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Earth-moving machinery — Loader and front loading excavator buckets — Volumetric ratings

AS ISO 7546:2021

This Australian Standard ® was prepared by ME-063, Earthmoving Equipment. It was approved on behalf of the Council of Standards Australia on 24 March 2021.

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The following are represented on Committee ME-063:
   Australian Industry Group
   Better Regulation Division – SafeWork NSW
   Construction and Mining Equipment Industry Group
   Department of Natural Resources, Mines and Energy, Qld
   Department of Regional NSW
   Engineers Australia
   Institute of Instrumentation, Control & Automation Australia
   Minerals Council of Australia
   Mining Electrical and Mining Mechanical Engineering Society
   University of Queensland

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Earth-moving machinery — Loader and front loading excavator buckets — Volumetric ratings

First published as AS ISO 7546:2021.

Preface

This Standard was prepared by the Standards Australia Committee ME-063, Earthmoving Equipment.

The objective of this document is to specify a method for approximating the volume of typical materials contained in the bucket of front end loaders and excavators with front loading buckets. The volume ratings are based on the inside dimensions of the bucket and representative volumes on top of the bucket.

The method employs the technique of dividing the complex shape of the material in the bucket into simple geometric forms to allow volume calculations of different bucket configurations.

The rating method is intended to provide a consistent means of comparing bucket capacities. It is not intended to define actual capacities that might be observed in any specific application.

This document is identical with, and has been reproduced from, ISO 7546:1983, *Earth-moving machinery — Loader and front loading excavator buckets — Volumetric ratings*.

As this document has been reproduced from an International Standard, the following applies:

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The terms "normative" and "informative" are used in Standards to define the application of the appendices or annexes to which they apply. A "normative" appendix or annex is an integral part of a Standard, whereas an "informative" appendix or annex is only for information and guidance.

Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (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 authorized 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 7546 was developed by Technical Committee ISO/TC 127, *Earth moving machinery*, and was circulated to the member bodies in December 1981.

It has been approved by the member bodies of the following countries:

Australia	France	Spain
Austria	Germany, F.R.	Sweden
Belgium	Italy	United Kingdom
Brazil	Mexico	USA
Bulgaria	Poland	USSR
Czechoslovakia	Romania	
Egypt, Arab Rep. of	South Africa, Rep. of	

The member body of the following country expressed disapproval of the document on technical grounds:

Japan

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Earth-moving machinery — Loader and front loading excavator buckets — Volumetric ratings

1   Scope and field of application

1.1   This International Standard specifies a procedure for approximating the volume of typical materials contained in the bucket of front end loaders and excavators with front loading bucket. The volume ratings are based on the inside dimensions of the bucket and representative volumes on top of the bucket.

1.2   The method employs the technique of dividing the complex shape of the material in the bucket into simple geometric forms to allow volume calculations of different bucket configurations.

1.3   The rating method is intended to provide a consistent means of comparing bucket capacities. It is not intended to define actual capacities that might be observed in any specific application.

2   References

ISO 7131, *Earth-moving machinery — Loaders — Terminology.*[1]

ISO 7135, *Earth-moving machinery — Excavators — Terminology.*[1]
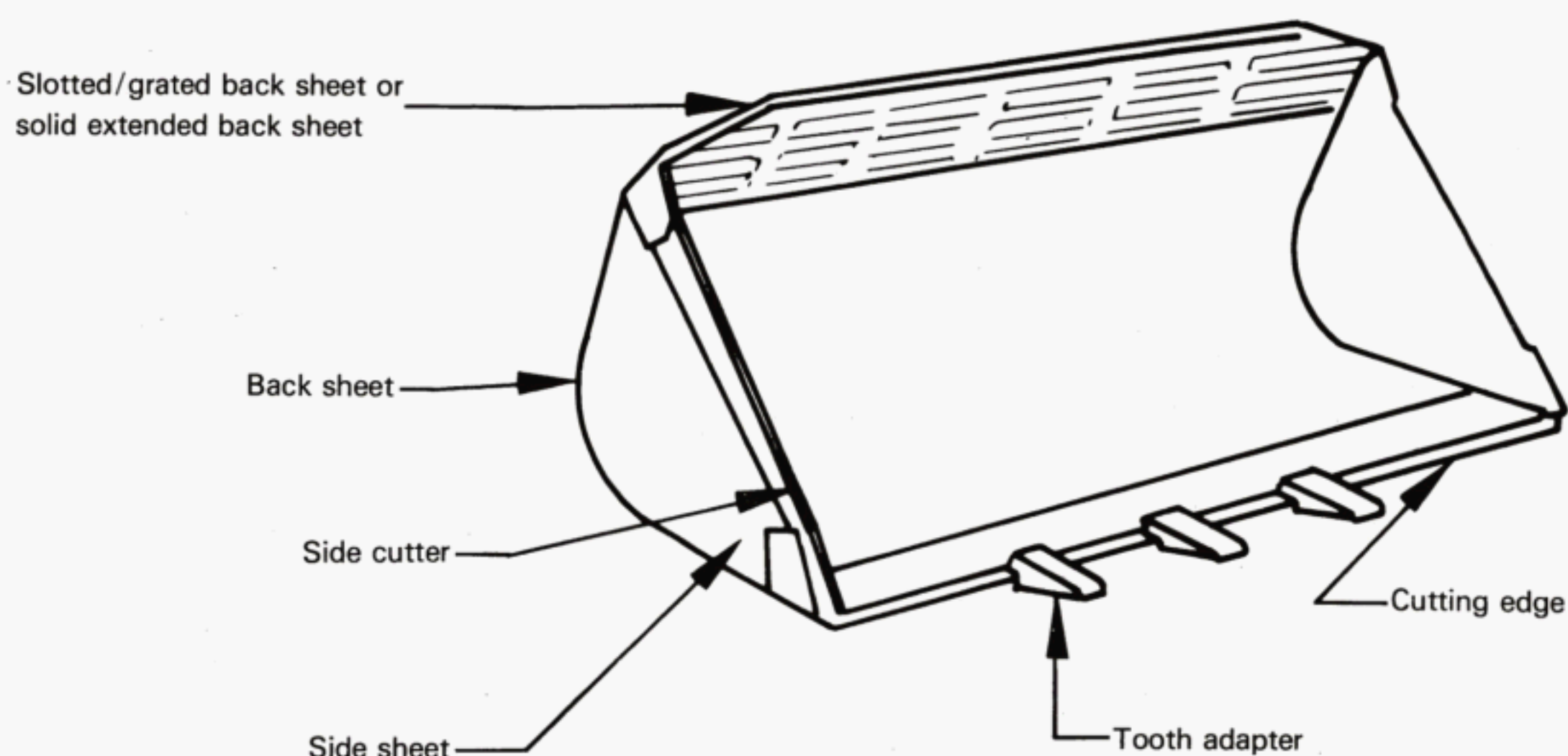
Figure 1 — Bucket

3   Restrictions and limitations

3.1   The effect on volumes of local discontinuities such as bucket teeth, tooth adapters, and gussets shall be ignored.

3.2   Grated or slotted back sheets attached to the bucket to protect the machine or operator from material that might spill over the back of the bucket shall not be included in the capacity calculations.

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[1]   At present at the Stage of draft.

Solid extended back sheets providing the same function may be included in the capacity calculations only if they are an integral part of the bucket.

3.3   Only buckets with an *X/Y* ratio greater than 12 shall be considered by the rating method(s). (See figure 2.)
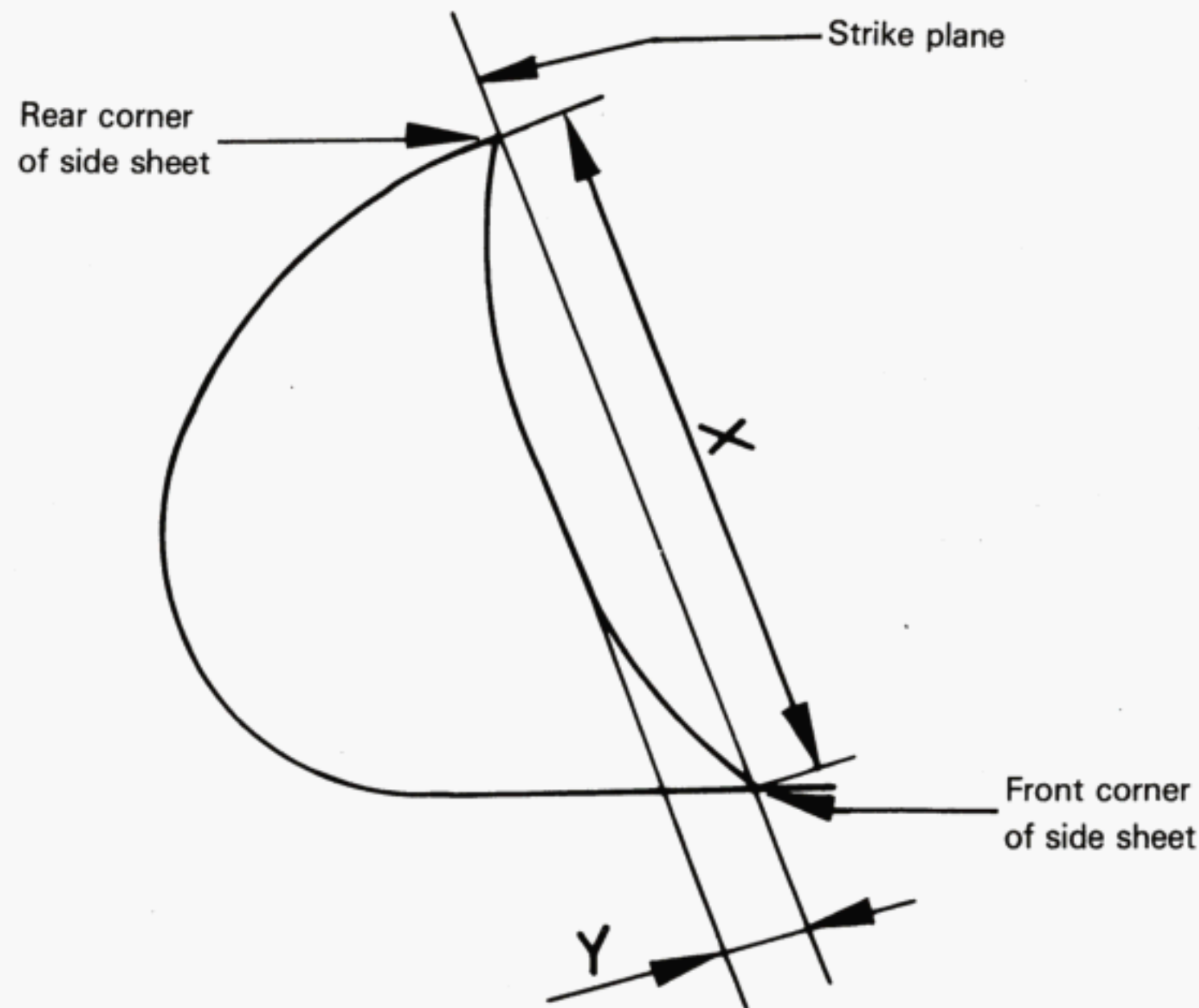
Figure 2 — *X* and *Y* dimensions for irregular side sheet

4   Definitions and symbols

4.1   bucket component

See figure 1 and ISO 7131 and 7135.

4.2
strike plane
Horizontal plane across the width of the bucket from the cutting edge to the back sheet.
(See clause 5 for different bucket shapes.)

4.3
struck volume
V_S
Volume which lies beneath the strike plane.

4.4
top volume
V_T
Volume of material, a 2:1 slope, which lies on top of the strike plane.

4.5
rated bucket volume
V_R
Rated bucket capacity.
This capacity is calculated by adding the struck and top volumes : $V_R = V_S + V_T$.

5   Volumetric ratings

5.1   Basic bucket

The back sheet does not extend beyond a transverse line connecting the rear corners of the side sheets and the cutting edge does not extend beyond a transverse line connecting the front corners of the side sheets.

5.1.1   The strike plane passes through a line along the top of the back sheet at the rear and a line along the top of the cutting edge at the front as shown in figure 3.

5.1.2   The volumetric capacity is calculated as shown in figure 3.
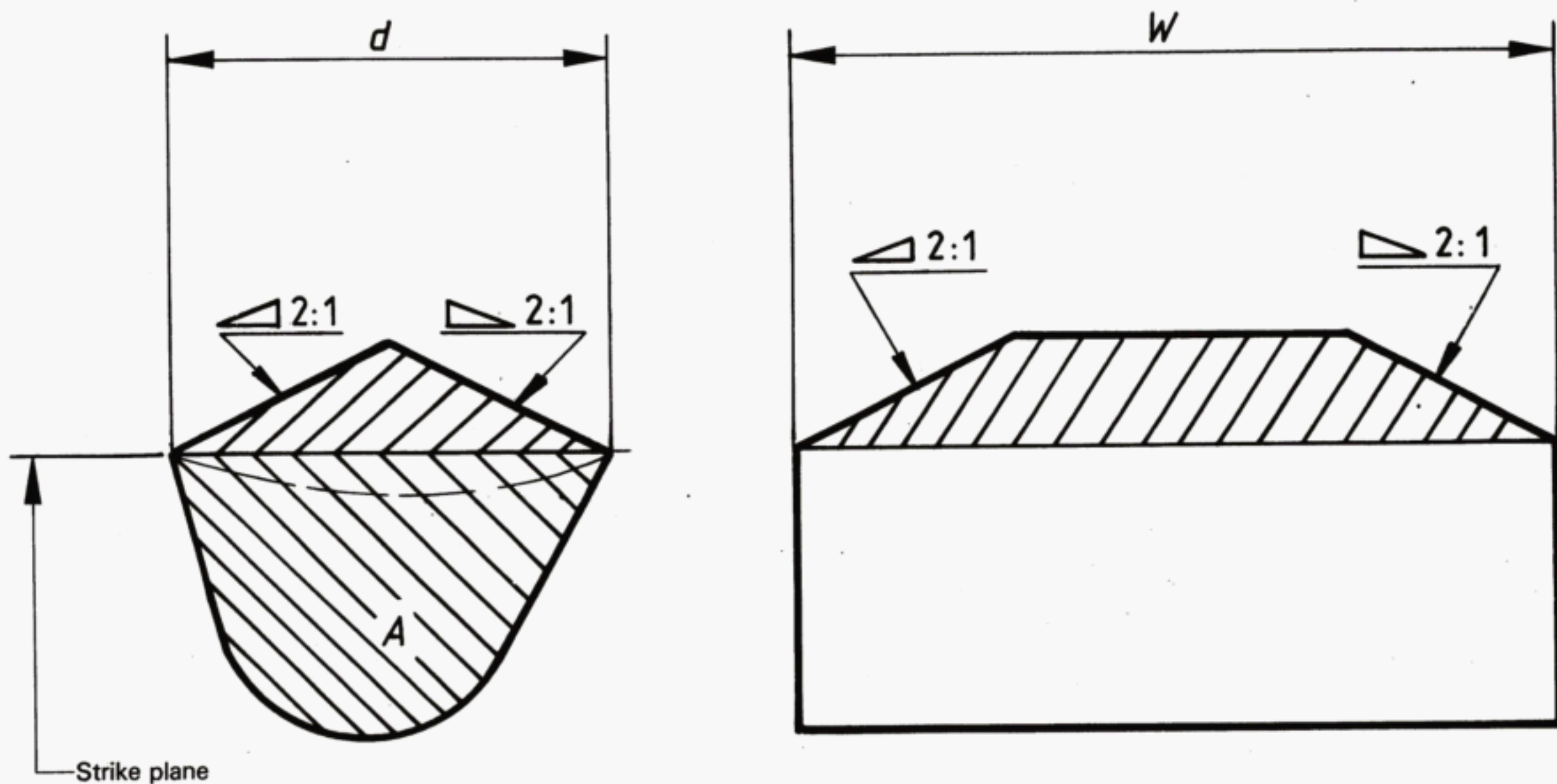
Struck volume : $V_S = AW$

A is the interior cross section area

W is the interior width of the bucket

Top volume : $V_T = \dfrac{d^2W}{8} - \dfrac{d^3}{24}$

d is at transverse middle of bucket

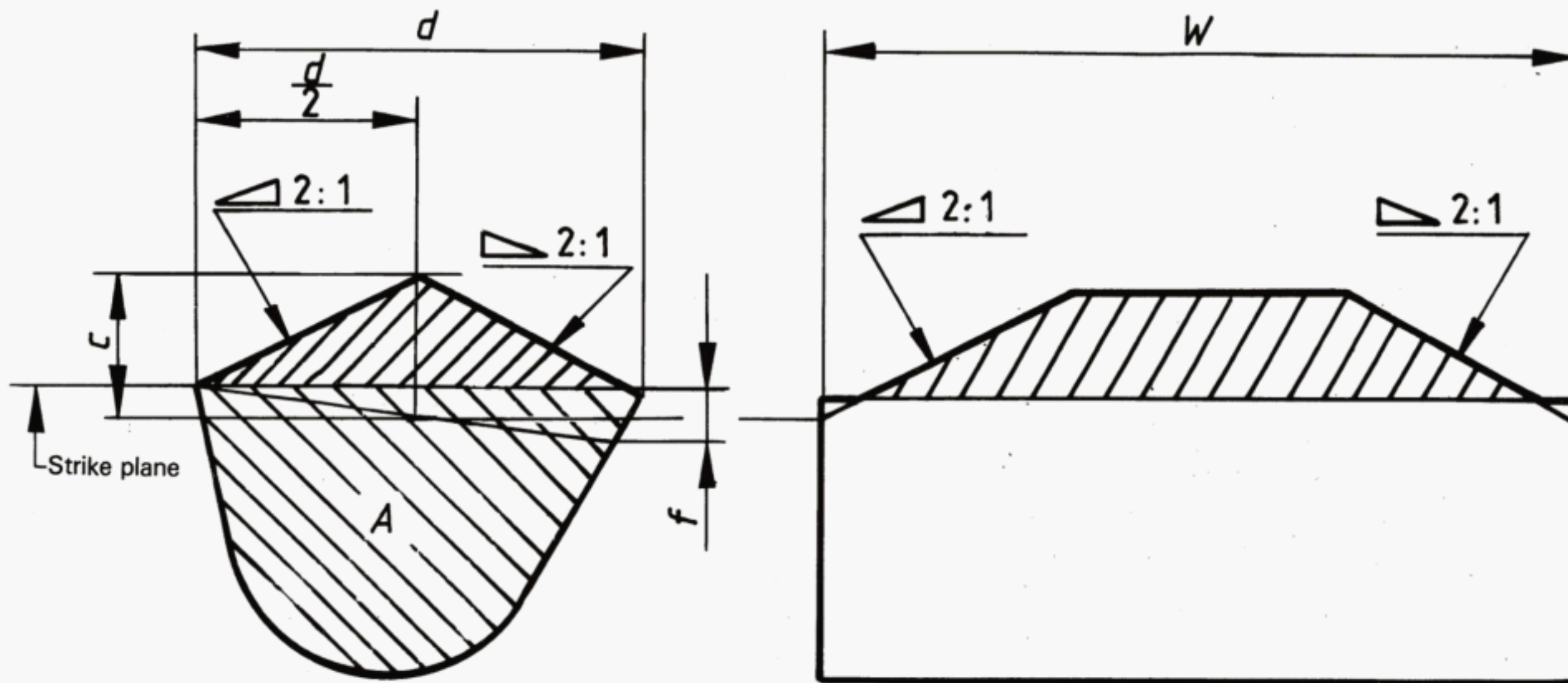The rated capacity is expressed as follows : $V_R = V_S + V_T$

Figure 3 — Basic bucket

5.2   Extended straight cutting edge

The cutting edge is straight in the transverse direction and extends beyond a transverse line connecting the front corners of the side sheets and the back sheet does not extend beyond a transverse line connecting the rear corners of the side sheets.

5.2.1   The strike plane passes through a line along the cutting edge at the front and a line along the top of the back sheet at the rear as shown in figure 4.

5.2.2 The volumetric capacity is calculated as shown in figure 4.

Struck volume : $V_S = AW - \dfrac{2f^2 d}{3}$

Top volume : $V_T = \dfrac{d^2 W}{8} - \dfrac{d^2}{6}(f + c)$

The rated capacity is expressed as follows : $V_R = V_S + V_T$
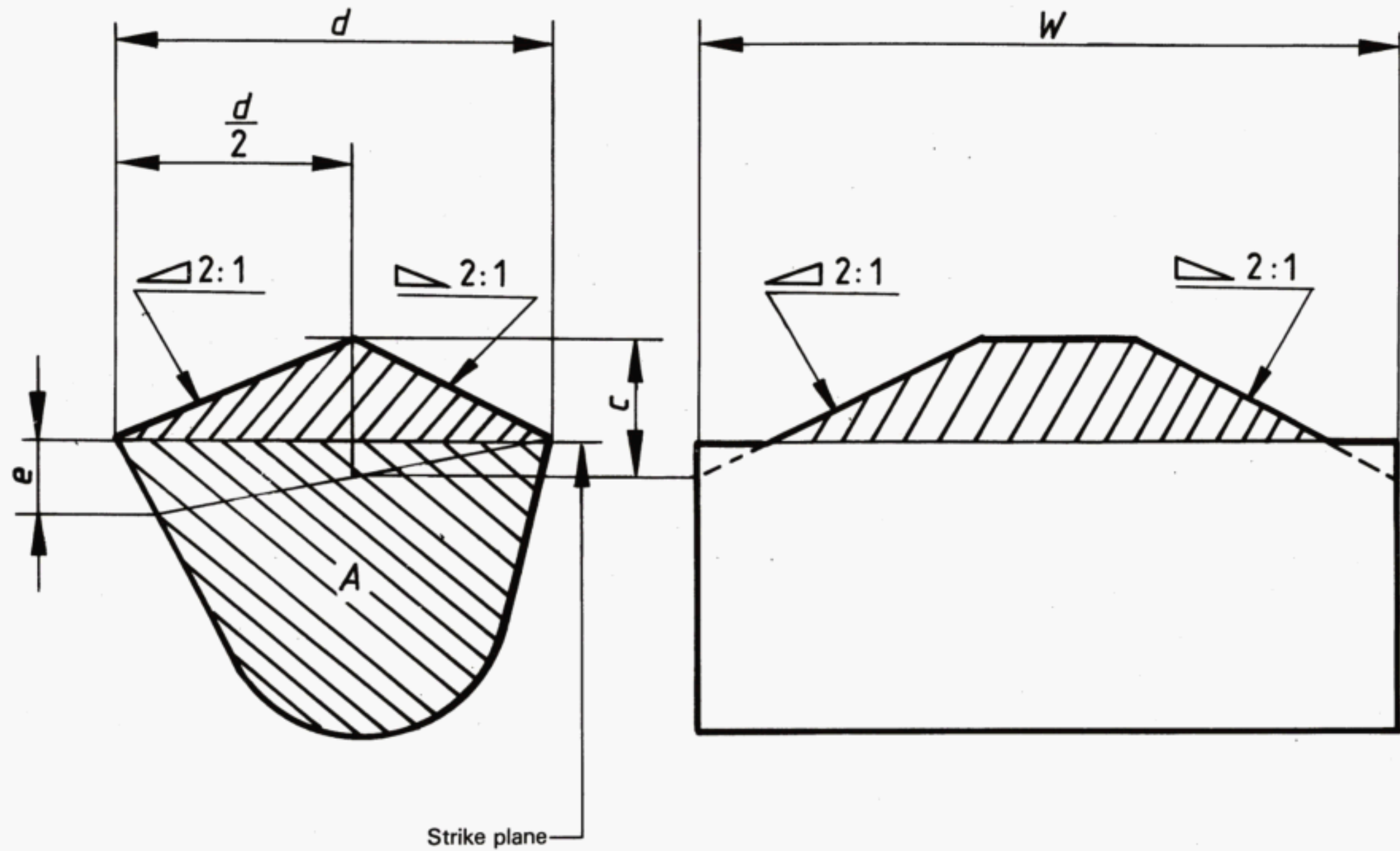
Figure 4 — Extended straight cutting edge

5.3 Extended back sheet

The back sheet extends beyond a transverse line connecting the rear corners of the side sheets and the cutting edge does not extend beyond the transverse line connecting the front corners of the side sheets.

5.3.1 The strike plane passes through the line along the top of the extended back sheet at the rear and a line along the cutting edge at the front as shown in figure 5.

5.3.2 The volumetric capacity is calculated as shown in figure 5.

Struck volume : $V_S = AW - \dfrac{2e^2d}{3}$

Top volume : $V_T = \dfrac{d^2W}{8} - \dfrac{d^2}{6}(e + c)$

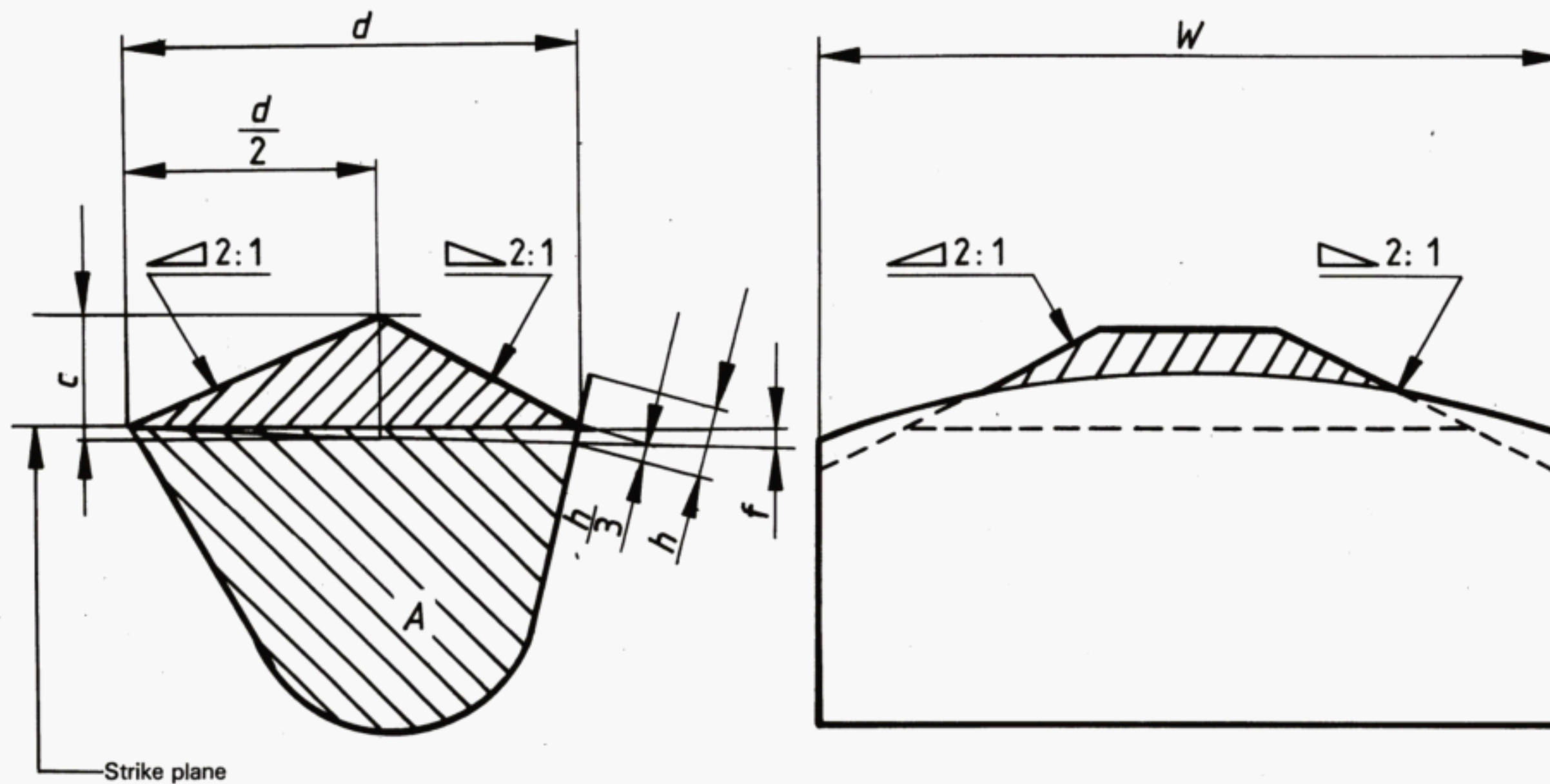The rated capacity is expressed as follows : $V_R = V_S + V_T$

Figure 5 — Extended back sheet

5.4   Irregular cutting edge

The cutting edge extends beyond a transverse line connecting the front corners of the side sheets and is not straight in the transverse direction. The back sheet does not extend beyond the transverse line connecting the rear corners of the side sheets.

5.4.1 The strike plane passes through an imaginary transverse line at one third the distance of the protruding cutting edge at the front and a line along the top of the back sheet at the rear as shown in figure 6.

5.4.2   The volumetric capacity is calculated as shown in figure 6.

Struck volume : $V_S = AW - \dfrac{2f^2d}{3}$

Top volume : $V_T = \dfrac{d^2W}{8} - \dfrac{d^2}{6}(f + c)$

The rated capacity is expressed as follows : $V_R = V_S + V_T$

Figure 6 — Irregular cutting edge

5.5   Extended cutting edge and extended back sheet

The cutting edge (straight or irregular) extends beyond a line joining the front corners of the side sheets and the back sheet extends beyond a line connecting the rear corners of the side sheets.

5.5.1   The strike plane rests on the top edge of the back sheet at the rear and on the top edge of a straight cutting edge or the $h/3$ point (see 5.4.1) of an irregular cutting edge at the front as shown in figure 7.

5.5.2 The volumetric capacity is calculated as shown in figure 7.
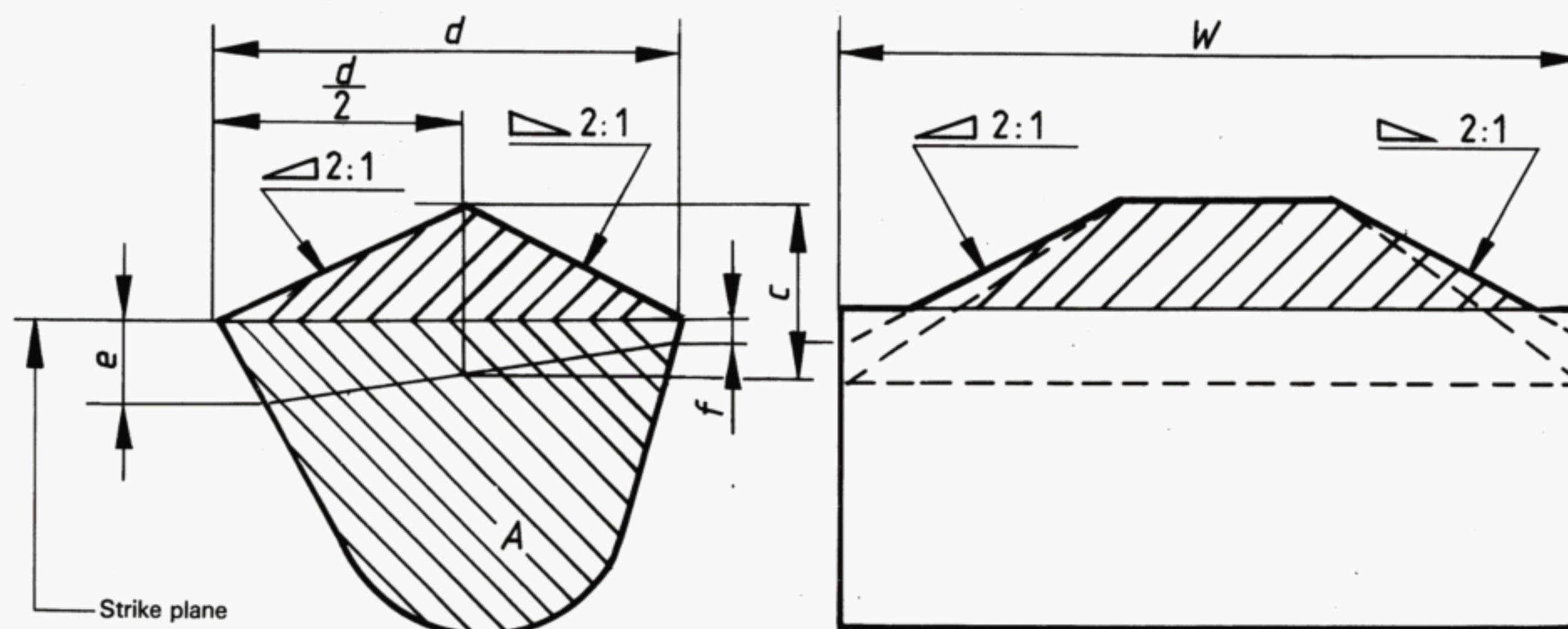
Struck volume : $V_S = AW - \dfrac{2(e^2 + ef + f^2)d}{3}$

Top volume : $V_T = \dfrac{d^2 W}{8} - \dfrac{d^2}{6}(e + f + c)$

The rated capacity is expressed as follows : $V_R = V_S + V_T$

Figure 7 — Extended cutting edge and extended back sheet

6   Expression of volumetric ratings

6.1 The volumetric rating of a bucket is the summation of the struck volume plus the top volume. It shall be expressed in cubic metres and published as the rated ISO bucket capacity as shown in the table.

6.2 If the determined capacity, as shown in the table, falls below a given rating interval by more than 2 %, the next lower interval shall be the rating.

Table

Range of rated capacity	Increments
Up to and including 0,6	0,02
Over 0,6 up to 1,5	0,05
Over 1,5 up to 2,5	0,1
Over 2,5 up to 5,0	0,2
Over 5,0 up to 10,0	0,5
Over 10,0	1,0

NOTES

Standards Australia

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