SAE International™ SURFACE VEHICLE STANDARD

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Personnel Protection - Skid Steer Loaders

1. ***Scope***—This SAE Standard is intended to provide personnel protection guidelines for skid steer loaders. This document is intended as a guide towards standard practice, but may be subject to frequent change to keep pace with experience and technical advances. This should be kept in mind when considering its use. This document provides performance criteria for newly manufactured loaders and it is not intended for in-service machines.

2. *References*

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated, the latest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001

SAE J153—Operator Precautions
SAE J674—Safety Glazing Materials—Motor Vehicles and Motor Vehicle Equipment
SAE J1042—Operator Protection for General-Purpose Industrial Machines
SAE J2292—Combination Pelvic/Upper Torso (Type 2) Operator Restraint System for Off-Road Work Machines
SAE J/ISO 3411—Earth-moving machinery—Human physical dimensions of operators and minimum operator space envelope
SAE J/ISO 3449—Earth-moving machinery—Falling-object protective structures—Laboratory tests and performance requirements
SAE J/ISO 3450—Earth-moving machinery—Braking systems of rubber-tyred machines—Systems and performance requirements and test procedures
SAE J/ISO 3471—Earth-moving machinery—Rollover Protective Structures—Laboratory tests and performance requirements
SAE J/ISO 5353—Earth-moving machinery, and tractors and machinery for agriculture and forestry—Seat index point
SAE J/ISO 6165—IdentificationTerminology of Earthmoving Machines
SAE J/ISO 6682—Earth-moving machinery—Zones of comfort and reach for controls
SAE J/ISO 9244—Earth-moving machinery—Safety signs and hazard pictorials—General principles
SAE J/ISO 10533—Earth-moving machinery—Lift-arm support devices
SAE J/ISO 10265—Earth-moving machinery—Crawler machines—Performance requirements and test procedures for braking systems

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2.1.2 ISO PUBLICATIONS—Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.

ISO 2867—Earth-moving machinery-Access Systems
ISO 3457—Earth-moving machinery-Guards – Definitions and Requirements
ISO 5006—Earth-moving machinery—Operator's field of view—Parts 1, 2 and 3
ISO 6405-1—Earth-moving machinery—Symbols for operator controls and other displays
ISO 6405-2—Earth-moving machinery—Symbols for operator controls and other displays
ISO 6683—Earth-moving machinery—Seat belts and seat belt anchorages
ISO 6750—Earth-moving machinery—Operation and maintenance—Format and content of manuals
ISO 7131—Earth-moving machinery—Terminology and commercial specifications
ISO 10968—Earth-moving machinery—Operator's controls
ISO 12508—Earth-moving machinery—Operator station and maintenance areas – Bluntness of edges
ISO 14397-1—Earth-moving machinery—Loaders and backhoe loaders—Calculation of rated operating capacity and test method for verifying calculated tipping load
ISO 14397-2—Earth-moving machinery—Loaders and backhoe loaders—Test method for measuring breakout forces and lift Capacity to maximum lift height

3. Definitions

3.1 A loader is a self propelled crawler or wheeled machine, having front-mounted equipment primarily designed for loading operation (bucket use), which loads or excavates through forward motion of the machine.

NOTE— A loader work cycle normally comprises filling, elevating, transporting, and discharging material.

3.2 A skid steer loader is a loader normally having an operator station between attachment-supporting structures, and steered by using variation of speed and/or direction of rotation between traction drives on opposite sides of a machine with fixed axles with wheels or with tracks.

NOTE— The component nomenclature is identified in ISO 7131. Earth-moving machinery definition is found in SAE J/ISO 6165.

3.3 A "guard" or "shield" is a barrier that is intended to prevent inadvertent contact with a potential hazard during normal operation and servicing.

3.4 "Moving machinery part hazard" is a source of potential injury by direct contact or entanglement. This includes, but is not limited to, the projections on rotating parts and the nip points at the acute entry angle of power driven gears, belts, and chains.

3.5 "Nip point" means the pinch point of gears and the run-on point where a belt or chain contacts a sheave, sprocket, or idler.

3.6 "Guarded by location" means a component is guarded during normal operation and servicing, when because of its location, no person can inadvertently come in contact with the potential hazard.

3.7 "Side screens" are barriers that cover the side openings of an operator cab.

3.8 "Normal operation" is the reasonable use of the loader by a trained person using attachments as approved by the loader manufacturer.

3.9 "Field maintenance" is a service performed in accordance with the operator manual, field service manual, or machine sign.

3.10 "Approved lift arm support device" is a mechanical device approved by the manufacturer, used to prevent accidental lowering of the lift arms when the lift arms are required to be held in the elevated position for maintenance, service, or purpose other than loader operation.

4. Operation Instructions—General operator instructions and field maintenance procedures shall be provided by manuals and/or machine signs attached to the loader. Manuals should use SAE J153 MAY1987 and ISO 6750 as a guideline.

4.1 Instructions shall be included for loading, traveling, and dumping. Information shall be included regarding the effects of changes of motion and of field conditions such as a slope.

4.2 Instructions shall be provided for transporting the loader.

4.3 Instructions shall be given for lifting the loader as a total unit.

4.4 Instructions shall be provided for field maintenance.

5. Operation

5.1 Movement of operator controls shall be in accordance with ISO 10968. It is not necessary to have neutral interlocks or steering controls with a secondary motion when passing through neutral.

5.2 Controls should be identified. If symbols are used, they should be in accordance with ISO 6405-Parts 1 and 2.

5.3 Handholds, steps, or other means to facilitate entry and exit from the loader operator's position shall be provided and comply with ISO 2867.

5.4 Location of operator seat and controls should be within guidelines established by SAE J/ISO 6682 and SAE J/ISO 5353.

5.5 Rated operating capacity shall be in accordance with ISO 14397 Parts 1 and 2. Tipping load is defined by ISO 14397-1.

6. Operator Constraints

6.1 Loaders shall be equipped with Type 1 seat belt systems which meet ISO 6683 requirements. Type 2 seat belt systems, if provided, shall meet SAE J2292.

6.2 A means to prevent lift arm movement ,attachment bracket pivoting and activation of the drive system when the operator is entering or exiting shall be provided.

7. Operator Guards and Shields

7.1 The following shall be shielded or guarded by location.

7.1.1 Nip point of exposed gears, belts, and chain drives.

7.1.2 Outside faces of pulleys, sheaves, sprockets, cooling fans and gears that rotate when the engine is running with all clutches disengaged.

7.1.3 Rotating parts with projections such as exposed bolts, keys, or set screws.

7.1.4 Revolving shafts, except smooth shaft ends, protruding less than one-half the outside diameter of the shaft.

7.2 Fluid System Shielding

7.2.1 Batteries, fuel tanks, oil reservoirs, and coolant systems should be constructed, located, or sealed per guidelines in SAE J1042.

7.3 Guard Design

7.3.1 Guards and shields shall comply with ISO 3457.

7.3.2 Guards which must be opened for frequent lubrication or inspection, such as required for field maintenance, shall be hinged or otherwise permanently attached and latched.

8. Operator Cab

8.1 Skid steer loaders shall be provided with suitable cabs with side screens as follows:

8.1.1 A Rollover Protective Structure (ROPS) which complies with SAE J/ISO 3471, and is labeled accordingly.

8.1.2 A Falling Object Protective Structure (FOPS) which complies with SAE J/ISO 3449 Level 1.

8.1.3 If ROPS or side screens/side windows are capable of being removed, a warning sign to reinstall them before operating the loader shall be attached to part of the loader which is not removed. A sign shall also be attached to the machine warning against modifying equipment.

8.1.4 Operator cab shall have at least two openings for emergency exit, one of which can be the normal operator entrance. They shall conform to ISO 2867.

8.1.5 Glazing material, such as glass or plastic used in cabs, shall be in accordance with SAE J674.

8.1.6 All edges, corners, or other projections that might be contacted by a 95th percentile male operator restrained by a tight seat belt shall comply with ISO 12508.

8.1.7 The operator space envelope shall comply with ISO 3411.

8.1.8 Loader visibility shall be evaluated from the operator's position as defined by the manufacturer according to ISO 5006 - Parts 1, 2, and 3.

9. Braking and Parking Requirements

9.1 Wheel loaders shall comply with SAE J/ISO 3450. Track loaders shall comply with ISO 10265. Traction drives are normally used as the service braking system and brakes need not be directly applied to wheels or tracks.

10. Safety Signs

10.1 Safety signs shall be displayed to warn the operator and others of potential hazards which may occur during normal operation and servicing.

10.2 Safety signs shall conform to J/ISO 9244.

11. Fire Protection

11.1 Service fill openings on all fluid tanks shall have proper identification of fluid attached adjacent to the fill opening on a non-removable surface.

11.2 Fuel spillage during fill shall drain to avoid contact with hot engine parts and entering operator cab.

12. Lift Arm Support Device

12.1 An approved lift arm support device, if required, shall conform to load required by SAE J/ISO 10533.

12.2 The operator's manual shall provide instructions on the use of the approved lift arm support device.

13. Notes

13.1 **Marginal Indicia—**The change bar (l) located in the left margin is for the convenience of the user in locating areas where revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

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