

## Technical Pre-Qualification Requirement for Belt type Gravimetric Feeder Assembly with VFD

1. The vendor shall be an established manufacturer of **Belt type Electronic weighing type raw coal Gravimetric Feeder assembly with VFD & state of the art microprocessor based controls (henceforth referred to as Gravimetric Feeder)** having adequate Engineering and Manufacturing facilities. Vendor shall furnish technical backup documents for proof of availability of above facilities.
2. The supplier shall have experience of having supplied state of the art microprocessor based 24 inch or higher sized gravimetric feeder - 7 feet centre to centre distance & with VFD for coal weighing applications in thermal power plants.
3. The proposed Gravimetric Feeder shall be from the regular manufacturing range of the supplier.
4. As proof of above pre-qualifying requirement points, vendor should furnish:
  - a. Product catalogue which lists the enquired feeder meeting the above technical requirements.
  - b. Vendor shall furnish general reference list with details of Customer name, the feeder parameters, P.O date, customer reference details wherein the vendor has supplied state of the art microprocessor based Gravimetric Feeders meeting the technical requirements stated above.
  - c. Minimum ONE end user certificate for satisfactory operational performance of the state of the art microprocessor based Gravimetric Feeder meeting the pre-qualifying requirements stated above.

**OR**

Minimum Two past purchase orders of similar state of the art microprocessor based Gravimetric Feeders meeting the minimum pre-qualifying requirements stated above.

- d. Vendor to attach the corresponding data sheets/ technical documents of the Gravimetric Feeder pertaining to the P.Os / End user certificate (submitted vide point 4.c).
5. In case of order placement, the Vendor shall have the responsibility for the following and same shall be confirmed point wise.
  - i) Vendor should have the component replacement responsibility in case of defect / failure of Feeder parts.
  - ii) Experts from Vendor's side shall assist in commissioning activities at site, if required.
  - iii) Vendor should ensure the product performance during erection & commissioning.

### 6. DOCUMENT SUBMISSION CHECKLIST FOR THE VENDOR TO MEET PQR

S. No	Document description	Vendor confirmation	Document name
a.	Back-up documents as per pt. 1	<input type="checkbox"/>	
b.	Product Catalogues as per pt. 4a	<input type="checkbox"/>	
c.	General reference list as per pt. 4b	<input type="checkbox"/>	
d.	One end user certificate OR Two P.Os as per pt. 4c	<input type="checkbox"/>	
e.	Data sheets/ technical documents as per pt. 4d	<input type="checkbox"/>	
f.	Confirmation to clause (5)	<input type="checkbox"/>	

**Vendor's seal**

**BHARAT HEAVY ELECTRICALS LIMITED,  
TIRUCHIRAPPALI 620 014  
QUALITY ASSURANCE DEPARTMENT**


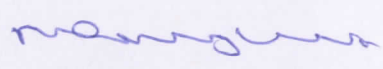

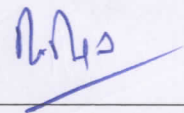
**STANDARD QUALITY PLAN FOR  
GRAVIMETRIC FEEDER**

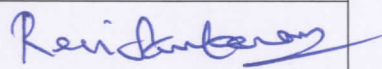
**SQP: NP: 11/04**

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Quality Assurance

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Engineer / QA

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QUALITY ASSURANCE (R.Ramasamy)	

Revision No.	Date	Approved by	Signature
00	01/04/93	SM / QA	
01	15.07.96	SM / QA	
02	31.03.2005	SM/QA	
03	15.12.2007	C.R.RAJU/SDGM / QA	
04	11.03.2015	U.REVISANKARAN/AGM/QA&BE	

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STANDARD QUALITY PLAN

BHEL QUALITY ASSURANCE  
SQP NP 11/04

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## RECORD OF REVISIONS

Rev.No.	Details of revision	Remarks
00	This document consolidates all requirements of various previous SQPs. Latest applicable TDC and SIP Nos editorial corrections made.	
02	Applicable TDC incorporated in Note 1 and editorial Corrections made for better clarity.	
03	Editorial corrections made in Cl. 1.2.2, 2.2.1 & Note 3 altered. One Main cl..added for Machining and the contents rearranged. Footer changed new legends introduced. Cat. A, B,C Introduced. M,C,N descriptions modified. Sketch and check list deleted. Cl. 3. Ref. Document and acceptance based on BHEL QC CHECK LIST.	
04	Witness and Verification points for agency 'C' added.	



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**QUALITY ASSURANCE**

**STANDARD QUALITY PLAN**

**GRAVIMETRIC FEEDER**

QP NO. : SQP:NP:11 REV.: 04  
 DATE : 11/03/2015  
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SL NO	COMPONENT/ OPERATION	CHARECTERISTICS	C	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOC/ ACCEPTANCE NORM	AGENCY			REMARKS
							M	C	N	
1	2	3	4	5	6	7	8	9	10	

MATERIALS*	*Materials shall be as per drawing.	TC	P	V
1.0 1.1 Plates, Castings, Forgings, Bars, Tubes and pipes.	Chemical & Mechanical properties	TDC/ Matl.Specn. Note 1		
1.2 1.2.1 SUB DELIVERIES Feeder Belts, Bulls-eye lens	Compliance to Purchase order	Purchase Spec. and drawing.	P	V
1.2.2 Remote and local cabinets, Feeder electronics, Encoder/Tacho generator, Load cell, Motion monitor sensor Motor,ECC /VFD & Gear Drive Assy.}	Compliance to Purchase order	C&I Q.P for Gravimetric feeder cabinet and feeder electronics and Motor & Drive ASSY	P	V
2.0 INPROCESS:	Refer QCP: 002 (Latest) for relevant process controls			
2.1 Marking, cutting and preparation	Shape, size & location of holes	Drawing & Note .2	P	V

**LEGEND : CI: Class ( A: Critical B: Major , C: Minor) \* M : Manufacturer , C :BHEL QC/TPI N : CUSTOMER , R : Record, P: Perform, V-Verification,W-Witness**



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QUALITY ASSURANCE		STANDARD QUALITY PLAN					GRAVIMETRIC FEEDER				
SL NO	COMPONENT/ OPERATION	CHARECTERISTICS	C	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOC/ ACCEPTANCE NORM	TYPE OF RECORD	AGENCY		REMARKS	
1	2	3	4	5	6	7	8	M	C	N	
									9		10

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2.2	Cold rolling	Length, diameter, ovality & profile departure	C	Measurement	100%	Drawing	R	P	V		
2.3	Welding qualifications	Procedure Personnel	A	Document Review - do -	100%	AWS D1.1 / SIP:NP:07 WTC Approved list / SIP:NP:07	WPS WQR	P P	V V		
2.4	Welding Inspn.	Weld size Weld Quality	B B	Visual LPI / MPI	100% 10%	Drawing, Note 3 and SIP:NP:06 BHE:NDT:PB:PT1/MT1(Latest)	R	P P	V V		
2.4	Feeder body fabrication	Dimensions* Orientation	A	Measurement Visual	100%	Drawing and QC check list	R	P	V		
2.4	Inlet pipe & motor mount welding	Weld quality SS weld Quality	B	LPI / MPI LPI	*100% 100%	BHE:NDT:PB:PT1/ MT1(Latest) BHE:NDT:PB:PT1 (Latest)	R R	P P	V V		* 10 % for other welds
2.5	Feeder components Bearing Housings, rollers, shaft , pulleys & Flanges	Dimensions(Linear and Angular),Finish, Perpendicularity& Parellicity. Runout	A	Measurement & Visual	100%	Drawing, Note 3	R	P	V		
3.0 3.1	Machining Body Machining after Fabrication	Dimensions, finish, orientation of bores & tapped holes	B	Measurement and visual	100%	Drawing and BHEL QC CHECK LIST	R	P	V		



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QUALITY ASSURANCE		STANDARD QUALITY PLAN					QP NO.: SQP:NP:11 REV.: 04 DATE : 11/03/2015 PAGE : Page 5 of 7			
		GRAVIMETRIC FEEDER					TYPE OF RECORD	AGENCY		REMARKS
SL NO	COMPONENT/ OPERATION	CHARACTERISTICS	C	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOC/ ACCEPTANCE NORM	8	M	C	N
1	2	3	4	5	6	7	8	9	9	10
3.2	Weigh span roller, Head pulley, Take-up pulley, Tension roll Inlet span roller, Clean out conveyor Drive shaft & Shaft, take-up, Test weight.	Orientation Weld quality Dimensions, Finish, Squareness, Coaxiality, parallality of faces and runout	A	Measurement and visual	100%	Drawing	R	P	V	
3.3	Drag link assy. components	Dimensions & Orientation	c	Measurement Visual	100%	Drawing	R	P	V	
4.0	FINAL:	Completeness & Orientation of components	A	Visual	100%	Drawing, Notes 4 & 5	R	P	W	
4.1	Assembly of Feeder	Leak test	A	Air test	100%	Drawing, Note 5	R	P	W	
4.2	Feeder Housing	Functional & calibration	A	Functional test & calibration	100%	C&I QP vide Clause 1.2.2	R	P	W	
4.3	Feeder and cabinet Final tests	Finish, Coat thickness	C	Visual Measurement	100% Random	SIP:PP:22 (Latest) Drawing	R	P	W	
4.4	Painting & Preservation	Project, W.O. No., DU	C	Visual	100%	Drawing	R	P	V	

**NOTE.1** The materials normally used and their requirements are given below:

<u>Plates</u>	IS 2062 Gr A&B	As per Specn.
	IS 1079	As per Specn.
	ASTM A36	As per Specn.
	SA 240 TP 304	As per Specn.
<u>Bars</u>	IS 1875 CL IV	As per Specn.
<u>Forgings</u>	SA 105	TDC 0:309
	AISI C1020	As per Specn.
<u>Pipes</u>	SA 106 Gr.B	As per Specn.
	SA 210 Gr. A1	As per Specn.
<u>Tubes</u>	SA 213 Type 304H	As per Specn.
<u>Castings</u>	ASTM A216 WCB	TDC :0:412
	IS 305 Gr AB1	TDC: 0:413
	ASTM A48	As per Specn.
	CL30A,35A	
	CS 1025	As per Specn.
	CAST Al 319	As per Specn.

**Note 2 MARKING ,CUTTING AND PREPERATION**

**2.1 SHELL PLATE**

- 2.1.1 Check the lay out marking as per drawing. Diagonal difference shall be within 2 mm.
- 2.1.2 Check the markings of cut outs and openings as per drawing. Ensure punch marks shall be extended by 50mm on both axis over and above the drawing dimensions.

**2.2 MARKING FOR FEEDER BODY**

- 2.2.1 Check the center line and other reference line markings of feeder body and discharge flange on surface plate as per drawing.
- 2.2.2 Ensure the center line of discharge flange and axis of inlet end bottom flange coincides with the layout marking on the surface plate.
- 2.2.3 Check the marking of the center line for shell ring fixture coincides with bottom shell center line.

**2.3 MARKING OF MACHINED COMPONENTS**

- 2.3.1 Ensure sufficient machining allowance over and above the drawing dimensions during marking of components for machining.

Note 3 The following are the checks after machining the components.

- a) Check the dimensions and Machining finish as per drawing.
- b) Check and Ensure dimensions within the tolerances ie. Linear ,Angularand Geometric as indicated in the drawing.
- c) For weigh span roller check the weight of the roller, perpendicularity, run out to the reference lines as indicated in the drawing.
- d) Check the finished weight of Test weight as per drawing.

Note 4 **FEEDER ASSEMBLY**

- a) Check the orientation of components as per drawing.
- b) Ensure all the moving components are applied with lubricant.
- c) Check the clearance between belt and inlet skirt as per drawing.
- d) Belt movement is free from side tracking.
- e) Ensure direction of rotation of belt as per drawing.

Note 5 **AIR LEAK TEST PROCEDURE**

- a) Connect manometer or pressure gauge(0 - 5psi) at the location shown in the test scheme drawing.
- b) Pressurize air slowly until the test pressure(2 psi) has reached The air supply to the feeder shall be shut off and the test pressure shall be maintained for a period of 15 minutes.
- c) The pressure drop shall be observed and recorded. The test shall be deemed acceptable ,if pressure drop is less than 1 psi in 15 minutes.
- d) If the pressure drop is more than 1 psi leaking spots are to be identified, repaired and then retested.

**BHARAT HEAVY ELECTRICALS LIMITED**  
**TIRUCHIRAPPALLI - 620 014**

**FUEL SYSTEMS / PE/ FOSSIL BOILERS**

**TITLE SHEET**


*Specification for*  
*24 inch Inlet, 7 Feet Centre Distance*  
**GRAVIMETRIC FEEDER**

*SPECIFICATION NUMBER: **GF-724***

*REVISION No. : 00*

<i>Rev.No.</i>	<i>Rev. Date</i>	<i>Description</i>	<i>Updated/Chd./Appd.</i>

	Name	Signature	Date
Prepared	Sairam N	-sd-	11/03/2022
Checked	MCHS Gangadhar	-sd-	11/03/2022
Approved	MCHS Gangadhar	-sd-	11/03/2022

	<b>Specification for 24 inch Inlet, 7 ft.CD GRAVIMETRIC FEEDER</b>	SPEC. No. <b>GF-724</b> REV. 00	Sheet 2 of 13
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- 2.0 GENERAL SPECIFICATION
- 3.0 EXCLUSIONS
- 4.0 QUALITY REQUIREMENTS
- 5.0 GUARANTEE
- 6.0 DOCUMENTS
- 7.0 PACKING
- 8.0 DEVIATION
- 9.0 LIST OF ATTACHMENTS

	<p align="center"><b>Specification for 24 inch Inlet, 7 ft.CD GRAVIMETRIC FEEDER</b></p>	<p align="center">SPEC. No. <b>GF-724</b> REV. 00</p>	<p align="center">Sheet 3 of 13</p>
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## 1.0 SCOPE OF SUPPLY:

- 1.1 Design, manufacture, testing, certification, marking and identification and packing for shipment of 24 inch ID inlet 7 ft. center distance, electronic weighing type raw coal gravimetric feeder assembly comprising of items listed in this specification.
- 1.2 Mounting of feeder integral cabinet on to the feeder and wiring of all the feeder mounted electrical items viz. drives, micro switches etc to feeder integral cabinet using conduit and connectors.

### NOTE:

The extent of supply stated herein is not necessarily exhaustive and shall not relieve the Supplier from his responsibility to provide goods and services necessary to satisfy the Purchaser's performance criteria and required life, to be complete for installation and to be fit for purpose, safe, reliable, easily maintained and efficient in operation.

The supplier is requested to state the items that are to be supplied to meet the intent of the requirements, which will be used during the evaluation. The make of components shall be as per BHEL/CUSTOMER approved list applicable. The prime function of the feeder is to feed the raw coal from the bunker into the pulveriser in controlled and varied quantities corresponding to the boiler load demand. In order to accomplish this objective, the raw coal feeders are generally provided with an A.C.Motor with gear reducer coupled with Eddy Current Clutch/VFD, which enables the controlled variation of the feeder speed. The make of ac motor shall be as per BHEL/CUSTOMER approved list.

## 2.2 Working environment:

Feeder should be suitable for operation in damp, dusty, polluted atmospheres of 100% relative humidity at an ambient temperature of  $-20^{\circ}$  C to  $+70^{\circ}$  C.

## 2.3 Description:

The Gravimetric coal feeder is a precision coal-feeding device, which conveys coal on a rubber belt inside a pressure tight housing, designed to withstand internal pressure as per NFPA standard 85 requirements. The

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conveying belt is driven by the drive pulley and passes around the tension pulley at the other end. Adequate supporting arrangement under the belt at the coal feed inlet column is provided to support the coal column weight. The belt that is wider than the inlet opening ensures minimum spilling of coal on the belt sides due to the projections provided at either sides of the belt. Below the belt arrangement, a mechanical drag link conveyor (clean-out conveyor) is provided to clear the spilled coal, on a continuous operating cycle. The feeder also houses important diagnostic and operational features like coal on belt switch assembly, feeder discharge pluggage switch assembly, inspection window glass assembly with lighting fixtures, water spray nozzles etc. to take care of efficient and safe operation of the feeder. The feeder has a provision for reverse rotation to facilitate emptying.


For feeder arrangement, dimensions and end connection detail refer Annexure-IV (Gravimetric feeder arrangement) of this specification.

#### **2.4 Principle of operation:**

The electronic weighing type of Gravimetric feeder uses two precision strain gauge type load cells, which are temperature compensated, barometrically insensitive and environmentally sealed and measures the weight of coal acting on the weighing span. These load cells supporting half the load of the weighing span attached to weighing roller at the center of the span. The weighing span is defined by two fixed rollers, precisely located in the feeder body. A third roller is located midway on the span, suspended on each side by a load cell. As coal passes over the span, the center roll transmits a force to the cells, which is directly proportional to the load acting between the fixed rollers.

The feeder delivery rate is computed as follows:

A measurement sample is taken from the output of load cell and converted into a digital signal. After checking this signal for acceptable limits, it is stored in memory. Same operation is performed on the output of other load cell signal. Once the signals are validated, the two outputs are summed and the tare is subtracted. This result is multiplied by a factor determined during calibration of feeder to arrive at the weight of material per unit of belt length.

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The belt speed is determined by measuring the period of output frequency of an ac tachogenerator attached to the motor shaft. This frequency signal is multiplied by another calibration factor determined during feeder calibration to arrive at a number that represent belt travel speed per second. Finally the belt speed and weigh are multiplied together to arrive at the feed rate. This result is compared to the demanded feed rate to determine the error and to operate the speed control.

$$\text{Weight (kg/cm)} \times \text{Belt speed (cm/s)} = \text{Feed rate (kg/s)}$$

The feed rate, representing the feeder output is then compared with Customer's fuel demand signal. The result of this comparison is used to control the belt speed. Belt speed is varied by the speed variation facility provided in the feeder drive system.

The feeder is driven by an AC motor with ~~Eddy Current Clutch~~/VFD and gear box.

## 2.5 Features:

2.5.1 Feeder type : Gravimetric belt type with size of 24" (610 mm)

2.5.2 Maximum feed rate capacity: (refer Annexure-I/II to Specification)

2.5.3 Environment: (a) Ambient temperature 70°C (max)  
(b) Explosion pressure : 3.5 kg/cm<sup>2</sup>  
(c) Other environmental conditions envisaged.

2.5.4 Feeder weighing Accuracy : ± 0.5%

Repeatability: 0.1%

2.5.5 System shall be capable of tolerating large supply voltage variation.

2.5.6 All site equipment shall be suitable for 70°C ambient temperature and other environment conditions envisaged.

2.5.7 "NO COAL" flow detection to be provided to stop the feeder when no coal is detected on the conveyor belt and when pluggage occurs at feeder outlet.

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Paddle type coal alarm switch shall be provided for this purpose at the following location:

- (a) Over the feeder conveyor belt: For indication of loss of coal flow & tripping the feeder.
- (b) At the feeder discharge: To stop the feeder in the event of Coal pluggage at the feeder outlet.

2.5.8 The feeder casing shall be designed to withstand an explosion pressure of 3.5 kg/cm<sup>2</sup> (g). However, a minimum thickness of 10mm shall be provided for feeder casing.

2.5.9 The feeder belt shall be of multiply reinforced rubber of single piece construction with arrangement for tracking and to prevent spillage.

2.5.10 Width of the belt shall have sufficient margin while operating in conjunction with the feeder inlet opening provided. However, width of belt shall not be less than 838 mm.

2.5.11 All raw coal feeder components coming in contact with coal (except belt), shall be made of stainless steel.

2.5.12 Suitable arrangement to adjust belt tension shall be provided.

2.5.13 The following provisions for the feeders shall be provided.

- (a) Spraying water inside the casing
- (b) Purge air to feeder

2.5.14 Adequate doors (end doors & weigh compartment doors) shall be provided on the feeder, for easy access.

2.5.15 Easy access to any part of the feeder internals shall be possible without dismantling the complete casing.

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## 2.6.0 Major sub assemblies:

The feeder shall consist of the following major sub assemblies.

### 2.6.1 Feeder Body

Feeder design shall exceed NFPA Code 85 requirements and shall withstand an explosion pressure of 3.5 kg/cm<sup>2</sup> (50 psi). All parts in contact with active coal flow shall be fabricated of type 410 stainless steel. Side skirting is to be provided to contain the coal on the belt and a leveling bar near the feeder inlet to shear the coal column to form a profile conducive to maximum weighing accuracy.


Dust-tight doors are to be provided at both ends and each side of the feeder for access to critical components.

Bulls-eye viewing ports in the doors to permit observation of the feeder interior during operation. From the common air header, suitable hose connections shall be provided to each bulls-eye for cleaning the same before viewing the feeder internals through the glass while feeder in operation. A work light mounted above each end door shall be designed to allow bulb changing from outside the feeder.

### 2.6.2 Belt and drive system:

2.6.2.1 The feeder belt shall be supported by a machined drive pulley near the outlet, a slotted take-up pulley and adequate number of belt support rollers at the inlet end, a weighing idler in the middle of the feeder. A counter weighted scraper with replaceable rubber blade continuously cleans the carrying surface of the belt after the coal is delivered to the outlet. Proper belt tracking is to be accomplished by crowning the take-up pulley. In addition to the above, to prevent lateral movement of belt (belt tracking) either grooved pulleys to accept a molded V-guide in the belt or an arrangement with belt track rollers is to be provided. The pulleys shall be easily removable for belt changing and bearing maintenance

Belt tension is to be applied through downward pressure exerted by the tensioning idler on the return strand of the belt. Proper tension is to be obtained when the round protrusion at the center of the tension pulley/spring take up arrangement is inline with the center indicator mark on the tension indicator plate. The tension roll indicator is to be found on the drive

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motor side of the feeder and is to be visible through the viewing port in each tension roll access door. Tension adjustments can be made with the feeder operating or at rest by turning the two belt take-up screws which protrude through the inlet end access door.

**2.6.2.2** The drive system for the belt consists of a four pole, 3 phase induction motor, coupled to a speed reducing gear box via an ~~Eddy Current Clutch~~/VFD control. The motor is ~~5.5KW for ECG~~/7.5KW for VFD, 1450 rpm, Totally Enclosed Fan Cooled motor (or inverter duty TENV). Two numbers of Tachogenerator shall be in-built at the output shaft of the clutch to give redundant isolated output. The make of LT motor shall be from any one of the following makes.

M/s Siemens, KEC, NGEF, Alsthom (GEC), ABB, CGL, BBL and KEC.

**2.6.2.3** A paddle-type alarm is to be mounted above the center of the belt to detect the presence or absence of coal on the belt. The alarm consists of a stainless steel paddle mounted on one end of a horizontal shaft and a dust tight switch housing on the other end, accessible on the outside of the feeder. Four single pole switches, are to be mounted in the switch housing. The switches are to be actuated by adjustable cams mounted on the end of the shaft inside the switch housing. The make of micro switches shall be as per BHEL approved vendor list.

### **2.6.3 Weigh sensing components:**

The feeder weighing signal is generated by two load cells of adequate capacity which support a weighing roller. Located on each side of the weighing roller are two weigh span rollers, which accurately define a given length of belt on which the coal is weighed. The weighing module (load cell assembly) shall be of reputed make subjected to Purchaser's approval.

### **2.6.4 Clean-out Conveyor:**

The Clean out conveyor are made of two strands of malleable iron drag chain with alternately spaced wing links are to be used to automatically clean coal from the bottom pan of the feeder. The clean out conveyor is to be driven by a 0.25 KW totally enclosed non ventilated drive motor through a gear head and a reduction gear box to an operating speed of

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approximately 60 cm per minute. The make of LT motor shall be as specified in clause 2.6.2.2 above.

In addition to electrical overload protection, a shear pin in the gear box limits the output torque to prevent mechanical overload and damage. Shear pin breakage results in contact closure of limit switch LSCC, stopping the drive and actuating a remote alarm annunciator. As an alternate to the mechanical shear pin arrangement, an equivalent drive protection system with electronic current sensing relay is also acceptable.

#### 2.6.5 Feeder Integral Cabinet:

Fully assembled feeder integral cabinets – one per feeder will be supplied along with mounting fasteners. The feeder mounted electrical items viz. main drive motor, clean out conveyor motor, coal on belt and discharge pluggage paddle switches and feeder work lights are to be wired to the feeder integral cabinet through flexible conduit and end fittings. These conduit fittings shall be fixed onto the feeder body through fixing clamps for aesthetic appearance. Necessary conduits and connectors, cables and accessories are to be carried out by the vendor both at the component side and at the feeder integral cabinet. **The feeder integral cabinet is excluded from scope of this specification.** (covered in C&I specification of feeder-TCI :283)

#### 2.6.7 Feeder discharge paddle alarm:

An alarm paddle is to be mounted in the feeder outlet to detect the presence of coal plugging the discharge. As the coal backs up to the level of the paddle, it pushes the paddle towards the feeder end plate and closes the contacts of limit switch LSFD, stopping the belt drive motor. The alarm consists of a stainless steel paddle mounted on one end of a horizontal shaft and a dust tight switch housing on the other end, accessible on the outside of the feeder. Three numbers of micro switches mounted in the housing are actuated by adjustable cams on the end of the shaft. The make of micro switches shall be as per BHEL approved vendor list.

#### 2.6.8 Reverse operation of feeder:

A reversing drive motor selector switch mounted in feeder integral cabinet enables the feeder belt to be driven forward, for normal operation, or in

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reverse. Reverse operation is a safety feature to quickly discharge burning coal from the feeder or to clear the belt in the event of pulveriser failure. Reverse can also be used to conveniently remove coal from a bunker through a temporary discharge chute attached to the inlet end of the feeder or to facilitate removal of an interior pluggage or obstruction. A reverse rotation emptying chute shall be supplied along with each feeder.

### **2.6.9 Grease Hoses:**

Grease connection hoses along with end fittings shall be mounted on the feeders. Drawing for the same shall be furnished.

### **2.7.0 End connections :**

#### **2.7.1 Feeder Inlet :**

Feeder inlet chute shall be of 610 mm ID, 10 mm thickness, SS410 material. OD of the inlet chute shall be suitable to connect the feeder inlet with the outlet collar of raw coal gate by means of a Slip-on pipe coupling (refer ANNEXURE-IV).

#### **2.7.2 Feeder Outlet :**

For Feeder outlet and mounting details, refer ANNEXURE-IV.

#### **2.7.3 Fire quenching water spray connections :**

½" BSP (F) at 2 places as per ANNEXURE-IV.

#### **2.7.4 Purge air connection :**

As per View-P of ANNEXURE-IV.

#### **2.7.5 Manometer connection :**

As per ANNEXURE-IV.

### **2.8.0 Fasteners :**

All fasteners coming in the feeder assembly shall be Metric and cadmium plated.

### **2.9.0 Bearings :**

	<b>Specification for 24 inch Inlet, 7 ft.CD GRAVIMETRIC FEEDER</b>	SPEC. No. <b>GF-724</b> REV. 00	Sheet 11 of 13
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All bearings shall be of SKF make or equivalent . Vendor shall furnish the list of bearings indicating the model number, load detail etc. with catalogues.

### 2.10.0 Painting :

Painting shall be done as per the Annexure-V attached with the specification.

### 2.11.0 Special Tools :

The following special tools shall be supplied along with each feeder.

- |                                |                     |
|--------------------------------|---------------------|
| a) Test weight for calibration | - 1 no. per feeder  |
| b) Shear pin (COC)             | - 2 nos.per feeder  |
| c) Shear pin Hub (COC)         | - 1 no. per feeder  |
| d) Bar- Pulley lift assembly   | - 1 no. per boiler. |
| e) Turn buckle assembly        | - 1 no. per boiler  |
| f) Pulley removal tool         | - 1 no.per boiler   |
| g) Rail extension -RH          | - 1 no.per boiler   |
| h) Rail extension –LH          | - 1 no.per boiler   |
| i) Checking bar                | - 2 nos.per boiler  |
| j) Shim set for calibration    | - 2 sets per boiler |

If any other tools / tackles are required, the Vendor may specify.


### 3.0 Quality requirement:

Vendor shall submit the Quality Plan for the approval of the owner and shall comply to the requirement of the owner.

**Feeder calibration and feeder weighing accuracy test shall be carried out by the vendor at their works after interconnecting the remote power cabinet indented for the feeders, as per applicable test procedures.**

The following tests as per the attached test procedure (Annexure-III) shall be done on feeders and test certificate shall be produced by the supplier.

- a) Hydrostatic test
- b) Leak test
- c) Accuracy test (Type test)

	<b>Specification for 24 inch Inlet, 7 ft.CD GRAVIMETRIC FEEDER</b>	SPEC. No. <b>GF-724</b> REV. 00	Sheet 12 of 13
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#### 4.0 Guarantee:

Vendor shall furnish guarantee for the trouble free service and for the intended performance stated in the specification for a period of 18 months from the date of operation.

#### 5.0 Documents:

5.1 The following documents / details shall be furnished along with the offer.

- i) Assembly and sub assembly drawings with bill of material.
- ii) Total cross sectional assembly drawing with BOM.
- iii) BELT cross sectional Drawing with details
- iv) Filled in data sheet (Annexure-I/II)
- v) Drive (Main drive and COC drive) selection calculations
- vi) Commissioning spares, if required
- vii) List of spares for 2 years trouble free operation
- viii) Suppliers' catalogues for feeders.
- ix) List of Boilers supplied with the specified equipment.
- x) Compliance to each clause of this specification and QP.

5.2 The following documents shall be furnished after placement of purchase order.


- i) Filled in data sheet (for approval)
- ii) General Arrangement and Cross Sectional Drawing (for approval)
- iii) Quality plan (for approval)
- iv) Lubrication details
- vi) Feeder Speed Vs Capacity curve
- viii) Test certificate for each feeder.

5.3 The documents to be supplied along with the main supply shall include the following.

- i) Operation and instruction manuals
- ii) 4 sets of test certificates for each feeder
- iii) Packing and shipping details

#### 5.4 O & M manuals:

O&M manuals are to be supplied both in soft and hard formats. Hard copy manuals shall be in printed form.

	<b>Specification for 24 inch Inlet, 7 ft.CD GRAVIMETRIC FEEDER</b>	SPEC. No. <b>GF-724</b> REV. 00	Sheet 13 of 13
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Drawings shall be printed or laser printed only.

Spiral or comb bound copies should be totally avoided.

If manuals are supplied in folders, the folder shall have 3 hole punching system.

O & M manuals, shall be submitted to BHEL/ Tiruchirappalli prior to despatch of the equipment

Manuals, generally should contain the following:

- i) Data sheet for components and drives
- ii) Brief description of the equipment
- iii) Storage, installation and Operation procedure
- iv) Maintenance (including lubrication, where necessary) and service.,  
Recommended spares list for 2/3 years trouble free service.
- v) Calibration and trouble shooting procedures
- vi) Assembly drawings with part list, dimensional drawings & other certified drawings.
- vii) Manuals should pertain only to the type or model supplied for a particular order. Copies shall be sent to BHEL / Tiruchirappalli.

#### **6.0 Packing:**

The feeder shall be packed in such a way that it does not get damaged during transport. It shall be properly covered with thick tear proof polythene sheet and dispatched in suitable moisture proof wooden / steel crates.

#### **7.0 Deviation :**

Vendor shall highlight the deviations from the specification (if any) or special features of the feeders, which are not covered in the specification during the offer stage itself.

#### **8.0 List of attachments:**

- i) ~~Annexure - I (Data sheet - ECG)~~
- ii) Annexure - II (Data sheet-VFD)
- iii) Annexure - III (Feeder test procedures)
- (iv) Annexure - IV (General arrangement drawing)
- (v) Annexure - V (Painting schedule)

Sl.no	Description	As per Specification	Quoted by Vendor
1	Type of Feeder	Gravimetric, belt feeder, composite type <b>having automatic tensioning feature</b> and Electronic weighing Microprocessor based control system.	
2	Feeder Designation / Model	Vendor to furnish	
3	Material to be handled & size	Coal - upto 2"	
4	Feeder inlet size	24" ID	
5	Centre Distance (inlet - outlet)	7 Feet	
6	Overall dimension (lxbxh)	Vendor to furnish	
7	Total Weight of feeder	Vendor to furnish	
8	Feeder capacity (max), TPH	<b>39</b>	
9	Weighing Accuracy	+ / - 0.5%	
10	Type of Feeder Control	Electronic weighing - MicroProcessor based Control	
11	No.of Load cells and make	2 nos. Make to be indicated by vendor.(Subject to purchaser's approval)	
12	Turn down ratio	10:1	
13	Feeder Belt width / Thk.	838 mm (minimum) / 7.1 mm	
14	Belt material & Make (Refer Notes below)	Nylon-Nylon fabric impregnated with natural rubber	
15	Type of Feeder Drive	VFD	
16	Motor rating	Vendor to furnish	
17	Motor Speed	1450 rpm	
19	Gear box ratio	Vendor to furnish	
20	C.O.C.Drive motor rating	0.25 KW	
21	Gear Ratio	1041:1	
22	No.of Bullseye glass	Vendor to furnish	
23	No.off bullseye cleaning hoses provided	Vendor to furnish	
24	No.of inlet support rollers	To be indicated by vendor	
25	No.of weigh span rollers	2	
26	Weigh Span	Vendor to furnish	
27	Location, Type and Make of Bearings	Vendor to furnish	
28	Feeder body material & thickness	Carbon steel / 10 thk	
29	Feeder inlet chute material & thk.	SS 410, 12 thk(min)	
30	C.O.C trough material	SS410	
31	C.O.C.Chain Link matl.	ASTM A47-77 Gr.32510/Equivalent	
32	All Fasteners	Cadmium plated -Metric	
33	List of Special tools	Vendor to furnish	
34	Emptying chute for feeder Reverse rotation	Vendor to furnish	
35	Water spray nozzle size, Location and no.off.	1/2"BSP(F), 2 nos.	
36	Manometer connection	1/2"BSP(F)	
37	Painting shade and code	Vendor to furnish	
38	Feeder leak test certificate	Vendor to furnish	
39	Hydrostatic test certificate	Vendor to furnish	
40	Feeder accuracy test	Vendor to furnish	
1	<p><b>The particular type and make of equipment/system should be rated at least for the duty specified / required and shall be in successful operation in at least two (2) separate plants for a minimum period of two (2) years as on the date of submission of bid documents. Alternatively, the design of all equipment/ system shall be got vetted from the respective Collaborators / original equipment designers. If the proven design is not used then testing of the prototype or the type test shall be done compulsorily, the cost of which shall be deemed to be included in the quoted prices of the Bidder.</b></p>		vendor to confirm
Prepared		Sairam N	
Checked		Gangadhar MCHS	
Approved		Gangadhar MCHS	



**24inch inlet, 7ft Centre Distance  
Gravimetric Feeder Test Procedure  
(Annexure – III to Specification GF-724)**

Sheet no.1/7

**HYDROSTATIC TEST PROCEDURE**

**1. SCOPE:**

*This specification covers the requirements for Hydrostatic Testing of Feeders.*

**2. HYDROSTATIC GENERAL REQUIREMENTS :**

2.1. *Notification of the Hydrostatic test will be given to the Quality Assurance Department, customer or customer's agent as per specification or contractual obligations.*

2.2. *Items to be tested manufactured or stainless steel will suitably protected to eliminate the possibility of contamination.*

2.3. *Pressure gauges will be calibrated against a standard dead-weight tester or calibrated master gauge prior to each test or series. Pressure gauges should have a range of two (2) times but not less than one-half (1 ½) times the Hydrostatic Test Pressure.*

2.4. *A trained technician will be available to conduct the test.*

2.5. *A representative from Quality Control will be present to witness the test.*

**3. PREPARATION FOR TEST:**

3.1. *Water used for testing shall be at a temperature min.60 Degree F, and max.120 Degree or unless otherwise specified by the customer specification.*

3.2. *The pressure gauge shall be connected directly to the part(s) to be tested. The pressure gauge is to be located so that the Technician can monitor pressurization.*

3.3. *Vents shall be provided at all high points of the feeder in the position in which it is to be tested to purge possible air pockets while the feeder with water.*

3.4. *Sufficient time will be allowed for the water temperature and feeder temperature to stabilize prior to running the actual Hydrostatic Test.*

3.5. *Before applying pressure, the test equipment shall be examined to see it is tight and that all low pressure filling lines and other appurtenances that should not be subject to test pressure have been disconnected and suitably blanked off.*



**24inch inlet, 7ft Centre Distance  
Gravimetric Feeder Test Procedure  
(Annexure – III to Specification GF-724)**

Sheet no.2/7

3.6. *Unless otherwise specified or permitted by the applicable requirements, tests shall be made after all heat treatment and weld repairs have been completed.*

**4. HYDROSTATIC TEST :**

4.1. *The Hydrostatic Test Pressure of the feeder will be as per engineering specifications. Allowable working pressure will take into consideration feeder loadings, temperatures and materials of construction. The exact pressure of the Hydrostatic test will be specified on the Engineering drawing or in accordance with customer specifications.*

4.2. *Following the application of the Hydrostatic Test pressure, an inspection will be made on all joints and connections. This inspection shall be made at a pressure not less than two-thirds of the test pressure. The test pressure shall be held for a maximum of 30 minutes. If the cognizant Engineer feels a minimum or longer holding time is required for this Hydrostatic Test, he will indicate this on the drawing by specific call out.*

4.3. *Upon completion of the Hydrostatic Test, the pressure gauge will be checked against a standard dead-weight tester or calibrated master gauge at the pressure.*

4.4. *Hydrostatic Test report form will be completed upon acceptance of the test.*

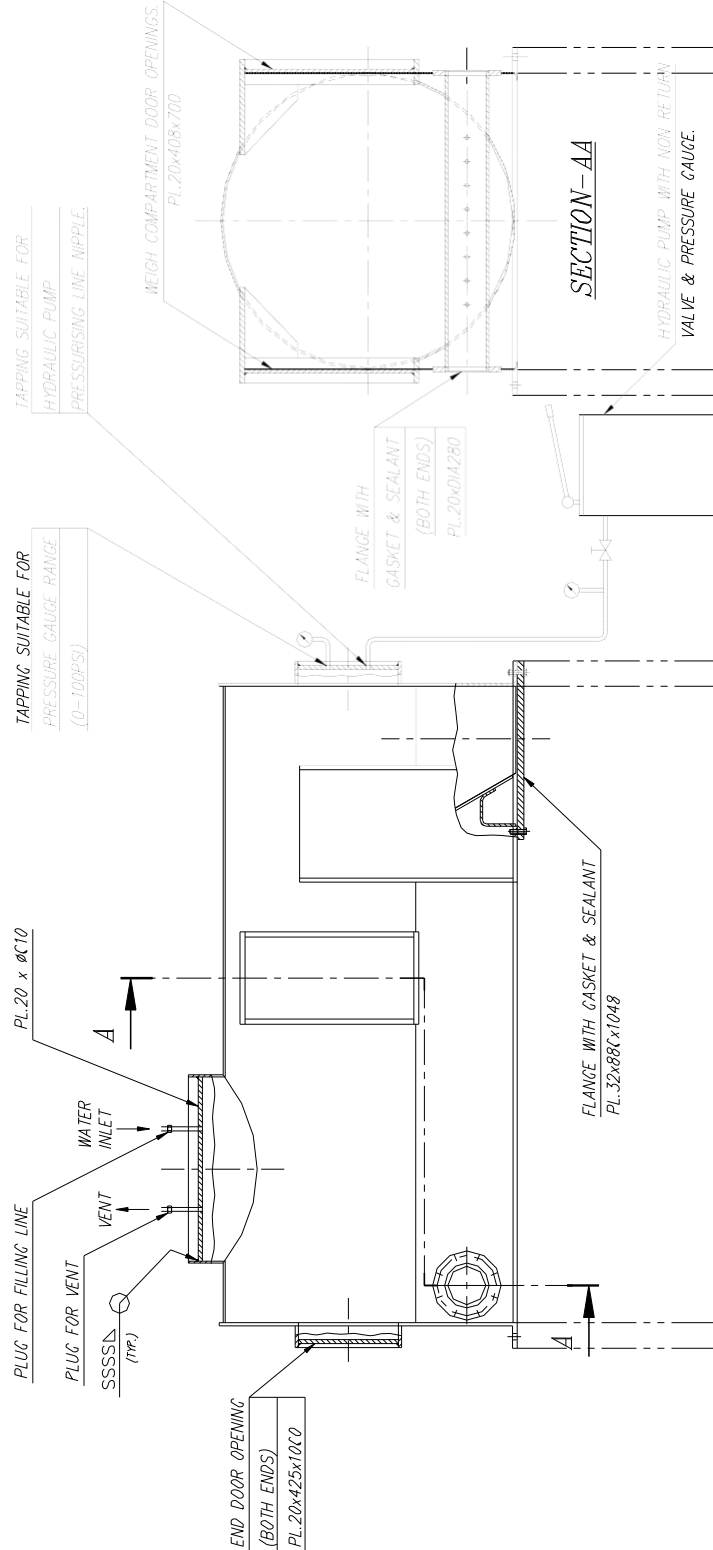
4.5. *All equipment will be drained and dried.*



# 24inch inlet, 7ft Centre Distance Gravimetric Feeder Test Procedure (Annexure – III to Specification GF-724)

Sheet no.3/7

## 24" GRAVIMETRIC FEEDER HYDROSTATIC TEST SET UP



### NOTE:—

ALL OTHER OPENINGS IF ANY TO BE BLANKED BY 12mm THICK PLATE.

### PRESSURISING PROCEDURE:

1. FILL IN WATER INSIDE THE FEEDER BODY THRU' THE WATER INLET OF FEEDER INLET DUMMY PLATE KEEPING THE VENT HOLE OPEN.
2. VENT HOLE AND WATER INLET HOLE ARE TO BE CLOSED WITH THE PLUG AFTER FEEDER BODY IS COMPLETELY FILLED WITH WATER (VENT OVER FLOWING).
3. PRESSURISE THE FEEDER BODY USING HYDRAULIC PUMP UNTIL FEEDER BODY PRESSURE GAUGE READING INDICATE 50PSI AND HOLD THE SAME FOR 5 MINUTES.



**24inch inlet, 7ft Centre Distance  
Gravimetric Feeder Test Procedure  
(Annexure – III to Specification GF-724)**

Sheet no.4/7

**Leak Test Procedure**

**1. SCOPE :**

*This procedure shall be used for leak testing feeders.*

**2. PROCEDURE :**

- 2.1 *Prior to leak testing, all parts to be assembled to the feeder must be inspected for proper assembly and tightness.*
- 2.2 *Blank (false) steel test covers with the specified mounting bolt hole pattern are to be attached at all external openings. ¼ “ thick plate as a minimum will be used for test covers. One (1) side of the plate is to be flat and a ¼” min. thick rubber (or equal) gasket is to be inserted between the plate and the part opening. Fasteners and other closures are to be assembled and tightened as required.*
- 2.3 *One (1) blank cover is to be fitted with a ¼” pipe tap for the air inlet line connection. Similar pipe gages are to be provided in the remaining blank covers for attaching a pressure gauge and a manual air release valve.*
- 2.4 *The test gauge must be calibrated before running the test.*
- 2.5 *Once all covers, closures, relief valve and the test gauge have been installed. Air will be slowly admitted until the test pressure (not to exceed 2 PSI) has been reached. The test pressure will be maintained for 15 minutes prior to leak testing. (See paragraph 2.8).*
- 2.6 *All exterior connections, fittings and welds are to be checked for air leakage.*
- 2.7 *A soapy type liquid is recommended to be applied to the various feeder areas to indicate leakage. Ordinary household soap or detergents are not permitted as substitutes for bubble testing solutions.*
- 2.8 *To measure the leakage rate, the air supply to the feeder shell is shut off and the pressure decay is monitored. With the pressure at 2PSI, begin timing the decay rate for 15 minutes, then take another pressure reading. The accepted limit for this test is a decay of 1 PSIG in 15 minutes.*

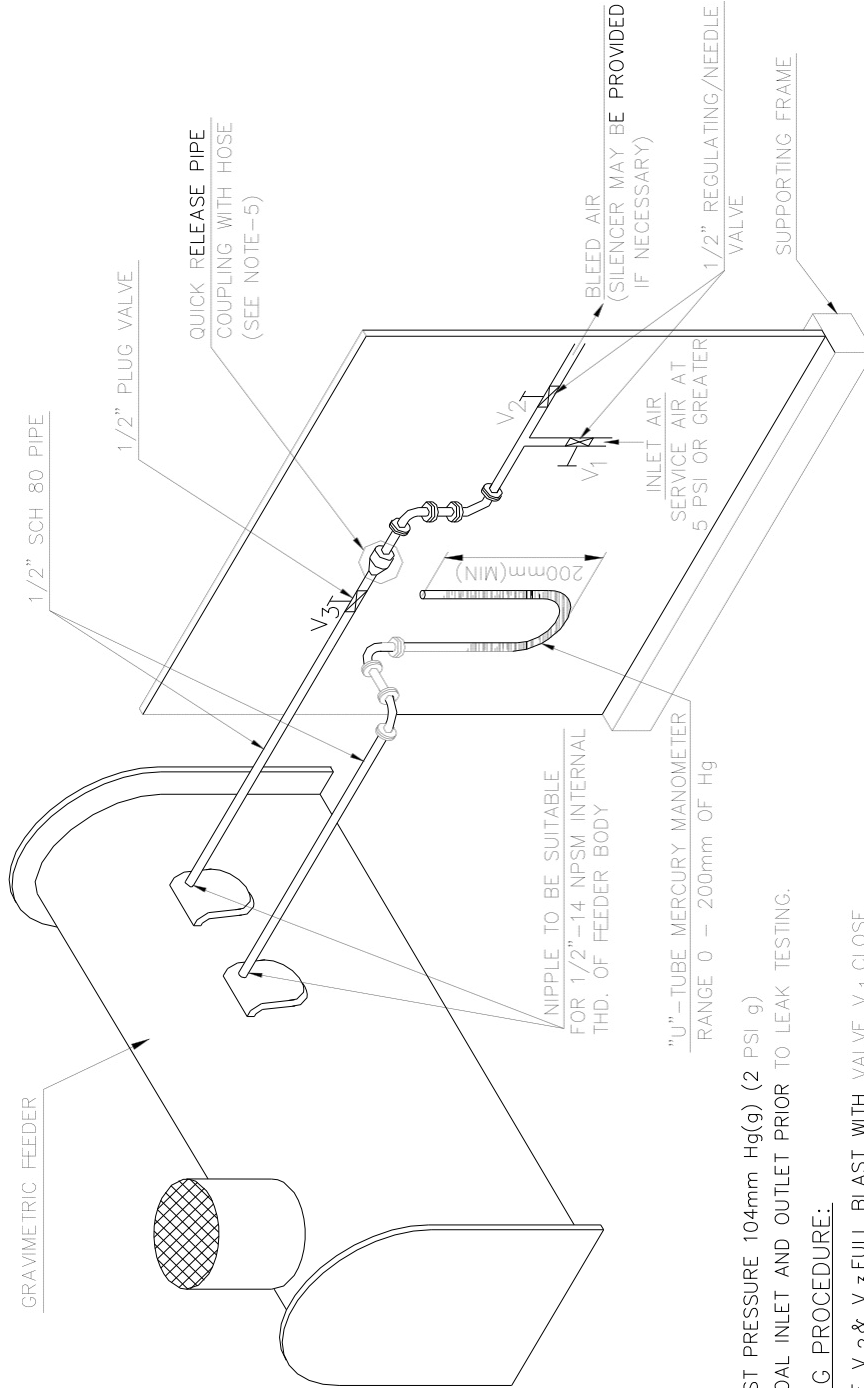
**3. INSPECTION :**

- 3.1 *All work under this specification will be inspected by authorized inspection agency.*
- 3.2 *Bubble indications at any air leak proof area are unacceptable.*
- 3.3 *Leakage rates for items not identified as air tight shall not exceed engineering approved rates.*
- 3.4 *All areas requiring repair due to unacceptable leakage shall be retested after repairs have been completed.*



# 24inch inlet, 7ft Centre Distance Gravimetric Feeder Test Procedure (Annexure – III to Specification GF-724)

Sheet no.5/7



## GRAVIMETRIC FEEDER LEAK TEST SCHEME

**NOTE:**

LEAK TEST TEST PRESSURE 104mm Hg(g) (2 PSI g)  
BLANK RAW COAL INLET AND OUTLET PRIOR TO LEAK TESTING.

**PRESSURISING PROCEDURE:**

1. OPEN VALVE V<sub>2</sub> & V<sub>3</sub> FULL BLAST WITH VALVE V<sub>1</sub> CLOSE.
2. OPEN VALVE V<sub>1</sub> GRADUALLY TO PRESSURISE FEEDER.
3. ADJUST V<sub>1</sub> & V<sub>2</sub> TO HOLD THE FEEDER BODY PRESSURE AT 104mm Hg(g)(2 PSI g).
4. CLOSE THE VALVE V<sub>3</sub> TO HOLD PRESSURE INSIDE FEEDER BODY.
5. QUICK RELEASE PIPE COUPLING WITH HOSE, CONNECTING VALVE V<sub>3</sub> ON THE UPSTREAM SIDE TO BE UNCOUPLED WHILE HOLDING THE PRESSURE (2 PSI g) INSIDE FEEDER BODY.



# 24inch inlet, 7ft Centre Distance Gravimetric Feeder Test Procedure (Annexure – III to Specification GF-724)

Sheet no.6/7

## **Accuracy Test Procedure**

### **OBJECTIVES :**

*To compare the amount of coal that the feeder delivers with the amount of coal registered on the totalizer.*

### **1. SCOPE :**

*This test shall be done on complete feeder assembly in the test tower.*

### **2. REFERENCE DOCUMENTS :**

*This procedure is prepared based on related stock procedure.*

### **3. TEST PROCEDURE :**

- 3.1. *Install the feeder in test tower and interconnect the same with the remote and integral cabinets.*
- 3.2. *Calibrate the feeder as per feeder calibration procedure.*
- 3.3. *Keeping the outlet gate of feeder inlet bunker closed, fill coal in the inlet bunker.*
- 3.4. *Weigh the empty outlet trolley and place it under the feeder discharge.*
- 3.5. *Ensure the outlet gate of feeder inlet bunker is closed.*
- 3.6. *Start and run the feeder for 10 minutes at about 700 RPM.*
- 3.7. *Stop the feeder.*
- 3.8. *Set demand signal corresponding to the desired feed rate.*
- 3.9. *Open the outlet gate of feeder inlet bunker.*
- 3.10. *Note the feeder totalizer reading.*
- 3.11. *Start and run the feeder till all the coal in the inlet bunker is delivered to the outlet bunker.*
- 3.12. *Note the feeder totalizer reading on completion of coal delivery.*
- 3.13. *Weigh the outlet trolley with coal.*



**24inch inlet, 7ft Centre Distance  
Gravimetric Feeder Test Procedure  
(Annexure – III to Specification GF-724)**

Sheet no.7/7

3.14. Repeat steps 4.3 to 4.13 for 10 runs with different feed rates.

3.15. Record Data in the format.

**4. COMPUTATION OF PERCENTAGE ERROR.**

4.1. Compute actual coal delivered in each run in Kgs. as measured in weigh scale  
= Gross weight of outlet trolley with coal – Tare weight of outlet trolley  
(Empty).

4.2. Compute coal delivered in each run as per totalizer = Feeder totalizer after  
run – Feeder totalizer before run.

4.3. Add the actual coal delivered for 10 runs.

4.4. Add coal delivered as indicated by totalizer for 10 runs.

4.5. Percentage Error =  $[(W_A - W_T) / W_A] \times 100$

Were  $W_A$  = Weight actual coal deliver

$W_T$  = Weight of coal delivered as indicated by totalizer.

-----



**ANNEXURE-V TO GF-724**

**PAINTING SCHEDULE**

PROJECT: NALCO DAMANJODI

PGMA	Surface Prepn &- Surface Profile	Primer coat		Intermediate coat	Finish coat			Total DFT $\mu$ m (min)
		Paint	No. of coats		Paint	No. of coats	Shade	
65-724	SSPC-SP3/ Power Tool Cleaning	PVC copolymer based (or) synthetic enameling alkyd resin based paint with 30 DFT(At Shop)	2	NIL	PVC copolymer based (or) synthetic enamelling alkyd resin based paint with 30 DFT(At Site)	2**	Smoke grey shade no. 692 of IS 5	120

\*\* - To be applied at site



**TECHNICAL SPECIFICATION FOR MICROPROCESSOR BASED  
GRAVIMETRIC FEEDER CONTROLS**

SPECIFICATION NO: TCI: 283 (VFD) / NALCO DAMANJODI /REV 00

**TECHNICAL SPECIFICATION FOR MICROPROCESSOR BASED  
GRAVIMETRIC FEEDER CONTROLS  
REMOTE POWER CABINET & FEEDER INTEGRAL CABINET  
EMC TYPE**

REVISION HISTORY:

REV NO	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
00	07/03/2022	FRESH RELEASE	SKS	KV	DK



## TECHNICAL SPECIFICATION FOR MICROPROCESSOR BASED GRAVIMETRIC FEEDER CONTROLS

SPECIFICATION NO: TCI: 283 (VFD) / NALCO DAMANJODI /REV 00

### 1.0 Scope of supply for microprocessor based gravimetric feeder controls :

1.1	Remote power cabinet housing the microprocessor controls (With dimensions 2315 (H) X 600 (D) X 1200 (W) mm)	
1.2	Feeder Integral Cabinet housing the load cell Amplifier and Electronics for feeder calibration. All the feeder mounted C&I instruments.	
1.3	Feeder Calibration instrument & accessories (as applicable to the design) - <u>3</u> <u>sets / boiler</u>	
1.4	"No COAL" flow detector of ultrasonic type shall be provided in the raw coal discharge line from bunker to the coal feeder. This shall be as per Specification TCI :267/STD/REV.03.	
1.5	<p><b>Commissioning spares comprising of the following items</b></p> <p>Vendor shall replace any component failures including electrical /electronic modules/ controller during commissioning of the system for any number of feeders without any commercial implications BHEL.</p>	
1.6	<p><b>Quantity of Spare components (as applicable to the design) to be supplied for each boilers of PO:-</b></p> <p>MPCB - 2 Nos. MCCB - 2 Nos. MCB – 6 Nos. Phase failure Monitor – 2 Nos. Control Relays – 6 Nos. Contactors – 6 Nos. Indication lamps – 5 Nos. Timers – 4 Nos. Surge suppressors -10 Nos. Pushbutton – 2 Nos. Overload relay – 3 Nos.. Controller – 1 No. HMI – 1 No. I/O Card – 1 No. Any other electronics applicable to vendor specific design -1 No. each type.</p> <p>Vendor shall maintain the above quantities for each ratings/types. Note: These spare components are excluding to clause 1.5 for commissioning spares.1.5</p>	



**TECHNICAL SPECIFICATION FOR MICROPROCESSOR BASED GRAVIMETRIC FEEDER CONTROLS**

SPECIFICATION NO: TCI: 283 (VFD) / NALCO DAMANJODI /REV 00

1.7	<p><b>Document Submission</b></p> <p>Documents listed in clause 4.2 of the specification to be submitted within 15 days after placement of purchase order for approval.</p>	
1.8	<p><b>Commissioning support</b></p> <p>As per clause 8.0 of this specification.</p>	
1.9	<p><b>Training</b></p> <p>As per clause 6.0 of this specification.</p>	

**2.0 Specification for feeder controls with microprocessor based control system:**

2.1 The MPC based feeder controls (Variable frequency Drive based controls) shall be suitable to process signal from two independent speed sensors and shall comprise of associated amplifiers etc. for each of the coal feeders. Output from the speed sensors shall be processed to provide six numbers of 4-20 mA DC analog signals representing actual federate and any other signal(s) required for the control of coal feeder. Weighing system of the equipment shall be based on dual load cells and shall have the high resolution by proper selection of load cell range.

Each coal feeder controls shall receive signals from DDCMIS for feeder speed controls. The signal provided by DDCMIS is 4-20 mA DC signal. Vendor shall provide galvanic isolation in the offered feeder control system to receive the 4-20mA DC signal from DCS. Vendor to provide all required power amplifier units/interface devices to accept this 4-20 mA signal.

All associated electronics like buffer amplifiers, frequency to current converters etc, shall be provided for each feeder controls with feeder delivery rate/speed indicators and integrators. Special outlets shall be used for all low level signals. The speed sensors shall be totally enclosed, fire, dust and weather-proof suitable for the service conditions. The belt speed measurement shall be non-contact type (using proximity switch etc.) Necessary sensing arrangement to monitor coal on belt, feeder discharge plugged and other protection interlocks for safe operation of the feeder are to be provided.

Alphanumeric display of feed rate; density; motor speed; total weight, automatic and manual calibration of the weighing system and adjustment of system drift, non-volatile memory to store information and program data, alarm generation automatic transfer from gravimetric to volumetric in case of failure of load cell, status LED, keyboard for configuration.



## TECHNICAL SPECIFICATION FOR MICROPROCESSOR BASED GRAVIMETRIC FEEDER CONTROLS

SPECIFICATION NO: TCI: 283 (VFD) / NALCO DAMANJODI /REV 00

The control cabinet shall be provided with self diagnostic facility and provision to display alarms for abnormal conditions. Vendor shall facilitate to display the diagnostic alarms on the OWS in Unit control room.

Electronic modules mounted local to the feeder body shall be suitable for operating in a non-air-conditioned area in a suitable enclosure to combat the effect of noise, vibration, entry of dust etc. Coal feeder controller shall be located in the CER (Control Equipment Room).

The control cabinet shall be provided with individual lights to signal the individual internal trip conditions. Necessary electronics/push buttons shall be provided in the control cabinet for resetting feeder internal trip. In addition to the internal trips, there shall be overload trip associated with feeder motor starter. Provision for resetting the same shall be provided. If there are any electronic modules required to be mounted local to the feeder body, then those shall be suitable for operating in non-air conditioned area in a suitable enclosure to combat the effect of noise, vibration, entry of dust etc.

The coal feeder system shall include the necessary instrumentation for local and remote indication of rate of flow, speed and totaliser showing the total weight of coal passed to the pulverisers.

All instrumentation and control system shall be constructed in accordance with the latest applicable requirements of ANSI, IEEE, ISA, NEMA, DIN, VDE, TRD, NFPA etc.

Motor shall be energy efficient IE3 as per IS:12615

Motor Degree of protection : IP55 with additional removable canopy

### 2.2 Accuracy & Repeatability:

Feeder weighing accuracy	: $\pm 0.5\%$
Repeatability	: 0.1%.

### 3.0 Items listed below are required from the vendor pertaining to the design in which microprocessor controls are mounted in remote power cabinet located between 30m and 300m.

3.0.1 Remote power cabinet as per clause 3.1 & 4.0 of this specification

3.0.2 Feeder integral cabinet as per clause 3.2 & 4.0 of this specification.

3.0.3 Calibration instruments kit and accessories suitable for the above design.



**TECHNICAL SPECIFICATION FOR MICROPROCESSOR BASED  
GRAVIMETRIC FEEDER CONTROLS**

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3.0.4 Special testing instruments if any may be specified and included in the offer.

**3.1 Remote Power Cabinet:**

3.1.1 Free standing weather-proof remote power cabinet (EMC PANEL) containing MPCB with door interlock, power transformers, control transformers, main drive AC motor starter, Variable Frequency Drive controller with forward and reversing, cleanout conveyor motor starter (continuous operation), start circuit relay, extra relays for contacts, time delay relays for feeder trip, slave relays to meet contact ratings, microprocessor control system, rate/speed feedback modules providing 4-20 mA DC feedback signals, dual speed detector, LED for indication lamps, selector switches, anti-vibration pad along with 2 mm thick stainless steel kick plate covering base channel and anti-vibration pad, power reed relay etc. shall be provided. All the components/electronics mounted inside the remote power cabinet shall be EMC (electromagnetic compatible) compatible and make shall be subject to BHEL approval. For dissipation of heat generated inside the RPC, necessary cooling fan with EMI compatible louver with honey comb filters and perforated brass mesh screen at the bottom and EMI compatible louver with honey comb filters and perforated brass mesh screen at the top shall be provided.

3.1.2 All interlocks and control hardware required for feeder start, stop/trip and run shall be taken care of in the cabinet.

3.1.3 The cabinet shall be suitable for mounting in a non-air conditioned room, which is away from the coal feeder.

3.1.4 All the electrical and electronic components provided in the cabinet shall suitable for operating continuously trouble free at an ambient temperature of 60°C.

3.1.5 The height, width, depth, colour and finish of the cabinet shall be as per BHEL approved general arrangement drawing.

3.1.6 All the mating surfaces including cable gland plates etc. on which the gaskets are fixed shall be made electrically conductive surface and then the conductive gaskets shall be fixed by using silver based conductive glue.

**3.1.7 Cabinet Fabrication & Construction Details**

3.1.7.1 The cabinet shall be of professional quality welded / modular construction made from CRCA Grade-D sheet steel (branded make) as per IS-513 (or) GI Sheet steel 2mm (min.) thick for door, 2mm (min.)



**TECHNICAL SPECIFICATION FOR MICROPROCESSOR BASED  
GRAVIMETRIC FEEDER CONTROLS**

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thick for sides, 3.0 mm for faces supporting instruments and shall be rigid freestanding, neat in appearance. Component mounting plate shall be rigidly fixed and made from 3mm thick GI sheet steel (branded make) or Zinc passivated to 15-20 microns. Necessary stiffeners / supports shall be provided to avoid bowing and bending. Component mounting plate shall not be fixed directly on to the cabinet enclosure.

Panel dimension: {2200+15+100(H)x1200(W)x600(D)}mm

- 3.1.7.2 The cabinet shall be mounted on anti-vibration pad, 15 mm thick suitable for fixing to the ISMC channel of 100mm height with self-drilling anchor bolts together with all required accessories. The cabinet construction shall have adequate strength to support mounted components during shipment.

GI strip of 1mm thick shall be welded to inner side of door that is mating with the conductive gasket. Enclosure doors should be connected to inside of the side panels at regular intervals using thick braid or metal strips.

- 3.1.7.3 The finished cabinet surface shall be free from all waves, bellies and other imperfections.

Painting: The finished cabinet surfaces shall be free from all waves, bellies and other imperfections. All cabinet exterior steel surfaces shall be pre-treated by 7-tank process (or) pre-treatment (Spray line) & Primer (Dip coat). Surface preparation shall be done by power tool cleaning after degreasing and rinsing. Powder coating (Epoxy based powder) shall be done for both exterior and interior of the control panel. Thickness of painting for exterior, interior shall be 75 microns.

Applicable paint shade: Exterior & Interior RAL 7035 (SemiGlossy)

- 3.1.7.4 For routing the cables coming from outside, the cabinet shall have bottom removable cable gland plate of 4mm thick CRCA grade-D sheet steel fixed with conductive gasket. The mating surface shall be made conductive surface first and then conductive gasket shall be fixed using silver based conductive glue. EMC compliant cable glands are to be supplied along with each panel for which cable size details will be provided after purchase order.

- 3.1.7.5 The cabinet enclosure shall be suitable for IP-32 degree of protection as per IEC 60529. Suitable canopy (removable type) at top to prevent ingress of dripping water shall be provided.

- 3.1.7.6 Wire duct of adequate size shall be provided for better layout and easy maintenance.

- 3.1.7.7 Grouping and termination of power and control wiring inside the RPC shall be done neatly.

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- 3.1.7.8 Tinned copper earth bus 25x3mm with mounting base, insulated bush etc shall be provided with 8 termination screws for different cable size varying from 2.5.mm<sup>2</sup> to 16 mm<sup>2</sup>. Separate earth strip to be provided for electronic components earthing.
- 3.1.7.9 Two numbers brass bolt with nut for connecting customer's GI earth flat shall be provided on back side of the panel.
- 3.1.7.10 Zinc plated (yellow) wiring accessories such as plate washer, spring washer and serrated washers as required shall be used for fixing of components.
- 3.1.7.11 Flush type ergo form lock/Manufacturer standard control panel lock shall be provided for door locking.
- 3.1.7.12 The locking arrangement shall be such that left side door can be opened only after opening right side door. Also necessary defeat mechanism shall be provided for the power isolation switch for opening the door without switching OFF the incoming power supply.
- 3.1.7.13 Four number of M12 lifting hooks shall be provided on top of the panel.
- 3.1.7.14 Aluminium anodized nameplates shall be provided for all door mounted and inside mounted components. The nameplates provided on the door of the cabinet shall be fixed using screws in addition to pasting. For inside mounted components, the nameplates shall be fixed by using suitable adhesive compound.
- 3.1.7.15 EMC compatible Indicating lamps, selector switches shall be provided by vendor on the panel front as per schematic diagram.
- 3.1.7.16 Terminal block used for power wiring shall have a rating of 44A, 800 V rating. The terminals shall be identified with number strip with legible numbering. The terminals blocks shall be rigidly fixed using zinc plated screws and washers/ screwless (Wago/equivalent) terminal blocks shall be provided. 20% spare terminals shall be provided over and above the terminal blocks wired.
- 3.1.7.17 Terminal block used for control wiring shall have a rating of 26A, 800V rating. The terminals shall be identified with number strip with legible

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numbering. The terminals blocks shall be rigidly fixed using zinc plated screws and washers / screwless (Wago/equivalent) terminal blocks shall be provided. 20% spare terminals shall be provided over and above the terminal blocks wired.

3.1.7.18 Wire dressing spiral of polyethylene material of adequate size shall be used for neat dressing of door-mounted components wiring.

3.1.7.19 Removable screw type canopy shall be provided on top to prevent ingress dripping of water.

3.1.7.20 **Cabinet wiring and accessories:**

Power cables used in the cabinet shall be of 1100V grade, multicore stranded annealed copper conductor, and FRLS PVC insulated 4.0 mm<sup>2</sup>. Similarly the control cable shall be of 1100V grade, multicore stranded, annealed copper conductor of size 1.5 mm<sup>2</sup>. (Reference standard IS 694)

All power and control terminal blocks used in the cabinet shall be of nickel- coated brass (non-ferrous) including fasteners in TB's with 800V rating. At least 20% spare terminals shall be provided over and above the actual number required. Not more than two wires shall be connected to one terminal. The control terminal blocks shall be suitable to receive cables of cross section 0.5 mm<sup>2</sup> to 2.5 mm<sup>2</sup> and power terminal blocks shall be suitable to receive cables of cross section 2.5 to 16 sq mm.

The terminal blocks (power/control) shall be located at a minimum of 150mm from bottom of the cabinet so that easy termination of external cables can be done after panel erection at site. 100mm space between adjacent terminal blocks shall be provided to ensure safe working of the system. The terminal blocks within the cabinet shall be mounted on support brackets fixed to the component mounting plate with round-machined screws. All terminals shall be clearly marked with identification numbers to facilitate connections to external wiring.

Over voltage (+ 15%) and under voltage (-15%) shall be set in phase failure relay at vendor works itself. However, the phase failure relay shall have facility for adjusting the over voltage and under voltage setting. Two changeover contacts shall be provided in the phase failure relay to meet the circuit-wiring requirement.

Contact outputs from the power and auxiliary contactors shall be terminated as per the requirement shown in the schematic diagram. Output contacts of auxiliary contactors shall be rated for minimum 5A at 240V AC and 0.5A at 220V DC and for power contactors the contact rating shall be as indicated in the bill of material.

All exposed conductive parts of the enclosure shall be connected to ground



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through low impedance conductor.

Sensitive cables like Input / Output cables to card rack and modules, CPU module to display unit RS 232 cable etc. should not be routed close to openings of the enclosure.

One 3 phase, 2-stage power line filter with adequate rating shall be provided at input of transformer. Separate power line filter shall be installed for digital input logic card, I/O rack motherboard and keyboard & display unit.

3.1.8 Panel shall have provision for mounting smoke detectors arranged by customer. 24V DC for the smoke detector will be arranged for each remote power cabinet. For terminating power supply and feedback contacts, 12 way terminal blocks shall be provided inside the remote power cabinet.

3.1.9 **Potential free contact to be provided in Remote Power Cabinet for FSSS interface:**

1. Feed Rate  $\geq 50\%$  (NO)
2. Feeder Run (NO)
3. Feeder Off (NC)
4. Feeder Off (NC)
5. Feeder in Remote (NO)
6. Coal on Belt (NO)\*

(NO) - Normally Open

(NC) - Normally Close

“\*” - There shall be mechanism to detect coal availability over the belt.

**All the above potential free contacts shall be rated for minimum 5 amps. At 240 volt AC or 0.5 amp. At 220 volt DC.**

**All the above potential free contacts shall be available at Control room panel and properly wired at Terminal Block.**

3.1.10 **Potential free contact to be provided in Remote Power Cabinet for DDCMIS for alarm purpose:**



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1. Feed Rate  $\geq 50\%$  (NO)
2. No coal flow (NO)\*\*
3. Feeder Discharge Plugged Alarm (NO)
4. Feeder Run (NO)
5. Feeder Off (NC)
6. Coal on Belt (NO)
7. Clean out conveyor shear pin alarm (NO)
8. Coal flow in bunker downspout (NO)
9. No Coal flow in bunker downspout (NC)
10. Phase Failure (NO)
11. Feed Rate Error Alarm (NO)
12. Feeding normally(NO)
13. Feeder Trip (NO)
14. Power loss trip after 2Sec. (NO)
15. Feeder Running Reverse (NO)
16. 100KG Pulse Data Logging Programmable (NO)
17. Belt Motion Monitor (Zero speed sensor) Alarm (NO)
18. Feeding Gravimetric (NO)
19. Feeding Volumetric (NC)

(NO) – Normally Open

(NC) – Normally Close

\*\* - No Coal flow indicates non availability of coal over the belt in remote mode.

**All the above potential free contacts shall be rated for minimum 5 amps. At 240 volt AC or 0.5 amp. At 220 volt DC.**

**All the above potential free contacts shall be available at Control room panel and properly wired at Terminal Block.**

Note: For 100KG Pulse Data Logging Programmable (NO) – vendor shall use separate



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reed relay consisting of 2NO+2NC outputs.

**Comus relay 3582 7454 24 3 / Coto relay 8704-24-10 / Equivalent**

**3.1.11 Indication lamps to be provided:**

1. Cleanout motor Over load - Amber
2. Feeder motor Over load - Amber
3. No coal flow - Red
4. Discharge plugged -Red
5. Phase failure- Red
6. Cleanout conveyor run - Red
7. Cleanout conveyor off - Green
8. Bunker no coal flow - Red

**Aluminium anodized nameplates aesthetically good in nature shall be provided for all indication lamps. The nameplates provided on the door of the cabinet shall be fixed using screws in addition to by pasting.**

**3.1.12 Essential trip conditions:**

1. Loss of both speed sensor signal
2. Zero speed sensor timed out (provision to disable the trip shall be available, tripping time delay programmable)
3. Feeder discharge plugged (tripping time delay programmable)
4. No coal on belt in remote mode (tripping time delay programmable)
5. Coal on belt in local or calibration (tripping time delay programmable)
6. Motor-starter fault
7. RPM deviation
8. Bunker no coal flow in remote mode (provision to disable the trip shall be available)

Note: Bunker no coal flow tripping time delay is the time required to empty the bunker volume at current actual feedrate.



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**All other trip conditions applicable to the feeder design shall be taken care.**

**3.1.13 Essential alarm conditions:**

1. Load cell 1 signal out of range
2. Load cell 2 signal out of range
3. Demand signal out of range
4. Loss of speed sensor-1\*
5. Loss of speed sensor-2
6. Feed rate error

\*- In case of Loss of speed sensor-1, automatic smooth changeover from speed sensor-1 to speed sensor-2 shall take place and vice versa.

**All other alarm conditions applicable to the feeder design shall be taken care**

**3.1.14 Essential programmable parameters:**

1. Maximum feedrate ( in metric tonnes per hour )
2. Minimum feedrate ( in metric tonnes per hour )
3. Speed for local / calibration mode ( in rpm or in % )
4. Default density

**All other programmable parameters applicable to the feeder design shall be taken care.**

**3.1.15 Self check display:**

1. Actual feedrate ( in metric tonnes per hour )
2. Raw load cell signal
3. Historic density
4. Motor actual speed or Belt speed
5. Gravimetric mode material total ( in metric tonnes )
6. Volumetric mode material total ( in metric tonnes )



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7. Material total (gravimetric + volumetric ) ( in metric tonnes )

\* – Automatic change over from gravimetric to volumetric mode shall happen in case of load cell signal failure. In volumetric mode feeder shall run based on historic density computed from past data minimum for one hour. Provision to run feeder from default set density shall be available.

All other self check display applicable to the feeder design shall be taken care.

**3.1.16 Feedrate feedback signal to customer (4-20 mA):**

1. Feedrate feedback signal to combustion control ( to DDCMIS)
2. Feedrate feedback signal to combustion control ( to DDCMIS)
3. Feedrate feedback signal to mill air flow & temp. Control (DDCMIS)
4. Feedrate feedback signal (to SADC)
5. Spare
6. Spare

All Feedrate feedback signals shall be galvanically isolated using loop powered current isolators for each signal and the same shall be in vendor scope.

**3.1.17 Demand signal from customer (4-20 mA):**

Feedrate demand signal from combustion control (from DDCMIS)

Note:

1. 20mA corresponds to maximum feedrate keyed in program parameter.
2. The minimum feedrate programmed shall be maintained constant down to 4mA.

**3.1.18 Feeder ON/OFF input:**

**IN REMOTE MODE:**

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Feeder START command is through normally open potential free contact from FSSS system. The START command is a momentary pulse signal.

Feeder STOP commands is through normally closed potential free contact FSSS system. The STOP command is a momentary pulse signal.

Also based on program, system shall be able to accept sealing START command (instead of momentary pulse).

**IN LOCAL MODE:**

By way of HMI in feeder remote control cabinet.

**3.1.19 Utility requirement:**

1. Cooling air fan with louver suitable for 240V AC shall be provided at the bottom in control room cabinet.
2. Industrial grade convenience plug & sockets 3-way (15A, 240V AC) with fuse and surge protection shall be provided with rigid supporting bracket with protective cover and warning sticker in control room cabinet.

**3.1.20 General requirement:**

1. Electronics handling caution sticker (anodised aluminium) shall be engraved and fixed on the inner side of the control cabinet door.
2. Caution sticker over the shrouding of power terminal blocks and transformers shall be provided.
3. One no. 415V, 3ph, 3 wire, 50 Hz (voltage variation  $\pm 10\%$  and frequency variation  $\pm 5\%$ ) and combined variation 10% (absolute sum) power supply given to each remote control panel. Any other power supply required for controls mounted inside RCP & Field cabinet shall be derived from incoming 415V power supply
4. One no. 230V, 1ph, 50 Hz UPS (voltage variation  $\pm 10\%$  and frequency variation  $\pm 5\%$ ) and combined variation 10% (absolute sum) power supply is provided for each RCP for feeder controls.
5. 110 V Ac, 1Ph supply is required from field cabinet for interfacing bunker acoustic coal flow monitor. Which shall be derived from 240V, 1ph, 50 Hz UPS



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Hz in RCP.

6. The 230V, 1ph, 50 Hz (voltage variation  $\pm 10\%$  and frequency variation  $\pm 5\%$ ) and combined variation 10% (absolute sum) power supply is for illumination/cooling fan purpose only.

**3.1.21 Switch requirement:**

1. Clean out conveyor on/off selector switch shall be provided on control room cabinet.
2. Door limit switch shall be provided for control room cabinet illumination.

3.1.22 Incoming power supplies to be terminated in terminal block prior to wiring to disconnect switch/MPCB.

3.1.23 Foundation bolts, nuts and washers shall be supplied along with remote power cabinet.

3.1.24 Schematic drawing, interconnection drawing shall clearly indicate the terminal block detail. The ferrule number shall be clearly indicated in the scheme and interconnection diagram.

3.1.25 All control, power and shielded cable wiring to terminal blocks shall be done using cable lugs.

**3.2 Feeder Integral Cabinet:**

3.2.1 The FIC (EMC TYPE) shall be fabricated from CRCA grade-D sheet steel (branded makes) as per IS-513 of 2mm thick for door, 3.0 mm for faces supporting instruments ,2mm thick for sides and shall be suitable for wall mounting onto the coal feeder. The FIC shall be provided with mounting brackets at the back to facilitate mounting onto the feeder. The FIC shall have continuous hinge with stainless steel pin and single door arrangement. FIC GA drawing shall be referred for the overall dimensions, layout of components viz. selector switches, indication lamps, cable entry cut out details on the sides of the panel etc.

3.2.2 The construction of the FIC shall meet the enclosure protection class of IP-55 as per IS-13947 and shall be EMC compliant. Suitable Canopy shall be provided for Feeder Integral Cabinet.

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- 3.2.3 The door shall be suitable for 120° opening.
- 3.2.4 Pad lock with six-lever Godrej lock / Panel manufacturer standard lock and 3 keys shall be supplied for door locking to meet IP-55 enclosure protection. SS handle to be provided on the door for opening and closing. OR ergo form lock to be provided.
- 3.2.5 Removable un-drilled Gland plate made from 4mm thick CRCA grade-D material shall be provided at the bottom of the panel. Drilled gland plate made from 4mm thick CRCA grade-D material shall be provided at the side of the panel. All the mating surfaces for cable gland plates (bottom & side) on which the gaskets are fixed shall be made electrically conductive surface and then the conductive gaskets shall be fixed by using silver based conductive glue.
- 3.2.6 Tinned copper earth bus of size 25x3mm shall be provided with approximately 10 termination screws for different cable sizes varying from 2.5 to 16 mm<sup>2</sup> with suitable insulated cable lugs and required accessories.
- 3.2.7 Zinc passivized component mounting plate of 3mm thick CRCA grade-D material shall be provided for mounting all the electrical and electronic modules. The component mounting plate shall be zinc passivated to 15-20 microns. Component mounting plate shall not be fixed directly on to the cabinet enclosure.
- 3.2.8 The panel shall have suitable cabinet illumination lamp suitable for 240V, 1Phase AC along with door-operated switch.
- 3.2.9 Two number of M12 lifting eye bolts with washer and nut shall be provided on top of the cabinet.
- 3.2.10 Fixing clamp with spring loaded nuts (6 Nos. / Panel) for mounting the panel onto the feeder shall be supplied along with each FIC.
- 3.2.11 Necessary stiffeners for door shall be provided by the vendor to avoid bowing and bending. The mating part of the door shall be provided with GI strip of 1mm thick to ensure conductive path. Also braided wire of adequate size shall be provided between the door and the panel.
- 3.2.12 Two numbers M8 brass bolt with nut and washer for connecting GI earth flat shall be provided.



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3.2.13 All component-fixing screws shall be zinc passivated and provided with spring washers

3.2.14 Aluminium anodized nameplates shall be provided for all door mounted and inside mounted components. The nameplates provided on the door of the cabinet shall be fixed using screws in addition to pasting. For inside mounted components, the nameplates shall be fixed by using suitable adhesive compound.

3.2.15 The terminal block used for power wiring shall have a rating of 44A, 800V rating.

The terminals shall be identified with number strip with legible numbering. The terminals blocks shall be DIN rail mountable and be rigidly fixed using zinc plated screws and washers / Screwless wago make terminal block. 20% spare terminals shall be provided over and above the terminal blocks wired.

The terminal block used for control wiring shall have a rating of 26A, 800V rating. The terminals shall be identified with number strip with legible numbering. The terminals blocks shall be DIN rail mountable and be rigidly fixed using zinc plated screws and washers / Screwless wago make terminal block. 20% spare terminals shall be provided over and above the terminal blocks wired.

3.2.16 Terminal blocks shall be located at a minimum of 100 mm from the base of the cabinet for easy accessibility of termination of external cables. The space between adjacent terminal blocks shall be 150 mm minimum.

3.2.17 Fasteners of power and control terminal blocks shall be nickel- coated brass (non-ferrous). Not more than two wires shall be connected to one terminal. The terminal blocks shall be suitable to receive cables of cross section 0.5 sq.mm to 10 sq.mm.

3.2.18 Wire dressing spiral of polyethylene material shall be used for neat dressing of door-mounted components wiring.

3.2.19 **Painting:** The finished cabinet surfaces shall be free from all waves, bellies and other imperfections. All cabinet exterior steel surfaces shall be pre-treated by 7-tank process or pretreatment (Sprayline) & Primer (Dipcoat). Surface preparation shall be done by power tool cleaning after degreasing and rinsing. Powder coating shall be done for both exterior and interior of the control panel. Thickness of painting for exterior, interior and component mounting plate shall be 50-60 microns.

Applicable paint shade: Exterior & Interior 631 of IS5

3.2.20 Control wiring shall be done with cables of 1100V grade, stranded, annealed tinned



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copper conductor of size manufacturer standard with FRLS insulation.

- 3.2.21 For neat layout of components, vendor shall adopt aesthetic wiring practices.
- 3.2.22 Zinc plated (yellow) mounting fasteners such as plate washer, spring washer and serrated washers as required shall be used for fixing of components.
- 3.2.23 Mating surface shall be made conductive surface first and then conductive gasket shall be fixed using silver based conductive glue. EMC compliant cable glands are to be supplied along with each panel for which cable size details will be provided after purchase order.

Removable screw type canopy shall be provided on top to prevent ingress dripping of water.

**3.2.24 Indication lamps to be provided in Feeder integral Cabinet**

1. Local - Amber
2. Calibrating - Amber
3. Cleanout conveyor run - Red
4. Cleanout conveyor off - Green
5. Remote- Amber
6. Feeder run forward- Red
7. Feeder off - Green
8. Feeder run reverse- Red

Aluminium anodized nameplates aesthetically good in nature shall be provided for all indication lamps. The nameplates provided on the door of the cabinet shall be fixed using screws in addition to by pasting.

**3.2.25 Switch requirement:**

1. Door limit switch shall be provided for field cabinet illumination.
2. 3 position rotary selector switch (lockable & removable in forward position) with front legend plate engraved with REV-OFF-FWD
3. 4 position rotary selector switch with front legend plate engraved with



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REMOTE-OFF-LOCAL-CAL.

(For Remote run, local run (when there is no coal on conveyor) and calibration purpose)

4. 1 pole on/off rotary selector switch ( feeder work light selector switch)

**3.2.26 Utility requirement:**

1. Industrial grade convenience plug & sockets 1-way (15A, 240V AC) with fuse and surge protection shall be provided with rigid supporting bracket with protective cover and warning sticker in field cabinet.

**3.2.27 Cable requirement:**

1. Following interconnecting cables are in BHEL scope of supply:
  - a.) Power Cable : Between Feeder integral cabinet (FIC) and Remote power cabinet(RPC): 3Core cable for Main drive (6mm<sup>2</sup> to 16 mm<sup>2</sup>) & clean out conveyor (2.5mm<sup>2</sup>).
  - b.) Utility power cable: Between FIC & RPC : 2Core (2.5mm<sup>2</sup>)
  - c.) Control Cable: Between FIC & RPC: 19Core (1.5/2.5 mm<sup>2</sup>).
  - d.) Signal Cable: Between FIC & RPC : 2pair (1.5mm<sup>2</sup>) pair & overall shielded cable

Along with offer bidder to mention the no. of runs applicable for above cables.

2. Any other variety of cables required for the system integration shall be under vendor scope (The run length between Field & Remote cabinet per feeder is 300 m (approx.)).

Considering above points, along with offer, Bidder to furnish complete list of cables, No. of cores, Type of cable, No. of runs, Size of cable etc. to BHEL which are in BHEL scope of supply & Bidder scope of supply.

Note: Vendor to group the terminal blocks in both the panels to suit the above cable details w.r.t size & type.

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**3.2.28 Soft Link Communication to DCS**

Offered Feeder control system shall be capable of remote monitoring & control with existing DCS by soft link connectivity.

Required interface terminals for control and monitoring of coal feeder from station DCS including feeder diagnostics shall be provided. The feeder controller shall have communication facility with DCS through softlink (free Ethernet based TCP/IP or OPC softlink communications)

All required signal like feeder run, feeder stop, feeder speed, coal flow rate, totalizer, clean out conveyor run & stop, feeder discharge plugged & coal on belt etc. shall be available at station DCS through soft link communication for control and monitoring.

**4.0 Document submission schedule**

4.1 The vendor shall furnish the following documents for microprocessor based Gravimetric Feeder Control system along with the offer.

- a) Clause wise confirmation to this tender specification.
- b) Functional write-up for microprocessor based control system offered
- c) Confirmation for overall dimensions of remote power cabinet and feeder integral cabinet and gland plate size and floor cut out details of remote power cabinet.
- d) Block diagram showing the input/output signals.
- e) Heat loading for the control panel.
- f) List of customer / installations where similar type of MPC based controls with AC motor and variable frequency drive operation have been commissioned.
- g) Vendor quality plan.
- h) Motor Data Sheet – Main drive motor & COC motor.
- i) Complete BOM with exact quantity including make & model.

4.2 In the event of purchase order the following documents shall be furnished for approval [within 15 days].

- a) Feeder control schematics.
- b) GA drawings showing internal arrangement with dimensional details for remote power cabinet and feeder integral cabinet.
- c) Feeder logic diagrams.
- d) Internal layout and termination (connection) diagram.
- e) Catalogues for the electrical and electronics components used in the above cabinets.
- f) Cable schedule and specification for shielded cables required for interconnecting Feeder integral cabinet and Remote Power Cabinet shall be furnished.



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- g) Gravimetric feeder control write-up including calibration procedure.
- h) VQP as detailed in clause 5.4 (5 copies along with 2 copies of reference documents).
- i) Motor data sheet – Main drive motor & COC motor.

**4.3 O&M**

Vendor shall furnish complete O&M including as fitted drawings, program parameter settings, Complete BOM, Motor & Gear Box datasheets & connection diagrams between RPC & FIC. ( 3 Nos. of Soft Copies in CDs & 1 No. of hard copy per unit )

- a. The O&M manual shall contain complete details about the system including the following :
  - (a) Applicable drawings
  - (b) Full details and drawings of all equipment furnished the testing, operations and maintenance procedures etc. separately on each equipment.
  - (c) Application software listing
  - (d) As fitted drawings , Program parameter setting value, complete BOM, Motor & Gear box datasheets, Connection diagram between RPC & FIC.
  - (e) Relevant catalogues of all the modules / components used in the system
  - (f) Complete spare parts list, including ordering procedure and complete address(es) of spare part supplier(s)
  - (g) Storage instruction of components.
  - (h) Do's and Don'ts
  - (i) Testing and troubleshooting instructions.
- (j) Any other details felt necessary by the Purchaser.
- (k) **3 Nos. of soft copies in CDs & 1 No. of hard copy per unit.**

**5.0 QUALITY ASSURANCE REQUIREMENTS.**



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TYPE TEST REQUIREMENTS

EMC & Environmental Type test certificates for panel/electrical, electronics and instrumentation items shall be furnished as per applicable relevant standards and codes which in general shall not be more than 5 years old from the effective date of contract. In case Type test certificates are not available, Vendor/Supplier shall organize Type test for such items at their cost.

5.1 The vendor shall submit the vendor quality plan (VQP) and the VQP shall be as per the format” that will be provided in the event of PO.

5.2 VQP shall be duly signed by the vendor with all document control requirements like QP No. Rev.No., page control etc. All columns shall be duly filled including name of project, package, package no. etc. as indicated here.

PROJECT :  
PACKAGE :  
CONTRACT NO. :  
CONTRACTOR :

5.3 The VQP shall indicate all quality checks performed right from raw material, bought out items, manufacturing, assembly, final assembly, inspection and testing stage and shall list down all routine & type test as per relevant National / International standards. This shall also indicate pre-treatment, painting and details on electronic items.

5.6 **Electronics:**

5.6.1 Test methods adopted for electronic module based on International practice have to be indicated in the VQP. Environmental test for electronics like burn-in-test, temperature rise test have to be included in the VQP. The electronic components shall be suitable for operating under stringent environmental condition – expected when the boiler is operating.

5.6.2 The electronic components (electronic modules) shall be industrial grade or better and shall be suitable for operating at 85°C.

5.7 **For the cabinets with modules.**

5.7.1 Tests like elevated temperature variable voltage test have to be done as



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detailed below:

**5.7.1.1 BURN-IN AND ELEVATED TEMPERATURE TEST:**

All solid state electronic systems / equipments shall be tested as a complete system / equipment with all devices connected for a minimum of 168 hours continuously under energised conditions prior to shipment from manufacturing works, as per the following cycle.

**5.7.1.2 ELEVATED TEMPERATURE TEST:**

During the elevated temperature test which shall be for 48 hours of the total 168 hours of testing, the ambient temperature shall be maintained at 50°C. The equipments shall be interconnected with devices which will cause it to repeatedly perform all operations it is expected to perform in actual service with load on various components being equal to those which will be experienced in actual service.

During the elevated temperature test the cubicle doors shall be closed (or shall be in the position same as they are supposed to be in the field) and inside temperature in the zone of highest heat dissipating components / modules shall be monitored. The temperature rise inside the cubicle should not exceed 10°C above the ambient temperature at 50°C.

**5.7.1.3 BURN-IN-TEST:**

The 48 hour's elevated temperature test shall be followed by 120 hours of burn-in test as above except that the temperature shall be reduced to the ambient temperature prevalent at that time.

During the above tests, the process I/O and other load on the system shall be simulated by simulated inputs and in case of control systems; the process which is to be controlled shall also be simulated. Testing of individual components or modules shall not be acceptable.

5.7.2 All instruments / devices which are not otherwise covered in the check list shall be tested as per relevant standards to conform to specification requirements.

5.7.3 The temperature rise inside the cabinet shall be less than 10°C. For the entire field mounted equipments and cabinets enclosure protection certificates shall be submitted.

5.7.4 Following tests shall be indicated for the verification of routine tests:

- General arrangement, dimensions & bill of materials



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- Painting & finish
- Wiring – output contacts verification
- Shrouding of power terminals
- Name plate details etc.
- Continuity test
- Insulation resistance test
- High voltage (di-electric) test
- Functional check (Integral testing) (The cabinets shall be simulated with a similar mechanical feeder for checking its accuracy and other parameters)

5.8 Reference documents column: This shall include purchase order, approved specification, drawings, data sheets and National / International / Plant standards.

5.10 Manufacturing can start only after VQP is approved.

**5.11 INSPECTION & TEST REQUIREMENTS**

5.11.1 Wherever `CHP` (Customer Hold Point) is indicated in the approved VQP, vendor shall offer the material for inspection and wherever `W` is indicated in the approved VQP, vendor shall offer the material for inspection.

5.11.2 Wherever `CHP` is indicated against a stage, further manufacturing can start only after `CHP` stage is cleared.

5.11.3 Vendor shall give 21 days notice for arranging inspection.

5.11.4 Wherever `CHP` is indicated against verification of `Type test clearance from Engg.`, vendor shall ensure the same prior to inspection and submit the same during inspection.

5.11.5 Material can be despatched only after obtaining **M.D.C.C** (Material Despatch Clearance Certificate). No material shall be despatched without MDCC.

5.11.6 Vendor shall submit copy of all test certificates / documents as indicated in the approved VQP along with inspection call.

5.11.7. Testing charges for routine tests if any shall be included in the product cost and no separate testing charges for this will be considered.



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**6.0 Training:**

Vendor to indicate charges for 2 man weeks of training at vendor's works for maximum of 5 Engineers and to quote under optional items.

**7.0 Mandatory spares:**

Vendors to indicate separately charges for mandatory spares with break up price details which will be 10% of total quantity of each type & model of electronic modules or a minimum of 2 Nos. of each type & model of electronic whichever is more and to quote under optional items.

**8.0 Commissioning support:**

Vendor to indicate charges for providing commissioning support & testing at job site, under optional items.

**9.0 General Points:**

- 9.1 The microprocessor controls offered shall be of latest proven design i.e. using 16 bit Microprocessor. Vendor has to submit performance certificate from coal fired Thermal power station of minimum 250 MW rating for a period of two years.
- 9.2 The vendor shall submit necessary calculation for achieving the reliability of system with detail on MTBF (Mean Time between Failures) and MTTR (Mean Time to Repair)
- 9.3 Modules shall be with gold plated connector fingers.
- 9.4 All I/O modules shall be designed for short circuit proof.

**10.0 Instructions to vendor:**

Vendor to check receipt of complete documents referred to in the 'contents'. In the event of



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order, the entire specification will form part of purchase order for compliance during execution.

Deviation if any shall be clearly brought out in the "Deviation schedule". In case of no deviation, 'NIL' statement shall be filled in, authenticated and furnished along with the offer. Otherwise it will be construed that the vendor is fully complying with the specification.

Time is essence of the contract. Therefore, the delivery of the goods specified in the event of purchase order should be made within the time limit prescribed. Where the seller supplies or dispatches goods, beyond the delivery period specified the purchaser will have no obligation to accept the goods.