

Australian/New Zealand Standard™

Methods of testing protective helmets

Method 9: Determination of load distribution

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee CS-097, Testing of Helmets and Visors, to supersede AS/NZS 2512.9:1996, *Methods of testing protective helmets, Method 9: Determination of load distribution*.

This Standard is republished without technical alteration

METHOD

1 SCOPE

This Standard sets out a method for determining the ability of a protective helmet to distribute the force of an impact.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS/NZS

2512 Methods of testing protective helmets

2512.1 Method 1: Definitions and headforms

2512.2 Method 2: General requirements for the conditioning and preparation of test specimens and laboratory conditions

2512.3.1 Method 3.1: Determination of impact energy attenuation—Helmet drop test

SAE

J211b Instrumentation for impact tests, recommended practice

3 PRINCIPLE

An anvil is dropped towards the outer surface of a helmet positioned on a hemispherical headform. The force imparted to a force transducer mounted in the headform is measured.

4 APPARATUS

The following test apparatus (as shown in Figure 1) is required:

- (a) Headform and force transducer complying with the following requirements:
 - (i) Headform with a hemispherical upper surface of radius 70 ± 0.5 mm (60 ± 0.5 mm for helmets intended to fit on the size A headform as specified in AS/NZS 2512.1) and a ground finish of $25 \mu\text{m}$ or better. The headform and support shall be made of steel and constructed as shown in Figures 2 and 3.

- (ii) An appropriate strain gauge type force transducer, capable of measuring the force transmitted by a steel load transfer pin of $100 \pm 1 \text{ mm}^2$ circular area as shown in Figure 4. The relative dimensions of the pin and hole shall be such as to allow the pin to move freely vertically, but not laterally, within the hole. The instrumentation data channel shall comply with the requirements for channel class 1000 of SAE J211b down to 1 Hz.

The upper end of the pin shall be a flat plane, essentially normal to the pin's long axis and shall have a ground finish of 25 mm or better.

NOTES: Use of a strain gauge of the following (or better) characteristics is recommended:

- (a) Rated capacity, 100–250 kgf.
 - (b) Non-linearity, 0.5%.
 - (c) Rated output (RO), 5–30 H: 0.1% RO.
 - (d) Hysteresis, 0.5%.
 - (e) Repeatability, 0.05% RO.
 - (f) Temperature range, -10 to $+50^\circ\text{C}$.
 - (g) Frequency response, substantially flat response characteristics up to 200 Hz.
- (b) Drop anvil complying with the following requirements:
 - (i) The mass of the anvil and drop assembly shall be 3 ± 0.045 , -0 kg.
 - (ii) The anvil is constructed of steel, 250 mm long with the cross-section as shown in Figure 5.
 - (iii) The anvil is mounted so that the centre of gravity of the anvil and drop assembly is above the centre of the load measurement area; with the axis horizontal and with the 90° edge at the bottom.
 - (iv) The impacting surface is to be a ground finish of 25 mm or better, and the edge shall have a radius of 10 ± 0.5 mm.
 - (c) Mount for anvils, as specified in AS/NZS 2512.3.1.
 - (d) Means of controlling the direction of free fall.

5 PROCEDURE

The procedure shall be as follows:

- (a) Condition and prepare the helmets in accordance with AS/NZS 2512.2.
- (b) Ensure that the laboratory conditions are as specified in AS/NZS 2512.2.
- (c) Select test points.
- (d) Position the helmet on the hemispherical headform such that the test point corresponds to the centre of the long axis of the anvil.

NOTE: In order to avoid the helmet dislodging during testing, it may be lightly retained on the headform.

- (e) Drop the anvil from the height specified in the product Standard towards the outer surface of the helmet.
- (f) Measure the force imparted to the force transducer.

NOTE: The height is measured from the leading edge of the anvil to the test point on the outer surface of the helmet unless the test point is a hole. In that case, measure the height of the anvil from the edge of the hole nearest to the anvil.

6 TEST REPORT

The test report shall include the following:

- (a) Identity of the helmet under test.
- (b) The force (measured over a circular area of 100 mm²) imparted to the force transducer.
- (c) Reference to this Australian/New Zealand Standard, i.e. AS/NZS 2512.9.

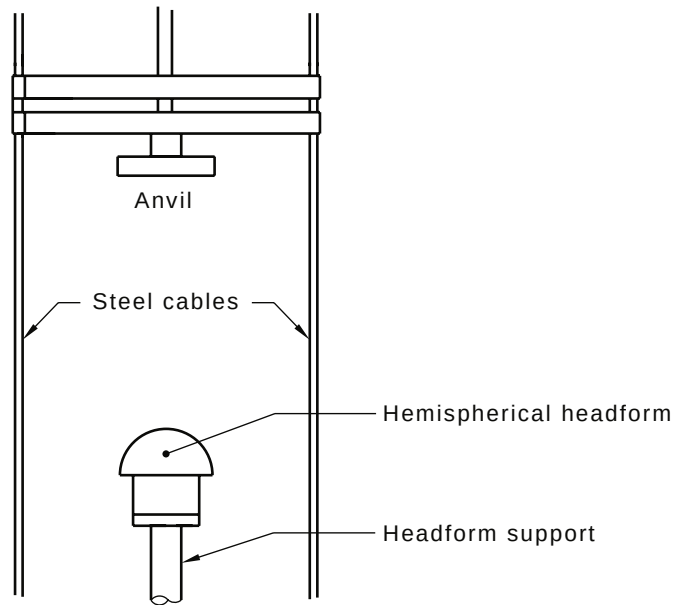
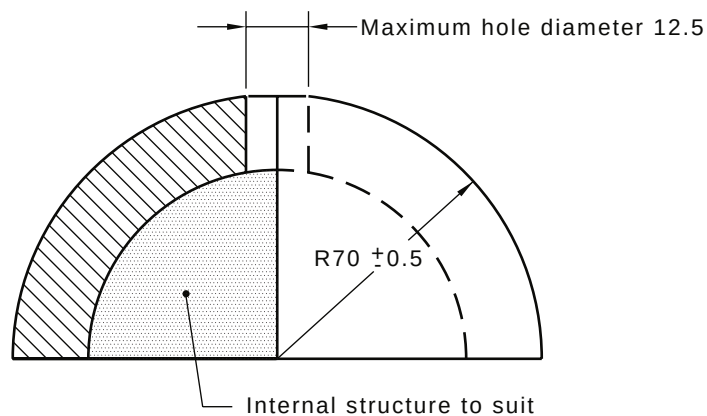


FIGURE 1 TYPICAL TEST RIG LAYOUT



NOTE: R is 60 ±0.5 mm for helmets intended to fit on the size A headform.

DIMENSIONS IN MILLIMETRES

FIGURE 2 HEMISPHERICAL HEADFORM CONSTRUCTION