The Safe Use, Maintenance and Statutory Examination of Overhead Travelling Cranes

(Duncan Wall – March 2013)

Introduction

It is inevitable that cranes will be used in the steel stockholding industry. There are many types of cranes but overhead travelling cranes are commonly used. If they are maintained to a good standard, operated in the correct fashion, and the people who use them are properly trained then the hazards that arise from their use will be controlled. However, if there are shortcomings in any of these areas then it is likely that accidents will happen. Cranes are indispensable tools but their misuse can lead to significant injury or damage to property and equipment. The purpose of this document is to outline good practice for the operation and maintenance of these devices.

Safe Use

This document reflects the requirements of Section 6 of the Health and Safety at Work etc. Act 1974, amended March 1988. It outlines the care and safe use of overhead travelling cranes and is based on Section 14 of the LEEA Code of Practice for the Safe Use of Lifting Equipment.

Certification

Cranes are lifting appliances for which the following regulations apply –

The Lifting Operations and Lifting Equipment Regulations 1998 require the user to hold a current Report of Thorough Examination. This equipment requires thorough examination at least every 12 months. A Report of Thorough Examination must be provided with every new crane and subsequent periodic examinations must be carried out. In addition, The Supply of Machinery (Safety) Regulations 2008 requires the user to hold a Declaration of Conformity.
Training


Storage

When not in use, overhead travelling cranes should be parked or stored in a safe location, with any pendant, radio control device, or other controls out of access to unauthorised users.

SWL

The Safe Working Load is clearly marked on the beam of the crane. In certain circumstances the SWL may be derated. Overload alarms or trips may be fitted and the user must not exceed the marked SWL.

Selection

Overhead cranes are available in a range of types, sizes, capacities and duty classes. Select the crane to be used and plan the lift taking into account the capacity, class of use and range of lift. Consult the supplier if the crane is to be used in areas of high risk, exposed to the elements, water, steam etc., with hazardous substances, e.g. acids or chemicals, or subjected to extremes of temperature.

Installation

Overhead travelling cranes must be installed by competent installation engineers, who take account of all the crane loadings when specifying supporting structures. Any modifications must be properly designed and the work carried out by competent people. Overhead travelling cranes and the supporting structures must be tested and certified as detailed above before first use.

Operating instructions and safe use

The operating instructions contain important information on how to handle product in a safe, correct and economic way. Acting in accordance with these instructions helps to avoid dangers, reduce repair cost and down time and to increase the reliability and lifetime of the equipment. Although many of these are common sense, they should be reiterated as the simplest of failures in safe use can have serious consequences.
ALWAYS

- Take the weight of the load gently.
- Ensure the travel path is clear before travelling the crane.

NEVER

- Shock or side load overhead travelling cranes.
- Attempt to drag loads along the ground
- Allow persons to pass under suspended loads.
- Place ladders or climb on overhead travelling cranes.

USING OVERHEAD TRAVELLING CRANES SAFELY

- Never attempt lifting operations unless you have been trained in the use of the equipment and slinging procedures.
- Do not use defective overhead travelling cranes or accessories.
- Position the overhead travelling crane hook correctly. The crane hook must be directly over the centre of gravity of the load. Do not use the crane hook to drag loads along.
- Take the load gently and avoid shock loads. Similar care is needed when lowering loads as sudden loading or unloading may cause the crane rope and bridge beam to whip.
- Before moving the overhead travelling crane or suspended load, ensure you have a clear view of the travel path and that this is free of any obstructions etc.
- Avoid swinging loads. Where possible, push rather than pull on suspended loads.
- Do not allow anyone to pass under or ride upon the load. Never leave suspended loads unattended unless in an emergency when the area should be cordoned off and kept clear.
- Never lift or lower more than the marked SWL. In the case of manual equipment if abnormally high effort is required, or if the load slips this is an indication of too high a load or a fault – check the load and the appliance.
- Do not use the hoist chain or wire rope to sling the load, i.e. do not wrap it round the load, back hook or choke hitch.
• Do not lift on the point of the hook or overcrowd the hook with fittings.

• Do not drive the crane into the long travel end-stops or use the long travel end-stops as an operating limit. This will damage the crane, apply excessive stresses to the supporting structure and cause the load to swing dangerously.

• Do not drive the hoist into the cross travel end-stops or use the cross travel end-stops as an operating limit. This will damage the crane and hoist, apply excessive stresses to the supporting structure and cause the load to swing dangerously.

• Do not drive the crane hook block into the hoist or use the up limit on the hoist as an operating limit. This will damage the crane and hoist, and could cause the rope to fail and drop the load.

**IN-SERVICE INSPECTION AND MAINTENANCE**

• The Provision and Use of Work Equipment Regulations 1998 and the Lifting Operations and Lifting Equipment Regulations 1998 both require that lifting equipment be properly maintained. This is an on-going duty that falls on the user and a planned routine maintenance programme will be needed.

• In addition to the statutory thorough examinations by a Competent Person, regular in-service inspections should be made to find any faults and damage that might arise. If any are found they should be referred to the Competent Person.

• The maintenance programme must meet the requirements of the manufacturers’ instructions and any special requirements due to the conditions of service. This may be combined with maintenance of other equipment used in association with the appliance.

Further information is given in: The Code of Practice for the Safe Use of Lifting Equipment, published by the Lifting Equipment Engineers Association and; HSE Guidance Note GS39 – Training of Crane Drivers and Slingers.

**MAINTENANCE PERIODS AND THE SCOPE OF EXAMINATION**

It is often the case that external contractors carry out the examination and maintenance of overhead cranes, but it is important to understand the scope of the work they do as well as the criteria they apply to ‘pass’ or ‘fail’. LOLE requires periodic examination of an overhead crane at least every 12 months. It is the responsibility of the operator to establish an appropriate maintenance period for each specific crane. The following inspections are carried out at each periodic examination –

**HOIST MOTION:**

The load hook will be travelled through its full extent, to ensure that the operation is smooth and without excessive noise.
CROSS TRAVEL MOTION:

The hoist unit and trolley will be travelled along the entire length of the crane bridge to ensure that the operation is smooth and no excessive noise is present. Visual observations will be made as the cross-crane cable carrying trolleys travel along the C rail catenary system. The cables will be observed to ensure they are of sufficient length and the parking area for the trolleys is adequate.

MAIN TRAVEL MOTION:

The crane bridge will be travelled in both directions to ensure that the operation is smooth and no excessive noise is present. Visual observations will be made as the mains collectors travel along the mains conductor system to ensure smoothness of passage. Observations will be made to ensure the crane does not make contact with the building structure or services. The operation of all limit switches and anti-collision systems will be checked during the checks for all motions.

LOAD HOOK ASSEMBLY:

The load hook will be inspected for wear, damage and free rotation of the crosshead arrangement. The sheaves will be inspected for wear, damage, and free rotation of the crosshead arrangement. The sheave covers will be inspected for wear, damage and security of fixings within the load hook assembly. Capacity markings and plates will be inspected to ensure they are correct, visible, and free from damage.

LOAD ROPE:

The load rope will be inspected for wear and damage along its entire length, with particular attention being paid to the lubrication of the strands. The ropes can be levelled by adjusting the shims under the slack end anchorage support brackets.

ROPE REPLACEMENT CRITERIA:

The load rope should be replaced if any of these faults are found -
Over any length of 10 diameters, 5% of the total individual wires are broken; or
A strand is broken; or
Local groups of wires are broken; or
There is deterioration at the termination; or
There is deterioration of the inner core; or
Wear, i.e. rope diameter is less than 85% of the nominal diameter; or
There is internal corrosion; or
There is wire slackness.
**ISOLATION OF THE EQUIPMENT:**

The equipment will be positioned in the appropriate working area and the mains supply will be isolated either at the equipment or the appropriate isolator. If possible the fuses will be removed and an *Isolock* fitted to the handle of the isolator. A “*Man Working on the Equipment*” sign will be displayed on the isolator and the control station. The service engineer will gain access to the equipment via suitable access equipment and carry out the maintenance work.

**GENERAL:**

All assemblies will be inspected for wear and damage. All bolts will be checked to ensure they are tight. Particular attention will be paid to the motors, couplings, drives and crane structure.

**MOTORS:**

The motors will be inspected for external damage, and where possible each motor will be opened to inspect the accessible internal components for wear and damage.

**HOIST/TROLLEY:**

The side plates and frame will be inspected for cracks, deformation or damage. The crossbolts will be inspected to ensure they are not bent or worn. The suspension links will be inspected to ensure they are free from cracks, deformation, or damage and the bolt holes are not elongated. The wheels will be inspected to ensure they are free running, free from cracks, deformation or damage, and that the correct type of wheel is fitted. The gauge of the unit will be checked to ensure that the side plates and the frame are set correctly, and within manufacturer’s guidelines.

**GEARBOXES:**

All gearboxes will be inspected for wear, deformation, cracks and oil leaks. The oil levels will be checked to ensure they are correct and the quality of the lubricant is acceptable.

**BRAKES:**

The brake covers will be removed and the brake mechanisms will be inspected for wear, defacement, cracks, and serious damage. The air gap will be measured with suitable instruments to ensure it complies with manufacturer’s guidelines.
ROPE BAND AND GUIDE:

The rope guide (if fitted) will be inspected for wear, deformation, cracks and correct positioning by the joining plates, bolts and nuts. The tension of the springs will be checked to ensure it is correct and free from defects.

ROPE CLAMPS:

The clamps will be inspected for correct fitting, wear, and secure holding of the rope.

ROPE DRUM:

The drum will be inspected for misalignment, wear, deformation and cracks.

ROPE WEDGE ANCHORAGE:

This will be inspected for wear, defamation, cracks, and correct fit.

ROPE SHEAVES:

The sheaves will be checked for wear, deformation, cracks and free rotation.

CABLES:

All cables will be inspected for external defects i.e. frayed, damaged, signs of overheating, perished insulation, etc.

PUSH BUTTON CONTROL STATION:

The control station will be inspected for the following -
It is supported by a support line/s and not the electrical cable;
The pendant case is not cracked or damaged, and is secure;
The push buttonsswitcheslights are free from wear, cracks and operate correctly;
The legends are correct and visible;
The electrical connections within the station are tight;
The electrical cable is held securely by the tensioning grip.

CONTACTORS, OVERLOADS, FUSES, TRANSFORMERS, ISOLATORS:

Where possible the electrical contactors will be opened to inspect the condition of the fixed and moving contacts, laminations and coil. The condition of the electrical wiring and connections will be
checked for tightness and conformity. The items will be inspected for wear, deformation, cracks, and secure positioning. Particular attention will be paid to the settings of overloads, timers, etc., along with ensuring the correct types of fuses are fitted to the fuse carriers.

**LIMIT SWITCHES, ANTI-COLLISION SYSTEMS:**

All limit switches and anti-collision systems will be inspected for correct operation, wear, deformation, cracks and for secure in positioning with the appropriate fixings. The terminations will be checked for tightness and conformity.

**DRUM CONTROLLERS:**

The drum controllers (if fitted) will be inspected for wear, deformation, cracks and for correct setting and lubrication of the contact tips and moving segments. The terminations will be checked for signs of overheating, tightness, and conformity.

**RESISTANCE BANKS:**

The resistance banks will be inspected for wear, deformation, cracks and signs of overheating etc. The terminations will be checked for tightness and conformity.

**END CARRIAGE UNITS:**

The end carriage and crane bridge connection points will be inspected for wear, deformation, and cracks. The main travel wheels will be inspected to ensure they are free running, and have no wear, deformation, cracks or damage. Attention will be paid to the wear plates, axles and gearing.

**BRIDGE RAILS & BEAMS:**

The bridge rails and beams will be inspected for wear, deformation, cracks, and secure positioning by the joining plates, bolts, and nuts.

**CAPACITY MARKINGS/SIGNS:**

Inspected for conformity and secure positioning.

**GENERAL STRUCTURE:**

Inspected for wear, deformation, cracks and security of fixings
LUBRICATION:

The lubrication system will be inspected for defects and conformity. All points will be charged with lubricant.

LOAD LIMITING:

The load limiting system will be checked for wear, deformation, cracks and where possible for correct setting. It will be established that the load limiting system operates only after the upper travel limit on the hoist has been breached. It will be established that the load limiting system is not being used as an operating limit.

REMOTE RADIO CONTROL SYSTEM:

The system will be inspected for the following -
- The transmitter unit is in good condition;
- The receiver unit is in good condition;
- The electrical terminations are secure;
- The system functions correctly.

COMMISSIONING:

The mains conductor system electrical supply will be reinstated to the equipment and the operational check procedure will be repeated once again. On the satisfactory completion of this procedure the equipment will be released to your appointed personnel, and all permits etc. will be cancelled.

REPORTING PROCEDURES:

A detailed service report and a ‘Report of Thorough Examination’ will be submitted. Any defects will be reported immediately.