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Title: Inspection Procedure of	Overhead Cranes	Rev: 2
Established By: Ashraf Elsaid	Position: Lifting Supervisor	Date: JULY-2022
Approved By: Ahmed Mohamed	Position: Operation Manager	

Inspection Procedure of Overhead Cranes

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1. YOUR SAFETY IS FIRST:

Your safety wear is mandatory at job sites including in general: suit, shoes, helmet, gloves, ear plugs, glasses, and mask.

2. SCOPE:

This procedure covers the inspection and testing of overhead travelling cranes.

3. PRODUCT/ MANUFACTURE STANDARDS:

BS 7121- 1: 2016	<i>Code of practice for safe use of cranes- General</i>
BS 7121- 2- 1: 2012	<i>Code of practice for the safe use of cranes-Part 2-1: Inspection, maintenance and thorough examination- General</i>
BS 7121-2-7:2012+A2:2022	<i>Code of practice for the safe use of cranes, Part 2-7: Inspection, maintenance and thorough examination – Overhead travelling cranes, including portal and semi-portal cranes, hoists, and their supporting structures</i>
ASME B30.2 - 2022	Overhead and Gantry Cranes

4. PERIODIC THOROUGH EXAMINATION (IN-SERVICE INSPECTION):

Overhead cranes and supporting structures shall be thoroughly examined periodically whilst in service at intervals of 6 months for cranes that lift people and 12 months for cranes that lift goods only.

4.1- PREPARATION OF THOROUGH EXAMINATION:

- The crane shall be cleaned as required.
- The crane should be positioned in a suitable area to enable the thorough examination to be undertaken safely.
- That safe means of access to the crane shall be provided, e.g. scaffolding, working platforms, mobile elevating work platforms.
- Adequate lighting shall be insured, (ambient light or portable lighting).
- Check the identification and rated capacity marked on the crane against records.
- The last report of thorough examination and in-service inspection reports should be consulted.
- The crane should be made safe by isolating and locking-off the power supply.
- Where it is not possible to ascertain the condition of hidden mechanism parts, dismantling prior to thorough examination shall carried out.

4.2- THOROUGH EXAMINATION:

The competent person carrying out a periodic thorough examination shall work to a defined scope of thorough examination established specifically for the crane they are required to examine.

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4.2.1- COMPONENTS TO BE INCLUDED:

The following points shall be included in the thorough examination:

- End carriage structures
- Long travel drive, wheels, axles, bearings and brakes
- Bridge girders
- Crab structure
- Cross travel drive, wheels, axles, bearings and brakes
- Cross travel rails
- Hoist mechanism including motor, brake, couplings, gearbox, drum and bearings
- Wire rope(s), their terminations and anchorages, guides, sheaves/pins, bearings, bottom block and hook(s)
- Electrical control panel and wiring
- Operator cab and seating
- Operator controls, whether cab, pendant or cable-less
- Limit switches
- Platforms and access ladders
- Supporting structures
- Gantry beams, rails and fixings
- End stops and buffers
- Down shop conductor system

4.2.2- ASSESSMENT CRITERIA OF COMPONENTS:

The assessment criteria for inspection shall be as follows:

- Alignment, within manufacturer's tolerance
- Corrosion, affecting strength or functionality
- Wear, affecting strength or functionality
- Cracks, affecting strength or functionality
- Damage, affecting strength or functionality
- Distortion, affecting strength or functionality
- Functionality, as intended by manufacturer
- Leaks, affecting strength, functionality and slips
- Adequacy of lubrication
- Markings presence, accuracy and condition
- Mode of operation, as intended by manufacturer
- Rope fit, as specified by manufacturer
- Rope reeving, as specified by manufacturer
- Rope specification, as specified by manufacturer
- Rope condition (as per 6. *Assessment of wire Rope Condition and Discard Criteria*).
- Obstructions, impeding safe access
- Security attachment of components and sub-structures, fasteners, welds, etc.;

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- Seizure, full or partial seizure of rotating components
- Tidiness, general housekeeping

Note: Critical parts as assessed by the competent person may be inspected by suitable NDT methods (PT, MPI, and/or UT)

5. LOAD TESTING OF CRANES AND SUPPORTING STRUCTURES:

- Proof load testing of cranes and supporting structures shall be carried out to supplement thorough examination in the following conditions:
 - after assembly and after each re-installation
 - after major repairs or modifications.
 - after heavy use
 - after exceptional circumstance such as accidents
 - As per client's requirements
- It might be necessary to treat the crane(s) and the supporting structure as separate entities, for example where a structure supports more than one crane. Load testing of supporting structures should be carried out in accordance with (5.2 *Load testing of supporting structures*).

5.1- LOAD TESTING OF CRANES:

5.1.1- THOROUGH EXAMINATION AND FUNCTIONAL TESTING:

- Before proof load testing, the crane and the part of the supporting structure within the test area should be thoroughly examined to determine whether it is in a safe state and condition to be proof load tested.
- The crane should be functionally tested **without a load applied** to determine whether controls, switches, contactors, relays and other devices operate correctly.

5.1.2- LOAD TEST AT RATED CAPACITY:

After the functional tests, the crane shall be tested with a load equivalent to the rated capacity according to the following steps:

- Position the crane over a supporting stanchion or column of the gantry or beneath the connection point of a suspended track, as appropriate, with the crab or hoist positioned adjacent to the end carriage.
- Measure the deflection of the crane main girders at the center span.
- Raise the load until each tooth of the train of gears has been subjected to the load.
- Lower the load to 100 mm to 200 mm above the ground.
- Hold the load in this position for 10 minutes to check the brakes.
- Raise the load from the suspended position by a further 200 mm to check the ability to re-hoist and then lower the load to 100 mm to 200 mm above the ground.
- The crab shall be traversed to mid-span. Measure and record the deflection.

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- Lower the load to the ground to relieve the structure, then raise to determine whether the deflection remains constant.
- The load shall be traversed to the opposite gantry.
- The crane should be travelled along the track until each tooth of the train of gears of the long travel motion has been subjected to the load
- The load should be traversed across the bridge to the opposite gantry and the crane should be returned to its original lift position.

The deflection shall not exceed the maximum deflection permitted in the standard to which the crane was manufactured:

- Max. permissible deflection of cranes manufactured to BS 466:1984: 1/750 of the span
- Max. permissible deflection of cranes manufactured to BS 466:1960: 1/900 of the span
- For cranes manufactured to BS EN 15011:2011: The elastic deformations of the crane structure shall not have a detrimental influence on the function of the crane.

The measured value should be retained in the machine history file to provide a baseline for comparison with any future measurements.

5.1.3- PROOF LOAD TEST:

after performing the load test as per (5.1.2), The load should then be increased to the proof load test value = **1.25 × WLL**, according to the following steps:

- The proof load test load shall be hoisted until each tooth of the train of gears has been subjected to the load.
- Lower the load to 100 mm to 200 mm above the ground
- Repeat the subsequent steps detailed in (5.1.2) with the proof load test load suspended from the crane.

During the proof load test the crane should remain stable and structurally sound and the brakes on each motion should function effectively. The traverse and travel braking systems should also function effectively with the load applied.

Note:

For **cranes with two or more hoists**, separate tests in accordance with (5.1.2) and (5.1.3) shall be carried out for each hoist. Where the use of more than one hoist at a time is possible, all tests, including the measurement of deflection in accordance with (5.1.2) shall be carried out with all these hoists loaded simultaneously.

5.1.4- POST-TEST THOROUGH EXAMINATION OF THE CRANE:

On completion of the tests, a further thorough examination of the crane shall be carried out by the competent person.

Any overload protection devices should be reset and their correct operation checked.

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5.2- LOAD TESTING OF SUPPORTING STRUCTURES:

5.2.1- ASSESSMENT AND THOROUGH EXAMINATION:

- Parts of the supporting structure which are not solely for the support of the crane gantry or track shall be assessed by a structural engineer before any load test is carried out.
- Parts of the supporting structure which are solely for the support of the crane should be subjected to a load test.
- Prior to the application of the test loads, the competent person should carry out a thorough examination of the structure to determine whether it is in a safe condition to be load tested.
- An unloaded crane should then be travelled the full length of the supporting structure to check the alignment.
- Testing should be carried out using the combination of loadings, cranes and crane positions that imposes the maximum loadings on the structure under test.

5.2.2- LOAD TEST AT RATED CAPACITY:

- Each crane involved should lift a load equivalent to its rated capacity 100 mm to 200 mm above the ground.
- The load lifted by each crane should be traversed to the end of the crane bridge nearest the side of the structure being tested.
- The cranes should be positioned along the span of the structure so as to provide the maximum deflection at the span center.
- Measure the deflection, the deflection measurement should be made on the longest span of the gantry.
- Where the gantry has more than one beam section, it should be made on the longest span of each section.
- Where the gantry beams are supported by a structure which is solely for the support of the crane, if there is any variation of design or construction of the structure, the test should be repeated for each variation.

The deflection shall not exceed the maximum deflection permitted in the standard as follows:

- For structures built in accordance with **BS 449-2**: Max. deflection shall not exceed 1/360 of the span.
- For structures built in accordance with **BS 5950-1** or **BS EN 1993-6**: Max. deflection shall not exceed 1/600 of the span.

5.2.3- PROOF LOAD TEST:

- The proof load test load on each crane should be that determined in accordance with (5.1.3. *Proof Load Test*)
- Each crane involved should then lift the proof load test load 100 mm to 200 mm above the ground.
- The load lifted by each crane should be traversed to the end of the crane bridge nearest the side of the structure being tested.
- The cranes should be travelled the full length of the structure in such relative positions as to impose the maximum combined loading.
- The steps should be repeated for the other side of the structure.

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5.2.4- POST-TEST THOROUGH EXAMINATION OF THE SUPPORTING STRUCTURE:

On completion of the test, a further thorough examination of the supporting structure should be carried out by the competent person.

6. ASSESSMENT OF WIRE ROPE CONDITION AND DISCARD CRITERIA:

When carrying out examination of wire ropes as part of the thorough examination of a crane, the competent person shall examine the rope in accordance with: **BS ISO 4309:2017: Cranes – Wire ropes – Care and maintenance, inspection and discard** Clause 5: *Inspection*, and Clause 6: *Discard Criteria*, as follows:

6.1- All wire ropes used on the crane shall be inspected over their entire length for the following defects:

- Check for Corrosion, kinks, broken wires, changes in rope diameter, wear, heat damage, and lack of lubrication.
- Check terminal fittings for wear, damage, distortion, and signs of overloading (i.e. collapsed thimbles).
- Examine wire rope test certificate to ensure rope is the correct size, capacity, and construction for the crane.

6.2- Deterioration normally results from a combination of several defects occurring simultaneously giving a cumulative effect. The overall effect should be taken into consideration when deciding if a wire rope should continue in service. However, the following defects would result in the rejection of the rope:

- Total number of broken wires in one lay length must not exceed 6.
- Total number of broken wires in one strand in one lay length must not exceed 3.
- Total number of broken wires in a measured length of 10 rope diameters must not exceed 5% of the number of wires in the rope.
- No broken wires are permitted where the rope enters the termination.
- Wear must not exceed 10% of the original diameter for a 6-strand rope and 3% for a multi strand rope.

Note: Any broken wire found in the course of the examination, which do not constitute rejection shall be broken off in the lay of the rope and their location noted for future reference.

6.3- The reeving configuration of the crane must be checked against the manufacturer's schematic, which shall be provided by the operator prior to the inspection. Particular attention should be paid to any area where the rope could come into contact with the crane structure during the travel of the jib.

7. REPORTING AND CERTIFICATION:

A certificate of test and thorough examination will be issued upon the satisfactory completion of the examination, i.e. the lifting equipment is safe to operate

A defect report will be issued if the lifting equipment fails to meet the requirements.

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8. Inspector Competency and Qualification:

Inspector shall have minimum qualification of LEEA Foundation – LEEA Overhead Travelling Crane