

REF : 77-08-6027

**PRE TENDER TIE UP**

**TECHNICAL SPECIFICATION**

**FOR**

**CONVEYOR SYSTEM AND STRUCTURES**

**FOR**

**RAW MATERIAL HANDLING SYSTEM**

**OF**

**BOKARO STEEL PLANT**



**भारत हेवी इलेक्ट्रिकल्स लिमिटेड**

(भारत सरकार का उपक्रम)

**Bharat Heavy Electricals Limited**

(A Government of India Undertaking)

**इण्डस्ट्रियल सिस्टम्स ग्रुप**

**INDUSTRIAL SYSTEMS GROUP**

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## **1 General**

### **1.1 Site Conditions**

#### **1.1.1 Location**

Bokaro Steel Plant (BSL), SAIL is located at Bokaro Steel City in the state of Jharkhand in the eastern region of India. The site lies between 23.290 North latitude and 86.090 East longitude.

The location of Bokaro Steel City is as follows:

From New Delhi, the national capital	- 1209 kms
From Kolkata	- 220 kms
From Chennai	- 1900 kms
From Mumbai	- 1782 kms

The distance from State Capital Ranchi to Bokaro Steel City is 140 kms. The Steel Plant is well connected by rail and road network. The nearest railway station is Bokaro Steel City Station of the SE Railway.

#### **1.1.2 Meteorological Data**

The meteorological details are given below:

##### **1.1.3 Ambient Temperature**

Absolute maximum : 46.1<sup>0</sup> C

Absolute minimum : 1.8<sup>0</sup> C

Highest of mean monthly : 43.8<sup>0</sup> C

Ambient Air

Ambient air quality : Industrial

Relative Humidity

Maximum : 100%

Climate : Tropical Humid

Rainfall

Heaviest rainfall in 24 hours : 272 mm

Annual Average : 1197.3 mm

Wind

Predominant wind direction : NW to SE

Mean wind speed : 7.8 kmph

Maximum wind speed : 108 kmph

Altitude

Average altitude of the land is 210 m above MSL

Temperature inside shop premises is generally taken as 5<sup>0</sup> C above ambient, unless otherwise specified.

#### **1.1.4 General Rules and Regulations**

All plant units with respect to their location, layout, general arrangement and design of equipment, structural design, etc. shall be safe to the personnel and conform to the relevant statutory requirements issued by Jharkhand Government and the Government of India but not limited to the following.

- Jharkhand State Factory Rules/Acts.
- Indian Electricity Rules/Acts
- Electricity Regulatory Commission Act
- Indian Petroleum Regulations/Acts
- Indian Boiler Regulations/Acts
- Indian Explosives Acts
- Gas Cylinders Rules/Acts
- Carbide of Calcium Rules/Acts
- Static and mobile Pressure Vessels Codes (unifired) Rules/Acts
- Fire Protection Manual issued by Tariff Advisory Committee (India)
- Pollution Control Regulations/Acts

Pollution control measures shall be provided considering the latest norms and international standards. These should satisfy the stipulations of Central Pollution Control Board and Department of Environment and Forest, Government of India.

In the event the requirements of this specification exceeds the requirement stipulated in the corresponding standards, regulation, safety code, the specification shall govern.

In the event of conflict between the standard, regulations and codes, the most stringent one shall govern and the decision of the Purchaser shall be final.

### **1.2 Brief System Description**

The Expansion of Raw Material Handling System comprises of the following sub-systems:

- Preparation of six nos. new beds for storing iron ore fines and flux materials
- Material receipt at Wagon Tippler WT # 5 and onward transport to the six(6) nos. new Ore fines and flux material storage bed for Stacking.
- Interconnectivity with WT #1,2,3 &4 to the new beds.
- Reclaiming from new beds & transportation to existing conveyor system for onward transmission to Sinter Plant ,Blast Furnace.
- Reclaiming flux material from new beds & transportation to new Lime/Dolo Plant of SMS-III.
- Receiving Lump Iron Ore from conv. KD1-3 and store in Intermediate Storage Bunker Building and feed back to conv KD1-3 near BF Stock House.
- Provision of DRI shed and iron ore storage near Lime/Dolo plant for feeding to SMS-III.
- 4<sup>TH</sup> Series Of Reclaiming Conveyor In Raw Material & Materialhandling Plant (RM & MHP)
-

The raw material to be handled by the proposed system are mainly, Iron Ore Lump, Iron Ore Fines, Lime Stone (BF grade), Lime Stone (SMS grade), Dolomite (BF grade), Dolomite (SMS grade), Quartzite, DRI and Ferro-alloys. These raw materials are mainly required for Blast Furnace, Sinter Plant, Lime-Dolomite Plant and Steel Melting Shop etc. All the raw materials will be received at the plant boundary by rail. The type of Wagon will be BOX,BOXN,BOXN MARK-II, BOXNHA, BOY,BOBX,BOBS,BKC,BOBRN, BOST, which will transport the raw materials depending upon the location of loading and type of raw materials.

## 2 Design Considerations

The Raw Material Handling System (RMHS) systems have been planned based on the following assumption:

### 2.1 Size of Raw Material

1. Lump Iron Ore : (+) 8 to (-) 30 mm
3. Iron ore fines : (-) 8 mm
4. Lime Stone (BF/SP grade) : (+) 15 to (-) 50 mm
5. Dolomite (BF/SP grade) : (+) 25 to (-) 50 mm
6. Quartzite : (+) 25 to (-) 50 mm
7. Lime Stone (SMS grade) : (+) 25 to (-) 50 mm
8. Dolomite (SMS grade) : (+) 10 to (-) 25 mm
9. Pellets : (+)9 to (-) 16mm
- 10.DRI (By Truck to SMS-III) : (+)4 to (-) 20mm

### 2.2 No of Days of Working per year: 330 days

To handle raw materials required for 7.4 MT expansion of BSL, Bokaro from its present production capacity, additional wagon tippler for receipt of raw material and 6 nos additional beds in the preparation plant have been envisaged. This plant shall deal with receipt, storage, handling of raw materials required to process / consumer plants like Blast furnace, Lime and Dolomite plant, Steel Melting Shop, etc.

The Raw materials requirement for I for 7.4 Mt expansion is shown in Table-05.01 with daily consumption, number of stock piles and storage capacities etc. including handling losses as envisaged.

Sl.	Material	Bulk density, t/m <sup>3</sup>	Annual requirement with losses, t	Daily consumption	Selected Stock Pile	Storage Capacity	
				t		m <sup>3</sup>	Days
	I/O (Lump) (8-25mm) BF Plant	2.2	4,84,330	1384	1	18000	28
	Coke (BF Plant)	0.5	3,169,320	9055	-	-	-
	I/O (Fines) Sinter Plant	2.4	7,649,070	23179	10	230000	23
	Sinter BF Plant	1.7	9,791,430	27976	-	-	-
	Quartz BF Plant	1.5	1,24,520	356	1	23000	97
	Lime Stone for Sinter Plant	1.5	1,304,270	3952	2	46000	17
	Dolomite for Sinter Plant	1.6	6,080,80	1843	1	23000	19

	Lime Stone for Lime Plant (SMS)	1.5	4,61,120	1317	1	23000	26
	Dolomite for Lime Plant (SMS)	1.6	2,03,610	582	1	23000	63
	L/D Slag, Mn Ore etc.	-	As required	-	1	-	-
	Pellet	2.2	4,325,530	12359	6	123000	21
	Coke breeze	0.8	6,25,680	1896	-	-	-
<b>TOTAL</b>			<b>2,93,49,760</b>	<b>85,668</b>	<b>24</b>		

The estimation of stockpile/storage capacities have been made based on the following assumption.

**A. Iron Ore Lump, Iron Ore Fines, Fluxes, Pellets :**

- Stock pile length available = 230m
- Stock pile width = 25m
- Height of stock pile = 8.5m
- Each stock pile volume = 23,000m<sup>3</sup>

**B. No. of Days of working per year :**

- For Blast Furnace = 350 days
- For Sinter Plant = 330 days

Material carrying capacity of each wagon shall be 70t (considering high sided wagon) with gross weight of wagon 100t. All material will be received in Wagon Tippers. Wagon tippler with pusher car has been considered for unloading the materials received in BOXN/BOST/ BOXNHA/BOY wagons. DRI, Iron ore for SMS-III will be transported by road.

The facilities required for achieving the targeted productions additional handling facilities has been envisaged. The scheme has been described hereunder.

**2.2.1 UNLOADING AND STACKING OF IRON ORE AND FLUX**

- One number Wagon tippler WT no.5 along with a Pusher Car in addition to 4 numbers existing Wagon Tippers has been envisaged for unloading Iron ore (lump and fines), Limestone & Dolomite (both SMS grade and Sinter Plant grade), Mn-ore, Quartzite etc.
- The Wagon Tippers shall be of Rotaside Type capable of unloading BOXN and proposed BOXNHA and BOY wagons upto a gross weight of 120t and an axle load of 23 t. The rated unloading capacity shall be 20 Tips/hour.
- The placement of rakes shall be done by 7000t Wagon Pusher Car capable of handling a full rake BOXN, BOXNHA and BOY wagons.
- Two belt feeders below each Wagon Tippler shall convey the raw material on conveyor P1C1 upto Jn House JNA1. From Jn House JNA1, which has been connected to Jn House JNA2, JNA3 and JNA4 by a conveyor P2C1 & P2C2 to stack material in the new six numbers beds through conveyor P3C1, P4C1, P5C1 and twin boom stacker ST1, ST2, ST3. It shall be possible (in the case of exigency) to stack material in new beds after unloading material in WT no.1, 2, 3 & 4 and transfer the same in Junction House JNB1 & JNB2, to conveyor P2C1, P2C2.
- In the Raw material handling yard, 6 nos. of additional stock pile of length 230m and 25m width each have been considered to accommodate additional requirement of Iron Ore Fines, flux (LDP), Pellet and Iron ore Lump along with transfer car, stacker and barrel reclaimers adjacent to existing LDP (Flux) storage area. The new stockpile arrangements have been shown in the Layout drawing. For 7.0Mt expansion in the existing yard no. of beds for Pellets to be increased to 6 nos and Iron Ore lump and Flux beds has been

reduced. Brief descriptions of the various sub-systems are given below and are also reflected in the drawings enclosed. However the Tenderer shall consider the Tender drawings only as indicative and for tender purpose only and any changes for completeness and improvement shall be finalized during submission of basic engineering document for approval by the successful tenderer.

## **2.2.2 RECLAIMING AND TRANSPORTATION OF IRON ORE AND FLUX**

- Iron ores after reclaiming from this yard with the help of 3 nos. Barrel Reclaimer and through yard conveyors P6C1,P7C1,P8C1, P9C1, P10C1, P11C1/C2C3, JNA8A, PC12C2/C3 to 4th series conveyor in JNA10 and to the existing conveyors KP11-1/KP11-2/KP11-3 through 2 nos. new shuttle conveyor RSC10-1 & RSC10-2 in JNA11 has been envisaged to accommodate additional capacity of Raw Material Handling to the existing consuming units.
- Pellet will be stored in the stock pile as shown in the layout drawing and will be reclaimed through the existing conveyors to the Blast Furnace high lines.

## **2.2.3 Raw Material feeding for LIME/ DOLO Calcination plant & SMS -III**

- Out of new 6 beds 5 beds are for iron ore fines and one bed has been envisaged for feed materials of LDP plant for SMS-III. Flux material also reclaimed with the help of Barrel Reclaimer and transported through yard conveyors P5C2, JNA8, conveyor PC12C1,JNA8A, conveyor P12C1 and to conveyor L1C1 in JNA9. From JNA9 flux material reached to raw material bunkers of Lime & Dolo Plant of SMS-III through conveyors L1C1,L2C1,L3C1,L3AC1,L4C1,L5C1 and LCPC1. Calcined lime/dolo is transported to the feed junction house beside converter building (SMS-III) by conveyors LC6 and SMSC1. The conveyor SMSC1 shall also carry limestone, DRI, iron ore fines. Iron ore fines and DRI is fed to conveyor SMSC1 in the Junc House L6 through conveyor L6C2 and two nos. fixed hopper and vibro feeder. Iron Ore fines and DRI will be stored on both side of Fixed Hopper. DRI shall be stored under covered shed .
- Any other material e.g. limestone/ bauxite can also be transported under emergency conditions.
- 6 nos. shuttle conveyors JNA5RSC1, JNA6RSC1/C2, JNA7RSC1/C2, JNA8RSC1 has been envisaged in Junction House JNA5, JNA6, JNA7, JNA8.
- 1 no. transfer car has been envisaged for these beds for transfer of barrel reclaimer from one bed to another. One no. bucket wheel reclaimer has been envisaged over existing conv KP13-4 for transportation of flux to the existing system.

## **2.2.4 Intermediate storage of lump ore**

- One no intermediate storage building for storing of lump ore has been envisaged near Lab building of BF because of inadequate space for lump ore storage in the Stock House. Lump ore will be received from conv.KD1-3 with the help of fixed tripper to conv. SBC1 to Storage bldg. and sent back lump ore to the conv. K1-3 through vibro feeder and conv. SBC2 onward transport to stock house as per requirement. Total Capacity of these 4 nos. bunkers shall be 15000t. Level indicator also envisaged for these bunkers. Suitable number of electrically operated Under-Slung Cranes, Hoists etc. shall be provided in all floors of Junction Houses and building for maintenance of equipment Belt- Weigh-Scales, Air-Blasters/ Bin Vibrators shall be provided to make the system complete and the operation/ maintenance smooth.

**2.2.5 One no area repair shop and electrical store has been considered beside Conv gallery KP16-2 as mentioned in chapter 06.05**

**2.2.6 4<sup>Th</sup> Series Conveyors**

- The scope of work for this package shall cover design, preparation of fabrication / erection drawings, fabrication, manufacture, inspection, supply and transportation to site of plant and equipment, dismantling, insurance, handling, erection, testing commissioning and performance guarantee test for mechanical, electrical, civil and structural areas as elaborated in the subsequent clauses to be executed on Turnkey basis.
- All mechanical items i.e. Gear box, Couplings,(high speed & low speed), Motor, Brake and Belt etc. shall be under the scope of the successful Tenderer.
- The drive pulleys and other pulleys for Conveyor KP12-0 shall be as per existing design and will be in the scope of Tenderer.
- The Purchaser will supply GA & detail drawings of Idler frames to the successful tenderer. Based on these drawings the Successful Tenderer will supply the complete idler sets including frames identical to existing conveyors.
- For Conveyor KP11-0, KP11A-0, KP12-0, KP11-1(extension of conveyor), KP3A-3, W-4 & Shuttle Conveyors KPP12-0 (S-1), PKP3-1, PKP3-2, PKP20-1, PKP20-2 complete conveyor system will be in the scope of Tenderer.
- All works envisaged in this package shall generally be carried out by the Successful Tenderer based on indicative drawings furnished in the TS. The Successful Tenderer shall prepare all necessary general arrangement drawings including fabrication / erection drawings of above proposed equipment and facilities. Any underground structure / facility which is not shown in the existing drawings or otherwise not envisaged and needs to be dismantled / diverted for the completion of the job shall be carried out by the successful Tenderer. One cable and one communication line along axis A+10602.00 is fouling with conveyor alignment. Apparently these underground lines may be newly laid or may not be laid at all. A water tunnel along axis A+10598.80 is very near the proposed gallery centre line at A+10602.70. If any rerouting / diversion / redesigning of the structure and / or facilities are required, the same shall be covered in the scope of successful Tenderer.
- The Tenderer shall survey the site, study drawings / documents and discuss with the Purchaser / Consultant, if required, regarding any further technical clarification and satisfy himself with respect to the nature and extent of work involved. The Tenderer shall confirm the visit to the site.
- The Successful Tenderer shall submit drawings / documents for approval and reference of the purchaser / consultant based on the list to be discussed and mutually agreed upon.
- The technical specifications covering the details of equipment and drawings of this specification shall be taken for the purpose of tendering and design concept and shall not be taken as final and firm for the completion of the project. However, rated capacity of different equipment including other minimum technical parameters have been furnished in the TS shall be strictly adhered to.

### **3 Safety**

#### **3.1 Safety Regulations**

- The Contractor shall comply with the, relevant Safety Rules and Regulations but not limited to the following:
  - Jharkhand State Factory Rules/Acts.



- Indian Electricity Rules/Acts
- Electricity Regulatory Commission Acts
- Indian Petroleum Regulations/Acts
- Indian Boiler Regulations/Acts.
- Indian Explosive Acts
- Gas Cylinder Rules/Acts
- Carbide of calcium Rules/Acts.
- Static and Mobile Pressure Vessels codes(Unfired) Rules/Acts
- Fire protection manual issued by Tariff advisory committee (India)
- Pollution Control Regulations/Acts
- Strict attention shall be paid to all statutory regulations and safety rules for prevention of accidents.
- The safety posters/regulations for prevention of accidents shall be displayed by the Contractor at appropriate places. Notices and warning signs shall be displayed for all sources of dangers.
- The Contractor is not permitted to construct any temporary road crossing on the rail tracks for the sake of their convenience at work site.
- When the work is carried out at night or in the obscure day light, adequate arrangements for flood lighting in the working area shall be made by the Contractor at his own cost and got approved by the Purchaser.
- All handling/transport and rigging equipment including lifting tools and tackles shall be checked at regular intervals and kept in good and safe working condition. A register is to be maintained regarding the results of periodical tests/checks and other particulars in respect of each and every such equipment.
- The Contractor must take sufficient care in moving his construction plant and equipment from one place to another, so that those do not cause any damage to the property of the Purchaser or obstruct construction activities of other Contractors.
- 05.01.08 The Contractor shall depute a full time safety engineer who will exclusively look after all the jobs pertaining to safety at site and keep close liaison with Purchaser/Consultant. He will be responsible for maintaining safe working conditions at site, promoting safety consciousness among the workmen and reporting to concerned authorities in case of accident/dangerous occurrences.
- Before execution of work in hazardous area like
  - Gas contamination
  - Working at height.
  - Storage of inflammable materials
  - Danger of electric shocks
  - Explosion risks
  - Excavations more than 2 m deep, etc.

A protocol should be prepared in association with the concerned agencies of the Purchaser/Consultant.

### **3.2 Safety while Working with Explosives.**

- Explosives shall not be used on the work site by the Contractor without the written permission of the Purchaser and that too only in the manner and to the extent to which it has been prescribed.
- Explosives shall be stored in special premises approved by the Purchaser and at the cost of the Contractor who shall be liable for all damages, loss or injury to any person or property and shall be responsible for complying with all statutory obligations in these respects.

### **3.3 Safety Appliances**

- The Contractor shall provide the safety appliances conforming to the relevant Indian standards to all their workmen and supervisors engaged by them as well as by the sub contractors.
- The Contractor shall ensure that all the workmen and supervisors, are using the safety appliances regularly during work at site.
- Any form of compensation in lieu of safety appliances shall not be permitted. Any violation in safety provisions or failure to maintain safe working conditions will lead to serious penalty on the Contractor and finally may lead to termination of the Contract.
- The workmen of the Contractor deployed for construction and erection in hazardous areas shall be provided with personnel protective safety appliances of special nature suitable for hazardous working conditions.

### **3.4 Safety during Construction/Execution**

- The Contractor shall be responsible for the safety of his workmen and employees. The Contractor shall ensure that safety practices are followed so as to prevent personal injury to his workmen and also to other persons working/passing by in that area.
- The Contractor shall ensure that in case of any accidents, the same are reported without delay to the Purchaser/Statutory Authorities as per Rules. In case of any injury/accident the Contractor shall bear all the expenditure for medical treatment and shall pay the compensation in case of permanent disability or death.
- The Contractor shall ensure that all personnel employed do not stray into other areas. Any injury caused due to this shall be the sole responsibility of the Contractor.
- The Contractor shall ensure that skilled labours required for specific works have necessary trade certificates and adequate experience of the job. This is likely to be checked by the Purchaser. The concerned operator, mechanics, electricians, fitters, riggers, etc. must be fully conversant with the hazards associated in operation/maintenance of their relevant equipment.
- Safer Working Platforms
  - Contractor shall use strong and secured planks and boards of the right sizes.
  - These planks shall be painted at the edges brightly to warn the workers for any misuse (usually zebra paint)
  - Barricades should be put-up to prevent them from falling.
  - Contractors shall make sure that scaffolds are erected by trained scaffolders.
  - Supervisors must inspect scaffolds once every week.
- Falling Objects and Debris
  - No loose materials which can fall down should be kept on the working platforms.
  - Overhead shelters should be provided to minimize damage from falling objects.
  - Strong nets to be provided to catch these objects or debris.
  - Nets must envelop all sides of the building.
- Personal Safety Equipment
  - Workers must wear approved safety helmets and shoes.
  - For those working in high places safety belts shall be provided.
  - The safety belts must be attached to strong anchorage points.
- Operating Construction Machine
  - Contractors shall make sure that those operating the construction machinery are well trained for their jobs.
  - The keys of such machinery shall be kept with the authorized persons.
  - The keys shall be removed after use of the machine.

- Safer Electrical Installations
  - Contractor shall use approved types of electrical sockets and plugs.
  - Proper insulators for all electrical wirings shall be provided.
  - Wiring should not be allowed to lie on the floor or on the ground.

### **3.5 Safety in Designing of Equipment**

- All machinery and equipment must be equipped with safety devices. The safety provisions shall conform to the recognised standards, safety codes and statutes.
- All safety measures as required to be adopted as per the statutory regulations and the safety rules of the plant shall be strictly followed by the Contractor during the execution of the Contract.

## **4 Scope of Work And Battery Limits**

### **4.1 Scope of Work**

The broad turnkey scope of work shall be as per the following:

- Design, manufacture, inspection, shop & primary coat of paint & supply of complete plant & equipment, fabrication (shop & site) of building structures & technological structures, power distribution, electrics, instrumentation & automation, as required, for complete & trouble free operation of Raw Material Handling System in an integrated manner.
- Basic engineering, detail engineering and reference category of drawings, operating software and documents, in requisite copies, for approval of BSL / MECON. Further, the Tenderer will furnish final basic & detail engineering drawings, manufacturing drawings of fast wearing items and non-standard items, as built drawings, erection drawings/ documents, operating software, operation and maintenance manuals in soft editable format.
- Receipt of material, loading / unloading, storage, civil construction, complete erection, testing, commissioning, handing over of plant to Purchaser, demonstration of performance guarantee and post commissioning services for a period of six months after commissioning. Preparation and approval of erection survey / alignment schemes, grouting clearances, painting clearances, testing of welds, pressure testing protocols and other related site protocols.
- Deputation of representatives of equipment suppliers and technology suppliers to site for supervision of erection, testing and commissioning.
- Applying final finish coat of paint as per approved procedure & shades before handing over, first fill of lubricant & oil, special tools & tackles, mobile equipment, handling & hoisting equipment etc.
- Supply of all commissioning spares and insurance spares. A list of such commissioning spares & insurance spares shall be indicated separately as indicated in schedule chapter 12. Tenderer shall quote separately for two years spares along with the main offer.
- Progress reporting as per agreed formats, providing documentary evidence of purchase orders on sub vendors with addresses of contact persons, attending all site progress review / engineering review meetings at BSL, Bokaro or at MECON, Ranchi, opening an equipped site office with coordinator over seeing all activities.
- Arrangement of all erection equipment viz. cranes, hoists, winches, etc, and safety appliances as required for erection of plant & equipment. Appointment of safety officer by the contractor shall be included.
- Specialised training of Purchaser's / Consultant's personnel for operation, maintenance, for smooth handing over the plant.
- Testing and cold trial run of systems/ sub - systems and integrated testing shall be carried out by the successful Tenderer on continuous basis for complete Raw Material Handling System alongwith associated facilities followed by commissioning. On successful commissioning of the various sub-systems of the RMHS, PG test of the entire plant shall be carried out as elaborated in the relevant chapter.
- Receiving delivery of items at site, their proper storage, and handling at site, watch and ward services, removal of debris to a location specified by the Purchaser etc.
- Site shall be handed over to the Purchaser in clean and orderly manner to the satisfaction of the site engineers after commissioning of the project.

- Getting Purchaser's/ consultant's approval for the drawings prepared by the successful Tenderer, obtaining required approval from statutory authorities, providing adequate personnel, equipment, tools & tackles for timely completion of the project.

This is a turnkey project for additional Raw Material Handling System and all the facilities required for proper functioning of the plant and achieving the rated production shall be deemed to be covered in the tender specification, unless specifically excluded from the Tenderer's scope.

#### **4.2 Delivery**

The project is schedule up to handing over to Purchaser shall be within 24 months from the date of placement of LOI on successful contractor to handing over. The delivery of plant & equipment shall be FOR, BSL site/ stores at Bokaro, Jharkhand.

#### **4.3 Battery Limits**

Overall battery limits of the Raw Material Handling System has been described in the "Brief System Description" chapter 05 along with the Flow Diagrams – Drawing Nos MEC/S/E24F/11/17/K/01/55/02101. Battery limits for Raw Material Handling System (RMHS) comprises of the following:

- Material receipt at Wagon Tippler WT # 5 and onward transport to the new Ore fines and flux material storage bed for Stacking, Reclaiming from new beds & transportation to existing conveyor system for onward transmission to Sinter Plant, Blast Furnace and also transportation to new Lime/Dolo Plant of SMSIII.
- Provision of Intermediate Storage Bunker Building for Lump Iron Ore near BF Stock House.
- 4Th Series Conveyors

#### **4.4 Obligations of Purchaser**

- Purchaser shall allot leveled land with an undulation of about +500mm from the predetermined level as per the layout drawing for installation of the Raw Material Handling System.
- Purchaser shall provide construction power, drinking water during construction and space for storage and site office as per GTS. The Tenderer shall indicate the details required by them in the prescribed format.

#### **4.5 Additional Points**

- The requirement of construction power and water shall be indicated.
- List of activities to be performed by the Purchaser for completeness of the work shall be mentioned by the Tenderer. (4Th Series Conveyors)
- The resource deployment for carrying out the job as suggested by the Tenderer shall be mentioned. (4Th Series Conveyors)
- Supply of the initial fill is in the Tenderer's scope.
- The Tenderer shall confirm the supply of all consumables required for erection, testing and successful commissioning of the system.
- The Tenderer shall also confirm the provision of commissioning spares required for all equipment.
- The Tenderer shall confirm the supply of all special tools and tackles required for erection, testing and successful commissioning of the system.

- The Tenderer shall furnish spares for two years normal operation/ maintenance of the offered equipment to ensure availability of the equipment. Price of such spares shall be quoted separately.

## 5 List of Equipment

### 5.1 RMHP Area

#### UNLOADING AND STACKING OF IRON ORE AND FLUX

Handling system from receiving of material at Wagon Tippler , conveying and stacking in the Six nos. new Beds shall be considered as rated capacity of 1650TPH.(Design cap approx. 2000TPH)

SL. NO	DESCRIPTION	LOCATION	Qty	REMARKS
3	Belt Feeder – 1 & 2,BW – 1800 Cap. – <b>1650TPH</b> . C/C – 5000 Lift – 0	Near WT-5	2	
4	Grating over hopper		lot	
5	Mn. Steel liner plate/st impregnated rubber for 2 hoppers at Wagon Tippler#5.		lot	
6	20/5 t EOT crane x 15.5 m span		1	
7	Rod Gate(RH01,RH02)		2	
8	Conv.P1C1, BW=1400 mm, Cap= <b>1650TPH</b> , C/C=237.0 m, Lift-36.0 m, V-2 m/s	WT#5 TO JNA1	1	
9	Conv.P2C1/C2, BW=1400 mm, Cap= <b>1650TPH</b> , C/C=447.0 m, Lift-7.0 m, V-2 m/s	JNA1 TO JNA4	2	
10	Conv.P3C1, BW=1400 mm, Cap= <b>1650TPH</b> , C/C=326 m, Lift-0 m, V-2 m/s	JNA2 TO YARD	1	
11	Conv.P4C1, BW=1400 mm, Cap= <b>1650TPH</b> , C/C=326 m, Lift-0 m, V-2 m/s	JNA3 TO YARD	1	
12	Conv.P5C1, BW=1400 mm, Cap= <b>1650TPH</b> , C/C=326 m, Lift-0 m, V-2 m/s	JNA4 TO YARD	1	
13	Conv.P6C1, BW=1400 mm, Cap=1000TPH, C/C=316 m, Lift-6.0 m, V-2 m/s	YARD TO JNA7	1	
14	Conv.P7C1, BW=1400 mm, Cap=1000TPH, C/C=316 m, Lift-6.0 m, V-2 m/s		1	
15	Conv.P8C1, BW=1400 mm Cap=1000TPH, C/C=316 m Lift-6.0 m, V-2 m/s	YARD TO JNA6	1	
16	Conv.P9C1, BW=1400 mm Cap=1000TPH, C/C=316 m Lift-6.0 m, V-2 m/s	YARD TO JNA6	1	
17	Conv.P10C1, BW=1400 mm Cap=1000TPH, C/C=316 m Lift-6.0 m, V-2 m/s	YARD TO JNA5	1	
18	Conv.P5C2, BW=1400 mm Cap=1000TPH, C/C=316 m Lift-6.0 m, V-2 m/s	YARD TO JNA8	1	
19	Electrically operated flap gate.	JNA5/6/7/8	7	
20	Conv.P11C1/C2/C3, BW=1400 mm, Cap=1000TPH, C/C=511 m, Lift-15.0 m, V-2 m/s	JNA5 TO JNA8A	3	
21	Conv.P12C1/C2 BW=1400 mm, Cap=1000TPH, C/C=283 m, Lift-0 m, V-2 m/s	JNA8A TO JNA9	2	

22	Conv.P12C3 BW=1400 mm, Cap=1000TPH, C/C=350 m, Lift-0 m, V-2 m/s	JNA8A TO JNA9	1	
23	RBC-A/B, BW=1400 mm, Cap=1200TPH, C/C=5 m, m, V-2 m/s, Lift-0	JNA1	2	
24	Electrically operated flap gate.	JNA1	1	For 1650TPH Material Flow
25	Electrically operated flap gate.	JNB1	2	
26	Electrically operated flap gate.	JNB2	2	
27	FIXED TRIPPER	JNA2	2	For 1650TPH Material Flow
28	FIXED TRIPPER	JNA3	2	For 1650TPH Material Flow
29	FIXED TRIPPER	JNA10	2	
30	RSC10-1 / 2, BW=1400 mm, Cap=1000TPH, C/C=6.5 m, Lift- 0 m, V-4 m/s	JNA11	2	
31	REV. SHUTTLE CONVEYOR RSCJNA5/6/7/8,LENGTH=5 M,LIFT-0,SPEED-2M/S,	JNA5/6/7/8	6	
32	REV SHUTTLE CONVEYOR RSCJNA1,JNB1/B2,LENGTH=5M,LI FT-0,SPEED-2M/S	JNA1,JNB1/B2	3	
37	MANUAL HOISTS	VARIOUS JUNCTION HOUSES		
	-1T		7	
	-2T		10	
38	ELECTRIC HOISTS	-DO-		
	-2T		2	
	-3T		1	
39	CHUTES WITH LINERS	-DO-	LOT	
40A	BELT WEIGH SCALE (0-2000TPH) (Rated)	Conv.P2C1/C2	2	
40B	BELT WEIGH SCALE	Conv.P12C1/C2/C3	3	
41	METAL DETECTOR AND SUSPENDED MAGNET	P12C1/C2/C3	3	



## 5.2 Raw Material Feeding for Lime / Dolo Calcination Plants, SMS and CCP

SL. NO	DESCRIPTION	LOCATION	Qty	REMARKS
1	Conv. L1C1, BW = 1200 mm, Cap = 1000TPH, C/C = 637m, Lift=7m, Seed=2m/s	JNA9 to L-1	1	
2	Conv. L2C1, BW = 1200 mm, Cap = 1000TPH, C/C = 4 m Lift-0 m, V-2 m/s	L-1 to L-2	1	
3	Conv. L3C1, BW = 1200 mm, Cap = 1000TPH, C/C = 500 m, Lift-3.0 m, V-2 m/s	L-2 to L-3	1	
4	Conv. L3AC1, BW = 1200 mm, Cap = 1000TPH, C/C = 40 m, Lift-0.0 m, V-2 m/s	L-3 to L-3A	1	
5	Conv. L4C1, BW = 1200 mm, Cap = 1000TPH, C/C = 454 m, Lift-3 m, V-2 m/s	L-3A to L-4	1	
6	Conv. L5C1, BW = 1200 mm, Cap = 1000TPH, C/C = 310 m, Lift-6 m, V-2 m/s	L-4 to L-5	1	
7	Conv. LDPC1, BW = 1200 mm, Cap = 1000TPH, C/C = 590 m, Lift-12 m, V-2 m/s	L-5 to LDP	1	
8	Conv. L6C1, BW = 800 mm, Cap = 200TPH, C/C = 137 m, Lift-9.5 m, V-2 m/s	LDP to L-6	1	
9	Conv. L6C2, BW = 800 mm, Cap = 800TPH, C/C = 70 m, Lift-9.5 m, V-2 m/s	FH to L-6	1	
10	Conv. SMSC1, BW = 800 mm, Cap = 800TPH, C/C = 240 m, Lift-48 m, V-2 m/s	L-6 to SMS	1	
11	Fixed Hopper	Storage beside SMS	2	
12	Vibro Feeder, 0-200 TPH	Below FH	2	
14	Electric hoist 2 T		7	
15	MANUAL HOIST 2T			

### 5.3 Intermediate Storage Building of Iron Ore

SL. NO	DESCRIPTION	LOCATION	Qty	REMARKS
1	Conv. SBC1, BW = 1200 mm, Cap = 1000TPH, C/C = 204 m, Lift-4 m, V-1.6 m/s	JH-SB to IOSB building	1	
2	Conv. SBC2, BW = 1200 mm, Cap = 1000TPH, C/C = 203 m, Lift-25mV-1.6m/S	IOSB building to JH-SB	1	
3	Fixed Tripper	JH-SB	1	
5	Vibro feeder 400tph	IOSB	4	
6	Mobile Tripper	IOSB	1	
7	Belt Weigh Scale	Conv.SBC2	1	

### 5.4 4<sup>th</sup> Series Conveyors

#### 5.4.1 Proposed new facilities

1. Conveyor KP12-0 & Conveyor KP11-0 shall be new but the major items i.e. Motor, Gear Box, Pulleys, idler frames, belt, couplings shall be identical to existing conveyor of KP11-2 (ref. **Drg. No. CET RN 2433 ME1 01 010 R=2**).
2. Conveyor KP11A-0, KP3A-3, Reversible Shuttle Conveyor PKP3-1, PKP3-2 & PKP20-1, PKP20-2 shall be new conveyors. Drive unit i.e. Motor, Gearbox. Couplings, Brake shall be as per data sheet enclosed with TS. During detailing the layout may change for which approval of purchaser will be needed. Presently Conveyor KP3A-3 is receiving material from existing Conveyor KP3-3 & KP3-4. Existing Conveyor KP3A-3 will be dismantled and new Reversible Conveyor KP3A-3 is to be installed and this conveyor will be able to discharge material to Conveyor KP11-0 & KP11-1 and accordingly discharge chute of existing Conveyor KP3-3 & KP3-4 are to be replaced.
3. A fixed tripper with Flap gate arrangement at JH-12.
4. 2 nos. suspended Magnet (one no. at Discharge end of conveyor KP11-0 & another at discharge end of conveyor KP12-0. Reject chutes shall be provided to collect the iron particles & the same shall be fed to a hopper at ground level.
5. Existing Belt conveyor KP11-1 shall be extended from JH-7 to JH-3. The scope of work involves dismantling of existing drive system, drive frame, drive & snub pulleys, drive pulley frames, scrapper, some portion of technological structures / idlers at head end, discharge chutes etc. New drive frame, pulley frame, scrapper, chute, drive pulley (similar to KP11-3) etc. suitable for 200 kw motor shall also be under the scope of successful Tenderer. At tail end, tail pulley & supporting structures, take-up pulley & take-up tower etc. are to be dismantled and extended. Additional new idlers, technological structures, take-up pulley with take-up frame, counter weight deck plate etc (as per existing). shall be under the scope of successful Tenderer. Drive unit i.e. Motor, Gearbox, couplings shall be identical to KP11-2. Take up unit of Conveyor KP11-1 shall be dismantled and shall be installed in new position at JH-3.
6. A new shuttle conveyor S-1 (reversible) shall be installed in JH-12 & will discharge material either to Conveyor W-4 or existing Conveyor AFS1.
7. All the new conveyors shall be complete with belting, technological structure like drive frame, head frame, tail frame, short support, deck plate, skit board, protection cage, hood, drive motor & complete drive system (gear box, coupling, brakes etc), pulleys with

- bearing, idlers, take-up unit with take up structure, inter connecting chutes with liner, internal & external scrapers, Safety switches, seal plates etc.
8. Chain pulley block of capacity 3t at JH-1A, JH-1B, JH-12, JH-12A, JH-3A shall be provided with mono rail.
  9. Conveyor W-4 shall be a new conveyor with Feeding & Discharge chutes.
  10. 1 no. motorized Flap gate at discharge end of W-4.
  11. Chute vibrator in all Discharge chutes of Conveyors 11-0, 11A-0, 12-0, W-4, KP3-1, KP3-2, KP3A-3, PKP20-1 & PKP20-2.
  12. Modification of existing conveyor of shuttle conveyor PKP20-1 & PKP20-2 for discharging material to new conveyor KP11-0 or existing conveyor KP15-1 & KP15-2 at JH-20.

#### **5.4.2 Dismantling Work**

1. Dismantling of Tail unit & Gravity unit etc. of conveyor KP11-1 (ref. Drg. No. CET RN 2433 ME1 01 010 R=2).
2. Dismantling partly the conveyor gallery of KD1-4 & KD1-5 for making junction house JH-12A.
3. Dismantling of Chutes and Conveyors PKP3-1, PKP3-2, PKP20-1 & PKP20-2.
4. Dismantling of Conveyor KP3A-3.

## **6 Technical Specification**

### **6.1 Technological**

#### **6.1.1 General**

Technical specifications for major technological equipments are furnished in this chapter. However, most of the common Material Handling equipment are covered in the "General Technical Specification(MEC/S/E24F/11/38/0/00/00/F1874/R0) – Material Handling Equipment chapter-06".

The equipment covered in the GTS are:-

- Belt Conveyors and related equipment, Belt Feeder, Shuttle Conveyor and Reversible Shuttle Conveyor System
- Vibratory Feeders
- Gates
- Motorised Diverter Gate
- Weigh Hoppers
- Belt Weigh Scales (BWS)
- Vibration Isolation System
- Travelling Tripper and Bunker Sealing Arrangement
- In-line Magnetic Separator (ILMS) & Suspended Magnetic Separators
- Metal Detectors (MD) & Magnet
- Charging hatches
- Cranes and Hoists
- Transfer Cars
- Vulcanising Machine and Mobile Belt Changing units

The Tenderer may please note that the plant shall be complete with all equipment & facilities. Further, some of the equipment whether specifically mentioned or not in this TS, but which the Tenderer feels it necessary to be included in this TS for successful and trouble free operation of the plant shall also be included in the offer. Technical parameters furnished against each equipment are broad in nature. However, the Tenderer shall confirm the same & furnish various technical parameters and capacity of each equipment in his offer.

Any deviation/ exclusion from TS shall be clearly spelt out with justification

## **6.2 Conveyor System & Related Equipment**

### **6.2.1 Scope**

The scope of work of the Tenderer shall include design, engineering, manufacture, fabrication, assembly, testing and inspection, packing, dispatch, transportation, transit insurance, delivery FOR Purchaser's site, unloading, handling and storage at site, insurance during storage, erection supervision, testing, inspection, commissioning, guarantee testing and handing over to the client including all electrics and standard accessories the following components for all the conveyors indicated in the enclosed drawings.

- i) Motors
- ii) Gear boxes
- iii) Couplings
- iv) Pulleys with bearing blocks – head, trail, snub bend and take-up
- v) Idlers – carrying, return, impact, self-aligning and transition
- vi) Idler frames
- vii) Belt cleaning devices
- viii) Hold back devices
- ix) Electro-magnetic brakes
- x) Pull-cord switches with cord
- xi) Belt sway switches
- xii) Zero-speed switches
- xiii) Take up pulley frame with take up guides
- xiv) Bend pulley frame
- xv) Head pulley frame
- xvi) Tail pulley frame
- xvii) Drive base frame
- xviii) Guards – tail pulley, bend pulley, coupling
- xix) Discharge hood up to 500 mm below the discharge pulley platform
- xx) Skirt Boards
- xxi) Belt Weigh Scale – wherever required

The scope of the Tenderer shall be deemed to include all such items which although are not specifically mentioned in the specification, but are needed to make the equipment complete in all respect for its safe, reliable, efficient and trouble free operation.

3. The scope of supply and services of the Tenderer shall include the following:

- a) Mechanical
  - Each equipment shall be complete in all respect including, its drive units, cables, safety switches, structural, mechanical and other standard accessories.
  - Provision of necessary fixtures, supporting angles and brackets required for mounting and supporting the equipment.
- b) Electrical
  - LT AC motors and brakes with rectifier panels as required for the equipment.
  - Switches as necessary for interlocking and control and safe operation of equipment.
  - Complete flexible cable festoon arrangement with protective chain, cable guide & rollers, junction boxes etc. required for shuttle conveyors / carriages including power & control flexible cables and their termination up to junction boxes. Junction boxes for power and control supply shall be separate and shall be supplied by the Tenderer.

Any other mounted electrics that may be required for satisfactory operation and maintenance of equipment supplied by Tenderer.

## 6.2.2 Design Basis & Hierarchy of Specifications

The equipment shall be designed as per design criteria given below:

Hierarchy of Specifications

- a) Technical Specification
- b) General Technical Specification (GTS)
- c) Inter Plant Standard for Steel Industries(IPSS)
- d) Indian Standard(IS).
- e) Indian Electricity Rules & statutory requirements of Central Govt. and State Govt.

Equipment complying with other recognised Standards such as IEC, BS, VDE, and IEEE will also be considered if it ensures performance equivalent to or superior to Indian Standards.

The components and materials used and the equipment supplied shall conform to high standards of design, engineering and workmanship and shall be suitable for efficient operation and reliable service in steel plant conditions.

### Design Basis

- Utilisation of cross sectional area - 80 % of theoretical cross sectional area indicated in IS 11592-2000 (for computation of belt speed)
- Design capacity of belt conveyors- 20% more than rated capacity to be considered while calculating motor power
- Troughing angle - 35o
- Friction factor (for kW calculation) of belt conveyors- 0.03
- Belting
  - a) Top cover thickness - 6 mm(Min)
  - b) Bottom cover thickness - 3mm(Min)
  - c) Running tension < 80% of allowable belt tension
  - d) Starting tension > 150% of allowable belt tension
- Idlers -152.4 mm Outer Diameter with 5.0 mm shell thickness
- Flat return Idlers – 152.4 mm Outer Diameter.
- Carrying idler spacing -1000 mm. Spacing in the convex curve position of conveyor shall be limited to half the normal spacing of carrying idlers
- Return idler spacing - 3000 mm spacing
- Training Idler spacing
  - a) Carrying side - 15 m
  - b) Return side - 30 m
- Impact idler spacing - 500 mm or less - (min. 6 Nos.)
- Deck plate - 3.15 mm thick wherever specified
- Drive pulley –12 mm thk. vulcanized natural rubber lagging, minimum durometer hardness of 55o shore A scale. Pulley Shell thickness 16 mm minimum
- Tail/ Bend/take-up pulley – 10 mm thk vulcanized natural rubber lagging, minimum durometer hardness of 45o shore A scale, and shell thickness 12 mm minimum.
- Pulley face width - As per IS 8531-1986, Reaffirmed in 1993.
- Pulley Shaft – major shaft diameter upto 160mm- steel, class - 4 as per IS 1875-1992. More than 160mm- forged steel, class-4 normalised as per IS:2004- 1992.
- Pillow blocks
  - a) Material - cast iron / cast steel
  - b) Bearing - Self aligning spherical roller bearing
  - c) Life - 40,000 working hrs min
  - d) Construction - Horizontal split type (one end fixed and the other end expn. type)
- Reducer

- a) Service rating of 1.5 times the calculated shaft kW and thermal capacity of gear box shall be better or equal to that of motor
  - b) Material - fabricated or cast steel
  - c) kW rating shall be not less than 1.25 times the motor kW. Higher value of 'a' or 'c' will be considered
  - d) No worm gear except for traveling gate
- Brakes
- D.C. electromagnetic brakes on conveyors wherever required
- To prevent roll back
  - Where stopping time regulation is required.
  - Roller type hold back device -To be provided on all inclined conveyors to prevent roll back.
- Rating minimum 1.5 times the maximum calculated torque.
- Take up
- Screw take up - up to 40 m (with protected thread)
- Automatic take up travels as per I.S.
- High speed coupling - gear coupling/ resilient coupling less than 30 kW
  - Fluid coupling for 30 kW & more
- (Pin bush coupling - Not Applicable)
- Low speed coupling - gear or resilient.
  - External scraper
- Multi sprung blade type.
- Material scraped shall fall into main chute.
- Blade material – metallic blade with tungsten carbide tips
- Internal scraper
- V shaped, mounted on carrier assemblies with elasto-mount and nonmetallic polyurethane blade.
- Belt sway switch - At both ends and at 100 m interval (Approx.)
  - Belt slip and snap switch - away from the drive (1 No.)
  - Pull cord switch - at 30 m interval on both sides for each conveyor, starting from the drive end.

### **6.2.3 Belt Conveyor system**

#### **1. General**

All equipment shall be designed, manufactured, supplied, erected, tested and commissioned in accordance with relevant Indian Standards, IPSS and International Standard where applicable in addition to the requirement mentioned herein.

The Supplier shall make his own calculation in respect of belt speed, motor kilowatt, belt tension etc. of belt conveyors to ensure satisfactory performance of the conveyor components and system as a whole. The drive motor selected shall not be of lesser kW than what is indicated and the belting chosen shall not be of inferior quality than what is specified.

The starting torque of drive motor and the high speed coupling shall be so chosen as to allow soft start condition.

Adequate no. of locating pins and match marking shall be provided for easy assembly and dismantling.

Standardisation of components and assemblies shall be carried out to the maximum possible extent to ensure interchangeability.

All equipment shall be designed such that all components are easily accessible for inspection, repair and maintenance.

#### **2. Conveyor Belting**

Belting shall be designed for heavy duty condition and shall be suitable for 24 effective working hours operations per day and 365 working days per year. It shall be suitable for installation over conveyor system having 35o troughing angle and shall be suitable for operation at an ambient temperature of 50oC. It shall have sufficient resistant against exposure to open sunlight so that its qualities do not deteriorate while working in open sun. It also may have to work in rain and / or in conditions where relative humidity goes upto 100%. The fabric for belting shall be of Nylon/Nylon

heavy duty type. The belting shall be prestretched, straight ply, skin coated with open ends. It shall have sufficient strength to give required tension at 10 safety factor and 80% tension utilisation. All belts shall be joined by vulcanized splicing.

The belt shall have sufficient lateral flexibility so that it suits the troughing angle requirements even when it is empty. The belt shall have sufficient longitudinal flexibility so that it can easily flex around different pulleys of the conveyor system. The belt shall have sufficient impact resistance to withstand impact at the loading points. The rubber cover used in the top and bottom cover of the belting generally shall be of M-24 grade. For material above 50 deg C cover shall be of HR grade and material above 100 degC & red hot FR grade belt shall be provided. The edge shall be of cut edge construction.

On the carrying surface, at interval of maximum 12 meters, the belting shall be marked as follows:

- a) Manufacturer's name and trade mark, if any.
- b) Fabric designation as NN
- c) Belt designation i.e. KN/m
- d) Code of rubber cover i.e. M-24.
- e) Last two digits of year of manufacturing.

Belt roll shall be packed in wooden drums. This packing should enable easy unreeling of the belting. On the body of the wooden drum the direction of belt and location of end of the belting should be indicated so that belting can be properly placed while unreeling.

The design, construction, testing and performance of the belting shall comply with all applicable codes and as per IS, IPSS and International Standards.

Before dispatch, the finished material shall be subject to inspection by the Purchaser/MECON. The inspection shall be carried out in the presence of Purchaser/MECON, in terms of up to date engineering practice and relevant IPSS, IS and International Standards in this respect, for which all facilities shall be provided by the Contractor at his cost. This shall interalia, include the following:

- a) Full thickness belt test
  - i) Breaking load, Kg/sq. cm for wrap and weft.
  - ii) Elongation under reference load (%).
  - iii) Elongation at break (%).
- b) Rubber cover test (Top/Bottom)
  - i) Tensile strength of cover, Kg/sq. cm
  - ii) Elongation at break (%)
  - iii) Adhesion between ply to ply and between covers and ply.
  - iv) Abrasion loss of rubber cover
- c) Physical dimension check
- d) Flexibility Test

All relevant type test certificates shall have to be produced during inspection and along with supply for necessary verification and approval.

### 3. Conveyor Pulleys

All pulleys shall be of welded steel construction, stress relieved before boring and machining and statically balanced. Solid end discs shall be designed and provided to give maximum strength. Pulleys shall be designed as per relevant Indian Standard and IPSS where applicable. Pulleys shall be connected to the shaft preferably through keyless friction grip connections for HT motors and key connection for LT motors unless otherwise agreed.

Shell thickness of the pulley shall be suitable for taking bending loads on the pulley. This shall not be less than 16mm for drive pulley and 12 mm for tail and other pulleys.

Drive pulleys shall be covered with minimum 12mm thick diamond rubber lagging. Tail, bend and take-up pulleys shall be covered with minimum 10 mm thick diamond rubber lagging. The depth and width of the grooves in the lagging shall be 6 mm spaced at 30mm interval. The eccentricity of pulley shell shall not be more than + 0.5% of the diameter prior to lagging. Drive pulleys shall be machined at steel faces prior to lagging. Shore hardness of rubber for drive pulleys shall be



not less than 55 deg A and for other pulleys shall be not less than 45 deg A. All pulleys shall be statically balanced to minimize the vibration during running.

Rolled steel may be used for pulley shafts of diameter up to 140 mm. Forged steel shall be used for shafts above 140 mm diameter. The deflection slope of pulley shaft at bearings shall be restricted to 1/2000 under rated load condition. Combined stress value shall be restricted to 500kg/sq.cm. Shaft diameter shall be selected based on the maximum value. The shaft diameter shall be as per IPSS.

Pulley shafts shall be supported on self-aligning double row spherical roller bearings with adequate sealing and external lubrication arrangement in plummer blocks. One bearing for each shaft shall be fixed to prevent any movement of the shaft assembly and the other bearing shall be floating to have free axial movement. All lubricating nipples shall be readily accessible without removing the guards. All plummer blocks shall also have four mounting bolts.

Welding on the pulley shell shall be tested radio graphically or by ultrasonic method. Pulley shafts shall be ultrasonically tested. Checking of out of roundness and static balancing tests shall be carried out before dispatch of the pulleys.

#### **4. Idlers**

Three roll inline troughing idlers of equal length shall be used throughout. The angle of inclination of side rollers to horizontal shall be 35o. Troughing as well as return idlers shall be of reputed make and manufactured out of heavy duty seamless tube/ ERW tubes as per IS:9296-1983. Spindle - Class 4 , IS :1875-1992. Frame - Rolled section. Troughing Idlers - in line equal rolls. Idlers shall be of "drop-in-slot" type. Minimum diameter of idlers shall be as follows:

Carrying Idlers – 114.3 mm Outer Diameter for 500 mm and 650 mm belt and 139.7 mm for higher width belt with 4.5 mm shell thickness. Transition idler at 10o and 20 o troughing at both head and tail end.

The eccentricity (diametrical run out) of troughing and return idlers shall not exceed + 0.8 mm. Minimum shell thickness of idler tube shall be 5.0 mm. All idlers shall be fitted with either heavy duty deep groove ball bearings or seize resistant ball bearings. The bearings shall be held positively on the shafts. Multi-labyrinth seals shall be used for retention of grease. All bearings shall be greased and sealed for life against ingress of dust, water and escape of grease. All bearings shall be rated for minimum 40,000 working hours. Bearing - Taper roller bearing/ deep groove. Bearing housing of idler shall be made of pressed steel of CRCA sheet press fitted and preferably be welded with idler tube.

Self-aligning troughing and return idlers with vertical guide rollers shall be of above specified construction. All self-aligning idlers shall be provided with grease lubricated anti-friction bearings at pivot points. All grease fittings shall be of the button head type or equivalent and shall be accessible from the walkway side of the conveyor by piping. The grease tubing shall be made of aluminium. The grease fittings shall have adequate protection against dust collection.

Impact cushioned idlers shall be of above specified construction. The rings or disc for impact idler shall be made of rubber. The minimum number of impact idlers at each loading point shall be six. The first impact idler shall be placed approx. 150 mm behind the loading point. Conveyor with multiple loading points shall also be provided with impact idlers at each loading points.

Transition idlers of above specified construction shall be used adjacent to head and tail drums to permit proper support of loaded belt near the head and tail pulleys without excessive stress and stretch of the belt edges. The transition idlers shall be installed in steps of 10o, 20o troughing angles. Horizontal carrying idlers for supporting flat loaded belts shall also be of above specified construction. Return idlers for wet or sticky material shall be of rubber disc type of two roller trough design. Flat return idlers only shall be used under the "V" scrapers and in high tension areas. One number disc type self cleaning idler shall be provided near discharge pulley.

Training idlers shall not be used close to belt-weighing scales.

Idler shaft shall be made of class -4, IS-1875 or EN-8, BS-970 or bright bar of equivalent grade suitable for the duty requirement. Idler frame shall be made of rolled/ formed steel with provision

for securely bolting to the stringers of the conveyor frame. All fixing bolts shall have spring washers.

Clearance, gap etc. for the carrying and return idlers shall conform to the relevant IS/IPSS Standard to extent possible. The fixing arrangement of carrying and return idlers shall be such as to permit adjustment of idler sets for the purpose of belt training. Allowance for such adjustment shall be provided on both sides of the conveyor and the play shall not be less than 10 mm on either side.

All idler rollers shall be painted with 2 coats of red oxide primer and 2 coats of enamel finish paint.

Following tests shall be carried at random on the assembled idler roller in the presence of Purchaser / MECON:

- a) Friction factor test
- b) Idler running test at high speed.
- c) Test for dust proof
- d) Test for water proof
- e) Quality test.
- f) Alignment and co-axiality test.

#### **5. Belt Cleaners**

##### **a) External belt cleaners**

External belt cleaners shall be provided at the discharge pulley of the conveyors. The cleaner shall have sprung metallic blades (in segments) with tungsten carbide tips. Polyurethane deflector skirts shall be provided below the tips to prevent materials build up on the unit. The cleaners shall be mounted on an elastomount system to facilitate automatic blade adjustment on wear. The inclination of the blades should be such as to effect efficient scrapping of the belt. The spring action of the individual metallic blades should ensure constant contact with belt during operation and suitable sprung deflection of contact with uneven surface of the belt. The blades shall be in segments for ease of replacement and mounting on the head pulley frame. The material scrapped should fall inside the discharge chute directly.

##### **b) Internal scraper**

'V' shaped internal scraper shall be provided on the upper side of the return belt near the tail end, fitted with wear resistant non-metallic scraper blade to remove spilled materials on the belt. The blade shall be adjustable after the wear.

#### **6. Gear Boxes**

Conveyors shall be driven through totally enclosed oil-cooled reduction gearing having anti-friction bearings with oil seals at shaft projection. These shall be suitable for continuous operation at full load and shall be suitable for shock loads. Wherever required, oil temperature rise over ambient shall be restricted by 50o C (Max.). Worm gear or chain drive shall not be used. The reducers shall be selected with a service rating of minimum 1.5 times of motor kW or 1.8 times the calculated kW whichever is higher. The transmission efficiency of the gearing shall not be less than 0.98 per stage. The material of gears, profile and geometry shall ensure high power/weight ratio with low volume. Gears and pinions shall preferably be solid forged. Where forging is not possible, forged steel gear rims shall be fitted on steel centers to withstand shock loads. All reducers shall have permanent magnet plugs. All gear box shall be of fabricated steel or cast steel casing onstruction. No cast iron casings shall be used .

#### **7. Couplings**

Flexible couplings shall be used between motor and gear-box and geared couplings shall be used between gear-box and drive pulley. The hub and sleeves of the geared coupling shall be of forged C-40 steel and bolts shall be of alloy steel. The hub teeth shall be of triple vary crown design. Traction type fluid coupling shall be used between motor and gear-box for drives of 30 kW to 100 kW , Delayfil Chamber type fluid coupling for LT motor above 100kW and Scoop controlled fluid coupling(Air cooled type) for HT motor to be used. All coupling bolts shall be replaceable without shifting of drive components.

#### **8. Hold Back and Brakes with panel**

All inclined conveyors shall be provided with suitable roller type hold back devices (other than brakes) to prevent belt from running back in case of conveyor stoppage due to power failure or otherwise. Holdback rating shall be minimum 1.5 times the maximum calculated torque.

D.C. Electro-magnetic brake shall be provided on all conveyors after calculating the coasting time. Brake shall have min 1.5 times the max. calculated torque rating. Brakes shall be mounted on brake drum coupling at input shaft end of gear box. Rectifier panel complete with conactors, timer, fuses, rectifier, resistors etc. shall be provided with each brake.

#### **9. Take Up**

All conveyors up to 40 meter in length shall have screw take - ups having protected threads. Take-up travel shall be minimum 500mm. The screw of the screw take-up shall be of square thread type and stainless steel construction with brass nut.

Automatic counterweight gravity take up shall be provided for conveyors above 40 meters in length. Horizontal gravity take up/VGTU shall be provided wherever feasible. Take-up travel shall be as per IS:4774 (part-I) and it shall be complete with pulley carriage suitable for guide structure made of pipe. Suitable hoisting arrangement shall be provided to handle cwt. Weight/gravity take up pulley .Metallic counter weight shall be used.

#### **10. Discharge Hood**

Hood shall be made of 6mm thick mild steel plate for portion above the pulley frame. For portion of hood below the pulley frame and upto 500 mm below the floor, the thickness of plate shall be 10mm. 10 mm thick liner plate shall be provided in this portion of hood in the material impact zone. The hood shall be in segments bolted to each other for ease of maintenance. The hood shall cover discharge opening for the chute as well as pulley. Rubber curtain and guard shall be provided at the entry of belt in the discharge hood. Easily adjustable baffle plates shall be provided in the hood to control trajectory of materials, if necessary.

Hinged inspection door shall also be provided in the hood. The door shall preferably be located within a height of 1200 mm from the floor. Adequate opening shall be provided in the hood for withdrawal and adjustment of belt scrapers.

#### **11. Guards**

Guards on the conveyor shall comply with the relevant IS/IPSS Standard. The guards shall be of expanded metal conforming to IS: 412 (current)

Safety guards shall be provided for all couplings, brakes etc. of the conveyor drive and screwed on the above base frame.

#### **12. Chutes**

All transfer points shall be provided with non choking chutes made of minimum 10 mm thick mild steel plates and shall be constructed in small segments for easy dismantling.

Hinged type sealed inspection doors shall be provided at suitable height and location. The size of the door shall allow replacement of liners without any dismantling.

Snub pulley near discharge end shall be covered with spillage chutes.

Chutes shall be designed such that impact of the material on the conveyor is minimum. They shall be designed to ensure continuous flow of material to the centre of the belt with minimum spillage, noise and dust emission.

Minimum valley angle of the chute shall be 55 deg. to the horizontal. Minimum angle of slope of chute plate shall be 60 deg. The valley angle and slope angle shall be suitably increased for handling wet or sticky material.

Adjustable stone box shall be provided at discharge end of chute for arresting the free fall of material and to form a natural bed of material for protecting the parent plate. Chutes shall be oriented as far as possible so as to ensure discharge of material in the direction of travel of receiving belt.

Liner shall be as follows:

Bunkers- For lumps of more than 80 mm size, Reinforced Rubber liner of 40 mm thickness (minimum) in secondary impact zone, 60mm thick reinforced rubber liner in Primary impact zone & 10 mm thick SAIL hard/ LA60/wearesist in rest of the portion upto 1 m height . For storage bunkers of fine/ sized material (lump size less than 20mm) cast basalt or 6mm thick SS-410 /SS-316 may be used at inclined area. For lump size between 20mm to 80mm 40 thk rubber liner shall be used.

Chute- Rubber liner of 40 mm thickness (minimum in secondary impact zone and 60 mm in primary impact zone for lumps of 40mm and above of coal and ore. For coke lumps 40mm and less, 20 mm thick PU liner/ SS-409 M (8 mm thick) shall be used.

For ore lumps 40mm and less stainless steel liner (SS-304/SS-409) 6mm thick shall be used.

### **13. Conveyor Frames**

Conveyor frames shall be made of joists and/or channels suitably stiffened and braced. The spacing of supports shall not exceed 3000 mm. Frames shall be connected to floor beams/civil foundation of junction house by bolting.

### **14. Deck Plates**

Deck plates of minimum 3.15 mm thickness shall be provided throughout the length of shuttle conveyor to avoid spillage of materials from the carrying side of belt on to the return side. For other conveyors, loading zones (at least 15m), within /junction /houses and at road/ rail crossings etc. shall have deck plates.

### **15. Skirt Boards**

Skirt boards of minimum 5000 mm length shall be provided at the loading points of all conveyors, however wherever dust-suppression system with water spraying arrangement is provided – the length & height of the skirt shall be suitably designed. Wherever the loading points are nearer to each other, the skirt board shall be made continuous between them. Minimum length of skirt boards from the beginning of loading area in the chute shall be 2500 mm in the direction of belt travel. Skirt shall be totally covered where dust extraction system is envisaged or when handling dry fine materials (<10 mm). The thickness of skirt plate shall be minimum 10 mm. The top cover plate where provided shall be minimum 3 mm thick. Skirt plates shall be provided with suitable (minimum 10 mm thick) replaceable liners.

The arrangement for fixing rubber curtain and PU board (Min 15 thk) shall be used for side sealing so as to ensure quick adjustment. The thickness of rubber curtains shall be minimum 10 mm. PU block shall be in segments and the design shall ensure automatic adjustment of block for proper sealing. Shore hardness of skirt rubber shall be min. 55o A.

### **16. Drive Base Frame**

The drive unit consisting of motor, gear-box, coupling and brakes along with protective guards shall have a common base frame and shall be fabricated from heavy structural sections and plates. Suitable bracings should be provided wherever necessary on the drive unit base frame and structure to make it rigid. Proper arrangements shall be provided with gear-boxes and motors to maintain correct alignment with finish pads for mounting. The drive base frames shall be bolted to the structural floor beams/civil foundation of junction houses provided by the Purchaser. Necessary load data and foundation details shall be furnished by the successful Tenderer to facilitate design of the structural / civil floor for accommodating the same by the Purchaser.

### **17. Reversible Shuttle Conveyors**

Refer TS drawing showing the general arrangement of reversible shuttle conveyors. Shuttle conveyors shall have independent drive for travel motion through electric motor and bevel helical gearbox. Stringer frame for the conveyor shall be in segments independently supported on wheels and connected together through hinged pins. Screw take – up arrangements for the belt conveyors shall be positioned at one of the hinged joints to avoid shifting of discharge pulley location in the discharge hood.

Double flanged parallel tread wheels shall run on flat bottomed rails of minimum 60 lb/yd and shall have min hardness of 350 BHN. Cleaners shall be provided to sweep the rail from spilled material. Anti-friction bearings shall be used throughout. The travel drive shall be so designed that no part of equipment shall project below rail level.

The belt conveyor shall be driven through motor and bevel-helical gear box. All other stipulation for conveyor component as detailed above shall be applicable for the shuttle conveyor.

The minimum clear distance between two adjacent shuttle/ reversible shuttle conveyors shall be 1000mm at any given position of the same.

Power supply shall be given through flexible trailing cable system.

Position indicators shall be provided as per requirement of control logic.

#### **18. Belt Feeders**

Belt Feeder shall be rugged construction having heavy duty flat belt, life sealed idlers. Inlet opening to the feeder shall be equipped with a manually adjustable vertical slide gate to adjust the depth of material in the feeder. The load area shall be skirted on three sides. The width of belt shall be so chosen that material shall not rub with the side skirt. The feeder below hopper / bunker shall be driven with a variable speed drive and rest with normal drive. The speed of feeder below hopper / bunker shall be provided with facility to put on or withdrawal of endless vulcanized belts from side. Belt scraper shall be provided to clean carrying as well as return side of the belt.

#### **19. Pull Cord Switches**

Pull cord switches shall be provided for emergency stoppage of conveyor. The first switch shall be about 4000 mm away from the driving drum and subsequently at not more than 30 m interval. The pull wires shall run along the entire length of each conveyor on both sides. Where mobile trippers are used on conveyors, the pull wires shall run along the hand railings on conveyor walkways. All pull cord switches shall have individual local indication lamps to indicate when operated.

#### **20. Belt Sway Switches**

Belt sway switches shall be provided on each conveyor for protection against excessive sway of the belt. A pair of switch shall be installed near the head end and a pair near the tail end and a pair of switch shall be installed at 100 m interval thereafter. A pair of these switches shall also be provided before the belt weighing scales.

#### **21. Belt Slip Switches**

Belt slip switches shall be provided for each conveyor to stop the drive in case of excessive slippage of belt or over speeding. Provision shall be made such that preceding conveyor does not start unless the running conveyor picks up 80% of the rated speed.

#### **22. Chute Jamming Detectors**

Chute jamming detectors shall be provided on each chute. The detectors shall be so located or protected that they do not come in contact with regular flow of material. The detector shall, also, be protected against deposit of fine particles causing false alarm or stoppage of the conveyors. The position of each detector shall be decided based on the braking time of the delivery conveyor at rated capacity and the holding capacity of the chute.

#### **23. Motors**

Totally enclosed fan cooled squirrel cage motors shall generally be used for all the above mentioned equipment unless it is necessary to use slip ring or D.C. motors for speed control. Where power requirement is more than 180 KW, HT motors shall be considered. All LT motors from 30 KW and above shall be suitable for continuous duty (S3) category and all motors below 30 KW shall be suitable for intermittent duty (S4) category.

#### **6.2.3.1 Erection Norms**

Erection of all equipment shall be carried out as per manufacturer's recommendation.

Manufacturer's standards and recommendations for tolerances in assembly and erection shall be submitted to the Purchaser before actual erection of equipment.

Unless specified otherwise by equipment manufacturers, equipment shall be installed within the tolerances indicated below:

a)	Supporting structures for drive pulleys, tensioning drum, intermediate frame, electric motor, gearbox & idler supporting structure.	:	In height 3.0 mm In horizontal plane - 1/1000 of length in mm
b)	Driving pulley	:	1/1000 of length of pulley in
c)	Axis of conveyor & center line of drum.	:	10 mm in horizontal plane
d)	Tension pulley	:	+ 2 mm in vertical plane + 2 mm in horizontal plane
e)	Idler arrangement	:	+ 2 mm in vertical plane + 2.5 mm in horizontal plane
f)	Rail mounted equipment like trippers, shuttle conveyor etc. in longitudinal direction of the same rail	:	2 mm /m of rail 5 mm/ 25 m of rail 15 mm Max.
g)	Rail gauge	:	+ 5 mm
h)	Difference in rail level respect with to one another base	:	+ 1 % of rail gauge for rigid +2% of rail gauge for flexible base
i)	Difference in height of connecting rails at joints	:	less than 0.3 mm
j)	Horizontal gap between rails at joints	:	less than 0.3 mm
k)	Location of end stopper (in plan) with respect to one another	:	+ 1% of gauge but max 20 mm.
l)	Deviation of rail in plan with respect to true line	:	+ 10 mm but shall not exceed + 1 mm in 2 m length
m)	Tilt of rail in horizontal	:	+ 8% of rail head plane width
n)	Deviation in conveyor centre line	:	2 mm for 1 m length , 5 mm for 2 m length but 15 mm max for total length
p)	Absolute bearing vibration velocity r.m.s. for rotating machines (to be measured by vibration measurement instrument )		
	i) Up to 15 kw	:	Less than 0.7 mm/sec
	ii) Up to 300 kw	:	Less than 1.1 mm/sec

#### 6.2.3.2 Performance Tests & Guarantee Parameters

I. After the equipment are completely erected at Purchaser's site, each item/ equipment will be thoroughly inspected for correctness and completeness of the installation and they shall be subjected to final tests as to performance and guarantee to be carried out in the presence of Contractor and the Purchaser / MECON to demonstrate that the performance of the equipment conforms to relevant standards and specifications and meet the requirements as given in this specification. The tests/ checks to be conducted shall be generally as under :

II. For each equipment, the load test shall be conducted in stages. The equipment shall be run for 8 to 10 hours continuously (cumulatively) at no load, 25%, 50%, 75%, 100% of the rated capacities or at rate mutually agreed upon between Contractor and Purchaser / MECON. The intervening period shall be available for making adjustments and arrangements by the Contractor as may be required.

III. All the specified speeds of the equipment shall be measured under full load conditions.

IV. Proper operation of all positional limit switches for shuttle conveyor and all safety switches for cable reeling drums, limit and safety switches/ alarm for conveyors like pull cord switch, zero speed switch, belt sway switch etc. shall be demonstrated by the Contractor in the presence of Purchaser / MECON.

V. During operations of the equipment at no load and at full load, performance of all the drives shall be checked in respect of current drawn by the motors, temperature rise, vibrations, gear box noise and its heating, bearing heating etc. consumption of power and various consumptions like lubricants etc. shall also be measured and compared with the respective rated values.

VI. Any other observations/ tests felt necessary for judging the performance of the machines and mutually agreed between Contractor and Purchaser shall be carried out.

VII. If during the test runs, there is an interruption exceeding 2 hours due to any cause other than power failure or shortage of input materials for which the Purchaser is responsible, the test run shall be discontinued and fresh date shall be decided mutually by both the parties.

VIII. The equipment shall be considered to have performed satisfactorily when

- i) Rated capacity of equipment is demonstrated with all its drives and accessories functioning properly over a minimum period of eight (8) hours.
- ii) It runs successfully for a continuous period of 15 days at the rated capacity.
- iv) Successful reversing of reversible shuttle conveyors (if any) on load.

#### **6.2.3.3 Drawings / Document / Information to be furnished by Tenderer**

##### **1 List of drawings /data to be submitted along with tender**

- a) General arrangement drawing of conveyors/ shuttle conveyors etc. showing overall dimension, profile, idler spacing, take-up arrangement, motor kW, drive arrangement etc. along with chutes, scrapper, skirt boards, switches, wheel load, wheel spacing, wheel diameters, travel drive, power supply arrangement for travel drive etc.
- b) General Arrangement of conveyor-equipment showing overall dimensions and weight as well as GA of motor with its component list.
- c) Supplier's name for conveyor components (like idlers, pulleys, motors, and gearbox) catalogues for these items shall be furnished.
- d) List of commissioning spares proposed by the Tenderer.
- e) List of recommended spares for two years maintenance of plant and equipment along with itemised price.
- f) Duly filled up questionnaire given below.
- g) List of imported components in the equipment, if any.

##### **2 List of drawings to be submitted for approval (by successful Tenderer)**

Following design data, calculations and drawings shall be submitted by the Successful Tenderer to the Purchaser / MECON in stages for approval.

- All the drawings/ data listed in clause above, giving all the details, loads/ power requirement etc.
- Calculation of motor kW, gear box, coupling and pulley selection of shuttle conveyor.
- Technical parameters of shuttle conveyor in a tabulated form.
- In addition to the above, the Purchaser/ Consultant reserve the right to insist on submission of calculations/ drawings/ data for any mechanical, structural or electrical equipment/ component as required.

##### **3 Drawing/data/calculation for reference (by successful Tenderer)**

- Load data and foundation pedestal plan for head end, tail end, drive base frame etc., specially where the Junction House/ building is provided by another supplier/ purchaser.

- Wheel load diagram for shuttle conveyors.
- Any other load data/information required by Purchaser / MECON for design of building/ structures.
- All drawings and documents approved by Purchaser/MECON as per GTS.
- Procedure for testing and commissioning. This shall also be furnished in soft copy.
- Spare part list and drawings
- Catalogues/literatures
- Operation and maintenance manual.
- Final test certificates
- As built drawings
- Ordering specifications for operating consumables/ supplies

#### 6.2.3.4 Questionnaire (To be filled by by Tenderer)

The Tenderer shall also furnish the following questionnaire and submit with his offer. This data shall form a part of the contract with Successful Tenderer.

##### • General

- 01 Name and address of the Tenderer :
- 02 Previous experience of the Tenderer :
- 03 List of similar equipment supplied :
- 04 Whether the Tenderer has any technical collaboration with any other company/ organisation for his equipment. :
- 05 If answer to question .04 is yes, furnish the following details. :
- a) Name and address of the collaborator
- b) Nature of the collaboration in detail
- c) Previous experience of the collaborator
- 06 List of drgs./ literatures enclosed with the offer. :

##### • Questionnaire for conveyors

- i) Conveyor no. :
- ii) Carrying capacity (t/h) :
- iii) Centre to centre horizontal distance (m) :
- iv) Belt width (mm) :
- v) Belt speed (m/s) :
- vi) Total weight of conveyor (kg) :
- vii) Pulley details :

Followings to be indicated for head, bend, snub, tail, take-up pulleys separately :

- a) Make :
- b) Pulley diameter (mm) :
- c) Face width (mm) :
- d) Shell thickness (mm) :
- e) Bearing
- Make :
- Expected life (hrs) :
- f) Weight (kg) :
- viii) Idlers :

The following to be indicated for carrying, cushion, return, SAC, SAR and transition idlers:

- a) Type (in-line / off set) :



b) Diameter (mm)	:
c) Shell thickness (mm)	:
d) Tube specification (ERW / Seamless)	:
e) Max. roll eccentricity (mm)	:
f) Troughing angle	:
g) Bearing	:
- Make	:
- Expected life (hrs)	:
h) Weight (kg)	:
ix) Motors	:
a) KW rating	:
b) RPM	:
c) Type	:
e) Bearing	:
Make	:
Expected life (hrs)	:
x) Gear Boxes for belt drive and carriage travel	:
a) Make	:
b) Type	:
c) Reduction ratio	:
d) Torque rating (kg-m)	:
e) Overall efficiency	:
f) Wt. of Gear box (kg)	:
xi) Couplings	:
a) Make and type of high speed couplings	:
b) Make and type of low speed couplings	:
c) Weight (kg)	:
xii) Take-up type	:
xiii) Belt cleaners – type	:
– Weight (kg) :	:
xiv) Pull chord switches (no. of pairs )	:
xv) Belt sway switches (no. of pairs )	:
xvi) Zero Speed Switches	:
xvii) Brakes	:
a) No. and location	:
b) Brake drum diameter (mm)	:
c) Torque rating (kg-m)	:

#### **6.2.4 Vibro Feeders**

##### **6.2.4.1 Scope Of Work**

1. The scope of work of the Tenderer shall include design, engineering, manufacture, fabrication, assembly, testing and inspection, packing, dispatch, transportation, delivery FOR Purchaser's site, unloading, handling and storage at site, insurance during storage, erection supervision, testing, inspection, commissioning, guarantee testing and handing over to the client including all electrics and standard accessories of Vibratory feeders as covered under this specification.

The scope of the Tenderer shall be deemed to include all such items which although are not specifically mentioned in the specification, but are needed to make the equipment complete in all respect for its safe, reliable, efficient and trouble free operation.

2. The scope of supply and services of the Tenderer shall include the following:

- Mechanical
- Each equipment shall be complete in all respect including, its drive units, cables, safety switches, structural, mechanical and other standard accessories.
- Provision of necessary fixtures, supporting angles and brackets required for mounting and supporting the equipment and feed chute.
- Electricals and controls

3. All fixing bolts and nuts including foundation bolts shall be included in the scope of supply of Tenderer.

4. Two years maintenance spares.

5. Commissioning spares as required during testing and commissioning of the equipment.

6. Insurance spares.

7. Required quantity of initial fill of oil, grease, lubricants, hydraulic fluid etc. and other consumables which are necessary for cleaning/ flushing including erection, testing and commissioning the equipment shall be in the scope of supply of the Tenderer.

8. Necessary tools and tackles for each equipment required for maintenance, testing or inspection of the equipment.

9. Statutory approval wherever required shall be taken by the Tenderer for the equipment being supplied by them from relevant state/ central authorities.

10. The scope of work shall stand supplemented by such details as are given in this specification, tender drawing, and instruction to the Tenderer, General Conditions of Contract (GCC), or any other part of the document.

##### **6.2.4.2 Technical Specification**

###### **1. General**

All equipment shall be designed, manufactured, supplied, erected, tested and commissioned in accordance with relevant Indian Standards and International Standard where applicable in addition to the requirement mentioned herein.

The Supplier shall make his own calculation in respect of motor kilowatt to ensure satisfactory performance of the equipment.

Standardisation of components and assemblies shall be carried out to the maximum possible extent to ensure interchangeability.

All equipment shall be designed such that all components are easily accessible for inspection, repair and maintenance.

###### **2. Equipment Specification (Mechanical)**

a. Vibratory feeders shall be of generally electro-mechanical type (any other type shall be indicated in data sheet for respective equipment). The vibrating units of the feeders shall be of unbalanced motor type. The vibrating feeders and their mounting arrangement shall be properly designed to suit the scheme shown in the TS drawing. It shall be ensured that no vibration is transmitted to the supporting/ surrounding structures. The troughs of the feeders shall be of tray type construction and shall be made out of minimum 6 mm thick MS plate (IS: 2062-1992). 10 mm thick liner (SAIL Hard) shall be provided inside the trough along its length and cross section. The trough liner shall be provided with adequate side guard to avoid spillage. The trough shall be covered with dust tight hoods with provision of cut out and flange for dust extraction. The equipment will be provided with enclosed dust proof vibrators (unbalanced masses).

b. All the feeders shall be of suspended type unless otherwise mentioned in data sheets. Each vibrating feeder shall be supplied complete with supporting structures, feed chutes, manually operated feed control gates, hood cover, electrics, plates and fixing nuts and bolts, suspension rods, ropes, turn buckets etc.

c. The successful Tenderer shall ensure that minimum amount of assembly will be required for erection and commissioning of equipment at site. Site welding etc. shall be avoided as far as possible

d. The feeders shall be of robust construction and of balanced design.

e. SAIL hard liner of 10 mm thick shall be provided in feed chute

f. All bolts except those with nyloc nuts shall be provided with lock nuts and spring washers.

g. No cast iron parts shall be used (except for pillow block)

h. Equipment shall be designed such that all components are easily accessible for inspection, repair and maintenance

#### **6.2.4.3 Documentation**

a) List of drawings /data to be submitted along with tender

b) General arrangement drawing with bill of material of equipment showing overall dimension, motor kW, drive arrangement etc. along with load data, weight etc.

c) Supplier's name for components (like motors, coupling, gearbox etc.) catalogues for these items shall be furnished.

d) List of commissioning spares proposed by the Tenderer.

e) List of recommended spares for two years maintenance of plant and equipment along with itemised price.

f) List of tools and tackles to be supplied with the plant and equipment.

g) Duly filled up questionnaire.

h) The Tenderer has to furnish one copy of the specification drawing duly signed by him as a token of acceptance along with the list of deviation from tender documents.

#### **6.2.4.4 Questionnaire**

The Tenderer shall furnish the following questionnaire and submit with his offer. This data shall form a part of the contract with Successful Tenderer.

- |  |   |
|--|---|
| 01. Name and address of the Tenderer           | : |
| 02. Previous experience of the Tenderer        | : |
| 03. List of similar equipment supplied         | : |
| along with user's certificate                  |   |
| 04. Is it the Tenderer's intention, if awarded | : |
| The contract, to comply fully in all respects  |   |
| with Purchaser's specifications covering       |   |
| the work? If not, he shall state specific      |   |

exception in details.

05. Location / Nos. off	:
06. Type of feeder & Designation	:
07. Capacity through	:
08. Material of construction of different parts	:
09. Total weight and weight of individuals parts	:
10. Type of liner and thickness	:
11. Motors	:
a) KW rating	:
b) RPM	:
c) Type	:
d) Bearing	:
Make	:
Expected life (hrs)	:
12. Gear Boxes	:
a) Make	:
b) Type	:
c) Reduction ratio	:
d) Torque rating (kg-m)	:
e) Overall efficiency	:
f) Wt. of Gear box (kg)	:
13. Couplings	:
a) Make and type of high speed couplings	:
b) Make and type of low speed couplings	:
c) Weight (kg)	:

## **6.2.5 Gates**

### **6.2.5.1 Scope Of Work**

1. The scope of work of the Tenderer shall include design, engineering, manufacture, fabrication, assembly, testing and inspection, packing, dispatch, transportation, delivery FOR Purchaser's site, unloading, handling and storage at site of the equipment.

The scope of the Tenderer shall also be deemed to include all such items which although are not specifically mentioned in the specification, but are needed to make the equipment complete in all respect for its safe, reliable, efficient and trouble free operation.

2. The scope of supply and services of the Tenderer shall include the following:

3. All fixing bolts and nuts shall be included in the scope of supply of Tenderer.

4. Two years spares for each type of gates.

5. Commissioning spares as required during testing and commissioning of the conveyor system.

6. The scope of work shall stand supplemented by such details as are given in this specification, tender drawing, and instruction to the Tenderer, General Conditions of Contract (GCC) or any other part of the document.

### **6.2.5.2 Technical Specification**

1. Only the broad specifications covering the technical requirements for the equipment to be supplied are indicated. It is not the intent of this specification to specify complete details of the equipment including design and manufacture. The Successful Tenderer shall carry out detailed design, engineering and manufacture in a manner that shall ensure smooth and trouble free performance of the equipment as a whole.

2. The Tenderer shall ensure that minimum amount of assembly is necessary for erection and commissioning of equipment at site. Site welding shall be avoided as far as possible.

3. All components shall be designed and tested in accordance with latest Indian Standards unless stated otherwise & agreed to.

4. All components shall be manufactured with material of approved quality & best of workmanship. The equipment shall be shop assembled for checking operation and accuracy of parts

5. All working parts of the equipment shall be suitably located for convenient operation, inspection, lubrication, repairs & easy replacement

6. Rod gates shall be fitted between the bunker & equipment below like feeder/screens etc. to control the feed rate and to isolate the equipment from the bunker during maintenance. The gate shall be normally in partial /full open position and shall be controlled manually. The gates shall be fabricated from rolled steel. All rods shall be of diameter that ensures no bending. The spacing between rods shall be decided based on size of material stored in hopper/ bin & direct material load. The tapered ends of the rod shall rest on square bars placed beyond zone of discharge. A tray shall be provided on the hopper for storing the rods.

7. Sector gates shall be fitted below bins/ bunkers and shall be manually operated to regulate the discharge of material from the bins/ bunkers. Sector gates shall be constructed out of materials having good resistance against impact and sliding wear rolled plates St 58 HT (IS: 961 – 1975) after hardening and tempering to HRC 25-30, shall be used. The material of pin shall be C-40 (IS: 1570 – 1979). The sector gears used shall be made of cast steel grade 23- 24 (IS: 1030 – 1989) or EN-8 or equivalent and the teeth shall match perfectly to render noiseless and smooth service in operation. Wear resistant liner plate of suitable material shall be provided. Liner shall be provided on the gate main body and bottom portion. Antifriction ball and roller bearings shall be used throughout.

- All bolts except those with nyloc nuts shall be provided with grip lock nuts or washers. Stud or body bolts shall not be used as fasteners for mechanical items.

- Manual lubrication nipples shall be provided for all the bearings.

8. The motor operated flap gates shall be provided in transfer chutes as specified and shall be complete with electrically operated actuators. The gates shall be of robust construction and suitable for trouble free operation.

- The flap gates shall be used to divert the flow of material received from feeding conveyor to the receiving conveyors. The gates shall be operated by an electromechanical linear actuator. The actuators will be mounted on the chute body/ or on a working / maintenance platform. The exact mode of support will be intimated to the successful Tenderer.

- The gate shall be fabricated out of 10 mm thick MS plates with wear resistant, replaceable liners. The liners will be bolted by counter sunk bolts. The thickness of the liners shall be adequate so as to give minimum 3 years operating life.

- The gate shall be capable of changing the direction of material on remote mode of control even when the material is being discharged from the feeding conveyor pulley.

- The equipment shall be capable of being operated for at least 15 switchings per hour at rated load and thrust and shall be suitable for 10 Nos. consecutive switchings at rated load and thrust. The equipment shall be shop tested to prove the requirement.

- The motor rating for the actuator shall be so selected as to provide sufficient thrust (min. 2500 kg) for operation of the flap gates against the moving weight of material and/or flap gate.

- The flap gate travel shall be in the range of 60° to 70°. Limit switches shall be provided to indicate extreme positions. Lever arm shall be provided between actuator and flap gate shaft for obtaining required thrust. Each gate shall be provided with a shaft, a hand lever and self aligning type antifriction bearings with adequate sealing for dust proofing.

- The actuators shall be capable of preventing any over travel. Suitable travel dependent limit switches controlling the travel; of the flap gates on either direction shall provided. These shall be placed internal to the drive unit and shall be completely dust-proof. The limit switches shall be capable of adjustments to vary to total length of travel of the gates.

- Suitable thrust dependent limit switches shall be provided. This shall trip off the actuator motor in case of excessive thrust due to jamming the gates during its travel in either direction.

- Provision for alternative manual operation shall also be made using declutchable hand wheel. The diameter of hand wheel shall be selected considering a 25 kg (max.) force to be applied by a single operator.

- Suitable stiffening arrangement shall be provided between the two faces of the gate plate. At the end of the travel the total length of edge of flap gate shall rest on a suitable projected surface from chute to prevent leakage of material through the available clearance between chute and flap gate.

- Maximum feasible counterweights shall be provided for better utilisation of system. However for calculation of thrust required, the benefit of counterweight shall not be taken into consideration.

- Suitable self aligned double row ball bearings of approved make in dust tight housing shall carry the gate shaft

- For standardisation purposes, only one standard type of actuator (of 2500 kg thrust load) of flap gates shall be provided. Flap gate actuator as a whole and individual component wise shall be completely interchangeable for all locations.

- The material of shaft shall be EN-8 or equivalent material. The diameter of the shaft shall be suitable for motor stalled conditions and associated twisting.

- The deflector plates fixed to the actuators through linkages shall be used to divert the flow of materials onto the chutes below. Details of the deflector plates will be furnished to the successful Tenderer.

9. Rack & Pinion Gates shall be of two types, i.e. motorised actuator operated or manually operated. All clauses below under "Motorised Rack & Pinion Gate" shall be applicable for manually operated Rack & Pinion Gates also, except that the mode of operation shall be manually and hence actuators, drives etc. are only for the motorised type.

10. Motorised Rack & Pinion Gates

- The gate shall be fitted in the transfer chutes between the bunkers / hoppers and feeders to control the feed rate to the feeder. During maintenance of equipment lying below the hopper / bunker, the gate shall be utilised for restraining fall of material from the hopper / bunker.
- The gate shall be normally in partial / full open position. Actuator shall be provided for opening & closing of the gate. In case of by-passing the actuator, the gates opening shall be controlled by the hand chains (manually).
- The actuator operated rack & pinion gates shall be suitable for closing and opening the gate with hopper / bunker full.
- All components shall be designed and tested in accordance with latest IS Specification unless stated otherwise and agreed to. In such case where Indian Standards are not available reputed International standards shall be followed.
- Rack and Pinion Gates shall be fabricated from rolled steel plates and section. It shall be complete in all respects including gates plate, frame work, operating chains, sprockets, gear rack and pinion, rollers etc. The gates plate shall have wear resistant liners and shall slide over rollers mounted on anti-friction bearings. The flap shall be properly stiffened to avoid distortion of flap. The flap shall be made of minimum 12 mm thick plates and lined. Material of construction for various elements shall be:-

Gate plate	Gate plates to be made from 20 thk ms plates conforming to IS : 2062 and to be suitably lined with sail hard plates of 16mm thk.
Pin	C-45 / EN-8
Liner	Material SAIL HARD 16 thk. On Gate plate & 10 thk. On side walls.
Rack	EN-8 / C-45 Hardness-225 BHN (min)
Pinion	EN-8 / C-45 Hardness-250 BHN (min)
Roller	EN-8 on Ball bearing.

- The pull required to operate the gate manually (on actuator bypass) shall not exceed 25 kg when operating under a loaded bunker / hopper.
- All bolts except those with nyloc nuts shall be provided with grip lock nut or grip washers. Stud or body bolts shall not be used as fasteners for mechanical items.
- Gear boxes used shall be of approved make.

**6.2.5.3 Documentation**

**1. List of drawings /data to be submitted along with tender**

- a. General arrangement drawing of each type of gates showing overall dimension, profile, material of construction, weight etc.
- b. List of commissioning spares proposed by the Tenderer.
- c. List of spares for two years operation.
- d. Duly filled up questionnaire.

**2. List of drawings to be submitted for approval by successful tenderer**

Drawings listed hereinafter shall be submitted to the Purchaser/ MECON for approval, starting within one month of issue of letter of intent and prior to the commencement of fabrication.

- a) General arrangement drawing of each type of gates showing overall dimension, profile, material of construction, weight, bill of materials etc.
- b) In addition to the above, the Purchaser/ Consultant reserve the right to insist on submission of calculations/ for component selection.

**3. Drawing/data/calculation for reference to be submitted by successful tenderer**

- Procedure for testing and commissioning.
- Instruction for storage /erection, testing & commissioning.
- Catalogues/literatures
- Operation and maintenance manual.
- Final test certificates

**6.2.5.4 Questionnaire**

The Tenderer shall also furnish the following questionnaire and submit with his offer. This data shall form a part of the contract with Successful Tenderer.

- 01 Name and address of the Tenderer :
- 02 Previous experience of the Tenderer :
- 03 List of similar equipment supplied :
- 05 List of drgs./ literatures enclosed with the offer. :
- 06 List of gates with details :



## **6.2.6 Belt Weigh Scale**

### **6.2.6.1 Scope Of Work**

The scope of work of the Tenderer shall include design, engineering, manufacture, fabrication, assembly, testing and inspection, packing, dispatch, transportation, delivery FOR Purchaser's site, unloading, handling and storage at site, insurance during storage, erection supervision, testing, inspection, commissioning, guarantee testing and handing over to the client including all electrics and standard accessories of electronic micro-processor based Belt Weigh Scales as covered under this specification.

The scope of the Tenderer shall be deemed to include all such items which although are not specifically mentioned in the specification, but are needed to make the equipment complete in all respect for its safe, reliable, efficient and trouble free operation.

- Two years maintenance spares.
- Commissioning spares as required during testing and commissioning of the equipment.
- Insurance spares.
- Required quantity of initial fill of oil, grease, lubricants, hydraulic fluid etc. and other consumables which are necessary for cleaning/ flushing including erection, testing and commissioning the equipment shall be in the scope of supply of the Tenderer.
- Necessary tools and tackles for each equipment required for maintenance, testing or inspection of the equipment.

### **6.2.6.2 Technical Specification**

#### **1. General**

Belt weigh scale for measurement of flow rate and total-quantity shall be provided at specified locations as per relevant requirement as indicated in data sheets.. System shall be complete with flow rate indicator, totaliser, control panel etc.

#### **2. Codes & Standards**

The design, manufacture, inspection and testing of Belt Scales shall comply with all the currently applicable statutes, regulations and safety codes in the locality where the equipment is to be installed. The Belt Scales shall conform to the latest edition of the following standards and codes. Other internationally acceptable standards/codes, which ensure equal or higher performance than those specified, shall also be accepted.

IS:11547 Electronic weighing in motion system

#### **3. Equipment Specification**

The weigh scale shall be automatic and electronic type. It should be designed for continuous automatic weighing, metering of coal flow.

Each belt weigh scale shall comprise of a belt weigh scale platform with minimum 4 nos. weighing idlers. It shall have unitised construction for ease of installation and shall be fully floating type (without pivot points). Minimum 3 nos. hermetically sealed load cells of precision strain gauge type shall be applied in tension to support the weigh bridge. The load cells shall have 100% overload protection and shall be structurally safe upto to 250% of rated belt scale capacity.

Belt scale shall be electronic microprocessor based with its program stored in non-volatile memory.

It shall be provided with self diagnostic features for trouble shooting of the entire belt scale system.

Fully automatic zero and span calibration facility shall be provided. The electronic systems offered by the Bidder shall include all signal conditioning, power amplifiers and printed circuits etc. The printed circuits shall be encapsulated against dust and moisture.

Belt scale shall be provided with flow rate total quantity etc. Remote flow rate indicators shall also be provided in the Central Control Room (CCR).

The flow rate indicator shall have minimum 4 digits. The flow totalizer should have 8 digits display scale with reset facility.

Complete belt scale system shall be suitable for 50°C ambient temperature and 100% relative humidity. It shall be suitable for out door installation in a dusty area. The electronic circuit enclosure, sensors housing shall be dust and watertight. The electronic printed circuits shall be encapsulated with epoxy or other suitable material for protection against dust and moisture.

Minimum three years battery back up power failure protection shall be provided.

Belt scale shall be designed for a range of 20% to 120% of rated capacity with an accuracy of at least  $\pm 0.5\%$  throughout its range.

Supply of test weights for calibration of belt scales shall be the tenderer's responsibility.

Local panel for belt scale shall be of sheet metal

#### **6.2.6.3 Documentation**

##### **1. List of drawings /data to be submitted along with tender**

- a. General arrangement drawing with bill of material of equipment showing overall dimensions.
- b. Supplier's name for components & catalogues for these items shall be furnished.
- c. List of commissioning spares proposed by the Tenderer.
- d. List of recommended spares for two years maintenance of plant and equipment.
- e. List of tools and tackles to be supplied with the plant and equipment.
- f. Duly filled up questionnaire.

##### **2. List of drawing/documents to be furnished by the Successful Tenderer**

The following drawing/ document are to be submitted by the Successful Tenderer within one month of placement of order:

- a. General arrangement drawing of equipment showing full details of BWS.
- b. Quality assurance plan for inspection
- c. Requirement of tools and tackles for erection.
- d. Part list, bill of materials and material specification.
- e. Major sub assembly drgs., safety features etc.
- f. List of spares, special tools and tackles
- g. Operating and maintenance manuals.

##### **3. List of drawings/ documents to be furnished alongwith equipment by the Successful Tenderer**

- a) All approved GA drawings, complete assembly and sub assembly drawings of the equipment.
- b) Drawing of all equipment/ component received from sub suppliers.
- c) Engineering and design calculations.
- d) Test reports and inspection reports
- e) Instruction manuals for testing and commissioning
- f) Operation, maintenance and safety manuals in ten copies
- g) Requirement of special tools and tackles, if any, for subsequent maintenance
- h) Detail drawing and specifications of all wearing out parts and parts subject to breakage during normal operating conditions.
- i) List of spare parts with drawings, sketches, specifications and manufacturer's catalogues.

#### **6.2.6.4 Questionnaire**

Type	:
Operation	:
No. of floating idlers	:
Load Cells Details	:
Overload protection	:

Capacity :  
Flow Rate Indicator  
Flow totalizer  
.  
Accuracy :  
Calibration :

## **6.2.7 Travelling Trippers And Bunker Sealing Arrangement**

### **6.2.7.1 Scope**

1. The scope of work of the Tenderer shall include design, engineering, manufacture, fabrication, assembly, testing and inspection, packing, dispatch, transportation, delivery FOR Purchaser's site, unloading, handling and storage at site, insurance during storage, erection supervision, testing, inspection, commissioning, guarantee testing and handing over to the client including all electrics and standard accessories of Travelling /Trippers & Bunker Sealing Arrangement, as covered under this specification.
2. The scope of the Tenderer shall be deemed to include all such items which although are not specifically mentioned in the specification, but are needed to make the equipment complete in all respect for its safe, reliable, efficient and trouble free operation.
3. The scope of supply and services of the Tenderer shall include the following:
  - a) Mechanical
    - Each equipment shall be complete in all respect including, its drive units, cables, safety switches, structural, mechanical and other standard accessories.
    - Provision of necessary fixtures, supporting angles and brackets required for mounting and supporting the equipment and feed chute.
  - b) Electricals and controls
4. Two years maintenance spares.
5. Commissioning spares as required during testing and commissioning.
6. Insurance spares.
7. Required quantity of initial fill of oil, grease, lubricants, hydraulic fluid etc. and other consumables which are necessary for cleaning/ flushing including erection, testing and commissioning the equipment shall be in the scope of supply of the Tenderer.
8. Necessary tools and tackles for each equipment required for maintenance, testing or inspection of the equipment.
9. Statutory approval wherever required shall be taken by the Tenderer for the equipment being supplied by them from relevant state/ central authorities.
10. The scope of work shall stand supplemented by such details as are given in this specification, tender drawing, and instruction to the Tenderer, General Conditions of Contract (GCC), or any other part of the document.

### **6.2.7.2 Technical Specification**

1. The tripper shall be designed as per IS: 14386-1996.
2. Travel drive of trippers shall be individual wheel drive, independent of the main conveyor drive and shall be through electric motor, helical gear box etc. Chain drive shall not be used. Tripper shall be provided with D.C. electro-magnetic brake for stopping the same at desired location. Travel speed of trippers shall not exceed 0.2 m/sec
3. The traveling tripper shall consist of belt scrapper with adjustable rubber strip, rubber lagged head and bend pulleys complete with shaft bearings, chutes, stops and limit switches, brakes etc. The tripper shall have two-way discharge chute which shall be capable of discharging material into the bunker openings.
4. Traveling trippers shall be of adequate length with proper slope of conveyor idlers to match with the flow properties of material being handled. The maximum inclination of the conveyor belt on the tripper shall not be more than 120.

5. Vertical and horizontal guide rollers shall be provided to control sway and uplift of the belt in unloaded condition. The tripper shall run on standard flat bottom Indian Rails at least of 60 lb/yd. Wheels shall be double flanged with parallel tread running on anti-friction bearings and shall have min hardness of 350 BHN. Material of wheel shall be forced steel / cast steel.
6. Traveling trippers shall be equipped with manually operated rail clamps and rail cleaners and jacking pads.
7. Diverter gates on two way or three way chutes shall be electrically operated.
8. Power supply to the tripper shall be given through motorized cable reeling drum with trailing cables, cable trays for resting the trailing cables and end limit switches for protection against over travel of the tripper. The cable reeling drum and trailing cable of each tripper shall be suitable for the entire length of the bunker bay. The cables shall have copper conductors, proper insulating material and braided armoring in accordance with IS: 691.
9. Position indicators shall be provided as per requirement of control logic. Operating push buttons for local control and emergency stop shall be within easy reach of the operator on the main conveyor walk way.
10. All stipulation regarding belt pulley, belt scraper, idlers, safety guards, wind guard, access for maintenance etc. specified for belt conveyors, diverter gates and discharge chutes shall be applicable for the traveling tripper.
11. The rating of tripper travel motor shall be adequate to move the tripper smoothly either in forward or opposite direction to belt direction under fully loaded conditions. Coefficient of friction shall be taken as maximum 0.15.
12. Minimum two drive axles shall be provided for tripper travel. Arrangement shall be provided at the starting point of the tripper to avoid folding of belt.
13. Provision shall be kept for automatic tripping of bunker bay conveyor in event of traveling tripper getting dragged (.i.e. travel speed in excess of rated speed).
14. The supporting structures for the rails with necessary end stops shall also be supplied under this specification. Suitable belt hold down guide pulley shall be provided over the concave curve of belt over tripper.
15. The bunker sealing arrangement shall keep the bunkers sealed and prevent dust emission into tripper room.
16. Separate openings shall be provided on the bunker floor of each bunker to measure level of material in the bunker. Hinged door/ flaps shall be provided on these openings.
17. Suitable gratings are to be provided in between bunkers in the tripper travel zone. Opening size shall be decided during the detail engineering stage.
18. Suitable dust cover shall be provided over tripper head pulley. Serrated rubber seal shall be provided at open side to prevent dust nuisance. Suitable dust tight access doors shall be provided. Counter weighted type belt cleaner shall be provided below the tripper head pulley to cleaning the carrying side of the belt.
19. Suitable access platform of Chequered plate with ladders, hand railings and walkways on both sides shall be provided for access / maintenance of equipment on tripper. Also crossover platform shall be provided with tripper so that operator can cross the belt through the same.
20. Continuous deck plates shall be provided below carrying idlers on the trippers.

#### **6.2.7.3 Documentation**

##### **1. Drawings / document to be supplied by the Tenderer**

- a) General arrangement drawing of Mobile Tripper showing overall dimension, profile, idler spacing, LT drive arrangement, motor kW etc. along with chutes, scraper, skirt boards, switches, wheel load, wheel spacing, wheel diameters, power supply arrangement for travel drive etc.
- b) Details of bought-out items & component list.

- c) List of commissioning spares proposed by the Tenderer.
- d) List of recommended spares for two years maintenance of the equipment.
- e) Duly filled up questionnaire given below.

**2. Drawings / documents to be supplied by the successful bidder for approval.**

a) For approval.

General arrangement drawing showing the following:

- i. Constructional feature.
- ii. All dimensions and technical parameters as per technical specification.
- iii. LT drive & their arrangement
- iv. Motor ratings.
- v. Speeds.
- vi. Maintenance and repair provision.
- vii. Operating weight.
- viii. Any other information for making the GA drawing complete.

b) For reference / records.

- i. Major sub-assembly drawings of drives, safety features, lubrication arrangement etc.
- ii. List of spares, consumables, special tools & tackles.
- iii. Operation & maintenance manuals.

**6.2.7.4 Questionnaire (To be filled by by Tenderer)**

1. The Tenderer shall also furnish the following questionnaire and submit with his offer. This data shall form a part of the contract with Successful Tenderer.

**General**

- 01 Name and address of the Tenderer :
- 02 Previous experience of the Tenderer :
- 03 List of similar equipment supplied :
- 04 Tripper Details
- 05 Sealing belt details :
- 06 List of drgs./ literatures enclosed with the offer. :
- 07 Drive details
- 08 Motors
- a) KW rating :
- b) RPM :
- a) Type :
- b) Bearing
- Make :
- Expected life (hrs) :
- 09 Gear Box
- a) Make :
- b) Type :
- c) Reduction ratio :
- d) Torque rating (kg-m) :
- e) Overall efficiency :
- f) Wt. of Gear box (kg) :
- 10) Couplings
- a) Make and type of high speed couplings :
- b) Make and type of low speed couplings :
- c) Weight (kg) :
- 11) Belt cleaners – type :
- Weight (kg) :

## **6.2.8 Metal Detector**

### **6.2.8.1 Scope Of Work**

The scope of work of the Tenderer shall include design, engineering, manufacture, fabrication, assembly, testing and inspection, packing, dispatch, transportation, delivery FOR Purchaser's site, unloading, handling and storage at site, insurance during storage, erection supervision, testing, inspection, commissioning, guarantee testing and handing over to the client including all electrics / electronics / microprocessors and standard accessories of Metal Detector as covered under this specification.

The scope of the Tenderer shall be deemed to include all such items which although are not specifically mentioned in the specification, but are needed to make the equipment complete in all respect for its safe, reliable, efficient and trouble free operation.

- The scope of supply and services of the Tenderer shall include the following:

#### **a) Mechanical**

- Each equipment shall be complete in all respect including, its drive units, cables, safety switches, structural, mechanical and other standard accessories.
- Provision of necessary fixtures, supporting angles and brackets required for mounting and supporting the equipment.
- The Tenderer shall also include supervision services at site during erection, testing and commissioning of the equipment supplied by them.

#### **b) Electricals**

- All fixing bolts and nuts including foundation bolts shall be included in the scope of supply of Tenderer.
- Two years maintenance spares..
- Commissioning spares as required during testing and commissioning of the equipment.
- Insurance spares.
- Required quantity of initial fill of oil, grease, lubricants, hydraulic fluid etc. and other consumables which are necessary for cleaning/ flushing including erection, testing and commissioning the equipment shall be in the scope of supply of the Tenderer.
- Necessary tools and tackles for each equipment required for maintenance, testing or inspection of the equipment. The list of such tools and tackles shall be furnished and included in offer.
- Statutory approval wherever required shall be taken by the Tenderer for the equipment being supplied by them from relevant state/ central authorities.
- The scope of work shall stand supplemented by such details as are given in this specification, tender drawing, and instruction to the Tenderer, General Conditions of

### **6.2.8.2 Technical Specification**

#### **• Codes & Standards**

The design, manufacture, inspection and testing of Metal Detectors shall comply with all the currently applicable statutes, regulations and safety codes in the locality where the equipment is to be installed. The Metal Detectors shall conform to the latest edition of standards/codes, which ensure equal or higher performance than those specified, shall also be accepted. Nothing in this specification shall be construed to relieve the contractor of the required statutory responsibility.

#### **• Equipment Specification**

Metal detectors shall have high reliability with enough sensitivity to detect 25 mm aluminium sphere below the burden of material. It shall also detect other metals like brass, copper, stainless steel, manganese steel, bars, scraps etc.

The equipment shall have provision for automatic static calibration with adjustable sensitivity.

Metal detectors shall be completely solid state using latest state of art technology. It shall be suitable for 50oC ambient and RH of 100%. The search sensor shall be protected from rain and direct sunlight by means of a non metallic covering other than wood. Control unit shall have adjustable controls for sensitivity, ON/OFF push buttons, reset table operation counter, audio-visual alarms local remote selector switch and all other necessary controls for trouble free operation of metal detector. It shall be suitable for mounting on wall, column, structure, etc. with IP-65 degree of protection. It shall be constructed from FRP of thickness not less than 2 mm.

The metal detectors shall also have the following features:

- ☐ The coils shall be protected against being struck by an oversized material/ coal.
- ☐ In order to counteract interference from external sources such as motors, lighting and radio-transmitters, and to nullify the effect of climate changes/ aging, dual receiver coils are to be used.
- ☐ In order to allow passing of metal belt fasteners without giving alarm and at the same time detection tramps, suitable arrangements shall be provided.
- ☐ In case a few non-magnetic idlers or non magnetic deck plates are required, the bidder shall provide these. However, these shall be metallic. Wood is not be used.
- ☐ LED display of COAST COUNT to indicate the number of pieces of tramp iron detected since last reset shall be provided so that the operator is alerted for the pieces of tramps, if any, between tramp marker and coil before restoring conveyor.
- ☐ TOTAL COUNT, which is not resettable, shall also be provided on the same LED display on demand.
- ☐ The location of tramp metal pieces shall be indicated by liquid colour spray.
- ☐ Construction Requirement

Fiber glass enclosure (with IP-65 degree of protection) shall be provided for all type of coils.

Suitable tramp metal markers shall be provided.

Local control panel shall be provided with IP-65 degree of protection.

### **6.2.8.3 Documentation**

#### **1. List of drawings /data to be submitted along with tender**

- a) General arrangement drawing with bill of material of equipment showing overall dimension and details.
- b) Supplier's name for components & catalogues for these items.
- c) List of commissioning spares proposed by the Tenderer.
- d) List of recommended spares for two years maintenance of plant and equipment.
- e) List of tools and tackles to be supplied with the plant and equipment.
- f) Duly filled up questionnaire.
- g) The Tenderer has to furnish one copy of the specification drawing duly signed by him as a token of acceptance along with the list of deviation from tender documents.

#### **2. List of drawings /data to be submitted by the successful tender**

- f) General arrangement drawing with bill of material of equipment showing overall dimension & details.
- g) Supplier's name for components & catalogues for these items shall be furnished.
- h) List of commissioning spares proposed by the Tenderer.
- i) List of recommended spares for two years maintenance of plant and equipment along with itemised price.
- j) List of tools and tackles to be supplied with the plant and equipment.



**6.2.8.4 Questionnaire**

Type & Name of Supplier  
Sensitivity  
Enclosure  
Control  
Calibration  
Tramp metal markers

### **6.3 Structure Work**

#### **6.3.1 General**

This specification for structural works furnished herein are intended as guidelines for execution of the works satisfying the Owner's requirements as also complying with all technical norms in totality.

##### **6.3.1.1 Units :**

Structural steel work under the scope of this contract cover the following main facilities envisaged for Augmentation of Raw Material Receipt & Handling facilities of Bokaro Steel Plant , SAIL hereinafter referred to as " Owner " in this specification. Technological layout drawing which is issued along with Main Technological Specification shall be referred in this context.

Conveyor Galleries : Conveyor Gallery GLC1 TO GLC24.

Junction Houses : JNA1, JNA2, JNA3, JNA4, JNA5, JNA6, JNA7, JNA8, JNA8A, JNB1, JNB2, JNA9, JNA10, JNA11, L1, L2, L3, L3A,L4, L5, L6 JHSB. Buildings: WAGON TIPPLER # 5, PENT HOUSE, IOSB.

Monorail / Hoisting facility: Monorail shall be considered for the ABOVE BUILDINGS.

##### **6.3.1.2 List of Steel Structures**

Columns ( rolled section or built-up ), column bracings, Crane Girder, Surge Girder, Gable Platforms, Rails & Fixtures, Monorail beams and supports, Roof Trusses, Roof Girders, Bunker Girder, Bunker, Liner Plate, Purlins, Roof hand rails, Floor Beams, Sheeting Posts, Side runners, Louvres, Bracings, Sag angles, Sag rods, wind-ties on roof, Wind girders, Platforms, Walk-ways, Stairs, Ladders, Hand rails, Gutters and Down comers, Gallery truss, Gallery Trestles, Bracings , rafter & rafter bracings for gallery truss, End portal , Top & Bottom chord Bracings for Gallery Trusses, Roof & side Cladding with GCS/Translucent sheeting etc.

##### **6.3.1.3 Other Points**

The work to be performed under this specification consists of design, engineering , dismantling, modification, strengthening ,addition of new floors ,supply, fabrication, erection and cladding, as well as providing all labour, materials, consumables, equipment, temporary works, temporary labour and staff colony, constructional plant, fuel supply, transportation and all incidental items not shown or specified but reasonably implied or necessary for the completion and proper functioning of all the above units and auxiliaries, all in strict accordance with the specifications, including revisions and amendments thereto as may be required during the execution of the work.

Supply of all materials including structural steel, roof cladding & side-cladding sheets, fasteners, paints, consumables like gas, electrodes etc. and all other materials as deemed necessary for proper completion of the work, are included in the scope of the Contractor.

The work shall be carried out according to the design/drawings to be developed by the Contractor and approved by the Owner/Consultant. For all buildings and structures, necessary layout and details are to be developed by the Contractor keeping in view the statutory & functional requirements of the plant and facilities and providing enough space and access for operation, use and maintenance. Certain minimum requirements are indicated in this specification for guidance purpose only. However, the Contractor's offer shall cover the complete requirements as per the best prevailing practices and to the complete satisfaction of the Owner.

#### **6.3.2 Scope of Work**

The scope of work shall cover, but shall not be exclusively limited to, the following:

- collection of all site related data & conducting site investigations,
- design, preparation of all design drawings, fabrication drawings,
- Dismantling, Modification ,Addition of Floors, Strengthening of Existing Units.
- obtaining Owner's/Consultant's approval on general arrangements and design of structures
- dismantling, retrieval, sorting and storing of any existing structures as directed by the owner.
- supply of all materials viz, raw steel, sheeting for roof and side cladding, and paints
- supply of fasteners like bolts, nuts, washers etc
- supply of consumables like electrodes for welding, gases for gas cutting etc
- supply of plant & machinery, tools tackles, instruments for fabrication and erection
- providing facilities for testing of materials and conducting NDT
- providing facilities for transport and handling
- deploying requisite skilled and unskilled manpower
- making arrangements for all services like approach to site, electricity, water etc
- fabrication of structures , their transport and proper storing at site
- erection of structures, claddings, gutters, down pipes etc
- application of paints at shop after fabrication and at site after erection
- providing all reasonable facilities for inspection by Owner/Consultant
- conducting NDT as stipulated by the Owner and making test results available to Owner / Consultant for evaluation
- compliance with primary acceptance tests / inspection, liquidation of defects ; compliance with final acceptance tests / inspection, liquidation of defects;
- carrying out field-engineering decisions as desired by the Owner
- preparation of "As Built" drawings for all the structures and hand over to the Owner the completed structural work to the Owner's full satisfaction .
- any other work deemed incidental for the completion of the overall work but not included in the above detailed scope.

### **6.3.3 Design Of Building Structures**

#### **6.3.3.1 General**

01 Structures shall be designed such that they are economical and safe and meet the functional and service requirement of the technological process for which they are designed. The architectural planning of the building shall be based on technological requirements.

02 The structures shall be designed conforming to the relevant safety regulations, Factory Acts, Electricity Rules and stipulations of Statutory bodies as applicable to the project and as per relevant Indian Codes of Practice or, any International Code approved by the Owner.

03 Natural ventilation shall be provided ensuring that it does not permit rain water entry into the building. Scope of natural lighting shall be used to the maximum possible extent.

### **6.3.3.2 Design**

#### **6.3.3.2.1 Design of structures**

- a) Design of steel structures shall be done in accordance with IS:800-1984 or any equivalent international code of practice that may be acceptable to the Owner.
- b) Structures subjected to fluctuating/reversal of stress (eg. Rail Supp. Beams ) shall be designed in accordance with IS:1024-1979.
- c) Resonance in structures : Structures supporting vibratory/reciprocating equipments shall be designed so as to obviate occurrence of resonance. The ratio of applied frequency to natural frequency shall not lie within the range 0.7 to 1.5.

#### **6.3.3.2.2 Loading codes**

- a) All live loads shall be considered in accordance with IS:875(Part-2)-1987. (Also refer clause 3.3.04)
- b) Wind loads shall be in accordance with IS:875(Part-3)-1987 and any other consideration specific to the site.
- c) Seismic loads shall be in accordance with IS:1893- 2002.

#### **6.3.3.2.3 Fabrication Of Steel Structures**

##### Drawings

The Contractor shall prepare fabrication drawings, erection drawings, bill of materials, drawing office despatch lists / shipping documents, schedule of bolts and nuts and as built drawings. All drawing work shall be in metric system and all writing work shall be in English.

##### Material of Construction

All steel and other materials used for steelwork and in association with steelwork shall conform to appropriate Indian standards. Only tested materials shall be used unless written authority is obtained for the use of untested materials for certain secondary structural members.

Unless otherwise specified in the drawings

All rolled sections and plates up to & including 20 mm thickness shall conform to Grade "A" as per IS : 2062.

Plates of thickness above 20 mm and Plated structures subjected to dynamic loading shall conform to Grade "B" as per IS: 2062.

For High Tensile steel requirements, material conforming to IS:8500 or SAIL- MA (HYA or HYB) shall be used.

Steel sheets shall conform to IS : 1079.

Steel tubes for structural purpose shall conform to IS : 1161 (of Grade Yst 240)

Corrugated Galvanised Sheets shall conform to IS:277 with appropriate Zinc coating for the selected thickness of sheet on roof and sides.

Aluminium industrial troughed sheets conforming to IS : 1254 shall be used as follows :

- i) On roof - 0.91mm thick
- ii) On side walls - 0.71mm thick

Translucent sheets shall be fibreglass reinforced polyester sheets of matching profile as per IS:12866.

Colour coated sheets shall be as per appropriate standard.

Gutters shall be of copper bearing steel conforming to Grade "A" as per IS :2062.

Rails shall conform to IS : 3443.

All black bolts, nuts and locknuts shall conform to IS : 1363 and IS : 1364 (for precision and semi precision hexagonal bolts) of property class 6.4 unless otherwise specified. Washers shall conform to IS : 6610

All tapered washer shall be as per IS:5372 for channels, and IS:5374 for Joists. Spring washers shall conform to IS:3063.

All HSFG bolts shall conform to IS : 3757. Assembly of joints using HSFG bolts shall conform to IS : 4000. Nuts and washers for HSFG bolts shall be as per IS:6623 & IS:6649 respectively.

Covered electrodes for arc welding shall conform to IS: 814.

Certified mill test reports of materials used in the work shall be made available for inspection by the Owner / Consultant upon request.

#### Fabrication

Fabrication of all structural steelwork shall be in accordance with IS:800 or their equivalent foreign national standard of the country of origin of supply unless otherwise specified, and in conformity with various clauses of the Technical Specification.

Wherever practicable and wherever perfect matching of parts is required at site, members shall be shop assembled before despatch to minimise site work. Parts not completely assembled in the shop shall be secured, to the extent possible, to prevent damage during despatch.

#### **6.3.3.2.4 Erection Of Steel Structures**

##### Scope

The scope of work under erection includes in addition to provision of erection and transport equipments, tools and tackles, consumables, materials, labour and supervision, the following:

- a) Storing and stacking at site of erection of all fabricated structural components/ units/assemblies till the time of erection.
- b) Transportation of structures at site.
- c) Receiving at site of structures including site handling /movement, unloading, storing and stacking at site of erection of technological structures such as bunkers and the related structures
- d) All minor rectification / modification such as :
  - i) Removal of bends, kinks, twists, etc. for parts damaged during transportation and handling;
  - ii) Cutting chipping, filing, grinding, etc., if required, for preparation and finishing of site connections;
  - iii) Reaming for use of next higher size bolt for holes which do not register or which are damaged.
  - iv) Welding of connections in place of bolting for which holes are either not drilled at all or wrongly drilled during fabrication.
- e) Other rectification work such as
  - i) Re-fabrication of parts, damaged beyond repair during transportation and handling or incorrectly fabricated.
  - ii) Fabrication of parts omitted during fabrication by oversight or subsequently found necessary.
  - iii) Plug-welding and re-drilling of holes which do not register and which cannot be reamed for use of next higher size bolt.
- f) Fabrication of minor items/missing items or such important items as directed by the Owner / Consultant.

- g) Assembly at site of steel structural components wherever required including temporary supports and staging.
- h) Making arrangements for and providing all facilities for conducting ultrasonic X-ray or gamma ray tests on welds; getting the tests conducted by reputed testing laboratories, making available test films/ graphs, reports and interpretation.
- i) Rectifying at site, damaged portions of shop primer by cleaning and touch-up paint.
- j) Erection of structures including making connections by bolts/high strength friction grip bolts / welding.
- k) Alignment of all structures true to line, level plumb and dimensions within specified limits of tolerances as per IS :12843 "Tolerance for Erection of Steel Structures".
- l) Application of second coat of primer paint and two coats of finishing paint at site after erection.
- m) Grouting of all column bases after proper alignment of columns and only after obtaining clearance from Owner / Consultant.
- n) Conducting preliminary acceptance and final acceptance tests.
- o) Preparation of as built drawings, preparing of sketches/drawings to suit field engineering decisions, availability of material, convenience of fabrication, transportation and erection and changes during fabrication and erection.

All such works are subject to approval by the Owner / Consultant.

#### **6.3.3.2.5 Painting Of Building Steel Structures**

All steel structural work shall be painted as follows unless otherwise stated in the drawing / Technical Specification.

##### **Surface preparation**

The steel surface which is to be painted shall be cleaned of dirt and grease, and the heavier layers of rust shall be removed by chipping prior to actual surface preparation to a specified grade.

Following are the type and standards of surface preparation to be followed based on the requirement of a particular painting system or as specified in the design drawings.

Manual/Power tool cleaning :- Manual/Power tool cleaning shall be done as per Grade St-2 or St-3 of Swedish Standard Institution SIS 05 5900 or cl. 6.2.1.1 & 6.2.1.2 of IS : 1477 - 1987 (Part - 1).

Grade St-2 :- Thorough scraping and wire brushing, machine brushing, grinding etc. This grade of preparation shall remove loose mill scale, rust and foreign matter. Finally the surface is to be cleaned with a vacuum cleaner or with clean compressed air or clean brush. After preparation, the surface should have a faint metallic sheen. The appearance shall correspond to the prints designated St-2.

If no grade of surface preparation is specified, St-2 grade of preparation as per Swedish Standard shall be followed.

##### **Paint System**

- i. Surface preparation :- St-2
- ii. Primer paint :- Two coats of zinc phosphate in phenolic alkyd medium (35 microns/coat).
- iii) Finishing paint :- Two coats of synthetic enamel (25 microns/coat) conforming to IS : 2932 - 1974.

All paints shall be of approved and shade as per Purchaser / Consultant's requirements.

##### **Paint and Painting**

Manufacture of paints, mixing of paints, etc. shall be generally according to the relevant IS codes of practice.

Generally compatibility between primer intermediate and finishing paint shall be certified by the paint manufacturer supplying the paints.

Guarantee period shall commence from the date of completion of finishing coat of paint on entire structures. The guarantee period shall be indicated depending on the type of surface preparation and system of painting. To fulfill this obligations, the Contractor may obtain from the painting manufacturer, guarantee for the performance of paint/painted surfaces.

Application of paint shall be by spraying or brushing as per IS : 486-1983 and IS : 487-1985 and in uniform layers of 50% overlapping strokes by skilled painters. Painting shall not be done when the temperature is less than 5 degree C or more than 45 degree C and relative humidity is more than 85% unless manufacturer's recommendations permit. Also painting shall not be done in foggy weather. During application, paint agitation must be provided where such agitation is recommended by the manufacturer.

Painting shall be applied at painting manufacturer's recommended rates. The number of coats shall be such that minimum dry film thickness specified is achieved. the dry film thickness (DFT) of painted surfaces shall be checked with ELCOMETER or measuring gauges to ensure specified DFT.

All structures shall receive one coats of primer paint at shop after fabrication before despatch after surface preparation has been done as per requirements.

Unless otherwise specified all structures after erection shall be given one coat of primer and two coats of finishing paint of approved colour and quality. The under coat shall have different tint to distinguish the same from the finishing coat.

The proposed make, quality and shade of paint shall have the approval of Purchaser / Consultant.

**6.3.3.2.6 Quantities of Structural Items:**

The bidder shall indicate the estimated quantities of structural items of work ie fabrication/ erection tonnage, sheeting in sq.m etc. Bidder shall not make any additional claim if structural quantity of any items required for completion of entire package as per terms of contract exceed the quantity indicated by the bidder.

## **7 Deviations (To be filled by the tenderer)**

Tenderer shall clearly indicate the deviation from the tender specificaiton

Sl. No.	Deviations	Clause reference & Details	Remarks



## **8 Exclusions (To be filled by the tenderer)**

Tenderer shall clearly indicate the exclusions from the tender specificaiton

Sl. No.	Deviations	Clause reference & Details	Remarks

## 9 List of Drawings enclosed

Sl.	TS Drawing Number	REV	Description of Drawing
A	RMHS		
1	MEC/S/E24F/11/17/K/01/55/02101	0	RMHS Layout
2	MEC/S/E24F/11/17/K/01/55/02102	0	RMHS Flow Diagram
3			BSL General Layout
4	MEC/11/E1/E24F/RMHS/TS/02	0	RMHS Cable Route Layout
5	MEC/S/E24F/11/17/K/01/55/02103, sh 1 of 7	0	RMHS Conv Profile P1C1
6	MEC/S/E24F/11/17/K/01/55/02103, sh 2 of 7	0	RMHS Conv Profile P2C1 / P2C2
7	MEC/S/E24F/11/17/K/01/55/02103, sh 3 of 7	0	RMHS Conv Profile P11C1/C2/C3
8	MEC/S/E24F/11/17/K/01/55/02103, sh 4 of 7	0	RMHS Conv Profile P12C1/C2/C3
9	MEC/S/E24F/11/17/K/01/55/02103, sh 5 of 7	0	RMHS Conv Profile L1C1 & L2C1
10	MEC/S/E24F/11/17/K/01/55/02103, sh 6 of 7	0	RMHS Conv Profile L3C1 & L3AC1
11	MEC/S/E24F/11/17/K/01/55/02103, sh 7 of 7	0	RMHS Conv Profile L4C1 & L5C1
B	4 <sup>th</sup> SERIES CONVEYORS		
1	CET RN 2433 RM1 00 001	0	RMHS Layout
2	CET RN 2433 ME1 01 010	0	Flow Sheet
3	CET RN 2433 ME1 01 011	0	Layout of Conv KP11-0, KP12-0, KP11A-0
4	CET RN 2433 ME1 01 012	0	Conveyor KP11-0
5	CET RN 2433 ME1 01 013	0	GA of Conv KP12-0, KP11A-0
6	CET RN 2433 ME1 01 014	0	Layout of proposed Conv W-4 & Existing hv KD1-4 & KD1-5
7	CET RN 2433 ME1 01 015, sheet 1 & 2	0	Modification of Junction House 12

## 10 Project Schedule

The indicative implementation schedule of this project is given below. The tenderer shall submit the bar chart along with the offer, in line with this schedule.

ID	Task Name	Dur(w)		Year 1												Year 2																
				-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25			
1	BSL Expansion – Raw Material Handling System	104 w																														
2	Effective Date of Contract ( zero date )	0 w																														
3	Basic Engineering and Approval	22 w																														
4	Tendering & Ordering on sub vendors	30 w																														
5	Detailed Engg & Approval	56 w																														
6	Civil Work	65 w																														
7	Fabrication & Erection of Structures (incl Tech	69 w																														
8	Delivery of Equipment	52 w																														
9	Erection of Equipment	56 w																														
10	Testing & Commissioning – Utilities & Services	9 w																														
11	Testing & Commissioning – RMHS	13 w																														