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## GENERAL
The following Technical Specification shall be read in conjunction with General Technical Specification (GTS) of Bhilai Steel Plant, SAIL and General Specification. If there are any provisions in this Technical Specification, which are at variance with the provisions of General Technical Specification (GTS) of Bhilai Steel Plant, SAIL and General Specification, the provisions in this Technical Specification shall take precedence.

1.0 DOCUMENTS/ INFORMATION TO BE FURNISHED ALONGWITH OFFER.

(i) Clear Scope of supply.

(ii) Exclusions, if any.

(iii) Type and quantity of oil, lubricants & consumables for initial fill till successful commissioning of equipment.

(iv) List of Commissioning spares and start-up spares with unit rates.

(v) List with unit rates of special tools and tackles, if any required.

(vi) Price Schedule for equipment & erection work as per the format enclosed.

(vii) List of recommended spare parts for 3 years trouble free operation and maintenance alongwith unit rates as per the format enclosed in price schedule.

(viii) Technical Data sheets duly filled by the vendor (blank data sheets enclosed).

(ix) Weight of the equipment in Kgs.

(x) Catalogues/ Leaflets and O&M Manuals.


(xii) Reference list of your Customers for the similar supply of items.

(xiii) Quality Assurance Plan.

(xiv) Unpriced Copy
2.0 SCOPE OF SUPPLY

The scope of the supply includes Design, engineering, manufacture, shop fabrication, assembly, testing and inspection at manufacturer’s works, packing, dispatch, transportation, delivery to site, receipt, required fabrication at site, completion of facilities, performance guarantee testing, final painting at site and handing over to BSP, SAIL and supervision of installation, testing & commissioning of TWIN BOOM STACKER & BUCKET WHEEL RECLAIMER and ASSOCIATED WORKS as per specifications and scope defined in tender documents complete with all accessories and electrical, which are not mentioned specifically but are required for the efficient and trouble free operation of the equipment/system.

Following items are also included in vendor’s scope.

(i) Complete Twin Boom stacker & Bucket wheel reclaimers as per the details given in the specifications except civil works.
(ii) Consumables like first fill of lubricating oils etc. for the initial operation of the equipment till handing over.
(iii) Commissioning spares and start-up spare parts.
(iv) Special tools & tackles, if any required.
(v) Recommended spare parts for (3) three years trouble free operation and maintenance.
(vi) Painting of complete equipment (including final painting before handing over to the Employer).
(vii) Supervision of Installation, testing & commissioning at site.
(viii) All drawings / documents along with operation and maintenance manuals as per requirement mentioned elsewhere in the tender document.
(ix) Getting approval of design/drawings and any other design calculation related to the equipment from BSPI / MECON / EPI.
(x) Power supply at 415V±10%, 50Hz ±5% and combined voltage & frequency variation ±10% shall be provided at vendor’s Main Panel / control desk and equipment JB’s only. However supply of MCC and control as required shall be in vendor’s scope.
(xi) Trailing / Flexible Cables as required for the complete system shall be in vendor’s scope.
MECHANICAL
3.0 Technical Specifications of TWIN BOOM STACKER

(A) Scope of Work
The scope of work of the Bidder shall consist of design, engineering, manufacture, inspection, assembly shop testing, painting at manufacturer’s shop as well as at site after erection, supply at site including dismantling for transportation, packing, loading and transportation, receipt at site, erection testing and commissioning of the one number of twin boom stacker.

Supply and installation of resting pads for the boom conveyor in parking zone.

The equipment supply shall be complete in all respects including its structural, mechanical and electrical components and standard accessories such as electricals, flexible trailing power and control cables with cable reeling drum etc.

All items essential for the desired operation of these equipment whether specifically mentioned in this specification or not, shall be included in the scope of work of the Bidder.

The scope of work shall stand supplemented by such details as are given in this specification, tender drawing or any other part of the tender document.

All electrics/ electrical equipment as indicated under relevant clauses.

(B) Technical Specification

(i) General
The equipment covered in this specification shall be installed in the proposed new Ore Handling (OHP-II) Plant of BSP, Bhilai.

All equipment shall be designed for out door duty and shall be complete with mechanical, structural, power supply, conveyors, chutes, drives, controls etc.

(ii) Stacker
1. The stacker shall be of twin boom luffing type and shall be provided in the storage yard. Boom conveyor shall be at right angle to stacker travel while stacking. Height of boom of the Stacker should have adequate clearance from working reclaimer and Stacker’s interchanging facility with all other unloaders of the yard. The stacker shall receive the material from on-ground yard conveyor through a tripper. The tripper shall form an integral part of stacker. Boom conveyor shall be provided with luffing motion (hydraulic). It shall be possible to form centrally located stockpile in any boom position. Position indicator shall be provided for luffing.

2. All motions of the stacker shall be synchronised and shall have VVVF drive control so that the material is stacked at a uniform rate irrespective of direction of travel of the stacker.

3. The equipment shall be controlled and operated from an operator’s cabin suitably located to give operator a full view of the operating zone in either direction of travel and optimum vision all round. The cabin shall have clear view of boom conveyor. The cabin shall be of totally
enclosed type having shatter proof glasses with electrically driven wind shield wipers. Windows shall be moving on hinges to facilitate its cleaning. The cabin shall be provided with adequate lighting, switches, controllers with three nos. of operator's revolving chair, telephone, split type air conditioner system and circulating fan and two adequately sized Co2 fire extinguishers. A hooter whose sound can be heard from a distance of 300m shall be provided outside the cabin.

4. Auto stop arrangement is to be provided for Stacker’s hoist mechanism to prevent damage of structure for lowering and hoisting. Indication of hoisting height to be provided in the cabin.

5. Electric house shall be completely closed and provided with 2 nos. window type AC of 2 TR cap. One no. of Window type AC of 1 Tonne cap. Shall be provided in Operator's cabin. Wherever Air conditioning has been sought, the structure of the unit shall be double walled.

(iii) Mechanical Specification

1. The stacker covered in this specification shall be complete with bogie mounted tripper. The tripper shall have minimum possible height to reduce belt tension and power requirement of the conveyor, on which the machine is mounted. The stacker shall be four corner support type.

2. The design of the bogie and carriages of the equipment shall be such that differential movement of the wheel sets of the machine on two rail tracks does not resulting in skewing effects. The traverse bogies shall be provided with material removing guard plate as well as rail cleaners at both ends so that the machine can travel even if there is spillage or overflow of material on rail track and the L.T. drives shall be selected accordingly.

3. Adequate no. of locating pins etc. shall be provided to ensure easy assembly after dismantling of equipment or mechanism etc.

4. All matching parts shall be given identifiable marking for easy erection of the machine.

5. Materials used for equipment's structures shall be of good quality and shall be free from fracture, cracks, blow holes, lamination, pittings etc.

6. Stability of this mobile equipment shall conform to the norms laid down in relevant International Standards.

7. Safe and adequate access with approach for repairs, handling, maintenance and removal of all mechanical and electrical parts shall be ensured without recourse to additional scaffolding. Adequate clearances between the floors shall be provided to facilitate easy maintenance. Also, the clearance between ground and undercarriage shall be kept min. 0.3 m for maintenance purpose.

8. All parts requiring replacement or inspection or lubrication shall be easily accessible without the need for dismantling of other equipment or structures. All electrical cables shall be laid so that they are not liable to damage and can be easily inspected and easily accessible for repair and maintenance.
9. Suitable handling facilities or provisions such as eye bolts, lifting lugs, ladders etc. of adequate capacities shall be provided on the machine at all necessary locations for maintenance of various mechanisms.

10. The boom conveyor shall be designed such that no spillage occurs when the stacker moves opposite to the direction of material flow of yard conveyor.

11. Adequate working space on the platform around all machinery parts shall be provided for personal working for maintenance or inspection.

12. Safety hand railing preferably of tubular constructions shall be provided around all walk ways. Railing shall not be less than 1000 mm in height with an intermediate member at a height of 500 mm. The minimum size of handrail be 32NB.

13. All edges or openings shall be provided with toe guards. Toe angles or bent plates shall be minimum 100 mm in height.

14. Essential openings, on the platforms or walk-ways shall be covered with removable covers.

15. All moving parts, wherever required from the safety point of view, except long travel gear wheels, shall be provided with covers opening on strong hinges. These covers shall preferably be made of minimum 3 mm thick plate. All heavy covers shall be provided with inspection windows.

16. Sufficient number of power points/outlets shall be provided at suitable places on the equipment to plug in welding transformers and hand tools for maintenance purposes.

17. Standardisation of assemblies shall be carried out to the maximum extent possible.

18. Sizes for all equipment viz. wheels, brakes etc. shall be selected from preferred number series and shall be of reputed make.

19. The design of the equipment shall ensure that there is no spillage of material on any part of the equipment. Dust covers shall be provided for all motors, gear boxes, drums etc.

20. End limit switches and over run limit switches shall be provided at both the ends of the travels for all machines. The corresponding strikers shall also be supplied by the supplier.

21. The machines shall be provided with adequate nos of buffers.

22. Free flow liners shall be provided in the discharge chutes. Chutes shall be equipped with chute clogging devices.

23. The parking area of the machine shall be indicated in the plot plan drawing and storm anchor shall be provided. Boom resting pad structure and buffer stop structure with fixing details shall be included in scope of work.

24. Two nos. of Electric hoists of min. 3 T cap shall be provided in E-House.

(iv) Drives

1. The long travel mechanism drive shall be provided with multiple
drives on each side. In the event of failure, any drive motor, the corresponding motor on the other side shall be automatically disconnected. However, the machine shall be operable with the remaining drives.

2. Double ended motor shall be provided in long travel drives, so that brake can be fitted to the free end of motor to ensure better maintenance and operation.

3. Protection against overloads shall be provided through suitable control system. The control system shall ensure smooth acceleration for all motions and variable speeds.

4. The equipment shall be supported on wheels mounted in bogies and shall be driven by electric motors through reduction gears. Chain drives and open gears shall not be used.

5. For long travel motion individual wheel drive shall be provided. Minimum 50% of the long travel wheels shall be positively driven.

6. For travel motion, rotating axle drive arrangement with 'L' type supports shall be provided.

7. The under carriages shall be fitted with substantial number of safety stops to prevent the equipment from falling more than 25 mm in the event of breakage of a track wheel, bogie or axle. These safety stops shall not interfere with the removal of wheels.

8. At suitable points, built in arrangement shall be provided for easy replacement of heavy electrical equipment and boom conveyor belts. Built in jacking up arrangement for bogie, frame etc. for changing of wheels and lifting provision for cable reeling drums and other heavy parts shall also be provided.

9. The under carriage shall have statically determinate support system to ensure its stability and to afford an evenly distributed load over the entire travel assemblies and to cater to any unevenness in the level of the rails.

10. LT motors shall be VVVF controlled in order to accommodate speed variation of 5 to 30 m/min. LT motors speeds indicated shall be reviewed accordingly. Automatic disengagement of drive on the other side shall be considered in case of failure of opposite side drive motor is detected. Minimum 12 Nos (excluding tripper) no. 630 mm dia LT wheels shall be considered.

11. Stall Torque motor of cable reeling drum of Demag make shall be provided.

(v) Gears and Gear Boxes

1. Straight and helical, spur gearing shall be used. Worm gears shall not be used unless specified otherwise. All spur gears shall have 20 degree pressure angle with involute teeth profile.

2. First and high speed reductions shall be through helical gears only.

3. All first reduction pinions and also other pinions, if feasible, shall be integral with the shafts.
4. Overhung or split gears and pinions shall not be used unless specifically called for.

5. All gears shall be of hardened and tempered alloy or carbon steel with machine cut teeth. Surface hardness for pinion shall be 255 to 300 BHN and for gear it shall be 220 to 225 BHN. Difference in hardness of pinion and gear shall not be less than 20 BHN. The gear teeth shall be ground and finished to suit the service conditions.

6. Gear teeth shall be cut in metric module system only.

7. All gears shall be completely enclosed in oil tight designs or guarded by covers firmly attached to rigid supports where complete enclosure is not possible.

8. All gear shafts shall be supported in bearings mounted in gear box.

9. In case of totally enclosed gear boxes splash or automatic lubrication system shall be used.

10. The housing for Gear boxes shall be of cast steel or fabricated. Fabricated gear boxes shall be made of minimum 8 mm thick steel plate and shall be stress relieved.

11. Covers shall be split horizontally at each shaft center line and fastened and arranged so that the top half can be removed for inspection and repair without disturbing the bottom half.

12. Directly above the mesh line of teeth, hand-holes with bolted covers be provided in the gear box body for inspection of the teeth.

13. The gear boxes shall be provided with breather vents, oil level indications, dip sticks and easily accessible drain plugs.

14. Radial clearance between the gear box inner surface and the outside diameter of the gear shall be at least 1.25 times the depth of the largest gear tooth inside the gear box or 20 mm whichever is higher. The facial or side clearance between the inner surface of the gear box and the face of the gear or pinion shall be at least 20 mm.

15. Bearings shall be housed in gear box/bosses or shall be mounted in cartridges held in place by top bolts and flanges. Suitable oil seals shall be provided at all required places in the gear box.

16. Oil pumps with filters etc. shall be used if vertical gearing exceeds two reductions. On horizontal gearing, the oil level shall be above the smallest gear.

17. All gear boxes shall be mounted on machined surfaces and shall have machined feet. Shims shall not be used.

18. Gear boxes shall be provided with lugs or other means for lifting purposes.

19. Interior of all gear box housing shall be sand blasted. Suitable resistance paint matching to the lubricant used shall be applied inside the gear box.

20. External cooling arrangement shall be provided wherever required to dissipate the heat generated inside the gear box. However, external cooling coils shall be avoided.
(vi) Bearings and Plummer Blocks
1. All bearing housings shall be made cast or wrought steel. Housings shall be of split type constructions to permit easy removal of shaft. The underside of the base of each pedestal shall be machined and shall bear upon machined surface.
2. Rated life of ball and roller bearings shall be designed for B -10 life of not less than 40,000 hours.
3. Plummer block housings shall be oriented on the supporting structure in such a manner that no shaft loads are transmitted to the housing cap.
4. Plummer block shall have provision for lubrication. Suitable oil seals shall be provided wherever necessary.
5. Anti friction ball or roller bearings of specified make only shall be used throughout. Cartridge bearing is not accepted.
6. Heavy caps shall be provided with means for lifting.

(vii) Couplings
1. Couplings shall be designed to suit the maximum torque required to be transmitted or to suit the total braking torque of the mechanism whichever is greater.
2. Fluid couplings shall be provided on input shafts of the motor of 30 KW & higher ratings. Geared coupling with crowned teeth or resilient type coupling shall be used on input shaft of motor of less than 30 KW and also on the output shaft of gear boxes. Any other special coupling which can give better and more reliable service may be used after obtaining the specific approval of the purchaser.
3. High speed couplings shall be selected of a natural frequency such that no resonance can occur at any operational speed.

(ix) Brakes
1. Only D.C. Electro magnetic brakes (BCH make) shall be used unless specified otherwise.
2. Double shoe brake shall be provided for each drive and shall be mounted on the input pinion of the gear train. The brake shoes shall be of hinged type. Brake levers shall be forged or fabricated or of cast steel. Hinge pins shall be of hardened alloy steel and shall be lubricated. These hinge pins shall be provided with steel bushes at bearing points.
3. Brake drums shall be forged or of cast steel and shall be completely machined and dynamically balanced. Width of the brake drum selected shall be 10 mm more than the width of the brake shoes on each side. Hardness of the brake drum shall be 300 to 350 BHN.
4. Rating of brakes for all mechanisms shall be selected as per required braking moment necessary for each mechanism with factor of safety and the required heat dissipation capacity.
5. Brakes shall be installed such that these are easily approachable for servicing.
6. In order to obtain low deceleration, the brakes of long travel drives of the machines shall close successively.

7. The service factor shall be 1.5 on motor (mechanical output) for selection of all gear-boxes/ couplings, brakes etc.

(x) Long Travel Wheels

1. The wheels shall be double flanged with straight tread, and shall be forged, double flanged, with Cylindrical ‘Straight’ or ‘Taper’ tread. Clearances between rail head and wheel flanges shall be suitable to the tolerances as per relevant Indian standard. Max wheel load considering all positions of stacking shall be limited to 25T. Wheel load diagram indicating wheel disposition shall be furnished. Minimum 12 nos. (excluding tripper) no. 630mm dia LT wheels shall be considered.

2. Wheels shall be heat treated to have a hardness of BHN-300 to 350 on the rolling surface and flanges to a depth of not less than 10 mm with a smooth pass to the non hardness zone.

3. Minimum diameter of the wheels shall be 630 mm. Complete wheel bogies shall be interchangeable with each other.

4. Driving pinions of LT bogies shall be of detachable type for better maintenance.

(xi) Rail Clamps and Anemometer System

1) The machines shall be protected against drift due to wind by means of two electric/hydraulic operated (one on each rail) rail clamps and two hand operated rail clamps.

2) Wind anemometer with suitable controls shall be provided to warn the operator of high wind velocities and stormy conditions. (The equipment shall be built to withstand wind velocity upto 180 km/hr., when not operating).

3) The electrical/hydraulic operated rail clamps shall be designed to operate automatically when the machine is switched off. These rail clamps shall also be designed to be operatable remotely from the operator’s cabin.

4) The automatic rail clamps shall be such that when wind velocity is higher than a predetermined value, the machine will be automatically shut down and the rail clamps applied.

5) The automatic and manual rail clamps shall be equipped with limit switches to monitor their operations. The long travel shall not be possible to start until and unless these clamps are in released position.

(xi) Hydraulic Luffing System

1. Hydraulic luffing of the boom shall be provided for stacker with following respective ranges

   luffing : (+) 14 to (-) 10 deg.

2. Two pumps, two electric motors with dual line system shall be provided to ensure that in the event of one of the drive unit failing,
full operation can be maintained without interruption. Failure of any drive unit shall produce audio visual alarm in the operator's cabin.

3. The acceleration and deceleration or raising and lowering the boom shall be smooth and operation shall be without giving any jerk to the boom. Suitable fail safe solenoid operated valves shall be provided for hydraulic cylinders.

4. The design and construction of hydraulic system shall be suitable to operate in the atmospheric conditions and dusty operating environment of the plant. The system shall be complete and consist of hydraulic fluid, various kinds of valves, accumulators, hydraulic motors/ hydraulic pumps, various accessories such as filters, strainers, magnet and restructures, hydraulic pipe work, fittings and fluid passages, flexible pipe work, sealing devices, instruments for indicating various parameters such as pressure, temperature etc., control devices for local and automatic operation of the system, safety devices and alarm for abnormal operating conditions, interlocks for sequencing and safe operations.

5. The hydraulic system/ components shall be designed / selected so that the working pressure shall not exceed 180 bars.

6. The hydraulic circuit shall be designed to minimise surge pressure. Suitable accumulators of adequate size shall be used to withstand maximum rate of surge pressure rise as well as the back surge pressure. All components shall be capable of withstanding the peak pressure.

7. Necessary connections, valves, outlines and apparatus shall be provided to facilitate testing, flushing, drainage, fluid sampling and repair & maintenance.

8. A suitable capacity reservoir with provisions for oil filling, air breathing, drawing, and inspection shall be provided.

9. The reservoir shall be designed to prevent the ingress of any foreign materials including water and dust.

10. Inner face of the reservoir shall be sand blasted and shall be suitably painted, so that it does not have any adverse effect on hydraulic fluid used.

11. Suitable level indicators shall be provided in the reservoir. Low level of the fluid in the reservoir shall produce warning alarm in the operator's cabin and switch off the hydraulic pumping unit.

12. Pump and pump motor shall be designed to operate under load conditions at a minimum of 125% of system operating pressure and give a flow rate of 125% of system operating flow rate.

13. Lockable type valves shall be provided to prevent tampering.

14. All hydraulic valves, accessories and devices shall be provided with identification metal tags.

15. Necessary relief valve shall be provided to protect the hydraulic
system from excessive pressure. The fluid leaked through the relief valve shall be suitably carried to the reservoir. The overload of the system in raising or lowering of the boom shall give necessary warning signal in the operator’s cabin.

16. Off line filtration shall be provided and Differential pressure shall not be less than 0.3.

17. Pumps speed shall be 1500 rpm. Electrical motor pump shall have 25% reserve power over and above required for operating the pump at working pressure and flow.

18. The number of standby pumps shall be as follows:

| Up to 3 nos. working pumps | 1 no. standby |
| For 4 to 6 nos. working pumps | 2 nos. standby |

19. The following cleanliness level of oil shall be maintained for hydraulic systems:

a) Systems without servo valves/ proportional valves: NAS.7.
b) Systems with proportional valves: NAS.5.
c) Systems with servo valves: NAS.4.

20. All filters shall have $\beta$ ratio $\geq 200$. The fineness of various filters shall be as follows:

<table>
<thead>
<tr>
<th>Hydraulic systems without proportional and servo valves</th>
<th>Pressure line filters</th>
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<tr>
<td>10 micron</td>
<td>pump flow at $\Delta p = 0.5$ bar in clean condition.</td>
</tr>
<tr>
<td>Circulation filters</td>
<td>Return line filters</td>
</tr>
<tr>
<td>10 micron</td>
<td>10 micron</td>
</tr>
</tbody>
</table>

21. The capacity of pressure line, circulation filters, return line filters shall be as follows:

| a. Return line filters | 3 times of maximum return flow or 3 times of maximum pump flow which ever is greater at $\Delta p = 0.5$ bar (total) in clean condition. |
| b. Circulation filters | Pump flow at $\Delta p = 0.5$ bar in clean condition. |
| c. Pressure line filters | 2 to 2.5 times pump flow at $\Delta p = 0.8$ bar in clean condition. |

All the filters shall be of absolute filtration design.

22. Solenoid coil voltage shall be 24 VDC.

23. First fill of oil shall be in the bidder scope of supply.

The specification of hydraulics as indicated above shall be applicable for hydraulic drives of wagon tippler, side arm charger, stacker and bucket wheel reclaimer.

(xii) Belt Conveyor
For Detailed Specification of Belt Conveyors and related equipment, refer General Technical Specification GS-06. Tripper conveyor shall have a maximum inclination of 12 deg. Suitable hold down pulley shall be provided on tripper car to prevent belt uplifting during starting of yard conveyor.

The bulk density to be considered for structural design and that for power calculation shall be 2.2t/Cu.M. It is only for volumetric capacity calculation that the bulk density is to be considered 2.0t/Cu.M.

Return idler shall be single piece identical to mark No. 621 and troughing idler shall be staggered type (sketch for troughing & return idlers enclosed)

All drive drum shaft above 100mm shall be forged.

All conveyor pulleys shall be connected to the shaft through Key Type arrangement

Screw take-up travel should be 1000mm in stacker, boom conveyors, wheel boom conveyor and all shuttle conveyors.

Conveyor transfer chute shall be designed in such a way that the scraped material shall flow freely.

Deck Plate shall be provided full length of the conveyors.

Ceramic lagging shall be provided on the boom conveyor of stackers & drive pulley of reversible shuttle conveyors.

Small length of the conveyor & shuttle conveyor troughing angle given 20 deg. Shall be 35 deg. Wherever possible.

(xiii) Safety Provisions

1. Machines included under this specification shall be equipped with adequate safety devices and provided with adequate working clearances all around the equipment fitted on the machines to comply with the purchaser's specific requirements, safety codes and statutory regulations prevalent at the place of installation.

2. Adequate numbers of fire extinguishers and fire extinguishing systems suitable for prevention of electrical fire as per safety rules shall be provided in the operator's cabins, electrical rooms and in other areas considered necessary. One no. Fire Extinguisher(min. 2.5Kg cap) shall be provided in the operator's cabins, electrical rooms and under carriage platform each.

3. Adequate numbers of fire extinguishers and sand buckets shall be provided at suitable locations for preventing fire hazards.

4. Suitable fire alarm with fire detectors shall be provided for the electrical premises.

5. The fire protection systems shall comply with provisions made by tariff advisory committee, a statutory body under Insurance Act 1938, and also conform to Indian Explosives Act, Indian Factories Act etc.

6. Boom and tripper conveyors shall be provided with guards to prevent belt warp in windy conditions.
7. Mechanical roof over outdoor installation like transformer, HT Switch, CRDs, Slipring box, to restrict deposition of spillage material from tripper conveyor.

(xiv) **Steel Structures**

The structures shall be designed and fabricated in accordance with IS:800-1984 taking the following additions/ deviations into account.

1. All steel structures and the portal frames shall be of box construction with double web plate girder. The span to depth ratio shall not exceed 18. For box plate girders, all diaphragms shall bear against the top flanges.

2. Flap gate shall be made light weight as well as durable for easy and quick operation.

3. The box girder shall be so constructed as to eliminate accumulation of water or oil inside it.

4. Structural steel conforming to IS: 2062-1992 only shall be used.

5. Electrodes of low hydrogen type only shall be used for welding of steel structures which are subject to dynamic loading.

6. Parts of steel frame carrying machinery shall be provided with doubling plates of adequate thickness welded and machined to true surface.

7. All bolts except those with nylon nuts shall be provided with grip lock nuts and/or spring washers.

8. For side alignments of motors, strong adjustable screws with lock nuts and sliding blocks shall be provided.

9. Welded snugs shall be fitted at pedestals, gear boxes etc. for alignment.

10. Stud or body bolts shall not be used as fasteners for mechanical items except for fixing inspection covers.

11. Design of the structures for these equipment shall take into account the following factors and shall have ample precautions taken to withstand the following.

   i) Reinforcement of the natural sway of the structure due to unbalanced dynamic oscillations of the machines.

   ii) Fatigue produced in the members due to frequent stress reversals.

   iii) All impact loads, super-imposed loads and loads due to wind.

   The structure shall be designed with adequate factor of safety to ensure smooth movement of operation without vibration.

12. The bulk density to be considered for structural design and that for power calculation shall be 2.2t/Cu.M. It is only for volumetric capacity calculation that the bulk density is to be considered 2.0t/Cu.M.

(xv) **Belt Weighing Scale**

For Detailed Specification of Belt Weigh Scale, Refer relevant
Chapter of GS-06 of this Technical Specification. Belt weigh scales shall be provided on the boom conveyors with an accuracy of ±0.5%.

(C) **Technical Parameter of Twin Boom Stacker**

Rail mounted self propelled, twin boom, electro mechanical winch luffing type stacker complete with electrics etc. shall be supplied as per the given specification. The main characteristics of the stackers shall be as follows.

1) **Type** : Rail mounted, self propelled twin boom, luffing type.

2) **Nos.** : 03 (three)

3) **Capacity, tph** :
   - **Rated** : 1500
   - **Designed** : 1800

4) **Boom length, m** : To suit the stock-pile width of 30M.

5) **Track centres** : 6.0 m, Rail size 60 kg/m

6) **Duty** : Continuous, 20 hrs/day, 350 days a year.

7) **Length of Travel** : ~ 350m

8) **Travel speed (VVF drives)** :
   - **Forward** 20 m/ min.
   - **Reverse** 30 m/min

9) **Hoisting speed /Luffing Range (With respect to discharge pulley)** :
   - 2 m/min (approx)
   - To suit the stock-pile width/ length

10) **Cross section of stock file** : Triangular

11) **Bottom width of stock pile** : 30 m

12) **Height of stock Pile w.r.t. to rail level** : 10.5 m

13) **Length of Stock pile** : 350 m

14) **Material to be handled** : Iron ore, Iron Ore fines, Lime stone, Dolomite, Coke etc.

15) The height of the boom end shall be automatically adjusted to limit the height of the free fall of the discharge materials. The boom hoist shall automatically get so adjusted that the height of free fall shall not exceed 2m and shall not be less than 1m. However, at the start of pile formation on the ground, the initial height of free fall may be up to 4m.

16) The technical characteristics of yard conveyor, refer chart sheet no. MEC/S/9101/11/17/00/00/061.B06/R1.

17) Type of belting and idlers shall be interchangeable with yard
conveyor. The belting to be provided will be indicated to the successful Bidder. However boom conveyor belt width shall be greater than or equal to that of the yard conveyor.

18) Before the stacking of material reaches to its top most height in a particular position, an audio visual signal shall be provided in the cabin to warn the operator to plan for shifting of the machine to the next location.

19) The boom's hoisting movement upwards shall be restricted to maximum limit to prevent it from damaging the stacker structure. However, the provision shall be made to enable the boom end brought to ground for repairs and maintenance by by-passing the operational limit switch that restricts its downward movement.

20) Walkway of minimum 800 mm width grating floor and hand railing shall be provided on both the sides of the conveyor in the tripper car and in the stacking boom, for maintenance purpose.

21) The tripper attached to the stacker shall be of adequate length so as to support maximum possible length of the yard conveyor belt. The maximum inclination shall be 12 degrees.

22) The working inclination of the stacker boom conveyor w.r.t. horizontal shall be within -12 degree to +14 degree. However, it shall be designed such that the boom may be lowered to touch the ground or raised upto +20 degree.

23) Electrical room shall be pressurised type

24) Press to talk system shall be provided.

25) Over travel device (non contact type) shall be provided

26) Auto tension trip device shall be provided for cables.

27) Provision for indication of LT speed in operator’s cabin shall be kept.

28) Layer counter with digital display at stacker cabin as well as control room with provision of hard copy output of all data shall be provided.

29) One Laptop computer for data analysis shall be included in the scope of work.

30) The bypass arrangement in all stackers shall be three position by pass i.e. 0%, 50% and 100% bypass. Hydraulically operated/ electromechanical actuator operated diverter gate shall be provided for this purpose.

31) Min. 2 Nos. multi blade torsion arm type/sprung blade type external (pre scraper & main scraper) and one no. diagonal type internal scraper to be provided on boom conveyor. Pre scraper and main scraper to be provided for tripper conveyor also.

(D) Codes and Standards

The equipment shall be designed and selected keeping in view the facility for inspection, cleaning, replacement and repair and for use where continuity of operation and safety are first considerations.
The equipment shall conform to the latest Indian Electricity Rules and Regulations as regards safety requirements, earthing and other essential provisions specified therein. They shall also comply with the statutory requirements.

The design, manufacture, testing as well as performance of the equipment covered in this specification shall comply with the latest editions of the following standards and safety codes.

(i) **Mechanical**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS:1891(Part - I)1994</td>
<td>Specification for Rubber Conveyor and Elevator Belting</td>
</tr>
<tr>
<td>IS:2062-1992</td>
<td>Weldable structural steel</td>
</tr>
<tr>
<td>IS:7155-1986</td>
<td>Code of practice for conveyor safety</td>
</tr>
<tr>
<td>IS:3443-1980</td>
<td>Specification for rails</td>
</tr>
<tr>
<td>IS:8535-1987</td>
<td>Specification for Flat Counter Sunk Nib Bolts</td>
</tr>
<tr>
<td>IS:7423-1974</td>
<td>Dimensions for Apron Conveyors</td>
</tr>
<tr>
<td>IS:5895-1985</td>
<td>Specification for steel roller conveyors</td>
</tr>
</tbody>
</table>
Enquiry Specification for Twin boom Stacker & Bucket wheel Reclaimer


ISO:5049 : Code of construction for structural steel design which ever is applicable

(i) Electrical

IS:8623-1993 : Specification for factory built assemblies for switchgear and control gear for voltages upto and including 1000V A.C. and 1200 V DC.

IS:4237-1982 : General requirement of switch gears and control gears for voltages not exceeding 1000 volts.

IS:13947 (Part-I) 1993 : Degree of protection provided by enclosures of LV switch gears.


IS:5578-1985 : Marking and arrangement for switchgear busbars, main connection and auxiliary wiring.


IS:13947-1993 : Specification for heavy duty air break switches and composite unit of air break switches and fuses for voltage upto 1000 volts.


IS:4160-1967 : Interlocking switch socket outlet

IS:1889-1982 : Codes of practice for installation and maintenance of transformers.
IS:3429-1966 : Specification for metal enclosed switchgear and control gear for voltages above 1000 volts but not exceeding 11,000 volts.
IS:1554 (Part - I) : PVC insulated heavy duty 1988 electric cables for working voltages upto and including 1100 volts.
IS:8130-1984 : Conductors for insulated electrical cables and flexible cords.
IS:6380-1984 : Elastometric insulation and sheath of electric cables.
IS:9968(Part - I) : Rubber insulated cables with copper 1988 conductors.

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.

The equipment may be designed as per any other international standard also after prior approval of the Purchaser.
4.0 Technical Specifications of BUCKET WHEEL RECLAIMER

(A) Scope Of Work (Including Battery Limit)

The scope of work of the Bidder shall consist of design, engineering, manufacture, inspection, assembly shop testing, painting at manufacturer's shop as well as at site after erection, supply at site including dismantling for transportation, packing, loading and transportation, receipt at site, erection testing and commissioning of the following items at Plant at site.

Supply and installation of resting pads for the boom in the parking zone. The equipment supply shall be complete in all respects including its structural, mechanical and electrical components and standard accessories such as electricals, flexible trailing power and control cables with cable reeling drum etc.

All items essential for the desired operation of these equipment whether specifically mentioned in this specification or not, shall be included in the scope of work of the Bidder.

The scope of work shall stand supplemented by such details as are given in this specification, tender drawing, Instructions to the Bidder, general conditions of contract or any other part of the tender document.

All electrics/ electrical equipment as indicated under relevant clauses.

(B) Technical Specification

(i) General

- The equipment covered in this specification shall be installed in the new Ore Handling Plant (OHP-II).
- All equipment shall be designed for out door duty and shall be complete with mechanical, structural, power supply, conveyors, chutes, drives, controls etc.

(ii) Bucket Wheel Reclaimer

1) Four numbers bucket wheel reclaimer will be provided for reclaiming Iron ore lump, Iron Ore Fines, Limestone, Mn Ore and dolomite. The reclaimer shall be bucket wheel type. The material received from the bucket wheel shall be discharged on the ground conveyor (through the boom conveyor and chutes) for onward supply to consumer shops. The slewing mass of the machine shall be balanced to contain the centre of gravity well within the slew bearing diameter.

2) The equipment shall be controlled and operated from an operator's cabin suitably located on the boom to give operator an full view of the operating zone in either direction of travel and optimum vision all round. Operator cabin should have clear view of boom
reclaiming conveyor also. The cabin mounted on boom shall have automatic leveling device i.e. the cabin shall always be horizontal irrespective of boom inclination. The cabin shall be of totally enclosed type having shatter proof glasses with electrically driven wind shield wipers. Windows shall be moving on hinges to facilitate its cleaning. The cabin shall be provided with adequate lighting, switches, controllers with three nos. revolving operator's chairs, telephone, split type air conditioner system and circulating fan and two adequately sized CO2 fire extinguishers. A hooter whose sound can be heard from a distance of 300m shall be provided outside the cabin.

3) Electric house shall be completely closed and provided with 2 nos. window type AC of 2 TR cap. One no. of Window type AC of 1 Tonne cap. Shall be provided in Operator's cabin. Wherever Air conditioning has been sought, the structure of the unit shall be double walled.

(iii) Mechanical Specification

1) The design of the bogie and carriages of the equipment shall be such that differential movement of the wheel sets of the machine on two rail tracks resulting in skewing effects does not occur. The traverse bogies shall be provided with material removing guard plate as well as rail cleaners at both ends so that the machine can travel even if there is spillage or overflow of material on rail track and the LT drives shall be selected accordingly.

2) Adequate no. of locating pins etc. shall be provided to ensure easy assembly after dismantling of equipment or mechanism etc.

3) All matching parts shall be given identifiable marking for easy erection of the machine.

4) Materials used for equipment's structures shall be of good quality shall be free from fracture, cracks, blow holes, lamination, pittings etc.

5) Stability of these mobile equipment shall conform to the norms laid down in relevant International Standards.

6) Safe and adequate access with approach for repairs, handling, maintenance and removal of all mechanical and electrical parts shall be ensured without recourse to additional scaffolding. Adequate clearances between the floors shall be provided to facilitate easy maintenance.

7) Also, the clearance between ground and undercarriage shall be kept min. 0.3 m for maintenance purpose.

8) All parts requiring replacement or inspection or lubrication shall be easily accessible without the need for dismantling of other equipment or structures. All electrical cables shall be laid so that they are not liable to damage and can be easily inspected and easily accessible for repair and maintenance.

9) Suitable handling facilities or provisions such as eye bolts, lifting lugs, ladders etc. of adequate capacities shall be provided on the machine at all necessary locations for maintenance of various
mechanisms.

10) Adequate working space on the platform around all machinery parts shall be provided for person working for maintenance or inspection.

11) Safety hand railing preferably of tubular constructions shall be provided around all walk ways. Railing shall not be less than 1000 mm in height with an intermediate member at a height of 500 mm. The minimum size of handrail be 32NB.

12) All edges or openings shall be provided with toe guards. Toe angles or bent plates shall be minimum 100 mm in height.

13) Essential openings, on the platforms or walk-ways shall be covered with removable covers.

14) All moving parts, wherever required from the safety point of view, except long travel gear wheels, shall be provided with covers opening on strong hinges. These covers shall preferably be made of minimum 3 mm thick plate. All heavy covers shall be provided with inspection windows.

15) Sufficient number of power points/outlets shall be provided at suitable places on the equipment to plug in welding transformers and hand tools for maintenance purposes.

16) Standardisation of assemblies shall be carried out to the maximum extent possible.

17) Sizes for all equipment viz. wheels, brakes etc. shall be selected from preferred number series and shall be of reputed make.

18) The design of the equipment shall ensure that there is no spillage of material on any part of the equipment. Dust covers shall be provided for all motors, gear boxes, drums etc.

19) End limit switches and over run limit switches shall be provided at both the ends of the travels for all machines. The corresponding strikers shall also be supplied by the supplier.

20) The speed of the boom conveyor shall be in line with the speed of the yard conveyor.

21) The machines shall be provided with adequate nos of buffers

22) The number of discharges per minute of bucket wheel while reclaiming will be limited to 50 per minute. Fill factor of 0.7 and 25% of ring volume shall be considered for reclaim capacity calculation.

23) Two nos. of Electric hoists of min. 3 T cap shall be provided in E-House.

24) The parking area of the machine shall be indicated in the drawing and storm anchor shall be provided. Boom resting pad structure and buffer stop structure with fixing details shall be included in scope of work.

25) Material of construction of bucket & supporting structures of bucket wheel shall not be less than 10mm MS Gr.B (base plate), IS 2062 and shall have sufficient strength to avoid bending or torsion.
(iv) Drives

1) The long travel mechanism drive shall be provided with multiple drives on each side. In the event of failure, any drive motor, the corresponding motor on the other side shall be automatically disconnected. However, the machine shall be operable with the remaining drives. LT Motors & slewing – motors with VVVF Drive shall be suitable for reversing, plugging control, frequent starting and mechanical braking duties. B/W and Boom conveyor drives shall be of reversible type. LT motors shall be VVVF controlled in order to accommodate speed variation of 5 to 18.75 m/min. LT motors speeds indicated shall be reviewed accordingly.

Automatic disengagement of drive on the other side shall be considered in case of failure of opposite side drive motor is detected. Minimum 20 Nos 630 mm dia LT wheels shall be considered.

2) Double ended motor shall be provided in long travel drives, so that brake can be fitted to the free end of motor to ensure better maintenance and operation.

3) For Bucket-wheel drive, low-speed high-torque hydraulic motors shall be provided. B/W and Boom Conv. Drives shall be of reversible type. BW drive shall be suitable for inching operation. Speed monitor shall be provided in B/W drive.

4) Protection against overloads shall be provided through suitable control system. The control system shall ensure smooth acceleration for all motions and variable speeds.

5) The equipment shall be supported on wheels mounted in bogies and shall be driven by electric motors through reduction gears. Chain drives and open gears shall not be used.

6) For long travel motion individual wheel drive shall be provided. Minimum 50% of the long travel wheels shall be positively driven.

7) For travel motion, rotating axle drive arrangement with 'L' type supports shall be provided.

8) The under carriages shall be fitted with substantial number of safety stops to prevent the equipment from falling more than 25 mm in the event of breakage of a track wheel, bogie or axle. These safety stops shall not interfere with the removal of wheels.

9) At suitable points, built in arrangement shall be provided for easy replacement of heavy electrical equipment. Built in jacking up arrangement for bogie, frame etc. for changing of wheels and lifting provision for cable reeling drums and other heavy parts shall also be provided.

10) The under carriage shall have statically determinate support system to ensure its stability and to afford an evenly distributed load over the entire travel assemblies and to cater to any unevenness in the level of the rails.
11) The reclaimer platform shall be supported on the turn table by a ball race slewing bearing with an external toothed rim. The slewing drive shall be of hydraulic type with integral hydraulically operated brake and proportioning valve to ensure smooth motion of the turn table during stoppage and reversal.

12) The output shaft of the hydraulic drive shall be equipped with a pinion, meshing with the toothed rim of the slewing bearing.

13) Stall Torque motor of cable reeling drum of Demag make shall be provided.

(v) Gears and Gear Boxes

1) Straight and helical, spur gearing shall be used. Worm gears shall not be used unless specified otherwise. All spur gears shall have 20 degree pressure angle with involute teeth profile.

2) First and high speed reductions shall be through helical gears only. No herringbone gear is acceptable for any reduction.

3) All first reduction pinions and also other pinions, if feasible, shall be integral with the shafts.

4) Overhung or split gears and pinions shall not be used unless specifically called for.

5) All gears shall be of hardened and tempered alloy or carbon steel with machine cut teeth. Surface hardness for pinion shall be 255 to 300 BHN and for gear it shall be 220 to 225 BHN. Difference in hardness of pinion and gear shall not be less than 20 BHN. The gear teeth shall be ground and finished to suit the service conditions.

6) Gear teeth shall be cut in metric module system only.

7) All gears shall be completely enclosed in oil tight designs or guarded by covers firmly attached to rigid supports where complete enclosure is not possible.

8) All gear shafts shall be supported in bearings mounted in gear box.

9) In case of totally enclosed gear boxes, splash or automatic lubrication system shall be used.

10) The housing for Gear boxes shall be of cast steel or fabricated.

11) Fabricated gear boxes shall be made of minimum 8 mm thick steel plate and shall be stress relieved.

12) Covers shall be split horizontally at each shaft center line and fastened and arranged so that the top half can be removed for inspection and repair without disturbing the bottom half.

13) Directly above the mesh line of teeth, hand-holes with bolted covers be provided in the gear box body for inspection of the teeth.

14) The gear boxes shall be provided with breather vents, oil level indications, dip sticks and easily accessible drain plugs.

15) Radial clearance between the gear box inner surface and the
outside diameter of the gear shall be at least 1.25 times the depth of the largest gear tooth inside the gear box or 20 mm whichever is higher. The facial or side clearance between the inner surface of the gear box and the face of the gear or pinion shall be at least 20 mm.

16) Bearings shall be housed in gear box/bosses or shall be mounted in cartridges held in place by top bolts and flanges. Suitable oil seals shall be provided at all required places in the gear box.

17) Oil pumps with filters etc. shall be used if vertical gearing exceeds two reductions. On horizontal gearing, the oil level shall be above the smallest gear.

18) All gear boxes shall be mounted on machined surfaces and shall have machined feet. Shims shall not be used.

19) Gear boxes shall be provided with lugs or other means for lifting purposes.

20) Interior of all gear box housing shall be sand blasted. Suitable resistance paint matching to the lubricant used shall be applied inside the gear box.

21) External cooling arrangement shall be provided wherever required to dissipate the heat generated inside the gear box. However, external cooling coils shall be avoided.

(vi) Bearings and Plummer Blocks

1) All bearing housings shall be made cast or wrought steel. Housings shall be of split type constructions to permit easy removal of shaft. The underside of the base of each pedestal shall be machined and shall bear upon machined surface.

2) Slew bearing shall be of the following makes: Rothe Erde, DRECON or IMO.

3) Rated life of ball and roller bearings shall be designed for B-10 life of not less than 40,000 hours.

4) Plummer block housings shall be oriented on the supporting structure in such a manner that no shaft loads are transmitted to the housing cap.

5) Plummer block shall have provision for lubrication. Suitable oil seals shall be provided wherever necessary.

6) Anti friction ball or roller bearings of specified make only shall be used throughout. Cartridge/ plain bearing is not accepted.

7) Heavy caps shall be provided with means for lifting.

(vii) Couplings

1) Couplings shall be designed to suit the maximum torque required to be transmitted or to suit the total braking torque of the mechanism whichever is greater.

2) Fluid couplings shall be provided on input shafts of the motor of 30 KW & higher ratings. Geared coupling with crowned teeth or resilient
type coupling shall be used on input shaft of motor of less than 30 KW and also on the output shaft of gear boxes. Any other special coupling which can give better and more reliable service may be used after obtaining the specific approval of the Purchaser.

3) High speed couplings shall be selected of a natural frequency such that no resonance can occur at any operational speed.

(viii) Brakes

1) Only DC Electro magnetic brakes preferably BCH make shall be used unless specified otherwise.

2) Double shoe brake shall be provided for each drive and shall be mounted on the input pinion of the gear train. The brake shoes shall be of hinged type. Brake levers shall be forged or fabricated or of cast steel. Hinge pins shall be of hardened alloy steel and shall be lubricated. These hinge pins shall be provided with steel bushes at bearing points.

3) Brake drums shall be forged or of cast steel and shall be completely machined and dynamically balanced. Width of the brake drum selected shall be 10 mm more than the width of the brake shoes on each side. Hardness of the brake drum shall be 300 to 350 BHN.

4) Rating of brakes for all mechanisms shall be selected as per required braking moment necessary for each mechanism with factor of safety and the required heat dissipation capacity.

5) Brakes shall be installed such that these are easily approachable for servicing.

6) In order to obtain low deceleration, the brakes of long travel drives of the machines shall close successively.

7) The service factor shall be 1.5 on motor (mechanical output) for selection of all gear-boxes/ couplings, brakes etc.

(ix) Long Travel Wheels

1) The wheels shall be double flanged with straight tread, and shall be forged.

2) Wheels shall be heat treated to have a hardness of BHN-300 to 350 on the rolling surface and flanges to a depth of not less than 10 mm with a smooth pass to the non hardness zone.

3) Minimum 20 nos. 630 mm dia LT wheels shall be considered. Complete wheel bogies shall be interchangeable with each other.

(x) Rail Clamps and Anemometer System

1) The machines shall be protected against drift due to wind by means of two electric/ hydraulic operated (one on each rail) rail clamps and two hand operated rail clamps.

2) Wind anemometer with suitable controls shall be provided to warn the operator of high wind velocities and stormy conditions. (The equipment shall be built to withstand wind velocity upto 180 km/hr., when not operating).
3) The electrical/ hydraulic operated rail clamps shall be designed to operate automatically when the machine is switched off. These rail lamps shall also be designed to be operatable remotely from the operator's cabin.

4) The automatic rail clamps shall be such that when wind velocity is higher than a predetermined value, the machine will be automatically shut down and the rail clamps applied.

5) The automatic and manual rail clamps shall be equipped with limit switches to monitor their operations. The long travel shall not be possible to start until and unless these clamps are in released position.

(xi) Luffing and slewing Hydraulic System

1) Hydraulic luffing and slewing of the boom shall be provided for reclaimer with following respective ranges

   luffing : (+) 7 to (-) 12 deg.
   Slewing : 220 deg. (110 deg. on either side of the track)

   Slew drive shall be hydraulic type. Slewing speed shall be 0.09-0.2 rpm (Stepless)

2) Two pumps, two electric motors with dual line system shall be provided to ensure that in the event of one of the drive unit failing, full operation can be maintained without interruption. Failure of any drive unit shall produce audio visual alarm in the operator's cabin.

3) The acceleration and deceleration or raising and lowering the boom shall be smooth and operation shall be without giving any jerk to the boom.

4) The design and construction of hydraulic system shall be suitable to operate in the atmospheric conditions and dusty operating environment of the plant. The system shall be complete and consist of hydraulic fluid, various kinds of valves, accumulators, hydraulic motors/ hydraulic pumps, various accessories such as filters, strainers, magnet and restructures, hydraulic pipe work, fittings and fluid passages, flexible pipe work, sealing devices, instruments for indicating various parameters such as pressure, temperature etc., control devices for local and automatic operation of the system, safety devices and alarm for abnormal operating conditions, interlocks for sequencing and safe operations.

5) The hydraulic system/ components shall be designed/ selected so that the working pressure shall not exceed 180 bars.

6) The hydraulic circuit shall be designed to minimise surge pressure.

7) Suitable accumulators of adequate size shall be used to withstand maximum rate of surge pressure rise as well as the back surge pressure. All components shall be capable of withstanding the peak pressure.

8) Necessary connections, valves, outlines and apparatus shall be provided to facilitate testing, flushing, drainage, fluid sampling and
repair & maintenance.

9) A suitable capacity reservoir with provisions for oil filling, air breathing, drawing, inspection shall be provided.

10) The reservoir shall be designed to prevent the ingress of any foreign materials including water and dust.

11) Inner face of the reservoir shall be sand blasted and shall be suitably painted, so that it does not have any adverse effect on hydraulic fluid used.

12) Suitable level indicators shall be provided in the reservoir. Low level of the fluid in the reservoir shall produce warning alarm in the operator’s cabin and switch off the hydraulic pumping unit.

13) Pump and pump motor shall be designed to operate under load conditions at a minimum of 125% of system operating pressure and give a flow rate of 125% of system operating flow rate.

14) Lockable type valves shall be provided to prevent tampering.

15) All hydraulic valves, accessories and devices shall be provided with identification metal tags.

16) Necessary relief valve shall be provided to protect the hydraulic system from excessive pressure. The fluid leaked through the relief valve shall be suitably carried to the reservoir. The overload of the system in raising or lowering of the boom shall give necessary warning signal in the operator’s cabin.

17) Power pack (individual for each drive) with common reservoir for oil may be considered for a) Luffing and operator’s cabin leveling. However bidder may combine impact table adjustment with luffing mechanism power pack, and Chute/ skirt lifting/lowering mechanism with power pack for operator’s cabin leveling. Reservoir for power packs wherever combined, shall be mentioned. The B/W drive hydraulic system shall be independent of other hydraulic system with its own dedicated oil tank/filters.

18) Electronic Drive Controller for Drive operation Control, annunciation and interfacing between Machine PLC and Plant PLC shall be supplied. Hydraulic motors of hollow shaft design, shall be directly mounted onto the driven shaft using a shrink disc (Ring feeder).

19) Apart from the hydraulic cyclinders for operators cabin levelling, provision shall be kept for rubber shock absorbers in order to avoid shocks due to any failure in hydraulic system.

(xii) Belt Conveyer

For Detailed Specification of Belt Conveyer System Refer General Technical Specification. Tripper conveyor shall have a maximum inclination of 12 deg. Suitable hold down pulley shall be provided on tripper car to prevent belt uplifting during starting of yard conveyer.

The bulk density to be considered for structural design and that for power calculation shall be 2.2t/Cu.M. It is only for volumetric capacity calculation that the bulk density is to be considered 2.0t/Cu.M.
Return idler shall be single piece identical to mark No. 621 and troughing idler shall be staggered type (sketch for troughing & return idlers enclosed)

All drive drum shaft above 100mm shall be forged.

All conveyor pulleys shall be connected to the shaft through Key Type arrangement

Screw take-up travel should be 1000mm in stacker, boom conveyors, wheel boom conveyor and all shuttle conveyors.

Conveyor transfer chute shall be designed in such a way that the scraped material shall flow freely.

Deck Plate shall be provided full length of the conveyors.

Ceramic lagging shall be provided on the boom conveyor of stackers & drive pulley of reversible shuttle conveyors.

Small length of the conveyor & shuttle conveyor troughing angle given 20 deg. Shall be 35 deg. Wherever possible.

(xiii) Lubrication

1) The machines shall be supplied with two separate central lubrication systems:
   a) Central lubrication system for the under carriage.
   b) Central lubrication system for the upper part.

2) The lubrication systems shall be complete with grease pumps, double supply lines, direction control valves, the distributors etc.

3) The level of grease in the grease tanks shall be monitored electrically and low level of the grease shall give the audio warning signal in the operator's cabins.

4) Independent centralized high pressure group lubrication system with hand operated grease pump shall be provided for traveling gear, hoisting arrangement bucket wheel hinge and slew ring. In addition to above a separate upper structure grease lubrication system for bucket wheel fork end bearing shall be provided. Centralised (manual) lubrication systems shall be considered for other arts where motorized lubrication not considered. The lubrication systems shall be complete with grease pumps, double supply lines, direction control valves, the distributors etc. The level of grease in the grease tanks shall be monitored electrically and low level of the grease shall give the audio warning signal in the operator's cabins.

(xiv) Safety Provisions

1) Machines included under this specification shall be equipped with adequate safety devices and provided with adequate working clearances all around the equipment fitted on the machines to comply with the purchaser's specific requirements, safety codes and statutory regulations prevalent at the place of installation.

Adequate numbers of fire extinguishers and fire extinguishing systems suitable for prevention of electrical fire as per safety
rules shall be provided in the operator's cabins, electrical rooms and in other areas considered necessary. One no. Fire Extinguisher(min. 2.5Kg cap) shall be provided in the operator's cabins, electrical rooms and under carriage platform each.

2) Adequate numbers of fire extinguishers and sand buckets shall be provided at suitable locations for preventing fire hazards.

3) Suitable fire alarm with fire detectors shall be provided for the electrical premises.

4) The fire protection systems shall comply with provisions made by tariff advisory committee, a statutory body under Insurance Act 1938, and also conform to Indian Explosives Act, Indian Factories Act etc.

5) Mechanical roof over outdoor installation like transformer, HT Switch, CRDs, Slipring box, to restrict deposition of spillage material from tripper conveyor.

(xv) **Steel Structures**

The structures shall be designed and fabricated in accordance with IS: 800-1984 taking the following additions/ deviations into account.

1) All steel structures and the portal frames shall be of box construction with double web plate girder. The span to depth ratio shall not exceed 18. For box plate girders, all diaphragms shall bear against the top flanges.

2) The box girder shall be so constructed as to eliminate accumulation of water or oil inside it.

3) Structural steel conforming to IS: 2062-1992 only shall be used.

4) Electrodes of low hydrogen type only shall be used for welding of steel structures which are subject to dynamic loading.

5) Parts of steel frame carrying machinery shall be provided with doubling plates of adequate thickness welded and machined to true surface.

6) All bolts except those with nylon nuts shall be provided with grip lock nuts and/or spring washers.

7) For side alignments of motors, strong adjustable screws with lock nuts and sliding blocks shall be provided.

8) Welded snugs shall be fitted at pedestals, gear boxes etc. for alignment.

9) Stud or body bolts shall not be used as fasteners for mechanical items except for fixing inspection covers.

10) Design of the structures for these equipment shall take into account the following factors and shall have ample precautions taken to withstand the following.

   a) Reinforcement of the natural sway of the structure due to unbalanced dynamic oscillations of the machines.

   b) Fatigue produced in the members due to frequent stress
reversals.

c) All impact loads, super-imposed loads and loads due to wind. Boom conveyor shall be provided with guards to prevent belt warp in windy conditions.

11) The bulk density to be considered for structural design and that for power calculation shall be 2.2t/Cu.M. It is only for volumetric capacity calculation that the bulk density is to be considered 2.0t/Cu.M.

(xvi) Belt Weighing Scale


(C) Technical Parameter Of Bucket Wheel Reclaimer

Rail mounted self propelled, boom type luffable, slewable and mobile boom type bucket wheel reclaimer, complete with electrics etc. shall be supplied as per the given specification. The main characteristics of the machine shall be as follows.

(i) Type : Rail mounted, self propelled boom type luffable, slewable bucket wheel reclaimer to be mounted on rail.

(ii) Nos. : Four

(iii) Capacity, tph : Rated : 1500 t/h
                     Designed : 1800 t/h

(iv) Boom length, m : To suit the stockpile of given cross section

(v) Track centres : 7 m, Rail size 60 kg/m

(vi) Track rail size : To suit equipment kg/m

(vii) Duty : Continuous, 20 hrs a day 350 days a year.

(ix) Length of travel : Approx. 400.0 m

(x) Travel speed : 5-20 m/min, VVVF controlled

(xi) Slew speed/ Range : 0.09 to 0.2 rpm (approx.), VVVF controlled
                         110 deg on either side

(xii) Luffing mechanism

1) Speed : 5 m/min at centre of bucket

2) Range : +7.0°, - 12°

[Range shall be suitable for making the specified pile cross section. However inclination of more than ±12° is not acceptable]
(xiii) Stockpile Cross section of: Triangular/ trapezoidal
(xiv) Bottom width of stock pile: 30.0 m
(xv) a) Height of stock Pile: 10.5 m w.r.t. to rail level.
   b) Length of stock Pile: 350 m
(xvi) The technical characteristics of yard conveyers - (Refer Drawing No MEC/S/9101/11/17/0/00/061.B06/R1). The bulk density to be considered for structural design and that for power calculation shall be 2.2t/Cu.M. It is only for volumetric capacity calculation that the bulk density is to be considered 2.0t/Cu.M.
(xvii) Type of belting and idlers of the machine shall be interchangeable with yard conveyor. The belting and type of idlers to be provided will be indicated to the successful bidder.
(xviii) No intermediate conveyor shall be given to connect boom conveyor of Reclaimer and connecting yard conveyor.
(xix) Walkway of minimum 800 mm width grating floor and hand railing shall be provided on both the sides of the boom conveyor maintenance purpose.
(xx) The boom’s hoisting movement upwards shall be restricted to maximum limit to prevent it from damaging the Reclaimer structure. However, the provision shall be made to enable the boom end brought to ground for repair and maintenance by bypassing the operational limit switch that restrict its down ward movement.
(xxi) The machine shall be suitable for reclaiming material from the stock pile of the given cross section with full capacity by operating from one side of the stock pile leaving a maximum 2% as dead stock. Boom length and bucket dia. shall be accordingly chosen.
(xxii) The electrical room shall be pressurized type.
(xxiii) Press to talk system shall be provided.
(xxiv) Over travel device (non contact type) shall be provided.
(xxv) Auto tension trip device shall be provided for cables.
(xxvi) Apart from the Hydraulic cylinders for Operators Cabin leveling, provision shall be kept for Rubber shock absorbers in order to avoid shocks due to any failure in the hydraulic system.
(xxvii) Independent centralized high pressure group lubrication system with hand operated grease pump shall be provided for traveling gear, hoisting arrangement, bucket wheel hinge and slew ring. In addition to above a separate upper structure grease lubrication system for bucket wheel fork end bearing shall be provided. Centralised (manual) lubrication shall be considered for other parts where motorized lubrication not considered. The lubrication systems shall be complete with grease pumps, double supply lines, direction control valves, the distributors etc. The level of grease in the grease tanks shall be monitored electrically and low level
of the grease shall give the audio warning signal in the operator's cabins.

(xxviii) Bucket wheel shall have Mn-steel renewable wear plates 15mm thick with provision for scraping. BW fixing holes shall be with renewable bushes. Bucket shall be of wear resistant steel. Bucket teeth and tip shall be of high abrasion resistant manganese steel.

(xxix) The number of discharges per minute of bucket wheel while reclaiming will be limited to 50 per minute. Fill factor of 0.7 and 25% of ring volume shall be considered for reclaim capacity calculation.

(xxx) Min. 2 nos. multi blade torsion arm type/sprung blade type external (pre scraper & main scraper) and one no. diagonal type internal scraper to be provided on boom conveyor. Pre scraper and main scraper to be provided for tripper conveyor also.

(D) Codes and Standards

Same as that stipulated under clause for “Codes & Standards” of Twin Boom stacker Clause: 3.0(D)

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.

The equipment may be designed as per any other international standard also after prior approval of the Purchaser.

(E) supervision of Erection Plan

The Bidder shall submit an erection plan along with the tender for the plant & equipment under his scope of supply.

The plan will outline:

(i) The erection techniques.
(ii) Resources of supervision.
(iii) Requirement of construction power, water and storage needs.
(iv) Requirement of erection machineries.
(v) Requirement of manpower of specific trade and requisite skill.
(vi) Equipment delivery planning
(vii) Erection material planning
(viii) Sequencing of erection to avoid accumulation / under utilization of resource & to achieve better progress.
(ix) Action plan for completing critical work
5.0 HYDRAULICS

(A) Facilities to be provided in the Hydraulic Power Pack Room.

Hydraulic power pack shall be installed in room where adequate provisions are made to keep ambient air free from dust, moisture and ambient temperature shall be kept below 35°C.

Adequate facility shall be provided for handing of equipments/ components installed in the power pack room.

Adequate illumination.

Adequate fire alarms, fire protection system and fire fighting facilities.

Antiskid title floor shall be provided in the power pack room.

Design of floor shall be such that spilled oil / leakage oil, if any is collected into drain pit and from there, arrangement shall be provided for collection and disposal of leakage oil into oil barrels for reclamation purpose.

Emergency doors and Adequate space to carry out maintenance activities.

Hydraulic circuit of the system on anodized plate(s) shall be provided.

(B) Whatever Servo / Proportional Valves are used in the system, supplier shall supply Servo Valve flushing facility and test kits for Servo and Proportional Valves.

(C) For hydraulic systems with conventional valves, the supply voltage to various controls shall be 24 DC.

(D) BSP’s approved preferred make in vogue shall be followed.

(E) Mineral oil shall be used in hydraulic systems until otherwise agreed upon by BSP.

(F) All the pipes and fittings used in hydraulic systems of critical production units shall be stainless steel until otherwise agreed up on by BSP.

(G) Filters shall be provided for continuous removal of contaminants from the hydraulic fluid, which are likely to cause malfunction of pumps, valves and actuators and maintain desired cleanliness level of hydraulic fluid. Adequate filtration shall be provided for each system considering the ingress rate of contaminants in each applications.

(H) All the pressure line, return line and circulation filters shall be of absolute filtration design with B (x) ratio greater than or equal to 200. Total delta p across filters shall not exceed 0.5 bar with filter element in clean condition. (Total p means pressure drop across clean filter element plus pressure drop filter housing).

The micron rating shall be as specified in T.S. for individual filters.
(I) All the hydraulic system shall be provided with dedicated oil purifier. The oil purifier (vacuum dehydrator type) shall be capable to remove undissolved as well as dissolved water and solid containments from the hydraulic oil of the system in a reasonable time to the desired level.

(J) Portable oil transfer unit with built in filtration facility shall be provided for transfer oil from barrels to oil reservoir of the system.

(K) Calibration and Testing Facilities for the Hydraulic Components installed in the hydraulic systems shall be provided as detailed below.

The scope of work covers design, engineering, manufacture, supply, erection, testing and commissioning of following facilities :-

1. Power pack for Test Rigs of conventional control values, pumps, motors and hydraulic cylinders.

2. Test rig for conventional control valves.

3. Test rig for pumps and motors.

4. Test rig for hydraulic cylinders.

5. Test rig and Power pack for Servo and Proportional valves (if Servo / Proportional valves are used / installed in the hydraulic systems).

6. Repair benches for the above components.

7. Cleaning Station for hydraulic components.

8. All connected electrical, instrumentation and automation equipment and accessories.

The scope of supply shall also include all components and accessories as required to tender the system complete in all respect.

All the above equipments / components handling facility shall be provided. Adequate facility shall also be provided for storage of components (both un-repaired and repaired / tested components).

The Test Rigs shall have facilities for on-line acquisition of test parameters of the components while testing and shall be transferred to the main computer for records and references.

(L) Plate Type Heat Exchanges of adequate capacity shall be provided in the Hydraulic Systems.

(M) The hydraulic system shall have facility for on-line Pressure measurement in P, T, A and B lines at suitable locations of the circuit. Necessary instruments, conditions monitoring system and facilities shall be provided by the supplier.

(N) Necessary training shall be imparted by the supplier to Engineers Technicians with regard to operation and maintenance of the systems.
(O) HYDRAULIC PIPE LINE ERECTION, TESTING, PICKLING, FLUSHING AND COMMISSIONING

Hydraulic pipe work shall be assembled, pressure tested, pickled, flushed and commissioned as per piping instructions given by the system designer / consultant.

Provision of pipe line pickling and flushing facility shall be in the scope of work (provision of separate tank, pumps filters elements, pickling and flushing fluids shall be the supplier’s scope).

Supply of minimum 50 nos. of spare filter elements of each type along with the hydraulic system at the time of Erection, Testing and Commissioning shall be in the supplier’s scope of supply.

Oil cleanliness shall be checked during commissioning and facilities for checking and monitoring oil cleanliness shall be in the bidders scope of supply.

Suppliers Scope of Work in hydraulic pipe work shall also include :-

1) Equipment Supplier shall give a comprehensive cleaning and flushing scheme for hydraulic systems and provide necessary facilities to carry out the activity.

2) Adopt cleaning and flushing guidelines from ISO 5910.

3) Hydraulic System cleaning and flushing documents shall be part of acceptance checks in the Quality Assurance Program. Compliance to this shall be reported in the overall QAP.

4) Develop a plan for how to systematically control hook-up of subsystems into the main system. Documentation of results as part of the total flushing procedure. Describe cleaning and flushing connections and looping methods along with the details of components required to carry out the above.

5) Suppliers to specify sampling points to be used for condition monitoring during flushing and in service.

6) Connection program after cleaning and flushing is over with built-in check for prevention of contaminants during connections and assembling.

7) Acceptance norms shall be given by the Equipment Designer / Supplier.

(P) All pipelines shall be of seamless type clamped with polypropylene heavy series clamps. However, in the hot zone heavy series aluminum clamps shall be used.

(Q) All hydraulic pipe lines shall be painted as per the standard color mode.

(R) Special Conditions for hydraulics:

1) Off line filtration shall be provided and Differential pressure shall not be less than 0.3.
2) Pumps speed shall be 1500 rpm. Electrical motor pump shall have 25% reserve power over and above required for operating the pump at working pressure and flow.

3) The number of standby pumps shall be as follows:

   Up to 3 nos. working pumps : 1 no. standby

   For 4 to 6 nos. working pumps : 2 nos. standby

4) The following cleanliness level of oil shall be maintained for hydraulic systems:-

   Systems without servo valves/ proportional valves: NAS.7.
   Systems with proportional valves: NAS.5.
   Systems with servo valves: NAS.4.

5) All filters shall have $\beta$ ratio $\geq$ 200. the fineness of various filters shall be as follows:

   Hydraulic systems without proportional and servo valves:
   | Pressure line filters : 10micron |
   | Circulation filters : 10 micron |
   | Return line filters : 10 micron |

6) The capacity of pressure line, circulation filters, return line filters shall be as follows:-

   a. Return line filters : 3 times of maximum return flow or 3 times of maximum pump flow whichever is greater at $\Delta$ p= 0.5 bar (total) in clean condition.

   b. Circulation filters : pump flow at $\Delta$ p= 0.5 bar in clean condition.

   c. Pressure line filters : 2 to 2.5 times pump flow at $\Delta$ p= 0.8 bar in clean condition.

   All the filters shall be of absolute filtration design.

7) Solenoid coil voltage shall be 24 VDC

8) First fill of oil shall be in the bidder scope of supply.

The specification of hydraulics as indicated above shall be applicable for hydraulic drives of wagon tippler, side arm charger, stacker and bucket wheel reclaimer.
## Brief Details for Bins / Bunkers / Hoppers / Chutes for Stacker & reclaimer

### A. WAGON TIPPLER & TRACK Hopper

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Bin / Bunker</td>
<td>RCC Silos</td>
</tr>
<tr>
<td>Quantity</td>
<td>Refer drawing</td>
</tr>
<tr>
<td>Effective volume of each bunker</td>
<td>Refer drawing</td>
</tr>
<tr>
<td>Material to be handled</td>
<td>Iron Ore, Fines &amp; Lump, Coal, Limestone, Dolomite &amp;</td>
</tr>
<tr>
<td>Bulk density</td>
<td>Various</td>
</tr>
<tr>
<td>Material size</td>
<td>Various</td>
</tr>
<tr>
<td>Moisture</td>
<td>--</td>
</tr>
<tr>
<td>Bins construction / Shape</td>
<td>As per drawing</td>
</tr>
<tr>
<td>No. of outlets/ bunker</td>
<td>As per drawing</td>
</tr>
<tr>
<td>Liners</td>
<td>Polymer liners -20 mm thk</td>
</tr>
</tbody>
</table>

### B. SURGE HOPPERS/ BINS

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Bin / Hopper</td>
<td>Fabricated Steel Construction of Carbon Steel with stiffened plates of 10 mm thk.</td>
</tr>
<tr>
<td>Location</td>
<td>JH-27A</td>
</tr>
<tr>
<td>Material to be stored</td>
<td>Iron Ore</td>
</tr>
<tr>
<td>Bulk Density</td>
<td>2.2 t/m3</td>
</tr>
<tr>
<td>Material Size</td>
<td>-30mm</td>
</tr>
<tr>
<td>Moisture</td>
<td>3%</td>
</tr>
<tr>
<td>Bins construction / Shape</td>
<td>Rectangular at top &amp; conical at bottom (As per drawing)</td>
</tr>
<tr>
<td>No. of outlets/ bunker</td>
<td>One each</td>
</tr>
<tr>
<td>Liners</td>
<td>20mm thk. High Mn. Steel (Sail hard/ Tiscral/ Equiv.)</td>
</tr>
<tr>
<td>Level Indicating System</td>
<td>None</td>
</tr>
<tr>
<td>Air Blaster/Bin Vibrator</td>
<td>None</td>
</tr>
</tbody>
</table>
## C. CHUTES/DIVERTER GATES etc

<table>
<thead>
<tr>
<th>Type of:</th>
<th>Fabricated Steel Construction of Carbon Steel with stiffened plates of 10 mm thk.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Various.</td>
</tr>
<tr>
<td>Material to be stored</td>
<td>Various</td>
</tr>
<tr>
<td>Bins construction / Shape</td>
<td>As per drawing</td>
</tr>
<tr>
<td>No. of outlets/</td>
<td>One each bunker</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liners</th>
<th>Lump size, mm</th>
<th>Primary impact</th>
<th>Secondary impact</th>
<th>Flow zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>+80 mm</td>
<td>Min. 60 mm reinforced rubber liner</td>
<td>Min. 40 mm reinforced rubber liner</td>
<td>Min. 10 mm thk High Mn Steel (Sailhard / Tiscral / Equiv.)</td>
<td></td>
</tr>
<tr>
<td>20-80</td>
<td>40 thk rubber liner</td>
<td>- do-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-20 mm</td>
<td>8 mm thk SS-409M</td>
<td>- do-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## D. SKIRT BOARD

<table>
<thead>
<tr>
<th>Type of skirt boards</th>
<th>Fabricated Steel Construction of Carbon Steel with stiffened plates of 10 mm thk.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Various places at receiving point of belt conveyors</td>
</tr>
<tr>
<td>Material to be stored</td>
<td>Various</td>
</tr>
<tr>
<td>Bins construction / Shape</td>
<td>As per drawing</td>
</tr>
<tr>
<td>No. of skirt board</td>
<td>1 pair each</td>
</tr>
<tr>
<td>Liners</td>
<td>10 mm thk. High Mn Steel (Sailhard/ Tiscral/ Equiv.)</td>
</tr>
</tbody>
</table>
For belt conveyors of Stacker & reclaimer

Following points shall be considered in view of changes as given below:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Clause (As per GTS)</th>
<th>Description (As per GTS)</th>
<th>TS to be followed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cl.- 01.02, sub clause-04</td>
<td>Three roll inline troughing idlers of equal length shall be used throughout..... 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 idlers of above...... 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.....</td>
<td>3 roll, 159mm dia. staggered type idlers on the carrying side shall be provided throughout the conveyor. All idler bearing will be seize resistance ball bearing. Specification shall be as per BSP standard. However on the return side double roll V type (10degree/15degree trough) shall be considered.</td>
</tr>
<tr>
<td>2.</td>
<td>Cl.- 01.02, sub clause-08 - Hold Back and Brakes with panel</td>
<td>D.C. Electro-magnetic brake shall be provided on all conveyors after calculating the coasting time.</td>
<td>D.C. Electro-magnetic brake of BCH make shall be provided on all conveyors which is more than 25 m long except belt feeders/shuttle conveyors.</td>
</tr>
</tbody>
</table>

Bidder to note the following:

a) All the new conveyors of 1500 tph capacity shall be designed with maximum inclination of nine degrees. The new conveyors J10-C2 and J15-C2 in the OHP I circuit shall also be designed with inclination limited to 9 degree max.


c) Chute clogging device for all transfer chutes shall be considered by the bidder.

b) Belt rating shall be of 4-ply minimum.

e) Size of stringer post shall be ISMC 100 minimum and of stringer ISMC 125 minimum for all conveyors
ELECTRICAL & INSTRUMENTATION
6.0 **ELECTRICAL POWER DISTRIBUTION, DRIVES, CONTROL & ILLUMINATION**

(A) General

This section covers major features of Power Distribution System, Shop- Electrics, Drives, Control, Automation and Illumination System to be supplied by bidder for the Ore Handling Plant Part-B Complex.

The Bidder shall refer to General Technical Specification (GTS) for Electrics and Illumination for detailed specification of equipment / components. This Technical Specification (TS), General technical Specification (GTS) including Preferred Makes for Equipment and other attached documents considered, as a whole shall comprise the complete Tender Specification. These are complementary and anything laid down in one and not in other will be deemed as binding, as though laid down in the Tender specification as a whole. In case of conflict between the Technical specification and GTS, the Technical specification (TS) shall prevail.

(B) HT Power Supply System & Battery Limit

Power supply for the Ore Handling Plant Part-B (OHP-B) Complex shall be made available from the 6.6 kV switchboards proposed to be installed at HT substations (HTSS) which will be located at OHP-B premises under a separate package by purchaser (package no. 071). Refer enclosed drawing no. MEC/S/9101/11/E1/06/00/061.01/R1

The scope of work of the Bidder shall commence from the outgoing terminals of 6.6 kV switchboard located at new HTSS in OHP-B area.

This 6.6 kV Switchboards will be provided by Purchaser at HTSS for supplying power to all LT substations (LTSS) and all HT Motors under the scope of this package. Supply, laying and termination (at both ends) of all HT & Control Cables from HT switchboard to LTSS & HT motors shall be in the scope of Bidder. Power to all the HT motors shall be supplied from the HT Switchboards.

Adequate number of LT Substations (LTSS), (at suitable locations to be decided by the Bidder) each comprising of LT switchboard along with two transformers shall be included by the Bidder in his scope of work. The transformer rating shall be worked out on the basis of guidelines given in General Technical Specification. However, the rating of transformers shall be 2000/1000 kVA depending upon the load. The interconnection between transformer secondary and LT switchboard shall be through bus ducts.

The Bidder shall indicate the numbers of 6.6 kV feeders required by Bidder in the HTSS in the offer to facilitate the planning and designing of Power Distribution by Purchaser. The bidder shall indicate the details of connected load (KW) & Maximum Demand in 15 min. duration for each
feeder and also the overall expected maximum demand in 15 min
duration for the entire plant under normal operating conditions.
The following are to be considered in addition to the equipment
specification spelt out in GTS.

a) The vector group for all distribution transformers (LT S/S) shall be of
Dyn 11 only to take care of circulation of harmonic currents. However, care should be taken not to envisage mixing of supply with the existing LT power sources of 2.5 MT area as the existing distribution transformers are of Yy0 vector group.

b) Separate analogue voltmeters for line voltage & bus voltage and ammeter in each of the three phases shall be provided.

c) All out going ACBs shall be 800A, 1000A or 1600 A as per requirement with protection settings selectable at site.

d) Check-synchronising relay shall be provided wherever sectionalizing is envisaged between two different sources of power supplies.

e) Care should be taken to avoid location of LT Substations under Conveyor galleries/ dust prone areas.

f) LT Busduct insulators shall be of porcelain.

g) The CT mounting arrangement inside the cable chambers of all feeders shall be such that CTs and secondary connections will be easily accessible for maintenance, replacement, etc.

h) For LT Busduct/ busbars, the minimum clearance shall be considered as follows in line with GTS
   - phase to phase : 25.4 mm
   - phase to earth : 19 mm

i) Training of personnel on operation and maintenance of the new equipment at manufactures work shall be arranged by the supplier.

Each of the LT substations shall have the following facilities:

a) The substation design shall be dust proof and all entry points shall be provided with double door arrangements.

b) Sufficient quantity of fire extinguishers at various locations shall be provided as part of safety equipment inside sub-station.

c) Air cooling facility shall be provided in all LT substations with air washing.

d) Lighting circuits of different rows shall be controlled by different MCBs for better energy saving.

e) Breaker handling facilities shall be provided.

f) Tools & tackles along with store room facilities shall be provided.
g) Two nos of 4 legged wooden stools of height 1 m and 4m each shall be provided.

h) Chain pulley block or telpher arrangement shall be provided.

Following HT / LT Power and motor feeders required for OHP (Part-B) have already been included by the Purchaser’s in other package for the Bidder’s use. Supply of cables from Purchaser’s boards, laying, termination at both ends, erection, commissioning etc. will be under the Bidder’s scope.

Bidder to note that the feeder rating and locations mentioned are tentative only. Final ratings and locations will be decided during detail engineering.

A. HT Power and motor feeders for Bidder’s use:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>HT Sub Station</th>
<th>Location</th>
<th>Feeders for Bidder’s use</th>
<th>Description</th>
<th>Nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>HT Sub Station</td>
<td>Near existing Storage yard</td>
<td>6.6/0.433kV, 2000kVA transformers</td>
<td>4 Nos.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HT Motors</td>
<td>3 Nos.</td>
<td></td>
</tr>
</tbody>
</table>

B. LT Power and motor feeders for Bidder’s use:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>LT Sub Station</th>
<th>Location</th>
<th>Feeders for Bidder’s use</th>
<th>Description</th>
<th>Nos.</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>LTSS-1</td>
<td>Near WT</td>
<td>WT &amp; SAC</td>
<td>1 No.</td>
<td>275 kW</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>LTSS-2</td>
<td>Near J-3 / J-4</td>
<td>Motor feeders</td>
<td>2 Nos.</td>
<td>160 kW</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Motor feeder</td>
<td>1 No.</td>
<td>125 kW</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>LTSS-3</td>
<td>Near Storage bed</td>
<td>Motor feeders</td>
<td>2 Nos.</td>
<td>180 kW</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MCC</td>
<td>2 Nos.</td>
<td>350 kW</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PDB</td>
<td>2 Nos.</td>
<td>400 A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MLDB</td>
<td>2 Nos.</td>
<td>400 A</td>
<td></td>
</tr>
</tbody>
</table>

(C) Scope of work

The scope of work of Bidder shall cover design, basic and detailed engineering, submission of drawings for approval, manufacture, factory testing, inspection by client / consultant, packing, loading, forwarding, delivery at Plant site, loading/unloading, storage, handling of material/equipment to erection site, erection, no-load and load testing, commissioning, PG test, PAT/FAT and liquidating the defects and handing over all electrics related to drives & control, illumination for complete & satisfactory operation of New Ore Handling Plant (Part-B) on turnkey basis.

Bidder’s scope of work for New OHP (Part-B) also includes necessary electrics and PLC based automation system including upgraded of existing automation system for integration of existing
drives of OHP and Priority conveying routes upto JH-27.

Any item or equipment not specifically mentioned but essential for process and technological requirement, proper installation, reliable operation, maintenance and safety of plant, equipment and personnel will be included by the bidder in his scope of work.

I POWER DISTRIBUTION EQUIPMENT

1. Adequate numbers of Double ended 6.6/0.433 kV LT substations (LTSS)

2. Each double ended substation shall comprise of 6.6/0.433 kV Distribution transformers, 415 V PCC, 415 V bus duct, ACDB, MLDB, LDB, HT/ LT power & control cables and other necessary items as required for completion and successful operation of the power distribution network, in an integrated manner.

3. Vacuum circuit breaker (VCB) without protections in the transformer room if transformer is fed from remote HT switchboard for tripping of upstream breakers.

- Push Button stations with trip PBs (press to lock and turn to release) in the transformer room if transformer is fed from HT switchboard located in the same building for tripping of upstream breakers.

4. Power and control cables, Cable termination kits, laying and termination (at both ends) of all associated power and control cables from the Purchaser's 6.6 kV switchboard. Only 11 kV (UE) grade cable shall be used for 6.6kV (UE) applications.

5. AC distribution boards (PDB) - Single front, non draw-out type, sheet steel enclosed, modular construction with IP54 enclosure, having two incomer with a bus coupler shall be provided for auxiliary equipment of LTSS.

6. Adequate numbers of Lighting Distribution Boards (LDB) for Power supply to various Sub Lighting distribution Boards (SLDB).

7. Illumination system of the OHP-B complex Substation rooms. Illumination system shall include all type of light fittings/fixtures.

8. Power and control junction boxes for termination of field cables.

9. Maximum demand (MD) of the MCC shall be calculated considering the following:
   a. Working load of the MCC shall be calculated based on the motor kW rating.
   b. The load factor shall be considered as follows:
      o For continuous drives – 0.9
      o For intermittent drives like sump pumps etc. – 0.6
For electrically actuated valves I dampers – 0.2
For maintenance loads like hoists, cranes etc. - 0.4

c. Load factor shall be applied on the kW rating of motor.
d. Diversity factor shall be considered as one.
e. Spare feeders shall also be considered for calculation of maximum demand as per guidelines indicated in Sl. No.2
f. Load of power supply feeders shall be corresponding to the load being fed with 0.9 load factor.
g. Cyclic load shall be converted to continuous load and shall be used for MD without load factor. (e.g. 22kW motor at 40% duty factor will have continuous load as 22x\sqrt{0.4})

Construction Power Supply :
The facilities for distribution of construction power supply shall be in the scope of the bidder.

For construction power supply, one no. outgoing feeder of 415/230V AC, 3ph/single phase, 50 Hz will be made available to the nearest established sub-station by the purchaser.

Supply, erection, testing and termination at both ends of incoming power cable to construction power distribution board and regular maintenance of the cable will be included in the scope of supply and work.

II DRIVES, CONTROLS & ILLUMINATION SYSTEM

1. All HT and LT AC/DC motors, actuators, brakes etc. as per technological and process requirement.
   HT motor winding and bearings, temperature sensors, vibration sensors shall be hooked up with PLC for monitoring.

2. Generally Squirrel Cage Induction Motor with DOL starter/VFD/Soft Starter shall be provided. Use of Slip ring motor in general shall be avoided. Suitable Rotor contactor panels and SS-grid Resistance Boxes shall be provided for slip ring motors if inevitable.

3. Indoor 415 V LT MCC and Control panel with CT, PT, metering and Protection etc. as required.
   - Motor Control Centres for new OHP-II shall be Intelligent, draw-out type with two incomers and bus coupler for control of drives of rating up to 90kW of various technological units having communication with Plant Automation System.
   - For control of drives of rating from 110kW to 200kW Intelligent type Motor control panels (MCPs) having communication capability as above.
   - MCCs for drive motors of New series conveyors parallel to existing conveyors from OHP-I to Junction House J-20 shall be non Intelligent draw-out type and shall be
connected to Rockwell system/L&T system by providing remote I/O stations as per existing control philosophy.

For control of drives of rating from 110kW to 200kW non-Intelligent type Motor control panels (MCPs) shall be provided.

- Control panels for Stacker, Reclaimer, Wagon Tippler, Tripper car, crane, hoist, AC/ventilation system etc shall be conventional, non draw-out type. All control panels on the mobile machines shall be mounted on anti vibration pad.
- Electronic over load relay upto 90kW motor and Motor Protection Relays for motors above 90 kW rating in conventional type (non- intelligent) MCC /Control panel shall be used.
- Local/Remote selector switch shall be mounted on MCC & Control Panel.

4. VVVF converters for 415 V motor drives having requirement of speed control where process requirement calls for variable speed application. All drives shall have communication capability with Plant Automation System.

5. All HT Motors for conveyor drives shall be provided with Flux Compensated Magnetic Amplifier (FCMA) Soft starter for low starting current. FCMA soft starter shall have suitable By-pass contactors and controls to ensure running of the motor at full speed. FCMA soft starter shall be indoor duty, rugged in construction, user friendly and maintenance free.

6. UPS system consisting of SMF battery bank for 30 minute back up incase of power failure, Battery charger, UPS Power distribution boards & sub-distribution boards for distribution of UPS power supply to control & Automation equipments, Instrumentation system equipment, FDA system, Weighing system & any other equipment in the New Ore Handling Plant (Part-B) as per requirements.

7. Local control stations housing push buttons, indication lamps etc. for all drives. LCS for LT motor above 45kW and HT motor shall have Ammeter also.

8. Power distribution boards (PDB) with two incomers and one bus coupler for repair network like welding sockets, maintenance cranes and hoists. All PDBs to be mounted in Technological/Auxiliary/Service buildings (Other than Electrical room) shall have double doors.

9. Main Lighting Distribution Boards (MLDB) with two incomers and one bus coupler for Power supply to various Lighting distribution
Boards (LDB). Adequate nos. of LDBs and Sub Lighting distribution boards for providing power to light fittings.

10. Emergency lighting distribution boards (ELDBs) with two incomers and one bus coupler for Power supply to various Emergency Sub Lighting distribution Boards (ESLDBs).
   - Adequate nos. of Emergency Sub Lighting Distribution Boards (ESLDBs) for providing power to emergency light as given Emergency lighting in all Junction houses, Process/technological buildings, pump houses, compressor houses, conveyor tunnels, underground premises, LTSS, Dispatcher/Control rooms, staircases, entry/exit of building, office rooms, attendant/operators rooms, shift in charge rooms, canteen/rest rooms etc.
   - 10% Emergency lighting in conveyor galleries.

11. DCEM Brakes shall be used for Conveyors and brake panels shall be housed in MCC room.

12. All LT motors for conveyors shall be S6 duty and shall have class F insulation with temperature rise limited to class B.

13. Surge protection device shall be provided at the incoming side of MCCs, VFDs, PLCs/Remote I/O stations etc. to protect the system/equipment as required.

14. All field devices, valves, safety switches like Pull chord switches and belt sway switches, zero speed switch, chute jamming switches and Proximity switches, Warning hooters, photo-electric sensors, level sensors, relays, limit switches, binary encoders, position transducer,isolators, speed sensors etc. as necessary for the process and control of the material handling equipment/system and its all associated/auxiliary equipment/systems. Addressable type PCS, BSS, ZSS and Belt rupture protection switches shall be provided for all new conveyors under OHP-B. Proximity type Limit switches shall be used for shuttle conveyors, tripper car etc. Sensing distance of proximity in the Zero Sped Switch shall be 60 mm.

15. All HT/LT Power, control, signal, communication cables (fiberoptic/electrical), special cables, rubber insulated flexible cables, illumination cables etc. as required. All HT and LT Power cables will be XLPE insulated. All HT Power cables will be 11kV grade and FRLS sheathed. LT Control cables will be PVC insulated.
16. 415V, 100A interlocked switch socket outlets for repair network, welding sockets at different floor, premises, buildings and area of Ore Handling Plant. Wagon Tippler Building shall have adequate nos. of circuits from PDB so that minimum 4 nos. welding machines can run at a time.

17. 240V, 15A and 24V, 5A receptacles from Lighting Distribution Board/Sub Lighting Distribution Board.

18. Load break isolators for maintenance crane, hoists, tripper car etc. to be located near the equipment.

19. Power and control junction boxes for termination of field ables.

20. Power trolley line conductor (DSL)/Festoon Cable trolley system/Plastic Cable Carriage system including rails/angles, supporting brackets, insulator assembly, junction box etc. will be provided as follows:
   - Festoon Cable trolley system for hoists etc.
   - Plastic Cable Carriage system for power and control trailing cables for Side Arm Charger, shuttle conveyors, EOT cranes etc.

21. Illumination of the plant covering new storage yards, wagon tippler inhaul and outhaul area, wagon tippler area, Road in and around the proposed Ore Handling Plant, Sub-station rooms, MCC rooms, Control rooms, Ventilation rooms, conveyors, Junction houses, various technological auxiliary buildings and other installations of the plant by providing Lighting Transformer, Main Lighting Distribution Board, Lighting Distribution Boards, Sub-lighting Distribution Boards, Feeder pillars, Light Fittings, Lighting towers, high mast, low voltage switch sockets, conduits, Ceiling fans, Exhaust Fans, all lighting cables etc.

Total plant lighting system shall comprise of the following categories of lighting system.
   - Normal I240V AC lighting system.
   - 24V AC maintenance lighting system.
   - Emergency lighting system.

22. Portable Emergency lights will also be provided in strategic areas like LTSSs, Electrical premises, control rooms/Despatchers, staircases, entrance of cable tunnels/basements, escape routes, attendant/operators room in the technological buildings etc.

23. Complete electrics including motors, control panel, LCS, Brakes with panel, field devices, cables etc. for Conveyors, Screens, Actuators, valves, gates, vibro feeders, belt feeders etc. as per technological requirement.
24. Completes electrics including motors, control panel, LCS, Brakes with panel, field devices, cables etc. for Shuttle conveyors, Tripper cars, Cranes, Hoists etc. required under new Ore Handling Plant (Part-B).

25. Completes electrics and load cell for Weigh feeders, Weigh hoppers, Belt scales etc. as per technological requirement.

26. Completes electrics required for Suspended magnets, In Line Magnetic Separators, Metal presence detectors etc. as per technological requirement.

27. Complete electrics, controls, instruments, level controllers, solenoid valves, Bag filters, Timer controls etc. for the Dust suppression system, Dust extraction system, Ventilation, Air Conditioning system, Compressor required under Ore Handling Plant (Part-B).

28. Completes electrics including motors, control panel, LCS, level sensors, cables etc. for sump pumps, slurry and dewatering pumps shall be provided in underground floor of technological building Junction houses, Tunnels, cellar etc. 415V, 100A Sockets shall also be provided near sumps.

29. Completes electrics including motors, control panel, LCS, level sensors, cables etc. for all pump houses, fire fighting system etc.

30. Complete electrics for Bin vibrators with rectifier panels and Air Blaster with solenoids, control panels, cables etc. for Bunkers as required.

31. Complete electrics for sampling systems covering motors, control panels, cables LCS etc. as required.

32. Scope of work and Battery limit for Electrics and Automation for upgradation/ modification of existing drives/mechanism are defined in the Clause No. 6(K).

33. Automation system of OHP (Part-A) shall be interfaced with Automation system of OHP (Part-B) so that entire OHP consisting of existing OHP, new OHP (Part-A) and proposed OHP (Part-B) can be operated in an integrated way from a common automation platform.

34. Complete electrics for Wagon tippler and Side Arm charger (SAC).
   
   - Motors with necessary accessories and brakes.
   - Conventional type Control panel, VVVF drive panels, PLC panel at Electrical room and Control panel on SAC.
• Control desk both at control room and on SAC. Provision in control desk for control of Dust Suppression system for Wagon Tippler.
• Weighing facility with load cells for recording and transmitting data of incoming materials to Despatchers D1 & D2 and central control room.
• Local Control Station and Field devices such as actuators, valves, photo-electric sensor/relay, limit switches, proximity switches, encoders, position transducer, isolators, safety switches, speed sensors, junction boxes; warning hooters, Rail Clamp, Earth shoes etc.
• Plastic Power cable carrier system and necessary Flexible cables.
• Air Conditioning/Ventilation facility for Electrical panel room and Control room.
• All power, control and special/instrument cables, cabling, terminations etc.
• Complete earthing of machine including rail earthing.

35. Complete electrics for Paddle feeders including Motors with necessary accessories and brakes, Control Panel, VFD, Brake panel, Local Control Station, control desk, cable reeling drums, Field devices such as limit switches, proximity switches, position transducer, isolators, safety switches, speed sensors, junction boxes, power, control and special cables, earthing etc.

36. Complete electrics for Stacker and Reclaimer including the followings:

• HT load break isolator with fuse and Shunt trip facility on ground and VCB without protection on the machines.
• Moterised cable reeling drums (power & control) including flexible cables, stalled torque motors, slip ring boxes, Cable guide and clamp, Power and control Junction boxes etc.
• Dry type Transformer shall be wheel mounted and with suitable protection.
• AC drive motors with DCEM/Thruster Brakes.
• Conventional type Control Panel, VVVF AC drives, Relay panel, Resistance boxes, Brake panels, LCS, junction box etc.
• Complete electrics for hydraulic drives and hydraulic cylinder with necessary accessories.
• Anemometer and motorised rail clamps.
• UPS, PLC, HMI stations with necessary hardware and software for Radio communication with the respective Control room/ Despatcher PLC. A provision shall be kept for remote programming, interlocking and status monitoring etc. Radio communication shall be in addition to hardware
interfacing between Machine PLC and the Despatcher PLC through CRD control cable for minimum interlocking requirement.

- Control desks, Fault Annunciation panels and programming unit.
- All Safety switches/devices (including pull chord, belt sway etc.), Limit Switches, instruments, Tacho-generator, Pulse Encoder, Warning hooters, anti collision feature, chute jamming switch, Zero speed switches, material sensing probe etc. as required.
- HT and LT power, control and specialI instrument cables etc.
- Suitable indoor and outdoor Illumination with lighting Transformer, lighting DBs, 240V and 24 V socket outlets.
- 415 V Welding sockets.
- Complete earthing of machine and rail earthing.
- Air conditioning system for Electrical panel room/Control room and operator’s cabin.
- Telephone and Walky-Talky for voice communication between machine and Despatcher1central control room.

37. PLC based Level–1 automation system shall be provided as mentioned in the automation chapter for running the new and existing material handling plant in an integrated manner.

38. CCTV camera with cleaning facility shall be provided in the following tentative locations with monitors at Despatcher/Control room for extensive monitoring of OHP.
   - 2 Nos. for new & existing OHP Yard.
   - 1 No. at new Wagon Tippler.
   - 1 No. at new Track Hopper
   - 1 No. at JH-Z 1.0.
   - 1 No. at JH-Z 1.5.
   - 1 No. at JH-N 1.02.

Exact location will be finalised during detailed engineering.

39. Electrical equipment will be supplied as per the Make list given in GTS (GS- 1.3). However, in case of non-availability or delay in delivery, the Bidder will take prior approval of BSPIMECON for additional make before ordering.

**III CONTROL ROOMS, ELECTRICAL PREMISES, VENTILATION, AIR- CONDITIONING & FDA SYSTEM**

1. All civil construction work for cable basement/cellar, cable tunnel and concrete cable channels, MCC Rooms, Despatchers/Control rooms, Electrical premises etc. including their associated utility areas like Ventilation rooms, Stairs, Toilet etc.

2. Cable Tunnels/Structures for overhead cable bridge as required.
3. LTSSs/Electrical premises, Dispatcher/control rooms, overhead cable bridge etc. will be designed considering the features as per GTS.

4. Intelligent, microprocessor based, addressable type automatic fire detection and alarm system for all MCC rooms, Electrical Premises, Cable cellar, Despatchers/Control rooms using smoke detectors, heat detectors with cross zoning.

5. Air conditioning system for Control rooms/ Despatchers (housing Operator contro/HMIs, Servers, Engg. stations, Instrument panels, UPS etc).

6. Air conditioning system at (35 deg C max.) for premises housing Intelligent MCCs, MCPs & VVVF panel rooms and other local control rooms complete with instruments, electrics, controls etc.

7. Ventilation system for substation building, Cable tunnels, Cable basement/cellar consisting of suitable capacity fan, Pumps, GI ducting etc.

8. Exhaust ventilation system for toilets, storerooms, Battery rooms etc.

9. Excavation, back filling, and leveling of cable trenches within battery limits.

10. Cable supporting structures in the Electrical Premises, Despatchers /control rooms, cable cellars, cable tunnel, cable channel or overhead cable bridge for interplant cabling.

IV  EARTHING AND LIGHTNING PROTECTION

1. Measurement of soil resistivity test at site for designing earthing system.

2. Lightning protection system for entire plant including Air termination, separate dedicated earthing stations, conductors, testing links, interconnections and accessories as per IS.

3. Supply and installation of complete earthing system including earth pits, earth grid with GI strips for the substations, neutral earthing of transformers, earthing of all electrical equipments in electrical premises, Junction houses, process/technological building etc.

4. Special earthing system (including earth pits, earth grid with GI strips, Copper Cables as required) for earthing of PLC, RIO panels, VFD, other Electronics equipment & automation system,
TR set panels as per their manufacturer’s recommendation.

V ERECTION  ACCESSORIES,  SPARES,  SAFETY
ITEMS,  DOCUMENTATION  &  OTHER  
MISCELLANEOUS ITEMS

1. Supply of all erection accessories and materials, all steel members (angle, channel, plate, steel sheet, etc.) for installation of electrical equipment, GI pipes, GI conduits, bends, clamps, nut, bolts, ladder and perforated type cable trays, tray installation materials & accessories, cable supporting structures, heat protection materials, flexible metallic hoses, sealing materials for openings, double compression cable glands, cable lugs, cable tags, cable fasteners, insulating tapes, ferrules, RCC slabs, sand, bricks for under ground cable laying, GI pipes for protection of cables at road crossings and other places, cable markers, cable jointing & termination kits and materials, earthing strips of different sizes, junction boxes, pull boxes, heat resistance paints and all consumable materials for complete laying & termination of cables, erection of electrical equipment and earthing system etc.

2. Construction power supply will be provided by the purchaser at one point. Further distribution including PDB, power (both incoming and outgoing) and control cables, cable trays, cable laying etc. will be in the Bidder’s scope.

3. Submission of basic and detailed engineering drawings, design calculations etc.

4. Supply of As-built drawings, operation and maintenance manuals. CD in duplicate and reproducible of all As built drawings.

5. Supply of all commissioning spares as required till the plant is commissioned and handed over to BSP.

6. Supply of recommended spares list for two year normal operation.

7. Special tools & tackles.

8. Canopy of all outdoor electrical equipment, if any.

9. First fill of all consumables, printers, papers, cartridges, floppy, CDs etc.

10. Safety items like hand gloves, shock treatment charts, discharge rods, rubber mats (of required voltage classes) in front and rear of all panels, danger! caution boards, fire extinguishers, fire sand buckets, nicely framed As built Single Line Diagram of LT PCC/ LTSS, MCCs, PDBs, MLDBs, LDBs, SLDBs keys and key boxes etc., keys and key boxes, etc.
11. Portable fire extinguishers, sand buckets & other fire fighting equipments as per statuatory requirements at each substation.

12. Supply and installation of GI pipes for protection of cables at road crossings and other places where cables may be subjected to mechanical stress and damage.

13. Supply and installation of cable supporting structures in the LT substation building, cable cellars, cable tunnel, cable channel or overhead cable bridge for interplant cable routing.

14. Walkable Cable Bridge between Purchaser’s HT Substations to Bidder’s LTSSs and further for routing outgoing cables to different consumers/buildings etc. as required.

15. No underground buried cable shall be provided. Cables shall be laid either over ground through structural cable bridge/conveyor gallery or through concrete cable trench covered with pre-cast slabs.

16. Cables of one area/conveying route shall not cross and shall not be laid through conveyor of other area/conveying route.

17. An electrical area repair shop in Ore Handling Plant shall be considered with a facility of rest room, repair area, store, provision to keep tools and tackles, measuring instruments/testing instrument including megger, clamp tester, hand held tachometer, CRO, multimeter, vibrometer etc.

18. Furniture for the monitor, control rooms etc.

19. Training of Purchaser’s engineers at manufacturer's works/training centers for Automation system, UPS system, AC drives, Weighing system etc.

20. Any additional items/equipment which is necessary for achieving specified performance and completeness of the system shall be provided by the bidder within the time schedule unless it has been excluded from the scope of the bidder.

(D) Approval of Statutory Authorities

The successful bidder shall obtain necessary approval of statutory authority as per rules of State Government and Central Electricity Authority for the work under his scope, before energizing/charging the equipment. However, purchaser shall extend all assistance in this regard, like submission of application, relevant documents and payment of statutory fees etc.
(E) Installation

For installation work at site, the contractor shall be fully responsible for arranging the required tools and tackles, welding sets, pipe bending machine, cable crimping tools, gauges, scaffoldings, ladders, temporary water and power connections.

On completion of the installation but before energisation of the system, all installation shall be physically checked and properly tested. These checks and tests shall be conducted by the contractor under the supervision of BSP I MECON. The contractor shall furnish the final status and test results. Any defect observed during such check and tests shall be rectified by the contractor free of cost within contract completion period.

All clamps brackets, bolts, nuts, screws, markers, ferrules, lugs and glands and other hardware necessary for erection work, shall be included in the scope of work and shall be arranged by the contractor. Equipment shall be painted to withstand the heavily polluted and saline environment prevailing in at site.

(F) Design basis for equipments & installations

(i) Voltage Level:

- Control Voltage – 230V AC
- PLC input interrogation Voltage shall be 230V AC and output voltage 24V DC.

(ii) Ambient conditions of shop units

Generally following ambient temperature shall be considered in Electrical / Control Rooms.

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Area</th>
<th>Ambient Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td><strong>Electrical Rooms</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>LT Sub-station/ switchgear room (Pressurized ventilation)</td>
<td>+ 45 Deg. C</td>
</tr>
<tr>
<td>2.</td>
<td>MCC rooms (housing intelligent MCCs, VFD panels, TR controllers, RI/IOs etc.)</td>
<td>+ 35 Deg. C</td>
</tr>
<tr>
<td>3.</td>
<td>Cable basements/tunnels</td>
<td>+ 50 Deg. C</td>
</tr>
<tr>
<td>B.</td>
<td><strong>Control Rooms</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Control rooms – Air conditioned</td>
<td>+ 24 Deg. C</td>
</tr>
</tbody>
</table>

- Equipment selection and dating shall generally be based on
ambient temperature of + 50 Deg.C. For specific areas and shops, the ambient temperature conditions indicated above shall be taken into consideration and equipment suitably derated wherever necessary.

- Equipment installed in MCC rooms/Control rooms shall be designed for + 45 deg C so that in case of failure of Air-conditioning/ventilation facilities also the equipment should not be affected.

- The equipment offered should be suitable for smooth, efficient and trouble-free service in the tropical humid climate prevailing at plant site and under the ambient temperature conditions indicated above for the different shops and areas. In hot areas of higher temperature conditions, the equipment shall be adequately protected against damage from radiant heat and hot air.

- The equipment shall be designed to give efficient and reliable performance under heavy steel mill conditions and shall be such that the risks of accidental short-circuit due to animals, rodents and vermin are obviated.

- The quantities of equipment, cables, cable terminations, straight through joints, cable supporting structures, earthing/lightning and erection materials, shall be as per actual requirement in accordance with the approved detail engineering drawings.

- All equipment shall strictly conform to the General Specification, except where any deviations have been explicitly spelt out, specifically discussed and mutually agreed upon between the bidder and the purchaser.

- The detailed specification and schedule of quantities shall be worked out based on the detailed engineering to be carried out by the successful bidder, for complete and proper execution of the specified tasks.

- The final ratings of the circuit breakers, CTs, busbars shall be adequate for the actual loads and considering the derating factors as substantiated by temperature rise test on the 415 V switchboards. All CT ratios/VA burdens, ranges of meters and instruments, types of relays and relay setting ranges shall be submitted for Purchaser’s approval during detail engineering.

- All HT cables will be 11kV (UE) grade of size 3x185 sq mm.

**Design basis for Electrical Premises of Ore Handling Plant**

- Basic Insulation level : 28kV/60kVp.

GTS is to be referred for designing of electrical premises & layouts, selection of equipment and installation. In addition to this, following points shall be considered.
- Motor Control Centre (MCC), RIO stations, PDB, MLDB etc. to be installed in various MCC rooms, shall be provided near various shop/technological units.

- Wherever required, MCC rooms and LT substation rooms (including rooms for distribution transformers) can be combined with separation wall and independent entry for both LTSS and MCC rooms considering the location of Substation and shop unit. Each LTSS building will have store facility.

- PLC, CPU panels, Operator panel/HMIs, Engg stations, UPS, UPS battery shall be located in the air-conditioned room in the control room floor.

- For high rise buildings structural walkway shall be provided for maintenance of light fittings.

(H) Design Basis for Illumination System

GTS is to be referred for designing of Illumination System, selection of equipment and installation. In addition to this, following points shall be considered.

- Illumination levels of all units shall be as indicated elsewhere in this specification.

- The maintenance factor for design of illumination level shall be considered as 0.6 for all areas.

- For arriving at utilization factor, manufacturer’s recommendation shall be followed.

- All rooms with false ceilings shall be provided with recessed type decorative mirror optics fittings.

- All MCC Rooms shall have lighting switches near doors.

- All decorative type fittings shall be mirror optics type.

- All buildings shall be provided with peripheral lighting.

- The power factor of lighting system shall be improved to 0.9 by providing in built capacitors with individual light fittings.

- Area, outdoor and peripheral lighting shall be fed from separate LDB/SLDBs having two modes of control - AUTO and Manual. Under AUTO mode lights shall be automatically switched ON/OFF through timers where as in Manual mode, lights shall be switched ON/OFF through local control station located in Despatcher/Control room. Selector switch for mode of control shall be located on local control station.

- Lighting in conveyor gallery and junction houses (floors above ground) shall be connected to separate lighting circuit and the same shall be
switched ON/OFF by PLC based control from HMI at Despatcher.

- Area lighting, wherever applicable, shall be provided through 400W, HPSV flood light fittings mounted on lighting towers.

- Road lighting will be provided with 250W HPSV street light fittings.

- Well glass light fittings will have threaded covers.

- All the offices shall be provided with ceiling fans.

- For indoor lighting, outgoing feeders in MCB DBs shall be 20A SPN MCBs. Each feeder shall not be loaded more than 2 kW. Incomer to MCB DB shall be suitably rated heavy-duty switch and ELCB for detection of leakage current.

- For area and road lighting, 3 phase & neutral feeders may be used and accordingly suitably rated 4 core cables may be provided.

- HPSV lamp fittings shall be provided with external electronic igniters and a built in sensor to sense failure of lamp and switch off igniters.

- Single phase/three phase circuits are connected to RYB phase such that total connected load to each phase equal and phase balancing is achieved.

- Stroboscopic effect shall be corrected by providing power factor improvement capacitor and power phase distribution.

- Point wiring will be done through PVC insulated PVC sheathed copper cable. Minimum 6 sq.mm aluminum cable for 15A socket outlet and min. 4 sq.mm cable for lighting circuit shall be considered.

- Single phase 3 pin 230V, 15A and 5A, switch-socket outlets shall be provided with interlocked switches (male and female units) at the following locations:
  
  o At each floor of building at every 30 m intervals or minimum one for each row/side.
  o Two numbers each in switch gear room, cable basement, control room and MCC room.

- Group control and sectorial control shall be envisaged through MCBs provided in the respective LDBS. Separate control switches shall be envisaged for light points and fan points.

- Near every chute in Junction houses and other technological buildings
24V, 5A sockets shall be provided for maintenance lighting by hand lamp.

(I) **Cable Routes, Cables**

Bidder shall note the following requirements.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Requirement</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Inter shop cable routing</td>
<td>Through overhead cable bridge/Structure/Cable Tunnel/Conveyor gallery.</td>
</tr>
<tr>
<td>2.</td>
<td>Bottom most level of cable trench in MCC room</td>
<td>Above ground level</td>
</tr>
</tbody>
</table>

(J) **Control and Operational Requirement:**

1. All the necessary controls, interlocks and annunciation as required for smooth, efficient and safe operation of the plant shall be provided.

2. Bidder shall provide suitable PLC based automation system including all hardwares and softwares to run the existing and new material handling plant in an integrated manner.

For integrating the existing drives of Ore Handling Plant and priority conveying route system for Sinter Plant, Junction House-27 etc. in the new PLC based automation system, the existing 5-6015-80 series PLC of MIs Rockwell make (located at Despatcher D1 & D2) shall be upgraded by replacement of Processor, communication cards etc. to make it compatible with new PLC system retaining the existing RI/O panels and hardware. Quantum series PLC (of MIs L&T make) located at exiting Despatcher-D3 near JH-27.

For integration of OHP (Part-A) being arranged by the purchaser through a separate package, suitable gate way shall be provided in the automation network. Integration and interfacing shall be done to run the entire ore handling plant and Priority Conveying route system in an integrated manner.

Automation configuration diagram is enclosed to refer in this regard.

3. All HT drives shall be provided with extensive monitoring facilities for fault detection and alarm annunciation. Alarm annunciation shall be provided for over winding temperature, over bearing temperature, overload etc.

4. Alarm annunciation system shall cover all the equipment of the
electrical system.

5. **Mode of control**:

i) Plant shall have four modes of control.

- Local de-interlock mode for control of individual drive motor from local push button station (LCS).
- Local interlock mode for running the drive motor in sequence interlock mode from LCS.
- REMOTE interlocked individual drive control from the HMI at Dispatcher/Control room.
- REMOTE interlocked route wise control of conveying system from the HMI at Dispatcher/Control room.

ii) Mechanism selector switch for selection of above modes of operation of each drive motor will be provided in the MCC/Control Panel/DFP. A selector switch box shall be provided near respective Remote IIO station for HT motors. Local selection of any drive will be shown on the HMI screen with some sort of caution.

iii) The local de-interlock mode is meant for testing and maintenance purpose only. However, all safety interlocks (Pull Chord Switches, motor Over Load & emergency stop etc.) shall be connected in LOCAL de-interlock mode of operation. In local de-interlock mode the mechanism is not interlocked with other drive and after receive of permission from operator/PLC, drive/equipment can be started from LCS independently.

The stop P.B. of local control station shall be able to stop the drive mechanism selected for any mode of control. Hooter PB shall be provided in LCS for pre start warning.

iv) In Local interlock mode the drive/equipment can be run in sequence interlock from LCS. Selector switch shall be put in local interlocked position and permission from operator/PLC shall be a condition for operation in this mode. Start, stop, motor Over Load, emergency stop, Pull Chord and Belt Sway Switches, Zero Speed Switch, chute jamming switches shall be connected in the circuit in addition to sequence interlock with successive drives. All the above shall be connected through hardwire.

v) In Remote interlocked individual mode of control the drives/mechanisms in the material flow path will be started in succession sequentially opposite to direction of material movement from operating station/HMI. On tripping of any conveyor/drive/mechanism, all the mechanisms feeding to the affected
(tripped) mechanisms will stop according to material flow diagram. All the mechanism selector switches of the selected material flow path will be set to REMOTE position in this case. Programmable Logic controller will be used for the control, interlocking, operation, and monitoring of the equipment.

vi) In Remote interlocked Route-wise control, following operations is to be carried out from HMI by the operator before starting of a conveying route.:
   a) Selection of material flow path including source and destination as per requirement.
   b) Selection of mechanisms within the selected material flow path.
   c) Selection of switching devices, flap gate etc. in a conveying route
   d) Selection of control mode in REMOTE of master selector switch for each material flow path block chain.

On receiving start permissive signal from HMI, the operator will give ON command to start the desired conveying route.

vii) Normal stop and Emergency stop of mechanism for each material flow path, P.B, switches for pre-start warning signal for each material flow path, start & stop P.B. switches of drives with independent operation etc. will also be mounted on desk/HMI.

viii) A pre-start audio warning signal through motorised hooters will be given in the premises where the mechanisms are to be started before start of the mechanism. The duration of the pre-start audio signal will be as per requirement. Sequential start of the mechanism will be possible only after the pre-start audio signal is over.

ix) The conveying system will be integrated with the associated auxiliary/other system for interlocking, sequencing and monitoring.

x) **Stopping of mechanisms**:

   a) For regular stop, the feeding equipment will be stopped first to stop the material flow in the conveying path and then after some time delay the equipment in the route will be stopped in sequence from feeding end ensuring no material is in the conveying path.

   b) Emergency stop push button will be provided on the Control desk for emergency stop of material flow path.

   c) In case of tripping due to fault of any drive, the part of the conveying route before the faulty drive will stop. There shall have signaling of the stopped mechanisms by changing colour in the
graphic. This will give an indication of the fault.

6. **Signaling**:

A) Status of ON, OFF, Trip/Fault, Route selection etc. for all mechanisms of conveying system, dedusting system, dust suppression system, weigh feeder etc. shall be available in the operator work station.

B) When a drive in a conveying route is shifted to local controls, indication will be available in the HMI.

C) The annunciation shall be provided on HMI for each drive fault and actuation of safety and limit switches.
   a) Annunciation for O/L & fault of each drive motor.
   b) Individual annunciation for all HT motors trip due to high bearings and winding temperature.
   c) Combined fault HT switch gear for Each HT motor including power supply to MPR failure separately.
   e) Switching devices, flaps etc failed to close or open.
   f) Individual annunciation for HT motors bearings and winding temperature high alarm.
   g) Individual annunciation for following conditions of electrical system:
      - 6.6 kV switchgear trouble
      - 415 switchgear trouble
      - Transformer trouble alarm.
      - Combined fault/trouble in bag filter system of D.E
      - Unhealthiness of various machines
      - Any other failures
   h) Every unplanned stoppage or abnormal condition shall be brought to the notice of operator.

7. Current readings of all HT and LT motors connected to Intelligent MCC shall be available in HMI at Dispatcher.

8. Drainage/sump/slurry pump shall be provided with Auto/Local mode of operation. Under automatic mode of operation any one of the pump motors shall start automatically at set level and if the level rises further the second/ reserve pump shall start automatically at second set level and both the pumps shall stop at set low level. If the first pump trips, second pump shall start automatically. Emergency high level annunciation shall be available in the control room.

   Under local mode of operation, the pump motors shall start/stop locally through local control boxes depending on level.

9. For fire fighting system, suitable control system shall be provided
for main fire water pump, jockey pump, hydro pneumatic tank etc.
with line pressure switch.

(K) ELECTRICS AND AUTOMATION FOR EXISTING DRIVES

Scope of work for Electrics and Automation will be as follow for upgradation/modification and integration of existing conveyors /equipment:

For Reversible Shuttle Conveyor J9B-RSC1:

- Bidder shall dismantle existing motor, Festoon Cable trolley system, associated power and control cables, related to the particular drives and replaced by the new drives/Plastic Cable Carriage system for power and control trailing cables and associated cables.
- Supply and installation of new Limit switches for additional feeding points.
- Necessary cabling for additional feeding point.
- Existing feeders of the MCC shall be modified by the replacement of the relays, components etc. to match with the upgraded drives.
- Scheme and Software modification for selection and feeding of additional points.

The approval/clearance of BSP/their representative shall be taken before carrying out new installation for upgradation/modification for existing conveyors/equipment.

For the purchaser’s approval clearance, Bidder shall submit detailed shut down plan of the existing drives indicating temporary arrangement to be made by the bidder for running suitable alternative conveying routes so that plant can maintain production level.

In the temporary arrangement in case any electrics is required, the same shall be provided by the bidder without any price implication.

List of Existing Conveyors controlled from MCC and PLC/ RI/O Panels:

Details of existing drives with MCC No. I RII O Panels and their location are as indicated below. Further details, if any, shall be furnished during detailed engineering stage.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Existing Equipment / Conveyor</th>
<th>MCC No.</th>
<th>MCC / R-I/O</th>
<th>Nos. of RI/O Panels</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Conv.-J9BC1</td>
<td>30MCC</td>
<td>Near SIS-22</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Sh. Travel -J9BRSC1</td>
<td>-DO-</td>
<td>-DO-</td>
<td></td>
</tr>
</tbody>
</table>
(L) Technical Specification

(i) General

GTS shall be referred for technical specification of various electrical equipment. However for specific application following TS shall be considered.

(ii) Wagon Tippler and Side Arm Charger

01 Variable Voltage Variable Frequency Converters (AC Drives):

- AC drives shall have communication facility with PLCs for data transfer and speed reference set point.
- Software of AC drives shall be developed in such a way that after over voltage or under voltage when the drive trips, the AC drive shall be automatically resetted without any manual intervention after normalising of the voltage.
- Remaining features shall conform to General Technical Specification (GTS).

02 Programmable Logic Controller (PLC):

- The system shall be complete with CPU, I/O racks, memory, keyboard and monitor. HMI shall depict graphics of various mechanism operations and also provide alarm annunciation system. Spare CPU with loaded software shall be installed in the PLC panel.
- Communication between PLC and AC drive shall be possible for smooth operation of the Tippler. PLC shall have facility to communicate with Despatcher-D1/Central Control room PLC. All the required hardware and software for these communications shall be provided.
- PLC shall perform the following task:
  - Logic interlock functions, control & supervision of drives & solenoid valves.
  - Automatic sequential operation of various drives.
  - Status indication & signaling.
  - Fault monitoring & annunciation.
  - Diagnostic features to recognise and display faults.
  - Communicate with Despatcher-D1/ Central Control room PLC.
- Remaining features shall conform to General Technical specification.
03 Control Desk:

- Control desk shall be provided for centralised control, monitoring of all the drives of Wagon tippler and SAC, including annunciations of all the faults, over-load trip condition of drives, failure of safety devices, all faulty conditions, warning conditions, overIunder positioning conditions, over travel conditions etc. Separate and independent annunciation for each shall be provided instead of group annunciation.
- Control desk shall have suitable nos. of status indication lamps to cover complete dust suppression system, SAC positions & movements including arm positions etc. and also for down stream equipment of wagon tippler.
- A control desk shall be provided also on the side Arm Charger.
- Remaining features shall conform to General Technical Specification (GTS).

04 Weighing System:

Microprocessor based weighing system shall be provided. The load cell shall be magneto – elastic type/ strain gauge type, suitable for over load up to 300% of their nominal load. Minimum 3 (three) numbers of load cells are to be provided at each weigh bridge integral with wagon tippler table. Accuracy of weighing system shall be +/- 0.1 % or better. For other features Specification for Belt scale shall be referred.

Indicating cum data logging type weighbridge for weighing both loaded and empty wagon shall be complete with PC based operating station in the wagon Tippler Control Room.

The supply shall be complete with the following:
Load cells, signal converters, PCs , 19” colour monitor, keyboard, mouse, etc.), original licensed operating software and application software, inkjet printer, UPS,control room furniture for installation of PCs, printers, power distribution boards, etc.

The capacity of the weigh bridge shall be adequate to permit passing of 180 metric tones weight of shunting loco at the speed of 8 Km per hour.

- Remaining features shall conform to General Technical Specification (GTS).

05 Control and Operational Requirement
• All drives and mechanisms shall have Auto, Remote - interlocked mode and Local mode controls. Local controls shall be provided and normally it will be used for maintenance and testing purpose only. Only safety interlocks shall be covered in Local control. STOP push button of Local control shall be able to stop the drive/mechanism selected for any mode of control.

• It shall be possible to operate the side arm charger (SAC) both from control panel located in the Operator cabin of SAC and Control desk located in the control room. Auto operation of SAC along with wagon tippler operation shall be done from Control desk. SAC operation from its control box in the SAC operator cabin will be done as required after the receipt of instructions /permissive from control desk operator.

• Operation philosophy shall be developed in such a way that normally one operator shall be required to operate the wagon tippler and SAC from wagon tippler control room and one helper near tippler table to de-couple the leading wagon from the rake. Emergency stop switch shall be considered at WT and SAC in addition to control desk.

• The loaded wagon to be tippled will be decoupled manually from the rest of the rake and the person doing the decoupling operation will press a switch installed near-by to indicate to control room that decoupling operation is complete. Subsequently, pulling of the wagon by SAC, placing it on wagon tippler, return of SAC to wagon rake for start of next cycle, tippling of wagon by wagon tippler etc. shall start automatically in proper sequence.

• The SAC will pull and place the decoupled wagon over the tippler.
Once the wagon is placed on tippler deck and SAC clears the tippler deck, tippler will clamp the wagon, tipple it, return to its original position, declamp the wagon and other operations as required. The wagon vibrator will operate automatically, if selected for auto-mode when the wagon is in inverted position. The type of wagon being unloaded, identification of sick wagons etc. will be registered in Control desk by the control room operator.

• The water spraying for dust suppression will start automatically when wagon is being tippled and will stop when the tippler is not operating by establishing suitable interlocking between controls of wagon tippler and dedusting system.

• Each operational cycle will be repeated automatically till the last wagon is tippled and removed from the tippler deck. The complete operation will be done in automatic sequentially interlocked manner and some of the activities will be parallel so
that system can easily achieve a required tippling rate per hour.

- Positioning of Wagon Tippler and SAC will be through proximity switches and backed-up by heavy duty rotary limit switches. All limit switches and proximity switches must work smoothly and without adjustment and mal-functions under severe conditions of vibrations. All rotary switch and limit switches should be mounted and housed with suitable vibration damping arrangement.

- Wagon counter shall be provided with correction facility by authorized person to account for sick wagons.

- Laser Beam sensors with transmitter and receiver at both ends of Wagon Tippler to ensure that no other wagon is in close proximity to the wagon tippler table.

(iii) Yard machines

01 **HT Load Break Switch / HT VCB without Protection**

General Technical Specification (GTS) shall be referred for detailed specification of HT Load Break Switch.

02 **Cable Reeling Drum**

a) For Yard Machines

- Two cable reeling drums, one for power and other for control shall be provided on the machine. The cable reeling drum shall be complete with stalled torque motors, suitable slip-rings and brush assembly, cable guides for proper paying in/paying off cables, cable layering arrangement, protection against over tension and under tension of cable, limit switches etc. The stalled torque motor may be of slip-ring induction type with rotor resistance steps automatically adjusted depending on the position of the machine and tension in the cable.

- The cable reeling drum shall also be provided with gear cam limit switch, pendulum limit switch, the directional limit switches etc. as necessary for the application. At least two spare turns of cable shall be provided for each reeling drum. The traveling gear shall stop when the next to last turn of cable is reached. Necessary limit switches shall be provided for the same. The speed of the winding of cable shall be properly matched with machine travel speed.

- The number of slip-rings for the power cable reeling drums shall be four, three for power and one for earth. The number of slip-rings for control reeling drum shall be as per requirement keeping at least
two as spare. Slip-ring & brush-gear assembly of cable reeling drums shall have dust and weather proof enclosure having inspection window suitably located. The inspection window shall be readily accessible.

- The enclosure of motor shall be IP:55 as per IS:4691 and the motor shall have weather-proof construction.
- The cable reeling drum shall be of substantial strong construction with components such as chain etc. selected for heavy duty applications.
- Flexible cable length and CRD shall be adequate to take desired travel length of machine and dead turn of cable.
- To avoid damage of HT flexible cable during paying off from CRD a structural arrangement beside rail / yard conveyor shall be provided to place the CRD cable. Arrangement shall be such that cable will be pay off on the guided structural platform installed at one side of yard conveyor.

b) TS of CRD in Tripper car, Paddle feeders and other mobile machines shall be as above.

03 Variable Voltage Variable Frequency Converters (AC Drives):

- AC drives shall have communication facility with PLCs for data transfer and speed reference set point.
- Software of AC drives shall be developed in such a way that after over voltage or under voltage when the drive trips, the AC drive shall be automatically resetted without any manual intervention after normalising of the voltage.
- AC drive panels shall be mounted on anti vibration pads
- Remaining features shall conform to General Technical Specification (GTS).

04 Programmable Logic Controller (PLC):

- Each machine shall be provided with PLC and HMI. The system shall be complete with CPU, I/O racks, memory, key board and monitor. HMI shall depict graphics of various mechanism operations and also provide alarm annunciation system. Spare CPU with loaded software shall be installed in the PLC panel.
- Communication between PLC and AC drive shall be possible for smooth operation of the machine.
- PLC shall have facility to communicate with PLC at Despatchers
/central control room / HMI through radio communication and also hardware communication by CRD control cable. All the required hardware and software for radio communication shall be provided.

- Minimum 7 nos. field programmer for yard machines shall be provided.

- PLC shall perform the following task:
  - Logic interlock functions, control & supervision of drives & solenoid valves.
  - Automatic sequential operation of various drives/devices.
  - Status indication & signaling.
  - Fault monitoring & annunciation.
  - Diagnostic features based on logical rules to recognise and display faults.
  - Communicate with respective Despatchers/Central Control room.

- PLC panels shall be mounted on anti vibration pads.
- Remaining features shall conform to General Technical Specification (GTS).

05 Control Desk

Control desk in operator's cabin shall contain:

- Machine power 'ON' lockable push button and indication lights.
- Machine control 'ON' push button and indication lights.
- Selector switches for various sequences.
- Push buttons and indicator lights required for auxiliaries control.
- Master controllers shall be provided as required.
- Inductive type master controller shall be provided for VVVF controlled drive.
- Ammeters shall be provided.
- Monitor & key board of HMI system and printer.
- The monitor of HMI system shall depict the required graphics.

06 Control modes

1. Local de-interlocked mode operation from Local control station mounted near the drives and the same shall be generally used for testing.

2. Remote mode from Control Desk:
All the drives shall be controlled from control desk located in the operator’s cabin. Robust industrial type hooters & sirens shall be ON before starting of machine.

Following types of sequence control shall be provided.

a. Semi-automatic operation

- Different process sequence shall be automatic. Progress of a sequence shall depend on limit switches or sensors corresponding to different positions.

- Each sequence shall be controlled from control desk by push button/HMI key board.

- A sequence shall start only when all the preconditions and permanent requirements including healthiness of drives and circuit are met.

- It shall be possible to switchover to interlocked step-by-step mode during the operation of the sequence.

b. Interlocked step-by-step operation

- Each sub-sequence of the main sequence shall be controlled from control desk by separate push button ! key board.

- The progress of sub-sequence shall depend on the limit switch position or sensors.

- Each movement shall be started only after ensuring the necessary interlocks.

- The progress of each sub-sequence shall be displayed on the control desk and monitor of HMI.

- It shall be possible to switchover to semi-automatic mode only after the completion of a sequence.

c. Annunciation and indications

An alarm shall be available in case of any fault. An acknowledge push button and the fault display shall also be provided.

Annunciation shall be provided for all faulty condition including interlocking failure, safety system failure and abnormal condition like emergency tripping, failure of all drives, rail clamp not fully open, boom position low, over tension, slackness, fully unwound conditions for CRD’s, transformer over load, temperature high, hoisting alarm limits for boom, wind pressure high, hydraulic system failure etc.
07 Special Requirement

CRD (power & control) shall be provided with declutching arrangement in the cable guide mechanism for easy adjustment of cable guide.

- Suitable structure beside yard conveyor to place the flexible cable during paying off from CRD.
- Layer counter shall be provided for Stacker to count nos. of layers.
- Angular position of the boom of Stacker shall be displayed in the Stacker cabin.
- All yard machines shall have facility to control from operator cabin and also from Despatcher/Control Room. Normally operator desk in cabin shall be used. Necessary radio communication between yard machines and control room shall be considered.
- Over speed protection shall be provided for long travel of Stacker.
- In addition to walky-talky sets and telephone sets, DA (Press to talk) system shall also be provided in the expansion galleries and junction houses. This DA system shall be integrated with existing DA system of Stacking or Reclaiming route.
- Suitable overground structure at one side of the yard conveyor to place the flexible cable during paying off from CRD. Both CRD shall be on one side of yard conveyor.
- Portable emergency lighting.

(iv) Motorised Damper, Switching Device, Slide Valve, Diverter Gate, Flap Gate Etc.

01 The motor shall be 3 phase squirrel cage TEFC class F insulated (temperature rise limited to 70 deg. C. over an ambient of 50 deg. C), IP-55 enclosure both for motor switches & its terminal box, and with high starting torque and high stalling torque. The duty cycle shall be S2-10 min or S4/ S5-1200 cycles per hour or S4/ S5-600 cycles per hour depending upon the rating and application of the actuator.

02 Each actuator shall be provided with extremely dependable both 'Open' and 'Close' torque and position limit switches. The torque and limit switches shall be provided with suitable means like mechanical selection, end position latching etc. for easily and accurately setting at required end position. The torque switch should not unnecessarily trip during initial unseating Hammer blow effect. The anti-hammer feature of the torque switch latch shall be available throughout travel including at end positions. Once the torque switch has tripped in either direction, it can
only be reset by operation of the actuator in the opposite direction. Each switch shall have 2 NO + 2 NC potential free double break contacts. Switch contact ratings on inductive circuits shall be 5A AC at 230 V AC.

Actuator shall be provided with motor over-riding feature like hand wheel for emergency manual operation and a limit switch shall be provided which contacts shall be used in the motor control circuit to forbid the motorised operation during manual operation by hand wheel. Also when the motor is switched 'ON' the hand wheel connection shall be disengaged automatically. Motor operation shall always have priority over manual operation.

Internal wiring shall be tropical grade PVC insulated, stranded copper conductor cable of 10A rating for control circuits and required ratings for motor. All wires shall be clearly numbered at both the terminal block and component ends. The voltage grade of cables! wires shall be 1100 V. Power terminals shall be separated from the control terminals by means of an insulating cover. Separate terminal block fitted to switching unit shall be provided. The terminal box shall be designed for the protection class or IP-65. A durable terminal identification card showing plan or terminals shall be provided attached to the inside of the terminal box cover indicating serial number, external voltage values, wiring diagram number and terminal layout.

The actuator shall be suitable for operation at specified ambient temperature. All actuators shall be neoprene O-ring sealed water tight and dust proof to IP-67 protection and shall at the same time have an inner watertight neoprene O-ring seal between the terminal box and the internal electrical elements of the actuator, fully protecting the switch mechanism, motor and all other internal electrical elements of the actuator from ingress of moisture and dust when the terminal box cover is removed on site for cabling! maintenance.

The actuators shall be operated from the Remote Control Station and Local control station (LCS) shall be provided separately for local operation of the actuator for testing and maintenance purpose. Isolator along with starter for the actuator motor shall be located in the Bidder's MCC. Separate power cable shall be used for motor wiring.

(v) Belt Weigh Feeders

General Technical Specification (GTS) shall be referred for detailed specification of Belt Weigh Feeders.

(vi) Belt Weigh Scales

General Technical Specification (GTS) shall be referred for detailed specification of Belt Weigh Scale.

(vii) Suspended Electromagnet/ ILMS
The magnet will be of high permeability cast steel as per IS : 4491 with an integral terminal box of adequate size. Leads will be brought to the terminal box through a water tight sealed gland. An earthing terminal will be provided inside the terminal box. The coil of the magnet will be designed for continuous duty for full supply voltage. The magnet will be fed from 220V DC obtained through rectifier panels.

The magnet coil shall be Fiber glass wound copper wire and class H insulation shall be used.

Control panel shall be free standing, floor mounted, front attended, made of CRCA sheet steel of thickness not less than 2mm with IP54 enclosure class. In-comer feeder will have load break switch interlocked with the door.

Panel shall have air cooled control transformer, full wave, silicon diode Rectifier Bridge having 220V DC output and complete with RC circuit across each diode, PIV of diode will not be less than 1560V.

Complete safety and protection equipment against surge voltages, discharge resistance in DC load side will be provided. Electronic temperature sensing circuits for protection against excessive temperature in the magnet coil will also be provided.

For In Line Magnetic Separator necessary electrics shall be included.

**(viii) Dust Suppression System**

Control Panel for DS system shall have necessary starter for Pump motors and 24V DC power supply arrangement for Solenoid valves. Valves shall be energised either by Local Push button station or by under belt switch depend upon selection of control mode. Necessary electrics shall be provided for desired operation of pumps, compressors, valves etc. for DS system. DS system shall be interlocked with corresponding conveyors/technological equipment. DS system shall have local manual and remote auto mode control. Compressor may be connected to nearest MCC considering location of Compressor house.

**(ix) DUST EXTRACTION SYSTEM**

The Dust Extraction System will be started first and will be suitably interlocked with corresponding conveyors/technological equipment. The equipment of D.E. system will be operated in sequence as per requirement in the REMOTE mode from the HMI. Power supply to bag filter panel will be interlocked with the DE fan. Bypass arrangement will be provided such that technological equipment may be operated without operation of DE system in case need arises.

**Electrics for Bag Filter System of DE System.**
The bag filters of D.E. system shall consist of pressure switches cum indicator in the compressed air line, differential pressure switches, solenoid valves, control panel and all other associated equipment. The brief specification of the major components shall be as given below:

**01 Control panel for Bag filter**
The control panel shall be free standing floor mounting fabricated from 2.5 mm thick CRCA sheet steel on a base channel or 250 mm height provided with cable gland plates, having synthetic rubber gasketting provided with double door & canopy and enclosure conforming to IP-55. The control panel shall be factory assembled, wired with 1.1 kV grade PVC flexible wire of copper conductor (minimum size 2.5 sq.mm), factory painted. The control panel shall be provided with following major equipment:

b) Incoming switch (minimum 30A, AC23 duty) with operating handle inter-locked with the door, HRC fuses, contactors, MCBs in the various circuits.

c) Control transformer or required VA rating having +/- 5 percent and +/- 2.5 percent tapings in the primary side of the control transformer with Isolating switches/MCBs in the primary & secondary sides.

c) 24V DC power pack complete with fitter and protective elements and also isolation cum short circuit protection both at AC and DC sides for power supply to solenoid valves.

d) Auxiliary contactor for control power supply monitoring interlocking, and controls etc.

e) Auto-manual selector switches, push button switches, indication lamps, various monitoring devices, terminals (with 20 percent spare terminals) and other circuit elements required for control and monitoring

f) Solid State Bag filter timers.

**02** The bag filter timer shall be solid state device suitable for dusty, tropical and specified aggressive environment. The bag filter timer shall be provided with internal semi-conductor fuse protection and shall have provision for pulse frequency setting and pulse duration setting through independent operating knobs. The number of contacts in the timer shall be equal to number of solenoid operated valves so that the timer shall energise only one solenoid valve at a time.

**03** The Bag Fitter Timer shall provide timed sequential energisation of 24V DC operated solenoid valves of bag filters LEDs for each solenoid energisation. Power ON in PCB feed back relay shall be
provided with potential free contacts which will close under following conditions:

a. Fault in the PCB.

ii) Open contact in the output side connected to individual solenoid valves. The contact will not close in the event of power failure to the controller.

iii) The sequential control (i.e. process) will start when the Differential Pressure (DP) switch is actuated at the first set point for normal operation. The process will continue till the pressure differential drops below the set value. When again the DP switch is actuated the process will continue from the previous position (i.e. next solenoid valve). However, when the power supply to sequential controller trips, the process will stop and sequential controller is reset to first load position enabling the process to start from the beginning.

iv) Sufficient space shall be provided for installation of bag filter panel with required front clearances for operation and maintenance including side and back clearances as required.

04 Differential Pressure Switch

i) The differential pressure switch will have two sets of independent micro switches. The first set will be used for normal sequential cleaning operation of the bag filters as per lower set value of differential pressure. This set point will be independently adjustable.

ii) The second set of N.O. contact will close at upper set value of differential pressure representing clogging condition of bag filter and will be used for signaling and monitoring. This set point will also be independently adjustable. The contacts will be rated for 5 Amp, 240V AC.

iii) The DP switch will be suitable for outdoor installation. The DP switch casing will be made of pressure die cast Aluminium with enclosure conforming to IP-65.

iv) One number differential pressure switch with two set points shall be provided for each module of the Bag filter. Alternatively, two numbers of DP switches may be provided for each module one for initiation of bag cleaning operation and other for signaling and monitoring of clogging condition.

05 Solenoids

The solenoid coil shall have encapsulated coil (class ‘F’ insulated with a water proof (IP-65) plug-on connector. The coil shall be suitable for 24V DC. The coil shall be made of copper conductor.

06 Air Pressure Switch cum indicator
One number compressed air pressure switch cum indicator shall be provided for each DE system in the incoming compressed air pipe line of the bag filter. The pressure range shall match with the operating pressure. The switches shall be snap action type with i NO + i NC contacts of SA, 230 V AC. These contacts shall be wired up to terminals in the bag filter control panel. The enclosure of the air pressure switch will be pressure die cast aluminium conforming to IP-55.

(x) Type of Light Fittings and Illumination Levels

Illumination level and light fittings shall be provided for different units as indicated below:

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>UNITS</th>
<th>ILLUMINATION LEVEL (LUX)</th>
<th>TYPE OF LIGHT FITTINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Electrical rooms, substations, MCC Rooms etc.</td>
<td>200</td>
<td>Trough type, 2x40W, fluorescent tube light fittings with reflectors.</td>
</tr>
<tr>
<td>2</td>
<td>Junction Houses and Conveyor Galleries/tunnels</td>
<td>100</td>
<td>70W/150W, HPSV, well glass fittings and 250W High bay as required.</td>
</tr>
<tr>
<td>3</td>
<td>Crusher house, other process and Technological Building</td>
<td>150</td>
<td>70W/150W, HPSV, well glass fittings and 250W High bay fitting as required</td>
</tr>
<tr>
<td>4</td>
<td>Office rooms</td>
<td>300</td>
<td>Trough type/Decorative recessed type, 2x40W, fluorescent tube light fittings.</td>
</tr>
<tr>
<td>5</td>
<td>Corridors, walkways, Staircase</td>
<td>100</td>
<td>Trough type, 2x40W fluorescent tube light fittings with reflectors.</td>
</tr>
<tr>
<td>6</td>
<td>Control room, laboratories, instrumentation rooms.</td>
<td>300</td>
<td>Decorative type, 2x40W fluorescent tube light fittings with mirror optics.</td>
</tr>
<tr>
<td>7</td>
<td>Battery room</td>
<td>100</td>
<td>Corrosion!Vapour proof, 2x40W fluorescent tube light fittings.</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Quantity</td>
<td>Details</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------</td>
<td>----------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>8.</td>
<td>Battery Charger! UPS room</td>
<td>200</td>
<td>Decorative type, 2x40W fluorescent tube light fittings with mirror optics.</td>
</tr>
<tr>
<td>9.</td>
<td>Periphery of buildings and cooling towers</td>
<td>50</td>
<td>Well glass fittings with 70W, HPSV Lamp.</td>
</tr>
<tr>
<td>11.</td>
<td>Area lighting through flood light towers</td>
<td>20</td>
<td>Flood light fittings with 250 / 400W, HPSV Lamp.</td>
</tr>
</tbody>
</table>

Number of light fittings shall be decided on the basis of specified lux level, maintenance factor 0.6 and appropriate co-efficient of utilization as per manufacturer's recommendation.

(vi) **Drawings & Documents**

Bidder’s scope of work for all design drawings and documents shall be as given below.

The bidder shall submit a list of all drawings and documents he proposes to submit within 2 weeks of LOI. The list will be approved by Client / MECON and may be modified if necessary. Each drawing/documents in the list shall be identified with a serial number, description and scheduled date of submission.

Bidder shall also furnish soft copies of all the drawings indicated below and drawings of technological layout/units.

All design, engineering and manufacturing drawings shall be required to be approved by Purchaser/Consultant.

Work shall be carried out exactly as indicated on the approved drawings and specification. No alterations shall be made without prior written approval by purchaser / his consultant.

The bidder shall check all the drawings prepared by them and/or received from their vendors/supplier/sub-supplier and satisfy themselves about the correctness of drawings before issuing to Purchaser/Consultant. After checking, properly stamped drawings shall be sent to Purchaser/Consultant for approval / clearance.

Comments on all drawings will be forwarded to the successful bidder for incorporation and resubmission.
The approval of drawings by purchaser or their authorized representative does not absolve or relieve the supplier from any of his obligations under this contract and he shall be wholly and solely responsible for the satisfactory operation and guaranteed performance of equipment / system / plant.

(a) **Information/data/drawings to be furnished by the Bidder along with the Tender. (Electrical)**

1. List of equipments considered for supply (Unpriced copy).
2. General description of equipment offered specifying the important features, make, technical parameters, materials of construction, etc. to enable the owner to have proper understanding of the equipment offered and its operation. Technical details shall be supported by manufacturer’s.
3. Literature/ catalogues of offered equipment.
4. List of Basic Engineering drawings.
5. Drive list indicating kW ratings.
6. HT and LT Motor data sheet as per enclosed format.
7. Feeder requirements from purchaser at 6.6 kV indicating maximum demand of each feeder, overall maximum demand of each LT substation and total connected load and maximum demand of the plant.
8. Power supply distribution scheme indicating numbers of HT/LT substations, transformers, HT motors etc. and CL/MD.
9. Proposed location of electrical premises such as LT substations, electrical rooms, control room, cable tunnels/Overhead Cable Structures/Bridge etc.
10. Single line diagrams for Power Control Centres, Motor Control Centres/ Control Panels, Power Distribution Boards, Main Lighting Distribution Boards, Lighting distribution boards etc.
11. Typical control scheme of a DOL/RDOL feeder indicating inputs & outputs considered.
12. Basic power and regulation diagram of VVVF converters for AC drives.
13. Tentative Equipment layout in electrical premises with tentative dimensions of all panels.
14. List and capacity of emergency loads and their feeding arrangement.
15. Automation system configuration with list and details of hardware. Details about numbers & locations of RI/O panels & count of Inputs & outputs of various types considered. I/O count of each type should distinctly specify the I/O count + spare I/O count + chassis capacity of additional I/O.
16. Details & Scheme of Illumination system and Emergency lighting.
17. Details & BOM of Electrics related to Yard Machines, Wagon Tippler & Side Arm Charger, Ventilation and Air conditioning system etc.
18. List of commissioning spares.
19. List of spares for 2 years normal operation.
20. List of insurance spares.
21. List of special tools, tackles, instruments and calibration equipment & devices.
22. List of deviations, if any, from Technical Specification & G.T.S.
23. List of exclusions.
24. Duly filled in questionnaire.
25. Reference list of similar jobs.
26. Time bar chart indicating various activities starting from date of placement of order till commissioning.
27. Any other details which may be felt necessary.

(b) **Basic Engineering drawings (Electrical)**
1. List of drawings (Basic Engg /Detailed Engg/ Reference) and drawing numbering system along with schedule of submission.
2. Single line diagrams of MCCs /Control Panels, PDBs, MLDBs, LDBs, SLDBs, Main fire detection and alarm panel etc. with rating of components, cable sizes and details of protection and metering etc.
3. HT & LT Motor and component list including field mounted electrics
4. HT and LT Motor data sheets as per enclosed format.
5. Type-II Co-ordination chart as per IS: 13947-1993 for MPCB/ MCCB, Contactor and Overload relay.
6. Schematic drawing of different feeders, control, alarm, indications, interlocking and other schematics.
7. Shop/Unit wise Maximum Demand calculations.
8. Relay settings with calculations for total network to ensure proper co-ordination.
9. Busbars sizing calculation with respect to temperature rise & short circuit withstand capacity.
10. Design Calculations for selection of main equipment such as transformers drive motors, AC drives, bus bars, cables, batteries etc.
11. Typical schemes of DOL, RDOL feeders indicating inputs & outputs applicable to the various feeders indicated in SLDs.
12. Power and regulation schemes of AC drives.
13. Calculation for temperature rise of busbars.
14. Layout of substations, electrical rooms and control rooms including ventilation and air-conditioning rooms, handling facilities. The layout drawings indicating cable trench, wall openings, conduit inserts, plate inserts, Minimum clearances from electrical panels for installation of panels, cable trays, conduits for concealed wiring etc.
15. Electrical Equipment Layout of all electrical rooms, control rooms indicating panel dimensions, space available for future expansion with building dimensions.
16. General arrangement of equipment with plan, front view and sectional views, comprehensive bill of materials with description, quantity, make and type.
17. Cable layout drawings in cable tunnel, cable channels, overhead cable structures/bridge and incoming cable route etc.
18. Interplant cable route drawings.
19. Type tests certificates of all major equipment like transformers, switchgear etc.
20. Level-1 automation system configuration & I/O lists, Belt Scale, Belt Weigh feeder, UPS & VVVF single line diagrams.
21. Functional description, control philosophy for the plant indicating start up, shut down, control locations, interlocking and annunciation system, mimic pages, report/data formats (for reference).
22. Sizes, ratings & locations of various LDBs & SLDBs.
23. Tentative Dimensions of panels.
24. Earthing and lightning protection scheme and layout of earthing and lightning protection network with calculations.
25. Quality assurance plan for various electrical equipment.
(c) **Detailed engineering drawings (Electrical)**

1. Civil/Structural engineering design drawings of Electrical buildings, Electrical rooms, Control rooms, Motor foundations, Cable tunnels, Overhead cable structures/Bridge etc.
2. General arrangement of all electrical equipment/electronic panels/controllers with plan, front view and sectional views, comprehensive bill of material with description, quantity, make and type.
3. Equipment and cable layout drawings in LT Substation, Electrical premises, Control rooms etc.
4. Schematic drawing of different feeders, control, alarm, indications, interlocking, inputs/outputs to PLC and other schematics.
5. Single line diagrams of all PCCs, MCCs/Control Panels, PDBs, MLDBs, LDBs, SLDBs, UPS, other equipment Control panel for sump pump, magnet and other auxiliary system etc. Module wiring diagrams indicating all interlocks, terminal numbers. Wiring terminal plan drawings with cable connections.
6. Single line diagram of VVVF Drives, Soft Starter etc.
7. GA, BOQ, Layout drawings, dimensional details for LT switchgear equipment, MCCs/Control Panel, PDBs, MLDB, LDBs, SLDBs, Main fire detection and alarm panel etc. with rating of components, cable sizes and details of protection and metering etc.
8. Level-1 automation system software and graphic displays.
9. I/O listing in specified format to be finalised during engineering.
10. Sizing calculation of the UPS and the backup battery. UPS panel wiring diagram and circuit diagrams.
11. Wiring terminal plan drawings with cable connections.
12. Technical data sheets for Motor, Brake, Proximity switches & all field mounted electrics, GA drawings.
13. Interplant cable route drawings.
14. Layout of cable trays in cable cellars inside the substation & other electrical premises, cable channels, cable tunnel, overhead cable structures, cable shafts etc.
15. Cable layout drawings in cable tunnel, cable channels, overhead cable structure (as applicable), and incoming cable route etc.
16. Power & control cable schedules
17. GA drawing for erection accessories like cable trays, supporting structures etc.
18. Installation drawings of all equipment with layout of equipment, cables.
19. Illumination layout of all the indoor & outdoor premises. Layouts at each floor of Electrical/Technological building with details and numbers & locations of light fittings, Lighting distribution boards etc. SLDs of Lighting distribution board.
20. Earthing and lightning protection scheme and layout of earthing and lightning protection network with calculations including special electronics earthing
21. Relay settings with calculations for total network to ensure proper co-ordination.
22. Communication cable (Field bus) routing and procedure for laying of communication cable.
23. QAP for all items covered in this specification
(d) **For Reference/Erection purposes (Electrical)**

1. Schedule of electrics, and their location.
2. HT/LT feeder requirement with individual maximum demand.
3. Control circuit diagrams.
4. Static and dynamic loading of all major equipment
5. External connection diagram (panel wise and scheme wise).
6. Composite drawings showing circuitry of switch-gear remote panels, and other items pertaining to complete circuit for its proper functioning.
7. Power & regulation schemes for AC drives, UPS, soft starter including FCMA type.
8. Motors & field devices.
9. Speed-torque, current vs. time, thermal withstands characteristics for motors.
10. List of interfaces between successful Bidder’s equipment and Purchaser’s equipment.
11. Cable termination plans with terminal block arrangement and markings.
12. Interconnection diagrams.
13. Internal wiring diagrams of equipment.
15. Motor and electric consumer list.
17. Procedure for testing and commissioning of the entire plant, electrical & automation equipment. This shall also be furnished in soft copy.
18. Erection specification with bill of materials of erection materials, earthing materials, junction box, GI conduits etc. This shall also be furnished in soft copy.
19. Spare part list and drawings.
20. Instruction for storage /erection, testing & commissioning.
22. Detailed technical literature / catalogue of manufacturers.
23. Graphic display sheets, report/data generation, fault listing etc.
24. Terminal plan drawings
25. System grounding/ earthing scheme.
26. Application software program listings with detailed documentation.
27. Ladder Logic diagram /Statement Lists and software details.
28. Formats and work sheets for generation and display of overview, groups, loops, graphics, alarms, operator's guide messages, real time and historical trends Log and shift formats.
29. List of drawings & spare parts.
30. Final test & calibration certificates and guarantee certificate / warrantee certificate.
31. As built Control description with Operational instruction use of various commands, instruction for control of plant and equipment from Operator workstation.
32. Drawings/documents for inspection of equipment:
   (I) Type test certificate for identical equipment.
   (II) Sub-supplier's/vendor's catalogue/technical literature.
   (IV) Test reports for internal inspection.
   (V) Test certificate of components.
   (VI) Technical specification & data sheets of equipment.
   (VII) All “Approved” drgs./ “Commented” drgs as applicable.
33. Automation systems.
   (I) Software including media and documentation.
(II) Description of all components of the user system with functional description, overview flow diagram, interface listing, mathematical models, and fault message lists, operator commands, simulation facilities, etc.

(III) Source code of the user system.

(IV) Object code of the user system.

(V) I/O listing

(VI) Ladder/block diagrams, etc.

(VII) Factory Acceptance Tests & procedures for PLC/DCS

34. Other Drawings/documents:

(I) Operation & maintenance manual.

(II) Catalogues and manuals.

(III) All “As-built” drawings.

(IV) Soft copies of all drawings.

(V) Technical specification/data sheet of equipment.

(VI) Instructions for storage/erection/testing/commissioning

(VII) Commissioning report.

(e) As-built drawings (Electrical)

Upon installation and commissioning supplier shall incorporate revisions/modifications if any in the reproducible and submit 'as built' drawings for purchaser's record as per general condition of contract.

Complete and comprehensive instruction manuals for operation and maintenance of the equipment with drawings. This shall include the following:

1. Log sheets indicating daily/hourly recordings of power system parameters to be noted down by customers operating personnel. The parameters shall indicate loading of various electrical equipment, quality of power supply, energy consumption of various units, energy consumption and maximum demand of the plant.

2. Preventive maintenance schedule for equipment.

3. Procedure for shut down and energisation.

4. Safety procedures for safe operation of equipment and complete system.

5. Specification of equipment installed.

6. Test procedure for site tests.

7. All as built drawings.

8. Spares list for each equipment for 2 year operation and maintenance.

9. Soft copies of all as built drawings along with hard copies shall be submitted during commissioning.

(Vii) LIST OF DRAWINGS & DOCUMENTS (Automation)

Following drawings and documents shall be submitted by the Bidder:

(a) To Be Submitted Alongwith Offer

1. System configuration diagram for the Automation system along with its peripherals. Configuration should indicate nos. of Processors & interfacing details with plant PLC.
2. Bill of quantities of all hardware & peripherals viz; CPU, I/O units, communication & power supply modules, operator/engineering stations, bus cables & erection accessories etc. offered for the automation system with brief specification.

3. Detailed technical catalogues & a write-up explaining the system offered shall also be submitted along with details of various software being considered.

4. Total power requirement & heat load for automation system.

5. List of commissioning spares with details.

6. List of two years operation & maintenance spares with details & unit rates.

(b) To Be Submitted By The Successful Bidder During Detailed Engineering

(I) FOR APPROVAL:

1. Finalised system configuration diagram for the automation system along with its peripherals with list of hardware and write-up on the system.

2. Bill of Materials & Data Sheets of all the hardwares i.e. Processors, Communication modules, Power supply cards, RLM, OLM, Operator stations, Eng Stations, Servers, Bus cables etc.

3. Overall General arrangement drawings & sectional views of various cabinets, panels, consoles, etc., showing internal disposition of all components/ units, with dimensional details and bill of materials.

4. Interfacing details for interfacing with mail PLC.

5. Single line power supply diagram with specification and bill of quantities of electrical accessories.

6. Quality assurance plan & Factory Acceptance Test procedures for Automation system.

7. Control room layout drawing showing disposition of panels, consoles, desks, etc with dimensional details.

(II) For Scrutiny And Reference

1. Detailed technical literature/ catalogue for Automation system with peripherals, highlighting the model number.

2. Input/ Output list.

3. Terminal diagram of all the Marshalling panels.

4. Cable schedule and specification.

5. System grounding scheme.

6. Formats and work sheets for generation and display of overview, groups loops, graphics, alarms, operator’s guide messages, real time & historical trends, log & shift formats.

7. Detailed listing of application software, system software, HMI software, etc and the number of licenses.

8. Application software formats and details in documentation and CDs.

9. Manufacturer’s test, calibration and guarantee certificates for all instruments and automation system.

10. Operation and maintenance manuals for Automation system.

11. As-built documentation.
7.0 AUTOMATION SYSTEM (LEVEL-1)

(A) Please refer the enclosed documents for general technical specification of BSP chapter 06.11 (Annexure - IV).

(B) Stacker and reclaimer PLC communication with despatcher PLC

Stacker and Reclaimer machines shall have its in-built PLCs for its operation, interlocking, monitoring, control and positioning. All these PLCs shall communicate with respective Despatcher PLC through radio communication link and also through cables for interlocking, monitoring, control and remote operation. Radio frequency modem/RTU shall be supplied by the third party to achieve data communication for monitoring, remote operation & control between Stacker and Reclaimer machines (3 nos new stackers and 4 nos new Reclaimers ) PLCs and Despatcher PLC. All these PLCs shall work in integrated way to achieve overall functional requirement. To achieve data transmission through radio communication equipment all PLC input/output signals of Stacker and Reclaimer machines shall be hardwired interfaced with the RTU of radio communication device.

The PLC input/output signals of Stacker and Reclaimer machines shall be duplicated and terminated in their respective PLC panels for data communication with desptcher PLC through radio communication device and hardwired/ cables connection. For hardwired connectivity, the required control/signal cables from Stacker/Reclaimer machines PLC panels to their respective junction Box (after cable reeling drum) shall be supplied by the Stacker/Reclaimer vendor. PLC panels shall be provided with the provision for entry of external I/O cables for radio communication equipment.

Stacker/Reclaimer machines supplier shall extend technical assistance/ support to third party during erection, testing and commissioning of radio communication system for establishing and ensuring smooth and uninterrupted communication, operation of the machines and data transfer through radio communication between their Stacker and Reclaimer PLCs and Despatcher PLC. Stacker/Reclaimer machines shall be supplied with the provision to install Radio communication equipment.

In addition to the above all the PLCs of Stacker and Reclaimer machines shall be provided with Ethernet connectivity (Ethernet IP); Modbus TCP/IP communication interface or if required, necessary converter gateway with required hardware and software for establishing data communication through radio modem/RTU between Stacker and Reclaimer machine PLCs and despatcher PLC.

Any modification/configuration and hardware/software required at Stacker and Reclaimer machine PLCs end for establishing radio communication would be in the scope of the vendor. Stacker and Reclaimer vendor shall submit the complete I/O list and control philosophy for control of Stacker and Reclaimer machines. Four (4) nos field programming unit with latest hardware configuration and loaded with latest version of software shall be supplied by the vendor for the PLC of Stacker and Reclaimer machines.
8.0 SPARES

(A) Commissioning Spares and Insurance Spares

Supply of commissioning spares and insurance spares as required shall be in scope of supply of the Bidder along with the equipment. The list of commissioning spares and the insurance spares as per the format as given in SBD shall be furnished along with the tender. It shall cover requirements of erection, cold tests, startup and initial operation of the plant till integrated testing & successful commissioning and commencement of commercial production up to a period of six months. Any leftover commissioning spares shall be the property of the Purchaser. Any commissioning spares required over and above the list given by the Bidder shall have to be provided by the Bidder free of cost up to the successful commissioning & commencement of commercial production of the plant and equipment. The Bidder shall supply adequate insurance spares to ensure smooth operation and maintenance of the plant.

(B) Consumables

The Bidder shall supply all consumables such as initial fill of lubricants, oils, grease, chemicals, refractories, resins etc. as required to complete the plant till commissioning and shall have a shelf life of minimum one year. The scope of consumables shall include electrodes, shims, packings, bolts, nuts, gaskets, rivets, washers etc. The Bidder shall fulfill the requirement given in SBD.

The Bidder shall also furnish Indian equivalent of oils, lubricants, refractories and other consumables along with necessary specifications, drawings, catalogues etc. to enable the Purchaser to procure them from indigenous sources.

The Bidder shall indicate the annual requirement of all such consumables.

(C) Operating, Maintenance and Two Years’ Spares:

1. The Bidder shall ensure the interchangeability of the parts wherever possible. The Bidder shall furnish an itemized list of interchangeable spares as given in SBD.

2. The list of spares as necessary and recommended by the respective manufacturer for two years’ of reliable and trouble free operation and maintenance of all equipment under this package shall be in the scope of the Bidder. The same shall be quoted separately. In the event of order the successful Bidder shall furnish complete specification of the same.

3. Spares list giving complete list of the replaceable parts, fully illustrated, shall be supplied. The list shall include the following information.
• Item designation
• Reference drawings
• Quantity installed
• Quantity recommended for two years’ normal operation including the insurance spares
• Weight of each spare part
• Supplier or sub-supplier’s catalogue number
• Recommended minimum stock
• Expected replacement time
• Installation instruction in detail shall be supplied both for original installation and future, for replacement of major electrical equipment, circuit wiring diagram shall be provided.

(D) Special Erection / Maintenance Tools and Tackles:

(1) The Bidder shall supply a complete and unused wet of all the special tools and tackles including required number of tool boxes as required for erection, maintenance, overhaul or complete replacement of the equipment and components required for the plant. The Bidder shall submit a list of such special erection and maintenance tools and tackles.

(2) All the tools shall be supplied in separate containers clearly marked with the name of the equipment for which they are intended.

(3) The Successful Bidder shall indicate list of construction machineries, handling equipment and other facilities including tower crane or equivalent for erection at high elevation required for the execution of work based on their previous experience, considering site conditions and other considerations of work and furnish resource deployment plan. The successful Bidder shall mobilize these equipment at site for the execution of work and this is an important requirement of the project. The availability of required facilities shall be ensured for completeness of the project in time.

(4) For any fabrication / control assembly (necessary for erection) work to be done in the plant premises the plan shall be indicated by the Bidder. The necessary equipment such as plate bending machines, special purpose welding machines, fixtures, tools & tackles and other equipment required for fabrication shall be arranged by the successful Bidder.

(5) The successful Bidder shall carry out the testing of welded joints by radiographic and ultrasonic methods. They must have only qualified / certified welders with them for completing all the welding jobs.

(6) All the measuring instruments shall be calibrated having reference to NPL (National Physics Laboratory).
(7) All tools and tackles, apparatus, special instruments required for erection, testing, commissioning and establishment of the Performance Guarantee Test, measurements required for establishing the pollution control norms and such other instruments, as required, shall be arranged by the successful Bidder. After commissioning, the successful Bidder shall handover all the special tools & tackles to the Purchaser as per the requirement given in SBD.

(8) The successful Bidder shall supply all required consumables, initial fill, oil, lubricants, construction and erection materials including but not limited to shims, packing plates, joining compounds, kerosene, solvents, sealing compounds, tapes, connectors, brazing and soldering materials, welding and brazing gases and rods, electrodes and wires, erection bolts, nuts, rivets, piano wire, packing sheet and packing compounds, temporary supports, spacer templates, jute and cotton waste cloth, sand and emery paper etc. for the commissioning of the plant.

(9) For load testing of handling equipment, loads shall have to be arranged by the successful Bidder. Electrical/ operation tests, as per standard practice, shall also be arranged and completed by them.

(10) All materials, equipment, tools, tackles etc. brought at site by the successful Bidder within the plant area shall not be removed without the written permission of the Purchaser. Similarly, all enabling works built/erected and/or acquired by them within the plant premises shall not be dismantled and removed without the written permission of the Purchaser.

(E) General tools and tackles A list of general tool and tackles to be supplied shall be indicated as per the format given in schedule at Chapter 12.

(F) Information/ Data on Spares and Consumables

The list of Spares & consumables shall be furnished by the successful Bidder as required in SBD. However, the successful Bidder shall furnish various information regarding spares, consumables, tools & tackles etc. as per the schedules indicated in chapter 12 of this Technical Specification.
DATA SHEETS
### 8.0 TECHNICAL DATA SHEET (To be filled by the vendor)

### 8.1 TECHNICAL DATA SHEET (Mechanical)

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

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>I</strong></td>
<td>TWIN BOOM STACKER</td>
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<tr>
<td><strong>A</strong></td>
<td>General</td>
</tr>
<tr>
<td>1.</td>
<td>Name and address of the Bidder</td>
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<tr>
<td>2.</td>
<td>Previous experience of the Bidder List of similar equipment supplied.</td>
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<tr>
<td>3.</td>
<td>Whether the Bidder has any technical collaboration with any other company/organisation for his equipment.</td>
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<tr>
<td>4.</td>
<td>If answer to question 03 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</td>
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<tr>
<td>5.</td>
<td>List of drgs. literatures enclosed with the offer.</td>
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<tr>
<td>6.</td>
<td>Is it the Bidder’s intention, if awarded the contract, to comply fully in all respects with owner’s specifications covering the work? If not, he shall state specific exception in details.</td>
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<tr>
<td>7.</td>
<td>Have drgs and all other Technical data been included in your tender as enquired under clause no. 09.01.</td>
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<tr>
<td>8.</td>
<td>List of applicable codes and standards</td>
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</table>

| **B** | Stacker |
| 1. | Capacity of the stacker, t/h at max. boom inclination |
| 2. | Rail centres, m |
| 3. | Travel length, m |
| 4. | Travel, luffing speeds & range in m/min, rpm, m/min, deg. |
| 5. | Maximum wind velocity (Random direction) at which the equipment can operate, m/sec |
| 6. | Maximum wind velocity (random direction) |
that the equipment can withstand in non operating condition without any damage to equipment or relative movement between track and equipment, m/ sec.

7. Total electrical load, kw

8. Weight in tonnes
   a) Structural component
   b) Mechanical component
   c) Electrical component
d) Total shipping weight
   i) Total service weight including material on belt
   ii) Heaviest weight to be lifted during shipping/ transport with overall dimensions.
   iii) Heaviest weight to be lifted during maintenance with height of lift above rail.

9. Stock pile parameters :
   a) Height :
   b) Length :
   c) Width :
   d) Capacity :

10. Method of stacking

11. Effective boom length

12. No. of points of suspension

13. Special storage requirement, if any

14. Material of construction, national code or specification for the materials ?
   (i) Stacker & tripper structure
   (ii) Boom conveyor structure
   (iii) Travel
      a) Bogie frames
      b) Wheels
   (iv) Chutes
   (v) Wear liners (for chutes etc.)
   (vi) Conveyor pulleys etc.
   (vii) Conveyor pulleys shafts
   (viii) Gear boxes
   (ix) Rope sheaves
   (x) Ropes drums
   (xi) Gears
   (xii) Shafts
   (xiii) Plummer blocks

<table>
<thead>
<tr>
<th>C</th>
<th>Boom Conveyor</th>
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<tbody>
<tr>
<td></td>
<td>1. Head to tail pulley centre distance, m</td>
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<tr>
<td></td>
<td>2. Belt width, mm</td>
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<tr>
<td>Section</td>
<td>Description</td>
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<td>3.</td>
<td>Belt speed, m/sec</td>
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<td>4.</td>
<td>Conveyor drive</td>
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<tr>
<td>a)</td>
<td>Motor - type, HP, RPM</td>
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<tr>
<td>b)</td>
<td>Reducer - type, rating, ratio</td>
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<tr>
<td>c)</td>
<td>Coupling - type, rating</td>
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<td>d)</td>
<td>Hold back - type, size</td>
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<tr>
<td>e)</td>
<td>Brake - type, size</td>
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<tr>
<td>D</td>
<td>Pulley</td>
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<tr>
<td>a)</td>
<td>Head - Dia. face width, lagging, bearing center</td>
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<tr>
<td>b)</td>
<td>Tail - do -</td>
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<tr>
<td>c)</td>
<td>Snub - do -</td>
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<tr>
<td>E</td>
<td>Take-up type and travel</td>
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<tr>
<td>F</td>
<td>Conveyor belt</td>
</tr>
<tr>
<td>a)</td>
<td>Type</td>
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<tr>
<td>b)</td>
<td>Construction</td>
</tr>
<tr>
<td>c)</td>
<td>Top &amp; bottom cover thickness</td>
</tr>
<tr>
<td>d)</td>
<td>Quality of cover rubber</td>
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<tr>
<td>e)</td>
<td>Special features, if any.</td>
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<tr>
<td>G</td>
<td>Carrying idlers</td>
</tr>
<tr>
<td>a)</td>
<td>Trough angle</td>
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<tr>
<td>b)</td>
<td>Roll dia.</td>
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<td>c)</td>
<td>Shaft size</td>
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<td>d)</td>
<td>Idler spacing</td>
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<tr>
<td>e)</td>
<td>Bearing No.</td>
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<tr>
<td>f)</td>
<td>Lubrication</td>
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<td>H</td>
<td>Return idlers</td>
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<tr>
<td>a)</td>
<td>Type</td>
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<tr>
<td>b)</td>
<td>Roll dia.</td>
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<tr>
<td>c)</td>
<td>Shaft size</td>
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<td>Lubrication</td>
</tr>
<tr>
<td>I</td>
<td>Impact Idler</td>
</tr>
<tr>
<td>a)</td>
<td>Type &amp; trough angle</td>
</tr>
<tr>
<td>b)</td>
<td>Roll dia.</td>
</tr>
<tr>
<td>c)</td>
<td>Shaft size</td>
</tr>
<tr>
<td>d)</td>
<td>Idler spacing</td>
</tr>
<tr>
<td>e)</td>
<td>Bearing No.</td>
</tr>
<tr>
<td>f)</td>
<td>Lubrication</td>
</tr>
<tr>
<td>J</td>
<td>Type of Belt cleaners</td>
</tr>
<tr>
<td>K</td>
<td>Maximum inclination of boom</td>
</tr>
<tr>
<td>a)</td>
<td>During parking</td>
</tr>
<tr>
<td>b)</td>
<td>During operation</td>
</tr>
<tr>
<td>L</td>
<td>Maximum declination of boom during operation</td>
</tr>
<tr>
<td>M</td>
<td>Maximum outreach of boom conveyor from on ground stacking conveyor</td>
</tr>
<tr>
<td>N</td>
<td>Boom luffing details</td>
</tr>
</tbody>
</table>
### a) Type

### b) Drive details including hydraulic pumps

### c) Luffing speed m/min at the discharge end of boom conveyor

### d) Whether 100\% stand-by arrangement provided?

### e) Working hydraulic pressure

<table>
<thead>
<tr>
<th><strong>O</strong></th>
<th>Width of walkways on both sides of boom conveyors, mm</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>P</strong></th>
<th>Height of boom conveyor material receiving point (belt top) from rail top, m</th>
</tr>
</thead>
</table>

### Q Travel System

- **a) Track rail size**
- **b) Track rail centre distance**
- **c) Whether the rail tolerances given are acceptable**
- **d) Show in drawing disposition of bogies**
- **e) Total number of bogies**
- **f) Total number of driven wheels**
- **g) Total number of non-driven wheels**
- **h) Wheel type & diameter**
- **i) Flange dimensions**
- **j) Bearing type, size**
- **k) Lubrication of bearings**
- **l) Maximum wheel loads and wheel load diagram**
- **m) Travel speeds of machine**
  - During operation
  - During approach/ shift from one place to another
- **n) Describe drive system**
  - Motor - type, HP, RPM & number
  - Reducer - type, rating, ratio
  - Coupling - type, rating
  - Brake - type, size
- **o) Type and number of rail anchoring /clamping devices its rated holding force and actuator data. Approximate clamp load worst condition.**
- **p) Buffers on machine**
  - Number
  - Type and make
  - Size
  - Load on buffers stops
  - Height of buffer centre line
- **q) Whether anti skew device provided**
- **r) Whether built-in jacks for wheel replacement provided**
- **s) Whether driven and non-drives bogies interchangeable**
### R  Tripper

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Furnish the complete technical details of tripper</td>
</tr>
</tbody>
</table>
| b) | Pulleys  
   | Head - dia, face width, lagging, bearing centres  
   | Bend - dia, face width, lagging, bearing centres |
| c) | Type of idlers |
| d) | Whether carrying idlers laid on curvature |
| e) | Height of discharge pulley top from rail top |
| f) | Whether belt sway switches near head pulley provided |
| g) | Whether wheels provided are identical to non driven wheels |
| h) | No. of wheels, diameter, hardness, bearing no. |

### S  Lubrication

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Bidder shall briefly describe each central lubrication system</td>
</tr>
</tbody>
</table>

### T  Safety Devices

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| Describe safety devices on stacker  
  1. To prevent over run on travel  
  2. To prevent damage to electric power/Control cable.  
  3. Emergency stopping of completes stacker.  
  4. To prevent belt side travel.  
  5. Whether chute jamming indicators provided?  
  6. Whether wind speed sensor provided?  
  7. Emergency stopping of boom conveyor by pull cord switch.  
  8. Whether under speed & over speed limit switches for boom conveyor provided?  
  9. Whether automatic anchoring device to hold the machine in hurricane weather Operable from cabin provided?  
  10. Device to prevent excessive luffing in upward and downward direction provided. Specify the appliance employed for this purpose.  
  11. Operator’s cabin location, type. Whether minimum requirements of cabin as described in the specification provided. |

### U  Data sheet for noise protection

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 01. | Type of noise source  
   | - Specn with catalogue |
| 02. | Directional characteristic  
<p>| - Directivity index in solid angle |</p>
<table>
<thead>
<tr>
<th>03.</th>
<th>Sound pressure level</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Value at ref. distance in dB (A) (with and without noise control measures)</td>
</tr>
<tr>
<td>-</td>
<td>Reference distance shall be 1m horizontal and 1.5m vertical as per API 615.</td>
</tr>
<tr>
<td>04.</td>
<td>Sound spectrum</td>
</tr>
<tr>
<td>-</td>
<td>Frequency - noise level characteristic in each octave band within 35 Hz – 20 Hz range.</td>
</tr>
<tr>
<td>05.</td>
<td>Type of control measures built-in</td>
</tr>
<tr>
<td>-</td>
<td>Silencer/ muffler/ enclosure/ any other</td>
</tr>
<tr>
<td>06.</td>
<td>Vibration anticipated</td>
</tr>
<tr>
<td>07.</td>
<td>Type of measures provided in case of vibration.</td>
</tr>
<tr>
<td>08.</td>
<td>Whether the equipment conforms to latest OSHA noise norms?</td>
</tr>
</tbody>
</table>

### II Technical Information of Boom on Bucket Wheel Reclaimer

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

#### A General

1. Name and address of the Bidder
2. Previous experience of the Bidder List of similar equipment supplied.
3. Whether the Bidder has any technical collaboration with any other company/organisation for his equipment.
4. If answer to question 3 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
5. List of drgs. literatures enclosed with the offer.
6. Is it the Bidder's intention, if awarded the contract, to comply fully in all respects with owner's specifications covering the work? If not, he shall state specific exception in details.
7. Have drgs and all other Technical data been included in your tender as enquired under clause no. 09.01
8. List of applicable codes and standards

#### B Bucket Wheel Boom Type Reclaimer

1. Capacity of the Reclaimer, t/ hr
2. Rail centers, m
3. Travel length, m
4. Travel speeds in m/ min
5. Maximum wind velocity (Random direction) at which the equipment can operate, m/Sec
6. Maximum wind velocity (random direction) that the equipment can withstand in non operating condition without any damage to equipment or relative movement between track and equipment, m/sec.
7. Total electrical load, kw
8. Weight in tonnes
   a) Structural component
   b) Mechanical component
   c) Electrical component
   d) Total shipping weight
      - Total service weight including material on belt
      - Heaviest weight to be lifted during shipping/ transport with overall dimensions.
      - Heaviest weight to be lifted during maintenance with height of lift above rail.
9. Stock pile parameters
   a) Height
   b) Length
   c) Width
   d) Capacity
10. Method of Reclaiming
11. Special storage requirement
12. Material of construction By which national code or specification are the materials identified?

(i) Travel
   a) Bogie frames
   b) Wheels
(ii) Chutes
(iii) Wear liners (for chutes etc.)
(iv) Conveyor pulleys
(v) Conveyor pulleys shafts
(vi) Gear boxes
(vii) Rope sheaves
(viii) Ropes drums
(ix) Gears
(x) Shafts
(xi) Plummer blocks

C Boom Conveyor
1. Head to tail pulley centre distance, m
2. Belt width, mm
3. Belt speed, m/ sec
4. Conveyor drive
   a) Motor - type, HP, RPM
   b) Reducer- type, rating, ratio
   c) Coupling- type, rating
   d) Hold back-type, size
   e) Brake- type, size

D Pulley
   a) Head- Dia. face width, lagging, bearing centre
   b) Tail - -do-
   c) Snub - -do-

E Take-up type and travel

F Conveyor belt
   a) Type
   b) Construction
   c) Top & bottom cover thickness
   d) Quality of cover rubber
   e) Special features, if any.

G Carrying idlers
   a) Trough angle
   b) Roll dia,
   c) Shaft size
   d) Idler spacing
   e) Bearing No.
   f) Lubrication

H Return idlers
   a) Type
   b) Roll dia.
   c) Shaft size
   d) Idler spacing:
   e) Bearing No.: 
   f) Lubrication:

I Impact Idler
   a) Type & troughing angle
   b) Roll dia.
   c) Shaft size
   d) Idler spacing
   e) Bearing No.
   f) Lubrication

J Type of Belt cleaners

K Maximum inclination of boom
   a) During parking
   b) During operation
<table>
<thead>
<tr>
<th>L</th>
<th>Maximum declination of boom during operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Maximum out reach of boom conveyor from yard conveyor:</td>
</tr>
<tr>
<td>N</td>
<td><strong>Boom luffing/ slewing details</strong></td>
</tr>
<tr>
<td></td>
<td>a) Type</td>
</tr>
<tr>
<td></td>
<td>b) Drive details including hydraulic pumps</td>
</tr>
<tr>
<td></td>
<td>c) Luffing speed at bucket wheel end</td>
</tr>
<tr>
<td></td>
<td>d) Whether 100% standby arrangement provided?</td>
</tr>
<tr>
<td></td>
<td>e) Working hydraulic pressure</td>
</tr>
<tr>
<td>O</td>
<td>Width of walkways on both sides of boom conveyors, mm</td>
</tr>
<tr>
<td>P</td>
<td>Percentage of dead stock which can not be reclaimed</td>
</tr>
<tr>
<td>Q</td>
<td><strong>Travel System</strong></td>
</tr>
<tr>
<td></td>
<td>a) Track rail size</td>
</tr>
<tr>
<td></td>
<td>b) Track rail centre distance</td>
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<td>- During approach/ shift from one place to another</td>
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<tr>
<td></td>
<td>n) Describe drive system</td>
</tr>
<tr>
<td></td>
<td>- Motor - type, HP, RPM &amp; number :</td>
</tr>
<tr>
<td></td>
<td>- Reducer - type, rating, ratio</td>
</tr>
<tr>
<td></td>
<td>- Coupling - type, rating</td>
</tr>
<tr>
<td></td>
<td>- Brake - type, size</td>
</tr>
<tr>
<td></td>
<td>o) Type and number of rail anchoring/ clamping devices, its rated holding force and actuator data. Approximate clamp load worst condition.</td>
</tr>
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<td></td>
<td>p) Buffers on machine</td>
</tr>
<tr>
<td></td>
<td>- Number</td>
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<tr>
<td></td>
<td>- Type and make</td>
</tr>
<tr>
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</tr>
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<td>- Load on buffer stops</td>
</tr>
<tr>
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<td>q) Whether anti skew device provided</td>
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<td>r) Whether built-in jacks for wheel</td>
</tr>
</tbody>
</table>
s) Whether driven and non-driven bogies interchangeable

<table>
<thead>
<tr>
<th>R</th>
<th>Bucket wheel details</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of buckets</td>
</tr>
<tr>
<td></td>
<td>Dia of bucket wheel, m</td>
</tr>
<tr>
<td></td>
<td>RPM of bucket wheel</td>
</tr>
<tr>
<td></td>
<td>Capacity of each bucket</td>
</tr>
<tr>
<td></td>
<td>Type of bucket</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b) Drive Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor- type, HP, RPM</td>
</tr>
<tr>
<td>Reducer - type, rating, ratio</td>
</tr>
<tr>
<td>Coupling - type, rating</td>
</tr>
<tr>
<td>Brake - type, size</td>
</tr>
</tbody>
</table>

d) Whether safety device to prevent motor over loading, in case of bucket jamming provided?

e) Maximum out reach of bucket from centre line of yard conveyor
   - along the length of stock pile
   - along the width of stock pile

| f) Whether bucket wheel drive is of reversible type to facilitate the withdrawal of wheel in case of excessive under cutting. |

<table>
<thead>
<tr>
<th>S</th>
<th>Lubrication</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Bidder shall briefly describe the central lubrication system.</td>
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<tr>
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<th>Safety Devices</th>
</tr>
</thead>
<tbody>
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<td>Describe safety devices</td>
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</tr>
<tr>
<td>1. To prevent over run on travel</td>
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</tr>
<tr>
<td>2. To prevent damage to electric power/ control cable.</td>
<td></td>
</tr>
<tr>
<td>3. Emergency stopping of complete machine.</td>
<td></td>
</tr>
<tr>
<td>4. To prevent belt side travel.</td>
<td></td>
</tr>
<tr>
<td>5. Whether chute jamming indicators provided?</td>
<td></td>
</tr>
<tr>
<td>6. Whether wind speed sensor provided ?</td>
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</tr>
<tr>
<td>7. Emergency stopping of bridge conveyor by pull cord switch.</td>
<td></td>
</tr>
<tr>
<td>8. Whether under speed &amp; over speed limit switches for bridge conveyor provided ?</td>
<td></td>
</tr>
<tr>
<td>9. Whether automatic anchoring device to hold the machine in hurricane weather operable from cabin provided ?</td>
<td></td>
</tr>
<tr>
<td>10. Operator's cabin location, type. Whether minimum requirements of cabin as described in the specification provided.</td>
<td></td>
</tr>
<tr>
<td>11. Whether Anti collision device provided?</td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>Data sheet for noise protection</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>01</td>
<td>Type of noise source</td>
</tr>
<tr>
<td></td>
<td>- Specn with catalogue</td>
</tr>
<tr>
<td>02</td>
<td>Directional characteristic</td>
</tr>
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<td>Vibration anticipated</td>
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<td>07</td>
<td>Type of measures provided in case of vibration.</td>
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<tr>
<td>08</td>
<td>Whether the equipment conforms to latest OSHA noise norms?</td>
</tr>
</tbody>
</table>
8.2 TECHNICAL DATA SHEET (Electrical)

MOTOR

1. Project :  
2. Make :  
3. Driven Equipment :  
4. Motor Tag No. :  
5. Quantity :  
6. Voltage With Variation :  
7. No. of Phases/Connection/ : No of Terminals  
8. Frequency With Variation :  
9. Fault Level (Mva) & Duration :  
10. Motor Type And Duty :  
11. KW RATING/POLE :  
   • At 40 Deg.C. :  
   • At Specified Ambient Temp.:  
   • With Derating.  
   • BHP/BKW of Driven Eqpt. : At Rated Load  
12. Frame Size/Mounting :  
13. Insulation Class With Temp Rise:  
14. Enclosure Type :  
15. Full Load Speed :  
16. Full Load Torque (FLT) :  
17. Starting Torque as % of FLT :  
18. Pullout Torque as % of FLT :  
19. FULL LOAD CURRENT (FLC) :  
20. Starting Current as % of FLC :  
21. Starting Time on Rated Load At :  
   • Rated Voltage :  
   • 85 % of Rated Voltage :  
22. Locked Rotor Withstand Time  
   • Cold :  
   • Hot :  
23. Rotation Viewed From Driving End  
24. Gd Square of Motor :
25 GD Square Of Driven Equipment:
26 Weight Of Motor :
27. Power Factor at
   (i) 50%Load :
   (ii) 75%Load :
   (iii) 100%Load :
28. Efficiency at
   (iv) 50%Load :
   (v) 75%Load :
   (iii) 100%Load :
29 Space Heater Watts/Volts :
30 Terminal Box Type & :
   No. of Terminals
31 No. of Starts Per Hour :
32 Noise Level at a Distance of 1m : From The Motor
33 Thermal Withstand Time :
34 Cooling :
35 Applicable Standard :
36 Location :
37 Hazardous Area Classification :
38. Bearing Details
   (i) Type of DE/NDE :
   (ii) Size of DE/NDE :
   (iii) Make :
39 Location of Terminal Box :
   Position From DE Side
40 Lubrication Type :
41 Cable Size :
42 Paint Shade :
43 G.A., Dimensions & Mounting : YES/NO
   Detail Drawings Enclosed
44 Details Drawings FoR T.B. : YES/NO
45 Performance Characteristics : YES/NO
   Curves Viz. Speed V/S Current & Speed V/S Torque Enclosed