INTERNATIONAL STANDARD 3164

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Earth-moving machinery — Laboratory evaluations of roll-over and falling-object protective structures — Specifications for the deflection-limiting volume

Engins de terrassement — Études en laboratoire des structures de protection au retournement et contre les chutes d'objets — Spécifications pour le volume limite de déformation

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3164 was drawn up by Technical Committee ISO/TC 127, *Earth-moving machinery*.

This second edition was submitted directly to the ISO Council, in accordance with clause 6.12.1 of the Directives for the technical work of ISO. It cancels and replaces the first edition (ISO 3164-1974), which had been approved by the Member Bodies of the following countries :

Austria	Germany	Thailand
Brazil	India	Turkey
Bulgaria	Japan	United Kingdom
Czechoslovakia	Poland	U.S.A.
Finland	Romania	U.S.S.R.
France	South Africa, Rep. of	

The Member Bodies of the following countries had expressed disapproval of the document on technical grounds :

Australia
Italy
Sweden

Printed in Switzerland

Earth-moving machinery — Laboratory evaluations of roll-over and falling-object protective structures — Specifications for the deflection-limiting volume

1 SCOPE

This International Standard gives specifications for the deflection-limiting volume to be used in laboratory evaluations of roll-over and falling-object protective structures. It relates to ISO 3471, dealing with roll-over protective structures, and to ISO 3449, dealing with falling-object protective structures. The dimensioning of the deflection-limiting volume takes into account the large operator (see ISO 3411).

2 FIELD OF APPLICATION

This International Standard shall be used when performing laboratory evaluations of roll-over protective structures set forth in ISO 3471 and falling-object protective structures set forth in ISO 3449.

3 REFERENCES

ISO 3411, *Earth-moving machinery – Human physical dimensions of operators and minimum operator space envelope.*

ISO 3449, *Earth-moving machinery – Falling-object protective structures – Laboratory tests and performance requirements.*

ISO 3471, *Earth-moving machinery – Roll-over protective structures – Laboratory tests and performance requirements.*

4 DEFINITIONS AND ABBREVIATIONS

For the purpose of this International Standard, the following definitions apply :

4.1 roll-over protective structure (ROPS) : A system of structural members, arranged on a vehicle in such a way as to reduce the probability of the vehicle crushing its operator in the event of its accidentally overturning.

4.2 falling-object protective structure (FOPS) : A system of structural members arranged on a machine in such a way as to provide operators with reasonable protection from falling objects (for example trees, rocks).

4.3 deflection-limiting volume (DLV) : A volume that serves to set limits and deflections permissible when performing laboratory evaluations of ROPS and FOPS. The volume is based on the seated dimensions of the ninety-fifth percentile operator, i.e. height 1,92 m (75.6 in) and mass 98 kg (215 lb).

4.4 locating point (LP) (see figure 2) : A point in the middle vertical plane that is parallel to the longitudinal axis of the seat and at the intersection of the following two lines in this plane :

- HH : The horizontal line that is tangential to the highest point of the seat cushion in this plane;
- VV : The vertical line that is tangential to the most forward point of the seat back in this plane.

This point is defined to establish a practical definitive location for the DLV (4.3) regardless of morphological characteristics or mass of operator.

4.5 locating axis (LA) (see figure 1) : That line which is perpendicular to the middle vertical longitudinal plane of the seat and intersects that plane at the locating point (LP) defined in 4.4.

5 APPARATUS

A volume as shown in figure 1. Accuracy of the lengths : ± 13 mm (0.5 in).

6 POSITIONING OF DEFLECTION-LIMITING VOLUME (DLV)

6.1 The seat shall be adjusted to the rearmost position first and then to the lowest position.

The position of seats with suspension systems shall include that static deflection of the suspension system which a seated operator as defined in 4.3 would impose on the suspension system (all mechanical, hydraulic, or gas elements to be at the manufacturer's recommended settings for this size of operator).

6.2 Any seat having rotational adjustment for work operations about a transverse or vertical axis shall be at the middle or central position when determining the LP.

6.3 A locating point (LP) and a locating axis (LA) shall be located as follows :

a) the LP shall be in the middle vertical plane that is parallel to the longitudinal axis of the seat;

b) the LP shall be at the intersection of the two lines in this plane (see figure 2 and 4.4);

c) the LA shall be that line which is perpendicular to the middle vertical longitudinal plane of the seat and intersects that plane at the LP defined in 4.4 and 6.3 a) and 6.3 b).

6.4 The DLV, figure 1, shall be positioned so that its LA coincides with the LA defined in 6.3 c). The DLV shall be centred transversely in the seat and the principal axis of the DLV shall be parallel to lines HH and VV of figure 2. This positioning takes into account the nominal compression of 50 mm (2 in) of the seat cushion and back. Accuracy shall be ± 13 mm (0.5 in).

6.5 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.

7 APPLICATION

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

7.2 FOPS loading

The DLV shall not be entered by any FOPS supporting member.

7.3 ROPS loading (side and vertical loading)

7.3.1 The DLV shall not be entered by any ROPS or FOPS member.

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

1) upper member to which load is applied;

2) outermost point in end view of above member;

3) vertical line through above point;

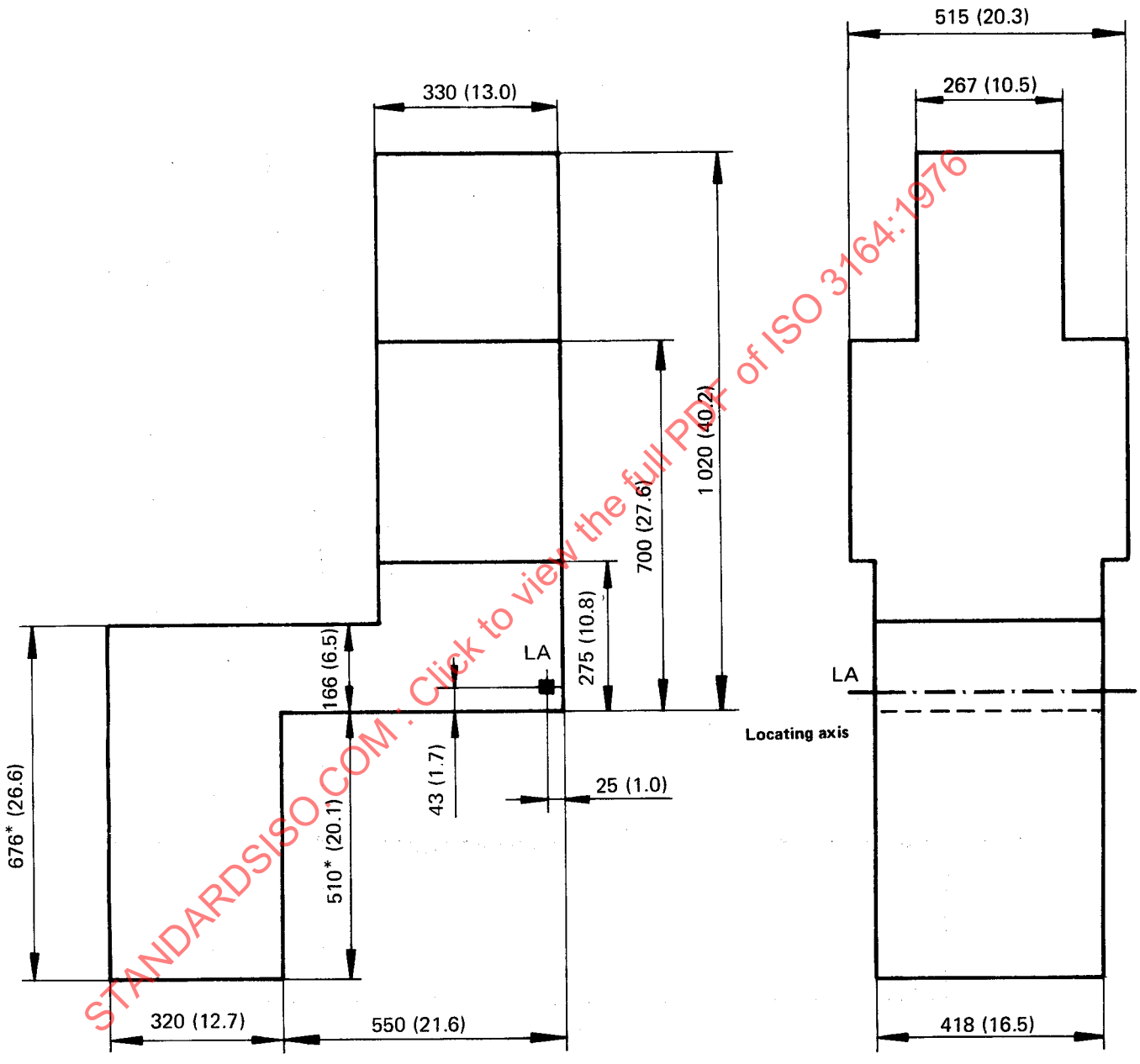
4) vertical plane parallel to vehicle's longitudinal centre line through the above line;

5) rotate plane described in item 4), 15° away from the DLV about an axis perpendicular to the point described in item 2); this establishes the SGP;

6) the SGP shall be established on an unloaded ROPS and shall move with the member to which the load is applied.

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

Dimensions in millimetres
(Inch values in parentheses)



* But not below
the floor plates.

FIGURE 1 — **Deflection-limiting volume (DLV)**

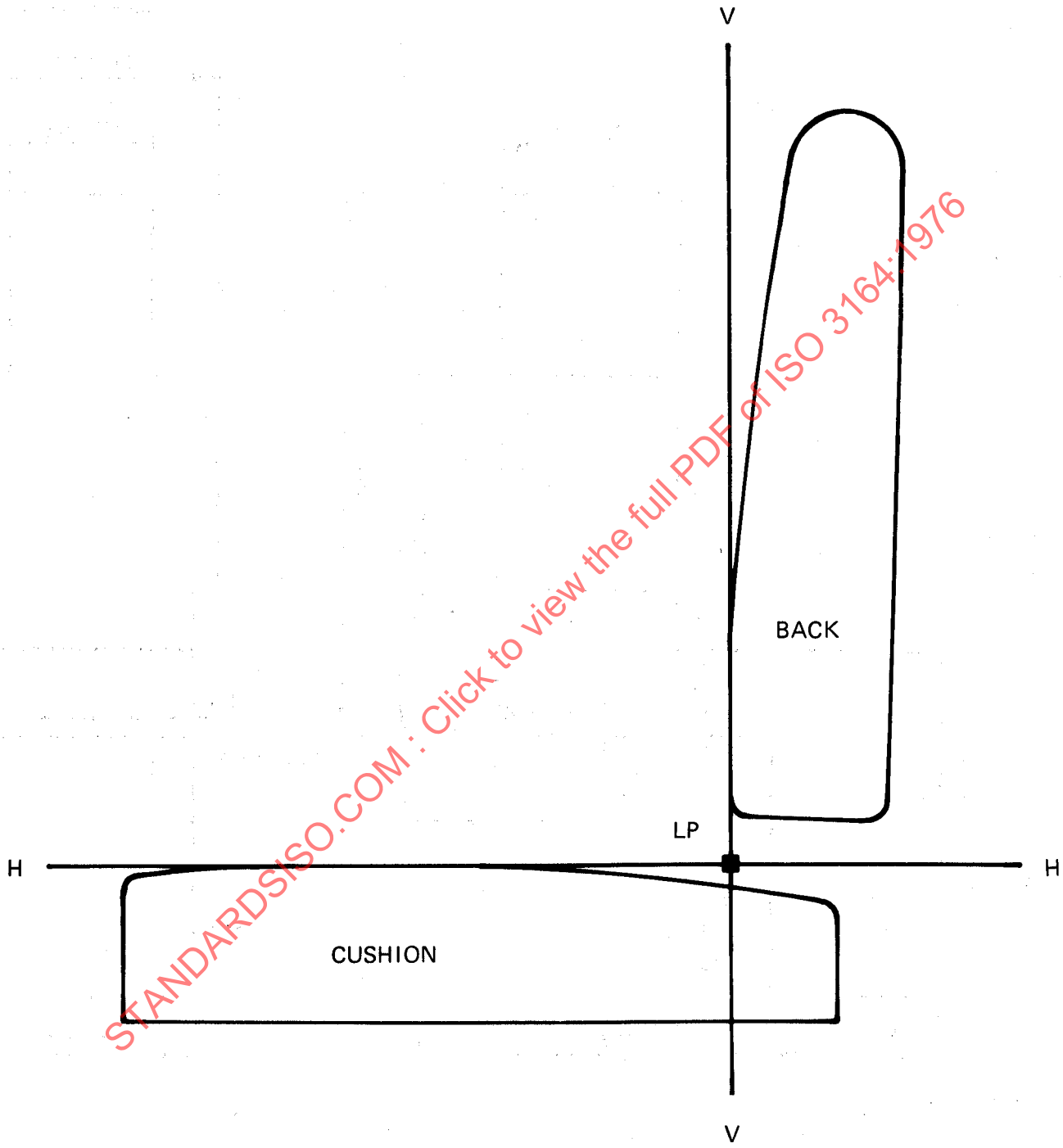


FIGURE 2 – **Deflection-limiting volume locating point (LP)**