

Appendix H

Record of Performance—Inspection and Brake Test— Off-Highway, Wheel-Type Construction Machines, Loaders, Dumpers, Scrapers, Graders, Tractor Water Wagons, and Similar-Type Machines

General

All nonexempt, off-highway, wheel-type construction machines described above and in section 20 of Reclamation Safety and Health Standards must be performance inspected and brake tested by the owner and/or contractor: (a) prior to initial onsite operation; (b) at least once annually thereafter; and (c) whenever directed to do so by Reclamation.

Such inspections and tests must be conducted in the presence of a Bureau of Reclamation representative and recorded in the appropriate places on this form. The form will then be signed and submitted to Reclamation. Initial and periodic performance inspection and brake tests must be conducted onsite after each unit has been assembled, reassembled, and/or prepared for operation. Manufacturer's or owner's offsite inspection and tests must not be substituted for onsite inspections and tests. Performance brake tests must not be conducted until all appropriate inspection items are found to be available and in acceptable condition.

Performance Inspection

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

Item	Description	Available/ acceptable
(1) Manufacturer's operating and maintenance manuals	Manufacturer's operating and maintenance manuals shall accompany all off-highway, rubber-tired equipment covered by section 20 and this appendix. These manuals set forth inspection, operation, and maintenance criteria that is not available from any other source.	
(2) Maintenance and "frequent" and "periodic" inspection records	Inspection and maintenance records must be complete and current. Unless owner can produce these records, brake tests will not be conducted until the appropriate maintenance and inspections have been performed and current records developed.	

Item	Description	Available/ acceptable
(3) Reverse signal alarm	An automatic reverse signal alarm is installed and functions when machine is placed in reverse gear or is moving in reverse. It has been field tested.	
(4) Audible warning device	All operator-controlled machines are equipped with an audible warning device having the control lever(s) within reach of the operator(s) when seated in the operating position(s). The device has been field tested.	
(5) Lights	Off-highway use. A minimum of two head lamps mounted symmetrically on the front. Head lamps must provide adequate illumination for a distance that exceeds machine maximum stopping distance at maximum speed. Two stop lamps at rear of machines for day operation, plus two tail lamps and one backup lamp for night operation. Work area floodlamps for night operation, including scraper bowl lamp, motor grader blade and front lamp, bucket lamps, ripper lamps. One rotating amber lamp visible in all directions on motor graders, front-end loaders and similar slow moving machines used on public or haul roads or in borrow or fill areas. On-highway use equipment intended for use on highways, public roads, or in public accessible areas must be equipped for highway operation.	
(6) Cabs	Cabs are provided with safety glazed windows, heaters, defrosters, windshield wipers, door restraints, and rearview mirror on bidirectional machines.	
(7) Access	Walking surfaces are of the skid-resistant type. Platforms are provided with guardrails. Access systems incorporate the three-point support method; one foot-two hands; one hand-two feet on handholds or ladders at all times.	
(8) Fire extinguisher or fire suppression systems	Two 2A 40 B:C extinguishers are required on vehicles transporting flammable or explosive materials. Two 2A 40 B:C extinguishers and a fixed nozzle fire-suppression system are required on all diesel-powered equipment operated underground. All other equipment must be equipped with the type and number of extinguishers or suppression systems deemed necessary by Reclamation.	
(9) Fenders	Machines with a maximum speed exceeding 15 mph are equipped with fenders or operator tire guards conforming to SAE J321 or devices providing equivalent protection.	

Item	Description	Available/ acceptable
(10) Seatbelts	Machines with installed ROPS are equipped with operable seatbelts conforming with criteria set forth in applicable SAE standards (See table-1, RSHS section 20.) Only seatbelts permanently and legibly marked or labeled with: (1) year of manufacture; (2) model and style number; (3) trademark of manufacturer, distributor, or importer; and (4) design and test data certification are acceptable.	
(11) Exhaust systems	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.	
(12) ROPS	Machine is equipped with a rollover protective structure that has a permanently attached label that certifies the structure conforms to applicable SAE standard. Nonlabeled structures must not be used without a manufacturer's or PE's written confirmation that the structure meets the aforementioned criteria or practices. ROPS showing signs of damage, repair, or modification must not be used on equipment unless recertified.	
(13) FOPS	Machine is equipped with falling object protective structure unless the contractor representative notes on this inspection report that the machine will not be loaded and/or used in a manner that would subject the operator to falling material. Installed FOPS will be certified as conforming with SAE J/ISO 3449 criteria by a permanent label on the structure or the contractor has a written certification from the manufacturer or PE.	
(14) Operator enclosure	Tractors, loaders, or forestry machines used in tree clearing operations, winching operations, or other operations where objects may intrude into the operator's area are equipped with enclosures conforming to SAE J1084. Equivalent protective enclosures acceptable to Reclamation meet this requirement.	
(15) Emergency steering	Wheeled earthmoving machines such as tractors, scrapers, wheel loaders, graders, and dumpers manufactured in or after 1980 using a power steering system are equipped with emergency steering provisions meeting SAE J1511.	

Item	Description	Available/ acceptable
(16) Dump truck safety devices	<p>Dump trucks of all descriptions are equipped with:</p> <ul style="list-style-type: none"> a. Trip handle or dump-body operating levers, safety latches, or an equivalent protective system for preventing accidental movement of the lever. b. Permanently mounted device for preventing accidental lowering of dump body or bed during inspection or maintenance operations. c. Operator protective cab shield or canopy to protect operator during machine loading or unloading operations. Machines without this protection will display a suitable warning sign directing the operator to leave the cab during the loading or unloading process. 	
(17) Brake systems	<p>All off-highway, wheel-type machines (regardless of age) are equipped with an operable and effective service braking system, emergency stopping (brake) system, and parking brake system. The braking systems conform fully with the criteria contained in SAE J/ISO 3450, this appendix, and RSHS section 20. If the machine was manufactured prior to 1980, its braking system may conform with the SAE standard under which it was manufactured, if that standard requires the three braking systems and failure of a common component or system will not reduce machine stopping capability below the emergency stopping performance criteria shown on the attached "Brake Performance Test Record" form. In no circumstances can dropping the scraper bowl, loader bucket, or grader/tractor blade or equipment loads be considered as an emergency braking system.</p> <p>Reclamation may exempt emergency braking systems requirements for compactors and rollers manufactured prior to 1976 if such systems are not available from the manufacturer. Additionally, compactors and rollers intended for use on 3 percent or less grades can be Reclamation exempted from brake performance test requirements.</p> <p>The braking systems have been inspected, tested, and found to conform with applicable requirements contained in the referenced standards and on attached brake performance test record form. Further, the inspection and test results have been recorded on the inspection form.</p>	

Braking System Requirements and Test Procedures

Part I - General

Nonexempt, off-highway, wheel type machines must have braking systems conforming to the section "Mobile and Stationary Mechanized Equipment" and item 17 of this appendix (performance inspection criteria). Further, the machines braking systems must incorporate the features, components, accessories, and performance capabilities required under parts II and III of this form

Machines found to meet the requirements of item 17 and part 11 of this form and the section "Mobile and Stationary Mechanized Equipment" must be brake tested in accordance with the requirements, procedures, and methods described in part III of this form. Results must be recorded in parts V, VI, and VII of this form. The completed form shall be signed in part VIII and submitted to Reclamation. Equipment failing brake test(s) must not be placed into service until the braking system has been repaired and satisfactorily tested.

Part II - Braking Systems, Features, Components, and Accessories

A. Service Braking System

1. All machines must have an effective service braking system. The service braking system must have the capability equivalent to holding the respective machine under the following conditions:

Machine	Grade	Condition
Loaders	30%	Loaded to manufacturer's gross weight rating and distribution with bucket in SAE carry position.
Dumpers and tractor scrapers	25%	Loaded to manufacturer's gross weight rating and distribution.
Graders	30%	Cutting edge to be in the transport position.
Tractors with dozers	30%	Lowest part of cutting edge to be 18 feet above test surface
Compactor loaders	20%	All conditions of loading

2. The braking system must be capable of bringing the machine to a stop within the distances and under the conditions specified in part III.

3. The service braking system must be of the type that can be applied or released by the operator while sitting in the operating position.
4. All tractor scrapers and dumpers must have braked wheels on at least one axle of the prime mover and one axle of each trailing unit. All other machines may have only two braked wheels (one right hand, one left hand) if the system meets stopping distance requirements of part III.
5. With the machine stationary, the service braking system's primary power source must have the capability of delivering at least 70 percent of maximum brake pressure when the brakes are fully applied twelve (12) times at rate of four (4) applications per minute with the engine at maximum governed speed for dumpers and tractor scrapers and twenty (20) times at the rate of six (6) applications per minute for loaders, graders, tractors with dozer, compactors, and rollers.
6. The service braking system using stored energy must be equipped with a warning device that activates before system energy drops below 50 percent of manufacturer's specified maximum operating energy level. The device must be readily visible and/or audible to the operator and provide a continuous warning. Gages indicating pressure or vacuum do not meet these requirements.

B. Emergency Stopping Systems

1. All machines, unless exempted elsewhere, must be equipped with an emergency stopping system.
2. The emergency stopping system must be capable of bringing the machine to a stop within the distance and under the conditions specified in part III.
3. The emergency system must be capable of being applied from the operator's position. The system must be arranged so that it cannot be released by the operator unless immediate reapplication can be made from the operator's seat to stop the machine or combination of machines.
4. In addition to the manual control, the emergency stopping system may also be applied automatically. If an automatic system is used, the automatic application must occur after the warning device is actuated.

C. Parking Brake System

1. All machines must be equipped with a parking system capable of being applied from the operators position. The brake must be such that it cannot be released unless immediate reapplication can be made by the operator.

2. The parking system, when applied, must maintain the parking performance despite any contraction of the brake parts, exhaustion of energy, or leakage of any kind.

D. Features, Components, and Accessories

1. Braking systems utilizing stored energy or vacuum assist device must be equipped with a gage that indicates the pressure or vacuum available for braking.
2. Braking systems may use common components; however, a failure of a common component must not reduce the effectiveness of the machine stopping capability below the emergency stopping performance requirement.

Part III - Brake Testing Methods and Procedures.

All off-highway, wheel-type machines described in the RSHS section, "Mobile and Stationary Equipment" and, unless exempted elsewhere, must undergo the braking performance tests required. Such tests must be conducted in accordance with the following methods and procedures.

A. General

1. All tests must be conducted with applicable braking systems fully charged.
2. Units will be tested under the following condition:

Machine	Conditions
Loaders	Unloaded with bucket in carry position (The vertical distance from ground to center-line of bucket hinge pin, with the angle of approach at 15 degrees
Dumpers and tractor scrapers	Loaded to manufacturer's gross machine weight rating and distribution.
Tractors with dozers	Lowest part of cutting edge 18 inches above test surface.
Compactors or rollers	Maximum fuel, oil, sprinkler system water, and ballast as actually in use when operating.
Graders	Cutting edge to be in the transport position.

3. All dynamic stopping tests must be conducted from 20 mph, except compactor and roller stopping tests will be conducted from 10 mph or the maximum rated speed, if less than 10 mph.

4. Stopping tests shall be conducted with the transmission in the gear range commensurate with 20 mph testing speed. The power train may be disengaged prior to completing the stop. On machines using hydrostatic drives, the drive train shall be disengaged to eliminate the retarding torque of the transmission.
5. Auxiliary retarders shall not be used in the test unless the retarder is simultaneously activated by the applicable brake control system.
6. Stopping distances shall be measured from the point at which the brake control is applied to the point at which the machine stops.
7. Means shall be provided to determine weight of equipment and stopping distances with an accuracy of plus or minus 2 percent and test speeds with an accuracy of plus or minus 5 percent.

B. Services and Emergency Braking Systems

1. Service and emergency dynamic braking tests shall 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 surface. The course length will be sufficient for accelerating from 0 to 20 mph (10 mph for compactors and rollers) and providing a stopping distance equal to 1-1/2 times that shown for the emergency braking system. Static service brake holding tests shall be conducted on the greater of 15 percent grade or maximum grade of intended travel.
2. Service and emergency braking systems shall have the following stopping capabilities in feet when traveling at 20 mph (10 mph for compactors and rollers).

Machine	Machine weight (lbs)	Service braking	Emergency braking
Loaders tractors with dozers	Up to 36,000	45	135
	Over 36,000 to 70,000	61	183
	Over 70,000 to 140,000	75	225
	Over 140,000 to 280,000	89	267
	Over 280,000	111	333
Dumpers	Up to 100,000	59	153
	Over 100,000 to 200,000	74	173
	Over 200,000 to 400,000	96	202
		118	231

Machine	Machine weight (lbs)	Service braking	Emergency braking
Combination dumpers and dumper trains	Up to 100,000	59	153
	Over 100,000 to 200,000	89	192
	Over 200,000 to 400,000	125	241
	Over 400,000	177	310
	Over 400,000		
Tractor scrapers	Up to 50,000	58	151
	Over 50,000 to 100,000	73	170
	Over 100,000 to 150,000	88	190
	Over 150,000	102	209
Graders	Up to 35,000	42	126
	Over 35,000 to 70,000	54	162
	Over 70,000	75	225
Compactor rollers	Up to 12,000	23.7	56.5
	Over 12,000 to 30,000	27.4	60.2
	Over 30,000	31.1	63.9

C. Parking Brake System

1. Parking brake systems must be conducted on a dry, 15-percent grade surface. The tests must be conducted with the unit facing both up and down the slope. Once the unit is in place and the parking brake set, all other holding devices and braking systems must be released and the transmission placed in the neutral position. Any stored energy assist sources (air, vacuum, hydraulic) must be depleted. The unit must remain in this condition without movement for 5 minutes.

D. Energy Recovery Test

Energy recovery tests must be conducted as follows:

a. Machine will be placed on the stopping test surface. The engine speed will be increased to the maximum governed revolutions per minute. The system storage pressure or vacuum will be allowed to increase until gages indicate the system is at the manufactured full rated level. The brakes on dumpers and tractor scrapers must be fully applied four times per minute for 3 consecutive minutes. During this test procedure, the pressure/vacuum gage must never read less than 70 percent of full rated reading. The brakes on loaders, graders, tractors with dozer, compactor, and rollers must be fully applied 6 times per minute for 3-1/2 consecutive minutes. During this test procedure, the gage must never read less than 70 percent of full rated reading.

