

Form No.



**PRODUCT STANDARD
PULVERISERS
HYDERABAD**

Product **BA89135**
STD NO.Rev No. **00**Page **1** of **3**

TECHINICAL PRE-QUALIFICATION REQUIREMENTS

ACCEPTANCE CRITERIA

Weigh feeder & pneumatic diverter along with accessories for
Wet ball milling system

SL. NO.	REQUIREMENT	ACCEPTANCE	REMARKS
1.	Capacity/Rating of the system.	Supply of similar or bigger capacity WEIGH FEEDER for wet ball mill system, to at-least one thermal power station, and which are in satisfactory operation for a minimum period of one year as on the date of submission of bid documents.	a) Reference List of supplies made so far. b) Un-priced PO copies of the reference supplies. c) End-user certificates of the reference stations.
2.	Design / Engineering capability for designing of suitable WEIGH FEEDER to meet customer specification requirements	Bidder must have exclusive engineering/design capabilities	Details of Design methods adopted or Collaboration documents to be furnished.
3.	Manufacturing facilities	Bidder must have manufacturing facilities for manufacture of similar rating of WEIGH FEEDER	a) Detail list of Manufacture facility shall be furnished. b) Details of Manufacturing facilities at tied-up parties, in case of offloading of manufacturing, shall be furnished (if applicable)

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Revisions:**Refer to record of revisions:****Prepared:**

PVS B

Approved:

KHRK

**Date of
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	5.	Inspection agencies for earlier supplies	Lloyds / TUV / NTPC / BHEL / SGS / BHEL TPIA or any other International/ Indian inspection agency.	Copies of earlier inspection certificates to be furnished.
	6.	Service after Sales & supply of spare parts	Availability of service center and technical experts to meet the after sales service requirements for the supplied equipment at project sites.	Details of the service centers and technical expertise to be furnished.
	7.	Financial capability	Financial turnover shall be atleast 50% of the value of the bid.	Financial turnover of the bidder during last three years (certified by CA) shall be submitted.
	<p>NOTE :</p> <p>The Suppliers not meeting the above criteria (OR) not submitted the required documents will be disqualified.</p>			

<p>Revisions:</p> <p>Refer to record of revisions:</p>	<p>Prepared:</p> <p>PVSB</p>	<p>Approved:</p> <p>KHRK</p>	<p>Date of First Issue:</p> <p>04.07.2022</p>
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LIME STONE WEIGH FEEDER & PNEUMATIC DIVERTER ALONG WITH ACCESSORIES FOR BHADRADRI WBM.

This specification stipulates the requirements for design, engineering, manufacturing, cleaning coating, painting, inspection, testing, packing, forwarding, delivery at site, site painting (if any), supervision of erection, testing, commissioning, performance guarantee test at shop/site, liquidation of punch points of '**Belt Weigh Feeder & Pneumatic diverter along with accessories** 'with all equipment and auxiliaries

Bidder shall refer Document No.BA89135 for qualification requirement.

1. GENERAL DESCRIPTION OF WEIGH FEEDER

The duct from the limestone silo hopper feeds the limestone to the weigh feeder. The weigh feeder feeds limestone to Wet ball mill system.

Sl. No.	Description	Requirement
1.	Quantity and Design Capacity of Feeder	
	Quantity and Design Capacity of Feeder	27.0 TPH –2 sets
2.	Parameters	
	Media to be Handled	Limestone
	Limestone Analysis	Refer Annexure -1
	Duty	Continuous

2.SCOPE OF WORK

Scope for the bidders shall include Design, Engineering, Manufacture, Inspection/testing as per approved quality plans, Packing, Supply, Supervision of Erection & Commissioning, Performance Guarantee Test and handing over of final Customer.

- a. Design:** Includes basic engineering, detail engineering, preparation and submission of engineering drawings/calculations/datasheets/quality assurance documents/field quality plans, storage instructions, commissioning procedures, Erection & assembly Drawings, operation & maintenance manuals,


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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.			<p>performance guarantee test procedures and assisting BHEL in obtaining time bound approval from NTPL.</p> <p>b. Testing: The scope of the bidder includes all shop tests, type tests, site tests, routine tests etc., fulfilment of complete quality assurance & inspection requirement and related activities for all the equipment & systems covered under the scope of the bidder.</p> <p>c. Painting: The bidder scope of work includes supply of paints and painting of all equipment's as per approved painting schedule from TSGENCO/BHEL. Approved painting schedule will be provided after award of contract. Tentative painting schedule attached</p> <p>d. Supervision of Erection & commissioning: Includes supervision of erection & commissioning, supervision of startup and trial operation.</p> <p>Performance Guarantee Test: The guarantee tests shall be carried out as per approved Performance guarantee test procedure, all the special equipment, tools and tackles, instruments, measuring devices required for successful conductance test shall be provided by bidder free of cost.</p> <p>3.. Scope of Supply: The scope of supply shall include but not limited to the following.</p> <p>3.1.Mechanical:</p> <ol style="list-style-type: none"> a) One number of Spool Piece (Above Rod Gate) b) One number of Rod Gate c) One number of Spool Piece (Below Rod Gate) d) One number of Spool Piece Between Slide Gate and Feeder Inlet e) One number of Belt Weigh Feeder (one number below each limestone day silo) each of capacity specified in clause No.1 complete with variable speed drive and its controls to achieve the capacity from 0 to 100% load, load cell, belt, pulleys, idlers, drive motors, brakes, coupling, coupling guard, complete drive unit, supporting frame along with stools, feeding and discharge chute, belt tensioning arrangement, belt cleaners, dust tight enclosure, pull chord switches, belt sway and zero speed switches, inserts, fasteners, weighing and calibration devices, speed sensor, device for loss of flow detection, local control system etc. including all mechanical, electrical, C&I and structural parts and accessories. Limestone weighing shall be automatic and shall include local & remote indication of rate of flow& totalizer counter. 			
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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.		<p>f) Distance Piece: Feeder discharge hood and discharge chute up to Inlet flange of wet ball mill.</p> <p>g) One number of Motorised gates at feeder inlet</p> <p>h) One number of Motorised gates at feeder outlet</p> <p>i) One number of pneumatic diverter gate.</p> <p>j) One number of mill inlet chute.</p> <p>k) One number of bypass chute.</p> <p>l) Equipment fittings, supporting structure, along with insert plates, fixing bolts, MS sleeves, base plates, grouting and proper alignment etc.</p> <p>3.2 Electrical & Control instruments</p> <p>a) Cables, Cable glands ,Local electrical control panels, JB'S, transmitter, Motors with terminal boxes, VFD with accessories (cable sizing, cable race way and cable procurement between VFD and VFD operated motor) , Cable trays/conduits with supporting system</p> <p>b) All the necessary Control & field instrumentation i.e. Transmitters, process actuated switches pull cord switches, belt sway switches, zero speed switches, Under Belt Switch, Chute Blockage Switch ,limit switches, switch for loss of flow, sensors, final control elements, solenoid / motor operated valves, etc. as per finally approved P&ID/Flow Scheme, and to facilitate effective control of the system, shall be supplied by Bidder.These shall suit the actual FGD DDCMIS</p> <p>c) All transmitters, gauges etc. shall be suitably grouped together and mounted inside:</p> <p style="padding-left: 40px;">(i) Local Instruments Enclosures (LIEs) in case of open areas</p> <p style="padding-left: 40px;">(ii) In Local Instrument Racks (LIRs) in case of covered areas.</p> <p style="padding-left: 40px;">Instrument rack / enclosure shall be free standing type with CRCA steel and painting</p> <p>d) Belt Weigh feeder shall be controlled through either through microprocessor based DDCMIS, supplied by Employer or local control panel based on bidder's standard practice. However, in case of control through LCP, start / stop command with necessary control and monitoring feedback (Hard wired) shall be provided by bidder from LCP to DDCMIS. Detailed operation and control philosophy shall be furnished by bidder and the same shall be subject to</p>				
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purchaser / owner's approval during detailed engineering.

e) Two (2) number of pull-cord switches shall be provided at both side along the length of each belt conveyor, which shall enable the respective conveyor to be stopped immediately. Each pull chord switch shall be identified by a specific number on HMI in the main control room. All instruments/JB/racks shall be tagged as per Purchaser's tagging philosophy.

f) Scope of C&I Cable and Cable engineering:
 From field instruments/ valves/ devices to JB's – Bidder's scope.
 From JB's/field instruments/valves/ devices to Bidder's supplied Local panels- Bidder's scope

g) For DDCMIS preparation of logic/loops in case of operation from DDCMIS, I/O list, Drive list, Instrument List, mimics/ displays etc. shall be provided by Bidder for implementation in DDCMIS for Belt weigh feeder.

h) Temperature transmitter, pressure transmitter and motorized actuators shall be HART PROTOCOL based. All actuators shall be certified for SIL 2 or better.

3.3 Scope of Supply - Civil & Structural:

Structural loading drawings indicating the vertical and lateral loads transmitted to the foundation at each support location. The loads due to dead load, live load, wind load, seismic load and other pertinent conditions shall be listed separately. This shall include, but not be limited to, magnitude, direction of forces; location, service, and / or connection details to Purchaser's furnished supports. All such drawings shall be submitted under separate cover. Overall base plate dimensions and Anchor bolt information shall include the size and location of bolts in relation to equipment center-line, anchor bolt projection above concrete surface, bolt material strength, and required length. Levelling provisions shall be fully described.

BIDDER shall submit design calculations, which include the determination of operating loads, foundation reactions and anchorage design.

****Bidder shall supply any other items required for completeness of the equipment except the items covered in the exclusions.**


4 .Miscellaneous Scope:

I. All equipment, systems and components etc. supplied under this specification

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Bidder without any commercial and schedule implication to Purchaser.

5 Equipment Functional Guarantee

- I. Bidder shall provide minimum availability of Belt Weigh Feeder as minimum 98%.

6 .Other Services

- a) Training of Employer’s Personnel :

The Bidder’s supervisory personnel at site shall train adequate number of Employer’s operation and maintenance personnel at site during erection and commissioning of equipment to enable them to take over proper operation and maintenance of the equipment after commissioning.

- b) Shop inspection and Test Procedures

The Equipment’s covered by this specification shall be subjected to inspection and testing. The Bidder shall provide all services to establish and maintain quality of workmanship in his works and that of his sub-Vendors to ensure the mechanical accuracy of components, compliance with drawings, identification and acceptability of all materials, parts and equipment.

- c) Quality plan shall submit after award of contract. Bidder shall follow quality plan approved by BHEL/Customer

- d) Packaging for Transportation

All the equipment’s shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit till the time of erection. While packing all the materials, the limitation from the point of view of the sizes of railway wagons available in India should be taken.

The Bidder shall be responsible for any loss or damage during transportation due to improper packing.

Preservative coatings used on components shall be suitable for the conditions normally expected during shipping, storage and throughout the erection period.

Each type of preservative used shall be identified as to quality, life expectancy and type. Toxic and hazardous-type preservatives shall not be allowed. Complete information shall be submitted to the Purchaser covering step-by-step procedures, including federal, state and local governing controls for handling and removal of each

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type of preservative. This information shall be submitted six months prior to delivery.
 The Bidder shall indicate the Weights and dimensions of each component, which shall be shipped along with the offer.

7 .EXCLUSION:

Broad terminal points have been indicated in the tender specification. Within these terminal points, all equipment and electrical distribution, piping network, control and instrumentation etc. as required shall be furnished by the Bidder unless specifically excluded as follows:

7.1 Mechanical

- I. Limestone Day Silo and its supporting structure.
- II. Wet ball mill
- III. All concrete foundations and RCC works (if applicable).

7.2 Electrical

- I. Main LT power supply
- II. Lightning System.

7.3Control & Instrumentation

- I. FGD DDCMIS and its associated RIOP Cabinets, Data highway, Workstation
- II. Cabling between local JB/LCP to FGD DDCMIS
- III. Fire Detection & Alarm System

7.4 CIVIL:All concrete foundations and RCC works,

8. TERMINAL POINTS

The following are the Bidder's battery limits:

8.1 MECHANICAL

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Sl. No.	System / Equipment	Bidder's Battery Limits / Purchaser's Connection
1.	Limestone receipt	Limestone day silo shall be provided by Purchaser. Bidder scope starts from the Discharge flange of Silo. Counter flange, gasket, fasteners and seal shall be supplied by bidder
2.	Limestone Discharge	Bidder's scope terminates at the limestone discharge at wet ball mill material inlet. Counter flange, gasket, fasteners and seal shall be supplied by bidder

8.2 ELECTRICAL

The following are the Bidder's battery limits:

Sr.No.	System/Equipment	Bidder's Battery Limit / Purchaser's Connection
1	VFD	a. Terminals for Main incoming power cable b. Terminals for control cable interface c. Earthling terminal
2	Local Push Button Station (LPBS) if any provided by bidder	a. Control terminals b. Earthling terminals on LPBS enclosure

8.3 Control & Instrumentation

Sr.No.	System/Equipment	Bidder's Battery Limit / Purchaser's Connection
1.	Outgoing cables to FGD DDCMIS	Belt weigh feeder local JB/LCP terminals
2.	Power supply to C&I equipment/items	Purchaser will be provide the 230V AC UPS/Non UPS or 24V DC power to equipment / instruments at one end and further distribution through distribution box (PDB) of power supply to instruments / actuators will be in bidder's scope of supply.

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3,	Earthing	Earthing of bidder supplied panels by bidder to nearest earthing JB including earthing JB.
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9. CODES AND STANDARDS

All equipment, systems and services covered under this specification shall comply with all currently applicable statutory regulations and safety codes in the locality where the equipment will be installed. The equipment and systems shall also conform to the latest applicable standards specified. All codes and standards referred to in the specification shall be understood to be the latest version on the date of offer made by the Bidder unless otherwise indicated. Nothing in this specification shall be construed to relieve the Bidder of this responsibility.

Bureau of Indian standards (BIS)

Japanese Industrial Standards (JIS)

American National Standards Institute (ANSI)

American Society of Mechanical Engineers (ASME)

American Society for Testing and Materials (ASTM)

American Petroleum Institute (API)

American water works association. (AWWA)

Standards of the Hydraulic Institute, USA

International Organisation for Standardisation (ISO)

Tubular Exchanger Manufacturer's Association (TEMA)

American Welding Society (AWS)

National Electrical Manufacturers Association (NEMA)

National Fire Protection Association (NFPA)

International Electro-Technical Commission (IEC)

Expansion Joint Manufacturers Association (EJMA)

Heat Exchange Institute (HEI)

IEEE Standard

JEC Standard


Occupational Safety & Health Administration (OSHA)


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PAINTING REQUIREMENTS

Painting shall be followed as per approved painting scheme. However, for components where no specific requirement is stipulated, the painting conforming to the requirements stipulated below shall be as per OEM practice.

11. Documents Submission:

11.1 Documents along with offer

Bidder shall submit the following drawings/data and technical information along with their Techno-commercial offer

Item	Description
1.	General arrangement drawing of belt weight feeder
2.	Quality assurance plan(QAP)
3.	Published equipment brochures and documents
4.	Experience/installation list of similar projects
5.	Other vendor supplied supporting documents
6.	Warranty & performance guarantee schedule
7.	Sub vendor list
8.	Guaranteed auxiliary power consumption
9.	Complete electrical load list .

11.2 Documents along with offer

Bidder shall submit the following drawings/data and technical information along with after award of contract. For approval or Information:

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REVISION See record notes of revision	PREPARED BY P V S B	APPROVED BY AMAN SURIN	DATE 04.07.2022
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RESTRICTED USE



106-1 Rev No. 5	Form No.		PRODUCT STANDARD PULVERISERS HYDERABAD		Product STD no.	BA89134
					Rev No.	02
					Page	14 of 15
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"> COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company. </p>			<p>contain full details required for erection, commissioning, operation and maintenance of each equipment. The manual shall be specifically compiled for this project. The erection portion of manual shall contain erection strategy, sequence of erection, erection instructions, critical checks (along with permissible deviations/tolerance), Bill Of Materials, procedure for erection, general safety procedures to be followed. Procedure for initial checking after erection, procedure for testing (along with acceptance norms) check list for commissioning/pre-commissioning activities, List of tools and tackles.</p> <ul style="list-style-type: none"> All the manuals shall be two rim PVC bound stiff sided binder able to withstand constant usage. The cover shall be printed with project name. <p>13. SUPERVISION OF ERECTION, TESTING AND COMMISSIONING</p> <ul style="list-style-type: none"> The erection of Belt Weigh Feeder & Pneumatic diverter along with accessories will be done by owner (BHEL) as per Erection Manual and check List provided by bidder. The bidder has to supervise for erection, pre-commissioning & post-commissioning check-up, start-up, trial runs of all the items covered under the scope of supply. There will be two visits per each weigh feeder assembly totally there will be 4 visits. The bidder will be informed well in advance for the visit. Bidder shall consider 15 working days per weigh feeder assembly. In case erection and commissioning activities get delayed due to any account, resulting into overstay of vendor supervisory engineer beyond schedule time, then BHEL shall pay for additional man-day stay of vendor supervisory engineers. Vendor to quote Per day cost for deputation along with this offer. TA/DA, boarding and lodging shall be borne by the bidder and shall be inclusive in supervision charges portion. Charges for supervision of Erection & commissioning shall be quoted by the bidder. Price comparison for evaluating the lowest bid will be considered all main supply, supervision of E&C charges and mandatory spares price all together. <p>**Confirmation shall be taken from BHEL during detail engineering for Mating flange and interface details accordingly vendor drawing shall be updated.</p> <p>14. Guarantee/ Warranty Requirement:</p> <ul style="list-style-type: none"> 18 months from the date of commissioning or 24 months from the date of supply whichever is early 			
REVISION See record notes of revision			PREPARED BY P V S B	APPROVED BY AMAN SURIN	DATE 04.07.2022	

106-1

Rev No. 5

Form No.



PRODUCT STANDARD

PULVERISERS

HYDERABAD

Product
STD no.

BA89134

Rev No. 02

Page 15 of 15

ANNEXURES LIST:

Annexure Sl. No.	Description
1.	Lime stone properties
2.	Deviation list.
3.	Vendor scope of items drawing
4.	Wet ball mill and Day silo GA drawing
5.	Painting Schedule (tentative)
6.	Equipment sizing report and details
7.	VFD specification attached

VARIANTS – TABLE

VARIANT NO.	DESCRIPTION	MATEIRAL CODE
00	LIME STONE WEIGH FEEDER & PNEMUNATIC DIV	BA9789134002

RECORD OF REVISIONS

REV. NO	DATE	REVISION DETAILS	REVISED	APPROVED
01	13.07.22	Vfd details updated	pvsb	aman
02	15.07.22	Guarantee details finished	pvsb	aman

REVISION
See record notes of revision

PREPARED BY
P V S B

APPROVED BY
AMAN SURIN

DATE
04.07.2022

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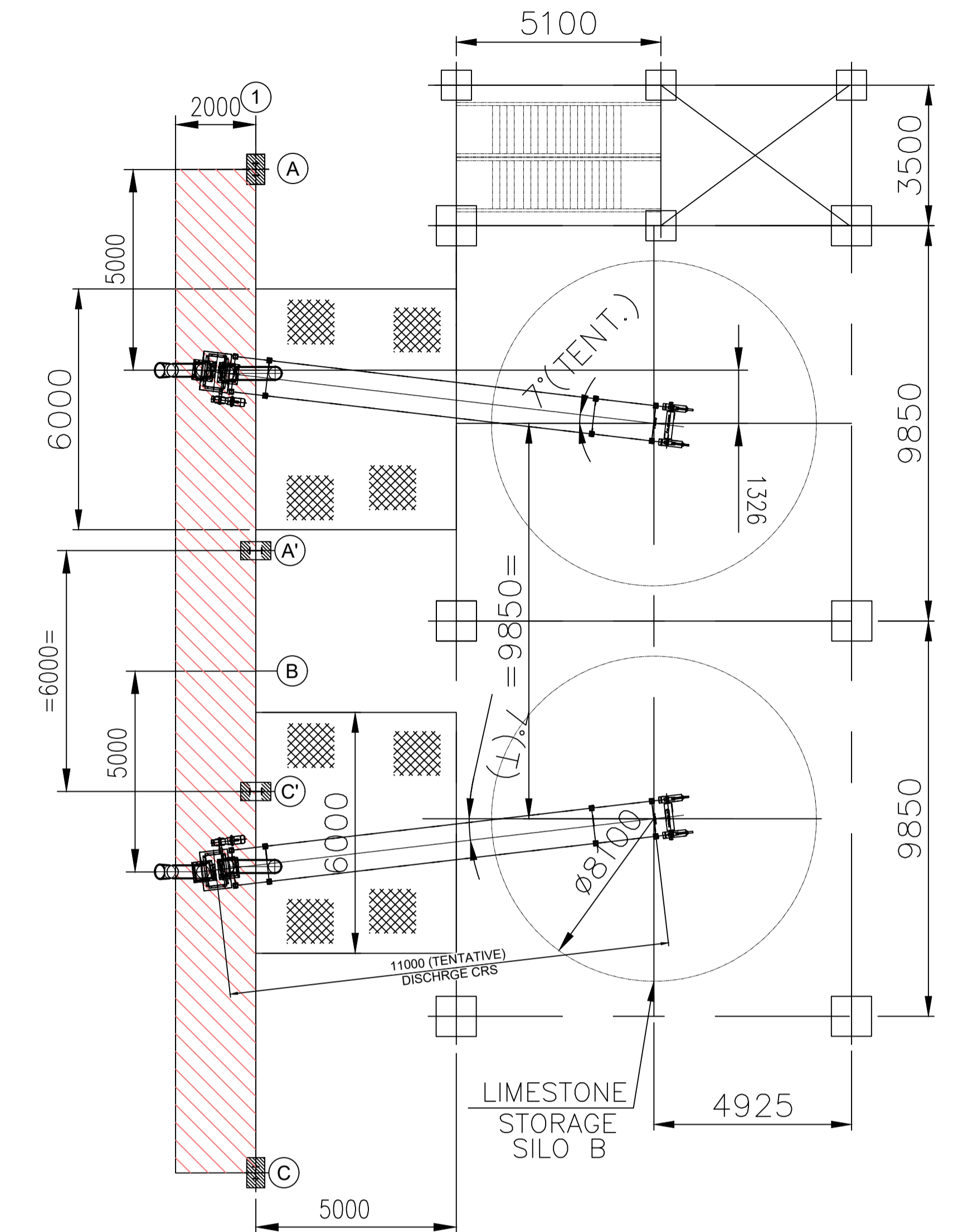
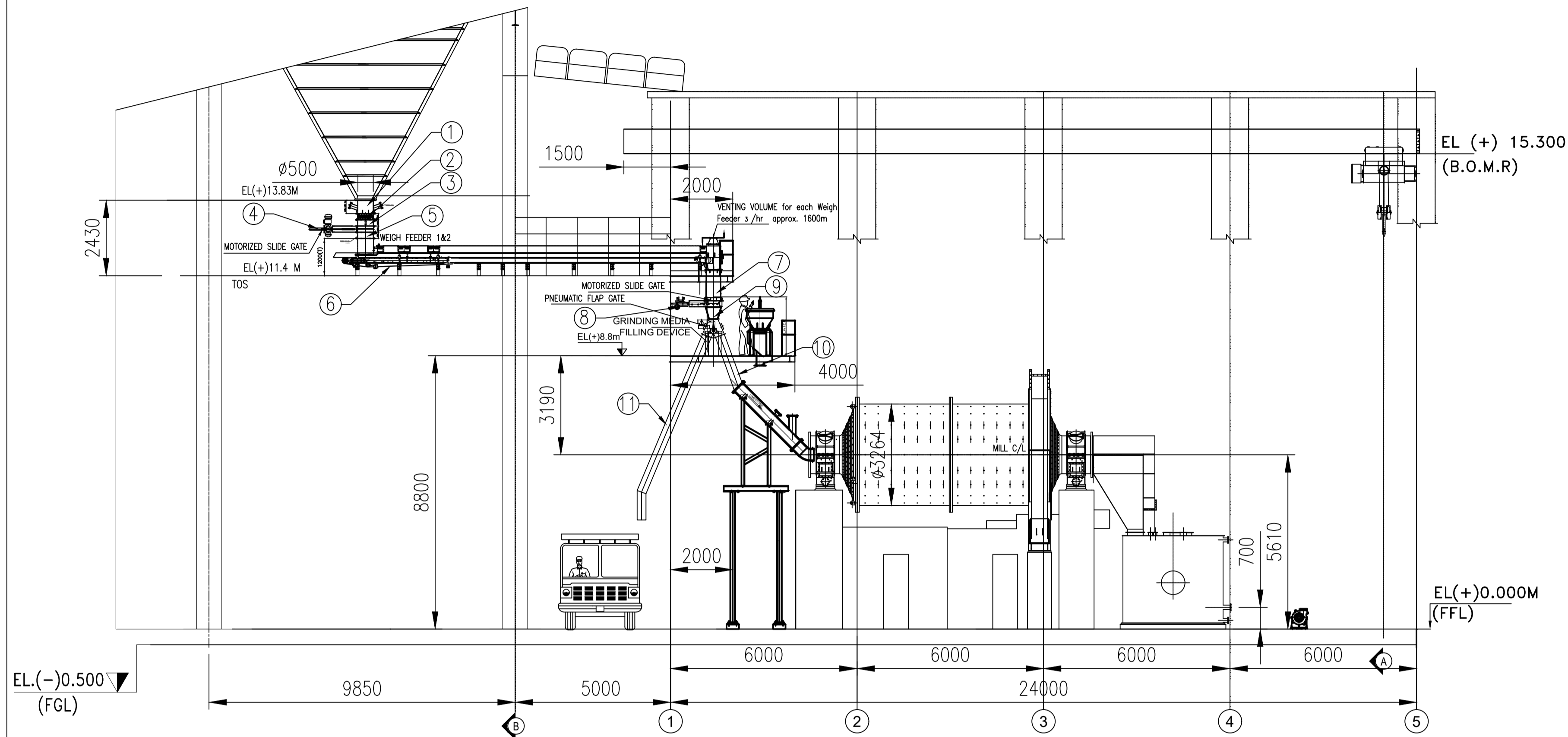


FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG.NO. 3-62-221-00042

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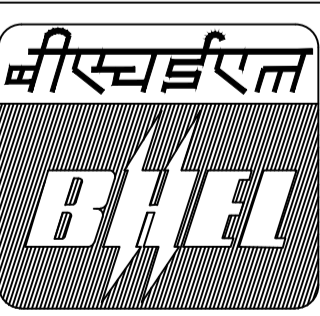
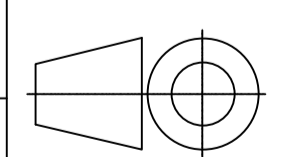


PLAN VIEW AT FEEDER FLOOR AT
EL 11.4 M

ITEM LIST AND SCOPE		
SL. NO	DESCRIPTION	SCOPE
1	SPOOL PIECE (ABOVE ROD GATE)	VENDOR
2	ROD GATE	VENDOR
3	SPOOL PIECE (BELOW ROD GATE)	VENDOR
4	MOTORIZED SLIDE GATE ABOVE FEEDER	VENDOR
5	SPOOL PIECE BETWEEN SLIDE GATE AND FEEDER INLET	VENDOR
6	WEIGH FEEDER	VENDOR
7	DISTANCE PIECE	VENDOR
8	MOTORIZED SLIDE GATE BELOW FEEDER	VENDOR
9	PNEUMATIC DIVERTER GATE	VENDOR
10	BYPASS CHUTE	VENDOR
11	BALL MILL INLET CHUTE	VENDOR

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

- REF.TO HY0230261 FOR UNSPECIFIED TOLERANCES.
- CHAMFER M/CD SHARP EDGES 1.2 TO 1.0 AT 45°.
- INTERNAL M/CD CORNER RADII 1 TO 0.7.
- THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRG.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		TELANGANA STATE POWER GENERATION CORPORATION LTD TELANGANA, INDIA BHADRADRI TPS, UNITS # 1 TO 4 (4X270 MW),MANUGURU, KHAMMAM DISTRICT			
 BHARAT HEAVY ELECTRICALS LTD. HYDERABAD		NAME	SIGN.	DATE	NO.OF VAR.
		DRN. BGK		07.04.22	
		CHD. PVS		07.04.22	
DEPT. PULV ENGG.		SCALE NTS	WEIGHT (KG) --	REF. TO ASSY DRG.	ITEM NO. 01
CODE 446					NO.OF ITEMS 01
TITLE				DRAWING NO.	REV.
WEIGH FEEDER ALONG WITH ACCESSORIES-27TPH				3-62-221-00042	00
SHEET NO. 01		NO OF SHEETS 01			

INVENTORY NO.	REV.	DATE	ALTERED		REV.	DATE	ALTERED	
			CHD.	APPD.			CHD.	APPD.



3.2 LIMESTONE CHARACTERISTICS:

3.2.1 LIMESTONE CHARACTERISTICS CONSIDERED FOR FGD DESIGN:

CHEMICAL ANALYSIS (% BY MASS)			
Sl. No	Description	unit	Values
1.	CaO	%	47.0- 51.0
2.	MgO	%	0.9 – 3.8
3.	Fe ₂ O ₃	%	0.45 - 1.0
4.	Al ₂ O ₃	%	1.19 – 2.1
5.	Si ₂ O ₃	%	2.1 – 4.5
6.	Mn ₂ O ₃	%	< 0.12
7.	P ₂ O ₅	%	Traces
8.	Cl ₂	%	< 0.015
9.	Na ₂ O	%	< 0.16
10.	K ₂ O	%	< 0.01
11.	TiO ₂	%	< 0.02
12.	Total Sulphur	%	< 0.1
13.	LOI		38 – 41.3
PHYSICAL PROPERTIES			
14.	Bond Index	KWh/Metric ton	14.33
15.	Granule size (at limestone crusher)	-	Medium (250 mm)
	Granule size (at ball mill inlet)	-	25.0 mm
16.	Bulk density		
	a. Volume	Kg/m ³	1400
	b. Torque and drive calculation	Kg/m ³	1700
	c. Structural load calculation	Kg/m ³	2200

Note: BHEL considered CaO % in limestone as 47.0 % for FGD design point and 50 % for FGD guarantee point.

Project Name :ENQ/ NIT No: _____(Vendor to fill & submit along with offer)

LIST OF DEVIATIONS/ EXCEPTIONS (IF ANY, vendor to fill and submit along with offer)

Sl No	Clause No	Page No	Description of Deviation

Note: Enlarge the table to incorporate items

SIGNATURE OF BIDDER -----

NAME -----

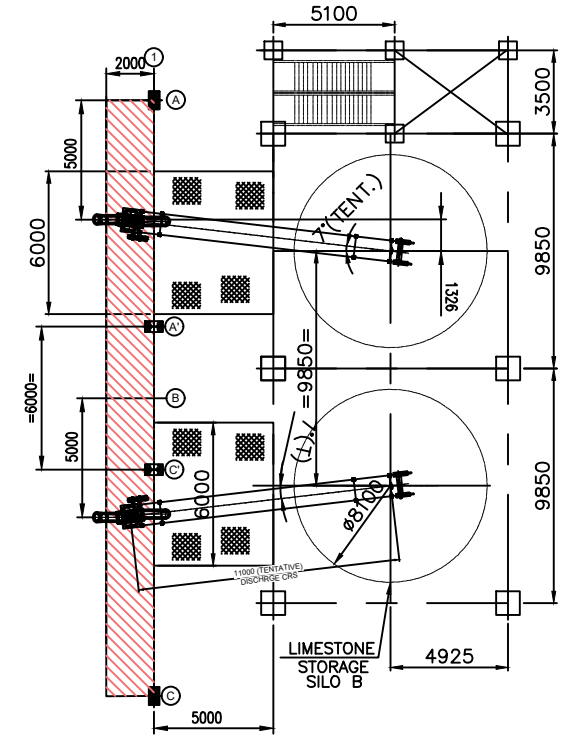
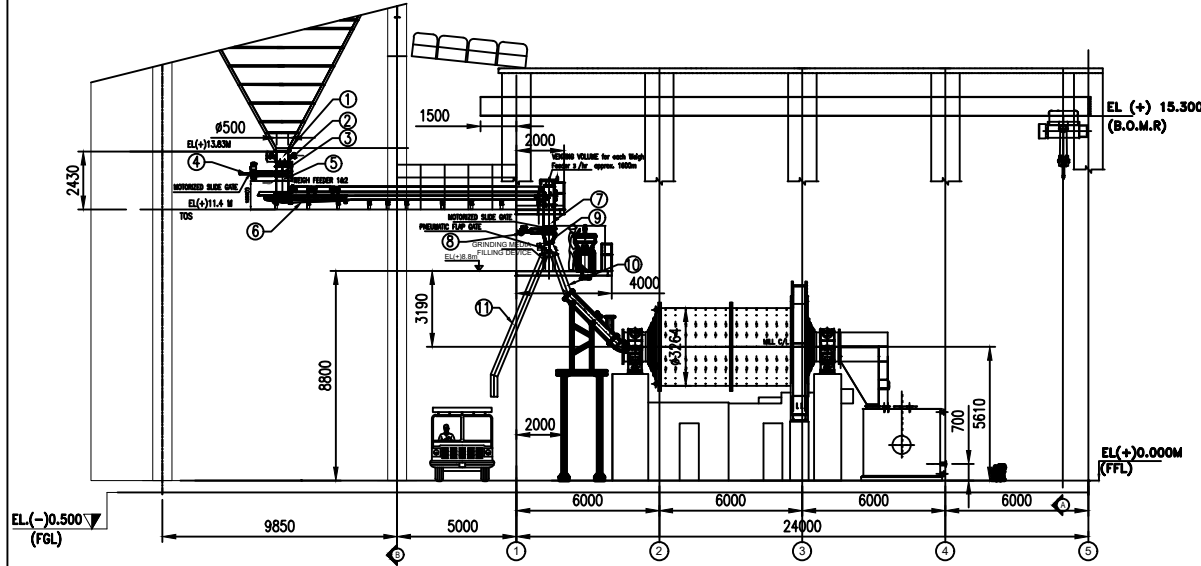
DESIGNATION -----

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG.NO. 3-62-221-00041

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PLAN VIEW AT FEEDER FLOOR AT EL 11.4 M

ITEM LIST AND SCOPE		
SL. NO	DESCRIPTION	SCOPE
1	SPOOL PIECE (ABOVE ROD GATE)	VENDOR
2	ROD GATE	VENDOR
3	SPOOL PIECE (BELOW ROD GATE)	VENDOR
4	MOTORIZED SLIDE GATE ABOVE FEEDER	VENDOR
5	SPOOL PIECE BETWEEN SLIDE GATE AND FEEDER INLET	VENDOR
6	WEIGH FEEDER	VENDOR
7	DISTANCE PIECE	VENDOR
8	MOTORIZED SLIDE GATE BELOW FEEDER	VENDOR
9	PNEUMATIC DIVERTER GATE	VENDOR
10	BYPASS CHUTE	VENDOR
11	BALL MILL INLET CHUTE	VENDOR

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

- REF. TO HY0230261 FOR UNSPECIFIED TOLERANCES.
- CHAMFER M/CD SHARP EDGES 1.2 TO 1.0 AT 45°.
- INTERNAL M/CD CORNER RADII 1 TO 0.7.
- THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRG.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT TELANGANA STATE POWER GENERATION CORPORATION LTD TELANGANA, INDIA BEADRADI TPS, UNITS # 1 TO 4 (43270 MW), MANUGURU, KHAMMAM DISTRICT



BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

DEPT. PULV ENGG. CODE 446



SCALE NTS

WEIGHT (KG) --

NAME	SIGN.	DATE	NO. OF VAR.
DRN. B GK		07.04.22	
CHD. PVSB		07.04.22	
APPD. AMAN SURIN		07.04.22	

TITLE WEIGH FEEDER ALONG WITH ACCESSORIES-27TPH

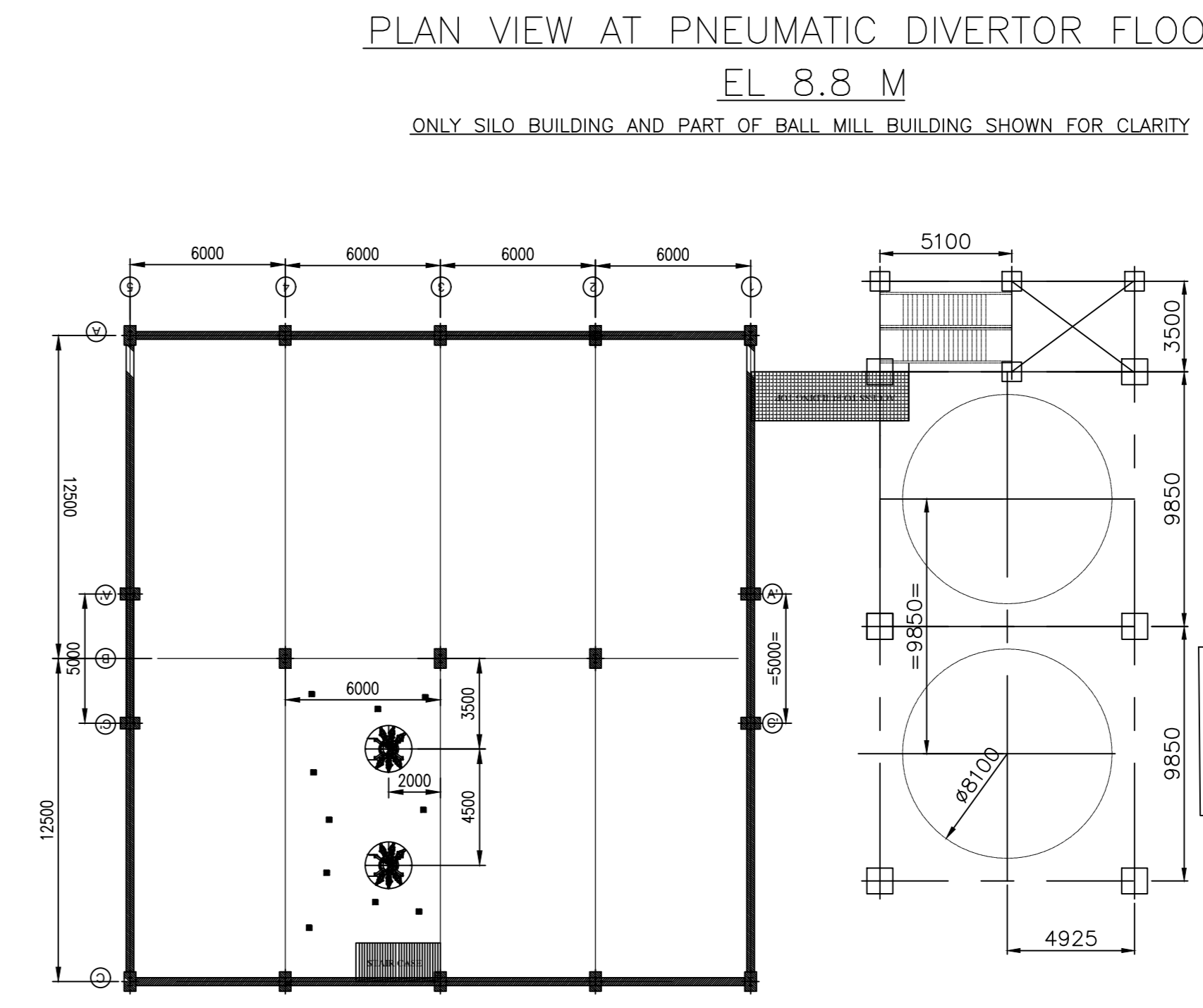
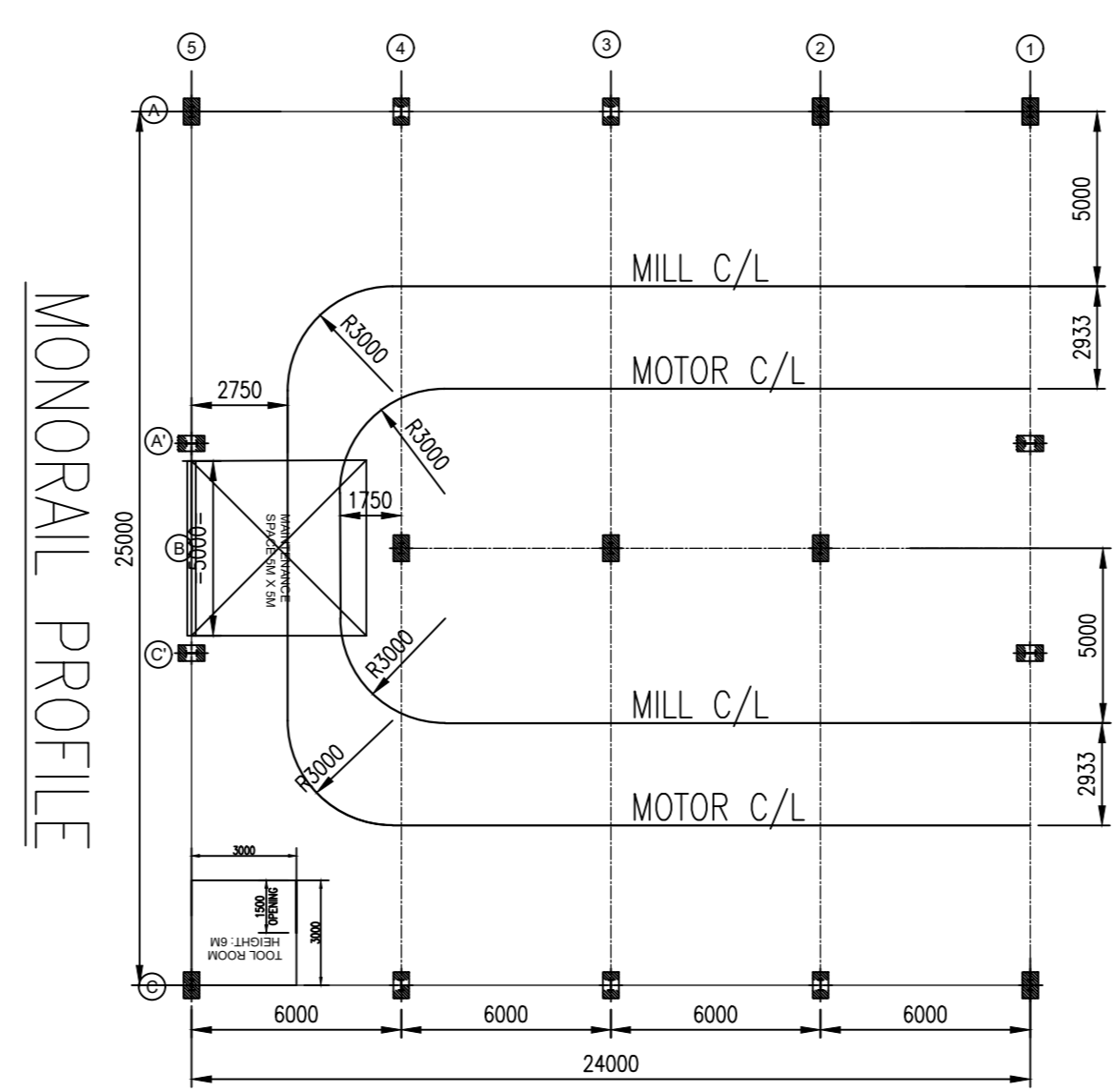
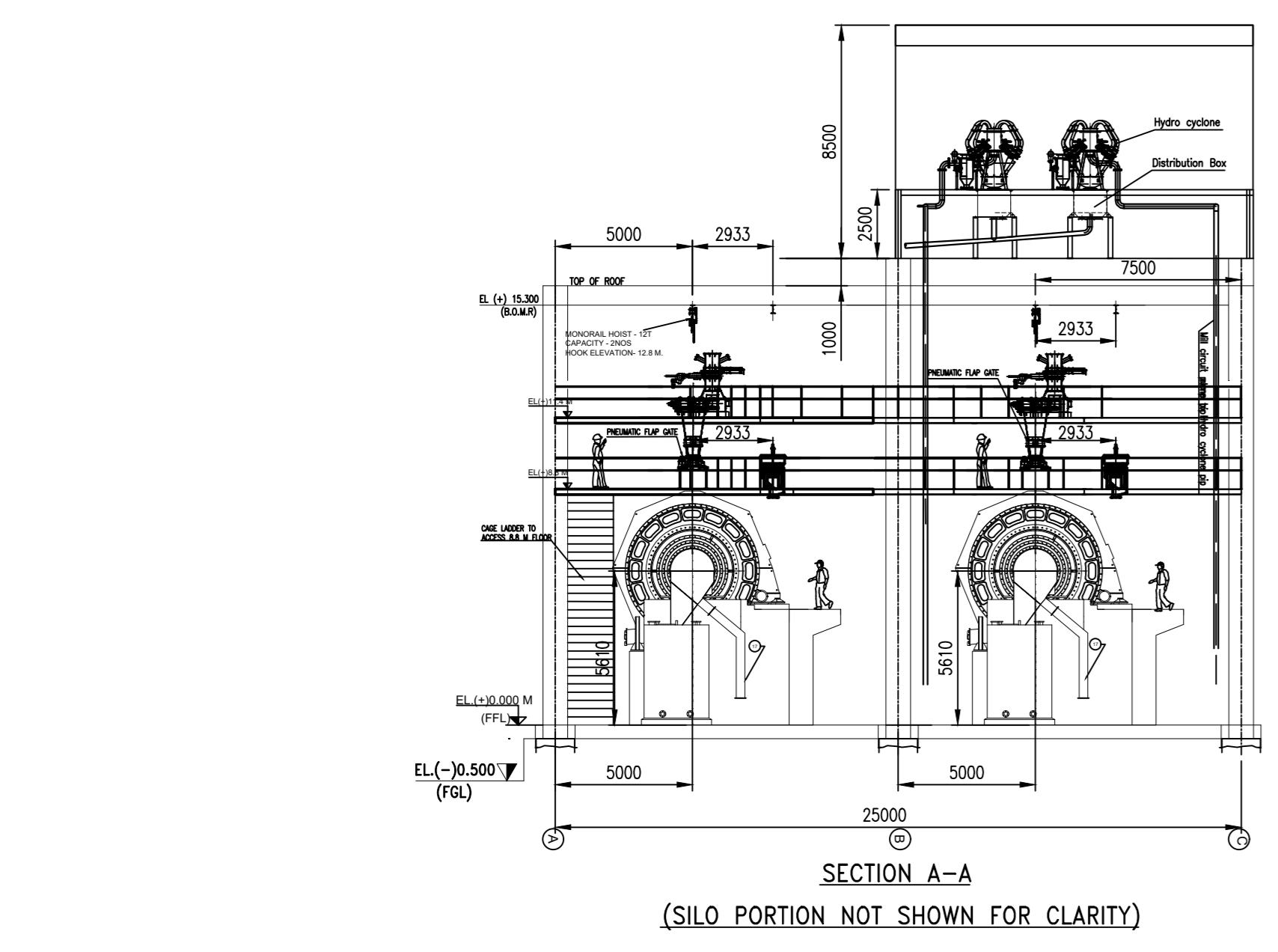
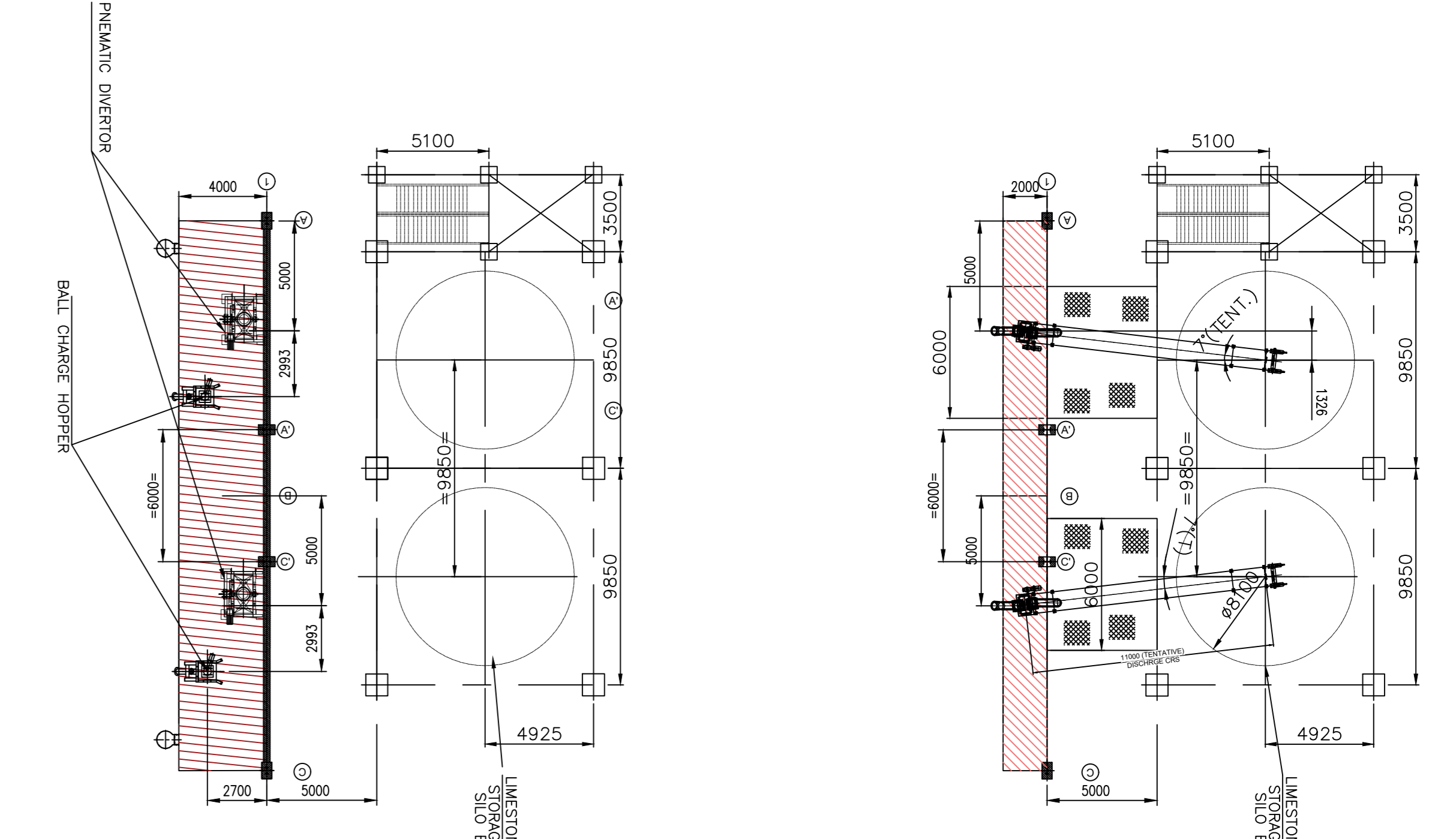
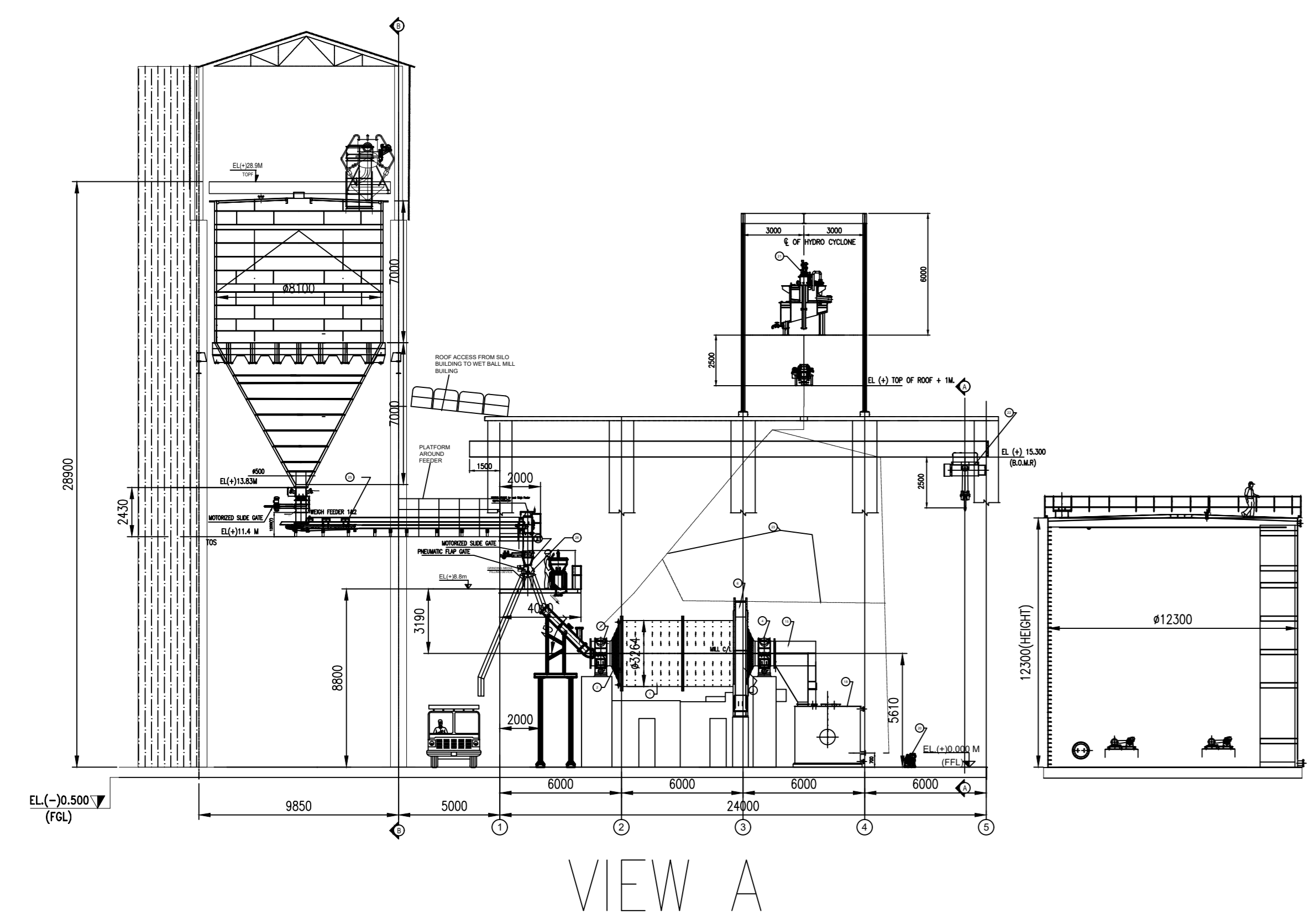
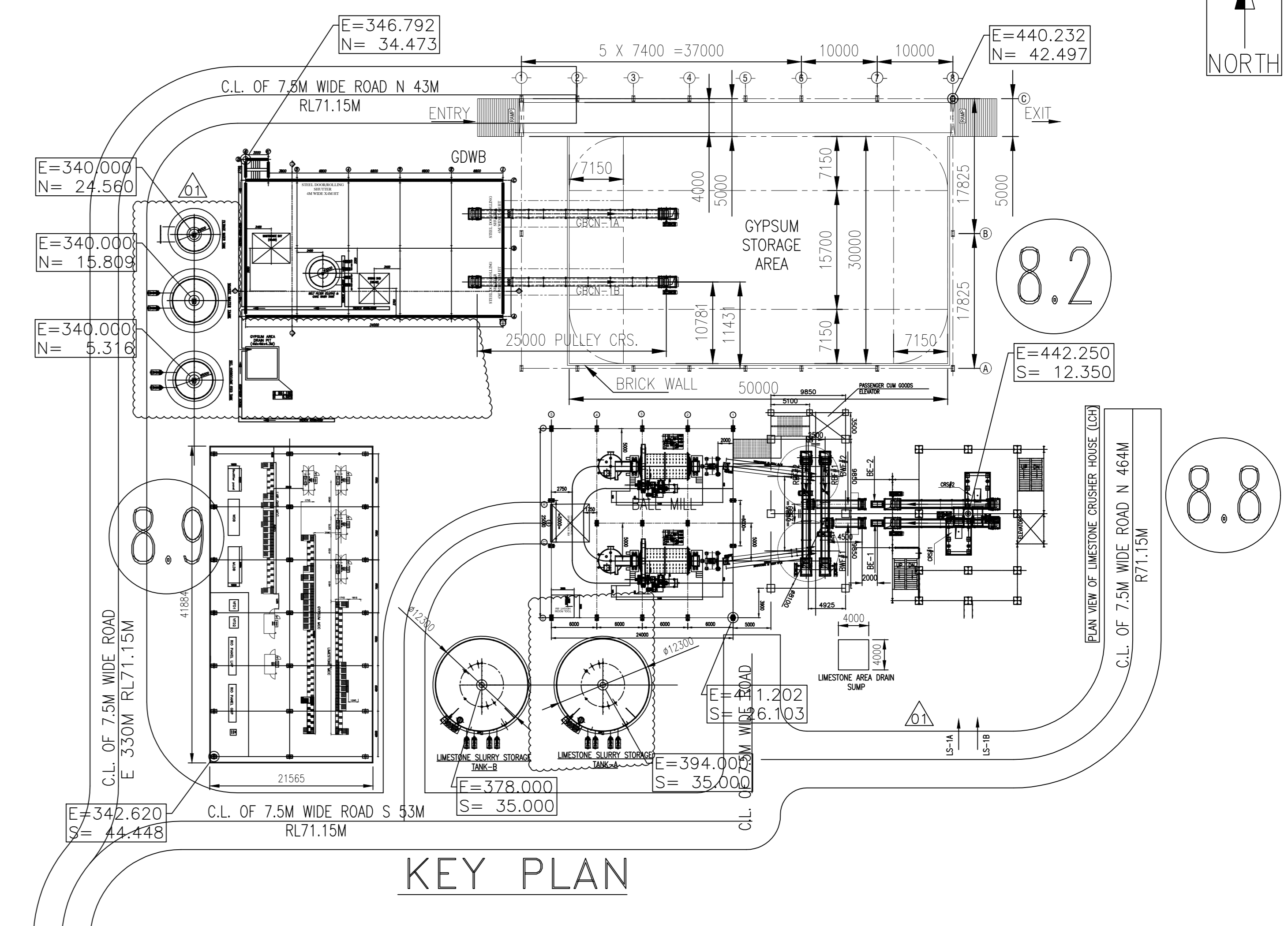
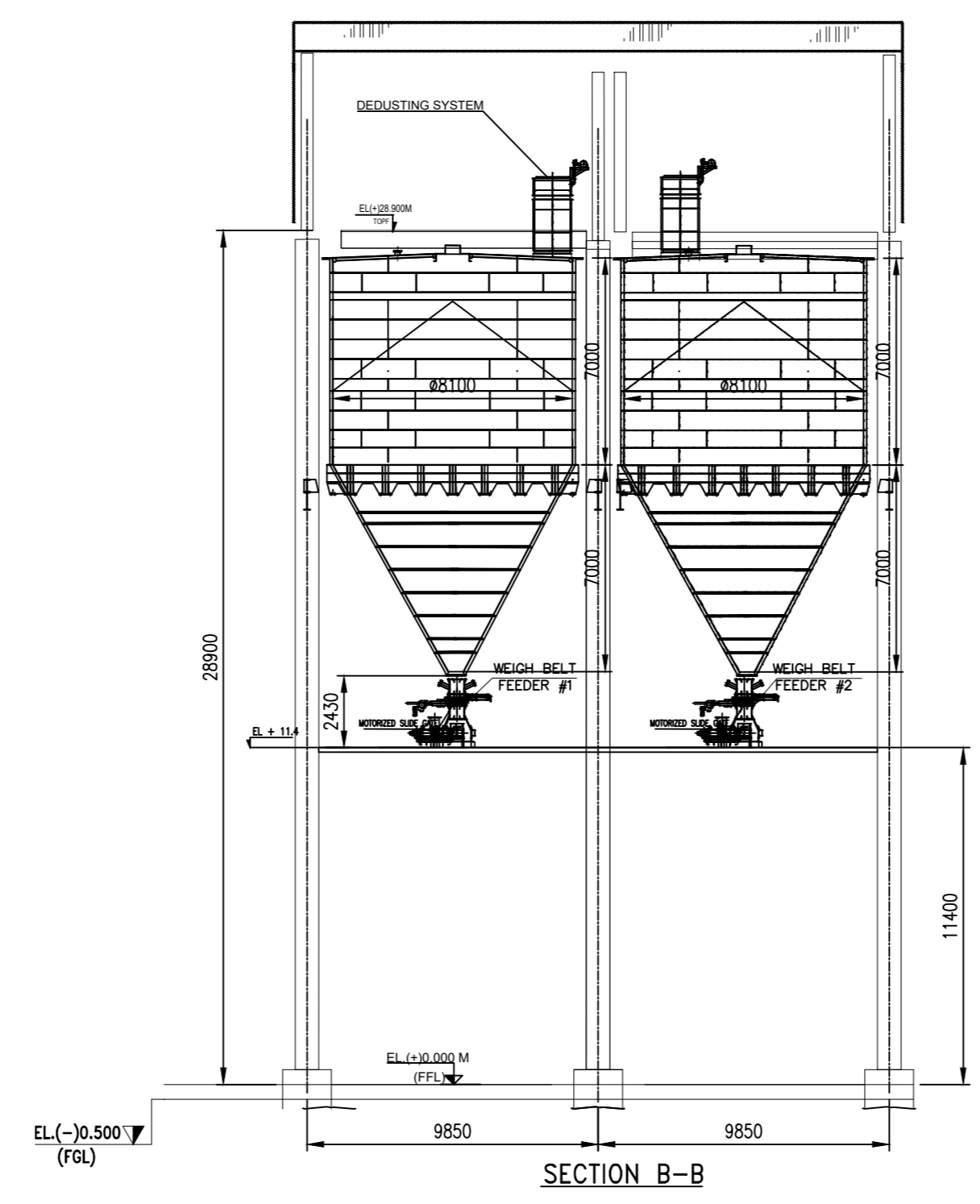
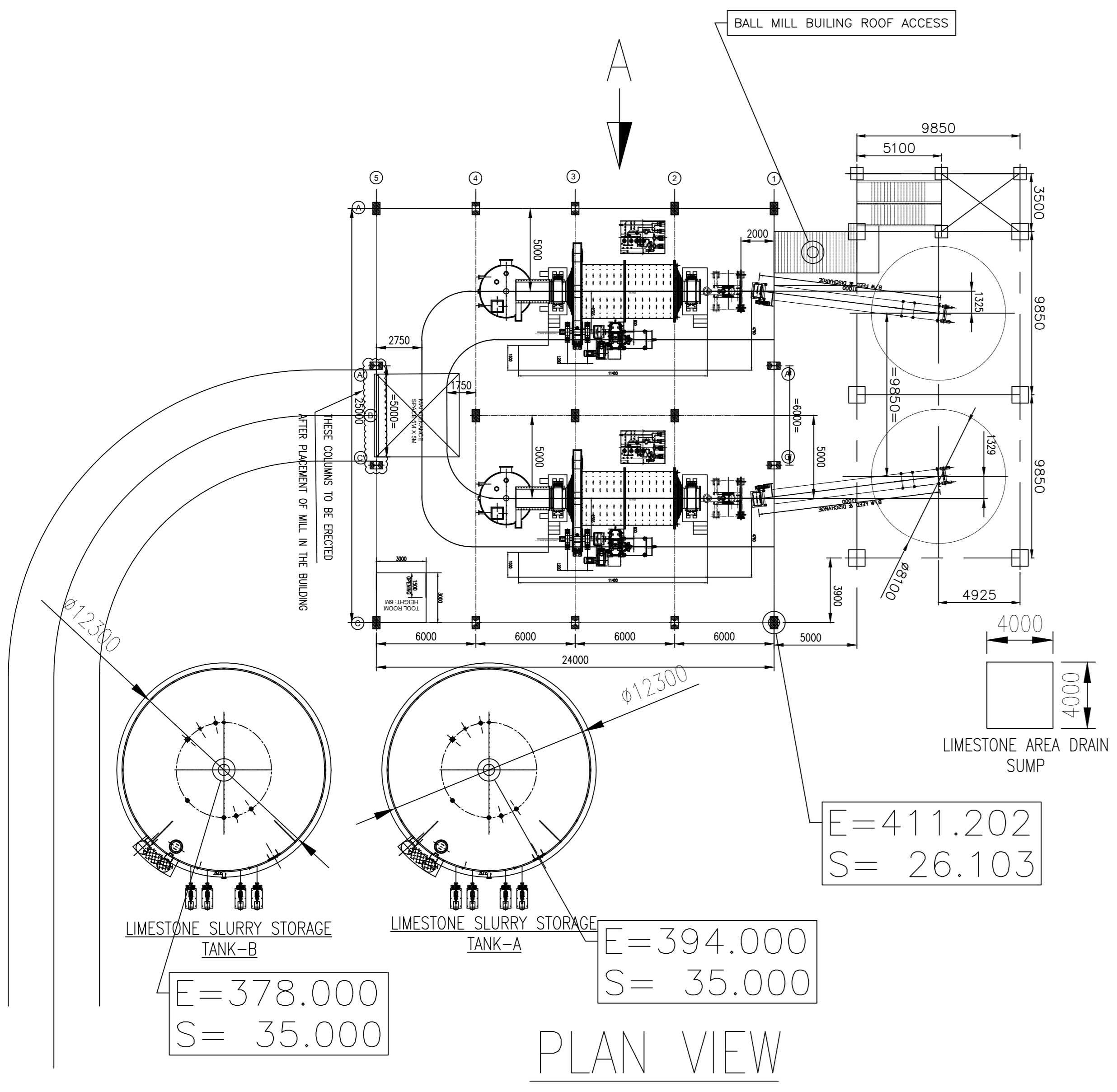
REF. TO ASSY DRG.	ITEM NO.	NO. OF ITEMS
	01	01

DRAWING NO. 3-62-221-00041

SHEET NO. 01 NO OF SHEETS 01

INVENTORY NO.	REV.		DATE		ALTERED		ZONE
	CHD.	APPD.			CHD.	APPD.	

ANNEXURE - II



LEGEND :-

P.F.L = FINISHED FLOOR LEVEL
P.A.L = FINISHED PLASTER LEVEL
T.O.P.F = TOP OF FINISHED FLOOR LVL
T.O.P = TOP OF STEEL
T.O.S.C = TOP OF STEEL COLUMN
B.O.M.C = BOTTOM OF MATERIAL CONCRETE
M.S = METAL SHEET
R.S = REINFORCED STEEL
T.P = TRANSFER POINT
L.S = LIMESTONE STORAGE AREA
C.S.A = CRUSTE LAMINATE SURFACE
L.S.S = LIMESTONE STORAGE AREA
B.O.L = BOTTOM OF SILO

BILL OF MATERIAL - WET BALL MILLING SYSTEM

ITEM NO.	DESCRIPTION	QUANTITY	UNIT
01	STEEL ROLLER ASSEMBLY	01	NO
02	STEEL ROLLER ASSEMBLY	01	NO
03	STEEL ROLLER ASSEMBLY	01	NO
04	STEEL ROLLER ASSEMBLY	01	NO
05	STEEL ROLLER ASSEMBLY	01	NO
06	STEEL ROLLER ASSEMBLY	01	NO
07	STEEL ROLLER ASSEMBLY	01	NO
08	STEEL ROLLER ASSEMBLY	01	NO
09	STEEL ROLLER ASSEMBLY	01	NO
10	STEEL ROLLER ASSEMBLY	01	NO
11	STEEL ROLLER ASSEMBLY	01	NO
12	STEEL ROLLER ASSEMBLY	01	NO
13	STEEL ROLLER ASSEMBLY	01	NO
14	STEEL ROLLER ASSEMBLY	01	NO
15	STEEL ROLLER ASSEMBLY	01	NO
16	STEEL ROLLER ASSEMBLY	01	NO
17	STEEL ROLLER ASSEMBLY	01	NO
18	STEEL ROLLER ASSEMBLY	01	NO
19	STEEL ROLLER ASSEMBLY	01	NO
20	STEEL ROLLER ASSEMBLY	01	NO
21	STEEL ROLLER ASSEMBLY	01	NO
22	STEEL ROLLER ASSEMBLY	01	NO
23	STEEL ROLLER ASSEMBLY	01	NO
24	STEEL ROLLER ASSEMBLY	01	NO
25	STEEL ROLLER ASSEMBLY	01	NO
26	STEEL ROLLER ASSEMBLY	01	NO
27	STEEL ROLLER ASSEMBLY	01	NO
28	STEEL ROLLER ASSEMBLY	01	NO
29	STEEL ROLLER ASSEMBLY	01	NO
30	STEEL ROLLER ASSEMBLY	01	NO

CUSTOMER: TELANGANA STATE POWER GENERATION CORPORATION LTD
 TELANGANA, INDIA
 BHADRABADI TPS, UNITS # 1 TO 4 (4x270 MW), MANUGURU, KHAMMAM DISTRICT

OWNER'S CONSULTANT: DESEIN PRIVATE LIMITED
 BHARAT HEAVY ELECTRICALS LTD
 HYDERABAD

REVISIONS

REV	DATE	ALTO	CHD	APPO	DEPT	SCALE	DRAWING NO.	DATE
							0-FW-000-01085-BTPS	01.11.2021

TITLE WET BALL MILL BUILDING GA DRAWING

DEPT. SCALE

DRAWING NO. 0-FW-000-01085-BTPS

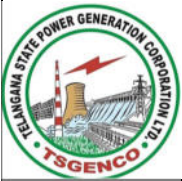
SHEET OF 01

REV. 01

SIZE A0

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PROJECT:
4 X 270 MW BHADRADRI THERMAL POWER STATION



OWNER:
TELANGANA STATE POWER GENERATION CORPORATION LTD



Owners Consultant:
DESEIN PRIVATE LTD KOLKATA



EPC CONTRACTOR:
BHARAT HEAVY ELECTRICALS LTD

FGD DOCUMENT TITLE:
Painting Schedule of Wet Ball Milling system and Silo.

ISSUED FOR:

- INFORMATION
- ENQUIRY
- CONSTRUCTION
- APPROVAL
- AS BUILT

BHEL Doc No : **BA-WBM-PS-BHAD-00**

REV. : **00**

TSGENCO Doc No:

REV. : **00**

Rev No	Date	Reason of Revision	Prepared by	Reviewed by	Approved by
			BHEL	BHEL	TSGENCO
00	05.08.2021	First Submission	UDAY REDDY	PVS/AMAN	

*Painting scheme of Wet Ball
Milling system:
Shop manufactured Items*

FGD TSGENCO BHADADRI

Painting Scheme : Wet Ball Milling system Outsourced (BOHT) Items

Revision : 0 - Date : 05.08.2021

Outsourced (BOHT) Items

Shop manufactured jobs

Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT External surface	Colour shade for external surface	Remarks
1	Mill Shell - Internal surface	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate paint. Dry film thickness (DFT) 50 microns.	Not applicable (NA) since rubber lining being installed across surface of internal surface		NA	NA	
2	Mill shell - External surface	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate paint. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Grey White RAL 9002	
3	Support bearing housing- Internal surface	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate paint. Dry film thickness (DFT) 50 microns.	Not applicable (NA) as surface shall be in permanent contact with oil		NA	NA	
4	Support bearing housing- External surface	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate paint. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Grey White RAL 9002	
5	Ball charging hopper and ball charge chute	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate paint. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Grey White RAL 9002	
6	Material inlet & outlet - Internal surface - Rubber lining	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate paint. Dry film thickness (DFT) 50 microns	Not applicable since rubber lining being installed across surface of internal surface			NA	Not applicable since rubber lining being installed across surface of internal surface.

FGD TSGENCO BHADADRI

Painting Scheme : Wet Ball Milling system Outsourced (BOHT) Items

Revision : 0 - Date : 05.08.2021

Outsourced (BOHT) Items

Shop manufactured jobs

Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT External surface	Colour shade for external surface	Remarks
7	Material inlet & outlet - External surface	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate paint. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Grey White RAL 9002	
8	Base frame of Pinion shaft assembly: Un-machined surface	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate paint. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Grey White RAL 9002	All unmachined surfaces
9	All Machined surface - Ball Mill		Tectyl 506 / standard rust preventive /equivalent			NA	NA	Temporary protection for machined surface. Includes all components i.e. Pinion; Shaft; bearing shoe; drive bearing; mill web portion; girth gear and base frame etc.
10	Girth gear - Un-machined surface	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate paint. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Grey White RAL 9002	
11	Anti-Friction Bearing Housing (for Pinion Shaft Assembly)	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate paint. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Grey White RAL 9002	
12	Girth Gear guard - Internal surface	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate paint. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Grey White RAL 9002	

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Painting Scheme : Wet Ball Milling system Outsourced (BOHT) Items

Revision : 0 - Date : 05.08.2021

Outsourced (BOHT) Items

Shop manufactured jobs

Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT External surface	Colour shade for external surface	Remarks
13	Girth Gear guard - External surface	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate paint. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Grey White RAL 9002	
14	Fastners & hardware/ foundation bolts	NA	NA	NA	NA	NA	Shall be applied with temporary oil.	

*Painting scheme of Wet Ball
Milling system:
out-sourced (BOHT) Items*

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Painting Scheme : Wet Ball Milling system Outsourced (BOHT) Items

Revision : 0 - Date : 05.08.2021

Outsourced (BOHT) Items

Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT - External surface	Colour shade for external	Remarks
1	GearBox							
i.	Main Gear Box (GB)	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only
ii.	Base Frame (GB + Motor)	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns)	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only
iii.	Inching Reducer	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns)	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only

FGD TSGENCO BHADADRI

Painting Scheme : Wet Ball Milling system Outsourced (BOHT) Items

Revision : 0 - Date : 05.08.2021

Outsourced (BOHT) Items

Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT - External surface	Colour shade for external	Remarks
iv.	Base Frame (GB + Motor + Brake)	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only
2	Lubrication System - Support Bearing							
i.	Tank	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Shade: Grey White RAL 9002. Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only

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Painting Scheme : Wet Ball Milling system Outsourced (BOHT) Items

Revision : 0 - Date : 05.08.2021

Outsourced (BOHT) Items

Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT - External surface	Colour shade for external	Remarks
ii.	Base Frame	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns.	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns.	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats).	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only
3	Lubrication System - Girth Gear							
i.	Drum Cover, AMU Plate, Spary Panel Plate	All CS surfaces - Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns.	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns.	Two coats of Polyamide cured color pigment epoxy based paint. Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only

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Painting Scheme : Wet Ball Milling system Outsourced (BOHT) Items

Revision : 0 - Date : 05.08.2021

Outsourced (BOHT) Items

Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT - External surface	Colour shade for external	Remarks
4	Hydro-Cyclone & Slurry Pumps							
i.	Slurry Pumps	Power tool cleaning to St3(SSPC-SP3	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns.	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only
ii.	Hydro-cyclone	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns.	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only

FGD TSGENCO BHADADRI

Painting Scheme : Wet Ball Milling system Outsourced (BOHT) Items

Revision : 0 - Date : 05.08.2021

Outsourced (BOHT) Items

Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT - External surface	Colour shade for external	Remarks
5	Weigh Feeder							
i.	Weigh Feeder Assembly	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns.	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only
ii.	Rod Gate	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns.	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only

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Painting Scheme : Wet Ball Milling system Outsourced (BOHT) Items

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Outsourced (BOHT) Items

Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT - External surface	Colour shade for external	Remarks
iii.	Connecting Chute	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns.	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only
iv.	Vent Hood	SS Parts are not painted						
v.	Damper Gate	SS Parts are not painted						
vi.	Transition Chute	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns.	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only

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Painting Scheme : Wet Ball Milling system Outsourced (BOHT) Items								
Revision : 0 - Date : 05.08.2021								
Outsourced (BOHT) Items								
Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT - External surface	Colour shade for external	Remarks
vii.	Stool	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns.	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only
6	Pneumatic Diverter Gate							
i.	Valve	Standard Bought out (BOHT) item. Color shade & DFT shall be maintained as per manufacturer standard						
ii.	Actuator	Standard Bought out (BOHT) item. Color shade & DFT shall be maintained as per manufacturer standard						
7	Motorized Slide Gate							
i.	Motorized Slide Gate	Standard Bought out (BOHT) item. Color shade & DFT shall be maintained as per manufacturer standard						
8	Agitator							
	Agitator	Standard Bought out (BOHT) item. Color shade & DFT shall be maintained as per manufacturer standard						
9	Mill Circuit Tank (including Agitator Support)							
	Mill Circuit Tank (including Agitator Support)	Standard Bought out (BOHT) item. Color shade & DFT shall be maintained as per manufacturer standard						

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Painting Scheme : Wet Ball Milling system Outsourced (BOHT) Items

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Outsourced (BOHT) Items

Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT - External surface	Colour shade for external	Remarks
10	Slurry Pipe & Fittings (Temp < 90°C)							
	Slurry Pipe & Fittings (Temp < 90°C)	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns.	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns.	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only
	Slurry Pipe & Fittings (Temp < 90°C)	For FRP Pipes & Fittings- painting is not applicable						
11	Process Water & Cooling Water - Pipe & Fittings (Temp < 90°C)							
	Process Water & Cooling water Pipe & fittings (Temp < 90°C) (For External surface only)	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns.	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns.	Two coats of Polyamide cured color pigment epoxy based paint Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only

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Painting Scheme : Wet Ball Milling system Outsourced (BOHT) Items								
Revision : 0 - Date : 05.08.2021								
Outsourced (BOHT) Items								
Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT - External surface	Colour shade for external	Remarks
12	Instrument Air Pipe & Fittings (Temp < 90°C)							
	Instrument Air Pipe & Fittings (Temp < 90°C)	GI Pipes & Fittings will be used for Slurry application. Hence, painting is not applicable						
13	All Valves (Temp < 95°C)							
	All Valves (Temp < 95°C) (For External surface only)	Commercial blast Swedish Std. SA2.5	One coat of Inorganic Zinc Silicate. Dry film thickness (DFT) 50 microns.	One Coat of Micaceous iron oxide (MIO) epoxy based paint Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint. Dry film thickness (DFT) 70 microns (35 micron X 2 Coats).	220	Shade: Grey White RAL 9002	The mention DFT shall be maintain on blasted surface only
14	All Electrical & Instrumentation Items (applicable for Wet Ball Mill FGD Package)							
	All Electrical & Instrumentation Items (applicable for Wet Ball Mill FGD Package)	Standard Bought out (BOHT) item. Color shade & DFT shall be maintained as per manufacturer standard						

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Painting Scheme : Wet Ball Milling system Outsourced (BOHT) Items

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Outsourced (BOHT) Items

Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT - External surface	Colour shade for external	Remarks
15	Rubber liners, grinding media, stainless steels, rubber parts, ERW Pipes, forging /casting							
	Rubber liners, grinding media, stainless steels, rubber parts, ERW Pipes, forging /casting	Painting not applicable.						

NOTE:

1. The above equipment wise painting scheme given for major system covering broader level items. As regard other small components and misc items not covered above, then painting scheme/colour shade shall be as per OEM manufacturing standard.
2. No painting for FRP Pipes, FRP pipe fittings, SS, Aluminium, non-ferrous, stainless steel and galvanized items.

***Painting scheme of Silo,
Passenger cum bucket elevator
for silo, Air canons and Dust
extraction System items.***



FGD TSGENCO BHADADRI

Painting Scheme : Silo, Passenger cum goods elevator for silo structure, air cannons and Bag filter

Revision : 0 - Date : 05.08.2021

Silo Items

Sl. No.	Description	Surface Preparation	Primer Coat	Intermediate Coat	Finished Coat	Total DFT External surface	Colour shade for external surface	Remarks
1	Limestone Silo - Internal surface	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate primer coat. Dry film thickness (DFT) 50 microns.	NA	NA	NA	NA	
2	Limestone Silo - External surface	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate primer coat. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint. Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint. Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Grey White RAL 9002	
3	Passenger cum goods elevator and accessories	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate primer coat. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint. Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint. Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Grey White RAL 9002	
4	Bag filter	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate primer coat. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint. Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint. Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Grey White RAL 9002	
5	Air Canons	Commercial blast Swedish Std SA 2.5	One coat of Inorganic Zinc Silicate primer coat. Dry film thickness (DFT) 50 microns	One Coat of Micaceous iron oxide (MIO) epoxy based paint. Dry film thickness (DFT): 100 microns	Two coats of Polyamide cured color pigment epoxy based paint. Dry film thickness (DFT) 70 microns (35 micron X 2 Coats)	220	Grey White RAL 9002	

	BHARAT HEAVY ELECTRICALS LTD	PROJECT: 4 X 270 MW BHADRADRI TPS FGD		TELANGANA STATE POWER GENERATION CORPORATION LTD
BHEL DOC.NO. – HY-WBM-BTPS-DS-0		<u>Equipment Sizing Report</u>		Page 2 of 10
TSGENCO Doc. No. – HY-WBM-BTPS-DS-0				

1. INTRODUCTION

The Limestone grinding and slurry preparation system, which consists of wet ball mill circuit for limestone slurry preparation purpose, is a part of FGD (Flue Gas Desulphurisation) plant. The power plant uses coal as the fuel to generate power. The combustion reaction (burning of the coal) process produces flue gas, which typically releases Sulphur dioxide in the atmosphere. FGD system is designed to reduce the amount of Sulphur dioxide in the flue gas prior to discharge it to atmosphere and limestone slurry is used as the reagent for the same.



2. PROJECT INFORMATION

Owner	:	TELANGANA STATE POWER GENERATION CORPORATION LTD
Contractor	:	BHEL
Project/Product	:	4 X 270 MW BHADRADRI TPS FGD
Ambient temperature (Min.)	:	27°C
Ambient temperature (Design)	:	45°C
Ambient Relative Humidity	:	60%

3. EQUIPMENT INFORMATION

Below indicated are the main components of the limestone grinding / slurry preparation System.

- 1) Wet Ball Mill.
- 2) Weigh Feeder.
- 3) Gates (Rod, Knife, Flap).
- 4) Mill Slurry Tank with Agitator.
- 5) Slurry Pumps.
- 6) Hydro-Cyclone.
- 7) Piping and Valves.
- 8) Chutes

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4. EQUIPMENT SIZING AND SELECTION DATA

4.1 Wet Ball Mill (2 nos.)

There shall be two numbers of wet Ball mills for grinding of limestone; each mill shall be sized to meet the following conditions.



WBM Design Capacity	24.5 Tons Per Hour (TPH)
Input Limestone Size	Max. 25 mm, 100% < 25mm & 90% < 20mm.
Minimum Slurry Conc. Leaving System (at hydro cyclone overflow)	30% Solids (w/w)
Output Fineness (at hydro cyclone overflow)	90% passing through 325 mesh (44 µm).
Limestone bond index	14.3 kWh/ton (design)
pH of Limestone slurry	7 to 9
Chloride content in Limestone slurry	50 to 70 ppm as CaCO ₃ / 35.4 to 49.6 mg/l

An emergency auxiliary drive is provided to prevent settling /solidification of limestone when the mill is out of operation and also for maintenance purpose.

All parts of the mill including mill body, trunnion, hydro-cyclones, integral pipes, mill circuit pumps and other parts in contact with limestone slurry is provided with replaceable rubber wear liners.

Facility shall be provided for on-load loading of steel balls to the mill.

The material of the balls shall be chosen to ensure that the balls do not lose their original shape and to ensure minimum ball consumption.

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4.2 Weigh Belt Feeder (2 nos.)

Weigh belt feeders / Gravimetric feeders (closed type) are sized to meet 110% of the maximum mill design capacity.

Therefore, belt weigh feeder capacity = 24.5 TPH x 1.1 = 26.95 TPH, rounded to 27 TPH.

27 TPH is the maximum capacity with highest speed of weigh feeder. This capacity can be reduced as per requirement. The speed variation is in the range of 1:10 for drive motor.



All parts of weigh feeder (battery limit i.e. from inlet hopper to discharge hood) which are in contact with limestone except belt will be of stainless steel.

The interconnecting chutes, which do not come under battery limit of weigh feeder equipment i.e. from Silo outlet to the transition chute below discharge hood, construction will be MS (6thk.) mother plate + SS304 (3thk.) Liner.

The feeder shall have adequate instrumentation to detect "loss of flow" and also to have weighing instruments to accurately control the feed rate.

The chutes will be designed to ensure proper flow of the limestone. However, in case of jamming / blockage, suitable poke doors/holes shall be provided in the inlet chute of weigh feeder.

One no. chute blockage switch is provided to trip the feeding conveyor in case of Chute blockage and protect the feeding conveyor equipment.

	BHARAT HEAVY ELECTRICALS LTD	PROJECT: 4 X 270 MW BHADRADRI TPS FGD	 TELANGANA STATE POWER GENERATION CORPORATION LTD
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4.3 Rod Gate and Motorised Gate (at feeder inlet and feeder outlet)

The Rod gates are installed at bottom of limestone storage silo and Motorised Gate at Feed & Discharge of weigh feeder.

Motorized slide gate with actuator is designed to ensure 100% opening & closing of the gate even with storage silo full of material.

In addition, a hand wheel with proper access shall also be provided for manual operation of the knife gate at the discharge of weigh feeder. The force at the rim of the hand wheel shall not exceed 35 Kg with bunker full of limestone.

All the actuator gates shall be provided with local as well as remote operation.

All parts in contact with limestone shall be of stainless steel construction

Material flow: Max. 27 TPH.

4.4 Change Over Flap / Diverter Gate (2 Nos.)

The change-over flap / diverter gate is installed at discharge of weigh feeder after knife gate to divert the material flow either to ball mill or to chute, which is extended up to floor level in mill building.

The arrangement can be used for emptying the silo & for weigh feeder calibration as needed.

Material flow: 27 TPH (Design)

4.5 Mill Circuit – Limestone Slurry Tank with Agitator (2 nos.)

The Mill Circuit tank is provided to hold and dilute the circulating slurry of the mill circuit for desired operation of the Ball mill for limestone grinding. It is also required

SPECIFICATION OF VARIABLE FREQUENCY DRIVE (VFD)

1. General Requirement :

The VFD shall be selected for motor, which drives the weigh feeder with variable speed.

2. Application :

The variable speed drive is used to drive the motor of a weigh feeder in wet ball milling system in an electrical energy-generating power station. A power plant distributed control system provides a signal to the VFD to regulate motor speed. The signal will be 4 to 20 mA DC. The motor and drive will be installed in a power plant application requiring reliable and continuous operation 24 hours per day and 365 days per year with minimal downtime maintenance.

3. Environmental Conditions :

The drive is to operate within an environment with temperatures ranging from 0°C to 50°C. The motor is to operate within an environment with temperatures ranging from 0°C to 50°C. The equipment, motor will be located in an area in which is in dusty environment which will result in the material settling on the equipment. The motor will be installed less than 500 meters from the VFD.

4. Scope of Supply :

The Supplier will provide the following items:

- 4.1 Variable frequency drive to meet specified electrical, control and construction requirements.
- 4.2 Variable frequency drive with enclosure cabinet with wired local control panel and necessary switchgears. Cabinet shall be of Rittal/ ABB or Siemens make. The cabinet shall have thermostatically controlled air conditioner. The dimension of cabinet shall minimum size. All the operation & display shall be possible from front door of the panel without opening the door. It should be min. IP54.
- 4.3 VFD shall be provided with air cooled arrangement.
- 4.4 Certified drawings.
- 4.5 The Supplier shall indicate if output line reactors are required to prevent impedance mismatches and potential damage to the motor from voltage spikes. If output line reactors are required, the Supplier must quote them as an option
- 4.6 It is the supplier's responsibility to ensure the supplied VFD is satisfying all functional requirements as per clause 9. Vendor to include any or all accessories/equipment for the same even if not mentioned in this specification.

5. Power and speed requirements :

Vendor shall select the speed range of motor with VFD as per weigh feeder functional requirement.

6. Noise Requirements :

The Supplier shall furnish the drive motor to a maximum predicted sound pressure level of 85 dBA, measured 3 ft (1 m) horizontally from the surface of the motor. Allowable sound pressure level applies to one motor with negligible sound contributed by other equipment.

7. Low Voltage Starting:

The motor and drive must be capable of starting without damage to the motor with a supply voltage range of 90 – 110 % of motor nameplate voltage. The motor must also be capable of starting with 80% motor nameplate voltage.

8. Surface Preparation and Paint :

Equipment shall be prepared and painted per manufacturer's standard for a minimum of 10 year power station operating life in a tropical environment. Equipment must arrive at the site with a finished coat.

9. Variable Frequency Drive Requirements :

- 9.1** The system offered shall be energy efficient, provide very high reliability, high power factor, low harmonic distortion, low vibration and noise. It shall be easy to install with minimum time and expense and no special tools shall be required for routine maintenance.
- 9.2** The system shall be suitable for the load characteristics and the operational duty of driven equipment. It shall be capable of withstanding the thermal and dynamic stresses and the transient mechanical torques, resulting from short-circuit. Any damage resulting from such a short-circuit or internal fault shall be limited to the component concerned.
- 9.3** The system shall be speed, torque or power controlled as dictated by the driven equipment.
- 9.4** The system shall be suitable for continuous speed control of the motors in single drive system as per data sheet and soft start feature shall be provided to reduce the disturbances in the electrical system.
- 9.5** The drive will vary the frequency of the supplied AC power to control motor speed according to a signal from the plant distributed control system (DCS). A 4 to 20 mA DC/0-10V DC signal from the DCS will represent 0 to 100% motor speed .VFD to have facility for user to configure range of speed for 4-20mA /0-10 V input signal.
- 9.6** The drive motor shall be speed regulated to a speed corresponding to purchaser's 4-20mA or 0-10 V reference signal. Upon complete loss of the DCS speed reference signal, the drive shall automatically run at constant speed as determined by the last speed reference available prior to the loss of signal.
- 9.7** All components of the drive system shall be mounted in an IP-54 enclosure fully accessible from the front.
- 9.8** In case of failure of VFD, for any reason, VFD shall have an in-built facility to immediately isolate VFD output and switch-On motor in DOL condition, via a bypass breaker.
- 9.9** Power semi-conductors shall be IGBT (Isolated Gate Bipolar Transistor) type. Fast switching SCRs are not acceptable.
- 9.10** The drive shall also include the
 - 9.9.1** Electric Thermal overload protection.
 - 9.9.2** Potential free contacts for local indication in control room for following functions :
Supply Healthy, Run, Trip, Stop
 - 9.9.3** 4-20 mA signal follower.
 - 9.9.4** Local Control panel, mounted on VFD panel, for user operation, with functions as per clause 12.
 - 9.9.5** Connection for control keypad to be through the cabinet door.
 - 9.9.6** Current limit adjustment 50% to 150% of drive rating
 - 9.9.7** Independent acceleration and deceleration ramps adjustable from 0.1 of a second to 1800 seconds.
 - 9.9.8** Slip compensation to improve speed regulation.
- 9.11** Vendor to select operation / type / quadrant of operation of VFD to be suitable for load / application characteristics.
- 9.12** The modulating control scheme shall closely approximate actual sine wave current throughout the speed range of the drive.

- 9.13** The regulator shall be fully digital with microprocessor control of frequency, voltage and current.
- 9.14** Speed resolution shall be within +/- 1 RPM.
- 9.15** All drive adjustments and custom programming, configuration etc. shall be capable of being stored in a non-volatile memory.
- 9.16** The drive shall be designed to protect itself against instantaneous current levels above 200% of its rating. The drive shall continue to operate through instantaneous current spikes below 200%.
- 9.17** Isolation transformers shall not be used to eliminate possible line converter notching of the input filter. The drive shall not be sensitive to line notching from other drives.
- 9.18** The drive shall be capable of automatic restart upon power failure or momentary source voltage dips, and restarting into a rotating motor at any speed without tripping.
- 9.19** The drive shall actively monitor its output current and frequency and shut down the drive if the motor is in a stall condition. A stall condition is defined as operating in current limit at or below 10 Hz for 10 seconds. This definition of stall shall be field adjustable to match the application.
- 9.20** Power capacitor voltage levels shall be discharged below 50 volts within one minute of de-energization or less per NEMA and NFPA standards.
- 9.21** The input displacement power factor of the drive shall be a minimum of 0.95 at all speeds and loads above 10% load.
- 9.22** Drive efficiency shall be evaluated and the Supplier shall provide drive efficiency curves for 0% to 100% speed at 25, 50, 75, and 100% rated load. Minimum acceptable efficiency shall be 97% at full load.
- 9.23** The drive shall be capable of operating with the output open circuited.
- 9.24** The Total Harmonic Distortion for Voltage and Current Harmonics shall be in line with latest revision of IEEE 519 standard at the supply side of the drive system based on the short circuit capacity of the bus.

10. Drive Protection :

Drive protection functions shall operate independent of the microprocessor control logic and shall include as a minimum:

- 10.1** Over current protection
- 10.2** Short circuit protection.
- 10.3** DC bus under voltage protection.
- 10.4** DC bus over voltage protection.
- 10.5** Over temperature protection.
- 10.6** Ground fault protection.
- 10.7** Electronic thermal overload monitor.
- 10.8** Settings for trip / alarm settings shall be user configurable either through software interface / local control panel.

11. Drive Diagnostics :

The drive shall include first fault indication in the protection functions and ability to store 20 successive fault indications in order of occurrence. As a minimum, the following fault indications shall be displayed on the local operator control panel:

- 11.1** Over current
- 11.2** Short circuit
- 11.3** Under voltage or phase loss
- 11.4** Over voltage

- 11.5 Over temperature
- 11.6 Motor Thermal overload

12. Drive Controls :

- 12.1 The drive shall be supplied with a local control panel which shall include the following operating functions
 - 12.1.1 Drive Start and Stop
 - 12.1.2 Fault reset
 - 12.1.3 Provision to increase or decrease the local speed reference with accuracy to 1 RPM.
 - 12.1.4 Local/remote selection.
- 12.2 The local control panel shall include a digital display to monitor the following functions:
 - 12.2.1 Local frequency reference
 - 12.2.2 Motor load calibrated in amps
 - 12.2.3 Output frequency
 - 12.2.4 Output voltage
 - 12.2.5 Remote frequency references
 - 12.2.6 Fault diagnostic messages
 - 12.2.7 Trouble shooting test points
 - 12.2.8 Motor speed
- 12.3 The local control panel shall be the operator interface for making all drive adjustments. Internal adjustments are not permitted.
- 12.4 The drive shall also include provisions for the following hard wired inputs and outputs for remote operator controls:
 - 12.4.1 Digital inputs, 24 VDC contacts from plant controls including: 1 Drive start 1 Drive stop 1 Remote control selector 1 Run at present speed.
 - 12.4.2 Digital output relay contacts 5 Amps 125 VDC / 250 VAC rating, 1 Drive off, 1 Drive running, 1 Drive fault.
 - 12.4.3 Analog input for reference signal, 4 to 20 mA.
 - 12.4.4 Analog output signal, 4 to 20 mA and/or 0 to 10 VDC to transmit output frequency and speed.
- 12.5 The drive is to be factory programmed and wired for:
 - 12.5.1 having the speed ramped as a function of a 4 to 20 mA signal input
 - 12.5.2 any trouble with the drive is to give a dry fault contact
 - 12.5.3 the drive is to get its start and stop signal as an input contact from the DCS.
 - 12.5.4 the drive is to output a signal indicating the motor speed.
 - 12.5.5 the drive is to be programmed for an acceleration ramp of 60 Hz/180 seconds.
 - 12.5.6 the drive is to be programmed for a deceleration ramp of 60 Hz/180 seconds.
 - 12.5.7 the drive is to be programmed so that during a start cycle it will catch and stop a reversed spinning load before it starts it in the correct direction.
 - 12.5.8 the drive is to be programmed so that if there is a loss of load it will trip and send out a fault signal.
 - 12.5.9 the drive is to be programmed so that if the power (current) exceeds the motor name plate rating for more than 3 seconds, it will trip and send out a fault signal. This shall be configured from LCP.

13. Quality Assurance :

- 13.1 All work is to be done in accordance to the Manufacturing Quality Plan and so documented.

13.2 All material, components and subassemblies shall be inspected and/or tested for conformance to these specifications and Supplier's engineering and quality assurance specifications.

13.3 The Supplier shall on request make available for review copies of Supplier Quality Assurance Policy, documentation, and records pertinent to equipment purchased.

13.4 The drive is to conform to NEMA, IEEE, UL and IEC standards.

14. Testing :

14.1. Type Test & Routine Tests like, No load tests, Insulation test, Functional test, Rated current test & Visual inspection, etc.

14.2. No load tests includes: Motor shaft voltage & Vibration severity measured at bearing housing, etc.

14.3. Insulation test (vendor to specify with relevant standards).

14.4. During Inspection, any physical damage or non-working of the unit shall be replaced with new units.

15. Document submission :

1. Recommended Spare Parts List (motor and drive)
2. Drive Electrical Schematic Drawing
3. Drive Dimensional Drawing
4. Drive Parameter List -Settings
5. Drive Installation, Operation and Maintenance Manual (Electronic pdf format)
6. General Arrangement drawing, Test certificates, conformance certificates.

16. Preservation and Packaging :

16.1 The material is to be preserved for long term storage (two years minimum) without additional onsite preservation activities.

16.2 The motor and drive to be boxed in shrink-wrap covering.