3.0 BRIEF SYSTEM DESCRIPTION

The turnkey package of this Contract Document comprises of the following sub-systems:

1) **New Ore Handling Plant (OHP-II)** including receiving, unloading, Stacking & Reclaiming and finally transporting of Raw Material required for Blast Furnace #8, Sinter Plant-III.

2) New conveyor line for New Lime Dolomite plant RMP3 and for proposed SMS-III.

3) **Modifications/ up-gradations of existing equipment, including:**
   - An additional series of conveyor from OHP I to JH-20 and JH-42(Exst'g) parallel to existing route.
   - Up gradation of capacity of existing shuttle conveyors J9BRSC1.

3.1 New Ore Handling Plant (OHP-II)

The raw material to be handled by the proposed system is mainly, Iron Ore Lump, Iron Ore Fines, Lime Stone (BF grade), Lime Stone (SMS grade), Dolomite (BF grade), Dolomite (SMS grade), Quartzite, Manganese ore. These raw materials are mainly required for Blast Furnace, Sinter Plant, Lime-Dolomite Plant, SMS. All the raw materials will be received at the plant boundary by rail. The type of Wagon will be BOXN, BOXNHA, BOY, BOBRN, BOST, BOBS, BOXNEL, BOYL, BOXN HS etc which will transport the raw materials depending upon the location of loading and type of raw materials.

(i) **Design Considerations**

The Ore Handling Plant (OHP-II) has been planned based on the following assumption:

**A. Size of Raw Material**

1. Lump Iron Ore : -40 mm
2. Iron ore fines : -8 mm
3. Lime Stone (BF/SP grade) : -60 mm
4. Dolomite (BF/SP grade) : -60 mm
5. Quartzite : -50 mm
6. Lime Stone (SMS grade) : -25 mm
7. Dolomite (SMS grade) : -25 mm
8. Pellets : -18 mm
9. Manganese Ore : -25 mm
10. Coke Breeze : -25 mm

**B. No of Days of Working per year:** 330 days

**C.** Maximum material carrying capacity of each wagon shall be as per IS: 10095-1982 reaffirmed 2001. Iron-ore-lump will be received in Track-Hopper & all other
material in Wagon Tipplers. Two Track Hoppers have been considered for materials received in BOBS/BOBRN wagons (mainly iron-ore), whereas wagon tippler with side arm charger has been considered for unloading the materials received in BOXN/BOST/BOXNHA/BOY/BOBS, BOXNEL, BOYL wagons.

(ii) UNLOADING, STORAGE, BLENDING AND RECLAIMING IN OHP-II

One number Wagon tippler WT no.B1 along with a Track Hopper TH-B1 with two parallel tracks on it have been envisaged for unloading Iron ore (lump and fines), Limestone & Dolomite (both BF grade and Sinter Plant grade), Mn-ore, Quartzite etc. The Wagon Tippler shall be of Rota-side type capable of unloading BOXN and proposed BOXNHA ,BOXNHS, BOBS, BOY wagons as per IS:10095-1982, reaffirmed 2001. The rated unloading capacity shall be rated 20 Tips/hour. Adequate system of handling sticky rakes such as vibrator/air blaster shall be provided.

25t wagon axle load and 110t gross weight of wagons (BOX, BOXN, BOXN HA, BOXN HS, BOXN EL, BOYEL) to be considered for design of Wagon Tippler and track hopper. 2 nos. Weighbridges included in contractor’s scope. The location of Weigh Bridge shall presently be considered at entry of pre hopper yard. However as the total railway track is being engineered by RITES, the location of Weigh Bridge may undergo change in detailed engineering stage. The drawings of wagon tippler/track hopper shall be subjected to approval by RITES/SECR/RDSO as applicable.

The placement of rakes shall be done by Side arm chargers capable of handling a full rake BOXN, BOXNHA, BOBS, BOY, BOXNEL, BOYEL wagons.

Two nos. of track hopper each of length 210 m excluding maintenance bay and holding capacity of 6000 t each considering material of bulk density of 1.6 t/ cu.m. shall be included in contractor’s scope. The side angle of hopper with vertical shall be minimum 60 deg. Each hopper shall have four compartments. Track hopper envisaged to accommodate minimum 18 BOBS wagons. Contractor to maintain sufficient height of the track hopper superstructure to take care of OHE.

Total 4 nos. Electric hoist of 5 t capacity shall be provided for maintenance of Paddle Feeder at both ends of Track Hopper building. Two nos. double door pressurized cabin shall be provided for paddle feeder inside the track hopper tunnel. Anti-derailment device/check rail shall be provided in the track hopper subject to approval of RITES. Supply / Laying of 60 kg/ m rail with continuous MS insert plate within track hopper building only are in scope of contractor.

In addition to the above, one dedicated compressor station at track hopper TH-B1 for unloading of BOBRN wagons is to be provided. Compressed air connection to BOBRN wagons to be provided at 15 mts interval. The details of requirement of compressed air, the pressure and type shall be obtained from RDSO. Other points as applicable for compressed air station shall be considered as per CS for compressed air facilities indicated elsewhere.

Provision of adequate illumination should be there on both pre & post tippler as well as on Merry Go Round circuit.

Two belt feeders below Wagon Tippler shall discharge the raw material on either of two conveyors i.e. Z1-C1 or Z1-C2 which, in turn will discharge the material at Jn House JH-Z1. From Jn House JH-Z1, conveyors Z3-C1 & Z3-C2 will carry the material and discharge at JH-Z3. There will be three incoming conveyors in Junction House JH-Z3. The tail end of two conveyors Z3-C1 & Z3-C2 will start from JH-Z1 and Belt conveyor Z3-C3 from JH-Z2. Junction house JH-Z2 shall be located in between the JH-Z1 & JH-Z3.

The track hopper with four nos. paddle feeders of 1500 tph each, two on conveyors Z2-C1 and two on conv Z2-C2 has been envisaged. From Jn. House JH-Z2, either of
three conveyors Z3-C1, Z3-C2 (coming from JH-Z1) & Z3-C3 (begin from JH-Z2) shall carry the material upto Jn house JH -Z3. Reversible shuttle conveyors Z2RSC1/2 at JH-Z2 will facilitate to discharge the material on either of any three conveyors. Therefore, JH-Z2 shall be designed suitably so as to receive material from any of the conveyors coming from Track Hoppers. Non sticky liners/ polymer liners are to be fixed in the track hoppers to improve flowability.

Suitable interchangeability shall be provided below Wagon Tipplers and Track Hoppers for the conveyors by providing Diverter gates.

In Jn House Z3, three nos. Reversible Shuttle conveyors no. Z3-RSC1,2&3 can feed any one of conveyor no. Z6C1, Z6C2 and Z6C3. Contractor to provide jumbo gallery suitable for three nos. mobile trippers up to JH-Z5 from JH Z4 over conveyors Z6C1, Z6C2 and Z6C3. Out of three trippers, two nos. (Over conv. Z6C2 and Z6C3) shall extend upto JH-Z6 and one no. shall have provision of extension up to junction house coming in future. Maintenance hoist of minimum 5t cap shall be provided for the trippers. Each of the three conveyors Z6C1, Z6C2 and Z6C3 shall be capable of feeding the stacking conv. Z4BC1 as well as itself in JH Z4 and stacking conv. Z5BC1 as well as itself in JH Z5. Each of the two conveyors Z6C2 and Z6C3 shall be capable of feeding the stacking conv. Z6BC1 as well as future conveyor in Junction House –JH-Z6.

The raw material can be either transported via. Jn House Z4, Z5 or Z6 to the respective stacking conveyors Z4B-C1, Z5B-C1 & Z6B-C1 for stockpiling or can be fed directly to the reclaiming conveyors Z7-C1/ Z7-C2 which means convey material directly from the WT/ Track Hopper to:

(a) To the Blast Furnace#8 Stock House
(b) To the Fuel & Flux crushing circuit of Sinter Plant-III.

Suitable interchangeability shall be provided at Junction house JH-Z4, 5 & 6 for the conveyors by providing 2-way chutes in mobile tripper. 5T Electric hoist each shall be provided at JH-Z5 & JH-Z6. Whereas, JH-Z4 shall be designed only as a transfer point.

The Stacking conveyors Z4B-C1, Z5B-C1 & Z6B-C1 can form a stockpile 30m wide, 350m long and 10.5 m (maximum) high with the help of Twin boom stackers.

Suitable number of electrically operated Under-Slung Cranes, Hoists etc. shall be provided in all floors of Junction Houses and building for maintenance of equipment. Electro-Magnetic Separators, In-Line Magnetic Separators, Metal Detectors, Belt-Weigh-Scales, Air-Blasters/ Bin Vibrators shall be provided to make the system complete and the operation/ maintenance smooth.

(iii) STORAGE AND RECLAMATION OF ORE

From the Wagon Tipplers WT-B1 and the Track Hopper TH-B1, the raw material may sometimes be fed directly to the consuming plant in case of emergency. However, this shall not happen under normal circumstances, when the three Twin-boom stackers over conveyors Z4B-C1, Z5B-C1 & Z6B-C1 store the raw material in the designated place of the yard in bed nos. 1 to 6. Flexibility shall be in built in the Jn Houses Z4, Z5, & Z6 to ensure stacking is trouble free.

Bed blending system shall be possible with the stacker running to and fro on the length of the pile -or- on a length between two defined position in case more than one material is stored in a bed marked by travel limit switches, which through a relay sequencing circuit, with time control-reverses the traveling gear after the travel in each direction covering the desired length of the pile. After a layer of some pre -
determined amount is deposited in one traveling direction of the stacker, probes fitted on the stacker boom gives it a “raise” signal as soon as a net height of material is formed. The next layer is then formed.

Iron ore may require stockpile formation as described above for blending and uniformity. However, the emphasis on blending shall be for iron ore fines which shall be blended while stacking.

Four nos Bucket-wheel reclaimers have been envisaged for bed no. 1 to 6.

All stacking line conveyors feeders and stackers etc. shall have a rated capacity of 1500 tph & a designed capacity of 1800 tph.

All reclaim line equipment shall have a rated capacity of 1500 tph and a designed capacity of 1800 tph in the ore handling area.

Reclamation takes place by the conveyors Z7-C3 (Bed no. 1), Z4A-C1 (Bed 2or 3), Z5A-C1 (Bed no.4 or 5) and Z6A-C1 (Bed no. 6) and the reclaimed material via Jn House Z4A, B, Z5A, B, Z6A and Z6B shall reach Jn House Z7. Two reclaim conveyors Z7-C1 and Z7-C2 between Z6A to Z7 will receive all the materials from yard for further transportation.

Reclamation from OHP takes place for the following circumstances:-

- Feeding of iron ore lump, dolomite, limestone, manganese, quartzite, pellet etc. to BF#8 stock house.
- Transporting Limestone/ Dolomite (SP grade) and iron-ore fines to fuel & flux crushing area for Sinter Plant-III.

Two streams of belt conveyors shall reclaim the material from new OHP-B yard to above places. Belt conveyor Z7-C1 & C2 shall carry the material and transport thru Z8-C1, C2, Z9-C1, C2, Z10-C1, C2 to Z11-C1& C2 to Junction house JH-Z11. Junction House-Z11 can discharge the material either to existing conveyors R103/ R104 of Sinter Plant-III or proposed conveyor Z12-C1/ C2 of BF#8, with the help of reversible conveyors. To receive the material from Z11-C1 & C2, suitable modification in existing gallery of R103 & R104 is required. Also a junction house JH-Z11 with two reversible conveyors & tail end of belt conveyors Z12-C1 & C2 shall be erected above these conveyors. Further, conveyor Z12-C1 & C2 and then Z13-C1 & C2 shall move towards stock house of BF#8 and discharge at JH-Z15 onto reversible shuttle conveyors J15RSC1/2. The gallery from JH-Z14 to JH-Z15 shall have provision for installation of three identical conveyors i.e. Z15-C1, Z15-C2 and future conveyor Z15-C3. Suitable insert plate/ foundation bolts shall be provided for future conveyor Z15-C3. However, future conveyor Z15-C3 is not in scope of contractor.

**Specification of future conveyor:**

Length ~ 35 m: Lift 0.0 m: Capacity 1200 tph: Belt width ~ 1400mm

Centre to centre distance from Z15C2 – 3010 mm

A junction house JH-Z14 shall be provided in between the junction houses JH-Z13 & JH-Z15. Two series of belt conveyors shall discharge the Sinter at the Junction House Z14 over belt conveyor Z15-C1 & C2. Junction House JH-Z14 and conveyors Z14-C1/C2 shall be in the scope of Employer i.e. BSP.

Suitable Junction houses with RCC floors, diverter gates & galleries shall be provided to transfer the material from one conveyor to another. The scope of contractor shall finish at JH-Z15 with complete drive and discharge (including reversible shuttle conveyor) facilities. The receiving belt conveyor below Z15-C1 & C2 shall be in the scope of Employer i.e. BSP. However, JH-Z15 shall have a provision (inserts/foundation bolts) to erect outgoing conveyors to Stock House.
3.2 OTHER ADDITIONS/ MODIFICATIONS AND UPGRADATION IN EXISTING OHP

**(REF. DRG. NO. MEC/S/9101/11/17/00/00/061.B01/ R2)**

(i) **An Additional series of conveyor from OHP to J-20 and JH-42(Exst’g)**

Another proposed conveyor No J9-C1 parallel to J9-C3/J9-C4, besides conveyors R-102, shall start from Jn. House JH-9B and shall discharge the material in a proposed conveyor J9H-C1 in existing JH-9, which in turn feeds to conveyor J10-C2 in new Junction house JH-9H. Conv J10-C2 can feed proposed conveyor J11-C3, J11-RC2, J14-C2/J12-C2 (Exst’g), J15-C2. Conv J15-C2 shall feed new reversible conv J15-RC1 in junction house JH-15, which in turn can feed either existing SMS-II feeding conv. J15A-C1 or new conv. J15B-C1. Conv. J15B-C1 or another new conv. J15B-C2 which shall receive sinter from existing conv. SS-10 shall feed new conveyor J16-C3 in new junction house JH-15B which in turn shall discharge onto new conv. J16-C3A in new junction house JH-16A. Conv. J16-C3A shall discharge onto new conv. J17-C3 in JH-16A which shall convey material to conveyor J17A-C1 in JH-17(exst’g). Conveyor J17A C1 (Capacity 1500tph) shall discharge to either of the two conveyors J20C3 or J17B-C1 through a adjustable flap gate in junction house J17A. Further J17B-C1 shall discharge the material over J42-C2 in JH-17B. The capacity of the outgoing conveyors J20C3 and J17B-C1/J42C2 shall be 500tph and 1000tph respectively. Conveyor J20-C3 shall be provided with one no. belt weigh scale and have provision of discharging onto existing sinter carrying conveyor J27-C5 (Exst’g) in junction house JH-20 (Exst’g). Conveyor J42-C2 shall have provision of discharging onto existing conveyor J44-C5 in junction house J42 (Exst’g). Necessary modification/strengthening shall be carried out in junction house J42 to take care of additional loads by new conveyor. Suitable electrical interlock shall be provided between the conveyors J27-C5 & J20-C3 in junction house JH-20 to trip all the incoming conveyors in case feed rate exceeds capacity (500tph) of the corresponding downstream conveyor J27-C5. Similar interlock shall also be provided between J44-C5 & J44-C2 in junction house JH-42 to avoid any spillage/chute blockage.

These additional conveyors with gate will facilitate a new additional route for BF # 7.


(ii) **Up gradation of Reclaiming conveyors**

The capacity up-gradation and utilization of reclaim conveyors are of utmost importance to ensure smooth operation in the OHP.

The list of conveyors in the reclaiming circuit that shall be upgraded to 1500 tph are given in table 03.01.

<table>
<thead>
<tr>
<th>SL No</th>
<th>CONVEYOR NO</th>
<th>EXISTING</th>
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<td></td>
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<tr>
<td>1</td>
<td>J9B-RSC1</td>
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<td>500 m³/hr</td>
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| Table 03.01 |
The capacity of all Belt conveyors shall be 1500tph for all raw materials viz. iron ore, limestone, dolomite with 1400mm belt width and belt speed shall be 2.0 m/s with a troughing angle of 35°. (Bulk density of raw material shall be considered as 2.2 t/m³ for power calculation/load data of structures and 1.6 t/m³ for volumetric capacity calculation of conveyor)

### 3.3 NEW LIME DOLO PLANT (RMP III) AND SMS III CIRCUIT

Existing conveyor R-101/R-102 shall be utilized to convey raw material required for Lime/Dolo Calcination plant RMP III and of SMS-III by tapping the conveyor from Jn house JH-N102 (With suitable modification in the Jn House) and taking a new route to the proposed Lime/Dolo calcination plant/SMSIII. Any civil work related to installation of new conveyors in existing junction house JN#102 shall be contractor's scope.

The SMS grade limestone, dolomite and iron ore in existing OHP-I shall be reclaimed via. Jn House N101, N102. Existing Belt Conveyors R101/102 coming from OHP-I shall now mostly carry Lime stone and dolomite. In JH-N102, two existing reversible conveyor R103A & R104A are having a provision for taking material to Sinter plant III as well as proposed Lime Plant. A discharge chute below R103A & R104A to feed at the tail end of proposed belt conveyor L1C1 shall be provided at Junction house J-N102. Belt conveyor L1C1 shall discharge the material on L2C1 in junction house JH-L2. Conv L2C1 discharges onto conveyor L3C1 which discharges onto L4C1 in JH-L3.Conv L3C1 in turn discharge material at Junction House JH-L4 to any of the two conveyors i.e. L5C1 & L7C1 with the help of diverter Gate.

Thereafter, conveyor L7C1 will carry the material and transfer onto conveyor L9C1. Conveyor L9C1 will carry the material up to Surge Bin building JHL9 through reversible shuttle conv. JL9RSC1. Surge bin building JHL9 shall have 3 nos. bunkers of minimum geometric capacity 190 cub m each for storing iron ore lump/limestone/bauxite. Suitable rod gate and motorized rack and pinion gates shall be fitted at the bottom of bunkers. Three (3) nos. VVF controlled vibro feeders of 420 tph capacity each shall withdraw material from bunker and discharge it onto conveyor L10C1 which shall convey up to Junction house JH L10 for onward transportation to Surge Bin Building for SMS-III (Surge bins with Vibro-feeder as shown in flow diagram at JH-L9 are in contractor’s scope.) through SMS feeding conveyor. Conveyor L10C1 complete with discharge facilities and junction house JH L10 shall be in the scope of contractor and SMS feeding conveyor shall be in the scope of employer.

The other conveyor L5C1 shall receive material from conveyor L4C1 and discharge at JH-L5 on to conv. L6C1 which shall convey up to junction house JH-L6 and discharge onto lime plant feeding conveyor for onward transport to Lime & Dolomite calcination plant RMP III. Conveyor L6C1 complete with discharge facilities and junction house JH L6 shall be in the scope of contractor. However lime plant feeding conveyor shall be in the scope of employer i.e. BSP.

Calcined lime/dolomite is received from the day bins of lime/dolo product storage building of RMP III onto conveyor L8C1.Conv. L8C1 discharges onto conv. L9C2 in JH L8 which in turn discharges onto conveyor L10C1 in Surge Bin building JH L9. This finished product of RMP III is transported to the junction house JH L10 by conveyors L10C1 which shall also carry limestone, bauxite, iron ore received directly from OHP I yard to SMS III. The scope of contractor starts from tail end on conveyor L8C1 including skirt boards.

A fixed hopper of 8 cub m capacity on conveyor L10C1 near JH L9 with VVF controlled vibro feeder of 420 tph capacity shall also be used to transport coke fines as and when required in the storage bins of the bulk material charging system of SMS III. Any other material e.g limestone/ DRI can also be transported under emergency conditions through fixed hopper. Suitable ramp shall be provided to unload the material over hopper.
3.4 Two separate **Automatic Sampling system** complete with sample cutter, collection, sizing, crushing and grinding shall be provided for the RMHS system.

3.5 **DRAWINGS**

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<thead>
<tr>
<th>Sl. No.</th>
<th>Drawing No.</th>
<th>Title</th>
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<tr>
<td>1.</td>
<td>MEC/S/9101/11/17/0/00/00/061.B01/R3  (Sheet 1 of 2)</td>
<td>FLOW DIAGRAM</td>
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<td>FLOW DIAGRAM</td>
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<td>3.</td>
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<td>LAYOUT PLAN</td>
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