# Procedures for Assembly, Disassembly, and Inspection (PADI) of the Child Pedestrian Headform

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# 1. Introduction

This document was prepared for the National Highway Traffic Safety Administration (NHTSA) under the title "Procedures for Assembly, Disassembly, and Inspection (PADI) of the Child Pedestrian Headform."

A photograph of a child pedestrian headform is shown in Figure 1.

**Figure 1. Oblique view of the child pedestrian headform**

## 1.1. Purpose

This document contains the procedures for assembly and disassembly of the child pedestrian headform for the purpose of inspection and preparation for testing. Certification tests are specified in a UNECE Addendum 126 Regulation Number 127 Revision 1 Annex 6 Section 3. The details of this test are also specified in the NHTSA companion document "Qualification Procedures for Pedestrian Test Devices December 2019." The headform user will periodically perform the qualification tests to assure that the headform is maintained at the specified performance levels.

## 1.2. Part Numbers

All part numbers in this document refer to the drawing package entitled "Child Pedestrian Headform Drawing Package December 2019".

## 1.3. Abbreviations

The abbreviations for threaded fasteners used throughout the PADI are listed in Table 1.

**Table 1. Threaded fastener abbreviations**

| Abbreviation | Description |
|---|---|
| SHCS | Socket Head Cap Screw |
| FHCS | Flat Head Cap Screw |

### 1.4. Torque Specifications

No torque requirements are specified.

## 2. Construction

Some of the design highlights of the child pedestrian headform include:

- Cast aluminum sphere with removable vinyl skull cap skin. The vinyl skin has been tuned to produce humanlike response for impacts.
- Triaxial accelerometer mounting capability at the center of gravity.

## 3. Clothing

The child pedestrian headform does not utilize clothing.

## 4. Available Instrumentation

The child pedestrian headform utilizes accelerometers to measure the acceleration of the head center of gravity along the x, y, and z directions. There are two configurations of accelerometers available for use. This PADI presents a configuration in which three damped uniaxial accelerometers are installed on a mount that is attached to the headform back plate. The second configuration (not presented here) utilizes a single damped triaxial accelerometer that is attached to the headform back plate. Any damped uniaxial or triaxial accelerometer can be used as long as the dampening coefficient matches (0.7), the overall mass of the assembly remains within specification, and the accelerometer(s) can be mounted to measure at the head center of gravity. Sensors are listed in Table 2.

**Table 2. Child pedestrian headform instrumentation capability**

| Sensor Type | Location | Part # | Measurements | Total # Channels |
|---|---|---|---|---|
| Damped uniaxial accelerometers | Head center of gravity | SA572-S5 | X, Y, Z | 3 |
| Damped triaxial accelerometer | | NA | | |

## 5. Procedures for Assembly, Disassembly, and Inspection

The components in Table 3 are included in the child pedestrian headform assembly. Figure 2 shows a drawing of the headform assembly components with parts labeled as listed in Table 3.

**Table 3. Child pedestrian headform components**

| Part Description | Quantity | Part Number | Item # |
|---|---|---|---|
| Skull casting assembly | 1 | CHI-0200 | 1 |
| Headform flesh | 1 | CHI-0300 | 2 |
| Back plate assembly | 1 | CHI-0100 | 3 |
| Screw, SHCS M8x1.25 x 30 | 6 | 5000372 | 4 |
| Back plate insert disc | 1 | CHI-0120 | 5 |
| Screw, FHCS M5x0.8 x 12 | 6 | 5000096 | 6 |
| Triaxial accelerometer mount block | 1 | CHI-0550 | 7 |
| Damped uniaxial accelerometer | 3 | SA572-S5 | 8 |
| Screw, SHCS M1.4x0.3 x 3 | 6 | 9010407 | 9 |
| Screw, SHCS M3x0.5 x 8 | 2 | 5000388 | 10 |

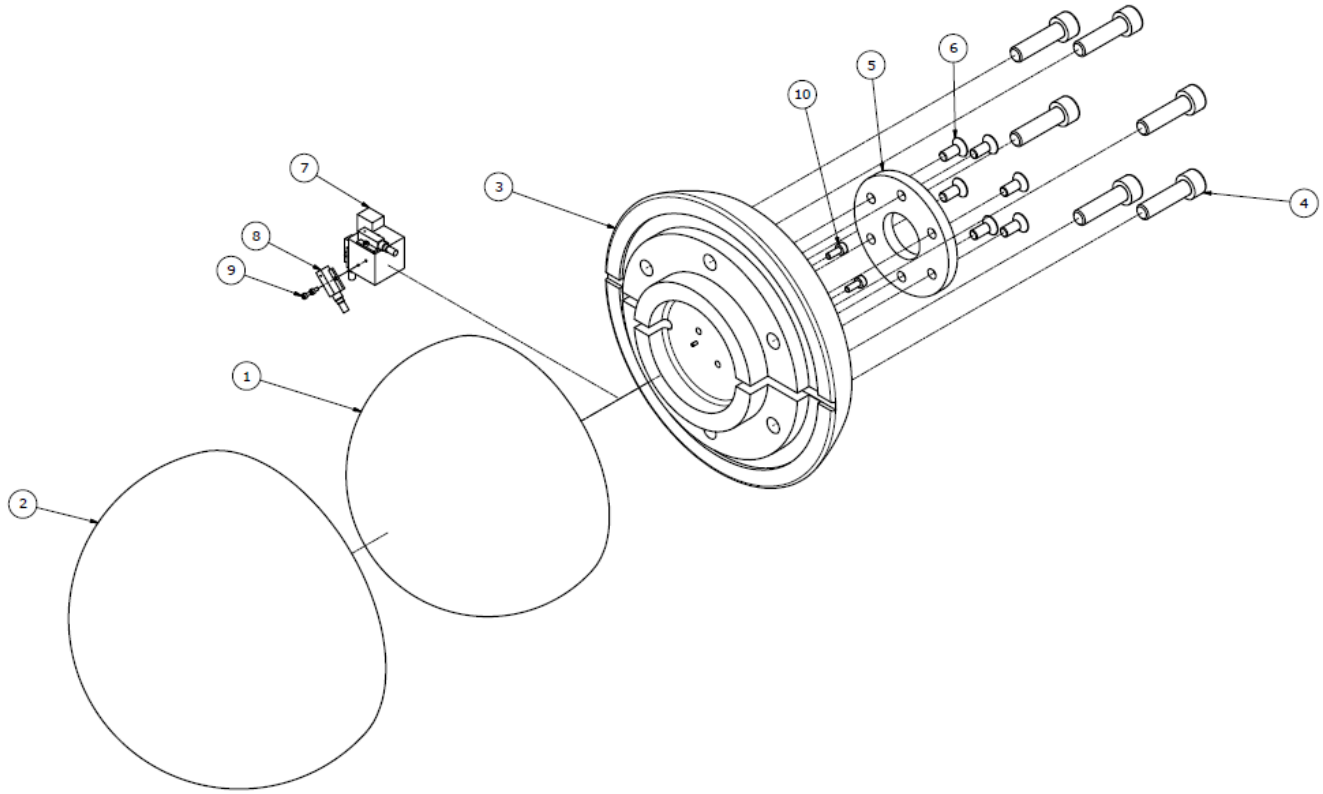


**Figure 2. Child pedestrian headform assembly**

### 5.1. Assembly

Position the triaxial accelerometer mount block (Item 7) on the back plate assembly (Item 3) (Figure 3). Fasten the triaxial mount block from the backside using two SHCS M3x0.5 x 8 (Item 10), after attaching the back plate insert disc (Item 5) to the back plate assembly using six FHCS M5x0.8 x 12 (Item 6), as shown in Figure 4.

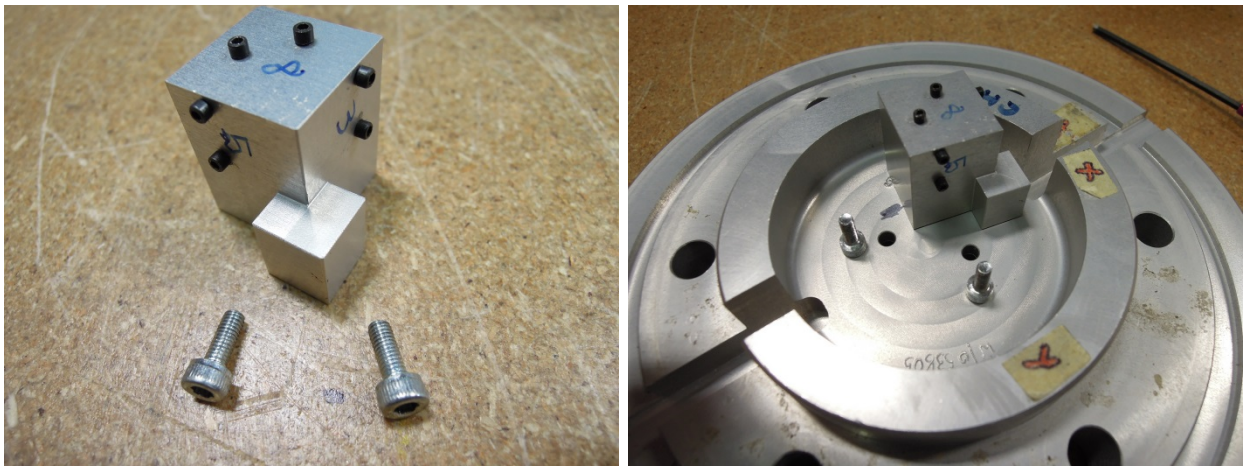

**Figure 3. Positioning of the triaxial accelerometer mount block on the back plate assembly**


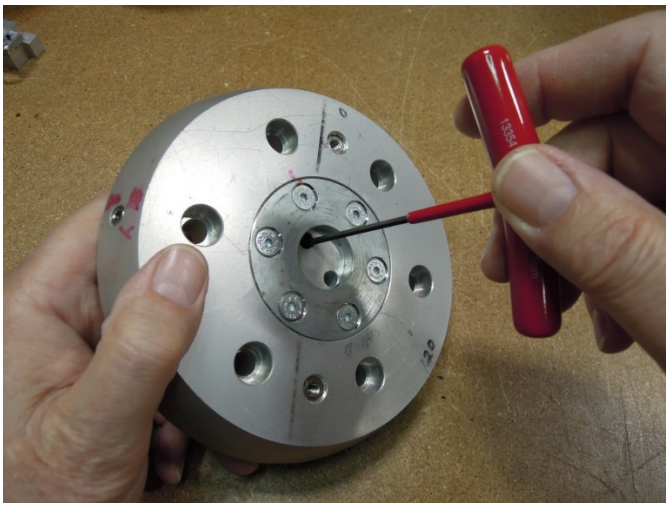

**Figure 4. (Left) Attachment of back plate disc to back plate; (Right) Installation of the triaxial accelerometer mount block to the back plate assembly**

Install three damped uniaxial accelerometers (Item 8) to the mount block using six SHCS M1.4x0.3 x 3 (Item 9) – as shown in Figure 5.

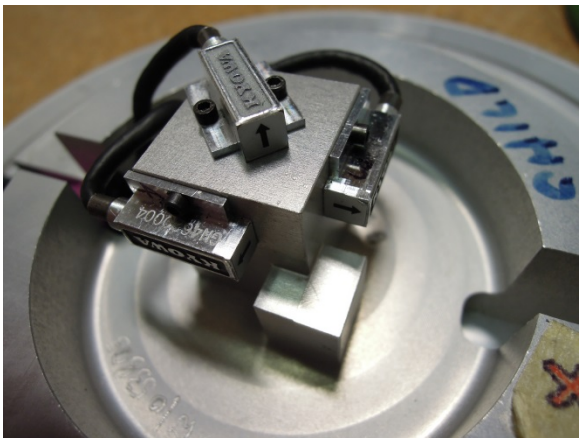

**Figure 5. Installation of damped accelerometers to the accelerometer mount block**

Route the accelerometer wires through the grooves in the back plate – as shown in Figure 6.

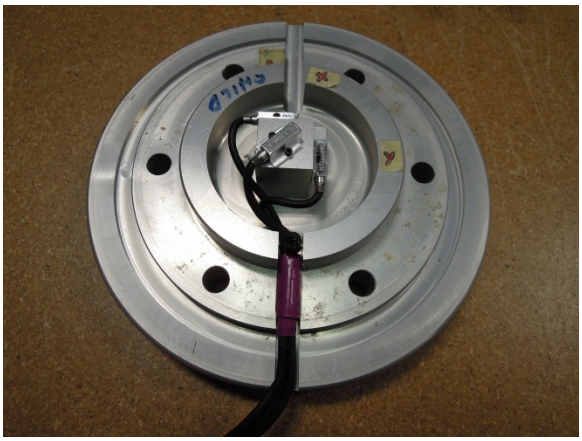

**Figure 6. Routing of the accelerometer wires**

Insert the skull casting assembly (Item 1) into the headform flesh (Item 2) if it is not already attached – as shown in Figure 7.

**Figure 7. Insertion of skull casting assembly into the headform flesh**

Attach the back plate assembly to the skull casting assembly and fasten with six SHCS M8x1.25 x 30 (Item 4) – as shown in Figure 8.

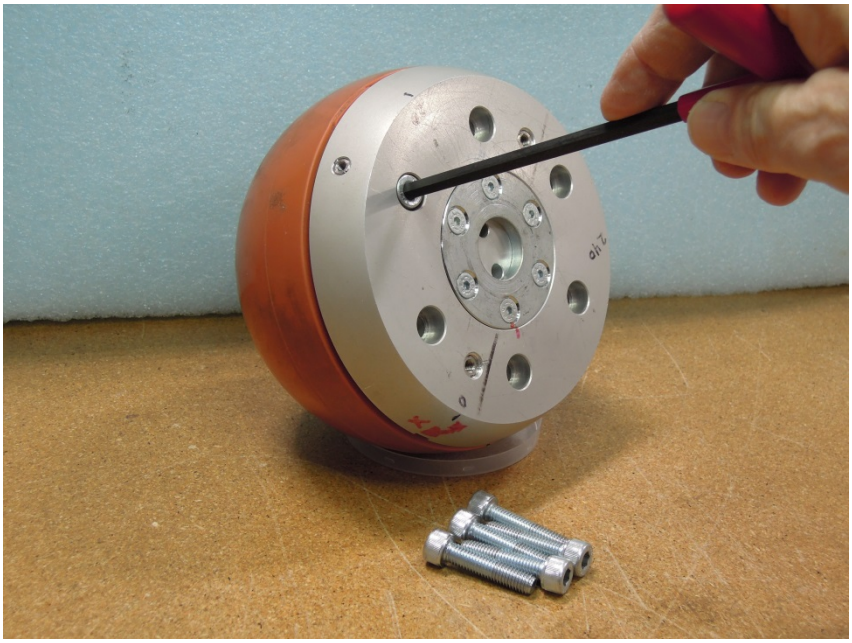

**Figure 8. Attachment of the back plate assembly to the skull casting assembly**

### 5.2. Disassembly

To disassemble the head, reverse the process described in Section 5.1 Assembly.

### 5.3. Inspection

Inspect the head skin for tears or cracks and inspect the skull assembly and back plate for cracks and thread damage. Repair or replace damaged parts.

## 6. External Dimensions

The dimensions for the child pedestrian headform, which are listed in Table 4, are illustrated in Figure 9.

**Table 4. External dimensions of the child headform impactor**

| Dim. | Description | Spec. | Tolerance |
|---|---|---|---|
| A | Overall diameter | 165 mm | ± 1 mm |
| B | Skin thickness | 14 mm | ± 0.5 mm |

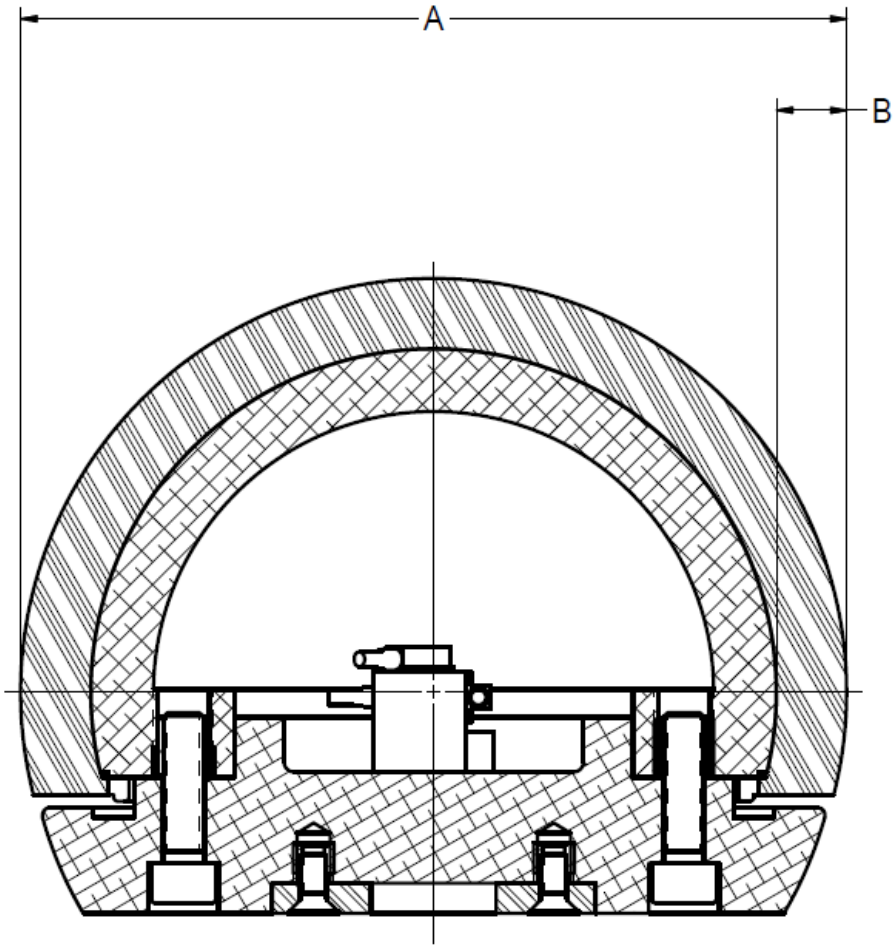


**Figure 9. External dimensions of the child headform**

## 7. Mass Measurements

The mass properties of the child pedestrian headform are listed in Table 5. The moment of inertia about an axis through the center of gravity and perpendicular to the direction of impact shall be within the range of 0.008 to 0.012 kgm$^2$. The center of gravity of the headform impactor including instrumentation shall be located in the geometric center of the sphere with a tolerance of ± 2 mm.

**Table 5. Mass measurements of the child headform impactor**

| Segment | Spec. | Tolerance |
|---|---|---|
| Head Assembly | 3.5 kg | ± 0.07 kg |