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# EARTH-MOVING MACHINERY—TESTS AND MEASUREMENTS

## Part 10—LOADERS—MEASUREMENT OF TOOL FORCES AND TIPPING LOADS

(ISO Title: Earth-moving machinery—Loaders—Methods of measuring tool forces and tipping loads)

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The following interests are represented on Committee ME/63:

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Construction Equipment Importers and Manufacturers of Australia
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Department of Conservation, Forests and Lands, Vic.
Department of Defence
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## FOREWORD

1. This Australian Standard corresponds with ISO 8313—1986, *Earth-moving machinery—Loaders—Methods of measuring tool forces and tipping loads.*
2. Introduction to and complete listing of the SAA series of earth-moving machinery Standards (AS 2951 to AS 2958) is available on request.
3. For the purpose of this Australian Standard the words 'International Standard' should be replaced by 'Australian Standard'.
4. ISO Standards referred to in this Standard correspond with the following Australian Standards:

| ISO Standard | Australian Standard |
|---|---|
| ISO 5998 | AS 2954.1 |
| ISO 6016 | AS 2955.5 |
| ISO 6165 | AS 2951.1 |
| ISO 6746-1 | AS 2951.2.1 |
| ISO 7131 | AS 2951.4 |
| ISO 7546 | AS 2954.5 |

# Earth-moving machinery—Tests and measurements Part 10—Loaders—Measurement of tool forces and tipping loads

## 1 Scope

This International Standard specifies methods for determining the tool forces and tipping loads of loaders, together with their limiting conditions.

## 2 Field of application

This International Standard applies to wheel and crawler loaders as defined in ISO 6165 (see also ISO 7131).

## 3 References

ISO 5998, *Earth-moving machinery — Rated operating load for crawler and wheel loaders*.

ISO 6016, *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components*.

ISO 6165, *Earth-moving machinery — Basic types — Vocabulary*.

ISO 6746/1, *Earth-moving machinery — Definitions of dimensions and symbols — Part 1: Base machines*.

ISO 7131, *Earth-moving machinery — Loaders — Terminology and commercial specifications*.

ISO 7546, *Earth-moving machinery — Loader and front loading excavator buckets — Volumetric ratings*.

## 4 Definitions

For the purposes of this International Standard the following definitions apply.

### 4.1 Tool forces

**4.1.1 breakout force:** Maximum sustained vertical upward force generated at a point 100 mm behind the lip of the bucket, when operating the lift cylinders or the tilt cylinders, and with the bottom of the cutting edge parallel with and 20 mm above GRP (ground reference plane).

For buckets with a curved or pointed cutting edge, the forces shall be measured at the centre of the bucket width.

**4.1.2 lifting capacity:** Maximum load which can be lifted in the bucket from the ground to full height using the lift cylinders, with the bucket tilted back and the load being applied through the centroid of the rated bucket volume (as specified in ISO 7546).

**4.2 tipping load (at maximum outreach or at a specified height):** Minimum mass acting downwards through the centroid of the rated bucket volume which will rotate the machine to the following tipping limiting conditions (see also 4.5.3 and 8.1):

a) On crawler loaders

For rigid frame suspensions the tipping load is determined when the front track rollers are fully off the track (see figure 1). For other types of suspension the method of determining tipping load shall be specified by the manufacturer and shall be reported.

b) On wheel loaders

The tipping load is determined when at least one of the rear wheels is fully off the ground.

In this limit condition the machine is in balance between the overturning moment supplied by the tipping load and the righting moment supplied by the mass of the machine.

**4.3 mass:** Operating mass of the machine, as defined in ISO 6016.

### 4.4 Hydraulic pressure

**4.4.1 system hydraulic pressure:** Nominal pressure measured near the outlet of the pump (the system relief valve pressure).

**4.4.2 circuit relief pressure:** Maximum pressure at each circuit (e.g. the lift or bucket cylinder) which is secured by a circuit relief valve.

**4.5 Limiting conditions** (see also 8.1)

**4.5.1 hydraulic limiting condition:** Moment when the tool forces or lift capacity are limited by any relief valve pressure setting.

**4.5.2 engine stall limiting condition:** Moment when the tool forces are limited by the engine stalling.

**4.5.3 tipping limiting condition:** Moment when the tool forces are limited by the onset of tipping of the machine.