

## CICA HOIST SECTOR FAQs - CRANE MAINTENANCE

### A. How frequently do I need to inspect my crane? Why?

**Summary: Two ways to determine inspection frequency: 1) manufacturers' recommendation, 2) if that information is not available, then based on duty of the crane and its various components. For either way, it is wise to keep data logging to accurately reflect the requirements of crane inspection intervals.**

*Crane inspection must be in accordance with the manufacturers' recommendation. If that information is not available, then the inspection will be based on the duty of the crane and its various components. An assessment can be made on the actual duty being performed and then compare that to recommended maintenance inspection frequencies given in AS2550.3 Table 7.2.1. You need to ensure that the requirements of your environment are being taken into account, and that the operating conditions of your Crane has not changed in recent times. Alternatively, the crane owner can assess what those frequencies should be according to the known maintenance records of the crane.*

*These assessments should be conducted by a person who is deemed competent and has at least 5 years' experience in maintaining /assessing OET cranes (AS 2550.1 provides detail on assessing competency). Should the crane owner inspect or maintain the crane at a frequency interval greater than recommended by the manufacturer or the competent person, then a thorough risk assessment of the rationale and control processes shall be conducted, implemented and audited to ensure compliance.*

*It is recommended to have a third party review your maintenance programme periodically to ensure that you are meeting the requirements and keeping your Crane in optimum condition.*

*Any maintenance program is only effective if appropriate records are kept, and AS2550.3, section 7.2.2 states that a written report shall be furnished on completion of the maintenance. The standard goes on to give an example of what a typical inspection and testing certificate may look like.*

*A continuous working record (e.g., logbook) of the significant events concerning the safety and operation of the crane shall be kept and shall be readily available. Such records shall include checks, adjustments, replacement of parts, repairs and inspections*

## *Lifting Industry Standards*

*performed and all irregularities or damage concerning the crane's safe use. For example, Defects found during the pre-operational inspection shall be recorded in the logbook and reported to a responsible person.*

*For maintenance and inspection of hoist, bridge and gantry cranes, the individual part of the standard AS2550.3, overrides the General Requirements of AS2550.1.*

*In reality, most cranes are usually working on duties below their classification (for crane classification, refer to [CICA Hoist Sector FAQs-Crane Design Specification](#)). Since crane inspection frequency specified by manufacture or in the standards are based on crane classifications, for most cranes, record the crane usage (data logging) can benefit crane owners economically by extend the intervals between each inspection. Data logging records containing state of loading, duration of operation and number of load cycles can be used to determine a more accurate inspection interval and avoid excessive effort spend on crane inspection.*

*For crane railways and monorails, according to AS1418.18-2001, the frequency of inspections is subject to variances in the extent of usage of the crane(s) and engineering judgement. Generally, in the first 6 years of the runway life there should be no problems. However, if a bad detail is present, then failure may occur very early on. Initial inspection frequency should not be greater than 2 years. In later life, the frequency may reduce to 12 or 6 months. This will be based on the accumulated data and inspection records.*

## **B. What are the critical elements of inspections?**

***Summary: Each crane has critical structural, mechanical and electrical elements for crane inspection that should be identified by a competent person.***

*Critical Elements for the crane include:*

*Structure;*

- *Bridge girder box construction- connection between top flange and web, especially in the middle quarter of the span- cracking.*
- *Bridge girder- lattice construction- node points, on main girder, especially, top chord centre connection, end panel, horizontal bracing between main girder and the auxiliary girder*
- *Bridge girder- plate web construction- as in box, top flange to web connection under the rail on the middle quarter of the span.*

## *Lifting Industry Standards*

- *End carriage connection to main girders- check for bolt tightness or cracking of welded connections*
- *End carriages- long travel wheel or bogie connection to end carriage- check for cracking around the wheel bearing to carriage connection and around cut outs in the end carriage for the wheel.*
- *Cross travel trolley- end carriages and wheel connections, as above*
- *Cross Travel Trolley- return sheave or fixed anchors for hoist rope, support beam(s)*

*Cross travel cross beam lower flanges for damage or cracking and connections to end carriages*

- *For cabin cranes, fixed and roving cabins- connection of cabin to bridge structure.*

### *Mechanical*

- *Hoist rope condition*
- *Hoist brakes- condition of pads or shoes, adjustment; ensure adjusted to correct torque setting to suit duty of hoist. Mounting bolts secure*
- *Hoist emergency brake, if fitted- condition pads or shoe, adjustment and operation to ensure brake engages promptly.*
- *Gearboxes- gearbox has oil and condition of oil- recommended periodic oil samples are taken to test for presence of wear particles for gears. Seals are good. Mounting bolts secure.*
- *Couplings- bolts are tight (preferably moused), backlash on travel drives is not excessive, refer to manufacturers' data sheets.*
- *Shafts- intact, no evidence of cracking, especially around keyways.*
- *Wheels- no spalling on the wheel tread, flanges are intact not worn thin and no bending evident (requires replacement once bending commences.*
- *Hooks- rotate freely, no evidence of cutting or wear in bight of hook, no evidence of cracking in the hook body to shank under nut.*
- *Rails- minimal (say 3 -5 mm maximum) burring of rails heads, rails clips are in place and tight, snug blocks in place.*

### *Electrical*

- *Hoist limits, working and top limits. Include a bottom limit if fitted.*
- *Emergency functions- ensure operable.*
- *Travel slow down limits if fitted- these are important as the buffers sized is predicated on the speed of collision. Where a slowdown limit is fitted, the end*

## Lifting Industry Standards

*stop buffer will be sized for a much slower collision speed. If the limit has failed and a collision should occur, significant damage to the crane structure would result.*

- *Manual crane control- joysticks or buttons, pendant or fixed- checked functionality, return to neutral function is operable.*

## C. What are the critical elements of a major inspection? What should a service include?

**Summary: Refer to requirements of major inspection in AS2550.1, AS2550.3 and AS1418.**

*When completing a Major Inspection AS 2550.1 requires that ‘a written report shall be furnished on completion of the inspection. A competent person shall assess the results with regard to risks and hazards associated with the crane’s current operation.’ This shall include a determination of the reasonable practicability of applying the current requirements of the AS 1418 series, in particular the following:*

- *Rated capacity limiter and/or indicator.*
- *The indicating and motion limiting devices.*
- *Emergency retrieval system.*
- *Platform, handrails and gate.*
- *Controls and emergency stop (e.g., ability to unintentionally engage free fall).*

*This is reinforced in AS 2550.1 which requires that a Major Inspection includes consideration of the current statutory safety regulations and standards.*

*The current Australian design standards for overhead cranes were released in 2002 (AS 1418.1) & 1997 (1418.3) so any crane manufactured before these dates were designed to different requirements. Common design requirements of the current standards which are not present in many older cranes include:*

- *Overload protection.*
- *Earthing conductor or other positive earthing means that does not require earthing through the crane wheels.*
- *Travel limits when the crane is remote controlled.*
- *Anti-drop / anti-derailment pads.*
- *E-stops on all control stations.*

*In addition to the above include,*

## *Lifting Industry Standards*

- *Review of maintenance records paying particular attention to records of collisions or overloading of the crane*
- *Review current duty of crane and compare to original design and expected duty into future. This will determine scope of repairs or upgrades to existing equipment necessary to keep crane operational.*

## **D. What upgrades or updates should I include in a major inspection?**

***Summary: Factors that determine scope of repairs or upgrades to existing equipment that necessary to keep crane operational should be determined by a qualified engineer.***

*Review current duty of crane and compare to original design and expected duty into future. This will determine scope of repairs or upgrades to existing equipment necessary to keep crane operational.*

*Review requirements of current design standard and determine whether modifications are appropriate to meet current standard.*

## **E. Do I need to load test a crane and when?**

***Summary: Load testing is a critical tool in ensuring crane safety. The type of load test required depends on the maintenance, service, repair and inspection completed.***

### ***Commissioning***

*The Australian Crane Standards (AS 1418 & AS 2550) only explicitly require load testing at commissioning. AS 1418.3. Section 12 Inspection & Commissioning requires the following tests be completed:*

- *Apply maximum rated capacity at point of maximum deflection.*
  - *Measure bridge deflection and compare with calculated deflection.*
  - *Remove load and measure permanent deflection.*
- *Check each hoist brake function, hoist speed and input current at both maximum rated capacity and 110% of maximum rated capacity.*
- *While the rated capacity is held by the main hoist.*
  - *Test travel and traverse motions at full speed to ensure load is controlled.*
  - *Test hoist brake function when power failure occurs during lowering.*

## *Lifting Industry Standards*

➤ *Test electrical system for voltage drop during simultaneous operation of the main hoist and travel under full load and acceleration.*

- *Check noise levels.*
- *Prepare an accurate and complete report of all test results.*

*Note that AS 2550.3 requires a continuous working record of all significant events concerning the safety and operation of the crane be kept and shall be readily available. The commissioning test results are one of the most important documents that should be maintained by a crane owner/operator.*

*Clarification of the load testing requirement was provided by a Standards Australia Ruling SA RUL CR.1-2013 Rulings to cranes, hoists and winches which confirms that when testing the brake function under power failure that the test should be performed at the rated capacity and full speed. Using the emergency stop is only satisfactory if it sufficiently simulates the condition of power failure. No prescribed stopping distance is provided, only that the brake 'shall be capable of bringing the fully loaded crane to rest, without shock, in the shortest possible distance consistent with safe working'.*

*A safety bulletin on power failure testing has also been issued by the WA Department of Mines & Petroleum.*

### **Major Inspection or Repair**

*The Australian Crane Standards do not specifically require load testing as part of a Major Inspection. However AS 2550.3 requires that structural integrity, emergency functions and braking systems be checked. It is our opinion that a load test is an important test in validating these functions and mitigating the risk of their failure. The intent of the Major Inspection is effectively to recommission the crane so a comparable test regime should be completed and documented.*

*The Crane Industry Council of Australia's Major Inspection Verification Plate Requirements includes at a minimum a 110% overload test to confirm brake holding capacity.*

### **3rd Party Inspection**

*Again the Australian Crane Standards do not require load testing for an annual inspection.*

*A 100% load test is required as part of CraneSafe's 'Green Sticker' Inspection. Our view is that a load test can be a valuable tool to mitigate risk and should be completed if practicable. However especially with larger capacity cranes an annual load test can introduce significant additional costs, where alternative risk mitigation methods may be more appropriate.*

## Lifting Industry Standards

### Summary

*Load testing is a critical tool in ensuring crane safety. The load testing and documentation requirements of AS 1418.3 are comprehensive and our experience has been that the majority of overhead cranes we review do not have documentation to satisfy this requirement. Ensuring that a suitable load test program is completed and made available is one of the critical actions a crane owner can take to ensure their responsibilities under the OHS Act and Regulations are met.*

### Load tests are carried out

- *when the crane is new & first commissioned*
- *should the crane have its loading capacity increased.*
- *Should the crane have its duty increased*
- *Should the crane be recommissioned or relocated.*
- *Should the crane hoist brake design be changed or replaced.*
- *Following an overload- note only test at rated load capacity.*
- *Following significant structural or hoist drive modifications or repairs*

## F. How do I know my crane needs a major inspection?

**Summary: Three types of scenarios require major inspection: crane has reached its nominal design life; recommissioning previously decommissioned cranes, or re-purposed cranes.**

*Major inspections are required under the following circumstances,*

- *Crane has reached its nominal design life- typically this is 25 calendar years for the structure. Note, cranes are designed to be able accept a predetermined number of cycles according to the duty rating (C & M rating). If the crane is subjected to a higher frequency, higher magnitude of loads or a combination of the two, then the crane will attain its nominal design period faster than originally envisaged. Any increases in duty cycles must be recorded by the owner and an accurate maintenance record is maintained. Additionally cranes which can be shown to have been used at lower frequency or load magnitudes can have major inspections put off beyond the nominal design life in years.*
- *Recommissioning previously decommissioned cranes.*
- *Re-purposed cranes, ie cranes that were originally design for a certain duty , but have had the duty changed significantly, eg ordinary mill cranes has been re-purposed as a foundry crane handling hot metal.*

## G. What competency level do I need to service a crane?

**Summary: Requirements regarding competent person are specified in AS2550 Section 1.7 and AS1418.1 Section 1.4.2.**

Competency is listed in AS2550.1, Section 1.7 as saying 'All activities required to be carried out under this Standard shall be carried out by a competent person (s). The million dollar question is 'what defines a person as being competent?' A 'sister' standard to AS2550 is AS1418, and in AS1418.1-2002, Section 1.4.2 it states that a Competent person is 'A person who has acquired through training, qualification, experience or a combination of these, the knowledge and skill enabling that person to correctly perform the required task'

An interpretation of this is that the company or employer must ensure that they have taken all reasonable steps to make sure that personnel who are performing work on overhead cranes have been adequately trained.

## H. How often should I inspect my monorail? What should I inspect?

**Summary: Requirements regarding inspection frequency for runways and monorails are specified in AS1418.18 section 9.3; inspection scopes are specified in AS1418.18 section 9.2.**

AS 1418.18 Section 9.3 recommends the following inspection frequency for runways and monorails:

The frequency of inspections is subject to variances in the extent of usage of the crane(s) and engineering judgement. Generally, in the first 6 years of the runway life there should be no problems. However, if a bad detail is present, then failure may occur very early on. Initial inspection frequency should not be greater than 2 years. In later life, the frequency may reduce to 12 or 6 months. This will be based on the accumulated data and inspection records.

AS 1418.18 9.2 states that the scope of inspection for runways and monorails should identify:

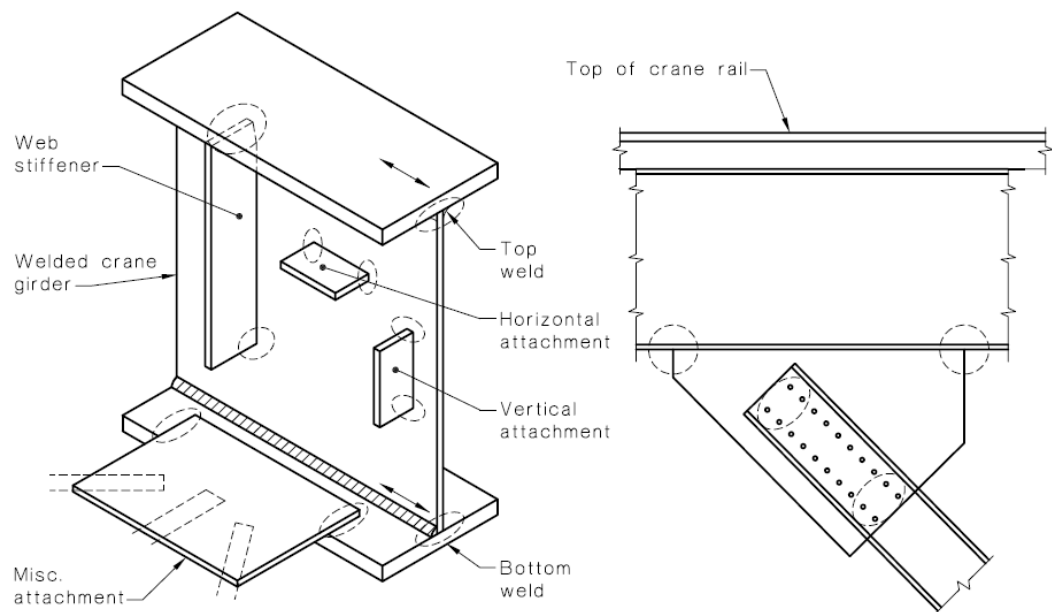
- Potential problem areas which, because of their fatigue sensitivity, are prone to crack initiation and propagation (see Figure below). Special inspection requirements for such areas should be specified by the designer, e.g. type of



## Lifting Industry Standards

*non-destructive test (visual, magnetic particle and similar) and acceptance criteria.*

- *For elements subject to excessive wear or corrosion, a schedule for their planned timely restoration or replacement should be established based on measured rates of deterioration.*
- *The requirements for checking whether critical dimensions remain within specified or acceptable tolerances should be established.*
- *For non-structural attachments, which do not appear on engineering drawings, welded to structural elements of the runway system, engineering advice should be sought as to whether these attachments are permitted.*



*For a monorail the inspection should include inspection of the condition of:*

- *The beam (including thickness / wear of bottom flange).*
- *End stops.*
- *Connection to supporting structure.*
- *Markings include the rated capacity of the beam and a number identifying the beam (as per AS 1418.18-5.12.6 below).*

*AS 1418.18-5.12.6: Monorails shall be marked in a permanent manner with the following information:*

- *Number identifying the beam.*



## Lifting Industry Standards

- *Rated capacity.*

*Marking shall be of sufficient size to be legible from the working area below the beam. When the rated capacity of a hoist is not matched to that of the beam, the hoist and the beam shall be marked with the lesser-rated capacity, as appropriate.*

## I. How often should I inspect my serial hoist? What should I inspect?

*Serial Hoist inspection must be in accordance with the manufacturers' recommendations. If that information is not available, then the inspection frequency and inspection scope shall be based on the requirements specified in AS2550.1.*

## J. What is the definition of a Third Party?

*AS2550.1 Section 1.4.15 states:*

*“NOTE: For the purpose of this definition, ‘independent’ means not employed by the same organization unless that organization uses a quality process that confirms independence.”*