SAE The Engineering Resource For Advancing Mobility®

A Product of the
Cooperative Engineering Program

SAE J397 FEB86

Deflection Limiting Volume — ROPS/FOPS Laboratory Evaluation

SAE Recommended Practice
Reaffirmed February 1986

Submitted for Recognition as
an American National Standard

ISSN 0148-7191

RATIONALE:

This Recommended Practice is currently being revised by Subcommittee 12, Machine Test Procedures.

RELATIONSHIP OF SAE STANDARD TO ISO STANDARD:

Not applicable.

REFERENCE SECTION:

SAE J231, Minimum Performance Criteria for Falling Object Protective Structure (FOPS)

SAE J1040, Performance Criteria for Rollover Protective Structures (ROPS) for Construction, Earthmoving, Forestry, and Mining Machines

APPLICATION:

The purpose of this Recommended Practice is to establish limits on deflection permissible during laboratory evaluations of ROPS and FOPS as defined in J1040 and J231.

COMMITTEE COMPOSITION:

DEVELOPED BY SUBCOMMITTEE 12, MACHINE TEST PROCEDURES:

W. C. Jackson, Evans, Charles & Associates, Inc., Las Cruces, NM - Chairman
D. J. Pankow, Clark Equip. Co., Gwinner, ND - Vice Chairman
D. C. Ager, Deere & Co., Dubuque, IA
D. M. Anderson, J. I. Case Company, Terre Haute, IN
M. M. D'Jivre, Ontario Ministry of Labour, London, Ontario, Canada
J. L. Dahle, Woodward Associates, Inc., San Diego, CA
H. C. Davis, Merritt Cases, Inc., Redlands, CA
G. W. Douglas, Brownsburg, IN
A. L. Freedy, Caterpillar Tractor Co., Aurora, IL
W. O. Gipp, Racine, WI
D. W. Hadden, Lanham, MD
J. T. Janas, Clark Michigan Company, Benton Harbor, MI
M. L. Johnson, Caterpillar Tractor Co., Peoria, IL
R. A. Kluver, Palm Industries, Inc., Litchfield, MN
D. A. Lockie, Saf-T-Cab, Inc., Fresno, CA
D. J. Nelson, Weldco - Beales, Portland, OR
J. R. Prosek, Sr., Du Page Engrg. Services, Inc., Glen Ellyn, IL
G. C. Randall, Ford Motor Co., Troy, MI
W. L. Renken, WABCO C.M.E.G., Peoria, IL
K. W. Richter, Ingersoll-Rand Co., Shippensburg, PA
A. P. Schutte, Dresser Industries, Inc., Libertyville, IL
L. E. Spencer, J. I. Case Co., Burlington, IA
G. A. Stangl, Charles Machine Works, Inc., Perry, OK
S. A. Swan, Bureau of Mines, Minneapolis, MN
J. W. Zurek, Dresser Industries, Inc., Libertyville, IL

SPONSORED BY THE SAE OFF-ROAD MACHINERY TECHNICAL COMMITTEE:

L. E. Miller, Davenport, IA - Chairman
W. L. Black, Clark Michigan Co., Buchanan, MI - Vice Chairman
G. R. Bailey, Bailey Marketing Inc., Crystal Lake, IL
W. F. Busbey, Caterpillar Tractor Co., Decatur, IL
J. B. Codlin, Springfield, IL
L. W. G. Collins, Deere & Co., Dubuque, IA
W. L. Daniels, Sr., B. F. Goodrich Co., Bloomington, IN
D. W. Driscol, Cummins Eng. Co., Inc., Columbus, IN
B. Gill, American Honda Motor Co., Inc., Gardena, CA
T. O. Goodney, Platteville, WI
F. A. Green, GMC, La Grange, IL
J. H. Hyler, Peoria, IL
R. B. Janvrin, Fluid Controls Inc., Easley, SC
K. A. Julian, Julian Elec. Service & Engrg. Inc., Westmont, IL
P. L. Kelsey, Marathon LeTourneau Co., Longview, TX
L. B. Kloepfer, Budd Canada Inc., Winnipeg, Manitoba, Canada
A. D. Lewis, Sparta, NJ
M. E. Moore, Caterpillar Tractor Co., Peoria, IL
R. J. Nelissen, Deere & Co., Dubuque, IA
D. Oldenburg, Caterpillar Tractor Co., Aurora, IL
J. E. Page, Harnischfeger Corporation, Escanaba, MI
J. T. Parrett, St. Joseph, MI
S. P. Pertzsch, Harley-Davidson Motor Co., Milwaukee, WI
G. C. Randall, Ford Motor Co., Troy, MI
P. D. Redenbarger, Flotec Inc., Indianapolis, IN
G. H. Ritterbusch, Caterpillar Tractor Co., Peoria, IL
J. C. Skroski, J. I. Case Co., Racine, WI
G. A. Stangl, Charles Machine Works, Inc., Perry, OK
D. R. Thomas, Dresser Industries Inc., Peoria, IL

SAE The Engineering Resource For Advancing Mobility®

400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

OFF-HIGHWAY MACHINERY PRACTICE

Submitted for recognition as an American National Standard

SAE J397

Issued July 1969
Revised Feb. 1986

Reaffirms J397b

DEFLECTION LIMITING VOLUME--ROPS/FOPS LABORATORY EVALUATION

1. PURPOSE: To establish limits on deflection permissible during laboratory evaluations of ROPS and FOPS as defined in J1040 and J231.

2. SCOPE: The Deflection Limiting Volume (DLV) is shown in Fig. 1. It is an orthogonal approximation of a large operator in the normal seated position.

3. ACCURACY: All lengths and positions in this Recommended Practice shall be within ±0.5 in (13 mm) of that specified.

4. LOCATION:

4.1 The transport seat shall be adjusted to the rearmost position first and then to the lowest position possible in the rearmost position. The position of seats with suspension systems shall include that static deflection of the suspension system which a seated operator of the above description would impose on the suspension system (all mechanical, hydraulic, or gas elements to be at the manufacturer's recommended settings for this size operator).

4.2 Any seat having rotational adjustment about a transverse or vertical axis shall be at the middle position possible when determining the locating point (LP).

4.3 A locating point (LP) and locating axis (LA) shall be determined as follows:

4.3.1 The LP shall be in the middle vertical plane which is parallel to the longitudinal axis of the seat.

4.3.2 The LP shall be at the intersection of the following two lines in this plane (Fig. 2):

HH - The horizontal line which is tangent to the highest point of the seat cushion in this plane.

VV - The vertical line which is tangent to the most forward point of the seat back in this plane.

4.3.3 The LA shall be that line which is perpendicular to the middle, vertical longitudinal plane of the seat and intersects that plane at the above defined LP.

4.4 The DLV (Fig. 1) shall be positioned so its LA coincides with the LA defined in paragraph 4.3. The DLV shall be centered transversely in the seat, and the principal axes of the DLV shall be parallel to lines HH and VV of Fig. 2. (This positioning takes nominal compression of the seat cushion and back into account.)

4.5 The location of the DLV shall remain coincidental with the LA even though that line may move during any or all of the laboratory loadings.

5. APPLICATION:

5.1 Intrusion of non-ROPS elements is not a violation of the DLV.

5.2 FOPS Loading: The DLV shall not be entered by any FOPS or ROPS structural member.

5.3 Side and Vertical Loading:

5.3.1 The DLV shall not be entered by any ROPS and FOPS structural member.

5.3.2 Static loading shall not cause the load side planes of the DLV (Fig. 3) to extend beyond or intersect the simulated ground plane (SGP) defined as follows:

(a) Upper member to which the 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 the vehicle's longitudinal centerline through the above line.

(e) Rotate plane described in item (d), 15 deg away from the DLV about a horizontal axis perpendicular to the point described in item (b). This establishes the SGP.

(f) SGP is established on an unloaded ROPS and shall move with member to which load is applied.

5.4 It is not required that the included volume of a four, or more, vertical member ROPS-FOPS need entirely envelop the positioned DLV nor intended that a one or two frame be excluded as either a FOPS or ROPS.

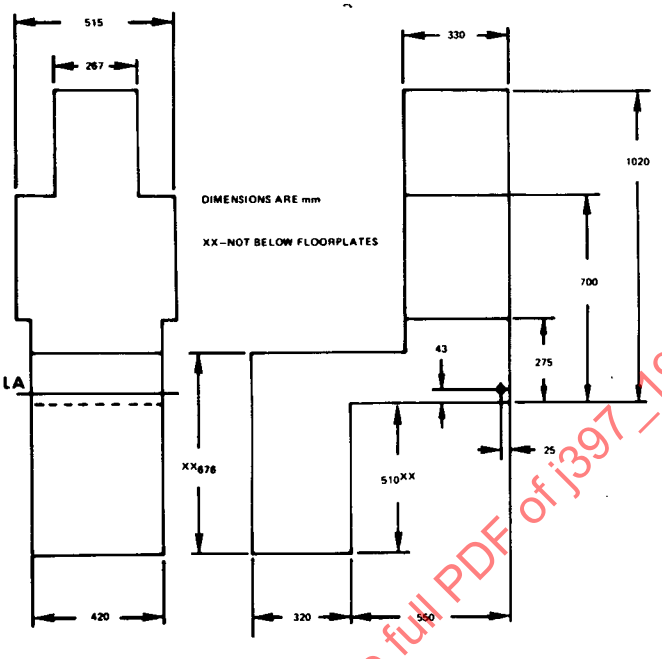

FIG. 1

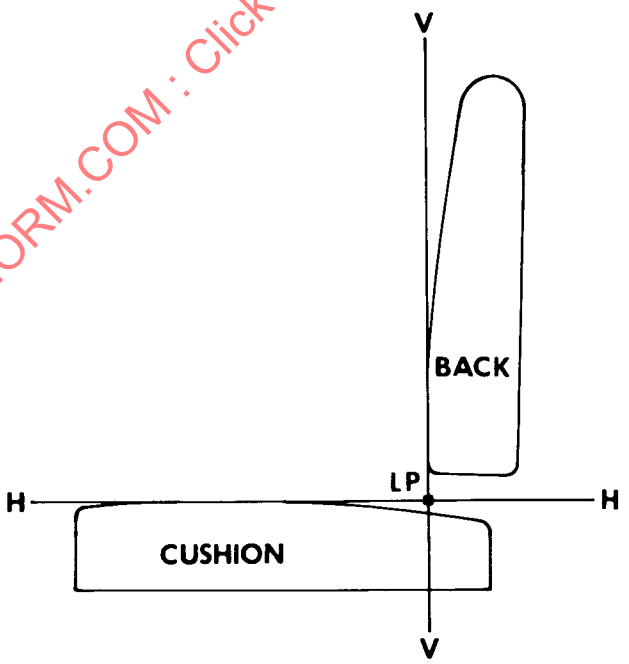

FIG. 2