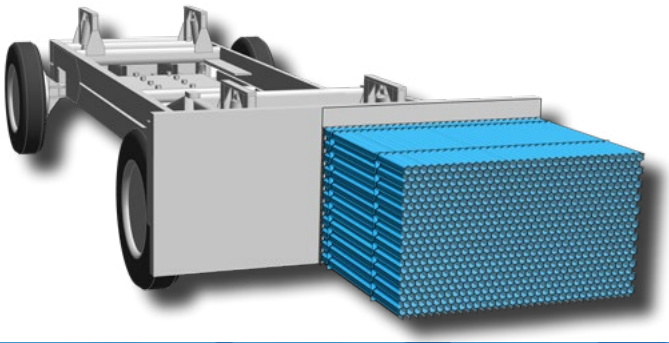
Arup Cellbond Barrier Models

Working in collaboration, Arup and Cellbond have developed a range of LS-DYNA finite element models based on the aluminium honeycomb barriers produced by Cellbond.



MPDB

Mobile Offset Progressive Deformable Barrier
LS-DYNA Shell model for frontal impact

This model has been developed to take advantage of the latest developments in the LS-DYNA code and is designed to provide robust and efficient analysis.

- Used for frontal impact testing.
- Introduced in 2020 by ANCAP, C-NCAP, EuroNCAP and JNCAP.
- Unique REPORTER template that fully automates the post-processing of the LS-DYNA analysis results according to Euro and China NCAP assessments is available in the Oasys REPORTER Automotive library.
- Model calibration and validation processes go beyond the barrier specification tests: the model is correlated to additional dynamic tests at component and full barrier levels, including full speed real vehicle tests.

ARUP

CELLBOND

MPDB

Mobile Offset Progressive Deformable Barrier LS-DYNA Shell model for frontal impact

The specifications used for the development of the Mobile Offset Progressive Deformable frontal impact barrier (MPDB) described in this document have been taken from 'Euro NCAP Mobile Progressive Deformable Barrier Face Specification' Draft Version 1.0, 23 October 2017, TB 022.

The MPDB barrier is used in the 2020 European New Car Assessment Programme (EuroNCAP) in their Frontal Impact Testing Protocol.

Specifications

Element Type	LS-DYNA Release Version	Total Number of Elements	Timestep	Regulation Test	Regulation Speed
Shell	LS-DYNA 971 R9.3.0 SMP/MPP	1221651	0.9E-6	EuroNCAP 2020 Frontal Impact Test	Target: 50kph for vehicle and trolley

Validation

The LS-DYNA model calibration has been done using the test results provided by Cellbond for four different impact conditions. The tests involve the barrier on a trolley impacting a vertical impactor, a quarter wall, a rounded impactor and an tubular impactor (specified by Euro NCAP).The force-deflection curves for the barrier (generated from analyses and tests) have been compared. Additionally, material testing has also been performed to define the material models for the different parts of the barrier.

This validation work has been carried out in both SMP and MPP versions of LS-DYNA R9.3.0 to ensure the performance and accuracy.

Oasys D3PLOT and REPORTER Tools

The MPDB LS-DYNA model comes with an Oasys D3PLOT post-processing tool and Oasys REPORTER template which fully automate the post-processing of results and the calculation of the Euro NCAP compatibility modifier. These tools can be readily integrated with the official EuroNCAP compatibility assessment spreadsheet for this regulation.

The REPORTER template is easy to use and provides test-specific relevant information: compatibility penalty, barrier intrusion plot, scoring rationale, OLC calculation details and deformed screenshots among its many features.