An ISO 9001 Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant**)**
Tiruchirappalli – 620014, TAMIL NADU, INDIA
MATERIALS MANAGEMENT

TITLE **DRAG LINK CHAIN FEEDERS**	Phone: +91 431 2574091/2574046 Fax : +91 431 252 0233 / 0525 Email : kg@bheltry.co.in

	Reference Number: 5101100295	**Enquiry Date: 05.08.2011**	**Due date for submission of quotation: 31.08.2011**
You are requested to quote the Enquiry number date and due date in all your correspondences.			

BHEL/Trichy is looking for ..... Supply of DRAG LINK CHAIN FEEDERS

BHEL commercial terms & conditions with Price Bid formats and all annexure can be downloaded from BHEL web site http://www.bhel.com or from the Government tender website http://tenders.gov.in (public sector units) M/S Bharath Heavy Electricals Limited) under reference **" 5101100295 dtd 05.08.2011 "**	
Tenders should reach us before 14:00 hours on the due date Technical bid will be opened at 14:30 hours on the due date Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present.	Yours faithfully, For **Bharath Heavy Electricals Limited** Manager / Purchase/ FBC&HRSG

Bharat Heavy Electricals Limited

HIGH PRESSURE BOILER PLANT,TIRUCHIRAPPALLI 620 014.

TECHNICAL DELIVERY CONDITIONS

FOR SUB - DELIVERY COMPONENTS OF

CONTROLS AND INSTRUMENTATION

LT MOTOR (AC) (NON FLAME PROOF)

Rev. No.	DATE	DESCRIPTION	PREPARED	REVIEWED	APPROVED ENGG	APPROVED QAC
01 - 05	----	General Revisions	Sd/-	Sd/-	Sd/-	Sd/-
06	29/04/99	Revised for special improvement project	Sd/-	Sd/-	Sd/-	Sd/-
07	22/12/03	Revised after revisit	Sd/-	Sd/-	Sd/-	Sd/-
08	21/04/05	Revised as per MOM dated 06/04/05 between BHEL(T) and BAP(Ranipet) at BAP(Ranipet) and BAP(Ranipet) mail dated 09/05/05				

Cl No.	CHARACTERISTICS	REQUIREMENT	VENDOR COMPLIANCE (Refer Note: 2)
1.0	SITE CONDITIONS		
1.1	Altitude above mean sea level	550 m.	
1.2	Ambient temperature condition	50°C.	
1.3	Relative humidity	100 %	
1.4	Atmosphere	Tropical ,Dusty, salty, corrosive & highly polluted.	
2.0	GENERAL		
2.1	Reference standards	IS 325, IS 1231, IS 4722, IS 6362, IS 2253, IS 12065, IS 12075 , IS 4691.	
2.2	Application	As per Enquiry & PO.	
2.3	Duty cycle	Continuous S1	
2.4	Rated voltage, frequency & Phases	415 V AC ±10%; 50 Hz ± 5%; 10% absolute sum - 3 phase	
2.5	Minimum starting voltage	80% of the rated voltage	
2.6	Minimum voltage under which motor will run satisfactorily	75% of the rated voltage for 5 minutes	
2.7	Capacity to restart (at voltage specified in point No. 2.4)	i. One hot start from hot condition ii. Two successive starts from cold condition iii. Three equally spread start per hour	
2.8	High speed bus transfer withstand capability	Suitable to withstand 150 % of rated voltage	
2.9	Type of balancing for rotor	Dynamic balancing	
2.10	Direction of rotation	Suitable for both direction	
2.11	Direction of cooling air	Non-drive end to driving end	
2.12	Class of insulation	Class F with temperature rise limited to Class B.	
2.13	Winding treatment	The insulation shall be given tropical and fungicide treatment for successful operation of the motor in hot humid & tropical climate.	
2.14	Allowed temperature rise at continuous full load	60°C by thermometer method & 70°C by resistance method	
2.15	Starting current	Less than or equal to 600% full load current subject to tolerance as per IS.	
2.16	Starting time & locked rotor	The locked rotor withstand time at 110% rated	

Cl No.	CHARACTERISTICS	REQUIREMENT	VENDOR COMPLIANCE (Refer Note: 2)
	withstand time	voltage under hot condition shall be at least 3 sec more than the starting time (at 80% of rated voltage)	
2.17	Vibration	The peak amplitude of vibration shall be as per IS 12075	
2.18	Noise level	Within the limits specified by IS 12065. (<80 db at full load condition.	
2.19	Type of enclosure	TEFC, IP 55 as per IS 4691	
2.20	Type of mounting	Horizontal foot mounted	
2.21	Bearings & Lubrication	Bearings shall be of ball or roller type effectively sealed against ingress of dust. The bearing shall be so constructed that the loss of lubricating grease is kept to minimum.	
2.22	Shaft extension	Motors shall be provided with key slotted bare shaft extension with key at the driving end.	
2.23	Terminal box		
2.23.1	Type	Weather proof IP 55 as per IS 4691, Capable of being turned through 360° in steps of 90°.	
2.23.2	Cable gland and lugs	Double compression type nickel plated brass cable glands and insulated tinned copper crimping lugs to suit the cable size shall be supplied along with the motor. i) Size of power cables will be intimated during approval. ii) For space heater cable glands and lugs suitable for 2CX2.5 to be provided	
2.23.3	Type of terminals	Stud / screw type with plain washers, spring washers / checknuts & lugs	
2.24	Fault level	40 KA for 0.25 Sec	
2.25	Painting	Epoxy based paint (Colour shade 631 as per IS:5, unless otherwise indicated specifically in the enquiry)	
2.26	Space heaters		
2.26.1	Motors above 30 kW	Separate space heater suitable for 240V, single phase AC.	
2.26.2	Motors below 30 kW	Winding shall be suitable for heating continuously	

Cl No.	CHARACTERISTICS	REQUIREMENT	VENDOR COMPLIANCE (Refer Note: 2)
		at 24 V, single phase, AC	
2.26.3	Terminals	Separately terminated with clear identification in main terminal box	
2.26.4	RTD for winding/bearing	For motor rated 160kW and above only unless specifically called for in the enquiry.	
2.27	Lifting Device	Eye bolt or lugs to facilitate safe lifting	
3.0	INSPECTION & TESTING	As per applicable quality plan QA:CI:STD:QP:24	
4.0	DOCUMENTS a) Along with offer:	3 sets of technical data sheet as per the enclosed format and Motor general arrangement drawing giving foundation details, shaft details	
	b) After placement of order	6 sets of the following: 1. Technical Data sheet as per the enclosed format 2. Motor general arrangement drawing giving foundation details, shaft details 3. Motor characteristic curves 4. Guarantee certificate 5. O & M manuals.	
4.0	PACKING	As per Packing Procedure QA:CI:STD:PR:03 or as per Manufacturer's Standard Practice. The packing shall meet the Transport , Environment & Storage hazards.	

NOTE:

1. Refer current valid list for revision status of Quality Plan & Packing Procedure.
2. In 'Vendor compliance' column Vendor to indicate 'YES', 'NO' or 'NOT APPLICABLE'.
3. RTDs, if applicable, are to be provided two per phase (winding and bearing). RTDs shall be duplex type and terminated in a separate terminal box . Termination arrangement of RTD of winding and bearing shall be submitted alongwith offer.

DATA SHEET

CL. NO	CHARACTERISTICS	REQUIREMENTS
1.0	Application	
1.1	Tag Numbers	
2.0	Manufacturer	
3.0	Type & frame size	
3.1	Degree of Protection	IP55
4.0	Rated output in kW	
4.1	Rated speed	
5.0	Rated voltage , frequency & phases	415 V AC ±10%; 50 Hz ± 5%; 10% absolute sum - 3 phase
6.0	Full load current	
7.0	Full load efficiency & power factor	
8.0	Duty Cycle	S1
9.0	Rated torque	
10.0	Starting current	600% of full load current
11.0	Starting torque in % of full load torque	
12.0	Pull up torque in % of full load torque	
13.0	Pull out torque in % of full load torque	
14.0	No load starting time	
15.0	Locked rotor withstand time at rated voltage	a. Hot b. Cold
16.0	Locked rotor withstand time at minimum starting voltage	a. Hot b. Cold
17.0	Locked rotor withstand time at 110% rated voltage	a. Hot b. Cold
18.0	Starting time at minimum starting voltage with mechanism coupled	
19.0	Starting time at rated voltage with mechanism coupled	
20.0	Maximum permissible starting time	
21.0	Stator thermal time constant	
22.0	Stator winding connection	
23.0	Class of insulation & temperature rise	Class F; 60°C by thermometer method / 70°C by resistance method
24.0	Type & number of terminals broughtout	
25.0	Resistance per phase (indicative) at 20ºC	

CL. NO	CHARACTERISTICS	REQUIREMENT
26.0	Quantity and power consumption of space heater	
27.0	Direction of rotation	Bi-Directional.
28.0	Bearing make & type	Drive End; Non Drive End;
29.0	Lubricant quantity , grade & recommended interval of lubrication	
30.0	Type of mounting & shaft orientation	Foot mounting; Horizontal.
31.0	Terminal Box	
31.1	Location & angle of rotation	
31.2	Gland size for stator winding	
31.3	Gland size for space heater	Suitable for 2CX2.5 sq.mm(armoured), if applicable.
31.4	Cable entry	
32.0	GD² of motor (kg-m²)	
33.0	Total weight of motor (kg).	
33.1	Weight of stator (kg)	
33.2	Weight of rotor (kg)	
34.0	Total weight of motor (in kg)	
35.0	Anticipated bearing life	
36.0	Method of connection to driven equipment	
37.0	Limiting rotor temperature for determining safe stall time	
38.0	RTD for winding/ Bearing	Applicable ☐ YES ☐ NO Details:

Ref .Specification - TDC TCI 140 / REV 08

Vendor's signature and seal.

BHEL QP FORMAT	Bharat Heavy Electricals Ltd. PRODUCT ENGINEERING/ FBC &HRSG	MANUFACTURING QUALITY PLAN	For the spec. No.

MANUFACTURER'S NAME AND ADDRESS:	ITEM: SYSTEM:	QP No.: REV No.: DATE: PAGE No.:	PROJECT: CUST No: PACKAGE P.O. No. DATE:

SL No. 1	COMPONENTS & OPERATIONS 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6	REFERENCE DOCUMENT 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9	E 10	AGENCY 11			REMARKS 12
										VE	M	B	

MANUFACTURER/SUB CONTRACTOR		**LEGEND** **C OF C**: CERTIFICATE OF CONFORMANCE **VE**: MANUFACTURER/SUB-CONTRACTOR'S VENDOR **M**: MANUFACTURER/ SUB-CONTRACTOR **B**: BHEL NOMINATED INSPECTION AGENCY **E**: RECORD IDENTIFIED WITH "√" SHALL BE ESSENTIAL INCLUDED BY CONTRACTOR IN QUALITY DOCUMENTATION. **PT**: PENITRATION TEST	FOR BHEL USE
PREPARED BY	REVIEWED BY		
NAME & SIGNATURE		INDICATE 'P' PERFORM, 'W' WITNESS, AND 'V' VERIFICATION AS APPROPRIATE.	NAME & SIGN. OF APPROVING AUTHORITY & SEAL

BHARAT HEAVY ELECTRICALS LIMITED
TIRUCHIRAPPALLI

CONTROLS AND INSTRUMENTATION / FB
QUALITY ASSURANCE

STANDARD PACKING PROCEDURE
FOR
ELECTRICAL ACTUATORS, POWER CYLINDERS AND ELECTRICAL EQUIPMENTS

Rev	Date	Prepared	Checked	Approved	Revision History
00	01.01.96	Sd/-	Sd/-	Sd/-	Initial History
01	28.03.02	A.J.OMPRAKASH Sd/-	R.VARADARAJAN Sd/-	G.MATHIYALAGAN Sd/-	Department name changed
02	26.02.07	RM.VAIRAVAN	N.SRIDHAR	S.SOMASUNDARAM	Revised after discussion with Shipping Dept.

1.0 SCOPE

1.1 This procedure gives minimum guidelines to be complied with for packing of Electrical actuators, Power cylinders and other Electrical equipments. This packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage for periods more than one year.

2.0 WOOD SPECIFICATION FOR PACKING

2.1 Rubber wood as per manufacturer standard.
2.2 Silver Oak as per procedure PR:CHEM:017 or as per relevant International Standards.

3.0 PACKING

3.1 For Inland packing, rubber wood and export packing Silver Oak wood shall be used. The wood used shall be seasoned and treated.
3.2 The required wood case for the equipment to be packed shall be made out of individual planks of single length. The case should not have joints. Sufficient number of horizontal, vertical and diagonal planks (dimensions depending up on case size) shall be used for binding and strengthening runners have to be provided with metallic sling plates for handling.
3.3 Support planks are to be provided such that, no force is acting on the parts of equipment or its parts.
3.4 Power cylinders have to be packed with the piston in the closed condition.
3.5 Preservative chemicals are to be applied, wherever required.
3.6 Blank holes if any, shall be plugged.
3.7 Spring actuated equipments have to be de-energised before packing.
3.8 The equipments covered with a polythene sheet shall be kept inside the box, followed by coir, wooden bottoms, thermo coal, etc to prevent vibration effect during loading, transportation, etc.
3.9 The gap between job and the box shall be filled with suitable material like jute, coir, thermo coal, etc.
3.10 On all sides of the inner case, black polythene sheet shall be nailed.
3.11 Loose items of the equipment, if any, shall be packed separately.
3.12 Each case must have sufficient quantity of silica gel, packed in cotton cloth bags, shall be kept at different places as required.
The bags used shall have the following information marked on it.
Silica Gel activator type:
Blue: Active
Rose: Reduced active
White: No activity. To be replaced with fresh Silica gel.

4.0 MARKING

4.1 After completing the packing, Stencil marking, as per dispatch instructions and symbol marking as per Annexure – I shall be made. Please ensure the box is stenciled with “FRAGILE ITEM”, “HANDLE WITH CARE”

5.0 PACKING SLIP

5.1 A copy of the packing slip, kept in a polythene cover shall be kept inside the box. Another copy of the packing slip, kept in a polythene cover shall be kept out side the box and covered with a metallic plate to the case.

6.0 CAUTION

Do not pack any other Mechanical items with this case.

7.0 GENERAL

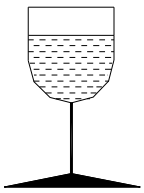
7.1 These packing procedures are the minimum requirements in addition to the standard instructions mentioned in the Purchase Order and Specification.

7.2 Deviation to meet the packing procedure requirements / non-clarity in packing approach in any quotation will be liable for rejection of offer.

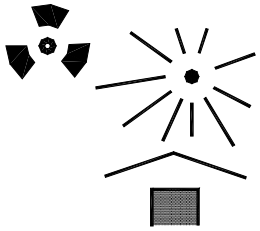
ANNEXURE – 1

TO

PROCEDURE NO:CI:QAC:PR:02/00 ; PR:03/00 ; PR:04/00



FRAGILE, HANDLE WITH CARE



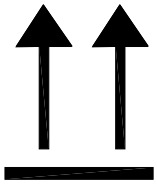
PROTECT FROM HEAT AND RADIOACTIVE SOURCES

USE NO HOOKS

NOTE: The design of heavy goods packages cannot always resist top lifting by grabhooks.

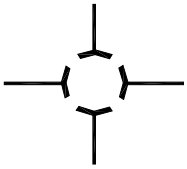
KEEP DRY

NOTE: Not all cases have waterproof internal linears: plywood used in the construction may not have a waterproof glueline.



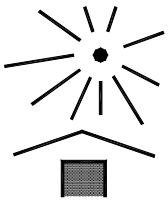
THIS WAY UP

NOTE: Certain designs of small cases make it difficult to distinguish top from bottom.



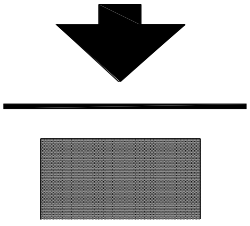
CENTRE OF GRAVITY

NOTE: This should be stancilled as a minimum on the two longest case sides (this information will normally be supplied by the manufacturer of the item(s) packed).



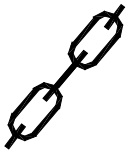
KEEP AWAY FROM HEAT

... kg max



STACKING LIMITATION

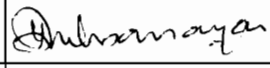
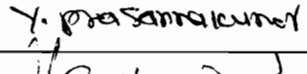
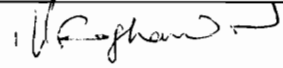
NOTE: The maximum load in kilograms should be marked above the arrow.



INTERNATIONAL "SLING HERE" SYMBOL

SPECIFICATION FOR PRESSURIZED DRAG LINK CHAIN CONVEYOR

CONTENTS:

	NAME	SIGNATURE	DATE
PREPARED	P.Subramanian		15.07.2011
CHECKED	Y.Prasanna kumar		15.07.2011
APPROVED	V.Raghavendran		15.07.2011

SPECIFICATION FOR PRESURIZED DRAG LINK CHAIN COVEYOR

1. Construction of feeder :

1.1 Scope:

1.1.1. To design, manufacture, inspect, testing and supply the feeders with required supporting structure and with control damper, motor, VFD, gearbox, coupling, transmission system, base frame, foundation bolts.

1.1.2 Supply of commissioning spares and special tools required for operation and maintenance of the feeders.

1.1.3. Supply of first fill of lubricants in a separate container.

1.1.4. Supervision for successful completion of erection & commissioning, conducting no load test trial runs and full load tests at site.

The extent of scope of supply stated herein is not necessarily exhaustive and shall not relieve the vendor from his responsibility to provide goods and services necessary to satisfy the performance criteria and guarantee specified.

Vendor can make alternate offer for different / reduced feeder width w.r.t. bunker opening dimensions. However, terminal point elevations are to be maintained.

1.2. Arrangement: Three drag link chain feeders to extract the material from bunker and feed to one feeder. That drag link chain feeder transports the material to the required distance as shown in the enclosed sketches.

1.3. Application:

1.3.1. The feeders are envisaged for fuel feeding system in CFBC boiler. Conveyors are required to extract coal from bunker and transports to a rotary feeder kept at a distance. The rotary feeder is in turn connected to the combustor which is at 900 Deg C. The rotary feeder is not a leak tight equipment.

1.3.2. The boiler has four feeding systems to feed coal to combustor. Normally all systems will be in operation and each feeder will feed 25 % of full load boiler requirement. However each conveyer is to be designed for a 50 % of boiler requirement at its full load. For exact capacity, refer enclosed "Annexure - A".

1.4. **Important Operational Point** : 3 extraction feeders with VFD operation, feed coal to one transport feeder, which is also operated with VFD. For positive discharge through transport feeder (without getting choked between feeders), it is to be operated with 10% more speed with respect to extraction feeder operation. Hence, the transport feeder motor is to be selected in such a way that **its rated speed is equal to 110% of its VFD operation**. This point is to be specifically confirmed by vendor in the offer.

2. Design requirement :

2.1. The feeder consists of tension head, driving head, double strand chain, drive motor, VFD, conveyor support, screw take up, shear pin, zero speed switch, no flow switch & speed transmitter control damper etc.., **The material column from Bunker is sheared by Flights. This side of chain shall be under tension.**

2.2. The feeder drive shaft consists of a chain drive with sprockets, gear box & motor. The drive system is to be mounted as an integral unit and to be placed aside of feeder on common (not on feeder itself) base frame. The tensioning of the drag link chain is to be achieved through suitable spring / screw take-up mechanism in the tension head. The tension head shaft is to be mounted on guide ways in which the assembly can slide. The feeder casing is to be of welded construction and

suitably stiffened. The wearable portion of the conveyor is to be lined with replaceable Basalt liners. That is both bottom and sides (to the conveying height of coal) is to be lined with Basalt tiles.

2.3. The terminal point details and a general conceptual arrangement & overall dimension of the feeder are as shown in Project related information.

2.4. Feeder, drive and motor should have adequate margin to overcome fuel choking. The margin provided in each of the above equipment is to be explicitly indicated by the vendor in the offer. The feeder casing shall be designed for a pressure of 1000 mmWC and to be tested at shop for this pressure. The operating pressure of feeder is 500 mmWC. Seal tightness has to be achieved in the mating parts of assembly, shaft penetration points in the casing, instrument inserts, guide plate assembly, access doors, manual control damper etc. by suitable selection of seals and gaskets. The end cover at tension end, drive end and top casing should be seal tight flanged arrangement. Wherever flanges are provided it is to be machined flanges only. The feeder shall be designed to feed fuel over the range linearly with respect to speed. Conveyor speed Vs feed rate graph is to be given by vendor in the offer. Feeder shall be provided with material level indicator to monitor the level of flow of material in the feeder and to alert the operating personnel to check the material at the inlet side when there is no flow of material. Provision should be available for easy approach of all feeder components for maintenance. Manual control damper is to be provided on the top casing for feeder. Enough number of seal tight inspection doors with easy opening arrangement on top casing and bottom casing shall be provided for inspection and maintenance purpose. Hood for the motor, transmission chain and sprocket shall be provided. The feeder shall be provided with a chain compensation indicator to monitor the conveying chain tension and adjust the tension whenever required. A suitable sprocket cleaning arrangement shall be provided for both drive and tail end sides of sprockets to prevent the built-up of material on the sprockets. A suitable arrangement (scavenger flights) shall be provided to continuously clean the built-up of material on the lengthy bottom plate of the conveyor even for 50% total moisture. Chain guide track shall be provided for the return leg of chain on both sides. Width of feeder will be in such a way that Coal particles should not fall on the link. The conveyor chain is to preloaded at $1/3^{rd}$ of the breaking load. Proof for the same is to be given by supplier. Partition wall provided in DLCF below bunker opening shall be of sufficient length. Provision shall be given to extend this plate at site in case of requirement. Completely assembled feeder shall be dispatched as a single unit based on transport limitations. **Provision is to be given on casing for air inlet to pressurize the feeder to 500 mmWC.**

2.5. Zero speed switch shall be provided on the tail end side shaft to monitor the speed of conveyor and it should be located in a dust proof enclosure. The signal from this shall be used to trip the motor in case of chain failure (zero speed) by purchaser. **After trial assembly, this zero speed switch (proximity sensors) are to be dismantled and dispatched in a separate box.**

2.6. Feeder motor selection should be done considering the wide speed variations requirement of the feeder as specified in the Annexure-A. Motor shall be suitable for VFD control. Specific confirmation and the details of motors with next higher frame size is needed in the offer. VFD is under BHEL scope.

2.7. Material of construction : The conveyor chain shall be of forged type. The typical drawing is enclosed for reference in Annexure-D. Conveyor chain links shall be connected using SS 420 connecting pin and SS circlip as shown in drawing in Annexure-D. If vendor feels that some other material is superior to SS 420 for the specified handling medium, the same shall be offered with justification. **Chain Link shall have BUSH, to be designed specially for the service condition.**

Provision of bush is to be specifically confirmed by vendor. Chain link shall be of 3Cr12 or superior material. All materials used shall be of tested quality. All components are to be suitably heat treated to the functional requirement.

2.8. Make of sub-delivery items and materials of construction of feeder shall be as per Annexure-A.

2.9. Major design requirements, to be specifically confirmed by supplier :

2.9.1. The conveyor flights shearing the material shall be in tension. Refer Annexure D, sketch – 1.

2.9.2. Drive system is placed on floor and not on feeder itself. Refer Annexure D, sketch – 1.

2.9.3. Both bottom and sides of casing, to the conveying height of coal is to be lined with Basalt tiles. Refer Annexure D, Sketch – 5.

2.9.4. Conveyor speed (where proximity sensor is placed) Vs feed rate graph is to be given.

2.9.5. Manual control damper after inlet to control the material fed into the conveyor.

2.9.6. Chain slackness compensation mechanism and its indicator are to be provided.

2.9.7. Detail of scavenger flights is to be shown.

2.9.8. Chain guide track (skids) are be provided in the material handling segments of conveyor. Refer Annexure D, Sketch – 5.

2.9.9. The transmission chain and sprocket are to be procured as a set from the same vendor to facilitate smooth running.

2.9.10. The conveyor chain shall be of forged type and as shown in Annexure D, Sketch – 3 and 4. Also, the links are to be provided with bush in all three holes.

2.9.11. The conveyor chain is to preloaded at $1/3^{rd}$ of the breaking load at supplier's works.

2.9.12. Extent of partition wall provided in DLCF below bunker opening is to be shown in G.A. drawing.

3. Inspection & Testing:

3.1. Test at vendors works: The feeders can be dispatched to site only after successful completion of the above tests.

3.1.1. Machined flanges, shafts, forged and heat treated conveyor chain links shall be offered for stage inspection before taking up assembly of the feeders. Surface finish of flanges, hardness of forged links, breaking strength and dimensions of parts shall be inspected during stage inspection.

3.1.2. The drag link chain feeder is to be inspected as per the BHEL approved Quality Plan at vendor's works.

3.1.3. No load test to be conducted for the feeders for a continuous duration of 30 minutes at vendor's work before dispatch..

3.1.4. The shear pin failure is to be demonstrated or a test certificate of the shear pin failure test shall be submitted for inspection.

3.1.1.5. Pressure withstanding test at 1000 mmWC and Leak tightness test at 500 mmWC are to be conducted at shop. This test is to be witnessed by buyer or his representative.

3.2. Test at site: To be done under the supervision of supplier.

3.2.1. No load test for a continuous duration of 1 hour on all the feeders after erection.

3.2.2. Trial runs at full, $2/3^{rd}$, $1/3^{rd}$,and at minimum load of the feeder for a continuous duration of 8 hours each. While conducting these test, vendor has to set the adjustable damper and set the feed rate as per the supplied Speed Vs flow graph.

3.2.3. Performance test at full load for a continuous duration of 15 days.

3.2.4.Power consumption test also will be done simultaneously along with performance test.

3.2.5. During operation, the noise level shall be within 80 dB-A at 1.0 m from feeder casing at any location.

4. Documents to be submitted along with offer: All documents under this heading should be submitted in three sets unless otherwise noted.

4.1. Point wise confirmation on the Specification.

4.2. General arrangement of the feeder with dimensional details for major dimensions and with cross-sectional views (at least three views) for clear understanding of the feeder indicating the terminal point details, the floor space and height requirement with bill of material for approval by purchaser. The drawing should show the supporting arrangement on floor including static and dynamic loading details. Drawing should show typical arrangement of shaft seals, conveyor chain links connecting arrangement.

4.3. Design calculations for the feeders as given below are to be given along with offer: a) Capacity; b) KW calculation; c) Calculation for Head and tail end shaft sizing; d) Calculation for sizing of tension screw; e) Calculation for shear pin design.

4.4. Procedure for basalt liner plate replacement and chain replacement.

4.5. Typical quality Plan as per BHEL format (format enclosed) including material, fabrication, assembly, functional test, no load test, leak tightness, shear pin test, bought out items etc.

4.6. Procedure for leak tightness test.

4.7. Document submission schedule.

4.7.1. Filled in data sheets as per Annexure - B.

4.7.2. Typical erection and commissioning procedure & one typical O&M Manual.

4.7.3. List of start up/commissioning spares.

4.7.4. List of recommended spares for 2 years trouble free operation and separate commercial offer with unit price in sealed cover.

4.7.5. Catalogues for conveyor chain, flight, conveyor sprocket, gearbox, drive sprocket, driven sprocket and transmission chain etc.

4.8. Schedule of deviations.

4.9. Material of construction, item wise, is to be given. Hardness value of the individual components of feeder such as: chain, Flight, Connecting pin, Circlip.

4.10. Guarantee schedule as per Annexure-E.

4.11. Checklist in the form of Annexure-C.

4.12. Weight of the conveyor chain per metre length and its Breaking load.

4.13. Relevant catalogues.

4.14. Applicable quality plan & test certificates.

5. Documents to be submitted after award of contract:

5.1. Detailed dimensional general arrangement drawing of total system with cross sectional details, bill of materials, and weight of individual parts. Detail of tension head assembly. Detail of Shaft seals arrangement. Detail of Conveyor chain links connecting arrangement for purchaser's approval.

5.2. All design calculations as specified above for review and comments.

5.3. The drawing showing the supporting arrangement on floor including static and dynamic loading details at each support to be submitted for purchaser's approval.

5.4. Specifications for bought out items.

5.5. Erection and commissioning procedures.

5.6. Draft O & M manuals also to be submitted to BHEL, Trichy, along with GA drawing and other documents which are submitted for our approval. The final O&M manuals incorporating our comments, if any, shall be dispatched to Trichy within 12 weeks from placement of order.

5.6.1. Manuals generally should contain the following.

5.6.1.1. Data sheet, Weight of each component, Relevant catalogues.

5.6.1.2. Important instructions (do & don'ts).

5.6.1.3. Installation, storage and Operation.

5.6.1.4. Maintenance (including lubrication, where necessary) and service, recommended spares for 2 years trouble free service.

5.6.1.5. Trouble shooting methods.

5.6.1.6. Assembly drawings with part list, bill of materials, dimensioned drawings and other applicable details.

5.6.1.7. Recommended lubrication schedule and scheme.

5.6.1.8. Packing / shipping list.

5.6.1.9. Applicable Quality Plan & test certificates for purchaser's approval.

5.6.1.10. Packing / shipping arrangement drawing for review.

5.7. Documents submitted for purchaser's approval should be submitted in 3 sets. Others Shall be submitted in two sets unless noted otherwise.

5.8. Manuals should pertain only to the types or model supplied for the particular contract. O & M manuals shall be supplied in CD copy along with 1 set of hard copy. Complete O&M documents shall be in English language. **One hard copy of O&M Manual has to be sent to site with each feeder in the same container.**

6. Exclusion - Supplier has to indicate clearly the exclusions under the heading 'exclusion' in the offer with specific reasons.

7. Deviations - All deviations shall be brought under the heading 'deviations'. If, there is no deviation, 'No deviation certificate' to be submitted by the vendor. Offers without listed deviations or 'No deviation certificate' will be treated as incomplete and will not be evaluated. Deviations after the placement of order will not be entertained.

8. Manufacturing Notes :

8.1. Tolerance on all the dimensions shall be provided to suit the proper chain manufacturing.

8.2. Tolerance on pins, bushes & rollers should be such that the maximum clearance shall not exceed 0.4 mm on the diameter.

8.3. Average breaking load of the chain shall be indicated on single strand by the vendor.

8.4. All the chain shall be pre loaded at 1/3 of the breaking load.

8.5. The permissible length tolerance in assembled chain length 10'- 0" shall be +0.25/-0.00 % as per ISO 1977/1.

9. Offer: The offer should be submitted in 3 parts as follows :

9.1. Supply of equipment as per scope of work 1.1.1 to 1.1.3. Minimum requirement of commissioning spares is 50 numbers of shear pins for each feeder and 20 numbers of flights, links, pins, circlips (complete set) for each feeder. And special tools like tension end tightening spanner etc..,.

9.2. Separate offer for supervision of erection and commissioning per 'Diam', as per lump sum basis (including travelling, boarding and lodging charges).

9.3. Recommended spares for 2 years trouble free operation with unit price.

ANNEXURE - A

TECHNICAL DATA

(Following Clauses are applicable for both feeders unless otherwise stated.)

SL No	Description	Unit	Value
1.	Material to be conveyed		Lignite
2.	Material characteristics		Corrosive due to sulphur and chlorine
3.	Required Number of feeder per boiler	Number	12 extraction feeders and 4 transport feeders. 3 extraction feeders supplies lignite to 1 transport feeder. One stream contains 3 + 1 feeders. Totally 4 streams are there.
4.	Boiler type		Circulating Fluidized bed combustion (CFBC)
5.	Feeder type		Drag link type feeder with double strand chain
6.	Location		Outdoor
7.	Operation		Continuous, through VFD. (VFD is in vendor's scope). The operational link between VFDs of 3 extraction feeders and VFD of one transport feeder is defined in E,C&I specification.
8.	Fuel analysis		Refer Annexure-F
9.	Maximum feeder capacity (Extraction)	t/h	42,7
10.	Normal feeder capacity (Extraction)	t/h	20
11.	Minimum feeder capacity (Extraction)	t/h	5,8
12.	Maximum feeder capacity (Transport)	t/h	128
13.	Normal feeder capacity (Transport)	t/h	60
14.	Minimum feeder capacity (Transport)	t/h	17,4
15.	Fuel size		Refer Annexure-F
16.	Bulk density	Kg/m^3	700 for volume and 900 for load
17.	Conveying speed (maximum)	m/min	8
18.	Fuel Temperature	°C	50
19.	Casing temperature(design)	°C	150
20.	Method of speed control of feeder		Variable frequency drive
21.	Speed variation required for feeder		10:1
22.	Range of material size distribution	mm	Refer Annexure - F
23.	Total moisture	%	Refer Annexure - F
24.	Design pressure of feeder	mmWC	1000
25.	Number of inlets for extraction feeder	No	1
26.	Number of outlet for extraction feeder	No	1
27.	Number of inlets for transport feeder	No	3
28.	Number of outlet for transport feeder	No	1
29.	Inlet Chute:		
	Material,(with liner plate)		IS 2062
	Plate thickness	mm	minimum 8
	Liner plate material		SS 304
	Liner Plate Thickness	mm	3.15
	End connection		Flanged
30.	Casing:		
	plate thickness	mm	minimum 6
	Casing plate material		IS:2062

SL No	Description	Unit	Value
31.	Liner: Material Thickness	 mm	 Basalt 30
32.	Feeder chain sprocket rim material		Forged alloy steel
33.	Feeder chain link		Stainless steel 3Cr12 or superior
34.	Factor of safety for chain link		Not less than 10
35.	Minimum thickness of Scrapper plate	mm	16
36.	Scrapper plate material		IS 2062
37.	Gear box make		Radicon/ Elecon/ Shanthi/ Greaves
38.	Transmission drive sprocket make		Rolcon/ Ti-Diamond/ Rolon
39.	Transmission driven sprocket make		Rolcon /Ti-Diamond/ Rolon
40.	Transmission chain make		Rolcon/ Ti-diamond/ Rolon
41.	Transmission chain overload protection		Shear pin arrangement on driven sprocket
42.	Heat treatment method for chain link, sprocket and pins		Flame hardening
43.	Surface hardness for chain links & sprockets	HRC	50-55
44.	Surface hardness for pins	HRC	45-50
45.	Material of pins		BHEL suggests SS420. However, Vendor to select the pin material as per their design, experience to suit specified service condition.
46.	Depth of hardness	mm	Minimum 0.8
47.	Zero speed flow and chain position switch type and speed transmitter		Non contact type
48.	Zero speed flow and chain position switch type and speed transmitter make		Refer Annexure-ECI
49.	Outlet Chute material		IS 2062
50.	Outlet Chute plate thickness	mm	Minimum 8
51.	Outlet Chute liner plate material		SS 304
52.	Outlet Chute liner plate thickness	mm	3.15
53.	Outlet Chute end connection		Flanged-As per enclosed sketch.
54.	Hinged door in the outlet chute		To the maximum size possible.
55.	Dust seal		Labyrinth seal (vendor to confirm the suitability of arrangement provided against maximum pressure condition)
56.	Lubrication for gears		Oil lubrication
57.	Lubrication for other parts		Grease lubrication
58.	Painting:		Surface preparation & surface profile : Blast cleaning to SA 2½. Primer coat : Epoxy zinc phosphate to 30 µm per coat. Number of coats : 2. Second coat : Epoxy MIO to DFT of 100 µm per coat. Number of coats : 1. Shade : Smoke Gray, shade number 692 of IS5.

ANNEXURE - B

DATA SHEET

(Following Clauses are applicable for both feeders unless otherwise stated.)
(To be filled and submitted by vendor along with offer)

1. **Project** :
2. **Capacity of feeder (tph)**
   - 2.1. Maximum :
   - 2.2. Normal :
   - 2.3. Minimum :
3. **Material to be handled** :
4. **Bulk density (kg/m^3)**
   - 4.1. For volume :
   - 4.2. For weight :
5. **Nature of material** :
6. **Temperature**
   - 6.1. Ambient temp. (Max.) :
   - 6.2. Operating temp :
7. **Material size distribution:** Size range :
8. **Conveyor profile** :
   - 8.1. No of inlets :
   - 8.2. No of outlets :
   - 8.3. Type of feed :
   - 8.4. Design pressure of feeder :
9. **Size of conveyor**
   - 9.1. Width :
   - 9.2. Height :
10. **Moisture of fuel** :
    - 10.1. Total moisture :
11. **Distance between centre line of**
    - 11.1. Inlet and outlet chutes :
12. **Height of material filling at**
    - 12.1. It's maximum capacity in conveyor :
13. **Inlet chute** :
    - 13.1. Plate material :
    - 13.2. Plate thickness :
    - 13.3. Liner plate material :
    - 13.4. Liner plate thickness :
    - 13.5. End connection :
14. **Casing detail**
    - 14.1. Drive end casing
      - 14.1.1. Casing thickness (Top, side & bottom) :
      - 14.1.2. Casing material (Top, side & bottom) :
      - 14.1.3. Liner thickness (Side & bottom) :
      - 14.1.4. Liner material (Side & bottom) :
      - 14.1.5. Height of side liner :
      - 14.1.6. Width of bottom liner :
    - 14.2. Tension end casing
      - 14.3. Casing thickness (Top, side & bottom) :
      - 14.4. Casing material (Top, side & bottom) :
      - 14.5. Liner thickness (Side & bottom) :
      - 14.6. Liner material (Side & bottom) :
      - 14.7. Height of side liner :

14.8. Width of bottom liner :
14.9. Intermediate casing
14.9.1. number off :
14.9.2. Casing thickness (Top, side & bottom) :
14.9.3. Casing material (Top, side & bottom) :
14.9.4. Liner thickness (Side & bottom) :
14.9.5. Liner material (Side & bottom) :
14.9.6. Height of side liner :
14.9.7. Width of bottom liner :

15. Outlet chute

15.1. Plate material :
15.2. Plate thickness :
15.3. Liner plate material :
15.4. Liner plate thickness :
15.5. End connection :

16. Chain assembly (Double strand)

16.1. Make of chain :
16.2. Breaking load :
16.3. Weight of chain (kg/m) :
16.4. Material of chain :
16.5. Type of chain :
16.6. Material of flight :
16.7. Height of flight :
16.8. Thickness of the Flight :
16.9. Thickness of the Scavenges :
16.10. Flight spacing :
16.11. Ratio between No. of Flights & no. of Scavenges :
16.12. Chain pull :
16.13. Factor of safety :
16.14. Maximum chain speed :
16.15. Minimum chain speed :
16.16. Pitch :
16.17. Surface hardness of connecting pin :
16.18. Surface hardness of circlip :
16.19. Surface hardness of flights :
16.20. Surface hardness of chain link :
16.20.1. Heat treatment method :
16.20.2.Depth of hardness :
16.20.3.Material of chain link :
16.21. Material of connecting pin and circlip :

17. Sprocket

17.1. Drive end sprocket
17.1.1. Type of sprocket :
17.1.2. Make of sprocket :
17.1.3. Material of hub :
17.1.4. PCD :
17.1.5. No of teeth :
17.1.6. Surface hardness of rim of sprocket :
17.1.7. Depth of hardness :
17.1.8. Heat treatment method :
17.2. Tension end sprocket
17.2.1. Type of sprocket :
17.2.2. Make of sprocket :
17.2.3. Material of hub :

17.2.4. PCD :
17.2.5. No of teeth :
17.2.6. Surface hardness of rim of sprocket :
17.2.7. Depth of hardness :
17.2.8. Heat treatment method :

18. Shaft

18.1. Drive end shaft(enclose sketch)
18.1.1. Material of shaft :
18.1.2. Diameter of shaft :
18.2. Tension end shaft(enclose sketch)
18.2.1. Material of shaft :
18.2.2. Diameter of shaft :
18.3. Shaft hardening :

19. Bearing

19.1. Drive end bearing :
19.1.1. Type of bearing :
19.1.2. Make of bearing :
19.1.3. Method of lubrication :
19.1.4. Size of bearing :
19.2. Tension end bearing
19.2.1. Type of bearing :
19.2.2. Make of bearing :
19.2.3. Method of lubrication :
19.2.4. Size of bearing :

20. Dust seal

20.1. Type of seal :
20.2. Seal material :

21. Motor rating

21.1. Rating (kW) :
21.2. Rpm :
21.3. Type of motor :
21.3.1. Degree of protection :
21.3.2. Make :

22. Transmission system

22.1. Chain type :
22.2. Chain Pitch :
22.3. Reduction ratio :
22.4. Number of strands :
22.5. Make of chain :
22.6. Number of teeth on drive sprocket :
22.7. Number of teeth on driven sprocket :
22.8. Pitch of the drive sprocket :
22.9. Pitch of driven sprocket :
22.10. Make of the drive and driven sprocket :
22.11. PCD of drive sprocket :
22.12. PCD of driven sprocket :
22.13. Centre distance between sprockets :

23. Gear box

23.1. Ratio :
23.2. No of stages :
23.3. Size :
23.4. Make :
23.5. Torque Maximum :

24. Coupling (for both faces)

24.1. Coupling make :
24.2. Coupling size :
24.3. Coupling bore :
24.4.

25. Safety device

25.1. Overload :
25.2. Zero speed switch :
25.2.1. Make :
25.3. No flow switch
25.3.1. Type :
25.3.2. Make :
25.4. chain position switch
25.4.1. Type :
25.4.2. Make :
25.5. Proximity switches
25.5.1. Type :
25.5.2. Make :
25.6. speed transmitters
25.6.1. Type :
25.6.2. Make :

26. Take up arrangement :
27. Painting :
27.1. Surface preparation :
27.2. Primer DFT :
27.3. Intermediate coat DFT :
27.4. Finish Coat DFT :
28. Total weight of conveyor :
29. Weight of chain per metre length :
30. Location of conveyors :
31. Operation :
32. Lubrication :
33. GA Drawings for feeder :
34. Pretentioning of complete flight for 1/3rd load at vendor's works : Yes
35. Provision of flight take off arrangement at drive end : Yes

Vendor's signature

ANNEXURE - C

CHECK LIST

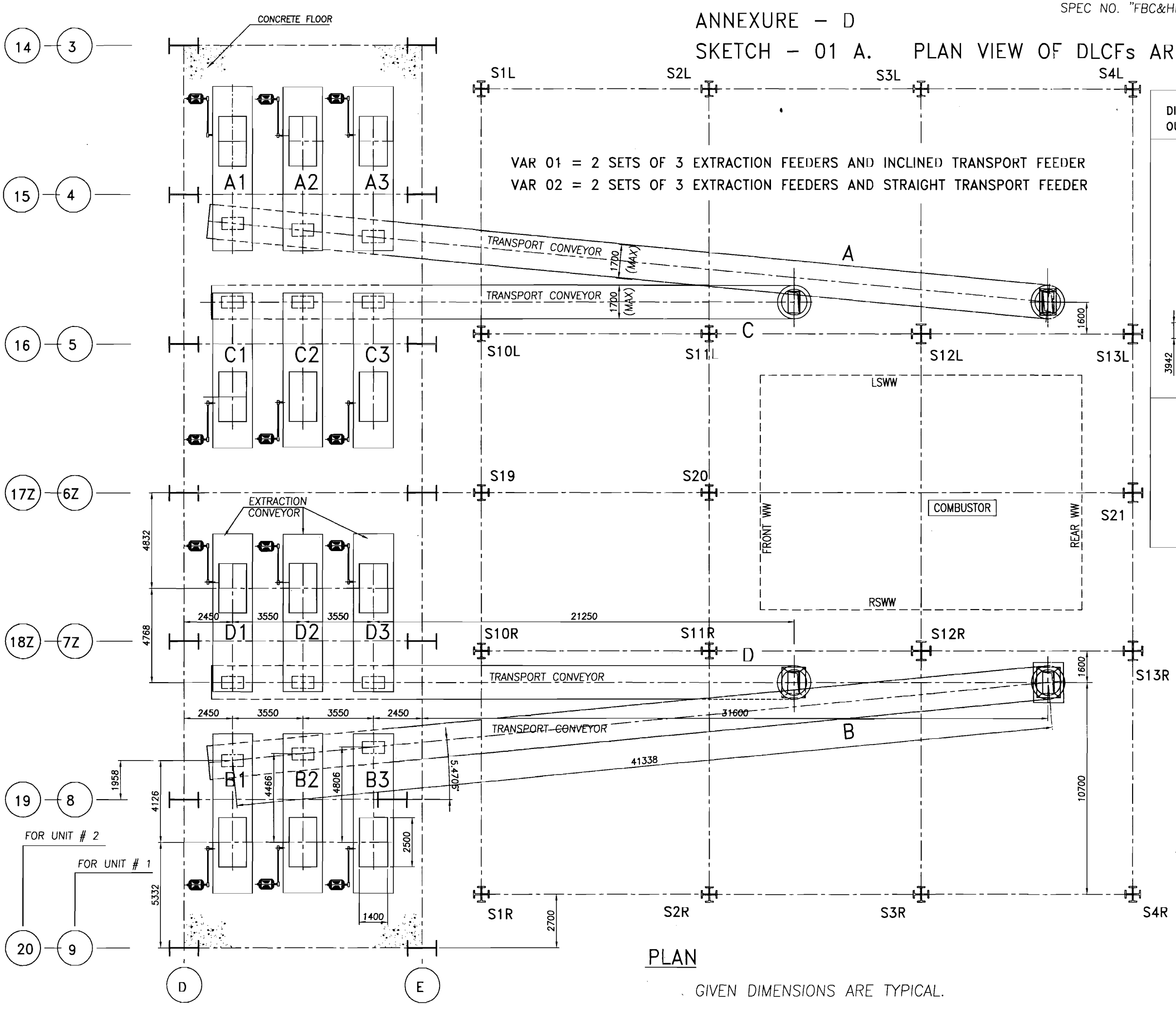
The following documents should be checked and signed by the authorised signatory with office seal. Offers not containing any of the documents will be liable for rejection without any further intimation. Vendor in his judgment may add further information, if required.

S.NO	DOCUMENT DESCRIPTION	STATUS
1.	Point wise confirmation of specification, sheet 02 to 08.	
2.	Confirmation for providing Bush in forged links (sketch – 04 of Annexure – D).	
3.	Confirmation for giving pressurized feeder for 1000 mmWC.	
4.	Confirmation for doing 1/3 pre-tensioning of conveyor chain at shop.	
5.	Confirmation for provision in casing for return flights in the design (sketch – 06 of Annexure – D).	
6.	Confirmation of point number 1.4 of specification.	
7.	General arrangement of feeder with dimensional details including supports.	
8.	Design calculation as per clause 4.3 of Specification.	
9.	Procedure for liner replacement.	
10.	Conveyor speed (where proximity sensor is placed) Vs feed rate graph	
11.	Details of control damper.	
12.	Confirmation for skid arrangement as shown in sketch – 05 of Annexure - D	
13.	Quality Plan as per BHEL format.	
14.	Leak tightness test procedure.	
15.	Filled in data sheets as per Annexure-B.	
16.	Typical erection and commissioning procedure.	
17.	List of commissioning spares. Confirmation for minimum spares mentioned under point 9.1	
18.	List of recommended spares for 2 years of trouble free operation	
19.	Catalogues of bought out items	
20.	Schedule of deviations if any. If no deviation is taken w.r.t. specification a "No deviation certificate" is to be enclosed.	
21.	Materials of construction (item wise)	
22.	Guarantee schedule Annexure-E	
23.	Checklist in the form of Annexure-C	
24.	Three sets of above documents	

SIGNATURE OF AUTHORISED SIGNATORY WITH OFFICE SEAL

ANNEXURE – D

SKETCH – 01 A. PLAN VIEW OF DLCFs ARRANGEMENT



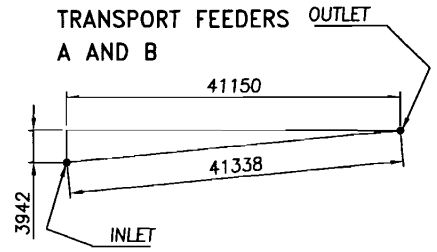
VAR 01 = 2 SETS OF 3 EXTRACTION FEEDERS AND INCLINED TRANSPORT FEEDER
VAR 02 = 2 SETS OF 3 EXTRACTION FEEDERS AND STRAIGHT TRANSPORT FEEDER

DISTANCE BETWEEN INLET CENTRE TO OUTLET CENTRE OF FEEDERS.

VAR 01

EXTRACTION FEEDERS
A1, B1 = 4126 mm
A2, B2 = 4466 mm
A3, B3 = 4806 mm

TRANSPORT FEEDERS OUTLET
A AND B



VAR 02

EXTRACTION FEEDERS
C1, D1 = 4768 mm
C2, D2 = 4768 mm
C3, D3 = 4768 mm

TRANSPORT FEEDERS
C, D = 28350 mm

NOTE :
BETWEEN COLUMNS S1 AND S4, FEEDERS ARE TO BE SUPPORTED ON STRUCTURAL STEEL BEAMS. THE LOCATION OF STRUCTURAL BEAMS AND ITS ELEVATION WILL BE GIVEN LATER.

BETWEEN D & E COLUMNS, FEEDERS ARE TO BE SUPPORTED ON CONCRETE FLOOR.

FOR UNIT # 2

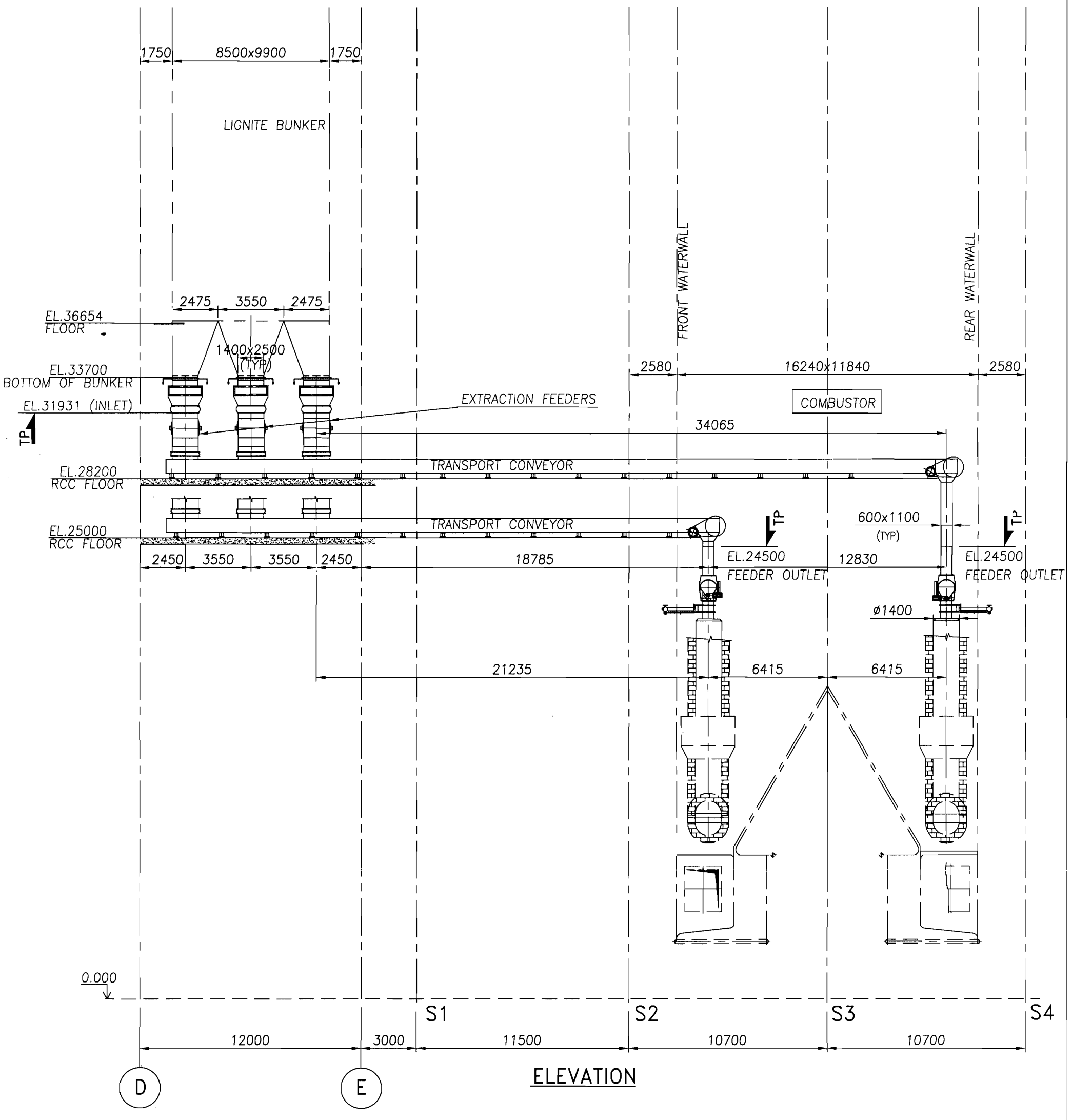
FOR UNIT # 1

PLAN

GIVEN DIMENSIONS ARE TYPICAL.

ANNEXURE – D

SKETCH – 01 B. ELEVATION OF DLCFs ARRANGEMENT

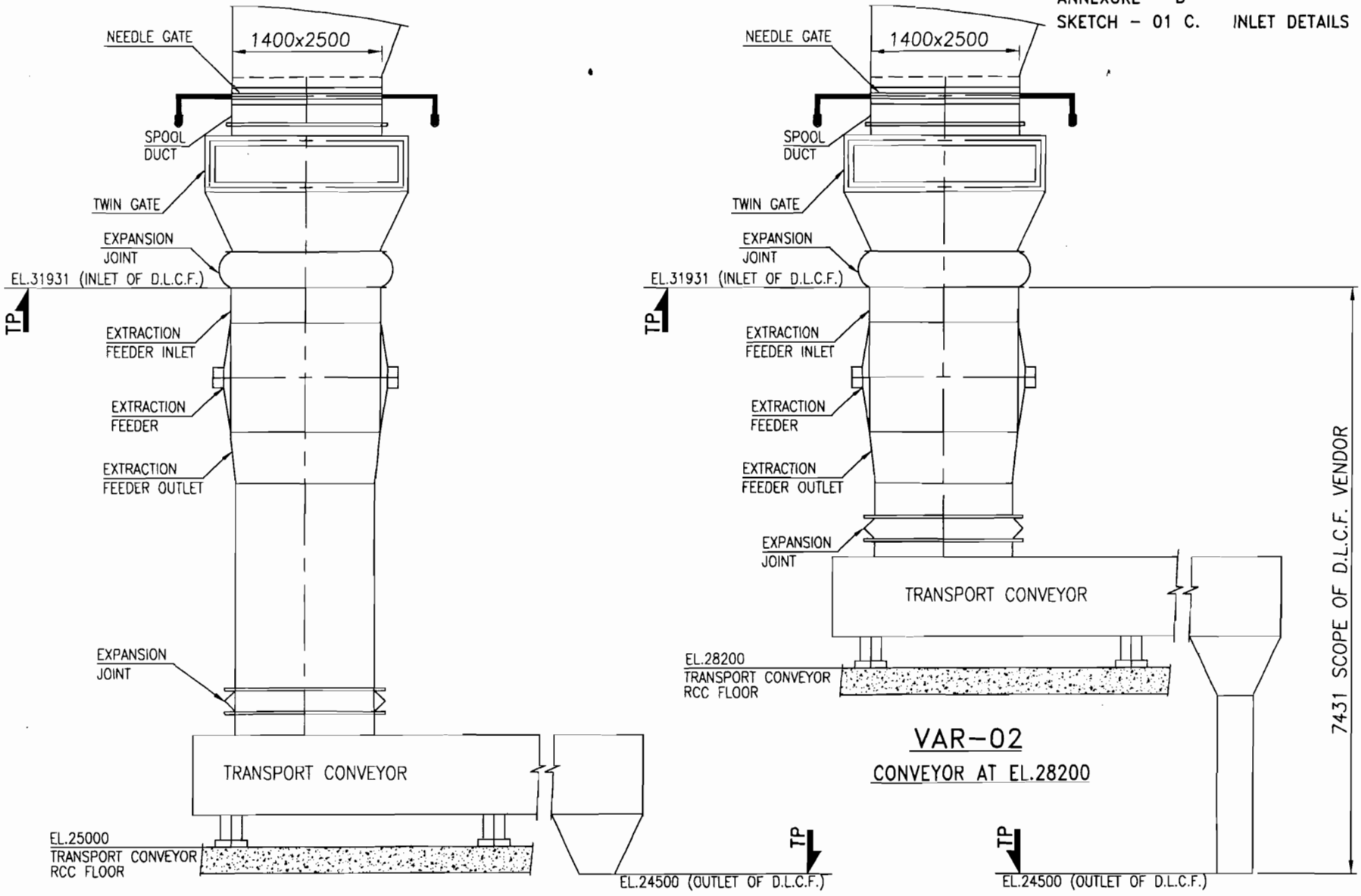


ELEVATION

GIVEN DIMENSIONS ARE TYPICAL.

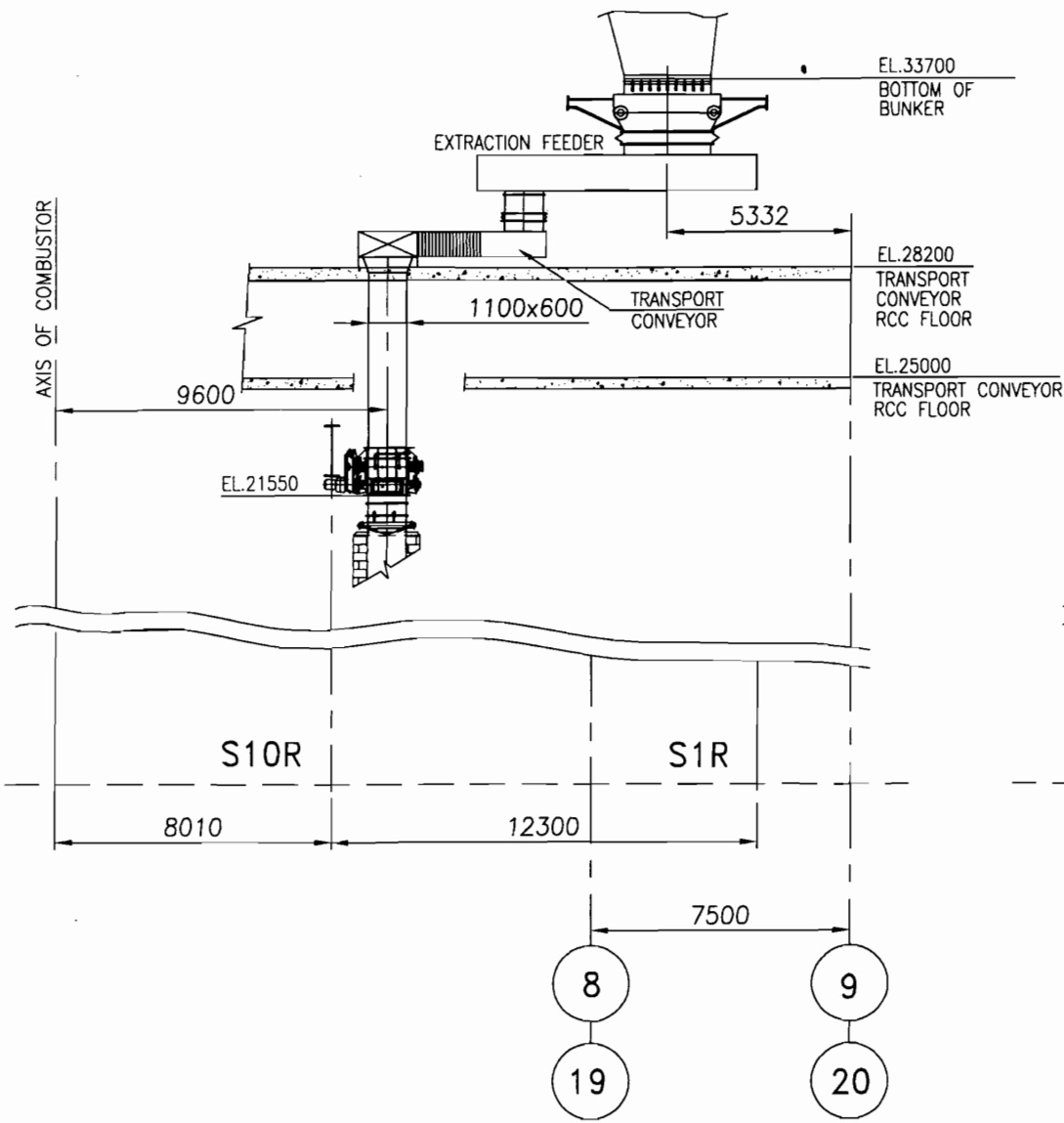
ANNEXURE – D

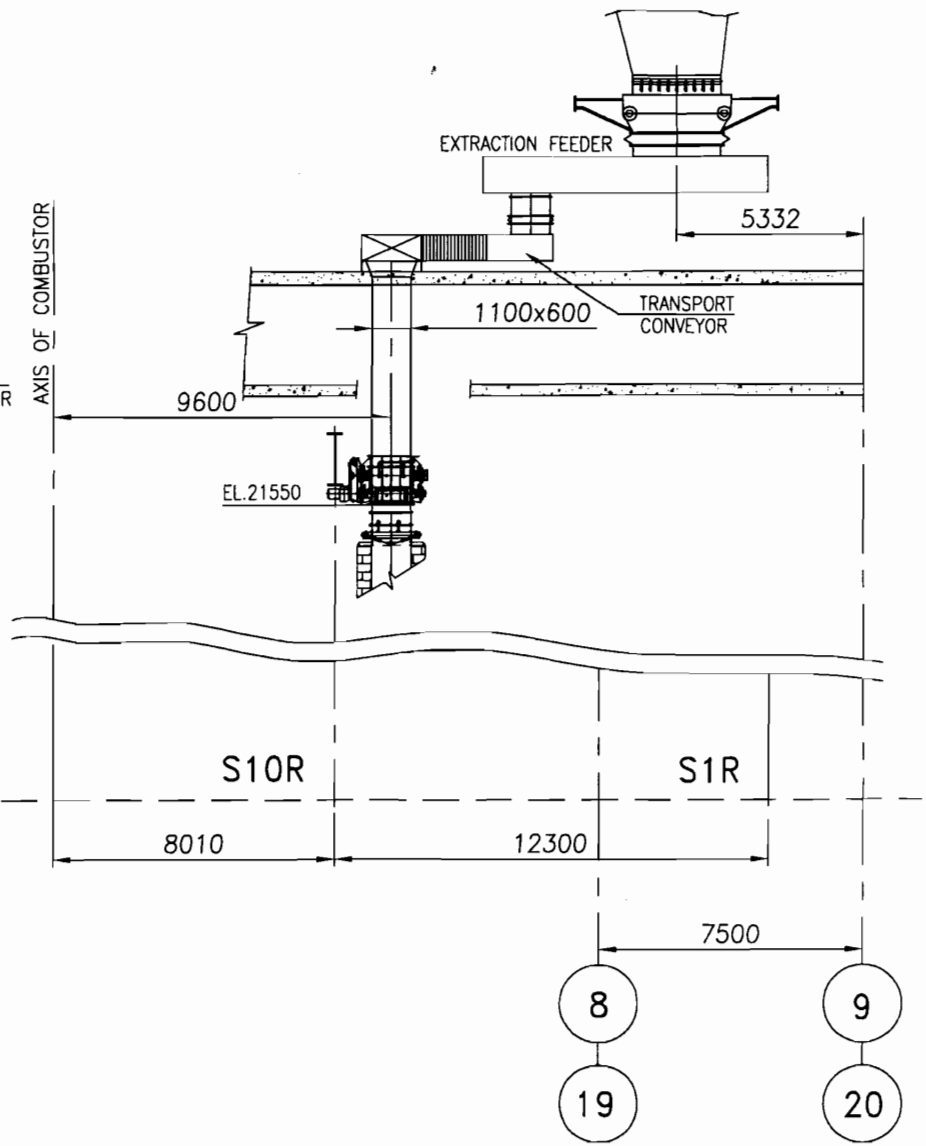
SKETCH – 01 C. INLET DETAILS OF DLCFs.



ANNEXURE – D

SKETCH – 01 D. END VIEW OF DLCFs ARRANGEMENT

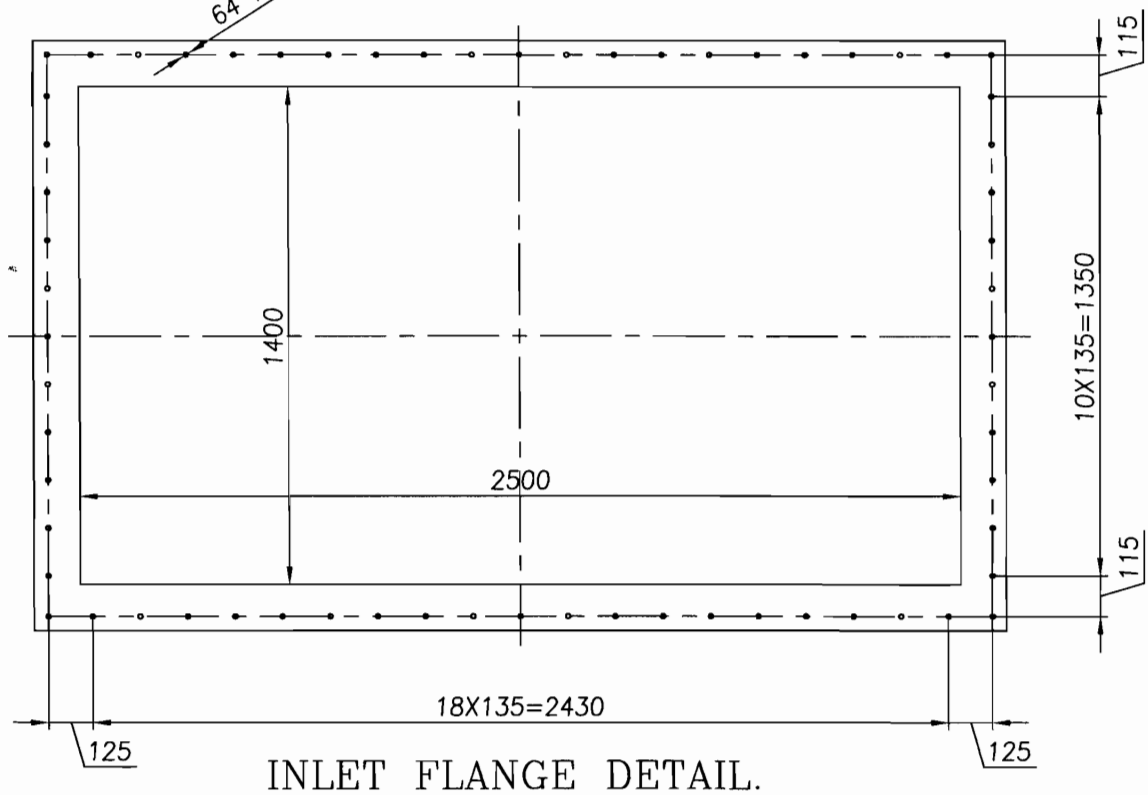




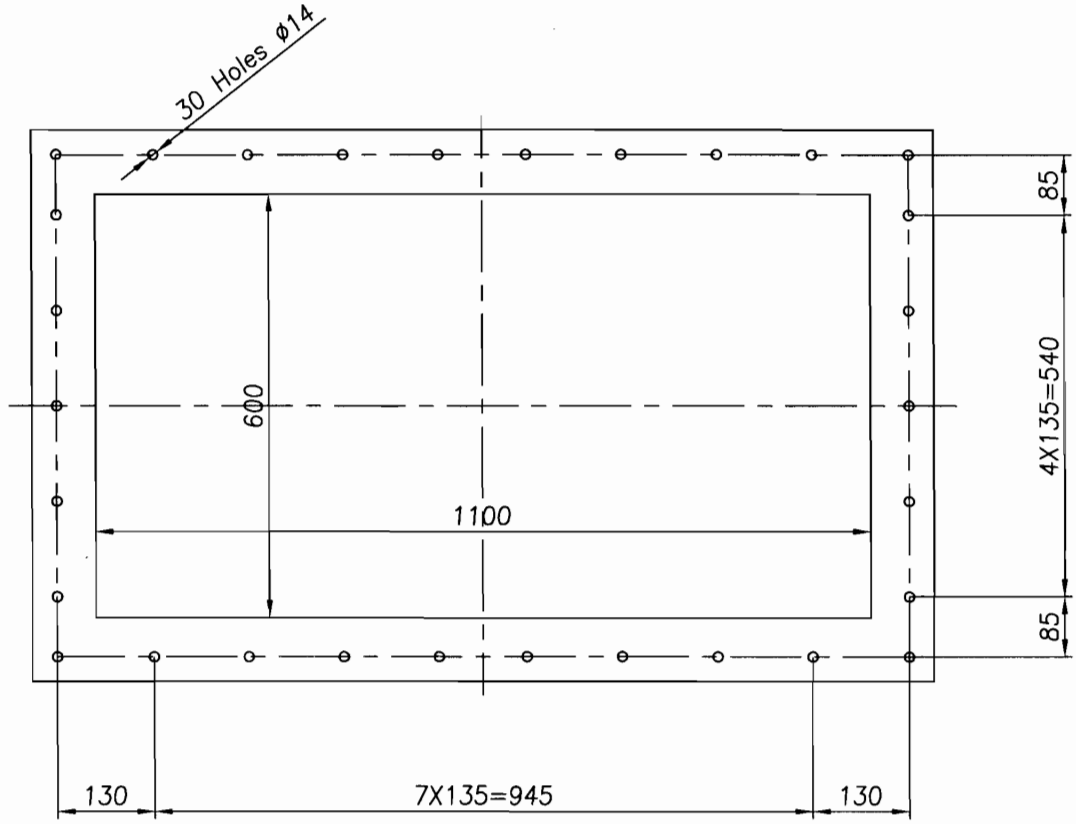
ANNEXURE – D

SKETCH – 02. FLANGE DETAILS.

DIMENSIONS WILL BE CONFIRMED DURING G.A. DRAWING APPROVAL.

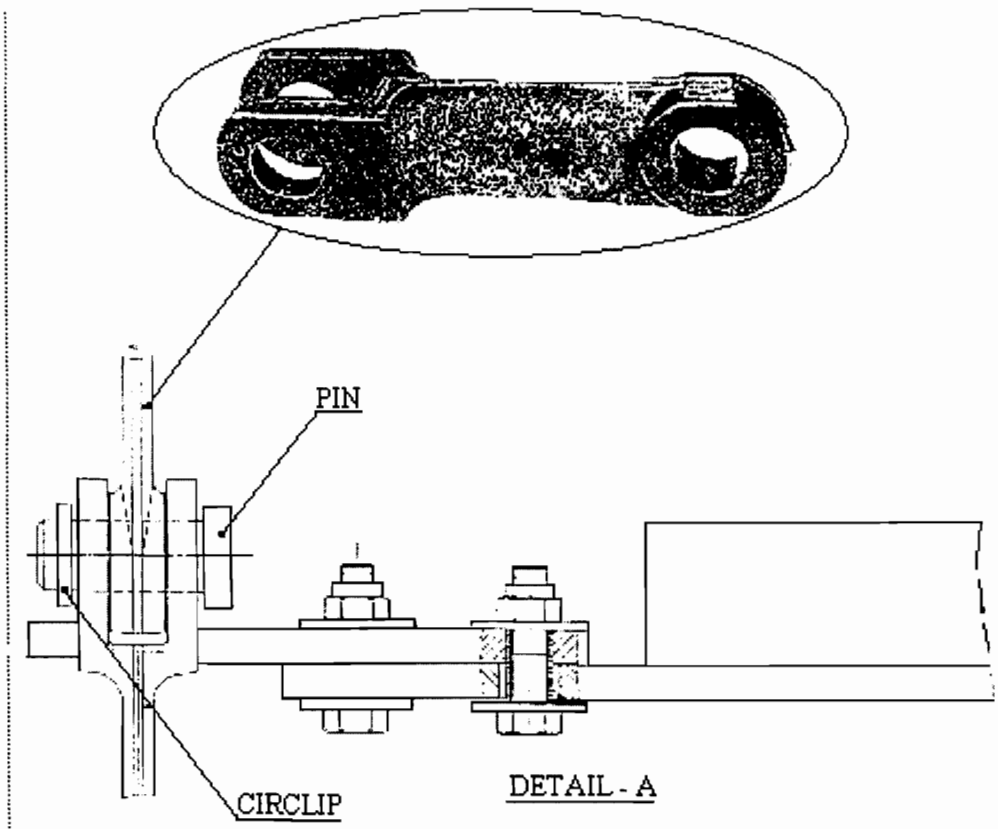


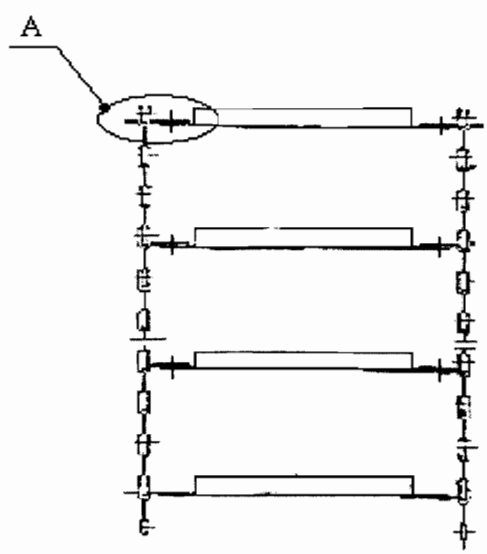
INLET FLANGE DETAIL.



OUTLET FLANGE DETAIL.

Sketch – 03. Double strand flight arrangement.

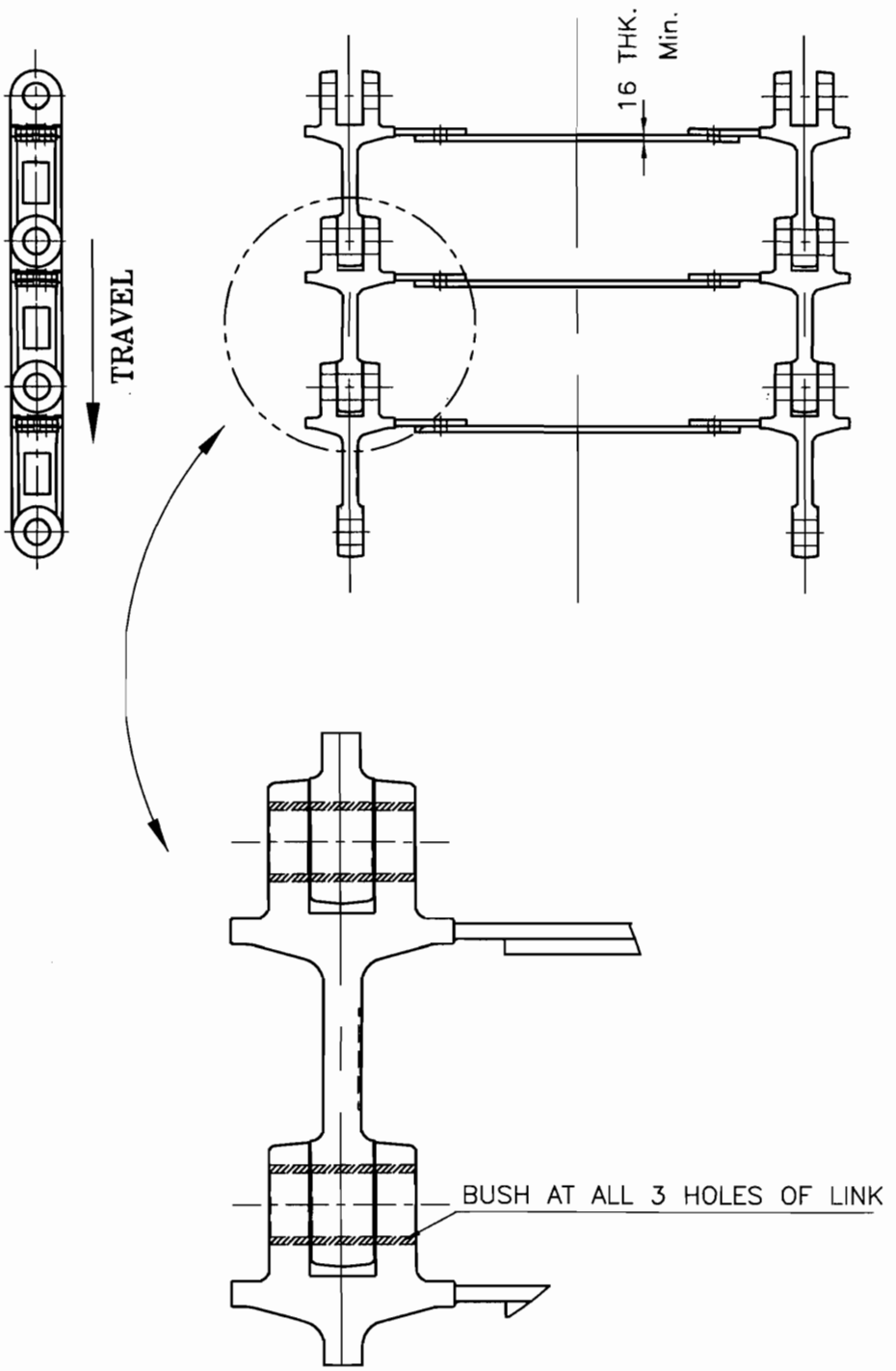




All dimensions of forged link,pin,circlip,flight, connection between flights & link are to be specified.

ARRANGEMENT OF CHAIN LINK AND FLIGHT DETAILS (TYP)

ANNEXURE – D

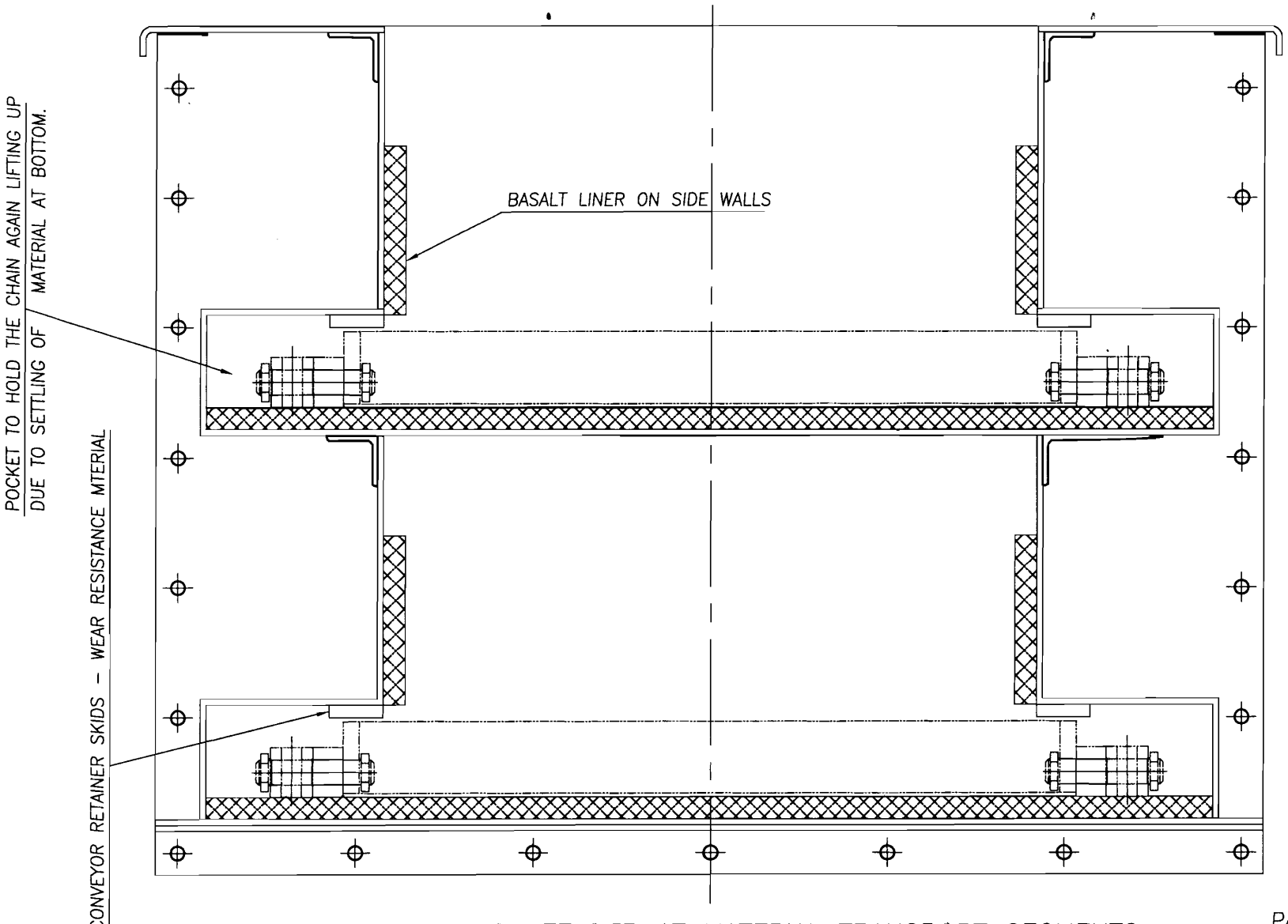


Sketch – 04.

Arrangement of bush between Link and Pin.

ANNEXURE – D

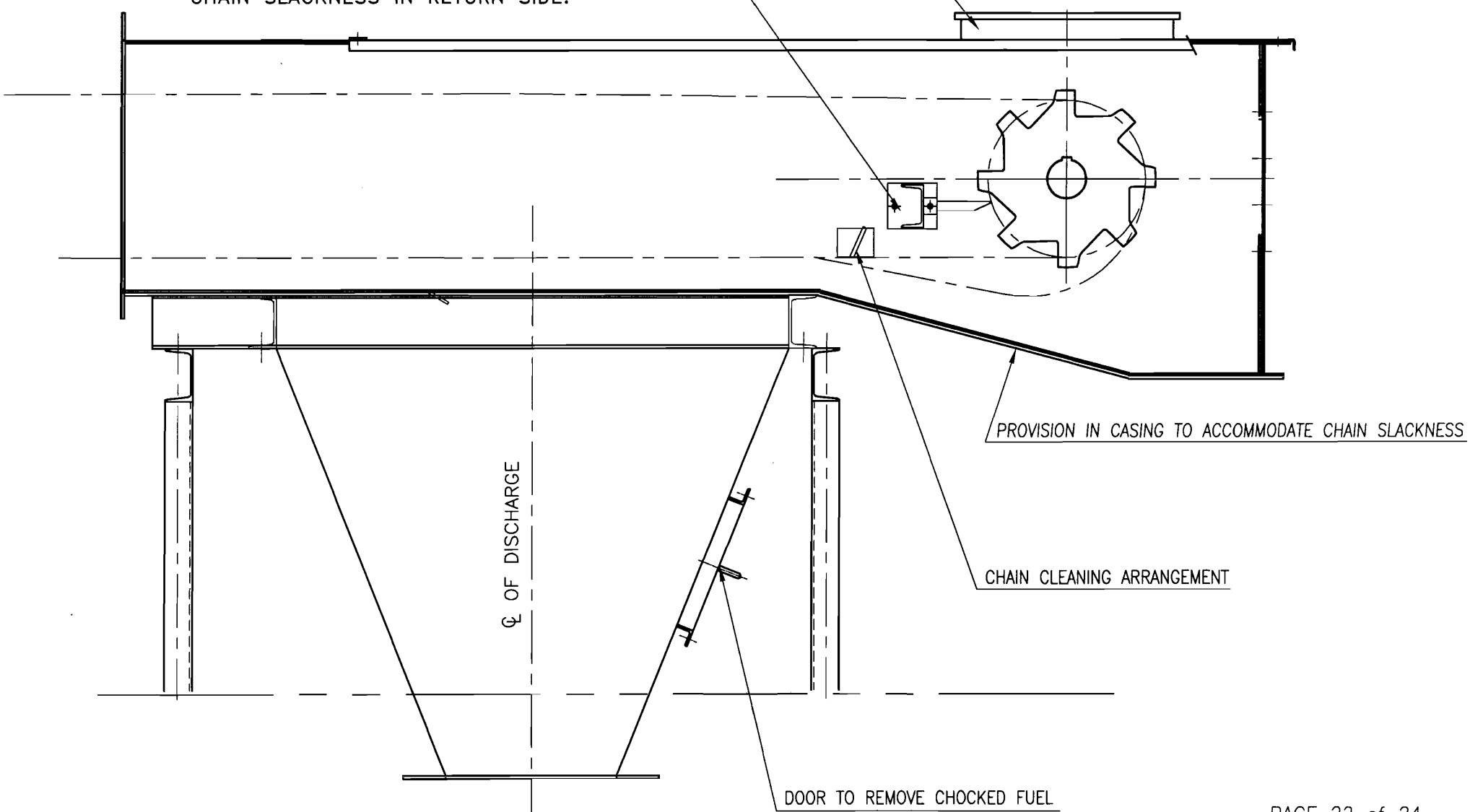
SKETCH – 05. SKID DETAILS TO PREVENT CHAIN LIFT.



CROSS SECTION OF FEEDER AT MATERIAL TRANSPORT SEGMENTS

ANNEXURE – D

SKETCH – 06. PROVISION IN CASING FOR CHAIN SLACKNESS IN RETURN SIDE.



ANNEXURE - E

Guarantee Schedule

Drag link chain feeder:

1. Capacity: Extraction feeder
   - 1.1. Minimum : 42,7 tph
   - 1.2. Normal : 20 tph
   - 1.3. Maximum : 5,8 tph
2. Capacity: Extraction feeder
   - 2.1. Minimum : 128 tph
   - 2.2. Normal : 60 tph
   - 2.3. Maximum : 17,4 tph
3. Turn down : 10: 1
4. Noise : 80 dB at 1.0 m from feeder casing at any point.
5. While commissioning, minimum 30 days trouble free, smooth, continuous operation of drag link chain feeder.

We hereby guarantee the above. Shortfall in any of the above will be set-right by us at our cost.

SIGNATURE OF AUTHORISED SIGNATORY WITH OFFICE SEAL

ANNEXURE – F
FUEL ANALYSIS

S.No	Description	Unit	Design	Worst	Best
1.0	**Fuel**		**Lignite**		
1.1	**Proximate Analysis:**				
	Fixed Carbon	%	16.5	-	18.56
	Volatile Matter	%	22.0	-	24.75
	Moisture	%	44.0	44.0	37.00
	Ash	%	17.5	20.58	19.69
	Chlorine	%	0.10	0.13	0.11
	HHV	kcal/kg	2600	2125	2925
1.2	**Ultimate Analysis:**				
	Carbon	%	26.00	21.46	29.25
	Hydrogen	%	2.13	1.42	2.40
	Sulphur	%	1.90#	4.00#	2.14#
	Oxygen (by diff)	%	7.93$	7.93 &	8.91 @
	Nitrogen	%	0.54	0.61	0.61
	Moisture	%	44.00	44.0	37.0
	Ash	%	17.50	20.58	19.69
1.3	**Sieve Analysis**				
	100%		< 10 mm		
	80%		< 2 TO 3 mm		
	50%		< 1 TO 1.5 mm		

Note:

Lignite ash softening temperature – > 1400 °C

Lignite analysis based on MOM dated 22, 23-10-08

$ - Includes Chlorine of 0.1%.

& - Includes Chlorine of 0.13%.

@ - Includes Chlorine of 0.11%.

# - Combustible sulphur	1.64%	3.46%	2.14%
Ash considering above combustible Sulphur	17.76	21.12	19.69

BHARAT HEAVY ELECTRICALS LIMITTED
TRICHY
FBC&HRSG

ELECTRICALS, CONTROLS & INSTRUMENTATION

SPECIFICATION FOR AC VFD PANEL FOR LIGNITE CONVEYOR

REV NO	DATE	DESCRIPTION	PREPARED	REVIEWED	APPROVED
00	20.05.2011	INITIAL ISSUE	P.V	A.S	SJP

SPECIFICATION FOR AC VFD PANEL FOR LIGNITE CONVEYOR

SL NO	SPECIFICATION	BHEL REQUIREMENTS	VENDOR @ CONFIRMATIONS (YES/NO/N.A)
1.0	SITE CONDITIONS:		
1.1	Altitude above mean sea level	550m	
1.2	Maximum Ambient Temperature	50 Deg.C	
1.3	Relative Humidity	0 - 95%	
1.4	Atmosphere	Topical, Dusty, Salty, Corrosive and highly Polluted.	
2.0	SCOPE OF SUPPLY		
2.1	Scope of supply (excluding motor and interconnecting cables)	VFD system shall be suitable for Lignite drglink feeder. VFD controller shall be of latest micro processor based technology, housed in a free standing indoor mounting, fully wired, sheet steel panel with all necessary switch gear, input contactor, input & output chokes, push buttons, ammeter, Indication lamps, Start/ Stop/Emergency Push Buttons etc operable from DCS/Local control box near feeder. Local /DCS selection is done in DCS..	
3.0	Requirements		
3.1	Input power supply	415V±10%, 3ph, 50 Hz, AC . The VFD shall be suitable for required drive rating of 415V ± 10%, 50Hz ±5%, 3ph AC. The model number selected with current ratings at 50 deg.c ambient figure should be clearly indicated in the offer itself. Necessary catalogues shall also be furnished with offer in triplicate.	
3.2	Control supply	240v, 50HZ, 1 ph Ac supply.	
3.3	System fault level	>50KA for 1 sec	
3.4	Rated capacity of the VFD controller	. VFD selection should be suitable for 90 KW motor i. Starting torque ii. Soft Self start iii. 120% continuous Full Load Current of motor iv. 150% over current for 1 Min. Vendor shall indicate and selected valves for the above. Optional offer suitable for 45 KW motor.	

SPECIFICATION FOR AC VFD PANEL FOR LIGNITE CONVEYOR

SL NO	SPECIFICATION	BHEL REQUIREMENTS	VENDOR @ CONFIRMATIONS (YES/NO/N.A)
4.0	TYPE OF INVERTER(6 pulse)		
4.1	Micro processor based with built in keypad and back illuminated LCD display	Required	
4.2	Logic & value functions programmable	Complete programme shall be done thro' key pad without any external hardware.	
4.3	Dynamic breaking resistance	Not Required	
4.4	DOL/VFD selector switch	Not Required	
4.5	Input choke for harmonic suppression	Required	
4.6	Output choke for minimum capacitive current	Required	
4.7	Cooling fan arrangement	Required	
4.8	Self diagnostic feature	Required	
4.9	Torque, over voltage, under voltage, Temperature frequency supervision.	This shall give output when the alarm limits are reached independently.	
4.10	Overload capacity	100% continuous 150% with adj. time constant	
4.11	Motor protection for Thermal, Stall, under voltage, over load programmable.	Required	
4.12	Starting torque	At least 2 times rated torque	
4.13	Running torque	1.5 times of rated torque	
4.14	Type of load	Constant torque & variable torque	
4.15	Easy configurability, user friendly, programming.	Required. Any additional configurating tool is required & same shall be offered with indicating unit price. Optional—Suitable software using customer PC shall be provided for diagnostics	
4.16	OUTPUT VOLTAGE:	Up to input voltage-regulated.	
4.17	Control system shall be V/F or sensor less vector	V/F	
4.18	Dedicated speed / position sensing proximity sensors located on the Drag link chain feeder, shall be hooked up in the VFD panel for generating 4-20 mA /digital contacts. Matching proximity controller shall be includedin the VFD panel. (The proximity sensor details will be furnished during Drg approval.	1.Proximity Speed Transmitter (tag no: 1HHE 11/21/31/41 12/22/32/42 13/23/33/43 14/24/34/44 CS001))(total 16 Nos/boiler) with 4-20mA isolated output required for DCS monitoring and feed back to VFD controller. 2. Proximity type speed switch ((tag no: 1HHE11/ 12/13/14 CS301))(total 16 Nos/boiler)with trip amplifier provided with 2NO+2NC Potential free contacts. 3.Proximity type chain position switches (tag no: 1HHE11/ 12/13/14 CG301/302))(total 32 Nos/boiler) meant for low-tension alarm. 4. Proximity flow level switches (tag no: 1HHE11/ 12/13/14 CL301)) (total 16 Nos/boiler) meant for low flow alarm with 2NO +2NC contact.	

SPECIFICATION FOR AC VFD PANEL FOR LIGNITE CONVEYOR

SL NO	SPECIFICATION	BHEL REQUIREMENTS	VENDOR @ CONFIRMATIONS (YES/NO/N.A)
4.19	DCS /PC interface RS 485 and MODBUS communication.	Required	
4.20	Status : Ready to start, VFD ON, Fault etc digital output for each of this.	Required	
4.21	Local / Remote selector provision at panel. (Lockable)	Required Local =from field Remote =from DCS Both shall be 4-20mA signals	
4.22	i. Accessories shall be freely spaced 300mm free space around from controller. ii.TB location should be 300mm above from bottom sheet	Required	
4.23	Force cooling using exhaust fan at the top	Required	
4.24	Fault annunciator (DO)	Required	
4.25	Speed flow rate(4-20mA) output	Required	
4.26	Totalized flow(Pluse) output	Required	
4.27	20% spare terminal	Required	
4.28	Panel illumination & power socket	Required	
4.29	Painting	Electrolytic / Powder coated	
	Exterior	Light grey semi-glossy 631 of IS5	
	Interior	Brilliant white glossy finish	
4.30	Type of enclosure for control panel	IP-54	
4.31	Control wiring shall be not less than 1.5 sq mm	Required	
4.32	Provision for changing the set points/ setting of control elements at site	Required	
4.33	Frequency holding ±1% of maximum frequency over 24 hours with temp change 10° C.	Required	
4.34	Control range	Minimum 10:1 continuous modulation Required..	
4.35	Panel shall be supplied with necessary mounting hardware along with anti vibration pads.	Required	
4.36	List of recommended spares for 2 years operation along with unit prices.	Required	
4.37	List of commissioning spares to be furnished. This has to be included in basic scope	Required	
4.38	Provision for auto restart on fault reset and fly catching	Required	

SPECIFICATION FOR AC VFD PANEL FOR LIGNITE CONVEYOR

SL NO	SPECIFICATION	BHEL REQUIREMENTS	VENDOR @ CONFIRMATION S (YES/NO/N.A)
4.39	i) No. of VFD Panel	i) 1 No per Drag link feeder.	
4.40	Approximat overall dimension of the panel.	1000(W)x1000(D)x1800(H) The panel shall have lifting hooks & Earthing features. VFD shall be mounted min 300 below from top and panel components shall freely spaced for easy maintenance.	
4.41	Configurator	Supply of configurating tool with loaded software and interconnecting cable for VFD drive.	
5.0	Control panel(front) components	1. R,Y,B power supply indication lamps 2. Power supply incoming switch(with HRC fuse) 3. Ammeter selector switch 4. Ammeter 5. Voltmeter selector switch 6. Voltmeter 7. Control supply ON /OFF switch 8. Emergency Stop PB 9. Fault / Trip-Indication lamp 10. Drive healthy/Run Indication lamp 11. Annunciator 12.Local / remote (DCS)selected indication	
5.1	Local operation Box (near drive)	IP-55 box having Start,Stop PB, Speed Variator and Digital speed indicator . local selected Indication.	
5.2	Approved Vendors i.VFD controller & panel ii.Proximity controllers	i)Customer approved vendors ii)to suit the proximity switch applicable for the feeders (indicated during drg approval.	
5.3	Vendors quality plan & testing procedures are subject to BHEL's approval.	Required for VFD Proximity controller and panel.	
6.0	Documents		
6.1	1.Along with offer	a) 3 sets of Technical leaflets/catalogues. b) Torque Vs HZ for VFD curve. c) Number of cables and their cross sections and rating for power &control cables. d) List of the interfacing signals from field to control room. This list shall contain list of analog signals and digital signals. e) Overall dimension of VFD panel. f) Weight of each panel. g) Heat dissipations of the panel. h) Fixing details/Foundation details. i) Spare list 1. Commissioning spares. 2. O&M spares. j) System write-up briefing power and control signal flow with block diagram. k) Power consumption of the VFD panel. l) filled up specifications	

SPECIFICATION FOR AC VFD PANEL FOR LIGNITE CONVEYOR

SL NO	SPECIFICATION	BHEL REQUIREMENTS	VENDOR @ CONFIRMATIONS (YES/NO/N.A)
6.2	2. After Ordering (to be provided after 4 weeks from award of contract for approval	a) Control circuit diagram. b) Panel OGA, Internal arrangement drawing c) Panel base frame drawings giving fixing details. d) Terminal block arrangement drawing for making interconnections. e) Detailed System write-up briefing power and control signal flow.	
6.3	3.Final documents	a) As built drawings. b) O&M manual 3 hard copies of doc 6.2 and VFD drive O&M & Two soft copy in CD form. c) Test & guarantee certificates. d) Programmable software for VFD drive in soft form.	
7.0	Commissioning of the equipment's / system offered shall be done by the vendor.	Optional offer with lumpsum / per day rate required	
8.0	Total packing list shall be furnished after PO placement.		
9.0	Packing	Shall be packed as per procedure QA:CI:STD:PR:02 & Seaworthy packing.	
10.0	Customer approved vendors for VFD panel:	a)MAKE: ABB SIEMENS L&T SCHENIDER EUROTHERM BHEL/EDN b)PANEL: RITTAL c)PROXIMITY SWITCH & CONTROLLER: TRUCK /P&F	

BHEL -TIRUCHY
FBC&HRSG
ELECTRICALS, CONTROLS & INSTRUMENTATION

ANNEXURE
ECI SPECIFICATION FOR LIGNITE DRAG LINK CHAIN FEEDER

REF: FBC&HRSG:CI:5316:DLF
Rev:00

A. ELECTRICAL.

1. The lignite Drag link chain feeder motor shall be suitable for VFD application.
2. The Lignite Draglink Chain feeder motor STD specification are as follows.
   (a) L.T.motor specification. No. TDC:TCI:140
   (b) Quality plan no. QA:CI:STD:QP:24
   (c) Packing procedure QA:CI:STD:PR:03
3. The make of motor: shall be of Customer approved Make
4. Vendor should submit the filled up data sheets (Part of Main & annexure specification) along with the offer itself.
5. **Documents after placement of order:**
   (i) Motor terminal details, Catalogue, Final motor data sheet completely filled in all columns.

B. CONTROL AND INSTRUMENTATION

1. i. Proximity Speed Transmitter (1No/feeder) (tag no: 1HHE11/ 12/13/14 CS001))(total 16 Nos/boiler) with 4-20mA isolated output required for DCS monitoring and feed back to VFD controller.

   ii. Proximity type speed switch (tag no: 1HHE11/ 12/13/14 CS301))(total 16 Nos/boiler) with trip amplifier provided with 2NO+2NC Potential free contacts.

   iii. Proximity type chain position switches (tag no: 1HHE11/ 12/13/14 CG301, 1HHE11/ 1213/14 CG302))(total 32 Nos/boiler) meant for low-tension alarm.

   iv. Proximity flow level switches (tag no: 1HHE11/ 12/13/14 CL301) meant for low flow alarm with 2NO +2NC contact)(total 16 Nos/boiler).

BHEL -TIRUCHY
FBC&HRSG
ELECTRICALS, CONTROLS & INSTRUMENTATION

ANNEXURE
ECI SPECIFICATION FOR LIGNITE DRAG LINK CHAIN FEEDER

Controllers for item 1 (i), 1(ii), 1(iii) & 1(iv) shall be suitable for 24 volt DC and terminated with required armoured FRLS PVC Cable up to IP65 junction boxes. All the controllers should be housed in junction box and TB to be provided in the junction box for terminating controller and sensor. JBs are to be provided with double compression nickel plated cable glands for incoming/out going cable entries. The junction box shall be suitably mounted (with fixing fasteners) on the feeder itself.

2. The make of the proximity switch/controller shall be TRUCK/ P&F/ E&H

3. The Junction boxes used in outdoor areas shall be weather proof type. Sheet steel thickness of the JBs shall be minimum 2 mm the sheet shall be hot dipped Galvanised. JBs shall be double door type with canopy at the top.. Terminal size shall be suitable for 0.5 sq.mm to 2.5sq.mm wire. JB shall have provision to add 10% additional terminals. Accessories like metal tag (SS), clamps, fixtures, bolts (SS), nuts (SS), gaskets (neoprene), lock & key etc. shall be supplied.

4. Vendor should submit the technical leaflet/catalogue of motor, proximity switch, Controller/Barrier & junction box with offer & its interconnection diagram.

Note:-

Vendor should indicate any protection requirement to be taken care by Purchaser to protect the motor/equipment.

	Name	Signature	Date
Prepared	Balaji		30.04.2011
Checked	P.Venkataraman		30.04.2011
Approved	A.Swaminathan		30.04.2011

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
HIGH PRESSURE BOILER PLANT
PURCHASE DEPARTMENT - FBC & HRSG
THIRUCHIRAPALLI - 620014
TAMILNADU (INDIA)

PHONE : 91-431-2574072
GRAMS : BHARATELEC
FAX NO: 91-431-2520233
E-mail :ssmci@bheltry.co.in
WEB : http://mm.bheltry.co.in

ENQUIRY
(INDIGENOUS)

OFFICE COPY

Collective No.	Enquiry Date	Due Date For Quotation
5101100295	05.08.2011	31.08.2011

Please quote Enquiry No, Date and due date in all correspondences.
This is only a request for quotation and not an order

Item	Description	Unit	Quantity	Delivery Quantity	Schedule Date
10	L531614700501001 1 SET CONSISTS OF 3 NUMBERS OF EXTRACTION FEEDERS AND 1 NUMBER OF TRANSPORT FEEDER AS PER VAR 01, SPECIFIED ON ANNEXURE-D (PAGE 14 OF 24) OF SPECIFICATION NUMBER "FBC&HRSG:47FDR:BECL:01:Rev00". FEEDERS A1+A2+A3+A IS ONE SET. FEEDERS B1+B2+B3+B IS ANOTHER SET.	SET	4.000	4.00	30.06.12
20	L531614700501002 1 SET CONSISTS OF 3 NUMBERS OF EXTRACTION FEEDERS AND 1 NUMBER OF TRANSPORT FEEDER AS PER VAR 02, SPECIFIED ON ANNEXURE-D (PAGE 14 OF 24) OF SPECIFICATION NUMBER "FBC&HRSG:47FDR:BECL:01:Rev00". FEEDERS C1+C2+C3+C IS ONE SET. FEEDERS D1+D2+D3+D IS ANOTHER SET.	SET	4.000	4.00	30.06.12
30	L531614700501003 16 NUMBERS OF PROXIMITY SENSORS (ZERO SPEED SWITCHES) FOR 12 NUMBERS OF EXTRACTION FEEDERS AND 4 NUMBERS OF TRANSPORT FEEDER AS PER SPECIFICATION NUMBER "FBC&HRSG:CI:5316:DLF, Rev00".	NO	32.000	32.00	30.06.12

General Note:

1)TC & GC required.

2) The materials are to be despatched to BECL site / Gujarat state after inspection & clearance at your works.

3) Prices shall be quoted with delivery terms FOR/ BECL site (Inclusive of P&F and Freight charges).

4) All the applicable Taxes, Duties & any other price elements shall be clearly indicated in the offer(considering the ex-works place location & the Destination location).

The offers should reach us 30 minutes before the time of opening of tenders. The offers will be opened at 14.30 hrs on the due date of tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening.Late and delayed offers are liable to be rejected.

Yours faithfully,
For **BHARAT HEAVY ELECTRICALS LIMITED**

K. GANESAN 06/08/11
MANAGER PURCHASE
Purchase (FBC & HRSG)
BHEL, TRICHY-14.

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
HIGH PRESSURE BOILER PLANT
PURCHASE DEPARTMENT - FBC & HRSG
THIRUCHIRAPALLI - 620014
TAMILNADU (INDIA)

5101100295 / 05.08.2011 19925

5) Vendor confirmation required for the following commercial terms for considering their offer apart from technical suitability.

(a) Payment terms:

Our payment terms will be 90% payment made against despatch documents & balance 10% payment against receipt & accetance of materials.

(b) LD:

Our LD clause 0.5% per week subject to max. of 15% shall be applicable for the delivery delay.

If you are not confirming the LD clause, we will take our standard LD clause of 0.5% per week subject to max of 15%.

(c) Validity:

our offer shall be valid for minimum 120days from the date of Technical Bid opening or 60 days from the date of Price-Bid opening whichever is later.

6) The tender will be operated in Two part bid basis and vendor to submit their offer in Two separate sealed covers(Techno-commercial & Price bid separately).

7) The offer will be finalised on package basis and total cost to BHEL basis only..

Enclosures:
1) General terms & conditions
2) Instructions to tender
3) FBC&HRSG:47FDR:BECL:01:Rev00
4) FBC&HRSG:5316:DLF,Rev.00
5) FBC&HRSG:5316:VPLC, Rev.00
6) TDC:TCI:140
7) QA:CI:STD:PR:03
8) BHEL QP Format

"LD clause has to be confirmed without fail."
"Payment to vendors will be made only thro E-Payment mode."

PR Links

Material.	PR.No	PR.Item.	Quanity	Acc. Assign	Customer Number
L531614700501	68050793	00010	**2.000**	C1/5316-LU-312-1-47-005	C1/5316

The offers should reach us 30 minutes before the time of opening of tenders.
The offers will be opened at 14.30 hrs on the due date of tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening.Late and delayed offers are liable to be rejected.

Yours faithfully,
For **BHARAT HEAVY ELECTRICALS LIMITED**

K. GANESAN 06/05/11
MANAGER / PURCHASE
(FBC & HRSG)
Purchase / FBC & HRSG
BHEL, TRICHY-14.