manual 8 deformable barriers

impact design europe

The fastest way in Pre Design

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DEFORMABLE BARRIERS AVAILABLE IN VCS

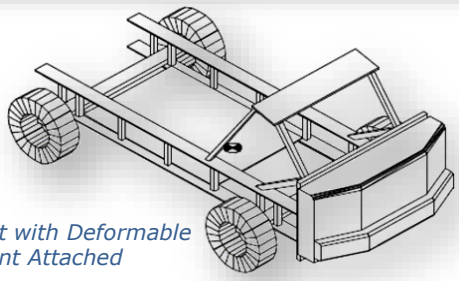
Visual Crash Studio offers two types of pre-defined deformable barriers.

IIHS MDB and ODB are created in reference to the regulations presented below:

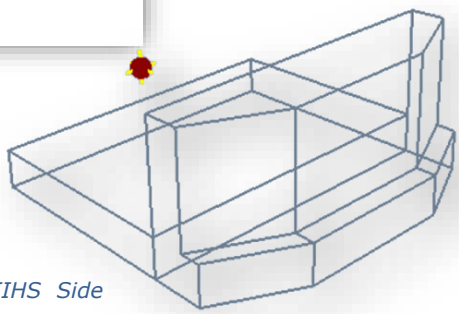
Side Impact Test Protocol - reference

IIHS MDB Properties

The MDB consists of an IIHS deformable aluminum barrier (version 4) and the cart to which it is attached. The crash cart is similar to the one used in Federal Motor Vehicle Safety Standard (FMVSS) 214 side impact testing but has several modifications (Figure 2). The wheels on the cart are aligned with the longitudinal axis of the cart (0 degrees) to allow for perpendicular impact. The front aluminum mounting plate has been raised 100 mm higher off the ground and has been extended 200 mm taller than a standard FMVSS 214 cart to accommodate the IIHS deformable barrier element (making the mounting plate top surface 300 mm higher from the ground than the FMVSS 214 barrier). Steel plates are added as necessary to increase the mass of the cart. The MDB test weight is 1,500 ± 5 kg with the deformable element, test instrumentation, camera, and camera mount. The MDB center of gravity in the fully equipped test condition is 990 ± 25 mm rearward of the front axle, 0 ± 25 mm from the lateral centerline, and 566 ± 25 mm from the ground. The MDB roll (I_X), pitch (I_Y), and yaw (I_Z) moments of inertia are 542 kg-m^2, 2,471 kg-m^2, and 2,757 kg-m^2, respectively.



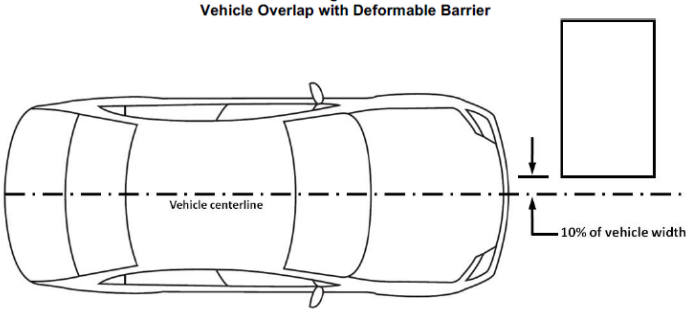
IIHS Test Cart with Deformable Barrier Element Attached

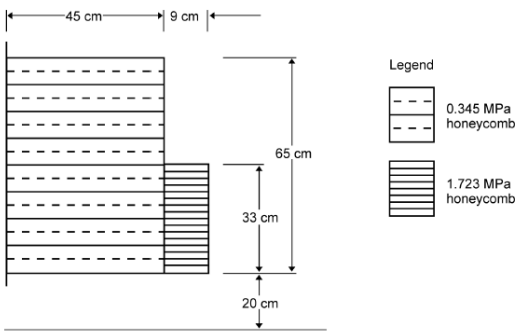


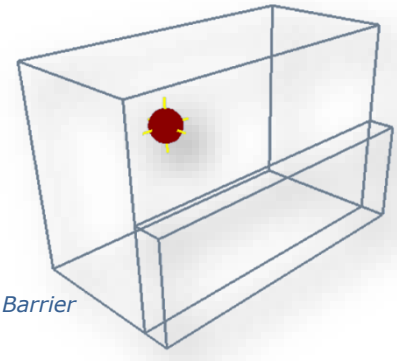
VCS model of an IIHS Side Impact Barrier

ODB Barrier Test Specification

Figure 1
Vehicle Overlap with Deformable Barrier







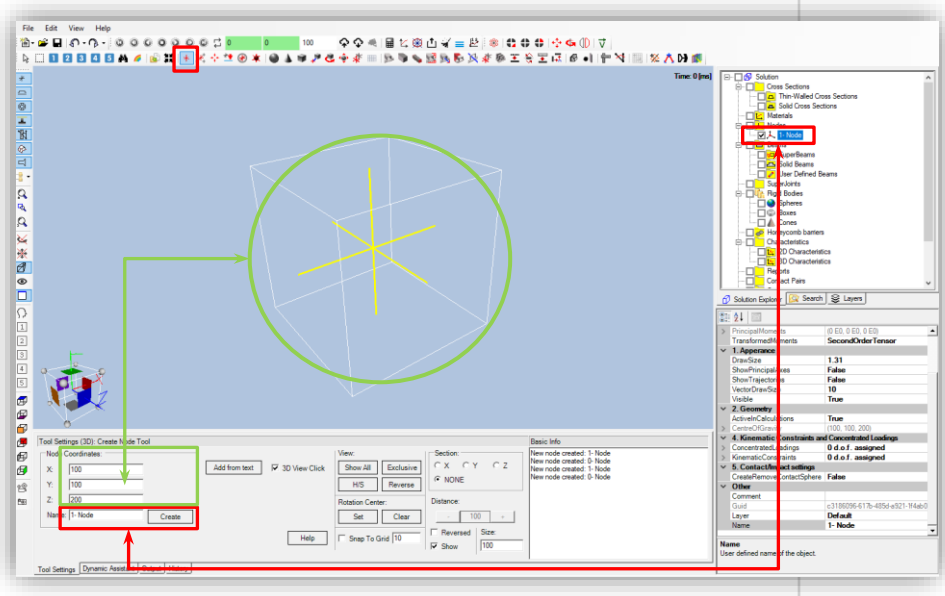
VCS model of an ODB Barrier

CREATE DEFORMABLE BARRIER

A Deformable Barrier is defined on a single Node present in a VCS Solution.
In consequence, in order to create a deformable barrier, the user needs to create a Node first. Afterwards the user should select the "Create Barrier" tool from the VCS main toolbar and select one of the given barrier types.

Step 1: "Create Node" tool

The „Create Node" tool can be found in the VCS main toolbar. The basic Node creation procedure is given below:



1) Select the "Create Node" tool from VCS main toolbar.

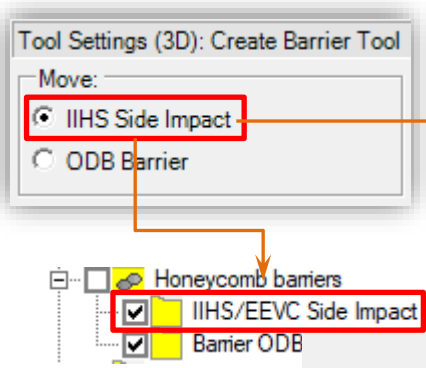
2) In the "Tool Settings" window you can set the coordinates of newly created Nodes.

3) You can also easily name each Node you have created.
The name of the new Node will be automatically added to the list of nodes in the Solution Explorer window.

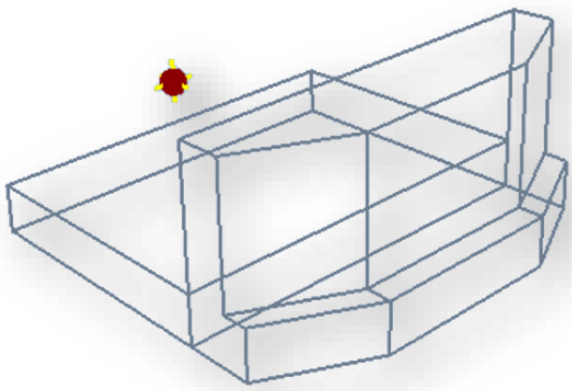
Step 2: "Create Barrier" tool

Visual Crash Studio offers two types of pre-defined deformable barriers.
A Deformable Barrier is defined on a single Node after selecting the "Create Barrier" tool from the VCS main toolbar and clicking on the required Node in the Solution's 3D view.

1) IIHS Side Impact barrier



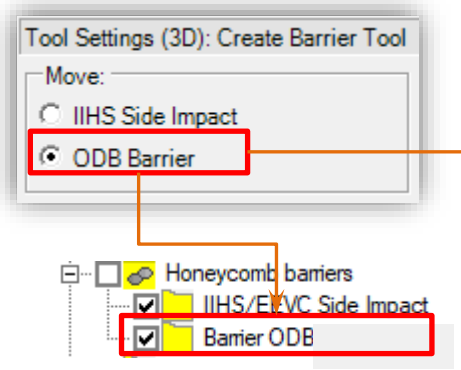
In the Tool Settings window the user can specify what type of barrier is to be created.
First deformable barrier type available in VCS is the IIHS Side Impact barrier.



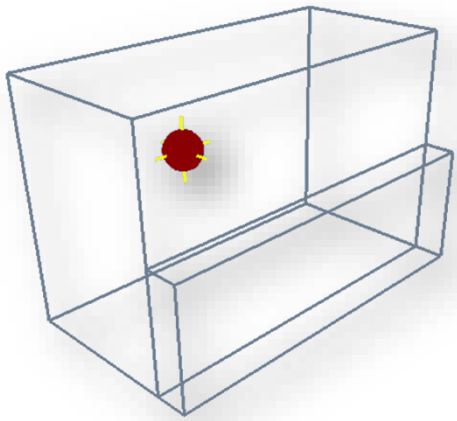
New barrier is automatically displyed in the 3D view and added to the Solution Explorer window

CREATE DEFORMABLE BARRIER TOOL

2) ODB barrier



In the Tool Settings window the user can specify what type of barrier is to be created.
Second deformable barrier type available in VCS is the ODB barrier.



New barrier is automatically displyed in the 3D view and added to the Solution Explorer window

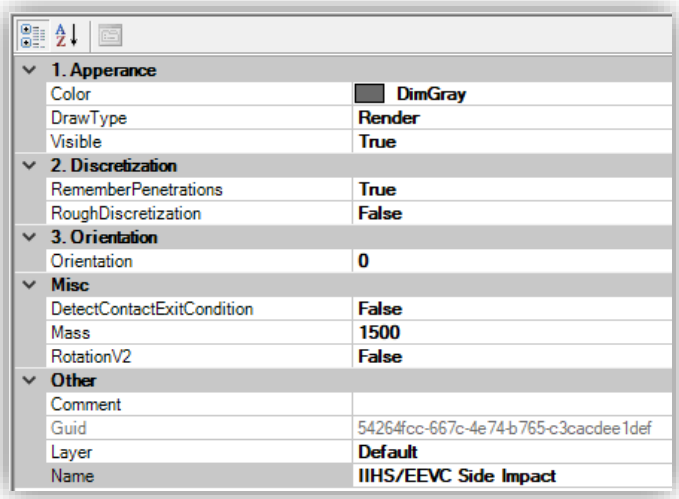
DEFORMABLE BARRIER - PROPERTIES

In the deformable barrier's Properties window you can set the details of object's appearance (color, visibility).

In the "Orientation" section you can define barriers position in the 3D space by indicating the degrees of rotation around the Z axis.

Please note that the mass of a deformable barrier is set by default and cannot be changed by the user.

Velocity of the barriers should by defined in the "Kinematic Constraints" section of the Nodes Properties window.

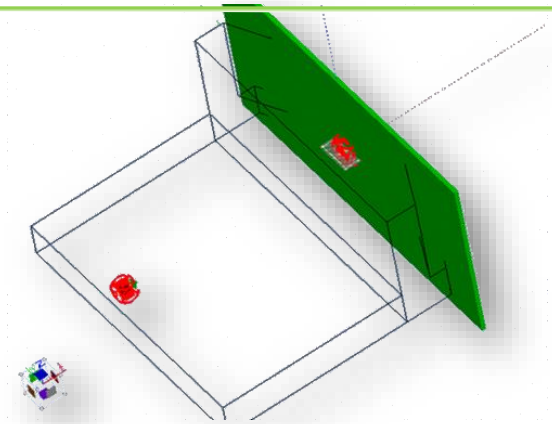


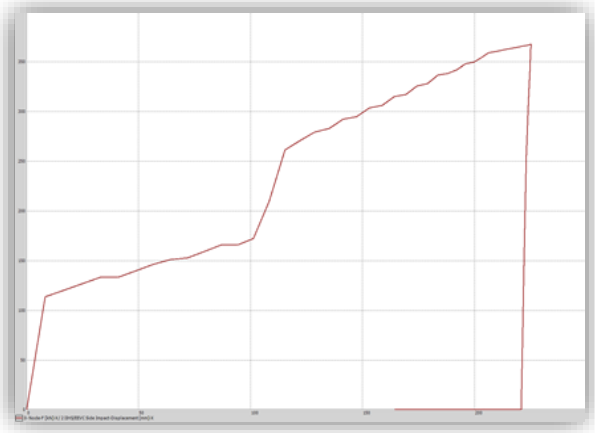
1. Apperance	
Color	DimGray
DrawType	Render
Visible	True
2. Discretization	
RememberPenetrations	True
RoughDiscretization	False
3. Orientation	
Orientation	0
Misc	
DetectContactExitCondition	False
Mass	1500
RotationV2	False
Other	
Comment	
Guid	54264fcc-667c-4e74-b765-c3cacdee1def
Layer	Default
Name	IIHS/EEVC Side Impact

IIHS MDB - BASIC TESTS

IIHS MDB – rigid wall impact test in VCS

The procedure of contact calculation is adjusted for sequential detection of multiple objects (rigid bodies/super beams) excluding full lap of single object.

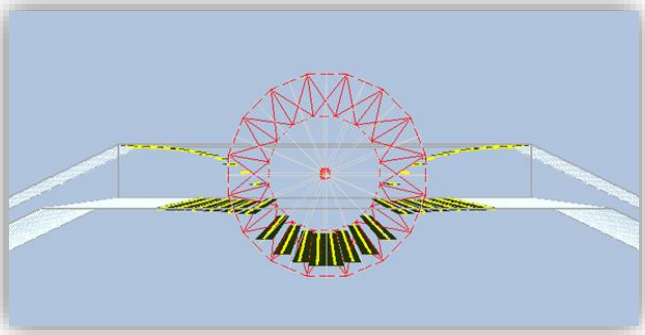


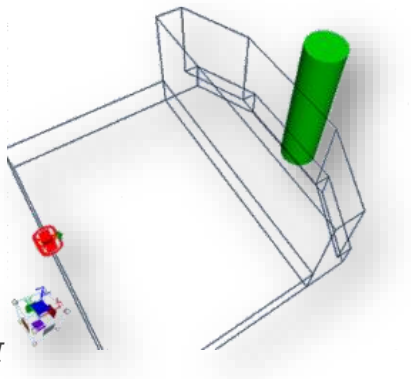


VCS model of IIHS MDB

Barrier Force X [kN] vs Displacement Barrier X [mm]

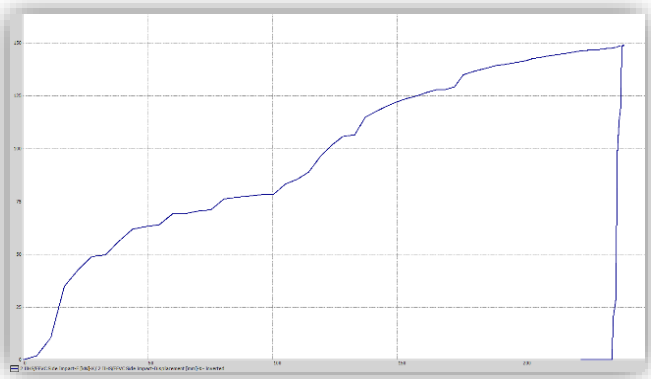
IIHS MDB – rigid cone impact test in VCS





Behind the GUI

The barrier strikes the body. Deformed cells (cells in direct contact with obstacle) affect neighbor cells.



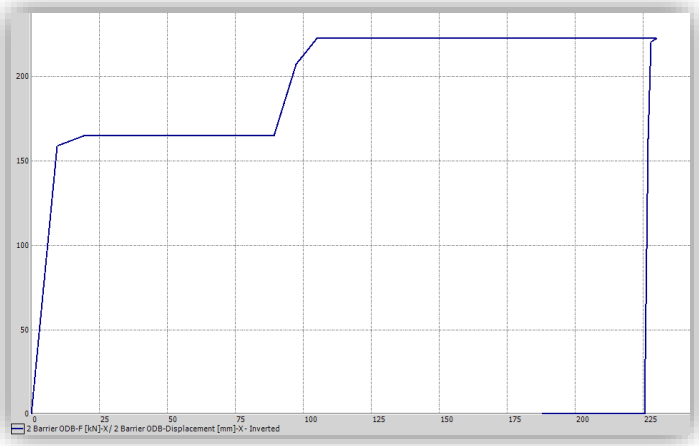
VCS model of IIHS MDB

Barrier Force X [kN] vs Displacement Barrier X [mm]

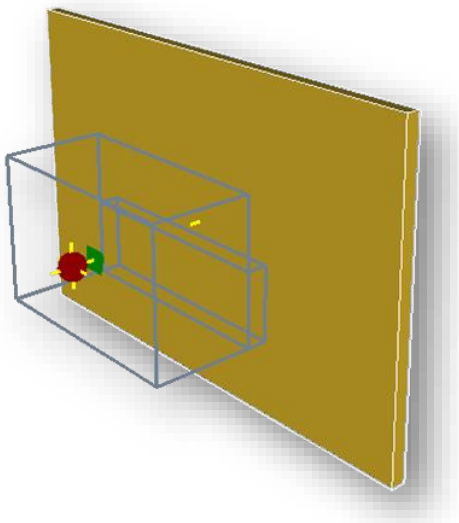
ODB - BASIC TESTS

ODB – rigid wall impact test in VCS

The procedure of contact calculation is adjusted for sequential detection of multiple objects (rigid bodies/super beams) excluding full lap of single object.

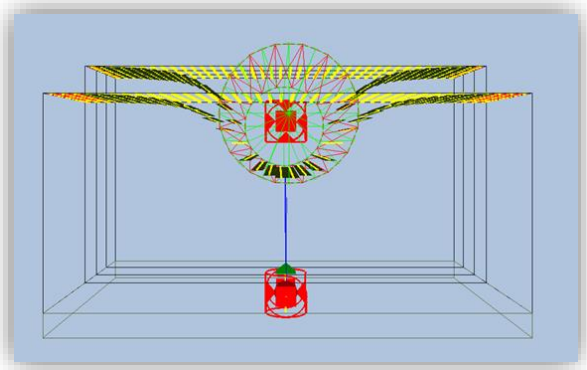


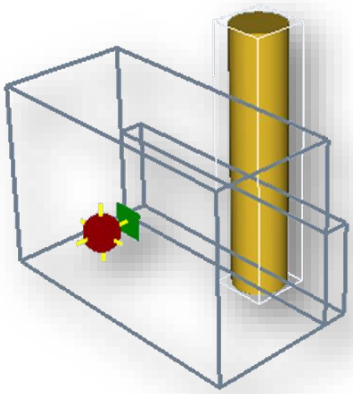
Barrier Force X [kN] vs Displacement Barrier X [mm]



VCS model of IIHS MDB

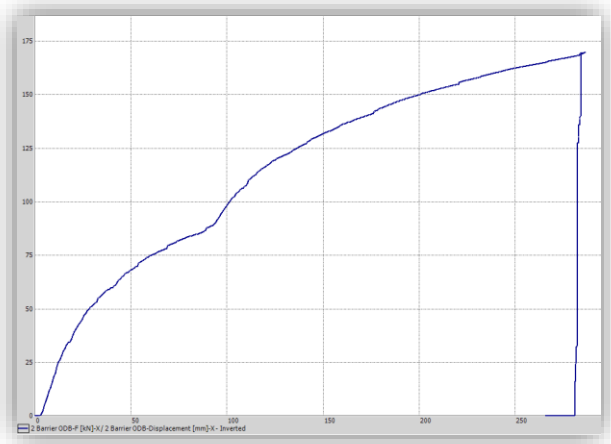
ODB – rigid cone impact test in VCS





Behind the GUI

The barrier strikes the body. Deformed cells (cells in direct contact with obstacle) affect neighbor cells.



VCS model of IIHS MDB

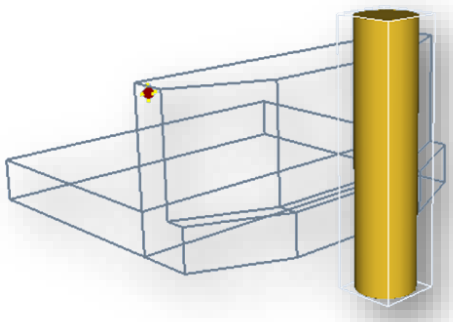
Barrier Force X [kN] vs Displacement Barrier X [mm]

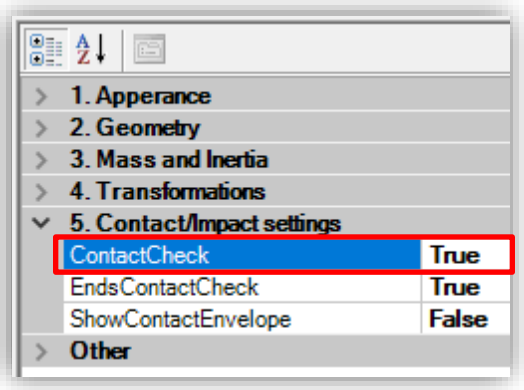
DEFORMABLE BARRIERS - CONTACT SETTINGS

Contact definition between the deformable barrier and an object of the VCS Solution is done in a specific procedure which does not include creation of contact bodies or contact pairs .
The User need to indicate the set of objects that are to be in contact with a deformable barrier and afterwards set appropriate sections in object's Properties window.
VCS deformable barriers automatically detect contact with all objects which have the Contact Check" flag set to "True"

Contact with Rigid Bodies

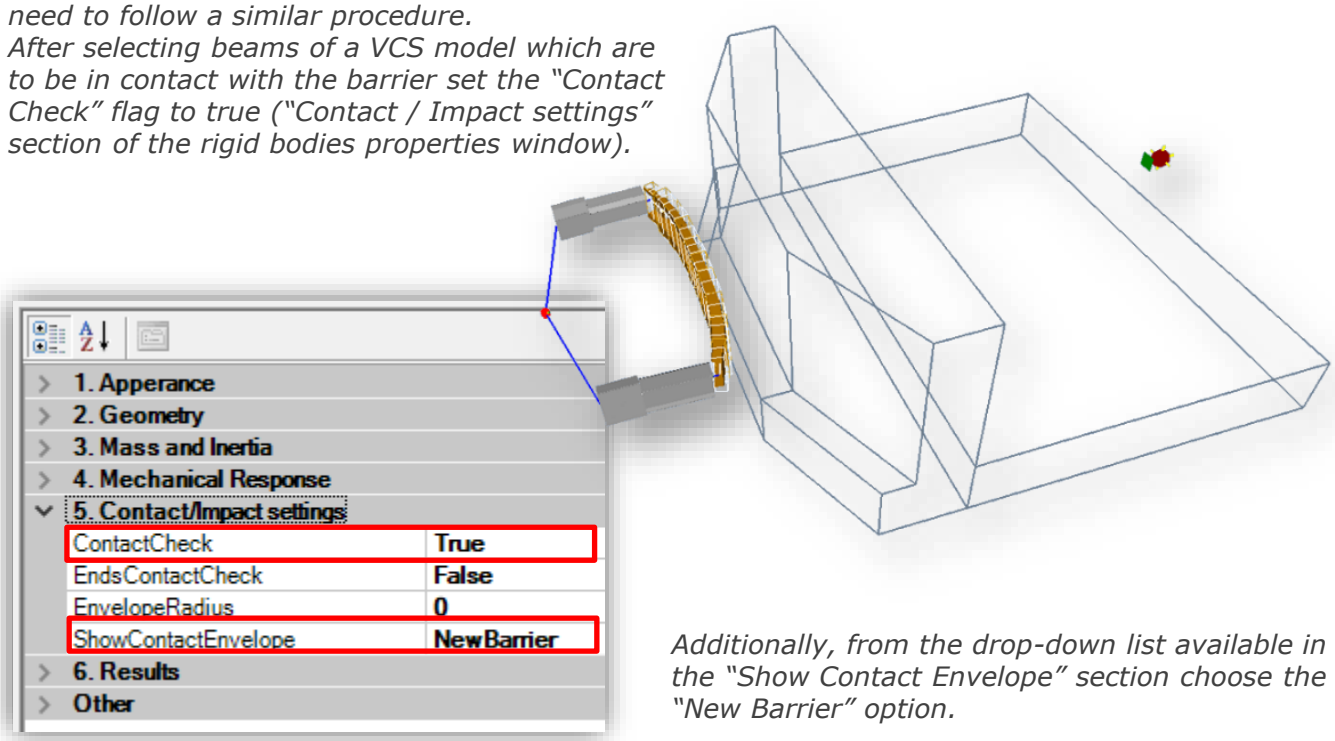
In case of rigid bodies set the "Contact Check" flag to true ("Contact / Impact settings" section of the rigid bodies properties window).





Contact with Super Beams

In case of defining contact with super beams you need to follow a similar procedure.
After selecting beams of a VCS model which are to be in contact with the barrier set the "Contact Check" flag to true ("Contact / Impact settings" section of the rigid bodies properties window).



Additionally, from the drop-down list available in the "Show Contact Envelope" section choose the "New Barrier" option.