AS/NZS 3629.11:2013

Australian/New Zealand Standard™

Methods of testing child restraints
Method 11: Measuring energy attenuation

PREFACE

This Standard was prepared as a new test method by the Joint Standards Australia/Standards New Zealand Committee CS-085.

The objective of this Standard is to provide a test method for determining energy attenuation of the sides of child restraints beside an occupant's head as required by AS/NZS 1754, *Child restraint systems for use in motor vehicles*. This test method was drafted from AS/NZS 2512.3.1, *Methods of testing protective helmets,* Method 3.1: *Determination of energy attenuation—Helmet drop*, and adapted to suit testing of child restraints using equipment for testing helmets.

METHOD

1 SCOPE

This Standard sets out a method of testing the sides of the child restraint beside the head of a test dummy in order to determine the level of energy attenuation provided by the child restraint in a side impact.

NOTE: AS/NZS 1754:2013, Clause 3.2.1(o), specifies the compliance requirements.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS/NZS		
1754	Child restraint systems for use in motor vehicles	
2063	Bicycle helmets	
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
3629	Methods of testing child restraints	
3629.1	Method 1:	Dynamic testing
SAE		
J211	Instrumentation for impact tests	

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3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS/NZS 2512.1 and AS/NZS 1754 apply.

4 PRINCIPLE

A sectioned head restraint/side wing from a child restraint is positioned on the surface and an appropriate instrumented headform is dropped in guided free fall. The acceleration imparted to the assembly is measured.

5 APPARATUS

The following test apparatus is required:

(a) Headform of the dimensions and design specified in AS/NZS 2512.1:2009 as 'Headform A', made of Mg K1A material and instrumented as described in Item (d)(iv) below.

NOTE: A material with the following composition has been found suitable—magnesium/zirconium binary alloy with 0.3% to 0.8% zirconium, $d = 1.79 \pm 0.01$ kg/dm^3.

(b) An anvil consisting of a solid mass of at least 450 kg faced with a steel plate of at least 25 mm in thickness and having a lateral dimension of at least 500 mm × 500 mm.

(c) Release mechanism capable of smoothly releasing the drop assembly.

(d) A drop assembly complying with the following:

(i) It shall consist of a headform (size A) and a supporting assembly, the combined mass of which shall be 3.1 ±0.05 kg.

(ii) The mass of the supporting assembly, which comprises the supporting arm and ball socket stem, shall not exceed 20% of the mass of the drop assembly.

NOTE: It may be necessary to obtain the mass of the ball socket stem by calculation.

(iii) The centre of mass of the combined test headform and supporting assembly shall be within a cone with its axis vertical and forming a 10° included angle with the vertex located at the point on the external surface of the test headform, which is vertically below the centre of the accelerometer. (See Figure 1).

The combined centre of mass shall be determined for all points on the headform above the test line.

NOTES:

1 This is because, as the headform rotates, the combined centre of mass changes.

2 This may be accomplished mathematically once the centre of mass of the headform and support assembly has been determined.

(iv) An acceleration transducer shall be mounted at the centre of the ball socket, with the sensitive axis aligned to within 5° of the vertical when the test headform is in the impact position.

(v) The acceleration data channel shall comply with the requirements for Channel Class 1000 of SAE J211.

(vi) A means to control the direction of the free fall.

(e) Means of securing the child restraint test specimen to hold it in position prior to, and whilst, the headform is impacting the specimen.

(f) Apparatus as specified in AS/NZS 3629.1 required for testing the child restraint in side impact.

Typical apparatus for impact energy attenuation test is shown in Figure 2.

6 VERIFICATION OF TEST APPARATUS

The velocity of impact shall not differ by more than 3% from the velocity of impact theoretically obtainable in free fall in vacuum, within 50 mm of the point of impact from the specified drop height.

NOTE: Increasing the drop height above the tolerance specified in the product Standard is not acceptable.

7 TEST SPECIMEN

The following apply:

(a) The test specimen shall not have been previously tested and sampled from a production batch.

(b) The child restraint shall be sectioned ensuring to maintain the structural integrity of the head restraint or side wing within the region of the test site, in accordance with Clause 8(b)(iv).

8 PROCEDURE

This test method is based on testing helmets as the helmet test methods may assist in conducting this test procedure.

The procedure shall be as follows:

(a) Determination of test sites:

(i) Position the child restraint on the test seat as specified in Clause 7(a) of AS/NZS 3629.1:2013 and shown in Figure 1 of AS/NZS 3629.1:2013.

(ii) Select the largest appropriate test dummy, specified in the requirements of AS/NZS 1754:2013, Table 5.1, *Sideways with door*, for dynamic testing. Record the test dummy selected.

(iii) Install the child restraint on the test seat, as specified in the manufacturer's instructions, and correctly position the appropriate test dummy into the restraint.

(iv) Move the test dummy's head in the direction of a 90° sideways impact and determine the contact between the head and head restraint and mark the centre of the position of the head to create the impact point.

NOTE: If the exact location cannot be determined the laboratory may estimate the contact site.

(b) Impact energy attenuation:

(i) Position the headform such that the impact point with the test site corresponds within a 15 mm radius from the intersection of the mid sagittal and transverse planes at the crown of the headform. See Figure 3.

(ii) Using the test headform and drop assembly, verify that the apparatus functions in accordance with Clause 6.

(iii) Ensure that the laboratory conditions are as specified in AS/NZS 2512.2.

(iv) Prepare the child restraint so that the headform can strike the surface required. This will mean removing the opposite side structure. In sectioning the child restraint, as much as possible of the backrest shall remain unmodified.

(v) Position the specimen on the test anvil in a position where the back of the structure sits on the anvil and the headform aligns with the dummy's head position identified in Step (a)(iv). Secure the sectioned child restraint so that it is stable preventing it from moving during the set-up and dropping of the headform. Tape or EPS supports may be used to secure the sectioned test specimen in place, but shall not interfere with the drop assembly. Figure 3 shows examples of positioning the test specimen on the test anvil and shows the alignment of the headform in order to contact the impact location determined in Step 8(a)(iv).

(vi) Raise the lowest part of the headform to a height of 1500 +30, –5 mm from the upper surface of the side of the specimen that the headform rested on in Step (a)(iv).

(vii) Drop the headform and ensure the strike is not affected by the back of the specimen.

(viii) Measure the headform acceleration at intervals specified in AS/NZS 1754.

(c) For child restraints incorporating more than one type designation, repeat Steps (a) and (b) for each type designation.

9 REPORT

The report shall include the following:

(a) Identity of the child restraint under test.

(b) Headform acceleration.

(c) A reference to this test method, i.e. AS/NZS 3629.11.

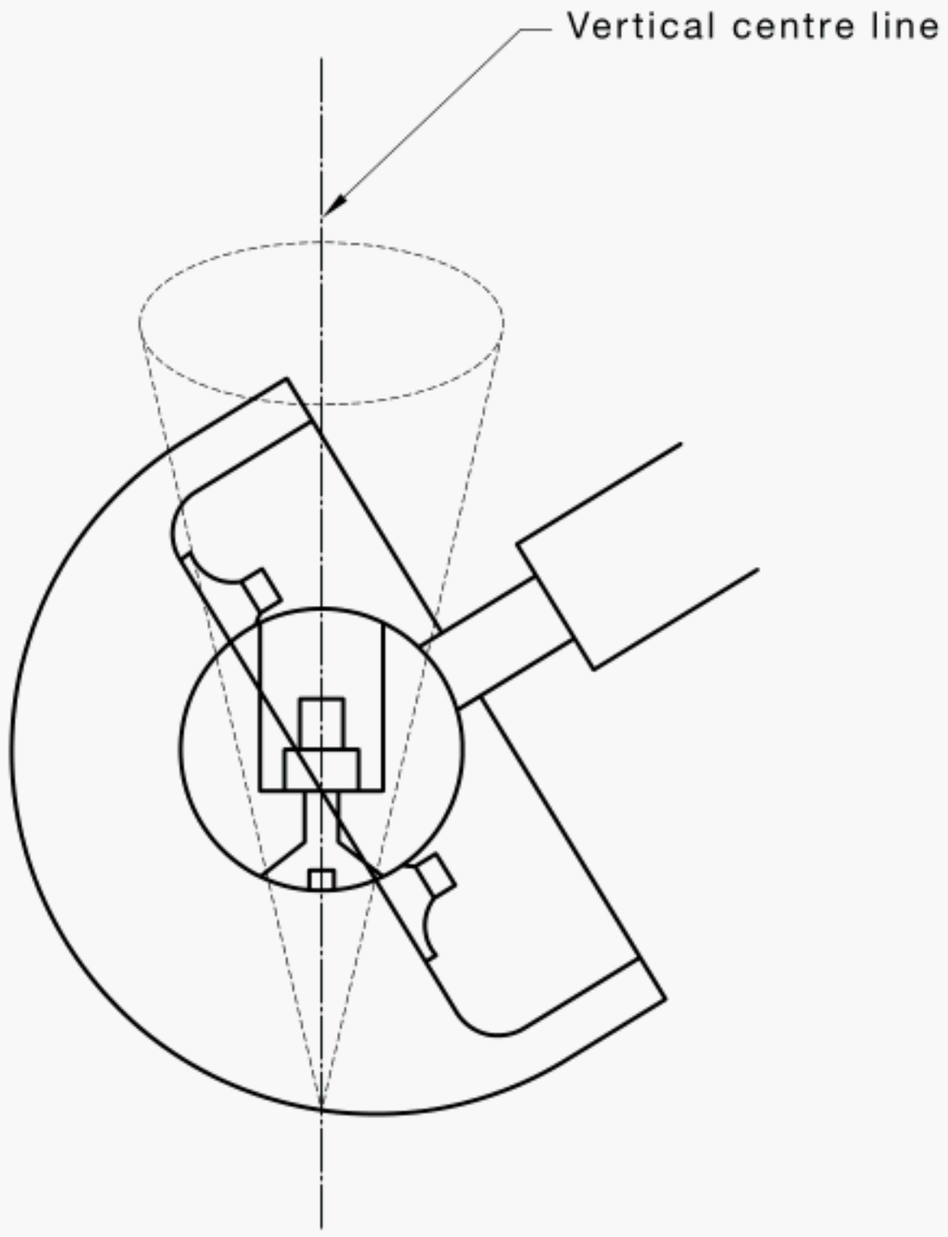


FIGURE 1 CENTRE OF MASS

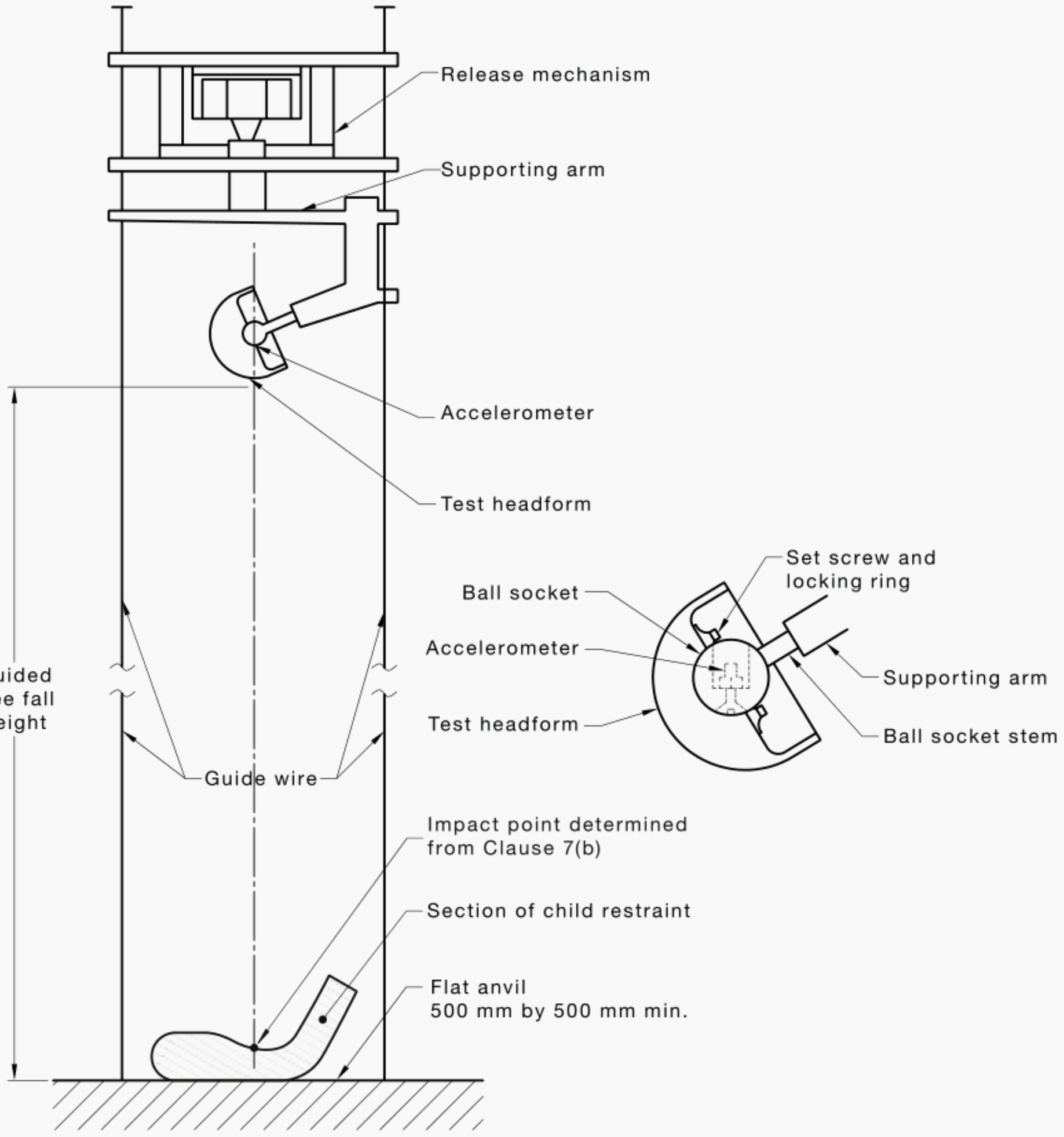
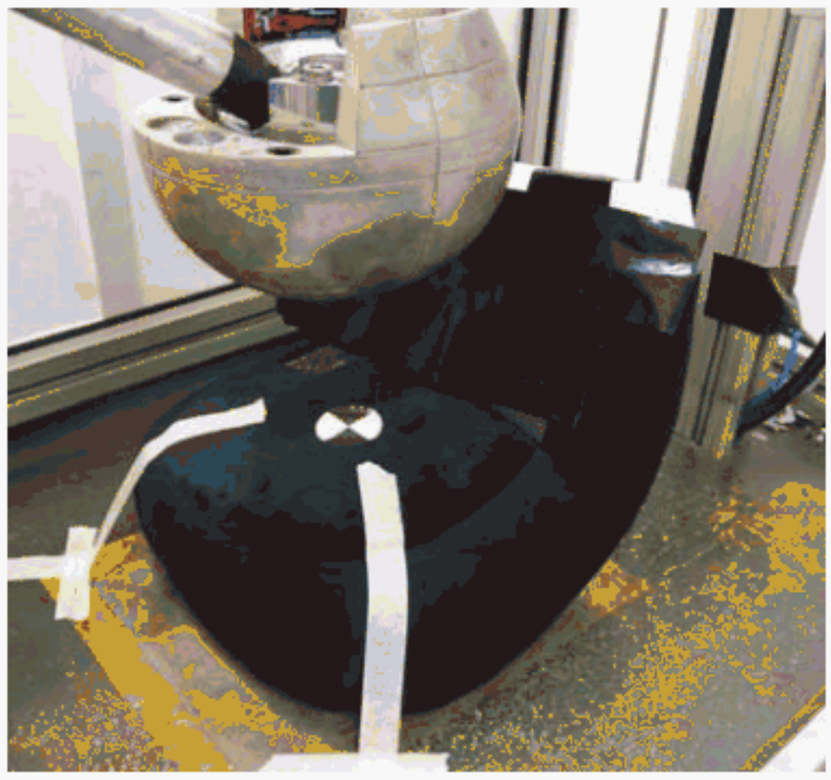


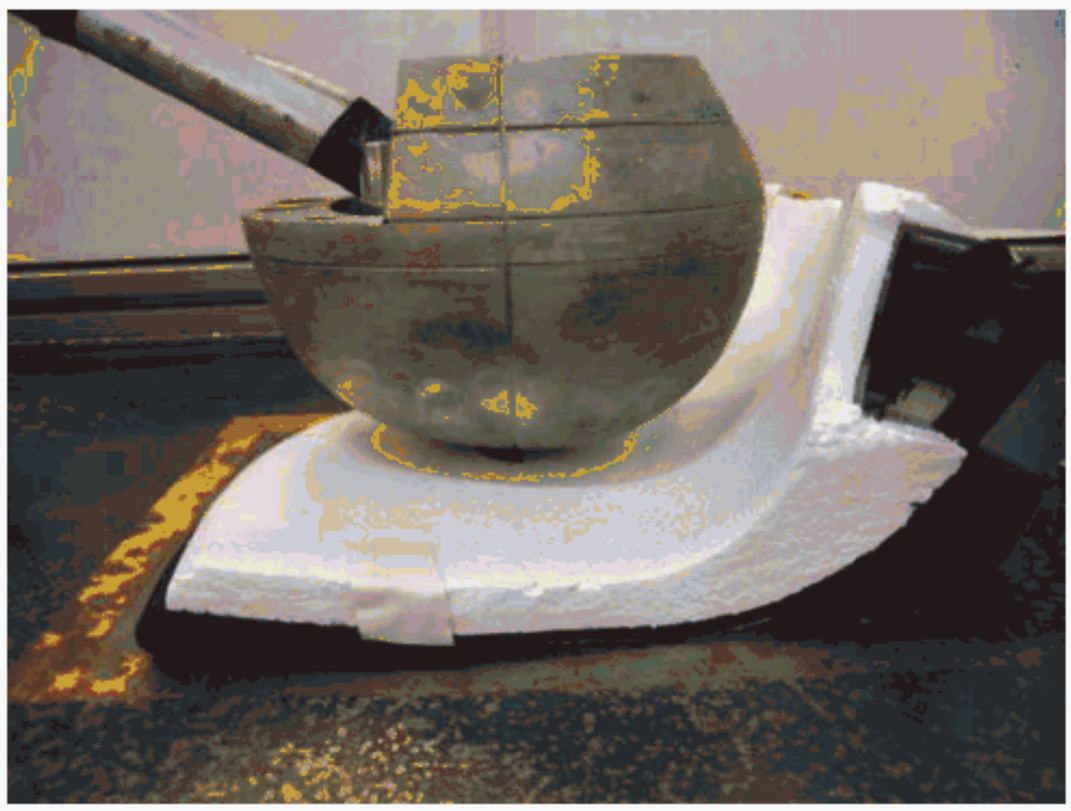
FIGURE 2 TYPICAL APPARATUS FOR IMPACT ENERGY ATTENUATION TEST

(a)



(b)

(c)



(d)

NOTE: The headform is shown positioned just prior to impacting the test specimen.

FIGURE 3 EXAMPLE OF DROP LOCATION AND POSITIONING ON THE FLAT ANVIL

NOTES

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The following are represented on Committee CS-085:

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