9	SURFACE VEHICLE STANDARD	SAE , J1040 Issued 1974-04	CAN- CELLED MAY2003		
		Cancelled 2003-05			
		Superseding J1040 MA	AY1994		
Performance Criteria for Rollover Protective Structures (ROPS) for Construction, Earthmoving, Forestry, and Mining Machines					
<i>Foreword</i> —This document has been replaced by J/ISO 3471.					
1.	Scope —This SAE Standard applies to the following off-road work machines of mass greater than 700 kg that are commonly used in earthmoving, construction, logging, and mining applications as identified in SAE J1116 JUN86 and designed for an-board, seated operator:				
	 a. Crawler tractors and loaders (see SAE J1057 SEP88 Sections 3.1 and 7.1 and SAE J727 JAN86 for description and nomenclature). b. Graders (see SAE J1057 SEP88 Section 6 and SAE J870 JUL84 for description and nomenclature). c. Wheel loaders, wheel tractors, and their modifications used for rolling or compacting, dozer equipped wheel tractors, wheel log skidders, skid steer loaders, and backhoe loaders (see SAE J1057 SEP88 Sections 3.2, 7.2, and 9 for description and nomenclature). d. Wheel industrial tractors (see SAE J1092 JUN86 for description and nomenclature). e. Tractor portion of semi-mounted scrapers, water wagons, articulated steer dumpers, bottom dump wagons, side dump wagons, rear dump wagons, and towed fifth wheel attachments (see SAE J1057 SEP88 Sections 4.1.1.4, 4.1.2, 4.2.1.1, 4.3.1.2, 4.3.1.3, 4.3.2, and 5 and SAE J869 JUL90 and SAE J728 JUL90 for description and nomenclature). f. Rollers and compactors (see SAE J1017 JAN86 for description and nomenclature). g. Rigid frame dumpers with full mounted bodies (see SAE J1057 SEP88 Sections 4.1.1.1, 4.1.1.2, 4.1.1.3, 4.1.1.5, and 4.3.1.1 and SAE J1016 JUL90 for description and nomenclature). NOTE—Additional machine types listed in SAE J1116 JUN86 may utilize these ROPS performance criteria if so directed by other SAE reports such as SAE J1052 JUN93. SAE J1194 MAY89 and SAE J2194 JUN93 cover agricultural tractors (defined in SAE J1150 OCT92). 				
	are specifically excluded. Rough terrain forklifts, 360 degree rotation excavators, and excavator based machines are also excluded along with rollover protection for the operator of an attachment with an alternate seat position from that used for mobile operation (for example, an attachment backhoe).				
1.1	Purpose —This document establishes a consistent, repeatable means of evaluating the load-carrying characteristics of ROPS under static loading and prescribes performance requirements of a representative specimen under such loading.				

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2003 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE	DOCUMENT	ORDER:
----------	----------	--------

 Tel:
 877-606-7323 (inside USA and Canada)

 Tel:
 724-776-4970 (outside USA)

 Fax:
 724-776-0790

 Email:
 custsvc@sae.org

SAE WEB ADDRESS:

This is a preview. Click here to purchase the full publication.

SAE J1040 Cancelled MAY2003

2. References

- **2.1 Applicable Publications**—The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.
- 2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J154 JUN92—Operator Enclosures Human Factor Design Considerations SAE J231 JAN81—Minimum Performance Criteria for Falling Object Protective Structure (FOPS) SAE J397 APR88—Deflection Limiting Volume—ROPS/FOPS Laboratory Evaluation SAE J429 AUG83—Mechanical and Material Requirements for Externally Threaded Fasteners SAE J727 JAN86—Nomenclature—Crawler Tractor SAE J728 JUL90—Component Nomenclature—Scrapers SAE J869 JUL90—Component Nomenclature—Construction Two- and Four-Wheel Tractors SAE J870 JUL90—Component Nomenclature—Graders SAE J995 JUN79—Mechanical and Material Requirements for Steel Nuts SAE J1016 JUL90—Component Nomenclature—Dumpers SAE J1017 JAN86—Nomenclature—Rollers and Compactors SAE J1042 JUN93—Operator Protection for General Purpose Industrial Machines SAE J1043 SEP87—Performance Criteria for FOPS on General Purpose Industrial Machines SAE J1057 SEP88—Identification Terminology of Earthmoving Machines SAE J1092 JUN86—Nomenclature—Industrial Tractors (Wheel) SAE J1116 JUN86—Categories of Off-Road Self-Propelled Work Machines SAE J1119 DEC88—Steel Products for Rollover Protective Structures (ROPS) and Falling Object Protective Structures (FOPS) SAE J1150 OCT92—Terminology for Agricultural Equipment SAE J1164 JAN91—Labeling of ROPS and FOPS SAE J1194 MAY89—Rollover Protective Structures (ROPS) for Wheeled Agricultural Tractors SAE J1199 SEP83—Mechanical and Material Requirements for Metric Externally Threaded Steel Fasteners SAE J2194 JUN93—Rollover Protective Structures (ROPS) for Wheeled Agricultural Tractors ASTM PUBLICATIONS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. ASTM A 370—Standard Methods and Definitions for Mechanical Testing of Steel Products

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

ISO 898/1—Mechanical properties of fasteners—Part 1: Bolts, screws and studs

- ISO 898/2—Mechanical properties of fasteners—Part 2: Nuts with specified proof load values
- ISO 3164—Earth-moving machinery—Laboratory evaluations of roll-over and falling-object protective structures—Specification for the deflection-limiting volume
- ISO 3471—Earth-moving machinery—Roll-over protective structures—Laboratory tests and performance requirements
- ISO 3471/1-1986—Earthmoving machinery—Roll-over protective structures—Laboratory test and performance requirements—Part 1: Crawler, wheel loaders and tractors, backhoe loaders, graders, tractor scrapers, articulated steer dumpers

3. Definitions

2.1.2

3.1 Bedplate—A substantially rigid part of the testing fixture to which the machine frame is attached for the purpose of the test.

This is a preview. Click here to purchase the full publication.

SAE J1040 Cancelled MAY2003

- 3.2 DLV—Deflection Limiting Volume, defined in SAE J397 APR88.
- **3.3 FOPS**—A Falling Object Protective Structure complying with SAE J231 JAN81 or SAE J1043 SEP87, as appropriate.
- **3.4** Machine Frame—Main chassis or main load bearing member(s) of the machine which extend(s) over a major portion of the machine and upon which the ROPS is directly mounted.
- **3.5 Maximum Recommended Mass, M**—The manufacturer's maximum recommended mass including attachments in operating condition with all reservoirs full to capacity, tools, and ROPS; exclusive of towed equipment such as rollers, compactors, and drawn scrapers.

For the tractor portion of semi-mounted scrapers, water wagons, articulated steer dumpers, bottom dump wagons, side dump wagons, rear dump wagons, and towed fifth wheel attachments, M is the manufacturer's maximum recommended mass of the tractor portion (prime mover) only. Kingpins, hitches, and articulated steering components that attach to hitches or towed units are excluded from the mass of these machines.

For rigid frame dumpers, M excludes the mass of the dump body and the payload when the "ROPS only" criteria are selected. When the "body only" criteria are selected, M includes the mass of the dump body but excludes the mass of the payload.

Soil, mud, rocks, branches, debris, etc., that commonly adhere to or lie on machines in use are not considered as part of the mass of any machine. Material dug, carried, or handled in any manner is not to be considered part of the machine mass in determining test requirements.

- **3.6 Representative Specimen**—A ROPS, mounting hardware, and machine frame (complete or partial) for testing purposes, that is within the manufacturer's specifications.
- **3.7 Rollbar ROPS**—A one- or two-post ROPS without a FOPS or any cantilevered load-carrying structural members.
- **3.8 Rollover Protective Structure (ROPS)**—A system of structural members whose primary purpose is to reduce the possibility of a seat-belted operator being crushed should the machine roll over. Structural members include any subframe, bracket, mounting, socket, bolt, pin, suspension, or flexible shock absorber used to secure the system to the machine frame, but excludes mounting provisions that are integral with the machine frame.
- **3.9** Simulated Ground Plane (SGP)—The flat surface on which a machine, after rolling over, is assumed to come to rest.
- 3.9.1 LATERAL SIMULATED GROUND PLANE (LSGP)—For a machine coming to rest on its side, the plane is determined as follows (see Figure 1):
 - a. Upper ROPS member to which the lateral load is applied.
 - b. Outermost point in the end view of the above member.
 - c. Vertical line through the above point.
 - d. Vertical plane parallel to machine longitudinal centerline through the above line.
 - e. Rotate plane described in (d), 15 degrees away from the DLV about the horizontal axis within the plane established in (d) passing through the point described in (b). This establishes the LSGP. LSGP is established on an unloaded ROPS and shall move with the member to which load is applied while maintaining its 15 degree angle with respect to the vertical.

This is a preview. Click here to purchase the full publication.