S. spindles.

22) Suitable capacity steam traps shall be provided in the exhaust line for the outlet of the condensate.

23) Steam flow meter of indicating, integrating and recording type shall be provided for PRDS shall be compatible to DCS.

24) Temperature recorders for raw, sulphited juice, evaporator exhaust steam, injection outlet/inlet water and vacuum recorder for last body of evaporator shall be provided at appropriate place, compatible to DCS.

25) For lagging the equipments, pipes and fittings etc. of the sugar plant as per specifications the Sellers scope of supply should be as follows:

All the equipments and pipelines (including fittings as defined under Clause 6 of IS:7413 specifications), surfaces in the sugar plant above 55 deg. C. temperature should be effectively lagged (except where heat dissipation is desirable and the surfaces which become hot intermittently such as steam traps and relief valve outlet pipes, vents, blow-down pipes etc.)

Material to be used:

i) For lagging: Factory made mattresses of Mineral wool (LRB mattresses) as per IS:8183 – (latest issue) specifications. The bulk density of the material should be:

100 kg/m^3 for hot surface temperatures upto 250 deg. C.

120 kg/m^3 for hot surface temperatures above 250 deg. C. but upto 550 deg. C.

(as per clause 3.2 of IS:8183 – (latest issue) specifications)

The thickness of the lagging should be such that the difference between temperature measured (at any time during the maintenance warranty period as per clause 22 of the draft agreement) at any point on the outer surface of the lagging cladding (i.e. protective finish) and the ambient temperature at that time should not exceed 10 deg. C.

ii) ***For protective finish***:

Material for cladding of all lagging in the sugar plant should be 22 gauge aluminium sheet cladding (as per IS:7413 standard specifications) (except as follows). It includes fixing of 'L' lugs, M.S. flat rings, wire netting stitched with lacing wire and fixing of aluminium sheet with the help of self taping screws and grooving all joints with necessary overlap to make it completely water proof.

a) The valves and flanges (including the flanges of the equipment) to be lagged shall be provided with openable lagging boxes for valves and fittings of the HP steam lines (including boiler plant) openable boxes shall be out of 18 SWG thick aluminium sheets as per IS:737 designation 31000 condition H3.

b) All the turbines lagging should be provided with boxes of 3 mm thick Aluminium sheets. Lifting block should be provided for these boxes.

iii) ***Balance materials (not specified above) should be as per IS:7413 specifications.***

Application and finishing of the lagging materials, protective coverings etc. should be carried out by the Seller as per IS:7413 (latest issue) specifications.

26) All maintenance tools, tube expanders etc. to be supplied by the Seller to the Purchaser as per scope of supply stipulated under this Agreement should be brand new and should not be those used by the Seller for erection and commissioning of the Sugar Plant.

27) All nuts and bolts and non-return valves should be as per ISI specifications.

28) In cases tensile strength or solidily has been mentioned the supplier shall submit a suitable certificate of the same from original manufacturer/Govt. approved testing laboratories/Govt. Engineering Colleges.

29) Suitable arrangements shall be provided for continuous sampling of following

Primary juice
a) Last mill juice
b) Mixed juice
c) Clear juice
d) Unsulphited / Sulphited syrup

6.0 INSTRUMENTATION AND AUTOMATION

Statutory Requirements

6.1 Online Conductivity Measurement of condensate water

i) To ensure the computability the sensor and transmitter shall be of same make.

ii) Well-designed and fabricated sampling system for each line shall be provided along with alarms and indication at DCS for sugar contamination. Exhaust condensate shall drain automatically in case of sugar traces in condensate.

6.2 DCS control rooms and Instrumentation panel

Factory shall have AC control rooms for different houses for centralised control. DCS control rooms of each house control their operations but indication/display shall be made available to other control rooms.
All the panel mounted instruments which are integral part of the following control and measurement systems shall be housed in a well designed, fabricated and wired instrumentation panel.
All the panel mounted instruments which are integral part of the following control and measurement system shall be housed in a well designed, fabricated and wired instrumentation panel.
- Auto Cane Feed Control System
- Auto milling controll
- Automatic Imbibition Water Flow and Temperature Control System
- Online Mass Flow Meter for juice and water
- Automatic pH Control System for Juice Defecation
- Online Brix Indicators
- Automatic Brix and Temperature Control of Molasses Conditioner & melter
- Online conductivity measurement of condensate water- For exhaust condensate only.

- Automatic massecuite level control in pug mill
- DCS Boiler Instrumentation, Automation and control system.
- Turbine DCS supervisory and control system.
- Massecuite feed control for continuous centrifugal machine

6.3 Microprocessor based Datalogger

For recording various process parameters like pressure, temperature, flow level etc. at various equipments in the boiling house two numbers µp based 32 channels data loggers specifications with 80 column dot matrix printer/132 column dot matrix printer/inkjet printer having following specifications shall be provided : one at evaporator floor and the other at pan floor.

Specifications

1.	Input	:	Universal
		a)	Thermocouple as per DIN 43710 (other than standard on request) (J,K.E,R,S,T,N,B grounded or ungrounded) Input resistance ≥ 1M
		b)	RTD PT - 100 as per DIN 43760 (Excitation current ≤ 2.5 mA)
		c)	Electrical signal (0/4-20 mA, 0/1-5 V.DC) Input resistance ≤250 for current input Input resistance ≥ 500 K for voltage i/p
2)	Display & Internal Scan Time	a) b) c) d)	3 ½ digit, ½", 7 segment LED display for process variable. 2 digits, ½", 7 segment LED display for channel no. 16 x 2/20 x 2 backlit LCD 50 m sec. per channel
3)	Range & Accuracy	:	Keyboard configurable for each channel separately with reading accuracy of 0.25% of F.S.
4)	Alarm facilities	:	2 settings (HI & LO) per channel over entire range, Facilities alarm output (NC/NO), programmable alarm acknowledgement & alarm status (bicolor LEDs) for each channel shall be provided.
5)	Broken Sensor	:	Indicated by displaying error message on display
6)	C.M.R.R	:	120 db
7)	Memory	:	It shall be possible to retain the user interaction memory for more than six months in case of power failure
8)	Operating Temperature	:	0 to 50°C with maximum ± 0.015% /°C drift
9)	Mains supply	:a)	230 V AC, ± 10%, 50 Hz, single phase (Standard)
		b)	110 V AC, ± 10%, 50 Hz, single phase (Optional)

10)	Communication Port	a)	RS 232 or RS 485 with Modbus RTU protocol for PC communication
		b)	Centronic parallel port for printer (log & print interval shall be user configurable with different print options)

6.4 Documentation

The following documents shall be sent to the Purchasers' Consultant for approval.

- Instrumentation hookup diagram.
- P & I diagram.
- Specification of instruments i.e. Range, make etc.
- Orifice plate design calculation data sheet as per BS 1042 for flow meters.
- Control valve sizing and Cv calculations.
- Instrument control panel cutout, foundation and panel wiring drawing.
- List and specification of erection material.

* Impulse tubing shall be of SS316/304 15 NB sch 40 pipewith SS isolating and drain valves.

* Instrument cables from field transmitters to panel shall be 1.5 mm x 1 pair armoured Cu signal cable.

* Field Junction boxes to DCS panels will be 1.5 sq.m(6 pair/12pair/2pair) Armoured Cu signal cable.

The following documents shall be submitted in triplicate along with instruments to the end user :

- Erection drawing and instrumentation calibration and test reports.
- Operation and servicing manuals.

6.5 Central data acquisition system

It shall be possible to connect all the data loggers to the centralised PC based data acquisition system.

6.6 Instrumentation Control Rooms

To achieve the desired working performance of various instrumentation measurement and control system even under extreme conditions like shock, vibrations, humidity, electrical interference installation of instrumentation panel shall be done in well designed and constructed rooms as per the standard instrumentation practices.

Annexure-B-3

a) **List of approved supplier for critical equipments**

b) List of approved supplier of important equipments

c) Various pump and their materials of construction (M.O.C.)

d) Modern laboratory supplied for analysis required to be carried out in sugar factory.

ANNEXURE-B-3a

LIST OF APPROVED SUPPLIERS FOR CRITICAL EQUIPMENTS

SL. NO.	NAME OF EQUIPMENT	NAME OF SUPPLIERS
1	MILLS	ISGEC/ THYSSEN KRUPP IND./ WIL/ FCB-KCP/ UTTAM/KAY-BOUVET/HITECH PUNE/ULKA/SS ENGG.
2	BOILERS	ISGEC/ THERMAX / WIL/FCB-KCP/ THYSSEN KRUPP IND./UTTAM/ HITECH
3	POWER TURBINE	TRIVENI/ SIEMENS/BHEL
4	ALTERNATOR	KIRLOSKAR/ TDPS/ SIEMENS/BHEL
5	CENTRIFUGAL MACHINES	KCP/ WIL/ THYSSENKRUPP
6	CENTRIFUGAL MACHINE ELECTRICAL PANELS	FARMOPLASTIC/ABB
7	CLARIFIERS	UNIVERSAL HEAVY ENGG./ SIMPLEX MEERUT /HI-TECH MEERUT
8	VACUUM FILTERS	UNIVERSAL HEAVY ENGG. / SIMPLEX MEERUT /HI-TECH MEERUT
9	SUGAR GRADER	IC MAKE/ BEVCON
10	VACUUM PUMP	KAKATI/KIRLOSKAR/PPI/TMVT
11	BOILER FEED WATER PUMP	KSB/SULZER
12	CENTRIFUGAL PUMPS	KIRLOSKAR/SINTECH GHAZIABAD/WILO MATHER
13	MILL DRIVE	KIRLOSKAR/CROMPTON/SIEMENS/ABB/YASKAWA
14	COMPRESSOR	KIRLOSKAR/INGERSOL RAND/ATLAS CAPCO
15	(a) ELECTRIC MOTORS (b) CRANE DUTY ELECTRIC MOTOR	KIRLOSKAR/ CROMPTON/ SIEMENS/ HAVELLS INDIA/ABB
16	VVV FD MOTORS FOR MILL DRIVE and OTHER DRIVE	ABB/ SIEMENS/ DANFOSS & their system houses/YASKAWA
17	OTHER PUMPS	KIRLOSKAR/ SINTECH GHAZIABAD / GITA/ RISANSI/ PSP/WILO MATHER
18	MILL GEAR BOX	ELECON/ PREMIUM/ WIL/TRIVENI
19	ROPELESS COUPLING	JPMA/EURO GEAR
20	DCS-MICROPROCESSOR SYSTEM	ABB/ SIEMENS/ YOKOGAVA/ HONEYWELL/ ROCKWELL
21	VF DRYER/FBDC SYSTEM	VS Project
22	ELECTRICAL PANEL	ABB/SIEMENS/SCHNEIDER ELECTRIC
23	VVVFD	ABB/SIEMENS/SCHNEIDER ELECTRIC/YASKAWA

ANNEXURE-B-3b

LIST OF APPROVED SUPPLIERS OF IMPORTANT EQUIPMENTS

1.	Thyrister Controls/ Invertor for AC/DC electric motors	- KIRLOSKAR/CONTROL TECHNIQUES/ HI-REL ELECTRONICS PVT. LTD./ DAN FOSS INDUSTRIES (P) LTD./AMTECH Electronics /PARKER HANNIFIN/ CROMPTON GREAVES/ VACON DRIVES AND CONTROLS PVT. LTD./ABB
2.	Brass Tubes	CUBEX / INDOFAB/ MEHTA TUBES / ACCENT METALS / METALS ALLOYS/ AISHLONI/MULTIMETELS
3.	Weighing Machine	a) Sugar – AVERY b) Checkwigh - AVERY/ BHARAT/ PRECISION/ AVON/ ASSOCIATED SCALES COMPANY.
4.	Stitching Machine	JUKIE/ STITCHWELL/ QUALITEX/ SINGER.
5.	Mills, Boiler Feed Water & Fibrizer Turbines	TEW/GUJARAT PRIME MOVERS
6.	Cane Unloader	UTTAM/ RACHITECH/ AUTOMECH/ SAISIDHA/SAI ENGINEERS & MACHINERY Pvt. LTD.
7.	Feeder Table	TECHNOCRAFT/ SIMPLEX/ SAISIDHA/ SAI ENGINEERS & MACHINERY Pvt. LTD.
8.	Cane Carrier & Feeder Table variable drive	GREAVES COTTON/ DYNASPEDE/ SERVODRIVE/ DYNODRIVE/ POWERMAG CONTROL SYSTEM PVT. LTD.
9.	Diesel Generating Set	DIESEL ENGINE: CUMMINS/KIRLOSKER/CATERPILLAR/ JACKSON ALTERNATOR : KIRLOSKAR/ NGEF/ CROMPTON / CUMMINS
10.	Enclosed Worm Gear Boxes	ELECON/ RADICON/ NEW ALLENBERRY/ SHANTI/ CPEC/ ESSENTIAL/ PREMIER.
11.	HP Steam Valves	BV VALVES/ LEADER / NETA VALVES/ STEEL STRONG VALVES/TECNIK VALVES PVT.LTD./ MICON VALVES (INDIA) PVT.LTD./ KSB/ BDK/ AUDCO / BHEL
12.	Electric Cables	KEI/POLYCAB/GLOSTER/POLYVION/POLYCORE/GRANDLAY/HAVELLS
13.	Instruments for Boilers	DATE PROCESS (PROCON)/ ROSE MOUNT/ ENCARDIO-RITE/ NIVO-CONTROL.
14.	Steam Pressure reducing & desuper heating station	MIL CONTROLS (CONTROL VALVES ONLY)/ CHEMTROL ENGG./VRL/ SAI ENGINEERS & MACHINERY Pvt. LTD.
15.	Stainless Steel Tubes	QUALITY/ VISHAL/ LEELA TUBES / DIVINE TUBES / SHUBLAXMI METALS & TUBES / SCORODITE/ MAXIM / ARVIND PIPES & FITTINGS / SLS TUBES / HINDUSTHAN INOX / MODERN TUBES / BHANDARIFOILS/STEAMLINE INDUSTRIES LIMITED/ SALASAR STAINLESS LIMITED/APEX

16.	Switch fuse Units	CONTROL & SWITCHGEAR / ELECTRIC CONTROL GEAR/ HAVELLS INDIA/ HPL-INDIA (LK-HPL BRNAD)/ SCHNEIDER ELE.INDIA PVT. LTD./ CRYSTAL/ C&S CONTROLS/ L & T / SIEMENS/ABB
17.	Air Circuit Breaker & Contactor & Relays	MEI/ KIRLOSKAR SYSTEM LTD., BANGALORE/ CROMPTON GREAVES/ BHARTIYA CUTLER HAMMER/ TELEMECANIQUE (for contactors only)/ CONTROL & SWITCHGEAR/ ANDREW-YULE/ ROCKWELL (UPTO 72 AMPS.)/ C&S CONTROLS/ L & T / SIEMENS/ ABB/HAVELLS
18.	CI Valves (Sluice, Globe & non-return)	CALSENS/ LEADER /JUNEJA METAL / STEAM & MINING/ BARMECHA/ KALPANA/ SONDHI INDUSTRIES/ KARTAR VALVES / CRANE PROCESS (SAUNDERS & BUTTERFLY) / NETA VALVES / PURI INDUSTRIES/ V.A.VALVES.
19.	Automatic Sugar Conveying, Weighing & Bagging System	NITIRAJ (ELECTRONIC)/ R.K. ENTERPRISES/ POWER BUILT/ R.B.TECHNOCRATS & RECLAIMERS PVT.LTD. /ELECON EPC
20.	G.M. Valves	SANT VALVES/ LEADER / PUNJAB METAL WORKS
21.	Micro Processor based Control System (Automation)	DCM Data Products / VRL AUTOMATION
22.	Hydro pneumatic Accumulators	EPE/ HYDACHYCOM (IND) PVT. LTD.
23.	Conveyor Chains	LAL BABA/ SWAJIT/ ROLCON/ GEE ESS/ SIJ/ TECNO- TACK ENGG./ LG BALAKRISHNAN/ RAJ AMAR/KAY KAY
24.	Soft Starters	JAYSHREE/ CONTROL TECHNIQUES/ ABB/ SIEMENS
25	EOT/HOT Cranes	HEBENKRAFT (EOT & HOT)/ SAI ENGINEERS & MACHINERY PVT.LTD./ RACHITECH/ AUTOMECH/ ROCKWELL HOISTO
26.	All Bearings	SKF/FAG.
27.	Planetary Gear Box	DYNASPEDE INTEGRATED / TOP GEAR TRANSMISSION / KAVITSU TRANSMISSION/ MAGTORQ/ PREMIUM
28.	Air heater tube	TATA
29.	Condensing and cooling system	M/S. SHAMRAJ ENGG. WORKS/ SPRAY ENGINEERING DEVICES LTD.
30.	Power Transformer	M/s. Emco Ltd./VOLTAMP/RIMA
31.	Material Handling System	M/s. Solid Material Conveying Systems./TEKNIK/METHODS/BELCOSYS
32	Mass flow meter / Magnetic Flow Meter	Emerson/YOKOGAWA/KROHNE MARSHALL/ABB
33	Donnelly Chute level sensor/ Transmitter	Energy Venture/ALPHA CONTROL
34	Mill Roller Lift sensor/ Transmitter	Energy Venture/ALPHA CONTROL
35	Globe Control Valves	Pneucon /MIL / Uniflow control

36	Butterfly Control / On-off Valve	Pneucon / Bray /Uniflow control/L&T
37	Pressure Transmitter	Yokogawa /Emerson /ABB
38	DP/Level Transmitter	Yokogawa /Emerson/ABB
39	Temp. Transmitter	Yokogawa /Emerson/ABB
40	Brix Transmitter(THERMOWAVE TYPE)	Berthold/EMERSON
41	PLC	Allen Bradley/ Yokogawa/ABB / Siemens
43	UPS	HIREL /EMERSON
44	Ultrasonic Level Transmitter	E&H/ Siemens
45	RTD / Thermocouple	Pyro Goa / GIC /TEMPSON/TIPL
46	Temperature / Pressure Gauge	Pyro Goa / GIC/FERBES/MARSHALL
47	Flow Element – Flow Nozzle/ Orifice	Delta/ Micro/PRECISION
48	Instrumentation Cables	KabKonnect/ LAPP/Thermopad
49	Solenoid Valves	ASCO / Rotex/FIESTO
50	SWAS	Steam Equipment/ Emerson/Yokogawa
51	Pressure Switch	Switzer/ Orion/DANFOSS
52	pH Transmitter/ Analyser	Teledyne- SEPL / Yokogawa / Emerson/ABB/HACH
53	Conductivity Analyser	Teledyne- SEPL / Yokogawa/ Emerson/ABB/HACH
54	G.P. ELECTRODE AS PER 6013 GRADE(I.S.I MARKED)	ADWANI/L&T/ESSEN/ D&H
55	CCTV	D-LINK/Panasonic/Honeywell

ANNEXURE-B-3c

Various pump and their materials of construction (M.O.C.)

PUMP APPLICATION	M.O.C.			
	CASING	IMPELLER	SHAFT	SLEEVE
VARIOUS JUICE PUMP	CF8	CF8	SS410	SS410
IMBIBITION WATER PUMP	CI	CF8	SS410	SS410
CONDENSATE PUMP	CI	CF8	SS410	SS410
ETP WATER PUMP	CI	CF8	SS410	SS410
ETP ASH WATER PUMP	H.CR	H.CR	SS410	SS410
SLURRY WATER PUMP	H.CR	H.CR	SS410	SS410
LIME PUMP	H.CR	H.CR	SS410	SS410
INJECTION PUMP	CI	CF8	SS410	SS410
SPRAY PUMP	CI	CF8	SS410	SS410
SUPERHEATED WASH PUMP	CI	CF8	SS410	SS410

ANNEXURE-B-3d

Modern laboratory shall be established for analysis required to be carried out in sugar factory.

Well equipped laboratory with a facility to analyse water, Mill house, boiler, sugar house products which includes ICUMSA value, all special analysis, boiler water, condensate water, evaporator scaling and BOD, COD, TDS testing / analysis for ETP plant etc. along with desired chemicals and apparatus shall be provided **as given below.**

Standard Sugar Lab Equipment & Apparatus requirements:

SN	Lab Equipment	Purpose of the analysis
1	Mechanical Stirrer for sugar solution for 20 sample	Preparing Sugar Solution
2	Double Distillation Plant (5 litre)	For preparation of Distilled Water for preparing Reagent
3	Hot Air Oven	For Mositure
4	Viscometer	For measurement of Viscosity of Massecuite
5	Digital Pipette	For Titration analysis
6	Digital Burette	For Titration analysis
7	Tyler Mesh	For measurement of Grain Size
8	Lab Crusher	For Cane Analysis & Juice Extraction
9	Vacuum Pump	For Vacuum Filtration
10	Vacuum Filtration Assembly	For filtration of Sugar Solution
11	Water Bath	For maintaing temperature
12	Digital Weighing scale	for weighing
13	pH Meter with Stirrer	measuremnt of pH
14	Conductivity Meter	measuremnt of conductivity
15	Spectrophotometer with double beam	For colour, pHosphate, Dextran, SO2, Absorbancy, etc.
16	Hot Plate with thermometer	For Heating
17	Hand Refractometer	For measuring Cane Brix
18	Digital Microscope	Measuring the crystal size
19	Vacuum Oven	For sugar Moisture
20	Rain Gauge	For rain measurement
21	Dessicator	For cooling of material
22	Turbidity Meter	Turbidity Measurement
23	Rapi Pol Extractor	Bagasse Pol measurement
24	Magnetic Stirrer with magnetic rod	For dissolving sugar.
25	Wet & Dry Bulb Thermometer/ Digital Humidity Meter	For Humidity Measurement
26	Maximum & Minimum Thermometer	Max. & Minimum temp measurement
27	Digital Thermometer	For Temp measurement
28	BOD Incubator	For BOD measurement

29	COD Photometer (Analyser)	For COD measurement
30	Refrigerator- 250 Liter	For storing Reagent
31	Sieve Shaker with speed regulator	for Grading measurement
32	Dirt Correction Apparatus	For measuring Dirt in Juice
33	Bomb Calorimeter	For measuring GCV of bagasse
34	Digital Polarimeter	For testing of Pol in cane

Annexure-B-4

a. Revised Consolidated Procedure for Inspection of sugar and brand new machinery by officers of NFCSF

b. Consolidated list of items of plant and machinery being inspected at manufacturers works during the course of manufacture and before despatch

c. Revised list of items of plant and machinery which do not require pre-despatch inspection effective from 1st Nov. 2009

Annexure-B-4(a)

E-MAIL Id.: nfcsf@yahoo.co.in PHONE No:011- 26263425,
GRAM : FEDSUCOP FAX No. : 011-26263658.

**NATIONAL FEDERATION OF COOOPERATIVE SUGAR FACTORIES LIMITED,
ANSAL PLAZA, BLCOK-C, 2nd FLOOR, AUGUST KRANTI MARG,
NEW DELHI – 110 049.**

Ref.No. IA-1(b). **Dt. 1st Nov.2009**

REVISED CONSOLIDATED PROCEDURE FOR INSPECTION OF SUGAR PLANT AND BRAND NEW MACHINERY BY OFFICERS OF NFCSF EFFECTIVE FROM, 1st NOVEMBER-2009.

1.0 GENERAL

1.1 Whenever there is no particular reference in the agreement about IS/ISO Standards, the equipments/units should be manufactured/fabricated strictly in accordance with Latest IS/ISO Standards.

Inspection at Manufacturer's workshop prior to dispatch

The machinery and equipment to be inspected by NFCSF, at manufacturer's works prior to despatch. The inspection call from OEM/Sub-Vendor should be enclosed with Internal Inspection Report duly signed by Sub-Vendors authorized person and OEM's representative.

1.4 During the course of inspection at manufacturer's workshop, the manufacturer will make available the following test certificates in respect of raw material for verification.

Material Test Certificate giving chemical composition, physical properties such as ultimate tensile strength, Elongation %, yield strength, hardness of finished product etc. in respect of steel forgings, steel castings, boiler drums and tubes, brass tubes, stainless steel tubes steam piping and valves, components of conveyor chains, gun metal parts of mills, C.I. shells for mill and GRPF roller/underfeed roller, drive and driven shafts of various equipments, various components of turbines, baskets and shafts of centrifugal machines, enclosed gear boxes and alternator etc.

1.5 At the time of inspection, the manufacturer will provide, free of cost, instruments, measuring devices such as straight edge, micrometers, DP test chemicals, line dori, verniers, calipers, 'GO' and 'NO GO' gauges, hardness tester, ultrasonic testing instrument, stroboscope, vibration meter, noise level measuring instrument, dial gauge, feeler gauge, drift expansion/flattening test facility for various tubes, breaking load test and hydraulic test facility or any other instrument or test facility as may be required.

1.6 For Electrical Items, the manufacturer will provide, free of cost, the instruments such as Secondary Injection Kit, High Voltage Testing Instrument, Megger, Kelvin bridge,

Vibration meter, Stroboscope, Phase sequence tester, Voltmeter, Ammeter, or any other instrument or test facility as may be required.

1.7 Chains for cane carrier, rake carrier, rake type intermediate carrier, feeder table, bagasse elevator, bagasse carrier, cross carrier, RBC etc. As per latest IS 8465& I.S.-8466 – Inspection will be carried out by NFCSF on samples drawn at random for dimensions , break loading test, measurement of hardness for pin, bush, roller etc. cumulative pitch verification 0.025 percent of nominal chain length of 3000 mm and fabrication and welding quality & chemical composition and test report for each component .

1.8 Cane Carrier, auxiliary carrier, rake type intermediate carrier, bagasse elevator, bagasse carrier, RBC and cross carrier.

- Dimension verification of structure, fabrication and welding quality will be inspected.

- Dimensional checking of assembled drive and driven shafts with sprockets, measurement of hardness of shafts, C.S. sprocket, profile of sprocket etc. Scrutiny of material test certificate for cast steel sprocket, Drive and Driven Shafts etc.

- Witnessing ultrasonic testing of drive and driven shafts.

1.9 For Stainless Steel Tubes, Brass tubes and boiler tubes, following inspection shall be carried out by NFCSF.

(i) Dimensional checking of random samples.

(ii) Witnessing Destructive Testing of sample tubes drawn at random, for tensile strength, flattening test, flaring test, reverse bend test, elongation test, acid test as per procedure of IS:13316-1992 for SS tubes, IS 407 for brass tubes and relevant IS/BS code for boiler tubes.

(iii) Verification of material test certificates furnished by manufacturer.

(iv) Witnessing hydraulic testing of random samples of SS/brass/boiler economiser & superheater tubes.

(v) For Boiler Tubes Verification of IBR test certificates, IBR stamping and heat numbers marked on the tubes, hydraulic test certificate.

1.10 Manufacturers shall also provide dynamic balancing test certificate for high speed rotating parts, wherever required.

1.11 The Inspecting Officer of NFCSF shall be within his rights to bring to the notice of the manufacturer/sellers, any defects and deviations observed from the approved drawings/agreement specifications/ standard engineering practices/relevant Indian/British/ DIN/ API codes etc. and the manufacturer/Seller shall be required to rectify such defects and deviations at their own cost. Such inspection by NFCSF or its nominees shall not absolve the manufacturer/sellers from their responsibility of supplying the machinery and equipment in accordance with the terms and conditions of the agreement.

1.12 The OEM/Sub-Vendor shall arrange test motors, gear boxes for witnessing, no load running trial of their equipment.

2.0 PARAMETER FOR INSPECTION AT MANUFACTURER'S WORKS (ANNEX.A)

2.1 MILLING TANDEM

2.1.1 Cane Unloader

- Checking up of calculations for deflection, modulus rigidity etc. for which calculations to be submitted with drawings in detail by the manufacturer prior to fabrication of unloaders/cranes.

- Stability certificate for safe working be submitted from Registered Chartered Engineer.

- Dimensional checking for bridge, viz span, camber, rail gauge, stoppers, shafts, wheel dia, brake drum dia, rope drum dia, diagonal measurement of LT wheel centers.

- Witnessing deflection test - for two motion crane with 15 T load plus two trolleys at center of the bridge. In case of 3 motion crane load of 7.5 T plus one trolley a the center of the bridge or in case of two trolleys on one bridge of 15 T plus two trolleys at centre.

- Water level check of bridge for camber.

- Checking up of components like motor, gear box and service factor, brake thrustor, pulleys, grab, starters, relays, S.F. units for make, duty parameters etc.

- Witnessing no load running and LT shaft and trolleys drum etc. for checking of L.T. speed, by counting speed of L.T., shaft revolution, C.T. and Hoist speed in terms of metres/sec., material test certificates for each components.

- Scrutiny of test certificates furnished by respective manufacturer for motor, gear box, rope etc. for its duty parameters. Testing shall be witnessed as per procedures described in IS 3177 & IS 807 of latest amendment and for motors IS 4722-1968/325-1978.

2.1.1.1 Hydraulic Truck Tipler

- Verification of dimensions,as per drawing, hydraulic system, no-load running trial of the tippler for its operation such as oil pressure, inclination of the tippler at extreme position, various. Components and its make as per agreement, and safety aspect etc.

2.1.2 Feeder Table

- Checking of various dimensions of drive and driven shafts with sprockets etc.

- Inspection of chains as per procedure detailed in para 1.7

- Witnessing no load running trial.

2.1.3 Cane Carrier, auxiliary carrier and rake carrier.

- Refer para 1.7 & 1.8

2.1.4 Cane Kicker, Chopper, Cutter, Leveller, Shredder and Fibrizer.

- Checking measurements as per manufacturer's drawings.

- Witnessing measurement of Hardness of shaft, hub, hammer, knives and anvil.

- Checking of weight of hammers and knives sample drawn at random for equal ness of weight.

- Checking assembly and static balancing for rotor assembly of kicker, chopper.

- Checking rotor assembly and witnessing dynamic balancing for fibrize leveller and cutter, with hammers and without hammers/knives.

- Scrutiny of material test certificates furnished by manufacturer of shaft, steel for hub, knives, anvil etc.

- Witnessing ultrasonic testing of all shafts.

- Checking for dimensions of bearings, plummer blocks,

- Verification of HP rating of couplings and gear box. Selection Details to be submitted and got approved prior to manufacture. of the said equipment.

2.1.5 Rake Type Intermediate Carriers

- Refer para 1.7 & 1.8

2.1.6 Mills including pressure feeder and under feed roller.

- Checking for dimensions and clearances of mill duly assembled with head stock, wear plate, bearings, side and top caps. However, in respect of firms manufacturing mill of a particular size for the first time, the mill to be assembled along with rollers, crown pinions, trash beam , trash plate , top& discharge scrapers and Hydraulic top cap etc. at its workshop.

- Checking various dimensions for various components.

- Witnessing the measurement of hardness for cast steel crown pinion (IS:2708 Grade- III), roller shafts (IS:1570-1979), roller shells (IS:11201-1985), tail bars.

- Witnessing hydraulic testing of bearings at 5 kg/cm sq. g and top cap duly assembled with ram at an oil pressure of 350 kg/cm sq.

- Witnessing of ultrasonic testing as per ASTM level 3 for mill roller shafts, pressure feeder roller shafts, underfeed roller shafts, crown pinions and tail bars.

- Hardness and MTC for steel casting.

- Tooth profile checking with template for crown pinions.

- Checking bore with micrometer with prescribed limits and key way profile with template of full size.

- Accuracy of pitch of roller grooves and grove profile with template and matching of trash plate on feed roller.

- Scrutiny of material composition and heat treatment certificates for steel castings, forgings and fabricated beds and Verification of marking of Heat No. on various components.

2.1.6.1 Witnessing no load running trial of rotary screen assembly with its drive.

2.1.7 Mill Drives

(a) Turbines for driving mills, fibrizer, shredder and feed water pump turbine

- Witnessing the no load running trial and checking up safety system for each turbine fitted with its primary gear box and forced lubrication system and direction of rotation with reference to mill layout.

- Verification of test certificates for hydraulic testing of casings, rotor material test certificates, balancing certificate of rotor, blade surface crack and verification of Heat no, Serial No. of rotor and casing of turbine etc.

- Checking up of protective devices functioning while running at Rated Speed , at No-Load, such as Over Speed Trip, Low Lub-Oil Pressure, High Exhaust Pressure, Aux. Pump Cut Off/On etc., and bearing temperature.

- Checking blade construction and sizes as per data sheet.

- Measurement of vibration in terms of amplitude, velocity, frequency and acceleration, noise level as per latest standards.

- Open inspection of turbine and gear box – to examine the condition of rotor, bearings, tooth contact of gears, back lash, hardness of gear, verification of service factor from catalogue and calculation with relevant standards, thrust clearance, clearance between moving and stationery blades, bearing clearance, trueness of rotor disc face i.e. Run-Out and Face-Out.

- Verification of residual unbalance after Mechanical Running Trial as per latest standards.

- Verification of characteristic curve for steam consumption versus load.

- Verification Correction Factor Chart for variation of pressure, temperature, and speed for inlet steam and exhaust steam in relation to the Design Parameters, of the Turbine.

(b) MOTOR DRIVES FOR MILLS OR PRESSURE FEEDER

(i) For D.C.Motors.

- Witnessing measurement of resistances and insulation values for main and field windings: Witnessing H.V. test.

- Witnessing no load trial and full load trial for relevant standards as described in IS 4722 and BS:7500 for temperature rise of windings.

- Witnessing measurement of vibrations as per IS 12075 during running trial.

- Scrutiny of test certificate for dynamic balancing and ultrasonic testing of rotor shaft.

NOTE : Type test shall also be witnessed in respect of any new size or design of manufacture of DC motor.

(ii) For Thyrister and Control Panels:

- Testing of thyrister Panel for temperature rise as per relevant class of duty.

- Checking of functioning of various protection devices and relays.

c) AC Motor

- Testing procedure with control panel as prescribed in the latest IS code.

d) Hydraulic drives for Mills

Procedure to be finalized in consultation with manufacturers.

2.1.8 Enclosed Transmission Gear Boxes for Mill/Pressure Feeder Drive

- Checking up of dimensions, handing and reduction ratio,

- Witnessing the no load running trial at full input speed of each gear box fitted with forced lubrication system at partial loading by damping.

- Open Inspection:

- Checking up of tooth contact and blue impressions.

- Measurement of back lash, tooth contact area, hardness of shaft and gear wheel and pinion, oil circulation system and nozzle location etc.

- Teeth surface finish checking – visually.

- Verification of material composition certificate, ultrasonic test and dynamic balancing certificate stress relieving & physical test report, for gears/pinions/shafts.

- Verification of Service Factor, H.P. rating calculations, and Pressure Lubrication System having 2 pumps, 2 motors, coolers, 2 micro filters etc.

- Routine test certificate of gearboxes.

2.1.9 Open Spur Gear and Pinion, Shafts, Plummer blocks, couplings and gear beds.

- Checking of dimensions as per manufacturer's drawings.

- Checking of tooth thickness at OD & PCD with reference to profile, tooth depth, MOT, no of teeth, mod etc.

- Measurement of hardness of gear, pinion and their shafts.

- Witnessing Ultrasonic testing as per ASTM level 3 in respect of gear/pinion/shaft at100% area of face on rim and hub.

- Scrutiny of material composition and heat treatment certificate for gear/pinion/shafts/gear beds/gun metal liners of Plummer blocks.

- Witnessing D.P. test for rim, hub face and bore of gear and pinion and at set of 5 consecutive teeth face at 4 places.

- Witnessing water fill test of Plummer blocks for Fibrizor and Master Gears only and checking of the fitting of GM liner and lubrication groove.

- Verification of HP rating calculations as per IS 4460 / ISO 6336.

- Checking of Magnetic Particle Test.

2.1.10 Bagasse Elevator & R.B.C.

As referred in para 1.8

2.1.11 Mill House E.O.T. Crane

Inspection and testing procedure shall be same as for cane unloader with a load as specified in the Specifications at 2.1.1 and as per I.S.807 & I.S.-3177.

2.1.12 BOILERS

2.2.1 Pressure Parts :

- Dimensional checking of drum, wall thickness, tube hole sizes (with go-no-go gauge), drum internals.

- Verification of material composition certificate for drum, tubes, super heater and economiser elements and tube holes size in drum, stress relieving certificate for drum, header, etc.

- Hydraulic test of headers and economiser coil and super heater coil etc.

- Witnessing destructive testing of random selected sample of boiler tubes as per para 1.9, and checking of tube thickness, o.d., and IBR stamping verification.

2.2.2 D.C. / A.C. variable frequency Motor Drives for ID/FD fans

Inspection and testing as per procedure described in para 2.1.7 (b) in case D.C. motors and as per relevant IS code in case of A.C. motors.

2.2.3 ID/FD/SA Fans:

- Verification of impeller curvature, wearpad for ID, test certificates for dynamic balancing of impeller of ID, FD, SA fan etc. and sizes of plates thickness etc.

- Verification of calculations for capacity and head of fans.

- Dimensional verification as per approved drawing.

- Witnessing measurement of free air delivery/capacity.

- Witnessing ultrasonic testing of shafts of fans.

- MTC for shaft, characteristic curves for fan performance etc.

2.2.4 Furnace Grate Assembly

- Dimensions of assembled frame sizes. etc.

- Operation of grate bar movement & traveling grate movement by fitting of auxiliary drive.

- Checking of grate bar hole details and hardness and MTC

2.2.5 Oil firing equipment assembly

- Running trial of the system.

- MTC, RTC and hydraulic testing certificate for individual equipment.

2.3 CLARIFICATION AND BOILING HOUSE MACHINERY

2.3.1 Juice, Water and Molasses Weighing Scale

- Dimensional check for capacity.

- Witnessing water tipping trial of the assembly at manufacturer's site i.e. water trial and accuracy test and vibration/stability and jerk checking.

2.3.2 Juice Heaters

- Witnessing hydraulic testing of shell with doors closed, at 9 kg/cm2.g.

- Verification of tube plate thickness, door thickness and door straightness etc. Measurement of tube plate holes size checking by go and no-go gauge, no. of holes per pass, no. of passes, lay out of passes on top and bottom covers, condensate outlet connection, noxious gas connection, juice drains, airvent connection, checking of door-tightening arrangement with T-bolt/I bolt with individual pin arrangement, Steam/Vapour entry connections , ligament, welding quality, distance between tube plates and alignment, variation pitch of holes, witnessing hydraulic testing of steam, vapour and double beat valve etc.

- Condensate outlet connection, noxious gases connection, juice drains/air vent connections, checking of steam/vapour connections.

- For plate type juice heaters, measurement of thickness of plates, size, gasket and hydraulic testing, scrutiny of material test certificate for S.S.

- Tube plate holes to be finished by reaming.

- Inspection and testing of S.S./Brass tubes shall be as per para 1.9.

2.3.3 Juice Sulphitation System

- Verification of dimensions, witnessing no load running trial of stirrer, checking up of volume of vessels etc.

- Checking the dimensions of juice scrubber.

- Checking of overflow level, SO2 coil layouts and sizes, lime entry position, site glass position & its washing coil etc.

- Checking of juice entry details, hole size and thickness of partition plates.

2.3.4 SO2 piping

- Measuring size, witnessing hydraulic testing etc. of all piping and valves for diaphragam valves dimensional check only, MTC.

2.3.5 Air Compressors and Vacuum Pumps

- Dimensional checking

- Witnessing measurement of free air delivery with nozzle test, measurement of power consumption as described in BS: 1571 part II.

- Checking pressure setting for valves, auto cut -off, bearing temps, cooling system checking.

- Verification of hydraulic test certificate and material test certificate.

2.3.6 Milk of Lime Station

- Verification of dimensions, checking up of volume, stirrer speed and witnessing no load running trial of lime slacker and classifier stirrers etc.

2.3.7 Clarifier

- Mock-up assembly checking for quality of fabrication, of main body assembled with bottom cone and tray plates.

- Dimensional and straightness check for central shaft assembly.

- Witnessing no load running trial of drive assembly.

- Witnessing water filling test of juice and mud boxes fitted with telescopic valves.

2.3.8 Vacuum Filter

- Verification of dimension, for various components, material test certificate for S.S. material, witnessing hydraulic testing of filtrate collection tubes.

- Run out and Face out check for the drum shell and trunnion with dial gauge.

- Checking the fixining of decks and its material along SS screen fitting.

- Witnessing no load running trial at low and high speed etc. measurement of drum & agitator speed etc.

- Checking of valve assembly and its blue matching with wear plate.

- Verification of dimensions for mud mixer, scroll, shaft assembly etc. and measurement of speed at no load.

- Working of lubrication system assembly.

- Water filling test in the trough.

2.3.9 Evaporators

- Verification of dimensions of calandria, body, catchall, tube plate thickness, holes etc., measurement of tube holes with go and no go gauge, alignment and distance between tube plates, ligament and pitch for tube holes, welding quality, witnessing hydraulic testing of steam and vapour valves etc.

- Checking the Layout of holes in the tube plate and its finish by Reaming, condensate outlet connections, noxious gases outlet connection, vapour inlet sizes, ovality of calandria, if any, tube plate straightness and tie rod fixing.

- Checking of saveall construction & plate thickness & curvature of vanes etc.

- Inspection and testing of S.S./Brass tubes shall be as per para 1.9

2.3.10 Vacuum Pans (Batch & Continuous)

As mentioned at Para No.2.3.9

2.3.11 Air and Water Cooled Crystallizers, Vacuum Crystallizers, Seed Crystallizers, Vertical Continuous Crystallizers

- Dimensional checking and capacity checking, quality of welding & plate thickness and reinforcement, stool centers etc.

- Witnessing hydraulic testing of cooling elements of water cooled and vertical crystallisers at 5 kg/cm2.
- Witnessing of no load running trial of each horizontal crystallizer fitted with its stirrer at manufacturing site, checking of tooth contact of worm and worm wheel.

- Checking of clearance between stirrers and body.

- Checking of capacity calculations.

- Checking worm wheel and worm details.

- Checking of hardness of worm screw/shaft and scrutiny of material test certificate for En-8. steel.

2.4 CENTRIFUGAL BATTERY

2.4.1 Batch and continuous centrifugal machines.

- Inspection and testing of ACVFD motors and panels as per procedure of para 2.1.7(b) at manufacturer works.

- Witnessing no load running trial of each centrifugal machine at manufacturer's site using test motor, checking of bearing temperature, vibration in terms of velocity and displacement at x,y,z axis, no load starting current, rpm measurement, pulley details,

- Hole details on basket – no. of holes, no. of rows and size of holes.

- Checking no. of cycles, working of panel, with respect to various steps for speed changing, steam and super heated water application etc.

- Checking of monitor casing, dimensions, etc..

- Checking dimensions of basket, shaft etc. with prescribed limits.

- Verification of material test certificate of basket and shaft, bearing housing.

- Basket welding checking by DP test and scrutiny of Radiography film/certificate.

- Verification of dynamic balancing certificate of basket assembly.

- Hydraulic testing of transient heaters.

- Inspection and testing of A.C. motors as per IS-4722 & IS-325 and control panels as per para 2.7.4(a).

- Witnessing hydraulic testing of superheated wash water system at 10 kg/cm sq.g.

2.4.2 Grass Hopper

- Dimensional verification

- Ultrasonic testing of Eccentric shaft and measurement of hardness and scrutiny of material test certificate for En 8 steel or special steel as the case may be, measurement of eccentricity.

- Witnessing no load running trial of each grass hopper.

- Checking of straight movement of hopper.

- Witnessing hydraulic test of air heater.

- Witnessing ultrasonic testing of drive shafts.

2.4.3 Sugar Grader

- Dimensional checking.

- No load running trial of each sugar grader assembly and measurement of Vibrations in terms of Amplitude, Frequency etc.

- Measurement of the slope of deck.

- Ultrasonic testing of drive shaft and measurement of hardness of shaft and scrutiny of material test certificate for En8 shaft or special steel shaft as the case may be.

- Measurement of screen hole – mesh sizes etc.

2.5 CONDENSING AND COOLING SYSTEM

- Dimensional checking for condenser and ejector and material of construction with MTC.

- Witnessing of hydraulic testing of condenser, ejector and tail pipe at 2 kg/cm2 g, nozzle plate details, nozzle convergent angle and distance.

- Nozzle details of condenser/ejector.

2.5.3 Cooling Tower

- Verification of service factor for gear boxes.
- Verification of capacity of fans
- Dimensional checking of fans
- Witnessing of no load running trial of fans
- Measurement of vibration noise level capacity of fans.
- Scrutiny of material test certificate for gear box & blades.

2.5.4 Spray Pond

- Dimensional check for spray pond piping and nozzles as per approved drawing.
- Witnessing nozzle discharge testing at a head of 5 metres.
- Witnessing of hydraulic testing of assembled pipes of different size of spray pond piping, sample drawn at random,at 2.7kg/cm2 g.
- MTC for nozzle and piping material.

2.6 PRESSURE REDUCING VALVES, EXHAUST AND VAPOUR PIPING

2.6.1 PRDS Station

- Checking up of pressure reducing valves, bypass valves,
- Pneumatic control checking
- Desuper heater checking and water spray trial
- Hydraulic testing of valves and vessels.

2.6.2 Exhaust piping and vapour piping and valves more than 400 MM, NB size.

- Verification of dimensions, thickness, welding quality.
- Checking of valves for its components and witnessing hydraulic testing at 6 kg/cm2.
- Verification of general arrangement drawing of exhaust/vapour piping.

2.7 POWER TURBINES AND ELECTRICALS

2.7.1 Turbogear Unit with its Base frame

- Witnessing the no load running trial for each power turbine fitted with its gear box , governor and forced lubrication system and checking up of functioning of protective devices.

- Measurement of vibrations – Amplitude, Velocity, Frequency, Acceleration, Noise Level as per latest standards.

- Checking oil cooler for its material and witnessing of hydraulic testing.

- Verification of residual imbalance as per latest standards.

- Verification of test certificates for hydraulic testing of casings, rotor material test certificates, balancing certificate of rotor, blade surface crack and verification of Heat nos., Sl. No. of rotor, casing and turbine/test etc.

- Checking up of protective devices functioning while running at no load, rated speed such as Over Speed Trip, Low Lub-Oil Pressure, High Exhaust Pressure, Aux. Pump Cut Off/On etc.

- Checking blade construction and sizes as per data sheet.

- Open inspection of turbine and gear box – to examine condition of rotor, bearings, tooth contact of gears, back lash, hardness of gear, verification of service factor from catalogue and calculation with relevant standards, thrust clearance, clearance between moving and stationery blades, bearing clearance, trueness of rotor disc face.

- Verification of Characteristic Curve for Steam Consumption versus Load.

- Verification of Turbine Correction Factor Chart for variation of pressure, temperature for inlet steam and exhaust steam in relation to the Design Parameters.

- Open inspection of power turbine, rotor, gear box, bearings, checking up of tooth contact, back lash, bearings, etc.

- Verification of HP rating calculations for gear box.

2.7.2 Alternator for T.G. set

- Witnessing tests as described in latest IS 4722 such as insulation test and measurement of resistances of main field, main windings, exciter armature, exciter field.

- Witnessing of open circuit test, short circuit test, overload test and H.V. test as per IS-4722.

- Verification of test certificates for ultrasonic testing and dynamic balancing of rotor.

- Phase sequence checking and verification of direction of rotation.

- Functional testing of AVR with alternator and regulation test, over voltage relay functional testing, on both AVR which are independent.

- Vibration measurement as per IS 12075 and sound level measurement during no load running trial of the alternator.

- Shaft current measurement.

2.7.3 ELECRICALS

a) Alternator Control & Excitation Panels for TG sets, MCC, Main distribution panel, Bus bar turnking, Bus coupler panel, APFC Panel, Control panel for DG set, Control panels for centrifugal machines.

- Verification of dimensions and makes of different components.

- Testing of simulation of various protective devices in each panel.

- H.V. and insulation test of each panel assembly, each MCC assembly and bus bar trunking assembly.

- No load sequence operation test of each panel assembly.

b) Verification of single line diagram of electrical distribution system as well as size of bus bars and cables and quantity of power factor improving capacitors.

NOTE: Type test as per IS 4722 shall also be witnessed in respect of any new size or design or manufacturer of alternator.

2.7.4 POWER HOUSE CRANE.

- As per detail mentioned for Cane Un-loader para 2.1.1

2.8 H.P. STEAM PIPING

2.8.1 Distribution Header

- Witnessing of the Hydraulic Testing of Header.

- Dimensional checking

- Verification or material test certificate, IBR approval.

2.8.2 H.P. Piping

- Checking up Pressure Drop Calculations, Pipe Sizes with reference to Flow and Velocity and general arrangement drawing.

- Checking flexibility analysis, Scrutiny of material Test Certificate for the H.P. Piping.

- Checking and hydraulic testing of pipes and manipulation as per approved drawing.

- Checking of IBR stamping of pipings and flanges.

2.8.3 Steam Separators

- Material test certificate verification

- Dimension at check

- Witnessing of hydraulic testing

2.8.4 Valves covered by IBR (covering over and above 100 mm size, 20 kg/cm2 pressure)

- Dimensional checking

- Witnessing hydraulic testing of sample drawn at random in each size.

- Scrutiny of test certificate given by manufacturer and C.I.B.

- IBR – stamping etc.

2.9 MISCELLANEOUS

- All C.I. Valves above 150 mm NB, all C.I. Pipes, Tees, Bend etc.

- Checking up of dimensions, internals and scrutiny of test certificate for S.S. components.

- Witnessing hydraulic testing of valves and pipes selected at random.

2.9.2 Bagasse Baling press

- Dimensional checking

- Witnessing of measurement of hardness for C.S. gear wheel, pinion as per specification.

- Witnessing no load running trial

3.0 APPROVED DRAWINGS

3.1 The manufacturer shall make available all approved drawings, to the Inspecting Officer of NFCSF, at the time of inspection.

3.2 In addition to the above, the manufacturer shall obtain prior approval of NFCSF, New Deli in respect of the following drawings and specifications

- Mill roller grooving and mill setting trash plate profile details.

- General arrangement drawing of the mill drive and transmission gearing system for the mills and pressure feeders along with HP rating calculations for enclosed gear boxes and

open spur/helical gearing system with rpm details of gear and pinion geometry, material of construction, hardness and dimensions – checking.

- Heating surface calculations of boiler, including radiation zone, convection zone, super heater, economiser, and air heater.

- Layout drawing of bagasse handling system.

- Calculations for capacity and head along with characteristic curves of ID fans, FD fans, and SA fans and wet/dry type fly ash arrestors.

- Heating surface calculations for Juice heaters, evaporators and vacuum pans and calculations for velocity of juice in J.H.

- General arrangement drawings of juice sulphiter, syrup sulphiter, juice heaters, each evaporator vessel, vacuum pans, air cooled, water cooled and vertical continuous crystalliser, condensers and ejectors, lay out of spray pond/cooling tower.

- General arrangement drawings of live steam piping including steam distribution header and PRDS with pressure drop calculations.

- General arrangement drawings with sizes of exhaust steam and vapour bleeding arrangement.

- Single line diagram of electrical distribution system showing feeder details.

- General arrangement drawing of main distribution board and MCC.

- General arrangement drawing of spray cooling piping along with sizing calculations.

- Specifications of all reductions gear boxes (giving input power and speed, ratio, size) and all pumps (giving speed, discharge, total head, HP of drive motor, fluid to be handled).Service factor calculation.

- Selection details of couplings, belts and bearings.

Annexure-B-4 (b)

NATIONAL FEDERATION OF COOOPERATIVE SUGAR FACTORIES LIMITED,
ANSAL PLAZA, BLCOK-C, 2ND FLOOR, AUGUST KRANTI MARG,
NEW DELHI – 110 049

Ref. No.IA-1(b) **Dated: 01-11-2009**

Consolidated list of items of plant and machinery being inspected at manufacturer's works during the course of manufacture and before dispatch. – effective from 1st November-2009.

I. CANE MILLING PLANT

1. Cane unloader including the bridge, trolley, grab, gear boxes, electric motors, control panel, driving and hoisting arrangements and supporting steel structure and gantry etc.

   Truck tippler with its hydraulic device etc.

2. Feeder tables including the chains, driving arrangements, assembly etc., including steel structure, variable speed drive and electric motor.

3. Cane carrier, auxiliary cane carrier and rake carrier including the structure, troughs, chains, rakes, slats, driving arrangement, driven shafts, idlers, spur gears, P. blocks including variable speed drive and electric motor etc.

   Belt type conveyer along with its drive, tramp iron separator etc.

4. Cane preparatory equipments including shafts, knives, bearings, plummer blocks, knife hubs, couplings, hammers, anvil plate, hood, deflector plate including electric motors etc.

5. Mills, pressure feeders including all head stocks, bed plates, roller and their shafts, trash beams, trash plates, under feed rollers, scrappers, mill couplings, tail bars, rake carriers, structure and trought, sprockets with shafts and chains, roller bearings, side caps and top caps of head stocks, crown pinions, pressure chute, Donnelly chute, juice troughts and whirler tanks etc. including fluid couplings and electric motors for rake carriers. Assembly of complete mill with rollers.

   Rotary type juice screening arrangement with drive etc.

6. Drives for Mills and pressure feeders with their primary gear boxes and oil coolers or, hydraulic drives with control panel or AC/DC motors with control panels and other accessories. Also drives for preparatory equipments.

7. Transmission gearing for mills and pressure feeders including high speed and slow speed reduction gear boxes, bed plates and plummer blocks for open spur helical gear wheels and pinions and their shafts, couplings, oil pumps and oil coolers etc.

8. Bagasse conveyors including the structure, chains and slats, driving and driven shafts, driving system including Plummer blocks, and electric motors and gear boxes etc.

   Belt type prepared cane bagasse conveyor along with its drive, structure etc. but excluding electric and gear box.

9. Mill house crane including driving and hoisting arrangement, gear boxes and electric motors, bridge, trolley, crane hook, control panel and the gantry girders and structure.

II. CLARIFICATION, EVAPORATION AND BOILING PLANT

10. - Juice and water check weigh bridges.

    - Automatic juice weighing scale assembly and accessories and structure and counter etc.

11. Juice heaters including body, cover plates and tube plates, accessories like double beat valves, etc. arrangements for condensate extraction and noxious gas removal, vapour and exhaust steam valves etc.

12. Juice sulphiter assembly including the vessel and stirrer with driving arrangement, correction vessel, recovery tower, lime proportionater, automatic pH controller, driving arrangement, gear box electric motor, cast iron piping etc.

13. Sulphur furnace including burner, melter, scrubbers, cooling, inter-connecting cast iron pipes, valves, micro processor controller etc.

14. Air compressors including body, piston, crank shafts, connecting rod, drive, etc. in case of reciprocating type compressors and body, rotor (impeller), drive etc. in case of rotory type compressor including electric motor etc.

15. Lime slaker, lime classifier and hydro cyclone including driving arrangement, gear boxes and electric motors etc. but excluding milk of lime tanks.

16. Continuous clarifier including main body and tray plates, central shaft, scrapper, flash tank, juice overflow and mud overflow box with telescopic valves, cast iron valves, drive arrangement, worm and worm wheel including gear box and electric motor.

17. Vacuum filter assembly including the shell, S.S. decking, screen, scrapping arrangement, vacuum regulating system, juice withdrawal, S.S. piping assembly, juice trough with stirrer, juice separator in the vacuum line, driving arrangement, electric motors, gear boxes etc.

    Belt conveyor with drive etc. for the filter cake.

18. Evaporator including bodies and calandria with tube plates, steam/ vapour and juice distribution, condensate extraction and noxious gas removal systems, inter-connecting vapour pipes, save all, vapour and exhaust steam valves etc.

19. Syrup sulphitation unit including the body, SO_2 gas distribution, coil assembly, absorption tower, cast iron piping etc.

20. Vacuum pans, including the body and calandria/with tube plates, save all, steam/vapour distribution, condensate extraction and noxious gas removal systems, discharge valves, vapour and exhaust valves etc.

21. Seed, vacuum, air cooled and water cooled horizontal crystallisers & vertical crystallisers assembly including the main shell, stirring arrangement, cooling/heating coils, driving arrangement, worm wheel and worm box and enclosed gear box and electric motor etc.

22. All condensers & ejectors duly assembled including the main body with the nozzles and their header, throat and tail pipes etc.

23. Spray pond cooling system including all piping, nozzles, junction boxes, headers, bends, tees, suction strainer etc.

    In case of cooling towers, the fans with driving arrangement, grid bars, nozzles, headers and piping etc.

24. Tubes for juice heaters, evaporators and vacuum pans.

III. <u>COOLING, CURING AND GRADING PLANT</u>

25. All batch and continuous centrifugal machines assembly including basket, shaft, bearings, and their housing, monitor casing, drive motor with its panel, solenoid valves, control panels, pneumatic valves, ploughing arrangement.

26. Superheated wash water arrangement and transient heaters for centrifugal machines.

27. Sugar grass hopper assembly including trays, driving arrangements, hot and cold air blowing arrangement, air heater, blower, electric motor etc.

28. Sugar drier including trays, driving arrangement, electric motor, ID fan with drive, FD fan with drive etc.

29. Sugar grader assembly including the main body, screens, driving arrangement, supporting steel structure, chutes, electric motor and magnetic seperators etc.

30. Molasses weighing scale assembly including the structure, tanks, registering counter etc.

31. Pug mills, magma mixers and sugar melter, all run-off molasses tank &Sugar elevator.

IV. STEAM GENERATING PLANT

32. Boilers including drums, headers, super heater and economiser coils, main bank and furnace tubes, soot blowers, ID, FD and secondary air fans with driving arrangement, turbine for turbo feed pump, furnace grate assembly, grate bars, wet/dry type fly ash arrestor, de-aerator, electric motors (A.C.), ducting, piping etc.

    If the boiler fans driven by D.C/A.C. variable frequency shall be inspected at manufacturer's works before dispatch.

    Feed water tank and de-aerated water tank.

V. POWER GENERATING PLANT

33. Turbo alternator set including turbines, alternator, enclosed reduction gear box assembly on base frame, protective devices of the turbine and alternator, excitation and control panel, oil coolers, radiator, bus bar trunking, governing system.

34. Power house crane including bridge, trolley and gantry girders etc.

35. Steam pressure reducing valves including main valves, by-pass arrangement, controls system , desuperheater, etc.

VI. MISCELLANEOUS ITEMS

36. Common desuperheater for exhaust steam.
37. All exhaust steam and vapour piping including valves of size 400 mm NB and above for juice heaters, evaporators pans and pan discharge valves
38. All cast iron valves of 150 mm NB and above.
39. All IBR valves of 100 mm NB and above
40. All CI pipes, tees, crosses, and bends.
41. Bagasse baling press with driving arrangement etc.
42. All main distribution panels, motor control, centers, auxiliary panel, lighting distribution boards, etc.
43. Steam distribution header and steam separators for live steam piping.
44. All D.C. electric motors including control panels.
45. All variable frequency drive control panels.
46. All electric motors (AC & DC) along with control panels for driving continuous and batch centrifugal machines.
47. All AC motors above 50 H.P. rating.
48. Spray and injection pumps, vacuum pumps to be inspected at manufacturer's work.

Annexure-B-4(c)

NATIONAL FEDERATION OF COOOPERATIVE SUGAR FACTORIES LIMITED,
ANSAL PLAZA, BLCOK-C, 2ND FLOOR, AUGUST KRANTI MARG,
NEW DELHI – 110 049

Ref. No.IA-1(b) **Dated 01-11-2009**

Revised list of items of plant and machinery which do not require pre-despatch inspection – effective from 1st November-2009.

I. CANE MILLING PLANT

1. Fluid couplings and and all other type of couplings.

2. Hydropneumatic accumulators, pumping set, gauge panel, piping etc. for hydraulic loading system of mills.

3. A.C. electric motors and enclosed worm/helical gear boxes for cane/rake carriers, cane preparatory devices, baggasse conveyors having rating below 50 HP etc.

4. Automatic cane feeding device.

5. Oil and grease lubricators.

6. Mill house imbibition equipment juice pumps and water pumps.

7. Mill service gangway /platform and all steel structure.

II. CLARIFICATION, EVAPORATION AND BOILING PLANT

8. All type of pumps for juice, syrup, massecuite, mud, milk of lime, magma, melt, molasses, condensate etc.

9. Equipment for preparation, storage and pumping of phosphate slurry and caustic soda solution.

10. All priming pumps.

11. Molasses conditioners and milk of lime tanks.

12. All condensate receivers and tanks, juice/syrup/lime strainers/grit catcher, all receiving tanks for weighed juice/water/molasses/syrup etc.

13. All pin and bush couplings in the boiling house.

14. Syrup and molasses storage tanks, mud receiving tank, sulphited juice/syrup receiving tank etc.

15. All supporting steel structure for boiling house and clarification house.

16. All worm type enclosed gear boxes and A.C. electric motors below 50 HP rating except those for vacuum filter, juice sulphiter, lime slaker an lime classifier.

III. COOLING, CURING AND GRADING PLANT

17. Supporting steel structure for batch and continuous centrifugal machines.

    Mono rail with chain pulley block for centrifugal battery.

18. Pumps for magma, melt, molasses, hot & cold water etc.

19. All pin and bush couplings for centrifugal station auxiliary equipment.

20. All worm type enclosed gear boxes.

21. Sugar weighing machines and bag stitching machines.

22. Final molasses storage tanks.

23. Overhead hot and cold water service tanks.

IV. STEAM GENERATING PLANT

24. All supporting steel structure for boilers.

25. Rotary bagasse feeders and rotary air lock valve including their drives etc.

26. Feed water transfer pumps along with electric motors, starters etc. but excluding steam turbine.

27. Chemical dosing equipment and its pumps etc.

28. Boiler ducting, ash hoppers etc.

29. All refractory and insulating materials.

30. Blow down tank and its piping etc.

31. Air preheater and its tubes.

32. Instrument panel with accessories and fittings, all instruments and gauges etc.

33. Boiler chimney.

34. Boiler feed water treatment plant / R.O. Plant.

V. MISCELLANEOUS ITEMS

35. All electric power and control cables.

36. All earthing material and lighting fixtures.

37 All pressure, vacuum and temperature gauges/recorders, steam/water flow meters and recorders.

38. All non-IBR M.S./Stainless steel piping, bends, flange etc. below 400 mm NB.

39. All IBR valves below 100 mm NB including drain valves, steam traps, strainers, blow down valves, safety valves, isolating valves etc.

40. All IBR steam piping, bends, flanges etc. excluding steam distribution header and separators.

41. All lagging and insulating materials.

42. All A.C. electric motors below 50 HP.

43. All worm type enclosed gear boxes.

44. All pumps except vacuum pumps, spray and injection pumps.

45. All cast iron valves below 125 mm NB.

Annexure-B-5

Schedule of Submission for drawing, manuals and other documents of plant and machinery

ANNEXURE – B-5

SCHEDULE OF SUBMISSION OF DRAWINGS, MANUALS & OTHER DOCUMENTS OF PLANT AND MACHINERY AS PER ANNEXURE – B-I

1. SUBMISSION OF DRAWINGS

1.1 **Finalisation of tentative layout** (within 07 days from the date of signing of the agreement) showing the provision for future equipment required of ultimate capacity, in consultation with Purchaser & Inspection Agency. The Purchaser & Inspection agency will suggestions/ comments within 07 days.

1.2 Within 21 days from the date of signing of the agreement, 2 copies of **the general layout** of the factory building showing the positions of the plant and machinery as per Annexure B-I. for the approval of the Purchaser& Inspection Agency. In the general layout, the Sellers shall also show the span, center to center distance of column, height of the trusses of the main factory building, span of the mills and power house cranes together with their maximum wheel load etc. The Purchaser & Inspection Agency shall unless they have any objection approve the same in writing or indicate the corrections within 07 days (required to be incorporated by sellers) subject to which the drawings can be deemed as approved so that the purchaser can go ahead further to save time. The sellers shall however incorporate the required correction and submit 6 copies of general layout for final approval and records within 07 days of the receipt of the latter's comments.

1.3 Within 15 days from the date of receipt of approval of general layout of the factory building as in 1.1 above, 2 copies of **the engineering layout** of the plant and machinery for the approval of the Purchaser & Inspection Agency. The Purchaser & Inspection Agency shall unless they have any objection, approve this layout in writing and despatch it with their approval/comments (by which the drawings can be deemed as approved – for saving time for execution) to the sellers within 07 days of its receipt. Sellers shall incorporate the required correction (if any) and submit 6 copies of engineering layout for final approval and records within 07 days of the receipt of the latter's comments.

1.4 Within 10 days from the date of approval of engineering layout as above, 2 copies of the **detailed material flow diagram** for juice, water, steam, syrup, massecuite, milk of lime, air, Sulphur di-oxide, vapours, molasses magma etc for approval by the Purchaser & Inspection Agency. The Purchaser & Inspection Agency shall unless they have objection approve the same in writing and despatch their approval/comments to the Sellers within 07 days of its receipt. If corrections are sought by Purchaser & Inspection Agency the Sellers shall incorporate the same and submit 6 copies of detailed juice flow diagram for the final approval and implementation within 07 days of the receipt of the latter's comments.

1.5 Within 30 days of the signing of the agreement the Seller will provide the equipment wise **price break-up** for major items of the Machinery and Equipment along with the monthly billing schedule and monthly fund requirement statement for approval by the Purchaser & Inspection Agency. The Purchaser & Inspection Agency shall unless they have objection approve the same in writing and despatch their approval/comments to the Sellers within 07 days of its receipt. If corrections are sought by Purchaser & Inspection Agency the Sellers shall incorporate the same and submit 6 copies of detailed juice flow diagram for the final approval and implementation within 07 days of the receipt of the latter's comments.

1.6 Within 30 days from the date of signing of this Agreement, a **delivery time schedule** relating to major equipment and erection work by the erection contractor for approval by the Purchaser & Inspection Agency. The Purchaser & Inspection Agency shall unless they have objection approve the same in writing and despatch their approval/comments to the Sellers within 07 days of its receipt. If corrections are sought by Purchaser & Inspection Agency the Sellers

shall incorporate the same and submit 6 copies of detailed juice flow diagram for the final approval and implementation within 07 days of the receipt of the latter's comments.

1.7 Within 30 days of signing of agreement, 6 copies of **detailed civil drawings, structural drawings, design calculations along with load data and coordinate drawings of main machinery** (Mills with drives and reduction gearing arrangements, boilers, power turbines, centrifugals, staging for boiling and clarification house equipments and clarifier) required for construction of foundation of the machinery after considering the actual layout of the building and space available for the same shall be furnished by the Sellers.

The drawings shall show the location of the foundations and loads thereon, sizes of base plates and details of foundation bolt holes. The Purchaser, Civil Consultant & Inspection Agency shall unless they have objection approve the same in writing and despatch their approval/comments to the Sellers within 15 days of its receipt. If corrections are sought by Purchaser, Civil Consultant & Inspection Agency the Sellers shall incorporate the same and submit 6 copies of detailed juice flow diagram for the final approval and implementation within 07 days of the receipt of the latter's comments.

1.8 Within 45 days of signing of agreement, 6 copies of **detailed civil drawings, structural drawings, design calculations along with load data and coordinate drawings of the balance machinery and equipments** required for the construction of foundations of the machinery (after considering the actual layout of the building and space available for the same) shall be furnished by the Sellers. The drawings will show the location of the foundations and load thereon, sizes of the base plate and details of foundation bolt holes. The Purchaser, Civil Consultant & Inspection Agency shall unless they have objection approve the same in writing and despatch their approval/comments to the Sellers within 15 days of its receipt. If corrections are sought by Purchaser, Civil Consultant & Inspection Agency the Sellers shall incorporate the same and submit 6 copies of detailed juice flow diagram for the final approval and implementation within 07 days of the receipt of the latter's comments.

1.9 Within 07 days of finalisation of engineering layout the Sellers shall, in consultation with Purchaser, Inspection Agency, Civil Consultant of Purchaser, indicate the dates in the proforma given below so as to commission the plant and machinery as per Annexure I by the stipulated date i.e. ……

S.No.	Description	Drawing & details to be received from the Sellers	Completion of designing of foundations by the seller & submission to purchaser for comments and approval	Completion date of foundation by seller for starting the erection work	Date of start and completion of supervision of erection by the Sellers
1	2	3	4	5	6

The Purchaser, Civil Consultant & Inspection Agency shall unless they have objection approve the same in writing and despatch their approval/comments to the Sellers within 07 days of its receipt. If corrections are sought by Purchaser, Civil Consultant & Inspection Agency the Sellers shall incorporate the same and submit 6 copies of detailed juice flow diagram for the final approval and implementation within 07 days of the receipt of the latter's comments.

1.10 Progressively and in proper sequence, within 60 days of the date of signing this Agreement, 2 copies of the following shall be submitted to Purchaser & Inspection Agency for their

approval. The Purchaser & Inspection Agency shall unless they have objection approve the same in writing and despatch their approval/comments to the Sellers within 07 days of its receipt. If corrections are sought by Purchaser & Inspection Agency the Sellers shall incorporate the same and submit 6 copies of detailed juice flow diagram for the final approval and implementation within 07 days of the receipt of the latter's comments.

a) **Layout of the pipelines**, including live and exhaust steam lines, vapour pipelines, juice, syrup and massecuite pipelines, cold and hot water lines and single line diagram for electric power installation showing all the details etc.

b) **Drawings of the staging for the plant and machinery** along with a stability certificate from a Chartered Structural Engineer.

c) **Drawings showing all dimensions of juice heaters**, evaporators, juice and syrup sulphitors, hoppers, cane bagasse carriers etc.

d) Detailed **calculations in duplicate regarding the heating surfaces** of

i) boilers

ii) evaporators

iii) pans and

iv) juice-heaters.

In case there is any comments by the Purchasers the matter shall be taken up by them with the appropriate authorities including the Boiler Inspectorate.

1.11 Progressively within 6 months from the date of signing of the Agreement, 6 copies of **all general arrangement drawings and instruction manuals** as may be required for running and maintenance of the plant and machinery, pipelines, electrical installation etc. except that in case of imported machines all drawings and instruction manuals in respect thereof, shall wherever necessary for running and maintenance of the plant and machinery be submitted at the time of delivery.

1.12 **Single line diagram** for electrical power installations complete details shall be supplied by the Sellers to the Purchasers also within 15 months from the date of receipt of approved Engineering layout of plant and machinery. The Purchaser & Inspection Agency shall unless they have objection approve the same in writing and despatch their approval/comments to the Sellers within 10 days of its receipt. If corrections are sought by Purchaser & Inspection Agency the Sellers shall incorporate the same and submit 6 copies of detailed juice flow diagram for the final approval and implementation within 10 days of the receipt of the latter's comments.

1.13 Within 02 months from the date of signing of agreement, 6 copies of the **drawings of machinery and equipmen**t listed in Annexure B-1 and annexures thereof showing assemblies, main design features of various equipment manufactured by the Sellers, their sub-contractors or subs-supplier shall be supplied by seller and the Purchaser & Inspection agency shall communicate their comments, if any, within 15 days of their receipt. If corrections are sought by Purchaser & Inspection Agency the Sellers shall incorporate the same and submit 6 copies of detailed juice flow diagram for the final approval and implementation within 10 days of the receipt of the latter's comments.

1.14 Within 02 months from the date of signing of agreement, 6 copies of **erection drawings of various equipments** listed in Annexure B-1 and Annexure thereof, shall be supplied by seller

(based on these drawings erection contractor will execute erection works). The Purchaser & Inspection Agency shall unless they have objection approve the same in writing and despatch their approval/comments to the Sellers within 10 days of its receipt. If corrections are sought by Purchaser & Inspection Agency the Sellers shall incorporate the same and submit 6 copies of detailed juice flow diagram for the final approval and implementation within 10 days of the receipt of the latter's comments.

1.15 The Seller will provide **list of plant & machinery with detailed specifications to be retained** with suggestions if any for approval of Purchaser within 45 days of signing of this Agreement. The Purchaser & Inspection Agency shall unless they have objection approve the same in writing and despatch their approval/comments to the Sellers within 07 days of its receipt. If corrections are sought by Purchaser & Inspection Agency the Sellers shall incorporate the same and submit 6 copies for the final approval and implementation within 07 days of the receipt of the latter's comments.

1.15 Purchaser& Inspection Agency shall have the right to suggest minor modifications to be made in the drawings, diagrams or layout as in their opinion may appear necessary for more efficient functioning of the plant and machinery and as may be mutually agreed upon by the Sellers and Purchasers.

2.0 MISTAKES IN DRAWINGS

The Sellers shall be responsible for and shall pay for any alternations of the plant and machinery due to any discrepancies of errors or omissions in the drawings or other particulars supplied by them whether such drawings or particulars have been approved by the Purchasers or not.

3. MANUALS AND OTHER DOCUMENTS

The sellers shall submit the following information, progressively within 4 months of signing the agreement. (this information shall also be filled in the proforma mentioned under 1.5 above)

i) 6 (six) sets of civil scope design data and necessary information in respect of all civil and structural engineering work including cable trenches, drains etc., to be carried out by the Purchaser. Design data should contain enough information on static load and other design data required for detailed calculations and designs for all plant buildings, structures, misc. works etc.

ii) 6 (six) sets of plans for equipment layout drawings showing all the details of the relevant location and space requirement of each item of plant and equipment.

iii) 6 (six) copies of flow sheets, showing the details of the flows pertaining to raw-materials, utilities and other inputs, items of machinery and equipments etc.

iv) 6 (six) copies of the plant operation and maintenance manuals containing specifications and detailed working guidance for each item of equipment, maintenance procedures, specifications of lubricants (of at least 4 prominent National lubricant oil manufacturers) recommended for all machinery and equipment to enable the Purchaser to arrange for the procurement of the same.

v) 6 (six) copies of the manuals of instructions for care and safe custody of plant and equipment at site and for their erection prior to the despatch of the plant and equipment.

vi) Such other information, explanation and advises as may be requested from time to time by the Purchasers/NFCSF with regard to the installation, erection start-up and operation of the plant for and upto a period of 2 (two) years after commissioning.

vii) 3 months before commissioning of the plant & machinery the seller shall furnish to the Purchasers the following:

i) 3 sets of list of all Ball/Roller bearings fitted in the Sugar Plant indicating bearing numbers, make and place of use etc.

ii) 3 sets of list of all electric motors installed in the sugar plant (equipment wise stating motor type, HP & rpm etc.)

iii) 3 sets of list of all reduction gear boxes installed in the plant indicating the place of use, gear box type, ratio, hp rating and service factor etc.

iv) 3 sets of list of all VFD's installed in plant indicating the place of use.

v) DCS philosophy and point of controls.

vi) 3 sets of list of all pumps installed in the plant indicating the type of pump, duty, discharge & total head etc.

vii) 3 sets of list of all coupling bushes, oil seals etc. fitted in the plant indicating the place of use, type & sizes etc.

Chart for submission of Drawings, Manuals and other documents

Sl.	Particulars	Seller will be submit for approval drawings etc. within	Purchaser will approve/give comments within	Seller will incorporate all required corrections and will submit revised drawings within
1	**Tentative layout**	10 days from date of signing of agreement	07 days	07 days
2	**General layout**	21 days from date of signing of agreement	07 days	07 days
3	**Engineering layout**	15 days from date of approval of General layout	07 days	07 days
4	**Detailed material flow diagram**	10 days from the date of approval of engineering layout	07 days	07 days
5	**Price break-up**	30 days from date of signing of agreement	07 days	07 days
6	**Delivery time schedule**	30 days from date of signing of agreement	07 days	07 days
7	**Load data and coordinate drawings of main machinery**	30 days from date of signing of agreement	15 days	07 days
8	**Load data and coordinate drawings of the balance machinery and equipments**	45 days from date of signing of agreement	15 days	07 days

9	Proforma for date of commissioning of the plant and machinery	07 days of finalisation of engineering layout	07 days	07 days
10	**Layout of the pipelines**	60 days of the date of signing of Agreement	07 days	07 days
11	**Drawings of the staging for the plant and machinery**	60 days of the date of signing of Agreement	07 days	07 days
12	**Drawings showing all dimensions of juice heaters**, evaporators, juice and syrup sulphitors, hoppers, cane bagasse carriers etc	60 days of the date of signing of Agreement	07 days	07 days
13	**Calculations in regard to heating surfaces**	60 days of the date of signing of Agreement	07 days	07 days
14	**All general arrangement drawings and instruction manuals**	06 months of the date of signing of Agreement		
15	**Single line diagram**	15 days of finalisation of engineering layout	10 days	10 days
16	**Drawings of machinery and equipmen**t	02 months of the date of signing of Agreement	15 days	10 days
17	**Erection drawings of various equipments**	02 months of the date of signing of Agreement	10 days	10 days

Annexure-B-6

Price break up of various equipment for cash flow and delivery schedule

ANNEXURE-B-6

PRICE BREAKUP OF VARIOUS EQUIPMENT FOR CASH FLOW ARRANGEMENT AND DELIVERY SCHEDULE

(This shall be furnished by Sellers in term of bar chart delivery details week-wise two to three months of signing the Agreement for Purchaser's planning of cash mobilization)

Tentative Format:

S.No.	Particulars		Rs. In lakhs	Delivery completed by
1	2		3	4
I.	CANE MILLING PLANT			
II.		CLARIFICATION; EVAPORATION; BOILING; COOLING; CURING; GRADING & BAGGING PLANT		

III.		**STEAM GENERATING PLANT**		
IV.		**POWER GENERATION PLANT**		

Grand total of above five plants is Rs……. Lakhs (Rupees……..) i.e. the total contract price mentioned as at section 3.0 of main agreement.

Annexure-B-7

Performance parameters of sugar plant of 4900 TCD per 22 hrs. basis and 12 MW Power Plant

ANNEXURE – B-7

PERFORMANCE PARAMETERS OF SUGAR PLANTS FOR 4900 TCD per 22 hrs. BASIS

1. ***Milling Plant***

i) The preparation index of prepared cane shall be 88 plus. The preparation index shall be determined by Aldrich / Rayner CCR Australian method.

ii) Crushing capacity – 4900 TCD per 22 hrs. basis.

iii) Primary extraction should be 71$\pm$1.

iv) Moisture of bagasse of first mill should be 55 $\pm$ 0.50.

v) Whole Reduced Extraction (Mittal) shall be 96% plus upto with imbibition 270% on fibre.

vi) Moisture % last mill bagasse shall not be more than 49 $\pm$ 0.5 with bagasse pol of 1.6 $\pm$ 0.1.

2. ***Clarification Plant***

i) Milk of Lime preparation, Juice Sulphiter and Clarifier -The clear juice obtained from clarifier should be free from suspended mud particles and thick mud should be obtained. In a sample of one litre muddy juice drawn from the clarifier, minimum 50 grams of dry insoluble solid should be obtained.

ii) Vacuum Filter – Vacuum filter efficiency (mud solids retention) should not be less than 75% based on the average of 6 samples taken under regular working conditions. The bagacillo should be available at the rate of 9 Kgs per tonne of cane per hour, pol % filter cake should not be more than 1.5 at wash water of 100% on cake.

3. ***Evaporator and boiling Plant***

a) Evaporator

(i) Minimum vacuum at the last body of evaporator shall be 635 mm at mean sea level.
(ii) The evaporator set should able to give upto 80% evaporation.
(iii) Steam consumption % cane should be less than 40%$\pm$2%.

b) Vacuum Pan

- Minimum vacuum at the pan body shall be 635 mm at mean sea level.
- Total cycle time (full strike level) shall not be more than the following:

A massecuite pan - 2.5 hours
B massecuite continuous pan - 30 Tons per hour capacity shall be achieved.
C massecuite pan - 6.0 hours after footing and C – massecuite brix 101 – 102 deg and less than 5.0 hours with mechanical circulator

c) Condensers

(i) Minimum vacuum in the body of the condenser shall be 650 mm.

(ii) Difference of temperature between vapours to be condensed and tail pipe water temperature shall be less than 10 deg. C.

d) Cooling Tower

Minimum drop of 20 deg C or within 5 deg C of wet bulb temp. shall be achieved during season.

4. ***Cooling, curing and grading***

(a) **Crystallisers**

(i) Minimum purity drop in C – crystallisers shall be 4 units reckoned from C – pan dropping massecuite to over flow of C – continuous crystallisers.

(ii) B – massecuite shall be cooled from 65 deg. C to 50 deg. C in 8 hours when supplied with cooling water at 30 deg. C.

(iii) C – massecuite shall be cooled from 65 deg. C to 40 deg. C in 15 hours when supplied with cooling water at 30 deg. C.

(b) **Rapid Reheating Equipment:**

The cooled C – massecuite shall be reheated rapidly in transient heatres from 40 deg. C to 50 deg. C and the final temperature shall not exceed more than 52 deg. C.

(c) **Continuous Centrifugal Machines:**

The guaranteed capacity of continuous centrifugal machines shall be linked to the following:

ii) B – massecuite brix 95-96, purity not exceeding 67.00

iii) C – massecuite brix 101-102, purity not exceeding 49.00

Performance Parameters to be obtained from Centrifugal machine:

(i) Purity of single cured C – sugar shall not be less than 82.00.

(ii) Purity of double cured C – sugar shall not be less than 94.00

(iii) Purity increase between Nutsch molasses purity (C – massecuite fed to C – fore workers) and final molasses purity from C – fore worker machines shall not be more than 1.5.

(iv) Purity of B – single cured sugar shall not be less than 95.0.

(v) Capacity of A batch machine shall be judged for average cycles during continuous four hours working and for continuous machines also for four hours continuous working for successive 7 days respectively.

(vi) Exhaustion of massecute shall be minimum 60%.

vii) Final molasses purity should be 28(+/-1)

(d) **Sugar Melter**

The brix of the melt should not be less than 65 deg. And melt shall be free from sugar crystals.

(e) **Grass Hopper**

The temperature of the sugar at the end of the last hopper shall not be more than 38 deg. C and moisture should not be more than 0.03% when the ambient temperature is below 36℃.

(f) **Reduced Boiling House Recovery**

The reduced boiling house recovery shall be 92% +(on C-heavy) and 90% + (on B-heavy) (Plus) by Gundu Rao formula.

5. ***Steam Generation Plant***

i) CO_2 in the flue gas should not be less than 14.5% measured after waste heat recovery units (corresponding to 35% excess air) with unburnt gases not exceeding 0.1%.

ii) The flue gas temperature shall not be more than 160 deg. C. Measured after last heat recovery units.

iii) Peak generation shall be 110% MCR for half an hour.

iv) Efficiency of the steam generation plant shall be minimum 70% on G.C.V. of bagasse having 50% moisture and determined as per IS 13980-1995. For every reduction in moisture% bagasse of 1% there shall be rise of 0.5% in boiler efficiency.

v) Steam generation capacity shall be 120 TPH continuously for a period of 24 hrs. at 67 ata and 490(+/-5) deg. C.

vi) Pressure and temperature drop at HP piping between super heater outlet and power turbine inlet shall not be more than 1 kg/cm.^{2} and 5 deg. C. respectively.

6. ***Power Generation Plant***

i) Specific steam consumption of the Turbo Generating Set shall not exceed 5.67 TPH/MWH during season at it's rated speed on normal steam operating parameters.

ii) The power factor of the electrical system shall not be less than 0.9. The performance of all electrical equipments shall be as per existing IS codes.

iii) The Alternator shall sustain a continuous load of 12000 KW at 0.8 Lag power factor at rated Voltage 11 KV, 50 Hz.

7. Raw Sugar :

- Pol % : 98 to 99
- Colour (ICUMSA) : 500 – 700
- Ash % : 0.5
- Starch (ppm) : < 100
- Dextran (ppm) : < 100
- Moisture % : ≤ 0.2

Refined Sugar:

- Pol % : 99.8
- Colour (ICUMSA) : 60(maximum)
- Ash % : ≤ 0.027
- Moisture % : ≤ 0.04

- Sediment (ppm) : ≤ 10
- Beverage Floc (ppm) : - ve

8. CONDENSATE POLISHING UNIT

QUANTITY AND CHARACTERISTICS OF PROCESS EVAPORATION CONDENSATE

Sr. No.	Parameter	Process condensate characteristics
1.	Quantity (M^3/day)	App. 410
2.	Temperature	50– 55^{0}C
3.	pH	2.50 to 4.50
4.	B.O.D. (PPM)	2,500 - 3,500
5.	C.O.D. (PPM)	8,000 - 10,000
6.	Volatile acidity (PPM)	3,500 - 4,500
7.	Total Solids content (TDS), PPM	1000
8.	T.S.S. (PPM)	Nil
9.	NH_3-N (PPM)	Nil

B) PARAMETERS OF TREATED WATER AT THE OUTLET OF ULTRA FILTERATION (CPU)

Sr. No.	Parameters	Unit	Value
1.	Quantity	M^3/day	To be specified
2.	Temperature	^{0}C	30
3.	pH		7.00 – 7.50
4.	B.O.D.	PPM	< 30
5.	C.O.D.	PPM	< 85
6.	TDS	PPM	< 300
7.	T.S.S.	PPM	< 5
8.	NH_3-N	PPM	To be specified
9.	H_2S	PPM	Nil

Annexure-B-8

Performance certificate

ANNEXURE-B-8

PERFORMANCE CERTIFICATE
(TO BE ISSUED BY AUTHORISED AGENCIES)

This is to certify that M/s…….. have supplied, supervised the erection and commissioning of plant & machinery having crushing capacity of 4900.TCD on 22 hrs basis commissioned on date …… and have given the successful performance as per the laid down performance parameters given at Annexure-B-7 ____The detail of performance parameters achieved during the performance trial for the----------are as under:-

Sr.No.	Detail of Performance Parameters	PP laid down as per Annexures **B-7**	PP Achieved

Annexure-B-9

Draft of Bank guarantee against first and second advance payment

DRAFT OF BANK GUARANTEE AGAINST FIRST & SECOND ADVANCE PAYMENTS

Bank Guarantee No._____

THIS GUARANTEE MADE THIS_____day of Two thousand & Twenty Three, by the _____ Bank, having its branch office at _____ (hereinafter called 'The Guarantor' which expression shall, unless repugnant to the context or contrary to the meaning thereof, include its successors and assignees) of the one part in favour of The Uttar Pradesh Coop. Sugar Factories Federation Ltd., Lucknow on behalf of The Kisan Sahakari Chini Mills Ltd., Gajraula ,Distt. Amroha, Uttar Pradesh hereinafter called 'The Purchaser' which expression shall, unless repugnant to the context or contrary to the meaning thereof include its successors and assignees) of the other part.

WHEREAS M/s .....**,** a company registered under the Indian Companies Act,1956 having its registered office at ..... and chief place of business at **.....** (hereinafter called 'The Seller' which expression shall unless repugnant to the subject or context include their legal representatives, administrator, successors or permitted assignees) has entered into with the Purchaser an Agreement dated _____ (hereinafter called the said Agreement) to design, manufacture, procure , supply and supervise erection & commissioning of the Machinery and Equipment of gravity flow type sugar plant of 4900 TCD on 22 hr. basis and construction of foundations and buildings on EPC basis (hereinafter referred to as "the said Machinery and Equipment") for the Purchaser's new sugar plant to be set up at Gajraula, Distt. Amroha, Uttar Pradesh in accordance with the terms and conditions therein contained.

AND WHEREAS under clause 16.1(i)/16.1(ii) of the said Agreement, the Purchaser is required to pay to the Seller against the security of a Bank Guarantee an advance payment of Rs..... lakhs (Rupees .....only) representing 10% (Ten per cent) of portion of Ex-Works Price mentioned at clause no. 3.1.1 (a) as first/second advance payment for the purpose of procurement of materials/equipment for the said Machinery and Equipment and such guarantee to be valid till the full advance amount is

adjusted against the Ex-Works price of the actual deliveries as provided in price break-up (Annexure-VI of the agreement) of Machinery and Equipment supplied to site.

AND WHEREAS before advance payment as aforesaid is made the Guarantor has at the request of the Seller agreed to give a guarantee as hereinafter contained.

NOW THIS DEED WITNESSES AS FOLLOWS:

(e) In consideration of the premises the Guarantor hereby undertakes to pay the Purchaser within thirty days of demand and without demur such a sum not exceeding Rs..... lakhs (Rupees .....only) as the Purchaser may demand representing 10% (Ten per cent) of the Ex-works Price and cost of foundations and buildings and if the Guarantor fails to pay the sum within the said period, the Guarantor will also pay, on the sum demanded, interest @ 12 % (Twelve percent) p.a. from the date of demand till the date of advance till the date of payment. Provided that the liability of the Guarantor hereunder shall be adjusted and reduced with the progress of delivery of Plant Machinery and Equipment supplied by the Seller and to the extent adjustment shown in Seller's invoices upto that time as per clause 16.0 and its sub-clauses of the said Agreement.

(f) The Guarantor shall pay to the Purchaser on demand the sum under Clause 1 above without demur and without requiring the Purchaser to invoke any legal remedy that may be available to them, it being understood and agreed, FIRSTLY that the Purchaser shall be the sole judge of and as to whether the Purchaser shall be the sole judge of and as to whether the Seller have committed breach of any of the terms and conditions of the said agreement and SECONDLY that the right of the Purchaser to recover from the Guarantor any amount due to the Purchaser shall not be affected or suspended by reasons of the fact that any dispute or disputes have been raised by the Seller with regard to their liability or that proceedings are pending before any Tribunal, Arbitrator(s) or Court with regard thereto or in connection therewith, and THIRDLY that the Guarantor shall immediately pay the aforesaid guaranteed amount to the Purchaser on demand and it shall not be open to the Guarantor to know the reasons of or to investigate or to go into the merits of the demand or to question or to challenge the

demand or to know any fact affecting the demand and LASTLY that it shall not be open to the Guarantor to require proof of the liability of the Seller to pay the amount before paying the aforesaid guaranteed amount to the Purchaser.

(g) This Guarantee shall come into force from the date hereof and shall remain valid till 30 days after the full advance amount is adjusted under clause 16.0 & its sub-clauses of the said agreement, which according to the terms and conditions of the said Agreement is stipulated to be adjusted by proportionate10% (ten per cent) of the Ex-works Price mentioned at clause 3.1.1 (a) of the said agreement of the sellers for effected actual deliveries of the Machinery and Equipment at site, but if the actual deliveries as aforesaid have not been completed by the Seller within the said period for any reason whatsoever, the Guarantor hereby undertakes that the Seller shall furnish a fresh or renewed guarantee on the same proforma for such further period as the Purchaser may intimate failing which the Guarantor shall pay to the Purchaser a sum or sums not exceeding Rs.....lakhs **(**Rupees .....only) or the residual amount of balance advance left after proportionate adjustment in accordance with clause 1 above, as the Purchaser may demand alongwith the interest @ 12 % (Twelve percent) p.a. on unadjusted amount of advance.

(h) This guarantee is in addition to and not in substitution for any other guarantee executed by the Guarantor in favour of the Purchaser on behalf of the Seller.

(i) The Seller and the Purchaser will be at liberty to vary and modify the terms and conditions of the said Agreement without affecting this guarantee, notice of which modifications to the Guarantor is hereby waived and the same shall be deemed to have been done with the assent of the Guarantor.

(j) This Guarantee shall not be affected by any change in the constitution of the Guarantor or of the Seller nor shall the guarantee be affected by the change in the constitution of the Purchaser or by amalgamation or absorption with

any other body corporate and this guarantee will be available to or enforceable by such body corporate.

(k) This guarantee is irrevocable except with the written consent of the Purchaser.

(l) The neglect or forbearance of the Purchaser in enforcing any payment of moneys, the payment whereas is intended to be hereby secured or the giving of time by the Purchaser for the payment thereof shall in no way release the Guarantor from its liability under this guarantee.

(m) The invocation of this guarantee shall be by a letter signed by the Purchaser and countersigned by the Managing Director, Uttar Pradesh Coop. Sugar Factories Federation Ltd., Lucknow and notifying/declaring the amount of advance remaining unadjusted alongwith the interest @ 12 % (Twelve percent) p.a. on unadjusted amount and payable to the purchaser.

(n) Notwithstanding anything stated hereinbefore the liability of the Guarantor under this guarantee is restricted to Rs..... lakhs (Rupees .....only) alongwith the interest @ 12 % (Twelve percent) p.a. on unadjusted amount of advance . This guarantee shall remain in force upto …….. Unless a demand or action under this guarantee is filed against the Guarantor in writing within three months from the date of expiry i.e. on or before …….. all rights of the Purchaser under this guarantee shall be forfeited and the Guarantor shall be released and discharged from all liabilities hereunder.

IN WITNESS WHEREOF _____ for and on behalf of the Guarantor have signed this deed on the day and year above written.

Witnesses: **For and on behalf of the Guarantor**

Annexure-B-10

Draft of Bank guarantee for timely delivery

ANNEXURE-B-10

DRAFT OF BANK GUARANTEE FOR TIMELY DELIVERY

Bank Guarantee No._____

THIS GUARANTEE MADE THIS_____ day of _____,Two thousand Twenty Three, by the _____ Bank, having its branch office at _____ (hereinafter called 'The Guarantor' which expression shall, unless repugnant to the context or contrary to the meaning thereof, include its successors and assignees) of the one part in favour of The Kisan SahakariChini Mills Ltd., Gajraula , Distt. Amroha, Uttar Pradesh having its registered office at Lucknow, in Uttar Pradesh State,
hereinafter called 'The Purchaser' which expression shall unless repugnant to the context or contrary to the meaning thereof include its successors and assignees)of the other part.

WHEREAS M/s.....a company registered under the Indian Companies Act, ... having its registered office at ..... and chief place of business at ..... (hereinafter called 'The Seller' which expression shall unless repugnant to the subject or context include their legal representatives, administrator, successors or permitted assignees) has entered into with the Purchaser an Agreement dated _____ (hereinafter called the said Agreement) to to design, manufacture, procure , supply and supervise erection & commissioning the Machinery and Equipment of gravity flow type sugar plant of 4900 TCD on 22 hr. basis and construction of foundations and buildings on EPC basis at Gajraula, Distt. Amroha (hereinafter referred to as "the said Machinery and Equipment") for the Purchaser's proposed new sugar plant at Gajraula, Distt. Amroha, Uttar Pradesh in accordance with the terms and conditions therein contained.

AND WHEREAS under clause ------ of the said Agreement, the Seller are required to furnish to the Purchaser a Bank Guarantee in respect of timely delivery of the said Machinery and Equipment and construction of foundations and buidings as provided in clause ------- of the said Agreement for the sum of Rs..... lakhs (Rupees ..... only) being 10% (Ten per cent) of the total contract price such guarantee to be valid till 30 days after the scheduled date of commissioning of the

Machinery and Equipment. AND WHEREAS at the request of the Seller, the Purchaser has agreed to accept a Guarantee from the Guarantor being these presents to secure such obligations on conditions expressly that the Guarantor shall on demand and without demur pay the aforesaid guaranteed amount to the Purchaser.

AND WHEREAS the Guarantor has at the request of the Seller agreed to give the guarantee as hereinafter appearing.

NOW THIS DEED WITNESSES AS FOLLOWS:

A) In consideration of the premises the Guarantor hereby undertakes to pay the Purchaser within thirty days of demand and without demur such a sum not exceeding Rs._____/- (Rupees _____ only) representing 10% (Ten per cent) of the Total Contract Price as the Purchaser may demand, and if the Guarantor fails to pay the sum within the said period the Guarantor will also pay, on the sum demanded, interest at the bank lending rate then prevailing reckoned from the date of demand.

B) The Guarantor shall pay to the Purchaser on demand the sum under clause 1 above without demur and without requiring the Purchaser to invoke any legal remedy that may be available to them, if being understood and agreed, FIRSTLY that the Purchaser shall be the sole judge of and as to whether the Seller have committed breach/or breaches, of any of the terms and conditions of the said Agreement and SECONDLY that the right of the Purchaser to recover from the Guarantor any amount due to the Purchaser shall not be affected or suspended by reasons of the fact that any dispute or disputes have been raised by the Seller with regard to their liability or that proceedings are pending before any Tribunal/Arbitrator(s) or Court with regard thereto or in connection therewith, and THIRDLY that the Guarantor shall immediately pay the aforesaid guaranteed amount to the Purchaser on demand and it shall not be open to the Guarantor to know the reasons of or to investigate or to go into the merits of the demand or to question or to challenge the demand or to know any fact affecting the demand and LASTLY that it shall not be open to the Guarantor to require proof of the liability of

the Seller to pay the amount before paying the aforesaid guaranteed amount ato the Purchaser.

C) This guarantee is in addition to and not in substitution for any other guarantee executed by the Guarantor in favour of this Purchaser on behalf of the Seller.

D) The Seller and the Purchaser will be at liberty to vary and modify the terms and conditions of the said Agreement without affecting this guarantee, notice of which modifications to the Guarantor is hereby waived and the same shall be deemed to have been done with the accent of the Guarantor.

E) This guarantee shall not be affected by any change in the constitution of the Guarantor or of the Seller nor shall the guarantee be affected by the change in the constitution of the Purchaser or by amalgamation or absorption with any other body corporate and this guarantee will be available to or enforceable by such body corporate.

F) This guarantee is irrevocable except with the written consent of the Purchaser.

G) The neglect or forbearance of the Purchaser in enforcing any payment of moneys, the payment whereas is intended to be hereby secured or the giving of time by the Purchaser for the payment thereof shall in no way release the Guarantor from its liability under this deed.

H) This guarantee shall come into force from the date hereof and shall remain valid till the supply and erection of the Plant and Machinery for the said plant is completed in all respects and to the satisfaction of the Purchaser and the said plant is commissioned in accordance with the stipulation in the said Agreement for which the stipulated date according to terms and conditions of the said Agreement is, but if the date is for any reason whatsoever and upon such extension the Seller fails to furnish or renew Guarantee for the extended period, the Guarantor shall pay to the Purchaser the said sum of Rs……../- or such lesser sum as the Purchaser may demand.

I) The invocation of this guarantee shall be by a letter signed by the Purchaser and countersigned by the Managing Director, Uttar Pradesh Coop. Sugar Factories Federation Ltd., Lucknow.

J) Not withstanding anything stated hereinbefore the liability of the Guarantor under this guarantee is restricted to Rs……./- (Rupees _____only). This guarantee shall remain in force upto ……., unless a demand or action under this guarantee is filed against the Guarantor in writing within three months from the date of expiry i.e……., all rights of the Purchaser under this guarantee shall be forfeited and the Guarantor shall be released and discharged from all liabilities hereunder.

IN WITNESS WHEREOF _____ for and on behalf of the Guarantor have signed this deed on the day and year above written.

Witnesses: For and on behalf of the Guarantor

Annexure-B-11

Updated guidelines for test and trials before start of crushing season at a new sugar plant

ANNEXURE-B-11

UPDATED GUIDELINES FOR TESTS AND TRIALS BEFORE START OF CRUSHING SEASON OF A NEW SUGAR PLANT

In order to ensure smooth and efficient cane crushing operations, it is absolutely necessary that the tests and trials of the different equipments and pipelines are taken before the crushing season is started. As far as possible, the trials of the moving machinery should be taken on load.

The hydraulic tests of all the pipelines, heat transfer vessels including boiler pressure parts, juice heaters, evaporator vessels, pans, condensers, etc should be taken at the prescribed pressures, after completion of erection and fitting of various valves, mountings etc. However, fitting of safety valves and insulation / lagging should be done after hydraulic testing. The running trials should be taken in phases.

The recommended procedure for hydraulic testing and running trials is follows:-

HYDRAULIC TEST OF THE PIPELIENS, VESSELS, TANKS, ETC.

The following pressures are recommended for hydraulic testing the different pipes, vessels, etc. after completion of erection, but before lagging / insulation.

Boiler pressure parts including super heaters – 1½ times the working pressure.

Live steam piping, PRD station, desuper heater vessels, exhaust steam piping with valves etc. – 1½ times the working pressure.

All process & water piping including spray / injection water, condensate, juice, water, syrup, molasses, magma, etc. should be tested for leakages by pumping water after taking into line the required pumps and equipments.

The compressed air receivers, superheated wash water vessel, radiator for alternator, steam jacket of sulphur burners, air heaters for grass hoppers, turbine oil coolers, mill roller bearing etc. – 1½ times the working pressure.

Calandria of tubular juice heaters – 10 kg/sq. cm.

Calandria of evaporators and pans – 5 kg/sq. cm

All the juice trays, juice receiving tanks, boiler feed water & deaerated water tanks, clarifier, evaporator bodies, pan bodies, condensers with tail pipes, vapour pipes at the evaproator and pan stations, syrup and molasses storage tanks and other tanks etc. should be tested for leakages by completely filling with eater.

The bodies of tubular juice heaters should be tested by pumping water using the mixed / sulphited juice pumps.

RUNNING TRIALS OF INDIVIDUAL EQUIPMENT

After the hydraulic tests have been completed satisfactorily, the running trials of the plant and machinery should be taken in phases. In the first phase, individual no load running trials of all the moving machinery should be taken. Before the machine is meggar and direction of rotation of the motors and the prime movers should be examined after taking out coupling bolts. After removing the initial effects during the individual trials, the endurance trial of each moving equipment should be continuously taken at no load in the second phase for the period noted below:-

Cane truck tippler/ unloader etc. – 4 hours.

Feeder table – 8 hours

Cane carrier – 12 hours.

Cane kicker / chopper – 12 hours

Cane _ealize / cutter/fibrizer/shredder assembly – 12 hours. During running trials, vibration levels should be measured and recorded.

Mills including pressure feeder, rake carriers etc. – 22 hrs.

During this period, grinding of the trash plates, scrappers, etc. should be completed. The vibration levels at mill drive motor/turbine and gear boxes hould be measured and recorded. All the safety devices for the turbines/motors should be tested for satisfactory operation.

Imbibition equipment including rotary screen, screw conveyor and mixed juice pumps – 8 hours.

Bagasse elevator and conveyor including cross carriers & RBC – 24 hours.

Juice and water weighing scale – 8 hours.

Juice sulphiters – 8 hours

Air compressor – 4 hours

Lime slacker, MOL pump, lime storage tank – 4 hours.

Vacuum filter including feed mixed – 8 hours.

Juice heaters, evaporators and pans – each 8 hours.

During the endurance trials of these equipments, water should be heated and boiled and vacuum trials should also be conducted.

All juice, syrup, water, condensate, molasses, magma, injection, spray pumps, etc.- each 8 hours.

Seed, vacuum, water cooled, air cooled and continuous verical crystallizers – 24 hours.

Each centrifugal machine – 2 to 4 hours.

It should be ensured that all the solenoid and pneumatic valves, electrical panels & fittings, lubricating system, etc. work satisfactorily. During running trials, the vibration levels should be measured and recorded.

Sugar melter, pug mills & magma mixers – 4 hours.

Grass hoppers, FBD dust arresting system including hot/cold air blowers – 16 hours

Sugar elevator – 16 hours

Sugar grader – 16 hours

Molasses weighing scale – 4 hours

Boilers – The boilers should be slow fired about 7/10 days before raising steam. This is required to dry the new refractory bricks properly. Thereafter, chemical boiling is to be carried out as per boiler supplier's recommendations.

Steam should be raised to working pressure in all the boilers and necessary adjustment of safety valves, etc. should be made as per boiler supplier's recommendations.

After the above trials are completed, the steam pipelines upto the prime movers are to be blow off.

All mountings, fittings, control system and safety devices for the boilers should be tested for satisfactory operation.

The auxiliary oil burning equipment should be tested for 4 hours.

ID, FD and secondary air fans – each 8 hours.

During running trials, the vibration levels of the fans should be measured and recorded.

Boiler instrument and control system should be tested for proper operation of various systems.

Turbo alternator set – The turbo alternator should have tiral runs on part load at least for two days. During each day, the set should be worked for 6 hrs. For putting load on the alternator, electric motor driven pumps and other electrical equipments should be simultaneously run and tested. During the running trials of the turbo alternator set, vibration level should be measured and recorded. All the safety devices of the turbo alternator set should be checked and tested for satisfactory operation.

In case major defects are detected, the endurance trails should be repeated. The endurance trails should be conducted till all the major defects have been removed.

COMPOSITE STEAM AND WATER TRIALS OF THE PLANT

After the endurance trials of all the moving machines and equipments has been carried out individually and the defects rectified, composite steam and water trial should be conducted. In these final trials, all the items of plant and machinery should be run simultaneously using water instead of juice and the entire electrical load should be put on the turbo alternator. The pumping sets should never be run dry. The water should be pumped from the mill house to the pans in proper sequence. It should be heated in the juice heaters and boiling should be done in the evaporators and pans. Initial filling of boilers should be done by treated water conforming to boiler supplier's recommendations. Water softening/demineralised plant should be commissioned sufficiently in advance so that boiler feed water storage tank contains sufficient treated water for initial feed as well as make up water required during initial periods of steam trials.

No exhaust should be blown out. The boiling in the multiple effect evaporator should be started immediately after the prime movers have been commissioned. Immediately after the condensate is available, it should be fed in the boilers and treated raw water should be used only as make up water. The surplus condensate should be collected in a tank to be used as and when required. It should be ensured that except the initial filling in the boilers, no treated raw water is taken as far as possible.

During this process of boiling, if there is any apprehension of formation of scales in the evaporator set, the raw water to be used in the evaporator should be treated by heating the same in the juice heaters and treating by lime and washing soda in the juice sulphiter. Halogens (chlorides /fluorides) should not be used if the juice heaters, evaporator or pans are fitted with stainless steel tubes.

The treated and boiled water should be sent to the continuous clarifier and decanted water from the clarifier should be taken in the evaporator. This process should be continuous during the period the boiling in the evaporator is continued. This will also enable thorough testing of the juice heaters, sulphiters, continuous clarifier and evaporators without such scaling. Similarly, the boiling in the pan should be done with soft treated water available from the clarifier.

The composite steam and water trial may be done once for a period of 8/10 hours and it should be ensured that all defects are rectified. If major defects are noticed during the composite trials, the same should be repeated after rectifying the defects noted during the first composite trials.

RECORDING OF DATA PERTAINING TO TESTS & TRIALS

The recording of data is as important as tests and trials themselves. It is suggested that section-wise registers may be maintained by the concerned Engineer/Chemist. All the details such as broad specifications of the equipment, date of hydraulic testing/running trial, name of the person supervising the trials and the result of the trials such as load on the drive motor/turbine, vibration level, bearing temperature, steam pressure and temperature, voltage and frequency, any other observations with regard to smooth working or otherwise, should be recorded. This will facilitate proper diagnosis and monitoring of the tests and trials.

Annexure-B-12

Indicative list of Plant & machinery to be retained

ANNEXURE B-12

INDICATIVE LIST OF PLANT & MACHINERY TO BE RETAINED

1. **Cane Weigh Bridges**
2. **Tube wells**

SECTION C:
DRAFT AGREEMENT FOR ERECTION AND COMMISSIONING
ON NON JUDICIAL STAMP PAPER (VALUE Rs.100)

FOR TIMELY ERECTION & COMMISSIONING

This agreement made on the day of……..2024 (…….two thousand eighteen) at Gajraula (Distt. Amroha) between The General Manager, Kisan Sahakari Chini Mills Ltd., Gajraula, Distt. Amroha – 276406, Uttar Pradesh, a cooperative society registered under the U. P. Copperative Societies Act,, having its registered office at Kisan Sahakari Chini Mills Ltd. Gajraula (Distt. Amroha) (hereinafter called the "MILLS"), which expression shall, unless repugnant to the subject or context, include their successors and assignees represented by Sri…….of the purchasers of the ONE PART, and the M/s. ……. a company within the meaning of companies act, 1956, having its registered office at …….hereinafter called the Erection Contractor or (E.C.) which expression shall, unless repugnant to the subject or context, include their legal representatives, administrators, successors or permitted assignees represented by Sri……., of the OTHER PART.

WHERAS the Mill are going to purchase refined sugar producing plant of crush rate of 4900 TCD at Gajraula (Distt. Amroha), under the agreement between the mills and M/s. …….. (hereinafter called the erection contractor).

Whereas the offer of erection contractor vide tender dated…….. to erect and commission the plant and machinery for refined sugar producing plant at Kisan Sahakari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh (thereafter referred to as the site) as specified in Annexure C-1 annexed hereto and forming part of this agreement (hereinafter referred to as 'the said machinery and equipment') has been accepted by the Mills on the terms & conditions hereinafter appearing .

Whereas the contract price hereinafter mentioned is based on the E.C.'s undertaking to erect, commission and make ready for commercial use the said equipment by …….. in which respect the time is essence of the contract and if the E.C. fails to do so, the contract price shall stand reduced as hereinafter provided.

NOW THEREFORE , the parties hereto have agreed on the following terms and condition for erecting and commissioning the said machinery and equipment and their matters connected therewith referred to herein along with the dismantling, shifting & land development of old machineries and plant building.

1.0 CONTRACT PRICE

1.1 The E.C. agreed to erect and commission the said machinery and equipments to be purchased by the Mills under the supply contract and dismantling, shifting and leveling of old plant building and machineries, , as specified in Annexure C- annexed to and forming part of the Agreement with the purpose to successfully design, supply machinery and equipment of the sugar plant and satisfy other relevant technical parameters related to the sugar plant and to do other works hereinafter mentioned, at a total price of ……..... (Rupees……..……lacs)

hereinafter referred to as the' contract price' subject to the terms and conditions hereinafter provided as given below-

Erection and Commissioning (with consumables including those mentioned below), supervision of erection and commissioning and of trial run of the equipment purchased under the supply contract for Sugar Mill and Installation of Power Plant including successful performance and inclusive of the cost of :-

(i) Cost of Site handling, erection, trials & commissioning of the plant and machinery.

(ii) Cost of electrical and power required including cost of power from diesel generating set for fabrication of the equipments.

(iii) Cost of handling at railway station / road transport agency at the point of dispatch and at the destination, unloading, site handling and storage handling and safe custody thereof

(iv) Cost of all consumable items such as electrodes, gas, emery paper, kerosene oil, cotton waste etc.

i) Cost of storage-cum-erection Insurance till commissioning of the plant.

ii) GST alongwith other taxes duties and cesses, as applicable

1.2.1 the price referred in clause 1.1 is firm in all respect till commission of the said equipment.

1.2.2 The contract price is inclusive of all taxes, duties and cesses thereon. Any increase or decrease in taxes, duties, cesses will be made applicable to both the Mills & E.C. subject to the authenticated proof. Any positive/ negative impact of GST/any new imposition of taxes, duties, levies, cess etc. will be to the account of the Mills from the date of implementation of GST/new imposition.

1.2.2 **INSURANCE**

The contract price mentioned in clause 1.1 above include the charges of storage cum erection insurance policy including fire, theft, storage erection, commissioning and other insurance policies in respect hereof shall be arranged by the Erection Contractor with full force and effect. The E.C. contractor shall also have the interest of the Mills and their financiers noted upon such policies of insurance. The insurance policy shall be taken by the E.C. under agreed bank clause in the joint names of the erection contractor as contractor, the Mills as Mills. It shall be the responsibility of the E.C. to ' lodge the claim , if any, with the insurance company and to replace the items of equipment and machinery lost or damaged during erecting, such replacement to be done by the E.C. free of cost delivery at site, within such reasonable time as may be decided by the Mills . All money received against claims shall be credited to the account of E.C.

1.2.3 SCOPE OF WORK

The E.C. shall erect and commission the said plant as detailed in Annexure C-1 & Annexure C-2, annexed hereinafter an integral part of this Agreement, in conformity with the specifications laid and according to progressive erection schedule matching the supply and delivery schedule and to the satisfaction and approval of the Mills so that the said plant shall be ready for commissioning and commercial production within the time provided in clause 4.1.

3.0 **ERECTION AND COMMISSIONING**

3.1 The E.C. agree to erect and commission the equipment and machinery by 16 months from the date of agreement to be supplied under the supply contract as specified in Annexure C-1 & Annexure C-2 annexed herewith to the satisfaction of the Mills .

3.2 The E.C. shall, at their own cost, provide at the site adequate tools, tackles and other erection equipment and also employ adequate number of labor and suitable skilled workmen for safe custody, erection and the commissioning of the machinery equipment and shall have the entire work supervised by qualified and experienced personnel to the satisfaction of the Mills. Any defect in the said erection or damage or loss to the equipment till commissioning shall be rectified /replace and made good forthwith by the E.C. at their own cost and expense.

3.3 **EXCESS MATERIALS**

Any materials including tools and tackles etc. brought by the E.C. at the Mill site and not paid for by the Mills can be taken out by the E.C. after the Mills approval.

4.0 **SCHEDULE OF ERECTION AND COMMISSIONING :**

4.1 The E.C. agree to erect and to give successful performance of the equipment, detailed in Schedule A annexed to and forming part of this agreement, so that the erection of the equipment is completed in all respect to the satisfaction of the Mills and the said equipment commissioned and made ready for commercial use by 16 months from the date of agreement in which respect **TIME IS THE ESSENCE OF THE CONTRACT**.

4.2 The E.C. shall be bound and hereby agree to erect and commission the said equipment by 16 months from the date of agreement in conformity with the drawings, diagram, design and layout as approved by the Mills and in accordance with the other terms and conditions of this Agreement.

4.3 The checking of the machinery foundation during different stages of construction shall be done jointly by the Mills or by their authorized representative and E.C. at factory site.

4.4 The E.C. shall in the erection work seek instruction from the sellers of the said equipment under the supply contract and shall comply with all instructions that the sellers of the said equipment may give to E.C. from time to time.

4.5 The E.C. shall receive the equipment to be supplied under the supply contract as agent of the Mills and shall keep the same in its custody for the purpose of erection. The E.C. shall indemnify the Mills against any loss or damage to the said equipments whilst in its custody

and in the event of loss or damage thereto, the E.C. shall replace the same at its own cost within time so as to adhere to the date of commissioning.

5.0 TRIALS AND TAKEOVER:

5.1 As soon as the equipment is erected and ready for commissioning, the E.C. shall notify in writing to the Mills specifying a date and time not less than 30 days later than the date of the notice when the E.C. intend to carry out the steam, water and load trials as per schedule decided by the Mills to enable the Mills to arrange for fuel and boiler feed water. Unless other wise agreed by the Mills and the E.C., the E.C. shall begin the said trials on the date and time so notified and the Mills shall attend to their carrying out the said trials.

If the Mills fail to attend on the agreed date and time to the said trials as required by this clause or if it is agreed between the Mills and the E.C. that the Mills shall not do so, then the E.C. shall carry out such trials in the absence of the Mills and shall forthwith notify the Mills of the results thereof and the results so notified shall not be questioned by the Mills.

5.2 After the said trials have been completed to the satisfaction of the Mills and / of their furnishing a certificate to the effect that all the equipment and machinery mentioned in schedule -'A' has been erected and commissioned and the equipment has been completed according to the terms and conditions of this Agreement, the E.C.'s obligations under this Agreement shall be deemed to have been fulfilled.

5.3 The Mills will give 20 days clear notice to the E.C. for conducting the performance trials.

The performance trial will be conducted in the presence of the performance trial committee which shall comprise the authorized representatives of the following :-

(a) UP Cooperative Sugar Factories Federation Ltd., Lucknow.
(b) The Director , National Sugar Institute, Kanpur,
(c) National Federation of Cooperative Sugar Factories Limited , New Delhi.
(d) Mills
(e) Erection contractor.
(f) Machinery supplier

The performance trial committee would tabulate the results, achieved during the trial period of seven days and also indicate clearly whether performance as per clause 9 of the supply contract has been achieved or not. In case of non achievement of performance, the extent of failure or default of clause-9 of the supply contract shall also be indicated by the said committee.

5.3.1 If the trials pursuant to clause 5.3 are completed to the satisfaction of the performance trial committee mentioned above, or in their absence to the satisfaction of committee constituted of persons mutually agreed upon by the Mills and the E.C., A certificate to the effect shall be issued by the Mills to E.C.

5.3.2 On furnishing of the certificate mentioned in clause 5.3.1 above, the said equipment shall be deemed to have been taken over by the Mills and the performance guarantee provided in the Erection contract shall stand discharged.

6.0 **DAMAGE TO PERSONS AND PROPERTY:**

During and until the commissioning of the said machinery and equipment the E.C. shall be fully responsible for any loss or damage to persons engaged or deputed at site by the E.C. resulting from any cause whatsoever connected with erection or operation of the works, The E.C. shall provide, at their own cost, for the chief erector and their assistants and erection workmen deputed by them for the erection, an insurance for death or bodily injury suffered by them.

In every case in which by virtue of the provisions of the workmen's compensation Act, the Mills are obliged to pay compensation to a workman employed by the E.C. or by any of their sub-contractors in the execution of the work, the Mills will recover from the E.C. the amount of compensation so paid, and with out prejudice to the rights of the Mills under section 12(2) of the said Act, the Mills shall be at liberty to recover such amount or any part thereof by deducting it from sums due by Mills to the E.C. whether under this contract or otherwise, or realize the same from the E.C.

The Mills shall not be bound to contest any claim made under section 12(1) of the said Act, except of the written request of the E.C. and upon their giving to the Mills, full security for all cost for which Mills might become liable in consequence of contesting the claim.

7.0 **MILL'S RESPONSIBILITY** :

7.1 WORKSHOP AND ERECTION FACILITIES :

7.1.1 The Mills shall provide free of cost suitable accommodation / space for storage of the Mills equipment and machinery and E.C. 's tools and tackles etc.

7.1.2 Workshop machinery facility as available at site shall be provided by the Mills to the E.C.

7.1.3 The Mills shall provide free of cost to the E.C. adequate water supply at factory site. However electricity shall be provided by the mill on cost.

7.2 The Mills shall provide at their cost technical staff and labour, including skilled and unskilled for steam and water trial and commissioning and operating the equipment.

7.3 The Mills shall pay the required statutory inspection and other fees and charges payable under the provision of any Act in respect of installation, operation , or use of machinery and equipment. The Mills shall also be responsible to submit the desired applications timely to the concerned authorities and to obtain the desired certificates/clearances in time.

7.4 **ACCOMODATION :**

Accommodation as available at site shall be provide by Mills to E.C. free of charge. In case of insufficient residential accommodation with Mills, EC has to arrange of his own for which no compensation will be given by mill. E.C. has to arrange for medical facility for his staff at site, for which no compensation will be given by the mill..

8.0 **GROUNDS ENTITLING THE E.C. TO AN EXTENSION OF TIME:**

The E.C. shall not be entitled to any extension of time mentioned in clause 4.1 for any reason, whatsoever except for the following reasons. Any extension of the commissioning date will be granted by the Mills only after obtaining approval of the Managing Director, U.P. Co-operative Sugar Factories Federation Ltd., Lucknow.

8.1 If the Mills order expressly in writing for execution of work by the E.C. to be suspended for no fault of the E.C. the E.C. shall be entitled to reasonable extension of time, as may be decided by the Managing Director, U.P. Co-operative Sugar Factories Federation Ltd, Lucknow.

8.2 The E.C. shall be entitled to corresponding extension of time due to force majeure as per clause of this agreement.

9.0 **FORCE MAJEURE:**

9.1 **Definition**

(a) The right of the E.C. to proceed with the work shall not be terminated as provided in Clause 20 because of any delay in the completion of the work due to unforeseen causes beyond the control and without the fault or negligence of the E.C. or their sub-contractors including (but not restricted to) Act of God or Public enemy, action of Govt. in its sovereign capacity, floods, epidemics, quarantine, strike, lock-outs, fires, explosions, accident, stoppage in the supply of power, civil commotion, riots, etc. In the event of any of the aforesaid contingencies, unusual or extra ordinarily prolonged, the Mills will be promptly kept informed by the E.C. by Fax/ E-mail followed by confirmation in writing with documentary proof within 15 days of the commencement and completion of force majeure circumstances. This Force Majeure clause shall also apply to major sub-contractors of E.C.

(b) Force Majeure shall not include (i) any event which is caused by the negligence or intentional action of a Party or such Party's Sub- Consultant or agents or employees, nor (ii) any event which a diligent Party could reasonably have been expected to both (A) take into account at the time of the conclusion of this Agreement, and (B) avoid or overcome in the carrying out of its obligations hereunder.

(c) Force Majeure shall not include insufficiency of funds or failure to make any payment required hereunder.

9.2 **Measures to be taken**

(a) A Party affected by an event of Force Majeure shall take all reasonable measures to remove such Party's inability to fulfill its obligations hereunder with a minimum of delay.

(b) A Party affected by an event of Force Majeure shall notify the other Party of such event as soon as possible, and in any event not later than 14 (fourteen) days following the occurrence of such event, providing evidence of the nature and cause of such event, and shall similarly give notice of the restoration of normal conditions as soon as possible.

(c) The Parties shall take all reasonable measures to minimize the consequences of any event of Force Majeure.

9.3 **Extension of time**

No Time extention given except Force Majeure.

10.0 **TERMS OF PAYMENT**

10.1 On written request after signing of this Agreement, First advance of 10% of contract price and Second Advance of 10% of contract price (as per clause 1.1) will be paid to the Seller on receipt of respective Bank Guarantees of 10%-10% of contract price including taxes on Mill's proforma. The advance given shall carry an interest @ 12% per annum on reducing balance from the date of issue of cheque/bank draft till the progressive adjustment in the bills. The date of adjustment of bills means the date on which the amount is paid by cheque/draft/RTGS.

10.2 2nd instalment of advance of 10% of contract price (as per clause 1.1) will be paid by cheque/RTGS in favor of Seller as mentioned above subject to furnishing and compliance of the following:

I. Utilisation certificate signed by the chief executive of the seller for advance paid as per clause 10.1. as required by Mill.
II. Statement showing the detailed price breakup of the contract price as per clause 1.1
III. Detailed schedule containing month wise erection prepared in consultation with and to the satisfaction and approval of the Mills.
IV. Proof of fulfillment of all contractual obligations in terms of this Agreement including those given in Schedule 'A', 'B' due upto that date.

Provided that if the Seller fails to comply with any of the contractual obligations due up to that date, the second instalment of advance will not be released to the Seller and all delay will be on Seller account and no extension in date of commissioning shall be granted by the Mills.

The advance payment made by the Mills shall be utilised by the Seller for arranging and making payment to manpower, tools and tackles for erection and commissioning of the said plant and machinery and for no other purpose whatsoever.

Provided that all the aforesaid advance payment shall be made by the Mills on receipt of bank guarantee of equivalent amount on the Mills proforma from Nationalised Bank.

If the seller fails to get any instalment of advance for non-compliance of the above obligations on their part, the payment of advance shall be delayed and such delay shall not in any way entitle the seller for grant of extension in the stipulated date of erection and commissioning under this Agreement.

10.3 After adjusting proportionate amount of advances and interest due there upon and other debits if any from the bill, balance amount will be paid for each bill. The payment shall be made by the Mills, only after the progress of the work has been certified by an authorized representative of the Mills, by RTGS/NEFT.

10.4 In the event of non-submission of the timely delivery guarantee by Seller to the Mills as per tender, the Mills shall deduct 10% of the gross amount.

10.5 (a) in making payment against the proportionate work done, the Mills shall always deduct there from proportionate advance given by that time.

(b) The mill shall deduct the income tax as per provision of Income Tax Act 1961 amended up to date and also other taxes at sources, if deductable to comply with the statutory requirements.

11.0 Liquidated Damages/ PENALTIES

Liquidated damages for delay in Commissioning:
To secure the contractual obligations under this Agreement, the Seller shall be liable to pay the following penalties, if the Seller,

Fail to Commissioning of Plant, machinery and Equipment within the time specified in this Agreement, they shall pay liquidated damages for delay by an amount equal to 1/2% (Half per cent) per week or part thereof on the unsupplied machinery and equipment or the part which has not been executed by the Seller, of the contract price but not exceeding 10% (Ten per cent) of the Total contract price.

12.0 **BANK GUARANTEE/SECURITES:**

12.1 To secure the contractual obligations as per this Agreement ,the Seller at their own cost shall furnish to the Purchaser, the following four bank guarantees, in favour of Purchaser, by a Nationalised. All the guarantees shall be in the formats enclosed as Annexure C-3 to C-4 to this Agreement.

(i) **Bank Guarantee for 1st Advance** – A bank guarantee for receiving the first advance of 10% of contract price amounting to Rs. ..... lakhs (Rupees

.....) only. This guarantee will be automatically adjusted and reduced with the progress of Erection & Commissioning of Machinery and Equipment. This guarantee shall be furnished at the time of signing this Agreement.

(iii) **Bank Guarantee for 2nd Advance** – A bank guarantee for receiving the second advance and on fulfilling the obligation of erection & commissioning for 10% of contract price mentioned in Clause 3.1(iii) amounting to Rs.....lakhs (Rupees .....) only. This guarantee will be automatically adjusted and reduced with the progress of Erection & Commissioning of Machinery and Equipment.

(iii) **Timely Erection and Commissioning Bank Guarantee** – A bank guarantee, within 30 days of signing of agreement, for 10% (Ten per cent) of Total contract price mentioned amounting to Rs..... lakhs (Rupees .....) only. This guarantee shall be against timely erection and commissioning of Machinery and Equipment. This guarantee shall be valid upto 60 days (sixty days) after the scheduled date of completion of supply & commissioning of entire Machinery and Equipment.

(iv) **SECURITY MONEY**

Security money will be 5% of the Contract price (excluding GST). This security money will be deducted on pro-rata basis from every bill.

This Security Money will be refunded in two part as mention below:

1. 60% of security Money deducted as mentioned above will be returned to seller/successful bidder, after successful commissioning date on request.
2. Rest 40% of security money will be returned after 30 days from the date of end of 3rd crushing season (crop days less than 45 days will not be considered as complete crushing season).

12.2 The recovery of the advance paid under clause 10.1 10.2 and 10.3 shall be made prorata (that is to say in the same proportion that the amount of the guarantee bears to the amount as mentioned under clause 10.5)

12.3 If the E.C. shall abandon this Agreement or fail to perform their part of this Agreement within the period, herein agreed or any extension thereof granted by the Mills as per terms of this Agreement or if the work or any part thereof is taken out of the E.C. 's hand under clause 17 then and in any such case the E.C. shall refund to the Mills within 30 days of demand such part of the advance payment hereunder made as the Mills may deem fit to protect their interest failing which the Mills may recover the same with the interest at the lending rate of banks then prevailing .

12.4 The Bank Guarantee required to be furnished by the E.C. under the provisions hereof to secure the advance payment of bank guarantee to secure the timely erection/ commissioning or performance of the plant and machinery or the Bank Guarantees for any other purpose under the provisions hereof shall be in the form(s) approved by the Mills which form(s) shall inter-alia invariably include the provisions that the decision of the Mills

as to whether there has been any loss or damage or default and /or negligence on the part of Mills will be final and binding on the guarantor, that the right of the Mills to recover from the guarantor any amount due to the Mills shall not be effected or suspended by reasons of the fact that any dispute or disputes have been raised by the E.C. with regard to their liability or that proceedings are pending before any tribunal, Arbitrator(s) or Court with regard there to or in connection therewith, that the guarantor shall pay to the Mills the sum under the guarantee without demur on first demand requiring the Mills to invoke any legal remedy that may be available to them, that it shall not be to open to the guarantor to know the reason thereof or to investigate or to go into the merits of the demand or to question or to challenge , the demand or to know any facts effecting the demand or to require proof of the liability of the E.C. before paying the amount demanded by the Mills under the guarantee(s) and that the guarantee shall be invoked only when the invocation letter is signed by the Mills & counter signed by the Managing Director of U.P. Cooperative Sugar factories Federtaion Limited, Lucknow (U.P.). The guarantee required to be furnished by the E.C. under the provision here of to secure the advance payment, timely erection & commissioning & performance of the plant and machinery or for any other purpose under the provision hereof shall be for such period as may cover the period of erection/ commissioning or the Guaranteed Performance respectively as the case may be, as stipulated under this agreement. If however , the period of this Agreement is extended under the provision hereof or due to E.C. not fulfilling their obligations under this Agreement, the E.C. shall have such guarantees extended up to the corresponding extended period at their cost and in no case extension of the period of the contract shall be construed as waiver of the right of the Mills to on force the guarantees.

13 SETTLEMENT OF DISPUTES

13.1 Amicable settlement

The Parties shall use their best efforts to settle amicably all disputes arising out of or in connection with this Agreement or the interpretation thereof.

13.2 Dispute resolution

13.2.1 Any dispute, difference or controversy of whatever nature howsoever arising under or out of or in relation to this Agreement (including its interpretation) between the Parties, and so notified in writing by either Party to the other Party (the “Dispute”) shall, in the first instance, be attempted to be resolved amicably in accordance with the conciliation procedure set forth in Clause 13.3.

13.2.2 The Parties agree to use their best efforts for resolving all Disputes arising under or in respect of this Agreement promptly, equitably and in good faith, and further agree to provide each other with reasonable access during normal business hours to all non-privileged records, information and data pertaining to any Dispute.

13.3 Conciliation

In the event of any Dispute between the Parties, either Party may call upon, Managing Director, U.P.Cooperative Sugar Factories Federation Limited and upon such reference, the said persons shall meet no later than 10 (ten) days from the date of reference to discuss and attempt to amicably resolve the Dispute. If such meeting does not take place within the 10 (ten) day period or the Dispute is not amicably settled within 15 (fifteen) days of the meeting or the Dispute is not resolved as evidenced by the signing of written terms of settlement within 30 (thirty) days of the notice in writing referred to in Clause 13.2.1 or such longer period as

may be mutually agreed by the Parties, either Party may refer the Dispute to arbitration in accordance with the provisions of Clause 14.

14.0 **ARBITRATION** :

"Solely for the purposes of settlement of any dispute arising between the parties out of this agreement, the contractor shall be treated as an agent of the mill and any dispute arising out and between the parties to this agreement shall be referred to arbitration to the Registrar in accordance with Section 70 of the UP Cooperative Societies Act, 1965."

15 JURISDICTION

The High Court of judicature at Lucknow and courts subordinates there to at Lucknow shall alone have jurisdictions to exclusion of all other courts subject to the arbitration proceedings under clause 13 of this Agreement.

17.0 **TRANSFERABILITY OF THE CONTRACT:**

The E.C. shall not transfer their rights and obligations arising out of or in relation to this Agreement except with the prior consent in writing of the Mills .

18.0 **NON - COMPLIANCE:**

If the E.C. shall neglect to erect and commission the equipment as per terms and conditions of this Agreement or to comply with any orders given to them in writing by the Mills in connection therewith , the Mills may give notice in writing to E.C. to make good , within a reasonable specified time, the failure neglect or contravention complained of , and if the E.C. still without reasonable cause fail to comply with the notice or fail to make good the matter to the satisfaction of the Mills within the time specified in the notice (to be reckoned from the date of receipt of notice by the E.C.) the Mills may take over the work of erection or commissioning of the equipment as a whole or in part out of the E.C.'s hands and or may give it to another person on contract at a reasonable price under intimation to the E.C. and the Mills shall be entitled to recover any excess cost from E.C. or make it good from any bills or dues of the E.C. pertaining to this Agreement.

19.0 **POWER TO CLOSE WORK:**

19.1 If at any time after signing this Agreement, if the supply contract is determined for any reason whatsoever or the Mills shall in order to comply with any directives of the Government of Uttar Pradesh not require the whole or any part of the work relating to erection or commissioning of the purposed said equipment under the terms of this agreement, to be carried out, the Mills shall give notice in writing of the fact to E.C. who shall have no claim to any payment by way of compensation or otherwise on account of any profit of advantage which they might have derived from the execution of the said work in full but which they could not derive in consequence of the giving up of the work before completion, the E.C. shall be paid at contract rates for the full amount of work executed and also actual expenses incurred by them on account of any labour and material collected at site or arrangement made for execution of the work which could not be utilised

either fully or partially on the work on account of the giving up of work as aforesaid: provided that where partial utilisation of material and arrangement as aforesaid has been made, the payment will be made in proportion to the value of the work done to the value of the whole work covered by the contract .

19.2 In the event of the closing of the work as above, the E.C. undertake to refund all outstanding unutilised and unadjusted amount of the advance payment, if any, within 60 days, failing which the erector shall be liable to refund to the Mills the above amount along with interest for the period beyond 120 days at the lending rate of banks then prevailing.

20.0 **Termination of Contract**

The Mills reserves the right to terminate the whole or part of this Contract due to any or all the following conditions:

20.1 If the E.C. assigns the contract, or sub-let the whole of the Contract without the consent of the Mills and E.C. has failed or refused to take remedial steps, or the Mills shall certify that the EC:

a) Has abandoned the contract, or

b) has without reasonable excuse suspended performance of the contract for 30 days after receiving from the Mills written notice to proceed, or

c) Despite previous warnings in writing from the Mills is not erecting and/or commissioning the Plant and equipment in accordance with the Contract, or is failing to proceed with due diligence or is neglecting to carry out his obligations so as to affect adversely the Performance of the Contract.

20.2 The Mills may give 21 days' notice to the EC of its intention to proceed in accordance with the provisions of this Clause. Upon the expiry of such notice the Mills may without prejudice to any other remedy under the contract and without affecting the rights and powers conferred by the contract on the Mills, terminate the Contract. Upon such termination the Mills shall be entitled to get erected and commissioned Plant and equipment or may itself complete the erection and commissioning of Plant and equipment, in which event as the Mills may direct, at the EC expense.

20.3 As soon as practicable after the Mills has terminated the Contract the Mills shall, by or after reference to the Parties and after making such enquiries as he thinks fit, determine the amount then due to the EC as at the date of termination and certify the amount thereof. The amount so certified is herein called 'Termination Value'.

20.4 Payment and termination - The Mills shall not be liable to make any further payments to the EC untill the costs of completing the erection and commissioning of Plant and equipment from elsewhere and all other expenses incurred by the Mills have been ascertained and the amount payable certified by the Mills (hereinafter referred to as 'the Cost of Completion'). If the Cost of Completion when added to the total amounts already paid to the Contract as at the date of termination exceeds the total amount which the Mills certifies would have been payable to the EC under the Contract on completion the Mills

shall certify such excess and the EC shall upon demand pay to the Mills the amount of such excess. Any such excess shall be deemed a debt due by the EC to the Mills and shall be recoverable accordingly. If there is no such excess the EC shall be entitled to be paid the difference (if any) between the Termination Value and the total of all payments received by the EC as at the date of termination.

20.5 If the Mills have any information that the EC has become bankrupt or insolvent, or have a receiving order made against him, or compound with his creditors, or commence to be wind up, not being a members' voluntary winding up for the purpose or amalgamation or reconstruction, or have an administration order made against him or carry on his business under an administrator or a receiver or manager for the benefit of his creditors or any of them, the Mills may be entitled to:

a) To terminate the Contract forthwith by 21 days' notice to the EC or to the receiver, manager, administrator or liquidator or to any person in whom the contract may become vested, or

b) To give such receiver, manager, administrator or liquidator or other person the option of carrying out the Contract subject to his providing a guarantee for the due and faithful performance of the Contract up to an amount to be agreed.

21 **E. C. 'S LIABILITY FOR INTEREST:**

In case the E.C. fail to commission the plant within the time agreed herein, the E.C. shall be liable to pay to the Mills interest at the prevalent bank lending rate per annum compounded half yearly on the amount of advance paid to the E.C. under clause 10 reckoned from the date of commissioning of the plant as specified in clause 4.1 till the date of actual commissioning .

22.0 **MISCELLANEOUS:**

22.1 Unless, otherwise especially agreed in writing any concession shown by the parties to this agreement to each other shall not prejudice their individual rights under this agreement .

22.2 The E.C. shall be deemed to have noted that time is the essence of this contract and have carefully examined and satisfied themselves as to the terms and condition, specifications etc, mentioned in this agreement .

22.3 All money which the Mills may under the terms hereof be entitled to recover from the E.C. may be recovered by the Mills from any payment due or which may at time become due to the E.C. under this or any other contract.

22.4 The E.C. shall invariably depute their accerdited representatives(s) to attend review meetings as may be fixed by the Mills to monitor the progress of the works and such representatives shall furnish such information and make such commitments on behalf of the E.C. 's as may be necessary in this behalf.

This agreement including the schedule and annexures have been executed in two copies, the original will remain with the Mills, whereas the second copy will remain with the E.C. . By signing this agreement , both i.e. the Mills and the E.C. agree to abide by its clauses .

This agreement consists of _____pages as below:-

1) Agreement

2) Annexure C-1 Specifications for Plant & Machinery

3) Annexure C-2 Classifications and elucidation

4) Annexure C-3 Draft 1st & 2nd Advance Bank Guarantee

5) Annexure C-4 Draft Timely Erection & commissioning Bank Guarantee

22.5 True certificate copy of the extracts of the Minutes of the meeting of the Board vesting in its General Manager power of the Mills to sign this Agreement and the Power of Attorney executed by E.C. authorising the Attorney to sign the Agreement on behalf of the E.C. are enclosed herewith. In witness whereof the parties hereto have herewith set their respective hands and put seal of the day and year first above written .

Signed by _____ Signed by : _____

Witness _____ Witness : _____

1.0

TECHNICAL SPECIFICATION FOR MILLING PLANT AND MACHINERY FOR CRUSH RATE OF 4900 TCD/22 HRS. (223 TCH)

The Technical specifications of the Milling House Plant & Machinery propsed shall be as under :-

6.1 Weigh Bridges:

The weigh bridges will be pit less, fully automatic electronic, load cell type, along with digitized software control. These weigh bridges shall be required for cane weighment at gate as well as at cane purchase centres.
The specifications of required weighbridges will be as under: -

S. No.	Capacity MT	Platform Size mtrs. x mtrs.	Least Count Kgs	No. of weigh bridges
1.	10	7 X 2.5	2	37 (Fully Electronic with 4 load cell)
2.	50	7 X 3	5	2 (Fully Electronic with 6 load cell)
3.	100	17 X 3	10	1 (Fully Electronic with 8 load cell)

Out of the above weighing bridges 23 Nos. of 10 T capacity are for cane purchase centres. Weigh bridge units will be along with platforms, suitable compression type load cells, suitable junction boxes, digitizers, screened cables and standard weights for calibration (Contractor to give performance guarantee for three crushing seasons for trouble free operation). It shall be provided with data logging and printing system. There shall also need of 30 Nos. of HHC machines (complete with drives).

- Inter-networking between weighment systems.
- Man less smart weighment system.
- One weigh bridge at token issue.
- Check Manual Weigh bridge

6.1.1 Cane Milling Plant

A) Cane Handling and Feeding Arrangement

(i) Cane Unloaders

Four Nos. of Cane un-loader with hydraulic grab each of three motion, having safe working load capacity 5T with minimum capacity of 3 T per lift. The crane shall be of 3 motion electrically operated overhead unloading crane conforming to class IV IS specifications and capable of 25 lifts per hour. The crane shall be complete with its accessories, RCC columns, attendant platform along the length of the gantry on both sides 2 Nos. ladders, etc. It shall be heavy-duty type and suitable for continuous outdoor working. All operations shall be electrically controlled from the operator's cabin. Cane un-loader motors of suitable capacity shall be of crane duty TEFC, S4 duty Class-IV, 1000 rpm, and 6 pole type with 900 starts per hour. The crane gantry span shall be 26 meters. The crane gantry shall be 50 meters in length with gantry columns 10 meters apart. Bridges shall be box type construction made of IS 2062 or equivalent gantry columns shall be L shape construction but the 4 no. end columns should have double L construction at 90 deg. End columns shall be provided with tie beam on each end. The structure of the gantry shall be of adequate strength to provide additional crane of identical specifications.

The design Code shall be as per standard norms and specification of civil engineering.

Hoisting, unloading drums trolley & bridge should be driven by hydraulic motors & power packs.Hydraulic drive system shall be provided for hoist & dehoist.
The height of the lift shall be 10 meters. All gear boxes shall be totally enclosed, dust proof, double helical type gear and shall be designed with a service factor of 2.0. All couplings shall be of flexible gear type / centrifugal type with periodically greasing arrangement. All brakes shall be of electro hydraulic thyristor operated type. Ratio of the pulley diameter (PCD) to wire rope diameter shall not be less than 20.

A suitable shed shall be provided over the structure of cane feeding area.

(iii) Auxiliary Cane carrier

One no. Auxiliary cane carrier of 3000 mm wide and loading length of 20 M with 15 deg. inclination with suitable elevation with Head on cutter to control cane feeding to main cane carrier shall be provided. Auxiliary carrier shall take unloaded cane from the truck tippler and feed main cane carrier with variable speed as per requirement of cane. Auxiliary carrier shall be located at the tail end side end of the cane carrier. The central axis of auxiliary carrier shall be either in line with the main cane carrier or perpendicular to it as per the suitability of the site location. It shall have six strands of chains of 200 mm pitch. The breaking strength of the chains shall be minimum 60,000 kgs. The cane carrier and its structure shall be of all steel construction, the slats 6 mm thick shall be as per IS : 8236 and fastened to chain by bolts and nylock nuts or by bolts and check nuts.

The tail portion of the auxiliary cane carrier shall be arranged below the ground level. Space of minimum 750 mm shall be left in the pit on either side of the carrier for inspection and cleaning purpose. The carrier framework shall not be less than 8 mm thick and mild steel plate extending along the complete length of the carrier.
The other details shall be as provided for the Main Cane Carrier.

It shall be driven by **55 KW** with constant torque characteristics and operating speed range. The motor with AC variable frequency VFD panel shall be directly coupled to planetary gearbox to provide 3 to 10mtr. /minute variable speed.

(iv) Cane Carrier

Primary cane carrier shall be of **2040 mm wide** with a horizontal loading length of **45 mtrs.** The length of its inclined portion shall be such that it gives an inclination of 15 deg. for the Chopper. It shall have **three strands** of chains of **200 mm pitch** IS-8465. The breaking strength of the chains shall be minimum 60,000 kgs. The cane carrier and its structure shall be of all steel construction, the slats 6 mm thick shall be as per IS : 8236 and fastened to chain by bolts and nylock nuts or by bolts and check nuts.
The cane carrier shall be driven by**90 KW** TEFC,S1 dutymotor with constant torque characteristic and operating speed range electric drive. The driving motor with AC variable frequency panel shall be directly coupled to suitable size of planetary gear box to provide apron speed of 3 to 10 mtrs. /minute variable speed. One small screw compressor for cane carrier chain cleaning continuously to remove dissipate flying particles.

The horizontal portion of the carrier shall be arranged below the ground level in such a way so that the sloping side of the carrier is about 300 mm above the ground level. Space of minimum 750 mm shall be left in the pit on either side of the carrier for inspection and cleaning purpose. Arrangement for adjusting the clearance between tip of head on chopper and leveller knives and the slats in the cane carrier shall be provided in the inclined portion. The carrier frame work of mild steel plate extending along the complete length of the carrier shall not be less than 6mm thick except at the place of chopper and leveler where the thickness should be 10 mm for about 2500 mm length.

The frame work shall be adequately stiffened at the top and bottom by angle iron welded to the side plates. The side plates shall be bolted to and supported by rolled steel 250mm x80 mm channels or sections of equivalent strength and be provided with base plate of ample area reinforced by gusset plates .Two foundation bolt holes would be provided in each base plate. The columns in the immediate vicinity of the cane knife set shall be 350 mm x 90 mm double channels or sections of equivalent strength. All the column at drive end should be adequately braced by angle cross pieces of heavy section secured by gusset plate and bolts or by welding. Three longitudinal 150 mm ISMB runners with renewable 10 x 65 mm thick spring steel wear pads would be bolted on the top side of the cross pieces to support the cane carrier chain rollers. The distance between the adjacent supporting columns should not exceed 2.5 meters. The runners would be lowered slightly where the chain arrives at and leaves the runners. 8 mm x 75 mm spring steel flat iron should be tack welded/bolted on the side plates of the cane carrier so that cane carrier slats touch the flat iron only to avoid wearing on side plates. The return side of the apron can slide on the guide angle runners with 8 mm thick spring steel wear flat provided the slats are equipped with renewable spring steel wear pads or alternatively be supported on idler pulleys of 60 mm wide and 280 mm dia. with 75 mm dia. 45C8 shaft running in frictionless suitable roller bearings with grease cups shall be provided.

The carrier chain driven by means of cast steel sprockets having machine cut teeth at least 16 in number and mounted on minimum 280 mm central dia. head shaft of 45C8 quality or equivalent and shall run in 220 mm size anti-friction roller bearings with cast steel Plummer block. The columns under the head shaft and carrier drive shall be extra heavy section to withstand vibrations. At the non-driving end of the cane carrier,

the chain shall be mounted on cast steel sprockets having machine cut teeth on minimum 200 mm central dia. tail shaft of 45 C8 quality or equivalent running in minimum 170 mm anti-friction roller bearing with sleeve incast steel housing with slide rails with tension bolts for tightening the chain.

The head and tail shaft shall be hot forged and ultrasonically tested. All the shafts shall be ultrasonically tested and proven flawless.

v) Rake Carrier with double drive arrangement

Rake type conveyor shall be of steel construction having suitable width trough to accommodate **2040 mm** rake width and of suitable length to suit feeding on the rubber belt conveyor. The inclination of the rake carrier shall be 45 deg. maximum and the boot having no horizontal portion at top.

The tail shaft centre of rake carrier shall be in line with head shaft centre of cane carrier. The rake carrier and its structure shall be of all steel construction with two strands block type forged chain of 229 mm pitch, having 80,000 kgs. Breaking strength having locking arrangement with nylock nuts or check nuts. Flights would be made out of 10 mm thick mild steel plate of suitable shape and profile and welded on box construction beams. These beams shall have suitable arrangement for fitting with the chain attachment at every fourth link with the help of bolts, nylock nuts or check nuts.

The rake carrier should have runners of channels angle iron with 10 mm spring steel wear flats or polymer liner with SS cladding and 10 mm thick mild steel bottom trough plate with stiffeners and should be supported on steel channel columns of adequate strength provided with rigid base plate. The columns should be adequately braced to avoid vibrations. The elevator chain shall be driven over two cast steel sprockets mounted on 250 mm central dia. head shaft of 45 C8 or equivalent quality running in minimum 200 mm size anti-friction roller bearings with cast steel robust plumber blocks secured to head shaft columns. The tail shaft of minimum 200 mm central diameter. 45 C8 or equivalent quality should have two cast steel sprockets having 16 machine cut teeth to guide the chains and would run in minimum 170 mm size anti-friction roller bearings with, cast steel Plummer blocks attached to the rake carrier boot.

The portion of the chain below the fibrizer shall be suitably covered to avoid damage due to prepared cane thrown by the fibrizer. A suitable online chain tightening arrangement shall also be provided.

Rake carrier drive shall have a constant torque characteristic over operating speed range. Two nos motors of **75 KW** TEFC, S1 dutywith AC variable frequency panel shall be directly coupled to the foot mounted planetary gear box to provide a linear speed of 10 to 33 meters/ minute of double drive arrangement.

iv) Rubber Belt Conveyor with Equalizer

One no. prepared cane belt conveyor of **2200 mm** effective width, 22 meter horizontal length shall be provided to receive the prepared cane from fibrized cane rake elevator & deliver it to first mill Donnelly chute. The belt conveyor shall be provided with suitable supporting structure, walk way on both side ladder, platform around drive staging of equalizer. Belt Conveyor shall be driven by **30 KW** TEFC squirrel cage motor with VFD

operating at 1440 rpm with foot mounted planetary gear box to provide 8 to 80 meter/minute linear speed of the belt.

The length of the belt conveyor shall be sufficient to cover the location of future zero mill along with Tramp Iron separator for the future expansion of the plant. The inclination of belt conveyor should not increase more than 10 deg. even with zero mill.

A suitable cane equalizer shall also be provided on the belt conveyor before the tramp iron separator. The equalizer shall have its independent drive comprising of **7.5 kW** rating motor and helical gear box of suitable ratio, So as to run equalize at 36 rpm at rated speed of motor.

v) Tramp Iron Separator

Electromagnetic type tramp iron separator shall be provided on the belt conveyor to pick up any iron piece up to a maximum weight of **30 Kg**. from a distance of 350 mm will be from top of belt a cane blanket of 300 mm thickness over the belt conveyor.

vi) Auto DCS Cane Feed Control System

One set DCS based automatic cane feeding device to ensure uniform feed rate to first mill with provision to change the feed rate at any time having a variation not more than +/- 5% of set rate. Primary cane carrier shall follow speed of secondary cane carrier/ cane rake carrier in a fixed ratio. Load of all cane preparation devices shall override the speed signal of each cane carrier. When load of any cane preparation device exceeds 80% of rated load, the speed of that cane carrier shall be proportionately reduced. If load exceeds 100% of rated load, that cane carrier will stop. It will restart automatically when overload condition on that cane preparation device becomes normal. These overload settings shall be adjustable from the control panel. The system shall have the following provisions.

Sensors:

For load sensing of cane preparatory devices such as chopper, leveller, fibrizer and 1st mill, suitable current transformers / two wire electronic analogue pressure transmitters with capacitance sensing technology with 4-20 Ma DC output and configurable for calibration to the required pressure ranges within the designed pressure span of the transmitter. In addition to this level sensing of prepared cane at donnely chute may be considered as option.

Control Action:

The system should be provided with two control actions i.e. proportional and ON-OFF control actions. Proportional control as per the 1st mill load.ON-OFF control as per the high load settings of the cane preparatory devices and first mill.

Set Point:

Following settings are to be provided,

iii) For loads of various cane preparatory devices and 1st mill drives precision load setters of 1 K 10 Turns helipots with dial knobs.

iv) For average height and feed rate precision 10 K 10 Turns helipots with dial knobs.

Visual Indication:

Coloured lamp indicators for the high set load values.

Carrier Speed Adjustments:

The speed of the cane carriers can be adjusted from zero to the rated RPM with the settings provided on the control panel at operator's console.

Indicators **:** Analogue load indicators (i.e. current or pressure indicators) and speed indicators .

Power Supply **:**230 V AC, 50 Hz

The device shall be capable to achieve performance even under extreme conditions of shock, vibration, humidity, electrical interference.

All electrical / electronic components used in the device shall confirm to the existing Indian specifications.

B) Cane Preparation Devices

i) Cane Chopper

One cane chopper set having not less than **42 knives** of forged and hard faced cutting edgesecured to cast steel hubs of IS:1030 grade 280 – 520W mounted on a forged steel shaft of 220 mm dia. of 45 C8 quality. The dia. over the tips of knives shall not be less than 1600 mm. The knife shaft shall be supported at 180 mm bore, heavy duty self-aligning double row spherical roller bearings with adopter sleeve in steel Plummer blocks. The knives shall be of special shock resisting steel having hard faced cutting edges, hardness 45 to 48 HRC and tennoed into the hubs eliminating the shear on the bolts which should be of EN8 steel or of equivalent strength with nylock nuts. The

knives shall conform to IS: 8461. A suitable fly wheel of Cast Steel Hubs of IS:2062 GR. 250 E well balanced shall be provided at the outer end of the shaft. The knife raw should be six only.

One spare set of knives as well as tip shall be provided.

Cane chopper set shall be driven by a continuously rated IP-55, TEFC, CACA, S-1 duty with 110 % overload, slip ring motor of **300KW** and 600 R.P.M. synchronous speed at a total slip of 15 percent. It shall be directly coupled geared coupling to get final speed of 600 RPM capable of transmitting **300KW** continuously. Provision to be given for Cane chopper shall be driven both end.
The motor shall be complete with starter (current not exceeding 300% of FLC) and suitable buffer resistance. Provision for additional identical motor drive with load balancer on other end should be made for ultimate capacity.

The knife set shall be installed on the horizontal portion of the secondary cane carrier before leveller and clearance in between the slats and Knives tips shall be maintained as 800 mm The knife set shall be totally enclosed by suitably reinforced hood of 10 mm thick and mild steel plate attached to the cane carrier frame work and provided with suitable swing flaps and bolted doors at top of the hood to suit reverse rotation. Two no. of flywheel of CS/CI grade FG 260, IS-210 machined and well balanced shall be provided on the either ends of the shaft.

ii) SwingTypeCaneLeveller

One Swing type cane leveller set having not less than **64 knives** forged and hard faced cutting edge secured to cast steel hubs of IS:1030 Grade 280 – 520W mounted on a forged steel shaft of 300 mm diameter of 45 C8 quality. The dia. over the tips of knives shall be not less than 1600 mm. The knife shaft shall be supported at 220 mm bore, heavy duty self-aligning double row spherical roller bearings with adopter sleeve in steel Plummer blocks. The Swing type Leveller should have detachable knives made of special shock resistance alloy steel and secured through 50 mm dia. S.S. pins, the leveller shank and disc should have SS bushes to suit S.S. pins. The knives shall be of special shock resisting steel having hard faced cutting edges, hardness 45 to 48 HRC. The knives shall conform to IS. 8461. Two no. of suitable size fly wheel of CI/CS Hubs of IS:2062 GR. 250 E well balanced shall be provided at the outer end of the shaft.

Cane leveller set shall be driven by two nos. 300 kW x 02 Nos., TEFC, IP-55, 50 Hz and Class ‘F’ slipring induction motors of 600 R.P.M. synchronous speed at a total slip of 15 percent. It shall be directly coupled by geared couplings capable of transmitting 300 KW continuously for each drive.The

motors shall be of CACA type having protection IP – 55/ IC611 complete with stator rotor starter panel. The motors shall be complete with starter (starting current not exceeding 300% of FLC) and suitable buffer resistance. The leveller knife set shall be installed on the inclined portion of the carrier and be provided with a suitable device for adjusting clearance in between the knives tip and slats from 250 to 300 mm. The knife set shall be totally enclosed by suitably reinforced hood of 10 mm thick and mild steel plate attached to th e cane carrier frame work and provided with suitable swing flaps and bolted doors at top of the hood.
There shall be arrangement for lifting motor & shaft of leveller & chopper, either from cane unloader or mill crane or separate M.S Guntry to be provided.

iii) Swing Hammer type Fibrizer

Swing hammer type fibrizer shall be located at the head end of the primary cane carrier, to suit 2040 mm wide cane carrier having **160** hammers. Weight of each hammer shall not be less than 22 kg. The hammer shank shall be 30 mm thick minimum. Fibrizer should be capable of providing preparatory Index of more than 90+ measured by AldericReyner method.

The rotor shaft shall be heavy duty minimum 420 mm dia. at the hubs and 300 mm dia. at the bearing journals and shall be 45 C8 forged steel as per IS:1570. Anvil plate shall be pocketed design, having wrap angle of not less than 140-deg minimum. The base plate thickness of the anvil shall be minimum 36 mm. Hard facing on the anvil working surface shall be having minimum hardness 600 BHN. Anvil plate shall have provision for adjusting the anvil clearance. A suitable floating flap of 20 mm thick to be provided at the entry point of anvil. Rotor shall be supported on two heavy duty self-aligning double row spherical roller bearings. Bearing shall be mounted on shaft with adapter sleeve. Tip dia. of hammers shall have **2200 mm swing dia.** when running at 750 rpm.

The fibrizor should have detachable domite tips made of special shock resistance alloy steel and secured through 70 mm dia S.S. pins, the hammer shank and fibrizer disc should have SS304bushes to suit S.S. pins. of suitable size. One spare set of hammers with domite tips shall also be provided. The hammer shank and fibrizor disc shall have G.M./SS bushes to suit S.S. pins. 70 mm hubs shall be of cast steel M.S. Fabricated fitted on rotor shaft. Deflector plate of 20 mm thickness with 5 mm thick S.S. lining shall be provided.

The fibrizer rotor shall be completely covered by reinforced mild steel fabricated hood made out of 16 mm thick plate attached to the cane carrier

frame work and will be complete with deflector plate, adjustable mild steel fabricated anvil plate, anvil suspension gear. Rotor bearing Plummer blocks shall be cast steel / M.S. fabricated pressure lubricating system for bearings shall be provided with 2 nos. pumps, 2 nos. coolers (one each as standby) oil reservoir, pressure gauge, piping, return line, needle valve fitting etc. with provision for auto start of standby pump.

The fibrizor shall be driven by two nos. **1000 kW.** 750 RPM, 11 KV HT TEFC/CACA, IP-55, , S-2 Duty, 50 Hz and Class F slipring induction motors with suitable bed frame and resilient flexible coupling shall be provided. The motors shall be of CACA type having protection IP – 55/ IC611 complete with stator rotor starter panel. Auto slip type stator rotor starter for above motors shall be provided. One spare motor for fibrizor of above specifications shall be provided. Provision for replacement with new higher capacity motor shall be provided for future expansion.

C) Mills

For having a crush rate of 4900 TCD on 22 hrs. basis, it is proposed to install 4 no., three roller mills of1020 mm diameter and 2040 mm long with GRPF on 1st and fourth Mills and 100 % size Under Feed Rollers on other mills with Donnelly type chutes on all the four mills. Mill to mill centre distance shall be 14 mtrs. All mills shall have provision for GRPF installation for which foundation should be provided.

i) Mill Rollers

Each mill roller shall be minimum nominal diameter of 1020 mm x 2040 mm length and journals of minimum510 mm diameter x 660 mm length and head stock centre distance of minimum 3200 mm.

Two Mill roller shafts with shell (Plain), three crown pinion and one trash beam shall be provided as spare.

The rollers shall be of coarse grain castiron having hardness 180 to 210 BHN.

The composition of the shell material shall conform to IS: 1985 and shall be:

Total carbon	-	3.20 to 3.6 percent.
Manganese	-	2.2 to 3.2 percent
Silicon	-	1.2 to 2.2 percent
Phosphorus	-	0.5 per cent Max.
Sulphur	-	0.15 percent Max.

The cast iron shell shall be hot shrunk on forged steel shaft of 45 C8 quality conforming to IS: 1570 or equivalent having a minimum tensile strength of 58 kg/mm$^{2.}$ All the shaft shall have square ends of 425 mm each side. Top roller shall be fitted with stationary flanges and juice rings in two halves. The bottom roller shall be provided with juice rings and removable guards to prevent entry of juice into the bearings. The cast steel **crown pinions** shall have minimum 550 mm face width and conform to IS :2708 Grade 3B having properly shaped teeth, keyed to roller shaft with suitable mild steel guards andoil troughs. All rollers shall be coated with surface roughening electrode.
All roller shell shall be provided with circumferential 'V' grooving. Chevron grooves shall be provided on the top & feed rollers and **Masschaert grooves** on the feed rollers only.
Messchaert groove scrapers shall be of spring steel secured on square shaft and supported on cast steel/fabricated steel blocks and provided with lever or another suitable adjusting device. Top roller of mill no. 1, 2 and 3 shall be of **full couch** type to provide better juice drainage.
Mill House gantry span should not be less than 26 mtrs.

ii) Head stocks

The **headstocks** shall be of cast steel as per IS: 1030grade 280/520 W. These will be of king/queen boltless type. Removable /gun metal/ wearing plates on feed side as well as discharge side and with lubricating arrangement between top roller bearings and wearing plates shall be provided. The top and side caps shall be of cast steel as per IS:1030 grade 280/560 W and shall be securely locked in position for quick assembly. Stainless steel strip of 8 mm thick shall be provided in the side roller bearing face of the head stock. The eccentricity between top roller bearing centre and hydraulic cap centre shall be kept suitably towards the feed side of the headstock, except in case of inclined headstock.

Top **caps** shall be made of cast steel and shall be securely locked in position for quick assembly. Top caps shall be secured to the headstocks through split type conical bushes and high tensile pins of tapered design fitted with steel liners. Forged steel **hydraulic ram** made of cast steel 40C8 grade material as per IS: 1570-1979 and shall be of **400 mm diameter** fitted with gun metal sleeve shall be provided in top cap. Side cap made of cast steel shall be secured to headstocks with the help of pins and bush.

Material and its bearings shall be of cast steel with gun metal lined as per IS-318 and with water cooling arrangement. The side roller bearing shall be of cast steel housing with renewable gun metal liner as per IS: 318. All mill house equipments shall be designed for the ultimate crushing capacity of 7500 TCD.

iii) GRPF on 1st Mill & Last Mill

GRPF on 1st Mill & Last Mill

Groove Roller Pressure Feeder System suitable for 3 roller conventional 1st& Last mill shall be supplied.
The rollers shall be (identical with Mill Rollers) of nominal dia.1020 mm x 2040 mm length, running in heavy duty G.M liner bearings fitted in cast steel housing. The journal size shall be 510 mm dia. X 660 mm long. The underfeed roller shall be of TUFR with juice drainage arrangement with heavy duty scrapper minimum 100% of GRPF roller dia. driven through pinions from top roller.
The GRPF roller speed shall be about 30% higher than the mill roller speed.
The scope of supply shall include heavy fabricated base frame, pair of cast steel/ fabricated headstocks, pair of rollers, bearings, and a pair of crown pinion. GRPF shall be independently driven by 300 KW AC VFD motor, TEFC / CACA, S-1 duty, Class-IV, IP-55 through suitable planetary gear box having service factor of not less than 2.5 and rope less coupling etc.

The cast steel head stocks shall be supported on M.S. fabricated pedestals. The pressure feeder roller shafts shall be of forged steel of 40C8 quality confirming to IS: 1570-1979 or equivalent having a minimum tensile strength of 58 kg/mm². In case of circumferential V groove pressure feeder, the pressure feeder rollers shall be interchangeable with mill rollers and shall be provided with 100% dia. Under feed roller with gear drives etc. One force feed lubricator shall be provided for each pressure feeder. One pressure chute shall be provided for each mill. This shall be fabricated out of 40 mm thick M.S. plate suitably reinforced and lined with 8 mm thick AISI-304 quality stainless steel plate. The chute shall have hard facing at finger tips. Pressure chute shall be designed to with stand a maximum pressure of 7 kg/cm² .Arrangement shall be provided for adjusting the pressure chute setting.
Lubrication for GRPF System shall be provided from centralized lubrication system.

Inter Rack Carriers between Mills

Rake type intermediate carrier, between the mills whose centre distance shall not be less than 12000 mm shall be provided. The width of the carrier trough shall be suitable to accommodate 2040 mm rake width and its cross section suitable for handling bagasse of 272.72 TCH crushing rate with imbibition up to 380% on fibre.

The rake carriers shall have runners of angle iron / channel with 8 mm spring steel wear flat and 8 mm mild steel bottom trough plate with stiffeners and be supported on steel channel column provided with rigid base plate. The columns shall be adequately braced wherever necessary.

Each rake carrier drive shall consist of the TEFC S-1 duty motor of **30 KW,** 1440 RPM with enclosed foot mounted planetary gear box reducer. The linear speed shall not be more than 30 m/minute.

The rake carrier chain shall be 229 mm pitch block type forged chain having breaking strength of minimum 80,000 kgs. driven over two cast steel sprockets having 14 No. machine cut teeth mounted on 220 mm central dia. head shaft of 40 C8 quality conforming to IS:1570 or equivalent and running in 180 mm size anti-friction self-aligning spherical roller bearing, cast steel bearings secured to head shaft columns. The tail shaft of 180 mm central dia. and of 45C8 quality or equivalent shall have two cast steel sprockets or drums to guide the chain and shall run in 160 mmsize anti-friction self-aligning spherical roller bearing, cast steel Plummer blocks attached to the elevator boot. Its bearing shall be outside the elevator trough. The tightening arrangement shallbe provided at the tail end facilitating online tightening facility. The angle of the rake carrier shall not be more than 45 deg. The rake carrier shall be designed for head end discharge of bagasse to the next mill Donnelly chute.

Mill Drive

The mill shall be driven by a continuously rated 700 kW AC MV 11/6.6 kV VFD drive. The motor base speed shall be 1000 rpm and shall have constant torque characteristics in between 20 % to 100 % base speed and constant power characteristics between 100% to 110 % of base speed.
The specification of motors shall be as under:

- Quantity — 4 Nos. Working Motor+ Drive, 1 No. Spare Motor with ACVFD DRIVE
- Rating — 700 KW , 1000 rpm base speed, 3 phase, TEFC squirrel cage, AC induction motor - Suitable for application and MV 11 / 6.6 kV

drive Duty Class IV.

- Protection IP- 55/ IC 416 (TEFC/CACA).
- Ventilation TEFC /CACA (Forced cooled type)
- Main Supply Motor rated of 6.6 kV 3 ph, 50 Hz, With MV VFD 11 kV Input /6.6 kV Output Multi Cell PWM Inverter with Cell with Cell bypass Arrangement.
- Speed range 20% to 110% of base speed.'
- Constant torque operation 20% to 110% of base speed.
- Maximum speed 110%.
- Direction of operation Bi directional operation.
- Mounting Horizontal foot mounting.
- Class of Insulation "F" but temp. rise limited to class "B".
- Designed ambient temp. 50 deg. C.
- Efficiency Typical power converter: 98 % Total drive system Drive+ motor > 95 %
- Internal 11/6.6 kV Input transformer of copper windings, forced-air cooling

The specifications of the VFD shall be as fallows -

MV VFD shall be of 11 kV Input & 6.6k V output. Each inverter cubicle shall be fabricated for 14/16 SWG. CRCS sheets, free standing, aestivated & painted with anticorrosive paints.

Overload duty shall be of class IV with a protection of IP - 41.Each drive shall be complete with all the salient features including protection for its drive.

The cubicle shall house all the switch gear & their protectors, controls, PWM topology , Cell modules with Faulty Cell Bypass arrangement, interlocking relays & filters etc.

All necessary meter indicators, enunciators, controls etc. shall be neatly arranged on cubicle front doors with neoprene gaskets on all edges of the panel.

Ventilation openings shall be provided at the top of the panel & on side covers by louvers suitably covered by wire mesh.

Drive shall have provision for bi-direction speed regulation & will be +/ - 1 % of the base speed by techno-feed back . The panel will have the facility to accept 4 - 20 m A signal for speed setting in local auto mode & to have control from PLC/DCS.

Each of the drives shall be provided Ammeter, Voltmeter with selector switch, speed indicators, KWH meters etc.

The pressure ventilation system with electric motor drive blower with filter shall be provided for panels. One common control desk with all the controls

shall be provided for each motor to be controlled common desk.

The electrical installation for mill drive motor, PWM inverter panel etc. shall be complete in all respect.

The room (Air Conditioned), civil work shall be provided by purchaser.

iv) Planetary Gear Box with Ropeless couplings

Each mill shall be driven independently through planetary gear box and rope couplings/ rope less couplings.

The planetary gear box shall be of foot mounted design, ratio 1000: 4.0 for 800KW continuous rating with 2.5 minimum service factor. The shafts of the planetary gear box shall run in antifriction bearings. The gear box shall be complete with forced oil lubrication system, geared type input coupling and rope type output couplings, base plates etc.

v) Mill Bearing Housings

The Bearing housing shall have water cooling arrangement. All top roller bearings shall be interchangeable. Similarly all feed side and discharge roller bearings shall be inter changeable by their respective bearings. Top roller top half bearing shall be of cast steel housing with gun metal lining as per I.S. 318. Bearing housing shall have water cooling arrangement. The bottom half shall be of gun metal liner. Side roller bearings shall be of cast steel housing with gun metal liner as per I.S. 318. The housing shall have water cooling arrangement. Juice sealing rings for bottom roller shall be provided.

vi) Trash Plate and scrappers

The mills shall be provided with cast steel **trash beam** as per IS:1030 grade 280 / 520W and supported on heavy steel brackets with pivoted journals fitted in the head stocks and adjustable by means of tie rods and fitted with removable cast steel trash plate as per IS:1030 grade 280/520 w , bolted by high tensile bolts and nuts. Top roller scrapers shall be of floating type. Scrapers for top and discharge rollers shall be of cast iron MOC.

vii) Hydraulic Loading System

Each mill shall be provided with hydraulic loading system, consisting of hydro-pneumatic accumulator, one for each of the journal of the top roller, one extra as spare and accessories such as pumping set, receiver tank, gauges, remote control panel and

roller movement indicator electronic type. The diameter of the hydraulic ram for top cap shall be minimum 400 mm. The hydraulic system shall be designed for an oil pressure of 280kg/cm^{2}g.

viii) Lubrication System

One centralized mill lubrication system having positive displacement pump at about 400 bar pressure having dual delivery lines made of SS 304 x 2mm thick (DIN standard) of 16mm diameter for main line on both sides of the mills with changeover valves, relief valves and distributors with delivery adjustment arrangement with feed line of 8mm diameter SS x 2mm thick provided to the bearings, complete with control panel pressure gauges and audio/video alarm with suitable timer arrangement for controlling pump operations suitable for grease lubrication system.

ix) Donnelly Chutes

Each mill shall be provided with Donnelly chute, fabricated out of 6 mm thick stainless steel plate of 409 grade with stiffeners and shall have arrangement to adjust the blanket thickness from top. The height of each chute shall be about 3 meter. Each Donnelly type chute shall have level sensors having ON/OFF control of intermediate rake carriers drives, sequencing interlock.

x) Ladders and Platforms

All the mills shall be high set so that no part of the juice tank pumps is situated below floor level. Access from mill **platform** to rake elevator drive platform with suitable cat **ladders** shall be provided. All gangways and staircase shall have hand railings. All mill shall have a common gangway of width not less than 1000 mm with mild steel fabricated gratings and 4 nos. staircase (one for fibrizer side, one for bagasse elevator side and two from mill drive platform) along with the cross connection between each mill and on both sides of mills shall be provided. Access from mill platform to cane carrier drive platform and rake elevator drive platform with suitable mild steel fabricated staircase and hand rails shall be provided. Drive platform for all intermediate rake carriers shall be interconnected with mild steel fabricated gratings.

6.1.2) Mill House Juice Handling System

ii) Juice trough

Juice trough located under the mills shall be made of 6 thick SS 409 M. The trough shall be bolted to the head stocks with stainless steel bolts and copper washers. Joint shall be suitably sealed to prevent any juice leakage. There is also option of strong and leak proof welding of trough with head stock.

All the mills shall be high set so that no part of the juice tank pumps are situated below floor level.

ii) Rotary Juice Screen:

For separating the cush–cush / fine bagacillo from the mixed juice, one no. Juice filtering rotary screen of the fallowing specification shall be provided:

1. Juice handling capacity	- 250 m^3 /hr.
2. Juice loading per sq. mtrs. screen open area	- 105 m^3 /hr. max
3. Drum circumferential speed.	- 1 to 1.5 mtrs. /sec. (RPM – not to exceed)
4. Drum size should not be less than	Dia. – 2.0 Mtrs., Length – 4.50 Mtrs.
5. Drive arrangement	Positive through transmission chain and chain wheels or directly coupled, minimum 7.5 HP with Planetary gearbox.
6. Material of construction	
a. Screen drum	Wedge wire screen of SS 304 welded type having slot width 0.45 mm.
b. Support and thrust rollers	Of METALON /Polyuvethene/ Carbon steel case hardened supported on anti-friction bearings
c. All juice wetted parts like juice tray, splash guards, inlet feed box, drum shell at inlet and outlet, cush-cush, discharge chute.	SS 409 M

7. Water sparging system	For cleaning and sanitation, to spray hot water through jet nozzles during Operation with provision of auto on/off Pressure at nozzle header min 4 kg/cm2.

The Rotary Screen shall be mounted on suitable steel staging, having platforms around the drum at right angles to the mills so as to directly discharge the cush - cush in to the inter rake elevator in between mill no. one and two.

IV. CONTROL PHILOSOPHY FOR OPERATION OF ROTARY SCREEN

d) Hot Water Sparging

The screen drum should be cleaned at regular intervals by spraying weighed hot water (80 to 85 ^{0}C) at adequate pressure (min.4 kg/cm2 at nozzle header) through spray nozzles. The hot water should be pumped by a separate high pressure Sparging pump. The starter panel of the pump should be provided with control circuit having timers to 'START' the pump at pre-set time intervals of every 5 to 10 minutes. The pump remains 'ON 'for about 30 to 60 seconds.

Alternatively

e) Screened Juice Sparging

The screen drum should be cleaned at regular intervals by spraying screened juice at adequate pressure (min. 4 kg/cm2 at nozzle header) through spray nozzles. The juice is tapped from screened juice pump delivery line and provided with a solenoid control valve, with control circuit to spray the juice at a pre-set interval for a set time period.

In this case, a separate pipe header is required for sanitizing the screen with either hot water (80 to 85 ^{0}C at 1.0 bar pressure from imbibition water system or with exhaust steam (125^0 C at 0.5 to 1.0 bar pressure) at least once in a shift for a period of one to two minutes

f) Caustic Soda Solution Cleaning

iii. In order to clean accumulated scum of gummy, waxy matter, a spray of dilute caustic soda solution (about 20 %), approx. 300 to 500 litters, is applied on to the

screen drum once in a week. Caustic soda solution pumped with the help of the same water-Sparging pump. It is necessary to stop the feed juice going to the screen, at this time. Dilute caustic soda solution should be allowed to react on the scum of gummy, waxy matter and later, hot water / screened juice should be sprayed to wash away the loosened scum as well as traces of caustic soda solution. The caustic soda solution is to be re circulated by installing a separate tank by installing a diverter and valve, so that this caustic soda solution does not add alkalinity to the juice.

iv. As an additional precaution, screen drum should be inspected and bagacillo, gummy, waxy matter accumulated & hardened in the screen slots over the period of time, should be thoroughly cleaned with brush & caustic soda dilute solution during the regular cleaning shut – down.

V. Juice tanks, gutters and Pumps

Juice from mill No.3 and 4 shall be collected in individual cylindrical whirler tank with conical bottom of 1500 mm dia. and 1200 mm height. The whirler tanks shall be made of 5 mm thick S S 409M connected to mill juice trough 5 m. m. thick SS 409 M gutterand juice shall be pumped through two No. (One as standby), chock-less pump with full bore discharge.

The juice from mill No. 2 and 1 shall be collected from individual mill juice trough to 5 mm SS 409 M gutters outside the mills and then connected to individual cylindrical whirler tank with conical bottom of 1500m.m. dia. height 450 mm more than the mill bed height. All whirler tanks shall be interconnected with gutter and flap at top level. Mill No. 1 whirler tank shall be connected with 2 nos. unscreened pumps.

The juice from whirler tanks of mill number 3 and 4 shall be pumped (two nos.,one for each mill juice & One as standbyfor each mill juice) through individual choke-less pump capable of pumping 150 m3 per hour of juice having minimum 50% solids at 12 meters head to imbibition juice distribution through a suitable surplus feedback device installed above the level of gangway at the mills to ensure steady and uniform rate of imbibition. The juice from Mill No.1, shall be pumped through two No. (One as standby for unscreened juice of mill no.1 as well as of mill no. 2.), chock-less pump with full bore discharge and each capable of pumping 400 m3 per hour of juice having minimum 50% solids at 12 meters head to rotary screen. Similarly for Mill No.2, two no.(One as standby choke less pump with full bore discharge and each capable of pumping 400 m3 per hour of juice having minimum 50% solids at 12 meters head to rotary screen shall be provided. All the above pumps shall be designed to operate at about 960 rpm. The screened juice shall be collected in a 5 mm thick SS 409 M cylindrical tank / column of 200HL capacity. Two strained/ screened juice pumps (one as stand by) each of 350 m3/hr capacity and 75 mtrs. head shall be provided for pumping the screened juice to juice heaters through juice flow meter.

Thus there will be total 10 nos. different size of juice pumps in mill house. All juice pumps Viz. Imbibition, unscreened and screened juice pumps to have SS bodies and with / SS impellers and SS shafts. All the juice pumps should have delivery lines not less than 250 mm. All the juice pipe lines in mill house shall be of SS with long bends to avoid chocking in the pipe lines. Screened juice pipe from mill house to boiling house shall be of SS material.

VI. Water Imbibition System

The system shall include two separate automatic control loops having various control system components as specified.

e) Imbibition water flow control system

Imbibition water flow will be controlled to maintain a fixed ratio of imbibition water to cane. The desired ratio will be fed through the DCS keyboard and the load on the penultimate mill or brix of Last Mill Juice will be measured. The flow of imbibition water will be regulated to maintain the ratio at various loads. If load of penultimate mill or brix of LMJ is below the minimum running level, imbibition water flow will stop.

Sensor	On-line brix measurement of LMJ with Coriolis density sensor with dual U tube design or single full bore straight tube design having following specifications.	
	Accuracy	+ or - 0.0005 gm/cc
	Ambient	0.001 % of nominal flow
	Temperature effect	rate per ^{o}C
	Power supply	85-230 VAC
	Housing	NEMA 4X

OR

Load of penultimate mill with two wire electronic analogue pressure transmitter with capacitance sensing technology having 4 – 20 mA DC output or current transformer out-put for recorder and controller.

Controller : Microprocessor based multi loop DCS controller.

Control Valve: Suitable for controlling the flow of imbibition water continuously with proportional control.

OR

A.C. variable drive : Suitable for controlling the speed of the electric motor employedfor imbibition water pump.

f) Imbibition water temperature control system

- **Sensor :** Suitable RTD PT 100.
- **Transmitter:** Two wire electronic analogue type with 4-20 m A, DC output.
- **Controller :** Microprocessor based single loop indicating type.
- **Control Valve: Suitable** for controlling the flow of water in well designed and fabricated condensate - water Mixing Arrangement.

g) Hot water imbibition pumps

2 Nos. (1 as standby) Hot water imbibition pumps of **120 m^3 /hr** Capacity and 50 mtrs. Head shall be provided.

h) Online magnetic flow meter for maceration water DCS system

For the accurate weighment of imbibition water online magnetic flow-meter of 220 T/hrs.at 100℃ capacity shall be provided.

On line calibration facility for check weighment with tank of suitable capacity shall be provided for random checking of imbibition water delivered by mass flow meter without stopping the crushing.

6.1.3) Mill House Crane and Gantry

One new three motion electrically operated overhead mill house travelling crane conforming to class II IS specifications having one trolley of **30 tones** SWL capacity and one HOT crane having **5T** SWL capacity with independent trolley, complete with crane gantry shall be provided. The crane rail centre distance shall be to suit the mill house building span and length of travel for Mill house crane shall cover fibrizer to Mill drive end. The specifications for mill house crane shall be as under:

Height of lift	-	10 meters
Main hoist speed	-	02 meters/minute
Long travel speed	-	10 meters/minute

Cross travel speed	-	10 meters/minute
Main hoist motor	-	30 HP, TEFC sq. cage, S5 duty
Long travel motor	-	Not less than 5+5 HP slip ring TEFC sq. cage. S4 duty (Both end independent drive)
Cross travel motor	-	Not less than 7.5 HP slip ring TEFC S5 duty.

All the above motors shall be of crane duty. The bridge shall be of box type construction made of IS: 2062. Provision for the inching of lifting and lowering system shall be provided. The span of crane not less than 26 M.

6.1.4) Bagasse Handling System –

I. Rubber belt conveyor for Bagasse

One no. belt conveyor of suitable capacity having minimum width of 1800 mm effective width and length 8000 mm driven by suitable motor and speed reducing arrangement, to carry bagasse from last mill to bagasse elevator is to be provided. Belt conveyor shall suit to the crush rate of 4900TCD on 22 Hrs. Basis. Necessity and location of the bagasse rubber belt conveyor shall be as per the need of the plant layout.

II. Bagasse Elevator (With Double Drive Arrangement)

One steel slat or rake type bagasse elevator of all steel construction of 2000 mm effective width and suitable length (inclination not to exceed 45 deg. with the horizontal) to carry about 135 tonnes of bagasse per hour and driven by TEFC S-1 Duty electric motor of **55 KW** through foot mounted Planetary gear box to give a linear speed of 25 - 30 metres/minute shall be provided. It shall have two strands of chains of 200 mm. pitch. The breaking strength of chains shall be minimum 60,000 kgs. One more drive of same size/capacity to be provided opposite side of this drive for emergency use.
The elevator chain shall be driven over two cast steel of 45 C8 sprockets with machine cut teeth only mounted on 200mm dia.,head shaft running in 160 mm size anti-friction spherical roller bearings with suitable size sleeve and adopter etc. and secured in cast steel housings.

The tail shaft shall have two cast steel sprockets having machine cut teeth mounted on 180 mm central dia. Shaft running in 140 mm size anti-friction spherical roller bearings with suitable size sleeve and adopter etc. gun secured in cast steel housing with side rails and tension bolts for tightening the chain. The head and tail shaft shall be ultrasonically tested of 45 C8 quality. The trough side and bottom plate shall not be less than of 6 mm

thick mild steel. The elevator shall be provided with horizontal section of suitable stretch as per the requirement of the layout.

Easy sliding screens shall be provided on the elevator for screening the bagacillo. The screening area shall not be less than 15 mt^2. Each screen shall have a blind portion for sliding it in the elevator portion for cleaning or changing the screens while working. Width of each screen shall not be more than 600 mm. The screen shall have punched conical holes having 6/8 mm dia. size on the surface facing the bagasse elevator. Platform and staircase shall be provided for approaching on both sides of the elevator. A suitable capacity bagacillo blower shall be provided to get the feed from the bagacillo chute placed below bagasse elevator. Bagacillo shall be blown to the vacuum filter through a suitable size bagacillo pipe.

III. Main Bagasse Carrier (With Double Drive Arrangement)

One main Bagasse carrier of double trough design and all steel construction of 2000 mm effective width shall be provided. Main Bagasse carrier shall be suitable to handle bagasse of 250 TCH crush rate. It should be able to carry about 135 tonnes bagasse per hour, driven by T.E.F.C S-1 Duty, electric motor of **75 KW** at 1440 rpm through foot mounted planetary speed reducer to give a linear speed of 25 - 30 meters/minute. It shall have two strands of chains of 200 mm pitch. The breaking strength of each chains shall be minimum 60,000Kgs.

One more drive of same size/capacity to be provided opposite side of this drive shaft for emergency use.
The main bagasse carrier shall have construction similar to bagasse elevator and to be supported on steel channel columns, provided with rigid base plate. The columns should be adequately braced. The conveyor should be covered(to protect bagasse from rain) shall be complete with all structure and feeding chute to boilers etc. and will have arrangement to feed bagasse to the boilers from return bagasse carrier. The individual chutes to each boiler should have slide operated diagonally cut doors operable from the working platform of the boilers having double pinion and rake type arrangements and stair case from boiler platform. Tail shaft and head Shaft MOC shall be 45 C8.

IV. Return Bagasse carrier

The return Bagasse conveying system shall consist the followings-
One no. troughed/ horizontal, double deck type belt conveyor of suitable width and length between sprocket centers of approximately 150 mtrs. shall be supplied with double drive.

Top deck of belt conveyor no.1 shall receive bagasse from belt no.2 and deliver it to the bagasse yard at multi points with the help of plough arrangement. Bottom deck of the belt conveyor shall receive bagasse yard and deliver it on top deck of main bagasse carrier. The belt bagasse carrier shall be complete with structure staging and suitable drive so as to operate at approximate speed of 80 mtrs. /min.

Belt conveyor no.2 shall receive bagasse from bottom deck of main bagasse carrier after boiler feeding and shall deliver the same on top deck of bagasse conveyor no.1. Length between the sprocket centers will be approximately 26 mtrs. The Return bagasse conveyor system is to be provided to handle bagasse of 7500 TCD. The location of conveyor shall be as per the requirement of lay out.

V. Surplus Bagasse Carrier

One No. surplus bagasse rubber belt conveyor of minimum 1500 mm width and of 60 meters length with suitable drives and staging structure shall be provided for conveying excess bagasse from main bagasse carrier to the bagasse storage yard. Height should be as per approved layout.
All conveyors of bagasse shall be suitable covered.

6.1.5) Recirculation and conservation of Mill water

For water Conservation and recirculation system necessary arrangement, be provided for recirculation of cooling water from power turbine, Mill bearing, enclosed mill drive gear boxes, crystallizers, air compressor and sulphur burner etc. All equipments like M.S. fabricated collection tank of suitable capacity, 2 nos. pumping sets (one as standby) piping, valves etc. be installed at suitable location to collect the water from above said sources and pump to the water reservoir for recirculation. The water shall be pumped to raw water reservoir through spray nozzles installed on the reservoir itself to achieve the atmospheric cooling.

All the surplus condensate shall be cooled by a suitable size Two Stage Fanless FRP Cooling tower having forced cooling system to cool the condensation to atmospheric temp and reused in recirculation water used for process only.
The necessary scheme be got approved for the same from the factory/NFCSF

6.1.6) Mill Roller Turning Lathe Machine

A lathe machine for machining of the mill rollers is required to be installed in proposed mill house with in the range of mill crane at a suitable place. The technical specifications of the desired mill roller lathe machine shall be as given below –

9.	Bed Length	- 30 ft.
10.	Bed Width	- 36”
11.	Centre height	- 30”
12.	Spindle Hallow	- 4.5”
13.	Admit between centres	- 18 ft.
14.	Swing over bed	- 60”

15. Effective length of gap - 24”

16. HP & RPM of motor - 20, 1440

All the attachments of the lathe machines along with the desired tools shall be supplied with the lathe machines.

6.1.7) Size and level of Mill house

The floor level of all the houses shall not be less than 300 mm. above the existing factory floor level. The covered sizes of houses will not be less than as given below.

Mill house : Width-26 x length-114 x height 17 (In Mtrs.).

The length of mill house building shall cover from before fibrizer to after bagassilo blower.

Cane feeding area : Width – 26 X length – 55 (Mtrs.).

7.0 TECHNICALSPECIFICATIONS OF BOILING HOUSE PLANT & MACHINERY FOR RAW SUGAR HOUSE

7.1Permeable

It shall be a **super gravity** flow plant and shall be provided with passenger lift and it shall be operative from ground floor to pan floor suitable to lift at least 600 kgs approx.

Two massecuite boiling scheme with A and B massecuite boiling for raw sugar productionand an additional Refinery massecuite boiling with back boiling process to control the molasses purity for refined sugar production shall be adopted Heavy shall be diverted to Molasses storage tank for the Production of Ethanol and Extra Neutral Alcohol during off season.

However, in Process House, the equipment required for three massecuite boiling shall be provided in the Pan station so that whenever required the total mixed juice will be utilized in process house to produce 100 % refined sugar of 60(MAX) ICUMSA on three massecuite boiling process.

The process of clarification adopted in Refinery shall be melt phospho flotation with double decolorization system to produce refined sugar of 60(MAX) ICUMSA. Overall steam consumption of boiling house in sugar plant for raw sugar & refinery process shall be around 40 % (+/- 2)on cane at 320% imbibition on fibre.

Minimum floor level of clarification and evaporation section shall be +9.50 meter from factory floor level (FFL) to facilitate gravity flow of juice, condensate and massecuite.

Boiling house span shall not be less than 26 meter

Live steam connection shall not be provided in boiling house except at sulphur furnace for start-up / emergency requirement. Butter fly valves shall be used in the system except for special duty like cutover valves, double beet valves, etc.

All the equipments and system shall be installed indoors except FFEs evaporator station.

Operating Parameters

Sl. No.	Units	Parameters
18.	Crushing rate	4900 TCD (223 TCH)
19.	M.J. % cane	116.50
20.	Fibre % cane	15.00
21.	Added water % fibre	320.00
22.	Filtrate return % cane	14.00
23.	Defecated juice % cane Defecated juice % cane entering the clarifier after	136.95 136.50

	DCH heating and vent loss	
24.	Clear juice % cane Clear juice % cane entering the 1st body of quintuple	123.50 127.31
25.	Brix clear juice	12.50
26.	Brix syrup	67.00
27.	A Massecuite % cane	26.00
28.	B Massecuite % cane	10.00
29.	C Massecuite % cane	9.00
30.	R1 Massecuite % cane	27.00
31.	Exhaust pressure (Absolute)	2.40 kg/cm.^{2}
32.	RBHR	92.00 plus
33.	F.M. Purity	28-29
34.	B heavy molasses purity(if B heavy diverts for ethanol	50-52

System / Technology proposed to be adopted

I. Motorised Valves:

Exhaust steam / vapour valves shall be rubber seated right angle valves. Exhaust steam valves of FFE 1, vapour valves of Evaporator & juice heater station which are not approachable from main platform shall have **motorised operation** compatible to DCS. Main platform shall mean +9.50 meter from FFL. The number of motorised valves required for these duty shall be decided by purchaser as per the site condition, For B continuous pan steam valve shall be of Butterfly type – auto control compatible to DCS

II. Magnetic flow meters with indicating, integrating and recording facility:

- Hot and cold water arrangement with auto control & Magnetic flow meter with indicating, integrating and recording facility with respect to level of clear juice in juice column.
- Magnetic flow meter with indicating, integrating and recording facility for hot water use in filter cake washing shall be provided
- All pans shall have individual magnetic flow meters in hot water line to pan feed headers.
- Magnetic flow meter with indicating, integrating and recording facility for hot water use in evaporator.

- Magnetic flow meter with indicating, integrating and recording facility in SHWW line to A-Centrifugal machines, continuous centrifugal machines separately for each duty.

- **A, B & C Continuous pans**

  - Flow meter with totaliser in hot water line to continuous pan shall be provided.
  - Condensate water flow indicator with integrator
  - Molasses quantity flow indicator with integrator

- Magnetic flow meter with indicating, integrating and recording facility for hot water use in magma melter.
- Magnetic flow meter with indicating, integrating and recording facility on tube well as per CPCB norms.
- Magnetic flow meter / venture meters with indicating, integrating and recording facility as per CPCB norms.

- **Vertical Crystallizer**

  - Diameter of vertical crystallizer shall be less than 3.6 mtr.
  - The crystallizer shall be driven by a high efficiency shaft mounted planetary gear drive to provide a stirrer speed of about 60 RPH for A massecuite and 40 RPH (0.33RPM) for B massecuite & 20 RPH for C massecuite.
  - The Speed of the stirrer shall be 60 RPH for speed crystallizer and vacuum crystallizer
  - The speed of the stirrer of vertical crystallizer for B and C massecuite shall be 20 RPH

- Magnetic flow meter with indicating, integrating and recording facility for hot water use in magma melter.
- Magnetic flow meter with indicating, integrating and recording facility on tube well as per CPCB norms.
- Magnetic flow meter/venture meters with indicating, integrating and recording facility as per CPCB norms.

III. On line conductivity measurement:

On line conductivity measurement with 3-way pneumatic dump valve should be provided in exhaust condensate water line to divert/drain

water if sugar traces detected with automation in DCS to save boiler water contamination with alarm in control room.

IV. Juice heaters (vertical tubular &DCH) Evaporators and vapour pipes designs:

These shall be designed as per standard norms and evaporation rate, shall specify the design parameters. However minimum evaporation rate of the quintuple body shall be as per the best standards of sugar industry. Bidder will submit HMBD in technical bid.

V. Vibro screens

- Light and heavy filtrate
- MOL
- All Melt

VI. Batch Pans

- All batch pans shall have mechanical circulators of efficient design to enable the pan to work at low vapour pressure / temperature
- All pans of 80 tons capacity shall have 02 Nos massecuite discharge of 600 mm size each.
- All pans shall have down take not less than 40% and graining volume around 45 %.
- S/V ratio shall not be less than 7.00.
- Length of the batch pan tubes in pans shall not exceed 800 mm
- Batch pan shall have top mounted mechanical circulator which shall be provided with Bevel helical gear box with AC VFD drive. Specification shall be designed to ensure efficient working of pans at low temperature vapour. Design parameter shall be provided considering type of massecuite.
- Pans shall be complete in every respect with necessary fittings for satisfactory operation including the discharge valve of suitable capacity, various pipelines (vapour, syrup, high and low grade molasses, movement water, inter connecting cut over pipe lines etc.) key sampler, vacuum and atmosphere venting. Hot water meter cum recorder capable of measuring 15 m3/hr of hot water to be provided.

VII. Massecuite Handling System

- A, B, and C messecuite shall be generated for better quality of sugar and to control the loss of sugar in final molasses.
- Individual pugmills, magma mixers and run of tanks with pumps and motors, shall be provided.
- All massecuite under reference shall flow by gravity from pans to receiving crystallizers and to respective pugmills.
- B and C massecuite shall be pumped to respective vertical crystallizers but in case of any emergency / failure of pumps B and C Massecuite receiving crystallizers shall have the provision to flow directly to respective pugmills. The respective pumps shall be placed at the crystallizer level only.
- Band C Massecuite sealing system from B and C continuous pan shall also be placed alongside the U shape crystallizer for other Massecuites. The pumps shall be placed at the crystallizer platform level only.

VIII. Magnetic separator and dust catcher

- The system shall be designed to ensure the sugar free from any iron particles and shall meet the norms of standard laid down by Govt. of India. Magnetic separators shall be installed were ever required
- Dryer house shall be dust free. Zero tolerance limit shall be provided. Efficient sugar dust collection system in dryer house shall be provided.
- 1kg, 2kg and 5kg packaging system shall be provided
- Necessary infrastructure is to be provided in drier house for maintaining hygienic condition as per the norms of fssai.

IX. Surplus condensateCooling System

Suitable capacity condensate cooling system complete in all respect shall be consider condensate cooling shall take please in two stages so that temperature of the cool condensate shall be less than 30 deg. C.

X. Clarification, evaporation and juice heating system

Every vessel and system will be complete in all respect like connection pipelines, valves, condesate/juice pumps and motor with valves, tubes, insulation, working plateform etc. in order to make trouble free working during crushing season and to get desire results.

XI. Water Cooling System for mills and turbines

Separate cooling system for mills and power turbines shall be considered make up water shall be made from tube well water reservoir.

XII. Air compressor unit for boiling house instrument operation

This shall be independent of any other air compressor in the boiling house

XIII. Final molasses cooling system:

On line cooling system of efficient design.

XIV. Irrigation Management Plant

Proper irrigation management plant as per norms of CPCB with necessary grid piping, valves and pumps shall be provided.

XV. Rain Water Harvesting

Proper Rain Water Harvesting system for all the Sugar Godowns and main factory building as per the norms of CGWA.

USE OF MODERN TECHNOLOGY

- Steam saving devices
- Power saving
- Condensate flash recovery system
- Continuous Vacuum Pans and Batch pan with Mechanical Circulator helps in massecuite boiling at low vapour pressure and temperature

- Water management -Water management is important to conserve natural water source. As such, condensate cooling system and its reuse shall be introduced to minimize tube well water use so that effluent discharge be minimised.

  To achieve effluent discharge level as per limit prescribed by Effluent control board, necessary arrangement shall be provided for collection, cooling and recirculation of cooling water from power turbine, mill bearings, enclosed mill drive gear boxes, crystallisers, air compressor and sulphur burners etc.
- Pneumatic controls Pan discharge valves and cut over valves
- Use of VFD to reduce power consumption
- Use of shaft mounted high efficiency helical planetary drives for low power consumption.
- No use of any direct steam (7kgs/cm2) for Boiling house.
- Use of 1st vapour for pan washing, fourth vapour for molasses conditioners.
- Use of 4th vapour for DCH type sugar melter.
- 2nd effect condensate to be used in PHE by L.P steam to get 115 Degree Cfor sugar drying.

Brief Description of Modern Technologies In The Project

The following are **the modern technologies** incorporated in the process house to reduce internal steam and power consumption and pass on balance to generate more power and enhance the revenue generation by selling excess power to grid.

The use of modern equipments and advanced technology in Indian sugar industry has helped to a considerable extent in reducing the overall cost of production of sugar. The ultimate aim of this project is to minimize steam and power consumption and with production of good quality refined sugar of 60(MAX) ICUMSA.

- Steam saving devices - Direct contact heaters for juice heating. Direct contact heaters can operate at 1-2 deg. C approach temperature and this salient feature makes us use later effect vapours for juice heating. This also facilitate continuous operation without any need for periodic cleaning of juice heater. For efficient operation and control of these heaters, automation for temperature control shall be provided.

- Condensate flash recovery system - Generally condensate is collected individually from evaporators and pans and sent to overhead hot water tank. The recovery of heat from the condensate of evaporator, pans is very important for higher level of thermal efficiency of the system. The flash vapour is recovered from different calandria and fed to evaporator bodies at lower pressure. Flash recovery enable us to get reduction in steam consumption by 2 – 2.5 % on cane. It also helps in reducing power consumption and maintenance cost due to reduction in number of condensate pumps.

- Continuous vacuum pans – It maintains steady consumption of vapours thus eliminating the problem associated with vapour flow fluctuation. Accordingly there will not be any variation in functioning of evaporator station and boiler steam generation. This system automatically manages the steady conditions for development and uniform growth of crystals. This system allows the use of lower grade vapour and helps to improve the exhaustion of sugar from mother liquor resulting in low molasses purity.
- Water management is important to conserve natural water source. As such, condensate cooling system and its reuse shall be introduced to minimize tube well water use so that effluent discharge be minimized.

- To achieve effluent discharge level as per limit prescribed by CPCB, necessary arrangement shall be provided for collection, cooling and recirculation of cooling water from power turbine, mill bearings, enclosed mill drive gear boxes, pumps, crystallizers, air compressor and sulphur burners etc.

  Power house, mill house and boiling house system shall be independent of each other.

- **Mechanical circulator** in all the batch pans for massecuite boiling This shall provide better circulation of massecuite boiling at low vapour temperature results in reduction of sugar losses and steam consumption

- The system shall be designed by incorporating latest technology using distributed control system (DCS) incorporating variable frequency drive (VFD) for centralized control for achieving high efficiency, reduction in power consumption and better utilization of man power. Centrally control rooms shall be provided at Boiling House.

DCS Control system:

- The system shall be designed by incorporating latest technology using distributed control system (DCS) incorporating variable frequency drive(VFD) for centralized control for achieving high efficiency, reduction in power consumption and better utilization of man power.

  A **variable-frequency drive** (VFD) (also termed adjustable-frequency drive, variable-speed drive, AC drive, micro drive or inverter drive) is a type of adjustable-speed drive used in electro-mechanical drive systems to control AC motor speed and torque by varying motor input frequency and voltage. Use of VFD saves energy which implies saving in terms of money.
- A **distributed control system** (DCS) refers to a control system of a process plant and industrial process wherein control elements are not only located in central location (like the brain) but are also distributed throughout the system with each component sub-system controlled by one or more controllers so the intelligence is distributed across the sections of the plant. DCS follows hierarchy in its control philosophy with various function spread across.

- Distributed control systems (DCSs) are dedicated systems used to control manufacturing processes that are continuous or batch-oriented. DCSs are connected to sensors and actuators and use set point control to control the flow of material through the plant. The most common example is a set point control loop consisting of a pressure sensor, controller, and control valve. Pressure or flow measurements are transmitted to the controller, usually through the aid of a signal conditioning input/output (I/O) device. When the measured variable reaches a certain point, the controller instructs a valve or actuation device to open or close until the fluidic flow process reaches the desired set point. A typical DCS consists of functionally and/or geographically distributed digital controllers capable of executing from 1 to 256 or more regulatory control loops in one control box. The input/output devices (I/O) can be integral with the controller or located remotely via a field network. Today's controllers have extensive computational capabilities and, in addition to proportional, integral, and derivative (PID) control, can generally perform logic and sequential control. Modern DCSs also support neural networks and fuzzy application.

- DCSs are usually designed with redundant processors to enhance the reliability of the control system. Most systems come with displays and configuration software that enable the end-user to configure the control system without the need for performing low-level programming, allowing the user also to better focus on the application rather than the equipment. However, considerable system knowledge and skill is required to properly deploy the hardware, software, and applications. DCSs may employ one or more workstations and can be configured at the workstation or by an off-line personal computer. Local communication is handled by a control network with transmission over twisted -pair, coaxial, or fiber-optic cable. A server and/or applications processor may be included in the system for extra computational, data collection, and reporting capability. The system shall be compatible to centralised controlled DCS system.

System Design Basis:

- Butter fly valves shall be used in the system except for special duty like cutover valves, double beet valves, massecuite suction line etc.
- Exhaust steam / vapour valves shall be rubber seated right angle valves.
- For continuous pan steam valve shall be of Butterfly type – auto control compatible to DCS.
- Steam duty globe valve in steam vapour line and NRV shall be tested not less than 15 kg/cm 2.
- Pressure relief valves shall be butter fly valves compatible to DCS. All the equipments and system shall be installed indoor.
- Design of the FFE shall be proven one subjected to efficient operation in the Industry.
- Vertical continuous crystallisers shall have proper coverage. Operator shall have proper passage from boiling house to top of crystalliser and shall have safe operation conditions subject to Purchaser approval.
- All liquid pumps except for molasses shall be provided with suitable size SS- 304 strainers system in suction line to arrest foreign particles.
- All process – juice – water etc MS piping shall be heavy duty C–class. SS 304 piping having diameter 150 mm and above shall be minimum of schedule 20. Below 150 mm pipe, it shall be scheduled 10. Piping from mill house (Screened juice) pumps to the inlet of evaporator first body FFE (Falling film evaporator) shall

be of SS-304 grade minimum of schedule 20. All direct contact heaters (Juice and molasses DCH etc.), **Condensate flash tank (Cigar)** with inter connecting pipe lines and nipples shall be of SS-304 grade.

- Pipelines & fittings – all hot and cold water, juice, syrup, magma, molasses, massecuite and bled vapour, live steam, reduced pressure and exhaust steam pipeline shall be suitable for 4900 TCD and shall be designed so that velocities given below are not exceeding at 4900 TCD.

Water and juice	:	Suction 1.0 m/second Delivery 1.2 m/second.
Condensate	:	Suction 1.0 m/second Delivery 1.20 m/second
Syrup	:	Suction 0.5 m/second Delivery 1.0 m/second.
Molasses	:	Suction 0.3 m/second Delivery 0.5 m/second.
Massecuite/Magma	:	Suction 0.1 m/second Delivery 0.15 m/second
Superheated/ Saturated steam	:	30 m/second
Exhaust steam	:	30 m/second
Bled vapours	:	30 m/second
Compressed air/SO2	:	20 m/second

A maximum pressure drop of 1.0 kg/cm2 g.shall be allowed from boiler outlet to the inlet of power turbine.

No pressure drop is allowed in the exhaust steam pressure between Power turbine station and at the inlet of evaporator station. Exhaust steam pressure at FFE 1 (Evaporator station) shall be minimum 1.50 kg./cm^2.g to 2.00 kg./cm^2.g

- In the boiling house chequered plate flooring shall be provided. All gangways, passages, staircases, working platform and railings shall be convenient. Chequered plate thickness shall be minimum 5mm.

- All statutory requirement regarding staging platform staircases, safety devices etc. shall be observed at the design stage.
- All the Grit catchers in the sugar plant shall be 800 mm dia x 1000 mm height - shell 8 mm thick, bottom 10 mm thick. Cover plate 20 mm thick. Covers shall be hinged and cover holding bolts should be 25 mm dia. The bucket screen shall be made of 3 mm thick AISI 304 quality SS and should have sturdy handles for lifting.
- All S.S. tubes shall be of grade SS-304 conforming to alloy I.S. 13316 fully annealed.
- Shaft mounted high efficiency helical planetary drive shall be M.S. Fabricated / C.S. construction
- .
- Specification for Mechanical circulator with drive shall be as below:-
    - Drive – AC VFD (suitable)
    - Gear box - Planetary gear box/Bevel Helical
    - Material of construction:
    - Blades – Stainless steel 304
    - Hub - Cast Steel
    - Shaft – EN -8

- Specification of right angle, double beat valve and Butterfly valve are as follows:-

d) M.S. Fabricated right angle valve

- O/S Yoke type rising Spindle
- S.S. – 410 Spindle
- S.S. – 410 Body Seat
- Flap Seat of EPDM Rubber suitable for 160 deg. C.
- Double Thrust Bearing for Easy Operation
- Without Flange Ends
- **Motorised operation of 400 mm size and above,** No. of valves required shall be decided by client as per condition laid down in earlier mentioned in right up of design philosophy.

e) S.S. fabricated double Beat valve

- S.S. – 409 Body heavy duty
- S.S. – 410 spindle
- S.S. body seat with Casted Guide
- S.S. Flap fitted with EPDM rubber
- Flange ends as per Table 'D'
- Top and Side flanges of MS

f) Butterfly valve

Item : Centerline (RS) wafer type soft seated butterfly valve

Body : Gray cast iron BS EN 1561 Gr. EN-GJL-250 phosphate and painted upto 300 mm, and sg IRON BS EN 1563 Gr. EN GJS-15 phosphate and painted for size 350 mm and above.

Disc : SS 316 floating disc design

Seat : Grade EPDM field replicable with back metal strip

Stem : AISI type 410

Ends : Water type to get sandwiched between flanges as per ANSI B 16.5 # 150

Method of operations: Manual hand lever operated upto size 150 mm and worm gear wheel operated for size 200 mm and above.

Leakage rate	:	As per ANSI B 16.104 Class VI (100%) leak tight
Shut off	:	Pressure 10 barg
Hyd. Body	:	Test 1.5 x shut off pressure
Hyd. Seat	:	1.1 x shut off pressure

- All juice piping at mills upto evaporation station shall be of SS 304 grade.
- Syrup, Molasses and melt pumps shall be high flow type.
- Exhaust steam provision shall be provided for start-up of all heat transfer units like juice heaters including DCH, pans & cut over line washings etc. shall be provided with motorized valve wherever required and compatible to DCS.
- M.S fabricated pipe for vapour duty shall be of 8 mm thickness upto 800 mm size and 10 mm thickness above 800 mm.
- All MS fabricated pipes of any size for injection and spray system shall be made out of 12 mm thickness.

- All the MS fabricated pipes shall be duly braced.
- The level of automation in the total plant shall be to achieve high efficient operating performance and also to optimize the working strength.
- Exhaust steam pressure at the header FFE 1 shall be 2.5 ata at 125-127 deg.C.
- Vertical multi pass tubular juice heaters shall be designed to have juice velocity around 1.5 m/sec.
- Raw Juice heating by flashed condensate water &vapour, defecated juice heating, clear juice heating and pan boiling will be by bled vapours from multiple effect evaporators.
- Sugar melting will be by vapours from 1st level of quintuple effect evaporators. Pan and cut over washing and 2nd stage molasses conditioning shall be carried out by vapour form 1st body of quintuple.
- Melt concentrator I st effect heating by Quint 3 vapours.
- Melt heating before melt clarification, Melt heating after Deep bed filters and molasses conditioning will be from Melt concentrator 1st effect vapours.
- Condensate flash heat recovery system for steam saving up to 2.5 %.
- The stream shall be envisaged to make the boiling house including refinery plant not to consume more than 42 % on cane.
- Milk of lime preparation and pumping facilities with all accessories.
- Juice defecation system shall be suitably designed with auto pH control to get better quality clear juice with low turbidity.
- Quintuple effect evaporation system-falling film evaporators as first three effects, Robert's type as remaining two effects with automation and standby tandem of identical evaporator set for de-scaling.
- Vertical tube horizontal type continuous vacuum pans for 'B' massecuite boiling with automation of proven design.
- Supply tanks at pan floor to store syrup, melt and molasses.
- Mono vertical crystallizers shall have cooling shall be divided in three stages with counter current flow water to have proper control massecuite cooling as per requirement.
- Single entry multi jet condensers for evaporators and pans with automation.
- Direct contact type sugar melter to melt 'B' & 'C' seed with automation.

- Direct contact type molasses conditioners with Conventional tank & stirrer type molasses conditioners for molasses conditioning ('AH', 'BH', and 'CL' Molasses).
- Auto pH control system should ensure Defecated juice within ± 0.05 of the set value.
- Heating surface of Juice heaters, evaporators and pans shall be calculated on the basis of mean diameter and effective tube length with contact of heating steam/vapour.
- Continuous flow and brix measurement of syrup at the outlet of last effect evaporators.
- The following shall be the recommended vapour bleeding arrangements.
- 2.5 ata exhaust steam to 1st effect evaporator calandria and to super-heated wash water system.
- 2.5 ata exhaust steam to vertical tubular juice heaters for initial startup.
- Exhaust steam by pass arrangement to pans, to continue pan boiling during mill stoppage and in emergency.
- Exhaust steam arrangement to vertical tubular juice heaters for start-up.
- Hydraulic / pneumatic discharge system for batch pans.
- All crystallizers drive speed reduction units shall be through planetary gearbox.
- Water cooled crystallizers S/V ratio (m2/m3) shall be minimum 2.0 for C/B massecuite.
- Minimum vacuum at the last body of evaporator and pan body shall be 635 mm at mean sea level.
- Carbon steel plates shall be as per IS 2002 – 2006 Gr E 250, nozzle shall be as per IS 1234 – 2004 heavy class, all pipe lines other than SS409/SS304 shall be as per IS 1234 – 2004 heavy class.
- Where ever pumps & motors are provided it shall be one working and one standby irrespective of application.
- Juice heaters, evaporators and pans calandria tube specification shall be:

  Juice Heaters

  Tubes : 45 mm OD x 1.2/ (1.5 mm for VLJH thick) ERW SS Tubes, Gr04, CR18, Ni10 as per IS 13316 – 1992 (EQ to AISI -304)

Ligament of Tubes	:	Vapour line juice heaters – shall not be less than 15mm other heaters – shall not less than 12 mm

Evaporators

Falling Film	:	45 mm OD x 1.2 mm thick ERW SS tubes, Gr04,
Ligament of tubes	:	16mm
Evaporator tubes		CR18, Ni10 as per IS 13316 – 1992 (EQ to AISI – 304)
Roberts' Tubes	:	45 mm OD x 1.2 mm thick ERW SS tubes, Gr04, CR18, Ni10 as per IS 13316 – 1992 (EQ to AISI – 304)
Ligament of tubes	:	Shall not be less than 12 mm

Pans

Tubes	:	102 mm OD x 1.6 mm thick, 800 mm long, ERW SS tubes, Gr04, CR18, Ni10 as per IS 13316 – 1992 (EQ to AISI – 304)
Ligament of tubes	:	shall not be less than 16 mm

- Safety valve, drain valves where ever necessary, required individual strainers shall be provided for each suction line with isolation facility.
- All delivery lines except molasses, magma, massecuite and seed shall have stop valve and non-return valve.
- All molasses, magma, massecuite and dry seed pumps shall have only suction valve, delivery line shall not have valve & non-return valve.
- All the delivery lines shall have by pass line (recirculation) with valve.
- The right angle valves used in exhaust steam and vapour pipe lines shall have stainless steel internals and spindle. In evaporator station valves above 2 meter elevation from working platform shall be motorized valves subject to site condition and purchaser's approval.
- All valve spindle 75 mm onwards shall be SS material and triple strand thread.
- Twin screw pumps / positive displacement cavity pumps with SS internals for molasses and melt.

- Blow off pipes / vents drains etc., shall be extended beyond roof / factory buildings as per requirement.
- Safety valves, drain valves, steam traps, non-return valves etc, shall be provided in all steam lines & vapour lines where ever required.
- All safety precautions shall be inbuilt into the design of plant and machineries to ensure safe operations at all times.
- Insulation (lagging) & claddings shall follow standard practices as set out and materials used shall confirm to relevant Indian standard specifications. Surfaces in the sugar plant above 55℃ temperature should be effectively lagged (except where heat dissipation is desirable and the surfaces which become hot intermittently such as steam traps and relief valve outlet pipes, vents, blow down pipes etc.).
- 20% extra margin shall be considered while selecting pipe sizes for the respective materials at the rated velocity.
- For plant automation wherever required pumps drives shall be suitable for VFD application.
- Weight of any vessels, equipment and machinery or platform shall not be transmitted to building columns.
- 'B' & 'C' grain storing crystallizers shall be located at pan floor level and shall feed to respective continuous pans and to common cut over line.
- 'B' & 'C' massecuite receiving crystallizers shall be located at a level from where it can be flowed directly to respective pugmils by gravity.From the crystallisers. From the mono vertical crystallizers massecuite shall be flow by gravity to respective centrifugals pug mill/header.
- All required structural columns, staging, working platforms, staircases, ladders, walkways, chequered plates, hand rails, toe boards, supports, conveyor belts etc, required for the installation and operation. The platforms, stair treads, ladders, hand rails and toe boards shall be mild steel.
- Instrumentation and control shall be as per P & ID drawings AS PER Purchasers approval.
- NOTE: Except where otherwise specified all materials shall conform to the requirement of relevant specifications and Indian standards specified. Materials not specified but which are to be used shall comply with relevant Indian standards. In

the absence of such a standard specification for the material alternate may be considered after approval by CONSULTANT.

- **Instrumentation**

  The plant shall be designed for complete automation through DCS system.To achieves CPCB / SPCB / GOVT. Norms, 03 underground reservoirs (UGRs) shall be proposed as below:

- Cold water RCC UGR to store water from tube well to work as make up water anywhere in the factory. It will receive water only from tubewell. It shall be circulated through 1st over head cold water tank meant for tube well water only. The system / tube well and pumps for this duty / operation shall be centrally controlled and shall be compatible to DCS.
- Cooled Condensate RCC UGR for boiling house to receive water from surplus condensate cooling system, recirculation to 2nd over head cold water tank. Cold water line provision from cold water O/H tank to be given for cooled condensate UGR for initial filling & cold water required during long stoppages.
- Hot water RCC UGR for boiling house to receive excess hot condensate water from hot water O/H tank. The first provision of overflow of hot condensate from hot water O/H tank shall be provided to cooled condensate UGR after proper double stage cooling system. The second provision will be given to hot water UGR to store excess hot condensate even after filling cooled condensate UGR.
- One Hot water O/H tank shall be provided exclusively for Refinery section. Material of construction shall be SS 409.

Proposed MS fabricated Pneumatic control pan discharge valves and cut over valves list:

S.No.	Units
i.	A& C massecuites & all graining pans discharge valves (All batch pans)
ii.	Cut over valves in Batch pans, Seed , vacuum crystallisers

Proposed VFD's list:

Compatible to central DCS controls with change over switch for direct operation.

Sl. No.	Drive Units
i.	Screened juice pumps
ii.	Defecated Juice pumps
iii.	Clear juice pumps
iv.	Exhaust condensate pumps
v.	Cigar hot water circulation pumps
vi.	Light & heavy filtrate pumps
vii.	Grain pumps for B massecuite continuous pans
viii.	Phosphate slurry dosing pumps
ix.	MOL pumps
x.	Cane juice clarifier stirrer drive
xi.	Vacuum filter drum drives
xii.	Injection water pump -02 Nos.
xiii.	Ejector water pumps
xiv.	Mechanical circulators for batch pans for duties as per massecuite requirement
xv.	VFD's for various dosing systems.
xvi.	Cane juice clarifier stirrer drive

Proposed DCS indication and control compatibility points

Sl. No.	Units
i.	Screened Juice Flow rate indication and controls to stabilize the juice flow
ii.	Imbibition water flow rate indication and controls
iii.	Juice temperature at heaters , indication and controls
iv.	Defecated& clear Juice tank level indications and pump speed control
v.	Exhaust condensate receiver level and pump speed control
vi.	Auto control of lime dosing and pH control system
vii.	MOL pump speed controls Light & heavy filtrate tank level indication and pump speed control
viii.	Syrup tanks indication
ix.	Cigar level indication & Condensate pumps / condensate flash recovery system pumps operation and speed controls

x.	Molasses conditions DCH – Temperature & Level indication Molasses conditions Batch – Brix & Temperature indication with control operation
xi.	Pan supply tanks level indication
xii.	Sweet water tank level indication
xiii.	All batch and continuous pans including mechanical circulators
xiv.	Vacuum system / condenser controls
xv.	Injection water pump indication and control
xvi.	Exhaust & vapour pressure indication in lines & Safety valves controls – size 300 mm Butter Fly valve steam duty
xvii.	Temperature and pressure steam coming to boiling house
xviii.	8.0 ata flow
xix.	Minimum 2.5 ata flowflow at evaporator station
xx.	FFE vapour temperatures,,brix and level control
xxi.	Condensate temperature to mill and boiler
xxii.	Massecuite level in batch pan indication and controls
xxiii.	Melt and Molasses run – off tanks level indication at centrifugal station
xxiv.	Batch and continuous pans automation and DCS controls
xxv.	Tube well operation control with respect to level of water in reservoir Hot &cold water pump operation control with respect to level of water in overhead tanks.
xxvi.	Grain pumps for continuous pan operation and controls
xxvii.	All system indications of mills and boilers in boiling house control room
xxviii.	Exhaust steam header pressure indication
xxix.	Evaporator station vapour headers pressure indication including pressure relief valve control
xxx.	Control of hot water addition in clear juice collecting tower from clarifier with respect to level

- Shaft / flange mounted planetary gear boxes / drives shall be used on Crystallizers, pug mill and magma mixers, where ever applicable.

Proposed shaft mounted high efficiency helical planetary drive /helical gear boxes / geared motors list:

S.No.	Drive Units
I	**Shaft mounted planetary drives- All crystallizer and wherever required.**
i.	Vacuum crystallizers
ii.	Dry seed crystallizers
iii.	Massecuite receiving crystallizers

iv.	B& C vertical crystallizers
v.	B- massecuite sealing cum receiving crystallizer
vi.	Mechanical circulators in A, B & C-massecuite pans(All batch pans)– shall have top mounted mechanical circulator which shall be provided with Bevel helical gear box with AC VFD drive
vii.	Pugmills
II	**Helical gear box**
i.	Lime slacker
III	**Geared motors**
i.	Stirrer drive of juice Defecator
ii.	B & C sugar melter
iii.	Rorimelter
iv.	Brown sugar melter
v.	Koran type lime classifier
vi.	Screw lime grit conveyor
vii.	Molasses conditioners
viii.	Rori, dust & dry seed conveyor belts
ix.	Sugar & lime elevators
x.	Milk of lime storage tanks
xi.	Magma Minglers

7.2 Juice Weighment

7.2.1 On –line mass flow meter – 1 No.

Mass flow meter for ultimate capacity**:** 400 T/hr.

Pressure drop access the system shall not exceed 1 bar.

The filtrate from filter station shall be pumped to juice sulphiter

For the accurate weighment of juice online mass flow-meter having following specifications shall be considered.

Type	**:**	Coriolis Dual U Tube design or single full bore straight tube design.
Wetted Parts and Connection	**:**	Tube, Manifold, and Process flanges in 316 SS welded design, enclosure in SS 304 and should fullfill NACE standard.
Accuracy	**:**	± 0.10% of mass flow rate
Ambient Temp. Effect	**:**	0.001 % of Nominal flow rate per℃
Repeatability	**:**	± 0.05% of rate
Inaccuracy in Current output	**:**	None

Core processor	:	It should be microprocessor based with digital communication having meter diagnostic capabilities and multivariable measurement with 4 wire system between the sensor and transmitter.
Outputs	:	i) 4-20 mA for mass flow rate ii) 0-1000 Hz frequency for mass flow rate iii) Digital HART for remote configuration
Power Supply	:	85-250 VAC / 24 VDC
Electrical Connection	:	¾ inch NPT
Electrical Housing	:	NEMA 4X
Temperature Limits	:	0 to 204°C
Indication facilities	:	i) Flow rate in TPH ii) Current hour flow in tonnes iii) Last hour flow in tonnes iv) Separate display for measured liquid during check weighment.
Communication Ports	:	a) RS 232/RS 485 for PC Communication b) Centronic parallel port for printer

Mass flow meter shall include

i) Mass flow sensor
ii) Mass flow transmitter
iii) Interface cables
iv) Centralized computer, system with CPU Color monitors, key board, printers etc.
v) Jumbo display arrangement at mill and boiling house.

Online calibration facility for check weighment with tank of suitable capacity shall be provided for random checking of juice delivered by the mass flow meter without stopping the crushing and affecting the working performance of mass flow meter. The check weighment shall have arrangement for discharging the juice to the screened juice tank by gravity/ pump. The party shall furnish detailed calculations showing mass flow rate accuracy, pressure drop, velocity at 10 operating steps weight and measures certificate

and stamping from regional weight and measures authorities shall be responsibility of the supplier.

The filtrate from filter station shall be pumped to Juice Defecator.
Suitable arrangement for preparation, storage and pumping of phosphoric acid solution shall be provided near screened juice tank in mill house. The tank shall be 3 mm thick construction SS-304 with stirrer, piping of PVC, two dosing pumps of suitable capacity and head with ACVFD drive.

Supply shall be complete in all respect and compatible for centralized control DCS system.

This mass flow meter of 400 cum. /hr. capacity shall be suitable for ultimate capacity of 7500 TCD.

7.3 Juice Flow Stabilisation System – 1 Set

Juice flow stabilization system for

Ultimate capacity	**:**	400 cu.m. / hr.
Control range	**:**	30% to 100%
Juice flow variation control	**:**	$\pm$ 5% of pre-set value

System is required to control screened juice flow rate to the process and to reduce aberration in juice flow quantity.

Whenever the level of juice in screened juice tank increases / decreases beyond a safe limit, an auto visual signal will be given to operator in mill house and boiling house for appropriate action. If the level of the screened juice tank is above the set point (upper limit) the carrier speed shall be reduced and is over rider to all parameter to prevent over flow of juice from tank. The system shall include necessary control units, including VFD at screened juice pumps / control valves, juice level indication in screened juice tank, flow indication at mills and boiling house flow recorder etc. and shall be compatible for centralized control DCS system

7.4 Juice Heating Station

Multi pass shell & tube type vertical as well as direct contact type heaters shall be employed for juice heating. Following scheme shall be adopted.

Juice & stage	Qty.	Type of heater	Heating media	Heating surface
Raw juice – 1st heating (VLJH)	1+1	Shell & tube type	Qnt.-5 vap.	450 m^2
Raw juice -2nd heating 3 set (2 working + 1 Standby) – New	2+1	(Battery type condensate heater)	Condensate	250 m^2
Raw juice – Final heating	1	Shell & tube type	Qnt. - 4 vap. / Qnt. 3rd vapour	430 m^2
Defecated juice – 1st heating	1+1	Shell & tube type	Qnt. – 4 vap.	430 m^2
Defecated juice –2nd heating	1	Direct contact	Qnt.-3 vap.	
Defecated juice – 3rd heating	1	Direct contact	Qnt.-2 vap.	
Clear juice – 1st heating	1	Direct contact	Qnt.-2 vap.	
Clear juice – 2nd heating	1	Direct contact	Qnt.- 1 vap	

The shell & tube type juice heaters shall have SS-304 tubes of 45 OD x 16 swg in VLJ heater x 5000 mm long sizes and 18 swg in rest of the vertical tubular juice heaters.

The direct contact juice heaters shall be of all SS-304 construction, complete in in-built entrainment separators, shall be designed with 25% extra margin but should work efficiently at existing crush rate.

7.9 Clarification Station

Hot Raw Juice Screening system:

Supply of totally closed construction Rotary Screen with staging structure for hot raw juice screening to be located near Juice Defecator.
Rotary Screen assembly fitted with 150 micron opening filtering media screen in stainless steel construction to handle hot raw juice.

Technical Data:

Particulars	Data
Drum/Screen diameter	2000 mm
Screen length	4800 mm long
Screening area	30.16 sq. mtr.
Opening	150 microns (0.15 mm)

Drive System	11.0 kW with VFD and DOL Bypass arrangement
	TEFC sq. cage S1 continuous duty electric motor with planetary type gear box and power transmission by heavy duty simplex chain and drive/driven sprockets.

The Hot Raw juice screening system shall be complete with timer operated automatic washing system by high head washing pump using clear juice and hot water periodically and caustic soda cleaning system with centralized electric control panel.

The filtering media screen shall be in SS 304 construction and all juice wetted parts shall be in stainless steel 409 construction.

One no. whirler type slurry preparation tank of suitable capacity with two nos. (One in operation, one as standby) slurry transfer pumps of suitable capacity shall be supplied to transfer the separated bagasse to mud tank / mills.

The equipment shall be complete with the required to and fro piping with valves for unscreened juice, screened juice, clear juice, hot water and caustic soda.

7.5.1 Juice defecators – 1 no

One set of continuous juice defecation unit in mild steel fabricated construction of 40m^3 capacity with 137.00% juice, retention time not less than 8 minutes and 2.0 meter working height of juice column above the gas distribution shall be supplied.

The juice defecator will consist of a reaction vessel and stack gas recovery tower.

The juice defecator shall have milk of lime proportioning unit complete with inter connecting piping.

The defecator shall have provisions for

- Pre liming
- Shock liming and
- Simultaneous liming

Defecated juice outlet shall be by overflow at a fixed height through peripheral gutter.

The reaction vessels will be provided with a stirrer. The stirrers shall be driven by a suitable HP, TEFC squirrel cage electric motor drive through a planetary gear box. The stirrer speed shall be around 16 rpm.

The vessel shall be complete with 200 dia sight & light glasses, continuous juice sampling device and other fittings and mountings.

Quick opening hinged manholes of 550 mm dia should be provided in the bottom cone, top cover and vessels for easy and quick cleaning of reaction vessel. Suitable number of hand-holes shall be provided in the recovery tower for cleaning of trays etc.

Defecated juice receiver

A 45 m^3 capacity, vertical cylindrical common Defecated juice receiving tank with conical bottom in mild steel fabricated construction complete with all fittings & mountings shall be provided.

Defecated juice pumps

Two (2) nos. one as standby, centrifugal pumps each of 350 m^3/hr, 75 m head, 1440 rpm with VFD. Defecated juice receiver level indication and pumps drive speed shall be compatible for centralized control DCS system.

Automatic lime dosing and pH control system

Lime dosing into Juice Defecator shall be automatically controlled based on pre-set ratio to juice flow. Lime flow will be measured to give feedback signal to the lime dosing control loop.

The volumetric flow of mixed juice from mass flow meter shall control lime dosing to pre-set ratio.

The control system shall be compatible for centralized control DCS system. The necessary control shall be made available with a remote / local selection switch.

7.5.2Milk of lime preparation station – one set

The milk of lime preparation unit shall consist of following :-

Lime elevator	1 set	1500 kg/hr, chain (roller chain) and steel bucket type with drive.
Lime slacker	1 set	1200 kg/hr, rotary drum type with drive.
Lime classifier	2 sets	Koran type with screw type grit remover with drives (one set standby)
Vibro screens	3 sets	Make SS – 304, Size 60 inch
Classified lime receiver /Tank	1 set	30 m^2 with stirrer, 16 rpm & drive

MOL pumps + grit catcher	2 nos.	12 m^3/hr with drive (one set standby) + VFD
Hydro clones	1 set	15 m^3 /hr Suitable for ultimate capacity
MOL storage tanks	2 nos.	Each of 30 m^3/hr with stirrer & drive
MOL pumps	2 nos.	12 m^3/hrwith drive (one set standby) + VFD
Grit washing trough	1 set	Suitable for ultimate capacity. This shall be of trouble free operation.

Lime elevator – One no.

One chain & bucket / slat bucket type lime elevator, 1500 kg/hr capacity to receive the lime from ground floor and deliver to the lime slacker's inlet box through closed chute. The lime slacker shall be placed at +5500 level above FFL.

The tail end of the elevator shall be below the ground level, and a feed hopper at the ground level shall be provided. The top of feed hopper shall be covered with bars to prevent accidental falling of any operator.

The sprocket shall be of cast Iron / cast steel.

Drive - Electric motor through shaft mounted planetary gear box.

Lime Slacker – One set

One no. mild steel welded construction lime slacker, revolving type with screens at the outlet of 1200 kg/hr. capacity complete with drive and running at 6 to 8 rpm.

The gear boxes shall either be helical enclosed or planetary type. Worm reducers are not acceptable.

Koran type Lime Classifier – One set

One no. mild steel welded construction Koran type Lime Classifier of 1200 kg /hr capacity complete screw type grit separator, and drives shall be supplied.

The gear boxes shall either be helical enclosed or planetary type. Worm reducers are not acceptable.

The classified milk of lime shall be delivered to the one MOL storage tank by gravity.

Hydro – cyclone and Vibro screens

Suitable designed hydro-clone and vibro screens of 15 cu meter for ultimate & 2 nos of vibro screens of SS-304 shall be provided for further separation of fine grits from milk of lime for ultimate capacity.

Milk of lime storage tanks – 3 nos.

Three numbers mild steel welded construction MOL tanks complete with drive and having 30 m3 capacity each.

One tank shall receive classified MOL from classifier. Two storage tanks shall receive screened & de-gritted MOL from **hydro –cyclone** through vibro screens.

The storage tanks to be made of 6 mm thick mild steel plates complete with stirrers. The stirrer drives shall include planetary gear box with motor or geared motor.

Separate gutters shall be provided over the two nos. de-gritted milk of lime storage tanks, one for the milk of lime coming from hydro-clone through vibro screens and other one for return milk of lime.

Milk of lime pumps – 4 nos.

Two (2) nos. (One standby) classified milk of lime pumps, each of 12 m^3/hr, suitable head to pump classified through hydro – clone and vibro screens shall be supplied. The pumps shall be complete with AC-VFD drives.

Two (2) nos. (One standby) milk of lime pumps, each of 12 m^3/hr, suitable head to pump de-gritted & screened MOL to the process shall be supplied. The pumps shall be complete with AC-VFD drives.

The casing and impeller of milk of lime pumps shall be of Ni-hard construction.

Complete independent 'To&Fro' pipe lines and return pipelines should be provided & from:

- Juice Defecators – lime proportioning device
- Weighed juice receiving tank
- Muddy juice tank and
- Condenser outlets

- Juice clarifier for maintaining pH of juice in clarifier during shut down

Grit washing Trough

A mild steel fabricated construction grit washing trough shall be supplied. All the grits from slacker, classifier, vibro screens and hydro clones shall be collected in this trough.

The grits shall be washed with water and only the washed water shall overflow to the injection channels. The washed grits shall be discharged through a manually controlled gate to a trolley for disposal.

7.10 Cane juice clarifier – 1 set

One no. 12200 mm dia. clarifier with four compartments, each compartment to have height of 1524 mm along with all accessories and inline mixture shall be provided.

Flash tank shall be suitable for ultimate capacity of 7500 TCD.

Clarifier shall have separate juice and mud outlet from each compartment.

The flocculating compartment complete with skimmer and feed well shall be installed separately.

Proper arrangement of flocculent / settling agent preparation and measured addition with dosing pumps with standby arrangement shall be provided for ultimate Capacity.

Clarifier shall be installed at +9500 mm from FFL on RCC structure.

The clarifier shall be made of mild steel plates having suitable thickness for 12200 mm size of clarifier.

The continuous clarifier shall be complete with mild steel flash tank and withdrawal boxes, 2 nos. for clear juice and one no. for mud with sleeves, telescope pipes and O-rings, hinge type squeezers, driving mechanism with variable speed drive head with motor consisting of sprocket, chain and drive guards, all inside and outside clear juice piping and mud piping, all valves and pipe fittings etc, and complete with peripheral walkway, angle iron bracket supporting angles, piping for railing, rail support etc; 4 manholes one for each compartment, each manhole to have platform, railing and access ladder; pumps tank with support, insulation material etc.

Mud liquidating pump of 80 m3/hr. and 20 m. head complete with drive motor shall be provided.

Two clear juice centrifugal pumps each of 350 m3 per hour and not less than 60m. head complete with drive motor and suitable column having (2 mx10 m) sight and light glasses shall be provided for pumping juice through clear juice heaters (DCH) to 1st body of Quintuple (FFE).

Provision of recirculation of juice in the clarifier shall be also provided. Arrangement of preparation and dosing of flocculent to be provided.

7.11 Rotary Cane Mud Vacuum Filters – 2 Sets

2 nos. each of 4.27m dia x 8.53m length (14' x 28').

Each rotary cane mud vacuum filter shall have nominal filtering area of 114m^2 totalling 228m2.

Rotary cane mud vacuum filters shall have bagacillo blowers, cyclone, mud mixer, vacuum pumps etc. conforming to standard specification shall be supplied.
The vacuum filters shall be installed on steel structural staging at +9500 mm level from the factory floor level.

The extraction of heavy as well as light filtrate shall be by gravity (barometric vacuum column). All the equipment including filtrate tank (one common for light & heavy filtrate), pumps etc. shall be above FFL.

The vacuum filters shall be complete with all accessories, auxiliaries, piping valves and fittings etc. so as to make the system complete for proper and satisfactory operation.
The arrangement shall be made to pump the light and heavy filtrate on 3 vibro screens (60" dia each) and the filtrate from the vibro screens shall be pumped to juice sulphiter absorption tower with standby pumps.

The screened bagacillo will be returned to the mud mixer by gravity.
The hot water temp. control system shall have provision to set the water temp. between 60 deg. C to 80 deg. C.

Magnetic flow meter with indicating, integrating and recording facility for hot water use in filter cake washing shall be provided.

Mud belt conveyor – 2 nos.

The mud receiving belt conveyor shall preferably be placed below the operating floor. The mud scrapped from the filter shall be delivered to the belt conveyor through a closed 5 mm thick MS fabricated chute.

The mud receiving belt conveyor shall transfer the mud to another inclined mud belt conveyor, which will discharge the mud in a mud bin.

Mud bins

The mid bin shall have a capacity to store 01 hourof mud. The mud bin shall have a power operated sealed door at the bottom. The bottom most level of the bin discharge door shall be minimum 2500 mm above FFL to accommodate tractor trolley with tractor.

7.12 Evaporation Station

7.8.1 Evaporator sets – 2 sets (one standby)

It is proposed to follow Quintuple effect evaporator system of following heating surfaces. The Robert body shall have a vapour space height between the top tube plate and bottom of the umbrella (cylindrical portion of the vapour space) not be less than 2.5 times the calendria height in case of 4th body and 3 times the calendria height in case of 5th body. Details as per **Annexure-I**

Unit	**Type**	**Heating surface (m2)**		**Tube sizes**
		Operating	**Standby**	**OD x thk x Length**
Quintupple-1	FFE	3800	3800	45 x 1.2 x 10000
Quintupple-2	FFE	3800	3800	45 x 1.2 x 10000
Quintupple-3	FFE	3800	3800	45 x 1.2 x 10000
Quintupple-4	Robert body	1800	1800	45 x 1.2 x 2000
Quintupple-5	Robert body	800	800	45 x 1.2 x 2000

The tubes shall be of stainless steel conforming to grade 304, I.S. 13316, fully annealed.

Magnetic flow meter with indicating, integrating and recording facility for hot water use in evaporator shall be provided.

7.8.2 Steam balance

Alternative arrangement of exhaust steam shall be provided for Pan washing.

a) Basic temperatures of juices at various stages of heating for calculation

Raw juice initial temperature	:	30.00 deg. C.
Raw juice temperature after 1st stage heating	:	38.00 deg. C
Raw juice temperature after 2nd stage heating	:	50.00 deg. C
Raw juice temperature after final stage heating	:	72.00 deg. C
Defecated juice temperature after 1st stage heating	:	78.00 deg. C.
Defecated juice temperature after 2nd stage heating	:	98.00 deg. C.
Defecated juice temperature after 3rd stage heating	:	102.00 deg. C.
Clear juice initial temperature	:	96.00 deg. C
Clear juice temperature after 1st stage heating	:	108.00 deg. C
Clear juice temperature after 2nd stage heating	:	116.00 deg. C

Automation at Evaporator Station:

One set of automation for each set shall be provided at evaporation station to control clear juice flow, exhaust steam flow and final brix at evaporation station without effecting pan working with centralised controlled DCS system.

The evaporator control shall be DCS based with temperature, pressure, level and brix control/monitoring.

Juice flow and recirculation system in FFE shall be monitored through magnetic flow meters as per standard practice and shall be compatible to centrally controlled DCS system.

Requirement of motorised valves is provided in design philosophy.

7.8.4 External save-all – 2 sets (one for each evaporator set)

A generously sized, efficient External Entrainment Separator shall be provided for each evaporator set. It shall be mounted on the out-going vapour pipelines from quintuple – 5 to VLJH and condenser.

7.8.4 Syrup Receiver – 2 sets (one for each evaporator set)

Vertical cylindrical vessels, each of 1200 mm dia, 2000 mm height each in mild steel construction complete with sight and light glasses, temp. & Pressure indicators, inlet outlet & vent connections with valves etc. shall be provided.

7.8.5Syrup extraction pumps – 4 nos. (one standby for each set)

Syrup extraction pumps each of 80 m3 capacity of 30 m head, 1440 rpm driven by suitable hp TEFC sq. cage AC motor shall be provided.

The 2 nos. pump shall be for each set (one standby) with separate syrup receivers.

7.8.6 Chemical System for cleaning (Rubber lined system)

Suitable arrangement for preparation of acid and caustic solution and their pumping to the evaporator bodies shall be provided. Recirculation arrangement also shall be provided. For open caustic soda boiling in Robert type bodies, exhaust connection with rubber seated right angle valves of suitable sizes and vapour outlet with suitable sizes valves to atmosphere from top of body shall be provided. Pipe shall be extended from outside the building.

Tanks	Quantity	Capacity	Type	Material of Construction
Chemical tank	1 No.	250 HL	Cylindrical Tank	Rubber lined MS construction
Caustic Soda Tank	1 No.	250 HL	Cylindrical Tank	Carbon Steel construction

Pumps	Quantity	Capacity	Type	Material of Construction		
				Casing	Impeller	Shaft
Chemical Pump	2 Nos.	100 m3/h, 22 m Head	Centrifugal type	CF8	Stainless steel	SS410
Caustic Soda pump	2 Nos.	100 m3/h, 22 m Head	Centrifugal type	Cast Iron	Stainless steel	SS410

7.9 Condensate Flash Recovery System

Flash vapours of all condensates except for condensate of last vessel of quintuple set is utilized.

Efficient condensate Flash Vessel of SS 304 Construction shall be provided. All interconnecting pipes shall be of SS-304 schedule 20 (min.)

Heat recovery from exhaust steam condensate through free flow plate type heat exchanger shall be done. By pass arrangement shall also be provided.

All condensate from different vessels and pans shall be collected in Condensate Flash Vessels.

Two plate type heat exchanger ((1 working & 1 standby) shall be provided to heat suitable condensate for superheated wash water operating on exhaust steam to maintain the final desired temperature of 115 deg. C of condensate for A centrifugals.

Arrangement shall be provided for heat exchange unit for hot air blower for sugar hopper using condensate of suitable temperature.

Suitable capacity inlet condensate receiving bottles, pumps (one operating and one standby), where required, for above operations with AC drive compatible for centralized control DCS system shall be provided.

Suitable arrangement of tank and pumps (One working & one standby) shall be made for back wash of plate heat exchangers (PHE).

7.10 Graining Station

7.10.1 Molasses conditioners for A heavy, B heavy, C Light molasses

The dilution cum heating shall be done in five High speed stirrer type on line Molasses conditioning unit complete with inter connecting pipes, valves and sampler shall be provided; one for A-heavy molasses, one for B-heavy and one for C-light molasses. Hot water from hot water O/H tank shall be used.

Vapour of Q2 body of quintuple shall be used for additional heating, if required. The stirrer shall be driven by AC motors through shaft mounted gear motors / planetary gear box with motors.

The conditioners shall ensure complete dissolution of grain nuclei.

These molasses conditioners shall be designed with following percentages of molasses.

A-heavy molasses - 15 percent on cane
B-heavy molasses - 8 percent on cane
C-light molasses - 4 percent on cane

Automatic control of temperature and brix system shall satisfy the following requirements:

iii) Temp. of conditioned molasses - 70 deg. C
iv) Brix of conditioned molasses - 70 - 75°

Conditioned molasses shall contain no fine grains

7.10.2 Pan feed tanks for syrup, melt & molasses

The pan feed tanks shall be of vertical cylindrical vessels with conical bottom and closed up construction complete with insulation, lagging manholes at top, internal ladder, heating coil, inlet, outlet washout connections, sight & light glasses, level indicator etc.

Each tank will be 36 m^3capacity in mild steel fabricated construction. Following shall be the quantity and duty distribution.

Syrup	:	3 nos.
Melt	:	2 nos.
A- Light molasses	:	1 no.
A-Heavy molasses	;	2 nos.
B-Heavy molasses	:	2 nos.
C - Light molasses	:	1 no.

7.10.3 Sweet water tank with pumps

One M.S. sweet water tank of holding capacity of 75 m^3 with 2 nos. pump (one as stand by) each of 30 m^3 / hr. capacity with 30 m head shall be provided. The tank shall be made of min 10 mm thick mild steel plate duly braced.

The level indication system shall be compatible for centralized control DCS system.

7.10.4 B& C seed crystallizer – 70 T – Two nos.

B & C seed crystallizer shall be of Horizontal U-shaped type MS fabricated, open from top with sturdy ribbon type stirrer.

Cut over valve shall be M.S. fabricated with
Pneumatic control operation.

The crystallizer shall be driven by a high efficiency shaft mounted planetary gear drive to provide a stirrer speed of about 60 rph.It shall be installed on pan floor.
Cut over valves shall be operated from the pan floor.

7.10.5 Vacuum crystallizers

Horizontal cylindrical MS fabricated with heavily stiffened flat ends. Vacuum crystallizer, with paddle type stirrers, conforming to following specifications.

A-massecuite	:	70 T, 65T each 1 no.
B massecuite	:	70 T, 65T each 1 no.
C massecuite	:	70 T, 40T each 1 no.

The crystallizer shall be driven by a high efficiency shaft mounted planetary gear drive to provide a stirrer sped of about 60 rph.

7.10.6 Vacuum pans

1. Continuous Pans for A, B & C massecuite boiling with mechanical circulator with VFD especially in tightening zones

iv)	A Continuous pan, capacity 60 Tons/hr	- 1 No.
v)	B Continuous pan, capacity 35 Tons/hr	- 1 No.
vi)	C Continuous pan, capacity 25 Tons/hr	- 1 No

= pans for massecuite boiling /graining with mechanical circulator with VFD are required whenever either of continuous pan is under cleaning, details as below:-

v)	60 Ton/strike capacity for B graining	- 1 No.
vi)	60 Ton/strike capacity for C graining	- 1 No.
vii)	80 Ton/strike capacity for A graining	- 1 Nos.
viii)	80 Ton/strike capacity for A/B/C – continuous Pans are under cleaning / water boiling	- 3Nos..

Specifications of Batch pan:

Type	Low head rapid boiling calendria type
Capacity	60 Tons each with mechanical circulator
Heating Surface area Strike Volume ($m^2/m^{3)}$	7.2
Vapour space in the cylindrical portion above the strike level	2.5 m
Internal save all	Centrifugal type
Graining volume	45%
Down take diameter	45% maximum
Tube details :	
Material	Annealed stainless steel tubes, 304 grade
Outside diameter	102 mm
Thickness	16 SWG
Ligament of the tubes	16mm (minimum)
Placement of the tubes	For effective steam distribution arrangement

Specification of Continuous Pan

A-Continuous Pan **Quantity – 1 No.**

One continuous pan, capacity 60 tons/hr shall be provided for A-massecuite boiling.

Massecuite to be boiled capacity **:**~60 t/h

Type **:**One No. Mechanical circulator top mounted in tightening zone/ jigger tubes in tightening zone as per SRI design.

The vertical continuous pan, if erected outdoor, may have problems in operation /supervision during chilled winter. Dependent solely on automation is not possible.

The continuous pan is designed for the above given output rate of massecuite having sufficient Heating Surface Area.

Surface Area to volume ratio is about 10.5.

Pan calendria shall be divided into three separate modules, each with independent steam control, non-condensable gas and condensate outlets. Each module shall be capable of being isolated and operated on either vapour-1/vapour-2/vapour-3 independent of the modules.

Automation

System shall be compatible to central DCS

B-Continuous Pan **Quantity – 1 No.**

One continuous pan of capacity 35 tons/hr shall be provided for boiling B-massecuite,

Massecuite to be boiled	:	B
Capacity	:	35 tons/hr
Type	:	One No. Mechanical circulator top mounted in tightening zone/ jigger tubes in tightening zone as per SRI design.

The continuous pan is designed for the above given output rate of massecuite having sufficient Heating Surface Area.

Surface Area to volume is about 10.5 m^2 / m^3, other specification and automation of continuous pan is similar to A-continuous pan. System shall be compatible to central DCS

C-continuous pan **Quantity: 1 No.**

One continuous pan, capacity 25tons/hr shall be provided for C-massecuite billing.

Massecuite to be boiled	:	C
Capacity	:	25 tons/hr
Type	:	One No. Mechanical circulator top mounted in tightening zone/ jigger tubes in tightening zone as per SRI design.

Other specification and automation of continuous pan is similar to A-continuous pan. System shall be compatible for centralised control DCS system.

GRAIN PUMPSFOR A,B& C MASSECUITE CONTINUOUS PAN Quantity-06 Nos. (TWO NOS. EACH FOR A, B & C PAN WITH STANDBY)

Helical rotor type pumps suitable for the duty, each of 12 m3/hr capacity, 30 m head driven by independent VFD through a planetary / helical gear box. The helical rotor shall be of stainless steel and stator shall be of erosion resistant material.

System shall be compatible for centralized control DCS system

'A','B'&Ç' massecuite sealing system

Massecuite sealing crystallizers will be separate for all three massecuites.

In case of A massecuite, 01 crystallizer of 65 Tons can be utilized and for B massecuite one crystallizer of 65 Tons and for C massecuite, one crystallizer of 45 Ton capacity can

be utilized. All these three crystallizers can be utilized from the existing plant.. Necessary pumping arrangement / gravity flow shall be made for its flow to the respective A, B & C receiving crystallizers.

The overflow outlet of the crystallizer shall be provided to facilitate movement of massecuite to the 'B & C' massecuite pumps for onward transfer to vertical crystallizer.

A clear space of 400mm shall be provided over the massecuite level.

The crystallizer shall be driven by a high efficiency shaft mounted planetary gear drive to provide a stirrer speed of about 60 rph.

The other feature /general specification of the crystallizer shall be similar to massecuite receiving crystallizers.

7.10.7Massecuite receiving crystallizers

Massecuite receiving crystallizer of horizontal U-shaped MS fabricated open top crystallizer with sturdy ribbon type stirrer of following specification shall be supplied:-

A massecuite	:	Air cooled	85 T each	3 nos.
B massecuite	:	Air cooled	85 T each	1 no.
C massecuite	:	Air cooled	85 T each	2 nos.

The crystallizer shall be driven by a high efficiency shaft mounted planetary gear drive to provide a stirrer speed of about 60 RPH for A massecuite, 40RPH for B massecuite and 20 RPH for C massecuite.

7.10.8Massecuite pumps

A massecuite shall flow by gravity from pans to receiving crystallizers and to pug mill of batch centrifugal machines. No pumps are required.

B & C massecuite shall be pumped to respective vertical crystallizers. But in case of emergency, B & C massecuite receiving crystallisers shall have the provision to flow directly to respective pugmills / system.

For B and C massecuites, following pumps shall be supplied.

B massecuit	:	Two nos.(1W & 1SB) pump for sealing cum receiving crystallizer to vertical crystallizer

e		Two nos. (1W & 1SB) separate pumps for 'B' massecuite liquidation from B-mono vertical to B-pug mill. Total 4 nos for B Massecuite Transfer of 45 T/hr - Rota Pumps with replaceble tips and driven by AC motor with planetary / Helical gear box.
C masssecuite	:	Two nos.(1w & 1SB) pump for sealing cum receiving crystallizer to vertical crystallizer Two nos. (1w & 1SB) separate pumps for 'C' massecuite liquidation from C- vertical to CFW pug mill. Total 4 nos for C Massecuite Transfer of 35 T/hr - Rota Pumps with replaceble tips and driven by AC motor with planetary / Helical gear box.

Independent pipeline from each pump shall deliver massecuite to its respective destination.

7.10.9 Vertical crystallizers

Vertical crystallizers for cooling & maturing of B & C massecuites to following specifications shall be supplied.

B massecuite	:	Mono vertical continuous	280 T/hr	1 no.
C massecuite	:	Twin vertical continuous in parallel	250 T/hr	1 no.

For 'B' massecuite, MS fabricated mono vertical crystallizer, with conical bottom water jacketed rise pipe and very sturdy stirrer.
For C massecuite, MS fabricated twin vessel in series type vertical crystallizer, with conical bottom and very sturdy stirrers.

Diameter of the vertical crystallizer shall be less than 3.6 meter
The bottom cone angle shall be 60 deg. from horizontal.
The crystallisers shall be driven by high efficiency shaft mounted planetary gear drive to provide a stirrer speed of about 20 RPH.
Necessary cooling surface to be provided in case of "B" massecuite cooling, so that the massecuite temperature is cooled from 65 deg C to 50 deg C when supplied with cooling water at 30 deg C. in 8 hours. For B vertical crystallizer- S/V ratio shall be 2.0.

In case of C massecuite, necessary cooling surface shall be provided so that the temperature of the massecuite is cooled from 65 deg.C to 40 deg.C in 24 hours, when supplied with cooling water at 30 deg.C. Provision in the design shall also be made for a maturing period of 4-5 hours in case of low-grade continuous crystallisers. The cooling surface (m^2) to volume (m^3) ratio shall be minimum 2. The heat exchange elements shall be tested at pressure of 6-kg/cm_2 g. suitable for continuous working. For C vertical crystallizer- S/V ratio shall be 2.0.

The design and arrangement should ensure

- The slow and uniform rate of cooling
- Uniform cooling across the cross section
- Plug flow of massecuite through the crystallizer
- Proper distribution of cooling and maturing zones.

Liquidation arrangement, cooling water & return piping shall be provided.
Independent cold water tanks with independent cold water circulation pumps (One operating & one standby) complete with drive, piping, valves, fittings etc shall be provided.
Common hot water receiving tank with independent pumps (one operating & one standby) complete with drive, piping, valves, fittings etc. shall be provided.

Provision will be made for re-circulation of hot water into the XLR's in case required.

The crystallizer shall be complete in every respect with necessary fittings for satisfactory operation.

Massecuite liquidation pumps

Four (4) nos., massecuite liquidation pumps, Two for 'B' massecuite, Two for C massecuite one pump each for individual vertical crystallisers, each of 45 T/hr capacity, suitable massecuite head sufficient to pump to overflow box of respective vertical crystallisers with replaceable tips and driven by AC motor through a planetary / helical gear box.

7.11 Vacuum Generating Station

7.11.1 Condensers

Each pan and each last vessel of evaporator sets shall be provided with a single water entry efficient condenser of all SS-304 construction. The tail pipe shall be of SS-304.

- Multi loop control system for minimizing the water consumption while maintaining the set vacuum and approach temp. of 10-12 deg. C shall be provided.
- Independent control with provisions for its operation from DCS shall be provided. The system shall be made available with a remote / local selection switch.
  Following data shall be indicated as well as recorded in digital as well as trends (graphics).

  - Inlet water temp
  - Tail water temp
  - Vapour temp
  - Vacuum (as set and as achieved)
  - Evaporation rate in pans

7.11.2 Ejectors

Three (3) nos. ejectors of all SS-304 construction shall be supplied primarily for following duties.

- Vacuum generation in vacuum crystallizers and assistance in vacuum generation in vacuum pans
- Nox gas removal in evaporator and heaters including DCH
- Assistance in Vacuum generation in pans /Standby

7.11.3 Injection and ejection water pumps

For vacuum pans & evaporators, three (3) nos. (two operating, one standby) vertical mixed flow type pumps, each of 3000 m^3/hr, 32 m head, maximum 960 rpm pumps, TEFC sq. cage AC motors with 2 nos. VFD drive shall be provided.

For ejectors, two (2) nos. (one operating, one standby), preferably vertical mixed flow type pumps, each of 450 m^3/hr, 32 m. head, maximum 960 rpm pumps, TEFC sq. cage AC motors with VFD shall be provided.

Separate water headers for condensers and ejectors shall be provided. Interconnection with isolation valve shall also be provided for emergency needs. Temp. pressure, vacuum indicators shall be provided at two places on each header. Transmitters for DCS shall be provided.

The delivery pipeline of each pumps shall be individually connected to the respective headers with tangential connection.

The pumps shall have CI casing, CF8 impeller and SS-410 shaft & SS-410 sleeves.
Suction strainer of stainless steel construction, NRV and isolation valves in the delivery lines shall be provided.

7.11.4 Cooling towers

An induced draft, mixed flow type cooling tower with two (2) cells, each of 3500 m^3/hr. capacity shall be provided.

Each shell shall have capacity to handle 3500 m^3/hr water to give cold water temp. within 5 deg. C of Wet Bulb temperature or at least minimum drop of 9-12 deg. C

The cells of cooling tower shall have induced draft fan with electric drive, RCC framework with extruded non-combustible PVC fills, splash bars supported on stainless steel grids, RCC louvers and polypropylene distribution nozzles.
The fan shall have lightweight aluminium alloy impellers and hub. The impellers / fan blades shall be detachable and must be securely locked into position for efficient and safe operations.
Horizontal vent spacing of fill would be in the ratio of 1: 1.5 and spacing of fills should not be less than 200 mm.
All nuts, bolts and washers to be made of 304 grade stainless steel.

Plant shall be super gravity.

7.12 Surplus Condensate Cooling System with Pumps

Suitable capacity cooling system with pumps and cylindrical RCC of suitable capacity for storage of cooled condensate shall be provided. Plant is to be designed on zero effluent discharge. Hot condensate shall be cooled to temperature less than 30 deg. C.
Common Cooling System With Pumps For Cooling Water From Mills And Turbines And Its Collection.
Efficient system is required to save any wastage on this account.

7.13 Massecuite Curing Station

7.13.1 Batch Type Centrifugal Machine
High grade fully automatic recycling with pneumatic controls centrifugal machines

four (4) nos. batch type, high grade centrifugal machines, each of 1750 kg / charge, 20 cycles / hr, fully automatic recycling type centrifugal machines shall be supplied for single curing of Á' massecuite with 94 – 95 deg. brix. The brix of massecuite shall not be less than 94 deg. Massecuite to pugmill shall be provided by gravity.

Basket shall be SS DIN Standard 1.4462

Working screen – Brass, Backing screen – S.S. Backing screen, 4 mesh DOVEX R Type

Spindle- material specification – Forged steel as per IS 2004 CLASS IV

The machines will be driven by suitable power AC VFD. The machines shall be complete with all accessories, auxiliaries, including support, structure, platform pug mill with drive, super - heated wash water system, Air compressors, run-off tans, run-off pumps (1+1) with drive, incoming and control panels etc.

Structure, pug-mill, molasses gutters and all other accessories suitable for installation of one no. similar machines shall be provided for ultimate capacity.

'Auto – manual' switch shall be provided for manual operation in case of failure of control system. Necessary manual controls shall be provided.

Manually operated power actuated brakes shall also be provided for emergency.

Necessary arrangement in the panel shall be provided for tripping of the machine in case of high temperature on sensing through ETD, of the motors and excessive vibrations / wobbling.

Suitable interlocking arrangement shall be provided in panels so that not more than one machine start at a time.

Two plate type heat exchanger ((1 working & 1 standby) shall be provided to heat suitable condensate for super-heated wash water operating on exhaust steam to maintain the final desired temperature of 115 deg. C of condensate for A centrifugals.

Arrangement shall be provided for heat exchange unit for hot air blower for sugar hopper using condensate of suitable temperature.

7.13.1.1 Molasses Run-off Tanks

Two (2) sets of vertical cylindrical, 5 mm thick, MS construction, molasses run-off tanks each of 3 m^3 capacity, one for AH molasses and one for AL molasses shall be supplied. The tanks shall have level indication compatible to DCS.

7.13.1.2 Molasses Pumps

Two (2) sets of molasses run-off pumps for each duty, one operating and one standby, complete in all respect.

7.13.1.3 Pug Mill

The pug mills shall be made out of 8 mm thick mild steel plate and provided having paddle type stirring arrangement, driven by Ac electric motors through shaft mounted planetary gearbox.

7.13.2 Continuous Centrifugal Machines

C massecuite shall be double cured. A& B massecuites shall be single cured.

Following continuous centrifugal machines shall be supplied.

'C'– massecuites	03 nos.	1500 mm dia, 0.05 mm screen, with transient heaters.
CAW magma	01 no.	1500 mm dia, 0.06 mm screen,
'B' massecuite & common standby for B & 'CAW' magma	04 no.	1500 mm dia, 0.06 screens.

Magnetic flow meter with indicating, integrating and recording facility for hot water use in continuous centrifugal machines shall be provided.

Continuous Centrifugal Machines for 'C' fore worker shall be capable to cure 'C' massecuite of minimum 102 brix and 48 purity at a rate of 8-10 tonnes per hour and shall be having a minimum gravity factor of 2400.
Continuous Centrifugal Machines for 'B' single curing shall be capable to cure 'B' massecuite of minimum 94 to 96 brix and purity not exceeding 78 to 65.00 at a rate of 15 tonnes per hour.
Continuous Centrifugal Machines for 'CAW' magma curing shall be capable to cure 'CAW' magma at a rate of 15 tonnes per hour
B and CA magma and its liquidation shall flow to horizontal magma melter, pump transfer from magma mixture.

Each continuous centrifugal machine shall be complete with following:

j) Mild steel monitor casing designed to provide a sturdy support for all machine elements,
k) Basket of SS 304 make
l) Separate compartments for sugar and molasses,
m) Sight and light glasses for inspection,
n) Hinged doors for access to the sugar chamber,
o) Sugar sampler and
p) Water/steam washing arrangement,
q) Stainless steel accelerating cone, receiving cup etc.
r) Hot water, exhaust steam & Q1 vapour for washing arrangement with metering device to measure the wash water,

Massecuite feeding device shall be **provided with manual as well as pneumatic control valves.** It shall operate automatically with load and shall stop in case power failure.

Drive arrangement having motor pulley, V belts and bearings, Massecuite feeding devices etc.

The angle of basket shall be 30° for all low grade of massecuite / magma.
Large enclosed distribution header of suitable size, with water jacket, shall be provided for C massecuite. Pug-mills for B – massecuite & CAW shall be provided and shall be mounted over the machines, suitable transient heaters, with automatic temp control shall be provided for C massecuite. Arrangement between B - massecuite and CFW magma pugmill shall be provided to use common centrifugal machine for B- massecuite and CFW magma curing.

The machines shall be complete with all accessories, auxiliaries, including support, structure, and platform pug mill with drive.

Auto controlled temperature of wash water system for massecuite curing in continuous centrifugal machines shall be provided. Run-off tanks, run-off pumps (1+1) with drive, incoming and control panels etc shall be as per requirement.

The pug-mills for B massecuite& CAW magma shall be made out of 8 mm thick mild steel plate and provided having paddle type stirring arrangement, driven by Ac electric motors through shaft mounted planetary gearbox.

The complete centrifugal station shall be complete in all respects and shall have necessary accessories namely Air compressor 7 kg/cm² (g) with receiver and refrigeration dryer system to supply moisture free air for pneumatic control, Air compressor under reference shall have standby arrangement and shall have no connection with any other air compressor proposed in boiling house.

Approach ladder and platform to top feed headers and pugmill shall be provided.

Vapour from 1st vessel of quintuple shall be used in continuous centrifugal machines & transient heaters, where ever required. Live steam shall not be used. In fact, Live steam connection shall not be provided in boiling house.

Monorail with 5 tonnes capacity, with chain pulley block over the centrifugal machines / motorised- remote control system shall be provided.

Provision shall be made in lay out suitable for ultimate capacity of 7500 TCD.

7.13.2.1 Molasses Run-off tanks

Independent molasses run-off tanks with independent pumps shall be provided.
Three (3) nos., vertical cylindrical, 5 mm thick, MS construction, molasses run-off tanks each of 3 m^3 capacity, one each for B-heavy, C-light and final molasses shall be supplied.

7.13.2.2Molasses Pumps with motor

Two (2) sets of molasses run-off pumps for each duty, one operating and one standby, complete in all respect.

7.13.2.3Magma Mixers with drive

The machines shall discharge sugar directly into the corresponding magma mixers of suitable capacity and design.
Independent magma mixers for CF sugar (2 nos.), CA sugar and B sugar will be provided. 2 nos. magma mixer shall be provided for B single cured sugar to avoid longer size magma.
The shell of the magma mixers shall be of 6 mm thick mild steel plates having double beater paddles, coupled to electric drive through suitable shaft mounted planetary gearbox.

7.13.2.4 Magma Pumps with motor

Two (2) nos. magma pumps (or as per requirement) one operating and one standby, each of 20 cu.m./hr. capacity, 12 m massecuite head with replaceable tips and driven by AC motor through a planetary / helical gearbox shall be supplied for CF magma.

Two (2) nos. magma pumps, one operating and one standby, each of 20 cu.m. /hr. capacity, 12 m massecuite head with replaceable tips and driven by AC motor through a planetary / helical gearbox shall be supplied for A1/C1 magma.
B and CA magma and its liquidation shall flow to horizontal magma melter by gravity. The staging level / operating platform level of all the machines shall be suitable for this purpose.
Independent Pug mill for each duty and pipeline from each pump shall deliver the magma to its destination.

7.14 Magma and Sugar Melters

7.14.1 B & C magma melter - One no.

Horizontal continuous sugar melter in fabricated construction, of 35 T/hr. capacity with automation for brix and temperature control shall be provided. The melter shall have

ribbon type stirrer supported on external roller bearings in CI plumber blocks. It shall be complete with all fittings, mountings etc.

Provision shall be made in sugar melter for its operation at two levels.

It shall be driven by an AC motor through a shaft mounted planetary gear box.

Magnetic flow meter with indicating, integrating and recording facility for hot water use in melter shall be provided.

It shall be placed adjacent to centrifugal machine and the magma shall be delivered to it by gravity.

Suitable size of vibro screens shall be installed in between melter and receiving tank.

One suitable capacity melt receiving tank shall also be provided.

Two nos. melt pumps (one standby) each having capacity of 40 m^3/hr at 30 m head driven by AC motor shall be provided.

7.14.2 Dirty (Brown) sugar melter – 1 no.

Vertical cylindrical sugar melter of 5 T/hr of sugar capacity, complete with planetary geared motor driven stirrer shall be provided.

One suitable capacity melt receiving tank shall also be provided.

Suitable size of vibro screens shall be installed in between melter and receiving tank.

Two nos. melt pumps (one standby) each having capacity of 20 m3/hr at 30 m head driven by AC motor shall be provided.

Suction side of all pumps shall be provided with strainers.

7.15 Process Automation – DCS

The process house automation in the boiling house including batch and continuous pans shall be achieved through DCS. Control room for centralised operation / control and housing the control panels shall be provided at a central point for easy approach with AC for maintaining desired temperature. It shall be fully equipped in all respect.

Compressed air, free from moisture, required for operation of pneumatic controls / automation system in boiling house with stand – by arrangement shall be provided for boiling house.

7.16 Final Molasses Handling & Storage System

7.16.1 Molasses Weighment, Unloading & Loading System

One magnetic type mass flow meter of capacity 15 tons/hr for final molasses weighment shall be provided.

7.16.2 Molasses Storage Tanks

One (1) No. molasses storage tanks each of **8000 m^3** with effective volume of 7200 m^3 capacity, mass flow meter,piping, valves, fittings, external cooling(spray & recirculation pump complete with motor, pump) shall be provided. Final molasses storage tanks shall be as per IS 5521-1980 specifications.

Six (6) Nos. molasses loading pumps for three (3) No. molasses storage tank complete with drive, piping, valves, fittings etc. shall be supplied.

One no. molasses loading tank capacity of 25 Cu.m, complete with support structure, platforms, railing, stairs etc. shall be supplied.

Three(03Nos.) pumps for each tank (09 nos.) for recirculation of molasses shall be provided. Proper MS coil inside the final molasses storage tanks for homogeneous molasses suction/circulation is required.

Arrangement of spraying water with 4 Nos. pumps sets–one common standby on all sides of tanks shall be provided with an arrangement of recovery of used water.

7.17 Miscellaneous

7.17.1 Overhead Service Water Tanks

Three rectangular overhead tanks of 8 mm thick mild steel plates with stiffeners and angle frame each having a capacity of 40 m^3 complete with valves, fittings, pipes shall be provided.

Bottom of the tanks shall be at least 6 meters above pan floor. The tanks shall be covered. Level indicators shall be provided, compatible to DCS.
Complete structure, platform around tanks, stairs / ladders etc. shall be provided.

Two parallel strainers with isolating valves shall be provided from overhead cold water tank to Mills, boiling house, Boiler & Power House for make up so that one will be standby for periodical cleaning.

All spent bearings and oil cooling water of boiling house shall be cooled to ambient temperature and collected in closed MS cylindrical tank of suitable capacity at proper place as per approved layout. Cooling system with 2 pumps (1W and 1 SB) & strainers shall be provided. The cooled water shall be reutilized for cooling purpose.

Two (2) nos. pumps (1 W &1 SB) and strainers with MS cylindrical tank for collection of recirculation water of suitable capacity shall be provided to transfer the spent cooling water to the proposed cooling system.
Hot &cold water distribution piping, valves, fittings etc. for the entire plant shall be provided.

7.17.2 Under Ground Hot and Cold Water Reservoirs

To achieve CPCB norms, 03 underground reservoirs shall be proposed as below:

- Cold water reservoir to store water from tube well to work as make up water anywhere in the factory. It will receive water only from tubewell. The system / tube well and pumps for this duty / operation shall be centrally controlled and shall be compatible to DCS.
- Cold water reservoir for boiling house to receive water from surplus condensate cooling system, recirculation to over head cold water tank and make up from cold water reservoir.
- Hot water reservoir for boiling house to receive condensate water from boiling house and recirculation to overhead hot water tank.

Above system shall be equipped with level sensors and compatible to centralised controlled DCS.

7.17.3 UGR and Service Water Pumps – Cold Water from Tube wells

UGR shall be of RCC of suitable capacity not less than 15, 00,000 litre.

Two (2) nos. water pumps each of 200 m^3/h, 50 m head, 1440 rpm, complete with AC-VFD drive, piping, valves, fittings etc. shall be provided tube well cold water UGR to transfer cold water to the required destination anywhere in the factory as make up to the system and automatically maintain set level in the UGR compatible to DCS.

7.17.4 UGR and Service Water Pumps – Cold Water from surplus condensate cooling system

UGR shall be of RCC of suitable capacity not less than 15, 00,000 litre.

Two (2) nos. water pumps each of 300 m^3/h, 50 m head, 1440 rpm, complete with AC-VFD drive, piping, valves, fittings etc. shall be provided at cold water UGR to transfer cold water to the overhead service water tank and automatically maintain set level in the tank and UGR compatible to DCS. Arrangement shall be made to make cold water UGR from surplus condensate cooling system before fresh water addition, with the approach to zero water use of fresh water.

7.17.5 UGR and Service Water Pumps – Hot Water (condensate)

UGR shall be of RCC of suitable capacity not less than 3, 50,000 litre

Two (2) nos. hot water pumps each of 200 m^3/h, 50 m head, 1440 rpm, complete with AC-VFD drive, piping, valves, fittings etc. shall be provided at hot water UGR to transfer hot water to the overhead service water tank in boiling house and automatically maintain set level in the tank compatible to DCS.

7.18 Effluent Treatment Plant

- Effluent treatment plant shall be installed as per Gazatte of India REGD. NO. D.L.-33004/99 dated 14.01.2016 and norms laid down by State and Central Pollution Control Board / Govt. Agencies. Necessary approvals/ formalities from Govt. agencies shall be the responsibility of supplier. On line monitoring system as per the norms of pollution Control Board shall be installed. Effluent treatment plant shall be installed for ultimate capacity of 7500 TCD.
- Decanter/centrifugal machines/filter press for sludge treatment, RO treatment at outlet, condensate polishing unit.

7.18.1 General Scheme and Process of Treatment:

Brief Treatment Scheme:

A: Preliminary Treatment

- Screen Chamber
- Oil & Grease Trap

B: Primary Treatment:

- Equalization Tank – Solids shall be kept in suspension by introducing diffused air.
- Primary Clarifier

C: Second Stage Biological Treatment

- Aeration Tank
- Secondary Clarifier

D: Tertiary Treatment – System shall follow CPCB norms.

- Multi – Grade Filter
- Activated Carbon Filter

E: Sludge Treatment:

- Sludge dewatering system

  Above process specification shall be based on feasibility report and terms & conditions specified in environmental clearance obtained for the project for ultimate capacity.

Flow meters shall be provided to determine gross effluent quantity.

- Outlet of sugar house cooling tower over flow & boiler blow downs.
- At the outlet of R.O. reject.
- At the inlet and outlet of ETP.
- At the inlet of makeup water in sugar house cooling tower.

7.18.2 CPCB & SPCB NORMS

The water/ effluent management system shall be designed for achieving norms laid down by central and state pollution control board / Govt. norms vide Environment Act 1986 and Amendment Rules 2016 as details given below:

S. No.	Industry	Parameters	Standard
"4.	Sugar Industry	EFFLUENTS	All concentration values arein milligramme per litre except for pH
		pH	6.5-8.5
		Temperature	Ambient
		Total Suspended Solids (TSS), milligramme per litre	<30
		COD miligramme per litre	<250
		BOD [3 days at 27°C] milligramme per litre	<30
		Oil & Grease milligramme per litre	10
		Total Disolved Solids (TDS) milligramme per litre	2100
		Final waste water discharge limit	200 litre per tonne of cane crushed
		(Final treated effluent discharge restricted to 100 litre per tonne of cane crushed and water from spray pond	

overflow or cooling tower blow down to be restricted to 100 litre per tonne of cane crushed and only single outlet point from unit is allowed).

4 (1) Treated effluent Irrigation protocol and waste water conservation or waste water management in Sugar industries.

(ii) Loading rates for different soil textures

S. No.	Soil Texture	Loading rate in m3/Ha/Day
6)	Sandy	225 to 280
7)	Sandy loam	170 to 225
8)	Loam	110 to 170
9)	Clay loam	55 to 110
10)	Clay	35 to 55

In addition to action proposed for achieving CPCB norms, the following shall be considered for better water management:

- Mill House effluent De-oiling /De-greasing/De-sludging to recycle water in mill house.
- Spray pond effluent de-sludging and treatment before loading / sending it to final ETP. Presence of sulphur in it affects the working of ETP.
- RCC Storage tank to collect tube cleaning waste water for regulating controlled flow to ETP for efficient control of norms and flow. Sludge removal provision shall also be made.
- Pumps and other necessary arrangements /piping, valves for discharging treated discharge to designated points as per layout and site conditions shall be in scope of supplier.
- Lagoon of 15000 cu m capacity.

7.19 Fire Fighting System

Fire fighting system shall be installed as per the norms laid by state and central Govt. directives for 4900 TCD plant expandable to 7500 TCD. Necessary approvals/ formalities from Govt. agencies shall be the responsibility of supplier.

7.20 Bore well

One (01) no. bore well, each of 60 cu.m. per hr. with 50 meter head shall be installed along with necessary pipelines & valves. The existing two nos. of borewells will be hooked up with the new borewell. Start up and stoppage shall be centrally operated in addition to manual operation at site, compatible to DCS which is in supplier's scope. Magnetic flow meters for individual bore wells with indicating, integrating and recording facility shall be provided.

Piezometer with separate boring to measure the underground water level as per the directives of CGWA shall be provided and Clearance from CGWA also required.

7.21 Modern laboratory shall be established for analysis required to be carried out in sugar factory.

Well-equipped laboratory with a facility to analyse water, sugar house products which includes ICUMSA values including all special analysis, boiler water, condensate water, evaporator scaling and BOD, COD tastings for ETP plant etc.

7.22 Insulation & Lagging

Insulation and lagging of all equipment, pipes and fittings etc. of the sugar plant shall be supplied.

All the equipment and pipelines (including fittings as defined under Clause 6 of IS:7413 specifications), surfaces in the sugar plant above 55 deg. C temperature shall be effectively lagged (except where heat dissipation is desirable and the surfaces which become hot intermittently such as steam traps and relief valve outlet pipes, vents, blow-down pipes etc.)

Lagging of boiling house equipment & piping shall be from factory made mattresses of Bonded Mineral wool of readymade mattresses specifications. All lagging shall be cladded with minimum 22 gauge aluminium sheet cladding.

7.23 Air compressor unit for boiling house instrument operation

Suitable capacity air compressor unit with standby system along with arrangement for supplying of moisture free air with suitable filters of adequate capacity, air receiver with suitable relief valve for operating of instrument at suitable pressure separately for boiling house shall be provided. This is most important during sudden shutdown of plant.

7.24 Galvaume Sheet for Roofing, Ridges And Galvaume For Plant.

Galvaume sheets shall be of following specification:-

Total coated thickness (TCT)	=	0.65 mm
Weight	=	180 gm/m.^{2}
Galvaume Coating (GSM) (As per I.S. Code)	=	Aluminium 55%and zinc 43.5% and silicone 1.5%

7.25 Helical Planetary Drives

Shaft mounted high efficiency helical planetary devices shall be M.S. fabricated / CS construction.

7.26Sugar Godowns

Two (02) no. sugar godown each of 20000 tons storing capacity shall be provided.

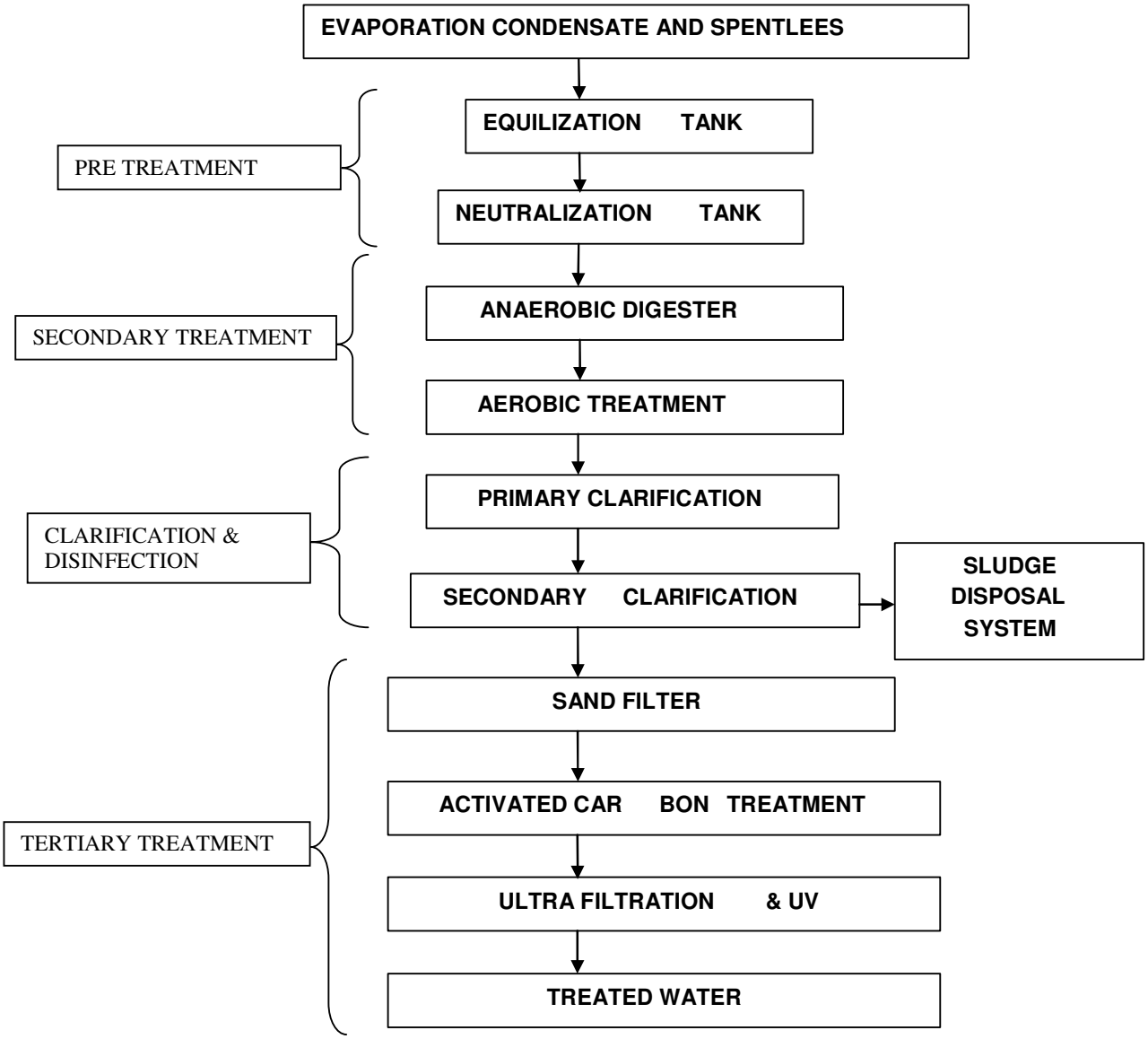
7.27Rain Water Harvesting

Rain water harvesting system shall be provided as per prescribed norms by Govt./ CPCB / SPCB.

7.28 Condensate Polishing Unit

Suppliers providing alternate technologies or deviating from below mentioned technology should provide all details to the Sugar mill and Inspection agency (NFCSF) well in advance.

TYPICAL PROCESS FLOW DIAGRAM FOR CONVENTIONAL TECHNOLOGY FOR CPU



(Supplier should provide cooling tower in order to cool the process condensate from 60^0C to the temperature of 35^0C or required temperature)

	EQUIPMENT LIST	
1	Evaporation condensate lifting pump with motors (Condensate + Spentlees)	Type- Self Priming, non clog, centrifugal Capacity- 30 M^3/hr Head- To be specified MOC-Shaft, Impeller- SS-316, Casing- CS Pump with motors – 1+1 Nos.
2	Lime /Soda ash tank	Capacity-1 M^3 MOC- HDPE, No. 1
3	Lime /Soda ash dosing pumps	Type - Self Priming, non clog, centrifugal Pump capacity - 0-50 LPH MOC - MOC-Shaft, Impeller- SS-304, Casing- CS Pump with motors – 1+1 Nos.
4	Nutrient tank	Capacity-1 M^3 MOC- HDPE, No. 1
5	Nutrient dosing pumps	Type – Electronic diaphragm operated Pump capacity - 0-50 LPH MOC – PP Pump with motors – 1+1 Nos.
6	Air Blower	Type - Twin Lobe Capacity- 1200 M^3/hr, Pressure 0.5 kg/cm^2 MOC – CI Nos. 1 + 1
7	Air grid with diffuser membrane	Type- Membrane Capacity- To be specified MOC- EPDM Type -Disc Nos. 1 lot
8	Poly dosing tank	Capacity-0.5 M^3 MOC- HDPE, No. 1
9	Poly dosing pumps	Type – Electronic diaphragm operated Pump capacity - 0-10 LPH MOC – PP Pump with motors – 1+1 Nos.

10	Primary Clarifier Mechanism for AT-1	Capacity - To be specified Type - To be specified MOC - To be specified Gear box & Motor- No. 1
11	Sludge pump for primary clarifier	Type - Self Priming, non clog, centrifugal or screw Pump capacity – 10 M^3/hr MOC-Shaft, Impeller- SS-304, Casing- CS Pump with motors – 1+1 Nos.
12	Secondary Clarifier Mechanism for AT-2	Size- To be Specified Drive- Centre Drive Gear Box & Motor- 1No. Scraping- MS Epoxy two scrapper arm with neoprene squeegees Make- To be specified Feed well- To be specified
13	Sludge pump for Secondary clarifier	Type- Self Priming, non clog, centrifugal or screw Pump capacity – 10 M^3/hr MOC-Shaft, Impeller- SS-304, Casing- CS Pump with - 1+1 Nos.
14	UASB digester feed pump	Type- Self Priming, non clog, centrifugal Pump capacity – 30 M^3/hr Head- To be specified MOC-Shaft, Impeller- SS-304, Casing- CS Pump with motors – 1+1 Nos.
15 16	Chlorine (Hypo chloride) dosing tank Chlorine dosing pumps	Capacity-0.5 M^3 MOC- HDPE, 1 No. Type – Electronic diaphragm operated Pump capacity - 0-10 LPH MOC – PP Pump with motors – 1+1 Nos.
17	Filter feed pump	Type- centrifugal Pump capacity - 30 M^3/hr MOC-Shaft, Impeller- SS-304, Casing- CS Pump with motors – 1+1 Nos.

18	Pressure Sand filter	Capacity- 30 M^3/hr Size- To be specified MOC- MSEP Piping size- To be specified Media- Graded Sand and Gravels Valve type- Butterfly Valve size- To be specified No. 1
19	Activated Carbon filter	Capacity- 30 M^3/hr Size- To be Specified MOC- MSEP Piping size- To be specified Media- Supporting media & Activated carbon Valve type- Butterfly Valve size- To be specified No. 1
20	Flare stack	No. 1 Type- Water seal type, manually ignited, MOC-SS-304 or MS with epoxy coated
21	Interconnecting Piping & Fittings	MOC- White CPVC Sch. 40 Accessories- Valves, Flanges, Reducers, Joints, Bends etc. Nos.- To be specified
22	Electrical & Equipments	Control Panel- 1No. Make- To be Specified Energy meter- 1 No. Cabling- To be specified
	ULTRA FILTRATION PLANT	
1	UF feed pump	Type - Centrifugal Pump capacity - 30 M^3/hr MOC-Shaft, Impeller- SS-304, Casing- CI Pump with motors – 1+1 Nos.
2	Basket filter	Capacity- To be specified Size- To be specified Media- 25 micron MOC of housing- SS-304 No. 1

3	Bag filter	Capacity - To be Specified Size - To be Specified Media - To be Specified MOC– SS-304 No. 1
4	UF system	Feed flow - 30 M^3/hr Product flow – Min. 27 M^3/hr Recovery – 90-95% Module Type - Hollow fiber or suitable Nos. - To be specified Membrane area - To be Specified Piping - 1 lot MOC - SS and CPVC Auto control valves - To be specified Type - Pneumatically Actuated PRV - To be specified MOC - Cast Steel Skid - To be specified MOC - MS Powder coated No. of units - To be specified
5	CEB 1 Dosing system	Chemical - Caustic & Chlorine Pump capacity – 0-20 LPH Type - Mechanical diaphragm operated Tank capacity (M^3) – 200 Lits. MOC - HDPE No. 1
6	CEB 2 Dosing system	Chemical - Acid Pump capacity – 0-20 LPH Type - Mechanical diaphragm operated Tank capacity (M^3) – 200 Lits. MOC - HDPE No. 1
7	UF Backwash strainer	Capacity - To be specified Size - To be specified Media - To be specified MOC of housing - SS-304 Nos. - To be specified
8	UF backwash pump	Pump capacity – To be specified Pump type - Centrifugal MOC-Shaft, Impeller- SS-304 , Casing- CI Pump with motors - 1+1 Nos.

9	Ultra Violet treatment system	To be specified
10	CIP system	Tank - 1 No. Tank capacity (M^3) - To be specified Tank MOC - HDPE Pump capacity (M^3/hr) - To be specified MOC of Pump -Shaft, Impeller- SS-304 Casing- CI Pump with motors - 1+1 Nos. Micron filter - To be specified MOC of housing – CPVC
11	Treated water pump	Type- centrifugal Pump capacity - 30 M^3/hr MOC-Shaft, Impeller- SS-304, Casing- CI Pump with motors – 1+1 Nos.
12	Instrumentation electrical and components	Mag flow meter -3 Nos.- To be specified Rota meters -Nos.- To be specified Level switch -Nos.- To be specified Actuated valves -Nos.- To be specified Temperature gauges -Nos.- To be specified Pressure gauges -Nos.- To be specified Sampling valves - Nos.-To be specified Online pH meters -Nos.- To be specified Online ORP meters -Nos.- To be specified Conductivity meter inbuilt in control panel -Nos.- To be specified HPS & LPS -Nos.- To be specified Solenoid valve for Auto flushing -Nos.- To be specified Solenoid valve for Auto Dumping -Nos.- To be specified
13	Control panel	Control Panel - 1 No. Make - To be specified Panel Type - Auto / Manual No. 1
14	Piping	MOC - White CPVC/SS-304 Pressure Rating - 20 Kg/cm2 Nos. - 1 Lot as per requirement

15	Electrical	Electric control panel (Micro processor based) - To be specified Operation - Semi automatic PLC - To be specified Cabling - To be specified Cable Tray - To be specified
16	Plant lightning – LED type	To be specified
17	Motor covers	As per requirement

8.0 SCOPE OF WORK AND TECHNICAL SPECIFICATIONS OF REFINED SUGAR PROCESS HOUSE EQUIPMENMTS

Cane Sugar Refining with Raw Sugar Melt Clarification process by Phospho-flotation to produce refined sugar of 60(Max) ICUMSA.

8.1 Raw Sugar Specifications

- Pol % : 98 to 99
- Colour (ICUMSA) : 500 – 700
- Ash % : 0.5
- Starch (ppm) : < 100
- Dextran (ppm) : < 100
- Moisture % : ≤ 0.2
- Sediment (ppm) : ≤ 70

8.2 Refined Sugar (Sulphur less) Specifications

- Pol % : 99.8
- Colour (ICUMSA) : 60(max)
- Ash % : ≤ 0.027
- Moisture % : ≤ 0.04
- Sediment (ppm) : ≤ 10
- Beverage Floc (ppm) : - ve

8.3 Description of process:

Raw Sugar is processed employing the processes of

- Melting,
- Melt clarification (Phospho flotation),
- Melt filtration (Multi Bed Filter),
- Crystallization
- Centrifugation

To produce refined sugar of above referred specifications.

The raw sugar is melted in hot water and screened before sending to clarification. In clarification, the Phospho flotation process is employed to get clear melt and scum will be sent to filter station in raw sugar house.

Clarified Melt is then passed through Multi Bed Filtration (MBF) to remove suspended particles from clarification.

Clarified melt is then passed through the Melt Concentrator (FEE) system and concentrated from 65° to 72 - 74° brix by 2nd body vapour of Quintuple evaporator set. This concentration of clarified liquor reduces steam consumption at Refined Massecuite boiling substantially.

In crystallization, refined massecuite boiling schemes depends upon the type, size and qty. of the crystal desired. Generally, in India Back boiling system is adopted. In back – boiling, the Run off from 1st massecuite is recirculated till the colour of refined sugar is 40 - 60 ICUMSA. Once it crosses, the back boiling is stopped and the runoff will be sent for raw massecuite boiling.

The refined massecuite from Pan, goes to closed O type crystallizers with insulationfor further crystallization and proper sizing of the crystal and goes to Centrifugal machine for separation of crystal and run offs.

The refined sugar from centrifugals is moist sugar and then dried in the long Grass Hopper length by Hot & Cold Air Blowers and through FBD system to keep the temperature of refined sugar around 40° C, this refined sugar is then sieved in Grader where different sizes of sugar obtained and sent to respective storage bins for bagging.

SCHEDULE OF EQUIPMENTS FOR REFINERY

The following are the equipments for Refined Sugar at 600 TPD capacity Plant:

Section	Refined Sugar Process House
b.	Melting,
b.	Melt clarification (Phosphotation),
c	Melt filtration (Multi Bed Filter),
d	Crystallization to produce refined sugar of above referred specifications.
e.	Refinery Centrifugals and Bagging System
f.	Piping, Insulation & Cladding

TECHNICAL SPECIFICATION

The system shall be compatible to PLC Control System.

8.4 Raw Sugar Melting & Screening

8.4.1 Raw Sugar Mingler / Magma Mixer — Quantity: 1 Unit

Raw Sugar shall be discharged to MS fabricated raw sugar mingler directly from A – Batch centrifugal machine or through Food grade belt conveyer as per site conditions. Raw Sugar magma of about 80 - 85° brix by using hot water and then shall flow by gravity to raw sugar melter. The capacity of magma mixer shall be suitable to magmize 18 TPH raw sugar magma.

8.4.2 Raw Sugar Melter — Quantity: 1 Unit

Raw Sugar magma is melted in MS fabricated horizontal cylindrical 3 compartments melter. The capacity of melter shall be 25 m3. Each compartment shall have stirrer for proper mixing. In melter, the melt overflows from one compartment to other. Suitable automation of Melt Brix and temperature should be provided. The melt brix is to be maintained 65° ± 2 and temperature around 70° C ± 2. The net volume of melter should be 30 M3. Vapour from 2nd body of Quintuple evaporator set should be used for melting.

8.4.3 Melt Pump — Quantity: 2 Unit

Capacity of each pump shall be 50 M3 / hr. and head 30 meter. Melt pump shall be centrifugal type, open impeller and material of construction Body – C.I., Internals - SS. Suitable motor shall be provided. One pump as working and one as standby.

8.4.4 Vibratory Screen for Melt — Quantity: 4 Unit

Melt from melter shall be screened in circular 3 – dimensional vibration screen. The mesh of screen should be 40 – 50. Handling capacity of screen should be 30 M3 / hr. the vibro screen should be installed above Screened Buffer Tank before sending for Clarification.

8.4.5 Dextran Treatment Enzyme Dosing Tank — Quantity: 1 Unit

Dextran Treatment Enzyme solution shall be prepared Chemical grade HDPE vertical cylindrical type tank with the help vigorous air agitation. The capacity of the tank shall be 1.0 M3.

8.4.6 Dextran Treatment Enzyme Dosing Pump — Quantity: 2 Unit

Dextran Treatment Enzyme Solution dosing pumps shall be of diaphragm type. For dosing of Dextran Treatment Enzyme variable frequency drive shall be provided with changeover switch so that same VFD can be used for standby pump. The capacity of each pump shall be 100 LPH.

8.4.7 Starch Treatment Enzyme Dosing Tank — Quantity: 1 Unit

Starch Treatment Enzyme solution shall be prepared Chemical grade HDPE vertical cylindrical type tank with the help vigorous air agitation. The capacity of the tank shall be 1.0 M3.

8.4.8 Starch Treatment Enzyme Dosing Pump Quantity: 2 Unit

Starch Treatment Enzyme Solution dosing pumps shall be of diaphragm type. For dosing of Starch Treatment Enzyme variable frequency drive shall be provided with changeover switch so that same VFD can be used for standby pump. The capacity of each pump shall be 100 LPH.

8.5 Melt Clarification System

8. 5.1 Screened Melt Buffer Tank Quantity: 1 Unit

Screened melt is collected in MS Fabricated vertical cylindrical type tank at ground floor. The capacity of the tank shall be 30 M3. Screened melt from Vibro Screens will fall by gravity in to this tank. Colour precipitant dosing connection should be provided at the entry of screened melt in to buffer tank.

8.5.2 Screened Melt Pump Quantity: 2 Unit

Screened melt from buffer tank is pumped to Melt Heater (DCH). Capacity of each pump shall be 50 M3 / hr. and head 30 meter. Screened Melt pump shall be centrifugal type, open impeller and material of construction Body – C.I., Internals - SS. Suitable motor with Variable Frequency drive shall also be provided. One pump as working and one as standby.

8.5.3 Melt Heater Quantity: 1 Unit

Melt heater shall be Direct Contact type (DCH). The heating media in the heater will be Vapour from 2nd / 3rd body of Quintuple evaporator set. The temperature of melt in the heater shall be maintained 70 to 85° C. the material of construction of DCH shall be SS 409 and thickness of about 4 mm. the DCH shall be equipped with suitable safety valve and sealing arrangement if working on 3rd body of Quintuple evaporator set.

8.5.4 Reaction Vessel with Cavitation Aeration System Quantity: 1 Unit

Hot melt shall enter in reaction vessel by gravity from DCH. One no. MS Fabricated reaction vessel shall be horizontal with three compartments where two compartment would be as reaction vessel and 3rd compartment would be as Cavitational aerator. In two compartment of reaction vessel, the total retention time would be 5 – 6 minutes of melt flow rate and in the 3rd compartment one minute retention time to be provided for aeration.
In reaction vessel suitable agitators alongwith and arrangement of Phosphoric Acid and Lime Sucrate dosing shall be provided. The cavitational aerator would have SS hollow Shaft with PP Disc and suitable number of nozzles at bottom shall be provided.

8.5.6 Froth Clarifier System Quantity: 1 Set

Melt after reaction and aeration shall enter in clarifier by gravity. Material of construction of Trayless clarifier system shall be MS. The clarifier shall have suitable gear box & drive. The capacity of the clarifier shall be 26 M3. The centre tube at the feed shall act as flocculator and from centre tube the flocculated melt enters in to the clarifier by overflow. The clarifier shall have scrapping arrangement from removing scum. Clarifier shall have Clear melt withdrawal coil which will connected to weir box (MS Fabricated). The level of clarifier shall be maintained by operating telescopic valve provided in weir box. Flocculant dosing arrangement shall be given in between Aeration and clarifier for flocculation of scum.

8.5.7 Clear Melt Tank **Quantity: 1 Unit**

Clear melt is collected in MS Fabricated vertical cylindrical type tank at ground floor. Clear melt from clarifier will fall by gravity in to this tank. The capacity of the tank shall be 30 M3.

8.5.8 Clear Melt Pump **Quantity:2 Unit**

Clear melt from tank is pumped to Melt Filtration (MBF). Capacity of each pump shall be 50 M3 / hr. and head 40 meter. Clear Melt pump shall be centrifugal type, open impeller and material of construction Body – C.I., Internals - SS. Suitable motor with Variable Frequency drive shall also be provided. One pump as working and one as standby.

8.5.9 Scum Buffer Tank **Quantity: 1 Unit**

Scum from Melt clarifier is collected in MS Fabricated vertical cylindrical type tank. The capacity of the tank shall be 10 m^3..tank shall be provided stirrer, suitable motor and gear box.

8.5.10 Scum Pump **Quantity: 2 Unit**

Scum from buffer tank is pumped to filter station in raw sugar house. Capacity of each pump shall be 15 M3/hr. with 30 m head. Scum pump shall be of construction Body – C.I., Internals - SS. One pump as working and one as standby.

8.5.11 Phosphoric Acid Dosing Tank **Quantity: 1 Unit**

Phosphoric Acid solution shall be prepared Chemical grade HDPE vertical cylindrical type tank with the help vigorous air agitation. The capacity of the tank shall be 1.0 m^3.

8.5.12 Phosphoric Acid Dosing Pump **Quantity: 2 Unit**

Phosphoric Acid Solution dosing pumps shall be of diaphragm type. For dosing of phosphoric acid variable frequency drive shall be provided with changeover switch so that same VFD can be used for standby pump. The capacity of each pump shall be 100 LPH.

8.5.13 Colour Precipitant Dosing Tank **Quantity: 1 Unit**

Colour Precipitant solution shall be prepared Chemical grade HDPE vertical cylindrical type tank with the help vigorous air agitation. The capacity of the tank shall be 1.0 m^3.

8.5.14 Colour Precipitant Dosing Pump **Quantity: 2 Unit**

Colour Precipitant Solution dosing pumps shall be of diaphragm type. For dosing of Colour Precipitant variable frequency drive shall be provided with changeover switch so that same VFD can be used for standby pump. The capacity of each pump shall be 100 LPH.

8.5.15 Lime Sucrate Dosing Tank **Quantity: 2 Unit**

Two nos. Lime Sucrate vertical cylindrical type tank shall be provided. One no. is for preparation and other for dosing. The Material of construction of each tank shall be MS. The capacity of each tank shall be 5.0 m^3. Each tank shall be provided stirrer, suitable motor and gear box.

8.5.16 Lime Sucrate Dosing Pump **Quantity: 2 Unit**

Lime Sucrate dosing pumps shall be of Screw type. For dosing of Lime Sucrate variable frequency drive shall be provided with changeover switch so that same VFD can be used for standby pump. The capacity of each pump shall be 1200 LPH.

8.5.17 Flocculant Dosing Tank **Quantity: 2 Unit**

Two nos. Flocculant vertical cylindrical type tank shall be provided. One no. is for preparation and other for dosing. The Material of construction of each tank shall be MS. The capacity of each tank shall be 5.0 m^3. Each tank shall be provided stirrer, suitable motor and gear box.

8.5.18 Flocculant Dosing Pump **Quantity: 2 Unit**

Flocculant dosing pumps shall be of Screw type. For dosing of Flocculent variable frequency drive shall be provided with changeover switch so that same VFD can be used for standby pump. The capacity of each pump shall be 1200 LPH.

8.5.19 Automation **Quantity: 01 Set**

System shall be compatible to central DCS for complete automation of Melt Clarification
System. Following are the control areas:

- Flow control.
- Dosing control
- Temperature control
- pH measurement & control.

8.6 <u>Multi Bed Filtration (MBF)</u>

Clarified Melt from Clarification will pass through Multi Bed Filtration to trap suspended particle up to 5 micron which is escaping from Melt Clarification.

8.6.1 Multi Bed Filters (MBF) **Quantity: 2 Units**

Two nos. MS Fabricated Multi Bed Filters shall be provided. The capacity of each MBF shall be compatible to 25 M3/Hr. melt flow rate. Each MBF shall have 1st filled media.

8.6.2 Filtered Melt Tank **Quantity: 1 Unit**

Filtered Melt is collected in MS Fabricated vertical cylindrical type tank at ground floor. The capacity of the tank shall be 30 M3. Filtered Melt from MBF will fall by gravity in to this tank.

8.6.3 Filtered Melt Pump **Quantity: 2 Unit**

Filtered Melt from tank is pumped to Melt Safety Filter en route to Multi bed filter. Capacity of each pump shall be 50 M3 / hr. and head 40 meter. Filtered Melt pump shall be centrifugal type, open impeller and material of construction Body – C.I., Internals - SS. Suitable motor with Variable Frequency drive shall also be provided. One pump as working and one as standby.

8.6.4 Backwash Tank **Quantity: 1 Unit**

Backwash from MBF is collected in MS Fabricated vertical cylindrical type tank at ground floor. The capacity of the tank shall be 25 M3. Backwash from MBF will fall by gravity in to this tank.

8.6.5 Backwash Pump **Quantity: 2 Unit**

Backwash from tank is pumped to MBF. Capacity of each pump shall be 80 M3 / hr. and head 40 meter. Backwash pump shall be centrifugal type, open impeller and material of construction Body – C.I., Internals - SS. Suitable motor with Variable Frequency drive shall also be provided. One pump as working and one as standby.

8.6.6 Backwash Screening Tank **Quantity: 1 Unit**

Backwash screening tank of 1.5 m^3 capacity MS Fabricated vertical cylindrical type at MBF working floor. Backwash screening tank is fitted with screen with support of 20 mesh.

8.6.7 Air Blower **Quantity: 2 Unit**

Air Blower Capacity shall be 3.5 m^3/ min. and pressure 0.7 Kg / Cm^2. Air Blower shall be twin lube type and material of construction Body – C.I., Internals - SS. Suitable motor shall be provided. One Air Blower as working and one as standby.

8.6.8 Automation **Quantity: 01 Set**

System shall be compatible to central DCS for complete automation of Multi Bed Filtration.

Following are the control areas:

Feed control.

Pressure control

8.7.9 Sweet Water Tank **Quantity: 1 Unit**

Sweet Water tank of 40 M^3 capacity MS Fabricated vertical cylindrical type at ground floor.

8.7.10 Sweet Water Pump **Quantity: 2 Unit**

Sweet Water from tank is pumped to Melting section. Capacity of each pump shall be 50 M^3 / hr. and head 30 meter. Sweet Water pump shall be centrifugal type, open impeller and material of construction Body – C.I., Internals - SS. Suitable motor shall be provided. One pump as working and one as standby.

8.8 MELT EVAPORATION

List of equipment in melt evaporation and crystallization section are given below and brief specification of each equipment is given in the subsequent paragraphs.

8.8.1 Melt Heater (Pre Heater) **Quantity: 1Unit**

One DCH/ PHE melt heater shall be provided to heat de-colorized melt from 60 deg. C to 85 deg. C by vapour from Q-3 body of quintuple. The material of construction shall be SS 304. DCH shall be designed for 30 % extra capacity.

Design duty condition of melt heater.

Type	:	DCH / PHE
Melt flow rate	:	45 m^3/h

8.8.2 Falling Film Evaporator Bodies (Melt Concentrator) **Quantity: 1 set**

Double effect falling film evaporator (FFE). Quintuple 3rd effect vapour of raw sugar factory evaporator shall be given as heating medium arrangement shall be provided for concentrating melt from about 60° Brix to 72° Brix for FFE, 1st effect of 500 m^2 & Vapour from FFE 1st effect will be given to FFE 2nd effect of 500 m^2. About 0.3 kg/cm^2 (a) pressure shall be maintained in the FFE 2nd effect. A common spare body of 500 m^2 HSA will be provided and material of construction shall be SS–409 m.
Double effect falling film type evaporator can be considered for this application.

Heating surface	:	500 m^2 & 500 m^2
Tube outside dia meter	:	45 mm
Tube wall thickness	:	18 SWG
MOC of Tube	:	SS 304
Length	:	10000 mm
Ligament	:	12 mm
Material	:	SS Annealed Conform to standard ASTM A 249

The system shall be equipped with suitable size, Melt Circulator pumps and melt transfer pumps with standby arrangements.
The condensate from double effect shall be sent to common condensate collection system (Condensate flash recovery tank).

8.8.3 Thick Liquor Pumps **Quantity: 2 Unit**

Provide two thick liquor pumps capacity 50 m^3/h and 30m head to transfer thick liquor to vertical storage tank, one working and one standby.

8.8.4 S.S. Vertical Liquor Tanks **Quantity: 2 Unit**

Three vertical cylindrical storage tanks each of 50 m^3 capacity shall be provided to store thick fine liquor. All tanks shall be fabricated with SS 409 material and located at pan floor.

8.8.5 Run Off Dilution Tanks (Molasses) **Quantity 3 Unit**

Vertical cylindrical storage tanks each of 50 m^3 capacity shall be provided to store thick fine liquor, R_1 Heavy and R_1 Light molasses tanks. All tanks shall be fabricated with MS material and located at pan floor.

8.8.6 Run Off Pumps **Quantity: 4 Unit**

Four run off pumps capacity 30m^3/h shall be provided to pump R_1 Heavy and R_1 Light molasses from vertical storage tanks to respective pan supply tanks (two working and two standby).

Type	**:**	Screw type
Capacity	**:**	30 m^3/hr
Head	**:**	30 m

8.9 PAN STATION:

8.9.1 Refinery Sugar Pans **Quantity 3 Unit**

Three refinery pans of capacity 80 tonnes shall be provided for refinery massecuite boiling. All refinery pans shall be fabricated with MS material. Distribution of pans for individual massecuite shall be as follows:

R_1 – massecuite	**:**	3 #

All the pans shall be provided with auto fine liquor / run off feeding arrangement and mechanical circulator with VFD, calendria type vacuum pans with central down take.

S / V ratio	**:**	7.0 m2 / m3
Down take dia meter	:	45% (maximum)

Tube shall be of annealed SS 304 grade.

Hydraulically / Pneumatically operated massecuite discharge valves of suitable size shall be provided for each pan.

Vapour space in the cylindrical portion shall be 2.5 mtrs. above the strike level in the pans.

The condensate from pans shall be sent to common condensate collection system (Condensate flash recovery tank).

8.9.2 Seed Crystallizer **Quantity 1 Unit**

One horizontal open seed, crystallizer of 60 tonnes capacity shall be provided to receive seed from grader through belt conveyors. The material shall be used as footing material for R1/R2 massecuite.

8.9.3 Run Off Dilution Tanks (Molasses conditioners) **Quantity 2 Unit**

Two dilution tanks for molasses (R1 H & R1 L) dilution tank shall be provided with auto control system of brix and temperature. Material of construction shall be SS 409.

8.9.4 Refinery Pans & Evaporator Condensers **Quantity 5 Unit**

Fiver single entry co-current condenser 3 # 80 tonnes pan and 1# double effect evaporator (FFE) & one for standby FFE shall be provided to condense vapour released from vacuum pans and double effect evaporator of suitable capacity.

8.10 Injection Water Pumps

The injection water pumps are considered in Raw sugar section.

8.11. Crystallizers **Quantity 3 Unit**

Four closed crystallizers of 85 tonnes capacity shall be provided to receive refined massecuite from batch pans.

Each crystallizers shall be horizontal cylindrical and closed and fabricated with MS material. The crystallizers shall be fitted with efficient stirrer of sturdy construction for continuous working:

Drives shall be shaft mounted high efficiency helical planetary drive /helical gear boxes.

Type	**:**	Horizontal rounded shape
Net Working capacity	**:**	85 tonnes each.

The system of crystallizer shall be arranged in such a way that the massecuite flow to the pug mills of the centrifugal machines by gravity without pumping.

8.11.1 Vacuum crystallizers **Quantity:1 Unit**

One No. vacuum crystallizers of 70 Tons capacity shall be provided.

Crystallizers shall be horizontal cylindrical and fabricated with MS material. The crystallizers shall be fitted with efficient stirrer of sturdy construction for continuous working. Drives shall be shaft mounted high efficiency helical planetary drive /helical gear boxes

8.12. Centrifugal **Quantity 3 Unit**

Three flat bottom fully automatic recycling batch type centrifugal machines capacity 1750 kg/charge and 20 charges per hour shall be provided for curing refinery massecuite. Both of the two machines shall be utilized for curing R1 massecuite. The centrifugal machines shall be driven by AC variable frequency drive motor.

R1 Heavy and R1 Light molasses run off tanks shall be of SS 409.

8.12.1 Superheated wash water system Quantity 1 Unit

Super-heated wash water equipment with tank, heating unit and temperature control unit to supply superheated hot water to all the batch centrifugal machines at a pressure of 6-7kg/cm2 at the nozzles. The capacity of the tank shall be 1 m3.

8.12.2 Superheated wash water pumps Quantity 2 Unit

The super-heated wash water pumps capacity 35 cum. m/hr. of suitable head shall be provided, one working and one standby.

8.13. REFINED SUGAR HANDLING SYSTEM

Sugar Conveying, Drying, Grading & Bagging Station

8.13.1 Sugar Hopper Conveyers

Following hopper conveyors shall be supplied. The plain tray hopper shall be placed below the centrifugal machines:

Plain tray type	One no., 2000 wide, minimum 300 mm inside height, 12 m effective length
Multi tray hopper	One no., 2000 wide, minimum 300 mm inside height, 12 m effective length
Fluidised bed sugar drier for ultimate capacity complete in all respect	One no., 2000 wide, minimum 300 mm inside height, 12 m effective length
Multi tray with rori separator	One no.,2000 wide, minimum 300 mm inside height, 12 m effective length

Two (2) nos. (One standby), twin lobe type cold air blowers complete with inlet strainers, AC motor drive through planetary gearbox, piping fittings etc. shall be provided.

8.13.2 Fluidized Bed Sugar Drier

One set of 2000 mm wide, fluidized bed sugar drier cum dust eliminator, complete with its hot and cold air forced draft blowers, induced draft blower, heat exchange for hot air, dry and wet cyclones, circulating water pumps with standby pump and other accessories and auxiliaries complete in all respect including sweet water pumps etc shall be supplied.

It shall be placed after 2nd multi tray hopper with hot air arrangement.

Hoppers and FBD system shall be so designed to achieve bagging sugar temperature 36-38 deg. C and shall be suitable for ultimate capacity.

8.13.3 Belt Conveyors for Lumps (Rori) – One Set

A set of belt conveyors, consisting of number of conveyors as required, each of 600 mm belt width complete with planetary gear drive, support structure as required, shall be supplied to transfer the lumps from last sugar hopper to the sugar melter.

8.13.4 Sugar Elevators (Belt driven)

Two (2) nos. steel cased, belt driven vertical sugar elevator, each of 25 T/hr. capacity complete in all respect with planetary gearbox, and drive motors shall be provided. Bucket shall be of SS- 304 grade.

The height of sugar elevators shall suit delivery of sugar to sugar graders placed above sugar bins.

8.13.5 Sugar Graders – 2 sets

Two (2) nos., one standby, Mugenson Sizer, of six decks each of 25 t/hr. capacity complete with distributor, drives for Distributor & Sizer /Grader, SS screens etc. shall be provided.

The sugar graders shall be placed above sugar bins with independent support structure.

The sizer / grader shall be complete with discharge chutes etc. in all respect.

8.13.6 Sugar Storage Bins – 3 Nos.

Three (3) nos. sugar bins each suitable for 12 hrs. holding capacity in MS construction complete in all respect shall be provide as per details below:

- 250 tons of net holding capacity for M Grade sugar
- 100 tons of net holding capacity for S Grade sugar
- 50 tons of net holding capacity for L Grade sugar

8.13.7 Belt Conveyors for Dry Seed – One Set

A set of belt conveyors, consisting of number of conveyors, each of 600 mm belt width complete with planetary gear drive, support structure as required, shall be supplied to transfer dry seed from graders to the dry seed magma above seed crystalliser on pan floor. Belts shall be of food grade.

8.13.8 Dust & Rori sugar melter – one no.

Vertical cylindrical sugar melter of 15 T/hr. of sugar capacity, complete with planetary gear box/ geared motor driven stirrer shall be provided.

It shall be placed adjacent to sugar grader. Sugar dust and rori from grades shall be delivered to it by gravity. Sugar lumps (Rori) from last hopper shall be delivered to the melter by a belt conveyor.

One suitable capacity melt receiving tank shall also be provided.

Suitable size of vibro screens shall be installed in between melter and receiving tank.

Two nos. melt pumps (one standby) each having capacity of 20 m^3/hr at 30 m head driven by AC motor shall be provided.

8.13.9 Automatic Sugar Weighing & Bag Filling Machines

Two (2) nos., electronic load cell type, duplex automatic or Four (4) nos. automatic sugar weighing sugar weighing machines each having capacity of 1000-1200 bags per hour of 50 Kg.and 300 bags for 100 kg. Both shall be installed at the bottom of each sugar bin with magnetic separators.

Suitable central control panel with MIMIC diagram shall be provided.

8.14 Sugar Bag Stitching Machines

Four (4) nos., double head, automatic bag stitching machines capable of stitching 350 / 700 bags of 100/ 50 kgs. per hour with 4 spare heads shall be supplied.

Each bag stitching machines shall have a 400 wide slat conveyor, capable of conveying 350 / 700 bags per hour of 100 kg/ 50 kg bags.

Each conveyor shall be drive by an AC motor through a planetary gearbox.

8.15. Sugar bags Packing Machine:

Two nos. of Sugar packing machine to pack 1 Kg & 5 kg to be provided to cater to the domestic branded sugar market.

The specification of the pacing machine is as follows:-

FORM FILL SEAL MACHINE - WITH FOUR HEAD INTELLIGENT ELECTRONIC WEIGH FILLER

Product	Sugar
Quantities to be packed	1kg and 5kg (with the help of changed forming parts)
Packing Material	Option A – Heat Sealable laminate films. Option B – Recyclable PE – PE laminates
Pack Size Range	Minimum Pack Size – 100 mm W x 160 mm L. Maximum Pack Size - 400 mm W x 160 mm L
Estimated output/Packing Speed	Quantity Speed Accuracy 1 Kg 45 – 50 PPM 0.5% SD under 2 Sigma 5 Kg 20 – 25 PPM 0.2% SD under 2 Sigma
Overall Efficiency	90 %

TECHNICAL SPECIFICATIONS:-

BAGGING MACHINE:

- Intermittent motion machine with Belt draw arrangement.
- Higher seal time for horizontal sealing leading to better seal integrity
- Belt draw-off system for positive and accurate film pulling
- Motorized paper pulling
- Specially developed machine body for better rigidity
- Quick & Easy size changeover of formers without tools.
- Adjustable stroke of cross sealing jaws for optimum performance.
- Built in Jumbo reel attachment to hold up to 500 mm dia rolls to avoid frequent reel change.
- Less wear& tear of rubber belts with capability.
- PID Temperature controller for constant heat seal jaws.
- Precise loop control through motorized film unwinding.
- Web Tracking System
- Print Mark Scanner
- Static Charge Eliminator

BUILT IN ACCESSORIES

PRINT-MARK SCANNER ASSEMBLY:

Consisting of a print-mark scanner and its control mechanism. Complete with mounting brackets and adjusting wheel.

STATIC CHARGE ELIMINATOR:

Consisting of a high voltage power supply (11 KV) with ring or rod elements depending upon the application required for removal of electro-static charge on the packaging film.

BUILT IN SEALING MECHANISM:

SEALING SYSTEM FOR NON RECYCLABLE LAMINATE FILMS

Horizontal Sealing mechanism:

- Constant seal jaws
- Seal with 8 mm to 50 mm
- Non-Recyclable laminates
- Constant seal jaw mechanism suitable for serrated broad seal of 8~15 mm seal widths proposed for non -recyclable films.
- Easy tear off notch and perforated chain of packs possible for <100g packs.
- Former on FIN setting for Vertical seal to be used for inner layers sealing of the pack.

OPTIONAL SEALING SYSTEM

SEALING SYSTEM SUITABLE FOR RECYCLABLE PE LAMINATE FILMS

- Constant seal jaw with Air cooling system
- Single / Double band seal
- PE – PE laminates
- Auto Logic with easy settings
- Operator friendly system.
- Precision in accuracy
- Auto correction logic to offer repeat assured performance
- Built in Auto tare facility.
- Equipped with 50 sets of recipes/ preliminary programs

8.16 Sugar bags handling system

Suitable sugar bags handling system for ultimate capacity shall be provided. This shall include sugar bags overhead belt conveyors with hood system, sugar elevators, stacks and re- claimers system, transfer of sugar bags in the warehouse and to sugar godowns as per layout. All conveyors of Sugar shall be suitable covered.

9.0 TECHNICAL SPECIFICATIONS FOR BOILER AND AUXILIARY SYSTEM.

Boiler –

A new boiler of 120 **T/hr**, 67 ata, 510℃(+/-5^0 C)is proposed for the Power Plant Scheme. Selection of 67 ata pressure with 510℃(+/-5^0 C) boiler is opted due to the fact that this can easily generate 12 MW power along with steam requirement of boiling house in most technical way with optimum technical efficiency. Hence the pressure of 67 ata with 510℃ temp has been selected to make the project viable and profitable. The Boiler shall be complete with Auxiliaries and shall be suitable for burning of Bagasse. The Boiler shall be an outdoor unit, and shall be of natural circulation, balance draft, radiant furnace design, with spreader stoker furnace with travelling grate for continuous ash discharge and will be equipped with two stage super heaters and inter stage de-super heaters etc. The design parameters and specifications for the above Boiler shall be as under:

Continuous Rating	:	120 TPH
Peak Rating	:	132 TPH
Super heater outlet pressure	:	67ata.
Superheater outlet temperature	:	510 $\pm$ (+/-5^0 C)
Feed water inlet temperature	:	180℃
Design fuel	:	Bagasse
Boiler efficiency	:	71% with bagasse with 50% moisture.
Flue gas temperature	:	less than160 deg. C
Excess air % theoretical air not more than:		35 %.
Fuel	:	Bagasse with 47– 52 % moist.
GCV 50% (Kcal/kg)	:	2270
Moisture % cane	:	47% to 52%
Ambient temperature		Max. 50℃
Relative Humidity		70-90%
Seismic Zone & wind velocity		Local condition of western UP (Distt. Muzaffar Nagar).
Emission concentration at ESP outlet		Less than 50 mg/n M^3(As per pollution board norms)
Standards to be followed		As per Gazatte of India REGD. NO. D.L.

The following are the other technical parameters of boiler.

The boiler shall be designed with 50% moisture bagasse as base fuel to generate a base capacity of 120 TPH, (Peak 132 TPH), with steam outlet parameter of 67 ata of pressure, 510 +/- 5℃ temperature and with feed water inlet temperature of 110℃ heated to 180℃ when the feed water passes through HP heater.

The boiler will have a control range of 60% - 100% MCR load on bagasse. Boiler headers shall be constructed in accordance with IBR specifications with flanged ends to promote cleaning and inspection.

The boiler shall be provided with one steam and one water drum (optional) and the drums shall be of fusion welded type with manhole, doors fitted with crossbars, studs and nuts on each end. The steam drum of the boiler shall be provided with primary separators and secondary separators of S.S. construction to promote circulation and ensure high steam purity. The drum shall be provided with semi-ellipsoidal dish end. The steam drum shall be provided with internals of proven design and the internals shall be of bolted connection. The necessary nozzle connection for the steam outlet, safety valves, feed water inlets, down comers, continuous blow downs, level indicators, chemical dozing, sampling connection, drain and vents shall be provided on the drums. All nozzle connections shall be of welded type.

9.1.1 Furnace

Travelling grate Furnaces driven by VFD through planetary gear box with all accessories shall be provided. The furnace design shall be of seamless tubes, fully water cooled membranes, fin welded walls, or of any other proven design and they shall be adequately supported. The furnace shall be suitable to burn bagasse with 50-52% moisture with pre-heated air. The furnace design shall be to give continuous rating with bagasse firing even when furnace chambers are being cleaned.

The furnace design shall incorporate necessary man holes, peep holes, and openings for fuel distributor etc. The down comers, supply pipes and risers sizing shall be based on circulation calculation. The furnace shall be located at 6.0 meters level above F.F.L. on R.C.C. platform. The furnace shall be so designed that there will be no harm to any part of the boiler due to the high temperature generated due to firing of low moisture bagasse and the heat generated is to be absorbed effectively by the suitably located boiler water tubes.

Travelling grate/ spreader stoker type furnaces with all accessories shall be provided with combustion chamber.

The combustion air from the FD fan, heated in the air heater to a temperature of not more than 160℃ shall be uniformly distributed under the grate. The hot secondary air for distribution and for meeting the over fire air requirement shall be supplied by the secondary air fan. The grate area shall be designed such that heat loading does not exceed permissible limit.

The furnace shall be located at 6.0 meters level above F.F.L. on R.C.C. Platform. Ash hoppers shall be provided below each furnace and boiler height shall be adjusted such that manually operated trolleys can be placed below the ash hoppers. Steel staging from ground level and M.S. operating platform at 4 m level, checkered plate shall also be provided.

The boiler bank design shall be of single pass inline arrangement and the tube spacing shall enable easy removal of the tube in case of any failure. There shall be adequate approach space to the tubes of the bank for easy maintenance. Baffle material is to be suitable for withstanding the gas temperature. Suitable number of soot blowers shall have to be provided to cover the entire surface of the bank.

9.1.2 Super Heater

The boiler shall be provided with super heater capable of superheating total steam generated by the boiler to a final steam temp of 510+/- 5 deg. C at 60 to 110% MCR and complete with inter-connected pipelines between the boiler and super heater, mountings such as safety valves – 02 Nos. with silencer, drain/air vent valves, pressure gauges etc. as per IBR. The super heated steam is envisaged from a minimum of two stages of super heaters with attemperator in between the stages.

The tube elements of the super heater shall be expanded into the steam drum at one end and butt welded/expanded to the manifold at the other end. The super heater manifold shall be fabricated from solid drawn seamless pipes. The manifold shall be supplied complete with branches for main steam take off safety valve, air release connection etc. A thermo well in the outlet manifold shall be provided to measure the temperature of superheated steam. The super heater design should be such that the temperature of steam at super heater outlet shall not exceed 525 deg. C in any case.

Super heater system shall be of 2-stage design with inter-stage de-superheating, to achieve the rated final steam temperature.

A spray type attemperator or heat exchanger attemperator in between primary and secondary Bank coils of super heater to be provided to maintain automatically the temperature of the steam at super heater outlet @ 590 $\pm$ 5ºC for steam flow rate between 60 to 110 % MCR. The tube elements of the super heaters shall be constructed from seamless alloy steel. The selection of super heater coils shall be as per IBR Norms to suit for 67 ata pressure and 590 deg.C temperature.

9.1.3 Economizer

An integral economizer with adequate heating surface to give rise in temperature of feed water of not less than 60℃ less than saturated temperature of drum-water. The economizer shall be of bare tube (seamless) construction, in-line arrangement, and counter flow type designed for an inlet temperature of 180℃. Suitable number of soot blowers shall be located in the economizer for effective cleaning of the heat transfer areas. The economizers shall be complete with seamless inlet and outlet headers, with drains, coils, coil supports, soot blower, casing, ducting, provision for measuring inlet & outlet water temperature, supporting structures, inter-connecting piping, lagging, access galleries, stairs etc. The economizer shall be designed in accordance with the requirement of IBR.

9.1.4 Air Heater

Air heater with adequate heating surface to heat the air by flue gas required for combustion shall be provided. Considering the high moisture in the flue gases, suitable precautions shall be taken to prevent the tube corrosion of the inlet side of the air heater. Air heater shall be complete in all respect with ERW tubes, tube plates, supports dampers casing and ducting etc. The entry of cold air shall be distributed properly over the length of air heater to avoid condensation of moisture. Air heater shall be provided with flue gas by pass arrangement with leak proof damper. Air Heater shall be in two stages.

The air heater and economizer shall be designed so as to give final gas temperature within 160ºC. Air heater should give the air temperature of not less than 180º.

9.1.5 Bagasse Feeding Arrangements

Suitable no. of rotary feeders coupled to variable speed drive of positively infinitely variable type for regulating the quantity of bagasse to furnace shall be provided. The bagasse feeders shall have speed variation by ACVFD motors and maximum speed not to exceed 25 RPM.

Suitable bagasse storage bunker (bagasse silo) of minimum five minutes storage capacity for each feeder shall be provided.

The boilers shall have a control range of 60 – 110 % MCR load on bagasse. The bagasse from the sugar mill is to be conveyed at inlet of the feeding system through the conveyor. The bagasse feeding system rotary feeders with VFD inlet chutes, feeders, feed chutes and the distributor etc. shall be provided. The bagasse input to the boiler shall be regulated by the feeding system with suitable isolation gates. Feed chutes shall be designed to prevent choking of bagasse with necessary poking facilities. The distributor shall be of pneumatic type with provision to distribute the fuel uniformly across the furnace. Lead facing of the screw feeder shall be hard faced.

The firing system for the steam generator shall consist of spreader stoker with travelling grate with variable speed hydraulic / VFD drive for continuous ash discharge.

9.1.6 Draft System

The draft system for the steam generator shall be suitable to ensure producing a balanced draft with sub atmospheric pressure conditions in the furnace.

The system to comprise of –

- 2 x 65 % of the total required capacity each, I D fans with LT Motor CACA, IP-55, 750/1000 rpm. A.C motor, speed control from control room by remote and AC Variable Speed Drive and pneumatically/ electrically operated inlet guide vane/damper with necessary base frames, base plate, foundation bolts, supports, cover, couplings, lubrication system etc. Replaceable wear liners or hard facing will be provided for blades. The shaft of the fan shall conform to 45 C8 of IS:1570-1978. Renewable hard faced wear pads on the blades shall be incorporated in the impeller. The Fan rated speed shall not be more than 750 RPM. The impeller of the fan shall be fabricated out of minimum 5 mm thick nickel chrome alloy steel. Impeller design should be curved vane type high efficiency fan. Impeller shaft should be provided with support on both ends. Each fan shall be provided with dampers at the inlet as well as at the outlet to control the flue gas quantity. The fan construction should be identical so as to have single spare impeller.

The ID fans shall be directly coupled to variable speed electrical drive digital type (variable frequency TEFC, CACA, IP-55, S-1 Duty, Class-V, 750 /1000 rpm. A.C motor, speed control from control room by remote) complete with control equipment, speedometer, operators control cubicle, DCS etc.

- 2 x 65% of the total required capacity each **FD fans** with LT motor CACA, IP-55, 1440 rpm. A.C motor, speed control from control room by remote and AC variable remote control for control room speed drive and pneumatically/ electrically operated inlet guide valve/damper with necessary base frames, base plate, foundation bolts, supports, cover, coupling etc. to supply primary air for combustion through air heater and shall be supplied to the furnace underneath the grate. The blades of fan rotor shall be fabricated out of minimum 5 mm thick mild steel plates. RPM of the FD fan shall be 1440.

  Both the FD fans shall be directly coupled to variable speed electrical drive digital type (variable frequency TEFC A.C motor) complete with control equipment, speedometer, operators control cubicle, DCS etc.

  The rotors of the ID & FD Fans shall be dynamically balanced. Fans are to be interlocked so that FD runs only when ID fan is running.

- 2 x 65% of the total required capacity each **SA fans** with AC variable speed drive CACA, IP-55, 1440 rpm. A.C motor, speed control from control room by remote and with inlet guide vane, with necessary base frames, base plate, foundation bolts, supports, covers, couplings, lubrication system etc. This will supply air into the furnace as a secondary air at high pressure through heat resisting nozzles for ensuring combustion completeness. The secondary air nozzles shall be installed in the furnace walls. From the same fan air shall be supplied to the pneumatic distributors to distribute the Bagasse on to the grate uniformly. The isolating/ controlling damper shall be provided at the fan suction and in the duct at a branching point. The suction of fan shall have provision for cold air as well as hot air from air heater with two separate dampers for hot air and cold air. The deliveries of both fans to be interconnected. Each fan to be coupled to the motor.

  Both the SA fans shall be directly coupled to variable speed electrical drive digital type (variable frequency TEFC A.C motor) complete with control equipment, speedometer, operators control cubicle, DCS etc.

All air and flue gas ducting with required stiffeners, expansion joints, guide vanes for bends, dampers, insulation, cladding, supports, etc. The shaft material for the above fans shall be **45 C8** conforming to IS: 1570-1978.

Silencers for FD and SA fans to limit noise level to 90 DBA at 3.0 meter distance is to be provided.

9.1.7 H P Heaters

HP heater is to preheat the feed water from 110° to 180℃ in with inlet / outlet isolation valves, drain valves and fittings, level control valve, drain and vent lines to de-aerator. The HP heaters should be shell and tube type designed to improve the boiler plant efficiency. The heaters will be located downstream of the feed water pumps, with the feed water passing through the tubes of the heater. The feed water entering HP heater at about 110℃ will be heated to 180℃.The steam for heating in HP heater shall be bled from the TG set (bleed during operation of turbine) at 12.8 ata to be used as heating medium on the shell side in HP heater. The condensate of the heating steam in HP heater will be cascaded to the de-aerator. Connection shall also be provided to get 100 % of the required steam in HP heating from newly installed PRDS as an alternate option. A suitable by-pass arrangement shall be provided for by-passing the heater. All the valves for the feed water outlet and the by-pass shall be motor operated. The steam inlet line valve to both HP heaters shall also be DCS controlled motor operated. In case of high condensation in the heater shell, all the valves will close automatically to isolate the heater and ensure that there is no water induction into the turbine. The HP heater condensate level in the HP heater is to be controlled by a level control system. All the operational parts shall be DCS controlled.

9.1.8 Soot Blowers

Adequate soot blowers of retractable type complete with PRS, piping, drain and other accessories are to be provided in sufficient nos. at appropriate location for effective cleaning of super heater coils, bank tubes, economizer coil etc. motorised automatic retractable soot blower for super heater elements each covering half of the furnace width shall be provided. Additional two nos.(minimum) steam operated soot blower(s) shall also be provided for the Economizer. Soot blowing sequential operation will be realized in DCS by data logging.

9.1.9 Chemical Dosing System

The boilers shall be provided with high pressure and low pressure dosing system. Each dosing system shall comprise of chemical proportioning tanks, two numbers positive displacement pumps with drives, motorized agitators, required interconnection piping, valves, fittings etc. The capacity of each tank shall be 400 litres and the system shall be located near feed water station on the ground floor.

9.1.10 Blow down System

One continuous blow down tank and one intermittent MS blow down tank as per IBR complete with all piping connected to the blow down tank within 10 meters outside the boiler house shall be provided for the boiler. The flash steam from the CBD tank shall be piped to the de-aerator and the outlet of the CBD tank shall be vented to the atmosphere. The design, material selection and manufacturing shall be in compliance to the requirement of the Indian Boiler Regulation Act.

9.1.11 De-aerator Tank

One De-aerator of suitable capacity at 110ºC to de-aerate the feed water to a level of oxygen content of less than 0.005 ppm shall be provided. The de-aerator is to be suitable to obtain a temperature from 85 to 110ºC by using exhaust at 2.5 ata on extraction from turbine or from the suitable PRDs from the boiler (87ata to 2.5 ata to be supplied with boiler). It shall be complete with all the fittings and mountings. The de-aerator water tank shall be of capacity suitable for 30 minutes for 110 % MCR generation capacity of the boiler. The de-aerator tank shall be supplied with platform around the Tank, Cat Ladder from GL and approach from boiler platform. The de aerator tank shall be installed at an appropriate height so as to provide positive head to the feed water pumps suction. Platform around the de -aerator shall be provided and shall have high and low level alarm along with gauge glass and 150 mm dia. dial type thermometer.

The following controls shall be provided with the De-aerator:

- De-aerator level control station consisting of 1 x 100% pneumatically operated control valve and 1 x 100% manual by pass valve including isolation valves for control valve.
- De-aerator pressure control station consisting of 1 x 100% pneumatically operated control valve and 1 x 100% manual by-pass valve including isolation valve for control valve.
- Feed water control station consisting of 1 x 100% motor operated and 1 x 50% pneumatically operated by-pass valve and 1 x 100% pneumatically operated control valve including manual isolation valves.

9.1.12 Boiler Feed Water Tank

One cylindrical closed mild steel tank shall be of 1000 HL capacity with inlet /outlet connection for condensate, treated water, chemical dosing arrangements, outlet connection for transfer pumps, overflow connection, air vent connection etc. High and low water level alarm shall be provided in the feed tank along with gauge glasses and 150 mm dia. size dial type thermometer.

Access ladder and platform around the tank shall be provided in the feed tank along with gauge glasses and also for the boiler working platform to de-aerator, feed water tank etc. is to be provided.

9.1.13 Boiler Feed Water Pumps

1 x 30% boiler capacity electric driven feed pump for start up with soft starter, motor, bed plate, coupling, ARC valve etc. shall be provided for any emergency use especially when TG set is not in operation and power supply is available through diesel set.

3 nos. x 65% boiler capacity boiler feed water pumps along with AC VFD drive soft starters, motors, bed plates, couplings, automatic circulation valves, lubrication system for pump and motor etc. etc. shall be provided. All integral piping and valves, thermal insulation and venting, foundation board, lifting and handling provisions and connecting flanges will be included. The system shall be complete in all respects.

2 nos. x 65% boiler capacity feed water transfer pumps with motors, bed plates, sole plates, couplings, piping, suction strainers, non-return valves for pumping the feed water from the feed water storage tank to the de -aerator shall be provided.

9.1.14 Boiler Feed Water Treatment Plant

A Reverse Osmosis membrane treatment plant with mixed bed resin having 50m^3/hr capacity along with piping etc., be provided. Two nos. treated water storage tanks of each having capacity of 2000 HL shall be procured. Three nos. pumps each of 60 $m.^3$/ hr and head of 75 meter to feed the treatment water from storage tanks to feed water tank. Existing water analysis shall be provided by purchaser.

9.1.15 Chimney

One RCC stack of suitable height as per Govt. rules & regulations for pollution norms are to be constructed with a minimum inside top dia. 3.8 mtrs. The air and flue gas ducting with required stiffener, expansion joints, guide vanes wherever required, dampers, insulations, cladding, over fire air nozzles and ducting supports etc. is to be provided.

Height of the boiler chimney should not be less than 70 meters and should be constructed so as to also comply with Central, State and Local Regulations. The Boiler refractory, insulation, inner and outer casing with all fixing material for boiler, ducting, piping, valves, fittings, the equipment etc., proper ladder with lightning arrester, Aviation Warning Lamps, etc. with suitable connection at the bottom shall be provided. Platform is to be provided with suitable size nipples and approach for stack monitoring as per norms of the pollution board.

9.1.16 Ash Handling Equipment

Ash from the furnace shall be handled by water impounded submerged belt conveyor and fed on to the main belt conveyor with cooling spray arrangement with water.

Submerged Front ash handling system:

- Submerged belt conveyor along with drive motor for discharging coarse ash from the front of the boiler up to elevation of +2.0m height located at one side of the furnace. (Further disposal of ash by client through trucks).
- Manual handling system below riddling hopper (The collection of ash is very minimum).

Dense Phase Fly Ash Handling system:

- Dense phase fly ash handling system for Economizer/Air Heater & ESP fly ash hoppers comprising of Carbon steel surge hoppers with bypass chute and manually operated isolation plate gate.

One no MS Silo. (having 8 hour storage capacity)

9.1.17 Instrumentation and Control System

The instrument control panel to be totally enclosed in a cubicle for dust free conditions by providing an exhaust fan on the panel. The control panel shall be properly wired, tubed

and connected to all field transmitters as per standard instrumentation practices. It is to be housed in A.C. room suitably sized, designed and constructed by seller.

A) The following instrumentation system are to be provided for measuring the various parameters.

vi. Steam flow meter of integrating, indicating and recording (in data logger type)

vii. Feed water level indicating, integrating and recording (in data logger type).

viii. Drum water level indicating and recording (in data logger type).

ix. Super heater Pressure indicating and recording (in data logger type)

x. Multipoint temperature scanner interface with 'K/J' type thermocouple and universal temperature transmitters with linear output for each of the following points.

All these points to be connected to data logger for recording -

- Super heated steam temperature at final super heater outlet and primary super heater outlet.
- Feed water temperature at economizer inlet.
- Feed water temperature at economizer outlet.
- Feed water temperature at de-aerator at boiler outlet
- Flue gas temperature at economizer outlet.
- Flue gas temperature at air heater inlet.
- Flue gas temperature at air heater outlet.
- Flue gas temperature at I.D fan inlet.
- Air temperature at air heater inlet.
- Air temperature at air heater outlet.
- Furnace temperature.

vi) Draft gauges for---

F.D fan discharge.

I.D. fan suction.

Furnace.

Flue gas at boiler outlet.

Flue gas at economizer outlet.

Flue gas at air heater outlet.

Flue gas at fly ash arrestor outlet.

Air at air heater outlet.

vii) O_2analyzer with signal connection to data logger.

viii) Pressure gauges of size 250 mm diameter with S.S. siphon and isolation valve to be provided at boiler drum, super heater outlet steam and at fire door level for super heater outlet steam.

ix) Pressure gauges with S.S. siphon and isolation valve to be provided at economizer inlet, economizer outlet, at each feed water pump outlet and feed water pumps common header.

x) Microprocessor based minimum 24 channel data logger programmable to any type of inputs like current, mv, T/C and digital for recording the following parameters with 80 column dot matrix printer and relay output for 8 channels for annunciation.

v. Steam flow
w. Feed water flow
x. Super heater steam temperature at primary super heater outlet
y. Super heater steam temperature at secondary super heater outlet.
z. Super heater steam pressure at secondary (final) super heater outlet.
aa. Drum level
bb. De-aerator level
cc. De-aerator pressure.
dd. Furnace pressure
ee. Air flow
ff. Feed water temperature at economizer inlet
gg. Feed water temperature at economizer outlet.
hh. Fed water temperature at de-aerator inlet.
ii. Flue gas temperature at boiler outlet.
jj. Flue gas temperature at economizer outlet.
kk. Flue gas temperature at aerator outlet.
ll. Flue gas temperature at I.D. fan inlet.
mm. Air temperature at air heater inlet.
nn. Air temperature at air heater outlet.
oo. For Furnace temperature.
pp. Oxygen Analyzer

B) Microprocessor based Annunciation with electronic Hooter to be provided for the following.

m) Feed water tank level low.

n) De-aerator tank level low

o) De-aerator tank level high.

p) Drum water level low.

q) Drum water level high.

r) Super heater steam temperature high.

s) I.D. fan trip

t) F.D. fan trip

u) S.A. fan trip

v) Feed water pump trip

w) Bagasse feeder trip

x) Feed water transfer pump trip

C) The following auto controllers are to be provided with the boiler.

f) **Three element drum level control system:** Drum level shall be automatically controlled using the three element control philosophy to ensure quick response of the system. In case of drum level falls below minimum level, the feed water control valve will open fully. In case drum level rises above maximum level, the feed water control valve will close fully.

g) **De-aerator pressure and level control system:** De-aerator pressure shall be maintained by regulating the steam flow to the de-aerator so that temperature of boiler feed water is maintained at the desired set value. De-aerator level shall be controlled so as to balance the inflow and out- flow of feed water.

h) Cascaded super heater steam temperature control system based on measuring temperature at outlet of primary super heater header and final super heater header.

i) **Combustion control system:** This will be an integrated control loop for maintaining the steam pressure. According to the steam pressure the master controller will adjust speed of VFD to feed more or less fuel to the boiler and FD fan to control amount of primary air sent to the furnace respectively. To ensure that this adjustment is correct, the signal of O2 % in flue gases will be taken in the loop to make the final correction in the speed of FD fan.

j) **Furnace pressure control system:** ID fan speed shall be controlled to maintain draft inside the furnace to – 5mm WC.

D) Two air compressors (one as standby) shall be provided to supply oil and moisture free air through refrigeration dryer system, for pneumatically controlled instruments. Spare air filtering and drying system shall also be provided along with standby compressor set.

All the above mentioned indication, monitoring and control systems to be based on distributed control system (DCS). All control monitoring and interlock function will be provided for smooth functioning of the boilers. Comprehensive instrumentation and control equipment shall be provided for each system of the plant. The controls will be located in the central control room. Instrumentation will broadly cover the following functions:

- Local indication by gauges
- Remote indications through transmitters
- Interlocks for safety of personnel / equipment
- Closed loop control system using single loop controller/DCS
- Status indicators
- Alarm annunciation

Controls and interlocking will be through microprocessor based hardware. Actuation will be done generally through pneumatic actuators. Speed regulation of Turbine operation will be through Electro hydraulic systems.

The DCS shall be provided keeping in view the safety, reliability and availability for comprehensive presentation of plant operation status, trends and essential operation interacting facility.

Transmitters for the measurement and control will be of electronic type using solid state hardware. Field signal transmission will be 4-20 mA, two wire systems suitable for long distance transmission and compatibility with computer interface and ease conversion into voltage signals using simple resistor.

The control system will be designed to facilitate manual operation of the plant from the control panel. Necessary hardware indicators and recorders will be provided on the control panel located in the control room.

Closed loop control system will be provided for Boiler and TG and their auxiliaries with processor and sensor level redundancy.

All control valves and damper operations will be of pneumatic type with fast response and have ease of maintenance.

Apart from Basic instrumentation and automation, Turbine will be provided with (a) turbine speed control system, (b) Suitable vibration monitoring system and (c) condenser hot well level control system. Steam and water analysis comprising of the conductivity, silica, oxygen analyzer with complete calibration kit is to be provided.

9.1.18 COMPUTERIZED BOILER AUTOMATION: -

All the above mentioned indication, monitoring and control systems to be based on distributed control system (DCS). All control monitoring and interlock function will be provided for smooth functioning of the boilers. Comprehensive instrumentation and control equipment shall be provided for each system of the plant. The controls will be located in the central control room. Instrumentation will broadly cover the following functions:

- Local indication by gauges
- Remote indications through transmitters
- Interlocks for safety of personnel /equipment
- Closed loop control system using single loop controller/DCS
- Status indicators
- Alarm annunciation

Controls and interlocking will be through microprocessor based hardware. Actuation will be done generally through pneumatic actuators. Speed regulation of Turbine operation will be through Electro hydraulic systems.

The DCS shall be provided keeping in view the safety, reliability and availability for comprehensive presentation of plant operation status, trends and essential operation interacting facility.

Transmitters for the measurement and control will be of electronic type using solid state hardware. Field signal transmission will be 4-20 mA, two wire system suitable for long distance.

Transmission and compatibility with computer interface and ease conversion into voltage signals using simple resistor.

The control system will be designed to facilitate manual operation of the plant from the control panel. Necessary hardware indicators and recorders will be provided on the control panel located in the control room.

Closed loop control system will be provided for Boiler and TG and their auxiliaries with processor and sensor level redundancy.

All control valves and damper operations will be of pneumatic type with fast response and have ease of maintenance.

Apart from Basic instrumentation and automation, Turbine will be provided with (a) turbine speed control system, (b) Suitable vibration monitoring system and (c) condenser hot well level control system. Steam and water analysis comprising of the conductivity, silica, oxygen analyzer with complete calibration kit is to be provided.

9.1.19 Air Compressors

Two air compressors (one as stand by) with receivers are to be provided to supply oil and moisture free air through dryer for controlled instruments. These shall be complete in all respects such as dryer, piping, valves etc. The air pressure at the outlet of the dryers shall be 7-8 kg/cm^{2}g. The service air shall be tapped from the receiver directly by-passing the dryers. Proper arrangements are to be made for auto start of the standby compressor in case of shutdown of the running compressor.

9.1.20 Bagasse Storage And Handling System

Bagasse generated by the sugar mill to be collected in the storage yard. The belt conveyor to feed the bagasse to the boiler silos. The operation of the entire conveyor system shall be controlled from the control room. The conveyors whichis feeding bagasse to boiler silos will get the bagasse from mills conveyors and these conveyors to be located above the ground level.

The stored bagasse to be fed through the belt conveyor to the bagasse feeding station of the boiler and during shut down of mills, bagasse will be handled through a front end loader and dozer and a suitably designed conveyor system.

9.2 Steam Piping System

Boiler integral piping consisting of all interconnecting piping between the economizer inlet stop valve and the super heater outlet header etc. shall be

provided. The piping shall be properly supported and provided with necessary tapping for instruments for measurement. Necessary supporting materials, towers, etc. to support the piping shall be supplied. The correct location of hangers and supports shall be considered for the flexibility analysis. Suitable expansion loops, restraints and anchors shall be provided to limit the stresses within the allowable values.
The material for the piping and fitting shall be properly selected for various services in the boiler integral piping. All integral piping shall be provided with valves, fittings, drains and vents, safety valves, exhaust piping, start-up vent with silencer, blow down system etc. Proper sampling facility shall be provided for feed water, super heated steam and blow down water. The system for sampling shall be complete in all respects for monitoring the satisfactory performance of the boiler.

The outlet steam from the boiler to be conveyed through carbon steel main steam piping with necessary valves and gauges etc. to the turbo generator.

Adequate stop valves, non-return valves, drain valves, traps etc. shall be suitably placed in the piping and header. The piping shall be with necessary supports, hangers, etc. Steam flow meter shall be provided to measure the flow of steam from the Boiler.

- 1 No PRDS (from Main steam line) for Process steam requirement of 65 TPH at PRDS outlet
- 1 no PRDS for De-aerator steam requirement

Drain vent and other piping –

- Safety valve exhausts/ vents piping up to a safe elevation of 1m above roof.
- Boiler blow down piping up to blow down tank.
- Drain piping from individual drains to drain header and from drain header to blow down tank.
- Piping from blow down tank to nearest drain trench.
- Raw water quenching line to blow down tank from terminal point.
- HP heater drain& vent piping to de-aerator.
- HP heater emergency drain piping to nearest drain trench.
- HP and LP dosing system piping from dosing skid to steam drum and feed pump suction respectively.
- Target plates and temporary piping as required for steam blowing.
- Cooling water piping from one point near boiler first row column to sample coolers.
- Overflow piping from de-aerator to DM Water storage tank (Max. 75 Mtrs. Considered)

Instrument air piping from terminal point to all equipment within boiler island requiring instrument.

9.3 Electricals

The boiler to be supplied with complete electrical accessories such as electric motors, starters, switches, MCC, earthing & cables etc. The supply to include the supply of power from 11 KV / 440 Volts to cogeneration auxiliaries and of sugar plant and running of the boiler. All power & control cables required for equipment are also included. The distribution transformers of suitable rating with switchgear and protection relay panel for the supply to the boiler auxiliaries and sugar plant shall be included in scope of supply.

All motors shall be with IP 55 / IP 56 enclosures as applicable depending on area of installation and suitable for equipment/area as specified and supplied as a complete unit.

The terminal box of motor shall be complete with cable glands, lugs, complete with earthing material, starter, push button, MCC, all cabling, cabling trays etc.

In brief, the scope of supply to include Boiler furnace, Travelling Grate with Mechanical Drive Super heater, water walls, boiler bank, economizer, air pre heater etc.

The boiler shall also include:

- Forced draft fans, induced draft fans, secondary air fan etc. with drive
- Air and flue gas ducting, dampers, supports, expansion joints etc.
- Electrostatic precipitators with all electrical, hoppers, electrodes, structural, points etc.
- Feed water transfer pumps – 3 Nos. of 65% capacity each with drive and accessories
- Feed water pumps – 3 Nos. of 65% capacity with variable speed AC VVFD drive suitable for working pressure of 87ata. The pumps' working pressure shall be designed after controlling pressure drop at various stages.
- One small pump of 30% boiler capacity with variable speed AC VVFD LT motor drive for initial start up / for emergency use.
- Refractory and insulation as required for the boiler and auxiliaries
- Soot blowers for super heater, boiler bank tubes and economizer region.

- Boiler ash hoppers with supports
- Complete integral piping with supports
- Boiler supports, platforms, hand rails
- Main Steam header at various outlets and gate valves
- DCS for boiler control including Control Panel
- Field instruments, local gauges, transmitters, etc.
- Flow nozzles for feed water, spray water and main steam flow measurements.
- 1 No. de-aerator for condensate / feed water including supports, nozzles, controls, valves and fittings
- Foundation materials for Boilers and auxiliaries
- Fuel feeders for Bagasse with variable speed drives, chutes, supports and distributors for fuel (Bagasse) feeding into the furnace including silos for Bagasse storage above the distributors.
- Boiler external piping like feed water from feed pumps to economizer and from de-aerator to feed pumps, HP, LP dosing system along with valves and fittings, feed water piping inlet to de-aerator, cooling water and compressed air piping, and feed water transfer piping from transfer pump to de-aerator.
- Sample coolers and HP/LP dosing system
- Boiler drains, vents, CBD/IBD tanks
- MCC/PCC and power and control cables for boiler equipments' drives and control panels including the LT supply Transformer with switch gear with necessary protection relays, cables etc. The interconnection with power supply is included for the P.C.C.
- Variable frequency drives for FD Fan motors, ID fan motors, SA fan motors, fuel feeders and boiler feed pumps with drive motors
- Power capacitors for boiler MCC to maintain p.f. 0.90.
- Location push button stations
- Equipment earthing complete in all respects.
- Lubricants, first fill oils, special tools comprising of tube expanders, man drills, ratchets, grease guns, set of spanners, torque wrench for level gauges etc.
- Commissioning spares for 2 years

9.4 General

Supporting structure, steel work, platform, ladders, galleries, staircases with fabricated floor grating including complete roofs, side cladding above the drum operating floor level, along with cladding structure for protection against rain and other weather conditions is to be provided. Proper support/ strengthening is to be provided to De-aerator and de-aerated water storage tank.

Boiler supporting steel work of welded construction from rolled steel section starting from finished floor level, foundation bolts and firing floor of MS construction.

All pipes / equipments mounted local gauges as required. All pressure test points with root isolating points, temperature test points complete with thermo wells and screw plugs, all flow primary elements including two pairs of root valves. Interconnecting cabling, cabling complete with cable trays and other accessories as required.

The boiler shall be manufactured in accordance with the requirements of Indian Boiler Rules and Regulations.

The boiler shall be provided with a steel supporting structure from rolled steel sections and designed with adequate strength for the loads imposed by the boiler and associated equipments.

The boiler shall be complete with necessary tubes, manifolds, integral pipe works, mountings and fittings with valves, gauges, high and low water alarm, maintenance tools consisting of expander, mandrells, ratchets two grease guns and a set of spanners, water gauges, chemical injection valves etc. The integral pipe work shall consists of blow-off bends, high and low pressure drains, water gauge piping, water and steam connections to the feed water regulator, piping from feed control valve to economiser inlet manifold, feed piping from economiser outlet manifold to the boiler steam drum, pressure gauge piping soot blower steam supply pipe works, safety valves escape pipe work etc. The boiler shall be provided with a three element type automatic feed water regulator of the electric/pneumatic controller type, which shall respond to momentary fluctuations in steam demand up to $\pm$ 5% of the rated MCR of the boiler. One hand operated control valve of cast steel (located such that its operator can see water level in gauge glass) capable of passing the required amount of water shall also be provided. The boiler shall have two water gauge glasses at the top drum independently connected.

Necessary mild steel ducting of 5 mm thick plate in case of air duct and 6 mm thick in case of gas duct with stiffeners shall be provided for the boiler, comprising of cold air ducting extending between the forced draft fan discharge and air inlet of air heater, hot air ducting from the air heater outlet to the furnace , flue gas ducting from fly ash arrestor to the chimney. All ducts of mild steel and above the ground.

Necessary regulating and isolating dampers at suitable points shall be provided for the efficient operation and maintenance of boiler. All dampers will have an effective area not less than the specified for the ducts they control.

Suitable galleries and ladders with grating or open steel flooring for affording access to the essential levels of the boiler plant complete with hand railings, curb angles and supports shall be provided.

All supporting steel work, hangers, thrust brackets and castings for the furnace shall be provided for boiler. All refractory tiles and bricks, adequate quantity of high grade refractory cement, special shaped refractory tiles castable refractory bricks for furnace and high temperature zones shall be as per IS-8 quality. All necessary high grade insulating materials for the exposed portion of the boiler, steam and water drums, integral pipe work from the feed pumps to the boiler, steam piping, gas and hot air ducting shall also be supplied. Reinforcement with wire mesh and super coated with a hard setting material so as to protect the high grade lagging materials against damage shall also be provided.

9.5 Performance Parameters of Boiler:-

Steam pressure at super heater outlet (ata) : 67
S.H. steam temp.at super heater outlet (℃) : 490 (+/-) 5
Max. Continuous Rating (T/hr) : 120.0
Peak load at 110% of MCR for bagasse (T/hr) : 132.0
Boiler efficiency % (bagasse firing), Moisture (50 – 51%) : 71.0(calculated as per ASME PTC 4.0 Indirect Heat Loss method.

9.6 Provision for future expansion from proposed 4900 TCD to 7500 TCD

Proposed 4900 TCD plant shall have provision for further expansion from 4900 TCD to 7500 TCD. To meet the additional requirement of steam for 7500 TCD cane crushing capacity space shall be provided in the layout to install an additional boiler of suitable capacity. Bagasse handling system shall be changed as per the requirement of additional boiler. A separate DPR shall be prepared for 7500 TCD cane crushing capacity in future.

10.0 TECHNICAL SPECIFICATIONS FOR POWER GENERATION, DISTRIBUTION & TRANSMISSION

10.1 Turbine Specifications –

It is proposed to install a new TG set of 12 MW. The new TG set to operate at a boiler steam pressure of 67 ata and temperature of 510 $\pm$ 5°C. The Turbine shall be multi stage impulse reaction, bleed cum back pressure type.

The turbine will be designed for the operation with inlet steam parameters of 62 ata and 480°C. The turbine will be designed to provide an back pressure steam at 2.5 ata up to 111.02 T/hr and bleed of 14.62 TPH (max.) at 12.8 Ata. for HP heater and ejector. Guarantee Turbine operating parameters such as inlet/ bleed/ extraction/ exhaust/ process steam parameters shall be as per HMBD. The uncontrolled extraction is considered for steam flow to HP heater. Back pressure steam to meet the requirement of sugar manufacturing process and de-aerator requirement

Turbine should have hydraulically operated servo motor control valves to minimise manual operation and quick re-alignment to varying load and input operating conditions to improve efficiency even at part load. The turbine shall have minimum six stages.
The following shall be the technical requirement for the new bleed cum back pressure turbine.

S.No	Description	Capacity
1.	Turbine Type.	Bleed cum back pressure.
2.	Boiler Steam parameters Pressure ata Temperature (°C)	67.00 510 $\pm$ 5°C
	Steam flow normal at Turbine stop valve (Season only)	111.02 TPH

3.	Steam pressure at turbine stop valve (ata)	62.0
	Steam temperature at turbine stop valve ℃	485 ± 5
4.	Extraction steam requirement	Season only
5	Bleed Pressure (ata)	12.8
	Temperature	Max. 259℃
	Flow TPH (Season Only))	14.62
6	Back Pressure	2.5
	Temperature deg. C	128
	Flow TPH (Season Only)	96.39
7.	Cooling water inlet temperature	30(℃)
8.	The economical steam rate required at percentage load (%)	20-100
9.	Power factor (lagging)	0.8
10.	Generation Voltage (KV)	11± 10%
11.	Ambient temperature for electrical equipment design (℃)	40
12.	Parallel Operation with grid	UPVNL Ltd.
13.	Grid Voltage (KV)	132
14.	Duty requirements	Continuous
15.	Atmospheric conditions (as prevalent in a sugar plant)	Dusty
16.	The maximum noise pressure level at 1.0 m distance for any equipment from the equipment surface shall be equal to or less than (db)	85
17.	System Frequency (Hz)	50 ± 5%

The turbine shall be designed for the operation in season operation performance at rated capacity shall be guaranteed.

The turbine shall be designed that it suffers no damage if exhaust pressure occasionally goes down to atmospheric pressure and/ or live steam temperature goes up to 505℃ and pressure 90ata. Turbine should have hydraulically operated servo motor control valves to minimise manual operation and quick re-alignment to varying load and input operating

conditions to improve efficiency even at part load. The turbine shall have minimum ten stages.

The turbine shall be bleed cum back type. The bleed will be uncontrolled at 12.8ata pressure. The back pressure shall be at 2.5 ata which will meet the low pressure steam requirement of the sugar plant and de-aerating steam requirement of the power plant. The steam pressure and temperature required at the battery limit shall be 2.5 ata and 130℃. De-super heater required to reduce steam temperature of the extraction steam to 125℃ shall also be provided (if required). The bleed at 12.8atapressure from the turbine shall be utilized in HP heater for heating of the feed water from 110 to 180 deg. C. and back pressure steam at 2.5 ata pressure shall be utilised for de-aerator to heat the feed water from 98 to 110 deg. C and to fulfil the requirement of process. The turbine should be capable to develop 12 MW power, even when steam pressure at inlet stop valve reduces to 60 ata & temperature to 470℃ with over load valves open.

The turbine shall be designed to bleed up to 15 TPH steam at 12.8/8 ata from turbine which will be utilised for HP heater and process. Total steam extraction of 96.39 TPH at back pressure 2.5 ata shall be there for process and de-aerator. The required de-super heaters to bring steam temperature of back pressure down to the required level of 125 deg C will be provided. It shall be designed for the total capacity of steam required for process from extraction of the turbine at 2.5 ata.

The turbine shall have solidly forged machine rotor with integral disks. The bladding shall be designed to resist all vibrations, thermal shocks and other loading that shall be experienced during service and system disturbances. The turbine shall be horizontal rotor, double pedestal, multistage, nozzle governed type and should have hydraulically operated servomotor control valves to minimize manual operation. It should respond to frequent variations in load and input operating conditions and ensure efficiency even at part load. The overall specific steam consumption at operative conditions shall not be more than 5.67 TPH/MWH during season.

All piping and components of soft seal system shall be sized for 150% of the calculated new clearance leakages.

The turbine shall be provided with liberally rated hydro dynamic thrust bearings (double pedestal). A pressure lubrication and control oil system shall be furnished for the turbo

generator unit to supply oil at the required pressure to the steam turbine, gear box, generator and governing system.

The turbine shall be provided with remote access device and diagnosistic system.

10.2 Lubrication System –

The oil system shall include the following:

1 x 100% capacity, main oil pump driven by the turbine shaft / low speed gear shaft

2 x 100% capacity (one operating and other standby), AC motor driven auxiliary oil pump of centrifugal type arranged to cut in automatically if the oil pressure falls to pre-set value. This pump shall also meet the requirement of oil during the start-up and shut-down.

1 x 30% DC motor driven EOP.

Emergency gravity lube oil system comprising of hand operated oil pump, overhead tank with SS lining and complete inter-connecting SS oil piping.

2 x 100% capacity (1 working and 1 stand-by) water cooled oil coolers. The oil coolers shall be water cooled with a duplex arrangement and change-over valves to ease in maintenance. The coolers shall be of shell and tube type with SS 304; 2 x 100% duty oil filters arranged in such a way that it is possible to clean one oil filter while the other oil filter is in operation. Suitable full flow twin oil filters shall be used for the lube oil, downstream of the coolers and shall be piped in parallel arrangement with transfer valves. Differential pressure gauge with alarm shall be provided across the filters. The filters and the coolers shall be arranged with continuous flow transfer valves.

Oil storage and settling tank with adequate reservoir capacity, duplicate strainers, level indicators with float features and alarm contacts vent and oil mist eliminators The reservoir made of carbon steel conforming to IS-2062 and interior rust proof, necessary piping, connection, valves, fitting, level switches and level gauges shall be provided for the cooling system and the oil system.

Flow and temperature indication for oils for alternator bearings shall be provided.

A centrifugal type oil purifier shall be provided for the removal of water sediment and other oxidation products. The purifier shall be a separate complete package mounted on a skid, complete with drive motors, piping, valves and fittings. Its operations shall be independent of the oil system and feed to the purifier shall be from drain end of the reservoir.

One no. online dehumidifier shall be provided for moisture removal.

10.3 Reduction Gear Box

The turbine shall be coupled to a suitable double helical type enclosed reduction gear box of hardened and ground gears and pinions designed to transmit 12000 KW continuously at turbine rated speed and ambient temperature of 45 C with a service factor not less than **1.5.** The gear box shall be coupled to the alternator through suitable design flexible coupling capable of transmitting 12000 KW continuously. The gear box shall be designed as per relevant DIN/IS/BS/AGMA standards. Necessary cooling and lubrication arrangements for the gear box shall be provided. Gear box shall be mounted on foundation with a sole base plate.

The turbine shall be provided with barring gear driven by AC motors to rotate the turbine and generator after shut down to prevent thermal distortion of the rotor. The barring gear shall be capable of starting the rotor from rest and run it continuously at low speed. The barring gear shall be interlocked with the lubrication system to prevent its operation without lubrication.

10.4 Service and Potable Water System

To meet the service water requirement of the power plant, the sugar plant facility could be extended. Similarly for the potable water requirement of the power plant, the existing facility of the sugar plant is to be extended. RO plant of adequate capacity to be installed for treating the raw water to suite feed water quality (if required).

10.5 Live Steam, Medium Pressure and Low Pressure Steam System

The outlet steam from the boiler shall be conveyed through carbon steel main steam piping to a common steam header and from the header to the turbo generator. Adequate number of stop valves, non-return valves & isolating valves shall be suitably placed in the piping arrangement. The piping arrangement shall be complete with necessary hangers, supports etc. Steam flow meters to be provided, to measure the boiler steam flow.

10.6 Turbine Control systems

The turbine control shall be through centrally located distributed control system. The control system shall be provided with redundancy for key function by use of separate sensors & monitors.

Turbine monitoring board shall have the following:-

- Inlet steam and exhaust steam pressure& temperature gauge
- Uncontrolled extraction steam pressure & temperature gaug
- Controlled extraction steam pressure & temperature gauge.
- Lube oil pressure gauge
- Control oil pressure gauge
- Steam turbine/generator speed indicators
- Push button stop for steam turbine & generator
- Run light
- Push button for emergency shut off.

10.7 Turbine Supervisory systems

The system shall observe all critical parameters of the turbine continuously with following provisions:-

- Monitoring of winding & bearing temperature, vibrations continuously.
- Audio/visual alarm & trip signals
- Set point adjustable separately for winding & bearing
- Immense to noise signals, radiations, electromagnetic interference.
- Ultra sensitive& accurate sensors.
- Built safety fuse &fail safe logic
- Change over relay contract outputs to activate buzzer or trip theturbine/motor.

The specifications of the system components shall be as specified below:-

(1) Sensor : PT100/Thermocouple & vibration.
(2) Accuracy : ±0.25% of FS

(3) Display : 3½ digits,7 segments for temperature & vibration.

(4) Scan Time : 3 to 30 seconds adjustable.

(5) Auto/Manual selection : Front panel switch

(6) Set points : Adjustable with front trim-pots.

(7) Power supply : 230/110 VAC;50 Hz.

Special maintenance tools for the turbine shall be supplied along with the turbine. The turbine shall be completed with a set of foundation bolts and levelling pads, isolating valve at steam inlet, isolating valve at extraction, extraction non-return valve, exhaust isolation valve, exhaust non-return valve and exhaust flow relief valve. Complete in all respect including valves, fittings, supports etc.

All piping required for effectively connecting the turbine with the sub-system within the battery limit shall be provided.

10.8 Generator

The alternator shall be complete with brushless exciter, base frame, couplings, water cooled radiator with inter connecting cables, etc. The alternator shall be provided with two pedestals (one at each end). The alternator shall be suitable for taking thyrister load (DC mode) of up to 40% of its rated full load. The efficiency of generator shall not be less than 96% at full load.

10.8.2 11 KV Vacuum circuit breaker incoming panel

VCB panel shall be single front draw-out execution floor mounting free standing suitable for 11 KV, ± 10% variation, 50 Hz frequency ± 5% variation, 3 phases 3 wire type supply system suitable for fault level 25 KA for 3 seconds. Panel earthing should be through NGR, suitable for 50º ambient temperature and relative humidity of 95%. Panel shall be indoor type. VCB shall be electrically operated type with spring charging voltage 240 V AC and closing and tripping coils suitable for 110 V DC. Panel bus bar shall be of electric grade aluminum EC – 91 E suitable for fault level 25 KA for 3 seconds. Panel shall have all necessary CTS, PTS, indicating lamps and other required equipments suitable for grid paralleling and operation of sugar factory. The breaker shall have suitable no. of auxiliary contacts for electrical interlocking with auxiliary power supply breaker etc.
Earthing Transformer considered for 11KV VCB panel Virtual Neutral .

Panel shall have interior illuminating lamp, space heater with thermostat suitable for 220 V AC, contactor for anti-pumping, trip circuit supervision relay, spring charging handle. Earthing trolley shall be provided to short incomer of breaker when breaker is taken out for maintenance. Panel shall be suitable for bottom cable/bus duct entry. Panel shall be suitable for extension on both sides to connect distribution panel.
Suitable mechanical inter-locking with castle lock shall be provided for interlocking of the main breaker with emergency power supply breaker of grid / DG set supply and Bus Coupler can be switched 'ON' only when one supply breaker is ON ; in addition to electrical interlocking. The scheme for interlocking shall be approved by purchaser.

10.8.3 Metering-cum-Synchronizing Panel

Panel shall be metal enclosed free standing floor mounting type shall be dust moisture and vermin proof simplex type with IP 52 degree of protection. Panel shall have all necessary metering, indication in annunciation, synchronizing equipments.

10.8.4. Annunciation

Minimum following annunciation shall be provided:

Under voltage relay operated, Over voltage relay operated, Reverse active power relay operated, Reverse reactive power relay operated, IDMT over current relay operated, Earth fault relay operated, Generator lock out relay operated, Turbine lock out relay operated, Loss of excitation relay with under voltage relay operated, Loss of excitation relay without under voltage relay operated, Negative phase sequence relay alarm, Negative phase sequence relay operated, Under frequency relay operated, Very under frequency relay operated, Over frequency relay operated, Df/Dt operated, Relay panel DC fail, Instantaneous over current relay operated, Metering and AVR PT fuse fail, Protection PT fuse fail, Excitation PT fuse fail, Winding temp. high, Over load relay operated, Generator bearing temp. high, Emergency trip push button operated, First rotor earth fault, Second rotor earth fault trip.
Annunciator shall have RS-485 communication port to communicate through Modbus communicate protocol. Panel shall have 16 channels temperature scanner suitable for PT 100 RTDS for generator winding and bearing, cold and hot air temperature.
Scanner shall have RS-485 communication port to communicate through Modbus communicate protocol.

Codes and Standards: Panel shall generally comply with relevant Indian Standard Specification and relevant codes and practices.

10.9 AVR & Excitation Panel

Field excitation system shall be fitted with suitable switching device with brushless generator for field excitation system such that field current is automatically cut off from circuit in the event of turbine/generator trip. Excitation system panel shall have DC ammeter, DC V meter, shunt field regulator for manual operation of excitor with auto/manual selector switch, suitable transformer indication lamps, fuses and field discharge resistance with necessary isolation facilities shall be provided.

There shall be 2 no. AVR panels (one operating and one standby) with auto/manual selector switch with independent primary and secondary modes complete with all accessories, over voltage relay, suitable volt meter and fine voltage adjustment device, automatic power factor regulation facility suitable for gird paralleling.

AVR shall have motorised auto potential meter, facility for enabling remote raise/lower of voltage, AVR priming, short circuit maintenance features, compounding features, auto PF controlling features, follow-up features, diode failure detector for exciter rotating diodes, over and under excitation limiter. Panel shall have following meter, alternator volt meter, exciter volt meter, exciter ammeter, null meter and power factor meter etc. Both independent AVRs and Excitation panel shall be suitable for paralleling with grid as well as with other TG sets.

10.10 Protection relay panel

Protection relay panel shall be same in construction and other features for metering panel. Relay panel shall have minimum following protective relays:

Under voltage relay, over voltage relay with timer, reverse active power relay, reverse reactive power relay, voltage control 3 element type over current relay, earth fault relay, differential relay, generator lockout relay, turbine lockout relay, loss of excitation relay, auxiliary relay for loss of excitation relay, under voltage relay, negative phase sequence relay, four stage frequency relay with one df/dt, DC supply supervision relay, instantaneous over current relay, master tripping relay with timers, voltage balance relays for metering and protection PTS, instantaneous over voltage relay for excitation PT fuse

fail sensing, overload relay, first rotor earth fault, second rotor earth fault relay, voltage surge relay, trip coil supervision relay, unit lockout relay.

Relay panel shall have necessary meters, switches, potentio meters etc. Differential relay shall be supplied with 3 nos. stablising registers and 3 nos. metrosil surge diverters.

Relay shall be preferably electro mechanical type or solid state electronic type numeric relays also can be considered. The relays shall conform to IS-3231 specification.
Necessary protection arrangement shall be provided so that any variation in the grid does not effect the working of power generation.

10.11 NGR with control panel

NGR shall be suitable for 11 KV, 3 phase, 50 Hz supply system with fault level of 25 KA for 3 seconds. Panel shall be metal enclosed free standing floor mounting type and shall be dust moisture and vermin proof. Neutral grounding equipment shall be completely assembled, wired and connected to neutral bus tap through seal off bushings.
Resistor unit mounted on the grid rods shall be fixed and assembled in tires and fitted into sheet steel enclosure. Resistor shall be able to carry specified current for the period of time as specified with temperature rise not exceeding 375ºCover maximum ambient temperature. The resistor shall also be able to carry at least 10% of its rated current continuously.
An Isolator shall be provided on incoming side to isolate the resister from the main equipment. Isolator shall be provided on front of the panel. Isolating switch shall be single pole, knife type having rating of 125 times the rated current of resister. Switch shall have adequate sets of potential free auxiliary contacts for remote indication/alarm/trip signals. An external handle suitably insulated and lockable both in ON & OFF positions shall be provided for isolating switch.
NGR panel shall have all necessary metering protections and indications and ammeter for earth leakage current.

10.12 LAPT panel (Lightning Arrestor and Surge Protection)

LAPT panel shall be complete and shall house 11 KV search capacitors and class III discharge gapless lightning arrestors in sheet steel cubicles.

LAPT panel shall have all necessary metering CTS, PTS and meters for protection metering and AVR sensing. Panel shall be suitable to connect 11 KV HT cable from at the top of the panel for incoming and at the bottom for outgoing cable of the panel.

PTS in the panel shall be cast resin, non draw out type suitable for nominal operation connected from line to ground and for 1.73 times rated line to ground voltage under sustain emergency condition. The lightening arrestor and surge capacitors shall be located in separate compartments and shall be single pole connected between line and ground terminals. The arrestor shall be station class, hermetically sealed type and shall be suitable for generator protection.

10.13 Turbine control panel (Free standing type)

Turbine control panel shall be indoor type, desk profile type metal enclosed free standing floor mounting and shall be dust moisture and vermin proof. The control disk shall have ON/OFF push buttons (illuminating type), trip indicating lamp, ammeter, local/remote selector switch for air blower motor, vapor extractor motor, actuator motor, ALOP motor, barring gear motor, ACOP motor, emergency oil pump motor. Panel shall have all necessary metering protections annunciations. Panel shall have temperature scanner for turbine and gear box bearings.

Enunciator shall have minimum following annunciation for:

Lube oil pressure low, lube oil pressure very low, control oil pressure low, differential pressure across filter high, control oil pressure very low, turbine speed high, high axial movement, Condenser low vacuum, turbine lock out relay operated, solenoid trip, turbine bearing temperature high, turbine bearing temperature very high, emergency trip, Enunciator shall be solid state microprocessor base type with taste, acknowledgment and reset push buttons.

10.14 Turbine auxiliaries MCC

415 V LT MCC/switch board for T.G. Set auxiliaries and Condenser shall be non-draw out type single front compartmentalized suitable for three phase, four wire, 415 V, 50 Hz supply system. MCC shall have switch fuse contactor, over load relay starters for various motors required for turbine lube systems and Condenser etc.

MCC shall be non-draw type, free standing floor mounting type suitable for indoor operation, cable entry shall be from top and shall have adequately rated incoming switch fuse unit and starters for outgoing feeders. All incoming cables for the panel should be top entry from cable tray.

MCC shall be constructed as per following IS codes:

IS-375 for bus bar clearances.

IS-2405 for current transformers

IS-4064 for switch fuse units

IS-9224 for fuses

IS-2959 for contactors

IS-3231 and 5544 for bimetallic over load relays with single phase preventer

IS-1248 for meters

IS-6875 for control switches & push buttons.

10.15 AC Distribution Board for Power House Auxiliaries (ACDB)

Panel shall be metal enclosed, wall mounting type, dust and moisture and vermin proof suitable for 230 V AC single phase 50 Hz supply system. Panel shall be indoor type having 1 no. switch fuse incomer feeder and 15 nos. two pole MCB outgoing feeders for supply to various control panels.

The distribution transformers with switch gear and protections for supplying power to the cogeneration auxiliary's sugar plant and to mills through converters transformers etc. All feeders and bus couplers shall be carefully interlocked to prevent improper paralleling of different supply sources. The loads shall be distributed in a manner that transformers, for the distribution, bus coupler & converter duty are not overloaded under any abnormal condition.

The distribution panels conforming to the latest revision of IS:8623/IEC:439 will be of dust & vermin proof construction, sheet steel clad, totally enclosed floor mounted, self-standing type with both front and rear access for PCCs and front access for MCCs. All panels will be of single bus bar type with bottom cable entries. The MCCs shall be of compartmentalized design with cable alleys at the sides. PCCs shall have the cable chambers at the rear. The bus-bars shall be of electrolytic grade aluminium alloy, designed for 40℃ temperature rise over an ambient of 45℃. All panels shall have neutral bus, sized to carry half the phase current. All panels shall be designed for 50 kA for 1 sec.

The L.T. panels shall have breakers for ratings 800 A ACB. All breakers shall be of electrically operated draw-out type with spring charged motor operated closing mechanism. MCC feeders shall be of fuse switch/switch fuse + contactor + bi-metal / electronic, motor protection relay type, with ammeters of suppressed scale above 15 kW and indication lamps, suitable for remote operation bus ducts of suitable rating shall be provided for connection between the primary of the distribution transformers and the

PCCs. The bus ducts shall be with copper conductors. The bus ducts shall be of non-segregated phase bus duct type interleaved design and shall be complete with flexible, bellows, vertical & horizontal bends, seal-off bushing, outdoor hoods, etc. for DCS. All motors shall be of squirrel cage type conforming to IS:325 / IEC:34, totally enclosed and fan cooled. Motors shall be of energy efficient type. The windings will be insulated by class 'F' insulation material and maximum rise shall be limited to 75℃ over an ambient of 45℃.Motors of rating less than 50 HP will be provided with DOL feeders in MCC. Higher sized motors may be provided with star/delta starter depending on application. Feed pump motors shall be provided with VFD for soft start. Motor feeders will be complete with contactor, over load relay and switch fuse units. Motors of higher ratings (above 75 HP) will be protected by motor protection relays.

10.16 DC batteries & battery charger

DC batteries shall be lead acid type conforming to Indian Standard Specification and Codes of practice. Each battery cell shall be 2 V connected in row and double tire formation for getting 110 V DC supply. Batteries shall be mounted teak wood rake complete with cell no. plates fixing nails and battery interconnectors. Batteries shall be suitable for ambient temperature 50ºC for satisfactory operation. Total 55 number cells are required for getting 110 V DC supply to various panels. Battery charger shall be rated for 110 V DC and suitable for maintenance free batteries. Battery charger panel shall have all necessary meters and lamps for indication purpose. Panel shall consist of two chargers, a float charger and float-cum-boost charger for trickle and boost charging of battery of specified rating. Charger shall have auto/manual operation mode and suitable for 415 V, 3 phase, 4 wire system. Battery charger rectifier shall be Silicon control bridge full wave type. Output voltage regulation shall be +/- 1% maximum from no load to full load. Ripple voltage shall be 3% of RMS voltage. Battery charger shall have following indications AC supply on FC, AC supply on FCBC, charger on FC, charger on FCBC, FCBC on float charging, FCBC on boost charging, phase fail and battery reverse polarity.

Following meters shall be provided. AC input V meter, DC V meter with selector switch, DC V meter and DC ammeter on load side, DC ammeter FC, DC ammeter battery.
Following annunciation shall be provided, FC fail, FCBC fail, DC voltage low, DC voltage high, overload FC, overload FCBC, mains failure, battery earth fault and rectifier failure.
Battery charger shall have following features and interlocks:

a) Float charger cannot be switched on when the boost charger is on under float mode.
b) Charger-1 is on and if charger-2 is made on in Float mode, charger-1 shall be tripped off automatically.
c) In case of ac main failure, battery shall supply the load on an automatic basis.
d) Rated output voltage shall be maintained during from charger to battery.
e) Interlock shall be provided such that when charger-2 is selected in boost mode, it will be disconnected from DC load
f) Normally the charger will work in float charging mode of FC.
g) In case any problem in float charger, automatically changeover will occur to float charging mode of FCBC.
h) After rectification of float charge of FC, manually it can be transferred to float charge of FC, from float mode of FCBC
i) In case of low Battery voltage, Battery should be connected to boost mode automatically and float charger of FC should feed the load.
j) After boost charging is over, battery tank shall be automatically connected to float charger of FC for trickle charging.
K) DC distribution panel shall be integral part of battery charger with following feeders: One number incoming feeder of adequate rating and 12 numbers outgoing feeders for supply of 110 V DC to various control panels.

10.17 11 KV & 415 V Power Distribution System

The electrical distribution system shall include 11KV cables/ Bus bar trunking/ tie trunking connecting the alternator breaker panel to alternator, 11 KV/433 distribution system, LT panel, Bus coupler panel, auxiliary panel, main and sub-lighting distribution board, motor control centers, all electric motors, starters, switches for all electric motors, power improving capacitors and their panel, all power, lighting and control cables including cables from DG to main LT panel in power house, earthy systems, electrical erection material etc. It will also include distribution boards, cables and lighting fixtures (without bulbs, tube lights and halogen lamps) for the lighting of the factory building, spray pond, cane carrier loading point etc.

The bus bar shall be made of electric grade (EC-91E) aluminium. The bus-bar trunking enclosure shall be fabricated out of 50 x 50 x 6 mm angle and folded covers of 2 mm thick aluminium sheets shall be provided on all four sides. The louvers shall be provided on side covers. The flexible copper connections at alternator ends and fixed connections at the breaker panel end shall be provided. The bus bar trunking shall be designed for continuous capacity at full load of transformer at 0.8 power factor at an ambient temperature of 50 deg.C. and the maximum temperature of the bus bar shall not exceed 85 deg.C. It shall be designed to withstand a symmetrical short Circuit current of 25/50 KA (RMS) for three seconds. The bus trunking shall also have a neutral bus bar of half the size of the phase bus. Provision shall be given for future expansion to 7500 TCD by installing similar equipment. Provision for suitable rating bus trunking, tie trunking etc. shall be given for the installation of bus coupler for 2nd TG set, VCB panel distribution transformer etc. for future expansion.

The entire electrical system shall confirms to the Indian Electricity Act & Rules.

10.18 Main distribution panel

This shall be designed for capacity of 4900 TCD (22 Hrs. basis) at unity load factor. One main distribution panel board shall be provided along with suitable bus coupler so that the set can be work in parallel. Necessary equipments for parallel operation shall be provided. The panel shall be fabricated from 14 SWG cold rolled sheetsteel and shall be totally enclosed floor mountingtype, dust, damp and vermin proof. Louvers shall be provided in the panel for air circulation. The panel shall be designed for an ambient temperature of 50 deg.C. and the maximum operating temperature of the bus bar shall not exceed 85 deg. C.The panel shall be designed to withstand symmetrical short circuit current of 50 KA (RMS) for one second. The operating heights of the panels shall be 2000 mm. The panel doors compartment shall be interlocked in such a way that it shall not be possible to open them when the switch/circuit breaker is in closed on position. The bus bars provided in the panel shall be of aluminum EC-91E grade. The size of the neutral bus bar shall be half of that of phase bus bar. The earth bus bar shall be located at the bottom and shall be continuous throughout the length of the panel. Removable sheet steel gland plates shall be provided at the top of the panels for cable entry.The panel shall have individual air circuit breaker or unit for outgoing feeders for motor control centers installed for cane preparation, mill drive, boilers and centrifugal. The panel shall

also have individual switch fuse unit for outgoing feeders for all other motor control centers. The panel shall also have individual switch fuse unit for feeders for auxiliary panel, and electric oil pump for turbo set. The panel shall also have one bus section coupler consisting of 4000 amp. four pole air circuit breaker connected in such a way that some of the load can be transferred from the turboset supply and be fed from the emergency power supply. Coupler and emergency supply incomer breaker shall have four pole, 3 phase, air circuit breaker or neutral contactor including an ammeter, voltmeter with selector switches, indicating lamps etc.

One no. four pole air circuit breaker of min. 4000 amp.rating shall also be installed in the main distribution panel for feeding the emergency power supply from diesel set/state electricity grid. All these Air circuit breakers shall be interlockedwith the alternator breaker panel such that only one source of power supply is fed to the bus bar at a time. The main distribution panel shall be fitted with spare ACB and switch fuse unit, one of each size subject to a maximum of three nos. and 2 nos. plugs and sockets, each of 63 amps. control supply of 230 VAC shall be obtained only through Phase & Neutral. Automatic Power factor correction panel with capacitors and incomer ACB of suitable capacity shall be installed near the main distribution panel for automatic improvement of power factor to a minimum of 0.90. Capacitors shall be APP double layer type suitable for sustaining for D.C. harmonics generated by thyrister drives.

The balance number of capacitors shall be installed at individual MCC's and across all motors rated above 125 KW with SF Units, contactor and 'ON' indication. The main distribution panel shall have ammeter and ON and OFF indicating lamps for each outgoing feeder. Ammeter, voltmeter and 3 nos.indicating lamps shall be provided for incoming emergency supply breaker. All switches, air circuit breakers, in the outgoing feeders in the main distribution board shall be designed for a rating of 1.2 times the connected load to each feeder. Each outgoing feeder shall be housed in individual separate cubicle with door interlock. Necessary harmonics filters with suitable panel complete in all respect shall be provided for DC harmonics.

10.19 11 KV distribution panel

11 KV distribution panel shall have VCBS (Vacuum Circuit Breakers)/ SF6 for each outgoing feeders feeding to plant transformers, convertor transformers, 11 KV motors

. All other features of the panel for metering rotection, relays and constructional features shall be same as 11 KV VCB incoming panel.

10.20 11 KV/ 433 V distribution transformers for plant load

Transformer shall be outdoor type, ground/platform mounting, oil immersed naturally cooled type (ONAN). Core type (Copper), double wound as per IS 2026 of suitable KVA rating. Suitable for 11 KV/433 V, 3 phases, HV delta connection and LV star connection with copper windings with vector group Dyn11. Transformer shall have HV terminal box suitable for terminating XLPE cables and LV terminal box suitable for bus bar ducting connection. Additional neutral will be brought out for earthing purpose for cable box/bus ducting arrangement. On HV side tapings on HV winding +/- 10% @ 2% shall be provided to maintain rated voltage on LV for constant KVA for HV variation. Tabs can be changed ON-OFF circuit with an external handle. Tab position indicators with locking arrangement on each step shall be provided. The loads shall be distributed in a manner that transformers, for the distribution, bus coupler & converter duty are not overloaded under any abnormal condition.

Transformer shall have following standard fittings:
Monogram plate, Conservator with sump & drain plug, Oil filling hole with flange & bolted cover, Prismatic Oil Level Gauge, Dehydrating Silica get Breather with oil seal, Thermometer pocket, Air Release plug, Inspection Cover, Lifting Lugs, Cover lifting Lugs, Jacking Lugs, Top Filter valve 32 mm , Drain cum Filter valve 32 mm, Earthing Boss, Off circuit switch, Storage & instruction plate, Skid type under base & Bi-directional plain Rollers.

Transformer shall have following accessories:
Top oil temperature indicator (Vapor pressure type) – Capillary tubing type with MRP/RSD and alarm and tip contacts, Double float Buchholz relay with alarm and trip contracts, Magnetic oil level gauge with low oil level alarm, winding temperature indicator with current transformer and heater coil, and alarm and trip contacts, marshalling box duly wired up from accessories to the box, Radiator shut off valves, pressure relief device.

10.21 Motor control centers

MCCs shall be of compartmentalized design with cable alleys at the sides. PCCs shall have the cable chambers at the rear. The bus bars shall be of electrolytic grade

aluminium alloy, designed for 40°C temperature rise over an ambient of 45°C. All panels shall have neutral bus, sized to carry half the phase current. All panels shall be designed for 50 kA for 1 sec.
The L.T. panels shall have breakers for ratings 800 A ACB. All breakers shall be of electrically operated draw-out type with spring charged motor operated closing mechanism. MCC feeders shall be of fuse switch/switch fuse + contactor + bi-metal / electronic, motor protection relay type, with ammeters of suppressed scale above 15 kW and indication lamps, suitable for remote operation.

Bus ducts of suitable rating shall be provided for connection between the primary of the distribution transformers and the PCCs. The bus ducts shall be with Aluminium conductors. The bus ducts shall be of non-segregated phase bus duct type interleaved design and shall be complete with flexible, bellows, vertical & horizontal bends, seal-off bushing, outdoor hoods, etc. for DCS.

All motors shall be of squirrel cage type conforming to IS:325 / IEC:34, totally enclosed and fan cooled. Motors shall be of energy efficient type. The windings will be insulated by class 'F' insulation material and maximum rise in temperature shall be limited to 75°C at an ambient of 45°C.
Motors rating less than 50 HP will be provided with DOL feeders in MCC. Higher sized motors may be provided with star/delta starter depending on application. Feed pump motors shall be provided with soft starter. Motor feeders will be complete with contactor, over load relay and switch fuse units. Motors of higher ratings (above 75 HP) will be protected by motor protection relays.

MCC shall be provided with 1 No: incoming switch of 1.2 times the connected load excluding the standby equipment, an ammeter, a voltmeter with selector switch, 3 phase energy meter and OFF and ON indicating lamps. Each MCC will have individual outgoing feeder for each motor connected to that MCC. For squirrel cage motors, each feeder shall have switch fuse unit, starter with over current protection, an ammeter and on indicating lamp. For slipring motors, each feeder shall have switch fuse unit, starter, an ammeter and on indicating lamp. In case of slip-ring motors rotor starters shall be provided and installed near individual motors. The MCC's shall also have feeders for connection of low loss power capacitors APP double layer type, each feeder having air break contactor with back up switch fuse unit, on indicating lamps, ammeter, ON-OFF push buttons. Each feeder in the MCC's shall be housed in separate individual compartments with door interlock.

Each MCC shall be 14/16 SWG cold rolled sheet steel fabricated cubicle type, floor mounted, dust, damp and vermin proof. Each MCC shall be expandable at both ends for additions of switches and starter for the motors if required at any stage. The bus bars shall be made of Electric Grade (EC-91E) aluminium. The earth bus bar shall be located at the bottom and shall be continuous throughout the length of each MCC. The operating height of each MCC shall be 1800 mm & max. Height shall be 2300 mm. Control supply of 230 VAC shall be obtained only through Phase & neutral. However, in centrifugal panels/ MCC 230 V A.C control supply shall be through control transformer.

Each MCC shall be designed to withstand symmetrical short circuit current of 35 KA (RMS) for one second. Each MCC shall be designed for an ambient temperature of 45 deg.C, the bus bar operating temperature at the ultimate capacity of 4900 TCD (in 22 hrs.) shall not exceed 85 deg. C Removable sheet steel gland plates shall be provided in each MCC for cable entry.

Each MCC shall be provided with spare switches, one of each size subject to a maximum of three nos. and a plug with socket of 63 amps. All squirrel cage motors up to an including of 40 HP rating shall be controlled with D.O.L. starters. All other squirrel cage motors shall be controlled with air break automatic star delta starters.
Incomers for all MCC s shall be SFU / ACB with 1.3 times the capacity of connecting load excluding the standby load. Each slip ring motor shall be controlled with rotor starter installed near motor. Electrical inter-locking of the following electric motor (With arrangement for de-interlocking) shall be provided.

(b) Cane cutter, cane leveler, fibrizer, cane carrier motors so that if any of the cane preparatory device trips, the cane carrier drive shall also trip.

(b) Bagasse elevator, bagasse carrier and return bagasse carrier motors.
(c) Sugar elevator with grass hopper.
(d) All self discharging batch type centrifugal machines to be interlocked such that not more than 2 machines accelerate simultaneously.

In addition to these MCC's, one pedestal mounted push button operating station (with ON-OFF push buttons) shall be provided near each squirrel cage motor. Also stop

push buttons at the ground floor shall also be provided for bagasse elevator, and return bagasse carrier.

10.22 Auxiliary panels

The auxiliary panel shall be provided with following outgoing feeders.

- 1 No: 160 amp switch fuse unit for tube well No: 1
- 1 No: 160 amp switch fuse unit for tube well No: 2
- 1 No: 300 amp SF unit for colony supply
- 1 No: 250 amp SF unit for workshop supply
- 1 No: 160 amp SF unit for factory lighting
- 1 No: 160 amp SF unit for street lighting
- 1 No; 63 amp plug and socket
- 1 No: 200 amp switch fuse unit for lighting auxiliary buildings
- 2 Nos: 160 amp switch fuse units as spare.

The auxiliary panel shall be with one incoming 1600 amps switch fuse unit.
One 3200 amps. 4 pole changeover switch shall also be provided for auxiliary panel so that it can be fed either from the turbo set supply or from the State Electricity grid/ DG set supply. Neutral bus bar shall also be provided in the auxiliary panel. Other construction details and fault level etc. of the auxiliary panel shall be the same as the main distribution panel. The auxiliary [panel shall be located in the power house. One ammeter with selector switch, one voltmeter and 'ON' indicating lamps shall be provided in the incomer. Each outgoing feeder shall have an ammeter and 'ON' indication.

10.23 Electric motors

All the electric motors up to 100 HP except ID Fan motors shall be squirrel cage TEFC enclosure induction motors. All the electric motors (except fibrizer and mill drive motors) shall be suitable for operation at 3 phase, 50 Hz, 415 volts, AC supply and shall conform to IEC:34 specifications. Fiberiser motor shall be of 11 KV and for mill drive motor it will be of 690V.

Motors for batch type centrifugal machines shall be suitable for S8 duty as per IS-4722 specifications and shall be designed for an ambient temperature of 50 deg.C and shall be fitted with ETDs in each phase for thermo-protection of motor windings.

Electric motors for cross travel and long travel of cane un-loader and mill house cranes shall be slip-ring TEFC enclosure suitable for S4 duty as per IS-4722 specifications. The electric motors for hoisting/de-hoisting of cane un-loader and mill house crane shall be squirrel cage TEFC enclosure suitable for S4 duty as per IS-4722 specifications.

10.24 Electric cables (11 KV, 1.1 KV grade)

All power, control and lighting electric cables for the entire electrical distribution system shall be supplied.

The power electric cables from the main distribution panel to each MCC and to auxiliary panel shall be suitable for the connected load at unity load factor excluding standby equipments. Suitable de-aerating factor for the cables shallbe considered as per the recommendations of cable manufacturers. All power and lighting cables shall be PVC insulated, armored, suitable for use at 1100 V and shall conform to IS-1554 (part I) specifications. All the control cables shall be of copper conductor. The minimum cross sectional area per core shall be 4 mm^2 for aluminum conductor and 2.5 mm^2 for copper conductor for power cables and 1.5 sq.mm. Copper conductors for control cables. All the power & lighting cables shall be 3. 1/2 core. All other cables from MCC to motors shall be 3 core.

All cable terminations shall be through crimping type cable lugs. Cable glands shall be provided at panels. All cable distribution/laying must be as per Indian Standard (overhead cable trays must be water proof / dust proof). All incoming cables for the panel should be top entry from cable tray.

10.25 Auto-Power factor correcting capacitors

Suitable number and rating low loss heavy duty power capacitors APP double layer type shall be supplied to improve the plant power factor to 0.90, at 4900 TCD (22 Hrs. basis expandable to 7500 TCD) crushing capacity. The power capacitors shall conform to IS-2834 specifications. Suitable capacity capacitors shall be connected to main distribution panel through APFC panel. Capacitors shall also be connected to the motor control centers and across motors of rating 125 KW and above with SF unit, contactor and 'ON' indication.

Capacitors shall be connected to main distribution panel through auto power factor correction relay and capacitor switching shall be by contactors / thyristeried switching. If thyristeried switching is used capacitors shall be MPP type.

10.26 Factory lighting and lighting distribution panel

One main lighting distribution board and sub lighting distribution boards for the lighting system fitted with miniature circuit breakers for each circuit shall be provided for the new installed equipments and houses. The main DB shall be located in the power house the sub-distribution boards shall be evenly spread in the factory area to be illuminated. Each sub-distribution board shall also be fitted with 3 nos. Three-pin plug points. The main DB shall have SFU, ammeter with selector switch and voltmeter on incoming feeder, SFU/MCB, an ammeter for 14 nos. outgoing feeders. The wiring for complete lighting system shall be done with the help of PVC insulated and armored aluminum conductor cables run on walls, ceilings or underground trenches as required The lighting boards shall be sheet steel fabricated.

The scope of work under this section shall be to provide illumination in inside and outside new constructed factory building, cane yard, spray pump house / cooling tower with additional two flood lights for illuminating spray pond only, injection water pump house, Condenser house, cane preparation house, surrounding cane feeding area, E.T.P., I.D. fan house, bagasse yard and molasses tanks. The average illumination levels shall be 50 luxin cane yard, 200 lux in power house and 150 lux in other areas. The lighting system shall be designed for use of fluorescent tubes in combination with HPSV (sodium vapors) / HPMV (mercury vapor)/ LED light fixtures. Minimum four no. towers shall be provided at different suitable places (Cane yard, cane carrier area, bagasse yard, ETP etc.) each tower having flood lights in bulk.
The emergency light shall be provided at mill, power house, turbine, boiler & lab etc.
The high mast light shall be provided at Cane yard, ETP, Administrative block & Guest house/ colony entrance & colony park

10.27 Air-conditioning and Ventilation System

The main plant DCS control room for Mills, boilers, turbo-generators and boiling house shall be air conditioned with commercial split air conditioners and suitable exhaust fans to

ensure effective ventilation and dust free atmosphere within the turbo generator complete building.

10.28 Plant Earthing

Earthing of all electrical installations shall be done as per IS-3043 specifications and the Indian Electricity Act and its rules and approved by the Electricity Authority of the Government.

All air circuit breakers shall conform to IS-2516 part I. All switch fuse units on cubicle switch boards shall conform to IS-4047 specifications. All switch fuse unit on Industrial Boards shall conform to IS-4064 Part I and Part II specifications. All ammeters and voltmeters shall be size 100 mm class 2.5% accuracy and shall confirm to IS-1248. All current transformers shall be class 1% accuracy and shall confirm to IS-2705. All contactor shall be of air brake type with at least 2 no. $\pm$ 2 auxiliary contacts and shall confirm to IS-2516(I).

9.29 Power House Crane

one no. electrical operated overhead travelling crane of 30 ton`s SWL capacity conforming to class ii of is specifications complete with rails, gantry, drives controls etc., shall be supplied. The crane rail centre shall cover powerhouse span and maintenance area. The crane shall be duly certified by the safety inspector following the safety norms. Eot crane shall also have one separate trolley for hand operated 5 T SWL capacity.

10.30 Diesel Generating Set

Two No. D.G. sets of 1000 KW rating with 0.8 power factor shall be supplied long with its all accessories.

The diesel generating set shall be continuously rated comprising multiple cylinder diesel engine having necessary protections such as low lube oil pressure trip, high engine temperature trip, over speed trip etc. and shall be fitted with speed control knob speedometer, hour meter battery charging meter, oil pressure and temperature gauges, radiator etc. The diesel engine shall be coupled with suitable alternator capable of developing continuously the rated power at 3 phase, 4 wire, 50 Hz at

normal voltage of 420 VAC (Alternator to be suitable for voltage range of 400-440 VAC) and conforming to IS-4722 specifications.

The alternator shall be fitted with minimum one ETD in each phase for thermo protection of the alternator windings. The alternator shall be designed for an ambient temperature of 45 deg. C. The alternator shall be self-excited and self-regulated. Both the diesel set each shall be complete with base frame, couplings, one M.S. fabricated, diesel service tank of 10 HL capacity, inter-connecting piping, D.C. storage battery and self-starting mechanism for starting of engine. One 2 mm thick for the back side and 1.6 mm thick for the other sides cold rolled sheet steel fabricated floor mounted, dust and vermin proof panel for the diesel set shall be provided.

The panel shall be fitted with air circuit breaker, over current relay, earth fault relay, reverse power relay, over voltage relay, reed type frequency meter, neutral isolating switch, three phase 4 wire unbalanced energy meters, KW meter, 3 phase power factor meter, 3 nos. ampere meters, one no. Voltmeter with selector switch, ON-OFF indicting lamps. The panel shall have neutral and phase bus bars of electric grade (EC-91E) aluminum and shall be designed to withstand symmetrical short circuit current of 35 KA (RMS) for one second.

The panel shall be designed for an ambient temperature of 45 deg. C, the operating temperature of the bus bars shall not exceed 85 deg. C. All the meters shall be class 1.5 per cent accuracy and shall conform to IS-1248 specifications. All the meters shall be square type of 100 mm sq. with 90 per cent deflection Interconnecting electrical cable 3½ core from the diesel set to the main distribution panel and to the auxiliary panel changeover switch shall be provided.

Necessary synchronizing panel with double voltmeter, double frequency meter, selector switch, lamps & synchroscope etc. shall be provided. Suitable bus coupler panel with ACB etc shall also be provided between the D.G. sets control panel to run separately and in synchronization connected suitably D.G. sets to Main Distribution board with interlocking.

Both D.G set shall be synchronized.
Both D.G set shall be of Eco friendly, green & silent operation

10.33 Plant Start up

The power plant auxiliary loads shall be shared by the new DG set of 1000 KW -2nos after synchronisation. Once the new power plant TG set is ready to take up the loads, the 11 KV bus shall be energized by closing the breaker in dead bus mode and the distribution transformer connecting the DG sets shall be energized. Then, 415 V breaker of the distribution transformer shall be closed by synchronizing the TG supply with the running DG supply, thus avoiding interruption of supply to the auxiliary loads. Immediately, first couple of breaker supplying power to the auxiliary load from DG sets shall be tripped to avoid continuous paralleling of the existing both DG sets with the new TG set. Now, the system shall be paralleled with the grid by synchronizing the 11 kV tie-breaker.

10.34Safety Regulations

Statutory regulations on safety measures shall be strictly followed. Safety appliances, viz. fire extinguishers, sand buckets, earth rods, gloves, rubber mats, danger boards, safety regulation charts, etc. shall be procured and installed as per safety norms. Oil collection pits and soak pits for the transformers shall also be constructed.

All air circuit breakers shall conform to IS-2516 partI. All switch fuse units on cubicle switch boards shall conform to IS-4047 specifications. All switch fuse unit on Industrial Boards shall conform to IS-4064 Part I and Part II specifications. All ammeters and voltmeters shall be size 100 mm class 2.5% accuracy and shall confirm to IS-1248. All current transformers shall be class 1% accuracy and shall confirm to IS-2705. All contactor shall be of air break type with at least 2 no. $\pm$ 2 auxiliary contacts and shall confirm to IS-2516(I).

10.35 Provision for additional power for Expansion to 7500 TCD

For future further expansion from proposed 4900 TCD to 7500 TCD, provision shall be given for addition of Turbo generator set of desired capacity in a separate building. Space to accommodate additional power house for Turbo-generator set with power distribution system etc. for further expansion of plant shall be given in the proposed plant layout.

11.2.7 Lightening Arrester

Lightning arrestors rated 30 KV, 10 KA will be provided for transformer equipment protection and on terminating ends of the transmission lines. The lightning arrester will be heavy duty station class type, discharge class III, conforming to IEC specification 99-6. Arrestors will be complete with Insulating Base, self-contained discharge counters and suitable mill ammeters.

11.2.8 Isolators and Insulators

Isolators complete with earth switch (wherever necessary), galvanized steel base provided with holes, solid core type post insulators with adequate creep age distance conforming to IS:2544, blades made up of non-rusting material, operating mechanism (gang operated, manual/motor charging mechanism) will conform to IS:1818. They will be of centre post rotating horizontal double break type and consist of 3 poles. The isolators will have interlocks with circuit breaker and earth switch.

11.2.9 AC & DC Auxiliary supplies

Supplies of single and three phase for illumination, transformer tap-changer drives, breaker /disconnect switch motors, space heaters in cubicles and marshalling kiosks shall be arranged from reliable AC supply source.

11.2.10 Safety Earthing System

A safety earthing system consisting of a buried GI flat conductor earthing grid will be provided. The earthing system will be formed to limit the grid resistance to below 1 ohm. as per IS: 3043.

The buried earthing grid will be connected to earthing electrodes buried underground. Neutral point of generator transformer, non-current carrying parts of equipment, lightning arrestors, fence etc. will be earthed rigidly. The following factors will be considered for earthing system design.

a. Magnitude of fault current
b. Duration of fault
c. Soil resistivity
d. Resistivity of surface material
e. Shock duration
f. Material of Earth Conductor, and

g. Earth mat grid geometry.

11.2.11 Structures

The structures will be made up of hot-dip galvanized steel and designed to withstand forces during normal conditions (viz. wind loads & dead load of components) and abnormal conditions (viz. short circuit, earthquake etc.)

11.2.13 Safety Regulations

Statutory regulations on safety measures shall be strictly followed. Safety appliances, viz. fire extinguishers, sand buckets, earth rods, gloves, rubber mats, danger boards, safety regulation charts, etc. shall be procured and installed as per safety norms. Oil collection pits and soak pits for the transformers shall also be constructed.

11.0 INSTRUMENTATION& CONTROL SYSTEM (D C S)

Accurate measurements and control of various process parameters are very important for efficient operations and safety of particular equipments in Sugar Industry & Cogeneration Plant. In a proposed Sugar Plant with Cogeneration, a need based Automation & Control system required to ensure stable & efficient operations of various sections in the Plant i.e. Mill, Boiler, Power House, Water Treatment Plant, PRDS and Boiling House (Clarification, Evaporators & Pan Station).

High ended DCS System & controllers and operating stations should be designed, software development with supervisory control console, inter-connected through Ethernet so that the total information about the Plant operation can be assessed from any operating station at various sections(Mill, Boiler, Power Turbine, Clarification Section, Pan Station, Evaporator Station, administrative block, Technical block. However, the Engineering Station &Servers should be centralised with proper redundancy in communication and power backup with printer(2 Nos.) with proper and separate earthing in the panels and power back-up. All process parameters of different sections should be with dynamic mimic diagrams.

Provision should be made for centralised online UPS System, 15% extra AOs and AIs and 15% DIs & Dos. All field instruments (transmitters/controllers/ control valves should be as per standard instrument practice along with proper standby for boilers, instruments & control system. Centralised Engineering Station for DCS system should be air-conditioned with proper ducting to maintain the temperature of control room (24 deg. C). The system shall have the capability and facility for expansions through

additions of stations, controllers, processors and processor IOs, IDs, AO &AI cards and Alarm & Event Display, Alarm Monitoring and Reporting. The supplier of Instruments & Control Systems has to provide trouble shooting & instruction manuals, training to the technical staff of Sugar Mills and will operate & maintain the instrument & control systems in all respects during warantee period free of cost and depute their Engineer, Programmer & Technician during the season for smooth functioning of the Control Systems.

12.1 Milling Section

12.1.1 Cane Carrier Speed Control

Cane carrier speed shall be controlled automatically, based on Donnelly chute level, to ensure uniform feeding of cane to first mill. Primary cane carrier shall follow speed of secondary cane carrier in a fixed ratio. Load of all cane preparation devices shall override the speed signal of each cane carrier. When load of any cane preparation device exceeds 70% of rated load, speed of that cane carrier shall be automatically proportionately reduced. If load exceed 100% of rated load, that cane carrier will stop. It will restart automatically when load on the cane preparation device fall below 100% of rated load. Cane carrier speed shall also be automatically controlled for maintain a set value of crush rate.

12.1.2 Speed Control of Mills

Load on first Mill will be measured and in case load increases above a set value, speed of cane carrier will be reduced to avoid overloading and jamming of first mill. Speed of first mill along with chute level will also be monitored and displayed. Normally first mill will run at a predetermined fixed speed. In case of load on mill increases beyond a set value, speed of mill will increase proportionally. Speed will reduce to pre-set value after overload is removed.

Speed, load and chute level of other three mills will also be monitored and displayed. Speed of these Mills will be controlled based on set point. Chute level and load on the mill will give overriding signals, so as to ensure optimum loading of the mill under all feeding

conditions. The operator will feed in the set point and speed will be controlled depending on load and level feedback signals. Proper inter-locking of all the DC & AC drives, Cane carrier, kicker, leveller and fibriser motors and all carrier drives for proper safety and reduced jamming.

12.1.3 Imbibition Water Flow Control & Temp. Control.

Imbibition water flow will be controlled to maintain a fixed ratio of imbibition water to cane. The desired ratio will be fed through the keyboard and the load on the third Mill will be measured. The flow of imbibition water will be regulated to maintain the ratio at various loads. If load of third Mill is below the minimum running load, imbibition water flow will stop. If third mill is bypassed, the system will automatically be controlled by second mill load through software program without any extra hardware cost. The level of the tank should also be monitored and controlled through VFD at pump and temperature of the maceration water is to be controlled between 70 – 90 deg. C.

DCS control system should include display of complete gimmick diagram of all the moving parts from cane carrier to bagasse carrier at milling station in motion. All the parameters like cane feed control speed control motor load amperage, levels of all the Donneley chutes, mill RPM, top roller lift indications, mix juice and imbibition water flow indications. Level in mix juice tank along with juice stabilisation system. All these parameters should be sensed and data logging and printing arrangement shall be provided. The entire display and control logging and printing system should be on DCS system and computerised control from air conditioned and dust proof control cabin.

12.2 Boiler Section

12.2.1 Drum Level Control

Drum level control of each boiler will be controlled by three element method. When boiler is running below 30% load, the control loop will automatically switch to single element control based on drum level. When drum level goes beyond these limits, an alarm shall be given to indicate “drum level high” or “low” as the case may be . In case drum level falls below minimum level, feed water control valve will open fully and “Drum lever very low” alarm will be given. In case drum level rises above maximum level, the feed water valve will open fully and “drum level very high” alary will be given. A standby three element control system for drum level and feed water regulation should be provided which

shall respond to the momentary fluctuations of the steam demand upto± 5% of the rated and CR of boiler in a separate instrument panel consisting of draft gauges, drum level pressure, temperature of steam and flue gas.

12.2.2 Auto Combustion Control of Boiler:-

This will be an integrated control loop for maintaining the steam pressure and improving combustion efficiency of boilers. The master controller will measure the steam pressure and speed of variable speed drive for bagasse feeders will be adjusted to maintain the required drive for bagasse feeders will be adjusted to maintain the required amount of primary air. To ensure that this arrangement is correct, the O2 signal from flue gases will be taken in the loop to make final correction to FD fan speed control by VFD, ID fan speed with VFD shall also be controlled to maintain a negative draft of 5 mm water column inside the furnace. Power Cylinders are to be fitted for complete opening and closure of the dampers at ID, FD and SA fans for remote control through DCS Systems. It will control the bagasse feeding, steam pressure & flue gas O_2 level etc.

12.2.3 De-aerator & HP Heater Pressure & Level Control System

This will be an integrated control loop for maintaining the temperature, pressure and level of the De-aerator and HP heater to maintain the required temperature, level & pressure in the tanks. De-aerator pressure shall be maintained by regulating the steam flow to the de-aerator so that temperature of boiler feed water is maintained at the desired set value. De-aerator level shall be controlled so as to balance the inflow and outflow of feed water.

12.2.4 Steam Temperature Control at Super Heater Outlet

Spraying feed water in the super heater system as per manufacturer's recommendations to control superheated steam temperature in close range to avoid any damage to turbine and consistent power output at rated efficiency of turbine.

Attemperator Temperature control should be provided through DCS. Following parameters are to be monitored.

1. Steam & Water flow with totalizer, super-heater pressure, temperature of various boiler parameters

l) Super heater steam at final super heater outlet and primary super-heater outlet. Feed water economiser inlet.

m) Feed water economiser inlet.

n) Feed water at economiser outlet.

o) Feed water at de-aerator inlet.
p) Flue gas temp. at boiler outlet
q) Flue gas temp. at economiser outlet.
r) Flue gas temp. at air heater outlet.
s) Flue gas temp. at KD fan inlet
t) Air temp. at ID fan inlet
u) Air temp. at air heater outlet
v) Furnace temperature**.**

All these parameters should be sensed and data logging and printing arrangement shall be provided. The entire display and control logging and printing system should be on DCS system and computerised control from air conditioned and dust proof control cabin

12.3 Steam Turbine

Following parameters are to be monitored and controlled through DCS System:-

a) Steam Flow at Turbine Control Valve
b) Steam pressure
c) Uncontrolled extraction (pressure& temperature)
d) Controlled pressure extraction
e) Vibration
f) Condensate operating pressure
g) Inlet temperature
h) Power factor
i) Cooling tower temperature
j) Remote control of cooling tower pumps
k) Uncontrolled extraction steam flow monitor & control
l) Pressure at different stages (oil & steam)
m) Ejector absolute pressure monitor & control.

All Gauges and indicators are to be provided in a separate panel near to the turbine with following parameters:

a) Steam Pressure Gauge

b) Steam Temp. gauge

c) Oil pressure gauge

d) Oil temp. gauge

e) Bearing temp. indicator for turbine

f) Bearing temp. indicator for gear box

g) Speedometer at stations.

h) Remote reading tachometer

i) Necessary oil pockets for the inlet live steam/ outlet exhaust steam

j) Steam flow meters

k) All essential tripping circuits to be provided as per turbine design parameters.

All these parameters should be sensed and data logging and printing arrangement shall be provided. The entire display and control logging and printing system should be on DCS system and computerised control from air conditioned and dust proof control cabin

12.4 Pressure Reducing & De-superheating Station

Pressure Reducing & De-superheating control valves shall be provided for controlling the temperature and pressure of the steam for Boiling House and to gain the additional steam for process. The quantity of live steam to the PRDS should be monitored with flow meter and totallizer.

12.5 Clarification and Evaporation Section

12.5.1 Juice Flow Stabilisation Control

Raw Juice from mill house shall be stablized to for consistent flow of juice to process section. The total juice flow to boiling house will be controlled as per a set point based onthe raw juice tank level and control with a mass flow meter and VFD driven pump. This set point will be automatically corrected according to the level in the raw juice tank, to take care of small changes in cane feeding rate. The control logic will be such as to ensure both high level and low level of juice in the tanks and actual set point will operate to maintain the tank level between 30% to 70% flow with flow variation of +/- 1.0%. In case of high or low level in juice tank, alarms will be generated to draw the attention of operator. If level of the tank is above the set point (upper limit),

then carrier speed should be reduced and is over rider to all parameters to prevent overflow from the raw juice tank.

12.5.2 Lime Control

Lime dosing to juice sulphiter shall be automatically controlled based on pre-set ratio to juice flow. The total lime slurry will be pumped to an overhead tank and overflow from this ill be fed to a lime-proportioning unit. The required amount of lime will be diverted to the process and rest will be sent back to the lime storage tanks. Lime flow will be measured to give feedback signal to the lime dosing control loop to ensure correct amount of lime is added to juice. In case juice flow reduced below 5% of crushing rate, the lime dosing unit will close 90% to 100% depending on operator set value.

12.5.3 PH Control

PH of treated juice will be measured and signal given to control speed of sulphur dosing pump of film type sulphur furnace. Combustion temperature of film type burner will be measured and air vent valve will be adjusted to control temp. of sulphur burner.

12.5.4 Clarifier Juice flow Control

Treated juice flow to clarifier shall be stablised according to a fixed set point for the stable flow to the flash tank and clarifier. This will be achieved with tank, magnetic mass flow meter and VFD on the pump. The tank level will govern the flow output and it will maintain between 30% to 70% level. Alarms will be generated for both high and low level in treated juice tank.

12.6 Evaporator Control

Automatically in case level in clear juice tank goes above or below set values. This will be achieved with flow meter and VFD on the pump. Also, there will be provision of water connection to wash of the juice on the evaporator tube surfaces and complete the batch pans cycle if any if factory requires shutdown of 8-10 hrs.

Syrup brix at evaporator outlet shall be measured and displayed on the operator station screen and to ensure final brix of above 66% and with limit of 70%. As with steam economy measures, factory steam % cane will be sensitive to evaporator syrup brix and lower value below 64% solid Clear juice flow to evaporators shall be controlled as per fixed set point and adjusted will increase the vapour requirement at pan and also vapour requirement for raw juice heating will decrease.

Vapour Pressure control to work at the designed saturation temp. is essential. Vapour pressure of last effect will be regulated by controlling the flow of vapour to condenser. Also, there will be throttle valve between 3rd and 4th effect, 2nd and 3rd effect to ensure vapour pressure in all the effects.

Water flow to condenser of last vessel of evaporator set shall be controlled based on vacuum in last body. Condensate flow from evaporator to boiler section shall be measured and recorded in the operator station, to enable estimation of exhaust steam consumption in the process. Excess Exhaust steam to the 1st body will go to vapour line through control valve. Similarly, the excess inlet vapours of 2nd body will go to 3rd body vapour line and excess of 3rd body will go to 4th body through proper control valves in bypass lines.

12.7 Pan Station

12.7.1 Molasses conditioners

Regulating the steam flow into the vessels will control the temperatures of molasses at outlet of molasses conditioners. Measuring the conductivity of molasses and controlling the water flow control valve will control this brix of molasses at 72% solid is important to maintain the pan vapour consumption as per designed steam balance.

12.7.2 Vacuum Control

Condenser water flow for each batch pan shall be controlled to maintain its vacuum during the pan boiling cycle. Vaccum will be controlled with provided Regulating type Single Entry Water control valves.

All these parameters should be sensed and data logging and printing arrangement shall be provided. The entire display and control logging and printing system should be on DCS system and computerised control from air conditioned and dust proof control cabin. The water consumption at the cooling and condensing system should not be more than 1.8 T/TCH.

12.7.3 Feed Control

Feed of syrup or molasses for all continuous pans, based on the conductivity measurement in each cell to ensure boiling super-saturation and existing crystal growth of seed of grain.

Batch pan shall be automatically controlled to maintain desired super saturating level during pan boiling cycle. Feed of syrup/ molasses shall be controlled based on

conductivity measurement of messecuite. The conductivity sensor shall be installed at the same level as the proof stick for proper co-relation between sensor reading and operator's checking.

There should be a separate spacious control room fully air conditioned (water cooled system) for providing the computerized control and monitoring and display centre for milling plant, boiler station, turbo alternator station, boiling house station, condensing and cooling system, pan station and centrifugal station etc.

12.8 Common Points

a) **All new workshop machinery shall be provided**
b) **All new Lab equipment's shall be provided**
c) **2/3 panel of common type /critical shall be in spare.**
d) **Electric motor of common type /critical shall be in spare.**
e) **Consumables shall be provided.**
f) **Control panel celling height shall must be 4 feet high from panel top.**
g) **MBC shall be properly covered.**
h) **LAN cables shall be used in DCS.**
i) **Centralized air conditioning system shall be provided for panel room**

Annexure-C-2

MISCELLANEOUS – CLARIFICATION AND ELUCIDATIONS

Annexure – C-2

MISCELLANEOUS – CLARIFICATION AND ELUCIDATIONS

1.0 Reducing Valves

Suitable for ultimate capacity of 4900 TCD.

The following along with required for mill, boiler and turbo generator shall be supplied with the machinery items shall be compatible to DCS.

(i) Two automatic steam reducing valve each to reduce pressure of 50,000 kgs of steam per hour from 110 - 104 kg/cm ^{2} g. to 7- 8 kg/cm^{2}g. pressure with suitable automatic desuper-heating arrangement and regulating system to maintain a steady temperature of 175 deg. plus-minus 5 deg.C. of the reduced pressure steam. There shall be provision for adjusting the down steam pressure at any pre-set valve between 7 to 8 kg/cm^2 g the reduced de-superheated steam shall be connected to a receiver with two branches to supply 15,000 kgs.of steam per hour to centrifugals, sulphur burners, mills, clarification equipment and boiling house etc.

(ii) The second branch shall be provided with two automatic steam reducing valve to maintain a steady pressure of 1.5 - 2.0 kg/cm2 g. in the receiver for exhaust steam from the prime movers by injecting steam up to 40000 kgs per hour, in each, after reducing pressure from 7-8 kg/cm2g. Suitable automatic de-superheating arrangement and relating system to be provided to maintain a steady temperature of 130 deg. C. plus-minus 5 deg.C. in the exhaust steam receiver by automatic de-superheating of the entire exhaust and make-up steam The de-superheated steam coming out of the exhaust steam receiver shall be dry.

There shall be provision for adjusting the pressure in exhaust steam receiver at any pre-set valve between 1.5 to 2.0 kg/cm^2 g.

(iii) Two pressure pumps with electric drive of suitable capacity (one standby) for injecting water in the specified reduced pressure steam lines through pneumatically operated control valves shall be provided for de-superheating.

(iv) All the reducing valves shall be provided with pneumatically operated pressure controllers designed to maintain steady pressure with down steam flow rate variation from 10% to 100% of the rated capacity. With overriding control system. One electric driven air compressor with receiver and piping shall be provided for operation of the reducing valves and de-superheaters.

One steam flow meter shall be provided in the high pressure side of the reducing valve system at (b)(i) above .

(vi) One steam pressure recorder capable of recording pressure up to 2.5 kg/cm^2 g. shall be provided in the exhaust steam line near the Evaporator station. A dial thermometer of 150 mm dia and 0-300 deg.C range shall also be provided in the exhaust line. One temperature recorder to record the temperature upto 300 deg.C shall be provided in the exhaust line near the Evaporator station. The system shall be campateable to central control DCS.

(vii) Suitable bypass arrangements as per IBR for each automatic reducing valve to be provided for manual operation. Isolating valves shall be provided to isolate the automatic valve for repairs while working. Steam strainers at upstream side of each reducing valve shall also be provided.

2.0 Pipelines and Fittings

All hot and cold water,, juice, syrup, magma, molasses, massecuite and bled vapours, live steam, reduced pressure and exhaust steam pipe lines shall be suitable for 4900 TCD and all headers shall be designed for ultimate capacity. Various pipelines shall be designed so that velocities given below are not exceeded at 4900 TCD.

(i)	Water and juice :	Suction 1.0 m/second Delivery 1.2 m/second.
(ii)	Condensate :	Suction 1.0 m/second Delivery 1.20 m/second
(iii)	Syrup :	Suction 0.5 m/second Delivery 1.0 m/second.
(iv)	Molasses :	Suction 0.3 m/second Delivery 0.5 m/second.
(v)	Massecuite/ Magma :	Suction 0.1 m/second Delivery 0.15 m/second
(vi)	Superheated/ Saturated steam :	30 m/second
	Exhaust steam :	30 m/second
	Bled vapours :	30 m/second
(vii)	Compressed air/ SO2 :	20 m/second

(viii) A maximum pressure drop of 2.0 kg/cm^2 g. shall be allowed from boiler outlet to the inlet of power turbine and maximum pressure drop of 0.10 kg/cm^2 g shall be allowed from power turbine to the inlet of evaporator.

(ix) All pipelines, valves etc. shall be designed for 4900 TCD and not for ultimate capacity, but main exhaust header, inter connecting piping at evaporator and vapour piping to pans shall be designed for capacity of 4900 TCD for 22 hrs. basis.

Safety valves to be provided in the steam pipe lines wherever necessary. Blow off pipes shall extend beyond the roof/factory buildings safety valves in the exhaust and reduced pressure lines shall be butterfly type auto operated compatible to DCS. Suitable drains, valves, steam traps etc. shall be provided in all steam lines, where necessary. High pressure steam manifold of 500 mm shall be provided for ultimate capacity. It

shall have additional provision of blind nipple for one additional boiler on incoming side one additional inputs for turbo alternator on outgoing side. It shall have flanged ends.

The pipes shall conform to specifications given below :

(i) Cast Iron Pipes and Fittings :

The pipes shall be class 'B' and shall conform to IS:1537-1976 specifications and integrally cast flanged joints or spun pipes with screwed ends on flanges as per IS:1536-1976 shall be used.

The pipe fittings shall be class 'B' and shall conform to IS:1538 (part I to XXIII) - 1976 specifications. Only flanged joints shall be used. One side of the flanges shall be machined in case all pipe fittings.

(ii) Mild Steel Pipes

All mild steel pipes and pipe fittings used for conveying of air, cold water, to water (except boiler feed water) oil (except oil for hydraulic accumulators), molasses, massecuite, juice, lime, syrup, noxious gases etc. shall conform to IS:1239(part I)-1976 and IS:1239 (part II)-1982 specifications. All juice from mills to inlet to evaporater shall be of SS grade 304 schedule 20 and syrup piping including imbibition juice piping shall be class `C' (heavy) and rest of the piping shall also be of class `C' class (heavey). The thickness of mild steel pipes having diameter more than 200 mm shall be 8 mm.

In case of all piping above 25 mm NB only flanged joints shall be used. All flanges to be as per IS:6392-1971 or to suit connecting prescribed valves.

(iii) Live steam, exhaust steam and boiler feed water piping:

These shall conform to I.B.R. wherever applicable. The thickness of exhaust and vapour steam piping shall be minimum 8 mm in case of 300 mm dia. and above.

The distance between two flanges in straight portion of pipes shall not exceed 6 metres except steam, vapour feed water pipe. In case of bends, flanges shall be provided atleast at one end. All steam expansion bellows shall be of stainless steel tested at 1.5 times the exhaust steam pressure.

Valves shall be provided in each branch line of juice heater,, reduced pressure steam lines, water separator, drain, steam trap etc.

All delivery lines of juice, water and syrup of centrifugal pumps shall have non-return valves except in case of unstrained imbibitions juice pump, lime and Mud pumps, Water connections to be provided at each station for cleaning.

All exhaust steam valves for evaporator and pans shall be right angle valves.

All bearing and oil cooling water to be collected in a masonry tank which shall not be more than 10 metres away from the factory building.

3.0 Supporting steel structure

(i) Necessary staging for all the machinery including supporting columns, integral floor structure, staircases, railings etc. shall be provided. Mills, mill drive, turbo generator, clarifier and lime slaker shall be on R.C.C. staging. Sulphur furnaces shall be on steel staging with R.C.C. flooring. Other machinery except those on floor level shall have its own supporting steel staging.

Pipelines, mill and power house cranes, condensers, flash tanks, cyclone separators can be supported on building columns. No weight of other machinery or platform shall be transmitted to building columns. Mills to have mild steel chequered or perforated or grating flooring. Centrifugals to have chequered plate floor. In the boiling house chequered plate flooring shall be provided. All gangways, passages, staircases, working platform and railings shall be convenient. Chequerred plate thickness shall be minimum 6 mm.
End columns of pan staging to be similar to intermediate columns to take load of pans to be added.

A clear working platform of atleast 2.0 m. width shall be provided in working front of pans and evaporator bodies. Moving space between pans shall be 1000 mm and in evaporator bodies a distance of 750 mm shall be provided. In case of other units a clear working platform of atleast 1.2 m. width to be provided.

All statutary requirement regarding staging platform staircases, safety devices etc. shall be observed at the design stage.

4.0 General Material Specifications

i) Gun metal used for bushes and bearings shall conform to IS : 318-1965.

ii) White metal used for lining of bearings shall conform to IS : 25-1966.

iii) Phospher bronze castings shall conform to IS: 28-1975.

iv) The mill drive pinions shall be made of cast steel as per IS:2708-1973B Grade III and gear wheels as per IS:2708-1973 Grade II.

v) Cast iron flexible couplings shall conform to IS:2693-1964.

vi) Glass wool for vessels and piping shall conform to IS:3690-1974 type 2. Mineral wool shall conform to IS:5696-1970. The thickness shall be to suit the temperature and diameter of pipe.

vii) Sheet rubber shall conform to type 8 of IS:638-1965. Grades to suit the nature of work.

viii) Compressed asbestos fibre shall conform to IS:2712-1971.

ix) Cast iron sluice valves shall conform to IS:780-1969.

x) Gun metal valves (not used for live steam) shall be heavy duty and shall conform to IS:778-1971.

xi) Plummer blocks used for roller bearings shall conform to IS:4773-1968.

xii) The slide rails for electric motors, if of grey cast iron conform to grade 15 of IS:210-1962. The slide rails shall be as per IS:2968-1964.

xiii) Stirrer shaft for crystallizers, pugmills, magma mixer, lime tanks, sugar melter, juice sulphiter, molasses dilution tank etc. shall conform to 30 C8 of IS:1570-1979 or equivalent, except when mild steel fabricated pipes are used.

xiv) Mild steel plates shall conform to IS:2062-1969 in case of fabricated headstocks, side caps, mill bearings, gear beds, for mill drive and all fabricated parts subjected to steam pressure higher than 1.5 kg/cm2.

xv) Structural steel and mild steel plates conforming to IS:226-1975 or equivalent shall be used for the fabrication of rest of the machinery and equipment.

xvi) All S.S. tubes shall be of grade SS-304 conforming to alloy I.S. 13316 fully annealed after final drawing.

xvii) Shaft mounted high efficiency helical planetary drive shall be M.S. Fabricated / C.S. construction.

xviii) Specification of right angle, double beet valve and Butterfly valve are as follows:-

a) M.S. Fabricated right angle valve

- O/S Yoke type rising Spindle
- S.S. – 410 Spindle
- S.S. – 410 Body Seat
- Flap Seat of EPDM Rubber suitable for 160 deg. C.
- Double Thrust Bearing for Easy Operation
- Without Flange Ends

b) S.S. fabricated double Beat valve

- S.S. – 409 Body heavy duty
- S.S. – 410 spindle
- S.S. body seat with Casted Guide
- S.S. Flap fitted with EPDM rubber
- Flange ends as per Table 'D'
  Top and Side flanges of MS

c) Butterfly valve

Item : Centerline (RS) wafer type soft seated butterfly valve
Body : Gray cast iron BS EN 1561 Gr. EN-GJL-250 phosphate and painted upto 300 mm, and sg IRON BS EN 1563 Gr. EN GJS-15 phosphate and painted for size 350 mm and above.
Disc : SS 316 floating disc design
Seat : Grade EPDM field replicable with back metal strip
Stem : AISI type 410
Ends : Water type to get sandwiched between flanges as per ANSI B 16.5 # 150

Method of operations : Manual hand lever operated upto size 150 mm and worm gear wheel operated for size 200 mm and above.

Leakage rate : As per ANSI B 16.104 Class VI (100%) leak tight
Shut off : Pressure 10 barg
Hyd. Body : Test 1.5 x sut off pressure
Hyd. Seat : 1.1 x shut off pressure

5.0 General

The Plant and Machinery is to be according to the guide line specifications for 4900 TCD, plant finalised by the govt. Of India and should incorporate the fallowing

1) In designing factory building and engineering layout criterion should be attached to local wind direction to ensure the following. General layout of plant and machinery shall show equipment for ultimate capacity.

- Effective natural ventilation of Power House.
- Non contamination of circulating waters by acidic agents.
- Statutory requirements of pollution preventions.

2) The factory floor levels as well as injection channels and cooling tower levels shall be decided to suit the topography at the Sugar Plant site.

3) Eves height of bagging house shall be to facilitate Sugar bins installation .

4) Plant and machinery to confirm to all State and Central laws.

5) All the cranes in the Sugar Plant (including cane unloader) should have box type bridge girders (and not lattice type). All the gear boxes installed on the cranes should be helical type having hardened and ground teeth, subjected to purchaser approval.

6) The O&M manuals, drawings, specifications etc. should be supplied by the Seller to the Purchaser 4 months before the scheduled date of commissioning of the Sugar Plant and should also include the following:

i) List of Ball/Roller bearings fitted in the Sugar / Power Plant (equipment wise stating bearing Nos.)

ii) List of all electric motors installed in the Sugar Plant (equipment wise stating motor type, H.P., RPM etc.).

List of all VFD's installed in the sugar / power plant with specification.

List of all valves / NRVs installed in the sugar / power plant with specification stating duty.

iii) List of all Reduction gear boxes installed in the Sugar Plant (equipment wise stating gear box type, ratio, H.P., rating, service factor etc.)

iv) List of pumps installed in the Sugar Plant (pump type, duty, discharge, total head etc.)

v) List of all coupling bushes, oil seals etc. fitted in the Sugar Plant (stating size wise qty and equipment name where the part is fitted).

7) The Sellers shall not make the use of building columns and trusses for lifting weights of machinery during erection. Factory building structure should not be used as stating for any items of machinery and equipment (except mill and power house cranes & piping).

8) All the Grit catchers in the Sugar Plant should be 800 mm dia. x 1000 mm height – shell 8 mm thick, bottom 10 mm thick, cover plates 20 mm thick. Covers should be hinged and cover holding bolts should be 25 mm dia. The bucket screens should be made of 3 mm thick. AISI 304 quality S.S. and should have sturdy handles for lifting.

9) Condensate outlet pipes from various units to have sight glasses at eye level in addition to sight glasses in extracting columns. Test cocks should also be provided for taking out condensate samples.

10) Test cocks should be provided in condensate outlets of all units individually for testing water for sugar traces. All the condensate pumps delivery lines should have 50 mm NB connection with a valve to let out the water in the drain, as and when sugar traces are found in the condensate.

11) Size of Condensate Receivers for Juice heaters and Evaporators shall be not less than 400 mm dia x 1200 mm height – Shell 8 mm thick, bottom 10 mm thick. Size of syrup receiver shall not be less than 1200 mm dia x 2000 mm height – shell and bottom 10 mm thick.

12) The RPM of the motor of the condensate extraction pumps should not be more than 1500.

13) Heating surfaces of juice heaters evaproator bodies, pans and boilers shall be calculated on the basis of mean diam and effective tube length with contact of heating fluid.

14) All the pumps of juice, lime and syrup should be provided with suitable catchers in the suction side. Also, juice delivery lines should be provided with non-return valves.

15) All the centrifugal pumps should have stop and non-return valves in the delivery pipes.

16) Centrifugal pumps: The service water pumps, injection and spray water pumps, syrup pumps, melt pumps should be bronze fitted. Otherwise these and other (except at mill house) centrifugal pumps should conform to IS-5659 and IS-5120 specifications.

17) All the vapour line of the pans and last body of the evaporators should be provided with a manhole to enable accessibility inside the vapour lines for cleaning and painting purposes. One 100 m dia x 150 mm long nipple should be welded in the vapour pipe along with a blind flange to enable water filling of the vapour line.

18) The diameter of the pipes for filling water into bodies and calandrias of evaporator and pans should not be less than 100 mm size.

19) All the valves for massecuite and magma lines should be of rising spindle type only and shall have S.S. internals and S.S. spindle.

20) All massecuite, magma and molasses lines at crystalliser and centrifugal stations should be provided with suitable size steaming arrangements along with non-return valves. Vapour from 1st vessel of quintuple shall be used.

21) The sluice/right angle valves used in exhaust steam and vapour pipelines shall have stainless steel internals and S.S. spindles.

22) Suitable capacity steam traps shall be provided in the exhaust line for the outlet of the condensate.

23) Steam flow meter of indicating, integrating and recording type shall be provided for PRDS shall be compatible to DCS.

24) Temperature recorders for raw, sulphited juice, evaporator exhaust steam, injection outlet/inlet water and vacuum recorder for last body of evaporator shall be provided at appropriate place, compatible to DCS.

25) For lagging the equipments, pipes and fittings etc. of the sugar plant as per specifications the Sellers scope of supply should be as follows:

All the equipments and pipelines (including fittings as defined under Clause 6 of IS:7413 specifications), surfaces in the sugar plant above 55 deg. C. temperature should be effectively lagged (except where heat dissipation is desirable and the surfaces which become hot intermittently such as steam traps and relief valve outlet pipes, vents, blow-down pipes etc.)
Material to be used:

i) For lagging: Factory made mattresses of Mineral wool (LRB mattresses) as per IS:8183 – (latest issue) specifications. The bulk density of the material should be:

100 kg/m^3 for hot surface temperatures upto 250 deg. C.

120 kg/m^3 for hot surface temperatures above 250 deg. C. but upto 550 deg. C.

(as per clause 3.2 of IS:8183 – (latest issue) specifications)

The thickness of the lagging should be such that the difference between temperature measured (at any time during the maintenance warranty period as per clause 22 of the draft agreement) at any point on the outer surface of the lagging cladding (i.e. protective finish) and the ambient temperature at that time should not exceed 10 deg. C.

ii) For protective finish:

Material for cladding of all lagging in the sugar plant should be 22 gauge aluminium sheet cladding (as per IS:7413 standard specifications) (except as follows). It includes fixing of 'L' lugs, M.S. flat rings, wire netting stitched with lacing wire and fixing of aluminium sheet with the help of self taping screws and grooving all joints with necessary overlap to make it completely water proof.

a) The valves and flanges (including the flanges of the equipment) to be lagged shall be provided with openable lagging boxes for valves and fittings of the HP steam lines (including boiler plant) openable boxes shall be out of 18 SWG thick aluminium sheets as per IS:737 designation 31000 condition H3.

b) All the turbines lagging should be provided with boxes of 3 mm thick Aluminium sheets. Lifting block should be provided for these boxes.

iii) Balance materials (not specified above) should be as per IS:7413 specifications.

Application and finishing of the lagging materials, protective coverings etc. should be carried out by the Seller as per IS:7413 (latest issue) specifications.

26) All maintenance tools, tube expanders etc. to be supplied by the Seller to the Purchaser as per scope of supply stipulated under this Agreement should be brand new and should not be those used by the Seller for erection and commissioning of the Sugar Plant.

27) All nuts and bolts and non-return valves should be as per ISI specifications.

28) In cases tensile strength or solidily has been mentioned the supplier shall submit a suitable certificate of the same from original manufacturer/Govt. approved testing laboratories/Govt. Engineering Colleges.

29) Suitable arrangements shall be provided for continuous sampling of following

Primary juice

a) Last mill juice
b) Mixed juice
c) Clear juice
d) Unsulphited / Sulphited syrup

6.0 INSTRUMENTATION AND AUTOMATION

Statutory Requirements

6.1 Online Conductivity Measurement of condensate water

i) To ensure the computability the sensor and transmitter shall be of same make.

ii) Well-designed and fabricated sampling system for each line shall be provided along with alarms and indication at DCS for sugar contamination. Exhaust condensate shall drain automatically in case of sugar traces in condensate.

6.2 DCS control rooms and Instrumentation panel

Factory shall have AC control rooms for different houses for centralised control. DCS control rooms of each house control their operations but indication/display shall be made available to other control rooms.
All the panel mounted instruments which are integral part of the following control and measurement systems shall be housed in a well designed, fabricated and wired instrumentation panel.
All the panel mounted instruments which are integral part of the following control and measurement system shall be housed in a well designed, fabricated and wired instrumentation panel.

- Auto Cane Feed Control System
- Auto milling controll
- Automatic Imbibition Water Flow and Temperature Control System
- Online Mass Flow Meter for juice and water
- Automatic pH Control System for Juice Defecation
- Online Brix Indicators
- Automatic Brix and Temperature Control of Molasses Conditioner & melter
- Online conductivity measurement of condensate water- For exhaust condensate only.
- Automatic massecuite level control in pug mill
- DCS Boiler Instrumentation, Automation and control system.
- Turbine DCS supervisory and control system.
- Massecuite feed control for continuous centrifugal machine

6.3 Microprocessor based Datalogger

For recording various process parameters like pressure, temperature, flow level etc. at various equipments in the boiling house two numbers µp based 32 channels data loggers specifications with 80 column dot matrix printer/132 column dot matrix printer/inkjet printer having following specifications shall be provided : one at evaporator floor and the other at pan floor.

Specifications

1.	Input	:	Universal
		a)	Thermocouple as per DIN 43710 (other than standard on request) (J,K.E,R,S,T,N,B grounded or ungrounded) Input resistance ≥ 1M
		b)	RTD PT - 100 as per DIN 43760 (Excitation current ≤ 2.5 mA)
		c)	Electrical signal (0/4-20 mA, 0/1-5 V.DC) Input resistance ≤250 for current input Input resistance ≥ 500 K for voltage i/p
2)	Display & Internal Scan Time	a) b) c) d)	3 ½ digit, ½", 7 segment LED display for process variable. 2 digits, ½", 7 segment LED display for channel no. 16 x 2/20 x 2 backlit LCD 50 m sec. per channel
3)	Range & Accuracy	:	Keyboard configurable for each channel separately with reading accuracy of 0.25% of F.S.
4)	Alarm facilities	:	2 settings (HI & LO) per channel over entire range, Facilities alarm output (NC/NO), programmable alarm acknowledgement & alarm status (bicolor LEDs) for each channel shall be provided.
5)	Broken Sensor	:	Indicated by displaying error message on display
6)	C.M.R.R	:	120 db
7)	Memory	:	It shall be possible to retain the user interaction memory for more than six months in case of power failure
8)	Operating Temperature	:	0 to 50°C with maximum ± 0.015% /°C drift
9)	Mains supply	:a)	230 V AC, ± 10%, 50 Hz, single phase (Standard)
		b)	110 V AC, ± 10%, 50 Hz, single phase (Optional)
10)	Communication Port	a)	RS 232 or RS 485 with Modbus RTU protocol for PC communication

		b)	Centronic parallel port for printer (log & print interval shall be user configurable with different print options)

6.4 Documentation

The following documents shall be sent to the Purchasers' Consultant for approval.

- Instrumentation hookup diagram.
- P & I diagram.
- Specification of instruments i.e. Range, make etc.
- Orifice plate design calculation data sheet as per BS 1042 for flow meters.
- Control valve sizing and Cv calculations.
- Instrument control panel cutout, foundation and panel wiring drawing.
- List and specification of erection material.

* Impulse tubing shall be of SS316/304 15 NB sch 40 pipewith SS isolating and drain valves.
* Instrument cables from field transmitters to panel shall be 1.5 mm x 1 pair armoured Cu signal cable.
* Field Junction boxes to DCS panels will be 1.5 sq.m(6 pair/12pair/2pair) Armoured Cu signal cable.

The following documents shall be submitted in triplicate along with instruments to the end user :

- Erection drawing and instrumentation calibration and test reports.
- Operation and servicing manuals.

6.5 Central data acquisition system

It shall be possible to connect all the data loggers to the centralised PC based data acquisition system

6.6 Instrumentation Control Rooms

To achieve the desired working performance of various instrumentation measurement and control system even under extreme conditions like shock, vibrations, humidity, electrical interference installation of instrumentation panel shall be done in well designed and constructed rooms as per the standard instrumentation practices.

ANNEXURE C-3

DRAFT OF BANK GUARANTEE AGAINST FIRST &
SECOND ADVANCE PAYMENTS TO BE GIVEN BY E.C.

Bank Guarantee No._____

THIS GUARANTEE MADE THIS_____day of _____ Two thousand & seventeen, by the _____ Bank, having its branch office at _____ (hereinafter called 'The Guarantor' which expression shall, unless repugnant to the context or contrary to the meaning thereof, include its successors and assignees) of the one part in favour of Kisan Sahakari Chini Mills Ltd., Gajraula ,Distt. Amroha, Uttar Pradesh hereinafter called 'The Purchaser' which expression shall, unless repugnant to the context or contrary to the meaning thereof include its successors and assignees) of the other part.

WHEREAS M/s .....**,** a company registered under the Indian Companies Act, **.....** having its registered office at ..... and chief place of business at **.....** (hereinafter called 'The E.C.' which expression shall unless repugnant to the subject or context include their legal representatives, administrator, successors or permitted assignees) has entered into with the Purchaser an Agreement dated _____ (hereinafter called the said Agreement) to dismantle and shift the old plant and machinery, erect & commission the new machinery & equipment for the Purchaser's sugar plant with co-genaration at Kisan Sahakari Chini Mills Ltd., Gajraula ,Distt. Amroha, Uttar Pradesh in accordance with the terms and conditions therein contained. (hereinafter referred to as the said machinery & equipment)

AND WHEREAS under clause ------ of the said Agreement, the Purchaser is required to pay to the E.C. against the security of a Bank Guarantee an advance payment of **Rs..... lakhs (Rupees .....only)** representing 10% (Ten per cent) of portion of **Contract Price mentioned** at **clause no. 1.1 as first/second advance payment** for the purpose for the said erection and commissioning **and such** guarantee to be valid till the full advance amount is adjusted against the payment to be made to E.C.

AND WHEREAS before advance payment as aforesaid is made the Guarantor has at the request of the E.C. agreed to give a guarantee as hereinafter contained.

NOW THIS DEED WITNESSES AS FOLLOWS:

(o) In consideration of the premises the Guarantor hereby undertakes to pay the Purchaser within thirty days of demand and without demur such a sum not exceeding **Rs..... lakhs (Rupees .....only)** as the Purchaser may demand representing 10% (Ten per cent) of **the Contract** Price, and if the Guarantor fails to pay the sum within the said period, the Guarantor will also pay, on the sum demanded, interest @ 12 % (Twelve percent) p.a.from the date of advance till the date of payment. Provided that the liability of the Guarantor hereunder shall be adjusted and reduced with the progress, erection and commissioning by E.C. **and to the extent adjustment shown in E.C. Bills** upto that time as per clause **10.0** and **its** sub-clauses of the said Agreement.

(p) The Guarantor shall pay to the Purchaser on demand the sum under Clause 1 above without demur and without requiring the Purchaser to invoke any legal remedy that may be available to them, it being understood and agreed, FIRSTLY that the Purchaser shall be the sole judge of and as to whether the E.C. have committed breach of any of the terms and conditions of the said agreement and SECONDLY that the right of the Purchaser to recover from the Guarantor any amount due to the Purchaser shall not be affected or suspended by reasons of the fact that any dispute or disputes have been raised by the E.C. with regard to their liability or that proceedings are pending before any Tribunal, Arbitrator(s) or Court with regard thereto or in connection therewith, and THIRDLY that the Guarantor shall immediately pay the aforesaid guaranteed amount to the Purchaser on demand and it shall not be open to the Guarantor to know the reasons of or to investigate or to go into the merits of the demand or to question or to challenge the demand or to know any fact affecting the demand and LASTLY that it shall not be open to the Guarantor to require proof of the liability of the E.C. to pay the amount before paying the aforesaid guaranteed amount to the Purchaser.

(q) This Guarantee shall come into force from the date hereof and shall remain valid till 90 days after the full advance amount is adjusted under clause **10.0** & its sub-clauses of the said agreement, which according to the terms and conditions of the said Agreement is stipulated to be adjusted by **proportionate** 10% (ten per cent) of the **Contract Price mentioned at clause 1.1 of the said agreement** of the E.C. for effected actual progress of the erection and commissioning at site, but if the actual progress as aforesaid have not been completed by the E.C. within the said period for any reason whatsoever, the Guarantor hereby undertakes that the E.C. shall furnish a fresh or renewed guarantee on the same proforma for such further period as the Purchaser may intimate failing which the Guarantor shall pay to the Purchaser a sum **or sums** not exceeding **Rs.....lakhs (Rupees .....only)** or the residual amount of balance advance left after proportionate adjustment in accordance with clause 1 above alongwith the interest @ 12 % (Twelve percent) p.a. on unadjusted amount, as the Purchaser may demand.

(r) This guarantee is in addition to and not in substitution for any other guarantee executed by the Guarantor in favour of the Purchaser on behalf of the E.C.

(s) The E.C. and the Purchaser will be at liberty to vary and modify the terms and conditions of the said Agreement without affecting this guarantee, notice of which modifications to the Guarantor is hereby waived and the same shall be deemed to have been done with the assent of the Guarantor.

(t) This Guarantee shall not be affected by any change in the constitution of the Guarantor or of the E.C. nor shall the guarantee be affected by the change in the constitution of the Purchaser or by amalgamation or absorption with any other body corporate and this guarantee will be available to or enforceable by such body corporate.

(u) This guarantee is irrevocable except with the written consent of the Purchaser.

(v) The neglect or forbearance of the Purchaser in enforcing any payment of moneys, the payment whereas is intended to be hereby secured or the giving of time by the

Purchaser for the payment thereof shall in no way release the Guarantor from its liability under this guarantee.

(w) The invocation of this guarantee shall be by a letter signed by the Purchaser and countersigned by Managing Director, U. P. Copperative Sugar Factories federation Limited notifying/declaring the amount of advance remaining unadjusted and payable to the purchaser.

(x) Notwithstanding anything stated hereinbefore the liability of the Guarantor under this guarantee is restricted to Rs..... lakhs (Rupees .....only) alongwith the interest @ 12 % (Twelve percent) p.a. on unadjusted amount. This guarantee shall remain in force upto …….. Unless a demand or action under this guarantee is filed against the Guarantor in writing within three months from the date of expiry i.e. on or before …….. all rights of the Purchaser under this guarantee shall be forfeited and the Guarantor shall be released and discharged from all liabilities hereunder.

IN WITNESS WHEREOF _____ for and on behalf of the Guarantor have signed this deed on the day and year above written.

Witnesses: For and on behalf of the Guarantor

ANNEXURE C-4

DRAFT OF BANK GUARANTEE FOR TIMELY ERECTION & COMMISSIONING

THIS GUARANTEE MADE THIS_____ day of _____,Two thousand seventeen, by the _____ Bank, having its branch office at _____ (hereinafter called 'The Guarantor' which expression shall, unless repugnant to the context or contrary to the meaning thereof, include its successors and assignees) of the one part in favour of The Kisan Sahakari Chini Mills Ltd., Gajraula ,Distt. Amroha, Uttar Pradesh. (hereinafter called 'The Purchaser' which expression shall unless repugnant to the context or contrary to the meaning thereof include its successors and assignees)of the other part.

WHEREAS M/s _____, a company registered under the Indian Companies Act, 19__ having its registered office at _____ and chief place of business at _____ (hereinafter called 'The E.C.' which expression shall unless repugnant to the subject or context include their legal representatives, administrator, successors or permitted assignees) has entered into with the Purchaser an Agreement dated _____(hereinafter called the said Agreement) to dismantle and shift the old plant and machinery, erect & commission the Machinery and Equipment for the Purchaser's proposed sugar plant at Kisan Sahakari Chini Mills Ltd., Gajraula ,Distt. Amroha, Uttar Pradesh in accordance with the terms and conditions therein contained (hereinafter referred to as 'the said Machinery and Equipment)

AND WHEREAS under clause ------ of the said Agreement the Erection Contractor (E.C.) are required to furnish to the Purchaser a Bank Guarantee in respect of timely erection and commissioning of the said Machinery and Equipment as provided in Schedule ‘A’ of the said Agreement for the sum of Rs._____/- (Rupees_____ only) being 10% (Ten per cent) of the total contract price (given at section 1.1). Such guarantee to be valid till 30 days after the scheduled date of commissioning of the Machinery and Equipment.

AND WHEREAS at the request of the E.C., the Purchaser has agreed to accept a Guarantee from the Guarantor being these presents to secure such obligations on

conditions expressly that the Guarantor shall on demand and without demur pay the aforesaid guaranteed amount to the Purchaser.

AND WHEREAS the Guarantor has at the request of the E.C. agreed to give the guarantee as hereinafter appearing.

NOW THIS DEED WITNESSES AS FOLLOWS:

K) In consideration of the premises the Guarantor hereby undertakes to pay the Purchaser within three days of demand and without demur such a sum not exceeding Rs. _____(Rupees _____ only) representing 10% (Ten per cent) of the Contract Price (given at section 1.1) as the Purchaser may demand, and if the Guarantor fails to pay the sum within the said period the Guarantor will also pay, on the sum demanded, interest at the bank lending rate then prevailing reckoned from the date of demand.

L) The Guarantor shall pay to the Purchaser on demand the sum under clause 1 above without demur and without requiring the Purchaser to invoke any legal remedy that may be available to them, if being understood and agreed, FIRSTLY that the Purchaser shall be the sole judge of and as to whether the E.C. have committed breach/or breaches, of any of the terms and conditions of the said Agreement and SECONDLY that the right of the Purchaser to recover from the Guarantor any amount due to the Purchaser shall not be affected or suspended by reasons of the fact that any dispute or disputes have been raised by the E.C. with regard to their liability or that proceedings are pending before any Tribunal/Arbitraotr(s) or Court with regard thereto or in connection therewith, and THIRDLY that the Guarantor shall immediately pay the aforesaid guaranteed amount to the Purchaser on demand and it shall not be open to the Guarantor to know the reasons of or to investigate or to go into the merits of the demand or to question or to challenge the demand or to know any fact affecting the demand and LASTLY that it shall not be open to the Guarantor to require proof of the liability of the E.C. to pay the amount before paying the aforesaid guaranteed amount to the Purchaser.

M) This guarantee is in addition to and not in substitution for any other guarantee executed by the Guarantor in favour of this Purchaser on behalf of the E.C.

N) The E.C. and the Purchaser will be at liberty to vary and modify the terms and conditions of the said Agreement without affecting this guarantee, notice of which modifications to the Guarantor is hereby waived and the same shall be deemed to have been done with the accent of the Guarantor.

O) This guarantee shall not be affected by any change in the constitution of the Guarantor or of the E.C. nor shall the guarantee be affected by the change in the constitution of the Purchaser or by amalgamation or absorption with any other body corporate and this guarantee will be available to or enforceable by such body corporate.

P) This guarantee is irrevocable except with the written consent of the Purchaser.

Q) The neglect or forbearance of the Purchaser in enforcing any payment of moneys, the payment whereas is intended to be hereby secured or the giving of time by the Purchaser for the payment thereof shall in no way release the Guarantor from its liability under this deed.

R) This guarantee shall come into force from the date hereof and shall remain valid till _____i.e. one month after the commissioning of the Plant and Machinery for the said plant is completed in all respects and to the satisfaction of the Purchaser and the said plant is commissioned in accordance with the stipulation in the said Agreement for which the stipulated date according to terms and conditions of the said Agreement is, but if the date is for any reason whatsoever and upon such extension the E.C. fails to furnish or renew Guarantee for the extended period, the Guarantor shall pay to the Purchaser the said sum of Rs._____/- or such lesser sum as the Purchaser may demand.

S) The invocation of this guarantee should be accompanied by a claim letter signed by the Purchaser and countersigned by Managing Director, U. P. Copperative Sugar Factories Federation Limited

T) Notwithstanding anything stated hereinbefore the liability of the Guarantor under this guarantee is restricted to Rs._____/- (Rupees _____only). This guarantee shall remain in force upto unless a demand or action under this guarantee is filed against the Guarantor in writing within three month from the date of expiry all rights of the Purchaser under this guarantee shall be forfeited and the Guarantor shall be released and discharged from all liabilities hereunder.

IN WITNESS WHEREOF _____ for and on behalf of the Guarantor have signed this deed on the day and year above written.

Witnesses: For and on behalf of the Guarantor

SECTION D DRAFT AGREEMENT FOR Civil works

ON NON JUDICIAL STAMP PAPER (VALUE Rs.100)

FOR CONSTRUCTION OF BUILDINGS, FOUDATIONS AND OTHER CIVIL WORK

This agreement made on the day of……..2024 (……two thousand Twenty Three) at Gajraula (Distt. Amroha) between The General Manager, Kisan Sahakari Chini Mills Ltd., Gajraula, Distt. Amroha – 276 406, Uttar Pradesh, a cooperative society registered under the U. P. Cooperative Societies Act , having its registered office at Gajraula (Distt. Amroha) (hereinafter called the "MILLS"), which expression shall, unless repugnant to the subject or context, include their successors and assignees represented by ……. of the Seller/Successful Bidder/Civil Contractor having its registered office at ……hereinafter called the Civil Contractor which expression shall, unless repugnant to the subject or context, include their legal representatives, administrators, successors or permitted assignees represented of the OTHER PART.

WHERAS the Mill are going to purchase refined sugar producing plant of crush rate of 4900 TCD at Gajraula (Distt. Amroha), under the agreement between the mills and M/s. …….. (hereinafter called the Supply contractor).

Whereas the offer of Seller/Successful Bidder/Civil Contractor vide bid dated…….. for construction of foundations and buildings necessary for successful erection and commissioning the plant and machinery for refined sugar producing plant at Kisan Sahakari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh (thereafter referred to as the site) as specified in Annexue D-1 annexed hereto and forming part of this agreement (hereinafter referred to as 'the said machinery and equipment') has been accepted by the Mills on the terms & conditions hereinafter appearing .

Whereas the contract price hereinafter mentioned is based on the Civil Contractor undertaking to construct foundations and buildings and make ready for commercial use of the said buildings and by …….. in which respect the time is essence of the contract and if the Civil Contractor fails to do so, the contract price shall stand reduced as hereinafter provided.

NOW THEREFORE , the parties hereto have agreed on the following terms and condition for construction of foundations and buildings and their matters connected therewith referred to herein

1.0 CONTRACT PRICE

1.1 The Seller/Successful Bidder/Civil Contractor agreed to construct foundations for the said machinery and equipments to be purchased by the Mills under the supply contract and also to construct buildings necessary for smooth operation of the plant, as specified in Annexure D-1 & Annexure D-2 annexed to and forming part of the Agreement with the purpose to successfully design supply machinery and equipment of the required sugar plant with power plant and satisfy other relevant technical parameters related to such sugar plant with power plant and to do other works hereinafter mentioned, at a total price

of …… (Rupees…….lacs) hereinafter referred to as the' contract price' subject to the terms and conditions hereinafter provided as given below-

Construction of buildings and foundations (with all materials) including those mentioned below), inclusive of the cost of :-

(v) Cost of all foundations

(vi) Cost of all Main Factory Buildings

(vii) Cost of all Auxiliary Factory Buidlings

(viii) Cost of other civil works i.e. roads, drains, Boundary Wall etc.

(iv) Cost of storage-cum-construction Insurance till commissioning of the plant.

(v) GST, Taxes and duties as applicable on above

1.2.1 The price referred in clause 1.1 is firm in all respect till completion of construction of buildings for commissioning of the said equipment and plant of 4900 TCD. The rates are inclusive of all taxes as per GST Act, works contract Act, loading and unloading, transporting, labour charges, T. & P, Scaffolds required for execution of work. Receipt of taxes will be submitted by Civil Contractor, failing of which, the amount of receipt will be recovered.

Any increase or decrease in taxes or duties will be made applicable to both the Purchaser & Supplier subject to the authenticated proof. Any positive/ negative impact of GST/ new imposition of taxes, duties, levies, cess etc. will be to the account of the Purchaser from the date of implementation of GST/new imposition.

1.2.2 **INSURANCE**

The contract price mentioned in clause 1.1 above include the charges of storage cum construction insurance policy including fire, theft, storage and all other insurance policies in respect hereof shall be arranged by the Civil Contractor with full force and effect. The Civil Contractor shall also have the interest of the Mills and their financiers noted upon such policies of insurance. The insurance policy shall be taken by the Civil Contractor under agreed bank clause in the joint names of the Civil Contractor as contractor, the Mills as Mills. It shall be the responsibility of the Civil Contractor to ' lodge the claim , if any, with the insurance company and to replace construction items lost or damaged during construction, such replacement to be done by the Civil Contractor free of cost delivery at site, within such reasonable time as may be decided by the Mills. All money received against claims shall be credited to the account of Civil Contractor.

1.2.3 SCOPE OF WORK

The Seller/Civil Contractor shall construct all foundations and buildings as detailed in Annexure D-1 & Annexure D-2, annexed to forming part of this Agreement, in conformity with the specifications laid and according to progressive erection schedule matching the supply and delivery schedule and to the satisfaction and approval of the Mills so that the

said plant shall be ready for commissioning and commercial production within the time provided in clause 4.1 .

3.0 **CONSTRUCTION AND COMPLETION**

3.1 The Civil Contractor agree to construct all foundations and buildings by 11months from the date of agreement. The foundations to be constructed are in accordance and requirement of machineries to be supplied under the supply contract as specified in Annexure D-1 & Annexure D-2, annexed to and forming part of this Agreement to the satisfaction of the Mills .

3.2 The Civil Contractor shall, at their own cost, provide at the site adequate material and other construction equipment and also employ adequate number of labor and suitable skilled workmen for safe construction and shall have the entire work supervised by qualified and experienced engineers to the satisfaction of the Mills. Any defect in the quality of construction shall be rectified /replace and made good forthwith by the Civil Contractor at their own cost and expense.

3.3 **EXCESS MATERIALS**

Any materials including construction equipments etc. brought by the Civil Contractor at the Mill site and not paid for by the Mills can be taken out by the Seller after the Mills approval.

4.0 **SCHEDULE OF CONSTRUCTION OF FOUNDATIONS:**

4.1 The Civil Contractor agree to construct foundations in accordance of priorty of sequence as agreed with supply contractor and Mills so that the erection of the equipment is completed in all respect to the satisfaction of the Mills and the said equipment commissioned and made ready for commercial use by 16 months from the date of agreement in which respect time is the essence of the contract.

4.2 The Civil Contractor shall be bound and hereby agree to construct foundation in conformity with the drawings, diagram, design and layout as approved by the Mills and Supply contractor and in accordance with the other terms and conditions of this Agreement. Non disturbing test to carried out by the Civil Contractor for all major foundations such as Mill, Turbine, Boiler and Fibrizer etc. The dimensions of houses/sections as per approved layout shall be final.

4.3 The checking of the machinery foundation during different stages of construction shall be done jointly by the Mills or by their authorized representative and Civil Contractor at factory site.

4.4 The Civil Contractor shall in the construction work seek instruction from the Mills and the sellers of the said equipment under the supply contract and shall comply with all instructions that the sellers of the said equipment may give to Civil Contractor from time to time.

4.5 The Civil Contractor have to make necessary safety and precautionary measures for their workers while they are performing the duty in site. In case, worker meets with any accident or serious calamity, the payment of compensation to them rests with Civil Contractor and

the Mills will not take any responsibility. It shall also be the responsibility of Civil Contractor to ensure payment of minimum wages, provident fund, ESI and other statutory payments required by the relevant Act for the workers engaged by the Civil Contractor.

4.6 The Civil Contractor shall ensure quality and standards of construction as defined in Schedule A and conforms to standards prescribed by U. P. PWD and IS codes.

5.0 TRIALS AND TAKEOVER:

5.1 As soon as the foundations and buildings are ready after construction, The Civil Contractor shall notify in writing to the Mills specifying a date and time . The Mills will take over the possession of the buildings

5.2 After the foundations are ready in sequence as desired by the Mills and supply contractor, The Mills will handover the said foundations to the erection contractor

6.0 **DAMAGE TO PERSONS AND PROPERTY:**

During and until the commissioning of the said machinery and equipment the Civil Contractor shall be fully responsible for any loss or damage to persons engaged or deputed at site by the Civil Contractor resulting from any cause whatsoever connected with construction or operation of the works, The Civil Contractor shall provide, at their own cost, for the engineers and their assistants and construction labour deputed by them for the construction, an insurance for death or bodily injury suffered by them.

In every case in which by virtue of the provisions of the workmen's compensation Act, the Mills are obliged to pay compensation to a workman employed by the Civil Contractor or by any of their sub-contractors in the execution of the work, the Mills will recover from the Civil Contractor the amount of compensation so paid, and with out prejudice to the rights of the Mills under section 12(2) of the said Act, the Mills shall be at liberty to recover such amount or any part thereof by deducting it from sums due by Mills to the Civil Contractor whether under this contract or otherwise, or realize the same from the Civil Contractor

The Mills shall not be bound to contest any claim made under section 12(1)of the said Act, except of the written request of the Civil Contractor and upon their giving to the Mills, full security for all cost for which Mills might become liable in consequence of contesting the claim.

7.0 MILL'S RESPONSIBILITY :

7.1 CONSTRUCTION FACILITIES :

7.1.1 The Mills shall provide free of cost suitable accommodation / space for storage of the construction equipment and machinery and Civil Contractor's tools and tackles etc.

7.1.2 Electricity shall be provided by the Mills to the Civil Contractor on actual cost basis.

7.1.3 The Mills shall provide, free of cost to the Civil Contractor adequate water supply at factory site.

7.2 The Mills shall pay the required statutory inspection and other fees and charges payable under the provision of any Act in respect of construction of foundations and buildingsThe Mill is responsible for getting the required statutory approvals thereof. The Mill shall also be responsible to submit the desired applications timely to the concerned authorities and to obtain the desired certificates/clearances in time.

7.3 **ACCOMODATION :**

Accommodation as available at site shall be provided by Mills to Civil Contractor free of charge. In case of insufficient residential accommodation with Mills, Civil Contractor has to arrange of his own for which no compensation will be given by mill. Civil Contractor has to arrange for medical facility for his staff at site, for which no compensation will be given by the mill.

8.0 **GROUNDS ENTITLING THE CIVIL CONTRACTOR TO AN EXTENSION OF TIME:**

The Civil Contractor shall not be entitled to any extension of time mentioned in clause 4.1 for any reason, whatsoever except for the following reasons. Any extension of the construction date will be granted by the Mills only after obtaining approval of the Managing Director, U.P. Co-operative Sugar Factories Federation Ltd, Lucknow.

8.1 If the Mills order expressly in writing for execution of work by the Civil Contractor to be suspended for no fault of the Civil Contractor the Civil Contractor shall be entitled to reasonable extension of time, as may be decided by the Managing Director, U.P. Co-operative Sugar Factories Federation Ltd, Lucknow.

8.2 The Civil Contractor shall be entitled to corresponding extension of time due to Force Majeure as per clause – 9 of this Agreement.

9.0 **FORCE MAJEURE:**

9.1 **Definition**

(a) The right of the Civil Contractor to proceed with the work shall not be terminated as provided in Clause 18 because of any delay in the completion of the work due to unforeseen causes beyond the control and without the fault or negligence of the Civil Contractor or their sub-contractors including (but not restricted to) Act of God or Public enemy, action of Govt. in its sovereign capacity, floods, epidemics, quarantine, strike, lock-outs, fires, explosions, accident, stoppage in the supply of power, civil commotion, riots, etc. In the event of any of the aforesaid contingencies, unusual or extra ordinarily prolonged, the Mills will be promptly kept informed by the Civil Contractor by Fax/ E-mail followed by confirmation in writing with documentary proof within 15 days of the commencement and completion of force majeure circumstances. This force majeure clause shall also apply to major sub-contractors of Civil Contractor.

(b) Force Majeure shall not include (i) any event which is caused by the negligence or intentional action of a Party or such Party's Sub- Consultant or agents or

employees, nor (ii) any event which a diligent Party could reasonably have been expected to both (A) take into account at the time of the conclusion of this Agreement, and (B) avoid or overcome in the carrying out of its obligations hereunder.

(c) Force Majeure shall not include insufficiency of funds or failure to make any payment required hereunder.

9.2 Measures to be taken

(a) A Party affected by an event of Force Majeure shall take all reasonable measures to remove such Party's inability to fulfill its obligations hereunder with a minimum of delay.

(b) A Party affected by an event of Force Majeure shall notify the other Party of such event as soon as possible, and in any event not later than 14 (fourteen) days following the occurrence of such event, providing evidence of the nature and cause of such event, and shall similarly give notice of the restoration of normal conditions as soon as possible.

(c) The Parties shall take all reasonable measures to minimize the consequences of any event of Force Majeure.

9.3 Extension of time

No time extention given except Force Majeure.

10.0 **TERMS OF PAYMENT**

10.1 On written request after signing of this Agreement, First advance of 10% of contract price and Second Advance of 10% of contract price (as per clause 1.1) will be paid to the Seller on receipt of respective Bank Guarantees of 10%-10% of contract price including taxes on Mill's proforma. The advance given shall carry an interest @ 12% per annum on reducing balance from the date of issue of cheque/bank draft till the progressive adjustment in the bills. The date of adjustment of bills means the date on which the amount is paid by cheque/draft/RTGS.

10.2 2nd instalment of advance of 10% of contract price (as per clause 1.1) will be paid by cheque/RTGS in favor of Seller as mentioned above subject to furnishing and compliance of the following:

I. Utilisation certificate signed by the chief executive officer of the Seller for the advance paid as per clause 10.1. That the said advance have been utilized exclusively for purchase of civil construction material for Mills. Seller has also to provide documentary proof to the satisfaction of the mills that the said advance has been fully utilized for the contract.

II. Statement showing the detailed price breakup of the contract price as per clause 1.1

III. Detailed schedule containing month wise detailed breakup of foundations and buildings to be prepared in consultation with Supply Contractor and to the satisfaction and approval of the Mills.

IV. Proof of fulfillment of all contractual obligations in terms of this Agreement including those given in Schedule 'A' due upto that date.

Provided that if the Seller fails to comply with any of the contractual obligations due up to that date, the payment will not be released to the Seller's and all delay will be on Seller account and no extension in date of construction shall be granted by the Mills.

The advance payment made by the Mills shall be utilised by the Seller for arranging and making payment to manpower, tools and tackles purchase of construction equipments and construction material for construction of foundations and buildings and for no other purpose whatsoever.

Provided that all the aforesaid advance payment shall be made by the Mills on receipt of bank guarantee of equivalent amount on the Mills proforma from Nationalised bank as per clause 12.3(a).

10.3 If the Seller fail to get any payment for non-compliance of the above obligations on their part, the payment shall be delayed and such delay shall not in any way entitle the Seller for grant of extension in the stipulated date of completion of construction under this Agreement.

10.4 In the event of non-submission of the timely delivery guarantee by Seller to the Mills as per tender, the Mill shall deduct 10% of the gross amount.

10.5 Balance payment of the contract price as provided in clause 1.1 alongwith 100% applicable taxes and duties thereon shall be paid against actual completion of the proportionate work after adjusting 20% advance and interest on advance on prorata basis when the Seller have complied with all obligations including furnishing of various guarantees and other obligations due up to the date of the said payment. The payment shall be made by the Mills only after the progress of the work has been certified by an authorized representative of the Mills by RTGS/NEFT. The payment bills will be done as per Approved Price Breakup after verification of work by Authorized Persons of Sugar Mill.

10.6 (a) In making payment against the proportionate work done, the Mills shall always deduct there from proportionate advance given by that time.

(c) The mill shall deduct the income tax as per provision of Income Tax Act 1961 amended up to date and also other taxes at sources, if deductable to comply with the statutory requirements.

11.0 Liquidated Damages/ PENALTIES

11.1 Liquidated damages for delay in Civil work:

To secure the contractual obligations under this Agreement, the Seller shall be liable to pay the following penalties, if the Seller,

Fail to civil work of the project within the time specified in this Agreement, they shall pay liquidated damages for delay by an amount equal to 1/2% (Half per cent) per week or part thereof on the unsupplied machinery and equipment or the part which has not been executed by the Seller, of the contract price but not exceeding 10% (Ten per cent) of the Total contract price.

12.0 **BANK GUARANTEE/SECURITES:**

12.1 To secure the contractual obligations as per this Agreement ,the Seller at their own cost shall furnish to the Purchaser, the following four bank guarantees, in favour of Purchaser, by a Nationalised. All the guarantees shall be in the formats enclosed as Annexure D-3 to D-4 to this Agreement.

(i) **Bank Guarantee for 1st Advance** – A bank guarantee for receiving the first advance of 10% of contract price amounting to Rs. ..... lakhs (Rupees .....) only. This guarantee will be automatically adjusted and reduced with the progress of civil work of the project. This guarantee shall be furnished at the time of signing this Agreement.

(iv) **Bank Guarantee for 2nd Advance** – A bank guarantee for receiving the second advance and on fulfilling the obligation of erection & commissioning for 10% of contract price mentioned in Clause 3.1(iii) amounting to Rs.....lakhs (Rupees .....) only. This guarantee will be automatically adjusted and reduced with the progress of civil work of the project.

(iii) **Timely civil work of the Project Bank Guarantee** – A bank guarantee, within 30 days of signing of agreement, for 10% (Ten per cent) of Total contract price mentioned amounting to Rs..... lakhs (Rupees .....) only. This guarantee shall be against timely civil work of the project. This guarantee shall be valid upto 60 days (sixty days) after the scheduled date of completion of supply & commissioning of entire Machinery and Equipment.

(iv) **SECURITY MONEY**

Security money will be 5% of the Contract price (excluding GST). This security money will be deducted on pro-rata basis from every bill.

This Security Money will be refunded in two part as mention below:

1. 60% of security Money deducted as mentioned above will be returned to seller/successful bidder, after successful commissioning date on request.

2. Rest 40% of security money will be returned after 30 days from the date of end of 3rd crushing season (crop days less than 45 days will not be considered as complete crushing season).

12.2 One Bank Guarantee in respect of advance payment as provided in clause 10.1 of this Agreement to be given before drawing the respective advance payment from the Mills.

Provided that the liability of the guarantor herein shall stand reduced by deductions pro-rata against the value of the work certified and passed for payment under clause 10.4.

12.3 The recovery of the advance paid under clause 10.1 shall be made prorata (that is to say in the same proportion that the amount of the guarantee bears to the amount as mentioned under clause 10.4)

12.4 If the Civil Contractor shall abandon this Agreement or fail to perform their part of this Agreement within the period herein agreed or any extension thereof granted by the Mills as per terms of this Agreements or if the work or any part thereof is taken out of the Civil Contractor's hand under clause 16 then and in any such case the Civil Contractor shall refund to the Mills within 30 days of demand such part of the advance payment hereunder made as the Mills may deem fit to protect their interest failing which the Mills may recover the same with the interest at the lending rate of banks then prevailing against bank guarantee already furnished by the Civil Contractor for aforesaid advance payment.

12.5 The Bank Guarantee required to be furnished by the Civil Contractor under the provisions hereof to secure the advance payment of bank guarantee to secure the timely completion of construction of foundations and buildings or the Bank Guarantees for any other purpose under the provisions hereof shall be in the form(s) approved by the Mills which form(s) shall inter-alia invariably include the provisions that the decision of the Mills as to whether there has been any loss or damage or default and /or negligence on the part of Mills will be final and binding on the guarantor, that the right of the Mills to recover from the guarantor any amount due to the Mills shall not be effected or suspended by reasons of the fact that any dispute or disputes have been raised by the Civil Contractor with regard to their liability or that proceedings are pending before any tribunal, Arbitrator(s) or Court with regard there to or in connection therewith, that the guarantor shall pay to the Mills the sum under the guarantee without demur on first demand requiring the Mills to invoke any legal remedy that may be available to them, that it shall not be to open to the guarantor to know the reason thereof or to investigate or to go into the merits of the demand or to question or to challenge , the demand or to know any facts effecting the demand or to require proof of the liability of the Civil Contractor before paying the amount demanded by the Mills under the guarantee(s) and that the guarantee shall be invoked only when the invocation letter is signed by the mill(s) & counter signed by the Managing Director, U.P. Cooperative Sugar Factories Federation Ltd, Lucknow. The guarantee required to be furnished by the Civil Contractor under the provision here of to secure the advance payment, timely completion of construction of foundations and buildings or for any other purpose under the provision hereof shall be for such period as may cover the period as the case may be, as stipulated under this Agreement. If however , the period of this Agreements is extended under the provision hereof or due to Civil Contractor not fulfilling

their obligations under this Agreement, the Civil Contractor shall have such guarantees extended up to the corresponding extended period at their cost and in no case extension of the period of the contract shall be construed as waiver of the right of the Mills to on force the guarantees.

13 SETTLEMENT OF DISPUTES

13.1 Amicable settlement

The Parties shall use their best efforts to settle amicably all disputes arising out of or in connection with this Agreement or the interpretation thereof.

13.2 Dispute resolution

13.2.1 Any dispute, difference or controversy of whatever nature howsoever arising under or out of or in relation to this Agreement (including its interpretation) between the Parties, and so notified in writing by either Party to the other Party (the "Dispute") shall, in the first instance, be attempted to be resolved amicably in accordance with the conciliation procedure set forth in Clause 13.3.

13.2.2 The Parties agree to use their best efforts for resolving all Disputes arising under or in respect of this Agreement promptly, equitably and in good faith, and further agree to provide each other with reasonable access during normal business hours to all non-privileged records, information and data pertaining to any Dispute.

13.3 Conciliation

In the event of any Dispute between the Parties, either Party may call upon, Managing Director, U.P. Cooperative Sugar Factories Federation Ltd, Lucknow and upon such reference, the said persons shall meet no later than 10 (ten) days from the date of reference to discuss and attempt to amicably resolve the Dispute. If such meeting does not take place within the 10 (ten) day period or the Dispute is not amicably settled within 15 (fifteen) days of the meeting or the Dispute is not resolved as evidenced by the signing of written terms of settlement within 30 (thirty) days of the notice in writing referred to in Clause 20.2.1 or such longer period as may be mutually agreed by the Parties, either Party may refer the Dispute to arbitration in accordance with the provisions of Clause 13.

14.0 **ARBITRATION** :

"Solely for the purposes of settlement of any dispute arising between the parties out of this agreement, the contractor shall be treated as an agent of the mill and any dispute arising out and between the parties to this agreement shall be referred to arbitration to the Registrar in accordance with Section 70 of the UP Cooperative Societies Act, 1965."

15.0 **SUB - CONTRACTS :**

The Civil Contractor has right to sub-contract any part of the contract to sub-contrators.

Provided that nothing contained in this clause shall be deemed, however, to create any contractual relations between the sub contractors of the one part and the Mills of the other part and shall not absolve the Civil Contractor from their ultimate responsibility for purpose of this Agreement.

16.0 **TRANSFERABILITY OF THE CONTRACT:**

The Civil Contractor shall not transfer their rights and obligations arising out of or in relation to this Agreement except with the prior consent in writing of the Mills .

17.0 **NON - COMPLIANCE:**

If the Civil Contractor shall neglect to construct foundations and buildings as per terms and conditions of this Agreement or to comply with any orders given to them in writing by the Mills in connection therewith , the Mills may give notice in writing to Civil Contractor to make good, within a reasonable specified time, the failure neglect or contravention complained of, and if the Civil Contractor still without reasonable cause fail to comply with the notice or fail to make good the matter to the satisfaction of the Mills within the time specified in the notice (to be reckoned from the date of receipt of notice by the Civil Contractor) the Mills may take over the work of construction of foundations and buildings as a whole or in part out of the Civil Contractor's hands and or may give it to another person on contract at a reasonable price under intimation to the Civil Contractor and the Mills shall be entitled to recover any excess cost from Civil Contractor or make it good from any bills or dues of the Civil Contractor pertaining to this Agreement .

18.0 **POWER TO CLOSE WORK:**

18.1 If at any time after signing this Agreement, the supply contract is determined for any reason whatsoever or the Mills shall in order to comply with any directives of the Government of Uttar Pradesh not require the whole or any part of the work relating to erection or commissioning of the purposed said equipment under the terms of this Agreement, to be carried out, the Mills shall give notice in writing of the fact to Civil Contractor who shall have no claim to any payment by way of compensation or otherwise on account of any profit of advantage which they might have derived from the execution of the said work in full but which they could not derive in consequence of the giving up of the work before completion, the Civil Contractor shall be paid at contract rates for the full amount of work executed and also actual expenses incurred by them on account of any labour and material collected at site or arrangement made for execution of the work which could not be utilised either fully or partially on the work on account of the giving up of work as aforesaid, where partial utilisation of material and arrangement as aforesaid has been made, the payment will be made in proportion to the value of the work done to the value of the whole work covered by the contract .

18.2 In the event of the closing of the work as above, the Civil Contractor undertake to refund all outstanding unutilised and unadjusted amount of the advance payment, if any, within 60 days, failing which the Civil Contractor shall be liable to refund to the Mills the above amount along with interest for the period beyond 120 days at the lending rate of banks then prevailing.

19.0 **Termination of Contract**

The Mills reserves the right to terminate the whole or part of this Contract due to any or all the following conditions :

19.1 If the Civil Contractor assigns the contract, or sub-let the whole of the Contract without the consent of the Mills and Civil Contractor has failed or refused to take remedial steps, or the Mills shall certify that the Civil Contractor:

a) Has abandoned the contract, or

b) has without reasonable excuse suspended performance of the contract for 30 days after receiving from the Mills written notice to proceed, or

c) Despite previous warnings in writing from the Mills is not constructing civil works for the Plant and equipment in accordance with the Contract, or is failing to proceed with due diligence or is neglecting to carry out his obligations so as to affect adversely the Performance of the Contract.

19.2 The Mills may give 21 days' notice to the Civil Contractor of its intention to proceed in accordance with the provisions of this Clause. Upon the expiry of such notice the Mills may without prejudice to any other remedy under the contract and without affecting the rights and powers conferred by the contract on the Mills, terminate the Contract. Upon such termination the Mills shall be entitled to get civil works of Plant and equipment completed or may itself complete the civil works of the Plant and equipment, in which event the Civil Contractor shall deliver the civil construction material in its then state to the Mills or as the Mills may direct, at the Civil Contractor's expense.

19.3 As soon as practicable after the Mills has terminated the Contract the Mills shall, by or after reference to the Parties and after making such enquiries as he thinks fit, determine the amount then due to the Civil Contractor as at the date of termination and certify the amount thereof. The amount so certified is herein called 'Termination Value'.

19.4 Payment and termination - The Mills shall not be liable to make any further payments to the Civil Contractor untill the costs of completing civil works of the Plant and equipment from elsewhere and all other expenses incurred by the Mills have been ascertained and the amount payable certified by the Mills (herein referred to as 'the Cost of Completion'). If the Cost of Completion when added to the total amounts already paid to the Contract as at the date of termination exceeds the total amount which the Mills certifies would have been payable to the Civil Contractor under the Contract on completion the Mills shall certify such excess and the Civil Contractor shall upon demand pay to the Mills the amount of such excess. Any such excess shall be deemed a debt due by the Civil Contractor to the Mills and shall be recoverable accordingly. If there is no such excess the Civil Contractor shall be entitled to be paid the difference (if any) between the Termination Value and the total of all payments received by the Civil Contractor as at the date of termination.

19.5 If the Mills have any information that the Civil Contractor has become bankrupt or insolvent, or have a receiving order made against him, or compound with his creditors, or commence to be would up, not being a members' voluntary winding up for the purpose or amalgamation or reconstruction, or have an administration order made against him or carry on his business under an administrator or a receiver or manager for the benefit of his creditors or any of them, the Mills may be entitled to:

a) To terminate the Contract forthwith by 21 days' notice to the Civil Contractor or to the receiver, manager, administrator or liquidator or to any person in whom the contract may become vested, or

b) To give such receiver, manager, administrator or liquidator or other person the option of carrying out the Contract subject to his providing a guarantee for the due and faithful performance of the Contract up to an amount to be agreed.

20.0 CIVIL CONTRACTOR LIABILITY FOR INTEREST/LIMITATION OF LIABILITY:

In case the Civil Contractor fail to construct the foundations and buildings within the time agreed herein, the Civil Contractor shall be liable to pay to the Mills interest at the prevalent bank lending rate per annum compounded half yearly on the amount of advance paid to the Civil Contractor under clause 10 reckoned from the date of completion as specified in clause 4.1 till the date of actual completion .

21.0 **MISCELLANEOUS:**

21.1 Unless, otherwise especially agreed in writing any concession shown by the parties to this Agreement to one, and other shall not prejudice their individual rights under this Agreement .

21.2 The Civil Contractor shall be deemed to have noted that time is the essence of this contract and have carefully examined and satisfied themselves as to the terms and condition, specifications etc, mentioned in this Agreement .

21.3 All money which the Mills may under the terms hereof be entitled to recover from the Civil Contractor may be recovered by the Mills from any payment due or which may at time become due to the Civil Contractor under this or any other contract.

21.4 The Civil Contractor shall invariably depute their accerdited representatives(s) to attend review meetings as may be fixed by the Mills to monitor the progress of the works and such representatives shall furnish such information and make such commitments on behalf of the Civil Contractor 's as may be necessary in this behalf.

22.0 This Agreement including the schedule and annexures have been executed in two copies, the original will remain with the Mills, whereas the second copy will remain with the Civil Contractor. By signing this Agreement, both i.e. the Mills and the Civil Contractor agree to abide by its clauses.

23.0 The High Court of judicature at Lucknow (UP) shall alone have jurisdictions to exclusion of all other courts subject to the arbitration proceedings under clause 13 of this contract.

This Agreement consists of ____pages as below:-

1) Agreement
2) Annexure D-1 Scope of Civil Works
3) Annexure D-2 Specifications of foundations and Buildings
4) Annexure D-3 Draft 1st & 2nd Advance Bank Guarantee

5) Annexure D-4 Draft Timely Completion Bank Guarantee

23.0 True certificate copy of the extracts of the Minutes of the meeting of the Board vesting in its General Manger power of the Mills to sign this Agreement and the Power of Attorney executed by Civil Contractor authorising the Attorney to sign the Agreement on behalf of the Civil Contractor are enclosed herewith. In witness whereof the parties hereto have herewith set their respective hands and put seal of the day and year first above written .

Signed by _____ Signed by : _____

Witness _____ Witness : _____

ANNEXURE D-1

SCOPE OF CIVIL WORKS

Building & Structure Civil Details:

Scope of civil construction work shall include, but not limited to the following:-

S. No.	Description	Qty.	Size (minimum)
1.	**LAND & SITE DEVELOPMENT**		
i.	Land Development		
ii	Construction of RCC internal roads(7 metre width),cane yard RCC roads of Sugar mills, token room, cattle shed, drains, culverts Common Toilet & washroom etc.	14582sq mtr	**Token room- 3m x 3m(3 nos.)** **Cattle shed-15 m x 7 m(2 nos.)**
iii	RCC Flooring from cane weigh bridge to cane carrier	5000 SQ MTR	
2.	**FACTORY RELATED CIVIL WORKS**		
i.	Main factory buildings Mill house Power house, TG building(G+1) Inside TG building TG control room & Panel room Building(G+2)	1 Lot	width-26 mtr x 114 leangth- to cover area befor cane chopper to bagassecillo blower inlet of bagasse elevator x height- so that EOT crane rail height will be kept at minimum 17 mtr 18M x 48M each floor 10M x 48M each floor
ii.	Clarification House with Machine Control Room & DCS inside house	1 No.	26 M x 55 M x 22 M
iii.	Evaporator House with Machine Control Room inside house	1 No.	House Open to sky but Machine Control Room will be covered of suitable size.
iv.	Pan & Centrifugal House building with	1 No.	26 M x 102 M x 27

	Machine Control Room inside house		M
v.	Injection Pump Shed	1 lot	8 M x 20 M
vi.	Dryer House	1 No.	28 M x 24 M x 31.5 M
vii.	Equipment foundation	1 No.	
viii.	Relocation of existing gate cane weigh bridge including cabin and foundation.		
ix.	Cooling tower complete in all respect for process	1 lot	2 cell of 3500 m^3(each cell)
x.	RCC Chimney	1 No.	not less than 70 mtr. Height
xi.	ETP	1 No.	New ETP to be constructed as per CPCB norms
xii.	AC control room for Mill, Boiler, Power & Boiling houses.	1 No.	Two floor-4M x 36 M each floor
xiii	UGR for boiler, water recirculation system, RO water, Boiler blow down, Rain water, Raw water lagoon etc.as per the requirement of the project	1 No.	As per required capacity and size of new UGR to be constructed
xiv	UGR for hot, cold and condensate cooling receiver	1 lot	As per required capacity and size of new UGR to be constructed
xv	Fire Fighting equipment as per the codel requirement including approval from the authorities	1 lot	As per requirement
xvi	sugar godown of 20000 tons storage capacity as per the IS code	2 Nos	
xvii	Molasses storage tanks foundation	1 No.	8000 M^3 (total volume)
xviii	Injection channel and pump house	1 No.	As per requirement
xix	new weigh bridge and shifting of old weigh bridges		As per tender
xx	Shed on Cane Unloader		As per tender
xxi	Rain Water Harvesting system for all the Sugar Godowns and main factory building as per the norms of CGWA/CPCB/UPPCB norms suitable for 4900 TCD plant and residential colony and offices		as per the norms of CPCB
xxii	Irrigation Management Plan as per the norms of CPCB		as per the norms of CPCB

xxiii	Toilet/washroom with proper water storage and supply at different locations with septic tanks	4 Nos.	5.5 M x 4.5 M each block
xxiv	General Store with provision of 02 rooms for office purpose inside the store.	1 lot	26 M x 20 M
xxv	Storm water and external drains	1 lot	1500 M
xxvi	Roads Internal as per layout with Bitumenous carriage way of 3.75 mtr.& minimum total width 7.00 meter	1 lot	4000 Sq. mtrs.
xxvii	Boundary Wall with suitable gates (Massonary work shall be minimum 2 mtr above FFL)along with r.c.c frame structure, above angle frame and concentina fencing of 600mm dia.	1000 mts.	
xxviii	Earth filling & development work (Earth filling in entire plant area shall match the FFL requirement)	1 lot	Plant Area+cane yard+bagasse yard
xxix	Dismantling of structures as per requirement and shifting of debris at the designated place to be decided jointly by Purchaser and civil contractor	1 job	any existing sheds of workshop/store, toilets, any type sheds; as per requirement.
xxx	ETP- lagoon capacity 15000 cubic mtr, electrical panel room, laboratory	1 lot	As per tender
xxxi	Work of fire fighting with internal and external fire hydrants, wet riser, sprinkler system including fire extinguishers etc as per NBC for entire complex.	1 lot	As per Statutory norms
xxxii	Workshop with shed	1 No.	26M x 15M
xxxiii	Gunny Bag Store	1 No.	15M x 8 M
xxxiv	bagasse yard RCC	1 No.	100 M x 100 M
xxxv	pressmud yard RCC	1 No.	25M x 25 M
3.	**STAFF RELATED CIVIL WORKS**		
i.	Main Technical Block with laboratory, Office Furniture, plumbing, electrical etc, individual Toilet in HOD offices. Drawing will be submitted for approval from from	1 No.	Plinth area GF+ FF(150 +150) sq mtr

	civil consultants.		
ii.	Guest House & Transit Hostel with, electrical , plumbing, flooring and finishing as per approval of our consultants. Drawing will be submitted for approval from from civil consultants	1 No.	App plinth area 250 sq mtr

Design Philosophy

Civil Design Basis

Generally all buildings shall be Steel or RCC framed or braced buildings.

Onto simulate building behaviour, structures shall be modelled on STAAD.PRO/SAP 2000 (or equivalent) validated and approved computer software programs. All loads and load combinations shall be as per NBC 2016 and the latest editions of all relevant BIS codes. The Liquid retaining structures such as spray pond, tanks etc. shall be designed as per relevant sections IS 3370 latest edition.

Architectural Design Basis

UP Sugar Factories Federation Ltd. and the UP State Government has very high aesthetical standards for this plant since it would like this plant to be a model sugar plant not for the state but also for the entire nation. The architectural philosophy should also follow this brief and the facades should comprise of sustainable materials and should reflect a modern industrial plant. Adequate light and ventilation through polycarbonate or other translucent sheeting and louvers must be provided. Ridge ventilation must be provided in all shed structures. . A minimum of four different elevations with 3-d views of the sugar factory (prepared in Revit or equivalent software) and power house should be presented to the management for approval. The power house lobby should be made of high quality finishes which will be used to host several state and national dignitaries.

Site Information Site Location:

Site is located at Gajraula, Distt. Amroha, Uttar Pradesh

Wind Speed:

Basic Wind speed: 47 m / sec

Units of Measurement

The International System of Units (SI) will be used.

Design Loads and Geotechnical data Dead Loads

Dead loads will include the weight of all structural and architectural components and other permanently applied external loads. Self-weight of materials may be calculated on the basis of unit weights given in IS: 875 Part 1

Live Loads

The loads listed hereunder are the minimum loads for the areas involved. Loading resulting from concentrations of facilities in specific areas will be substituted where listed base loading is exceeded.

The live loads on floor will be taken as per IS: 875 (part-2). Control rooms -10 kN/m2 Terrace area of any room -5kN/m2 Slab adjacent to mill foundation and TG laydown area in power house -20 kN/m2 Equipment Floor area -10 kN/m2 Industrial shop floor area without any equipment 5kN/m2 Official and non-industrial rooms -3.5kN/m2 Roof Live load -0.75kN/m2 (Not accessible) Roof Live load on corrugated sheets -0.4 kN/m2 All stairs -5 kN/m2

Wind Load

The Wind pressure shall be calculated based on the data furnished below and other provisions laid in IS: 875 (Part 3) – 1987.

Basic Wind speed = 47 m/sec Risk coefficient = 1.07 Terrain category = 1 Structure class = Class C for all houses Topography factor = 1.0

Earthquake Load

i) The lateral forces will be established in accordance with the recommendations of IS: 1893.-2016

ii) The importance factor for all power plant buildings and structures shall be taken as per IS 1893 Part IV 2015.

iii) Seismic zone = Zone IV

iv) Damping: For all concrete structure damping shall be 5%. For all Steel structures damping shall be 2%

v) Importance Factor as per IS 1893- Part 4 for relevant structures as given in Table 4 - Categorization of Industrial Structures, Table 3 Importance Factor I for Various

Categories of Industrial structures & Table 9 Importance Factor (I) Applicable to

Stack like Structures for chimneys etc.

vii) Response Spectra: For Type I soil as per IS 1893- Part 4

viii) For Response Reduction Factor 'R' refer table 4, IS1893 (Part 4) 2016 Table 4 Response Reduction Factor1), R for Industrial Structures and Table 10 Reduction Factor1), R applicable to Stack like Structures

Load Combinations

Generally combinations of the loads shall be as stated below:

i) DL ii) DL+LL iii) DL+WLorSL iv) DL+LL+WLorSL

Where, DL is Dead loads LL is Live loads WL is Wind loads SL is Seismic loads

Partial Safety Factors for Loads -RC Structures Design using Limit State Method as per IS: 456

LOAD COMBINATIONS	LOAD Factors For Limit state of collapse			LOAD Factors for limit state of serviceability.		
	D.L.	L.L	W.L	D.L.	L.L.	W.L.
DL + LL	1.5	1.5		1.0	1.0	--
DL + WL/SL	1.5		1.5	1.0	--	1.0
DL + LL + WL/SL	1.2	1.2	1.2	1.0	0.8	0.8

DL + WL/ SL

0.9

1.5

Note: Wind and seismic loads shall be considered for both X & Y directions as per the load combinations provided in IS 1893-2016 Part 4 Section 8.3.2 (same combinations for wind as for earthquake) and IS 875 Part 5
Permissible stress:

The permissible stress shall be as per relevant IS codes.

Foundations

Based on the geotechnical report the following conclusions can be drawn about the soil conditions at site
Soil strata is comprises of Silty clay of medium plasticity (CI) silty clay of low plasticity compressibility (CL) and silty clayey silt of very low plasticity (CI/ML) and 'ML' sandy silt .Observing bearing capacity from shear as well as from settlement criteria, it is revealed that shear failure consideration will govern the design of foundation rather than the settlement. Water table was met up to 6.0m depth below ground level. The values of allowable bearing capacity at 1.20m ,1.50m & 2.0m depth below existing ground level have been evaluated for Isolated footing of 1.20 m &1.50m widths and the results are tabulated below: -

Depth (m)	Width/ Size (m)	Type of footing	Allowable Bearing Capacity T/m2
1.20	1.20	Isolated Footing	8.80
1.50	1.20	Isolated Footing	10.20
2.0	1.50	Isolated Footing	11.05

Based on the above observations Isolated footing is recommended at 1.20m, 1.50m & 2.0m depth and bearing capacity values may be considered as per the above table If, any change is envisaged then the same may be referred to us for recalculation. All foundations considered are open spread type. Partial contact between the foundation and soil strata will be considered wherever applicable. The footing will be checked for minimum contact area, and maximum bearing pressure will be calculated for the actual contact area only. For design of foundations the permissible increase of Allowable Bearing Pressure or Resistance of Soils shall be as follows:

- As per Table 1 of IS1893 (Part 1 -2002) with combinations including seismic loads
- 25% with combinations including wind load.

Foundation shall be designed to carry all the loads from equipment or super-structure which they support in accordance with the relevant codes. FS against overturning as per IS 1904 clause 17.2 -1.5 (with wind and seismic) and 2.0 (Normal operating condition). FS against sliding as per IS 1904 clause 17.1.1 -1.5 (with wind and seismic) and 1.75 (Normal operating condition). Foundation plinth for structural columns and equipment supports shall extend not less than 50 mm from the edge of base plate. The clear distance between a standard mild steel anchor bolt or anchor sleeve/pocket and the face of the foundation shall be not less than 75 mm. All bolts confirming to IS 1367-8.8/8/CS Minimum thickness of lean concrete layer shall be 100 mm and shall extend 100mm beyond the foundation edge.

Buried structures shall be checked for floatation with ground water at FGL. (i.e. at finished ground level). FOS against floatation shall be □1.2

Foundation for Vibratory Equipment

Design of foundations for vibratory equipment such as engine, pump, fans etc. will be done in accordance with IS: 2974 and will be isolated for vibration control. To avoid resonance, natural frequency of the foundations will be kept 20% away from the operating frequency and amplitudes will be kept within the allowable limits specified by the manufacturer or in their absence as specified in the IS Codes. Other equipment foundations will be of block type. For minor foundations, dynamic analysis need not be carried out and the same will be sized as to have a mass 2 to 3 times the machine mass. Relevant IS codes will be referred for design of block foundation.

Mill foundation will be RCC block type foundations. Where free vibration and forced vibration cases will be checked against all necessary permissible limits. Mill foundation model will be analysed for:

a) Self weight of foundation, static weight of machines, (DL)

b) Normal torque load (TL)

c) Dynamic Load (RD)

Concrete mix M25 will be used and all foundation hardware and metal inserts will be embedded in to the concrete. IS code 2974 will be taken as guidelines for design and construction of the foundation.

Analysis Methods

3D Analysis of the structures is carried out by using the software STAAD Pro 2008 VI or higher or SAP2000 or equivalent approved software. Appropriate load and its combinations, as per relevant clauses in IS codes, for most unfavourable effects are chosen for design.

Design Life

The design life of the structure is assumed as 75 years. This requirement is not applicable to replaceable materials.

Design Methodology

All R.C.C structures shall be designed according to the Limit State Method as specified in IS: 456 – 2000.

Materials

The self-weight of the various elements are computed based on the unit weight of materials as give below:

Table 7-1:

Materials	Unit weight kN/m^3
Reinforced Cement Concrete	25.00
Steel	78.50

Concrete Grade

The following grades of concrete as per IS 456 will be adopted for the type of structure noted against each. Design mix shall be used for RCC work as per standards.

Type of structures		Grade of concrete
Lightly loaded structures, Grade slab, and paving etc.	:	M25
All RCC members in foundation & Substructure	:	M30
All RCC members in Superstructure	:	M30
All Water retaining structures and ACC	:	M30
TG Foundation, Superstructure & TG Deck	:	M30
Mill foundation	:	M25
Chimney Foundation	:	M30
Chimney Shell Wall (as per design)	:	M30
PCC for Water retaining structures	:	1:3:6
PCC for Remaining Foundations	:	1:4:8
Fill concrete	:	1:5:10

The groundwater & soil is assumed as non-aggressive in nature & sulphate /chloride contents are assumed within permissible limits. Hence, no any special cement is considered as well as no any special treatment to reinforcement is considered.

Fire Resistance for Concrete shall be min 2 hours for all vertical load carrying elements and 1.5 hours for slabs

Reinforcement Grade

High yield strength deformed bars of various diameters grade Fe-500 conforming to IS: 1786 will be used as reinforcement for all reinforced concrete structures.

Bricks

Local bricks having the following average compressive strengths will be used for masonry Class A = 4.2 N/sq.mm.Class B = 3.5 N/sq.mm.

Nominal Cover to Reinforcement

Concrete Cover to Reinforcement is defined in terms of nominal cover. Nominal cover is the design depth of concrete cover to all steel reinforcement, including stirrups/links. It is the dimension used in design and indicated on the engineering drawings. The engineer shall use the following nominal cover requirements.

Description	Top (mm)	Bottom (mm)	Sides (mm)
Footings	50	75	50
Grade Beam	40	40	40
Grade Slab	25	25	25
Beams above EL +0.00M	35	35	35

Description	Top (mm)	Bottom (mm)	Sides (mm)
Column & Pedestals	50		50
Lintel Beam(less than 300 x 300)	25	25	25
Slab & Stair cases	25	25	25
Block Foundation including STG Foundation	50	75	50
Water Retaining Structures			
Base Soft and Walls (Water face)	50	50	50
Base Soft and Walls (Soil face)	40	40	25
Pre-cast Units	15	25	20
Walls	25	25	35

For any other elements not specified above, clear cover shall be as per the clause 26.4 of IS: 456 – 2000.

Codes & Standards

The relevant Indian Standard codes, as given below, shall be followed for structural design:

Table 9-1:

Sr.No.	Code	Description
1.	IS: 875 (Part 1) -2016	Code of Practice for Design Loads (other than earthquake) for Buildings and structures – Unit weights of buildings materials and stored material.
2.	IS: 875 (Part 2) -1987	Code of Practice for Design Loads (other than earthquake) for Buildings and structures – Imposed Loads.
3.	IS: 875 (Part 3) -2015	Code of Practice for Design Loads (other than earthquake) for Buildings and structures – Wind loads.
4.	IS: 875 (Part 4) -1987	Code of Practice for Design Loads (other than earthquake) for Buildings and structures –Snow loads.
5.	IS: 875 (Part 5) -1987	Code of Practice for Design Loads (other than earthquake) for Buildings and structures – Special loads and load combinations.
6.	IS: 456 -2000	Code of Practice for Plain and Reinforced Concrete.
7.	IS: 1786 -2008	Specification for High Strength Deformed Steel Bars and Wires for Concrete Reinforcement.
8.	IS: 432 (Part 2) -1982	Specification for Mild Steel and Medium Tensile Steel Bars and Hard Drawn Steel Wire for Concrete Reinforcement – Hard Drawn Steel Wire.
9.	IS: 1343 -1980	Code of Practice for Prestressed Concrete.
10.	IS: 13920 -2016	Ductile detailing for reinforced concrete structures subjected to seismic forces – Code of practice.
11.	IS: 14268 -2022	Uncoated Stress Relieved low relaxation seven-ply stand for Prestressed Concrete
13	IS: 2974-Part 1-1982	Code of practice for Design and Construction for Machine Foundations: Foundation for Reciprocating Type Machines
14	IS:1893-(Part 1)-2016	Criteria for Earthquake Resistant Design of Structures: Part 1 General Provision and Buildings.
15	IS:1893-Part 4-2016	Criteria for Earthquake Resistant Design of Structures: Part 4 Industrial Structures including Stack-Like structures
16	IS:1904-2021	Code of Practice for design and construction of foundation in soils -General Requirements
17	IS: 2974-Part 2-1980	Code of practice for Design and Construction for Machine Foundations: Foundation for Impact type machines (Hammer foundations)
18	IS: 2974-Part 3-1992	Code of practice for Design and Construction for Machine Foundations: For rotary type machines (medium and high
19	NBC -2000	National Building Code (NBC) 2016

ARCHITECTURAL WORK SPECIFICATIONS AND FINISHES

FINISHES

All finishes and building specifications will be as per table below

Building Structure Name	**No. of floors / Ht as guidance**	**Features of Construction**	**Type of Roof**	**Side Cladding**	**Floor Finish**	**Remarks**
Mill house	Floor at 0.00m level and Working platform at 4.0 metre.	RCC framed structure for mill platform and control panel room. Steel frames structure for house	Steel truss /Portal frames with Aluminium profile colour coated sheet roofing with polycarbonate (5%)	Brick masonry 230 mm thick with RCC block jalli Or. Aluminium windows anodized	Granolithic floor finish(IPS) with tremix	width of the house 26 mXlength 114 mXheight 17 m as required
Evaporation, clarification, boiling and sugar house	Floor at 0.00m level and Working platform at 4.0	RCC framed structure for mill platform and control panel room. Steel frames structure for house	Steel truss /Portal frames with Aluminium profile colour coated sheet roofing with polycarbonate (5%)	Brick masonry 230 mm thick with RCC block jalli. Sugar house to have fixed Aluminium windows	Granolithic floor finish(IPS) with tremix. Sugar house to have Kotah flooring	width of the house 26 mXlength as required X height as required.
Power house (TG Bay)	Floors at 0.00m, 4.50 m and 9.0m level	Steel framed Structure with metal decking and RCC on top of decking	Steel truss /Portal frames with Aluminium profile colour coated sheet roofing with polycarbonate (5%)	Brick masonry 230 mm thick for walls with aluminium sliding windows(Anodised) of appoved quality	Granolithic floor finish(IPS) with tremix and non-metallic floor hardener for 0.00m, 4.50m, & kotah stone flooring for 9.0 m level	
Power house (Control Room)	Floors at 0.00m, 3.5m, 9.0m level	Steel framed Structure with metal decking and RCC on top of decking	Steel framed Structure with metal decking and RCC on top of decking with waterproofing coba.	Brick masonry 230 mm thick for walls with aluminium sliding windows and fixed glazed partitions for control room.	Access Flooring System (False Floor) for control room and Granolithic floor finish(IPS) for 0.0m & 3.50m level	
Battery Room	As per Requirement	Housed inside power house	Housed inside power house	20 mm thick Acid Resistant tiles up to 2.0M height and chemical	20 mm thick Acid Resistant tiles	

Building Structure Name	No. of floors / Ht as guidance	Features of Construction	Type of Roof	Side Cladding	Floor Finish	Remarks
				resistant paint for balance height.		
Boiler & ESP Area	Steel floor as per required height with steel staircase above operating floor	Steel supporting structure up to operating floor, RCC operating floor & foundation for supporting of boiler and auxiliary equipment RCC pedestals & foundation for supporting of ESP and auxiliary equipments		As per Requirement		
Cooling tower – 2 or 3 Cells		RCC framed structure				RCC fan stack
Cable gallery	Floors at 0.00m level	Steel framed Structure with metal decking and RCC on top of decking	Steel framed Structure with metal decking and RCC on top of decking with waterproofing coba.	230mm brick masonry	Granolithic flooring(IPS)	Underground RCC cable trenches
ESP & AHS - MCC & Control Room and Compressor room	Floors at 0.00m level	Steel framed structure with Steel truss	Steel truss /Portal frames with Aluminium profile colour coated sheet roofing with polycarbonate (5%)	230mm brick masonry	Granolithic flooring(IPS)	Underground RCC cable trenches
Fire Water Pump House	Floors at 0.00m level	RCC framed structure	RCC slab	230mm brick masonry	Granolithic flooring(IPS)	
Pipe rack/Cable Gantry	Generally at 3.0 m except	Steel structural				

Building Structure Name	No. of floors / Ht as guidance	Features of Construction	Type of Roof	Side Cladding	Floor Finish	Remarks
(wherever necessary – cable should be run in cable trenches)	at road crossings tiers at 6.0m above FFL	columns & Beams on RCC pedestals				
DM water tank	Above FGL	RCC tank				Foundation Only
WTP MCC & Control Room, Chem. Storage	Floors at 0.00m level	Steel framed structure with Steel truss	Steel truss /Portal frames with Aluminium profile colour coated sheet roofing with polycarbonate (5%)	230 thick brick masonry	Mandana tiles	False Ceiling for Control Room
DM Plant Shed	Floors at 0.00m level	Steel framed structure with Steel truss	Steel truss /Portal frames with Aluminium profile colour coated sheet roofing with polycarbonate (5%)	230 thick brick masonry/GI sheet cladding	Mandana tiles	
Site grading in plant area					Grading to be done (Max ±300 mm) Or as required for the project	
Transformers & Transformer Building		RCC pedestals & foundation for supporting the Transformers & RCC framed structure building for Transformer.			Fire wall	
Control Room.		RCC pedestal & Foundation for Supporting the equipments & RCC framed structure building for Control Room.		GI Chain Link fencing of mesh size 50 x 50 mm-10 gauge thick,including structural member and foundation for the structural members for the fencing complete		
Chimney	RCC Chimney (height 70m)	**Chimney Lining:** 115 thick fire brick lining (IS: 6) with 100 mm air gap.for bottom one third height with baffle wall and hopper area. **Ladder:** Cage ladder with safety ring for entire height.		**Painting scheme:** 1. Inner surface-Two coats of heat and acid resistant paint. 2. Outer surface-Two coats of polyurethane enamel paint over an epoxy sealant in red and white alternate 2.0/3.0 M wide bands for top 1/3 height and balance area will be painted with two coats of waterproof cement paint over one coat of primer.		
CC road	As per layout	GSB base 150 mm	thickness of CC 200 mm	PCC 1:4:8 thickness 150	Kerb stones on both sides of the roads	

Building Structure Name	No. of floors / Ht as guidance	Features of Construction	Type of Roof	Side Cladding	Floor Finish	Remarks
				mm.		
Drains and culverts	On both sides of Road as required	Brick / Stone masonry with internal cement plaster lining,culverts should be RCC box type			RCC cover slab only for wherever the crossing is required	
Paving in press mud area, bagasse yard and near cane carrier	-	Paving: 150 mm thick – M20 Grade+ 50mm PCC-1:4:8 with 230 mm metal soling for Boiler and ESP, area. (Area: 50,x50m press mud area, 100m x 100m in bagasse yard, 100m x 50m near cane carrier).Provide LDPE/ HDPE sheet below flooring				
Sugar Godown 2 nos.one lac quinrals each capacity of 50 kg. bag.	Floor level should be +750 mm.above the road.	RCC columns , steel trusses and 350 mm. thick brick wall upto required height with plaster on both sides.	Steel truss /Portal frames with Aluminium profile colour coated sheet roofing	- Rolling shutters and ramps .	150 mm. thick trimix floor over 150 mm. thick 1:4:8, 230mm soling or sand flling as per the IS code requirement	
Workshop and Store Building	Floor level should be +750 mm.above the road.	RCC columns , steel trusses and 350 mm. thick brick wall upto required height with plaster on both sides.	Steel truss /Portal frames with Aluminium profile colour coated sheet roofing	Rolling shutters, steel windows, ramps and RCC racks	150 mm. thick CC floor over 150 mm. thick 1:4:8, soling and soil filling	
Boundary wall	Plinth level +000	Rcc pillers ,brick wall 230 mm thick and plaster on both sides	Top of wall MS Angle post and spiral barbed wire fencing should be provided			

Note- The floor level of all houses shall not be less than 300 mm. above the existing old factory floor level.

Damp Proof Course

Plain Cement Concrete 1:1 ½ :3 with a minimum of 2% admixture of water proofing compound will be provided wherever required.

Plinth Protection

All building and structure will be provided with 1000 mm wide R.C.C. plinth protection all-round where paving / pitching is not done. The plinth protection will be 50 mm above respective finished ground level.

Anti-termite Treatment

For all plant buildings, anti-termite treatment will be provided.

Masonry Wall

First class bricks or modular AAC blocks will be used for all masonry works. 230 / 200 mm thick wall with 1:6 cement and coarse sand mortar will be used wherever applicable. Half brick thick brick wall in 1:4 cement and coarse sand mortar will be used. Two nos. of 6 mm diameter bars will be provided at every third layer. Glazed partition will be provided wherever view of the operating equipment is required. All internal plastering will be 12 mm thick with 1:4 cm and external plastering will be with 1:5 cement and coarse sand mortar of 18 mm thick.

Water Proofing

Unless otherwise specified the Contractor shall carry out water proofing treatment in basements, terrace, water retaining structures, sunk portion, floors of bath, W.C. and kitchen mories etc. through an approved firm.

The contractor shall provide a guarantee for ten years on a stamp paper in an approved form.
Any defects / leakages noticed during the guarantee period shall have to be rectified within a week's time free of cost by contractor including reinstating the surface to its original condition and finish.

The rates shall include drying and cleaning surface free of dust. The rates shall include for providing water proof lime / cement concrete terracing of adequate thickness to give desired slope for drainage of rain water from terrace. The actual area treated shall be measured and paid for.

Roof Drainage

i. Water from roof surface will be removed by a system of Roof Drain Headers, rainwater down comers and necessary fixtures. The roof will be provided with a slope of 1:100 (min) for efficient draining.

ii. Multiple drains (min.2) will be provided for all roof areas. System will be designed in accordance with stipulations of IS:1742.

False Ceiling

False Ceiling will be with Armstrong panels or Equivalent panels with mineral / glass wool backing, suspended from steel / RC beams. The illumination and duct grills in these areas will match the overall aesthetics.

Doors

Doors will be provided at appropriate locations to prevent dust ingress from outside and to suit respective system requirement and convenience.

i. Un-insulated hollow metal double plated (steel) flush doors with pressed steel frame will be provided for plant and utility areas.
ii. Factory made PVC flush doors will be provided in toilet.
iii. Aluminium glazed partitions and double doors with air lock in special areas.
iv. Fire proof doors for areas having fire hazard.

Rolling Shutters

Rolling steel shutters will be used where frequent use is not envisaged and for large openings. Unless noted otherwise, main entry doors will be steel rolling shutter of width and height to suite the requirements. Rolling shutter with area upto 8 m² will be pull and push type hand operated, while

between 8 m² to 12m² pull and push type with ball bearings. Rolling shutters with areas larger than 12m² will be mechanical gear type or electrically operated.

Windows

Powder coated/ anodized, steel or aluminium windows and ventilators will be proved as per the requirement. The number of windows will be so decided as to allow adequate natural ventilation and lighting. Minimum requirements for ventilation and natural lighting will be 15% of the floor area.

Specification

Roof Providing and fixing of trapezoidal/or approved proile, colour coated aluminium profile industrial troughed sheet made from primary producer alloy 31500B, confirming to IS 1254, IS 737, IS 2676. The sheet shall made of 0.71 mm thick, the profile detail width 1044mm cover width 1000 mm. I bolts with polymer protective cap and anti-leakage polymer washer of matching colour in 10 mm dia. drilled holes and with stitch bolts on sides as specified by manufacturer including end and side laps as required. Measurement shall be for net area.

The Paint system used should be non-toxic and Lead Free so as to make the system suitable for water harvesting. The following certificate need to be provided by seller:- Product Test Certificate, Packing List, Certificate for SRI, Non Toxic Raw Material certificate,BIEC Certificate.

Mill, Boiling, Clarification, sugar house:colour coated aluminium profile industrial troughed sheet made from primary producer alloy 31500B, confirming to IS 1254, IS 737, IS 2676. The sheet shall made of 0.71 mm thick, the profile detail width 1044mm cover width 1000 mm. over structural steel purlins with ridge ventilator to be provided for mill, boiling and evaporation house, turbo fans to be provided for mill, boiling, boiler and power house. Virgin polycarbonate Lexan sheets to be provided for all roofing and cladding at a minimum of 5% of the roofing / cladding area for natural lighting.

All control panel and office rooms:RCC slab with waterproof coba overlay.Air-conditioned areas:False ceiling with Armstrong board or equivalent.

Cladding

Mill, Boiling, Clarification, sugar house :230 mm thick Brick work with RCC block jalli / Windows upto 4m height. Further height can be colored galvalume sheeting with lexan sheets and brackets for ventiallation (min 5% of roof and cladding area)

Stairs

All stairs will have not more than fifteen (15) risers in one flight. Height of risers and width of treads will be 180 mm (max.) and 250 mm (min.) respectively. Minimum width of stairs will be 1000 mm. Hand railing minimum 900 mm high will be provided around all floor / roof openings, projections / balconies, walkways platforms, concrete and steel stairs. All hand rail pipes will be 32 mm nominal bore MS Pipes, medium class and will be galvanised with toe guard 100 mm x 6 mm thk minimum where required.

Doors, Windows & Ventilators

Fire Proof Doors :Division walls of cable spreader rooms and at all fire exit points this will be proved as per recommendation of Tariff Advisory Committee. These will be as per IS:3614. Fire resistance grade of the doors will be as per TAC requirements. However, minimum fire resistance grade will be for four (4) hours.

Powder Coated Aluminium Windows & Ventilators:Control rooms and other buildings.

Glazed Aluminium Door: Control room, control equipment room, computer room and rooms annexed to these etc. will be aluminium glazed doors. Glazed aluminium partitions.

Glazed Aluminium Partition: For control rooms, control equipment rooms etc. double glazed wall panels with aluminium frame will be provided on the side of control room facing the operating floor to

have clear view. Single glazed panel with aluminium framework will be provided as partition between two air conditioned areas where clear view is necessary.

PVC Doors :Main Toilet

PVC doors: Internal Toilet viz, EWC, Shower Glazing

Windows / Ventilators:4 mm thick clear glass will be provided for openable windows and 6 mm thick wired glass for fixed portion of windows / ventilators.

Doors:5.0 mm thick sheet glass will be provided for doors.

Floor finish: General, Mill, Boiling, Clarification, sugar house floor: 100 mm thick tremix flooring with Ironite/hardner

Control room & other areas:40 mm thick vitrified ceramic tiles.

Toilets:Toilets, including W.C and urinal will have cast-in-situ ceramic floor, Dado will be with glazed tiles of minimum 5 mm thickness up to 2.1 m height (door height).

Slippery Areas:Floor / staircase in areas prone to slippage due to oil spillage etc. is provided with anti-skid floor finish like brush – wash and chequered finish.

Staircase:Risers and treads of concrete staircase will be provided with cast-in-situ Kotah flooring. Nosing angles will be provided where required.

Painting External :External masonry surfaces of all buildings will have 3 coatsof water proof cement paint.

Internal:A coat of plastic emulsion paint will be provided over suitable primer for control rooms, control equipment rooms, computer rooms, UPS rooms and air conditioned areas including entrance lobbies.

All other areas will be provided with 3 coats of cement paint

Battery Room:Battery room and all other areas coming in contact with acid / alkali or other corrosive liquid will be painted with acid / alkali resistant chlorinated rubber paint over a suitable primer.

Ceiling:3 coats of white wash.

Structural Steel Internal & External:All structural steel members including rolling shutters and all other exposed steel work will have two coats of enamel paint over a coat of rust convertor primer conforming to IS:2074.

Wood Work :Two coats of Enamel paint over a coat of approved primer.

Fire Prone Areas:All fire exits will be painted in post office red / signal red colour shade, which will not be used any where else except to indicate emergency or safety measures

Fire-proof putty in cable penetration on walls of cable spreader rooms will be provided.

Oil Handling Areas:Oil resistant paint will be provided in oil equipment room.

FIRE-FIGHTING

Firefighting for the entire factory complex both inside the structures mentioned in the scope and outside each of the structures will have to be designed as per the norms of NATIONAL BUILDING

CODE OF INDIA PART 4 FIRE AND LIFE SAFETY-2005 (Second Revision of SP 7-Part 4). This will include ring mains, hydrants and sprinklers as appropriate along with a dedicated firewater tank of 3 lakh liter capacity with fire pumps (positive suction) with jockey pump provision etc.

WATER SUPPLY

The water supply plumbing inside the houses and mains connection to the water reservoir needs to designed as per IS 1172 (1993- Fourth revision). Points as desired for outlet will be provided.

PROVISION FOR EXPANSION

Power house, cooling towers, spray pond will have provision for expansion and the structures for each of these should be designed appropriately.

ANNEXURE D - 3

DRAFT OF BANK GUARANTEE AGAINST ADVANCE PAYMENTS TO BE GIVEN BY CIVIL CONTRACTOR

Bank Guarantee No._____

THIS GUARANTEE MADE THIS_____day of _____ Two thousand & seventeen, by the _____ Bank, having its branch office at _____ (hereinafter called 'The Guarantor' which expression shall, unless repugnant to the context or contrary to the meaning thereof, include its successors and assignees) of the one part in favour of Kisan Sahakari Chini Mills Ltd., Gajraula ,Distt. Amroha, Uttar Pradesh (hereinafter called 'The Mills' which expression shall, unless repugnant to the context or contrary to the meaning thereof include its successors and assignees) of the other part.

WHEREAS M/s .....**,** a company registered under the Indian Companies Act, **.....** having its registered office at ..... and chief place of business at **.....** (hereinafter called 'The Civil Contractor' which expression shall unless repugnant to the subject or context include their legal representatives, administrator, successors or permitted assignees) has entered into with the Mills an Agreement dated _____ (hereinafter called the said Agreement) to construct buildings and foundations as for the Mills' sugar plant with co-genaration at Kisan Sahakari Chini Mills Ltd., Gajraula ,Distt. Amroha, Uttar Pradesh, in accordance with the terms and conditions therein contained. (hereinafter referred to as the said machinery & equipment)

AND WHEREAS the Mills is required to pay to the Civil Contractor against the security of a Bank Guarantee an advance payment of **Rs..... lakhs (Rupees .....only)** representing 10% (Ten per cent) of portion of **Contract Price mentioned** at **clause no. 1.1 as advance payment** for the purpose for the said construction of foundations and buildings **and such** guarantee to be valid till the full advance amount is adjusted against the payment to be made to Civil Contractor.

AND WHEREAS before advance payment as aforesaid is made the Guarantor has at the request of the Civil Contractor agreed to give a guarantee as hereinafter contained.

NOW THIS DEED WITNESSES AS FOLLOWS:

(y) In consideration of the premises the Guarantor hereby undertakes to pay the Mills within thirty days of demand and without demur such a sum not exceeding **Rs..... lakhs (Rupees .....only)** as the Mills may demand representing 10% (Ten per cent) of **the Contract** Price, and if the Guarantor fails to pay the sum within the said period,

the Guarantor will also pay, on the sum demanded, interest @ 12 % (Twelve percent) p.a. on from the date of demand till the date of payment. Provided that the liability of the Guarantor hereunder shall be adjusted and reduced with the progress, erection and commissioning by Civil Contractor **and to the extent adjustment shown in** Civil Contractor **Bills** upto that time as per clause **10.0** and **its** sub-clauses of the said Agreement.

(z) The Guarantor shall pay to the Mills on demand the sum under Clause 1 above without demur and without requiring the Purchaser to invoke any legal remedy that may be available to them, it being understood and agreed, FIRSTLY that the Purchaser shall be the sole judge of and as to whether the Civil Contractor have committed breach of any of the terms and conditions of the said agreement and SECONDLY that the right of the Purchaser to recover from the Guarantor any amount due to the Purchaser shall not be affected or suspended by reasons of the fact that any dispute or disputes have been raised by the Civil Contractor with regard to their liability or that proceedings are pending before any Tribunal, Arbitrator(s) or Court with regard thereto or in connection therewith, and THIRDLY that the Guarantor shall immediately pay the aforesaid guaranteed amount to the Mills on demand and it shall not be open to the Guarantor to know the reasons of or to investigate or to go into the merits of the demand or to question or to challenge the demand or to know any fact affecting the demand and LASTLY that it shall not be open to the Guarantor to require proof of the liability of the Civil Contractor to pay the amount before paying the aforesaid guaranteed amount to the Mills.

(aa) This Guarantee shall come into force from the date hereof and shall remain valid till 90 days after the full advance amount is adjusted under clause **10.0** & its sub-clauses of the said agreement, which according to the terms and conditions of the said Agreement is stipulated to be adjusted by **proportionate** 10% (ten per cent) of the **Contract Price mentioned at clause 1.1 of the said agreement** of the Civil Contractor for effected actual progress of the construction of foundations and buildings at site, but if the actual progress as aforesaid have not been completed by the Civil Contractor within the said period for any reason whatsoever, the Guarantor hereby undertakes that the Civil Contractor shall furnish a fresh or renewed guarantee on the same proforma for such further period as the Mills may intimate failing which the Guarantor shall pay to the Mills a sum **or sums** not exceeding **Rs.....lakhs (Rupees .....only)** or the residual amount of balance advance left after proportionate adjustment in accordance with clause 1 above alongwith the interest @ 12 % (Twelve percent) p.a. on unadjusted amount of advance , as the Purchaser may demand.

(bb) This guarantee is in addition to and not in substitution for any other guarantee executed by the Guarantor in favour of the Mills on behalf of the Civil Contractor.

(cc) The Civil Contractor and the Mills will be at liberty to vary and modify the terms and conditions of the said Agreement without affecting this guarantee, notice of which modifications to the Guarantor is hereby waived and the same shall be deemed to have been done with the assent of the Guarantor.

(dd) This Guarantee shall not be affected by any change in the constitution of the Guarantor or of the Civil Contractor nor shall the guarantee be affected by the change in the constitution of the Mills or by amalgamation or absorption with any other body corporate and this guarantee will be available to or enforceable by such body corporate.

(ee) This guarantee is irrevocable except with the written consent of the Mills.

(ff) The neglect or forbearance of the Purchaser in enforcing any payment of moneys, the payment whereas is intended to be hereby secured or the giving of time by the Mills for the payment thereof shall in no way release the Guarantor from its liability under this guarantee.

(gg) The invocation of this guarantee shall be by a letter signed by the Purchaser and countersigned by the Managing Director, Uttar Pradesh Coop. Sugar Factories Federation Ltd., Lucknow and notifying/declaring the amount of advance remaining unadjusted and payable to the purchaser.

(e) Notwithstanding anything stated hereinbefore the liability of the Guarantor under this guarantee is restricted to Rs..... lakhs (Rupees .....only). This guarantee shall remain in force upto …….. Unless a demand or action under this guarantee is filed against the Guarantor in writing within three months from the date of expiry i.e. on or before …….. all rights of the Mills under this guarantee shall be forfeited and the Guarantor shall be released and discharged from all liabilities hereunder.

IN WITNESS WHEREOF _____ for and on behalf of the Guarantor have signed this deed on the day and year above written.

Witnesses: For and on behalf of the Guarantor

ANNEXURE D -4

DRAFT OF BANK GUARANTEE FOR TIMELY COMPLETION OF CONSTRUCTION OF FOUNDATIONS AND BUILDINGS WITH ALL CIVIL WORK

THIS GUARANTEE MADE THIS_____ day of _____,Two thousand ----------, by the _____ Bank, having its branch office at _____ (hereinafter called 'The Guarantor' which expression shall, unless repugnant to the context or contrary to the meaning thereof, include its successors and assignees) of the one part in favour of The Kisan Sahakari Chini Mills Ltd., Gajraula ,Distt. Amroha, Uttar Pradesh. (hereinafter called 'The Mills' which expression shall unless repugnant to the context or contrary to the meaning thereof include its successors and assignees) of the other part.

WHEREAS M/s _____, a company registered under the Indian Companies Act, 19__ having its registered office at _____ and chief place of business at _____ (hereinafter called 'The Civil Contractor' which expression shall unless repugnant to the subject or context include their legal representatives, administrator, successors or permitted assignees) has entered into with the Purchaser an Agreement dated _____(hereinafter called the said Agreement) for construction of foundations and buildings for the Purchaser's proposed sugar plant at Kisan Sahakari Chini Mills Ltd., Gajraula, Distt. Amroha in accordance with the terms and conditions therein contained (hereinafter referred to as 'the said Machinery and Equipment)

AND WHEREAS under clause 12.2 of the said Agreement the Civil Contractor (Civil Contractor) are required to furnish to the Mills a Bank Guarantee in respect of timely completion of construction of buildings and foundations of the said Machinery and Equipment as provided in Schedule ‘A’ of the said Agreement for the sum of Rs._____/- (Rupees_____ only) being 10% (Ten per cent) of the total contract price (given at section 1.1). Such guarantee to be valid till 30 days after the scheduled date of commissioning of the Machinery and Equipment.

AND WHEREAS at the request of the Civil Contractor, the Mills has agreed to accept a Guarantee from the Guarantor being these presents to secure such obligations on conditions expressly that the Guarantor shall on demand and without demur pay the aforesaid guaranteed amount to the Purchaser.

AND WHEREAS the Guarantor has at the request of the Civil Contractor agreed to give the guarantee as hereinafter appearing.

NOW THIS DEED WITNESSES AS FOLLOWS:

U) In consideration of the premises the Guarantor hereby undertakes to pay the Mills within three days of demand and without demur such a sum not exceeding Rs. _____(Rupees _____ only) representing 10% (Ten per cent) of the Contract Price (given at section 1.1) as the Mills may demand, and if the Guarantor fails to pay the sum within the said period the Guarantor will also pay, on the sum demanded, interest at the bank lending rate then prevailing reckoned from the date of demand.

V) The Guarantor shall pay to the Mills on demand the sum under clause 1 above without demur and without requiring the Mills to invoke any legal remedy that may be available to them, if being understood and agreed, FIRSTLY that the Mills shall be the sole judge of and as to whether the Civil Contractor have committed breach/or breaches, of any of the terms and conditions of the said Agreement and SECONDLY that the right of the Mills to recover from the Guarantor any amount due to the Mills shall not be affected or suspended by reasons of the fact that any dispute or disputes have been raised by the Civil Contractor with regard to their liability or that proceedings are pending before any Tribunal/Arbitraotr(s) or Court with regard thereto or in connection therewith, and THIRDLY that the Guarantor shall immediately pay the aforesaid guaranteed amount to the Mills on demand and it shall not be open to the Guarantor to know the reasons of or to investigate or to go into the merits of the demand or to question or to challenge the demand or to know any fact affecting the demand and LASTLY that it shall not be open to the Guarantor to require proof of the liability of the Civil Contractor to pay the amount before paying the aforesaid guaranteed amount to the Mills.

W) This guarantee is in addition to and not in substitution for any other guarantee executed by the Guarantor in favour of the Mills on behalf of the Civil Contractor

X) The Civil Contractor and the Mills will be at liberty to vary and modify the terms and conditions of the said Agreement without affecting this guarantee, notice of which modifications to the Guarantor is hereby waived and the same shall be deemed to have been done with the accent of the Guarantor.

Y) This guarantee shall not be affected by any change in the constitution of the Guarantor or of the Civil Contractor nor shall the guarantee be affected by the change in the constitution of

the Mills or by amalgamation or absorption with any other body corporate and this guarantee will be available to or enforceable by such body corporate.

Z) This guarantee is irrevocable except with the written consent of the Mills.

AA) The neglect or forbearance of the Mills in enforcing any payment of moneys, the payment whereas is intended to be hereby secured or the giving of time by the Mills for the payment thereof shall in no way release the Guarantor from its liability under this deed.

BB) This guarantee shall come into force from the date hereof and shall remain valid till _____i.e. one month after the commissioning of the Plant and Machinery for the said plant is completed in all respects and to the satisfaction of the Mills and the said plant is commissioned in accordance with the stipulation in the said Agreement for which the stipulated date according to terms and conditions of the said Agreement is, but if the date is for any reason whatsoever and upon such extension the Civil Contractor fails to furnish or renew Guarantee for the extended period, the Guarantor shall pay to the Mills the said sum of Rs._____/- or such lesser sum as the Mills may demand.

CC) The invocation of this guarantee should be accompanied by a claim signed by the Mills and countersigned by Managing Director, U. P. Cooperative Sugar Factories Federation Limited.

DD) Notwithstanding anything stated hereinbefore the liability of the Guarantor under this guarantee is restricted to Rs._____/- (Rupees _____only). This guarantee shall remain in force upto unless a demand or action under this guarantee is filed against the Guarantor in writing within three month from the date of expiry all rights of the Mills under this guarantee shall be forfeited and the Guarantor shall be released and discharged from all liabilities hereunder.

IN WITNESS WHEREOF _____ for and on behalf of the Guarantor have signed this deed on the day and year above written.

Witnesses: For and on behalf of the Guarantor

SECTION - E
DRAFT OPERATION & MAINTENANCE AGREEMENT

This agreement made on the day of……..2024 (……two thousand eighteen) at Gajraula (Distt. Amroha) between The General Manager, Kisan Sahakari Chini Mills Ltd., Gajraula, Distt. Amroha – 276 406, Uttar Pradesh, a cooperative society registered under the U. P. Cooperative Societies Act , having its registered office at Gajraula (Distt. Amroha) (hereinafter called the "MILLS"), which expression shall, unless repugnant to the subject or context, include their successors and assignees represented by ……. of the Operation and Maintenance Contractor of the ONE PART, and the M/s. …… a company within the meaning of companies act, 1956, having its registered office at ……hereinafter called the 'PARTY' which expression shall, unless repugnant to the subject or context, include their legal representatives, administrators, successors or permitted assignees represented by Sri…….., of the OTHER PART.

WHERAS the Mill are going to purchase refined sugar producing plant of crush rate of 4900 TCD at Gajraula (Distt. Amroha), under the agreement between the mills and M/s. …….. (hereinafter called the Supply contractor).

WHEREAS

Mills- _____is desirous of having Repair & Maintenance in Off-season _____and operation/production services for the crushing season _____ & _____in its Sugar Factory at_____, _____(hereinafter referred to as "MILL") in the areas with particular reference to off season repairing and maintenance of complete plant, Cane Crushing, Operation of power Plant, Production of Sugar, Predictive & Preventive Maintenance, Breakdown Maintenance, civil works related to repair & maintenance and Operation etc. (hereinafter referred to as "Services").

AND WHEREAS

All the repair & maintenance during off season _____ and operation of 4900 TCD sugar plant during season _____ and _____ including off-season _____ and _____ at _____and to provide such services required by Unit-_____at its site on the terms and conditions hereinafter contained:-

NOW IT IS HEREBY AGREED TO BETWEEN THE _____(PARTY) AND MILL AS FOLLOWS: -

1.**Scope of Work**;

The scope of work will involve complete repair & maintenance of plant during off season _____ & _____ and trial, testing & operation (along with repair & maintenance of plant during season) of the MILL during the season _____, _____ and_____. The Scope of repair and maintenance work during Off

season and operation of MILL during crushing season shall include but not limited to the followings:-

1.1 Repair & Maintenance Work during Off season_____ & _____:

1.1(1) For smooth functioning of the MILL, off season repair & maintenance of all sections/stations from cane unloading to final sugar bagging involving all mechanical, electrical& instrumentation work from cane unloader to final molasses storage tank including sugar stacker, belt conveyor system, ETP & all weighing scales have to be checked and repaired by the PARTY.

1.1(2) Servicing of various equipments and machinery such as DG sets, Turbo sets, Turbines, Compressors, Electrical Panels, tubewells etc which is normally done by manufacturer/ outside agency will be in the scope of the PARTY.Turbine repair will be done under original manufacturer.

1.1(3) The PARTY will prepare a report of assessment of work and will supply a copy of report along with required consumables/spare & machinery parts /store materials/ machinery etc. to MILL with a copy to UP Co operative Sugar Factories Federtaion Ltd. Lucknow (herein after called as "Federation') at the earliest after receiving final work order.

1.1(4) All consumables and material (required by the PARTY to repair the Plant will be arranged by the MILL.

1.1(5) Any other repair/modification work including all fabrication/ erection & commissioning work which is required for smooth functioning of the MILL, will be done by the PARTY. This will be applicable after final handover of plant after successful performance trials by plant supplier.

1.1(6) All the repair & maintenance work of the MILL in Off season _____ should be completed by the PARTY latest by end of September_____.

1.1(7) If any of the machinery item is required to be replaced by new one, the same shall be decided jointly by PARTY Senior Technical person as nominated by them and a Technical Staff of MILL and MILL will take approval for the same from Federation. In case any dispute /disagreement amongst the two, the decision of MD, Federation shall be final.

1.1(8) Quality of purchased material required for repair, maintenance and replacement shall be inspected jointly by Chief Engineer and Chief Chemist of MILL and Sr. Technical representative of the PARTY, and in case of any dispute with respect to quality of the new material, the decision of MD, Federation shall be final.

1.1(9) During Off season and season expenditure incurred on labour component of rewinding of motor and alternators (including spare and standby) will be in the scope of work of PARTY. PARTY shall ensure that all burnt / damaged motors shall be repaired it by their own staff or by reputed rewinder/ authorized works before start of season. New motor will be purchased only when it is beyond repairable and for this necessary approval from Federation must be taken.

1.1(10) Work related with cleaning of cane carrier and different houses, different drains in plants, cleaning of Quad bodies/ Juice Heaters/ Pans etc. and shifting of scrap from different houses to scrap yard during off season and crushing season shall be in the scope of work of PARTY.

1.1(11) Workshop will be run & managed by PARTY in season and off-season both. Reshelled rollers (with grooving and journal machining) will be provided by MILL but sheveron grooving and other related workshop jobs will be in scope of PARTY. Similarly only material of Trash Plates, scrappers & others CI/CS/GM casting material will be arranged by MILL but related workshop jobs such as machining and grooving will be in scope of work of PARTY. Mills & transmission gears bearings will be arranged by MILL as per drawing.

1.1(12) Handling of material from the store to site, like lubricants, lime, sulphur, gunny bags and chemicals etc shall be in the scope of work of PARTY.

1.1(13) To obtain NOC from Air and Water Pollution Control Board / Boiler Inspector will be in the scope of work of the PARTY and the required Fees will be deposited by MILL.

1.1(15) All DG sets/Tubewells will be maintained and run by the PARTY as per direction of MILL Technical Staff but requisite spares/parts/HSD etc will be provided by MILL.

1.1(16) During off season and season, if any machinery / machinery parts are repaired by PARTY in outside agency 's workshop then expenditure incurred in transportation will be born by PARTY.

1.2 Operation of MILL during crushing season _____, ____and_____:

The scope of work for smooth and fuel efficient operation of the MILL (which includes 4900 TCD sugar plant during the crushing season _____and _____ will involve all jobs required for operation of plant at all the stations and sections including civil jobs from unloading of sugarcane to bagging of sugar including Operation of De-Mineralisation Plant, Workshop, handling of baggase(tractor with diesel), handling of boiler ash, shifting of press mud,ash to designated place, packing and weighment of sugar bags in drier hous and shifting of sugar bags to godown, Operation of Air and Water pollution control system, DG sets, Tubewell, Unloading/Loading of Store material, tube cleaning of pan, evaporator bodies, juice heaters, unloading lime and shifting to designated place, dry seeds and sugar, brown sugar, BISS sugar reprocessing etc. except for following jobs which will be done by MILL.

1. Sale of Sugar
2. Sale of Molasses
3. Sale of Baggase and press mud
4. Sale of scrap
5. Supply of sugar cane upto Cane carrier.

1.2(1) Analysis of the laboratory shall be done by party and DMR (Daily Manufacturing Report) and other laboratory reports are jointly signed by both the parties. Mill may depute their laboratory staff independently to counter check the analysis report.

2.0 Manpower:

2.1 The BIDDER should have technically sound and well qualified experts and staff as per norms of Sugar Industry / Sugar Wage Board. Workman of desired qualification and experience will only be permitted to enter mill campus with authorized gate pass from mill. List of employees with their mobile numbers, agreement or any other proof of association of employee with company will be submitted as a part of technical bid document.

2.1.1 The bidder should have technically sound and well qualified experts and staff as per norms of Co-operative Sugar Industry/Sugar Wage Board in Uttar Pradesh. Specially, Boiler Engineer, Boiler In charge, Waterman, Fireman should have the boiler operation certificate of concerned class issued by the Directorate of Boilers. Other important technical personnel should have following qualification:-

A- Manpower list of engineering dept.(Mill House/Boiler):-

Sl. No	Designation	Qualification	Experience(Years)(in same Designation)
	Chief Engineer	B.Tech.Mech.	6 year experience in similar cap. & DCS based sugar mill
	Sr. Engineer	B.Tech.Mech./Elect. With BOE	6 year experience in similar cap. & DCS based sugar mill
	Electrical Engineer	B.Tech.Elect.	6 year experience in similar cap. & DCS based sugar mill
	Instrument Engineer	B.Tech. Instrument	6 year experience in similar cap. & DCS based sugar mill
	Asstt. Engineer(Shift Engineer)	B.Tech. Mech.	5 year experience in similar cap. & DCS based sugar mill
	Mill DCS Engineer	B.Tech. Mech.	6 year experience in similar cap. & DCS based sugar mill
	Turbine DCS Engineer	B.Tech. Mech.	6 year experience in similar cap. & DCS based sugar mill
	Boiler DCS Engineer	B.Tech. Mech. / Ist Class B.O.E.	6 year experience in similar cap. & DCS based sugar mill
	Foreman	Diploma in Mech. Engg.	6 year experience in similar cap. & DCS based sugar mill
	Mechanical Draughtsman	High School/ITI	6 year experience in similar cap. & DCS based sugar mill
	Electrician	ITI Electrician	6 year experience in similar cap. & DCS based sugar mill
	Electrician Helper	ITI Electrician	6 year experience in similar cap. & DCS based sugar mill
	Wireman	ITI Electrician	6 year experience in similar cap. & DCS based sugar mill

	Technician	ITI Instrument	6 year experience in similar cap. & DCS based sugar mill
	Motor attendant	High School/ ITI	6 year experience in similar cap. & DCS based sugar mill
	Oilman	High School	4 year experience in similar cap. & DCS based sugar mill
	Boiler Feed Pump Attdt.	ITI Mech/Boiler trade	6 year experience in similar cap. & DCS based sugar mill
	Boiler Attendant.	1st class Boiler Competency Certificate according to Indian Boiler Act.	6 year experience in similar cap. & DCS based sugar mill
	Fireman	2nd class Boiler Competency Certificate according to Indian Boiler Act.	6 year experience in similar cap. & DCS based sugar mill
	Water Attendant	2nd class Boiler Competency Certificate according to Indian Boiler Act.	6 year experience in similar cap. & DCS based sugar mill
	Head Fitter	ITI Fitter trade	6 year experience in similar cap. & DCS based sugar mill
	Fitter	ITI Fitter trade	6 year experience in similar cap. & DCS based sugar mill
	Helper	ITI Fitter trade	6 year experience in similar cap. & DCS based sugar mill
	Khalasi	8th pass	6 year experience in similar cap. & DCS based sugar mill
	Welder	ITI Welder trade	6 year experience in similar cap. & DCS based sugar mill
	Turner	ITI Turner	6 year experience in similar cap. & DCS based sugar mill
	Helper	ITI Turner	6 year experience in similar cap. & DCS based sugar mill
	Machinist	High School/ ITI mech trade	4 year experience in similar cap. & DCS based sugar mill
	Cane Unloader Operator	High School	6 year experience in similar cap. & DCS based sugar mill
	MBC Operator	High School	6 year experience in similar cap. & DCS based sugar mill
	Bagasse feeding point Sup.	High School	6 year experience in similar cap. & DCS based sugar mill
	E.S.P Field operator	ITI Fitter trade	6 year experience in similar cap. & DCS based sugar mill
1	Boiler Chemical Engineer	B.tech Chemical Engg.	6 year experience in similar cap. & DCS based sugar mill
2	D.M. Plant/ Water Treatment Attdt.	ITI Mech/Boiler trade	6 year experience in similar cap. & DCS based sugar mill
3	Tubewell operator/ UGR Pump opr.	ITI Electrical	6 year experience in similar cap. & DCS based sugar mill
4	WTP Operator	ITI Mech/Boiler trade	6 year experience in similar cap. & DCS based sugar mill
	TOTAL		

B- Manpower list of engineering dept.(Power House):-

Sl.No.	Designation	Qualification	Experience(Years)(in same Designation)
1	Electrical HOD	B.Tech.(Electrical)	6 year experience in similar cap. & DCS based sugar mill
2	Instrument HOD	B.Tech. Instrument	6 year experience in similar cap. & DCS based sugar mill
3	Electrician	ITI Electrician	4 yr exp. of similar plant
4	Turbine Field Opr.	ITI Fitter	4 yr exp. of similar plant
5	Switchboard Attendant	H.S./ITI Elec. Trade	6 year experience in similar cap. & DCS based sugar mill
6	D.G. Set Operator	ITI Electrical	4 yr exp. of similar plant

Manpower list of Manufacturing dept.(Boiling House & C/F House):-

Sl.No.	Designation	Qualification	Experience(Years)(in same Designation)
1.	Chief Chemist	B.Sc.,ANSI/VSI Sugar Tech	Min. 10 yr in DCS based Sugar Industry
2.	Manufacturing Chemist	B.Sc.,ANSI/VSI Sugar Tech	Min. 5 yr in DCS based Sugar Industry
3.	Lab Incharge	ANSI/VSI Sugar Tech	Min. 5 yr in DCS based Sugar Industry
4.	ETP Chemist	B.Sc.,ANSI/VSI Sugar Tech	Min. 5 yr in DCS based Sugar Industry
5.	Lab Chemist	B.Sc. PCM	Min. 5 yr in DCS based Sugar Industry
6.	Lab Boy	Intermediate (Science)	Min. 5 yr in DCS based Sugar Industry
7.	Sample Boy	High School	Min. 5 yr in DCS based Sugar Industry
8.	pH Recorder	B.Sc.	Min. 5 yr in DCS based Sugar Industry
9.	Evaporator Mate	Intermediate	Min. 5 yr in DCS based Sugar Industry
10.	Evaporator Helper	High School	Min. 5 yr in DCS based Sugar Industry
11.	Juice Heater Attendant	Intermediate	Min. 5 yr in DCS based Sugar Industry
12.	Sulphur furnace mate	Intermediate	Min. 5 yr in DCS based Sugar Industry
13.	Sulphur furnace helper	High School	Min. 5 yr in DCS based Sugar Industry
14.	Juice/Syp. Sulphitor	Intermediate (Science)	Min. 5 yr in DCS based Sugar

	Mate		Industry
15.	Dorr mate	Intermediate	Min. 5 yr in DCS based Sugar Industry
16.	Vacc. Filter Mate	Intermediate	Min. 5 yr in DCS based Sugar Industry
17.	Vacc. Filter Helper	High School	Min. 5 yr in DCS based Sugar Industry
18.	Lime Majdoor	High School	Min. 4 yr in DCS based Sugar Industry
19.	Pan Incharge)	SBCC Course from NSI/VSI	Min. 5 yr in DCS based Sugar Industry
20.	Pan Man(A side)	SBCC Course from NSI/VSI	Min. 5 yr in DCS based Sugar Industry as a Pan Man
21.	Asst. Pan man(A side)	SBCC Course from NSI/VSI	Min. 5 yr in DCS based Sugar Industry as a Pan Man
22.	Asst. Pan man(B continuous)	SBCC Course from NSI/VSI	Min. 5 yr in DCS based Sugar Industry as a Pan Man
23.	Pan Man(C-side)	SBCC Course from NSI/VSI	Min. 5 yr in DCS based Sugar Industry as a Pan Man
24.	Pan helper(A side)	High School	Min. 5 yr in DCS based Sugar Industry at similar post
25.	Pan helper(A & C side)	High School	Min. 5 yr in DCS based Sugar Industry at similar post
26.	Pan Storage Tank(A side)	High School	Min. 5 yr in DCS based Sugar Industry at similar post
27.	Pan Storage Tank(B&C side)	High School	Min. 5 yr in DCS based Sugar Industry at similar post
28.	Cryst. Operator(A side)	High School	Min. 5 yr in DCS based Sugar Industry at similar post
29.	Cryst. Operator(B & C side)	High School	Min. 5 yr in DCS based Sugar Industry at similar post
30.	Centrifugal Mate	High School/ ITI Fitter	Min. 5 yr in DCS based Sugar Industry at similar post
31.	Centrifugal opr.(B &C)	High School/ ITI Fitter	Min. 5 yr in DCS based Sugar Industry at similar post
32.	Centrifugal opr.(A-side)	High School/ ITI Fitter	Min. 5 yr in DCS based Sugar Industry at similar post
33.	Magma operator	High School	Min. 5 yr in DCS based Sugar Industry as magma operator
34.	Drier House clerk	Intermediate	Min. 5 yr in DCS based Sugar Industry as magma operator
35.	MPA Boiling House	High School & ITI Elec.	Min. 5 yr in DCS based Sugar Industry
36.	MPA C/F/ Injection	High School & ITI Elec.	Min. 5 yr in DCS based Sugar Industry
37.	Hopper Majdoor	High School	Min. 5 yr in DCS based Sugar Industry
38.	Vertical Cryst. Operator	High School	Min. 5 yr in DCS based Sugar Industry
39.	Majdoor for cleaning	8th pass	Experience as a sweeper

40.	Fitter Boiling House	High School & ITI Fitter	Min. 5 yr in DCS based Sugar Industry
41.	Helper Boiling House	High School & ITI Fitter	Min. 5 yr in DCS based Sugar Industry
42.	Welder	ITI Welder/ High School	Min. 5 yr in DCS based Sugar Industry
43.	Electrician	ITI Electrician	Min. 5 yr in DCS based Sugar Industry
44.	Fitter C/F House	High School & ITI Fitter	Min. 5 yr in DCS based Sugar Industry
45.	Helper	High School & ITI Fitter	Min. 5 yr in DCS based Sugar Industry
46.	Wireman	ITI Electrician/ High School	Min. 5 yr in DCS based Sugar Industry
47.	Khalasi	8th pass	5 yr experience as a khalasi

Manpower list of engineering dept. for Off-Season (Mill House):-

Sl.No.	Designation	Qualification	Experience(Years) (in same designation)
1	Chief Engineer	B.Tech. (Mech)	6 yr experience in similar cap. & DCS based sugar mill
2	Sr. Engineer	B.Tech. (Mech)	6 yr experience in similar cap. & DCS based sugar mill
3	Head Fitter	ITI Fitter trade	6 yr experience in similar cap. & DCS based sugar mill
4	Fitter	ITI Fitter trade	6 yr experience in similar cap. & DCS based sugar mill
5	Helper	ITI Fitter trade	6 yr experience in similar cap. & DCS based sugar mill
6	Khalasi	8th pass	6 yr experience in similar cap. & DCS based sugar mill
7	Welder	ITI Welder trade	6 yr experience in similar cap. & DCS based sugar mill
8	Foreman (mechanical)	Diploma in Mech. Engg.	6 yr experience in similar cap. & DCS based sugar mill
9	Turner	ITI Turner	6 yr experience in similar cap. & DCS based sugar mill
10	Helper (Turner)	ITI Turner	6 yr experience in similar cap. & DCS based sugar mill
11	Machinist	H.S./ITI mech. trade	4 yr experience in similar cap. & DCS based sugar mill
12	Machinist helper	H.S./ITI mech. trade	4 yr experience in similar cap. & DCS based sugar mill
13	Electrical Engineer	B.Tech. Electrical	6 yr experience in similar cap. & DCS based sugar mill
14	Electrician	H.S./ITI Electricaian	4 yr experience in similar cap. & DCS based sugar mill
15	Instrument Engineer	B.Tech Instrument	6 yr experience in similar cap. & DCS based sugar mill
16	Technician	ITI Instrument	6 yr experience in similar cap. & DCS based sugar mill

17	Wireman	ITI Electrical	6 yr experience in similar cap. & DCS based sugar mill

Manpower list of engineering dept. for Off-Season(Power House/Boiler):-

Sl. No.	Designation	Qualification	Experience (Years)(in same Designation)
1	Plant Manager	B.Tech.Mech.	6 year experience in similar cap. & DCS based sugar mill
2	Boiler Engineer	B.Tech.Mech./Elect. With BOE	6 year experience in similar cap. & DCS based sugar mill
3	Electrical HOD	B.Tech.Elect.	6 year experience in similar cap. & DCS based sugar mill
4	Instrument HOD	B.Tech. Instrument	6 year experience in similar cap. & DCS based sugar mill
5	Asstt. Engineer	B.Tech. Mech.	6 year experience in similar cap. & DCS based sugar mill
6	Boiler DCS Engineer	B.Tech. Mech. / Ist Class B.O.E.	6 year experience in similar cap. & DCS based sugar mill
7	Turbine DCS Engineer	B.Tech. Mech.	6 year experience in similar cap. & DCS based sugar mill
8	Electrical Engineer	B.Tech. Elect.	6 year experience in similar cap. & DCS based sugar mill
9	Instrument Engineer	B.Tech. Instrument	6 year experience in similar cap. & DCS based sugar mill
10	Electrician	ITI Electrician	4 yr exp. of similar plant
11	Technician	ITI Instrument	4 yr exp. of similar plant
12	Turbine Field Opr.	ITI Fitter	4 yr exp. of similar plant
13	Boiler Feed Pump Attdt.	ITI Mech/Boiler trade	6 yr exp. of similar plant
14	Boiler Attdt.	1st class Boiler Competency Certificate according to Indian Boiler Act.	6 year experience in similar cap. & DCS based sugar mill
15	Fireman	2nd class Boiler Competency Certificate according to Indian Boiler Act.	6 year experience in similar cap. & DCS based sugar mill
16	Water Attendant	2nd class Boiler Competency Certificate according to Indian Boiler Act.	6 year experience in similar cap. & DCS based sugar mill
17	Switchboard Attendant	H.S./ITI Elec. Trade	6 year experience in similar cap. & DCS based sugar mill
18	Foreman	Diploma in Mech. Engg.	6 yr exp. of similar plant

19	Fitter	ITI Fitter trade	4 yr exp. of similar plant
20	Helper	ITI Fitter trade	4 yr exp. of similar plant
21	Khalasi	8th pass	4 yr exp. of similar plant
22	Welder	ITI Welder trade	4 yr exp. of similar plant
23	MBC Operator	High School	6 year experience in similar cap. & DCS based sugar mill
24	Bagasse feeding point Sup.	High School	6 year experience in similar cap. & DCS based sugar mill
25	ESP Field Operator	ITI Fitter trade	6 year experience in similar cap. & DCS based sugar mill
26	D.G. Set Operator	ITI Electrical	4 yr exp. of similar plant
	W.T.P		
27	Boiler Chemical Engineer	B.tech Chemical Engg.	6 year experience in similar cap. & DCS based sugar mill
28	Tubewell operator/ UGR Pump opr.	ITI Electrical	4 yr exp. of similar plant
29	WTP Operator	ITI Mech/Boiler trade	4 yr exp. of similar plant
	Total		

Manpower list of Manufacturing dept. for Off-Season(Boiling House & C/F House):-

Sl.No.	Designation	Qualification	Experience (Years) (in same Designation)	Remark
1	Chief Chemist	B.Sc.,ANSI/VSI Sugar Tech	Min. 10 yr in DCS based Sugar Industry	
2	Manufacturing Chemist	B.Sc., ANSI/VSI Sugar Tech	Min. 5 yr in DCS based Sugar Industry	For maintenance of difft. House.
3	ETP Chemist	B.Sc.,ANSI/VSI Sugar Tech	Min. 5 yr in DCS based Sugar Industry	
4	Asst. Engineer	B.Tech.(Mech./ Elec.)	Min. 5 yr in DCS based Sugar Industry	For maintenance of difft. House.
5	Lab Chemist	B.Sc. PCM	Min. 5 yr in DCS based Sugar Industry	
6	Evaporator Mate	Intermediate	Min. 5 yr in DCS based Sugar Industry	one month before start of season

7	Dorr Mate	Intermediate	Min. 5 yr in DCS based Sugar Industry	one month before start of season
8	Pan Incharge	SBCC Course from NSI/VSI	Min. 5 yr in DCS based Sugar Industry	
9	Pan helper	High School	Min. 5 yr in DCS based Sugar Industry at similar post	
10	Centrifugal Mate	High School/ ITI Fitter	Min. 5 yr in DCS based Sugar Industry at similar post	15 days before start of season
11	Centrifugal Operator(A-side)	High School/ ITI Fitter	Min. 5 yr in DCS based Sugar Industry at similar post	15 days before start of season
12	Fitter for PAN	High School & ITI Fitter	Min. 5 yr in DCS based Sugar Industry	
13	Helper for PAN	High School & ITI Fitter	Min. 5 yr in DCS based Sugar Industry	
14	MPA Boiling House	High School & ITI Elec.	Min. 5 yr in DCS based Sugar Industry	
15	Fitter Cooling tower/injection	ITI Fitter	Min. 5 yr in DCS based Sugar Industry	
16	Helper Cooling tower/injection	High School & ITI Fitter	Min. 5 yr in DCS based Sugar Industry	
17	Fitter Boiling House	High School & ITI Fitter	Min. 5 yr in DCS based Sugar Industry	
18	Helper Boiling House	High School & ITI Fitter	Min. 5 yr in DCS based Sugar Industry	
19	Welder	ITI Welder/ High School	Min. 5 yr in DCS based Sugar Industry	
20	Electrician B.H./ centrifugal	ITI Electrician	Min. 5 yr in DCS based Sugar Industry	
21	Electrician helper	H.S./ITI Electrician	Min. 5 yr in DCS based Sugar Industry	
22	Fitter C/F House	High School & ITI Fitter	Min. 5 yr in DCS based Sugar Industry	
23	Helper C/F House	High School & ITI Fitter	Min. 5 yr in DCS based Sugar	

			Industry	
24	Wireman	ITI Electrician/ High School	Min. 5 yr in DCS based Sugar Industry	
25	Khalasi for B/H,PAN /CFG	8th pass	5 yr experience as a khalasi	

Note: The party will ensure smooth and trouble free operation during off season and crushing season at every station. The number of employees per station given above may vary on need base basis with the consultation of management in order to achieve performance parameter as per tender terms & condition in the interest of mill.

2.3 All persons engaged by the BIDDER directly or indirectly shall be employees of the BIDDER and it is obligatory on the part of the BIDDER to cover all their employees under workman compensation act 1923.

2.4 The BIDDER will be responsible for deduction and payment of EPF/any other such liabilities from all employees and MILL will not be responsible for any monetary claim or payment to BIDDER employee or statutory authorities under the Employee Provident Fund, Family Pension Fund or any other liabilities.

2.5 Group insurance of employees of the BIDDER will be responsibility of the BIDDER and MILL will not be responsible for any claim / compensation which may be made under the Workmen Compensation Act, 1923.

2.6 In the event of any accident/causality etc. of the employees of the BIDDER, MILL will not be responsible and BIDDER will ensure all safety measures for its employees.

2.7 The BIDDER shall ensure that the age of their employees will not be less than 18 years in any case.

2.8 The BIDDER shall withdraw/replace those Employees, who are not performing the work to the satisfaction of MILL or for their misconduct and for any other reason, as indicated by the MILL in writing to the BIDDER within 48 hours of the said communication. In order to ensure quality repair / maintenance of the plant, BIDDER should not replace / withdraw the maintenance staff without consulting to MILL.

2.9 If mill observed any adverse impact on work performance during off season and crushing season on account of less numbers of experienced, skilled staff, then under those circumstances mill will be forced to depute own required workforce at the cost of party. The amount incurred on providing the manpower by the mill will be deducted from the bills of party.

2.10 The BIDDER shall duly comply with the provisions of the Apprentices Act 1961 (III of 1961), the rules made there under and the orders that may be issued from time to time under said act and the said rules and on his failure or neglect to do so the BIDDER shall be subject to all liabilities and penalties provided by the said act and rules.

2.11 BIDDER will also ensure 100% reprocessing of brown/BISS and scrapping sugar of previous year including shifting of same from place of storage to curing house.

2.12 During continuance of the agreement, the BIDDER shall abide at all times by all existing enactments and rules made there under, regulations, notifications and bye-laws of the

state of central government of authority and all labor law (including rules), regulations, by laws that are applicable, the BIDDER shall keep the MILL indemnified in case any action is taken against the MILL by the competent authority on account of contravention of any of the provisionsof any act or rules made there under, the regulation or notifications including amendments. Thereof if the MILL is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non observance of the provisions stipulated in the notifications/ by laws/ acts/rules / regulations including amendments if any, due to any act or omission on the part of the BIDDER, the MILL shall have the right to deduct money due to the BIDDER including invocation of performance security. The MILL shall have right to recover from the BIDDER any sum required or estimated to be required for making good the loss or damages suffered by the MILL. The employees of the BIDDER or any person employed for any work indicated. In the agreement or indicated thereto, In no case shall be treated as the employees of the MILL at any point of time, in any manner whatsoever.

3.0 Accommodation

3.1 As per availability, accommodation for staff of the PARTY will be made available free of rent by the MILL.

3.2 The electricity will be provided for staff Quarters of PARTY on payment basis and water will be provided at the cost of MILL. Staff of PARTY should not misuse the electricity and water.

3.3 All other arrangements for food etc will be made by the PARTY.

4.0 Arrangement of Materials and consumables

4.1 A list of all material and consumables /spare & machinery parts / store materials/ machinery etc. with technical specification and estimated cost will be provided by the PARTY to the General Manager of MILL with a copy to Federation within one month from the date of signing of this agreement for _____season and within one month from the date of closure of Season _____ for _____ season. Keeping in view that progress of repair work may not suffer, the PARTY should submit the indents of long delivery /critical items within one month from the date of signing of this agreement for _____season and within one month from the date of closure of Season _____ for _____ season so that they may be arranged by MILL in time.

4.2 The PARTY must provide all the indents (except for emergency purchase) to MILL in consultation with MILL Technical Staff within two months of signing of this Agreement so that MILL can procure store items well in time. MILL will procure material and consumables /spare & machinery parts / store materials/ machinery/civil material etc after receiving the indent/requirement from the PARTY. Any delay in the supply of material due to late submission of indents by PARTY or due to any reason will not entitle the PARTY to any claim. PARTY should ensure that inventory of the store should not be increase after the end of the season.

4.3 All the tools & tackles arrangements will be made by the PARTY.

5.0 Supply of Sugarcane:-

5.1 The arrangement for the procurement and supply of sugar cane shall be done by the MILL. The supply of sugarcane as per indent of the PARTY up to the Cane Carrier will be the responsibility of the MILL. The indent will be issued by the PARTY in advance.

6.0 Performance parameters to be achieved by PARTY:

The overall performance of the PARTY will be judged on the basis of following parameters in the first year :

6.1 Stoppage due to Mechanical & Electrical Breakdowns:– Maximum 1.50 %

6.2 Stoppage Due to Process, General Cleaning & Others:– Maximum 1.50 % (Excluding No cane stoppages)

6.3 Loss: – Maximum 1.80% on cane is admissible on account of loss in Bagasse, Press Mud, Molasses and unknown.

6.4 Gross Capacity Utilization:- Minimum 90 % Gross capacity utilization (Excluding No cane stoppages) should be achieved at the end of crushing season.

6.5 Quality of Sugar:- The quality of sugar will be of 60 ICUMSA(maximum) value of M-30 with minimum 80 % medium size bold grain.

6.6 RME (Mittal Formula) 96% + at maceration % Fibre upto 270 +.

6.7 RBHR (Gunndu Rao Formla) 92%+(on C-Heavy); 90%+(on B-Heavy)

6.8 **Performance Parameters of Boiler:-**

Steam pressure at super heater outlet (ata)	**: 67**
S.H. steam temp.at super heater outlet (℃)	**: 510 ± 5**
Max. Continuous Rating (T/hr)	**: 120.0**
Peak load at 110% of MCR for bagasse (T/hr)	**: 132.0**
Boiler efficiency % (bagasse firing), Moisture (50 – 51%)	**: 71.0**

6.9 The power generating plant shall give an average steam consumption of 5.67 TPH/MWH in season for new TG set.

NOTE: The above performance parameters shall be applicable after successful completion of Performance Trials and Guarantee Test of the plant.

07 Damage to Machinery:-

7.1 Any damage of machinery/machinery parts during operation, if it has occurred due to negligence of staff of the PARTY, will be recovered from the PARTY.

7.2 If any machinery/parts is damaged during repairing work in off-season or during operation in season, a committee headed by General Manager of the MILL will review. If damage took place due to manufacturing defects then loss will be borne by the MILL. If machinery get damaged solely due to negligence of any staff of PARTY then loss liabilities will be born by the PARTY. The decision with respect to fixing of

responsibility/ loss responsibility shall be determined by the committee headed by MD, Federation whose decision shall be final and binding.

08.0 Penalties (will incorporate after performance trial):

8.1 Repair and Maintenance:

In case it is found that work is not being completed in the time schedule resulting delay in start of the season then penalty will be imposed @ of 1 % of Total Off Season Repair cost for every fortnight delay. For the purpose of calculation of penalty, parts of fortnight shall be treated as full fortnight.

8.2 Operation of the MILL:

In the event of not achieving any of the above mentioned performance parameters, penalty of Rs 10.00 lac (Rs. ten lacs) only per parameter will be recovered from PARTY. It may be recovered from the dues of the PARTY subject to maximum 5 % of total o&m contract value.

09.0 Bank Guarantee

To secure the contractual obligations, seller at their own cost shall furnish to the MILL, Performance Bank Guarantee of Rs. 50 lac from any nationalized bank with 15 days after signing of the o&m Agreement. This Bank Guarantee shall be valid till the end of 3rd crushing season or valid for a period of 30 (thirty) days beyond the date of completion of all contractual obligations of the supplier, including warranty obligations. If PARTY fails to submit the above said Bank Guarantee within stipulated period EMD deposited by PARTY will be forfeited.

BG shall be released on successfully completion of all the contractual obligations of the PARTY after finalization of RT(8)C of 3rd crushing season.

In the event of breach of contract / failure of contractual responsibilities / if repairs work are left unfinished & incomplete/ unable to operate the plant in complete season etc by the PARTY then MILL have the full rights to forfeit Bank Guarantee.

10.0 CHARGES

10.1 A lump sum charge per month during Season _____ and _____ for operation of the MILL (which includes 4900 TCD sugar Plant during the three crushing season _____, _____ and _____ (03 seasons) and for Repair and Maintenance, a Lump Sum charges for the Off-season _____ & _____ (02 off-seasons) shall be payable for all the services of annual overhauling and repair and maintenance as as under:-

Sr.No.	Particular's	Basic (Rs.)
1.	Repair & Maintenance of complete Sugar Mill during Off-season.	_____ per off-season (GST extra as applicable)

2.	Operation of Sugar Mill	_____per month (GST extra as applicable)

Note: TDS (Tax deduction at source) at prevailing rates shall be deducted by MILL while releasing payment to PARTY.

10.2 GST, duties and other levies as applicable shall be charged extra to MILL, at actual.

10.3 Season shall be considered before 7 days start of RT 8© formation.

11.0 Payment Terms

11.1 **DURING OFF SEASON_____:-**

a) The PARTY will supply the price break up and time schedule of the dismantling and repair & maintenance station wise along with civil work immediately after signing of this Agreement with consultation of MILL staff. This price break will be approved by MILL within one week of submission of price break up. Payment will be released accordingly on the submission of invoice after deducting the advance as mentioned in para 11.1(b) The PARTY will submit the invoice for payment on the basis of actual work done at each station corresponding to approved price break-up once in a month after completion of the month within the first week of the next month. Bill will be verified by Technical staff of MILL as per actual work done at each station corresponding to approved price break-up.

b) An advance of Rs. ---------- may be given to the PARTY against the Bank Guarantee of any nationalised Bank for off season repair and it will carry interest @ 12% p.a. This advance guarantee shall be valid for a period of 6 month. Aforesaid advance shall be repaid by PARTY in the following manner:-

"30%, 30% and 40% of advance of Rs. ---------- will be deducted in successive first three bills of Off Season. If any advance is left un-recovered than the validity of above BG should be extended for a suitable period by the party at their own cost.

c) During Off Season maximum payment/bill adjustment of 20 % of approved price break-up of each station shall be made for dismantling work and payment will be made as per percentage dismantling progress of each station.

d) Maximum payment/bill adjustment of 50% of approved price break-up of each station shall be made for the repairing and overhauling and payment will be made as per percentage repair progress of each station.

e) payment/bill adjustment of 15 % of approved price break-up of each station shall be made after the trial of each station of the plant and payment will be made as per percentage trial progress of each station.

f) Balance 05% payment/bill adjustment of approved price break-up of each station shall be made after 7 days of successful running of the plant from the date of start of the cane crushing.

g) payment/bill adjustment of balance 10 % will be made within 15 days of end of crushing season and on finalization of final manufacturing Report { R.T. (8) C}.

Note:- R.T.8(C) is final manufacturing report for the cane crushing season prepared in prescribed format of Central Excise Rule 83. It is authentic document of any sugar factory having mandatory disclosure of technical performance of the factory.

11.2 **DURING SEASON _____and_____:-**

The rates for operation of plant during the season will be decided and paid on per month basis. The PARTY will submit the invoice for payment once in a month after completion of the month within the first week of the next month.

Ninety percent payment of monthly Season bill will be made within seven days after submission of invoice/bill. Payment of balance Ten percent along with EMD will be made after finalization of R.T. (8) C latest by three one months from the end of the Crushing Season.

11.3 All taxes as applicable will be deducted at source.

11.4 After closure of crushing season _____and _____ a few jobs should be completed which are mandatory for any sugar factory like: Boiling Off process, production of Brown /BSS Sugar, cleaning of complete plant, washing of all boiling house vessels, scrapping of sugar , weighing & shifting of brown sugar to storage place, dismantling of cane carrier chain and mill rollers etc will be off season work. PARTY will insured that these jobs to be completed prior to submission of final bill for payment.

11.5 Final payment shall be made by the MILL within 15 days of receiving the proof of payment of all government dues and all labour/ workmen dues, including PF, GST etc. by the PARTY.

11.6 In drier House, register of sugar bagging shall be jointly signed by PARTY and MILL.

12 SETTLEMENT OF DISPUTES

12.1 Amicable settlement

The Parties shall use their best efforts to settle amicably all disputes arising out of or in connection with this Agreement or the interpretation thereof.

12.2 Dispute resolution

12.2.1 Any dispute, difference or controversy of whatever nature howsoever arising under or out of or in relation to this Agreement (including its interpretation) between the Parties, and so notified in writing by either Party to the other Party (the “Dispute”) shall, in the first instance, be attempted to be resolved amicably in accordance with the conciliation procedure set forth in Clause 12.3.

12.2.2 The Parties agree to use their best efforts for resolving all Disputes arising under or in respect of this Agreement promptly, equitably and in good faith, and further agree to

provide each other with reasonable access during normal business hours to all non-privileged records, information and data pertaining to any Dispute.

12.3 Conciliation

In the event of any Dispute between the Parties, either Party may call upon, Managing Director, UP Cooperative Sugar Factories Federation Ltd and upon such reference, the said persons shall meet no later than 10 (ten) days from the date of reference to discuss and attempt to amicably resolve the Dispute. If such meeting does not take place within the 10 (ten) day period or the Dispute is not amicably settled within 15 (fifteen) days of the meeting or the Dispute is not resolved as evidenced by the signing of written terms of settlement within 30 (thirty) days of the notice in writing referred to in Clause 12.2.1 or such longer period as may be mutually agreed by the Parties, either Party may refer the Dispute to arbitration in accordance with the provisions of Clause 13.

13.0 Arbitration

Solely for the purposes of settlement of any dispute arising between the parties out of this agreement, the contractor shall be treated as an agent of the mill and any dispute arising out and between the parties to this agreement shall be referred to arbitration to the Registrar in accordance with Section 70 of the UP Cooperative Societies Act, 1965.

14.0 Juridiction of Court

All dispute arising are subject to the jurisdiction of High Court Lucknow and Court subordinate to it at Lucknow, Uttar Pradesh.

15.0 Validity of Offer not applicable in agreement

Offer of the tender should be valid for the 90 days from the date of opening the tender.

16.0 Period of Agreement

The Agreement to be executed between the Successful Tenderer and Mill shall be valid up to finalization of R.T. (8) C for crushing season _____, _____ and _____ and Off season_____ & _____.

Note: Since _____season will be the 1st season and man power will be required for new plant trial and commissioning, therefore the period/duration of crushing season _____ will be calculated from three weeks before the actual date of start of crushing and seven days after the actual closure of crushing. However, for season _____ the period/duration of crushing season will be calculated from seven days before the actual date of start of crushing and seven days after the actual close of crushing.

17.0 Force Majeure

17.1 Definition

(a) The right of the PARTY to proceed with the work shall not be terminated because of any delay in the completion of the work due to unforeseen causes beyond the control and without the fault or negligence of the Seller or their sub-contractors including (but not restricted to) Act of God or Public enemy, action of Govt. in its sovereign capacity, floods, epidemics, quarantine, strike, lock-outs, fires, explosions, accident, stoppage in the supply of power, civil commotion, riots, etc. In the event of any of the aforesaid contingencies, unusual or extra ordinarily prolonged, the Purchaser will be promptly kept informed by the Seller by Fax/ E-mail followed by confirmation in writing with documentary proof within 15 days of the commencement and completion of force majeure circumstances. This force majeure clause shall also apply to major sub-contractors of seller.

(b) Force Majeure shall not include (i) any event which is caused by the negligence or intentional action of a Party or such Party's Sub- Consultant or agents or employees, nor (ii) any event which a diligent Party could reasonably have been expected to both (A) take into account at the time of the conclusion of this Agreement, and (B) avoid or overcome in the carrying out of its obligations hereunder.

(c) Force Majeure shall not include insufficiency of funds or failure to make any payment required hereunder.

17.2 Measures to be taken

(a) A Party affected by an event of Force Majeure shall take all reasonable measures to remove such Party's inability to fulfill its obligations hereunder with a minimum of delay.

(b) A Party affected by an event of Force Majeure shall notify the other Party of such event as soon as possible, and in any event not later than 14 (fourteen) days following the occurrence of such event, providing evidence of the nature and cause of such event, and shall similarly give notice of the restoration of normal conditions as soon as possible.

(c) The Parties shall take all reasonable measures to minimize the consequences of any event of Force Majeure.

18.0 Extension of Contract

On completion of contract period, the contract for repair and maintenance and operation of the mill with the Party can be extended yearly further for next season after assessing satisfactory performance for preceding crushing seasons. However contract may be extended with same terms and condition but Escalation in rates (Both in Off Season Repairs cost and Operation cost during season) is granted on the basis of percentage increase of Labour Price Index (All India Consumer Price Index for Industrial Workers) at the time of extension of Agreement.

IN WITNESS WHERE OF THE PARTIES HERE TO AFFIXED THEIR HAND AND SEALS ON

THIS _____DAY OF, _____ TWO THOUSAND AND EIGHTTEEN.

GENERAL MANAGER **FOR**

( ) ( )

WITNESS: WITNESS:

1. 1.

2. 2.

SECTION (F): CAPABILITY STATEMENT (CS)

1. (a) Name and complete mailing address of the business/sales office of the bidder.

(b) Name of Authorized Official
(c) Phone:
(d) Fax:
(e) E-mail:
(f) Principal place of business
(g) Website of Bidder's Firm
Parties Will Have To Furnish Under Noted Information During The Technical Discussions With Documentary Proof:

SNO	Particulars	
1	Address of main workshop where the major portion of the plant and machinery will be	
2	Address for sending all communication (letters) during the execution of the project	
3	Name of Banker & Address	
4	Number, size of Sugar Plants erected & commissioned and technology adopted.	
5	Detail of Tender Fee	
6	Details of E.M.D	
7	Details of Orders in hand/executed **(1) already executed.** **(2) under execution**	
8	The Bidder during the last ten years (not before 2013-2014 season), must have successfully Supplied, erected and commissioned A. At least one complete sugar plant of minimum installed capacity of 5000 TCD for 22 hrs on EPC basis, or at least two complete sugar plant of minimum installed capacity of 3500 TCD for 22 hrs on EPC basis, or have expanded atleast three complete sugar plants with minimum enhancement in capacity of 2000 TCD or more on EPC basis, B. along with, at least one high pressure boilers (Min pressure 67 ata). C. In addition to above, the bidder must have successfully Supplied, Erected & Commissioned:- atleast one sulphurless refined sugar plant in any or own sugar mill or	

	converted process from plantation white sugar production to sulphurless refined sugar production in atleast two sugar mills. D. The executed plant/plants must have given satisfactory performance for minimum two crushing seasons after commissioning in India. RT8(C) report must be provided for technical bid with performance certificate of the client. The bidder must submit the period of previous execution of EPC project from client.	
7	Details of executed Sugar plants as under i) Name and Address of the Sugar Plant ii) Date of Commissioning iii) TCH-Min. & Max iv) Mill size & drive details Plant & make v) Boiler capacity pressure & temp. of steam & make vi) T.G. set- capacity & type, pressure & temp. of steam & make vii) Major details of Boiling House equipments & make **Please enclose performance certificate, RT8C of trial and last crushing season**	
	Affiadavit regarding Supply,Erection and Commissioning of the Plants alongwith copy of letter of intent (LOI) & copy of agreement with purchaser	
8	Affidavit that the bidder has not been blacklisted	
9	Please enclose the Audited balance sheet and profit and loss account for the last 5 years.	
10	Please enclose the certificate from Chartered Accountant that average annual turn over is more than 180 crore per year. The data should be certified from audited profit and loss account	
11	The bank credit worthiness of the bidder should be atleast Rs. 180 crores duly certified by banker as per performa given in technical Bid which should not be earlier than 3 months from the date of bidding.	
	a) PAN No. b) GST Registration no.	
12	Status of the Company (registered as per Indian Companies Act) or Group of Companies/ Partnership Firm (registered as per Indian Partnership Act, 1932) /LLP/Firm along with documents.	
13	Year of establishment and Registration No.	
14	Registration No. of ESI and PF	
15	Work Contract Registration Number	
16	Name of Banker with full address	
18	Style of bank account and account no.	
19	Whether the firm has any suits/claims Pending with tax authorities (Give Details)	
20	Affidavit that bidder is not blacklisted with U.P. Cooperative Sugar Factories Federation, Lucknow/NCDC/NFCSF and by any Central/State Government organizations.	

TO WHOM IT MAY CONCERN

AFFIDAVIT IN RELATION TO THE E-TENDER

I ..... (Full Name), aged about, ... S/O Shri ..... (Full Name), is resident of .... (Permanent address/present address), is the director/representative/partner of M/s ..... (address of registered office), do hereby solemnly affirm and state on oath as under;

1. I/We state and confirm that I/we or our holding company/subsidiary company have not been convicted by any court of law or indicated or adverse orders were passed by a Regulatory Authority or Government of India/State Governments/ Undertakings or any FIR related to economic or criminal offence has been lodged against the directors/senior officials of the Company/Firm/me which would cast a doubt on our ability to manage/deal with the public sector unit or which relates to grave offence that outrages the moral sense of the community.
2. I/We further state and confirm that in regard to matters relating to security and integrity of the country, I/we or any our holding/subsidiary company have not been charge-sheeted/Black-Listed by any agency of the Government of India/State Governments/Undertakings and/or not been convicted for any offence by any court of law by me/us or by any of our holding/subsidiary company.
3. I/We undertake that in case of any change in the facts and circumstances during the agreement period, such change would attract the provisions of disqualification mentioned in tender document.
4. I/We state and confirm that I/we have not been debarred/disqualified from participating in the tender process of Government of India or State Governments or their instrumentalities.
5. I/We state and confirm that if as Bidder, has made, incorrect, misleading or false misrepresentation in the forms, statements and attachments submitted, whether intentionally or unintentionally be dropped from further consideration.

Deponent

Verification

I ..... above named (authorized signatory), do hereby verify the contents of para 1-5 are true to my personal knowledge.

Signed and verified on .....

Deponent

I identify the deponent who has signed before me.

Advocate

DRAFT OF BANK GUARANTEE FOR PERFORMANCE SECURITY

THIS GUARANTEE MADE THIS _____ day of _____, Two thousand twenty three, by the _____ Bank, having its branch office at _____, (hereinafter called 'The Guarantor' which expression shall, unless repugnant to the context or contrary to the meaning thereof, include its successors and assignees) of the one part in favour of The Kisan Sahakari Chini Mills Ltd., Gajraula ,Distt. Amroha, Uttar Pradesh having its registered office at Amroha, Uttar Pradesh hereinafter called 'The Purchaser' which expression shall, unless repugnant to the context or contrary to the meaning thereof include its successors and assignees) of the other part.

WHEREAS, M/s _____, a company registered under the Indian Companies Act, 1956 having its registered office at _____ and chief place of business at _____, (hereinafter called 'The Seller' which expression shall unless repugnant to the subject or context include their legal representatives, administrator, successors or permitted assignees) has entered into with the Purchaser an Agreement dated _____, (hereinafter called the said Agreement) to design, manufacture, procure, Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including all civil construction, foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh in accordance with the terms and conditions therein contained (hereinafter referred to as 'the said Machinery and Equipment')

AND WHEREAS under the said Contract, the Seller are required to furnish to the Purchaser a Bank Guarantee in respect of guaranteed performance of the Machinery and Equipment supplied by the Seller of the said Total Contract for Rs._____ (Rupees _____ only) representing 5% (Five percent) of the total contract price mentioned in the Contract.

AND WHEREAS the Guarantor has at the request of the Seller agreed to give the guarantee as hereinafter appearing.

NOW THIS DEED WITNESSES AS FOLLOWS:

1. In consideration of the premises the Guarantor hereby undertakes to pay to the Purchaser within 30 (thirty) days of demand and without demur such a sum not exceeding Rs._____/- (Rupees _____ only) representing 5% (Five per cent) of the Total Contract Price (mentioned at section 3.0) as the Purchaser may demand, and if the Guarantor fails to pay the same within the said period, the Guarantor shall also pay, on the sum demanded, interest at the bank lending rate then prevailing reckoned from the said thirty days till the date of payment.
2. The Guarantor shall pay to the Purchaser on demand the sum under Clause 1 above without demur and without requiring the Purchaser to invoke any legal remedy that may be available to them, it being understood and agreed, FIRSTLY that the

Purchaser shall be the sole judge of and as to whether the Seller have committed breach/ or breaches, of any of the terms and conditions of the Agreement and to the extent of loss, damage, costs, charges and expenses caused to or suffered by the Purchaser from time to time shall be final and binding on the Guarantor and SECONDLY that the right of the Purchaser to recover from the Guarantor any amount due to the Purchaser shall not be affected or suspended by reasons of the fact that any dispute or disputes have been raised by the Seller with regard to their liability or that proceedings are pending before any Tribunal, Arbitrator(s) or Court with regard thereto or in connection therewith, and THIRDLY that the Guarantor shall immediately pay the aforesaid guaranteed amount to the Purchaser on demand and it shall not be open to the Guarantor to know the reasons of or to investigate or to go into the merits of the demand or to question or to challenge the demand or to know any fact affecting the demand and LASTLY that it shall not be open to the Guarantor to require proof of the liability of the Seller to pay the amount before paying the aforesaid guaranteed amount to the Purchaser.

3. This guarantee is in addition to and not in substitution for any other guarantee executed by the Guarantor in favour of the Purchaser on behalf of the Seller.
4. The Seller and the Purchaser will be at liberty to vary and modify the terms and conditions of the said Agreement without affecting this guarantee, notice of which modifications to the Guarantor is hereby waived and the same shall be deemed to have been done with the accent of the Guarantor.
5. This guarantee shall not be affected by any change in the constitution of the Guarantor or of the Seller nor shall the guarantee be affected by the change in the constitution of the Purchaser or by amalgamation or absorption with any other body corporate and this guarantee will be available to or enforceable by such body corporate.
6. The neglect or forbearance of the Purchaser in enforcing any payment of moneys, the payment whereas is intended to be hereby secured or the giving of time by the Purchaser for the payment thereof shall in no way release the Guarantor from its liability under this deed.
7. The guarantee is irrevocable except with the written consent of the Purchaser.
8. This guarantee shall come into force from the date hereof and shall remain valid till the end of third crushing season from the date of commissioning but if the period of the contract is for any reason extended and upon such extension if the seller fail to furnish a fresh or renewed guarantee for the said extended period, the Guarantor shall pay to the Purchaser the sum of Rs._____/- (Rupees _____only) or such lesser sum as the Purchaser may demand.
9. The invocation of this guarantee shall be by a letter signed by the Purchaser and countersigned by the Managing Director, Uttar Pradesh Coop. Sugar Factories Federation Ltd., Lucknow .
10. Notwithstanding anything stated hereinbefore the liability of the Guarantor under this guarantee is restricted to Rs._____/- (Rupees _____ only). This guarantee shall remain in force upto the end of three months after completion and certification of successful establishment of performance of plant and machinery unless a demand or action under this guarantee is presented to the

Guarantor in writing within three month from the date of expiry all rights of the Purchaser under this guarantee shall be forfeited and the Guarantor shall be released and discharged from all liabilities hereunder.

IN WITNESS WHEREOF _____ for and on behalf of the Guarantor have signed this deed on the day and year above written.

Witnesses: **For and on behalf of the Guarantor**

TOPOGRAPHICAL SURVEY PLAN OF THE KISAN SAHKARI CHINNI MILL HASANPUR, AMROHA (U.P.)

DRAWING TITLE:
TOPOGRAPHICAL SURVEY OF LAND AT THE KISAN SUGAR MIL, HASANPUR , AMROHA (U.P.)

LEGEND:-

LAND AREA :-

DATE :- 24.01.2023

DRAWN BY :-
BRIJESH KUMAR

CHECKED BY :-

NORTH:-

SCALE :-
A0 1300

GRID :-
25X25 m.

SURVEYED BY:
DESIGNER'S WING
426B,4TH FLOOR SAHARA SHOPPING CENTRE, FAIZABAD ROAD LUCKNOW - 226016
MO. 9415150500

SECTION IV : FINANCIAL e-Bid

IV (A) **e-Bid FORM**

IV (B) **PRICE SCHEDULE/BOQ**

SECTION IV(A): e -**bid FORM**

IFB No. ……./UPF/GM(Pro.Fin)/GajraulaMill/2024 Date :

To:
The Managing Director,
U.P.Co-operative Sugar Factories Federation Ltd,
9-A, Rana Pratap Marg, Lucknow

Dear Sir,
Having examined the e-Bid Documents, we the undersigned, offer to supply..... (Description of Goods and services) inconformity with the said e-Bid Documents for the rates as may be ascertained in accordance with the schedule of rates attached herewith and made part of this e-bid, and hereby undertake that we accept all terms and conditions of E-Tender/contract (section II) of the e-Bid Document and will Supply, erection and commissioning of gravity flow type sugar plant of 4900 TCD on 22 hrs. basis including construction of foundation & Factory Buildings on EPC basis for production of sulphurless refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning of the plant at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh. from our manufacturing works/unit as per the Technical specifications (Section III (c) to your sugar factories. In addition to this, the particulars of our organization such as legal status principal place of business, details of experience and past performance, capability statement and the required e-Bid security in the form of R.T.G.S. or Bank Guarantee in favour of U.P. Co-operative Sugar Factories Federation Ltd. Lucknow are furnished with this e-Bid form.

We further undertake, if our e-Bid is accepted, to deliver the goods in accordance with the delivery schedule specified in the schedule of Requirements (section III (b))

We agree to abide by this e-Bid for the e-Bid validity period specified in Clause 13.1 of the ITB and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

Until a formal contract is prepared and executed, this e-Bid, together with you ,written acceptance thereof and your notification of award shall constitute a binding contract between us.

We undertake that, in competing for (and, if the award is made to us, in executing) the above contract, we will strictly observe the laws against fraud and corruption in force in India namely “Prevention of Corruption Act 1998".

We understand that you are not bound to accept the lowest or any e-Bid you may receive.

Dated.....day of.....20

....

(Signature & Name of Official) (In the capacity of)

Duly authorized to sign e-Bid for and on behalf of

PRICE SCHEDULE/BOQ

Validate Print Help BoQ

15

Tender Inviting Authority: MANAGING DIRECTOR,U.P. Co-operative Sugar Factories Federation Ltd. LUCKNOW.

Name of Work: COMPETITIVE e-bidding FOR Online e-tenders are invited for Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh.

Contract No: 239/UPF/GM(Pro.Fin)/GajraulaMill/2024

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE

(DOMESTIC TENDERS - RATES ARE TO GIVEN IN RUPEES (INR) ONLY)

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	TEXT #	NUMBER #	NUMBER	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Units	Basic Price In Figures To be entered by the Bidder in Rs. P	GST (in Rs.) Rs. P	TOTAL AMOUNT Without Taxes col (13) = (4) x (7) in Rs. P	TOTAL AMOUNT With Taxes col (14) = sum (8) to (13) in Rs. P	TOTAL AMOUNT In Words
1	2	5	7	9	13	14	15
1	**SUPPLY : in accordance with specifications & details as per E-tender Dcoument**						
1.01	Ex-works Supply of Machinery and Equipments as per Scope of Work and Specifications in E-Tender Document (including Freight Charges, Packing & Forwarding, taxes and Insurance etc.) . Necessary facilities including lagging, first filling of lubricants, transformer & turbine oils, painting, material including primary & final coating as per colour scheme of purchaser etc.	Single Plant			0.00	0.00	INR Zero Only
2	**ERECTION CUM COMMISSIONING : in accordance with specifications & details as per E-tender Dcoument**						
2.01	Cost of Site handling, erection & commissioning and trials of the plant and machinery including storage at site and security thereof etc.	Single Plant			0.00	0.00	INR Zero Only
3	**CIVIL CONSTRUCTION : in accordance with specifications & details as per E-tender Document**						
3.01	Cost of foundations	Single Plant			0.00	0.00	INR Zero Only
3.02	Cost of main factory buildings	Single Plant			0.00	0.00	INR Zero Only
3.03	Cost of auxiliary factory building	Single Plant			0.00	0.00	INR Zero Only
3.04	Cost of all other civil works given in E-tender Document	Single Plant			0.00	0.00	INR Zero Only
3.05	**Total Civil Cost (3.01 to 3.04)**	Single Plant	0.00	0.00	0.00	0.00	INR Zero Only
4	**Total Project Cost (1 to 3)**	Single Plant	0.00	0.00	0.00	0.00	INR Zero Only
5	**OPERATION & MAINTENANCE - in accordance with specifications & details as per E-tender Document**						
5.01	Per Off-season Repairs and Maintenance charges for sugar mill on lumpsum basis (considering 2 off seasons).	Single Plant			0.00	0.00	INR Zero Only
5.02	Per month Operation and Maintenance charges for sugar mill during crushing season (for 3 seasons, considering crushing season 180 gross season days)	Single Plant			0.00	0.00	INR Zero Only
Total in Figures					0.00	0.00	INR Zero Only
Quoted Rate in Words		INR Zero Only					

UTTAR PRADESH CO-OPERATIVE SUGAR FACTORIES FEDERATION LTD.
9-A, RANA PRATAP MARG, LUCKNOW
Telephone: (0522) 2200183 **Fax: (0522) 2627994**
(0522) 2628310 **Email: upsugarfed@yahoo.co.in**
259/UPF/GM(Pro.Fin)/GajraulaMill/2024 **Date : 20/02/2024**

Revised E-Tender Notice

Online e-tenders are invited for Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh.

1	Name of The Department	U.P. Co-operative Sugar Factories Federation Ltd. 9A, Rana Pratap Marg, Lucknow-226001
2	Procedure for obtaining and submission of bid documents	Tender form is to be downloaded from e-tender portal http://etender.up.nic.in and website www.upsugarfed.org
3	Bid EMD	Rs. 4,40,00,000/- (Rupees Four Crores Forty lakhs) through RTGS/NEFT by any Nationalised Bank/ Scheduled Bank in favour of UP Co-operative sugar factories federation ltd. payable at Lucknow. **Name of Benificary**:- U.P.Coop. Sugar Factories Federation Ltd. **Bank Account No.**:- **53012823858** **IFS Code No** :- SBIN0060284 **Name of Bank Branch**:- **VidhanSabha Marg,Lucknow.**
4	e-Bid Submission/Download Start Date	23-01-2024 from 18:55 hrs
7	Last Date And Time For Submission Of E-Bids	11-03-2024 UPTO 18:55 hrs
8	Date And Time Of Opening Of On-Line Technical E-Bids	12-03-2024 AT 11:00 am
9	Date And Time Of Opening Of On-Line Financial E-Bids	18-03-2024 AT 11:00 am

The details of submission of e-bids along with eligibility, date & time, opening of Technical/Financial bids, EMD, experience and other terms & conditions will be available on e-tender portal http://etender.up.nic.in and on Federation's website www.upsugarfed.org.The tender fee is Rs. 35000/- (Rupees Thirty Five thousand) + GST only Non refundable and required EMD will be deposited before opening of Technical bid. The detailed terms and conditions are given in e-tender document. E-Tender without E.M.D. & e-bid document fee shall be rejected. Bidder who have already submitted E.M.D. for this tender need not to deposit again, however, e-bid document fee for this tender should be deposited by all participating bidders. The Federation reserves the right to cancel bids or the e-bidding process without assigning any reason thereof. The decision of Federation will be final & binding upon bidders.

(Ramakant Pandey)
Managing Director

CORRIGENDUM

In Competitive e-bidding with reference to e-tender ref. No. 239/UPF/GM(Pro.Fin)/GajraulaMill/2023-24 dated 23/01/2024 regarding Supply, erection and commissioning of most modern sugar plant with Expansion of existing Sugar Mill of 2500 TCD capacity to new 4900 TCD sugar mill on 22 hours basis including civil construction of foundation & Factory Buildings on EPC basis for production of Sulphurless Refined Sugar including operation and maintenance of the plant for three crushing season and two off-season (crop days less than 45 days will not be considered as complete crushing season) after successful commissioning at The Kisan Sahkari Chini Mills Ltd., Gajraula, Distt. Amroha, Uttar Pradesh. and discussion during pre bid meeting dated 06/02/2024, necessary amendments are as follows :-

1- Page No. 71

(iv) Cane Carrier

Primary cane carrier shall be of 2040 mm wide with a horizontal loading length of 45 mtrs. The length of its inclined portion shall be such that it gives an inclination of 15 deg. for the Chopper. It shall have three strands of chains of 200 mm pitch IS-8465. The breaking strength of the chains shall be minimum 60,000 kgs. The cane carrier and its structure shall be of all steel construction, the slats 6 mm thick shall be as per IS : 8236 and fastened to chain by bolts and nylock nuts or by bolts and check nuts.

The cane carrier shall be driven by 90 KW TEFC, S1 dutymotor with constant torque characteristic and operating speed range electric drive. The driving motor with AC variable frequency panel shall be directly coupled to suitable size of planetary gear box to provide apron speed of 3 to 10 mtrs. /minute variable speed. One small screw compressor for cane carrier chain cleaning continuously to remove dissipate flying particles.

The horizontal portion of the carrier shall be arranged below the ground level in such a way so that the sloping side of the carrier is about 300 mm above the ground level. Space of minimum 750 mm shall be left in the pit on either side of the carrier for inspection and cleaning purpose. Arrangement for adjusting the clearance between tip of head on chopper and leveller knives and the slats in the cane carrier shall be provided in the inclined portion. The carrier frame work of mild steel plate extending along the complete length of the carrier shall not be less than 6mm thick except at the place of chopper and leveler where the thickness should be 10 mm for about 2500 mm length.

The frame work shall be adequately stiffened at the top and bottom by angle iron welded to the side plates. The side plates shall be bolted to and supported by rolled steel 250mm x80 mm channels or sections of equivalent strength and be provided with base plate of ample area reinforced by gusset plates .Two foundation bolt holes would be provided in each base plate. The columns in the immediate vicinity of the cane knife set shall be 350 mm x 90 mm double channels or sections of equivalent strength. All the column at drive end should be adequately braced by angle cross pieces of heavy section secured by gusset plate and bolts or by welding. Three longitudinal 150 mm ISMB runners with renewable 10 x 65 mm thick spring steel wear pads would be bolted on the top side of the cross pieces to support the cane carrier chain rollers. The distance between the adjacent supporting columns should not exceed 2.5 meters. The runners would be lowered slightly where the chain arrives at and leaves the runners. 8 mm x 75 mm spring steel flat iron should be tack welded/bolted on the side plates of the cane carrier so that cane carrier slats touch the flat iron only to avoid wearing on side plates. The return side of the apron can slide on the guide angle runners with 8 mm thick spring steel wear flat provided the slats are equipped with renewable spring steel wear pads or alternatively be supported on idler pulleys of 60 mm wide and 230 mm dia. with

75 mm dia. 45C8 shaft running in frictionless suitable roller bearings with grease cups shall be provided.

The carrier chain driven by means of cast steel sprockets having machine cut teeth at least 16 in number and mounted on minimum 280 mm central dia. head shaft of 45C8 quality or equivalent and shall run in 220 mm size anti-friction roller bearings with cast steel Plummer block. The columns under the head shaft and carrier drive shall be extra heavy section to withstand vibrations. At the non-driving end of the cane carrier, the chain shall be mounted on cast steel sprockets having machine cut teeth on minimum 200 mm central dia. tail shaft of 45 C8 quality or equivalent running in minimum 170 mm anti-friction roller bearing with sleeve incast steel housing with slide rails with tension bolts for tightening the chain.

The head and tail shaft shall be hot forged and ultrasonically tested. All the shafts shall be ultrasonically tested and proven flawless.

AMENDED AS

(iv) Cane Carrier

Primary cane carrier shall be of 2040 mm wide with a horizontal loading length of 45 mtrs. The length of its inclined portion shall be such that it gives an inclination of 15 deg. for the Chopper. It shall have three strands of chains of 200 mm pitch IS-8465. The breaking strength of the chains shall be minimum 60,000 kgs. The cane carrier and its structure shall be of all steel construction, the slats 6 mm thick shall be as per IS : 8236 and fastened to chain by bolts and nylock nuts or by bolts and check nuts.
The cane carrier shall be driven **by 75 KW TEFC,** S1 dutymotor with constant torque characteristic and operating speed range electric drive. The driving motor with AC variable frequency panel shall be directly coupled to suitable size of planetary gear box to provide apron speed of **3 to 12 mtrs. /minute** variable speed. One small screw compressor for cane carrier chain cleaning continuously to remove dissipate flying particles.

The horizontal portion of the carrier shall be arranged below the ground level in such a way so that the sloping side of the carrier is about 300 mm above the ground level. Space of minimum 750 mm shall be left in the pit on either side of the carrier for inspection and cleaning purpose. Arrangement for adjusting the clearance between tip of head on chopper and leveller knives and the slats in the cane carrier shall be provided in the inclined portion. The carrier frame work of mild steel plate extending along the complete length of the carrier shall not be less than 6mm thick except at the place of chopper and leveler where the thickness should be 10 mm for about 2500 mm length.

The frame work shall be adequately stiffened at the top and bottom by angle iron welded to the side plates. The side plates shall be bolted to and supported by rolled steel 250mm x80 mm channels or sections of equivalent strength and be provided with base plate of ample area reinforced by gusset plates .Two foundation bolt holes would be provided in each base plate. The columns in the immediate vicinity of the cane knife set shall be 350 mm x 90 mm double channels or sections of equivalent strength. All the column at drive end should be adequately braced by angle cross pieces of heavy section secured by gusset plate and bolts or by welding. Three longitudinal 150 mm ISMB runners with renewable 10 x 65 mm thick spring steel wear pads would be bolted on the top side of the cross pieces to support the cane carrier chain rollers. The distance between the adjacent supporting columns should not exceed 2.5 meters. The runners would be lowered slightly where the chain arrives at and leaves the runners. 8 mm x 75 mm spring steel flat iron should be tack welded/bolted on the side plates of the cane carrier so that cane carrier slats touch the flat iron only to avoid wearing on side plates. The return side of the apron can slide on the guide angle runners with 8 mm thick spring steel wear flat provided the slats are equipped with renewable spring steel wear pads or alternatively be supported on idler pulleys of 60 mm wide and 280 mm dia. with 75 mm dia. 45C8 shaft running in frictionless suitable roller bearings with grease cups shall be provided.

The carrier chain driven by means of cast steel sprockets having machine cut teeth at least 16 in number and mounted on minimum 280 mm central dia. head shaft of 45C8 quality or equivalent and shall run in 220 mm size anti-friction roller bearings with cast steel Plummer block. The columns under the head shaft and carrier drive shall be extra heavy section to withstand vibrations. At the non-driving end of the cane carrier, the chain shall be mounted on cast steel sprockets having machine cut teeth on minimum 200 mm central dia. tail shaft of 45 C8 quality or equivalent running in minimum 170 mm anti-friction roller bearing with sleeve incast steel housing with slide rails with tension bolts for tightening the chain.

The head and tail shaft shall be hot forged and ultrasonically tested. All the shafts shall be ultrasonically tested and proven flawless.

2- Page No. 72

iv) Rubber Belt Conveyor with Equalizer

One no. prepared cane belt conveyor of 2200 mm effective width, 22 meter horizontal length shall be provided to receive the prepared cane from fibrized cane rake elevator & deliver it to first mill Donnelly chute. The belt conveyor shall be provided with suitable supporting structure, walk way on both side ladder, platform around drive staging of equalizer. Belt Conveyor shall be driven by 30 KW TEFC squirrel cage motor with VFD operating at 1440 rpm with foot mounted planetary gear box to provide 8 to 80 meter/minute linear speed of the belt.

The length of the belt conveyor shall be sufficient to cover the location of future zero mill along with Tramp Iron separator for the future expansion of the plant. The inclination of belt conveyor should not increase more than 10 deg. even with zero mill.

A suitable cane equalizer shall also be provided on the belt conveyor before the tramp iron separator. The equalizer shall have its independent drive comprising of 7.5 kW rating motor and helical gear box of suitable ratio, So as to run equalize at 36 rpm at rated speed of motor.

AMENDED AS

iv) Rubber Belt Conveyor with Equalizer

One no. prepared cane belt conveyor **of 2000 mm** effective width, 22 meter horizontal length shall be provided to receive the prepared cane from fibrized cane rake elevator & deliver it to first mill Donnelly chute. The belt conveyor shall be provided with suitable supporting structure, walk way on both side ladder, platform around drive staging of equalizer. Belt Conveyor shall be driven by 30 KW TEFC squirrel cage motor with VFD operating at 1440 rpm with foot mounted planetary gear box to provide 8 to 80 meter/minute linear speed of the belt.

The length of the belt conveyor shall be sufficient to cover the location of future zero mill along with Tramp Iron separator for the future expansion of the plant. The inclination of belt conveyor should not increase more than 10 deg. even with zero mill.

A suitable cane equalizer shall also be provided on the belt conveyor before the tramp iron separator. The equalizer shall have its independent drive comprising of 7.5 kW rating motor and helical gear box of suitable ratio, So as to run equalize at 36 rpm at rated speed of motor.

3- Page No. 81

vi) Mill Drive

The mill shall be driven by a continuously rated 700 kW AC MV 11/6.6 kV VFD drive. The motor

base speed shall be 1000 rpm and shall have constant torque characteristics in between 20 % to 100 % base speed and constant power characteristics between 100% to 110 % of base speed. The specification of motors shall be as under:

•Quantity	4 Nos. Working Motor+ Drive, 1 No. Spare Motor with ACVFD DRIVE
•Rating	700 KW , 1000 rpm base speed, 3 phase, TEFC squirrel cage, AC induction motor - Suitable for application and MV 11 / 6.6 kV drive Duty Class IV.
• Protection	IP- 55/ IC 416 (TEFC/CACA).
• Ventilation	TEFC /CACA (Forced cooled type)
• Main Supply 50H z,	Motor rated of 6.6 kV 3 ph, With MV VFD 11 kV Input /6.6 kV Output Multi Cell PWM Inverter with Cell with Cell bypass Arrangement.
• Speed range	20% to 110% of base speed.'
• Constant torque operation	20% to 110% of base speed.
• Maximum speed	110%.
• Direction of operation	Bi directional operation.
• Mounting	Horizontal foot mounting.
• Class of Insulation	"F" but temp. rise limited to class "B".
• Designed ambient temp.	50 deg. C.
• Efficiency	Typical power converter: 98 % Total drive system Drive+ motor > 95 %
• Internal 11/6.6 kV Input transformer of copper windings, forced-air cooling	

The specifications of the VFD shall be as fallows -

MV VFD shall be of 11 kV Input & 6.6k V output. Each inverter cubicle shall be fabricated for 14/16 SWG. CRCS sheets, free standing, aestivated & painted with anticorrosive paints.

Overload duty shall be of class IV with a protection of IP - 41.Each drive shall be complete with all the salient features including protection for its drive.

The cubicle shall house all the switch gear & their protectors, controls, PWM topology , Cell modules with Faulty Cell Bypass arrangement, interlocking relays & filters etc.

All necessary meter indicators, enunciators, controls etc. shall be neatly arranged on cubicle front doors with neoprene gaskets on all edges of the panel.

Ventilation openings shall be provided at the top of the panel & on side covers by louvers suitably covered by wire mesh.

Drive shall have provision for bi-direction speed regulation & will be +/ - 1 % of the base speed by techno-feed back . The panel will have the facility to accept 4 - 20 m A signal for speed setting in local auto mode & to have control from PLC/DCS.

Each of the drives shall be provided Ammeter, Voltmeter with selector switch, speed indicators, KWH meters etc.

The pressure ventilation system with electric motor drive blower with filter shall be provided for panels. One common control desk with all the controls shall be provided for each motor to be controlled common desk. The electrical installation for mill drive motor, PWM inverter panel etc. shall be complete in all respect. The room (Air Conditioned), civil work shall be provided by purchaser.

AMENDED AS

vi) Mill Drive

Each mill shall be driven by a continuously rated 700 KW AC VFD drive. The motor base speed shall be 1000 rpm and shall have constant torque characteristics in between 20 % to 100 % base speed and constant power characteristics "between 100% to 110 % of base speed. One spare motor of 700 KW with ACVFD Drive shall be provided.

The specification of motors shall be as under

- Quantity : 5 Nos(Four nos working and one No stand by)
- Rating : 700 KW, 1000 rpm base speed, 3 phase, TEFC squirrel cage, AC induction motor – Suitable for application and12 pulse drive type. **Continuous Class V,** S1 duty
- Protection : IP- 55/ IC 416 (TEFC/CACA).
- Ventilation : CACA (Forced cooled type)
- Main Supply : **3 phase, 50 Hz, 690V through** inverter Duty transformer having one no. primary dual Wiring delta connected & two nos. Secondary wiring (One delta one star connected).
- Speed range : 20 %- 110 % of base speed.
- Constant torque operation: 20% to 110% of base speed.
- Maximum speed : 110%.
- Direction of operation : Bi directional operation.
- Mounting : Horizontal foot mounting.
- Class of Insulation : "F" but temp. rise limited to class "B".
- Designed ambient temp. : 50 deg. C.

The specifications of the VFD shall be as fallows –

Each VFD shall be of 12 pulse, 700 KW or its equivalent, suitable for incoming supply of 690 V, 50 HZ, AC. Each inverter cubicle shall be fabricated for 14/16 SWG. CRCS sheets, free standing, aestivated & painted with anticorrosive paints. Overload duty shall be of class V with a protection of IP – 41.Each drive shall be complete with all the salient features including protection for its drive.

The cubicle shall house all the switch gear & their protectors, controls, thyristor, regulating modules, interlocking relays & filters etc. All necessary meter indicators, enunciators, controls etc. shall be neatly arranged on cubicle front doors with neoprene gaskets on all edges of the panel. Ventilation openings shall be provided at the top of the panel & on side covers by louvers suitably covered by wire mesh.

Drive shall have provision for bi-direction speed regulation & will be +/ - 1 % of the base speed by techno-feedback. The panel will have the facility to accept 4 - 20 mA signal for speed setting in local auto mode & to have control from PLC/DCS.

Each of the drives shall be provided Ammeter, Voltmeter with selector switch, speed indicators, KWH meters etc.

The pressure ventilation system with electric motor drive blower with filter shall be provided for panels. One common control desk with all the controls shall be provided for each motor to be controlled common desk.

Specifications of Inverter Duty Transformers shall be -

- Quantity : 2 Nos.
- Rating : Continuous, 2.5 MVA each suitable for 12 pulse drive
- Primary Voltage : 11KV +/- 10 % (winding delta connected)
- Secondary Voltage : 690 V /690 V (winding delta / star)

- Impedance : 5.95 %.
- Vector : D Day 11.

The transformer shall be complete with fittings & accessories like conservator, MOG, BREATHER, Bucholtzrelay , with contacts etc. for alarm & trips , pressure relief devices, thermometer packets , OTI & WTI , Valves , earthing terminals , cooling accessories , bi-directional flanged rollers with locking &bolting device for mounting on rails , air release devices , inspection box , marshall box etc.

Each transformer feeder shall have incoming supply 400 amp 11 kvVCB , kw meter, kw h meter an ammeter , instantaneous o/c relay , earth fault relays , ID MT over current relay.

The electrical installation for mill drive motor, inverter panel and transformer etc. shall be complete in all respect.

Centrally Air conditioning system and equipment of control room for mill drive inverter penal shall be supplied by the seller. The room (Air Conditioned), civil work shall be provided by purchaser.

4- Page No. 91

iv) Return Bagasse carrier

The return Bagasse conveying system shall consist the followings-

One no. troughed/ horizontal, double deck type belt conveyor of suitable width and length between sprocket centers of approximately 150 mtrs. shall be supplied with double drive. Top deck of belt conveyor no.1 shall receive bagasse from belt no.2 and deliver it to the bagasse yard at multi points with the help of plough arrangement. Bottom deck of the belt conveyor shall receive bagasse yard and deliver it on top deck of main bagasse carrier. The belt bagasse carrier shall be complete with structure staging and suitable drive so as to operate at approximate speed of 80 mtrs. /min.

Belt conveyor no.2 shall receive bagasse from bottom deck of main bagasse carrier after boiler feeding and shall deliver the same on top deck of bagasse conveyor no.1. Length between the sprocket centers will be approximately 26 mtrs. The Return bagasse conveyor system is to be provided to handle bagasse of 7500 TCD. The location of conveyor shall be as per the requirement of lay out.

AMENDED AS

iv) Return Bagasse carrier

The return Bagasse conveying system shall consist the followings-

One no. rack type horizontal cum inclined return bagasse carrier of suitable width and length between sprocket centers of approximately 150 mtrs. shall be supplied with double drive. Top deck of rack carrierr no.1 shall receive bagasse from rack carrier no.2 and deliver it to the bagasse yard at multi points. Bottom deck of the carrier shall receive bagasse yard and deliver it on top deck of main bagasse carrier. The bagasse carrier shall be complete with structure staging and suitable drive so as to operate at approximate speed of 80 mtrs. /min.

Rack carrier no.2 shall receive bagasse from bottom deck of main bagasse carrier after boiler feeding and shall deliver the same on top deck of bagasse carrier no.1. Length between the sprocket centers will be approximately 26 mtrs. The Return bagasse carrier system is to be provided to handle bagasse of 7500 TCD. The location of rack carrier shall be as per the requirement of lay out.

5- Page No. 93

7.1Permeable

It shall be a **super gravity** flow plant and shall be provided with passenger lift and it shall be operative from ground floor to pan floor suitable to lift at least 600 kgs approx.

Two massecuite boiling scheme with A and B massecuite boiling for raw sugar productionand an additional Refinery massecuite boiling with back boiling process to control the molasses purity for refined sugar production shall be adopted Heavy shall be diverted to Molasses storage tank for the Production of Ethanol and Extra Neutral Alcohol during off season.
However, in Process House, the equipment required for three massecuite boiling shall be provided in the Pan station so that whenever required the total mixed juice will be utilized in process house to produce 100 % refined sugar of 60(MAX) ICUMSA on three massecuite boiling process.
The process of clarification adopted in Refinery shall be melt phospho flotation with double decolorization system to produce refined sugar of 60(MAX) ICUMSA. Overall steam consumption of boiling house in sugar plant for raw sugar & refinery process shall be around 40 % (+/- 2)on cane at 320% imbibition on fibre.

Minimum floor level of clarification and evaporation section shall be +9.50 meter from factory floor level (FFL) to facilitate gravity flow of juice, condensate and massecuite.

AMENDED AS

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Minimum floor level of clarification and evaporation section shall be +9.50 meter from factory floor level (FFL) to facilitate gravity flow of juice, condensate and massecuite.

6- Page No. 113

7.2 Juice Weighment

7.2.1 On –line mass flow meter – 1 No.

Mass flow meter for ultimate capacity: 400 T/hr.
Pressure drop access the system shall not exceed 1 bar.
The filtrate from filter station shall be pumped to juice sulphiter
For the accurate weighment of juice online mass flow-meter having following specifications shall be considered.

Type	:	Coriolis Dual U Tube design or single full bore straight tube design.
Wetted Parts and Connection	:	Tube, Manifold, and Process flanges in 316 SS welded design, enclosure in SS 304 and should fullfill NACE standard.
Accuracy	:	± 0.10% of mass flow rate

Ambient Temp. Effect	:	0.001 % of Nominal flow rate per°C
Repeatability	:	± 0.05% of rate
Inaccuracy in Current output	:	None
Core processor	:	It should be microprocessor based with digital communication having meter diagnostic capabilities and multivariable measurement with 4 wire system between the sensor and transmitter.
Outputs	:	i) 4-20 mA for mass flow rate ii) 0-1000 Hz frequency for mass flow rate iii) Digital HART for remote configuration
Power Supply	:	85-250 VAC / 24 VDC
Electrical Connection	:	¾ inch NPT
Electrical Housing	:	NEMA 4X
Temperature Limits	:	0 to 204°C
Indication facilities	:	i) Flow rate in TPH ii) Current hour flow in tonnes iii) Last hour flow in tonnes iv) Separate display for measured liquid during check weighment.
Communication Ports	:	a) RS 232/RS 485 for PC Communication b) Centronic parallel port for printer

Mass flow meter shall include

i) Mass flow sensor
ii) Mass flow transmitter
iii) Interface cables
iv) Centralized computer, system with CPU Color monitors, key board, printers etc.
v) Jumbo display arrangement at mill and boiling house.

Online calibration facility for check weighment with tank of suitable capacity shall be provided for random checking of juice delivered by the mass flow meter without stopping the crushing and affecting the working performance of mass flow meter. The check weighment shall have arrangement for discharging the juice to the screened juice tank by gravity/ pump. The party shall furnish detailed calculations showing mass flow rate accuracy, pressure drop, velocity at 10 operating steps weight and measures certificate and stamping from regional weight and measures authorities shall be responsibility of the supplier.
The filtrate from filter station shall be pumped to Juice Defecator.
Suitable arrangement for preparation, storage and pumping of phosphoric acid solution shall be provided near screened juice tank in mill house. The tank shall be 3 mm thick construction SS-304 with stirrer, piping of PVC, two dosing pumps of suitable capacity and head with ACVFD drive.
Supply shall be complete in all respect and compatible for centralized control DCS system.
This mass flow meter of 400 cum. /hr. capacity shall be suitable for ultimate capacity of 7500 TCD.

AMENDED AS

7.2 Juice Weighment

7.2.1 On –line mass flow meter – 1 No.

Mass flow meter for ultimate **capacity: 250T/hr.**
Pressure drop access the system shall not exceed 1 bar.
The filtrate from filter station shall be pumped to juice sulphiter

For the accurate weighment of juice online mass flow-meter having following specifications shall be considered.

Type	:	Coriolis Dual U Tube design or single full bore straight tube design.
Wetted Parts and Connection	:	Tube, Manifold, and Process flanges in 316 SS welded design, enclosure in SS 304 and should fullfill NACE standard.
Accuracy	:	± 0.10% of mass flow rate
Ambient Temp. Effect	:	0.001 % of Nominal flow rate per°C
Repeatability	:	± 0.05% of rate
Inaccuracy in Current output	:	None
Core processor	:	It should be microprocessor based with digital communication having meter diagnostic capabilities and multivariable measurement with 4 wire system between the sensor and transmitter.
Outputs	:	i) 4-20 mA for mass flow rate ii) 0-1000 Hz frequency for mass flow rate iii) Digital HART for remote configuration
Power Supply	:	85-250 VAC / 24 VDC
Electrical Connection	:	¾ inch NPT
Electrical Housing	:	NEMA 4X
Temperature Limits	:	0 to 204°C
Indication facilities	:	i) Flow rate in TPH ii) Current hour flow in tonnes iii) Last hour flow in tonnes iv) Separate display for measured liquid during check weighment.
Communication Ports	:	a) RS 232/RS 485 for PC Communication b) Centronic parallel port for printer

Mass flow meter shall include

i) Mass flow sensor
ii) Mass flow transmitter
iii) Interface cables
iv) Centralized computer, system with CPU Color monitors, key board, printers etc.
v) Jumbo display arrangement at mill and boiling house.

Online calibration facility for check weighment with tank of suitable capacity shall be provided for random checking of juice delivered by the mass flow meter without stopping the crushing and affecting the working performance of mass flow meter. The check weighment shall have arrangement for discharging the juice to the screened juice tank by gravity/ pump. The party shall furnish detailed calculations showing mass flow rate accuracy, pressure drop, velocity at 10 operating steps weight and measures certificate and stamping from regional weight and measures authorities shall be responsibility of the supplier.

The filtrate from filter station shall be pumped to Juice Defecator.
Suitable arrangement for preparation, storage and pumping of phosphoric acid solution shall be provided near screened juice tank in mill house. The tank shall be 3 mm thick construction SS-304 with stirrer, piping of PVC, two dosing pumps of suitable capacity and head with ACVFD drive.
Supply shall be complete in all respect and compatible for centralized control DCS system.
This mass flow meter of 250 cum. /hr. capacity shall be suitable for ultimate capacity of 7500 TCD.

7- Page No. 118

7.5.2Milk of lime preparation station – one set

The milk of lime preparation unit shall consist of following :-

Lime elevator	1 set	1500 kg/hr, chain (roller chain) and steel bucket type with drive.
Lime slacker	1 set	1200 kg/hr, rotary drum type with drive.
Lime classifier	2 sets	Koran type with screw type grit remover with drives (one set standby)
Vibro screens	3 sets	Make SS – 304, Size 60 inch
Classified lime receiver /Tank	1 set	30 m^2 with stirrer, 16 rpm & drive
MOL pumps + grit catcher	2 nos.	12 m^3/hr with drive (one set standby) + VFD
Hydro clones	1 set	15 m^3 /hr Suitable for ultimate capacity
MOL storage tanks	2 nos.	Each of 30 m^3/hr with stirrer & drive
MOL pumps	2 nos.	12 m^3/hrwith drive (one set standby) + VFD
Grit washing trough	1 set	Suitable for ultimate capacity. This shall be of trouble free operation.

AMENDED AS

7.5.2Milk of lime preparation station – one set

The milk of lime preparation unit shall consist of following :-

Lime elevator	1 set	1500 kg/hr, chain (roller chain) and steel bucket type with drive.
Lime slacker	1 set	1200 kg/hr, rotary drum type with drive.
Lime classifier	2 sets	Koran type with screw type grit remover with drives (one set standby)
Vibro screens	**2 sets**	**Make SS – 304, Size 60 inch**
Classified lime receiver /Tank	1 set	30 m^2 with stirrer, 16 rpm & drive
MOL pumps + grit catcher	2 nos.	12 m^3/hr with drive (one set standby) + VFD
Hydro clones	1 set	15 m^3 /hr Suitable for ultimate capacity
MOL storage tanks	2 nos.	Each of 30 m^3/hr with stirrer & drive
MOL pumps	2 nos.	12 m^3/hrwith drive (one set standby) + VFD
Grit washing trough	1 set	Suitable for ultimate capacity. This shall be of trouble free operation.

8- Page No. 125

7.8.6 Chemical System for cleaning (Rubber lined system)

Suitable arrangement for preparation of acid and caustic solution and their pumping to the evaporator bodies shall be provided. Recirculation arrangement also shall be provided. For open caustic soda boiling in Robert type bodies, exhaust connection with rubber seated right angle valves of suitable sizes and vapour outlet with suitable sizes valves to atmosphere from top of body shall be provided. Pipe shall be extended from outside the building.

Tanks	Quantity	Capacity	Type	Material of Construction
Chemical tank	1 No.	250 HL	Cylindrical Tank	Rubber lined MS construction
Caustic Soda Tank	1 No.	250 HL	Cylindrical Tank	Carbon Steel construction

Pumps	Quantity	Capacity	Type	Material of Construction		
				Casing	Impeller	Shaft
Chemical Pump	2 Nos.	100 m3/h, 22 m Head	Centrifugal type	CF8	Stainless steel	SS410
Caustic Soda pump	2 Nos.	100 m3/h, 22 m Head	Centrifugal type	Cast Iron	Stainless steel	SS410

AMENDED AS

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Pumps	Quantity	Capacity	Type	Material of Construction		
				Casing	Impeller	Shaft
Chemical Pump	2 Nos.	100 m3/h, 22 m Head	Centrifugal type	CF8	Stainless steel	SS410
Caustic Soda pump	2 Nos.	100 m3/h, 22 m Head	Centrifugal type	SS	Stainless steel	SS410

9- Page No. 126

7.9 Condensate Flash Recovery System

Flash vapours of all condensates except for condensate of last vessel of quintuple set is utilized.
Efficient condensate Flash Vessel of SS 304 Construction shall be provided. All interconnecting pipes shall be of SS-304 schedule 20 (min.)
Heat recovery from exhaust steam condensate through free flow plate type heat exchanger shall be done. By pass arrangement shall also be provided.
All condensate from different vessels and pans shall be collected in Condensate Flash Vessels.
Two plate type heat exchanger ((1 working & 1 standby) shall be provided to heat suitable condensate for superheated wash water operating on exhaust steam to maintain the final desired temperature of 115 deg. C of condensate for A centrifugals.
Arrangement shall be provided for heat exchange unit for hot air blower for sugar hopper using condensate of suitable temperature.
Suitable capacity inlet condensate receiving bottles, pumps (one operating and one standby), where required, for above operations with AC drive compatible for centralized control DCS system shall be provided.
Suitable arrangement of tank and pumps (One working & one standby) shall be made for back wash of plate heat exchangers (PHE).

AMENDED AS

7.9 Condensate Flash Recovery System

Flash vapours of all condensates except for condensate of last vessel of quintuple set is utilized.
Efficient condensate Flash Vessel **of SS 409 Construction shall be provided. All interconnecting pipes shall be of SS-304 schedule 10**
Heat recovery from exhaust steam condensate through free flow plate type heat exchanger shall be done. By pass arrangement shall also be provided.
All condensate from different vessels and pans shall be collected in Condensate Flash Vessels.
ONE plate type heat exchanger shall be provided to heat suitable condensate for superheated wash water operating on exhaust steam to maintain the final desired temperature of 115 deg. C of condensate for A centrifugals.
Arrangement shall be provided for heat exchange unit for hot air blower for sugar hopper using condensate of suitable temperature.
Suitable capacity inlet condensate receiving bottles, pumps (one operating and one standby), where required, for above operations with AC drive compatible for centralized control DCS system shall be provided.
Suitable arrangement of tank and pumps (One working & one standby) shall be made for back wash of plate heat exchangers (PHE).

10- Page No. 135

7.11.3 Injection and ejection water pumps

For vacuum pans & evaporators, three (3) nos. (two operating, one standby) vertical mixed flow type pumps, each of 3000 m^3/hr, 32 m head, maximum 960 rpm pumps, TEFC sq. cage AC motors with 2 nos. VFD drive shall be provided.
For ejectors, two (2) nos. (one operating, one standby), preferably vertical mixed flow type pumps, each of 450 m^3/hr, 32 m. head, maximum 960 rpm pumps, TEFC sq. cage AC motors with VFD shall be provided.

Separate water headers for condensers and ejectors shall be provided. Interconnection with isolation valve shall also be provided for emergency needs. Temp. pressure, vacuum indicators shall be provided at two places on each header. Transmitters for DCS shall be provided.
The delivery pipeline of each pumps shall be individually connected to the respective headers with tangential connection.
The pumps shall have CI casing, CF8 impeller and SS-410 shaft & SS-410 sleeves.
Suction strainer of stainless steel construction, NRV and isolation valves in the delivery lines shall be provided.

AMENDED AS

7.11.3 Injection and ejection water pumps

For vacuum pans & evaporators, three (3) nos. (two operating, one standby) vertical mixed flow type pumps, each of 3000 m^3/hr, 32 m head, maximum 960 rpm pumps, TEFC sq. cage **AC motors with VFD drive shall be provided on all motor.**
For ejectors, two (2) nos. (one operating, one standby), preferably vertical mixed flow type pumps, each of 450 m^3/hr, 32 m. head, maximum 960 rpm pumps, TEFC sq. cage AC motors with VFD shall be provided.
Separate water headers for condensers and ejectors shall be provided. Interconnection with isolation valve shall also be provided for emergency needs. Temp. pressure, vacuum indicators shall be provided at two places on each header. Transmitters for DCS shall be provided.
The delivery pipeline of each pumps shall be individually connected to the respective headers with tangential connection.
The pumps shall have CI casing, CF8 impeller and SS-410 shaft & SS-410 sleeves.
Suction strainer of stainless steel construction, NRV and isolation valves in the delivery lines shall be provided.

11- Page No. 136

7.11.4 Cooling towers

An induced draft, mixed flow type cooling tower with two (2) cells, each of 3500 m^3/hr. capacity shall be provided.

Each shell shall have capacity to handle 3500 m^3/hr water to give cold water temp. within 5 deg. C of Wet Bulb temperature or at least minimum drop of 9-12 deg. C

The cells of cooling tower shall have induced draft fan with electric drive, RCC framework with extruded non-combustible PVC fills, splash bars supported on stainless steel grids, RCC louvers and polypropylene distribution nozzles.
The fan shall have lightweight aluminium alloy impellers and hub. The impellers / fan blades shall be detachable and must be securely locked into position for efficient and safe operations.
Horizontal vent spacing of fill would be in the ratio of 1: 1.5 and spacing of fills should not be less than 200 mm.
All nuts, bolts and washers to be made of 304 grade stainless steel.

AMENDED AS

7.11.4 Cooling towers

An induced draft, mixed flow type cooling tower with two (2) cells, each **of 3000 m^3/hr**. capacity shall be provided.

Each shell shall have capacity to handle 3500 m^3/hr water to give cold water temp. within 5 deg. C of Wet Bulb temperature or at least minimum drop of 9-12 deg. C

The cells of cooling tower shall have induced draft fan with electric drive, RCC framework with extruded non-combustible PVC fills, splash bars supported on stainless steel grids, RCC louvers and polypropylene distribution nozzles.
The fan shall have lightweight aluminium alloy impellers and hub. The impellers / fan blades shall be detachable and must be securely locked into position for efficient and safe operations.
Horizontal vent spacing of fill would be in the ratio of 1: 1.5 and spacing of fills should not be less than 200 mm.
All nuts, bolts and washers to be made of 304 grade stainless steel.

12- Page No. 74

i) Cane Chopper

One cane chopper set having not less than 42 knives of forged and hard faced cutting edgesecured to cast steel hubs of IS:1030 grade 280–520 W mounted on a forged steel shaft of 220 mm dia. of 45 C8 quality. The dia. over the tips of knives shall not be less than 1600 mm. The knife shaft shall be supported at 180 mm bore, heavy duty self-aligning double row spherical roller bearings with adopter sleeve in steel Plummer blocks. The knives shall be of special shock resisting steel having hard faced cutting edges, hardness 45 to 48 HRC and tennoed into the hubs eliminating the shear on the bolts which should be of EN8 steel or of equivalent strength with nylock nuts. The knives shall conform to IS: 8461. A suitable fly wheel of Cast Steel Hubs of IS:2062 GR. 250 E well balanced shall be provided at the outer end of the shaft. The knife raw should be six only.

One spare set of knives as well as tip shall be provided.

Cane chopper set shall be driven by a continuously rated IP-55, TEFC, CACA, S-1 duty with 110 % overload, slip ring motor of 300KW and 600 R.P.M. synchronous speed at a total slip of 15 percent. It shall be directly coupled geared coupling to get final speed of 600 RPM capable of transmitting 300KW continuously. Provision to be given for Cane chopper shall be driven both end.
The motor shall be complete with starter (current not exceeding 300% of FLC) and suitable buffer resistance. Provision for additional identical motor drive with load balancer on other end should be made for ultimate capacity.

The knife set shall be installed on the horizontal portion of the secondary cane carrier before leveller and clearance in between the slats and Knives tips shall be maintained as 800 mm The knife set shall be totally enclosed by suitably reinforced hood of 10 mm thick and mild steel plate attached to the cane carrier frame work and provided with suitable swing flaps and bolted doors at top of the hood to suit reverse rotation. Two no. of flywheel of CS/CI grade FG 260, IS-210 machined and well balanced shall be provided on the either ends of the shaft.

AMENDED AS

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One spare set of knives as well as tip shall be provided.

Cane chopper set shall be driven by a continuously rated IP-55, **TEFC/CACA**, S-1 duty with 110 % overload, slip ring motor of 300KW and 600 R.P.M. synchronous speed at a total slip of 15 percent. It shall be directly coupled geared coupling to get final speed of 600 RPM capable of transmitting 300KW continuously. Provision to be given for Cane chopper shall be driven both end.
The motor shall be complete with starter (current not exceeding 300% of FLC) and suitable buffer resistance. Provision for additional identical motor drive with load balancer on other end should be made for ultimate capacity.
The knife set shall be installed on the horizontal portion of the secondary cane carrier before leveller and clearance in between the slats and Knives tips shall be maintained as 800 mm The knife set shall be totally enclosed by suitably reinforced hood of 10 mm thick and mild steel plate attached to the cane carrier frame work and provided with suitable swing flaps and bolted doors at top of the hood to suit reverse rotation. Two no. of flywheel of CS/CI grade FG 260, IS-210 machined and well balanced shall be provided on the either ends of the shaft.

13- Page No. 75

ii) SwingTypeCaneLeveller

One Swing type cane leveller set having not less than **64 knives** forged and hard faced cutting edge secured to cast steel hubs of IS:1030 Grade 280 – 520W mounted on a forged steel shaft of 300 mm diameter of 45 C8 quality. The dia. over the tips of knives shall be not less than 1600 mm. The knife shaft shall be supported at 220 mm bore, heavy duty self-aligning double row spherical roller bearings with adopter sleeve in steel Plummer blocks. The Swing type Leveller should have detachable knives made of special shock resistance alloy steel and secured through 50 mm dia. S.S. pins, the leveller shank and disc should have SS bushes to suit S.S. pins. The knives shall be of special shock resisting steel having hard faced cutting edges, hardness 45 to 48 HRC. The knives shall conform to IS. 8461. Two no. of suitable size fly wheel of CI/CS Hubs of IS:2062 GR. 250 E well balanced shall be provided at the outer end of the shaft.

Cane leveller set shall be driven by two nos. 300 kW x 02 Nos., TEFC, IP-55, 50 Hz and Class 'F' slipring induction motors of 600 R.P.M. synchronous speed at a total slip of 15 percent. It shall be directly coupled by geared couplings capable of transmitting 300 KW continuously for each drive.The motors shall be of CACA type having protection IP – 55/ IC611 complete with stator rotor starter panel. The motors shall be complete with starter (starting current not exceeding 300% of FLC) and suitable buffer resistance. The leveller knife set shall be installed on the inclined portion of the carrier and be provided with a suitable device for adjusting clearance in between the knives tip and slats from 250 to 300 mm. The knife set shall be totally enclosed by suitably reinforced hood of 10 mm thick and mild steel plate attached to th e cane carrier frame work and provided with suitable swing flaps and bolted doors at top of the hood.
There shall be arrangement for lifting motor & shaft of leveller & chopper, either from cane unloader or mill crane or separate M.S Guntry to be provided

AMENDED AS

ii) SwingTypeCaneLeveller

One Swing type cane leveller set having not less than 64 knives forged and hard faced cutting edge secured to cast steel hubs of IS:1030 Grade 280 – 520W mounted on a forged steel shaft of 300 mm diameter of 45 C8 quality. The dia. over the tips of knives shall be not less than 1600 mm. The knife shaft shall be supported at 220 mm bore, heavy duty self-aligning double row spherical roller

bearings with adopter sleeve in steel Plummer blocks. The Swing type Leveller should have detachable knives made of special shock resistance alloy steel and secured through 50 mm dia. S.S. pins, the leveller shank and disc should have SS bushes to suit S.S. pins. The knives shall be of special shock resisting steel having hard faced cutting edges, hardness 45 to 48 HRC. The knives shall conform to IS. 8461. Two no. of suitable size fly wheel of CI/CS Hubs of IS:2062 GR. 250 E well balanced shall be provided at the outer end of the shaft.

Cane leveller set shall be driven by two nos. **300 kW x 02 Nos., TEFC/CACA, IP-55**, 50 Hz and Class 'F' slipring induction motors of 600 R.P.M. synchronous speed at a total slip of 15 percent. It shall be directly coupled by geared couplings capable of transmitting 300 KW continuously for each drive.The motors shall be of CACA type having protection IP – 55/ IC611 complete with stator rotor starter panel. The motors shall be complete with starter (starting current not exceeding 300% of FLC) and suitable buffer resistance. The leveller knife set shall be installed on the inclined portion of the carrier and be provided with a suitable device for adjusting clearance in between the knives tip and slats from 250 to 300 mm. The knife set shall be totally enclosed by suitably reinforced hood of 10 mm thick and mild steel plate attached to th e cane carrier frame work and provided with suitable swing flaps and bolted doors at top of the hood.
There shall be arrangement for lifting motor & shaft of leveller & chopper, either from cane unloader or mill crane or separate M.S Guntry to be provided

14- Page No. 76

iii) Swing Hammer type Fibrizer

Swing hammer type fibrizer shall be located at the head end of the primary cane carrier, to suit 2040 mm wide cane carrier having 160 hammers. Weight of each hammer shall not be less than 22 kg. The hammer shank shall be 30 mm thick minimum. Fibrizer should be capable of providing preparatory Index of more than 90+ measured by AldericReyner method.

The rotor shaft shall be heavy duty minimum 420 mm dia. at the hubs and 300 mm dia. at the bearing journals and shall be 45 C8 forged steel as per IS:1570. Anvil plate shall be pocketed design, having wrap angle of not less than 140-deg minimum. The base plate thickness of the anvil shall be minimum 36 mm. Hard facing on the anvil working surface shall be having minimum hardness 600 BHN. Anvil plate shall have provision for adjusting the anvil clearance. A suitable floating flap of 20 mm thick to be provided at the entry point of anvil. Rotor shall be supported on two heavy duty self-aligning double row spherical roller bearings. Bearing shall be mounted on shaft with adapter sleeve. Tip dia. of hammers shall have 2200 mm swing dia. when running at 750 rpm.

The fibrizor should have detachable domite tips made of special shock resistance alloy steel and secured through 70 mm dia S.S. pins, the hammer shank and fibrizer disc should have SS304bushes to suit S.S. pins. of suitable size. One spare set of hammers with domite tips shall also be provided. The hammer shank and fibrizor disc shall have G.M./SS bushes to suit S.S. pins. 70 mm hubs shall be of cast steel M.S. Fabricated fitted on rotor shaft. Deflector plate of 20 mm thickness with 5 mm thick S.S. lining shall be provided.

The fibrizer rotor shall be completely covered by reinforced mild steel fabricated hood made out of 16 mm thick plate attached to the cane carrier frame work and will be complete with deflector plate, adjustable mild steel fabricated anvil plate, anvil suspension gear. Rotor bearing Plummer blocks shall be cast steel / M.S. fabricated pressure lubricating system for bearings shall be provided with 2 nos. pumps, 2 nos. coolers (one each as standby) oil reservoir, pressure gauge, piping, return line, needle valve fitting etc. with provision for auto start of standby pump.

The fibrizor shall be driven by two nos. 1000 kW. 750 RPM, 11 KV HT TEFC/CACA, IP-55, , S-2 Duty, 50 Hz and Class F slipring induction motors with suitable bed frame and resilient flexible coupling shall be provided. The motors shall be of CACA type having protection IP – 55/ IC611

complete with stator rotor starter panel. Auto slip type stator rotor starter for above motors shall be provided. One spare motor for fibrizor of above specifications shall be provided. Provision for replacement with new higher capacity motor shall be provided for future expansion.

AMENDED AS

iii) Swing Hammer type Fibrizer

Swing hammer type fibrizer shall be located at the head end of the primary cane carrier, to suit 2040 mm wide cane carrier having 160 hammers. Weight of each hammer shall not be less than 22 kg. The hammer shank shall be 30 mm thick minimum. Fibrizer should be capable of providing preparatory Index of more than 90+ measured by AldericReyner method.

The rotor shaft shall be heavy duty minimum 420 mm dia. at the hubs and 300 mm dia. at the bearing journals and shall be 45 C8 forged steel as per IS:1570. Anvil plate shall be pocketed design, having wrap angle of not less than 140-deg minimum. The base plate thickness of the anvil shall be minimum 36 mm. Hard facing on the anvil working surface shall be having minimum hardness 600 BHN. Anvil plate shall have provision for adjusting the anvil clearance. A suitable floating flap of 20 mm thick to be provided at the entry point of anvil. Rotor shall be supported on two heavy duty self-aligning double row spherical roller bearings. Bearing shall be mounted on shaft with adapter sleeve. Tip dia. of hammers shall have 2200 mm swing dia. when running at 750 rpm.

The fibrizor should have detachable domite tips made of special shock resistance alloy steel and secured through 70 mm dia S.S. pins, the hammer shank and fibrizer disc should have SS304bushes to suit S.S. pins. of suitable size. One spare set of hammers with domite tips shall also be provided. The hammer shank and fibrizor disc shall have G.M./SS bushes to suit S.S. pins. 70 mm hubs shall be of cast steel M.S. Fabricated fitted on rotor shaft. Deflector plate of 20 mm thickness with 5 mm thick S.S. lining shall be provided.

The fibrizer rotor shall be completely covered by reinforced mild steel fabricated hood made out of 16 mm thick plate attached to the cane carrier frame work and will be complete with deflector plate, adjustable mild steel fabricated anvil plate, anvil suspension gear. Rotor bearing Plummer blocks shall be cast steel / M.S. fabricated pressure lubricating system for bearings shall be provided with 2 nos. pumps, 2 nos. coolers (one each as standby) oil reservoir, pressure gauge, piping, return line, needle valve fitting etc. with provision for auto start of standby pump.

The fibrizor shall be driven by two nos. 1000 kW. 750 RPM, 11 KV HT TEFC/CACA, IP-55 , S-1 Duty, 50 Hz and Class F slipring induction motors with suitable bed frame and resilient flexible coupling shall be provided. The motors shall be of CACA type having protection IP – 55/ IC611 complete with stator rotor starter panel. Auto slip type stator rotor starter for above motors shall be provided. One spare motor for fibrizor of above specifications shall be provided. Provision for replacement with new higher capacity motor shall be provided for future expansion.

15- Page No. 179

9.1.6 Draft System

The draft system for the steam generator shall be suitable to ensure producing a balanced draft with sub atmospheric pressure conditions in the furnace.
The system to comprise of –

- 2 x 65 % of the total required capacity each, I D fans with LT Motor CACA, IP-55, 750/1000 rpm. A.C motor, speed control from control room by remote and AC Variable Speed Drive and pneumatically/ electrically operated inlet guide vane/damper with necessary base frames, base

plate, foundation bolts, supports, cover, couplings, lubrication system etc. Replaceable wear liners or hard facing will be provided for blades. The shaft of the fan shall conform to 45 C8 of IS:1570-1978. Renewable hard faced wear pads on the blades shall be incorporated in the impeller. The Fan rated speed shall not be more than 750 RPM. The impeller of the fan shall be fabricated out of minimum 5 mm thick nickel chrome alloy steel. Impeller design should be curved vane type high efficiency fan. Impeller shaft should be provided with support on both ends. Each fan shall be provided with dampers at the inlet as well as at the outlet to control the flue gas quantity. The fan construction should be identical so as to have single spare impeller.

The ID fans shall be directly coupled to variable speed electrical drive digital type (variable frequency TEFC, CACA, IP-55, S-1 Duty, Class-V, 750 /1000 rpm. A.C motor, speed control from control room by remote) complete with control equipment, speedometer, operators control cubicle, DCS etc.

- 2 x 65% of the total required capacity each FD fans with LT motor CACA, IP-55, 1440 rpm. A.C motor, speed control from control room by remote and AC variable remote control for control room speed drive and pneumatically/ electrically operated inlet guide valve/damper with necessary base frames, base plate, foundation bolts, supports, cover, coupling etc. to supply primary air for combustion through air heater and shall be supplied to the furnace underneath the grate. The blades of fan rotor shall be fabricated out of minimum 5 mm thick mild steel plates. RPM of the FD fan shall be 1440.

Both the FD fans shall be directly coupled to variable speed electrical drive digital type (variable frequency TEFC A.C motor) complete with control equipment, speedometer, operators control cubicle, DCS etc.

The rotors of the ID & FD Fans shall be dynamically balanced. Fans are to be interlocked so that FD runs only when ID fan is running.

- 2 x 65% of the total required capacity each SA fans with AC variable speed drive CACA, IP-55, 1440 rpm. A.C motor, speed control from control room by remote and with inlet guide vane, with necessary base frames, base plate, foundation bolts, supports, covers, couplings, lubrication system etc. This will supply air into the furnace as a secondary air at high pressure through heat resisting nozzles for ensuring combustion completeness. The secondary air nozzles shall be installed in the furnace walls. From the same fan air shall be supplied to the pneumatic distributors to distribute the Bagasse on to the grate uniformly. The isolating/ controlling damper shall be provided at the fan suction and in the duct at a branching point. The suction of fan shall have provision for cold air as well as hot air from air heater with two separate dampers for hot air and cold air. The deliveries of both fans to be interconnected. Each fan to be coupled to the motor.

Both the SA fans shall be directly coupled to variable speed electrical drive digital type (variable frequency TEFC A.C motor) complete with control equipment, speedometer, operators control cubicle, DCS etc.
All air and flue gas ducting with required stiffeners, expansion joints, guide vanes for bends, dampers, insulation, cladding, supports, etc. The shaft material for the above fans shall be 45 C8 conforming to IS: 1570-1978.
Silencers for FD and SA fans to limit noise level to 90 DBA at 3.0 meter distance is to be provided.

AMENDED AS

9.1.6 Draft System

The draft system for the steam generator shall be suitable to ensure producing a balanced draft with sub atmospheric pressure conditions in the furnace.
The system to comprise of –

- 2 x 65 % of the total required capacity each, I D fans with LT Motor CACA, IP-55, 750/1000 rpm. A.C motor, speed control from control room by remote and AC Variable Speed Drive and pneumatically/ electrically operated inlet guide vane/damper with necessary base frames, base plate, foundation bolts, supports, cover, couplings, lubrication system etc. Replaceable wear liners or hard facing will be provided for blades. The shaft of the fan shall conform to 45 C8 of IS:1570-1978. Renewable hard faced wear pads on the blades shall be incorporated in the impeller. The Fan rated speed shall not be more than 750 RPM. The impeller of the fan shall be fabricated out of minimum 5 mm thick nickel chrome alloy steel. Impeller design should be curved vane type high efficiency fan. Impeller shaft should be provided with support on both ends. Each fan shall be provided with dampers at the inlet as well as at the outlet to control the flue gas quantity. The fan construction should be identical so as to have single spare impeller.

  The ID fans shall be directly coupled to variable speed electrical drive digital type (variable frequency TEFC, IP-55, S-1 Duty, 750 /1000 rpm. A.C motor, speed control from control room by remote) complete with control equipment, speedometer, operators control cubicle, DCS etc.

- 2 x 65% of the total required capacity each FD fans with LT motor **TEFC, IP-55, 1440 rpm**. A.C motor, speed control from control room by remote and AC variable remote control for control room speed drive and pneumatically/ electrically operated inlet guide valve/damper with necessary base frames, base plate, foundation bolts, supports, cover, coupling etc. to supply primary air for combustion through air heater and shall be supplied to the furnace underneath the grate. The blades of fan rotor shall be fabricated out of minimum 5 mm thick mild steel plates. RPM of the FD fan shall be 1440.

  Both the FD fans shall be directly coupled to variable speed electrical drive digital type (variable frequency TEFC A.C motor) complete with control equipment, speedometer, operators control cubicle, DCS etc.

  The rotors of the ID & FD Fans shall be dynamically balanced. Fans are to be interlocked so that FD runs only when ID fan is running.

- 2 x 65% of the total required capacity each SA fans with AC variable speed **drive TEFC, IP-55, 1440 rpm. A.C motor**, speed control from control room by remote and with inlet guide vane, with necessary base frames, base plate, foundation bolts, supports, covers, couplings, lubrication system etc. This will supply air into the furnace as a secondary air at high pressure through heat resisting nozzles for ensuring combustion completeness. The secondary air nozzles shall be installed in the furnace walls. From the same fan air shall be supplied to the pneumatic distributors to distribute the Bagasse on to the grate uniformly. **Pneumatic operated dampers shall be provided for fans inlet and manual operated dampers shall be provided for fans outlet**. The suction of fan shall have provision for cold air as well as hot air from air heater with two separate dampers for hot air and cold air. The deliveries of both fans to be interconnected. Each fan to be coupled to the motor.

  Both the SA fans shall be directly coupled to variable speed electrical drive digital type (variable frequency TEFC A.C motor) complete with control equipment, speedometer, operators control cubicle, DCS etc.
  All air and flue gas ducting with required stiffeners, expansion joints, guide vanes for bends, dampers, insulation, cladding, supports, etc. The shaft material for the above fans shall be 45 C8 conforming to IS: 1570-1978.
  Silencers for FD and SA fans to be provided based on OEM recommendation.

16- Page No. 208

10.15 AC Distribution Board for Power House Auxiliaries (ACDB)

Panel shall be metal enclosed, wall mounting type, dust and moisture and vermin proof suitable for 230 V AC single phase 50 Hz supply system. Panel shall be indoor type having 1 no. switch fuse incomer feeder and 15 nos. two pole MCB outgoing feeders for supply to various control panels.
The distribution transformers with switch gear and protections for supplying power to the cogeneration auxiliary's sugar plant and to mills through converters transformers etc. All feeders and bus couplers shall be carefully interlocked to prevent improper paralleling of different supply sources. The loads shall be distributed in a manner that transformers, for the distribution, bus coupler & converter duty are not overloaded under any abnormal condition.
The distribution panels conforming to the latest revision of IS:8623/IEC:439 will be of dust & vermin proof construction, sheet steel clad, totally enclosed floor mounted, self-standing type with both front and rear access for PCCs and front access for MCCs. All panels will be of single bus bar type with bottom cable entries. The MCCs shall be of compartmentalized design with cable alleys at the sides. PCCs shall have the cable chambers at the rear. The bus-bars shall be of electrolytic grade aluminium alloy, designed for 40°C temperature rise over an ambient of 45°C. All panels shall have neutral bus, sized to carry half the phase current. All panels shall be designed for 50 kA for 1 sec.
The L.T. panels shall have breakers for ratings 800 A ACB. All breakers shall be of electrically operated draw-out type with spring charged motor operated closing mechanism. MCC feeders shall be of fuse switch/switch fuse + contactor + bi-metal / electronic, motor protection relay type, with ammeters of suppressed scale above 15 kW and indication lamps. suitable for remote operation bus ducts of suitable rating shall be provided for connection between the primary of the distribution transformers and the PCCs. The bus ducts shall be with copper conductors. The bus ducts shall be of non-segregated phase bus duct type interleaved design and shall be complete with flexible, bellows, vertical & horizontal bends, seal-off bushing, outdoor hoods, etc. for DCS. All motors shall be of squirrel cage type conforming to IS:325 / IEC:34, totally enclosed and fan cooled. Motors shall be of energy efficient type. The windings will be insulated by class 'F' insulation material and maximum rise shall be limited to 75°C over an ambient of 45°C.Motors of rating less than 50 HP will be provided with DOL feeders in MCC. Higher sized motors may be provided with star/delta starter depending on application. Feed pump motors shall be provided with VFD for soft start. Motor feeders will be complete with contactor, over load relay and switch fuse units. Motors of higher ratings (above 75 HP) will be protected by motor protection relays.

AMENDED AS

10.15 AC Distribution Board for Power House Auxiliaries (ACDB)

Panel shall be metal enclosed, wall mounting type, dust and moisture and vermin proof suitable for 230 V AC single phase 50 Hz supply system. Panel shall be indoor type having 1 no. switch fuse incomer feeder and 15 nos. two pole MCB outgoing feeders for supply to various control panels.
The distribution transformers with switch gear and protections for supplying power to the cogeneration auxiliary's sugar plant and to mills through converters transformers etc. All feeders and bus couplers shall be carefully interlocked to prevent improper paralleling of different supply sources. The loads shall be distributed in a manner that transformers, for the distribution, bus coupler & converter duty are not overloaded under any abnormal condition.
The distribution panels conforming to the latest revision of IS:8623/IEC:439 will be of dust & vermin proof construction, sheet steel clad, totally enclosed floor mounted, self-standing type with both front and rear access for PCCs and front access for MCCs. All panels will be of single bus bar type with bottom cable entries. The MCCs shall be of compartmentalized design with cable alleys at the sides. PCCs shall have the cable chambers at the rear. The bus-bars shall be of electrolytic grade aluminium alloy, designed for 40°C temperature rise over an ambient of 45°C. All panels shall have neutral bus, sized to carry half the phase current. All panels shall be designed for 50 kA for 1 sec.
The L.T. panels shall have breakers for ratings 800 A ACB. All breakers shall be of electrically operated draw-out type with spring charged motor operated closing mechanism. MCC feeders shall be of fuse switch/switch fuse + contactor + bi-metal / electronic, motor protection relay type, with ammeters of suppressed scale above 15 kW and indication lamps, suitable for remote operation bus ducts of suitable rating shall be provided for connection between the primary of the distribution

transformers and the PCCs. The bus ducts shall be **with ALUMINIUM conductors**. The bus ducts shall be of non-segregated phase bus duct type interleaved design and shall be complete with flexible, bellows, vertical & horizontal bends, seal-off bushing, outdoor hoods, etc. for DCS. All motors shall be of squirrel cage type conforming to IS:325 / IEC:34, totally enclosed and fan cooled. Motors shall be of energy efficient type. The windings will be insulated by class 'F' insulation material and maximum rise shall be limited to 75°C over an ambient of 45°C.Motors of rating less than 50 HP will be provided with DOL feeders in MCC. Higher sized motors may be provided with star/delta starter depending on application. Feed pump motors shall be provided with VFD for soft start. Motor feeders will be complete with contactor, over load relay and switch fuse units. Motors of higher ratings (above 75 HP) will be protected by motor protection relays.

17- Page No. 208

10.21 Motor control centers

MCCs shall be of compartmentalized design with cable alleys at the sides. PCCs shall have the cable chambers at the rear. The bus bars shall be of electrolytic grade aluminium alloy, designed for 40°C temperature rise over an ambient of 45°C. All panels shall have neutral bus, sized to carry half the phase current. All panels shall be designed for 50 kA for 1 sec.
The L.T. panels shall have breakers for ratings 800 A ACB. All breakers shall be of electrically operated draw-out type with spring charged motor operated closing mechanism. MCC feeders shall be of fuse switch/switch fuse + contactor + bi-metal / electronic, motor protection relay type, with ammeters of suppressed scale above 15 kW and indication lamps, suitable for remote operation.

Bus ducts of suitable rating shall be provided for connection between the primary of the distribution transformers and the PCCs. The bus ducts shall be with Aluminium conductors. The bus ducts shall be of non-segregated phase bus duct type interleaved design and shall be complete with flexible, bellows, vertical & horizontal bends, seal-off bushing, outdoor hoods, etc. for DCS.

All motors shall be of squirrel cage type conforming to IS:325 / IEC:34, totally enclosed and fan cooled. Motors shall be of energy efficient type. The windings will be insulated by class 'F' insulation material and maximum rise in temperature shall be limited to 75°C at an ambient of 45°C.
Motors rating less than 50 HP will be provided with DOL feeders in MCC. Higher sized motors may be provided with star/delta starter depending on application. Feed pump motors shall be provided with soft starter. Motor feeders will be complete with contactor, over load relay and switch fuse units. Motors of higher ratings (above 75 HP) will be protected by motor protection relays.

MCC shall be provided with 1 No: incoming switch of 1.2 times the connected load excluding the standby equipment, an ammeter, a voltmeter with selector switch, 3 phase energy meter and OFF and ON indicating lamps. Each MCC will have individual outgoing feeder for each motor connected to that MCC. For squirrel cage motors, each feeder shall have switch fuse unit, starter with over current protection, an ammeter and on indicating lamp. For slipring motors, each feeder shall have switch fuse unit, starter, an ammeter and on indicating lamp. In case of slip-ring motors rotor starters shall be provided and installed near individual motors. The MCC's shall also have feeders for connection of low loss power capacitors APP double layer type, each feeder having air break contactor with back up switch fuse unit, on indicating lamps, ammeter, ON-OFF push buttons. Each feeder in the MCC's shall be housed in separate individual compartments with door interlock.

Each MCC shall be 14/16 SWG cold rolled sheet steel fabricated cubicle type, floor mounted, dust, damp and vermin proof. Each MCC shall be expandable at both ends for additions of switches and starter for the motors if required at any stage. The bus bars shall be made of Electric Grade (EC-91E) aluminium. The earth bus bar shall be located at the bottom and shall be continuous throughout the length of each MCC. The operating height of each MCC shall be 1800 mm & max. Height shall be 2300 mm. Control supply of 230 VAC shall be obtained only through Phase & neutral. However, in centrifugal panels/ MCC 230 V A.C control supply shall be through control transformer.

Each MCC shall be designed to withstand symmetrical short circuit current of 35 KA (RMS) for one second. Each MCC shall be designed for an ambient temperature of 45 deg.C, the bus bar operating temperature at the ultimate capacity of 4900 TCD (in 22 hrs.) expandable to 7500 TCD shall not exceed 85 deg. C Removable sheet steel gland plates shall be provided in each MCC for cable entry.

Each MCC shall be provided with spare switches, one of each size subject to a maximum of three nos. and a plug with socket of 63 amps. All squirrel cage motors up to an including of 40 HP rating shall be controlled with D.O.L. starters. All other squirrel cage motors shall be controlled with air break automatic star delta starters.
Incomers for all MCC s shall be SFU / ACB with 1.3 times the capacity of connecting load excluding the standby load. Each slip ring motor shall be controlled with rotor starter installed near motor. Electrical inter-locking of the following electric motor (With arrangement for de-interlocking) shall be provided.

(a) Cane cutter, cane leveler, fibrizer, cane carrier motors so that if any of the cane preparatory device trips, the cane carrier drive shall also trip.

(b) Bagasse elevator, bagasse carrier and return bagasse carrier motors.
(c) Sugar elevator with grass hopper.
(d) All self discharging batch type centrifugal machines to be interlocked such that not more than 2 machines accelerate simultaneously.

In addition to these MCC's, one pedestal mounted push button operating station (with ON-OFF push buttons) shall be provided near each squirrel cage motor. Also stop push buttons at the ground floor shall also be provided for bagasse elevator, and return bagasse carrier.

AMENDED AS

10.21 Motor control centers

MCCs shall be of compartmentalized design with cable alleys at the sides. PCCs shall have the cable chambers at the rear. The bus bars shall be of electrolytic grade aluminium alloy, designed for 40°C temperature rise over an ambient of 45°C. All panels shall have neutral bus, sized to carry half the phase current. All panels shall be designed for 50 kA for 1 sec.
The L.T. panels shall have breakers for ratings 800 A ACB. All breakers shall be of electrically operated draw-out type with spring charged motor operated closing mechanism. MCC feeders shall be of fuse switch/switch fuse + contactor + bi-metal / electronic, motor protection relay type, with ammeters of suppressed scale above 15 kW and indication lamps, suitable for remote operation.

Bus ducts of suitable rating shall be provided for connection between the primary of the distribution transformers and the PCCs. The bus ducts shall be with Aluminium conductors. The bus ducts shall be of non-segregated phase bus duct type interleaved design and shall be complete with flexible, bellows, vertical & horizontal bends, seal-off bushing, outdoor hoods, etc. for DCS.

All motors shall be of squirrel cage type conforming to IS:325 / IEC:34, totally enclosed and fan cooled. Motors shall be of energy efficient type. The windings will be insulated by class 'F' insulation material and maximum rise in temperature shall be limited to 75°C at an ambient of 45°C.
Motors rating less than 50 HP will be provided with DOL feeders in MCC. Higher sized motors may be provided with star/delta starter depending on application. Feed pump motors shall be provided with soft starter. Motor feeders will be complete with contactor, over load relay and switch fuse units. Motors of higher ratings (above 75 HP) will be protected by motor protection relays.

MCC shall be provided with 1 No: incoming switch of 1.2 times the connected load excluding the standby equipment, an ammeter, a voltmeter with selector switch, 3 phase energy meter and OFF and ON indicating lamps. Each MCC will have individual outgoing feeder for each motor connected to that MCC. For squirrel cage motors, each feeder shall have switch fuse unit, starter with over

current protection, an ammeter and on indicating lamp. For slipring motors, each feeder shall have switch fuse unit, starter, an ammeter and on indicating lamp. In case of slip-ring motors rotor starters shall be provided and installed near individual motors. The MCC's shall also have feeders for connection of low loss power capacitors APP double layer type, each feeder having air break contactor with back up switch fuse unit, on indicating lamps, ammeter, ON-OFF push buttons. Each feeder in the MCC's shall be housed in separate individual compartments with door interlock.

Each MCC shall be 14/16 SWG cold rolled sheet steel fabricated cubicle type, floor mounted, dust, damp and vermin proof. Each MCC shall be expandable at both ends for additions of switches and starter for the motors if required at any stage. The bus bars shall be made of Electric Grade (EC-91E) aluminium. The earth bus bar shall be located at the bottom and shall be continuous throughout the length of each MCC. The operating height of each MCC shall be 1800 mm & max. Height shall be 2300 mm. Control supply of 230 VAC shall be obtained only through Phase & neutral. However, in centrifugal panels/ MCC 230 V A.C control supply shall be through control transformer.

Each MCC shall be designed to withstand symmetrical short circuit current of 35 KA (RMS) for one second. Each MCC shall be designed for an ambient temperature of 45 deg.C, the bus bar operating temperature at the ultimate capacity of 4900 TCD (in 22 hrs.) expandable to 7500 TCD shall not exceed 85 deg. C Removable sheet steel gland plates shall be provided in each MCC for cable entry.

Each MCC shall be provided with spare switches, one of each size subject to a maximum of three nos. and a plug with socket of 63 amps. All squirrel cage motors up to an including of 40 HP rating shall be controlled with D.O.L. starters. All other squirrel cage motors shall be controlled with air break automatic star delta starters.
Incomers for all MCC s shall be SFU / ACB with 1.2 times the capacity of connecting load excluding the standby load. Each slip ring motor shall be controlled with rotor starter installed near motor. Electrical inter-locking of the following electric motor (With arrangement for de-interlocking) shall be provided.

(b) Cane cutter, cane leveler, fibrizer, cane carrier motors so that if any of the cane preparatory device trips, the cane carrier drive shall also trip.

(b) Bagasse elevator, bagasse carrier and return bagasse carrier motors.
(c) Sugar elevator with grass hopper.
(d) All self discharging batch type centrifugal machines to be interlocked such that not more than 2 machines accelerate simultaneously.

In addition to these MCC's, one pedestal mounted push button operating station (with ON-OFF push buttons) shall be provided near each squirrel cage motor. Also stop push buttons at the ground floor shall also be provided for bagasse elevator, and return bagasse carrier.

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GENERAL CONDITIONS FOR BIDDER'S SCOPE OF WORK:

1. All the machinery and equipment supplied should be brand new of latest design, fabricated as per ISI or equivalent Standard and tested for construction of first class material and workmanship along with material test certificates including bought out items according to technical specifications and as per given Engineering standards (of tender document) for construction material and latest design model. All equipment and machinery installation are with all accessories like pump, motor, reduction gear, pipelines, pug mills, magma mixer etc. to run the plant during crushing season as per required specifications and to get the desired results.
2. The work is to be executed as per the terms & conditions stipulated in the tender document and this Agreement.

The bidder will provide HMBD of evaporator configuration and vapour bleeding arrangement to achieve steam consumption% cane 40%(+/-2%).

3. Scope of Supply includes all the necessary equipment/systems with structural staging, platforms, approach ladders, walkways, sheds, supports, electrical, s.s tubes, instrumentation etc. of each section/equipment, duly coated with protective paints both internally and externally and insulation as applicable and all civil works. This also includes other tools & tackles required for the fabrication, erection at site and adequate manpower quite conversant with the fabrication & erection work of such plant and machinery.
4. The complete plant SCADA system must have a Smart Client License of SCADA Software so that the SCADA screen showing complete process of sugar mill(real-time access to plant operations) can be viewed on a screen(minimum 5 individual screen) through static IP from any location.
5. All foundation bolts, foundation wedges, alignment packings, liners etc. are also included in the scope of supply.
6. After the finalization of the order, the Seller will prepare all civil foundations if any, structural and the detailed fabrication drawings and loading data of each and every plant & machinery, piping, electrical cabling, instrumentation, circuit drawing, layout drawing, isometric drawings, equipment layout drawings, elevation drawings for approval from Purchaser as well as by concerned Govt. Authority and shall be submitted well in advance to Purchaser for prior examination and approval thereof.
7. All shaft should be supplied with ultrasonic and Magnetic particle (MP) inspection tested with testing certificate.
8. Every shaft, gear & Pinion set, sprockets and each mill roller shell should be chemically tested with submission of test certificate of material composition as per IS standard.
9. All the consumables required for erection & commissioning like gas, all types of welding/ brazing or soldering rods, emery papers, grinding paste, hold lights, graphite, Kerosene Oil, Rustburg, back joints, steam packing etc. are also included in the scope of supply.
10. All types of tools & tackles like hoisting tools, chain blocks, pulleys, wire rope hooks, tube expanders, hydraulic pumps and all special tools etc. shall be arranged by Seller. All staff including engineers, technicians, skilled, unskilled workers, Khalasi required for loading/unloading, fabrication, erection, testing and trials etc. shall be arranged by Seller. The machinery & other equipment delivered at site should be properly stored at site. The transportation of machinery and equipment from the stored place to their respective position shall also be in the scope of Seller.
11. Technical services included in the scope of supply:
    a. Project In charge: Seller will retain a qualified, experienced and responsible project engineer/manager to supervise the installation and erection/ commissioning of the plant alongwith complete team at site.
    b. Training of the Purchaser's personnel: Seller shall arrange to train the Purchaser's personnel to operate the equipment/systems after three year/36 months warranty period.
12. All equipment including bought out items shall be offered for inspection to the authorized representative of Purchaser before dispatch.
13. The Seller shall prepare and submit to Purchaser the time schedule as per PERT/CPM chart. Seller should ensure that it will maintain the time schedule as per the chart. The equipment delivery shall strictly be in as per schedule given in the scope of work.
14. All materials of construction and fabrication shall be as per relevant ASME/ASA/AISI/ ASTM /ANSI /BS /IS/Standards and acceptable equivalent standards referred to in the Technical Specifications herein and in the tender document. They should also comply with standard and good engineering practices acceptable to the Purchaser and its expert consultant.
15. The Seller shall be fully responsible for any mishaps/casualty/fatal accidents of their employees during the contract period of project. Sugar mill shall not be responsible at all for such mishaps whatsoever. The Seller shall also be fully responsible for any mishaps/casualty/fatal accidents of Purchaser employees/machinery during erection and commissioning.

16. The layout for Installation of the equipment/system will be prepared by the Seller in consultation of Purchaser and will conform to various statutory requirements and gudielines of various Act/Statute/Rules and in order to provide working facility.
17. Painting – General
    a. All steel structures shall be given red oxide primer coating followed by appropriate final coating.
    b. Railings and staircases, wherever required as per the factory act., duly coated.

15. All designs with respect to civil, structures, tank foundations etc. should follow the standard code practice for earth quake resistant designs viz. as per IS 1893.
16. All dismantling, levelling/filling and shifting of waste to a designated placeif required shall be in scope of Seller. All required structural works etc. shall also be in the scope of seller.
17. Any other items or activities not specifically mentioned in the scope of work and equipment list and required for completion of project are deemed to be included in the scope of work.
18. Technical Specification of all equipment and machinery will be as per best standard of Industry. In case of any dispute, the decision of National Federation,New Delhi will be final.
19. In case crushing season 2024-25 starts with old mill, then there will not be any hindrance to start the crushing season 2024-25 in last week of october 2024.

AMENDED AS

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2. The work is to be executed as per the terms & conditions stipulated in the tender document and this Agreement.

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20. Technical Specification of all equipment and machinery will be as per best standard of Industry. In case of any dispute, the decision of National Federation,New Delhi will be final.
21. In case crushing season 2024-25 will be functional with old mill, then there will not be any hindrance to start the crushing season 2024-25 in last week of october 2024.

19- Page No. 67

11.0 INSTRUMENTATION& CONTROL SYSTEM (D C S)

Accurate measurements and control of various process parameters are very important for efficient operations and safety of particular equipments in Sugar Industry & Cogeneration Plant. In a proposed Sugar Plant with Cogeneration, a need based Automation & Control system required to ensure stable

& efficient operations of various sections in the Plant i.e. Mill, Boiler, Power House, Water Treatment Plant, PRDS and Boiling House (Clarification, Evaporators & Pan Station).
High ended DCS System & controllers and operating stations should be designed, software development with supervisory control console, inter-connected through Ethernet so that the total information about the Plant operation can be assessed from any operating station at various sections(Mill, Boiler, Power Turbine, Clarification Section, Pan Station, Evaporator Station, administrative block, Technical block. However, the Engineering Station &Servers should be centralised with proper redundancy in communication and power backup with printer(2 Nos.) with proper and separate earthing in the panels and power back-up. All process parameters of different sections should be with dynamic mimic diagrams.

Provision should be made for centralised online UPS System, 15% extra AOs and AIs and 15% DIs & Dos. All field instruments (transmitters/controllers/ control valves should be as per standard instrument practice along with proper standby for boilers, instruments & control system. Centralised Engineering Station for DCS system should be air-conditioned with proper ducting to maintain the temperature of control room (24 deg. C). The system shall have the capability and facility for expansions through additions of stations, controllers, processors and processor IOs, IDs, AO &AI cards and Alarm & Event Display, Alarm Monitoring and Reporting. The supplier of Instruments & Control Systems has to provide trouble shooting & instruction manuals, training to the technical staff of Sugar Mills and will operate & maintain the instrument & control systems in all respects during warantee period free of cost and depute their Engineer, Programmer & Technician during the season for smooth functioning of the Control Systems.

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9.1.4 Air Heater

Air heater with adequate heating surface to heat the air by flue gas required for combustion shall be provided. Considering the high moisture in the flue gases, suitable precautions shall be taken to prevent the tube corrosion of the inlet side of the air heater. Air heater shall be complete in all respect with ERW tubes, tube plates, supports dampers casing and ducting etc. The entry of cold air shall be distributed properly over the length of air heater to avoid condensation of moisture. Air heater shall be provided with flue gas by pass arrangement with leak proof damper. Air Heater shall be in two stages.

The air heater and economizer shall be designed so as to give final gas temperature within 160°C. Air heater should give the air temperature of not less than 180°.

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The air heater and economizer shall be designed so as to give final gas temperature within 160°C. Air heater should give the air temperature of not less than 180°.

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9.2 Steam Piping System

Boiler integral piping consisting of all interconnecting piping between the economizer inlet stop valve and the super heater outlet header etc. shall be provided. The piping shall be properly supported and provided with necessary tapping for instruments for measurement. Necessary supporting materials, towers, etc. to support the piping shall be supplied. The correct location of hangers and supports shall be considered for the flexibility analysis. Suitable expansion loops, restraints and anchors shall be provided to limit the stresses within the allowable values.
The material for the piping and fitting shall be properly selected for various services in the boiler integral piping. All integral piping shall be provided with valves, fittings, drains and vents, safety valves, exhaust piping, start-up vent with silencer, blow down system etc. Proper sampling facility shall be provided for feed water, super heated steam and blow down water. The system for sampling shall be complete in all respects for monitoring the satisfactory performance of the boiler.

The outlet steam from the boiler to be conveyed through carbon steel main steam piping with necessary valves and gauges etc. to the turbo generator.

Adequate stop valves, non-return valves, drain valves, traps etc. shall be suitably placed in the piping and header. The piping shall be with necessary supports, hangers, etc. Steam flow meter shall be provided to measure the flow of steam from the Boiler.

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The outlet steam from the boiler to be conveyed through main steam **piping (MOC of pipes will be as per IBR)** with necessary valves and gauges etc. to the turbo generator.

Adequate stop valves, non-return valves, drain valves, traps etc. shall be suitably placed in the piping and header. The piping shall be with necessary supports, hangers, etc. Steam flow meter shall be provided to measure the flow of steam from the Boiler.

22-Page No. 182

10.0 CHARGES

10.1 A lump sum charge per month during Season _____ and _____ for operation of the MILL (which includes 4900 TCD sugar Plant during the three crushing season _____, _____ and _____ (03 seasons) and for Repair and Maintenance, a Lump Sum charges for the Off-season _____ & _____ (02 off-seasons) shall be payable for all the services of annual overhauling and repair and maintenance as as under:-

Sr.No.	Particular's	Basic (Rs.)
1.	Repair & Maintenance of complete Sugar Mill during Off-season.	_____ per off-season (GST extra as applicable)
2.	Operation of Sugar Mill	_____per month (GST extra as applicable)

Note: TDS (Tax deduction at source) at prevailing rates shall be deducted by MILL while releasing payment to PARTY.

10.2 GST, duties and other levies as applicable shall be charged extra to MILL, at actual.

10.3 Season shall be considered before 7 days start of RT 8© formation.

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10.0 CHARGES

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_____ and _____ (03 seasons) and for Repair and Maintenance, a Lump Sum charges for the Off-season _____ & _____ (02 off-seasons) shall be payable for all the services of annual overhauling and repair and maintenance as as under:-

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Note: TDS (Tax deduction at source) at prevailing rates shall be deducted by MILL while releasing payment to PARTY.

10.2 GST, duties and other levies as applicable shall be charged extra to MILL, at actual.

10.3 **Season shall be considered 7 days before start of crushing season and 7 days after stop of crushing season as per RT 8© formation.**

10.4 **First season will be considered before 21 days of start of milling as per RT8C in view of commissioning of new plant. However, crop days less than 45 days will not be considered as complete crushing season after successful commissioning of the plant including civil works. The 45 days will be counted from the actual date of start of crushing season.**