



**CARRY MORE CRANES**

leading name in cranes

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**SINGLE GIRDER & DOUBLE GIRDER E.O. T CRANE.**

**INSTRUCTIONS**

**FOR THE CARE AND OPERATION**

**OF**

**CARRYMORE CRANES**

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## 1. INTRODUCTION

"CARRY MORE CRANES" is today's leading name in cranes. Carry More Cranes will be found working in all parts of the country. Cranes of wide capacity/span ranges are regularly manufactured. The range covers E.O.T. Cranes, Goliath cranes, Grabbing cranes, and special purpose cranes. Carry More Cranes are built in accordance with Indians/International Standards and engineered to meet the exact specification and requirements of the user. Tailor made for the job; these cranes handle loads with at most ease, efficiency and economy.

This manual is prepared for providing our clients with comprehensive Instructions for erections, operation and maintenance of the crane supplies.

However our partnership with our clients does not end with the installation & commissioning. We go on to provide maintenance, repair, & modernization services with the goal of reducing client's costs.

## GENERAL DESCRIPTION

### 2. 1 E. O. T Cranes :

The crane moves on the rails, fixed on top of the gantry girders. In this type generally three motions are incorporated, namely hoist, cross travel and long travel. At times according to the customer's requirement Auxiliary Hoist and micro motions are also incorporated. The Hoist and C. T. machinery are fitted on a common frame called the "Crab or Trolley" which moves on rails fixed on the Crane Girders.

### 2. 2 Goliath Cranes :

Goliath or gantry cranes is the one, which travels on rails fixed at ground level instead of rails fixed at a height as for E.O.T. cranes. These cranes are mainly used for outdoor duty as in stockyard and Dam sites.

### 2. 3 Grabbing Cranes :

These cranes are used for handling bulk materials, Fertilizers, Coal, Sand, Limestone, Gypsum, Clinker, Ore, Grains etc.

### 2. 4 Component Parts of a Crane :

The crane consists of the following main parts :

- A) Bridge girders.
- B) End carriages.
- C) Platforms.
- D) Travel mechanism.
- E) Trolley.
- F) Cabin.
- G) Electrical Equipment.

#### A. Bridge Girders :

A crane bridge consists of welded Box or composite beam structure, which is Composed of either a single girder or two girders. These form the main supporting members for all dead and live loads. The girders carry rails on which the trolley runs.

#### B. End Carriages :

These are the two supporting members on which the girders rest. The end carriages carry the crane wheels.

**C. Platforms :**

These provide support for the LT machinery, electrical panels, secondary resistors for the motors etc. They provide walking space along the span of the crane.

**D. Travel mechanism**

This consists of :

1. Electric motor.
2. Electro Magnetic or Electro-Hydraulic Thruster Brake.
3. Gear box to give the necessary output speed.
4. LT shafting transmitting the torque from the gear box output shaft to LT drive wheels.
5. LT wheels held in the End carriages and running on the gantry rails along the by length.

**E. Trolley**

The trolley consists of :

- a) Hoisting machinery.
- b) Traverse mechanism.
  - a) Hoisting machinery consists of :
    - I) Motor.(Sq. Cage )
    - II) EM DC Shoe Type Brake.
    - III) Gear box.
    - III) Rope drum & Coupling .
    - IV) Wire rope.
    - V) Snatch block.
    - VI) Rope Pulleys
    - VII) Rotary Limit Switch
    - VIII) Brake drum & coupling
  - b) Traverse mechanism consists of :
    - I) Motor
    - II) Electro Hydraulic Thruster Brake
    - III) Gear box.
    - IV) Shaft with couplings
    - V) Wheels
    - VI) Two way lever type Limit switch

**F. Cabin :**

The operator's cabin if provided is suspended either from one end of the girder, center of the girder or from the trolley. Drum/cam/Master controllers for each motor are located that he has maximum view of the working space.

**G. Electrical Equipment :**

In case of a Drum controller operated crane there is only panel called protective Panel located in the operator cabin. When the crane is "Floor operated" or "Cabin operated" through master controllers, the contactor panels for the individual motors are generally located on the Bridge.

Fig. 1. Indicated the nomenclature of crane parts as generally applied to the cranes. The actual configuration of the crane would be as per the general arrangement drawing of the unit.

The characteristics of the crane are indicated in this Manual for ready reference.

**CHARACTERISTICS OF E.O.T. CRANE**

HOISTING MECHANISMS			TRAVERSING AND TRAVELLING MECHANISMS			
	MAIN HOIST	AUX. HOIST		CRAB	CRANE	
Hoist Cap. Tonnes	15	5	Weight(Tonnes)	8	33 (approx.)	
Speeds			Speed (m/min)			
Main/micro (m/min)	10/1	15/1.	Main	40	18	
Lift Mtrs	9.25	8.6	Wheel Base	-----	4200mm	
Duty (IS 807/IS 4137)	III	III	Span	21000mm		
Power Supply	415V,3 Ph.,50Hz	415V,3 Ph.,50Hz	Duty(IS 807/IS 4137)	III	III	
			Power Supply	415V 3PH 50 C/S	415V 3PH. 50 C/S	
WIRE ROPE	Falls/Dia(mm) 6x37 Const. RH Ungalvanised (IS 2266 ) Tensile Strength Breaking Strength. Total Length	4 / 20mm FMC  180Kg/m m2  80 Mtrs.	4/12mm FMC    75 Mtrs.	Buffer Type Rail Size Wheel Load(T) Wheel Dia & Nos. Tread Width mm.	Spring 60 Lbs /yd  320mmx4 75mm	Spring CR80 16.9 Ton 500 mm x 4 100 mm
MOTOR	Make. Insulation H.P. /RPM.	BBL F 60 / 980 Sq. Cage	BBL F 30 / 975 Sq Cage	Motor Make Rating/Insulation. H.P./RPM.	ALSTOM F 6 / 950 SR	ALSTOM F 2x18 / 970 SR
BRAKE	Make / Type Size (mm) & Specn. Nos.	BCH / DC 300 dia	BCH / DC 250 dia -	Make & Type  Size (mm) . Specn Nos	Speedage & EHT 150mm dia	Speedage/EHT 200 dia
GEARBOX	Make / Type Redn. Ratio.	Carrymore Cranes	Carrymore Cranes	Make & Type Redn. Ratio.	Carrymore Cranes	Carrymore Cranes
Drum dia & Length (mm) Input Coupling Output Coupling	580/1600	353/1400	C. T. Conductors D.S.L. Conductors Platforms DSL Insp Cage		Flex. Cable Angle Iron Provided.	
Hook Type Sheave Dia(mm)&Nos.	----- -----	----- -----	Limit Switch SPECIAL FEATURES	----- -----	----- -----	

### 3. INSTRUCTIONS OF ERECTION OF CRANES

#### 3. 1 General :

The Instructions given here for the assembly, wiring, testing and commissioning of the Crane should be carefully followed as good installation will ensure years of satisfactory and trouble free operation.

Check up the cases, crates etc. forming the consignment. Open each case carefully and check up the contents as per the packing list. Any shortage or breakage should be reported immediately so that proper claims could be lodged with the Insurance Co. In case the consignment has been insured by you, this claim should be lodged by you directly with intimation to us.

For erecting the crane a clear site should be allotted. No other operation or construction job should take place on this site while the crane erection is in progress. The site dimensions should allow easy manipulation of the crane as preparatory stage as well as during the erection.

The person in-charge of erection is requested to go through all the instructions given here, and should also study the drawings sent along with this manual.

#### 3. 2 Preparatory Work for Erection :

- i). Select a space in the bay where the Crane is to be erected. The most suitable location of erection site is in the span in between Columns. It is advisable to choose a span which has no horizontal ties between trusses.
- ii). Keep all the erection equipment such as derricks, winches, pulley blocks, slings, tools etc. ready before commencing erection.

The following facilities should be available at the erection site.

- a) 415 V - 3ph 50 C/S. A. C. supply.
- b) 350 A - Welding Transformer.
- c) Oxy - acetylene gas cutting set.

Ensure that all the parts are identified, thoroughly cleaned and kept in an orderly manner. Look for match marks at every stage of the erection work, so that the assembly proceeds in the right manner.

iii). Check the gantry rails and ensure that they are in proper alignment. The smooth running of the Crane depends very much upon the rail alignment. Check the span which should be equal to the Crane span and make sure that deviations if any should be within the permissible limits. Any abnormal variations must be rectified prior to the erection of the Crane. End stoppers must be provided at the end of the gantry rails and the rails electrically earthed.

iv) The position, spacing and alignment of the main supply conductors i.e. Down Shop Leads (D.S.L.) have to be checked with respect to the General Arrangement drawing. See that the position of the end Carriage carrying the current collector is on the same side where shop D.S.L are provided.

V) In case the size of the Crane is small and the space and the lifting equipment permits, then the end carriage and girders may be assembled together on the ground and the complete assembled structure lifted together and placed on the gantry rails.

If this is not possible, the individual end carriage should be taken up and placed on either side, gantry rails. They should be properly secured to the gantry girder. Next the girders are to be taken up one at a time. In case the girder is having joint, it should be first assembled and joined together on the ground, before lifting.

The girders are then placed on the end carriages and fixed by means of machined bolts.

Place the Crab assembly on top of the girders, In case it is not possible to lift the fully assembled Crab, the hoisting machinery- Motor, gear box and rope drum, should be dismantled and the Crab frame with the C. T. mechanism should be lifted in one piece. Now the hoisting machinery should be reassembled, and wire rope wound on the rope drum, after riving through the snatch block and the top block assembly wire rope riving between snatch Block and Top Pulley block should be done in such a way that reverse fall. If any should be on Equalising Pulley (pulley which does not rotate).

Now fix the platform and Hand railing. Assembling the L.T. Machinery, check the alignment of the motors, gear boxes and brakes. Weld all loose or tack welded angle supports and cleats fully. Weld the nuts to the bolts which hold the Platform angles and supports after tightening them. This will prevent them from working loose and falling out since they are not likely to be seen during routine maintenance. Where platforms are of I.S. grating weld locating flats in the slots to prevent them from shifting.

Fix the cabin, panels and Resistance Boxes, ladder, guards, main D.S.L. Collector bracket and C. T. conductor arrangement. Any site work and welding to be done as per the drawing, is to be completed now.

Now complete the wiring as per the wiring diagram. Inspect all parts to ensure that everything is in order.

#### 4. OPERATION INSTRUCTIONS

##### 4. 1 Inspection before Operation :

Check the following, thoroughly, to ensure that the Crane is finally for trial runs.

- 4.1.1 The gear Boxes are filled with recommended lubricants, up to the maximum level marked on the respective dip sticks.
- 4.1.2 All points requiring lubrication are well lubricated.
- 4.1.3 Open reduction gears wherever used are properly greased with the recommended lubricant
- 4.1.4 The wire rope is properly greased.
- 4.1.5 Check buffers, and end stoppers are properly assembled.
- 4.1.6 Check all nuts and bolts, especially the girder-end carriage and joint bolts, machinery foundation bolts, wire rope-clamp bolts, to ensure that they are fully tightened.
- 4.1.7 Release the Brakes of each motion manually and ensure that all motion are free. Set the breaks.

#### **4. 2 Preparation for Operation :**

The Crane is operated by manipulating the controllers for each motion. Before charging the D.S.L. complete the following routine checks.

- 4.2. 1 Check cable interconnections as per wiring diagrams.
- 4.2. 2 Check for loose connections.
- 4.2. 3 Carry out insulation resistance test.
- 4.2. 4 Remove Power Circuit Fuses in the Main Panel, and switch on the main Isolator. Check the control circuit for proper operation. Operate the controller step by step, and check the sequence of operation.
- 4.2. 5 Switch off the main isolator. Replace the Power fuses. Ensure that all the over load relays are set for the full load currents of the respective Motors, as mentioned on the name plates
- 4.2. 6 Switch on due Power.
- 4.2. 7 In case any mechanism is provided with more than one drive, de-couple the Motors and check their direction of rotation. Ensuring all motors are rotating in the same direction, couple the motors to the gear boxes.
- 4.2. 8 Check the direction of each motion, with respect to the movement of the controller handle
- 4.2. 9 Try all the motion on no load.
- 4.2. 10 Set all the limit switches and check their functioning.
- 4.2. 11 Check the brakes and set them.

#### **1.3 Trial Operation :**

The Crane is now ready for Load-Testing. Load Test should be conducted as follows :

- 4.3.1 Check the gantry girder joints and the rail clamping.
- 4.3.2 Operate individual motions on No-Load. Record the Motor currents.
- 4.3.3 Take 25% of the rated Load. Operate the motions, record the currents. Follow the same Procedure by taking 50% load, 75% load and 100% load.
- 4.3.4 On 100% load record the speeds of each motion.
- 4.3.5 Position the load at the center. Remove the hook from slings. Take the trolley to one extreme end. Note down the height from fixed points on the floor at the center of the span. Now bring the trolley to the center of the span. Sling the load and lift the load to clear the floor. Once again note the height from the center of the span, to the fixed point on the floor. The difference in these two readings will give the deflection of the girder on full load. If this is within the permissible limits, load the Crane to 125% of the rated load. 4.3. 6 Check all the motions for over load. It is not necessary to record any readings. only ensure that the individual motions perform under overload conditions.
- 4.3. 7 From the records, see the currents drawn by each motor and set the overload relay at this point.
- 4.3 8 The Crane is now commissioned and ready for Regular Service.

#### **4.4 Safe Hoisting Practices :**

E.O.T Cranes are designed with the safety of the operating personnel first in mind. Your own safety and that of your fellow workers will be assured when the overhead material handling equipment is used as recommended by the manufacturer. Disregarding such recommendations, endangers life and property. The following are basic rules worthy of your careful consideration and attention.

**4.4.1 Do not Load Beyond the Rated Capacity :**

The immediate danger is the possible failure of some load carrying parts. Overloading might also start a defect which could lead to some future failure even at less than rated capacity.

**4.4.2 DO NOT USE ANY OVERHEAD MATERIAL HANDLING EQUIPMENTS FOR HANDLING PERSONNEL.**

**4.4.3 CONDUCT A PERIODIC VISUAL INSPECTION FOR SIGNS OF DAMAGE OR WEAR.** Particular attention should be paid to the wire rope and hook. If there are signs of wear or damage or if the hook is distorted or opened out, bring it to the notice of the safety engineers before loading the hoist.

**4.4.4 DO NOT USE HOISTING ROPES OR CHAINS AS A SUBSTITUTE FOR SLINGS.** Cable or chain slings should be of the proper size and type for the load being handled. Never use slings showing damage of any extent.

**4.4.5** Whenever the hook is lowered in such a manner as to take the load off the wire rope, the operator should determine, before making a lift again, if the wire rope is properly wound on the rope drum.

**4.4.6 STAND CLEAR OF ALL LOADS.** If you must travel a load over the heads of other personnel, give ample warning of your intention before you move.

**4.4.7 ALWAYS "INCH" THE HOIST INTO THE LOAD.** Running into the load at full hoisting speed imposes an excessive overload on the hoisting mechanism and could result in the failure of parts and/or the supporting structure. This is particularly true with high hoisting speeds.

The same principle applies to the travelling motion also, which would otherwise cause a swinging of the load leading to unforeseen damages.

**4.4.8 LIMIT SWITCHES ARE FOR EMERGENCY USE ONLY,** and should not be tripped during normal operation. If it is necessary to travel to the limit, use extreme caution and approach the limit in slow speed or by "inching". Do not leave the hook block in contact with the limit switch at the end of operation. A phase reversal with the block in this position will probably result in damage to the hoist if the "down" button or control lever is operated.

**4.4.9 BE SURE THAT THE HOIST RAISES OR LOWERS PROPERLY WHEN THE CORRESPONDING PUSH BUTTON OR CONTROL LEVER IS OPERATED.**

A reversal of direction indicates a phase reversal in the current Conductor, or an interchange of the wires on the push button or controller any of which would cause the limit switches to be inoperative. **DO NOT, UNDER ANY CIRCUMSTANCES,** operate the Crane until the fault has been located and corrected.

4. 4. 10 **CENTRE THE HOIST OVER THE LOAD BEFORE LIFTING.** Do not side pull or end pull. When the center of gravity is difficult to ascertain, the load must be raised a little at a time to see that each part leaves the ground at the same time. The use of many ropes would be meaningless if the load is not supported evenly.
4. 4. 11 **USE PADDING ON THE EDGE OF LOAD IF IT IS SHARP AND ANGULAR** to prevent damage to the rope (sling). Contact of the wire with a sharp angular edge of the load is unsafe. The wire rope can be cut very easily when it is twisted. **REMEMBER THAT TWISTING AND PULLING** is the method employed when it is necessary to cut the wire rope.
4. 4. 12 When the straddle angle of the sling is large, a larger load than commonly supposed, works on slings. The limit for this angle should be kept within 90°.
4. 4. 13 **WIRE ROPES FOR LOAD HANDLING** should not be placed on the portion of the load which may cause them to move or slip off.
4. 4. 14 **REVERSING THE POSITION OF AN OBJECT OR LOAD** is among the most dangerous types of operations. This operation should be done very slowly taking care that the ropes do not become loose. When the ropes become loose, the next thing to expect is a sudden several of the object position, which will cause very heavy strain on the ropes and possibly cause them to snap.
4. 4. 15 **DO NOT DRAG THE LOAD.** It is dangerous to assume that a load which has been safely tied can be dragged, because **DRAGGING THE LOAD CREATES HIGHER STRESSES** in the wire rope, than when suspending it.
4. 4. 16 **KNOW THE HAND SIGNALS,** if working with cabin operated Cranes. Operators should accept the signals of only those persons authorized to give them. Do not operate when signals are not clear.
4. 4. 17 **DO NOT LEAVE THE LOAD SUSPENDED IN THE AIR AND UNATTENDED.**
4. 4. 18 **DO NOT JOG CONTROLS UNNECESSARILY.** Hoist Motors are generally with a high starting torque, and high slip. Each start causes an inrush of current and leads to overheating and heat failure or burn out, if continued to excess.
4. 4. 19 **AFTER DISUSE:** When the Crane is to be used after a long period of disuse, be sure to operate all the motions without load first.

#### **4. 5 Floor man's Standard Hand Signals**

The determination of a system of operating signals side by side with a strict adherence thereto is strongly recommended from the standpoint of operating efficiency and accident elimination. Suitable examples are given below for the Operator's information.

- 4. 5. 1 For Hoisting : Hold forearm horizontally, palm up and move forearm upward.
- 4. 5. 2 For Lowering : Hold forearm horizontally, palm down, and move forearm downward.
- 4. 5. 3 For Travelling : Hold upper arm horizontally at the side of the body, raise forearm vertically with palm facing the direction of movement and move forearm in the direction of movement.
- 4. 5. 4 Degree : When degree or extent is to be indicated, the motion of the forearm is reduced (or repeated in small movements) for a slight movement, or increased when a greater movement is desired.
- 4. 5. 5 Stop Lowering : The previous position of the forearm is maintained, but the palm is turned over with the forearm in the same position.
- 4. 5. 6 Stop Travelling : The position of the forearm is the same as that for travelling, but the palm is turned over as in the case of Stop Lowering.
- 4. 5. 7 Emergency Stop : Hold forearm horizontally in front of the body and swing rapidly to left and right.
- 4. 5. 8 Operation : The completion of work is shown by raising both arms horizontally and lowering both at the same time.

If the travelling distance of lift is so much that the above signals are difficult to distinguish the entire arm may be moved, instead of the forearm. The use of a whistle together with the above signals will help in making them clearly understood.

When a whistle is used, with the signals, the following notes are sounded before the hand signals are made :

- a) Short movement
- b) Continuous movement
- c) Stop

It is essential only one man be assigned to the work of signaling. Operation according to signals received from two or more men is extremely dangerous. The operation of the Crane should also be performed by one man chosen for this purpose.

#### **4. 6 How to Start the Crane**

- 4. 6. 1 Check Crane and Crane track way for any obstructions.
- 4. 6. 2 Release all locking devices.
- 4. 6. 3 Check all lubricating points for required quantity of lubricants.
- 4. 6. 4 Ensure that no item are lying loose on the Crane and trolley.
- 4. 6. 5 See that all controllers are in the neutral position.
- 4. 6. 6 Switch "on" Crane protective gear.
- 4. 6. 7 Check signal and warning devices.
- 4. 6. 8 Check brake and limit switches for their proper functioning.

**NOW THE CRANE IS READY FOR OPERATION.**

#### **4. 7 How to Stop the Crane**

- 4. 7. 1 Run the empty hook and trolley into the specified resting position.
- 4. 7. 2 Bring the Crane to access point.
- 4. 7. 3 Set all control gears neutral position.
- 4. 7. 4 Trip working lights.
- 4. 7. 5 Trip protective gear.
- 4. 7. 6 Trip and Itch isolating switch.
- 4. 7. 7 Lock operators cabin.
- 4. 7. 8 Actuate locking devices, if any.

**NOW THE CRANE IS OUT OF OPERATION.**

### **5. MAINTENANCE :**

Service life and operational safety of the crane depend to a large extent on proper maintenance and lubrication. Needless to say, daily maintenance and inspection are not only important for safe operation but also govern the efficiency and service life of the crane. All driving parts should be regularly examined for faultless operation. In the event of unusual sounds or undue heating, the cause is to be investigated and the fault eliminated.

#### **5. 1 General Precautions :**

There are many points requiring attention for maintenance of the Crane, but the most important item may be broadly classified as follow :

##### **5. 1. 1 Lubrication :**

Lubrication, which is as important to a Crane as breathing for a human, must never be forgotten. Fill the proper amount of oil or grease at proper intervals. The lubrication chart for overhead Cranes is given for reference. The charts are only for guidance and small variations are permitted to suit local conditions and plant practices. Lubricants must be clean and stored in dust tight containers.

### **5.1.2 Worn or Deformed Parts and Broken Parts :**

If the wear or deformation is within a certain limit, the part can still be used. Every wear limit mentioned in the Wear Table is the usable wear limit.

At each periodic inspection, consider the amount of expected wear before the next inspection and repair or replace the part if necessary. Since the wear limit is specified as a percentage of the initial dimension in some cases, it is advisable to make a table indicating the initial dimensions and the wear condition to facilitate inspection.

### **5.1.3 Fasteners :**

Loose nuts etc. may result in serious trouble. Inspect all fasteners like nuts, lock, pins etc. with special care.

### **5.1.4 Contacting Parts :**

This mainly concerns electrical parts. Every operator while commencing his days work, should first go round the Crane once for a casual inspection. He should then operate all the motions without load. Check for unusual sounds. Operate the controller stepwise, and ensure the Crane is responding normally. If everything is satisfactory, put the Crane into operation. In case if any unusual thing is noticed, immediately switch off the Crane and report to the "Maintenance Staff".

## **5.2. Details of Maintenance :**

### **1) Lubrication :**

#### **a) Antifriction Bearing :**

These should be completely freed of old grease, the bearing housing rinsed and filled with clean antifriction bearing grease.

The grease filling should be according to the instructions of the manufactures of antifriction bearing and should not exceed two thirds of the free inner space.

During lubrication care should be taken, that no dirt gets into the bearing. Antifriction bearing enclosed in gear boxes do not normally require grease lubrication, since the oil mist formed inside the gear box provides sufficient lubricating film in the antifriction bearings.

#### **b) Plain Bearings :**

Plain bearings are re-lubricated in such a way that the old grease is pressed off the bearing by the new grease. Re-lubrication should be continued until clean grease comes out at the face sides of the bearing.

With centralized lubrication. Care should be taken to see that the grease reservoir is never allowed to remain empty. Further the grease pipes should be checked for clogging or mechanical damage.

### **5.2.1 c) Gear Boxes :**

The first oil change for all gear boxes should be carried out after 150 operating hours. For further oil changes the information given in the lubrication charts, are applicable. For oil change, the old oil is to be entirely removed and the gear box thoroughly rinsed, with rinsing oil, which is also to be removed completely, before filling fresh oil.

From time to time the oil level should be checked with the oil level indicator. Oil level should be maintained at the maximum mark by topping. Under no circumstances the level should be allowed to fall below the minimum mark.

### **d). Wire Ropes :**

Wire Ropes should always be kept well lubricated to protect them from rust and abrade. Before applying a fresh lubricant, the strands should be cleaned with a wire brush. The wire rope should not be cleaned by any grease solvent. When the rope is clean and dry apply the recommended lubricant by an ordinary paint brush.

### **5.2.2 Motors :**

Electric Motors should be kept clean, and protected against drops of water, oil etc. terminal covers should be carefully closed. It should be periodically inspected, for loose connections inside the terminal box, slip ring assembly, carbon brushes, and in the Resistor Bank while the Motor is running check the bearings for sound.

When checking the slip ring and brush holders, it is necessary to remove metal and coal dust from inside the terminal box and end casing. Portable blower should be used to drive away dust and other foreign particles from inside the casing. The slip rings should be wiped with cotton cloth. Pitted slip rings may be polished with fine emery paper, or a light cut can be taken on the lathe machine. When inspecting the brush solder, it is necessary to check the brush pressure on the rings and smoothness of arm motions. Worn out and broken brushes should be replaced.

Bearings of motors should be checked and washed with petrol, and the lubricant changed every 8 to 12 months. Lubricant should be added every 3 to 6 months. It should be noted that the lubricant fills no more than two-thirds of the bearing housing.

### **5.2.3 Brakes :**

The braking torque of the electromagnetic/thrustor brake is produced by the action of a strong compression spring. When the power is switched on, the brake is released by the solenoid/thrustor, working against the pressure of the operating spring. The normal position of the brake is therefore "ON" and the brake will return to this position if the power fails, or is switched off.

If spare shoes with brake lining are kept in stock they can be fitted in a few minutes, when the lining in use worn out. The worn shoes should then be relined and kept in readiness for future replacement.

The length of the operating spring is set during assembly to give the required torque, and no subsequent alteration is required. In case this spring requires to be replaced the brake name plate will indicate the length required to be maintained. Periodically the spring length should be measured, to ensure the same has not been disturbed.

The A. C. electro magnetic brakes need more attention than either thruster operated brakes or D.C. E. M. Brakes. The most common complaint is regarding, burning of the magnet coils. If this brake is properly maintained and regularly checked, trouble free service can be achieved.

Burning of coil occurs when the magnet stroke is not maintained up to 20 mm. When the stroke is more than 20 mm, the magnet coil may not develop sufficient power to pull the plunger instantaneously. The plunger operation become sluggish and the plunger may stick in some intermediate position being an A. C. coil, under these circumstances the air gap gives rise to a heavy current. A few operations in these conditions is sufficient to burn the coil. For trouble free service, proper maintenance of the brake is essential.

#### **5. 2. 3 (A). Brake setting A. C. Electromagnetic Brakes :**

- 1) Ensure magnet stroke is 20 mm. If not manipulate the adjuster nuts to obtain 20 mm stroke.
- 2) Make the hand release lever " ON".
- 3) Check uniformity of gap between brake drum and shoes. This gap should be 1.5 mm on both sides. If the gap is not uniform, adjust the shoe clearance adjuster bolts.
- 4) Make the hand release lever "OFF". Press the solenoid lever manually and Confirm that both shoe clear the brake drum.
- 5) Energize the coil. In case the magnet hesitates to close, adjust the spring pressure by loosening the adjusting nuts.
- 6) The stroke of the solenoid should be reset periodically to the figure given in the instruction plate to compensate for wear. The shoe clearance bolt should be adjusted simultaneously.

#### **(B) Electro Hydraulic Thruster Brakes :**

The Thruster incorporates a Motor driven centrifugal oil pump which exerts an upward thrust to the top cross bar or pen point. Thruster sent out are ready to work after filling with hydraulic oil to B. S. 148 Grade B -

Wipe away any dirt accumulated around the oil filter plug in the casing. There is also an oil level plug. Remove both these and slowly start pouring oil through the filter plug hole until it overflows through the level plug hole. Replace both plugs and operate the thruster manually, several times, it will operate in a jerky and irregular manner due to fall in oil level. Repeat this process until the thruster operates smoothly. The thruster having no side over flow plug should have oil poured in until it overflows from the filter plug hole.

All sizes of thrusters have an integral stator/rotor unit, the top bearing is grease lubricated and the bottom bearing splash lubricated from oil in the pump. These bearing should run satisfactorily without attention for several years under severe conditions.

Normally the operating oil will not require changing more than once in two years time. It is advisable check periodically that the oil level is correct. In case level has gone down top it.

#### **5.2.4 Coupling :**

Maximum service life of the flexible couplings can be effected through exact alignment of the motor gear box, shafting, wheels, rope drum etc. In the event of excessive wear and tear occurring, the alignment should be checked, and if necessary, realigned also ensure that in case of gear coupling the same are filled with grease properly.

The normal flexible geared coupling is examined by trying to twist one shaft, while holding the other shaft. If excessive free play is noticed, it indicates the gear teeth are worn out and the coupling opened and checked. It is likely that only the teeth on the bush or the outer casing, or both are worn out. The same should be replaced.

#### **5.2.5 Electrical Equipment :**

In general the break downs on Cranes are more often on the Electrical side then the mechanical. Hence your Electrical Equipment need special attention. The Electrical break downs are more often and are, of a very minor nature, like loose connection, but they are likely to put off the Crane.

Regular maintenance carried out by trained personnel ensures unhampered operation.

#### **A. Control Gear :**

The control gear, i.e. either, drum controller, cam - controller, master controllers pendent push button station, should be regularly checked for free functioning. Also the contacts be in good condition, pitted contacts are likely to cause single phasing. Keep the contracts clean with CTC and cotton cloth. Avoid using emery paper. Check the contact springs for proper tension. The rotor of the controller should be kept well lubricated at the pivot point.

Keep all terminal screws tight to avoid loose connections. Contacts should be kept covered with a thin film of petroleum jelly (white grease)

**B. Control Panels :**

Panels should be kept clean of dust etc. by regularly cleaning them with a portable blower. Do not use panels as a locker to keep tools etc. Attend the panels once in fifteen days. After attending the panels, it is most important to operate the control circuit and check the contractor sequence. Next try all the motions on load, if any found satisfactory hand over for "operation".

**C. Resistor Banks :**

Check for loose connections. Due to vibrations, it is quite likely that the grids may work loose. This will cause sparking, which in turn will puncture the mica tubes, on which the grids are stacked. Grids should be kept rigidly fixed on the racks.



## 6. PERMISSIBLE WEAR

Do not use the parts of the Crane over the following limits of wear. The parts which are worn out over these limits should be replaced immediately.

Part	Description	Permissible wear limits (decrease in size)
Gears	First pair of gearing	10% of tooth thickness on the p. c. d.
	Other gears	20% of tooth thickness on the p. c. d
Wheels	Flanges	50 % of full size
	Tread	30% of full size. When the difference in diameter between right side and left side wheels exceeds 1.5 % re-machine to rectify.
Sheaves	Groove dia.	50 % of wire rope diameter
Brake lining	Thickness	50 % of full size
Wire rope	No. of breakages of Steel wires	10 % of total stand per every 300 mm length over the entire length

## 7. LUBRICATION CHART

S. No.	Part to be lubricated	Method of application	INTERVAL		RECOMMENDED LUBRICANTS		
			Indoor	Outdoor	I. O. C.	HP	CALTEX
<b>1.</b>	<b>CLOSED GEARING</b>						
	a) Less than 12 HP ambient temperature Less than 50°C	Splash	A	B	Servomesh 140	Enklo 120	Alpha Znn . 140
	Ambient temperature greater than 50°C	Splash	C	D	Servomesh 140	Enklo 120	Alpha Znn 140
	b) 12 to 40 HP ambient temperature less than 50°C	Splash	A	B	Servomesh140	Enklo 120	Alpha Znn 140
	Ambient temperature Greater than 50°C	Splash	C	D	Servomesh140	Enklo 120	Alpha Znn 140
	c) Above 40Hp ambient temperature less than 50°C	Splash	A	B	Servomesh 140	Enklo 120	Alpha Znn 140
	Ambient temperature Greater than 50°C	Splash	C	D	Servomesh 140	Enklo 120	Alpha Znn 140
<b>2.</b>	<b>OPEN GEARING</b>	Manual	E	E	Servocoat 120	Hytak F 30	AP-3
<b>3.</b>	<b>BALL BEARING</b>	Grease Nipple	A	B	Servogem 3	Lithon EP 2	AP-3
<b>2.</b>	<b>PLAIN SLEEVE BEARING</b>	Grease Pump	F	F	Servogem 3	Lithon EP 2	AP -3
<b>7.</b>	<b>WIRE ROPE</b>	MANUAL	E	E	Servocoat-120	Cardium Compound	

### LEGEND:-

A- Check & Lubricate weekly. Change after 2000 Hours of operation or every 6 Months.  
 B- Check & Lubricate weekly. Change after 1500 Hours of operation or every 3 Months.  
 C- Check & Lubricate weekly. Change after 1000 Hours of operation or every 3 Months.  
 D- Check & Lubricate weekly. Change after 750 Hours of operation or every 2 Months.  
 E- Apply Weekly or every 50 Hours.  
 F- Apply Daily or every 8 hours

**Caution: - Be careful to keep oil away from the brake linings, electric cables, wires etc.**

## TROUBLE SHOOTING FOR ELECTRIC HOISTS

<u>SL. NO.</u>	<u>NATURE OF DEFECT</u>	<u>POSSIBLE CAUSE</u>	<u>REMEDY</u>
1.	Hoist Motor does not start at all.	<p>A. One of the supply fuse is blown off.</p> <p>B. Limit switch not making contact due to over travel of the snatch block in either direction or faulty internal contact assembly /cam.</p> <p>C. O/L relay tripped.</p> <p>D. Pendent push buttons are not working.</p> <p>E. Supply voltage too low.</p>	<p>A. check the fuse for all the 3 phases after the main fuse.</p> <p>B. Move the snatch block in opposite direction to reset the limit switch. If it does not reset open the limit switch and check the contacts. Replace the damaged contact or cam. Also verify the settings of the limit switch.</p> <p>C. Check cause of over loading and reset the relay.</p> <p>D. Open pendent &amp; click for proper connection &amp; function.</p> <p>E. Take action to correct the voltage.</p>
2.	Main Hoist contactors operate but motor does not work.	<p>A. Brake does not operate electrically.</p> <p>B. Motor defective.</p> <p>C. Loose connections in the control panel or motor terminals.</p> <p>D. Jamming in the mechanical system.</p>	<p>A. Check for brake setting &amp; proper function of brake.</p> <p>B. Check the motor.</p> <p>C. Check all connections &amp; tighten.</p> <p>D. Check Mechanical parts and rectify the Cause for mechanical jamming. Relubricate the parts if required.</p>
3.	Over heating / interruption of motor	<p>A. Bearing worn out.</p> <p>B. Overloading</p> <p>C. Supply voltage too low or too high.</p> <p>D. Wrong star or delta connection of Motor.</p> <p>E. Loose connections of Power or control circuit.</p> <p>F. Rotor of motor rubbing with starter.</p>	<p>A. Check bearings and change if required.</p> <p>B. Check bearings &amp; change if required.</p> <p>C. Check the load.</p> <p>D. Check &amp; correct the connections.</p> <p>E. Check the Loose connections.</p> <p>F. Check the Motor and rectify accordingly.</p>

4.	Limit switch does not function.	<p>A. Improper contact of Limit switch.</p> <p>B. Wrong connection of limit switch.</p> <p>C. Incorrect of supply.</p>	<p>A. Replace the defective contacts.</p> <p>B. Verify the connections with circuit diagram and correct it.</p> <p>C. Correct the sequence of supply.</p>
5.	Motor is noisy.	<p>A. Single phasing.</p> <p>B. Bearing worn out.</p> <p>C. Brake is defective.</p> <p>D. Fan of the motor ribbing with the fan cover.</p>	<p>A. Check all the three phases for proper voltage.</p> <p>B. Check bearings &amp; replace them.</p> <p>C. Check the brake for proper operation &amp; gap.</p>
6.	Brake does not operate.	<p>A. Supply voltage to coil is improper.</p> <p>B. Open circuit in brake coil.</p> <p>C. Brake circuit is improper.</p>	<p>A. Check for proper voltage on coil (AC/DC).</p> <p>B. Change the coil.</p> <p>C. Re-set brake properly.</p>
7.	Brake slips on load.	<p>A. Improper setting of brake.</p> <p>B. Worn out lining or springs.</p>	<p>A. Change or adjust the gaps of liners as per instructions.</p> <p>B. Check brake holding springs, change them if required. Inspect the condition of lining if springs are OK.</p>
8.	Brake magnet burns.	<p>A. Brake magnet coil and armature dusty or sticky.</p> <p>B. Mounting of magnet loose.</p> <p>C. Air gap of the armature or disc is more non uniform.</p> <p>D. Armature of the solenoid misaligned.</p>	<p>A. Clean the E section of magnet.</p> <p>B. Check all mounting screws of magnet and tighten them up.</p> <p>C. Set the brake properly.</p>
9.	Brake coil burning out.	<p>A. Jamming of brake.</p> <p>B. Supply voltage too low or too high.</p> <p>C. Frequent inching.</p> <p>D. More or non uniform gap of the armature.</p>	<p>A. Check for working of brake manually, adjust the gap.</p> <p>B. Check for proper voltage.</p> <p>C. Avoid unnecessary inching</p> <p>D. Set the brake properly.</p>

10.	Improper winding of rope.	<p>A. Rope guide is not working.</p> <p>B. Rope is over lapping because of angular load pulling.</p> <p>C. Hook touching on ground.</p>	<p>A. Check rope guide for proper function.</p> <p>B. Avoid pulling load at an angle.</p> <p>C. Adjust limit switch accordingly.</p>
11.	Motor runs but hoist does not operate.	<p>A. Rigid coupling key sheared off.</p> <p>B. Shaft broken.</p> <p>C. Coupling has given away.</p>	<p>A. Replace the key.</p>