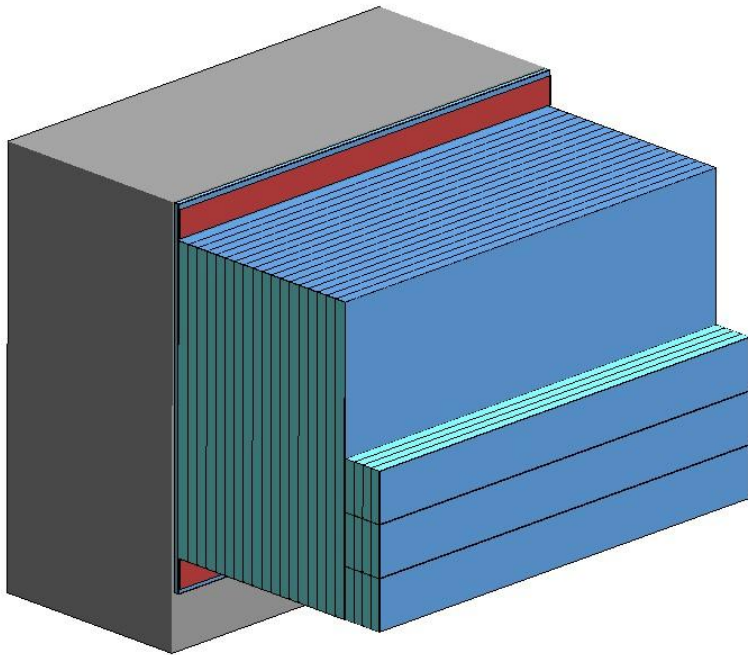


# European (EEVC) Offset Deformable Barrier (ODB) Model Version 1.1



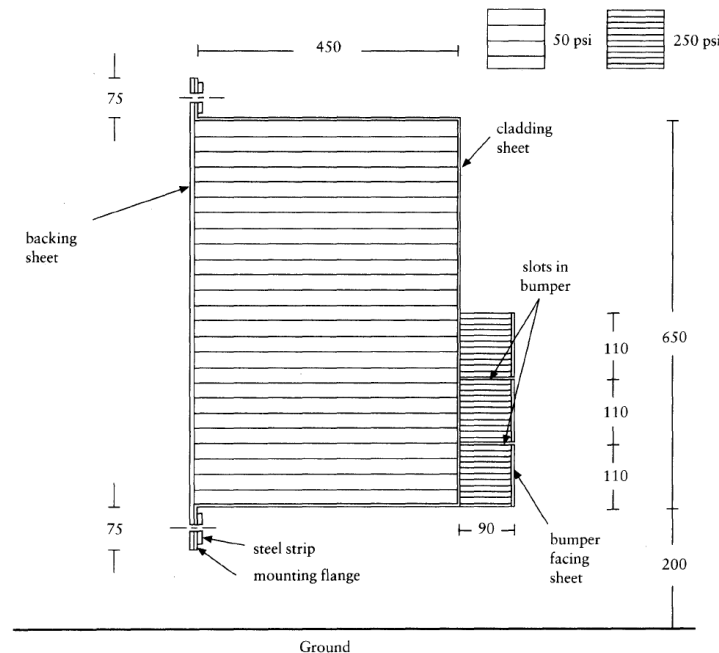
## User Manual

May 2009

The specification used for the deformable frontal impact barrier in this documentation has been taken ECE R94 Revision 1 - Frontal Impact Protection dated May 2007

### Barrier Characteristics

- The impactor consists of two different sized aluminium honeycomb blocks partially covered in aluminium sheets
- The main aluminium block should be 1000 mm wide, 650 mm high and 450 mm deep.
- The second 'bumper' block should be 1000 mm wide, 330 mm high and 90 mm deep.
- The ground clearance should be 200 mm.



### Material Characteristics

- The main honeycomb block should have a crush strength of 0.342 N/mm<sup>2</sup> (50 psi) +0 -10%.
- The bumper honeycomb block should have a crush strength of 1.71 N/mm<sup>2</sup> (250 psi) +0 -10%.

### Calibration Procedure

- No calibration test is specified for the deformable frontal impact barrier as its crush performance is characterised by its material properties.

### Model Description

- The units of the model are Newtons, Tonnes, seconds and millimeters. Versions of the model in other unit systems are available on request.
- The Barrier is oriented in standard vehicle coordinates, with the z-axis pointing upwards and the x-axis pointing forward, towards the vehicle.
- The barrier will need to be translated so that it is correctly positioned relative to the vehicle.
- The model mesh is shown in fig 1.1.

### Control Parameters

There is one Control Cards defined in the barrier model.

- Control Timestep - This control card has been added to the model to specify the mass scaling option and is set to the value we used in the barrier correlation.

### Contact Surfaces

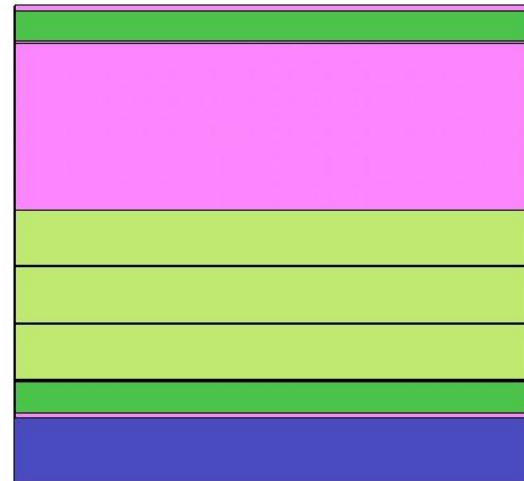
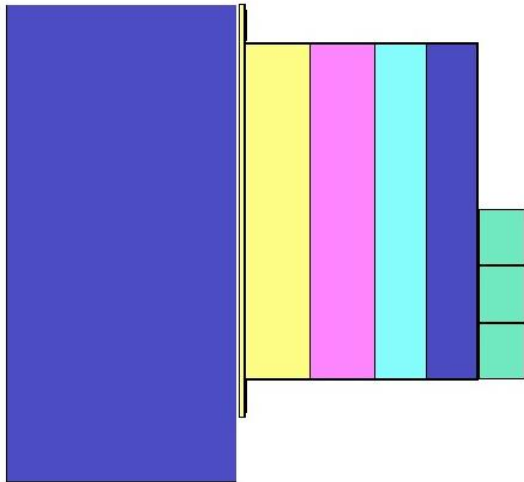
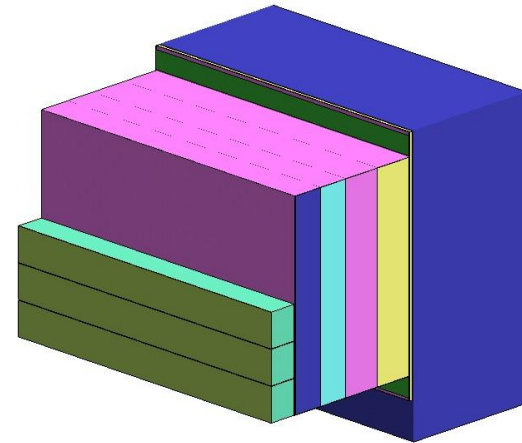
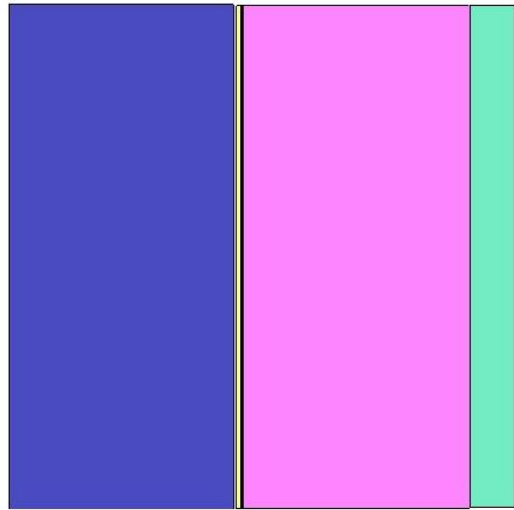
There are nine contact definitions in the barrier model:

- The first eight are internal contacts that relate to the barrier model.
- The ninth contact is an automatic surface-surface contact for setting up the contact with the vehicle. A part set with an id of 3 will need to be created containing the parts for the vehicle side of this contact.

### Instrumentation

There is a Database Cross Sections set up along the back face of the barrier to record the barrier force.

Figure 1.1 – ODB barrier model



### List of parts

The following parts were used in this model:

Part Number	Part Description
100	Bumper Plate
101	Bumper Honeycomb
102	Adhesive - Bumper Core to Bumper Plate
103	Adhesive - Bumper to Cladding
104	Bumper Null Shells
105	Bumper Internal Null
200	Cladding
203	Adhesive - Cladding to Backplate
204	Adhesive - Core to Backplate
205	Adhesive - Cladding to Core
206	Core Null Shells
207	Core Internal Null
211	Core Honeycomb P1
212	Core Honeycomb P2
213	Core Honeycomb P3
214	Core Honeycomb P4

Part Number	Part Description
300	BackPlate
301	Mounting Strip
302	Concrete Base (Centre)
304	Concrete Base (Side)
305	Loadcell

### Model Size

The number of elements in the model is as follows:

Element Type	Number
Deformable solids	23520
Deformable shells	13920
Total deformable elements	37440
Null shells	23660
Rigid shells	2515

### Adhesive Material Card

In LS-DYNA version 970 5434a and earlier the option to add a title to \*MAT\_ARUP\_ADHESIVE was unavailable. As such the barrier model may need to be modified to remove the titles from this material card. The following example show how the barrier model needs to be changed.

#### LS-DYNA version 970 6763 and later

```
*MAT_ARUP_ADHESIVE_TITLE
Main Core - Plate Adhesive
      4      1.0E-9      900.0      0.0      0.8      0.1      0.0      0.0
      2.0      2.0      0.0      0.0      0.0      0.0      0      0.0
```

#### LS-DYNA version 970 5434a and earlier

```
*MAT_ARUP_ADHESIVE
      4      1.0E-9      900.0      0.0      0.8      0.1      0.0      0.0
      2.0      2.0      0.0      0.0      0.0      0.0      0      0.0
```

# Version Data

## EEVC Offset Deformable Barrier Model

Model Version	Date	Modifications	Created by	Approved by
1.0	Aug 2007	New Model	I Bruce <i>Ian B.</i>	B Walker <i>BWalker</i>
1.1	May 2009	Extra failure added to adhesive material to help prevent negative volume problems	I Bruce <i>Ian B.</i>	B Walker <i>BWalker</i>

The Offset Deformable Barrier model is developed by Cellbond Composites in association with Arup.



[www.cellbond.com](http://www.cellbond.com)



[www.arup.com](http://www.arup.com)

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