

Memorandum Of Understanding

M/s BHEL
Trichy – 620 014

and

M/s. XXXXXXXXXXXXXXXXXXXX.
XXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXX
XXXXXXXXXXXX

(Vendor Code : XXXXX)

For supplying

Manually Operated Handling Equipment
(Item Code – 99HEM)

MOU NO : MOU / TPBHEL / M_HOIST- Rev.00
Date : 09-12-2013
Valid upto : 08-12-2015

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- 1.9 If any special or non-standard tools are required for installation, operation or maintenance, the same shall be supplied along with the hoists.
- 1.10 Trouble-free operation of the equipment shall be guaranteed for a period of 18 months from the date of commissioning OR 24 months from the date of dispatch whichever is earlier.
- 1.11 Vendor has to provide Bank Guarantee for 10% order value (as per BHEL format) valid for a period mentioned in point No.1.10.
- 1.12 Dispatch clearance will be issued along with PGMA with DU Nos. for the ordered items to vendor after the receipt of acceptable Inspection Report . Vendor agreed to mark the PGMA with DU Nos. in the casing of the packing and in the Packing Slip.
- 1.13 Materials shall be dispatched on "Door Delivery with or without Consignee Copy attached basis to avoid demurrage at transporter's godown.
- 1.14 Since the vendors works alone is approved by BHEL, it is agreed the vendor will manufacture this item in their own works only and will not off-load the jobs to any other suppliers without the written approval by BHEL.
- 1.15 All components of the hoists should be packed in such a way that it should not get damaged during transport.
- 1.16 BHEL and the Vendor shall have an involvement which will commence at bid stage and follow through the completion and acceptance, thus ensuring total conformity to Purchaser's requirements.

2.0 Technical Requirements:

- 2.1 *This purchase specification specifies the requirements for design, manufacture, inspection and testing at supplier's works and supply of manually (Hand) operated Trolley With Hoist (TWH), Ratchet lever, Under Hung Crane (UHC) and male & female interlock mechanism. For scope of supply, refer to Annexure II.*
- 2.2 *The trolley with hoist, under hung crane and interlock mechanism will be operating in normal ambient temperature range of 0 - 50°C. The atmosphere will be with excessive dust, heat, moisture and corrosive fumes.*
- 2.3 *The equipment shall be designed for operation suitable for **OUTDOOR DUTY** without any roofing above the equipment. The trolley with hoist / under hung crane shall be operated on monorail / runway beams of rolled or fabricated beam.*
- 2.4 *Technical parameters for equipment design are furnished in Annexure I. For scope of supply and special requirements refer to Annexure II. Annexure III comprises data*

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- 2.6.3 *All materials used for construction of different components shall individually conform to standards mentioned in clause 2.5*
- 2.7.0 **Hand operated chain pulley block, ratchet lever & under hung crane.**
- 2.7.1 **Frame:** *The Frame, crane girder and end carriage shall be designed for proper strength built from steel plates with bolted/welded construction (recommended material: IS 2062).*
- 2.7.2 **Gear & Pinions:** *Hand operated under hung crane and chain pulley block with trolley shall be supplied with helical / spur / worm gear. The gear shall be designed for surface durability and proper strength such as to afford efficient operation through out the period guaranteed by the manufacturers. In case of enclosed gearing, means shall be provided for ample lubrication. Such lubrication points are to be indicated along with specification of lubricant, market trade names, quantity of lubricant requirement and frequency of lubrication. Material of construction shall be conforming to relevant Indian standard or equivalent and casehardened. Hardness for CT & LT shall be minimum 250 BHN for pinions and 200 BHN for gears. Hardness for hoisting shall be in the range of 285 to 300BHN for pinions & minimum 250BHN for gears. However vendor shall maintain and ensure that gear hardness is always less than pinion hardness by at least 35BHN. Helical / spur gears only shall be used for hoists, CT & LT. All gears & pinions shall be examined by LPI / MPI for surface cracks after case hardening.*
- 2.7.3 **Gear Housing:** *Gear housing assembly consists of a fabricated housing in which gears are assembled (worm-worm wheel in case of worm wheel type and spur gear in case of spur gear type)*
- 2.7.4 **Load Brakes:** *Hand operated under hung crane and chain pulley block with trolley shall be provided with an automatic mechanical load brake, Ratchet & pawl type, which will prevent self lowering of the load and arrest and sustain load in all working positions. The load brake shall also allow smooth lowering of the load without serious overheating which may impair efficient working of the block.*
- The pawl and ratchet shall be made of steel and hardened and tempered to provide satisfactory degree of wear resistance. Hardness shall be minimum 375BHN for Pawl & minimum 300BHN for Ratchet. However vendor shall maintain and ensure that ratchet hardness is always less than pawl hardness by at least 50BHN. Material shall be of 45C8 - IS2004 & IS 4368 or equivalent. Supplier shall indicate material specification and provide material test certificates for compliance.*
- 2.7.5 **Bearing:** *Only antifriction bearings of reputed make shall be used. Supplier shall specify the make of the bearings used in the offer (make shall be of TATA, SKF, NBC, FAG, PRECISION).*

2.7.11.1 Trolley / under hung crane wheels shall be designed to suit the monorail / runway beam size and profile decided by purchaser (which will be furnished during drawing approval stage).

2.7.11.2 Shall be made out of forged or low carbon steel/cast steel with heat treated to minimum 200BHN hardness. Cast iron grade 20 with hardness of 200 BHN is also acceptable. The drive gears if any integral with the wheel shall be of the same material and hardness. Wheels for under hung crane and trolley wheels for hoists shall be spur geared type, cast / forged 4 wheeled.

2.7.12 Trolley:

The trolley for chain pulley block shall be of spur geared type, fabricated construction, 4 wheeled, driven by hand chain and shall have provision for mounting the chain pulley block.

2.7.13 End Carriage:

Shall be of 4 wheeled spur geared type and fabricated construction. Suitable wheelbase shall be provided. End carriages shall be designed to suit the runway beam size. (Which will be furnished by purchaser during drawing approval.) End carriages shall be connected with crane girder by welding or by fasteners (For ease of transportation, if welding required, the same shall be done at site by purchaser).

2.7.14 Ratchet Lever:

The ratchet lever consists of toothed wheel, pawl, catch etc., The pawls shall be of strength to arrest the full load from lowering due to gravity. The relative width and positioning of the ratchet wheel and the pawl shall be such as shall ensure full engagement irrespective of wear of the friction faces. The pawl and the ratchet shall be made of steel, hardened and tempered or given an equivalent treatment to provide satisfactory degree of wear resistance together with toughness. The hardness of the pawl tip shall not be less than 40HRC and that of ratchet not less than 30HRC. The pawl shall engage with the ratchet wheel either by means of a spring other than a tension spring or by some other equally effective means.

The pawl shall be so positioned that it engages the ratchet wheel under gravity should it operating mechanism fails. Adequate arrangements shall be made to ensure that the pawl does not seize on the pawl pin.

2.7.15 Crane Girder:

Crane girder shall be of rolled section. Fabricated beam and welded beam shall not be used for this purpose unless otherwise specified by the purchaser for special cases. For such cases, refer annexure - II to this specification for details. Camber /

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3.1 **Along with the offer:**

- 3.1.1 *Data sheets for Trolley With Hoist & Under Hung Crane (Annexure III)*
- 3.1.2 *Technical specification for equipment*
- 3.1.3 *Quality plan & typical arrangement drawing*
- 3.1.4 *Deviation: No deviation will be entertained on the MOU specification.*
- 3.1.5 *Exclusion: Any exclusion from scope of supply shall be clearly spelt out in the offer itself. Exclusion of major / critical items shall make the offer liable for rejection.*

3.2 **After placement of order:**

- 3.2.1 *Quality Plan is to be submitted by vendor for Purchaser and End user's approval.*
- 3.2.2 *Dimensional drawings for approval.*
- 3.2.3 *Data sheet for hoists and cranes for Purchaser's / End user's approval.*

3.3 **During supply:**

- 3.3.1 *Performance test certificates for TWH, UHC, Safety devices and Chain.*
- 3.3.2 *Physical, Chemical, hardness and NDE test certificates shall be provided wherever applicable for trolley / crane wheels, load chain, hand chain, pulleys, hook, gears, pinions, shafts and other materials.*
- 3.3.3 *Other certificates either for sub-vendor's manufacturing or bought-out items shall also be furnished if applicable.*

3.4 **Drawings & O & M Manuals:**

- 3.4.1 *The drawings furnished with the offer shall clearly indicate the items (bill of materials) that go to make the trolley with hoist and / or under hung crane. The drawings shall clearly indicate the weight particulars of such items / sub assembly that will be despatched as loose items in the packing cases.*

The bill of material shown in the drawing shall match with that of the despatchable unit as indicated in the packing slip. The drawing shall be prepared in AUTOCAD and vendor shall forward both hard copies (3 numbers each) and floppy (Copied with drawing files) to the purchaser.

- 3.4.2 *Performance and load test certificate shall be submitted along with the supply.*
- 3.4.3 *Catalogues and other details of the product shall be submitted along with the offer.*

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properly packed to provide adequate protection during shipment. All assemblies shall be properly match marked for site erection.

- 3.7.2 *Attachments, spare parts of the equipment and small items are to be packed separately in small cases. Each item shall be tagged with identification of the main equipment number, item denomination, and reference number of the respective assembly.*
- 3.7.3 *Detailed packing list in water- proof envelope shall be inserted in the package together with equipment.*
- 3.7.4 *Each equipment shall have a name- plate giving the salient equipment data, make, year of manufacture, equipment number followed by the firm, manufacturers name plate. Each hoist will have a name- plate fixed on both faces in such a manner that the safe working load can be clearly seen from the operating floor.*

3.8 Spare Parts

- 3.8.1 *Mandatory spares: The offer shall include list of recommended spare parts with itemised price, for 2/3 years operation of the equipment Proper coding and referencing of spare parts shall be done so that later identification with appropriate equipment will be easier.*
- 3.8.2 *Commissioning spares: The offer shall include the required commissioning spares as part of the main package. The cost of such spares included may be separately indicated in the offer.*

4.0 INSPECTION, TESTING & PACKING:

- 4.1 *Purchaser's (BHEL) and end user's (BHEL's customer) representative shall have the access to the works of vendor at all reasonable times for the purpose of witnessing the purchased equipment being tested.*
- 4.2 *Vendor shall provide a **Quality Plan** along with the offer for review and approval by Purchaser or end user.*
- 4.3 *Each chain pulley block with trolley shall be subjected to 1.5 times the safe working load for a lift of minimum one metre, which shall ensure that every part of the block mechanism and each tooth of the gears come under load. The trolley with load shall be tested for smooth operation for cross travel without any problems.*
- 4.4 *All visual examination after operational proof tests for deformation, cracks etc, shall be checked by Purchaser or it's appointed representative for all 100% cases.*
- 4.5 *Type test (static loading) shall be conducted at 200% safe working load. Static tensile loading shall be done once in a year or if there is a design change which ever is earlier. Records shall be maintained by the supplier for this and a copy of the same shall be furnished.*

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Full length of chain after proof loading shall be passed over actual load chain wheel.

4.11 *All structural welds, gears, castings/forging shall be examined by MPI / LPI for cracks, surface defects. Acceptance norms for LPI / MPI: No linear indications or crack are acceptable while carrying-out LPI / MPI. All butt welds shall be tested radiography and acceptance norms shall be as per AWS D1.1/ ASME -Section IX.*

4.12 *Performance test for Under Hung Cranes, Chain pulley blocks & Ratchet lever*

4.12.1 *Under hung crane shall be checked for smooth running of chain pulley block with trolley on crane girder and crane movement shall be checked with 125% safe working load on runway beam at site by purchaser / end user under vendor's supervision and if found defective, the same shall be replaced at free of cost by vendor.*

4.12.2 *Chain Pulley block with trolley and under hung crane shall be checked for brake system to arrest the movement and sustain the load at any working positions.*

4.12.3 *Chain pulley block with trolley shall be checked for smooth running on monorail with load above 2meters from ground.*

4.12.4 *Wheels shall be checked for matching with monorail / runway beam.*

4.12.5 *Ratchet lever shall be checked for its smooth operation to the rated capacity*

4.12.6 *Equipment shall be provided with nameplates consisting of:*

- a) Description*
- b) Serial No.*
- c) Manufacturer*
- d) Type*
- e) Capacity & size.*
- f) Year of manufacture.*

4.13 Protection & Painting

4.13.1 *Surface Preparation:*

The surfaces to be coated shall be free from contamination, weld slag and spatter shall be removed. Surface defects shall be removed by suitable methods.

Sharp edges shall be smoothened by grinding. Prior to surface preparation oil, grease, drilling / cutting emulsions and preservative agents shall be carefully removed by suitable solvents. The surface shall be carefully dried with clean cloths to prevent the dissolved impurities from spreading over the entire surface. The surface

Enquiry No. / P.O.No. :

Sl.No.	Description	Specification	Vendor Confirmation Yes / No
5.1	Hoist Parameter	Refer Annexure-I	
5.2	Painting schedule & Special requirements	Refer Annexure-II	
5.3	Spares		
5.3.1	Commissioning Spares	Vendor to specify	
5.3.2	2 years recommended spares	Vendor to specify	
5.4	Data Sheet		
5.5	Data Sheet	(Annexure-III) Vendor to submit	
5.6	G.A.Drawings (for hoists, cranes, CPB, Ratchetlever hoist etc.)	Vendor to submit	

- Note: 1. Deviation in the above requirements shall reject the offer.
2. If required, please add more sheets.

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Annexure-III to Specification

Project :xxxx

(Cust.no. xxxx)

Enquiry no:

The following data sheet is to be filled by the vendor and submitted along with the offer. This data sheet shall form part of ordering specification and shall be approved by Engineering On acceptance of the offer.

Technical Data sheet for Hand operated Handling equipment

1.0	Under hung crane					
1.1	Capacity - in tons					
1.2	Span - in m.					
1.3	Overhang on either side - in mm.					
1.4	Runway beam size (User / Purchaser) Will be furnished during vendor drawing approval.					
1.5	Operating floor - in m.					
1.6	Wheels					
1.6.1	Wheel shape whether match with runway beams	Yes / No				
1.6.2	Wheel material					
1.6.3	Wheel diameter - in mm.					
1.6.4	Wheel base - in mm.					
1.7	Wheel bearing					
1.7.1	Type					
1.7.2	Size					
1.7.3	Make					
1.8	Shaft					
1.8.1	Material					
1.8.2	Hardness					
1.9	Gears / Pinions					
1.9.1	Material					
1.9.2	Hardness					
1.10	Crane girder					
1.10.1	Type	Signle / Double / Box				
1.10.2	Size					
1.10.3	Material					
1.11	End stopper					
1.11.1	Provided	Yes / No				
1.11.2	Type					
1.12	Weight of the crane - in Kgs.					
1.13	Overall dimensions of crane					

Vendor Name :

Signature :

Date :

Annexure-III to Specification

Project :xxxx

(Cust.no. xxxx)

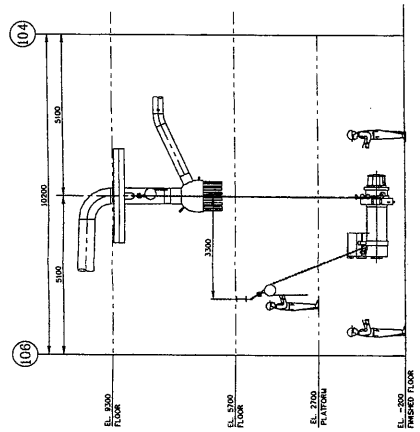
Enquiry no:

1.14	Clearance between Runway beam bottom & Crane girder top - in mm.					
2.0	Trolley With Hoist					
2.1	Capacity - in tons					
2.2	Lift - in m.					
2.3	Headroom - in mm.					
2.4	Operating floor - in m.					
2.5	Approximate weight - in Kgs.					
2.6	Overall dimensions of Trolley with hoist					
2.7	Trolley wheels					
2.7.1	Wheel diameter - in mm.					
2.7.2	Material					
2.7.3	Hardness					
2.7.4	Quantity					
2.8	Load chain					
2.8.1	Link diameter					
2.8.2	Material					
2.8.3	Ultimate tensile strength in kg/sq.mm.					
2.9	Hand chain					
2.9.1	Size					
2.9.2	Material					
2.10	Ratchet					
2.10.1	Material					
2.10.2	Hardness					
2.11	Pawl					
2.11.1	Material					
2.11.2	Hardness					
2.12	Gears & Pinions for Hoisting					
2.12.1	Material					
2.12.2	Hardness					
2.13	Gears & Pinions for Cross travel					
2.13.1	Material					
2.13.2	Hardness					
2.14	Hook					
2.14.1	Material					
2.14.2	Hardness					
2.14.3	Tensile strength in kg/sq.mm.					
2.14.4	Safety latch provided in the hook(Yes / No)					

Vendor Name :

Signature :

Date :



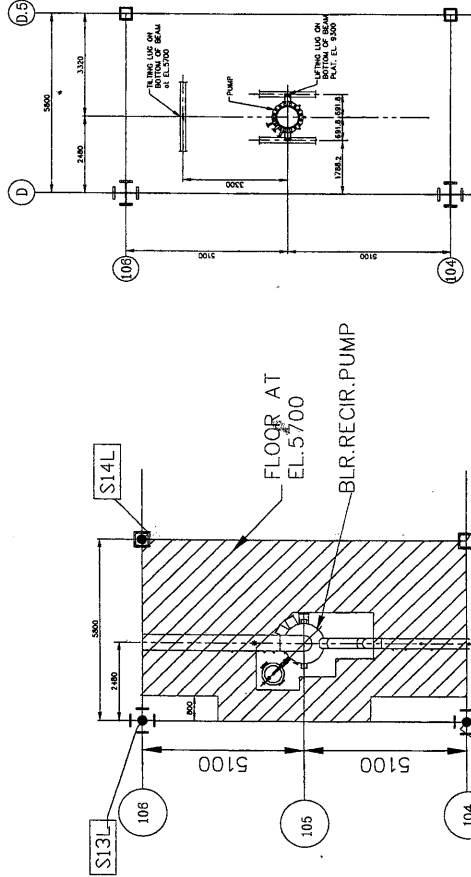
ELEVATION VIEW -- STEP #3

- (34). ATTACH 2 (TWO) SCREW PIN ANCHOR SHACKLES TO TILTING BRACKET TO ALLOW ATTACHMENT OF THE HOIST HOOK.
- (35). CONTINUE TO LOWER THE MOTOR ASSEMBLY DOWN VERY SLOWLY, WHILE SIMULTANEOUSLY LIFTING THE LOWER PORTION, BY MEANS OF THE TILTING BRACKET TO A HORIZONTAL POSITION.

(4A). IN A HORIZONTAL POSITION, LOWER THE MOTOR ASSEMBLY ONTO APPROVED DOLLIES AND SAFELY SECURE PUMP MOTOR BODY TO MAKE READY FOR LATERAL TRANSPORT.

COMPONENT WEIGHTS		PUMP DETAILS
ITEM	WEIGHT (kg.)	
PUMP CASE + MOTOR	19700	MAKE: Vilo Pump System Co.Ltd. MODEL: LUW1K250-550/1
PUMP CASE	13000	
PUMP MOTOR	1200	
PUMP COOLER	14200	
PUMP MOTOR + COOLER (MAXIMUM HANDLED WEIGHT)		

D.5



PLAN VIEW "AA" STEP #1
GRATING AT EL. 5700

- [illegible]

A PRADESH POWER DEVELOPMENT COMPANY LIMITED (APPDCL)
X800 MW SDSTPS, STAGE - II, UNIT-3, KRISHNAPATNAM
(BTG PKG)

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS

KOLKATA
BHARAT HEAVY ELECTRICALS LTD.
HIGH PRESSURE ROILER PLANT

[illegible]

5.0 PROJECT RELATED INFORMATION

Project Name : Krishnapatnam 1x800 MW (1816)

Enquiry No. / P.O.No. :

Sl.No.	Description	Specification	Vendor Confirmation Yes / No
5.1	Hoist, Crane & DSL Parameter	Refer Annexure-I	
5.2	Painting schedule & Special requirements		
5.3	Power & Control cable code	IS 694	
5.3.1	Power supply	415V, AC, 3PH, 50HZ	
5.3.2	Control supply	110V, AC , 50 HZ	
5.4	Commissioning Spares	Vendor to specify	
5.5	2 Years recommended spares	Vendor to specify	
5.6	Data Sheet	(Annexure-III) Vendor to submit	
5.7	G.A.Drawings (for hoists, cranes, DSL, Wiring diagram, pendant etc.)	Vendor to submit	
5.8	Motor Data sheet	(Annexure-IV) vendor to fill and submit after P.O	

- Note: 1. Deviation in the above requirements shall reject the offer.
2. If required, please add more sheets.