SPECIFICATION No. FT/SP/47A

Dated 14th March, 2007

FOR

EOT Cranes

BHARAT HEAVY ELECTRICALS LIMITED
CENTRAL FOUNDRY FORGE PLANT

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CONTENTS

I. GENERAL:

1.0 Scope of Supply

1.1 Scope of supply covers the design, manufacture, supply, erection and commissioning of an EOT Crane (70/20T X 18.5M) as per IS-4137, Class-4, IS-807, other relevant standards and this Specification and complete with all electricals, Radio Remote Control, Crane weighing system and standard accessories. The Crane is to be located in the existing Medium Bay of Steel Foundry and is to be used for handling liquid metal alongwith other foundry operations including knockout. A reasonable amount of jerking is expected during knockout operation. Cranes must be rugged and robust in operation as per their nature of work.

1.2 Scope of supply covers the design, manufacture, supply, erection and commissioning of EOT Cranes 25/5 T in Steel Foundry, 50/10T in Light Foundry and 30/10T in Machine Shop as per IS3177 Class M8/M6, IS807 and other relevant standards and this Specification and complete with all electricals, Radio Remote Control, Crane weighing system and standard accessories as per requirement of each crane. Cranes must be rugged and robust in operation as per their nature of work.

2.0 The Clearance Diagram for each crane is enclosed at Annexure-A.

3.0 The following should accompany the offer:

a) General Arrangement (GA) drawing to scale (showing elevation, cross section and plan of the crane) indicating clearances, hook approaches, lift, location and direction of view of operator, wheelbase, wheel loads with spacings etc.
b) Information as per Annexure-B.
c) Design calculations for all motions, structure etc., and selection of bought out items for deciding the suitability of offer. In absence of this information, the offer may be ignored.
d) Deviations from this specification, if any.

4.0 Successful tenderer should furnish the following prior to manufacture of the crane for approval by the purchaser.

a) The GA drawings containing all information as described in Clause 3.0 (a).
b) General layout drawing of the trolley.
c) Assembly drawing -inclusive of gearbox details- of individual drives like hoist, long travel and cross travel.
d) Layout of cabin showing location and fixing of all the equipment inside the cabin, such as Driver's seat, protective panel, isolating and control switches, fire extinguishers etc.
e) Circuit diagrams showing the wiring for the complete crane.
f) Final Design calculations for all motions, structure etc., should be submitted at the time of approval of GA drawings.

5.0 The following documents/ informations are to be supplied prior to commissioning of the crane. A CD containing the documents / information recorded on it should also be supplied.

a) All the drawings approved by the purchaser alongwith all workshop drawings for structural and mechanical items containing full information such as tolerance, heat treatment etc.
b) Operation & Maintenance manuals- 5 Sets, Maintenance Schedule, Lubricating Charts, Electrical circuit diagrams, catalogues of all electrical equipment etc. alongwith information on any other specific feature/s.

6.0 A toolbox containing all necessary tools (e.g., torque wrench, hand grease gun, set of spanners, screwdrivers etc.) required for the maintenance of the crane should be furnished along with the Crane.

7.0 The supplier should furnish material test certificates for all electrical equipment, cables, parts used in handling loads (e.g. wire ropes, chains, hooks etc.), structural steel, mechanical components such as couplings, gears boxes, rope drums, pulleys, shafts, wheels etc.

8.0 The supplier should ensure that the crane is manufactured as per tolerances specified below.

a) Span over L.T. Wheels ± 5 mm
b) Diagonal on Wheels ± 3 mm
c) Long travel wheel ± 1 mm

d) Tilt of wheels or balance axle ±2mm/1000mm(Horizontal and vertical)

e) Trolley wheel gauge ±3mm

f) Trolley track gauge ±3mm

g) Difference in height between trolley rails ±H depending upon trolley track gauge.

Trolley track Gauge S (mm)	Difference in height between trolley rails ±H
Up to 2500	4
2500 to 4500	6
Above 4500	8

h) Speeds at full notch with rated load, Voltage and frequency should be as follows.

Travelling and Traversing = +10% /-5%}
Hoisting = +10% /-5%} of specified speed
Lowering = +25% /-5%}

9.0 Assembly at site is to be kept as minimum as possible to enable early commissioning of the crane. Welding at site is to be avoided as far as possible. The supplier should satisfy himself about the site condition beforehand to avoid any difficulty during erection and commissioning of the crane.

10.0 The supplier should quote separately for spares as considered necessary for two years of normal operation of the crane. However, the purchaser may use his discretion in selecting the spares.

11.0 In addition to the tests specified in the IS tests as under should also be done after erection.

a) Speed Test

I. Rated load Test: All the motions should be tested with rated load and the rated speeds should be attained within the tolerance limits indicated under clause 8(h)

II. Overload Test

All motions of the crane should be tested with 25% overload in which case the geared speeds need not be attained but the crane should show itself capable of dealing with the overload without any difficulty.

b) Brake Test

I. The hoist brakes should be capable of braking the movement under conditions a (I) and a(II) of speed tests.

II. The long travel and cross travel brakes should be capable of arresting the motion within a distance in Meters equal to 10% of the speed in M/Min.

12.0 After the load test has been performed, the wheel loads should be checked. The wheel load measurement should not deviate from the values mentioned in the static calculations by more than +3% for maximum and -3% for minimum wheel loads.

13.0 Guarantee shall be provided for 18 months after the date of commissioning of cranes.

II. REQUIREMENTS:

A) TECHNICAL:

1.0 The crane should be designed in accordance with the latest editions of IS-807, IS-4137 (for Class-4 duty)/IS3177, other relevant standards referred to therein and also in accordance with the requirements specified herein after.

2.0 Safe access for maintenance and removal of all mechanical and electrical parts must be ensured without any additional scaffolding. All parts requiring periodic inspection/ lubrication/ replacement should be easily accessible without the need for dismantling other equipment or structures. All electrical cables should be so laid that they are not liable to be damaged and can be easily inspected and maintained.

3.0 All machinery or equipment included in this specification must be provided with safety devices and clearances as per standards and purchaser's requirements.

4.0 No cast iron part should be used on the crane except for electrical equipment. Similarly wood or combustible material and Bush Bearing should not be used in any part of the crane. Open gears should not be used in any drive/motion.

5.0 Full length and full width chequered plate platforms should be provided on the top for both the bridge girders in order to have access to operator's cabin, long travel drive, current collectors, trolley etc. Access to the cabin from the bridge girder platform should be via a staircase unless specified otherwise. Minimum width of the staircase should be 600 mm and inclined to the horizontal at an angle not more than 45^0. Passage through staircase should be fully protected to prevent any accident/ fear of accident.

6.0 Foot-walk should be of sufficient width to give at least 500 mm clear passage at all points, except between railings and bridge drive where this clearance may be reduced to not less than 400 mm.

7.0 All openings in foot walk flooring for access to bottom chord platforms and inspection platform should be provided with strong hinged covers. These covers in the maximum open position should be inclined at an angle slightly more than 90^0 to the horizontal and should be provided with a locking device both for the closed and fully opened position. They should be so located that in their open position, they should not foul with any moving part of the crane. Minimum size of hatch opening should be 600 X 600 mm. Any other opening in foot-walk or end carriage should be provided with bolted removable plate covers.

8.0 Suitable Guards to push away any object lying on the rails should be provided at the ends of the end carriages.

9.0 All wheels, couplings etc. should be provided with covers opening on strong hinges. These covers should be preferably be made of minimum 5 thick plates. All heavy covers should be provided with inspection windows.

10.0 Guards should be provided on the crane to prevent the hoist ropes from coming into contact with the down-shop leads.

11.0 All bolts except those with nyloc nuts should be provided with grip lock nuts or spring washers.

11.1 For side alignment of motors, strong adjustable screws with lock nuts should be provided. However for IEC frame size motors this is not considered necessary.

11.2 Welded lugs should be fitted against the feet of all pedestals, gearboxes etc. except motors. Motors should be provided with alignment screws for side alignment.

11.3 Fasteners for pedestal blocks, motors, gear boxes etc. should be easily removable from the top of platform. Studs or body bound bolts should not be used as fasteners for mechanical items except for fixing covers.

12.0 All cables should be clamped individually. All trailing cables should be clamped with PVC or nonmetallic clamps. Deviations are permissible only with purchaser's specific approval.

13.0 Safety hand railings preferably of tubular construction should be provided on bridge foot-walks, end carriages, stair cases, landing in cabin, trolley and in any other place where access has been provided. Railings should not be less than 1000 mm high with an intermediate member at a height of 500 mm. All edges or openings should be provided with toe guards, toe angles or bent plates wherever required and should be of height 100 mm (minimum).

14.0 Parts of steel frames carrying machinery should be provided with doubling plates of adequate thickness riveted or welded and machined to true surface.

15.0 Defects in materials like fractures, cracks, blowholes, laminations, pitting etc. are not allowed. Rectification of any such flaw is permissible only with the approval of the purchaser.

B) STRUCTURAL:

1.0 GENERAL:

In addition to the latest edition of IS-807, following additions/deviations are applicable.

1.1 Welded joints should be used unless otherwise specified.

1.2 Not less than four turned, fitted bolts or equivalent length of welding at each joint should be used for connections.

1.3 Black bolts should not be used in the main structures of the crane and high tensile steel bolts should not be used unless approved by the purchaser.

1.4 Bolts used in shear should be fitted into reamed holes.

1.5 Transverse fillet welding on load carrying members should be avoided.

1.6 100% of top & bottom flange, 40% of web plate of box girder and 25% of circular joints should be radiographed to ensure freedom from defects. Rest of the weld joints of Girder and Hoist Drum should be tested ultrasonically.

1.7 Plates, bars, angles and where practicable other rolled sections used in the load bearing members of the structure should be not less than 8 mm thick. Minimum thickness of chequered plates for platforms should be 6 mm over plain. Chequered plates should not be considered in computing strength of load carrying members.

2.0 BRIDGE GIRDERS:

2.1 The crane should be double girdered. The bridge girder should be of box construction and in one piece. Each girder should have double web plate. Girder should be sufficiently strong and rigid to withstand the most sever combination of loads that may develop under different working conditions.

Top flange of the girder should not be considered as giving support to the rail, in computing the rail size.

2.2 Trolley rail section should not be considered in the design of the bridge girders.

2.3 Full length wearing plate should be provided under the trolley rails. The wearing plates should be 10mm thick and welded in place to the flange with minimum 5mm continuous welds. The wear plates should be 10 to 12mm lesser in width than the rail base such that the welds of the wear plates do not project beyond the rail base. Wearing plate should not be considered in the strength calculations of the bridge girders.

2.4 Box girders should be so constructed as to eliminate accumulation of water or oil inside them. Squaring marks should be provided on each girder to facilitate erection and squaring of the bridge.

3.0 END CARRIAGES:

End carriages should be fabricated from plates welded together to form a box except for essential openings, which should be reinforced. If more than two wheels are required, bogies should be provided or articulated end carriages should be used. Wherever possible, the end carriages should be in two halves. Each half should be fitted to the respective bridge girder in the fabrication shop.

End carriages should be of ample strength to resist all stresses likely to be imposed on them under service conditions including collision with the cranes or stops. The length of end carriages should be such that no other part of the crane is damaged in collision.

On the end carriages with more than two wheels, the wheelbase should be taken as the distance between the centers of the outside wheels.

The end carriages should be fitted with substantial safety stops to prevent the crane from falling more than 25mm in event of breakage of a track wheel, bogies or axle. These safety stops should not interfere with the removal of wheels.

Suitable jacking pads at a height of 300mm from rail level should be provided on each end carriage for jacking up the crane when changing track wheels. Jacking pads should not interfere with the replacement of wheels.

4.0 TROLLEY FRAME:

Trolley frame should be produced in one piece. Drum bearings and supports for upper sheaves should be located so as to equalize the load on the trolley wheels as nearly as possible.

The trolley frame should be built up of rolled sections and plates to form a rigid structure capable of withstanding all stresses that will develop during the working of the crane and should be arranged to afford maximum accessibility to mechanical and electrical parts placed on it. It should be designed such that at the highest position of hook there should be clear distance of 700mm between the lowest point of bottom block. Deviation should be made only with specific approval of purchaser.

The top of trolley frame should be covered with plates all over except for openings required for the ropes and flexible cable for bottom block etc, to pass. The openings in the trolley frame should be such as to keep the ropes or cables at least 125mm away from any part of the trolley frame. The equipment should be placed above the trolley top plates as for as practicable.

For any parts placed below the trolley top plate, access for maintenance, repair and replacement should be provided. Hand rails should be provided on all the four sides of the trolley (except in case where protective guard is fitted on the trolley conductor side, hand rails on the three sides only should be provided) with openings on the platform side opposite to the trolley conductor side.

The trolley should be fitted with substantial safety stops to prevent the trolley from falling more than 25mm in the event of breakage of a tack wheel, bogies or an axle. This safety stops should not interfere with removal of wheels.

The trolley should be provided with lifting pads for jacking up the trolley on all Four Corners for wheel removal. The jacking pads should be at a height

of about 300mm from the rail level and should not interfere with the removal of wheels.

5.0 TROLLEY RAIL:

Trolley track rails made of rail steel should be clamped to the girders with double bolt clamping plates spaced not more than 900mm apart with welded alignment blocks between every 2 clamps such that the distance of a clamp from any adjacent alignment block should not be more than 450mm. Rails should be prevented from creeping in the longitudinal direction by rail stops, riveted or welded. Rails should be made continuous by welding standard lengths. At splice joints, rails may be welded at site and as such, edge preparation of the rails should be done in the supplier's work.

6.0 REPAIR CAGES:

Repair cage should be provided on the inside of the end carriage for attending to the current collectors. Repair cage should also be provided at the corners of the crane to facilitate removal of Long Travel wheels. The repair cages should be minimum 1000 mm wide and should be such that two persons can work comfortably in the space provided. The floor of Repair cage should be about 1500mm below the LT wheel centers.

The cages should be of structural steel and should be made substantially rigid by gusset plates and brace welded or riveted. Repair cages should be provided with railings on all sides except for the repair cages on the down shop lead, which should be provided with easily removable type protection guards on three sides for safety reasons.

7.0 OPERATOR'S CABIN:

Cabin should be totally enclosed with sliding windows for all the cranes except for 25/5 T crane for which it should be open type.

Following provisions should be made in the Cabin.

a) Cabin floor should be covered with heat and electric insulating carpet, made of material which can be cleaned easily.
b) Heat Convector or heater 1000 W.

c) Glasses should be toughened. Two Sets of glasses to be provided as spares for 70/20T crane only.

d) 5-mm thick bright steel to be used as heat reflector 150 mm below the cabin floor for 70/20T crane only.

e) Siren operated by Footswitch and also from a Push Button of Radio Remote Control, audible from a distance of 50-M minimum.

C) *MECHANICAL:*

The following features are required in addition to those specified in relevant standards.

1.0 DRIVE MECHANISM:

1.1 Long Travel

For 70/20T EOT Crane:

- One Brake for each drive.
- Total no of wheels should not be more than EIGHT (4 on each side).
- LT Drive should be 4 corner drive, driving not less than 50% of wheels provided. If any one corner motor fails, the other corner motor on the same girder should also trip to avoid skewing of the crane and the two other motors should be capable of driving the crane at reduced speed.
- All parts of the long travel drive should preferably be located above the top platform. Long travel drive, if located below the top platform, should be easily accessible for inspection, maintenance and removal from top. Shaft couplings should be as near as possible to the bearings.

For other cranes:

- One brake for each drive.
- Total no. of wheels should not be more than 4 – (two on each side)
- LT Drive should be 2 motor drive, driving not less than 50% of wheels provided. If any one motor fails, the other motor should be able to operate the crane.

1.2 CT Drive -

For 70/20T EOT Crane:

- One Brake for each drive.

- Total no of wheels should not be more than Four .
- CT Drive should be 2 corner drive for 70/20T crane. No part of cross travel drive should be located below the trolley platform. Either of the drives should be capable of operating the trolley movement in case of failure of the other drive.

For other cranes:

- One brake for each drive.
- Total no. of wheels should not be more than 4
- LT Drive should be single motor drive, (driving two wheels on same axis) is acceptable.

1.3 Main Hoist -

For 70/20T EOT Crane:

- Four Brakes (two for each motor).
- Total No of falls should not be more than 16.
- Main hoist should have twin motor drive through planetary gearbox. Either of the motors should be capable of lifting the load at 50% rated speed in case of failure of the other motor.
- Ramshorn hook should be suspended from a Balancing Beam. The Balancing Beam should be suspended from two separate Rope Drums driven through the planetary gearbox by two motors of identical capacity. The Wire rope in dual path reeving system on each drum should be provided to suspend balancing beam of bottom block. This is to hold the load safely in the event of failure of one rope. The gear box is to be designed duly taking care of the same. The Balancing Beam should be of box construction to offset heat radiation from liquid metal.

For other cranes:

- Total no. of falls should not be more than 8 for 50T hoist and should not be more than 4 for other main hoists.

1.4 Auxiliary Hoist Two brakes should be provided. Total No of falls should be restricted to 4 (max).

2.0 GEARING:

Straight and helical spur gearing should normally be used for all motions. Worm and bevel gears should not be used. First and high speed reductions should be through helical gears. All first reduction pinions and also the other pinions if feasible should be integral with the shafts. All gears should be of hardened and tempered alloy or carbon steel with machine cut teeth. Gear tooth should be cut in metric module system. Surface hardening of teeth is not allowed. Material of gears should be EN8 or equivalent.

3.0 GEARBOX:

Totally enclosed gear boxes with splash or automatic lubrication system should be used. The gearboxes should be fabricated using steel plate of thickness 8 mm (min). Covers should be spilt horizontally at each shaft center line and fastened so that the top half can be removed for inspection and repair without disturbing the bottom half.

4.0 BEARINGS:

Ball and roller anti-friction bearings of FAG, SKF make should only be used throughout except where specified otherwise. Grouped grease lubrication system for bearings may be provided wherever possible. Automatic centrialised lubrication is preferred.

5.0 COUPLINGS:

Motor shafts should be connected to gear extension shafts through flexible shock absorbing couplings. Geared or universal couplings should be used between gear box output shaft and intermediate shaft and wheel axle. Any other special coupling which can give better and more reliable service may

be used after obtaining specific approval of the purchaser. Pin Bush coupling should not be used.

6.0 LIFTING HOOKS:

Standard shank Ramshorn hook for the Main Hoist and shank type plain hook for Auxiliary Hoist should be used. These hooks should conform to the latest edition of BS:3017 and IS:3815 or any other relevant Indian / International.

7.0 BRAKES:

Double shoe brakes should be provided for each drive. Brakes should be mounted on the input pinion shaft of the gear train. The brake shoes should be of hinged type. Brake levers should be of steel. Hinge pins should be of hardened alloy steel and should be lubricated. These hinge pins should be provided with steel bushes at bearing points. Brake drums should be of forged or cast steel. Drums should be completely machined and dynamically balanced. Width of the brake drum should be 5 to 10 mm more than the width of the brake shoes.

Hardness of brake drum should be 38-43 Rc.

D) ELECTRICAL:

1.0 SCOPE OF SUPPLY:

Scope of supply covers all items of electrical equipment commencing from the main current collector gear on the crane. The crane electrics include, power disconnecting switch on the crane bridge walkway immediately after the main current collector gear, protective switch gear, motor control panels, resistors, Electro Hydraulic thruster operated brakes (alternatively disc brakes), limit switches, power and control cables, socket outlets, lighting distribution panel and lighting fixture with lamps, Bridge current collector system, joystick controllers, indication lamps, push buttons and equipment earthing material. All sundry erection materials required for installation and connection of electrical equipment with cable laying and fixing accessories should be in the scope of supply. Preferred make for basic electricals like contactors, MPCBs, ACBs, MCCBs, etc are to be Siemens. All timers are to be pneumatic type and BCH make. The protective and power panels are to be fuseless. ACBs are to be used at incomer, everywhere else, MPCBs must be used for protection of motors/thrustors/circuits, etc. Only thyristor drives to use thyristor protection fuses wherever applicable. All indicators to be LED type. All equipment should be of robust construction. All cables to have bottom entry into panels. Power and control terminals to be grouped separately with 10% extra terminals in each group. In general, the control voltage to be 220V AC, single phase, 50Hz. All trailing cables to be of reputed make EPR cables. Good quality junction box to be used for connecting EPR and PVC cables.

2.0 CLIMATIC CONDITIONS:

The equipment offered should be suitable for tropical and humid climate. For the purpose of equipment selection and specially for derating the capacities of drive motors and power cables, the ambient temperature 55°C should be taken as the basis. The equipment on the crane should be suitably protected against damage from radiant heat and should be rendered proof against ingress of dust and vermin.

3.0 STANDARDS:

The equipment should be selected, assembled and tested as per guide lines provided in the latest edition of Indian Standard Specification Nos. IS: 4137 for Class-4 duty. The equipment should also conform to the latest Indian Electricity Rules and regulations as regards Safety requirements, earthing and other essential provisions specified therein.

The equipment should be designed and selected to facilitate inspection, cleaning, replacement and repair and for use where continuity of operation and safety are first considerations. Wherever power cables having aluminum conductors are used for connecting up the electrical equipment on cranes, ample internal space for easy termination of these cables in the terminal boxes of the machines should be ensured.

4.0 POWER SUPPLY CONDITIONS:

The power available at existing down shop leads is 415V, 3 phase, 3 wire, 50hz. The equipment selected should be suitable for operation on 415V± 10%V

The following voltages should be used in the cranes.

4.1	400/415 + 10% V, 3 ph,50hz, AC	For motors and electro-hydraulic thrustors
4.2	415/220V, single phase Isolating Transformer	For control circuit, lighting and fan
4.3	24V,single phase, 50hz, AC	For hand lamp socket outlets
4.4	220 V, AC, 1- ph, 50 Hz.	For control circuits as applicable
4.5	24V, DC	For disc brakes as applicable

The different voltages mentioned above other than 415V, 3 ph, 50Hz, AC should be obtained through individual separate transformer and transformer rectifier units connected to 415 V, AC. Each transformer should be provided with tapping at $\pm 2^1/_2$ and $\pm$ 5% of secondary voltage.

5.0 CURRENT COLLECTION:

The supplier should arrange for main current collector system. Clearance diagram at Annexure-A may be referred for details.

5.1 BRIDGE CONDUCTORS:

The bridge conductors should be accessible for service. Bare copper wires should not be used as bridge conductors. Flexible trailing cable system mounted on retracting supporting system should be used. The conductors should consist of insulated multi conductor (or several single conductors) cables with permanent termination on the bridge and on the trolley. The flexible trailing cables should have ample length and should be supported by means of properly designed movable clamps. These clamps should be fitted with rollers and should run freely on guide rails allowing relative movement of bridge and trolley without undue stress or on the wear on the suspended cables. Consideration should be given to the inclusion of spare conductors to make provision for the later addition of additional conductors. The crane handles liquid steel for which the festoon cables should be selected accordingly and should be of reputed manufacturer.

5.2 COLLECTOR SHOES:

The main current collectors should be of cast iron gravity type and Double collectors should be provided for all the three phases.

The collectors should have adequate current carrying capacity. The design of collector should be such as to minimize the chance of binding at the hinge points due to dust or corrosion.

5.3 COLLECTOR SHUNTS:

Current carrying shunts on all the collectors should be designed so that there is no danger of contact with adjacent collectors. The shunts should be easily replaceable.

5.4 MOUNTING:

All the collectors should be mounted on rigid steel shafts and suitably insulated there from. Electrical clearance between live parts of adjacent shoes should be atleast 25mm. Flexible shunts in their least favorable position should not reduce this clearance. Collectors should be designed for ease of maintenance and so mounted that they are readily accessible for this purpose.

6.0 MOTORS:

6.1 GENERAL:

The crane should be provided with crane duty TEFC Slipring induction motors. The operation of each motion should be done from crane operator's cabin through Master Controller, Resistances, Timers, Contactors etc. individually installed in each motion from near zero to maximum speed. All interlocks should be monitored through contactors. Zero interlock of joysticks and gravity limit switches to be incorporated with line contactors.

The crane is to be installed in a very dusty foundry atmosphere and the dust contains an appreciable quantity of conducting dust. Adequate protection is to be provided from ingress of dust into electrical panels and equipment.

The supplier should furnish test certificates at the specified duty cycle for the individual motor. All the motors offered should be suitable for heavy-duty reversible crane service. The supplier should be responsible for selecting ratings that will meet the specified duty with the type of control specified. Ambient correction factors depending upon ambient temperature should be applied to derate the motor.

6.2 TORQUE:

The pull out torque of the motors at rated voltage and frequency should be not less than 2.75 times of the nominal torque.

6.3 CLASS OF INSULATION:

All motors should preferably be class 'H' insulated and the maximum permissible temperature measured by contact thermometer should not exceed 160^0 C. In the event of non availability of class 'H' insulated motors, class B/F insulated motors(class B for stator and class 'F' for the Rotor) with maximum permissible temperature measured by contact thermometer not exceeding 115^0 C and 130^0 C respectively may be offered.

6.4 OTHER FEATURES:

The terminal boxes should be large enough to accommodate aluminum conductor cables which may have derating factor as low as 0.4 on account of high ambient temperature and grouping factor.

The motors should be in IEC frame sizes. The terminal boxes should be located on top of the motor with facility to be rotated by 90^o and 180^o on horizontal plane.

6.5 RADIO REMOTE CONTROL

To be provided as specified in Part E

6.6 CRANE WEIGHING SYSTEM

To be provided as specified in Part F

7.0 MASTER CONTROLLERS:

Cam type Master controllers with joystick type levers should be used for all motions. Each controller should be provided 'OFF' position interlock. Each controller should bear an indication of the motion controlled and of direction of movement. A minimum of four notches in either direction should be provided.

The operating lever of the controller should move freely between the notches, should locate definitely and should remain in position at each notch unless pushed to the other position.

For motions like long/cross travel etc. double master controllers with universal joint should be offered to facilitate operation. In case double

master controller of dependable make are not available, single master controllers may be offered.

8.0 CONTROL PANELS:

All power and auxiliary contactors, thermal overload relays, time relays etc. should be mounted in sheet steel cubicles with lockable hinged doors. The door hinges should be such that during repair works inside the panel, the entire door can be lifted out and placed away enabling better access inside the panel. Each motion should preferably have its individual panel. All ventilating openings should have screen protection. Interior of the panel should be dust and vermin proof.

Panels should be front wired with readily accessible terminal blocks for making connection to the external equipment. All equipment is to be mounted in the front of the panel. Rear panel mounting is not permitted. All cable entry should be from bottom only. Removable plate is to be provided at the bottom of the panels for marking holes, providing cable gland for cables. Panels should be pre-wired up to terminal strip.

All contactors etc. should be mounted securely in a vertical arrangement with due consideration to the vibration encountered in the operation of the crane. The bottom most row of equipment mounted inside the panel excepting terminal strip should be atleast 350mm above the panel bottom cover to facilitate inspection and repair. Terminal strip should be fixed inside the panel preferably in horizontal manner leaving enough space underneath the panel for termination of cables in a convenient manner. Power and control terminals should be segregated. Power terminal blocks should be separated from each other by means of replaceable insulated spacers. Terminal blocks should have enough clearance to avoid tracking. At least 10% extra terminals in each of power and control groups must be provided.

All equipment inside the panel should have permanent identification labels in accordance with circuit diagram as also the power and control terminals. Terminal blocks should be robust and of such construction as to preclude possibility of cable connections getting loose due to vibration on crane.

Sheet steel used for fabrication of panel should have minimum thickness of 1.6mm. Panels should be mounted such that bottom of panel is at least 200 mm above the floor.

Clearance and creepage distance for the control gear should be 10mm and 12mm respectively. The electrical clearance in air between all live parts of different polarity and voltage and between live parts and earth should be not less than 75mm.

Contactor panels should be well braced to the crane structure and each panel should be provided with adequate number of lifting lugs.

9.0 CONTACTORS:

The current rating of all contactors should be at least 50% higher than the respective motor full load current at the specified duty cycle.

The minimum size of contactors on the power circuit should be as given for high currents that may be encountered on account of single-phase brake lowering, plugging and DC injection as per the control scheme chosen.

10.0 RESISTORS:

The resistors should be air-cooled, robust, heavy duty, corrosion resistant punched steel grid type.

Wire wound resistors should not be used on any motion of the crane except for attaining creep speeds through frequency converters and on magnet circuit.

Notwithstanding ventilation requirement, resistor housing on cranes working in open yards should be weather proof and on all cranes they should be adequately protected with cover to prevent accidental contact.

The electrical clearance in air between resistors and earthed metal should not be less than 100mm. Cable entry to the resistor banks should be from underside and terminal arrangement should be such that cable cores do not get loose due to vibration.

The value chosen should ensure smooth and uniform acceleration and allow for plugging and dynamic breaking without overheating. The resistors should be rated for minimum of 10-minute duty.

11.0 CIRCUIT PROTECTIVE SWITCH GEAR:

The protective switchgear should consist of following:

11.1 One triple- pole air circuit breaker, serving as main incoming protective switch fitted with automatic reset bimetal overload releases for protection against sustained overload and magnetic type instantaneous releases for protection under short circuit conditions, on all three phases.

The breaker should have adequate rupturing capacity to withstand and clear fault current of the order of 40KA. Further, the circuit breaker should have rating to carry combined full load current of two motions of the crane having largest horsepower. The setting of the over current release should be such as to trip the breaker instantaneously when current raises to 250% of the normal value. The incoming circuit breaker will be located inside driver cabin or nearby in such a way that enough clearance is provided as per IE rules.

To indicate whether power and control sources are ON, pilot LED indication lamps should be provided inside the driver's cabin.

11.2 In addition to incoming circuit breaker, following protective equipment should be provided inside the Driver's cabin.

a) MPCBs as appropriate to be used.

b) Complete panel must be fuseless, except thryristor drives.

12.0 AUXILIARY SWITCH GEAR:

A main iron clad pole isolating switch should be provided on the long travel bridge walkway as close as possible to the main current collectors. This switch should be without any fuse and of load isolating type.

This should isolate all circuit excepts the lighting circuit, magnet circuits and the circuit to the transformer supplying the portable lighting socket outlets.

Each of the above mentioned main isolating switches should be rated to carry at least combined full load current of two motions of crane having the largest horse powers and should be provided with means of locking the switch operating handle in the 'OFF' position. The switch cover should be interlocked with operating handle so that it can not be removed or opened

unless the operating handle is turned to the 'OFF' position. The live contacts inside the switch should be shielded to prevent accidental contact.
MPCBs are to be used. No fuses to be used.

13.0 LIMIT SWITCHES:

All hoist motions should be provided with rotary and extra Counterweight Limit Switch for over hoisting. For CT and LT, Cam operated limit switches should be provided. The limit switches should be provided for proper back up protection. The first limit switch to act in the event of over hoisting and over lowering, should be rotary type with self resetting feature, and be incorporated in the control circuit of the respective drive motor and the second one should be gravity operated switch (Push button bypass) connected in the trip circuit of the Line Contactor. Limit switch incorporated in the motor control circuit should act first, but in case this limit switch fails to operate the second limit switch should operate and trip the line contactor.

14.0 EMERGENCY STOP PUSH BUTTONS:

Safety switches of sustained contact type should be provided at the entrances to the crane bridge so that under any emergency conditions, operating any one of the switches, the incoming circuit breaker is tripped thus cutting off power to all the motions. Cabin door-interlocking switch, interlocked with the main incoming ACB should be provided. A pilot lamp incorporated in the control circuit will glow up when any of these switches is operated. Further a mushroom headed type OFF push button should be provided in the operator's cabin so that the main incoming breaker can be tripped under any emergency condition, by pressing the operating head.

15.0 CONTROL CHARACTERSTICS:

The hoist control gear should be designed so as to limit control the accelerating torque/ current for hoisting with 185% of full load torque/current for changing the controller from one notch position to another higher notch position. Similarly peak decelerating torque/current should be limited to 200% of full load value for changing the controller from highest position to the first lowering position. Bridge and trolley of the crane should have

revising plugging control circuit for rapid deceleration and stopping. The control circuit should be designed such that the brakes provided should not come into action simultaneously with plugging.

The control circuit should be designed such that the brakes provided should come into action immediately on controller coming to zero position.

16.0 BRAKES:

All motions of the crane should be provided with electrically operated brakes to arrest the motion safely. For all motions, Electro hydraulic Thruster Brakes or alternatively disc brakes of reputed make should be offered.

17.0 DISPOSITION OF ELECTRICAL EQUIPMENTS:

In case of fixed cabin cranes, the electric panels should be located as follows. For box girder cranes within the box if possible or on the walkway. In case equipment is located inside the box adequate lighting and ventilation should be provided.

18.0 LIGHTING:

Lighting should be provided in the driver's cabin, staircases and areas where control panels, resistors and transformers are installed. Bulkhead fitting with dust proof covers should only be used for the above areas. Four number underbridge lights of 400 W mercury vapour lamps complete fitting with reflector to be used. Lighting transformers should have 50% reserve capacity. The lighting distribution board and metalclad switches incorporating MPCBs / MCBs / MCCBs in every line of each circuit should be provided in the driver's cabin for the Crane lighting including underbridge lighting and Air conditioning or fans.

19.0 SOCKET OUTLETS:

Minimum of four socket outlets for hand lamps should be provided each at driver's cabin, long travel Side Bridge and in the area where control panels, resistors and transformers are installed. Hand lamps should operate at 24V AC supply. Industrial type metal clad plug and sockets should be provided.

20.0 CABLING:

All wiring for power, control, lighting etc should be carried out with 1.1KV grade PVC armored cables except flexible cables where armour should not be provided. All control cables should be minimum 2.5mm^2 Copper. All flexible cables should be multistranded copper. Single strand cables should not be used anywhere inside the crane. All cables exposed to direct heat radiation should be of special insulation or should be run in formed steel channels provided with heat resistant material. Cables laid on open racks should be adequately clamped.

Cable selection and routing on the crane, should form part of the crane design. Conduits and conduit fittings if used on crane for running cables should be of standard design and should be supplied with complete accessories. Each motor should be wired through separate conduits. All cables, remaining live in open position of isolator should be installed separately.

21.0 IDENTIFICATION OF CIRCUITS/CABLES ETC:.

Labels of permanent nature should be provided on supports of all switches, fuses, motors, brakes, contactors, relays etc. to facilitate identification of circuits and replacement. All panels, controllers, resistors etc. are to be properly marked for each motion. All power control cables, lighting and other cables are to be tagged at both ends as per cable number indicated in the supplier's drawing. All equipment terminals are also to be marked likewise.

22.0 SAFETY SCREEN:

Safety screen should be provided with crane near the Down Shop Leads.

23.0 EARTHING:

Earthing to the crane should be effected through track rails and crane structure. As such, all the electrical equipment mounted on crane should be connected to the crane structure by means of earthing links. The crane structure in turn should be made electrically continuous by proving jumpers over riveted or bolted joints. Equipment fed by flexible cables should be earthed by means of spare core provided in the flexible cable.

E) RADIO REMOTE CONTROL:

1.0 Radio Remote Control conforming to IS-3177 alongwith the following features should be provided. Preferred make is Stromag Engineers, Mumbai.

2.0 Technical Requirement:

2.1 The transmitter should be hand held Push Button type.
The crane should be operative either through Radio Remote Control or through Cabin Control. Cabin Control and Radio Remote Control should be interlocked and change over system should be manual located at the entry of the cabin.

2.2 There should be a common push button for siren and START and a separate push button for under-bridge lights.

2.3 Operating range should be 100 meters approx. for Radio Remote.

2.4 Isolation transformer and surge suppressor for the receiver supply to be provided.

2.5 Limit Switches should be provided & wired by the party for avoiding collision of two adjacent cranes.

2.6 The wiring should be connected to terminals/ equipment with proper size copper cable, wire lugs.

2.7 Supplier must give circuit diagrams of the entire RRC. All panel wires, cables should be ferruled, numbered and the same should appear on electrical drawings.

2.8 Three sets of long life Nickel Cadmium batteries for the transmitter alongwith a battery charger are to be provided.

3.0 Supplier should obtain frequency allocation letter for the RRC system from the Dept. of Telecommunication, Govt. of India, New Delhi on behalf of CFFP, Haridwar free of cost. For this purpose frequency allocation forms should be sent to CFFP after receipt of the purchase order for filling. These forms alongwith an authority letter from the Factory Manager shall be sent back to the supplier for further necessary action. After the system is

dispatched, necessary operating license/permission for the RRC system on the crane should be arranged by the supplier from statutory bodies as per the detail given in the frequency allocation letter. License fee, if any, should be borne by the supplier for the first time on behalf of CFFP, Haridwar.

4.0 Five copies of Operation & Maintenance Manual, safety provisions, photographs, schematic diagram, details of PCBs etc. should be provided. A CD containing the documents / information recorded on it should also be provided.

F) CRANE WEIGHING SYSTEM (Wherever required):

1.0 The Crane weighing System (Load Cell) of should be provided alongwith the crane, conforming to IS-3177 alongwith the following features. Preferred make: M/s. IPA, Bangalore, Philips/Leebow/other reputed makes. The Load cell should be installed on the Crab Frame of the EOT crane.

2.0 Technical Requirements:

2.1 Graduation should be 50 Kg. or better.

2.2 An additional display of 200-mm character height should be provided, opposite to the Crane operator's cabin at a suitable site from maintenance point of view on the crane. The control panel with display unit should be housed in the operator cabin.

2.3 Accuracy ±0.2% or better.

2.4 The system should have Tare zero facility. Provision should be made for setting ON/OFF, Zero and Tare through a Radio Remote Control.

2.5 The supply voltage should be 220V±10%, single phase, 50Hz, AC for which a separate step-down transformer should be used.

2.6 There should be overload indication (OL).

3.0 The supplier should calibrate the load cell, to the satisfaction of the Purchaser. Potentiometer should be identified in the panel to calibrate after commissioning, if needed. CFFP will provide weights for calibration.

4.0 Supplier should get Mechanical / Electrical assembly drawings approved by CFFP beforehand.

5.0 The following should be provided. A CD containing the documents / information recorded on it should also be supplied.

5.1 Operation and maintenance manual - 5 Sets.

5.2 Electrical circuit diagrams.

5.3 Assembly drawings/diagram showing the placement of components/parts alongwith make rating and specification.

5.4 Complete list of spares required for the smooth operation of the Crane Weighing System for 2 years alongwith prices and identification number.

5.5 Details of all bought out items with their specification, addresses of Vendors.

5.6 Test certificate and guarantee certificate for the Crane Weighing System as a whole and test certificates of individual bought out components.

6.0 Tool kit and spares required for smooth operation of the system for 2 years of trouble free operation should be supplied.

G. SPECIFIC DATA FOR EOT CRANES:

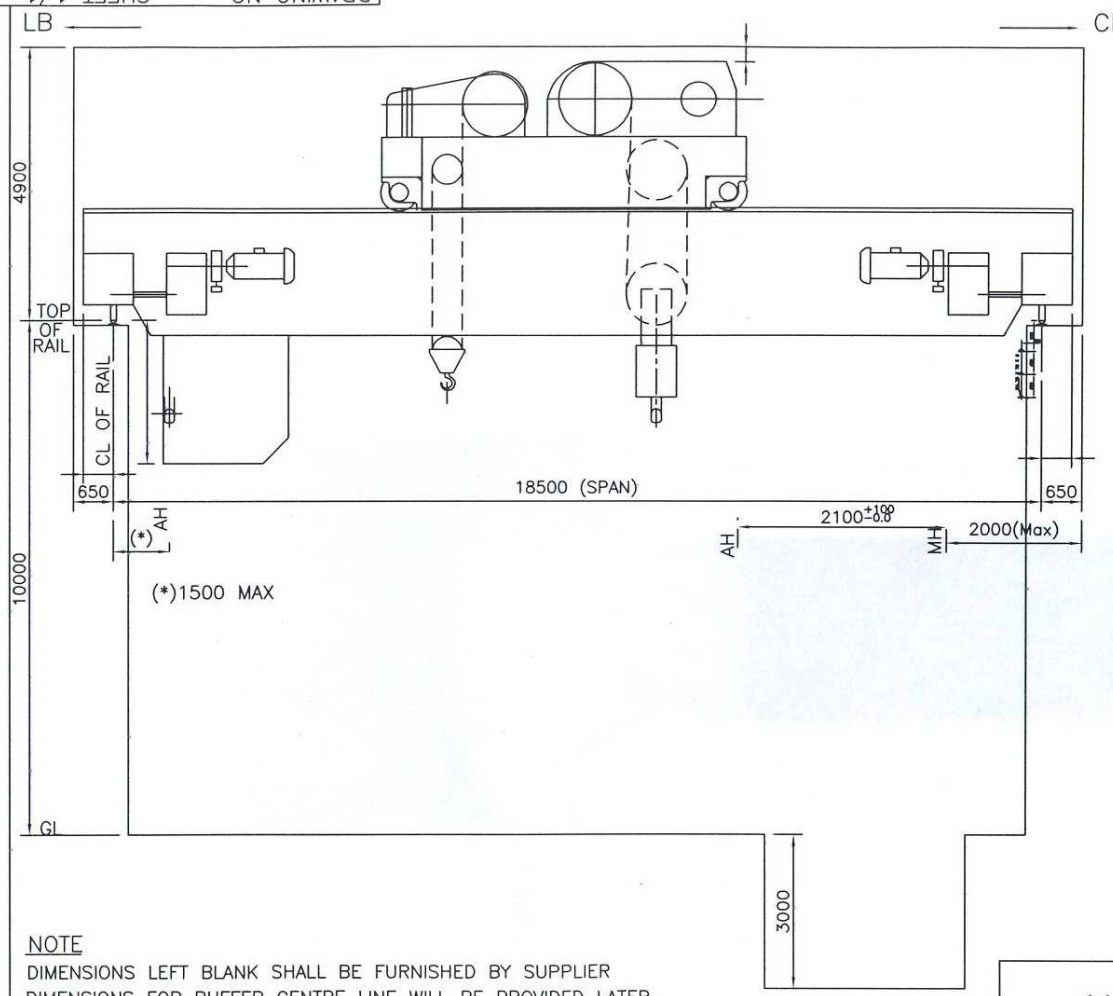
S. No	Description	25/5T	70/20 T	50/10T	30/10T	Remarks
1	Identification	Steel Foundry	Steel Foundry	Light Foundry	RMS	
2	No. of Cranes	1	1	1	1	
3	Compliance with IS and Class	3177 M-8	4137 Class-IV	3177 M-8	3177 M-6	
4	Lifting Capacity (MT) – Main hoist – Aux Hoist	 25 5	 70 20	 50 10	 30 10	
5	Type of Crane	Double girder box type	Double girder box type	Double girder box type	Double girder box type	
6	Span (center to center of rail)	18.5	18.5	22.5	18.5 M	In metres
7	Location Indoor/ outdoor	Indoor	Indoor	Indoor	Indoor	
8	Type / Nature of loads (Purpose)	Core handling	Hot metal handling	For knockout of castings	Handling of castings & forgings, loading & unloading from m/c.	
9	Lift Main Hook – Above floor – Below floor Aux. Hook – Above floor – Below floor	 7M 2M 7M 0	 8M 3M 8M 3M	 8M 2M 8M 2M	 10M 0 10M 0	
10	Speeds (m/min) full speed					
	Main Hoist	6 M/min	4 M/min	4 M/min	6 M/min	
	Aux. Hoist	12 M/min	12 M/min	12M/min	12 M/min	
	Cross travel	25 M/min	20 M/min	30M/min	25 M/min	
	Long Travel	70 M/min	70 M/min	70M/min	70 M/min	
	Creep Speed	Required	-NA-	-NA-	-NA-	

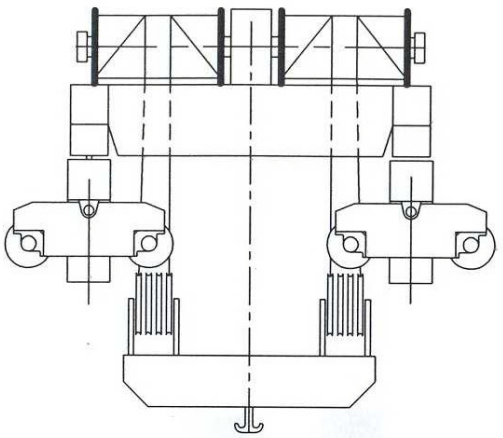
S. No	Description	25/5T	70/20 T	50/10T	30/10T	Remarks
11	Ambient Temp	50° C	50° C	50° C	50° C	
12	Type of Hook – Main Hoist – Aux Hoist	Plain shank plain hook	Ramshorn with balancing beam Plain shank	Ramshorn type plain shank	Ramshorn type Plain shank	BS 3017/IS 3815
13	Type of cabin (closed / open)	Open	Closed with sliding glass door	Closed with sliding glass door	Open type	
14	Hook Approaches (mm) Main Hoist – Cabin end – Opp. End Aux Hoist – Cabin end – Opp. End	 2600 1500 1500 2600	 3600 2000 1500 4100	 2000 1800 1100 2700	 2450 1250 1450 2250	These hook approaches are as indicative only. Better hook approaches shall be preferred. Please quote your best dimensions.
15	Cabin + Radio Remote control	Required	Required	Required	Required	
16	Crane weighing system	Not required	Required	Not required	Not required	
17	Clearance Diagram no.	FT-12-122/25	FT-12-122/70	FT – 12-108	04-06-035	
18	Crane Rail Size	CR 100	CR 100	FB 90 Pounds	CR 80	
19	Special requirement			Crane will be used for knockout of poured mould & is frequently subjected to jerks.		

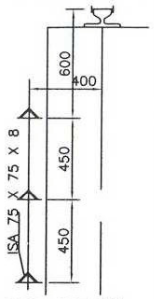
ANNEXURE–A

DRAWING NO. FT–12–122/70 SHEET 1/1

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)







DSL DETAIL
TO BE CONFIRMED
BEFORE MANUFACTURING

LIFT	BELOW GROUND LEVEL=3 M (min)
	ABOVE GROUND LEVEL=8 M (min)
SPEED IN METERS PER MINUTE	LONG TRAVEL = 70
	CROSS TRAVEL = 20
	AUX. HOIST = 12
	MAIN HOIST = 4
LT RAIL	CR 100
LOCATION	INDOOR
CLASS	4
STANDARDS	IS–807, IS–4137 AND OTHER RELEVANT
CAPACITY	MAIN HOIST 70 T, AUX. HOIST = 20 T

NOTE
DIMENSIONS LEFT BLANK SHALL BE FURNISHED BY SUPPLIER
DIMENSIONS FOR BUFFER CENTRE LINE WILL BE PROVIDED LATER

REV	DATE	ALTERED / CHECKED	REV	DATE	ALTERED / CHECKED	REV	DATE	ALTERED / CHECKED

BHARAT HEAVY ELECTRICALS. LTD.
CENTRAL FOUNDRY FORGE PLANT
RANIPUR HARDWAR

DEPTT.– FDY. TECHY | SCALE | WEIGHT IN KG.

	NAME	SIGN	DATE
DRN	FT/2/MISC		
WKD	T DAVE		
CHD	YNV RAO		
APPD	YNVRAO		14/3/07

TITLE
70/20T EOT CRANE CLEARANCE DIAGRAM

PROJECT AND CUSTOMER NAME
EOT CRANE, SPEC.No.FT/SP/47A
CFFP, HARIDWAR

TECHNOLOGY NO.
ANNEXURE–A

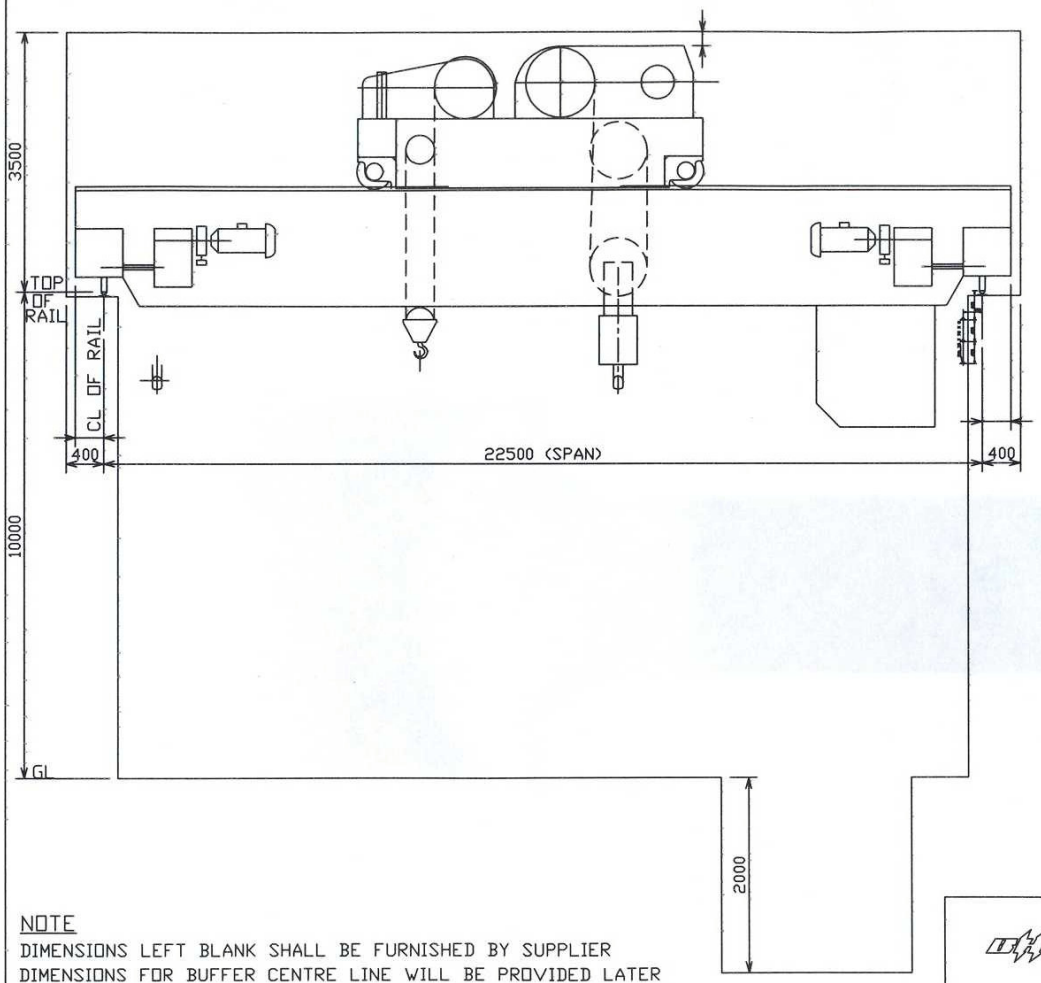
DRAWING NO.
FT–12–122/70

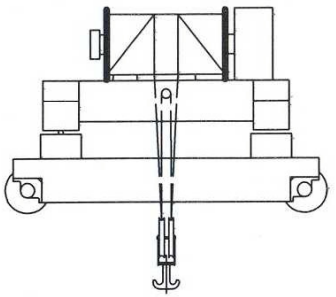
SHEET NO. | NO. OF SHEETS

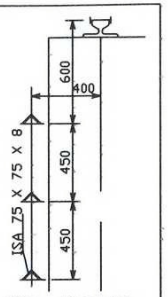
ANNEXURE-A

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

DRAWING NO. FT-12-108 SHEET 1/1







DSL DETAIL
TO BE CONFIRMED
BEFORE MANUFACTURING

LIFT	BELOW GROUND LEVEL=2 M (min)
	ABOVE GROUND LEVEL=8 M (min)
SPEED IN METERS PER MINUTE	LONG TRAVEL = 70
	CROSS TRAVEL = 30
	AUX. HOIST = 12
	MAIN HOIST = 4
LT RAIL	FB 90 POUND
LOCATION	INDOOR (GANTRY BAY, LIGHT FOUNDRY)
CLASS	M-8
STANDARDS	IS-3177, IS-807 AND OTHER RELEVANT
CAPACITY	MAIN HOIST 50 T, AUX. HOIST = 10 T

NOTE
DIMENSIONS LEFT BLANK SHALL BE FURNISHED BY SUPPLIER
DIMENSIONS FOR BUFFER CENTRE LINE WILL BE PROVIDED LATER

REV	DATE	ALTERED / CHECKED	REV	DATE	ALTERED / CHECKED	REV	DATE	ALTERED / CHECKED

BHARAT HEAVY ELECTRICALS. LTD.
CENTRAL FOUNDRY FORGE PLANT
RANIPUR HARDWAR

DEPTT.- FDY. TECHY | SCALE | WEIGHT IN KG.

	NAME	SIGN	DATE
DRN	FT/2/MISC		
WKD	R LAKRA		15/3/07
CHD	SVSN		15/03/07
APPD	SVSN		15/03/07

TITLE
50/10T EOT CRANE CLEARANCE DIAGRAM

PROJECT AND CUSTOMER NAME
EOT CRANE, SPEC.No.FT/SP/47A
LIGHT FOUNDRY, CFFP, HARIDWAR

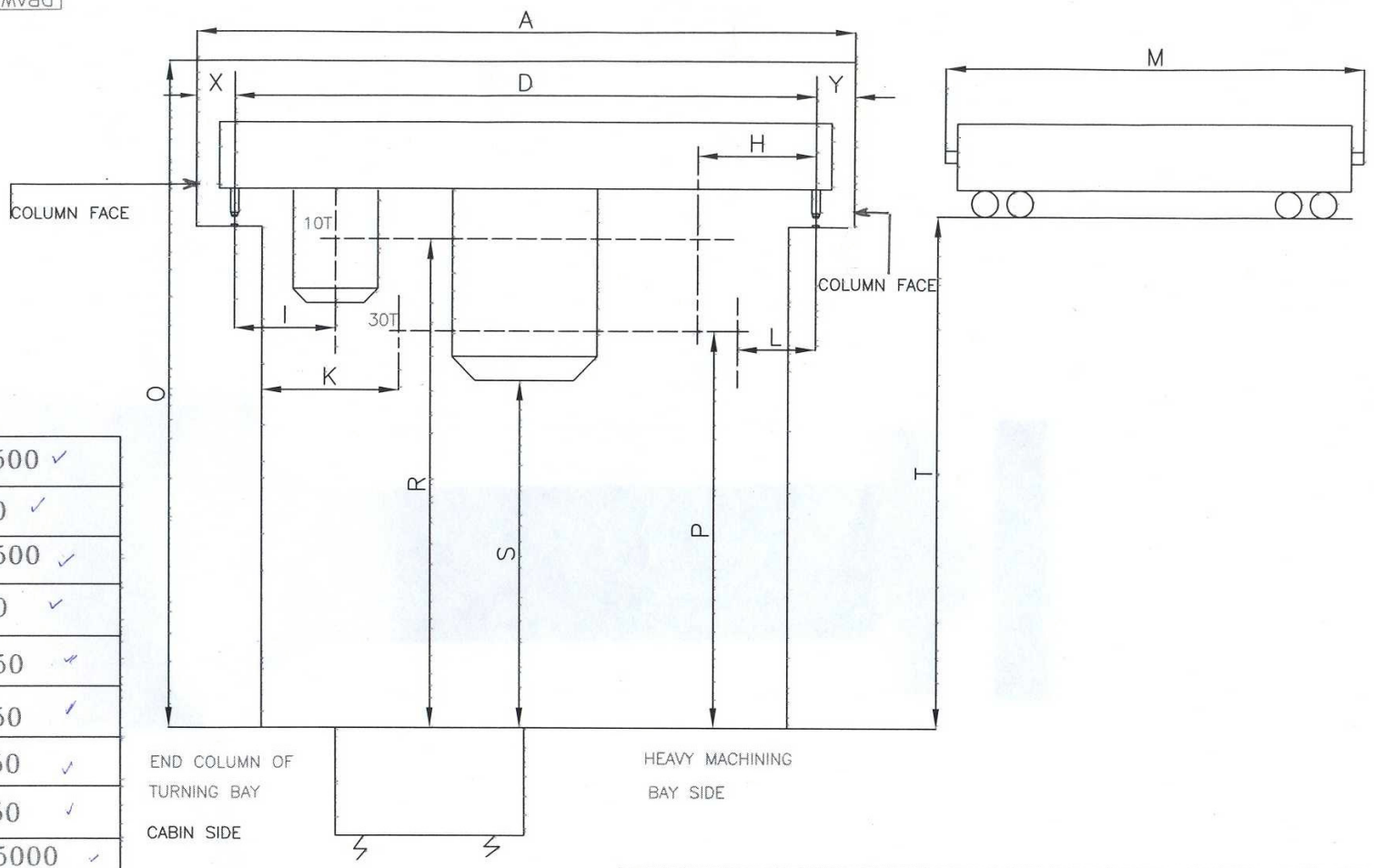
TECHNOLOGY NO. ANNEXURE-A

DRAWING NO. FT-12-108

SHEET NO. | NO. OF SHEETS

DRAWING NO. SHEET 1/1

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)



A	19500 ✓
X	500 ✓
D	18500 ✓
Y	500 ✓
H	2250 ✓
I	1450 ✓
K	2450 ✓
L	1250 ✓
M	<=5000 ✓
O	14,000 ✓
P	9000 ✓
R	9500 ✓
S	8000 ✓
T	10,000 ✓

BHARAT HEAVY ELECTRICALS. LTD.
CENTRAL FOUNDRY FORGE PLANT
RANIPUR HARDWAR

DEPTT.–M/C SHOP	SCALE	WEIGHT IN KG.	NAME	SIGN	DATE
TITLE: CRANE CLEARANCE DRG. 30/10T			DRN: R K Singh		13.3.07
			CHD		
			APPD		

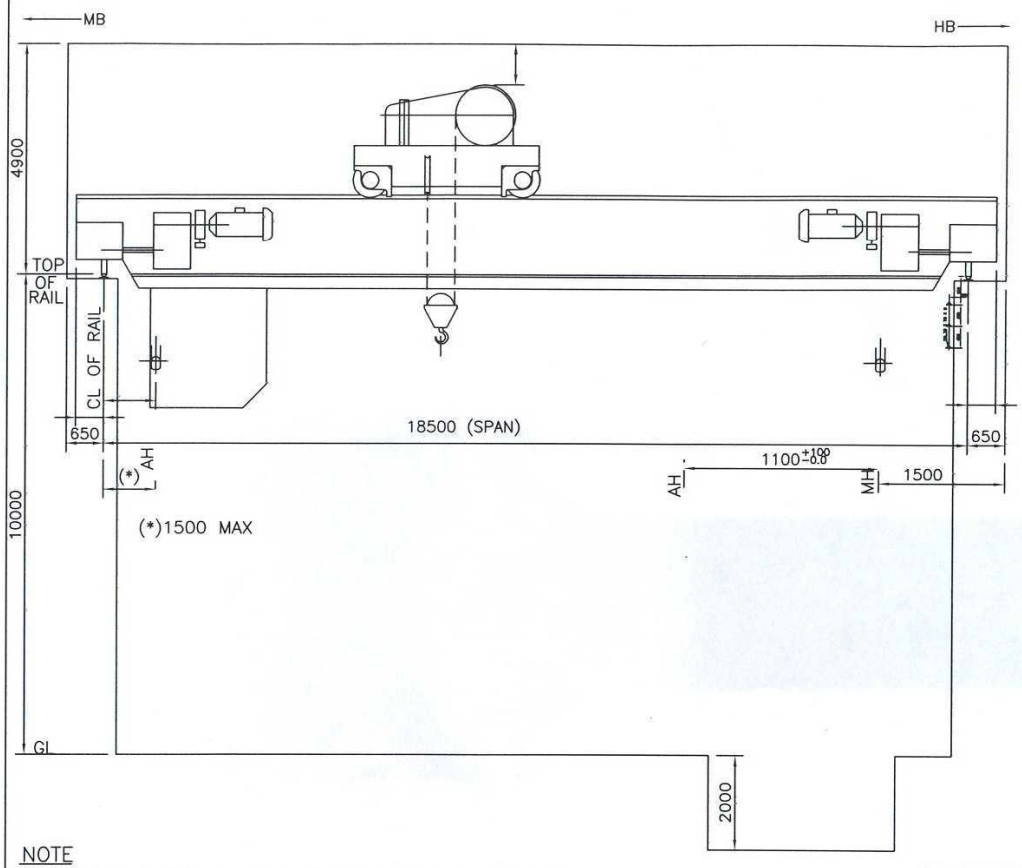
DRG. NO. 04-06-035

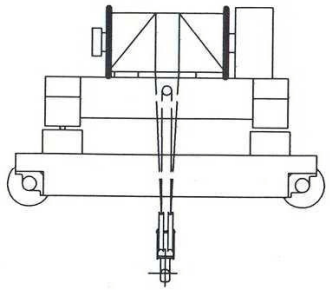
SHEET NO. | NO. OF SHEETS

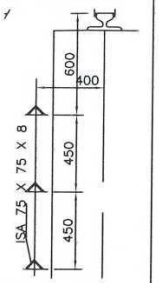
ANNEXURE–A

DRAWING NO. FT–12–122/25 SHEET 1/1

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)







DSL DETAIL
TO BE CONFIRMED
BEFORE MANUFACTURING

HOOK APPROACH	AS BEST AS POSSIBLE	
LIFT	BELOW GROUND LEVEL=2 M (min)	
	ABOVE GROUND LEVEL=7 M (min) DESIRED	
SPEED IN METERS PER MINUTE	LONG TRAVEL = 70	
	CROSS TRAVEL = 25	
	AUX. HOIST = 12	MAIN HOIST = 6
LT RAIL	CR 80	
LOCATION	INDOOR	
CLASS	M8	
STANDARDS	IS–807, IS–3177 AND OTHER RELEVANT	
CAPACITY	HOIST 25/5 T	

NOTE
DIMENSIONS LEFT BLANK SHALL BE FURNISHED BY SUPPLIER
DIMENSIONS FOR BUFFER CENTRE LINE WILL BE PROVIDED LATER

REV	DATE	ALTERED	REV	DATE	ALTERED	REV	DATE	ALTERED
		CHECKED			CHECKED			CHECKED

BHARAT HEAVY ELECTRICALS. LTD.
CENTRAL FOUNDRY FORGE PLANT
RANIPUR HARDWAR

DEPTT.– FDY. TECHY | SCALE | WEIGHT IN KG.

	NAME	SIGN	DATE
DRN	FT/2/MISC		
WKD	T DAVE		
CHD	YNVR		14/3/07
APPD	YNVR		

TITLE
25/5T EOT CRANE CLEARANCE DIAGRAM

PROJECT AND CUSTOMER NAME	TECHNOLOGY NO.	DRAWING NO.	
EOT CRANE, SPEC.No.FT/SP/47A CFFP, HARIDWAR	ANNEXURE–A	FT–12–122/25	
		SHEET NO.	NO. OF SHEETS

ANNEXURE-B TO SPECIFICATION FT/SP/47A

DETAILS OF CRANE TO BE FURNISHED WITH THE TENDER.

SN	Description			Details to be filled
1	Specification of the crane offered			
2	Deviations, if any			
3	Time – Supply / E & C			
4	Total weight of crane in MT			
	4.1	Total wt. of crane (MT)		
	4.2	Wt. of Trolley/Crab (MT)		
	4.3	Wt of each girder (MT)		
	4.4	Wt. of each end carriage (MT)		
	4.5	Wt. of cabin (MT)		
	4.6	Wt. of electricals		
	4.7	Wt. of platforms		
	4.8	Wt. of LT drive		
	4.9	Wt. of other components (specify the component name)		
	Note: Total wt. of crane should match the other break-up weights.			
	4.10	LT Wheel load (max / min)		
5	Hoist: (Main & Auxiliary)			
	Speed in M/min			
	With maximum working load			
	With empty hook			
	Rope size and construction details			
	No. of rope falls supporting the load			
	Dia of Drum			
	Material of Drum			
	Material of Sheaves			
	Lift of hook above floor level (exclusive of travel required to operate limit switch)			
	Drop of hook below floor level			
6	Trolley			
	Speed M/min with maximum load			
	Wheel span			
	Material & Diameter of wheels			
	Size of trolley runway rails			
7	Bridge			
	Speed M/min with maximum working load			
	Wheel base			
	Material & Diameter of wheels			
	Make,Type & Size of Bearings for gears			
	Number of wheels on each end of crane			
	Maximum wheel load & spacing			
	Clear width of foot walk			

9	Make of Control,	
10	Hook approach (MH)	
	Cab end	
	Opposite cab end	
	Distance between Main & Auxiliary hook	
11	Distance centerline between girders to extreme outside of crane	
	Cab side	
	Opposite cab side	
12	Distance bottom of cabin to floor	
	Clearances	
	Bridge truck & building column	
	Trolley & roof chord	
13	Maximum deflection of girders under maximum working load	
14	Wiring trade name and classification of wire insulation	
15	Make, HP & NO of Motors MH AH CT LT	
16	Make, Type & NO of Brakes MH AH CT LT	
17	Make, Type & NO of Lt Switch MH AH CT LT	
18	Material of Gears & Pinion, Type	
19	Material of Gear Boxes	
20	Radio Remote Control: Make, Type, Range, Provision for Siren, Lights etc	
21	Crane weighing system: Make, Capacity, No. of load cells, Location etc	

NOTE: If above clauses are found inadequate for furnishing all necessary information of the crane offered, the supplier may append further information separately.
Other information as per Appendix B of IS4137 and Annexure A of IS3177 may also be submitted, if asked for during technical discussion.