t) Air Heaters.

u) Coal Feeders.

v) Steam Generator Water Circulating Pumps (If applicable).

w) Seal Air Fans.

x) Lube oil pumps for fans/ Air heaters & mill system etc.

y) Scanner air fans.

z) Pressurizing pumps of fuel oil system

aa) Electrostatic Precipitator (with TR Sets as measured at the input terminals of the TR Set) when all ESP fields of all ESP passes are working and rapping system in normal operation).

ab) DM Cooling (normally working) Water pumps to supply cooling water on the primary (DM) side of the plate type heat exchangers in the closed loop Equipment cooling (Unit auxiliaries) water system.

ac) Auxiliary Cooling (normally working) water pumps to supply cooling water on the secondary side of the plate type heat exchangers in the closed loop Equipment cooling (unit auxiliary) water system.

ad) Circulating water pumps

ae) One third (33%) of power consumption of one stream of hydrogen generation plant.

af) Power consumption of any other continuously operating auxiliary for unit operation at different guarantee point loads.

Note :

1. The bidder shall furnish a list of equipments to be covered under Unit auxiliary power consumption, which shall be subject to Employer's approval.
2. Power consumption at rated duty point sl. no- (o), (ab), and (ac) to be arrived at based on shop test. Above test shall be carried out using respective job (own) motor.
3. Power consumption for air drying plant and hydrogen generation plant at its rated capacity shall be arrived at based on site test.

1.01.03.02

Station Auxiliary Power Consumption

The station auxiliary power consumption shall be calculated using the following relationship.

P_s = SUM (P_i X D_i) + T_L

P_s = Guaranteed Station Auxiliary Power Consumption.

P_i = Power consumed by each station auxiliary.

D_i = Duty factor to be considered for each station auxiliary.

T_L = Losses of the transformers supplied by bidder based on works test reports.

The station auxiliaries to be considered for calculating "P_s" shall include but not be limited to the following:

(Where duty factor is not indicated the same is to be considered as 1.0)

a) **Plant & Instrument air compressors & Air drying plant**

Power consumption of:-

i)	Instrument Air compressor	1 No	Duty Factor =0.6
ii)	Plant Air compressor	1 No	Duty Factor = 0.33
iii)	Air Drying plant (Heaters)	1 No	Duty Factor =0.5
iv)	Air Drying plant (Blowers)	1 No	Duty Factor = 1.0

b) **Air Conditioning & Ventilation System**

i) Power consumption at motor input terminals of working units (i.e. excluding stand-by) at its rated duty point of Chilling machines, Chilled water Pumps, Condenser water Pumps, Air cooled condensing machines, Air handling units (AHU) fans, for the Air conditioning system.

ii) Power consumption at motor input terminals of fans of Air washer units for TG building at its rated duty point.

c) **Auxiliary Water System Pumps**

i) Make-up water (raw water) pumps for PT pump and ash handling system

ii) CW Make-up water pumps(if applicable).

iii) AC & Ventilation system make-up pumps.

iv) Ash water recirculation pumps

v) Ash water blow down pumps

vi) Degassed Water Pump

vii) DM water make up pump

d) **Ash Handling Plant**

List of drives with corresponding weightage factors thereof for which power consumption is to be guaranteed is as follows:

S. N.	Drive	Weightage Factor
1.	Bottom Ash Crushers	0.3125 for jet pump system & 1.0 for submerged scrapper conveyor system
2.	Bottom Ash H.P. Water Pumps	0. 625 for jet pump system & 1.0 for submerged scrapper chain conveyor system
3	Bottom ash L.P. Ash Water Pumps	1.0
4.	Fly ash water pumps	1.0
5.	Bottom Ash Slurry Transportation pumps	1.0
6.	Submerged scrapper chain conveyor	1.0

7.	(i) Fly ash conveying air compressors with air drying plant (ADP)	1.0
	(ii) Fly ash conveying vacuum pumps	1.0
	(iii) Transport air compressor with air drying plant	0.5
8.	BA hopper cooling water over flow pumps	1.0
9.	Ash slurry disposal pumps	
	(i) With SCC for Bottom ash	1.0
	(ii) With jet pump system for Bottom ash	1.0 for continuously operating pump and 0.3125 for intermittently operating pump.
10.	Seal/cooling water pumps	1.0
11.	Instrument air compressor with air drying plant	1.0

e) **Mill Reject System**

Compressor : Duty Factor 1.0

f) **Coal Handling plant**

Total power consumption for all the equipments including auxiliaries with single stream operation at its guaranteed flow path capacity except.

- Lighting
- Hoists
- Coal sampling unit

GUARANTEES UNDER CATEGORY - III

1.03.00 The parameters/capabilities to be demonstrated for various systems/ equipments shall include but not be limited to the following:

1.03.01 Start-up, Loading, Unloading and Shutdown Capabilities (For Turbine Generator & Steam Generator)

i) Unit Start Up

Start-up time (upto full load), and loading capabilities for the complete unit (steam generator & Turbine Generator together) for cold start conditions (greater than 36 hours shutdown), warm start conditions (between 8 and 36 hours shutdown) and hot start conditions (less than 8 hours shutdown) as indicated by the Contractor in the offer and accepted by the EMPLOYER shall be demonstrated, ensuring that the various turbine operational parameters like vibration, absolute and differential expansion, eccentricity and steam-metal temperature mismatch etc. and various steam generator operational parameters like tube metal temperature, excess air level etc. are within design limits.

ii) Sudden Total Loss of External Load

On occasions, the steam turbine generator unit may experience sudden total loss of all external load. Under these conditions, the steam turbine generator unit shall not trip on over speed but shall continue to be in operation under the control of its speed governor to supply power for the plant auxiliary load with HP-LP bypass in operation while staying within the agreed limits of steam metal temperature mismatch, exhaust hood temperature, absolute and differential expansion, vibration and eccentricity. The same shall be demonstrated. Further, the provisions of clause 1.11.03, sub-section A-03, Part-B, Section-VI shall also be complied with.

iii) Steam Metal Temperature Mismatch Limitation

The steam-metal temperature differential for cold, warm and hot start up, loading/unloading and shutdown conditions shall be within the permissible limits indicated by the bidder in the offer and accepted by the Employer.

1.03.02 **Noise**

All the plant, equipment and systems covered under this specification shall perform continuously without exceeding the noise level over the entire range of output and operating frequency specified in Part-C of Section-VI of the technical specifications.

Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with a calibrated integrating sound level meter meeting the requirement of IEC 651 or BS 5969 or IS 9779.

Sound pressure shall be measured all around the equipment at a distance of 1.0 m horizontally from the nearest surface of any equipment/ machine and at a height of 1.5 m above the floor level in elevation.

A minimum of 6 points around each equipment shall be covered for measurement. Additional measurement points shall be considered based on the applicable standards and the size of the equipment. The measurement shall be done with slow response on the A - weighting scale. The average of A-weighted sound pressure level measurements expressed in decibels to a reference of 0.0002 micro bar shall not exceed the guaranteed value.

Corrections for background noise shall be considered in line with the applicable standards. All the necessary data for determining these corrections, in line with the applicable standards, shall be collected during the tests.

1.03.03 **Turbine Generator**

Turbine Generator Set Capability

The steam turbine generator unit shall be capable of delivering at generator terminals the output as indicated by the BIDDER in the heat balances submitted alongwith his bid, under the following conditions.

a) Continuous output at generator terminals corresponding to VWO condition under rated conditions at design condenser pressure 0% make-up to the cycle.

b) Maximum continuous output at generator terminals corresponding to all HP heaters out of operation, under rated steam conditions, at design condenser pressure and 3% make up.

NOTE: While conducting the tests of (a) and (b) above the condenser pressure measurement shall be done at 300mm above the top row of condenser tubes.

B. Guaranteed capacity in T/Hr of the following Equipments :

(i) Paddle Feeders

(ii) Crushers

(iii) Stacker Reclaimer

(iv) Vibrating Screening Feeder

Performance tests and the procedure for performance testing of complete coal handling plant shall be as per **Annexure-I.**

1.03.11 **Mill Reject System**

1. Continuous effective discharge and conveying at the rated capacity of the mill rejects without spillage or blockage in the system.

2. A) Following shall be demonstrated at shop for compressor

- Capacity and discharge pressure of each air compressor
- Power consumption of each air compressor at its rated duty point with its own motor.

B) Following shall be demonstrated at site for compressor

- Parallel operation of air compressors, if applicable
- Vibration and noise level of air compressors

1.03.12 **Ash Handling Plant**

S.No	DESCRPTION	PERFORMANCE GUARANTEE PARAMETERS	REMARKS
A.	Bottom ash system	(i) In case bidder offers intermittent type bottom ash removal system employing W-type water impounded hopper and jet pump system shall be guaranteed to meet following performance: Continuous effective extraction, crushing and conveying of bottom ash	Continuous effective conveying system shall be established by no stagnation of ash or slurry at any point in the complete system.

	iv) Hydrogen generation plant capacity (stream wise) shall be demonstrated at site. v) Vibration level and noise level of hydrogen gas compressors shall be demonstrated at site.
1.03.22	**Passenger & Goods Lift of Various Areas** Over load tests, travel and hoist speed checks, functional & performance tests
1.03.23	**(i) Performance Guarantee on Vibration Isolation Systems for Machine Foundations** The contractor shall guarantee the performance of the vibration Isolation System (VIS), to be provided by him for various machine foundations as specified in detailed technical specification, for a period of 24 months from the date of commissioning of each machine. **(ii) Performance Guarantee on Acid / Alkali Resistant Linings & Anti-Weed Treatment** The contractor shall furnish a performance guarantee for the acid/ alkali resistant linings and anti-weed treatment, as specified in detailed technical specification, for a period of three years from the date of completion of work or date of handing over, whichever is later. **(iii)** Any defect observed during the guarantee period shall be made good by the contractor by re-carrying out/ replacing or by rectifying (if the defect is localised) the acid-alkali resistant linings and the anti-weed treatment, to the entire satisfaction of the Employer without any extra cost to the Employer.
1.03.24	For all other equipment included in the scope of supply of the bidder but not covered above, the demonstration tests to be carried out shall be mutually finalised between contractor & Employer after award of contract.
1.03.25	**Control & Instrumentation System Requirements** **(DDCMIS SYSTEM GUARANTEE REQUIREMENTS)**
1.03.25.01	The parameters/capabilities to be demonstrated for various systems/ equipments shall include but not be limited to the following:

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1.03.25.02 **Performance Requirement of the Closed Loop Control System**

(i) The closed loop Control System shall provide automatic control of the plant for full applicable operating range of the unit and shall provide a unit operating turndown ratio of not less than six to one. The closed loop Control System shall permit the performance of the dynamic load tests (ramp test, steady state test & step tests) while maintaining safe furnace conditions, major process parameters and without endangering other equipment. All tests will be performed with the system in automatic mode:

(a) Drop 30 percent of maximum load capability from approximately full load at a rate of 10 percent per minute.

(b) *Drop load from full rated output to the lowest runback limit, at a rate* corresponding to the fastest run back rate

During transient conditions causing deviation of process variables, the control system furnished under the specification shall not permit deviations, which exceed those permitted by the manufacturers of the controlled process equipment, for load changes as indicated above. SG and its auxiliaries along with its control system (SG C&I), TG and its auxiliaries along with its control system (TG C&I) when integrated with UNIT C&I systems shall meet the permissible limits for important parameters, under various operating conditions specified. The tentative parameters to be monitored for this test are given in the Table-1, given below and the exact parameters shall be as finalised by the boiler and turbine suppliers. The control loops shall perform to return the controlled variable to the set point in a stable manner without cycling in the shortest possible time and without any loop interactions or cycling of generation when generation matches unit load demand.

(ii) The Bidder shall also guarantee that the control system provided by him will be responsive and stable and will maintain the deviation of controlled variables from set point within the limits specified so that the equipment being controlled will operate as specified over the range required. The controls shall operate automatically, with no assistance from the operator. The controller shall successfully demonstrate the performance of Closed Loop Control Systems before acceptance and taking over of this system by the Employer. However, limitation / constraints of main equipment supplied by Employer shall be considered.

(iii) The control system including furnace draft & firing rate control shall also comply with all relevant requirements of NFPA code no. 85 'Standard for Prevention of Furnace Explosions in Pulveriser Fired Utility Stations' and other applicable codes regarding safety.

(iv) All runback conditions listed below shall be proved by the Contractor without any oil support.

-- FD/ID/PA fan trip

-- BFP/CEP/ BCW trip

-- One mill and two mill trip.

-- Any other condition decided during detailed engineering.

PERFORMANCE REQUIREMENTS FOR CLOSED LOOP CONTROL SYSTEM

(TABLE – 1)

Sl.No.	Load/Rated of load change (% of MCR per min.)	MAXIMUM DEVIATION OF PARAMETERS FROM SET POINT					
		Throttle Pressure Deviation (Kg/cm²)	Flue gas Oxygen Deviation (% O2)	Furnace Pressure Deviation (mmwcl)	S.H. steam Temp. Deviation (Deg.C)	R.H. Steam Temp. Deviation (Deg. C)	Drum Level Deviation (mm wcl)
A.	Steady State Condition						
1	90% to 100%	±2.0	± 0.4	± 8.0	± 5.0	± 5.0	±15.0
2	60%	± 2.0	± 0.4	± 8.0	± 5.0	± 5.0	±15.0
B.	RAMP Test (Change For Max. Duration of Five Minutes for 3% & 5% ramp and Three minutes for 10% ramp)						
3	± 3%	± 3.0	±0.6/-0.4	± 12.0	± 8.0	± 8.0	±25.0
4	± 5%	± 3.0	±0.8/-0.4	± 12.0	± 10.0	± 10.0	±30.0
5	± 10%	± 4.0	±1.0/-0.5	± 15.0	± 15.0	± 15.0	±50.0
C.	Step Load Changes						
1	From 100% to 80% at the rate of 10% per min.	± 5.0	±1.5/-0.5	± 20.0	± 15.0	± 15.0	±50.0

Note 1 Sufficient time shall be allowed as setting period between conducting the tests.

2 Plant operating condition, i.e. main equipment status, availability of auxiliaries, operational and equipment constraints, which can influence the test, shall also be recorded.

3 Control system shall be running in the CMC mode i.e. Boiler master, fuel flow, air flow, feed water and turbine load control shall be in automatic mode Load set point, maximum and minimum load set point, rate of raise/lower of load shall be set through the Operator Work Stations, Large Video Screen.

1.03.25.02.01 The following parametric tests shall also be conducted under worst case loading conditions as defined in Appendix-1 to this sub-section – (details of which shall be as approved by Employer during detailed engineering.)

(i) For control system

- CPU loading, Cycle time/controller reaction time

(ii) For MMIPIS

- CPU loading, spare duty cycle, spare memory Capacity

(iii) Spare duty cycle for system bus

(iv) Various display response time

(v) System accuracy

(vi) Display update time

1.03.25.02.02 For the parametric test, the following requirements shall be met

(i) Processor Spare Duty Cycle (Free Time)

- Under worst case loading of MMIPIS and system bus each MMIPIS processor shall have 40% free time when measured over any two second period and 50% free time when measured over any one minute period.

- Under worst case loading conditions of control system control system processor shall have 20% free time when measured over any one minute period.

(ii) System Bus Spare Duty Cycle (Free Time). The Bidder shall furnish all necessary data to fully satisfy the Employer that the processor spare duty cycle figures quoted by the Bidder are realistic and based on configuration and computation capability of the offered system and these shall be actually achieved in the fully implemented system as commissioned at project site.

The system bus shall have min. 50% free time during the worst case loading conditions of control system, MMIPIS and the system Bus, measured over any 2 seconds interval

(iii) Response Time

(a) Display

The time from mouse click or last button pressed to the commencement of the requested display under the worst case loading conditions shall not be worse than the following:

All control related displays	1 sec
Point Details Display(single point)	1-2 secs
Bar chart display (20 points, current data)	2-3 secs.
Operator guide/plant start-up guide message display (full screen of alphanumeric information and a maximum of ten numbers of dynamic data items)	1-2 secs.
Plant mimic display of fair complexity with a minimum of 120 numbers of dynamic data items e.g., values, macros, line segment, etc.	2-3 secs.
Group review display (current values of twenty points)	2-3 secs.
X-Y plot display (2 X-Y- plots and a single display requiring both historical as well as current data)	3-4 secs.
X-T plot display (Trend of 6 analog points and a single display requiring both historical as well as current data)	3-4 secs.
Plant Summary display (e.g., bad point summary, limit check removed point summary. Assume the whole data base search is required and the summary display contains ten points only).	3-4 secs.

(b) Command:

The response time for screen update, after the execution of the control command, from the time the command is issued (for example command to start a motor to the time the screen is updated) shall be within two seconds (excluding the drive actuation time).

(iv) System Accuracy Requirements

The overall system accuracy from signal input terminals to output presentation on display and printers for the least accurate input range and maximum scan rate shall be not worse than +/- 0.1% of full scale of the engineering process range +/- ½ LSB for 4-20 mA input. For this purpose, the number of decimal places on display for testing purpose shall be sufficient to cover 0.01% of full scale range. For temperature input modules, the sensor range as per relevant ASME/DIN standard or equivalent shall be used in place of process range.

(v) Display Updated Rates

All displays shall be updated at least every two seconds.

(vi) The spare capacities of working and bulk memory shall meet the requirements indicated in Section-VI, Part-B, Sub-section -DDCMIS.

1.03.25. 03 **Sequence of Event**

1.03.25.03.01 The sequence of event in operating with 1 m sec. resolution as per Sub-Section-DDCMIS, Part-B, Section-VI.

1.03.25. 04 **Availability Tests**

1.03.25. 04.01 The Bidder shall guarantee 99.7 percent system availability for a continuous period of 180 days. An availability guarantee test shall be conducted to assure this level of availability. If the accrued down time exceeds 0.3 percent of 180 days, during availability test run, a new 180 days test run shall start at the time when the system becomes available again. Loss of availability (unavailable system) shall be defined as the loss of the system's guaranteed accuracy and repeat ability or of any system function, except however, that the loss of a function for not more than five percent of the points shall not be considered loss of availability. Loss of a function for more than five percent of the points shall be treated as partial unavailability and the corresponding outage time shall be weighted with respect to the function and the percentage of the points for which the function is unavailable. Loss of each function shall have one weighing factor and unavailability of each equipment, peripheral device or process I/O card etc. shall have another weighing factor. The guaranteed accuracy and repeat ability and system parametric requirements specified in clauses on system parametric requirements shall be maintained for the entire 180 days run without any manual recalibration or any other changes made to the DDCMIS.

1.03.25. 04.02 Downtime shall start upon loss of a system function and shall end upon full restoration of the affected system function. A minimum of one hour's down time shall be charged for each loss of availability in determining system availability.

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1.03.25. 04.03 The Bidder shall submit the Availability Test procedure for Employer's approval. The details regarding outage time, weighing factors for various system functions equipments to calculate the down time, test duration etc., shall be discussed and finalised during detail engineering. After conductance of availability test, Contractor shall prepare report covering the methods followed, observations & submit to Employer.

1.03.25. 04.04 If availability is lost due to reasons not attributed to the Contractor / Contractor's system or due to force majeure, then downtime shall not accrue & interrupted test resulting from the same shall be extended by an amount of time equal to the length of interruptions.

1.03.25. 04.05 Loss of each of the following functions shall be treated as full system unavailability (i.e. factor of 1) and the downtime shall accrue individually for each of the following function:

(a) Interruption of control command communication between HMI and controllers for a period more than three seconds for any drive (i.e. Unavailability of information in HMI for carrying out the control command shall also be treated as interruption of control commands).

(b) Permanent data loss in history functionality for a period more than three seconds for more than five percent of the history database.

(c) Delay in reporting of alarms in HMI for more than five percent of the alarms for more than three seconds.

If loss of function as described at (a) to (c) above is attributed to server changeover, due to system feature, then unavailability due to the above loss of function shall accrue even if the function is not specifically attempted by Employer during the server changeover period.

1.03.26 The operating capabilities of the plant as listed out in Sub-section- A-01, (Operating Capability) of Section-VI, Part-B shall also be demonstrated alongwith other parameters/ capacbilities specified under category-III guarantees. The treatment of these operating capabilities of compliance/ non-compliance shall be the same as given to other Cat.-III guarantees.

2.00.00 PERFORMANCE GUARANTEE/ ACCEPTANCE TEST

2.01.00 **GENERAL REQUIREMENTS**

2.01.01 It is the responsibility of the contractor to perform the Performance Guarantee/Acceptance test as specified in this subsection. The performance tests will be performed using only the normal number of Employer supplied operating

staff. Contractor, vendor or other subcontractor personnel shall only be used for instructional purposes or data collection. At all times during the Performance Tests the emissions and effluents from the Plant shall not exceed the Guaranteed Emission and Effluent Limits.

2.01.02 The Contractor shall make the plant ready for the performance guarantee tests.

2.01.03 All instruments required for performance testing shall be of the type and accuracy required by the code and prior to the test, the contractor shall get these instruments calibrated in an independent test Institute approved by the Employer. All test instrumentation required for performance tests shall be supplied by the contractor and shall be retained by him upon satisfactory completion of all such tests at site. All costs associated with the supply, calibration, installation and removal of the test instrumentation shall be included in the bid price. All calibration procedures and standards shall be subjected to the approval of the Employer. The protecting tubes, pressure connections and other test connections required for conducting guarantee test shall conform to the relevant codes.

Tools and tackles, thermowells (both screwed and welded) instruments/devices including flow devices, matching flanges, impulse piping & valves etc. and any special equipment, required for the successful completion of the tests, shall be provided by the contractor free of cost.

2.01.04 The contractor shall submit for Employer's approval the detailed Performance Test procedure containing the following :

a) Object of the test.

b) Various guaranteed parameters & tests as per contract.

c) Method of conductance of test and test code.

d) Duration of test, frequency of readings & number of test runs.

e) Method of calculation.

f) Correction curves.

g) Instrument list consisting of range, accuracy, least count, and location of instruments.

h) Scheme showing measurement points.

i) Sample calculation.

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j) Acceptance criteria.

k) Any other information required for conducting the test.

The Performance / Acceptance test shall be carried out as per the agreed procedure. The PG test procedure including demonstration tests shall be submitted within 90 days of the date of Notification of Award and finalization of the PG test procedure shall be done within 180 days from the date of Notification of Award. After the conductance of Performance test, the contractor shall submit the test evaluation report of Performance test results to Employer promptly but not later than one months from the date of conductance of Performance test. However, preliminary test reports shall be submitted to the Employer after completing each test run.

2.01.05 **Test Interruptions**

In the event of a test interruption resulting from an Event of Force Majeure or Employer-Caused-Delay, Contractor shall be entitled to relief as provided in the contract, provided that (except for certain interruptions of a Availability Test as specified below), the interrupted Performance Test must be started again and test data that were collected during the interrupted test must be ignored.

In the event of test interruptions as a result of Force Majeure or Employer-Caused-Delay during an Availability test, where.

(a) The total cumulative interrupted time during the test is more than twenty-four (24) hours.
(b) The total number of interruptions during the test is more than four (4).

The test shall not be deemed a successful Performance Test.

Except as provided above, the interrupted test resulting from Force Majeure or Employer-Caused-Delay shall be extended by an amount of time equal to the length of the interruptions, including time to return to steady-state operation; the test data for the period of interruptions shall be excluded from analysis; and the test data that were collected both before and after the interruptions shall be included in the analysis.

2.01.06 **Grid Restriction**

Any loss in generation in terms of power (KW) or energy (KWH) during Availability Test due to grid restrictions shall be treated as deemed generation. However, the total cumulative deemed generation shall not exceed 5% of the total generation during the test period failing which the test shall be extended to limit the deemed generation to 5% of the total generation.

ANNEXURE – I

DATASHEET – A

DATASHEET-A (MILL REJECT SYSTEM)

S. No.	Items/Description	UNCHAHAR TPP
1	Type of mill reject system	Dense phase Pneumatic Pressure Conveying
2	Material handled	Coal Mill reject
3	No of mills/Unit	9
4	Reject generation design rate	0.65 TPH
5	Mill layout	Side Mill Arrangement
6	Elevation of Mill Reject Spout (wrt FFL in Mill Area)	2.867 M from 0.0M elevation
7	Type of Mills	XRP 1003 with Planetary Gearbox
8	Silo Location	Refer Layout
9	Compressor Location	Refer Layout
10	Water spray system (Pyrite quenching)	Required
11	No of compressors	2x100% (1W+1S), Micro-processor/PLC based, non-lubricated reciprocating type compressor.(Each sized to cater air requirement of whole unit at design rating for system)
12	Sump Pumps	2 Nos.Fixed Type (1 per mill bay).
13	Type of control/ Main control panel location	DCS based control system (BHEL scope of supply)
14	Pneumatic/ local control panel	Yes with DOP of IP 55
15	Mandatory spares	Applicable

ANNEXURE – II

EQUIPMENT DESIGN/SELECTION CRITERIA

EQUIPMENT DESIGN/SELECTION CRITERIA

S. No.	Equipment	Design/Selection/Sizing Criteria
01	Conveying Air Compressor	Each compressor shall be selected to meet the following requirements: a) Each Compressor shall be sized such that it can cater air requirement of whole unit. b) A margin of 50 % shall be considered over and above the required/ calculated/ minimum compressor capacity arrived for conveying of total reject generated. c) Guaranteed reject conveying rate 650kg/hr. per mill. d) RH – As per project information (Climatological table) e) Air Temperature - As per project information (Climatological table) f) Height above MSL- As per project information. g) Noise level- Shall be limited to 85dBA at a distance of 1.0 m in horizontal direction from the nearest surface of the machine and at a height of 1.5 m from the floor level in elevation. Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with calibrated integrating sound level meter meeting the requirement of IEC 651 or BS: 5969 or IS 9779.
02	Air Receiver	As per IS 2825 Capacity: The air receiver capacity shall be selected to convey one complete cycle with a minimum margin of 25% provided over and above the arrived air receiver capacity.
03	Pyrite Hopper & Accessories	*a)* Number of outlet – Three (3) *b)* Capacity – 2-3 times denseveyor / transporter vessel capacity. *c)* MOC for plates – MS as per IS 2062 Gr. B (min)/Equivalent as per any other international standard, min 10 mm thk with sizing grid. *d)* Explosion vent *1)* Rupture Disc type (One no. per hopper) *2)* Rupture Disc Bursting Pressure – 0.5 kg /cm^2 (g) *3)* Sizing Grid Details – Shall be made from minimum 10 mm dia. / thk. MS bars/flats with opening suitable for entrapping reject larger than 40 mm in size. *4)* Surface Temperature – The surface temperature of the equipment shall be maintained within 60 °C. Insulation, if required, to achieve the same shall be provided by the bidder without any commercial implication. *5)* Water Spraying arrangement with Solenoid Valve & fog jet nozzle – Yes *e)* Valves 1) Inlet valve – Pneumatically Operated KGV with expansion joint &

		deflection cone with open & closed limit switch for interlock purpose. 2) Maintenance valve – Manual operated KGV 3) Over size chute – Pneumatically Operated KGV with open & closed limit switch for inter lock purpose 4) Emergency chute – Pneumatically operated KGV with open & close limit switch for inter lock purpose *f)* Min. instruments required 1) Two nos. of level switches (High/High-High) 2) One (1) no. of temperature switch
04	Denseveyor (transporter vessel) & its Accessories	a) MOC 1) Denseveyor – Mild Steel IS – 2062, Gr B/ equivalent as per any other international standard 2) Dome Valve / Inlet Valve – Refer S.No.08 below b) Quantity of material to be conveyed per hour by each denseveyor – Refer Datasheet-A c) Capacity of denseveyor - To suit the conveying rate with 85% filling d) Any cooling envisaged for dome valve – Bidder to decide e) Air supply pressure available – Bidder to decide f) Distance over which material is to be conveyed and the lift – Refer Layout Drawing
05	Bunker & its Accessories	*a)* Effective Storage Capacity –90T *b)* Number of outlet - One *c)* Minimum free board – 500 mm *d)* Bunker Plate – 10 mm thk. MS Plate conforming to IS 2062 Gr A/B *e)* Liner – 3 mm SS 304 Liner in complete bunker *f)* Minimum Valley Angle - 60 Degrees *g)* Discharge Gate i. Size – 400 mm x 400 mm (clear open) (min) ii. Type – Twin Sector, Manually operated. iii. MOC – CI to IS 210/ MS 10 mm thick (min) to IS 2062 (Gr. A min) with 8 mm thick SAILHARD/TISCRAL LINER on inner surface. Min 400 BHN. *h)* Level probe (high) shall be as per C&I specification requirement. *i)* Counter weight type Pressure relief valve designed for max. pressure subjected. **Bag Filter** Each Bag filter shall be sized considering simultaneous firing of one normal and one emergency cycle. a) Material of Filter Cloth – suitable for prolonged operation up to a temperature of 200°C without losing its collection efficiency & durability. b) Air to Cloth Ratio – 1.5 m/min (Further 10 % additional bags shall be provided) c) Bag – MS, IS 2062, Gr. A (min), 3.0 mm thick (min) d) Bag Cage – MS, IS 1079 galvanized. e) Outlet Air Quality – 50 mg/nm^3 (max) f) Bag Cleaning Mechanism – Automatic and shall comprise of solenoid

		valves, air nozzles, adjustable solid state timer, pressure switches, piping and fittings etc. g) Test on bag filter casing : In case bag filter is assembled in casing at site, smoke/ bubble test shall be carried out on the bag filter casing to ensure that the casing is free of welding defect. However, if assembly of bag filter & casing is done at shop, relevant NDT shall be carried out as per approved MQP for checking the soundness of weld. h) Chain Pulley Block over bag filter: Shall have 25% margin over weight of bag filter, but in no case the capacity shall be lower than 1.0 T, same shall be as per IS 3832
06	Lines for Various Services	As per the LP Piping Specifications given under Annexure VI
07	**Knife Gate/Plate Valve (pyrite hopper inlet, oversize discharge, emergency discharge, hopper isolation/maintenance)**	Operation: Manual/Pneumatic – As per flow diagram. Material of Construction Body – CI to IS 210 Gr FG 260 Gate/Plate – Min.10MM thk SS (ASTM A 240 type 304) with wearing parts provided with abrasion resistant material of hardness 350-400 BHN Size – 200 NB (min) for all valves (All knife gate valve shall be provided with open & close limit switches for interlock and control) Deflection cone : Required before the pyrite hopper inlet knife gate valve
08	Dome Valve/ Swing Disk Inlet Valve	Material of construction Body – CI to IS 210 Gr. FG 260 Dome – Alloy CI with hardness as 225 BHN with leak proof seat. Shaft – SS 304 Disk – SS 304/ Alloy CI, hardness of 500 BHN (min)
09	Conveying pipe bend	MOC & Hardness – Alloy CI, 400 BHN min with min 2% Ni End connection- Flanged
10	Fittings, Flanges, Fasteners & Gaskets	As per the LP Piping Specifications given under Annexure VI
11	Valves for Air & Water Lines	As per the LP Piping Specifications given under Annexure VI
12	Sump Pumps	Capacity – To meet system requirement but not less than 10 m^3/hr MOC & 10 MWC Head i. Casing & suction bell – 2.5 % Ni-CI to IS 210, FG260 ii. Impeller – 2.5 % Ni-CI to IS 210 , FG260 iii. Shaft/Sleeves – EN-8
13	Hand Operated Chain Pulley Block with Geared Trolley	i. Capacity (In Kg) - To suit the heaviest equipment lifting on silo top ii. Service condition - Class II outdoor iii. No. of CPB – Min.two Nos. iv. Lift (m) - To suit the requirement/16 m (min.)

		v.	Type of suspension- Traveling Trolley
		vi.	Head Room - As per Vendor data
		vii.	Type of gear in CPB - Spur Gear
		viii.	Type of bearing - Ball/Roller
		ix.	Grade of Load Chain - Alloy Steel /Gr. 80.
		x.	Grade of Hand Chain - Steel / Gr. 30
		xi.	Factor of Safety - As per Relevant IS

ANNEXURE – III

MANUFACTURING QUALITY PLANS AND CUSTOMER INSPECTION REQUIREMENT

09257

SUB-SECTION – E-98

MILL REJECT SYSTEM

1.00.00 **PNEUMATIC CONVEYING SYSTEM**

1.01.00 **PIPING, VALVES, STRAINERS AND FITTINGS**

(a) All pipes and fittings shall be tested as per applicable code.

(b) All valves shall be hydraulically tested for body, seat and back seat (if applicable) as per relevant Standard. Check valves shall also be tested for leak tightness test at 25% of the specified seat test pressure. Valves shall be offered in unpainted condition only.

(c) Functional checks of the valves for smooth opening and closing shall also be done.

(d) Strainer body shall be hydraulically tested. One of each type and size of Strainer shall be tested for Pressure drop v/s flow rate, if not tested earlier.

1.02.00 **PRESSURE AND STORAGE VESSELS:**

(a) Atmospheric Tank

(i) All weld joints shall be DP tested and complete tanks shall be water fill tested.

(ii) All atmospheric storage tanks fabricated and erected at site shall be subjected to all tests (Hydro, NDT and Vacuum) according to design code as applicable.

(b) Pressure Vessel

(1) NDT on weld joint shall be as per respective code requirements or the minimum as specified as below:

(i) 100% DPT on root run of butt weld, nozzle welds and finished fillet welds.

(ii) 10% DPT on all finished butt welds

(iii) 10% RT (covering all 'T'/cross joints) of butt welds

(2) Butt Welds of dished ends shall be stress relieved and subjected to 100% RT.

(3) Each finished vessels shall be hydraulically tested to 150% of the design pressure for a duration of 30 minutes.

1.03.00 **PACKAGE AIR COMPRESSOR**

In addition to Hydraulic tests of pressure parts, performance test of the compressor shall be done for FAD, pressure, power consumption, as per relevant code. Noise and vibration shall also be measure.

09259

CLAUSE NO.	QUALITY ASSURANCE	एनटीपीसी NTPC
1.04.00	**BAG FILTERS:**	
1.04.01	Leakage test shall be carried out for casing and other pressure parts	
1.04.02	Pulsing and sequential test on bag filter cages shall be done.	
1.05.00	**MANO RAIL HOIST/CHAIN PULLEY BLOCKS:**	
1.05.01	Chain pulley blocks shall be tested as per IS:3832	
1.05.02	UT & MPI/DPT shall be done on gear blank, pinion shaft, axles.	
1.05.03	Proof Load Test on hooks shall be carried out followed by DPT.	
1.05.04	100% Radiography on weld joints under tension and 25% radiography on compression butt joints followed by 100% DPT shall be kdone for rope drum, girder, end carriage etc.	
1.05.05	Complete hoists shall be tested for load and overload test as per IS:3177	
1.06.00	**VENTILATION SYSTEM:**	
1.06.01	Shop Run Test for all Centrifugal Fans to check noise, temp. rise & vibration.	
1.06.02	Performance test on one fan of each type for capacity, pressure, efficiency and power consumption.	

BHEL POWER PROJECTS ... LIMITED NBPPL

बी एच ई एल BHEL	S/Contactor :- Manufacturer :-	Manufacturing Quality Plan Item :- Rupture Disc QAP No. :- LOI Nos:- Contractor :- M/s BHEL	Project:- Package :- Mill Rejects System Client :- Consultant :-

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1 ->	**Materials** Rupture Disc Material	Physical & Chemical Properties	Major	Chemical Analysis, YTS & UTS	1 per Heat	ASTM A240 Type - 304 / Appved Data Sheet / Drg.	ASTM A240 Type - 304 / Appved Data Sheet	MTC	√	V	V	V	
2 -> ->	**Final Inspection** Dimension Burst Test of Rupture Disc	Measurement Functional	Major Major	Mesurement Burst Test @ 200 Degree Centigrade	100% 1 per lot offered	App. Drawing Approved drawing / Datasheet	App. Drawing Min 0.4 bar (g) @ 200 degree C Max 0.6 bar (g) @ 200 degree C / App. Data Sheet	IR IR / Burst Test Certificate	√ √	P P	W W	W W	

Manufacturer / Sub Vendor	Contractor	LEGENDS:-	For Client Use:-	Document No.:-
SIGNATURES		Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & K ->Client **P->Perform, V-> Verification, W-> Witness**	Name & Signature of Approving Authority with Seal	

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

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	S/Contactor :-	Manufacturing Quality Plan														
भा एच ई एल BHEL	Manufacturer :-	Item:- CHAIN PULLY BLOCK QAP No. :- LOI Nos:- Contractor :- M/s BHEL						Project:- Package :- Mill Rejects System Client :- Consultant :-								
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking				Remarks		
1	2	3	4	5	6	7	8	9		10				11		
								TYPE	D	M	C	K				
1	**Materials**															
->	Load Chain	Mech. Properties Breaking Load Test, Proof Load test	Major	Review of Mfr's Test Certificate	1 per Lot	IS:6216 /Appr. Drg / Appr. Data sheet	IS:6216 /Appr. Drg / Appr. Data sheet	MTC	√	P/V	V	V				
->	Load Sheave	Mech. Properties Chemical Composition	Major	Lab Analysis	1 per Heat	IS:1865 /Appr. Drg / Data sheet	IS:1865 /Appr. Drg / Data sheet	MTC	√	P/V	V	V				
->	Gear & Pinion	Chemical Composition	Major	Lab Analysis	1 per Heat	IS:4432/Appr. Drg / Data sheet	IS:4432/Appr. Drg / Data sheet	MTC	√	P/V	V	V				
->	Hook	Mech. Properties Chemical Composition	Major	Lab Analysis	1 per Heat	IS:8610 / IS:1875 /Appr. Drg / Data sheet	IS:8610 / IS:1875 /Appr. Drg / Data sheet	MTC	√	P/V	V	V				
2	**In Process**															
->	Hook	Proof Load Test	Major	Load Test	100%	IS:8610 /Appr. Drg / Appr. Data sheet	IS:8610 /Appr. Drg / Appr. Data sheet	MTC / IR	√	P	V	V				
		DPT after Load Test	Major	DPT	100%	ASTM E-165	ASTM E-165 / No Defects	IR	√	P	V	V				
3	**Final Inspection**															
->	Assembly	Operation Check	Major	Visual	100%	Smooth Operation / IS 3832 Appr. Drg / App. Data Sheet	Smooth Operation / IS 3832 Appr. Drg / App. Data Sheet	IR	√	P	W	V				
		Functional Test	Major	Visual	100%			IR	√	P	W	V				
		Load Test & Over Load Test	Major	Load Test	100%			IR	√	P	W	V				
		Overall Dimensions	Major	Measurement	100%			IR	√	P	W	V				
		Visual (After Load Test)	Major	Visual	100%	IS 3832	IS 3832	IR	√	P	W	V				

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT	For Client Use:-
SIGNATURES		**P->Perform, V-> Verification, W-> Witness**	Name & Signature of Approving Authority with Seal

Document No.:-

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

बी एच ई एल BHEL	S/Contactor :- Manufacturer :-			Manufacturing Quality Plan Item :- Bag Filter (Without Enclosure) QAP No. :- LOI Nos:- Contractor :- M/s BHEL			Project:- Package :- Mill Rejects System Client :- Consultant :-					
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	**Materials**												
1.1	Manifold Body / Casings (MS Plate / Sheet / Pipe)	Chemical & Physical	Major	Chemical & Mechanical	1 per Lot	App. Drawing / Data Sheet / IS:2062 Gr. A / IS:1079 Gr. 0 / IS: 1239 Class Med.	App. Drawing / Data Sheet / IS:2062 Gr. A / IS:1079 Gr. 0 / IS : 1239 Class Med.	MTC	√	V	V	V	
1.2	Bag Cages (Inserts)	Chemical & Physical	Major	Chemical & Mechanical	1 per Lot	App. Drawing / data sheet / IS:7887 Gr.8 / IS:1079 Gr. 0	App. Drawing / data sheet / IS:7887 Gr.8 / IS:1079 Gr. 0	MTC	√	V	V	V	
1.3	Solenoid Valves	Functional	Major	Operational	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	MTC	√	P	V	V	
1.4	Sequence Controller	Functional	Major	Operational	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	MTC	√	P	V	V	
1.5	Filter Bags (Make :- Charminar / Supreme)	Physical	Major	Visual / Measurement	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	MTC	√	P	V	V	
2	**In Process**												
2.1	Manifold	Dimensional & Visual	Minor	Dimensional & Visual	100%	As per Mfr's Drg.	As per Mfr's Drg.	IR	√	P	V	V	** -> DPT & Hydro -Test of Manifold to be witnessed by vendor
2.2		Welding	Major	DPT on Final Weld	100%	ASTM E-165	No Defect	IR	√	P	V**	V	
2.3		Hydro Test for 30 Minutes	Major	Leakage	100%	Appr. Data sheet	No Leakage	IR	√	P	V**	V	

Document No.:-

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
3	**Final Inspection**												
3.1	Assembly	Dimensional	Major	Measurement	100%	Appr. Drawing	Appr. Drawing	IR	√	P	**W**	V	**Pressure Drop across Filter Bags & Emission Level at Filter outlet shall be checked at Site**
	$-> Pneumatic Test at 1.1 times W/Pressure	Pne. test $of Manifold in Assly.	Major	Leakage by soap solution	100%	Appr. Data Sheet	No Leakage	IR	√	P	**W**	V	
		Functional Test of Pulsing System	Major	Pulse Sequence	100%	Appr. Data sheet / Testing Procedure	Appr. Data sheet / Testing Procedure	IR	√	P	**W**	V	
4	**Painting**	Measurement & Visual	Major	DFT / Finish	100%	Appr. Painting Schedule	Appr. Painting Schedule	IR	√	P	-	-	

TESTING PROCEDURE TO BAG FILTER

1-> Functional test through compressed air , Sequential pulsing through valves and sequential controller on **No - Load Condition** to be conducted.

2-> The Soenoid valve shall be connected to the sequential timer and suitable electric supply shall be provided. Air header to be connected to supply of compressed air. The Timer is set and Sequential operation of Solenoid operated valve is observed.

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT **P->Perform, V-> Verification, W-> Witness**	For Client Use:- **Document No.:-** Name & Signature of Approving Authority with Seal
SIGNATURES			

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

	S/Contactor :-	Manufacturing Quality Plan	Project:-
BHEL	Manufacturer :-	Item :- MS GI ERW Pipes (IS:1239/IS3589) QAP No. :- LOI Nos:- Contractor :- M/s BHEL	Package :- Mill Rejects System Client :- Consultant :-

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	Final Inspection of Finished Pipes	Physical	Major	Visual	100%	IS:1239 / IS:3589 / Approved Data Sheet	IS:1239 / IS:3589 / Approved Data Sheet	IR	-	P	W*	V	* -> Random 5% of offered lot irrespective of size
		Dimensional	Major	Measurement	100%			IR	√	P	W*	W*	
		Mechanical Properties	Major	Tensile, elongation, Bend or Flattening	IS: 4711			IR / TC	√	P / V	V	V	
		Chemical	Major	Chemical Analysis	1 per heat			TC	√	P / V	V	V	
		Hydro Test	Major	Pressure Testing	100%			IR / TC	√	P	W *	W*	
2	Galvanising (For GI Pipes	Uniformity & mass of Zinc Coating, Adhesion test, Free bore test	Major	As per IS:4736	As per IS:4736	As per IS:4736 / Approved Data Sheet	As per IS:4736 / Approved Data Sheet	IR	√	P	W#	V	# one sample for each size
3	Identification	Verification of Batch No. / Mfg stamp / Heat No.	Major	Visual	100%	Mfgr Practise / IS 1239 / IS 3589	Mfgr Practise / IS 1239 / IS 3589	IR	√	P	W	V	
4	Review of QA Documents	———	———	———	———	As per QAP	As per QAP	———	√	V	V	V	

NOTES :-

For SAIL Pipes verification of reports for the tests mentioned in Sl. No. 1 & 2 by BHEL & KPCL.
For GI Pipes, Galvanising Check as per relevant standard shall be done.
All material shall be as per approved data sheet in case of ambiguity in QAP, material as data sheet shall be final.

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT	For Client Use:-
SIGNATURES		**P->Perform, V-> Verification, W-> Witness**	Name & Signature of Approving Authority with Seal

Document No.:-

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

भा एच ई एल BHEL		S/Contactor :- Manufacturer :-			Manufacturing Quality Plan Item :- ACI Bends QAP No. :- LOI Nos:- Contractor :- M/s BHEL			Project:- Package :- Mill Rejects System Client :-. Consultant :- .						
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks	
1	2	3	4	5	6	7	8	9		10			11	
								TYPE	D	M	C	K		
1	**Raw Material**													
1.1	Scrap Receipt	Chemical	Major	Lab Analysis	Random Sample / Lot	Mfg's Std	Mfg's Std	Mfg's Log Sheet	–	P	–	–		
1.2	Ferro Alloys	Chemical	Major	Lab Analysis	Random Sample / Lot	Mfg's Std	Mfg's Std	Mfg's Log Sheet	–	P	–	–		
2	**Final Inspection**													
2.1	Product Analysis	Chemical Analysis	Major	Chemical	1 / heat	Mfg's Standard	Mfg's Standard	MTC	√	P	V**	V	** Chemical. Analysis to be Witnessed by Vendor	
2.2	Leakage	Hydro Test	Major	Pressure Test	100%	Approved Drg / Data Sheet	No Leakage	IR	√	P	W*	W*	* 10% by Vendor / BHEL / CLIENT	
2.3	Dimension	Dimension	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	√	P	W*	W*		
2.4	Hardness	Hardness	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR/TC	√	P	W*	W*		
Manufacturer / Sub Vendor		Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT **P->Perform, V-> Verification, W-> Witness**					For Client Use:-		Document No.:-				
SIGNATURES								Name & Signature of Approving Authority with Seal						

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

BHEL	S/Contactor :- Manufacturer :-			Manufacturing Quality Plan Item :- Knife Gate Valve [Manual / Pneumatic] QAP No. : LOI Nos:- Contractor :- M/s BHEL			Project:- Package :- Mill Rejects System Client :- Consultant :-					
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	**Raw Material / Bought Out's**												
1.1	Body	Chemical & Mechanical	Major	Foundary TC	1 per Heat	Relevent IS / Appr. Drg / Data Sheet	Relevent IS / Appr. Drg / Data Sheet	TC	√	P/V	V	V	
1.2	Gate	do	Major	Lab Analysis	1 per lot	do	do	Mill / Lab TC	√	P/V	V	V	
1.3	Stem (For Manual Valve)	do	Major	Lab Analysis	1 per batch	do	do	do	√	P/V	V	V	
1.4	Pneumatic Cylinder (For Pneu. Valve)	Visual & Functional	Major	Mfr's TC Review	100%	Smooth Operation	Smooth Operation	Mfr's TC	√	P/V	V	V	
2	**In - Process Inspection**												
2.1	Body, Gate	Dimensional	Major	Measurement	100%	Mfr's Drawing	In-Process Insp. Record	-		P	V	V	# -> Test Pressure as per Data Sheet
2.2	Body Shell Test	Leak Tightness	Major	Hydro Static Test #	100%	Approved Drg / Data Sheet	No Leakage	IR	√	P	V	V	
3	**Final Inspection**												
3.1	Assembled Valve	Dimension	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	√	P	W	W	BHEL / Vendor/CLIENT to Witness 10 % of Quantity.
3.2	do	Function	Major	Operation	100%	Smooth Opertaion	Smooth Opertaion	IR	√	P	W	W	
3.3	do	Seat Leakage	Major	Hydro Static Test #	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	√	P	W	W	

Manufacturer / Sub Vendor	Contractor	LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness	For Client Use:- Document No.:- Name & Signature of Approving Authority with Seal
SIGNATURES			

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

	S/Contactor :-	Manufacturing Quality Plan		
बी एच ई एल BHEL	Manufacturer :-	Item :- Compressor QAP No. :- LOI Nos:- Contractor :- M/s BHEL	Project:- Package :- Mill Rejects System Client :- Consultant :-	

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	**Raw Material / Bought Out's**												
1.1	Cylinder	Chemical & Mechanical	Major	Mfr's TC	1 per Heat or Lot	Relevent IS / Appr. Drg / Data Sheet	Relevent IS / Appr. Drg / Data Sheet	TC	√	P/V	V	V	
1.2	Frame Head	do	Major	do	do	do	do	do	√	P/V	V	V	
1.3	Outer Head	do	Major	do	do	do	do	do	√	P/V	V	V	
1.4	Crank Shaft	do	Major	do	do	do	do	do	√	P/V	V	V	
1.5	Connecting Rod	do	Major	do	do	do	do	do	√	P/V	V	V	
1.6	Temp. Switch	Mfr's TC	Major	Visual Review	100%	do	do	do	√	V	V	V	
1.7	Control Panel	Mfr's TC	Major	Visual Review	100%	do	do	do	√	V	V	V	
2	**In - Process Inspection**												
2.1	Cylinder, Frame Head & Outer Head	Leak Tightness	Major	Hydro Static Test	100%	Appr drg. / Data Sheet	No Leakage	IR	√	P	V	V	
2.2	After Cooler	Leak Tightness	Major	Hydro Static Test	100%	Approved Drg / Data Sheet	No Leakage	IR	√	P	V	V	
3	**Final Inspection**												
3.1	After Cooler	Dimension / Visual	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	√	P	W	W	
3.2	Control Panel	Dimension / Visual	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	√	P	W	W	
3.3	Compressor Assly	Nozzle Test (Mech. Run Test)	Major	Performance	100%	Approved Drg / Data Sheet / BS 1571 Part-2	Approved Drg / Data Sheet	IR	√	P	W	W	

Manufacturer / Sub Vendor	Contractor	LEGENDS:-	For Client Use:-	Document No.:-
SIGNATURES		Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness	Name & Signature of Approving Authority with Seal	

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

	S/Contactor :- Manufacturer :-			Manufacturing Quality Plan Item :- Sump Pump QAP No. :- LOI Nos:- Contractor :- M/s BHEL			Project:- Package :- Mill Rejects System Client - Consultant :- .					
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	**Raw Material / Bought Out's**												
1.1	Casing	Chemical, Mechanical, Hardness, Surface Defect	Major	Chem. Comp. Mechanical Hardness Visual	1 per Heat 1 per Heat 1 Per Heat 100 %	Relevent IS / Appr. Drg / Data Sheet	Relevent IS / Appr. Drg / Data Sheet	TC	√	P/V	V	V	
1.2	Impeller	do	Major	do	do	do	do	do	√	P/V	V	V	
1.3	Shaft	Chemical, Mechanical, Surface Defect	Major	Chem. Comp. Mechanical Visual & UT if Dia >50 mm	1 per Heat 1 per Heat 100 %	Relevent IS / Appr. Drg / Data Sheet / ASTM E 388 for UT	Relevent IS / Appr. Drg / Data Sheet / ASTM E 388	do	√	P/V	V	V	
1.4	Shaft Sleeve	Chemical Hardness	Major	Chem. Comp. Hardness	do	do	do	do	√	P/V	V	V	
2	**In - Process Inspection**												
2.1	Casing	Soundness of Casting / Leakage	Major	Hydro Static Test	100%	Appr drg. / Data Sheet / IS 5120	No Leakage	IR	√	P	V	V	Hyd. Test at 200% of pump rated head or 150% of Shut off head which ever is higher for 30 min.
2.2	Impeller	Residual unbalance	Major	Dyanamic / Static Balancing	100%	Approved Drg / Data Sheet / ISO 1940 Gr. 6.3	ISO 1940 Gr. 6.3	IR	√	P	V	V	

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
3	**Final Inspection**												
3.3	Performance Test with Calibrated Test Lab Motor	Q Vs Head, Power & Efficiency, Noise & Vibration	Major	Measurement & Curves	100%	Approved Drg / Data Sheet / HIS	Approved Drg / Data Sheet / HIS	IR	√	P	W	W	Noise - 85 db max. & Vibration - 50 microns max.
3.2	Pump strip test in case of doubt due to abnormal sound	Undue Wear	Major	Visual / Strip Test	100%	Mfr's Standard	No Undue Wear	IR	√	P	W	W	
3.3	Painting	Visual & Measurement	Major	Visual & Measurement	100%	As per approved Painting Schedule	As per approved Painting	IR	–	P	-	-	

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT **P->Perform, V-> Verification, W-> Witness**	For Client Use:- Name & Signature of Approving Authority with Seal
SIGNATURES			**Document No.:-**

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

	S/Contactor :- Manufacturer :-	Manufacturing Quality Plan Item :-EXPANSION BELLOW QAP No. :- LOI Nos:- - Contractor :- M/s BHEL	Project:- Package :- Mill Rejects System Client :- Consultant :-)

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	**Raw Material**												
1.1	Bellows	physical & Chemical	Major	Lab Analysis	1 per Heat	AS204 TP304/ Approved Drg.	AS204 TP304/ Approved Drg.	MTC	√	V	V	V	
1.2	Flanges/ End Pipe	physical & Chemical	Major	Lab Analysis	1 per lot	IS 2062 / Approved Drg.	IS 2062 / Approved Drg.	MTC	√	V	V	V	
2	**In - Process Inspection**												
2.1	Bellows & Pipe	Dimension	Major	Measurement	100%	Approved Drg.	Approved Drg.	IR	√	P	V	V	
	** For Bellows	Soundness Of Weld of L-Seam	major	DPT **(Before & After Forming)	100%	ASTM E- 165	No Cracks/ Linear Indication	IR		P	V	V	
3	**Final Inspection**												
3.1	Assembly	DP Test of Fillet Weld of Bellows to Pipe & Pipe to Flange	Major	visual	100%	ASTM E-165	No Crack / Linear Inication	IR	√	P	W	V	
3.2	Testing	Dimensions	Major	Measurement	100%	Approved Drg	Approved Drg	IR	√	P	W	W	
		pressure	Critical	Hydraulic	100%	EJMA D.3.2.1/ Data sheet	EJMA D.3.2.1/ Approved Drg.	IR	√	P	W	W	
		Spring Rate Test (Axial)	Critical	Stiffness Test	100%	EJMA / Data Sheet	EJMA / Data Sheet	IR	√	P	W	W	
		Deflection	Critical	Deflection Test	100%	EJMA / Data Sheet	EJMA/Data Sheet	IR	√	p	W	W	
3.30	Painting	Visual/ Measurement	Major	DFT	100%	Approved Painting Schedule	Approved Painting Schedule	IR	√	p	–	–	

		LEGENDS:-	For Client Use:-
		Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report	Document No.:-
Manufacturer / Sub Vendor	Contractor	M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT	
SIGNATURES		P->Perform, V-> Verification, W-> Witness	Name & Signature of Approving Authority with Seal

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

	Manufacturer's Name & Address :		MANUFACTURING QUALITY PLAN					Project :					
			Item : MS Plates & Structures		QP No. :								
					Rev. No. : 0			BHEL Ref. :					
			Sub-System :		Date :			Contract No.:					
					Page No.: 1 of 1			Contractor : BHEL SUB-CONTRACTOR-					
Sl. No.	Components & Operations	Characteristic/Item	Class	Type/method of check	Extent of Check	Reference Document	Acceptance	Format of Record		Agency			Remarks
										P	W	V	
1	2	3	4	5	6	7	8	9	D	10			11
	RAW MATERIAL												
1	Steel Plates	Chemical composition and Mechanical test	Major	Review of corelated MTC	One/heat	IS:2062	IS:2062	Mfgr. TC	✓	3		2.1	Refer Note Below
2		Visual and dimensional Check	Major	Visual and measurement	100%	Mfgr. TC	Mfgr. TC IS 1852	Mfgr. TC	✓	3	2,1		
3		Identification / Marking	Major	Co-relation establish	100%	AS per manufacturing practice	AS per manufacturing practice IS 2062	Mfgr. TC	✓	3	2	1	
			LEGEND :					BHEL Doc. No.					Rev. 0
			1 - BHEL / CUSTOMER		P - Agency Performing the Test								
			2 - VENDOR		W - Agency Witnessing the Test								
MANUFACTURER/ SUBCONTRACTOR		CONTRACTOR	3 - Manufacturer		V - Agency Verifying the Test								
			CR - Critical Characteristics										
			MA - Major Characteristics										
SIGNATURE			MI - Minor Characteristics					REVIEWED BY		NAME & SIGNATURE OF APPROVING AUTHORITY			

Notes:

1 In case material is despatched directly from SAIL/TISCO plant/stockyard or procured from dealer against co-related TC's witnessing by BHEL is waived off and material will be accepted based on MTC of SAIL/TISCO.

2 In case material is procured from dealer and co- related TC's are not available, check on 100% quantity of plates will be performed on sample drawn from each plate at NABL certified/ approved laboratory or any govt approved laboratory for chemical & physical properties, However dimensional check shall be witnessed by BHEL.

3 There will not be any inspection by CUSTOMER.

बी एच ई एल BHEL	S/Contactor : Mfgr:- Works:-			Manufacturing Quality Plan Item :-Local Panels QAP No. LOI Nos:- Contractor :- M/s BHEL			Project:- Package :- Mill Rejects System Client :- Consultant :-					
Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	N	
1	Materials CRCA Sheet	Visual	Major	Visual	100%	Appr. Drg / IS: 513	Appr. Drg / IS: 513	IR	-	P	-	-	
		Chem. & Physical.	Major	Chem.& Physical.	100%	Do	Do	TC	√	V	V	V	
		Thickness	Major	Measurement	100%	App. Drawing	App. Drawing	IR/TC	√	V	V	V	
2	Bought outs Verification of type, size & Make of FLV unit, PG, PS, SV	Visual	Major	Visual	100%	Appr. Drawing / Data Sheet	Approved Drawing / Data Sheet	IR/TC	√	V	V	V	
3	Painting Pre Treatment 7 tank process	Physical	Major	DFT / Shade / Finish	100%	Appr. Painting Schedule	Appr. Painting Schedule	IR/TC	√	V	V	V	
4	Final Inspection	Visual	Major	Visual	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	W	V	
		Dimension	Major	Measurement	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	W	V	
		Check for Pneumatic Circuit	Major	Visual	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	W	V	
		Check for Wiring / Mountings / Terminations	Major	Visual / Continuity	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	W	V	
		Functional Check for Solenoid Valve	Major	Functional	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	W	V	
5	QA Documents	Review	Major	verification	100%	-	-	-					
Manufacturer / Sub Vendor		Contractor	LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N ->CLIENT P->Perform, V-> Verification, W-> Witness				For Client Use:-		Document. No.:			
SIGNATURES							Name & Signature of Approving Authority with Seal						

	S/Contactor :			Manufacturing Quality Plan				Project:-					
भेल BHEL	Mfgr:- Works:-			Item :- Transport vessel QAP No. LOI Nos:- Contractor :- M/s BHEL				Package :- Mill Rejects System Client : Consultant :-					
Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	N	
1	Raw Materials												
1.1	Dome & dome Valve Body	Dimensions	Major	Measurement	100%	App. Drg. / Data Sheet / Standard	App. Drg. / Data Sheet / Standard	-	-	P	-	-	
		Surface Defects		Visual	100%			-	-	P	-	-	
		Physical Check		TS & Hardness	1/Heat			TC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat			TC	√	P/V	V	V	
1.2	Plates for Vessel	Dimensions	Major	Measurement	100%	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	-	-	P	-	-	
		Surface Defects		Visual	100%			-	-	P	-	-	
		Physical Check		TS & Elongation	1/Heat			TC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat			TC	√	P/V	V	V	
1.3	Insert Seal	Surface Defects	Major	Visual	100%	Mfr's Drg. / Std	Mfr's Drg. / Std	-	-	P	-	-	
		Hardness		Measurement	1/Lot			IR	√	P/V	V	V	
1.4	Shaft	Physical Check	Major	TS & Elongation	1/Heat	App. Drg./ IS Std.	App. Drg./ IS Std.	TC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat								
2	In - Process Insp.												
2.1	Welders & Welding	WPS / PQR / WPQ	Major	Procedure / Qualification	100%	ASME sec - IX	ASME sec - IX	WPS / PQR	√	P/V	V	V	Welders to be approved by BHEL / CLIENT
		Welding Defects	Major	DPT on Root run	100%	ASTM E-165	ASTM E-165	IR	√	P/V	V	V	
			Major	DPT on Final run	10%	ASTM E-165	ASTM E-165	IR	√	P/V	V	V	
2.3	Machining of Dome & dome Valve	Visual & Dimension	Minor	Visual, Measurement	100%	Mfr's Drg / Standard	Mfr's Drg / Standard	-	-	P	-	-	
2.4	Hydotest of Vessel	Soundness / Leakage	Major	Visual, Hydro Pressure Test	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	
3	Final Inspection												
3.1	Final Assly	Completeness & Dimension	Major	Visual / Measurement	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	At Painted Condition
3.2	Run Test / Performance	Operation of Dome Valve	Minor	Visual, 5 times Cycle operation	100%	Mfr's Standard	Mfr's Standard	IR	√	P/V	W	W	
3.3	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	√	P/V	W	W	
4	QA Documentation												
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan		–	P/V	V	V	

Manufacturer / Sub Vendor	Contractor	LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT	For Client Use:- Document No.
SIGNATURES		P->Perform, V-> Verification, W-> Witness	Name & Signature of Approving Authority with Seal

	S/Contactor : Mfgr:- Works:-	Manufacturing Quality Plan Item :- Pyrite Hopper QAP No. LOI Nos Contractor :- M/s BHEL	Project:- Package :- Mill Rejects System Client :-

Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	N	
1	**Raw Materials**												
1.1	Plates for Body	Dimensions	Major	Measurement	100%	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	-	-	P	-	-	
		Surface Defects		Visual	100%			-	-	P	-	-	
		Physical Check		TS & Elongation	1/Heat			MTC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat			MTC	√	P/V	V	V	
1.2	Spray Nozzle	Surface Defects	Major	Visual	100%	Mfr's Drg. / IS Standard	Mfr's Drg. / IS Standard	-	-	P	-	-	
		Chemical Check		Chemical Comp.	1/Lot			MTC	√	P/V	V	V	
		Dimensions		Measurement	100%			IR	√	P	V	V	
2	**In - Process Insp.**												
2.1	Welders & Welding	WPS / PQR / WPQ	Major	Procedure / Qualification	100%	ASME sec - IX	ASME sec - IX	WPS / PQR	√	P/V	V	V	Welders to be approved by BHEL
		Welding Defects		DPT on Root run	100%	ASTM E-165	ASTM E-165	IR	√	P/V	V	V	
				DPT on Final run	10%	ASTM E-165	ASTM E-165	IR	√	P/V	W	W	
2.2	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	-	-	P	-	-	
3	**Final Inspection**												
3.1	Final Assly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W*	W*	* -> Witness10%
3.2	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	-	P/V	W	-	Painting shall be Heat Resistance
4	**QA Documentation**												
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan		–	P/V	V	V	

Manufacturer / Sub Vendor	Contractor	LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> Client P->Perform, V-> Verification, W-> Witness	For Client Use:- / Document No.:-
SIGNATURES			Name & Signature of Approving Authority with Seal

	S/Contactor :- Mfgr:-			Manufacturing Quality Plan Item :- Terminal Box QAP No. :- LOI Nos:- Contractor :- M/s BHEL			Project:- Package :- Mill Rejects System Client :- Consultant :- .					
Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	Raw Materials												
1.1	Plates for Body	Dimensions	Major	Measurement	100%	App. Drg. / Data	App. Drg. /	-	-	P	-	-	
		Surface Defects		Visual	100%	Sheet / IS Standard	Data Sheet / IS	-	-	P	-	-	
		Physical Check		TS & Elongation	1/Heat		Standard	MTC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat			MTC	√	P/V	V	V	
2	In - Process Insp.												
2.1	Welders Qualification & Welding	WPS / PQR / WPQ	Major	Procedure / Qualification	100%	ASME sec - IX	ASME sec - IX	WPS / PQR	√	P/V	V	V	Welders to be approved by BHEL / KPCL
		Welding Defects	Major	DPT on Root run	100%	ASTM E-165	ASTM E-165	IR	√	P/V	V	V	
			Major	DPT on Final run	10%	ASTM E-165	ASTM E-165	IR	√	P/V	W	V	
2.2	Flange Machining and Drilling	Dimensions	Major	Measurement	100%	Mfr/Appr. Drg	Mfr/Appr. Drg	IR	–	P	-	-	
2.3	Connection -pipe to flange, pipe to body	Fit up	Major	Joint set up, PCD, Orientation	100%	Mfr/Appr. Drg	Mfr/Appr. Drg	IR	–	P	-	-	If Applicable
2.4	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	-	-	P	-	-	
3	Final Inspection												
3.1	Final Assly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	
3.2	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	–	P/V	W	-	Painting before disp.
4	QA Documentation												
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan		–	P/V	V	V	

Manufacturer / Sub Vendor	Contractor	LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness	For Client Use:- / Document No.:-
SIGNATURES			Name & Signature of Approving Authority with Seal

	S/Contactor :- Mfgr:- Works:-			Manufacturing Quality Plan Item :- Bunker Discharge Gate QAP No. :- LOI Nos:- Contractor :- M/s BHEL			Project:- Package :- Mill Rejects System Client :- Consultant :-					
Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9	10			11
								TYPE	D	M	C	K	
1	Raw Materials											
1.1	Plates for Body	Dimensions	Major	Measurement	100%	App. Drg. / Data	App. Drg. / Data	-	-	P	-	-	
		Surface Defects		Visual	100%	Sheet / IS Standard	Sheet / IS Standard	-	-	P	-	-	
		Physical Check		TS & Elongation	1/Heat			TC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat			TC	√	P/V	V	V	
1.2	Shaft	Physical Check	Major	TS & Elongation	1/Heat	do	do	TC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat			TC	√	P/V	V	V	
		UT If Dia > 50 mm		Internal defect	100%			IR	√	P/V	V	V	
1.3	Cylinder / Actuator	Visual / Specification	Major	Visual	100%	do	do	Mfr's TC	√	V	V	V	
2	In - Process Insp.											
2.1	Welders & Welding	WPS / PQR / WPQ	Major	Procedure / Qualification	100%	ASME sec - IX	ASME sec - IX	WPS / PQR	√	P/V	V	V	Welders to be approved by BHEL / CLIENT
		Welding Defects	Major	DPT on Root run	100%	ASTM E-165	ASTM E-165	IR	√	P/V	V	V	
			Major	DPT on Final run	10%	ASTM E-165	ASTM E-165	IR	√	P/V	W	V	
3	Final Inspection											
3.1	Final Assly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	
3.2	Operation with job / shop actuator	Opening & Closing of Gate	Major	Visual	100%	Proper Working	Smooth Operation	IR	√	P/V	W	W	
3.3	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	–	P/V	W	-	Painting before disp.
4	QA Documentation											
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan		–	P/V	V	V	

Manufacturer / Sub Vendor	Contractor	LEGENDS:- Records identified by √ shall be essentially included in QA documentation.TC -Test Certificate,IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N-> CLIENT	For Client Use:-
SIGNATURES		P->Perform, V-> Verification, W-> Witness	Name & Signature of Approving Authority with Seal

Document No.:-

	S/Contactor :-	Manufacturing Quality Plan		
बी एच ई एल BHEL	Mfgr:- Works:-	Item :- Pressure Relief Valve QAP No. : LOI Nos:- Contractor :- M/s BHEL	Project:- Package :- Mill Rejects System Client :- . Consultant :-	

Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	**Raw Materials**												
1.1	Plates for Body	Dimensions	Major	Measurement	100%	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	-	-	P	-	-	
		Surface Defects		Visual	100%			-	-	P	-	-	
		Physical Check		TS & Elongation	1/Heat			MTC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat			MTC	√	P/V	V	V	
2	**In - Process Insp.**												
2.1	Welders & Welding	WPS / PQR / WPQ	Major	Procedure / Qualification	100%	ASME sec - IX	ASME sec - IX	WPS / PQR	√	P/V	V	V	Welders to be approved by BHEL / KPCL
		Welding Defects	Major	DPT on Root run	100%	ASTM E-165	ASTM E-165	IR	√	P/V	V	V	
			Major	DPT on Final run	10%	ASTM E-165	ASTM E-165	IR	√	P/V	W	V	
2.2	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	-	-	P	-	-	
3	**Final Inspection**												
3.1	Final Assly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	
3.2	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	–	P/V	W	-	Painting before disp.
4	**QA Documentation**												
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan		–	P/V	V	V	

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT **P->Perform, V-> Verification, W-> Witness**	For Client Use:-
SIGNATURES			Name & Signature of Approving Authority with Seal

Document No.:-

	S/Contactor :-	Manufacturing Quality Plan	
बी एच ई एल BHEL	Mfgr:- Works:-	Item :- Air Receiver QAP No. :- LOI Nos:- Contractor :- M/s BHEL	Project:- Package :- Mill Rejects System Client :- Consultant :-

Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	**Raw Materials**												
1.1	Plates for Shell, Dished End & Flange	Dimensions	Major	Measurement	100%	App. Drg. / Data	App. Drg. / Data	-	-	P	-	-	
		Surface Defects		Visual	100%	Sheet / IS	Sheet / IS Standard	-	-	P	-	-	
		Physical Check		TS & Elongation	1/Heat	Standard		TC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat			TC	√	P/V	V	V	
1.2	Formed Dished End	Dimensions	Major	Measurement	100%	App. Drg. / Data	App. Drg. / Data	IR	√	P	-	-	
		Thickness/Thinning		Measurement	100%	Sheet	Sheet	IR	√	P	-	-	
		DPT of Knuckle		DP Test	100%	ASTM E-165	ASTM E-165	TC	√	P/V	V	V	
2	**In - Process Insp.**												
2.1	Welders & Welding	WPS / PQR / WPQ	Major	Procedure / Qualification	100%	ASME sec - IX	ASME sec - IX	WPS / PQR	√	P/V	V	V	Welders to be approved by BHEL / CLIENT
		Welding Defects	Major	DPT on Root run	100%	ASTM E-165	ASTM E-165	IR	√	P/V	V	V	
		do	Major	DPT on Final run	10%	ASTM E-165	ASTM E-165	IR	√	P/V	W	W	
		do	Critical	Radiography Test on all C/S & L/S including T & X	100%	IS 2825 Class-II / ASME Sec VIII	IS 2825 Class II / ASME Sec VIII	RT Film / Report	√	P/V	V	V	
2.2	Fabrication	Marking, Cutting, Rolling, Edge Preparation, Joint & Nozzle set up	Major	Visual, Measurement (Ovality, off set orientation)	100%	Mfr's Standard / Approved Drg.	Mfr's Standard / Approved Drg.	IR	-	P	-	-	
3	**Final Inspection**												
3.1	Final Assly	Completeness & Dimension	Major	Visual / Measurement	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	
3.2	Hydotest of Vessel	Soundness / Leakage	Major	Visual, Hydro Pressure Test	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	
3.3	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR		P/V	W	-	Painting before disp.
4	**QA Documentation**												
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-	–	P/V	V	V	

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC -> Test Certificate , IR - Inspection Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N-> CLIENT **P->Perform, V-> Verification, W-> Witness**	For Client Use:- Name & Signature of Approving Authority with Seal
SIGNATURES			**Document No.:-**

ANNEXURE – IV

SUB-VENDOR LIST

VENDOR LIST

Sl. No	ITEM/SERVICE	QAP/ INSP.CAT.	Scope of supply/manufacturer	Place	Remarks by BHEL
I	**SELF MFG ITEMS**				
1	Pyrite Hopper	I	SELF MANUFACTURER		
2	Conveying vessel	I	SELF MANUFACTURER		
3	Local Control Panel with accessories	I	SELF MANUFACTURER		
4	Mill Reject Conveying fittings/Bends	I	SELF MANUFACTURER		
5	Vessel inlet Valve(Pneumatic operated)	I	SELF MANUFACTURER		
6	Bunker Discharge Gate (Sector Gate)	I	SELF MANUFACTURER		
7	Pressure Relief Valve	I	SELF MANUFACTURER		
II	**BOUGHT OUT ITEMS**				
A	**MECHANICAL**				
1	Terminal Box	I	BHEL/ NTPC APPROVED FABRICATORS	INDIA	
2	AIR RECEIVER	I	PARKARE	DELHI	
		I	UNITED ENGG WORKS	NASIK	
		I	INTEGRATED ENGINEERS	PUNE	
		I	TEMASME VESELLEX	NOIDA	
		I	DIAMOND FABRICATIONS	PUNE	
3	DRAIN TRAP	III	SPIRAX MARSHAL	MUMBAI	
		III	GREAVES COTTON	MUMBAI	
		III	TRIDENT	COIMBOITORE	
4	Gate, Globe, Check valves/ NRV - C.I	II	LEADER	JULLANDHAR	
		II	BANKIM	HOWRAH	
		II	H SARKAR	HOWRAH	
		II	KBL	PUNE	
		II	AV VALVES	AGRA	Upto 300 NB
5	Gate, Globe, Check valves/ NRV - G.M	III	LEADER	JULLANDHAR	
		III	BOMBAY METALS & ALLOYS (GG)	MUMBAI	
		III	SANT VALVES	JULLANDHAR	
6	Knife Gate/Plate Valve (H/W Operated & Cylinder Optd)	I	FOURESS	MUMBAI	
		I	VASS	CHENNAI	
		I	(ORBINOX)	COIMBATORE	
7	Ball Valves	III	PRECISION ENGG	MUMBAI	
		III	Weir BDK	HUBLI	
		III	LEADER	JULLANDHAR	
		III	FLOW CHEM	GUJRAT	
8	Safety Relief Valve	III	LEADER	JULLANDHAR	
		III	SPIRAX MARSHAL	PUNE	
		III	KAYSTONE(TYCO FLOW CONTROL)	HALOL	
		III	BHEL	TRICHY	

9	M.S G.I / ERW PIPES	I	JINDAL	GHAZIABAD	UPTO 350 NB
		I	SURYA ROSHINI	BAHADURGARH	
		II	SAIL	ROURKELA	
		I	WELLSPUN	ANJAR	
		I	INDUS	GB NAGAR	UPTO 300NB
		II	TISCO	JAMSHEDPUR	UPTO 150NB
		I	MAHARASHTRA SEAMLESS	MAHARASHTRA	200NB TO 400NB IS 3589
10	Metallic Expansion Bellow(Metallic)	I	METALLIC BELLOWS	CHENNAI	
		I	SUR INDUSTRIES	KOLKATA	
		I	LONESTAR	CHENNAI	
11	Rupture Disc	II	BS & B SAFETY SYSTEM	CHENNAI	
12	Chain pulley Block (1 Ton)	II	hercules (INDEF)	mumbai	
		II	TRACTEL	FARIDABAD	
		II	LIFTING EQUIPMENTS & ACESSORIES	DELHI	
13	Conveying Air Compressor (Reciprocating Type)	I	KIRLOSKAR PNEUMATIC	PUNE	
		I	INGERSOLL RAND	AHMEDABAD	
14	Sump Pump (Water Service)	II	KSB PUMP	PUNE	
		II	MATHER & PLATT	PUNE	
		II	SAM	COIMBOITORE	
		II	FLOW MORE	GHAZIABAD	
		II	B & C	CHENNAI	
		II	KIRLOSKAR	PUNE	
		II	WORHTINGTON	GHAZIABAD	
15	Pneumatic Actuator/Cylinder(Metallic)	III	SCHRADDER	MUMBAI	
		III	NUCON	HYDERABAD	
		III	ROTEX	MUMBAI	
		III	VAAS	CHENNAI	
16	Tools and Tackles	III	BRANDED		
17	Steel Plate/ Structure/ Section/ SS liner	III	SAIL		
		III	JSW STEEL LTD		
		III	JINDAL STEEL & POWER LTD		
		III	TISCO		
		III	ESSAR		
		III	IISCO		
		III	LLOYDE		
		III	RINL		
18	Grating	III	INDIANA	PUNE	
19	Bag Filter	II	ACCO	KOLKATA	
		II	THERMAX	PUNE	
		II	BATLIBOI	DELHI	