



LOAD TEST PROCEDURE

Bridge, Gantry and Jib Cranes & Monorail Systems B001-R05/07

Introduction: Load testing and inspection of overhead cranes is required by many safety regulations, national consensus standards and manufacturers. It is the purpose of the annual condition inspection to ensure that the overall structural, mechanical and electric components of the equipment have been maintained in a safe and serviceable condition and are functioning properly according to the original equipment manufacturer's specifications. It is the purpose of the load test to ensure by actual overloading that the equipment is capable of safely lifting and moving the rated load through all designed motions. The inspection and load test do not take into account the duty factor of the equipment. The frequency of performing a load test can vary depending on regulatory jurisdiction. The CCAA recommends that load testing be performed at least once every four (4) years. Please keep in mind that the original equipment manufacturer may have more stringent requirements and these requirements must take precedence. A certification issued is not a license to use a crane beyond the original designed duty factor. Owners and operators should always be aware of the equipment's duty factor.

The following equipment requires proof testing:

1. All bridge cranes, gantry cranes, monorail systems and jib cranes of all capacities upon original installation and before equipment is put into service.
2. All bridge cranes, gantry cranes, monorail systems and jib cranes of all capacities to be proof tested once every four (4) years after original proof test.
3. All bridge cranes, gantry cranes, monorail systems and jib cranes of all capacities to be proof tested and operationally tested after significant modifications or major repairs are performed.

The certifying agency shall make a determination on whether the Modification's or repairs are sufficient to require a proof test. The following procedure is established to provide a method which will meet the most stringent requirements that apply to this type of crane. The methods herein recommended are intended to provide a safe and effective means by which load tests can be conducted.

1. Pre-test Procedures

- 1-1. Check that an operator's manual is available for the crane and review same for operational limitations.
- 1-2. Determine that lifting gear to be used with the crane in normal duties or for the purpose of testing the crane has already been tested independently. Check that all lifting attachments are clearly marked with their safe working load.
- 1-3. Review previous test and inspection certificates, wire rope inspections, and deficiency reports and determine that any necessary corrections have been made.
- 1-4. Review periodic inspection reports, maintenance records and documentation of repairs to determine that all work was in order.
- 1-5. Determine that the safe working load for the crane is known and clearly marked on the crane or on charts affixed to it. If the craneway supports more than one crane, verify that the craneway and its supporting structure were designed to support the cranes and loads in all authorized operational configurations.
- 1-6. Choose appropriate loads for the test based on the manufacturer's load ratings for the condition of use. A 25% minimum partial load, the rated load, and a proof load as close as possible but not exceeding 125% of rated load shall be used. Check manufacturer's limitations and or specific instructions on testing. Reeving configuration must be recorded.
- 1-7. Rigging should be arranged for the test loads which conforms to good rigging practice for a safe lift.
- 1-8. Barriers should be set up around the operating perimeter if there is any possibility that personnel or vehicles will intrude into the operating region.
- 1-9. A pre-test conference should be arranged with the operator, the riggers, and the signalman to establish how the test will be conducted and to review the signals to be used.
- 1-10. Inspect the crane in its entirety according to the checklist normally used for that type of crane. Particular attention should be given to the structural elements of the crane which will be subjected to stress during the load testing procedure. Any evidence of degradation among the structural elements should be evaluated and a determination made as to the suitability of the crane's condition for load testing and the need for nondestructive testing or dismantling for detailed examination.

- 1-11. Conduct a visual examination of the crane runway, track, power conductors, collectors and switch gear prior to commencing the test.
- 1-12. The crane should be operated without a load through its full range of operation and all safety devices and limit switches should be checked. The 25% partial load should then be applied and required adjustments made for appropriate function. (i.e., limit switches, variable frequency drives, soft starts, etc.)
- Note: Many of the new cranes today incorporate bridge and trolley travel limits including anti-collision devices, which can be adjusted to maintain a predetermined distance and eliminate the possibility of two (2) cranes or monorail hoists between runway support centers. Inspector must always beware of this fact before load testing.

2. Load Test

- 2-1. At the start of the rated load test the crane should be positioned over a supporting stanchion or column of the runway with the trolley positioned adjacent to the end truck. With the crane in this position, measure the deflection of the crane main girders and the runway girders at center span.
- 2-2. Lift the rated load a sufficient height to ensure that each tooth of the lifting gear train is subjected to the rated load. Lower the load to a height of 4-8 inches above the ground.
- 2-3. Traverse the bridge to mid span of each runway girder and measure the deflection. Traverse the trolley with rated load to mid span of the bridge and measure the deflection. Compare these values with appropriate specifications for the crane.

Published Deflection Specifications:

- CMAA #70 Top Riding Double Girder Cranes and Gantry cranes.
 - CMAA #74 Top Riding and Under Running Single Girder Cranes.
 - ANSI MH27-1 For Patented Track Underhung Cranes and Monorail Systems.
 - ANSI MH27.2 For Enclosed Track Underhung Cranes and Monorail Systems.
- 2-4. Raise the rated load approximately five (5) feet above the ground. With the hoist controller in the neutral position, release (by hand) the holding brake. The load controlling device should control the load.

- Note: many load brakes are designed to hold the load, always check with the manufacturer.
- 2-5. With the holding brake in the released position, start the load down slowly and then return the controller to the off position as the test load is lowering. The load controlling device should prevent the load from accelerating.
- Note: It is not mandatory for the load controlling device to halt the downward motion of the load however, one needs to refer to the manufacturer testing procedures, as many load brakes are designed to stop and hold the load.
- 2-6. For cranes with primary and secondary holding brakes and/or eddy current or hoist dynamic load brakes visually observe that correct operation ensures control of the rated load.
- 2-7. For cranes equipped with a hoist dynamic brake, eddy current brake, or regenerative brake, check lowering speeds against manufacturer's specifications to ensure correct brake operation.
- Note: A load test should not be attempted until a full understanding of the brake function is achieved.
 - Note: Do not release the holding brake when testing equipment with these brake systems. Could cause load to free fall. The speed test should be done with power on, so the holding brake will be in the released position.
- 2-8. In order to test the reaction of the hoist unit in the event of power failure during a lift, hoist the rated load to a convenient distance above the surface. Lower the load at high speed and, with the controller in the lowering position, disconnect the main power source. The test load should stop lowering when the power is disconnected.
- 2-9. Increase the test load to 125% of rated load to achieve the proof load. Repeat items 2-1 through 2-7 and determine that during these operations all crane functions operate effectively.
- Note: Hoist may be equipped with an adjustable or non-adjustable overload device. This device may require adjustment or modification in order to raise proof load. Always consult manufacturer for instructions.
- 2-10. While handling the proof load, operate the crane at speeds appropriate to the safe operation and control of the load.
- 2-11. For cranes with two or more hoists, separate tests must be carried out for each hoist.
- 2-12. Operate the trolley with the proof load suspended from the hook through the maximum operational range on the bridge. Use extreme caution and observe that the trolley brakes are operating properly if appropriate and allow for load swing and coasting.

- 2-13. Operate the bridge with the proof load suspended from the hook as near as possible to the runway rail on each side through the maximum operational range on the runway system. Use extreme caution and observe for any binding of bridge trucks and proper brake operation etc.
- 2-14. Test bridge and trolley brakes to determine that they stop their respective functions in a distance equal to 10% of full load speed in feet per minute when traveling at full speed with full rated load.
- NOTE: Some jurisdictions require that the bridge brakes must be capable of retarding the motion of the bridge at the rate of 1 foot per second per second while the full rated load is being carried. The stopping distance in feet to meet this requirement can be calculated from the formula, $S = 0.5(v^2/a)$, where v is the observed speed in ft./sec. and a is the deceleration in ft./sec./sec., in this case 1.0 ft./sec./sec.
- 2-15. When the regulatory authority specifies the rate of deceleration required to meet the energy absorbing requirement for runway and trolley bumpers, the formula in the above note can be used to determine the required stopping distance for the bridge and trolley. To use the formula substitute the appropriate deceleration value for "a" and the observed value of "v" for the particular function. Some jurisdictions specify "v" at a certain per cent of full speed, in which case the reduced value would be substituted in the formula.
- 2-16. For craneways with two or more cranes, the 100%* rated load test should be conducted simultaneously for all the cranes that can fit on a single runway span with their buffers in contact. The runway deflection should be measured with the loads suspended as close as possible to the runway with the cranes moving across the span between runway supports and the values compared to appropriate specifications.
- Reference: AISE Tech. Report #13 "Guide for Design of Mill Buildings" and specifically "Light and Heavy Industrial Buildings, Part II, With Cranes", Fisher & Buettner, AISE September, 1979.

3. Post-test Inspection

- 3-1. After the tests are completed, conduct a thorough examination to ensure that the crane has satisfactorily withstood the tests. Park the crane at the proper location for service access and relax all rigging and reeving to allow for inspection of the wire rope and reeving components. Open the main disconnect and install a safety lock-out device before mounting the crane.

- 3-2. Check all components of the crane for structural damage including cracks, weld separation, permanent deformation, paint flaking and loose fasteners.
- 3-3. Check the runway for structural damage or distortion, loose or damaged fasteners, track alignment and secure attachment to the structural support.
- 3-4. Check the crane and runway electrical components for deterioration and proper condition. Verify the integrity of wiring, connections and enclosures, checking for neatness, security and conformance to appropriate electrical codes.
- 3-5. Check all sheaves, drums and wire rope for evidence damage or excessive wear. Open the wire rope and inspect the core at several points to determine any deterioration. Give particular attention to potential damage at end fittings and anchor points.
- 3-6. Check that all required guards are securely attached. Verify that all shafts, couplings and open gears that can be contacted by personnel are properly guarded.
- 3-7. Make note of any damage, deficiencies, or corrections that may be required.
- 3-8. Hoist the load blocks clear of personnel or obstructions and verify that the wire rope has wound properly on the hoist drums. Open the main disconnect and leave the pendant, if any, in the designated location.
- 3-9. Complete the report and conduct an exit briefing, if appropriate.