## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOCUMENT REVISION HISTORY</td>
<td>3</td>
</tr>
<tr>
<td>SCOPE</td>
<td>4</td>
</tr>
<tr>
<td>PURPOSE</td>
<td>4</td>
</tr>
<tr>
<td>GENERAL DESCRIPTION</td>
<td>4</td>
</tr>
<tr>
<td>BARRIER COMPONENT DIMENSIONS AND SPECIFICATIONS</td>
<td>4</td>
</tr>
<tr>
<td>Main Honeycomb Block</td>
<td>5</td>
</tr>
<tr>
<td>Bumper Honeycomb Block</td>
<td>5</td>
</tr>
<tr>
<td>Sheet Metal</td>
<td>5</td>
</tr>
<tr>
<td>ADHESIVE BONDING PROCEDURE</td>
<td>6</td>
</tr>
<tr>
<td>Bonding Strength Tests</td>
<td>6</td>
</tr>
<tr>
<td>CONSTRUCTION</td>
<td>6</td>
</tr>
<tr>
<td>BARRIER IDENTIFICATION AND MARKING</td>
<td>6</td>
</tr>
<tr>
<td>Barrier Certification</td>
<td>6</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>7</td>
</tr>
<tr>
<td>FIGURES</td>
<td>8</td>
</tr>
</tbody>
</table>
DOCUMENT REVISION HISTORY

Revisions to Version II of this specification compared with Version I:

- Added another type of steel as an acceptable alternative for the Top Cladding (aluminum 5251 H22, in the Sheet Metal section).
- Removed the word "Moving" from the specification's title.
SCOPE

This specification describes the version of the deformable barrier that is used in the Insurance Institute for Highway Safety's (IIHS's) side impact 2.0 crashworthiness evaluations.

For information about the IIHS test cart to which the deformable barrier is attached, visit the Test protocols and technical information section of the IIHS website.

PURPOSE

The design and performance criteria described in this specification are intended to

- provide a measurement tool with sufficient precision to ensure repetitive and correlative results under similar test conditions and
- reflect adequately the protective performance of a motor vehicle or item of motor vehicle equipment with respect to human occupants.

GENERAL DESCRIPTION

The side impact deformable barrier consists of two parts: a Main Honeycomb Block and a Bumper Honeycomb Block.

The Main Honeycomb Block comprises four elements: one Upper, two Rails, and one Middle Bottom.

The Bumper Honeycomb Block comprises three elements: one Middle and two Sides.

An expanded view of the barrier components is shown in Figure 1. Barrier construction and assembly drawings are shown in Figures 2 to 5. All figures are included at the end of this specification.

BARRIER COMPONENT DIMENSIONS AND SPECIFICATIONS

The dimensions of the deformable barrier are illustrated in Figure 2. All dimensions in Figure 2 allow a tolerance of ± 5 mm (where applicable) unless otherwise specified.

Honeycomb crush strengths are measured in accordance with the certification procedure described in U.S. Department of Transportation, NHTSA Lab Test Procedure for FMVSS No. 214, Dynamic Side Impact Protection: Moving Deformable Barrier Test Requirements, TP-214D, Appendix C.*

* For the Upper Element of the IIHS deformable barrier, sample sizes were increased to 250 x 250 mm due to cell size. All other dimensions and tolerances remain as stated in NHTSA TP-214D, Appendix C.
Main Honeycomb Block
The Main Honeycomb Block is manufactured from four elements to exhibit the length, width, and height dimensions shown in Figure 2 and consists of the following:

- **Upper Element**
  
  The Upper Element is manufactured out of aluminum 3003 with nominal specification as follows: cell size of 25.4 mm, density of 20.8 kg/m³, and crush strength of 140 ± 16 kPa.

- **Rail Element**
  
  The two Rail Elements are manufactured out of aluminum 3003 with nominal specification as follows: cell size of 9.5 mm, density of 64.1 kg/m³, and crush strength of 1100 ± 88 kPa.

- **Middle Bottom Element**
  
  The Middle Bottom Element is manufactured out of aluminum 3003 with nominal specification as follows: cell size of 19.1 mm, density of 28.9 kg/m³, and crush strength of 325 ± 26 kPa.

Bumper Honeycomb Block
The Bumper Honeycomb Block is manufactured from three elements to exhibit the length, width, and height dimensions shown in Figure 2 and consists of the following:

- **Bumper Middle Element**

- **Bumper Side Element**
  
  The Bumper Middle Element and two Bumper Side Elements are manufactured out of aluminum 3003 with nominal specification as follows: cell size of 19.1 mm, density of 28.9 kg/m³, and crush strength of 325 ± 26 kPa.

Sheet Metal
All sheet metal dimensions have a ± 1 mm tolerance unless otherwise specified.

- **Base Plate**
  
  The Base Plate (Figure 3) is manufactured out of aluminum 5251 H22 or 5052 H32 (0.8 ± 0.05 mm). If an alternative alloy is used, proof of equivalency must be provided to IIHS.

- **Top Cladding**
  
  The Top Cladding (Figure 4) is manufactured out of aluminum 5251 H24, 5251 H22, or 5052 H32 (0.7 ± 0.04 mm). If an alternative alloy is used, proof of equivalency must be provided to IIHS.

- **Bumper Cladding**
  
  The Bumper Cladding (Figure 5) is manufactured out of aluminum 5251 H22 or 5052 H32 (3.0 ± 0.07 mm). If an alternative alloy is used, proof of equivalency must be provided to IIHS.
ADHESIVE BONDING PROCEDURE

Prior to bonding, all aluminum sheets shall be degreased. The adhesive to be used throughout should be a two-part polyurethane. If an alternative bonding method is used, proof of equivalency must be provided to IIHS.

Bonding Strength Tests

- Flatwise tensile testing is used to measure the bond strength of the adhesive according to ASTM C297/C297M-16, Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions.

- The test pieces should be 100 mm × 100 mm and 15 mm deep, bonded to a sample of the Base Plate material. The honeycomb used should be representative of the Rail Element within the impactor.

- The minimum bonding strength must be 0.6 MPa.

CONSTRUCTION

The Main Honeycomb Block is adhesively bonded to the Base Plate. The Base Plate extends beyond the height of the Main Honeycomb Block equally at the bottom and top, providing mounting flanges (Figure 3). The Top Cladding is adhesively bonded to the Main Honeycomb Block.

The three elements from the Bumper Honeycomb Block are adhesively bonded to the Bumper Cladding and the Top Cladding 50 mm from the bottom face.

The adhesive shall only be applied to the Cladding and Base Plate surfaces during bonding.

A maximum of 0.5 kg/m² of adhesive must be applied evenly over the surface, giving a maximum film thickness of 0.5 mm.

Care should be taken to ensure that adhesive does not run into the honeycomb cells, which causes an increase in the crush strength of the honeycomb.

BARRIER IDENTIFICATION AND MARKING

Each barrier shall carry a serial number that is stamped, etched, or otherwise permanently attached, from which the manufacturing details and version can be established.

Barrier Certification

Each barrier must have (included in its shipping container or in electronic format) a certification package available that provides information according to U.S. Department of Transportation, NHTSA Lab Test Procedure for FMVSS No. 214, Dynamic Side Impact Protection: Moving Deformable Barrier Test Requirements, TP-214D, Appendix C.
REFERENCES


FIGURES

Figure 1. Exploded View of the IIHS Deformable Barrier
Figure 2. General Assembly of the Main and Bumper Honeycomb Blocks

Note 1: All dimensions and tolerances are for honeycomb only.
Note 2: All honeycomb elements have the same ribbon orientation.

Note 3: All dimensions are shown in millimeters.
Figure 3. Base Plate and Mounting Flanges

Note: All dimensions are shown in millimeters.
Figure 4. Top Cladding

Note: All dimensions are shown in millimeters.
Figure 5. Bumper Cladding

Note: All dimensions are shown in millimeters.