CRANEX

Erection and maintenance manual for CRANEX electric overhead cranes

CRANEX LIMITED

Regd. Off:-
~~B2/21, Vasant Vihar, New Delhi - 110 057.~~
~~Tel: 676044. Telex: 31 3868 CRNX IN.~~

Works:-
57/1, Industrial Area , Site 4, Sahibabad (U.P.)
Tel:- ~~668043~~ 0120 - 4167628, 3240427

~~Branch Off:-~~
~~31 Seagull, 4 Carmichael Road, Bombay-400 026.~~
~~Tel:- 4923395, 4923055. Telex: 1176325 CRNX IN.~~

CRANEX

INDEX

CRANEX

1

INTRODUCTION

Congratulations. You have just joined a select band of organisations using Cranex equipment. In order to ensure long and trouble free service, this manual should be kept handy and maintenance undertaken as indicated.

Cranex Ltd. is one of the leading crane manufacturers having supplied equipments to all parts of the country. Whether a Turbine is to be lifted in Imphal, Defence Installations to be maintained in Ladakh, Locomotives to be lifted in Vishakapatnam, 747 Jumbo jets to be serviced in Bombay or Rockets to be checked before launching from Trivandrum, all are handled by Cranex Equipments. The range covers EOT, HOT, Goliath, Jib cranes, Winches and Electric Hoists. Tailor made for the job, these units efficiently and timelessly work to make your job of material handling totally carefree.

CRANEX

2

GENERAL DESCRIPTION

1. Bridge Girders

a) Double Girder Crane: Two bridge girders consisting of welded, rivetted or machine bolted structures. The girder towards the long travel machinery is known as drive side girder and the second girder as idle side girder.

b) Single Girder Crane: Only one girder consisting of a welded, rivetted or machine bolted structure. In this case the hoist machinery is suspended and runs on the bottom of the girder.

2. End Carriages

These house the long travel wheels, driving as well as idle, and the girders are supported on them.

3. Crab

This consists of the hoist and the cross traverse machineries. (Aux. hoist if required)

a) Hoist machinery consists of the following:
   1) Motor
   2) Brake
   3) Gear Box
   4) Rope Drum
   5) Wire Rope
   6) Snatch Blocks

b) Cross traverse machinery consists of the following:
   7) Motor
   8) Brake
   9) Gear Box
   10) Wheels

4. Platform

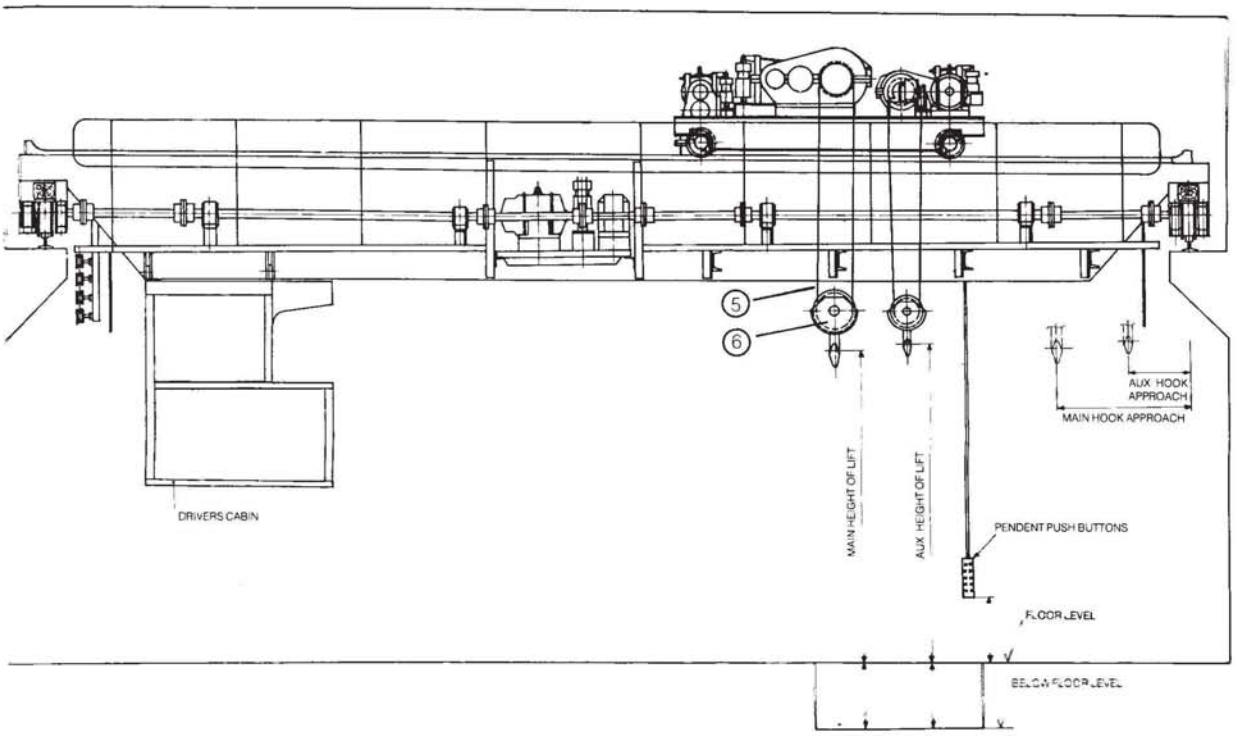
This is a walkway along the length of the crane for maintenance purpose. It also provides support for the long travel machinery.

5. Long Travel Machinery

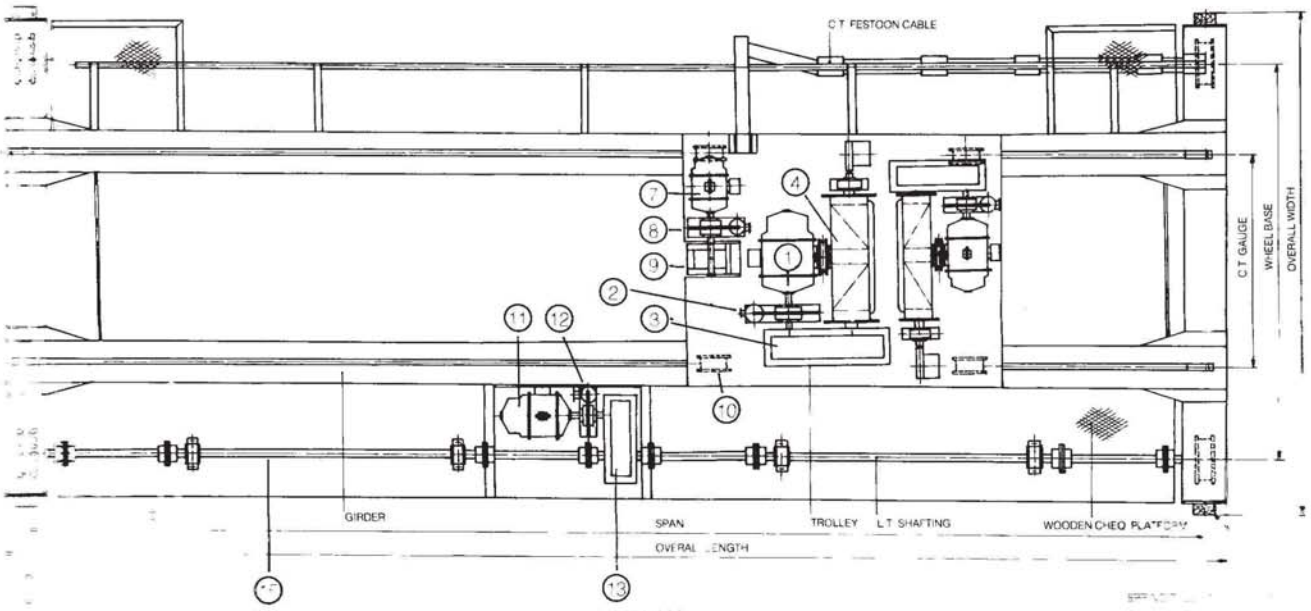
This machinery moves the crane along the length of the building and consists of the following:
11) One motor at centre of span or two motors connected directly to two wheels.
12) Brake
13) Gear Box
14) Wheels
15) Shaft along the full length.

6. Cabin

The cabin, if provided is suspended from one end, so positioned to give the operator an unobstructed view of the load to be handled. All the controls are housed inside the cabin.



ELEVATION



PLAN

The figures are only the general layout of the crane, however the actual layout is as per the assembly drawings

CRANEX

3

ERECTION INSTRUCTIONS

General

Erecting cranes may be either a simple or complicated and expensive process, depending upon the preparations made prior to the receipt of the crane and to the amount of importance attached to the instructions given below. We provide for easy erection by dismantling the crane in the shop after it has been completed and match-marking each dismantled part to facilitate erection.

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

Ensure that all parts are identified and thoroughly cleaned prior to undertaking erection. All parts have been match-marked at the works for easy assembly at site.

1. Gantry Rails

A correctly made runway is an important factor to ascertain that the crane will work for years with a minimum cost of maintenance. The span should be equal to the crane span and deviations, if any, must be within permissible limits. Refer chart enclosed for permissible deviations.

First straighten the runway along one side and use a steel tape and spring scale for checking the span and alignment of rail on the other side.

While checking span, a force of 10 kgs. should be maintained. Regardless of span the tape must only be held at both ends with no supports. End stops must be provided at the end of the gantry rails and the rails should be electrically earthed.

2. Crane

The Crane has been first fully assembled in the workshop and then dismantled for despatch. The two main bridge girders and end carriages have been match-marked for easy assembly. The connecting points in the end carriages and bridge girders have been marked A1, A2, B1, and B2.

a) The End Carriages should be first placed on the gantry rails and clamped in position. The bridge girders should then be lifted and placed on the end carriages ensuring that end A1 rests on point A1 and so on.

   If the girders are sent in pieces, they must be preassembled on the ground taking extra care to ensure straightness before welding.

b) After the Crane girders have been fixed in position the trolley should be lifted and placed correctly on the bridge rails and in the correct direction. In case headroom prevents the assembled trolley to be erected, it should be totally dismantled and erected piece by piece and finally assembled on the top itself.

c) Now the platform and its supports should be fixed using proper bolts at each support. The LT machinery should be fixed next, rechecking the alignment of motors, gear boxes and brakes. All locating pads should be welding to prevent shifting of any unit from its aligned position.

d) The bottom block should now be suspended from the trolley with rope wire clamping the ends of the rope drum with the clamps provided. The reeving should be as per the assembly drawing.

3. Down Shop Leads

a) The support brackets should first be welded to the gantry as per the drawing. The insulators etc. should now be fixed in position. The copper wire should then be lifted and tightened in position using the strain insulators at each end. The copper wire should be clear of each intermediate insulator by atleast 50 mm. Before the crane is finally put into commission it should be run very slowly over each bracket to ensure that the current collector does not foul.

b) Alternatively the Down Shop Leads (DSL) can be of Angle Iron type in which the conductor is of Angle Iron instead of copper wire. In this case also the brackets should first be welded to the gantry girder and then the busbar insulators fixed on them. Subsequently the Angle Iron conductors should be straigthened, aligned and welded as per the assembly drawings.

c) In some cases, specially for flameproof and spark resistant cranes, flexible cable down shop leads are provided. In this case the conductor is a flexible cable of suitable size suspended on suitable runners running on a support along the length of the shed.

4. Electrical Wiring

During transportation, a number of electric cables have to be disconnected and hence the electrician should reconnect all wires consulting the wiring diagram. Care should be taken to ensure that all the connections are made with proper lugs, glands and ferrules to prevent loose contacts at a later date due to normal crane vibrations.

The crane structure, motor frames and metal cases of electrical equipment are all earthed. The gantry rail is also earthed as it is generally accepted that for normal conditions the crane wheels can be considered to make an effective earth with the rail.

CRANEX

4

OPERATING INSTRUCTIONS

Inspection before operation

Check the following point by point to ensure that the Crane is finally ready for trial operation.

1) Make sure that phasing of Crane power supply is correct.
2) The gear boxes should be filled with recommended lubricants upto the maximum level marked on the respective Dip sticks.
3) All points of lubrication should be greased manually by a grease gun. Refer the enclosed lubrication chart for selecting the proper kind of lubricant.
4) Test and adjust the hoist limit switches. The actuating nuts are easily adjustable to suit the limits of hook lifts required by disengaging the driving chain. The lever limit switches for long travel and cross traverse should be properly positioned and wired.
5) Buffers and end stops must be properly fixed.

Trial Operation

1) One by one, operate all the mechanisms of the Crane on NO LOAD. Check performance of the mechanisms and safety devices and ensure that there is no malfunctioning of any component or assembly. Closely observe for any abnormal noise, vibration etc.
2) Drive the crane carefully along the whole length of the runway for checking clearances.
3) Test the Crane first with 100% load and then 25% overload.

Safe Hoisting Practices

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 only when the equipment is used in a proper manner and as recommended by the manufacturer. Disregarding such recommendations will endanger life and property.

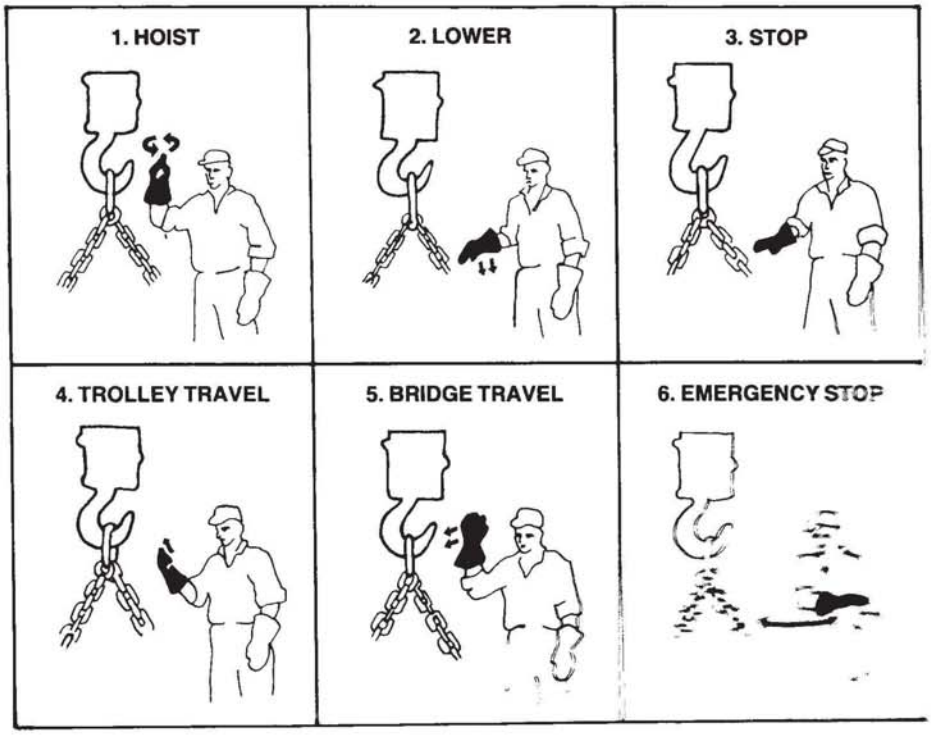
1) DO NOT OVERLOAD. The safe working load is very clearly marked on the Crane and under no condition should the crane be overloaded. Overloading may permanently damage some load carrying part and this could lead to a future failure even at less than rated capacity.
2) USE SLINGS ONLY. Cable or chain slings should be of proper size and type for handling the load. Never use slings showing any type of damage. Use padding on the edge of the load if it is sharp, to prevent damage to the sling.
3) STAND CLEAR OF ALL LOADS. If a load must be travelled over the heads of other personnel, ample warning must be given before the Crane is put into motion.
4) 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 vital parts and/or the supporting structure. This is particularly true with high hoisting speeds. To avoid the load swinging the same principle should be applied to the travelling motion also.

5) LIMITS SWITCHES ARE FOR EMERGENCY ONLY. Care should be taken not to trip limit switches during normal operation. If it is necessary to travel to the extreme limit, use caution and approach the limit in slow speed.
6) CENTRE THE LOAD BEFORE LIFTING. Do not pull the load. The load should be raised a little at a time to see that each part clears the ground at the same time. Care should also be taken to ensure that all slings are supported evenly to avoid excess load on any one sling. Do not drag the load as dragging creates higher stress in the wire rope than when the load is suspended.
7) USE HAND SIGNALS. Hand signals must always be used for cabin operated Cranes and only one person should signal to the operator. The floorman's standard hand signals are illustrated below for reference.
8) AFTER DISUSE. When the Crane is to be operated after a long period of disuse always run all motions without load first.

FLOORMAN'S STANDARD HAND SIGNALS.

It is essential that only one man be assigned the work of signalling as operating the Crane on signals from two or more men can spell disaster. The operation of the crane should also be performed by one trained man only.

1. **HOIST.** The floorman makes small circles with his hand with his index finger extended and his forearm in a vertical position.
2. **LOWER.**
   The floorman, with his hand open and forearm extending downward below the hip, waves to indicate downward movement.
3. **STOP.**
   The floorman, with his hand level with his hip, extends and holds his arm rigid.
4. **TROLLEY TRAVEL.**
   The floorman extends his arm just above his hip with fingers closed and thumb extended and indicates direction with his thumb, in the same way he would "thumb a ride."
5. **BRIDGE TRAVEL.**
   The floorman, with his hand open and with his palm facing the direction of travel and forearm vertical, indicates direction of travel by waving his arm.
6. **EMERGENCY STOP.**
   The floorman extends his arm with hand level with his hip and palm downward and moves his hand quickly to right and left.



CRANEX

5

MAINTENANCE INSTRUCTIONS

GENERAL

An overhead crane represents a sizeable investment which has been made to obtain the service that an overhead crane can give. This investment can and should be protected, as by doing so the life of the crane is prolonged and the cost to maintain it kept to a minimum.

Due to their complex nature, electric overhead cranes present special problems in that they are a combination of three branches of engineering, electrical, mechanical and structural. Each can immobilize the equipment due to poor maintenance. The economic upkeep of cranes can only be attained through a rigidly enforced preventive maintenance programme. Repairs can then be carried out without having to pay for overtime. Loss of production can be kept to a minimum. Additionally, the life span of the crane will be extended and the sequence of a defective part contributing to major breakdown can be prevented.

Needless to say, daily maintenance and inspection are not only important for safe operation but also govern the efficiency and ultimately life of the Crane.

The following points should especially be kept in mind to assure thorough maintenance.

CRANE RUNWAY

A good runway is essential for proper performance of a crane. Columns and runway members must be braced and strengthened to take the longitudinal and braking action of the crane. Runway rail alignment and span should be carefully checked at least once a year so that corrections may be made for normal settling of building or runway structures that occur through changes of seasons. Rails should be both level and parallel. Joints should be free from wide gaps and worn edges causing wear to the wheel surfaces and bearings.

In aligning runway rails, a definite procedure should be laid down. The rail adjacent to the main line conductors should be lined up first. A check of the dimension between the centre of the collectors contacting the runway wires and the adjacent track wheels should then be made with a transit although reasonably satisfactory results can be obtained with a chalk line on shorter runways. The second rail can be set up using a steel tape.

Rails should be checked for span in increments of not more than 3 metres of runway length. Runway rail alignment should never be allowed to deviate more than 6 mm as the danger of wheel flanges scrubbing the rail head can do irrepairable damage on the wheels and place undue strain on mechanical and structural components.

After runway rails have been aligned the conductors can be checked by using an indicator set up on the crane bridge.

Rugged crane bumpers are provided at each end of the runway. These are of steel and should engage with the buffers on the crane. It is essential that the bumpers are set square with the runway, otherwise the crane may be thrown askew when it comes into contact with them.

The main runway conductors form the basis of good electrical performance. The bare copper wire type should be supported on insulators at frequent intervals to prevent sagging

Serious problems with runway conductors frequently occur due to the power supply taps on a long runway being at a great distance from the operating area of the crane. The line voltage drops due to the distance involved. When making checks, capacity loads should be handled in the areas farthest away from the conductor feeder taps. At no time should voltage fluctuations be allowed, efforts should be made to maintain the voltage within 5% below and 10% above.

1. **Lubrication**
   Lubrication is most important and hence must be regularly checked. The lubrication chart is enclosed for reference.
2. **Loosening of fastened parts**
   Loose nuts etc. may result in serious trouble and should therefore be fastened with special care.
3. **Loose contact**
   Electrical contacts must be periodically checked and cleaned as required.

DETAILS OF MAINTENANCE

1. **Motors**
   Electric motors should be protected against drops of water, oil etc. Terminal boxes should be carefully closed. The electric motor should be periodically inspected and cleaned. Before inspection, the motor and slipring box should be cleaned of all dirt and dust.

   When checking slip rings and brush holders, it is necessary to remove metal and coal dust from the box. The rings are to be wiped with cotton cloth. If there is no dust or oil on the ring, the cloth could be soaked in petrol.'Scorched' rings can be polished with fine emery paper. When inspecting the brush holder it is necessary to check the brush pressure on the rings and smoothness of arm motion. Worn out brushes should be replaced by spare ones.

   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 2/3rds of the bearing housing.

2. **Brakes**
   General
   The pressure applied by the main compression spring determines the braking torque capacity of the brake. The brake comes from the manufacturer preset to give the required torque and the main spring should not normally need adjustment. When the current is switched on the brake is released by the solenoid/thruster closing against the pressure of the operating spring. The normal position of the brake is therefore 'ON' and the brake will return to this position in the event of a power failure.

   The brake shoe clearance must be equal and is adjusted by the shoe clearance adjuster bolt. In case the shoe is to be replaced, the stroke adjuster nut should be slackened and the brake released by operating the hand lever. The shoe pivot pin should then be removed and the shoe replaced. Always keep spare shoes with new linings ready for immediate replacements.

   Electromagnetic

   With the brake deenergised and with the shoes gripping the brake drum, adjust the solenoid stroke by turning the adjuster nut until stroke gap is adjusted between 16-19 mm. Do not exceed the rated stroke as this will render the brake ineffective.

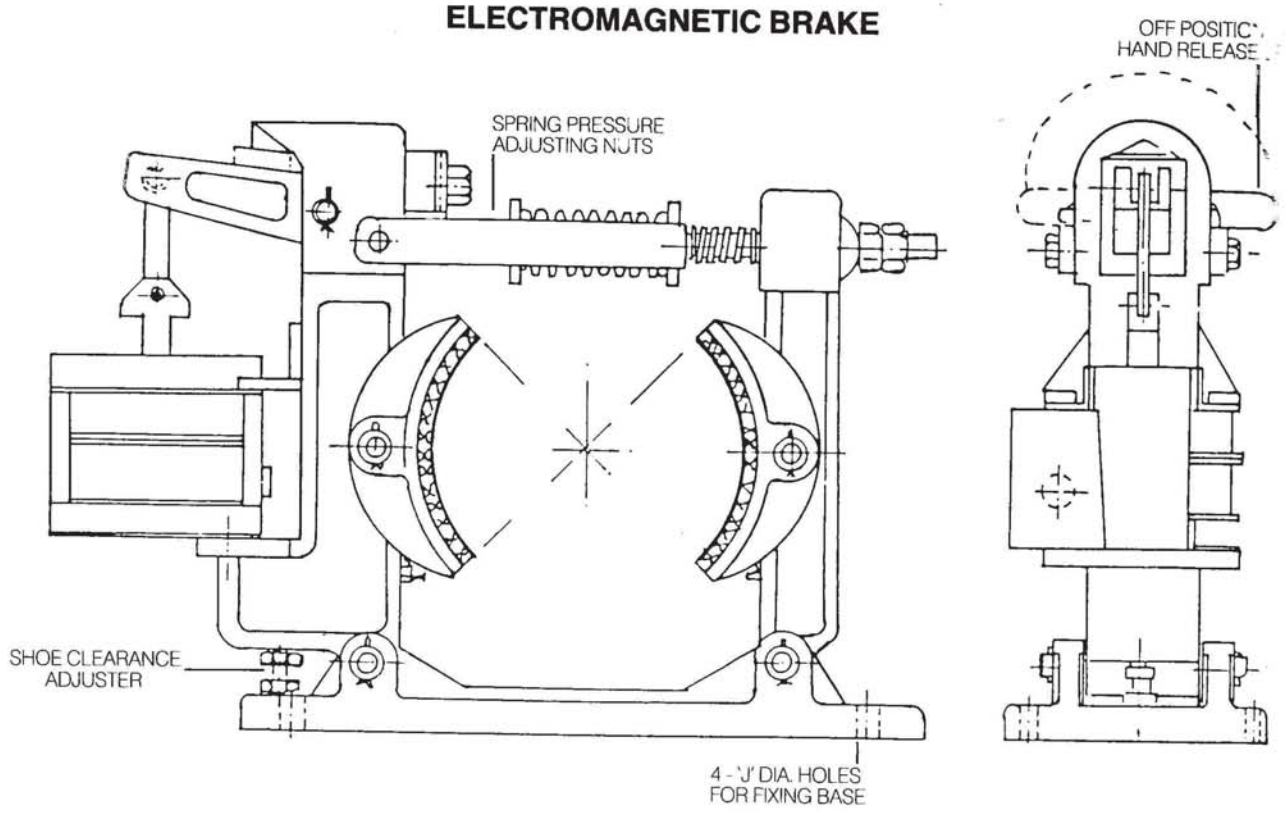
   Complaints about electromagnetic brakes have been frequent only when maintenance has not been proper. If a lot of dust enters the solenoid opening then the plunger sticks during movement. If dust is kept down then the movement of the plunger will be smooth and trouble free.

   In the magnet a heavy starting current is produced when the supply is switched on. As the current drops considerably as the gap between the plunger and the magnet reduces. The current drawn is at its lowest when the plunger has been fully drawn in and the air gap in the magnet circuit reduces to zero.

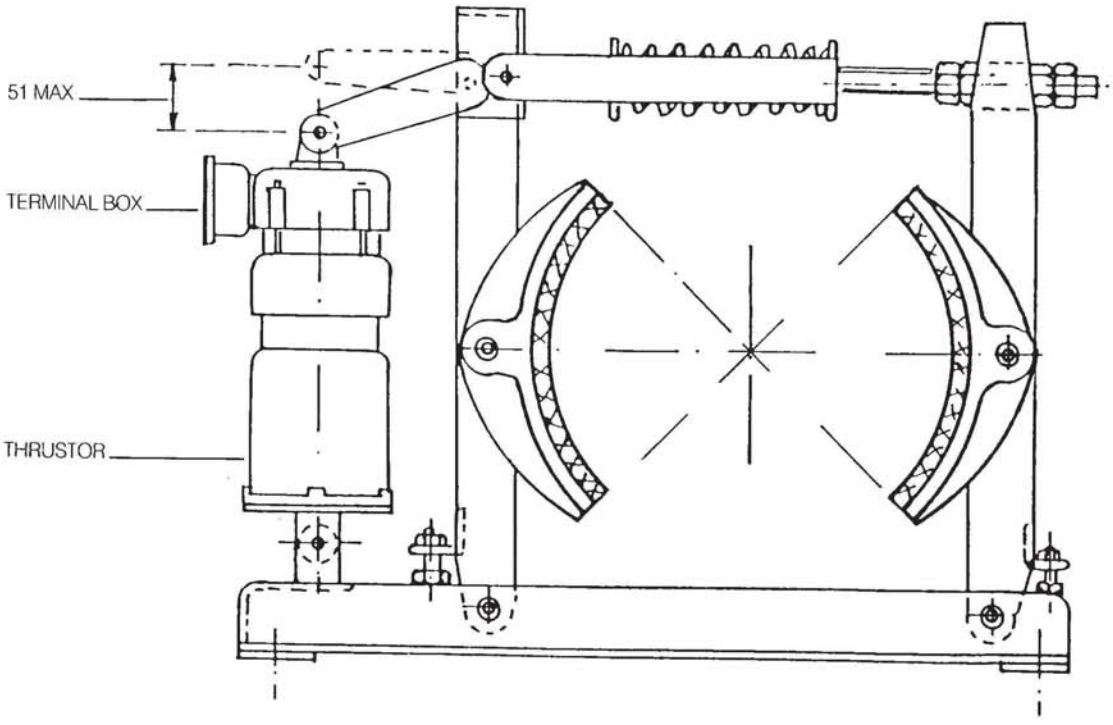
   In the event of sticking, some air gap results after the coil has been energised. It will therefore continue to draw heavy current and this can result in a coil burnout. Make sure that there is no air gap between plunger and the inner core of the magnet when energised then there will be no coil burnout.

   Brake setting
   1. Magnet stroke should be 16-19 mm.
   2. Hand release lever should be ON.
   3. Shoe clearance should be around 1.5 mm and uniform.
   4. Hand release lever should be OFF.
   5. Press the solenoid lever by hand and ensure that both shoes lift off the drum.
   6. Solenoid stroke should be reset periodically.

ELECTROMAGNETIC BRAKE



ELECTRO HYDRAULIC THRUSTOR BRAKE



Electro Hydraulic Thrustor
The thrustor consists of a cylinder filled with oil containing the centrifugal pump located at the bottom and the electric motor assembled on the top cover. The rotor shaft of the motor is extended vertically downwards into the cylinder and carries an impeller at its lower end. The top bearing of the motor is grease lubricated and the bottom bearing is splash lubricated from oil in the tank.

Remove oil filler plug and slowly fill oil till it overflows. Normally oil will not require changing more frequently than once in two years. However, the level must be checked periodically. In order to drain the oil the drain plug should be removed without dismantling the unit.

3. **Master Controllers**
   The main supply must be isolated before the master controller is opened. The contact surface will become dark and rough due to arcing but this does not affect the functioning and the contacts are not to be cleaned. If the silver contact facing is burnt down the contact must be replaced. To remove, unscrew the contact stud and replace with a new silver tipped contact stud.
4. **Gears**
   Gears should be inspected atleast every six months. During a check up care should be paid to the condition of working surfaces, degree of teeth, wear and correctness of meshing (specially during the first week of gear working). Normally gear should not make a sharp or cyclic sound. Axial shifting of gears is not permissible. Gear case flanges should not leak. The oil level should stay between the markings on the dip stick. The first change of oil in the gear case should be after 150 hours of operation.
5. **Bearings**
   When checking roller bearings care should be paid to their fastening in the bodies, tightness of covers, condition of packing and lubrication. When normally operated, bearings should not heat much, nor squeak as a result of dirt, insufficient lubrication, damage of some elements or friction of rotating parts against the body.
6. **Wire Rope**
   The reliability and soundness of wire rope for further use should be determined by the number of broken wires per strand per day. During routine check-up, it is imperative to thoroughly inspect and tighten fastening of rope ends on drum.

   To prevent untimely wear of ropes, they should be lubricated with the recommended lubricant.
7. **Travelling Wheels**
   Travelling wheels should not have cracks or worn collar rims. The rolling surface of the wheels should be clear of hollows and dents.

CRANEX

6

COMMON SOURCES OF TROUBLE

GENERAL

It is very important that any trouble with electrical control is rectified as soon as it is detected, to avoid high maintenance or replacement costs later. Most control devices have moving parts. Thus maintaining electrical control devices mostly means watching out for mechanical problems, not electrical ones.

Low voltage is a common source of trouble, especially on smaller systems. It can show up either in starting or running. If running, the motor will draw a higher current, causing frequent tripping of the overload relay. It may also drop to the point where the contactor may ride back on the springs and freeze the trips.

Another source of trouble is when the inrush of the motor in starting draws such a high current that the voltage is proportionately lowered. This could result in the welding and freezing of the contacts.

Overheated parts are always a sign of trouble. Since various parts operate at different temperatures it may be difficult to identify this symptom. For example blow-out coils and other parts of the contactor may operate at or exceeding the temperature of boiling water, hence these parts cannot be touched by the naked hand. Any evidence of baking or smoking, however, should be checked immediately.

Loose connections, always a source of trouble, may develop at any time. Therefore, control connections should be checked periodically along with the main line connections.

The best way to find grounds which may develop is to check the cables and conduits periodically with an ohm meter. This is especially necessary if water could collect in the conduit.

Only personnel familiar with electrical equipment and the hazards involved should be permitted to service these control units.

CONTACTORS AND SPRINGS

The contactors are designed with adequate margin for crane operation. After some time of operation however, small craters will appear on the contact surfaces which will cause increased resistance and accelerate the process of wear on the contacts. The contactor contacts should therefore be inspected at regular intervals and worked plane with a file.

For all types of contactors new contacts can be bought and it is not necessary to buy new contactors.

Contactors need the most care. Deposits on contacts should be removed with either sandpaper or a fine file. Emery paper should never be used because the emery dust embeds itself in the contact face and continues to wear.

In filing care should be taken to maintain the original shape of the contact, but do not overdo it. While copper oxide should be removed because it is an insulator, trying to keep contact surfaces smooth only wastes the material of the contact surface.

Silver contacts should never be filed unless they become severely roughened. Silver oxide is a good conductor and does not need to be removed. When contacts are deeply pitted, burnt, or worn thin, they should be replaced by new ones. Screws holding the contacts in place should be kept tight at all times.

Springs should maintain the proper contact pressure. If contacts are permitted to wear too thin, spring pressure decreases and overheating results. This overheating generally causes the spring to lose its temper, further decreasing the contact pressure.

New methods of impregnation have greatly reduced coil burn outs. However, in the event of a coil failure, the contactor should be checked for mechanical binding or blocking. For example, a contactor coil may have a 47 amp. inrush value with the magnet closed in the sealed position. If the magnet is accidentally blocked open, or the voltage is so slow that the magnet cannot seal against the contact springs, the AC current will be high, causing a burn out.

CONTROL FAULT DIAGNOSIS CHART

Symptom	Possible Cause	Cure
	MANUALLY OPERATED CONTROLLERS	
Excessive Contact Burning	Low contact Pressure, contacts not properly aligned	Adjustment by inspection. On drum controllers adjust star wheel lever spring to centre the finger so it strikes the contact squarely.
Burning Out Resistors	Starting sequence stopped at midpoint	Instruct operator
Failure to Pick Up	Low voltage on coil	Check system
Failure to Hold In	Coil burnt out or wrong coil	Replace, Check gap
Failure to Drop Out	Mechanical binding	Clean and adjust
	Contact welded	See contacts

	THERMAL OVERLOAD RELAYS	
Failure to Trip	Wrong size heater. Relay damaged by short circuits.	Check instruction sheets. Clean and adjust. Replace relay.
Trips at Low current	Wrong heater. Heater assembled incorrectly. Heater in high ambient	Check instruction sheets. Check instructions. Install relay and controller near motor or in cooler place.
Trips on Starting	Starting cycle of motor too long	Refer to factory
Failure to Reset	Broken mechanism	Replace relay or broken part
Burning of Relay Contacts	Short circuit	Check wiring of push button in the circuit.
	High coil current	Check holding coil current
	Vibration	Remount control
	Dirt and corrosion	Clean and adjust
	Misapplication	Use [illegible] relay [illegible] too high coil current for relay contacts

Symptom	Possible Cause	Cure
	CONTACTS	
Short Contact Life	Interrupting too high a current	Use special tips or next larger siz contactor.
	Using oil-immersed device when air should be used (Note: Contacts burn much faster in oil than in air)	Use air break device if oil is not necessary or if oil is imperative tr heavier duty oil-immersed device
	Bounce on opening or closing	Readjust contactor for 'Bounce'
	Abrasive dust	Dust tight enclosure
	Low Contact Pressure	New contacts and/or Springs
	Frequent jogging (inching)	Larger size contactor
Contactor Chatter or Pumping	Poor contact in Control Circuit	Check connections in control circ
	Fluttering control relay, such as Pressure or temp switch	Repair pilot device
	Broken Shading Coil	Replace
	Bad interlock	Increase wipe and pressure seal interlock
Overheating	Copper oxide	Clean lightly with file
	Heavy load for more than eight hours continuous operation	Use silver alloy tips
	Overloaded	Reduce load or use larger Contr
	Weak contact Pressure	Clean and adjust. Replace conta spring and contact if wear allowance is used up.
	Poor connection	Tighten
Weak Pressure	Worn tips	New tips
	Poor adjustment	Readjust gap and wear allowanc

	SLIDING CONTACTS USED ON RHEOSTATS, KNIFE AND DRUM SWITCHES	
Overheating	Contact pressure	Dress copper contacts or use special alloy contacts. Lubricate contacts periodically as recommended.
Excessive Burning	Rapid lever Operation	Operate more slowly to eliminate starting across the line which causes burning of contact surfac and flashover.
Irregular Surface	Lack of maintenance	Smooth over contact surface a- lubricate
		(Do not use emery cloth)
Abrasion	Lack of Lubrication	Apply light coat of vaseline

TROUBLE SHOOTING CHART

It would be a good idea to keep a record of all breakdowns and their remedies in a tabular form. A typical example would be the formation of a trouble shooting chart as shown.

FAULTS	POSSIBLE REASON FOR FAULT	REMARKS
No motions of crane operate	1) Main air-circuit-breaker off 2) Main contactor out 3) Runway collectors not making contact with conductors 4) Broken wire or connection	Press re-set button clean collectors and ensure they are all running on conductor wires
Hoist motion fails to operate	1) Control panel fuses out 2) Thermal relay out 3) Undervoltage relay out 4) Limit switch in open position only; allowing hoist to be lowered 5) Trolley collector off wire or dirty collectors	Press re-set button Open up limit switch and free contact
Trolley motion fails to operate	1) Control panel fuses out 2) Thermal relay out 3) Fuses for trolley blown 4) Undervoltage relay out 5) Trolley collector off wire or dirty collectors 6) Wheel axle broken	Press re-set button Seized bearing or broken gear
Bridge motion fails to operate	1) Control panel fuses out 2) Thermal relay out 3) Undervoltage relay out 4) Wheel axle broken	Press re-set button Seized bearing or broken gear
Hoist motion too slow or too fast	1) Non-release of magnetic brake 2) Drum controller finger contacts not connecting 3) Magnetic controllers accelerating contacts not operating 4) Loose resistor leads	Coil burnt out or broken wire
Braking action too slow for motion	1) Magnetic brake needs adjustment	Brake linings worn or loose linkages.
Bridge Skews	1) Low Voltage 2) Crane overloaded 3) Poor mechanical condition of bearings, gears wheels etc.	
Flashing of main conductor systems but no motion	1) Dirty main connectors	Clean contact face

CRANEX

Preventive Maintenance Check List.

If maintenance is done in accordance with the following checklist, crane tie ups and operating expenses may be kept to a minimum. In order to ensure thorough crane inspection the below mentioned check list should be referred to.

FIRST DISCONNECT MAIN SWITCH BEFORE WORKING ON CONTROLS.

CHECK	ITEM	OPERATION
☐☐☐☐	Dust	Clean
☐☐☐☐	Rust and Corrosion	Clean — Report if excessive.
☐☐☐☐	Connections	Tighten electrical connections. L for discoloration of any copper current carrying parts.
☐☐☐☐	Nuts & Bolts	Tighten
☐☐☐☐	Fuse Clips	Check for spring clip pressure.
☐☐☐☐	Contact Tips	Look for copper oxide scale and dress only if necessary. Check whether contact pressure is same on all tips.
☐☐☐☐	Bearings	Do not oil; Check whether they are free moving.
☐☐☐☐	Coils	Check for any signs of over heati or mechanical injury.
☐☐☐☐	Overload relays	Trip by hand, mechanically free,
☐☐☐☐	Push button	Clean, check contacts.
☐☐☐☐	Resistors	Check for signs of overheating.
☐☐☐☐	Gear Boxes	Drain small quantity of oil from dr plug to remove sludge, if too muc sludge, drain oil and clean. Chec level and add if required. Replace oil if black and dirty.
☐☐☐☐	Drum Contacts	Tighten and check for contact we and overheating, put small amour of vaseline of sliding surfaces.

A list should be maintained of all parts which may need replacement in the near future. Regular periodic checks should be carried out as detailed above.

IMPORTANT POINTS FOR CRANE OPERATORS

The foundation of good preventive maintenance is an educational programme for both operative and maintenance personnel. A few simple ideas applied in this respect can repay the effort involved many times over. It is suggested that a card be installed in the cab of each crane stipulating the following regulations:

DO:

Clean walkway, control cabinets, etc. regularly.
Take up slack in slings and cables gradually.
Provide good access to crane from the floor.
Secure all covers after maintenance.
Turn off main switch when operator leaves cab.
Remove main fuses when maintenance has to be carried out on crane.
Report immediately, any adjustments that should be made on the crane to the Foreman.
Regularly test the brakes, limit switch and controls before you start your "shift" on the crane.

DON'T:

Move any load except on signal from one floorman.
Run bridge or trolley up against the stops, ease it gently.
Use limit switches as regular stops.
Pick up a load at an angle or drag slings, hooks, or loads along the floor with the crane.
Let the block swing excessively.
Brake too hard and stop crane suddenly.
Overload the crane.
Jerk a load off the floor.
Leave tools etc. loose on crane or runway after maintenance.
Leave hook blocks hanging at head height over gangway or aisles.
Try to do maintenance on the crane with power on.
Step on cross shaft or couplings when crane is in motion.
Let hook block lie on the ground so that hoist cables become loose as this will cause cables to jump the sheaves and may result in broken cables.

CRANEX

7

PERMISSIBLE DEVIATIONS

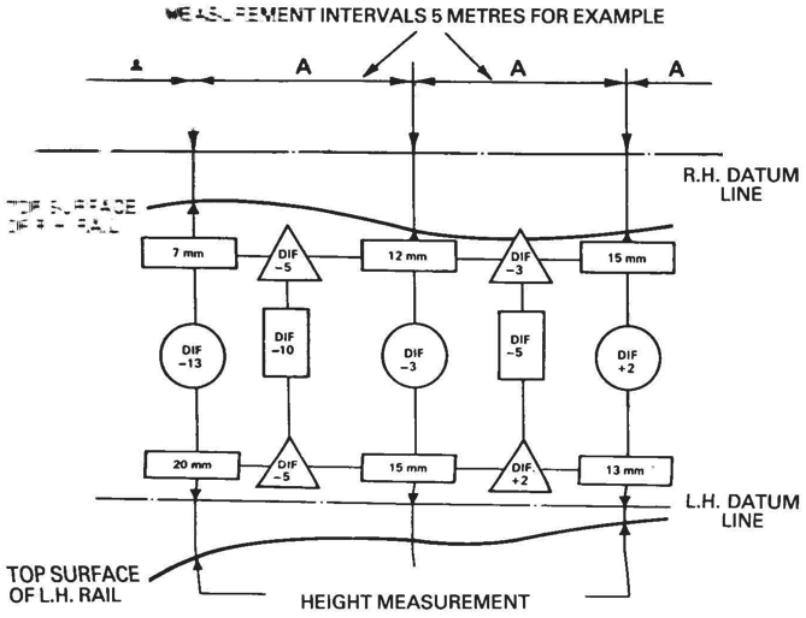
Permissible Wear

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

Part	Description	Permissible wear limits (decrease in size)
Gears	First part 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
	Thread	30% of full size. When the difference in diameter between r side and left side wheels exceed 1.5% remachine 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 strands per every 300 mm length over the entire length.

GANTRY RAIL ALIGNMENT ALLOWANCES

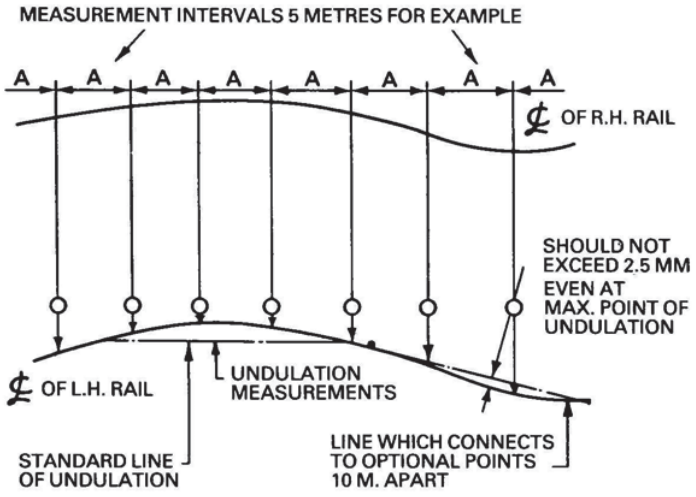
HEIGHT DIFFERENCE & SLOPE



MEASURED VALUE OF RAIL SURFACE OVER DATUM LINE

SLOPE OF RAIL SURFACE BETWEEN INTERVALS	TOLERANCE... ± 1/500	± 5M × 1/500 10 MM FOR 5M INTERVALS
RELATIVE SLOPE DIFFERENCE BETWEEN R.H. & L.H. RAILS	TOLERANCE... ± 1/500	± 5M × 1/500 10 MM FOR 5M INTERVALS
RELATIVE HEIGHT DIFFERENCE BETWEEN L.H. & R.H. RAILS	TOLERANCE:	± 16 MM FOR SPAN 6 M ~ 16 M. ± 20 MM FOR SPAN 16 M ~ 20 M. ± 25 MM FOR SPAN 20 M ~ 25 M. ± 31.5 MM FOR SPAN 25 M ~ 32 M. ± 40 MM FOR SPAN 32 M ~ 40 M.

SPAN & RAIL UNDULATION

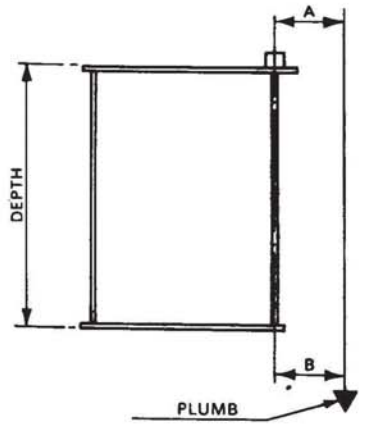


SPAN MEASUREMENT	TOLERANCE:	± 10 MM FOR SPAN 6 M ~ 20 M. ± 12 MM FOR SPAN 20 M ~ 25 M. ± 16 MM FOR SPAN 25 M ~ 32 M. ± 20 MM FOR SPAN 32 M ~ 40 M.

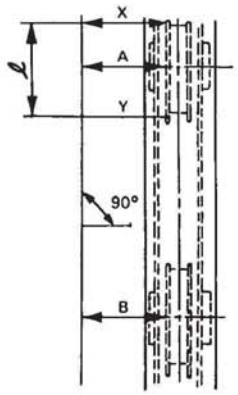
PERMISSIBLE DEVIATION IN CRANE ALIGNMENT

1. INCLINATION OF GIRDER

GIRDER DEPTH mm			ALLOWANCE
400	to	500	2.5
500	to	630	3.15
630	to	800	4.0
800	to	1000	5.0
1000	to	1250	6.3
1250	to	1600	8.0
1600	to	2000	10.0



2. DISPLACEMENT OF VERTICAL PLANE OF SYMMETRY OF TWO WHEELS



$A-B \leqslant 2$

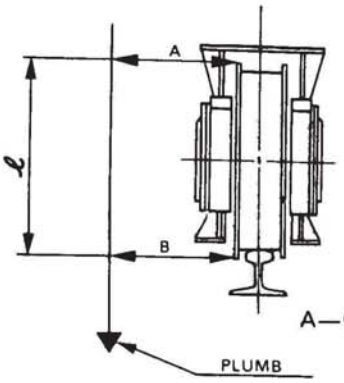
FOR TROLLEY WHEEL

$A-B \leqslant 3$

FOR CRANE WHEEL

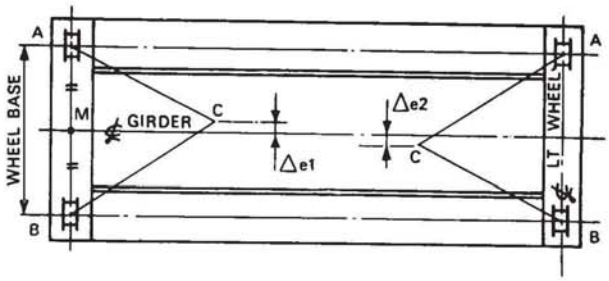
$x-y \leqslant \frac{\ell}{1000}$

3. DEVIATION OF THE VERTICALITY OF THE WHEELS



$A-B \leqslant \frac{\ell}{1000}$

4. DEVIATION OF THE SQUARENESS OF THE GIRDER & SADDLE



AB = BC = CA

WHEEL BASE mm			ALLOWANCE mm (Δe_1 or Δe_2)
	2500	Under	1.0
2500	3150	Under	1.25
3150	4000	Under	1.6
4000	5000	Under	2.0
5000	6300	Under	2.5
6300	8000	Under	3.15
8000	10000	Under	4.0
10000	12500	Under	5.0

LUBRICATION CHART

S.No.	Part to be lubricated	Method of application	INTERVAL Indoor	Outdoor	RECOMMENDED LUBRICANTS I.O.C.	HP
1.	**ENCLOSED GEARING**					
	a) Less than 12 HP ambient temperature Less than 50°C	Splash	A	B	Parthan 320	Enklo 220/320
	Ambient temperature greater than 50°C	Splash	C	D	"	"
	b) 12 to 40 HP ambient temperature less than 50°C	Splash	A	B	"	"
	Ambient temperature greater than 50°C	Splash	C	D	"	"
	c) Above 40 HP ambient temperature less than 50°C	Splash	A	B	"	"
	Ambient temperature greater than 50°C	Splash	C	D	"	"
2.	**OPEN GEARING**	Manual	E	E	Hytak 1	Hytak F 4/0
3.	**BALL BEARING**	Grease Nipple	A	B	Lithon 2	Lithon EP 2
4.	**PLAIN SLEEVE BEARING**	Grease Pump	F	F	Lithon 2	Lithon EP 2
5.	**TRACK WHEEL**					
	a) Plain sleeve bearings	Felt lubricated or grease pump	G	G	Parthan 320	Enklo 220/320
			F	F	Lithon 2	Lithon EP 2
	b) Antifriction	Grease Nipple	A	B	Lithon 2	Hytak 0
6.	**SHEAVE & HOOK BLOCK**					
	a) Plain sleeve Brg.	Grease Nipple	F	F	Plutek 1	Hytak F4
	b) Antifriction Brg.	Grease Nipple	A	B	"	"
	c) Hook Swivel	Manual	G	E	Mobile Grease Spl.	"
7.	**WIRE ROPES**	Manual	E	E	Hytak 1	Hytak F4
8.	**ELECTRICAL PARTS (PINS)**	Manual	E	E	Parthan 320	Enklo 220

LEGEND:

A - Check and lubricate weekly — Change after 2000 hrs. of operation or every six months

B — Check and lubricate weekly — Change after 1500 hrs. of operation or every three months

C — Check and lubricate weekly — Change after 1000 hrs. of operation or every three months

D — Check and lubricate weekly — Change after 750 hrs. of operation or every two months

E — Apply weekly or every 50 hours

F — Apply daily or every 8 hours

G — Apply monthly or every 50 hours