

Appendix F

Record of Performance Inspection and Test— Crawler, Locomotive, Truck, and Wheel Cranes

General

All mobile cranes must be performance inspected and tested by the owner and/or contractor in accordance with the provisions contained herein; in the section entitled “Hoisting Equipment, Piledrivers, and Conveyors; and on attached forms entitled “Brake Performance Test Record” and “Performance Load Test Record.” Such inspections and tests must be conducted (a) prior to initial onsite operation; (b) periodically, but at least once each 12-month period; (c) whenever the crane is modified, altered, or undergoes extensive repair, including rerigging; and (d) when directed by the Contracting Officer’s Representative (COR). For contractor equipment, such inspections and tests must be conducted in the presence of a Reclamation representative and recorded in the appropriate places on inspection records. The forms will then be signed by a contractor and Reclamation representative and submitted to Reclamation. Initial and periodic crane inspections and tests will be conducted onsite after the crane has been assembled or reassembled and fully rigged for operation. Manufacturer’s, contractor’s, or owner’s offsite inspections and tests must not be conducted until all appropriate performance inspection items are found to be available and in acceptable condition.

Reclamation Safety and
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Item	Description	Available/ Acceptable
(1) Manufacturer's operating and maintenance manuals	Manufacturer's operating and maintenance instructions and manuals must accompany all mobile hoisting equipment. These manuals set for the inspection operation and maintenance criteria that is not available from any other source.	
(2) Maintenance "frequent" and "periodic" inspection records	Inspection and maintenance records must be complete and current. Unless owner can produce these records, this performance inspection will not be continued until the appropriate maintenance and inspections are completed and current records developed. (See ANSI/ASME B30.5)	
(3) Reverse signal alarm	An automatic reverse signal alarm is installed and functions when unit is placed in reverse gear or is moving in reverse. The alarm has been field tested.	
(4) Audible warning device	The crane is equipped with an audible warning device having the control lever(s) within reach of the operator(s) when seated in the operating position(s).	
(5) Lights	On-highway type equipment has, as a minimum, two taillights, two stoplights, flashing emergency lights (forward and backward), turn signals (forward and backward), or combination turn, flashing, stopping lights, and backup light. DOT requirements shall govern when applicable. Off-highway type equipment must have two headlights, two combination stop and tail lights, and backup light. On- or off- highway equipment, when used in restricted visibility situations, must have floodlamps to illuminate working areas.	
(6) Cabs	Cabs are provided with safety glazed windows in the front and both sides. Visibility forward includes a vertical range adequate to cover the boom point at all times. A windshield wiper is provided for front window. An effective heater and defroster system is provided. Cab doors (whether of sliding or swinging type) have a restraining system while crane is traveling or operating. Operator's door swings outward or slides rearward. Operator is provided clear passageway from the operator station to exit door.	
(7) Access	Walking surfaces are of the skid-resistant type. Platforms are provided with guardrails. Access system incorporates the three-point support method. One foot - 2 hands; 1 hand - 2 feet on ladders or handholds at all times. (See SAE J185 or Federal Motor Carrier Safety Regulations 399.207, Truck and Tractor Access Regulations.)	

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Item	Description	Available/ Acceptable
(8) Fire extinguishers	One 2A 40 B:C fire extinguisher is mounted near operator's station and accessible from a ground location.	
(9) Fenders	Truck-mounted cranes are equipped with fenders. Self-propelled cranes are equipped with manufacturer available fenders.	
(10) Seat belts	Truck-mounted cranes have seat belts conforming to DOT standards. Self-propelled cranes have seat belts conforming to DOT or appropriate SAE standards.	
(11) Guarding	Exposed moving parts, such as gears, chains, reciprocating or rotating parts, are guarded or isolated.	
(12) Exhaust system	Engine exhaust gases are piped outside of cab and/or discharged away from operator. Exhaust pipes are guarded or insulated to protect operating and maintenance personnel.	
(13) Swing clearance protection	Materials for guarding rear swing area are available.	
(14) High-voltage warning sign	High-voltage warning signs displaying Reclamation requirements are installed at operator's station and at strategic locations on the crane.	
(15) Operator physical exam	Operator has evidence of undergoing and satisfactorily completing a physical examination within the preceding 12 months.	
(16) Boom stops	Telescoping shock-absorbing or hydraulic-type boom stops meeting SAE J 220 (see SAE J220) are installed in a manner that resists boom overtopping.	
(17) Jib boom stops	Jib booms are restrained from backward overturning.	
(18) Boom angle indicator	A boom angle indicator, readable from the operator station, is installed and field tested for accuracy.	
(19) Boom hoist disconnect	A boom hoist disconnect, shutoff or hydraulic relief, is provided to automatically stop the boom hoist when the boom reaches a predetermined high angle. The disconnect has been field tested.	

Reclamation Safety and Health Standards

Item	Description	Available/ Acceptable
(20) Two-block damage prevention device	All cranes with telescoping booms are equipped with a two-block damage prevention feature that has been onsite tested in accordance with manufacturer's requirements. All cranes to be used in manskip or shaft sinking operations are equipped with two-block prevention devices on all hoistlines intended to be used in the operation. The two-block device has automatic capabilities for controlling functions that may cause a two-blocking condition. A two-block prevention device which sounds an alarm only is not acceptable. Two-blocking devices have been tested during this inspection.	
(21) Power-controlled lowering	Cranes for use in manskip or shaft sinking operations are equipped for power-controlled lowering operation on all hoistlines. Cranes with free	
(22) Leveling indicating device	A device or procedure for leveling the crane is provided.	
(23) Sheaves	Sheave grooves are smooth and free from surface defects, cracks, or worn places that could cause rope damage. The bottom of the sheave groove forms a close-fitting saddle for the rope being used. Lower load blocks are equipped with close-fitting guards. Load hoisting sheaves have a pitch diameter not less than 18 times the nominal diameter of rope used. Lower block pitch diameters are not less than 16 times the nominal rope diameter.	
(24) Main boom, jib boom, boom extension	Boom jibs, or extensions are not cracked or corroded. Bolts and rivets are tight. Certification that repaired boom members meet manufacturer's original design standard must be attached to this form. Noncertified repaired members must not be used until recertified.	
(25) Load hooks and hook blocks	Hooks and blocks are permanently labeled with rated capacity. Hooks and blocks are counterweighted to overhaul line from highest hook position. Hooks do not have cracks or throat openings more than 15 percent of normal or twisted off center more than 10 degrees from the longitudinal axis. All hooks are equipped with effective safety catches.	

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Item	Description	Available/ Acceptable
(26) Ropes	<p>Ropes are proper size, grade, and construction for the particular performance or function. They do not have the following deficiencies:</p> <ul style="list-style-type: none"> a. In running ropes, six randomly distributed broken wires in one rope lay, or three broken wires in one rope lay, or three broken wires in one strand in one rope lay. (A rope lay is the length along the rope in which one strand makes a complete revolution around the rope.) b. In pendants or standing ropes, evidence of more than one broken wire in one lay. c. Abrasion, scrubbing, or peening causing loss of more than one-third of the original diameter of the outside wires. d. Evidence of visible corrosion. e. Kinking, crushing, or other damage resulting in distortion of the rope structure. f. Evidence of any heat damage from a torch or arc caused by contact with electrical wire. g. Reduction from nominal rope diameter of more than 3/64 inch for diameter up to and including 3/4; 1/16 inch for diameters 7/8 inch to 1-1/8 inches; 3/32 inch for diameters 1-1/4 to 1-1/2 inches. Marked for reduction in diameter indicates deterioration of the core, resulting in lack of proper support for the load-carrying strands. Excessive rope stretch or elongation may also be an indication of internal deterioration. h. Evidence of "bird caging" or other distortion resulting in some members of the rope structure carrying more load than others. i. Noticeable rusting or development of broken wires in the vicinity of attachments. 	

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Item	Description	Available/ Acceptable
(27) Hydraulic hoses, fittings, and tubing	Flexible hoses are sound and show no signs of leaking at the surface or its junction with the metal and couplings. Hoses show no blistering or abnormal deformation to the outer covering. There are no leaks at threaded or clamped joints that cannot be eliminated by normal tightening or recommended procedures. There is no evidence of excessive abrasion or scrubbing on the outer surfaces of hoses, rigid tubing, or hydraulic fittings.	
(28) Outriggers	Outrigger number, locations, types, and type of control are in accordance with manufacturer's specifications. Outriggers are designed and operated to relieve all weight from wheels or racks within the boundaries of the outriggers. If not, the manufacturer's specifications and operating procedures must be clearly defined. Outriggers are visible to the operator or a signal person during extension or setting.	
(29) Load rating chart	<p>A durable rating chart(s) with legible letters and figures is attached to the crane in a location accessible to the operator while at the controls. The rating chart contains the following data:</p> <ul style="list-style-type: none"> a. A full and complete range of manufacturer's crane b. Optional equipment on the crane such as outriggers and extra counterweight which affect ratings. c. A work area chart for which capacities are listed in the load rating chart (i.e., overside, over read, over front). d. Weights of auxiliary equipment (i.e., load block, jibs, boom extensions). e. A clearly distinguishable list of ratings based on structural, hydraulic, or other factors rather than stability. f. A list of no-load work areas. g. A description of hoistline reeving requirements. 	
(30) Hoisting rope specifications	Rotation-resistant rope and fiber core rope are not being used for boom hoist reeving. Socketing is being done in the manner specified by manufacturer. Eye splices meet manufacturer's requirements or these standards.	

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Item	Description	Available/ Acceptable
(31) Tires	Tires are the size recommended by the manufacturer for the anticipated load. Tire conditions are satisfactory, and the tires are inflated to recommended pressures.	
(32) Braking systems	<p>(a) Trucks and self propelled cranes: Truck cranes and self propelled cranes mounted on rubber-tired chassis or frames manufactured after July 1, 1967, are equipped with a service brake system, secondary stopping (emergency brake) system, and a parking brake system. All systems conform to J/ISO 3450, Braking Performance Rubber-tired Construction Machines, or Department of Transportation Federal Motor Carrier Safety Regulations 393.40 applicable provisions of this appendix and RSHS. Rubber-tired equipment manufactured prior to July 1967 are equipped with an effective service braking system having, as a minimum, features, components, accessories, and capabilities set forth on form entitled "Brake Performance Test Record." The units are also equipped with an effective secondary stopping system meeting these requirements unless the owner/operator can show written evidence that such systems were not required by the standards or regulations in force at the date of manufacture and are not available from the manufacturer. The braking systems have been inspected and tested and found to be in conformance with applicable requirements contained in the referenced standards and on an attached brake performance test record form. Further, the inspection and test results have been recorded on the aforementioned form.</p> <p>(b) Crawler cranes: Crawler cranes are provided with brakes or other locking devices that effectively hold the machine stationary on level grade during the working cycle. The braking system is capable of stopping and holding the machine on the maximum grade recommended for travel. The brakes or locks are arranged to engage or remain engaged in the event of loss of operating pressure or power.</p> <p>(c) Locomotive cranes: Locomotive cranes are provided with an effective braking system(s) that is capable of stopping and holding the cranes on the maximum grade recommended for travel. Further, a manual engagement means is provided to hold the machine stationary during the working cycle. Such means must be arranged to engage or remain engaged in the event of loss of operating power or pressure.</p>	

Performance Inspection

The performance inspection must as a minimum, include the following features, components, accessories, and tests.

Performance Test Procedure

Upon completion of a satisfactory performance inspection and Part I of the performance load test record form, the crane can be prepared for testing. The crane must be placed on level ground (or railroad tracks if rail type). Outriggers, if provided, must be firmly set and relieve all weight from wheels within the boundary of the outriggers. The owner or contractor must select a test weight and boom radius that will provide a test load of 110 percent of the manufacturer's rating for the selected radius when the boom angle is between 30 degrees and 60 degrees above the horizontal. The load will be raised and lowered and rotated through 360 longitudinal degrees or manufacturer's specified maximum degree of rotation. The load must remain in the raised position for 10 minutes, then be lowered to the ground and critical load-bearing parts inspected for damage. (Note: Paint chipping or cracking, or deformation of structural members usually denotes a serious structural deficiency.) This testing procedure is basic for all cranes. Cranes to be used with jibs or boom tip extensions or manually extended boom sections must have these components tested in accordance with the above procedures. (Note: If the jib or boom extension is to remain in place during main hoist line operation, the basic test must be conducted with the jib or extension in place and test loads adjusted accordingly).

Hydraulic or other type cranes with telescoping booms must be further tested during telescoping operations. Cranes to be used in pick and carry operations must be tested with a load consistent with owner/contractor intended operation but never greater than the manufacturer's Secom-mediation. Cranes to be used in manship or shaft sinking operations must be further tested in the power-controlled lowering mode. This test can be integrated into the basic testing procedure by raising the load a second time and lowering it under power to near ground level, and suspending it there an additional 10 minutes. Cranes without free falling capabilities need only be tested in the power-controlled lowering mode. (Caution: Exercise extreme care in determining mobile cranes test load).

Once manufacturer's rating charts are consulted to determine maximum loading at chosen radius, rigging limitations must be computed to ensure wire rope safety factors are not exceeded. Such determination is made by: (1) adding selected load weight to weight of all auxiliary handling devices such as hoist block, hooks, slings, etc.; (2) dividing this figure by number of parts of line to obtain hoisting load per single part of line; (3) obtaining manufacturer's specified breaking strength for type of rope being used (i.e., a 3/4-inch Manioc steel rope of 6 - by 35 filler wire constructed with independent wire rope core has a breaking strength of 25.6 tons); and (4) dividing or guy ropes. Compare this resultant figure with

single part line load to determine if selected load exceeds safe load. If safe load is exceeded, a new weight consistent with calculated line load must be chosen.

(Note: Calculated safe single part line load multiplied by number parts of line sets the maximum crane load rating under existing rigging conditions regardless of maximum crane rating set by manufacturer).

Computation of Test Radius¹

W_t = Test weight (weight + sheave + rigging or dynamiter reading)	=	_____	lbs.
$w.c.$ = Computed weight = test weight = $\frac{W_t}{\quad} = \underline{\quad}$	=	_____	lbs.
$w.g.$ = Crane chart rated capacity (use next weight greater than $w.c.$)	=	_____	lbs.
$w.L$ = Crane chart rated capacity (use next weight less than $w.c.$)	=	_____	lbs.
W = Weight difference ($w.g. - w.c.$) = _____ - _____	=	_____	lbs.
WO = Weight difference ($w.g. - w.L$) = _____ - _____	=	_____	lbs.
R = Radius shown on crane chart for $w.g.$	=	_____	ft.
R_{LL} = Radius shown on crane chart for $w.L$	=	_____	ft.
r = Radius difference ($R_{LL} - R$) = _____ - _____	=	_____	ft.
R_o = Computed radius difference = $\frac{W \times r}{WO} = \underline{\underline{\quad}}$	=	_____	ft.
T_r = Test radius ($R + R_o$) + _____ + _____	=	_____	ft.

¹ Contractor's test radius can be checked by the above formula for an estimate, but is not to be used for determining the actual test radius.

Braking System Requirements and Test Procedures

Part 1 - General

Truck cranes and self-propelled cranes mounted on rubber tired chassis or frames must have braking systems conforming to the section entitled "Mobile and Stationary Mechanized Equipment" and Item 32 of performance inspection criteria. Further, the crane's braking systems must incorporate the features, components, accessories, and performance capabilities required under parts II and III of this form.

Cranes that meet the requirements of item 32 and part II of this form and the section entitled "Mobile and Stationary Mechanized Equipment" shall be brake tested in accordance with the requirements, methods, and procedures described in that section and in part III of this form. Record the results in parts V, VI, and VII of this form. Sign the completed form in part VIII and submit it to Reclamation. Equipment failing brake test(s) must not be place into service or performance load tested until the braking system has been repaired and satisfactorily tested.

Part II - Braking Systems, Features, Components, Accessories

A. Service Braking System

1. All cranes must have an effective service braking system. The service brake system must be capable of stopping and holding an unloaded crane on a 25-percent grade with the boom and other applicable components in the transport position recommended by the manufacturer. This requirement applies to both forward and reverse directions. The braking system also must be capable of bringing the crane to a stop within the distances and under the conditions specified in part III.
2. The service braking system must be the type that can be foot-applied or released by the operator while sitting in the operating position.
3. Cranes must have service brakes on all wheels except:
 - a. Truck cranes with three or more axles need not have brakes on the front wheels unless equipped with two steerable axles, and then the wheels on one such axle must be equipped with brakes.
 - b. Self-propelled cranes may have only two braked wheels (one lefthand, one right-hand) if the system meets the stopping distance requirements (part III).

B. Secondary Braking System

1. All cranes, unless exempted by paragraph 20.6.3 of RSHS or item 32, must have an secondary braking system.
2. The system must be capable of being applied manually by a person seated in the operating position. The system must be arranged so it cannot be released from the operator's seat after any application, unless immediate replication can be made from the operator position.
3. The system may, in addition to manual activation, be activated automatically. If equipped with an automatic activation feature, the automatic application must occur after a warning device is activated.
4. The system must be capable of bringing the crane to a stop within the distances and under the conditions specified in part III.

C. Parking Brake System

1. All cranes must have an effective parking brake system.
2. The braking system must be capable of being applied by a person seated in the operator's seat.
3. The braking system can be applied by the driver's muscular efforts, by spring actions, or by other energy, provided that the brake will remain in the applied position despite any contraction of brake parts, exhaustion of

energy source, or leakage of fluid. The brake shall be such that it cannot be released unless adequate energy is available to make immediate further application with required effectiveness.

4. The braking systems must be capable of holding the crane stationary under the conditions specified in part III.

D. Features, Components, Accessories

1. Braking systems utilizing air, or vacuum energy assist devices must be equipped with a gage that indicates the pressure or vacuum available for braking.

2. Braking systems utilizing air, hydraulic (other than brake pedal pressure), or vacuum assist energy devices must be equipped with a readily visible or audible continuous warning device at the operator's position. The device will actuate: (a) before air or hydraulic pressure drops below 50 percent or maximum operating energy level; (b) when vacuum in the supply reservoir is less than 8 inches of mercury; or (c) before or upon application of dual hydraulic type systems. Gauges indicating pressure or vacuum do not meet this requirement.

3. All braking systems utilizing air, pressure, or vacuum for braking must have reserve capacity or a reservoir of sufficient capacity to ensure a full-service brake application with the engine stopped, without depleting the air pressure or vacuum below 70 percent of operating pressure or vacuum.

Part III - Brake Testing Methods and Procedures

All trucks and self-propelled cranes mounted on rubber-tired chassis or frames must undergo the braking performance tests required by the section entitled "Mobile and Stationary Mechanized Equipment." Conduct such tests in accordance with the following methods and /or procedures.

A. General

1. All tests must be conducted with applicable braking systems at full charge.

2. Units must be tested in an unloaded condition with all attachments and components in the transport position recommended by the manufacturer.

3. All stopping tests must be conducted from a 20-mile-per-hour speed.

4. Stopping tests must be conducted with the transmission in the gear range commensurate with the 20-mile-per-hour testing speed. The power train may be disengaged prior to completing the stop.

5. Auxiliary retarders must not be used in the test unless the retarders are simultaneously activated by the applicable brake control system.

6. Stopping distances must be measured from the point at which the brake control is applied to the point at which the machine stops.

7. Means must be provided to determine equipment weight and stopping distance with an accuracy of plus or minus 2 percent and test speed with an accuracy of plus or minus 5 percent.

B. Service and Secondary Braking System

1. Service and secondary braking tests must be conducted on a level (less than 1-percent grade in direction of travel and 3 percent at right angles to travel), clean, swept dry surfaces at least 18 feet 0 inches wide. The course length will be sufficient for accelerating from 0 to 20 miles per hour and providing a stopping distance equal to 1-1/2 times that shown for the emergency braking system.

Units utilizing a dual system for meeting emergency brake system requirements must have each system independently tested (i.e., each system of a dual hydraulic system must be tested independently).

2. Service and secondary braking system must have the following stopping capabilities when traveling at 20 miles per hour:

<u>Machine GVWR</u>	<u>Service brake</u>	<u>Secondary brake</u>
Up to 50,000	55 feet	146 feet
Over 50,000	62 feet	156 feet

The unit will not deviate from a 12-foot-wide lane before or during the test. Do not permit any wheels to drag during the service brake tests.

C. Parking Brake System

1. Conduct parking brake system tests on a dry, swept, 15-percent grade surface. Conduct the tests with the unit facing both up and down the slope.

2. Once the unit is in place and the parking brake is set, release all other holding devices and braking systems and place the transmission in the neutral position. Any energy assist sources (air, vacuum, hydraulic) will be depleted. The unit must remain in this condition without movement for 5 minutes.

D. Energy Recovery Test

1. The braking system's primary power source must have the following recovery capabilities:

a. Air. Seventy percent of maximum brake pressure when the service brakes are fully applied 12 times at the rate of 4 applications per minute with the engine running at maximum governed revolutions per minute.

b. Vacuum. Seventy-percent maximum brake vacuum after one full (pedal depressed to full limit of travel) service brake application with engine stopped.

c. Hydraulic. Pedal cannot be depressed to within 1 inch of floor or limit of travel on any one full application of the pedal.

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Part III			Travel under Load Test (if crane is going to travel under load on actual work)		
Load in Pounds	Boom Radius		Load Rating at Radius		
Part IV					
Performance Test - Jib or Boom Extension					
Load in Pounds	Boom Radius		Jib Used		
Degree of Swing			Outriggers		
Satisfactory: <input type="checkbox"/> Lifting <input type="checkbox"/> Swinging <input type="checkbox"/> Lowering <input type="checkbox"/> Braking					
Remarks:					
Part V					
Signatures					
Bureau Representative			Contractor Representative		
Date:			Date:		
<p>Note: (1) Load testing of cranes will be conducted in accordance with performance testing requirements contained herein and set forth in the section entitled, "Hoisting Equipment, Piledrivers, and Conveyors." (2) Contractors are responsible for equipment meeting or exceeding minimum specified requirements and/or standards, conducting required load tests, and signature of Government representative on the form only indicates the contractor did effect tests in accordance with Reclamation requirements. (3) Load tests will not be conducted until performance inspection requirements have been met.</p>					