

AS 2955.4—1988/ISO 6015/1—1986

Australian Standard®

**EARTH-MOVING MACHINERY—
TESTS AND MEASUREMENTS**

**Part 4—HYDRAULIC
EXCAVATORS—
MEASUREMENT OF
TOOL FORCES**

(ISO Title: Earth-moving machinery—Hydraulic excavators—
Part 1: Methods of measuring tool forces)

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Australian Mining Industry Council
Bureau of Steel Manufacturers of Australia
Construction Equipment Importers and Manufacturers of Australia
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Department of Conservation, Forests and Lands, Vic.
Department of Defence
Department of Forestry, Qld.
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 FOREWORD

1. This Australian Standard corresponds with ISO 6015/1—1986, *Earth-moving machinery—Hydraulic excavators—Part 1: Methods of measuring tool forces*.
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 6016	AS 2955.5
ISO 6165	AS 2951.1
ISO 6746-1	AS 2951.2.1
ISO 7451	AS 2954.6
ISO 7546	AS 2954.5

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Earth-moving machinery—Tests and measurements Part 4—Hydraulic excavators—Measurement of tool forces

1 Scope

This part of ISO 6015 specifies methods for determining the tool forces of hydraulic excavators, together with their limiting conditions.

2 Field of application

This part of ISO 6015 applies to all types of hydraulic excavators, crawler or wheel mounted, and with or without outriggers, as defined in ISO 6165.

3 References

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 machine.*

ISO 7451, *Earth-moving machinery—Hydraulic excavators—Hoe type buckets—Volumetric ratings.*

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

4 Definitions

For the purposes of this part of ISO 6015, the following definitions apply.

4.1 tool forces: On an excavator fitted with a hoe or shovel, tool forces are the actual forces generated at the bucket lip when operating the bucket or arm cylinder independently.

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

The direction of the tool forces to be measured shall be tangential to the arc described by the bucket lip.

4.2 grab and clamshell closing force: Maximum force available between the clamshells at the cutting edge or the tips of the teeth when closing.

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.

4.5.4 slipping limiting condition: Moment when the tool forces are limited by the machine slipping on the test surface.

5 Apparatus

The apparatus shall comprise the following.

5.1 Load cell or force transducer appropriate to the magnitude of the tool force to be measured and with an accuracy of $\pm 2\%$ inclusive of the readout device.

5.2 Hydraulic oil pressure gauge, with an accuracy of $\pm 2\%$.

5.3 Wire ropes and shackles, pulley, safety chains and adjustable supporting frames.

5.4 Apparatus for measuring linear dimensions to an accuracy of $\pm 2\%$.