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SURFACE VEHICLE INFORMATION REPORT

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Loading Ability Test Procedure - Scrapers

RATIONALE

The technical report covers technology, products, or processes which are mature and not likely to change in the foreseeable future.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE MTC1, Loaders, Crawlers, Scrapers and Mounted Attachments Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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Foreword—This procedure sets forth a method for measuring the loading ability of a scraper. The loading ability of scrapers is influenced by a number of variables, such as: properties of the material to be loaded, technique employed in loading, and force available at the scraper cutting edge. This procedure makes every effort to recognize and minimize these variables in order to reduce the effects on the test results. Compliance to this procedure provides a satisfactory means of evaluating the loading ability of various scraper designs.

The test is sufficiently general to cover any specified set of operating conditions. Any item listed as SPECIFIED is to be selected at the discretion of either the manufacturer, the test agency, the customer, or a combination of these parties.

The loading procedure involves a moving start for self-loading scrapers or a stationary start for push-loaded scrapers, following the manufacturer's recommended operating procedures. Because of the difficulties in controlling some of the variables, meaningful numerical comparison of time and load from scraper to scraper requires that data be taken at the same time and place, and that the units being compared be of approximately equal capacity.

1. Scope—This SAE Information Report applies to all independent or combination construction and industrial machines that are designed to scraper-load and transport material. (See SAE J1116 and J1057a.)

1.1 Purpose—The purpose of the scraper loading ability test is to determine the amounts of specified material that can be loaded within specified times and to express the data as a load-growth curve. The amount loaded is measured in kilograms and should be converted to volume by means of unit mass for reporting purposes.

1.2 Rationale—This document has been reaffirmed to comply with the SAE 5-Year Review policy.

2. References

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the lastest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J1057—Identification Terminology of Earthmoving Machines
SAE J1116—Categories of Off-Road Self-Propelled Work Machines

2.2 Related Publication—The following publication is provided for information purposes only and is not a required part of this document.

2.2.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J872—Drawbar Test Procedure for Construction, Forestry, and Industrial Machines

3. Definitions

3.1 Load Growth Curve—A line drawn through the average payloads obtained at each nominal load time.

3.2 Moving Start—The test machine enters the test course moving forward at the recommended speed prior to the start of ground penetration.

3.3 Stationary Start—The test machine is positioned at the start of the test course with pusher tractor in place prior to the start of the run.

3.4 Load Time—The time during which material was forced into the scraper bowl.

3.5 Base Time—A time representative of that required to obtain a full scraper load under the conditions of the test.

3.6 Nominal Time—One of a series of load times specified to assure an even distribution of data points between empty and full load.

3.7 Loading Distance—The distance traversed from the point where the cutting edge enters the ground to where it stops at the end of the test run.

4. Test Procedures

4.1 Facilities—The test requires a course with specified properties of material to be loaded. The course shall be relatively smooth with not over 3% average grade; the length and width will be determined by the size of scraper and power available.

4.2 Instrumentation—The test requires a means to measure the following parameters to the accuracy shown:

4.2.1 TIME OF RUN—±0.01 min.

4.2.2 MASS—±3% of maximum.

4.2.3 IN-PLACE SOIL DENSITY AND MOISTURE—±3%.

4.2.4 TIRE PRESSURE—±3% of maximum.

4.2.5 LOADING DISTANCE—±5%.

4.3 Preparation—Prior to the start of the loading test, the equipment shall be checked to insure that:

4.3.1 It is serviced and adjusted as specified.

4.3.2 Tires are inflated to the specified cold pressures and are not adjusted during the test.

4.3.3 It develops the specified power. (This may be checked by application of the Drawbar Pull Test or other suitable means.)

4.3.4 Cutting edges are of the specified type and condition.

4.4 Test Procedure

4.4.1 Immediately prior to and during the loading test, determine the density, and, if specified, the moisture content of in-place material at a sufficient number of points to obtain significant data.

4.4.2 Well-qualified and experienced operators should be used. Perform sufficient trial runs to familiarize personnel with the test machines and procedure.

4.4.3 Prior to recording test data, the machines shall be operated until lubricants reach reasonably stable conditions.

4.4.4 Time intervals shall be established as follows: the first load shall be as large as practical; note the time required. Using this time as a base time, set up a series of nominal loading times to provide sufficient data for the load growth curve.

4.4.5 At the start of each run, position the test equipment so as to produce parallel cuts. Assisting machines, if used, shall be in position to apply force.

4.4.6 The measured time begins with the start of ground penetration by the scraper cutting edge and terminates with the end of forward motion. It shall not deviate from the nominal time by more than 5% of the base time.

4.4.7 At the end of each cut, release the apron before raising the bowl.

4.4.8 Record general information as required on the data summary sheet. See Figures 1 and 2.

4.5 Data—Record the following data for each run:

4.5.1 Loading time in minutes

4.5.2 Gross scraper mass

4.5.3 Loading distance

4.6 Analysis

4.6.1 A minimum of five loads shall be checked for each nominal time. The R (%), defined as the deviation from the average load in percent of the average load in a 95% confidence interval, shall be determined for each series of loads from Equations 1 and 2:

$$R(\%) = 310\frac{\sqrt{\Sigma(\delta^2)}}{\Sigma L} \text{ for 5 loads} \qquad \text{(Eq. 1)}$$

$$R(\%) = 238\frac{\sqrt{\Sigma(\delta^2)}}{\Sigma L} \text{ for 10 loads} \qquad \text{(Eq. 2)}$$

where:

Σ = Symbol for summation
L = Mass of each individual load
$\delta = L - L_{avg}$
L_{avg} = Average of N weighings

SCRAPER LOADING ABILITY SPECIFICATION DATA SHEET

SCRAPER

DATE _____

MODEL _____ MFR _____

SERIAL NO _____ ENGINE KW _____ SAE STRUCK RATING - M^3 _____ HEAPED _____

TIRES

POSITION	PLY RATING	TYPE	SIZE	PRESSURE	CONDITION

CUTTING EDGE

	LENGTH	WIDTH	CONDITION	PROJ FROM MOLDBOARD
RIGHT				
CENTER				
CENTER				
LEFT				

DESCRIPTION OF METHOD USED TO CHECK POWER OUTPUT _____

ASSISTING MACHINE(S)

TYPE OF ASSIST PULL _____ PUSH _____ TYPE OF UNIT _____

MODEL _____ MFR _____

SERIAL NO. _____ ENGINE KW _____ GMM _____

TRACE SHOE LENGTH _____ CONDITION _____

GROUSER PROJECTION _____

TIRES

POSITION	PLY RATING	TYPE	SIZE	PRESSURE	CONDITION

DESCRIPTION OF METHOD USED TO CHECK POWER OUTPUT _____

TYPE OF ASSIST PULL _____ PUSH _____ TYPE OF UNIT _____

MODEL _____ MFR _____

SERIAL NO. _____ ENGINE KW _____ GMM _____

TRACE SHOE LENGTH _____ CONDITION _____

GROUSER PROJECTION _____

TIRES

POSITION	PLY RATING	TYPE	SIZE	kPa	CONDITION

DESCRIPTION OF METHOD USED TO CHECK POWER _____

OBSERVER(S) _____

REMARKS _____

FIGURE 1—SPECIFICATION DATA SHEET