1.0 BALL MILL & FEEDER SELECTION DATA

S.NO	DESCRIPTION	DATA
1.0	WET BALL MILL (WBM)	
1.1	Number of wet ball mills	Two (1W + 1S)
1.2	Rated capacity of wet ball mill, kg/h	15,000
2.0	FEEDER	
2.1	Type of feeder	Gravimetric
2.2	Number of feeders	Two (1W + 1S)
2.3	Capacity of feeder, kg/h	18,000
3.0	REVERSABLE BELT CONVEYOR	
3.1	Number of feeders	One (1W)
3.2	Rated Capacity, kg/h	15,000
3.3	Design Capacity, kg/h	18,000
4.0	Input Limestone size, mm	-20
5.0	LIMESTONE BULK DENSITY	
5.1	Bulk density for Volume calculation, kg/m3	1400
5.2	Bulk density for load calculation, kg/m3	1700
Refer tender for more details		
Refer Contract specification for Mandatory spares		

2.0 LIMESTONE ANALYSIS/CHARACTERISTICS

The following limestone property to be used designing Limestone grinding system

TABLE-VII

PROPERTIES OF LIMESTONE

Limestone is proposed to be brought by Trucks to the plant. The limestone size is expected to be (-) 250 mm.

1.	CaO	%	47.5-51.0
2.	MgO	%	0.9-2.0
3.	Fe_2O_3	%	0.45-1.0
4.	Al_2O_3	%	1.19-2.1
5.	Si_2O_3	%	2.1-4.5
6.	Mn_2O_3	%	<0.12
7.	P_2O_5	%	Traces
8.	Cl_2	%	<0.015
9.	Na_2O	%	<0.16
10.	K_20	%	<0.01
11.	TiO_2	%	<0.02
12.	Total Sulphur	%	<0.1
13.	LOI	%	39.0-41.3
Physical Properties:			
1.	Bond Index	kWh/t	13
2.	Granule size		Medium

3.0 WATER ANALYSIS

The following water to be used during the grinding process of limestone in Lime stone grinding system (LGS)

TABLE-II

TREATED WATER/ FGD PROCESS WATER QUALITY

Sr. Number	Item	Unit	Value
1.	TDS of permeate from Desalination RO System	ppm	<500
2.	Total Suspended solids	ppm	Nil
3.	Iron as Fe	ppm as Fe	<0.1
4.	Reactive Silica as SiO2	ppm as SiO2	<1.0
5.	Chloride as Cl	ppm as Cl	<200
6.	Sodium	ppm as Na	<150
7.	pH at 25 deg C	---	6.0-7.0

4.0 PROCESS DATA (All the blank cells to be filled by the vendor)

Stream no	<1>	<2>	<3>	<4>	<5>	<6>	<7>
Fluid	**Lump limestone**	**Limestone ball mill over flow**	**Hydro cyclone feed**	**Hydro cyclone underflow return**	**Process water to ball mill**	**Process water to mill tank**	**Limestone product slurry**
Total flow kg/h	15,000						
Total flow m^3/h							
Temp ^oC	45				45	45	
Solid wt.%	100				0	0	30

5.0 SCHEDULE OF GUARANTEES

Sl. No	Description			Data
1.	Rated capacity of Wet Ball Mill (WBM)	TPH	:	15.0
2.	Rated capacity of gravimetric feeder	TPH	:	18.0
3.	Power consumption at rated capacity #	kW	:	Bidder to Provide
4.	Noise level at a distance of 1.0 meter from the equipment at site and 1.5 m above operating floor	dB(A)	:	≤ 90 dbA(for ball mill) ≤ 85 dbA(for other equipments)
5.	Maximum vibration (peak to peak amplitude at site)	microns	:	Bidder to Provide
6.	Equipment Availability in % (avg. target 98%) Continuous for 120 days		:	Bidder to Provide
7.	Life of WBM wear parts	Hours	:	≥8000 hours operation without reversal of liners
8.	Scheduled Maintenance (Minor Overhauls): Recommended intervals between maintenance outages	hours	:	>25000 hours operation
9.	Scheduled Maintenance (Major Overhauls): Recommended intervals between maintenance outages shall be	hours	:	>75000 hours operation.
10.	Limestone output fineness at rated capacity		:	≥ 90% through 325mesh.
11.	Guaranteed ball consumption		:	Bidder to provide (<700 g per ton of ground limestone)
12.	In the event PG test is unsuccessful, bidder shall take necessary remedial action at his cost & PG test shall be repeated		:	Bidder to Confirm

power consumption to be guaranteed as per Schedule F1, Table 8, Sl. No 3 (v & vi) pg. 106/126

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

SECTION – 2

GENERAL PROJECT INFORMATION

2.0 GENERAL PROJECT INFORMATION

1	Owner / Purchaser	NLC Tamil Nadu Power Limited (NTPL) (A Joint Venture Between NLC INDIA LIMITED and Tamil Nadu Electricity Board)
2	Project Name	NTPL Tuticorin Thermal Power Project
3	Capacity and Configuration	1000 MW [2 x 500 MW]
4	Owner's Consultant	Development Consultants Private Limited
5	Geographical Location	Latitude $8^0$45'38.09"North Longitude $78^0$10'15.85"East At Tuticorin Taluk in Tuticorin district in the Southern Part of Tamil Nadu along the Bay of Munnar, India
6	Access to site	
6.1	Nearest Airport	Nearest airstrip is located at Pudukottai at a distance of 16.5 km
6.2	Nearest port	Tuticorin sea port is located adjacent to the plant.
6.3	Nearest Railway Station	The nearest railway station is Port Trust Railway Yard at a distance of 1.0 km
6.4	Nearest Town	Nearest town is Tuticorin, which is located 5.5 km away from the plant and nearest city is Pallayamkottai, away from 60 km from the plant.
6.5	Nearest Highway	National Highway No. 7A adjacent to plant
7	Meteorological data	
7.1	Site Elevation	The natural land profile of the site 1.46 m above mean sea level
7.2	Ambient Temperature DBT	
i.	Maximum DBT	36.5 ºC

ii.	Minimum DBT	20.8 ºC
iii.	Performance DBT	27 ºC
7.3	RELATIVE HUMIDITY	
i.	Maximum	82 %
ii.	Minimum	35 %
iii.	Performance	50%
7.4	Earthquake Zone	Zone II
7.5	Predominant Wind direction	East to West
7.6	Wind velocity	Civil/structural design will be done considering IS 875 part 3
7.7	Rainfall	
i.	Annual	437 mm
7.8	Availability of Raw Water	Main source of water of the plant is sea water, which shall be taken from the Bay of Munnar.

Annexure-3

MANDATORY SPARES

Sl. No.	Equipment/Package Name	Description	Quantity to be supplied
A.	**Mechanical**		
1	**Lime stone Feeders**		
	i)	Belt	2 Sets
	ii)	Belt drive motor	1 No.
	iii)	Belt drive reducer	1 no.
	iv)	Speed reducer assembly	1 no.
	v)	Weighing Instruments	1 Set
	vi)	Feeder weighing roll	1 no.
	vii)	Gravimetric feeder gate actuator assembly	1 no.
	viii)	Counter assembly of feeder complete	1 no.
	ix)	Feeder head pulley assembly	1 no.
2	**Knife Gate Valve**		
	i)	Slide	1 Nos.
	ii)	Complete assembly	
		a) Cylinder operated	1Nos.
		b) Manual operated	1 Nos.
	iii)	Solenoid Valves	1 Nos. each type
B.	**Electrical**		
3	**415 Volt Motor**		
	i)	Motor of each type and rating (Note : motors covered in mechanical spare items need not to be included here again) 10% of the installed quantity or minimum 1 number whichever be higher	10% of the installed quantity or minimum 1 number whichever be higher
	ii)	End Shield Cover Driving & Non-Driving End	1 set for each type and rating of Motor
	iii)	Heaters	2 sets for each type and rating of motor
	iv)	Bearings (DE and NDE) for each type and rating of motor	2 sets
	v)	Cooling Fan for all type and rating of LT motors	One (1) set
	vi)	Dust seals and gaskets for each type of motors	1 Set
	vii)	Motor Terminal Block	1 set for each type and rating of Motor

	viii)	Complete Set of Coupling	1 set for each type and rating
C	**Field Instrument**		
	vi)	**Solenoid Valve**	
	a	Complete Solenoid Valve Assembly	2 Nos. for each type and rating used in the system
	b	Coil (single or double coil type)	10% of total nos. used in the system or minimum 5(five) Nos. whichever is more for each type and rating.
	vii)	Gauge (Pressure, Differential Pressure, Temperature, Level)	10% of total nos. used in the system or minimum 1(one) no. whichever is more for each type and range.
	viii)	Air Filter Regulator complete set with pressure gauges	5 Nos.

1The prices of mandatory spares indicated by the Bidder in the Bid Proposal sheets shall be used for bid evaluation purposes.

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 ----------

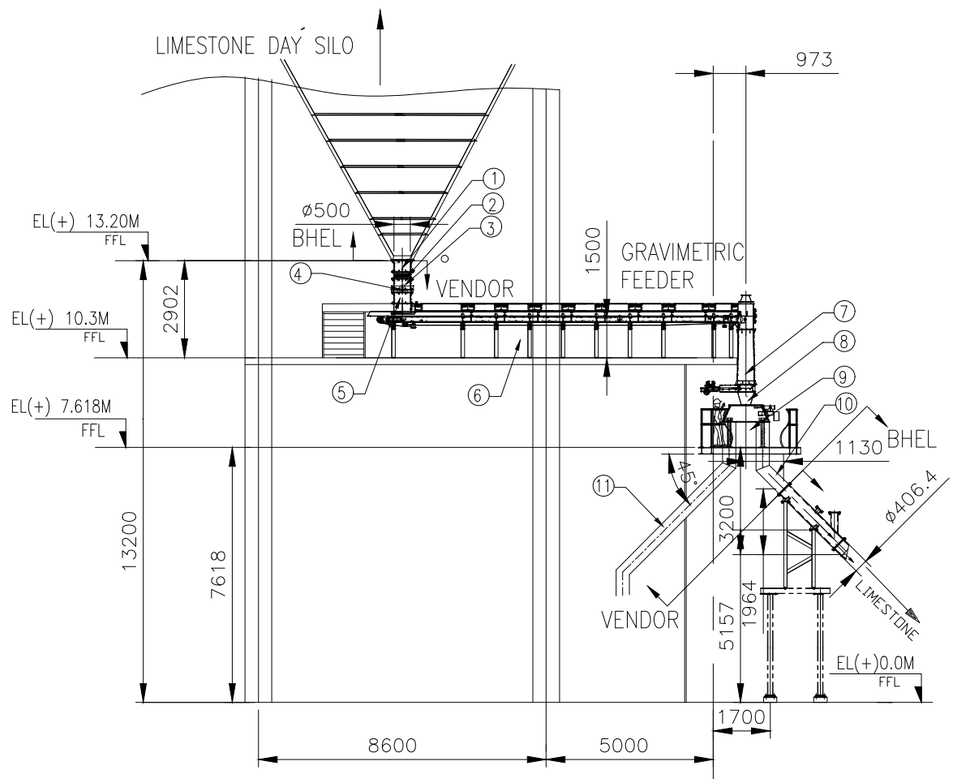
NAME ----------

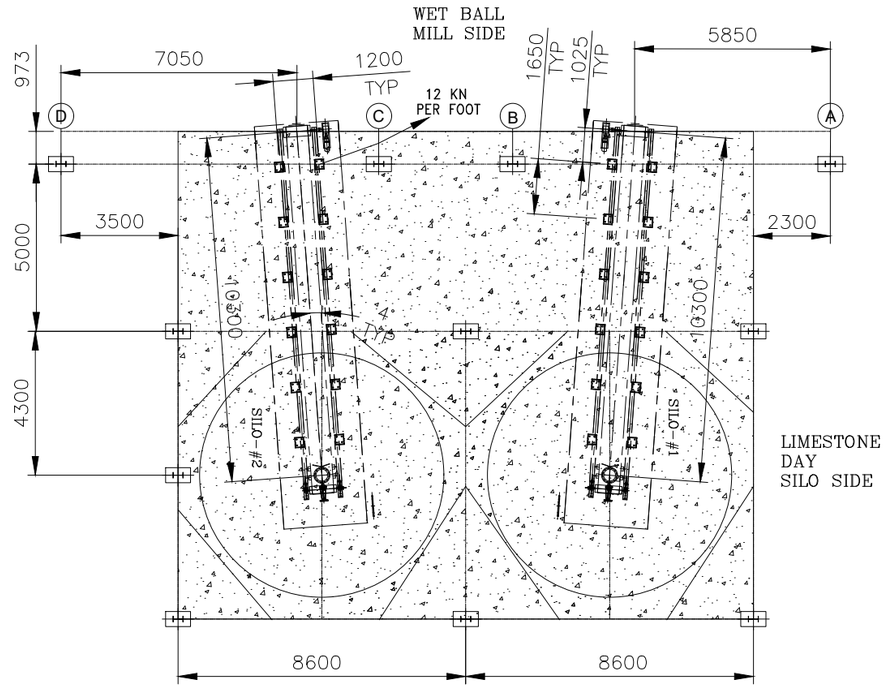
DESIGNATION ----------

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG.NO. 3-62-242-00041





FLOOR PLAN

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

NOTE:

1. ALL PARTS IN CONTACT WITH LIMESTONE EXCEPT BELT SHALL BE OF STAINLESS STEEL CONSTRUCTION.
2. INDICATIVE DRAWING.

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

1. REF.TO HY0230261 FOR UNSPECIFIED TOLERANCES.
2. CHAMFER M/CD SHARP EDGES 1.2 TO 1.0 AT 45°.
3. INTERNAL M/CD CORNER RADII 1 TO 0.7.
4. 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.

REV.	DATE	ALTERED		REV.	DATE	ALTERED	
		CHD.	APPD.			CHD.	APPD.
ZONE				ZONE			

TYPE OF PRODUCT
OR
NAME OF CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	BGK		28.03.22	
CHD.	PVSB		28.03.22	
APPD.	AMAN SURIN		28.03.22	

DEPT. PULV ENGG.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
CODE 446	NTS	--		01	01

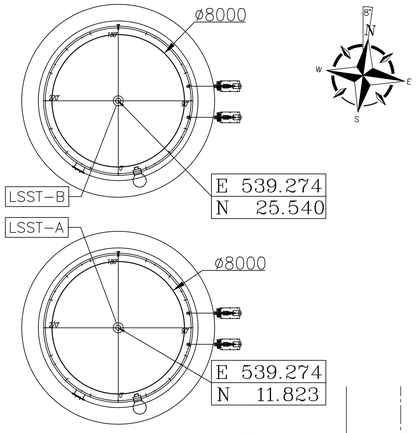
TITLE
WEIGH FEEDER ALONG WITH ACCESSORIES

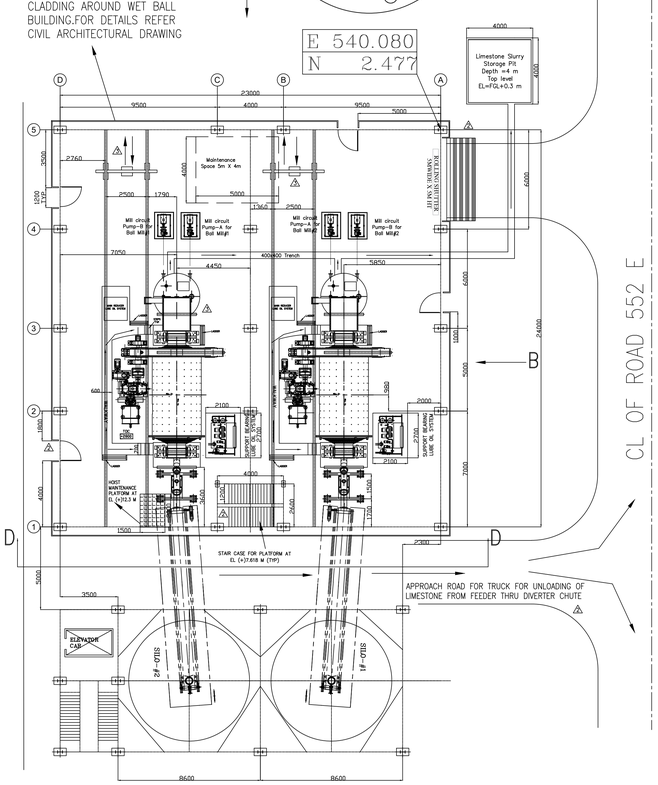
DRAWING NO. 3-62-242-00041 REV. 00

SHEET NO. 01 NO OF SHEETS 01

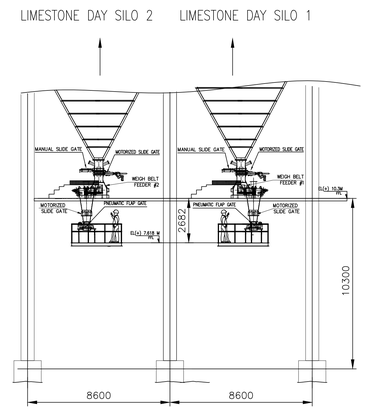
TD-151/REV. 03 SIZE A3

INVENTORY NO. | REF.DRG.NO. | FILE NAME

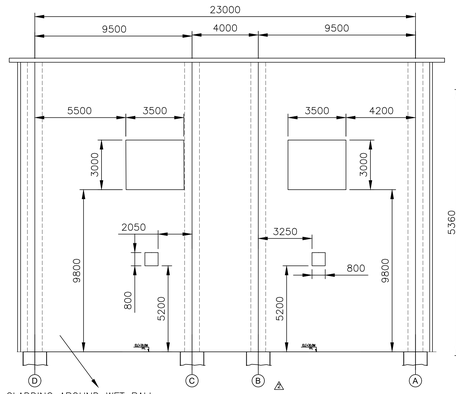




KEY PLAN OF WET BALL MILL BUILDING

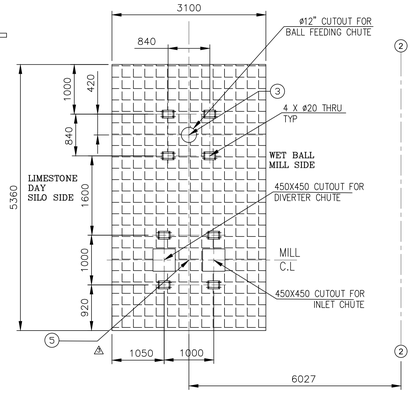


VIEW : C

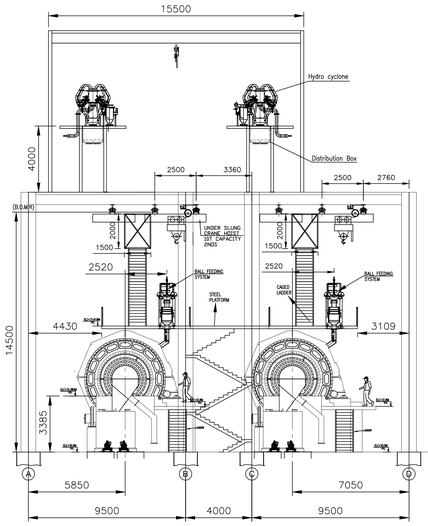


CLADDING AROUND WET BALL BUILDING.FOR DETAILS REFER CIVIL ARCHITECTURAL DRAWING

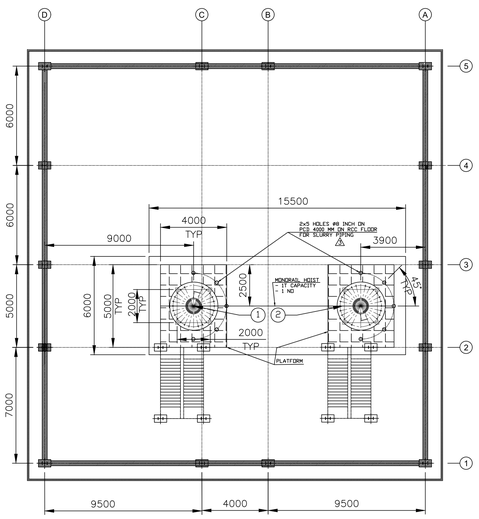
VIEW : D



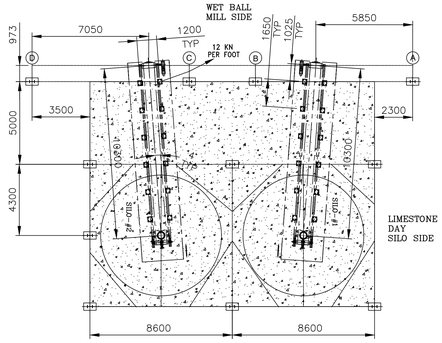
TOP VIEW OF PLATFORM (AT ELEVATION 7.618 M)



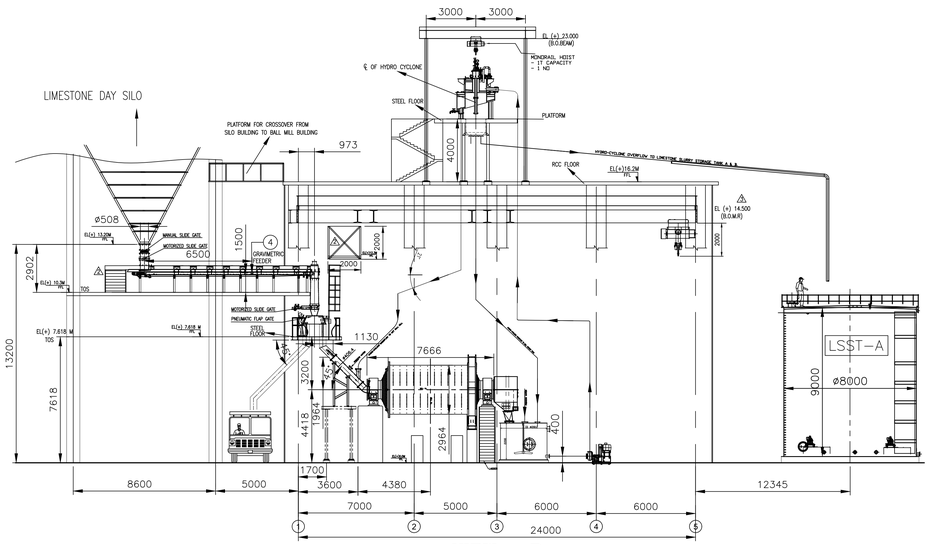
VIEW : A



FLOOR PLAN OF FEEDER FLOOR
TOS : EL (+) 10.3M FFL



PLAN VIEW AT TOP OF BUILDING



VIEW : B

NOTES:

1. REFERENCE DRAWING LIST
   a) FOUNDATION PLAN OF WET BALL MILL : 0-00-620-87107
   b) GENERAL ARRANGEMENT OF LIMESTONE DAY SILO BUILDING : 0-62-411-00028
2. EL±0.00 CORRESPONDS TO FINISHED FLOOR LEVEL OF PLANT WHICH IS 2.90M FROM CHART DATUM AND CHART DATUM IS −0.64 M FROM MEAN SEA LEVEL (MSL).
3. AS PER THE CLAUSE 2.03.00,POINT J,SECTION−IV: SPECIFIC DESIGN REQUIREMENTS ARCHITECTURE ,VOL−II−G/1,TENDER SPECIFICATION,MINIMUM OF 2.1M HIGH CLEAR HEADROOM BETWEEN TWO FLOORS SHALL BE MAINTAINED.
4. THE LOAD DATA ALONG WITH LOAD POINTS OF OTHER EQUIPMENT IN WET BALL BUILDING AREA WHICH ARE NOT COVERED IN BELOW TABLE ARE GIVEN IN FOUNDATION PLAN OF WET BALL MILL DRG.

ITEM	EQUIPMENT DESIGNATION	LOAD POINTS	LOADS PER POINT (KN)
I	HYDRCYCLONE SYSTEM	1	20
		2	20
II	BALL FEEDING SYSTEM	3	60
III	GRAVIMETRIC FEEDER	4	140
IV	PNEUMATIC FLAP GATE	5	15

BHEL-PROJECT ENGINEERING MANAGEMENT(CIVIL)
THIS DRAWING MARKED(✓) IS RELEASED FOR
☑ COMMENTS/APPROVAL
☐ PLANNING/INFORMATION
☐ CONSTRUCTION
STAMP ALL PREVIOUS REVISION AS SUPERSEDED
ISSUED BY

NAME	--
SIGNATURE	--sd--
DATE	16.08.2020

CUSTOMER:	NTPL	एनएलसी तमिलनाडु पावर लिमिटेड NLC TAMILNADU POWER LIMITED
CONSULTANT:		M/s DEVELOPMENT CONSULTANTS PVT LTD
PACKAGE:		FLUE GAS DESULPHURIZATION SYSTEM (FGD) PACKAGE
PROJECT:		NLC TAMILNADU POWER LIMITED (NTPL) 2x500 MW COAL FIRED UNITS AT TUTICORIN

JOB NO. 483
STATUS CONTRACT
DRG./REF. NO. (INTERNAL)
PRINT SCALE IN METRE
0 2 4 6 8 10 20 30 40 50

BHARAT HEAVY ELECTRICALS LTD
RC PURAM, HYDERABAD

DEPT CODE		NAME	SIGN	DATE
446	DRN	SHARIFF		12.04.21
	DESN	K PAVAN		12.04.21
	CHD	AMAN		15.04.21
	APPD	KHRK		15.04.21

TITLE :
GENERAL ARRANGEMENT OF WET BALL MILL BUILDING

MPL	ELEC	C&I	MSE	MAX	DEPT. SIGN DATE	SCALE VARIES

DRAWING NO. 0-00-620-87108
SHEET 1 OF 1 REV. 03

REV	DATE	ALTD	CHD	APPD	
03	19.08.21	SHARIFF	K PAVAN	AMAN	UPDATED AS PER CUSTOMER COMMENTS
02	09.07.21	K PAVAN	AMAN		UPDATED AS PER CUSTOMER COMMENTS
01	16.06.21	SHARIFF	K PAVAN	AMAN	UPDATED AS PER CUSTOMER COMMENTS AND LATEST INPUTS

CAD FILE NAME: \\10.5.4.123\pvkeng\0 JobBox\5. Wet Ball Mill DRGS\0-00-620-87108-S00-R03.dwg

FORMAT SIZE A0

ANNEXURE -7

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.