01.0 HANDLING AND HOISTING EQUIPMENTS

01.1 General

Handling and hoisting equipment shall include the following:

(a) Single Girder EOT / Underslung cranes (moving on rails) for each building along with side walkways on both sides with handrails.

(b) In addition to the above, if other hoisting and handling equipment are required as per Specification below, the same shall be included in the offer.

All the equipment mentioned above shall be complete with all its accessories and attachments, monorails, supporting structure, power supply, safety devices, controls etc.

The detailed Technical Specification of the above equipments shall be as per Specification given below:

Tenderer shall note the following:

i) Tentative quantities, locations and the type of equipment are indicated in the table.

ii) Height of lift, hook approach, length of travel etc. shall be finalized to suit the equipment / shop layout to be maintained or handled.

01.2 Indicative Technical Details of Handling & Hoisting equipment :

Sl. No.	Description	Qty.	Location	Remarks
1..	SG EOT / Underslung crane	As required	Compressor building	Pendant Operated
2.	SG EOT / Underslung crane	As required	Blower room	Pendant Operated
3.	SG EOT / Underslung crane	As required	Above silos	Pendant Operated
4.	Manual hoists as required (Both capacity wise & Quantity wise) as per Specification given below			
5.	Electric hoists as required (Both capacity wise & Quantity wise) as per Specification given below			
Note: - a/ The requirements of handling Equipment are only indicative (Minimum). All handling equipment to meet the process and maintenance requirement of technological process units as well as services units based on heaviest equipment part.				

Sl. No.	Description	Qty.	Location	Remarks
	b/ The no. of hoists will be finalised during Basic Engineering and additional quantity will be considered depending upon system and maintenance requirements. Any additional cranes/ hoists required during detail engineering for maintenance of the plant and equipment will be supplied by the contractor. c/ The lifting height of all the cranes/ hoists will be suitable to approach all the equipment to be maintained, whether on ground or pit. (As applicable). d/ The hook approaches of the cranes and hoists will be minimum and suitable to approach all the equipment planned in the building/ installation.			

01.3 **Scope of Work**

The scope of work of the bidder includes design, engineering, manufacturer, assembly, shop testing, painting at manufacturer's shop as well as at site after erection, supply including dismantling for transportation, packing, loading and transportation, receipt, unloading, storage and re-conservations at site, erection, testing and commissioning. Crane rail & its guide will also in the scope of Supply of the bidder.

01.4 The Hoisting and Handling equipments shall be procured from preferred makes for the project

02.00 Specification for Hoisting & Handling Facilities:-

Hoisting and handling Facilities shall be envisaged and supplied according to following principle, if technical parameters of hoisting equipment are not indicated, otherwise shall be provided according to specified parameters :-

a/ All Equipment/parts heavier than 100 kg shall be provided with mechanised handling facilities.

b/ The capacity of the handling equipment shall be 1.2 times the single largest weight to be handled.

c/ Manual Hoist shall be used for items weighing 100 Kg to 2000 Kg and height of lift Less than 10 m.

d/ If height of lift is equal to or more than 10 m, Electric Hoist will be used, irrespective of capacity of the hoisting equipment.

e/ Electric Hoist shall be used for items weighing more than 2000 Kg irrespective of height of lift.

f/ If wider area is to be covered by single hoisting equipment , Under slung crane or Over head crane shall be used

g/ HOT/ manual Underslung Crane shall be used for items weighing 100 Kg to 2000 Kg and height of lift Less than 10 m.

h/ If height of lift is equal to or more than 10 m, EOT/ Electric Underslung will be used, irrespective of capacity of the hoisting equipment

i/ EOT/ Electric Underslung shall be used for items weighing more than 2000 Kg irrespective of height of lift.

j/ Below 10000 kg capacity Single girder crane shall be supplied. For 10000 Kg or above Double Girder EOT crane shall be supplied.

k/ The list of hoisting equipment along with weight of parts to be lifted shall be furnished along with the offer

03.00 SINGLE GIRDER EOT/US CRANE

03.01 The **scope of work** of the Tenderer shall consist of design, manufacture, inspection, assembly, and painting at manufacturer's shop as well as at site after erection, supply and transportation to site, unloading and re-conservation at site, erection testing & commissioning of Single Girder EOT / Under Slung Cranes of various capacity.

03.02 Technical Specification

- Single girder cranes shall be designed, manufactured, assembled and tested in accordance with the latest revision of IS:807, IS:3177, IS:3938 and other relevant codes and practices for the cranes to be used in steel plants.

- The components of the hoist shall be designed, manufactured, assembled and tested in accordance with the latest revision of IS:3938 and shall be of standard make.

- All working parts requiring replacement or inspection or lubrication shall be easily accessible without the need for dismantling of other equipment or structure.

- All electrical cables shall be so laid that they are not liable to be damaged and can be easily inspected and tested.

- For out-door cranes all electrical and mechanical components which are exposed to weather shall be completely covered or made weather proof. The covers shall be in segments to facilitate easy dismantling and assembly.

- No cast iron parts shall be used except for electrical equipment and no wood or other combustible material shall be used unless specifically mentioned otherwise.

- Where down shop leads are located below runway rails, guard shall be provided on the crane to prevent the hoist ropes from coming in contact with down shop leads.

- All bolts except those with nyloc nuts shall be provided with grip lock nuts or spring washers.

- All trailing cables shall be clamped with PVC or non-metallic clamps.

- Steel frames carrying machinery shall be machined to true surface.

- All gears and bearings shall be lubricated by splash lubrication/ grease as required. All greasing points shall be easily accessible.

- C- type Maintenance platform of adequate size shall be provided at one of the gable ends., 2m below the bottom of monorail / top of rail for maintenance of cranes.

03.03 Structural Design

- The crane structure shall be designed in accordance with the latest revision of IS:807.
- The bridge girder shall consist of main and an auxiliary structure where necessary.
- End-carriages shall be fabricated from rolled steel sections or plates, or both, welded together to form a box.
- End-carriages shall be of ample strength to resist all stresses likely to be imposed on them under severe conditions, including collision with other cranes or stops. The length of the end-carriage shall be such that no other part of the crane is damaged in collision.
- The end-carriage shall be fitted with safety stops to prevent the crane from falling more than 25 mm in the event of breakage of a track wheel or axle. Suitable jacking pads shall be provided on each end-carriage for jacking up the crane while changing track wheels.
- For single girder EOT cranes with central L.T. drive, full length M.S. chequered plate platform shall be provided along the bridge girder for mounting and access to long travel drive, current collection system, control panels, etc. A clear head-room of minimum 2000 mm shall be made available over the top of platform from the bottom cord of the roof truss.
- Black bolts shall not be used in the load bearing structures of the crane. Also high tensile friction grip bolts shall not be used unless approved by the Purchaser.
- Bolts used in shear shall be fitted into reamed holes.
- Transverse fillet welding on the load carrying members shall be avoided.
- All butt welds on structural members, subject to tensile stress, shall be x-rayed.
- Plates, bars, angles and where practicable, other rolled sections used in the load bearing members of the structure shall not be less than 6 mm thick.
- Steel sections and plates, used for construction shall be of the latest revision of IS:2062 quality.

03.04 Mechanical Equipment

a. Design of Mechanisms

Each mechanism of the crane shall be modular in construction with built in facilities for easy dismantling and maintenance of each assembly as an independent unit.

b. Rope Drums

Fabricated rope drum shall be stress relieved before machining. For the cranes used in steel plants, the material of the rope drum shall be limited to C.S. / M.S.

c. **Wire Rope**

The wire ropes shall be regular right hand lay hemp cores as per IS: 2266/1989. However, ropes working under water and in corrosive atmosphere shall be galvanized and shall have steel core. For rope arrangement with 2 falls, wire rope shall be of non-spinning type. For the cranes in steel plant, selection of wire rope shall be as per IPSS.

d. **Rope Guides**

Suitably designed rope guides with pressure ring/ rope tightener shall be provided for each lead of rope from the rope drum to prevent the rope from overriding, loosening or rope coming off the groove.

e. **Rope sheaves**

For cranes in steel plants, material shall be either CS/MS. Bottom block sheaves shall be provided with suitable guards to retain the rope in the sheave groove. Equalizer sheave/ bar shall be arranged to turn and swivel to maintain rope alignment under all circumstances.

f. **Wheels**

For single girder EOT cranes, the wheels for long travel motion shall be double flanged with straight tread. The width of wheel tread shall be greater than the rail head by 30 mm. For under slung cranes hoists block, the wheels shall be single flanged with straight/ taper tread to suit the track beams. Minimum diameter of the LT wheels for S.G. EOT cranes shall be 320 mm. However, in case of steel plant duty cranes the combination of wheel diameter and rail size shall be ensured. Wheels shall be of forged/ rolled/ cast steel with minimum hardness of 200 BHN in case of single girder under slung cranes running on rolled steel joist and 300 BHN for EOT cranes and for under slung cranes/ hoists running on wear resistant flats welded to rolled steel joists. Minimum diameter of CT & LT wheels for under slung cranes shall be 150 mm.

g. **Long Travel Drive**

a) For Single girder EOT Cranes

Individual wheel drive (one wheel in each end-carriage) shall be provided when the crane span exceeds 13 meters. All parts of the long travel drive shall be located above the platform and easily accessible. The gear-box mounted on platform with foot mounted motor and brake shall be connected with driving wheel by means of locating shaft and flexible geared coupling. The use of open gearing, chain and sprocket, pulley and belt etc. is not permitted.

b) For under Slung Cranes

Dual drive arrangement located at either end of each end carriage shall be provided. Flange mounted geared motors may also be used.

h. **Hoist and Cross-Travel Drive**

The hoist and cross travel motions shall be combined in one block which shall be designed as per IS:3938/1983. It shall be ensured that skidding does not occur under any condition. (REFER SPECIFICATION FOR ELECTRIC HOISTS BELOW)

i. **Gearing and Gear-boxes**

Straight and helical spur gearing in metric module shall be used for all motions. Worm gearing shall not be used. All gears shall be of hardened and tempered alloy steel with machine cut teeth. Hardness for pinion shall be 220 BHN and for gears it shall be 200 BHN. All gearings shall be enclosed in oil tight gear-boxes. Fabricated gear-boxes shall be stress relieved before machining.

j. **Bearings and Bearing Housing**

Ball and roller anti-friction bearings shall be used throughout unless otherwise specified. Anti-friction spherical roller bearings shall be provided for live axles of travel wheels. Housings shall be split on shaft centre line to permit removal of the shaft. The underside of the base of each bearing pedestal shall be machined and shall bear upon a machined surface.

k. **Couplings**

Flexible coupling shall be used between the LT motor and gear-box and between gear-box out put shaft and wheel shaft. In case of single motor central drive for LT motion, out put shaft of the gear-box shall be connected through solid flange couplings. Half-geared couplings with floating shaft shall be provided between the wheel and the line shaft.

l. **Hook Blocks**

Hook blocks shall be of enclosed type leaving openings for ropes only so that ropes do not run off the sheaves. Standard swiveling shank hooks, mounted on thrust bearings shall be used unless otherwise specified.

m. **Brakes**

Electro-magnetic brakes shall be provided for each motion on the high speed pinion shaft of the gear-train.

n. **Buffers**

The crane shall be provided with rubber buffers on the four corners of the end-carriages unless otherwise specified. For electrically operated hoists, steel stops at all the four ends of the track beam shall be provided.

03.05 DOCUMENTATION

1. Drawings and documents to be submitted by the Tenderer with Tender

The tenderer shall submit adequate sets of following technical drawings & technical data/ information with tender for cranes without which the tender shall be considered as incomplete & may not be considered for acceptance.

- General Arrangement drawings of cranes/ hoists / attachments & signed copies of Clearance diagram me

- Duly filled in questionnaire

2. List of Drawing/ Documents to be furnished by the Successful Tenderer for approval / reference

a) General Arrangement drawings of cranes/ hoists / attcchments & signed copies of Clearance diagramme
a) Quality assurance plan for inspection.
b) Specification of oils and lubricants and other consumables and their quantity and frequency of change.
c) Detailed layout plan and sections for power supply system. (Angle Bus bar/Shrouded Bus Bar/ Festoon Cable etc.)
d) DSL / Trolley line arrangement layout.

3. List of Drawings/ Documents to be furnished alongwith equipment by the Successful Tenderer

01. Requisite no. of sets of all GA drawings, complete assembly and sub assembly drawings of the equipment.
02. Drawing of all equipment/ component received from sub supplier.
03. Engineering and design calculations.
04. Test and warranty certificate for each item of equipment.
05. Detailed erection schedule and manuals, assembly/ erection drawings, erection sequence, special precautions to be followed during assembly/ erection (these shall be despatched three months prior to FOT/FOR delivery).
06. Test reports and inspection reports.
07. Instruction manuals for testing and commissioning.
08. Operation, maintenance and safety manuals.
09. Requirement of special tools and tackles, if any, for subsequent maintenance.
10. Detail drawing and specifications of all wearing out parts and parts subject to breakage during normal operating conditions (two sets and one reproducible and/or two sets of catalogues).
11. List of spare parts with drawings, sketches, specifications and manufacturer's catalogue (two sets and one reproducible and/ or two sets of catalogues)
12. All other drawings and documents as stipulated in General Conditions of Contract.

03.06 QUESTIONNAIRE (SG EOT/US CRANE)

i/	Crane No.	:	
ii/	Nos. off		:
iii/	Type of crane	:	
iv/	Capacity (t)	:	
v/	Span (m)	:	
vi/	Duty class	:	
vii/	Location	:	
viii/	**Hoists :**		
	a) Speed with safe working load, m/min	:	
	b) No. of rope falls supporting the load and specification of rope	:	
	c) Lift of hook above floor, m	:	
	d) Drop of hook below floor, m	:	
	e) kW of motor at specified rating	:	
	f) RPM of motor	:	
	g) Make, type and size of brake	:	
ix/	**Cross - travel**		
	a) Speed with working load, m/min	:	
	b) Wheel base, mm	:	
	c) No. of wheels	:	
	d) kW of motor at specified speed	:	
	e) RPM of motor	:	
	f) Make, type and size of brake	:	
x/	**Bridge**		
	a) Speed with safe working load, m/min	:	
	b) Wheel base, mm	:	
	c) No. of wheel on each end-carriage	:	
	d) Diameter of wheel, mm	:	
	e) Maximum wheel load, kg	:	
	f) No. of motors	:	
	g) kW of motor at specified rating	:	
	h) RPM of motor	:	
	i) Make, type and size of brake	:	
xi/	Power supply	:	
xii/	Control voltage	:	
xiii/	Made and type of control	:	
xiv/	Total weight of crane, t	:	
xv/	Total weight of hoist, t	:	
xvi/	Break-up of crane weight, t	:	
	a) Structural	:	
	b) Mechanical	:	
	c) Electrical	:	
xvii/	General arrangement drawing showing details as enumerated	:	
xviii/	List of deviations from the Purchaser's Specification.	:	

04.00 ELECTRIC HOIST

04.01 **The scope of work** of the Tenderer shall consist of design, manufacture, inspection, assembly, and painting at manufacturer's shop as well as at site after erection, supply and transportation to site, unloading and re-conservation at site, erection testing & commissioning of Electric hoist of various capacity.

04.02 TECHNICAL SPECIFICATION

a) The hoist shall be designed in accordance with IS:3938-1983.

b) For outdoor hoists, motors, brakes & other equipment shall be covered to suit to outdoor operations.

c) All trailing cables shall be clamped with PVC or non-metallic clamps.

d) Defects in the materials like fractures, cracks, blowholes, or laminations are not allowed.

e) No cast iron parts shall be used except for electrical equipments and no wood or combustible material shall be used unless specifically mentioned otherwise.

f) All working parts requiring replacements or inspection or lubrication shall be easily accessible without the need for dismantling of other equipment or structure.

g) All bolts except those with nyloc nuts shall be provided with grip lock nuts or spring washer.

h) All parts of the hoist shall be thoroughly cleaned of all loose mill scales, rust or foreign matter & then painted as specified. All parts inaccessible after assembly shall be painted before assembly & assembled while paint is still wet.

i) All parts except motors, resistors, gears, thrustors, solenoids, etc. shall be de-rusted manually & painted as follows:

04.03 Mechanical details

01. Wheel & drive

The electric hoist shall run on two pairs of wheels, a pair of which shall be driven by motor through reduction gear. The wheels shall be of cast steel/forged steel, single flanged with taper / parallel treads to suit to monorail. The wheels shall be mounted on anti-friction bearings & shall be easily removable for repair & replacement. The wheel diameter shall be selected such that skidding does not take place even under unloaded condition.

02. Hoist mechanism

The hoist mechanism shall consist of a bottom block fitted with a standard forged swivel hook of the specified capacity, supported on 2 or 4 falls of wire rope. However, non-spinning type of wire rope shall be used for 2 falls rope

arrangement. The wire rope shall be wound on a grooved drum which shall be sufficiently long to accommodate in one layer the length of rope requisite for the specified lift & in addition not fewer than two turns at each anchored end & one spare groove at the opposite end. The hoist drum shall be motor driven through gears enclosed in oil filled reduction gearbox.

03. Gearing

Straight & helical spur gearing shall be used for all motions. Worm & bevel gears shall not be used with specific permission from purchaser. Preferably all first reduction gears shall have single helical teeth. All gears shall be hardened & tempered alloy or carbon steel with machine out teeth. Surface hardening of teeth is not acceptable. All gears shall be enclosed in oil filled gear box except when not possible.

04. Couplings

Each motor shall be connected to its gear drive by a flexible coupling.

05. Lubrication

All gears & bearings shall be lubricated either by splash lubrication or by grease. If possible, all the lubricating points shall be grouped together in easily accessible positions.

06. Bearings

Ball & roller antifriction bearings of reputed make shall only be used, with minimum bearing life as per IS: 3938.

07. Brakes

D.C. Electromagnetic brake shall be provided for each motion, however in case of conical rotor motors manufacturer's standard brake can be used.

08. The Electric hoists shall be inspected as per IS: 3938 - 1983 and as specified in GCC.

04.04 DOCUMENTATION

1. Drawings and documents to be submitted by the Tenderer with Tender

The tenderer shall submit adequate sets of following technical drawings & technical data/ information with tender for cranes without which the tender shall be considered as incomplete & may not be considered for acceptance.

a) General arrangement drawings of the Hoist with all technical parameters & details.
b) Duly filled in questionnaire.

2. List of Drawing/ Documents to be furnished by the Successful Tenderer for approval / reference

a) General arrangement drawing of equipment showing full details in plan and sections.
b) Quality assurance plan for inspection.
c) Specification of oils and lubricants and other consumables and their quantity and frequency of change (reference)
d) Detailed layout plan and sections for power supply system.

3. List of Drawings/ Documents to be furnished along with equipment by the Successful Tenderer

a) GA drawings, complete assembly and sub assembly drawings of the equipment.
b) Engineering and design calculations.
c) Test and warranty certificate for each item of equipment.
d) Test reports and inspection reports.
e) Instruction manuals for testing and commissioning.
f) Operation, maintenance and safety manuals.
g) Requirement of special tools and tackles, if any, for subsequent maintenance.
h) All other drawings and documents as stipulated in General Conditions of Contract.

04.05 QUESTIONNAIRE (ELECTRIC HOIST)

01 General

Item number :
Location :
Capacity :
Duty classification :
Total weight of hoist :
Make :

02 Hoist

Speeds with safe working load :
Lifting height :
a) Above floor level :
b) Below floor level :

Wire ropes
a) Type of construction :
b) Size :
c) Number of falls :
d) Factor of safety :

Rope drum :
a) Materials :
b) Diameter :

Drives

a) Type & material of gear box :
b) Gear & pinion :
c) Material & hardness :

Motors

a) Type & number :
b) Kw rating :
c) Synchronous speed :
d) Class of insulation :
e) Pull out torque :
f) Frame size :

Brakes :

a) Type :
b) Size :
c) Torque rating :

- Type & details of limit switches :
- Type of couplings :
- Type of bearings :

Lifting hook

a) Type :
b) Material :

- Type & details of control :

03 Trolley

- Speed with safe working load :

Wheels

a) Numbers :
b) Diameter :
c) Material & hardness :
d) Max. wheel load :
e) Wheel base :

Drive

a) Type & material of gear box :
b) Gears & pinions :
c) Material & hardness :
d) Kw rating :
e) Synchronous speed :
f) Class of insulation :
g) Pull out torque :
i) Frame size :

Brakes

a) Type :
b) Size :

c) Torque rating :

Type & details of limit switches :
Type of coupling :
Type of bearings :
Type & details of controls :

04 Clearance diagram indicating the basic dimensions :

05 Type & lubrication provided :

06 Type & size of cables :

07 Location & control details of hoist block power feeding arrangement :

05.00 MANUAL HOIST

05.01 The **scope of work** of the Tenderer shall consist of design, manufacture, inspection, assembly, and painting at manufacturer's shop as well as at site after erection, supply and transportation to site, unloading and re-conservation at site, erection testing & commissioning of manual hoist with traveling trolley of various capacity.

05.02 Technical Specification of Manual Hoist with Traveling Trolley

- Ball and roller anti frictional bearing only shall be used.
- Swiveling type standard shank hook mounted on grease lubricated anti-friction thrust bearing shall be used.
- The Chain Pulley Block shall conform to class-I duty as per IS: 3832-1986.
- Load chain & operating chain shall be of calibrated type.
- Pulley used for the operating mechanism shall have suitable guards to prevent the operating chain from coming out.
- All the open gearing shall have suitable cover.

05.03 DOCUMENTATION

1. Drawings/ Documents to be submitted with the tender.

The Tenderer shall submit the following technical drawings & technical data/ information with tender for manual hoist with traveling trolley, without which the tender shall be considered as incomplete & may not be considered for acceptance.

a) Typical General arrangement drawings & catalogues of the hoist.

b) The questionnaire filled in.

2. Final drawings/documents to be furnished along with the equipment :

a) General Arrangement drawings and all data /catalogues.

b) Supply of report on shop tests and material test certificate.

c) Supply of all operating manual, maintenance schedule & lubrication chart.

05.04 Questionnaire

1. Equipment No. :
2. Capacity :
3. Quantity :
4. Height of Lift :
5. Class of Duty :
6. Make :
7. Min^{m} Radius of Curvature Of Track beam size: :
8. Max. Tractive effort (Kgs)
   - Hoist :
   - Travel :
9. Movement in 'm' corresponding to operating chain movement of 30m.
   - Hoist :
   - Travel