

SURFACE VEHICLE STANDARD

SAE J742

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Submitted for recognition as an American National Standard

CAPACITY RATING—LOADER BUCKET

1. Purpose—The purpose of this standard is to provide a uniform method for determining the SAE struck capacity and rated capacity. The volume calculations used result in a realistically conservative heaped volume. The calculations are based on the inside physical dimensions of the bucket only without regard to bucket action provided by any particular machine.

For rating purposes, a nominal heaped load with a 2:1 angle of repose is to be used with bucket orientation dictated by the strike plane defined in paragraph 3.1. This in no way implies that the loader linkage must carry the bucket oriented in this attitude, or that all materials will naturally have a 2:1 angle of repose.

2. Scope

2.1 This standard applies to buckets of loaders (as defined by SAE J1057a, Identification Terminology of Earthmoving machines).

2.2 This method applies primarily to buckets having parallel sides and a cutting edge parallel to the top edge of the back sheet. Moderately clipped back sheet corners will introduce no appreciable errors. Bucket teeth, tooth adapters, as well as other similar local discontinuities are ignored.

(a) Interpretation of irregular shaped cutting edges is identified in paragraph 4.4.

(b) Interpretation of irregular shaped side sheets is identified in paragraph 4.5.

3. Definitions

3.1 Struck Capacity is the volume enclosed by the interior surfaces and a strike plane across the width of the bucket. The strike plane is to rest on the cutting edge and on the uppermost portion of the back sheet. (See SAE J731, Component Nomenclature—Loader.) The position of the strike plane for irregular shaped cutting edges or side sheets is further defined in paragraph 4.4 or 4.5.

3.2 Rated Capacity is defined as the Struck Capacity plus an additional volume above the strike plane bounded by 2:1 slopes as described in Section 4.

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3.3 Rated Capacity shall be expressed in cubic meters (cubic yards) and stated as the *SAE rating (nominally heaped)* according to the following:

Range of rated sizes m ³ (yd ³)	Increments m ³ (yd ³)
Under 0.6 (0.8)	0.02 (0.025) or (0.7 ft ³)
0.6-2.6 (0.8-3.4)	0.1 (0.13)
2.6-5 (3.4-6.5)	0.2 (0.26)
5-10 (6.5-13)	0.5 (0.65)
Over 10 (13)	1 (1.3)

3.4 If the calculated value falls below a given rating interval by more than 2%, the next lower interval shall be the rating.

EXAMPLE—A calculated value of 1.46 m³ (1.91 yd³) is under 1.5 m³ (1.96 yd³) by more than 2%, and therefore, the proper rating on the basis of the measurements and calculations is 1.4 m³ (1.83 yd³).

3.5 The addition of any auxiliary guard to protect against spillage of material which might injure the operator will not be included in bucket capacity calculations.

4. Calculation

4.1 Definitions

A—Cross-sectional area at the center of the bucket.

W—Inside width of the bucket.

a—Height of that portion of the back sheet extending above the side cutters and measured at the center of the bucket width normal to the strike plane.

b—Length of opening at the center of the bucket width.

c—A length required to establish the loss in volume due to the end slope conditions. This is the length of a line drawn normal to the strike plane, from the intersection (crest) of the 2:1 slopes to the intersection with a line drawn from the cutting edge to the junction of the leading edge of the side cutter and the back sheet.

h—Distance measured from the intersection of the leading edge of the side cutters and the cutting edge, to the most forward point of an irregular shaped cutting edge.

4.2 For Basic Buckets—See Figure 1.

The Struck Capacity is expressed:

$$V_s = AW$$

The Rated Capacity is expressed:

$$V_R = V_s + \frac{b^2W}{8} - \frac{b^3}{24}$$

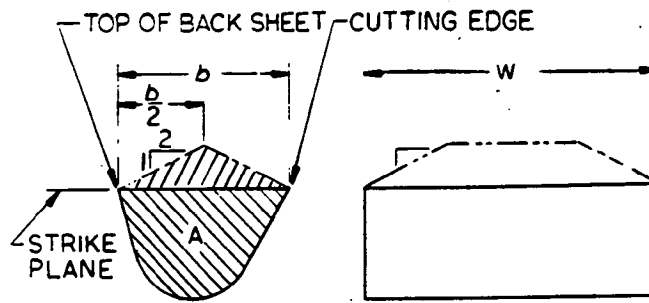


FIGURE 1—BASIC BUCKET

4.3 For Buckets with Extended Back Sheet—See Figure 2.

The Struck Capacity is expressed:

$$V_S = AW - \frac{2}{3}a^2b$$

The Rated Capacity is expressed:

$$V_R = V_S + \frac{b^2W}{8} - \frac{b^2}{6}(a+c)$$

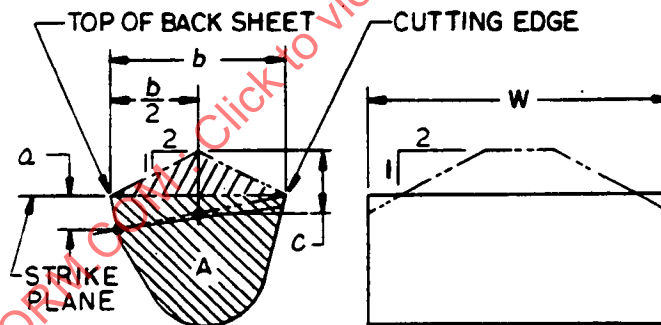


FIGURE 2—BUCKET WITH EXTENDED BACK SHEET

4.4 For Buckets with Irregular Shaped Cutting Edges—The strike plane as previously defined rests on the cutting edge; however, the irregular shaped cutting edge renders this definition impractical. The strike plane will now lie on the uppermost portion of the back sheet and on an imaginary line drawn parallel to the top of the back sheet at 1/3 the distance (h) of the protruding cutting edge. See Figure 3.

Bucket calculations are made as in paragraphs 4.2 and 4.3 with the mid cross-section area corrected as described in the preceding paragraph.

The Rated Capacity is expressed:

$$V_R = V_S + \frac{b^2W}{8} - \frac{b^2}{6}(a+c)$$

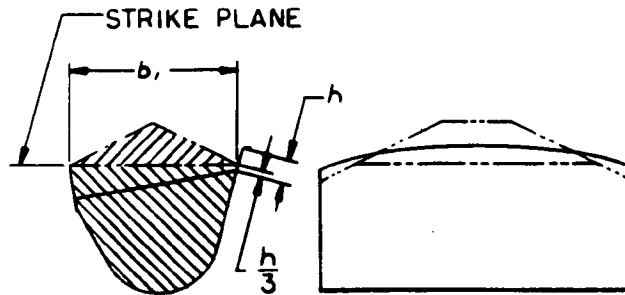


FIGURE 3—BUCKET WITH IRREGULAR CUTTING EDGE

4.5 For Buckets with Irregular Shaped Side Sheets—Establish a line connecting the intersection of the leading edge of the side sheet with the back sheet and its intersection with the cutting edge. The length of this line is x . If all portions of the leading edge of the side sheet lie within a distance y from this line such as the ratio of x/y is greater than 12, the bucket capacity may be calculated as specified in paragraphs 4.2, 4.3, and 4.4. If the ratio x/y is 12 or less, the SAE ratings will not be applicable. See Figure 4.

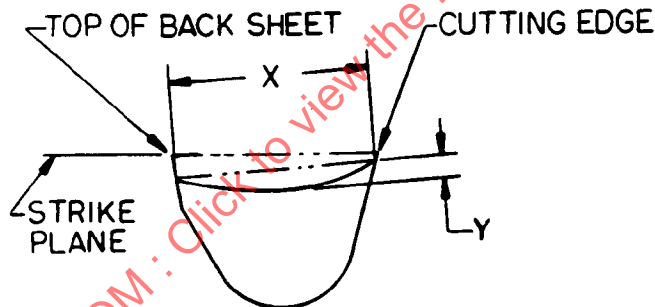


FIGURE 4—BUCKET WITH IRREGULAR SHAPED SIDE SHEETS

PREPARED BY THE SAE OFF-ROAD MACHINERY TECHNICAL COMMITTEE