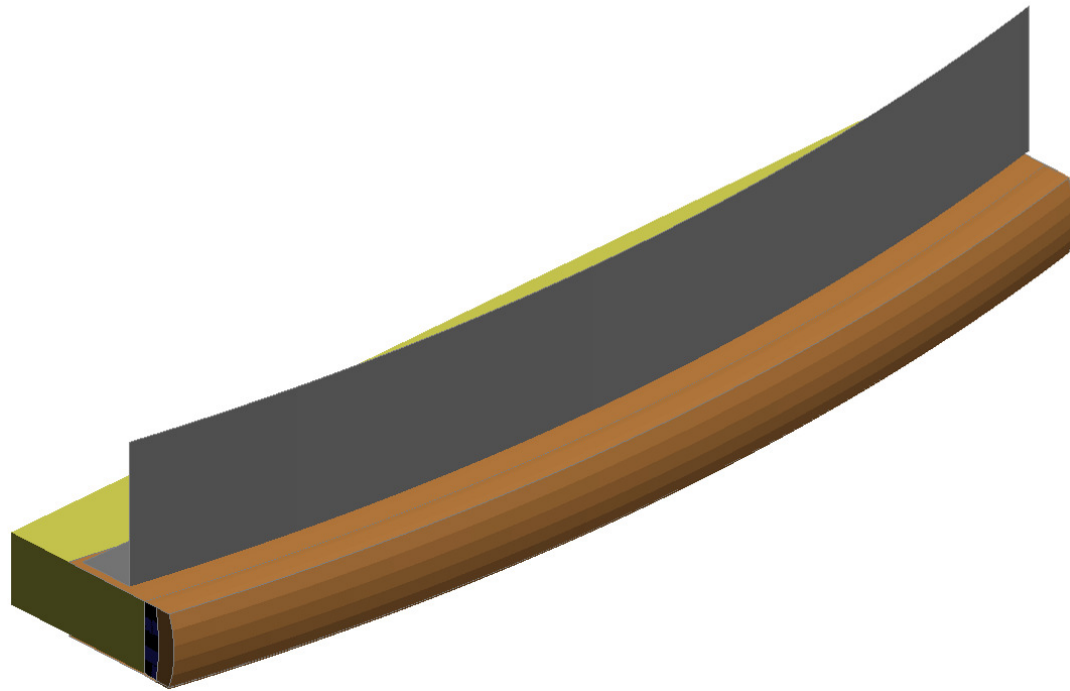


Research Council for Automobile Repairs (RCAR)
Bumper Barrier Model
Version 1.0



User Manual

November 2008

The specification used for the bumper barrier in this documentation has been taken from the [RCAR Bumper Barrier Dimensions and Specification - Appendix 1](#)

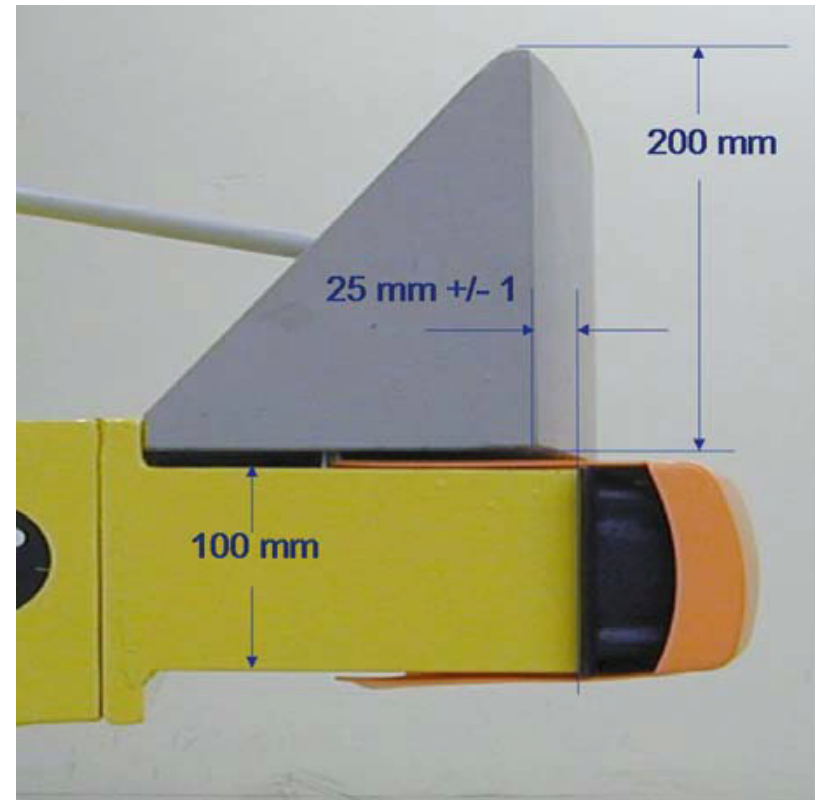
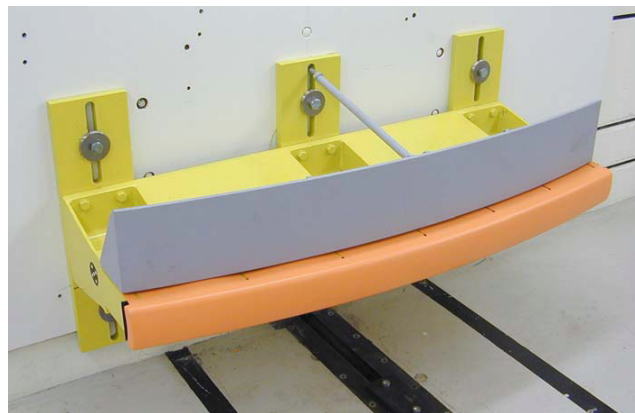
Barrier Characteristics

- The barrier consists of two different sized rigid steel components, with an energy absorbing element mounted on the front, and a plastic cover on top of the energy absorber.
- The front face of the yellow steel barrier is 1500mm wide by 100mm tall, and a radius of 3400mm across its full width.
- The energy absorber can be aluminium honeycomb, aluminium egg-crate or thermo-plastic material. It does not have to be one-piece, as long as the dimensions, crush strength, surface hardness and coefficient of friction are within specified ranges.
- The energy absorber shall be as long as the bumper face, 50mm deep, and curved along its length to a radius of 3400mm to allow for mounting onto the barrier face. It has a 150mm top-to-bottom radius.
- The ground clearance should be 405 or 455 mm to the bottom edge of the bumper barrier, dependent on the test vehicle's target market.

General Information

RCAR Bumper Barrier Model

The specification used for the bumper barrier in this documentation has been taken from the [RCAR Bumper Barrier Dimensions and Specification - Appendix 1](#)



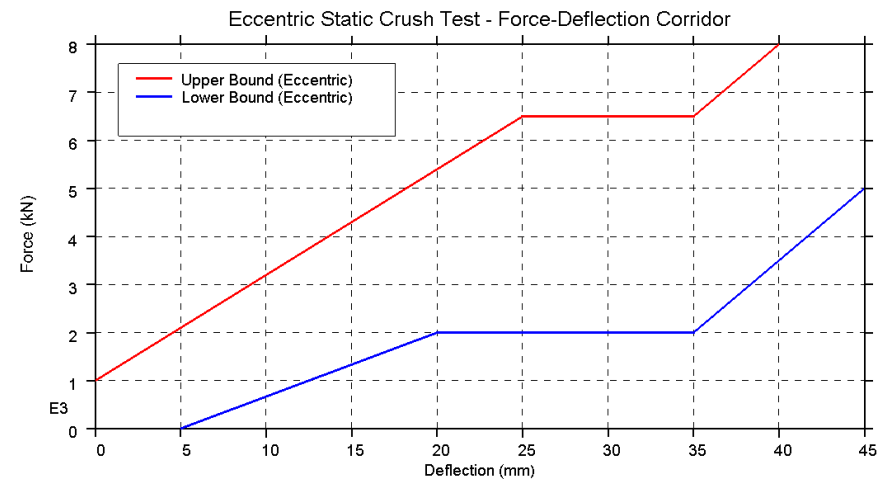
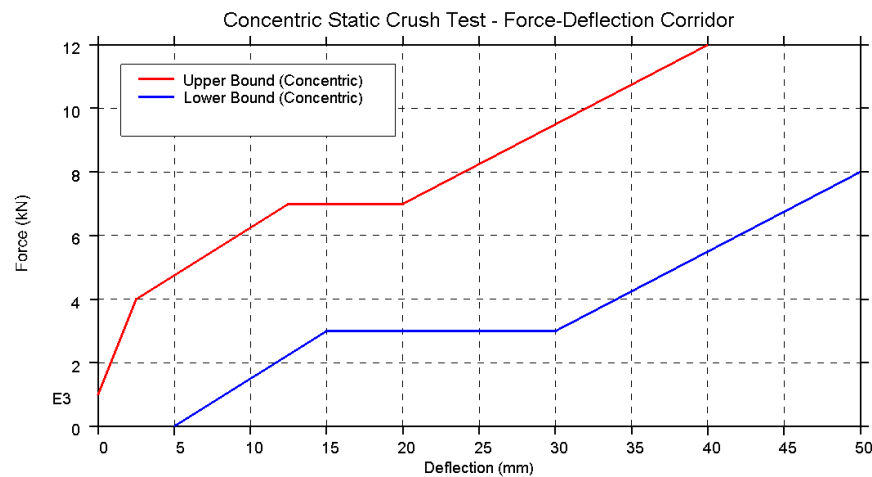
Material Characteristics

Material Properties – Impact Surface

- The impact surface of the energy absorber should have a hardness value between 30 and 150 Bhn and have a dynamic coefficient of friction between 0.25 and 0.5.

Calibration Procedure

- Two static crush tests are carried out on samples of the bumper barrier –
 - Test A is perpendicular to the barrier and covers the whole height of the bumper
 - Test B is offset eccentrically below the centreline, and covers 50mm of the bumper
- Barrier behaviour must lie within the force deflection corridors as shown below:



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 to the back of the barrier, the same direction as the front of 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 Card 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 five contact definitions in the barrier model:

- The first four are internal contacts that relate to the barrier model.
- The fifth contact (#100) 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.

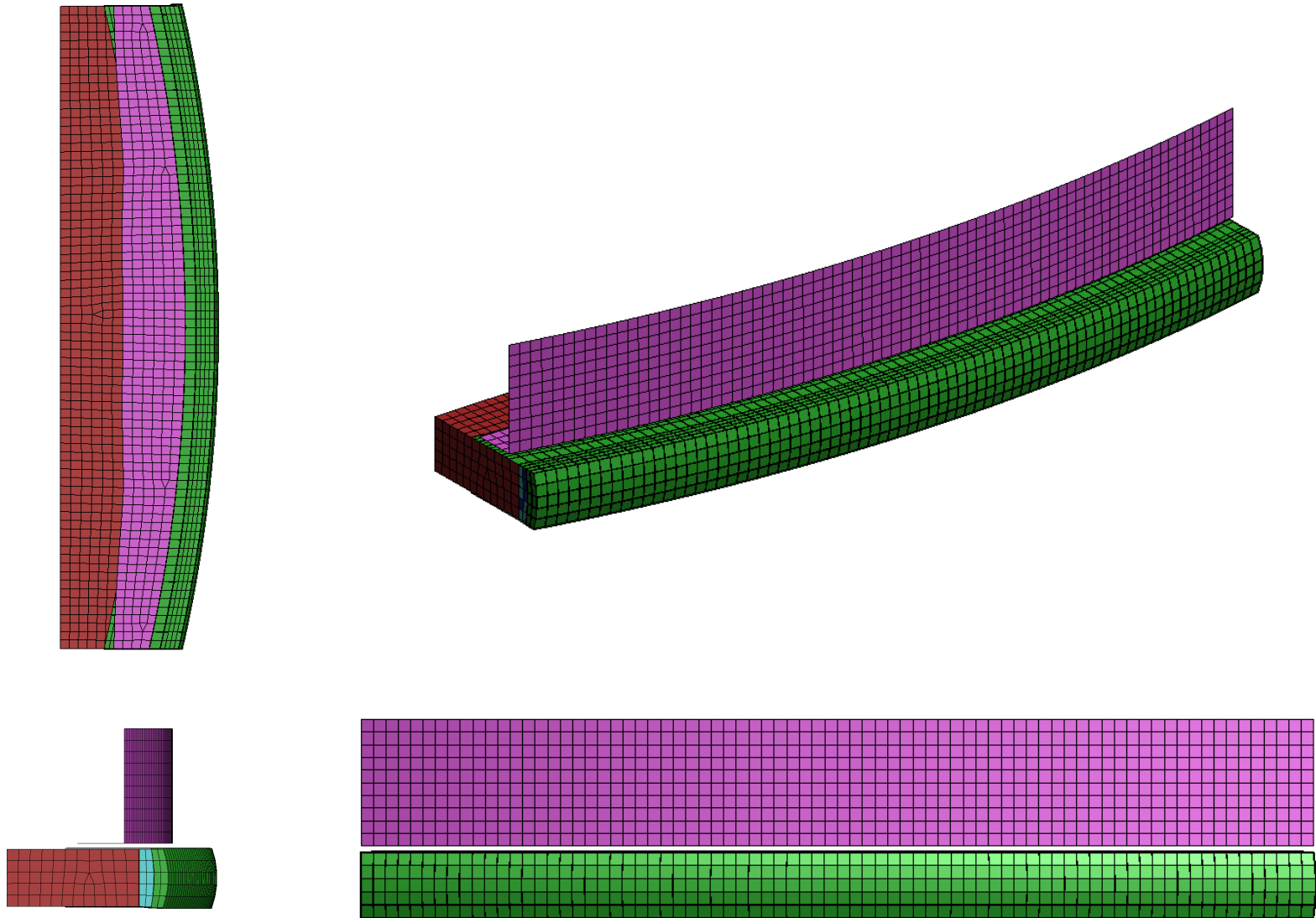
List of parts, Model Size

The following parts were used in this model, and the number of elements is also shown:

Part Number	Part Description	Element Type	Number
1	Rigid Barrier	Rigid shells	2833
2	Plastic Cover	Deformable shells	2680
3	Deformable Foam	Deformable solids	1520
4	Null Shells on Foam	Null shells	1408
5	Rigid Backstop	Rigid shells	1174
Total deformable elements			4200
Total rigid shells			4007

Figure 1.1 – RCAR bumper barrier model

RCAR Bumper Barrier Model



This Bumper Barrier finite element model was developed by Arup.



www.arup.com

For more information on the model please contact the following:

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