Australian/New Zealand Standard®

Methods of testing protective helmets

Method 3.2: Determination of impact energy attenuation—Striker drop test

PREFACE

This Standard was prepared by the Joint Standards Australia/Standard New Zealand Committee CS/95, Helmets for Ball Games.

The main factors in the ability of a helmet for ball games to provide impact energy attenuation are the deformation and acceleration of the helmet and the deceleration and deformation of the projectile. Attempts to simulate this situation using the existing test method for impact energy attenuation, AS 2512.3.1, *Methods of testing protective helmets*, Method 3.1: *Determination of impact energy attenuation—Helmet drop test* (which incorporates a non-deformable anvil), have proven to be unsuccessful, resulting in the decision to incorporate the actual projectile in this test method.

This method for testing the impact energy attenuation properties of helmets therefore differs from AS 2512.3.1 because it measures the ability of a helmet to provide protection against a deformable projectile. Research has shown that deformation of the projectile is a major component of the energy reduction mechanism when a helmet is struck by a ball or puck.

METHOD

1 SCOPE This Standard sets out a method for determining the impact energy attenuation of a helmet, temple protector or faceguard, intended for use in a sport where there is danger of being injured by a ball or puck.

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS
2512 Methods of testing protective helmets
2512.2 Method 2: General requirements for the conditioning and preparation of test specimens and laboratory conditions

AS/NZS
2512 Methods of testing protective helmets
2512.1 Method 1: Definitions and headforms

SAE
J211 Instrumentation for impact tests

3 DEFINITIONS For the purpose of this Standard, the definitions given in AS/NZS 2512.1 apply.

4 PRINCIPLE An instrumented ball or puck is dropped in guided free fall onto a bare headform and the deceleration on impact is measured. A helmet, helmet with temple protector, or helmet with faceguard is then placed on the headform and the procedure is repeated. The percent difference between the deceleration measurements indicates the shock absorption capacity of the helmet, temple protector or faceguard.

5 APPARATUS The following apparatus is required:

(a) A complete headform, i.e. a headform complying with the additional dimensional requirements below the *HH′* line, as specified in AS/NZS 2512.1. The headform shall be of solid construction.

NOTE: Headforms made of polyester resin or magnesium alloy have been found to be suitable.

(b) Headform mount, substantially rigid, enabling the headform to be rotated at approximately 15° increments, through not less than 90° between horizontal and vertical. A typical mount is illustrated in Figure 1.

(c) A ball or puck as specified in the product Standard.

(d) A drop assembly incorporating—

(i) a ball or puck, as specified in Item (c), and supporting assembly, the combined mass of which is 1.5 kg +30, −0 g. The supporting assembly shall include a striker which can hold a ball or puck in position during impact. The ball holder shall utilize a holding mechanism that ensures direct contact between the ball or puck and the holder during impact. A typical ball holder is illustrated in Figure 2;

(ii) an acceleration transducer firmly attached to the striker, with its sensitive axis coincident with that of the striker, within 5° of vertical when the ball or puck is in the impact position. The acceleration data channel shall comply with the requirements for channel class 1000 of SAE J211; and

(iii) a means to control the direction of free fall to within 1 in 400 of vertical with minimal retardation.

Typical drop assemblies are illustrated in Figure 3.

6 STRIKER VELOCITY CHECK The test apparatus shall be checked before and after each series of tests in respect of the velocity of impact. The velocity of impact shall not differ by more than 3 percent from that theoretically obtainable in free fall in vacuum, at the test location from the specified drop height.

7 PROCEDURE The procedure shall be as follows:

(a) Mark the test line on the helmet, temple protector or faceguard in accordance with the product Standard.

(b) Condition the helmet, helmet with temple protector, or helmet with faceguard in accordance with the product Standard.

NOTE: Do not remove the helmet, helmet with temple protector, or helmet with faceguard from the conditioning environment until Step (h).

(c) Ensure the laboratory conditions are as specified in AS 2512.2.

(d) Attach a ball or puck, as specified in Clause 5(c), to the drop assembly.

(e) Nominate a test site and position the headform so that the ball or puck will strike essentially normal to the horizontal tangential plane at the point of contact.

(f) Raise the drop assembly to the height specified in the product Standard.

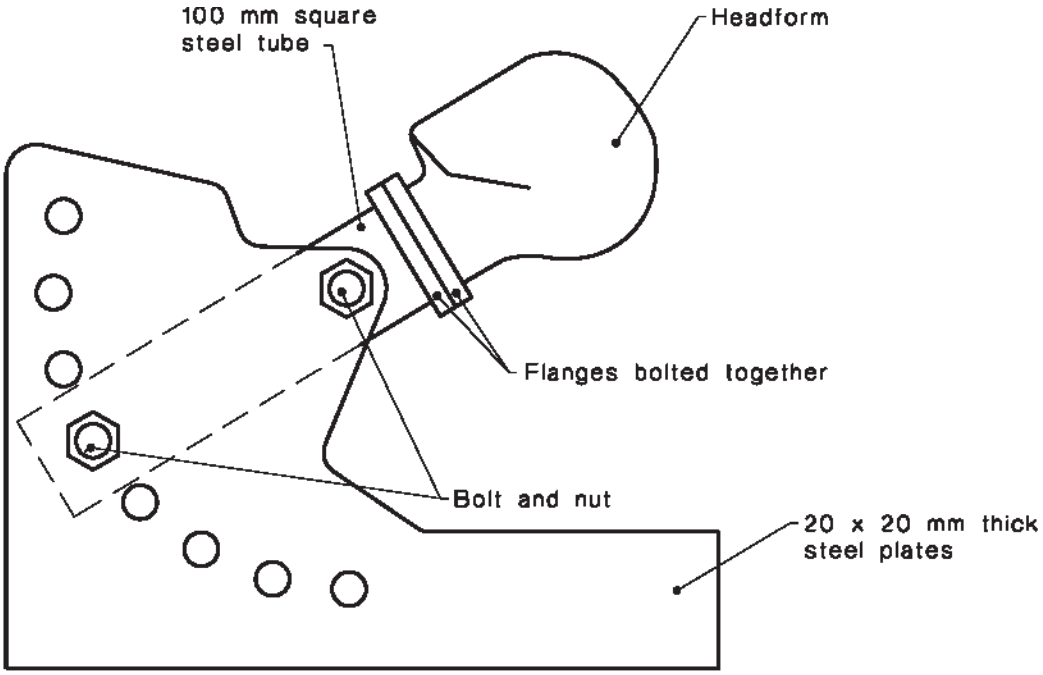
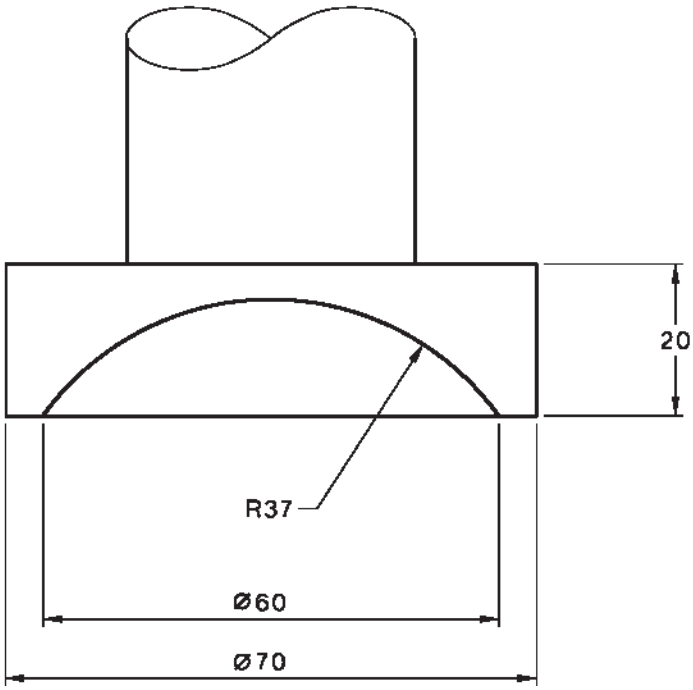


FIGURE 1 TYPICAL HEADFORM MOUNT



DIMENSIONS IN MILLIMETRES

FIGURE 2 TYPICAL CRICKET BALL HOLDER