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Superseding J296 JUN93

## Excavator, Mini-excavator, and Backhoe Hoe Bucket Volumetric Rating

This document is technically equivalent to ISO 7451-1983(E).

1. **Scope**—This SAE Standard provides a uniform method for determining rated and struck capacity for buckets used on excavators, mini-excavators, and backhoes as defined in SAE J1057 and equipped with hoe attachment. Calculations are based on the inside physical dimensions of the bucket only, without use of optional side cutters, spill guards, teeth, or other accessories and without regard to bucket action provided by any specific machine. This document does not cover shovel, clam, or dragline buckets described in SAE J67 or loaders buckets described in SAE J742.
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 J67 NOV84—Shovel Dipper, Clam Bucket, and Dragline Bucket Rating  
SAE J742 FEB85—Capacity Rating—Loader Bucket
    - 2.1.2 **ISO PUBLICATION**—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ISO 7451-1983(E)—Earth-moving machinery—Hydraulic excavators—Hoe type buckets—Volumetric ratings
  - 2.2 **Related Publications**—The following publications are provided for information purposes only and are not a required part of this document.
    - 2.2.1 **SAE PUBLICATIONS**—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J49 APR80—Specification Definitions—Hydraulic Backhoes  
SAE J1057 JUN81—Identification Terminology of Earthmoving Machines  
SAE J1116 JUN86—Categories of Off-Road Self-Propelled Work Machines  
SAE J1193 NOV84—Nomenclature and Dimensions for Hydraulic Excavators

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### 3. Definitions

3.1 **Bucket Components**—See Figure 1 for component nomenclature.

3.2 **Bucket Opening Height “D”**—The distance from the cutting edge to the uppermost edge of the back sheet (see Figures 2A and 2B).

#### 3.3 Strike Plane

3.3.1 With a straight cutting edge, the strike plane is a plane containing two parallel lines formed by the bucket cutting edge and the uppermost edge of the back sheets (see Figure 2A).

3.3.2 With an irregular-shaped cutting edge, the strike plane is a plane containing two parallel lines: one through the centroid of the bucket cutting edge shape and the other formed by the uppermost edge of the back sheet (see Figure 3).

3.4 **Side Plate Variance “C”**—The distance from the strike plane to the furthestmost point of the side sheet leading edge (see Figures 2A and 2B). Side plate variance above the strike plane shall not be used to increase bucket volume calculations.

3.5 **Strike Surface**—The surface defined by the cutting edge, uppermost edge of the back sheet, and the side sheet leading edges (see Figure 2B).

#### 3.6 Strike Volume “V<sub>s</sub>”

3.6.1 When C is below the strike plane and less than or equal to D/12, V<sub>s</sub> is the volume bounded by the strike plane, side sheets, bottom sheet, and back sheet (see Figure 2A).

3.6.2 When C is below the strike plane and greater than D/12, V<sub>s</sub> is the volume bounded by the strike surface, side sheets, bottom sheet, and back sheet (see Figure 2B).

3.7 **Heaped Volume “V<sub>E</sub>”**—The volume of material heaped on the top surface of the struck volume at a 1:1 angle of repose (see Figures 4A and 4B). This does not imply the hoe must carry the bucket oriented in this attitude, or that all material will naturally have a 1:1 angle of repose.

3.8 **Rated Capacity “V<sub>R</sub>”**—Rated capacity “V<sub>R</sub>” is the sum of the struck volume and the heaped volume.

$$V_R = V_S + V_E \quad (\text{Eq. 1})$$

3.9 **Width**—When bucket width is specified, both a bucket width and cutting width should be stated.

3.9.1 **Bucket Width “W<sub>B</sub>”** is measured over the sides of the bucket at the bucket cutting edge without corner teeth or side cutters attached (see Figure 5).

3.9.2 **Cutting Width “W<sub>C</sub>”** is the maximum dimension measured over the teeth or side cutters (see Figure 5).

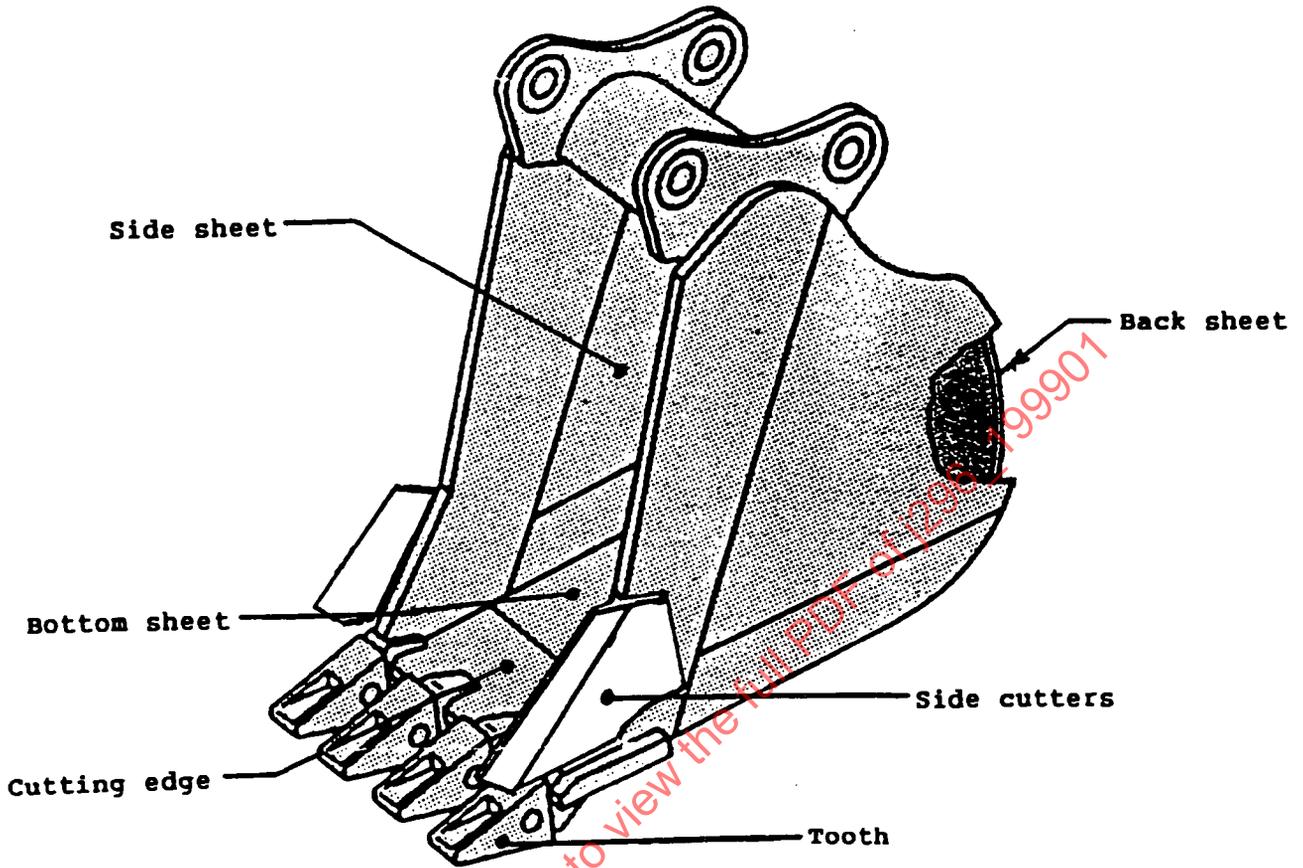


FIGURE 1—BUCKET—HOE TYPE

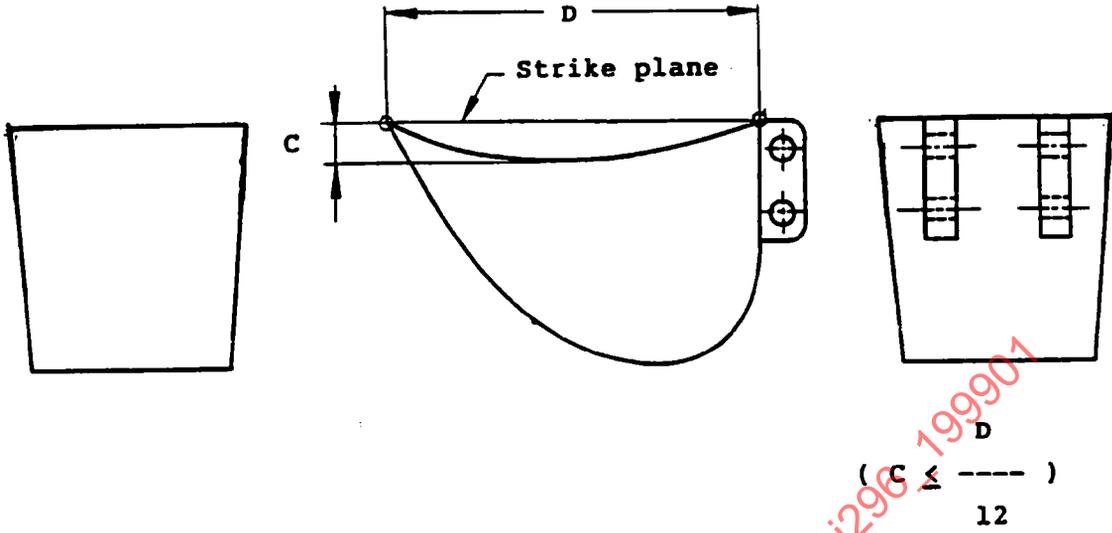


FIGURE 2A—BOUNDARIES OF STRUCK VOLUME

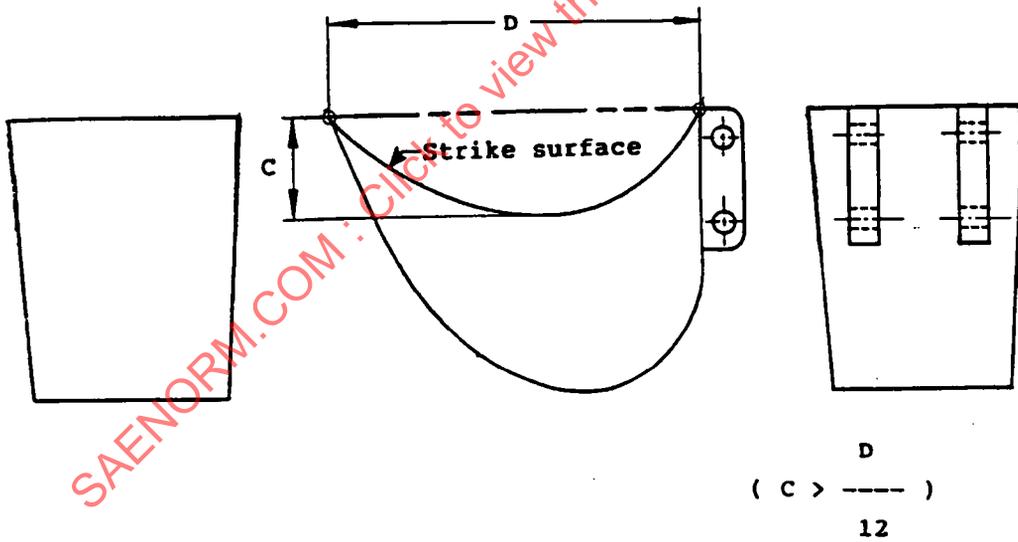


FIGURE 2B—BOUNDARIES OF STRUCK VOLUME

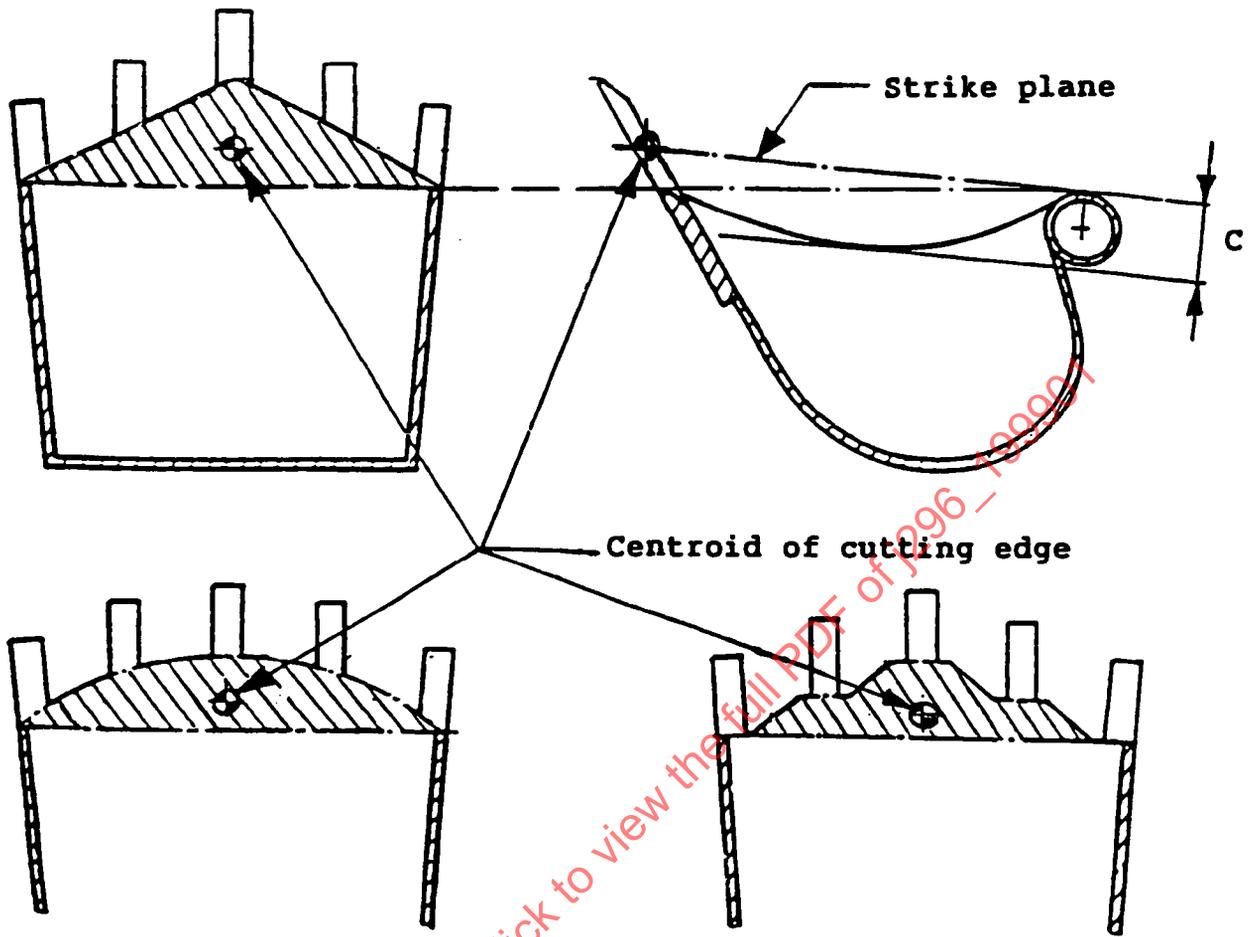


FIGURE 3—STRIKE PLANE WITH IRREGULAR-SHAPED CUTTING EDGE

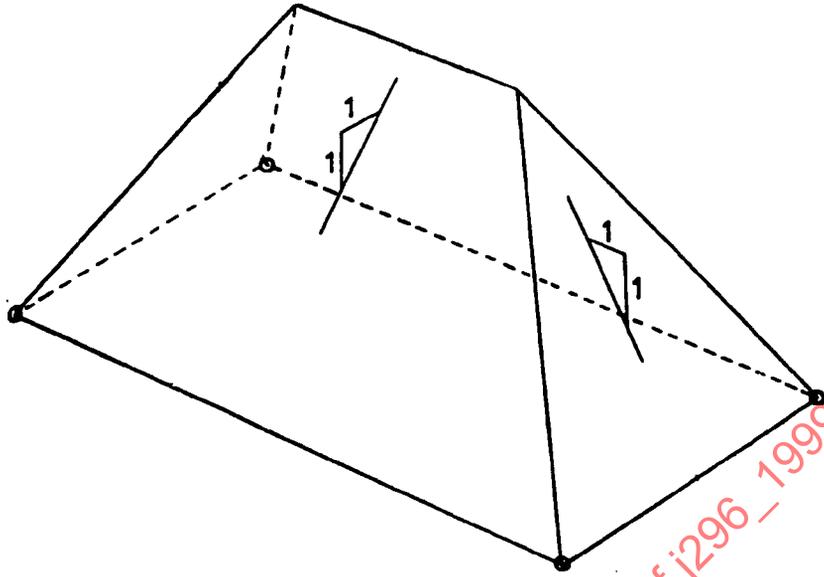


FIGURE 4A—BOUNDARIES OF THE HEAPED VOLUME

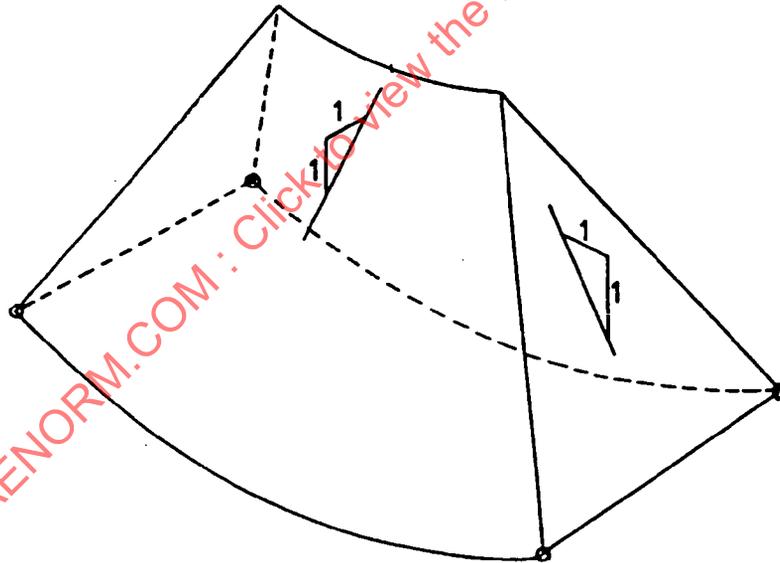


FIGURE 4B—BOUNDARIES OF THE HEAPED VOLUME