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.



IIHS Spec 2.0

Insurance Institute for Highway Safety LS-DYNA Shell model for side impact

Introduced for the 2023 IIHS test program update, replacing the previous IIHS Side Impact Barrier to better represent the frontend shape of current real-life vehicles.

- Used for side impact testing.
- Model developed to take advantage of the latest tools in the LS-DYNA code and designed to provide robust and efficient analysis.
- Calibration and validation processes for the LS-DYNA model 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.





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Upgraded Test Protocol

The specifications used for the development of the IIHS Side Impact Moving Deformable (MDB) Barrier 2.0 Specification described here have been taken from 'Side Impact Crashworthiness Evaluation Moving Deformable Barrier 2.0 Specification', Version 1, October 2020.

This moving barrier replaces the previous IIHS Side Impact Barrier developed back in 2000-2001. IIHS is now upgrading their <u>side impact test protocol</u> to include an updated deformable barrier (Specification 2.0) and a test setup that continues to reflect changes in vehicle types and accidents.

This new Specification 2.0 barrier has been redesigned to better represent the front-end shape of certain types of vehicles, SUVs and Pick-ups and is being introduced to make the barrier to vehicle tests more representative of real-life vehicle impacts. Planned introduction for the new test protocol is 2022.

Validation

The LS-DYNA model calibration has been done using the test data provided by Cellbond for three different impact conditions. The tests involve the barrier on a trolley impacting a vertical impactor, offset vertical impactor and a flat wall. 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. The barrier model has also been tested against a full vehicle model to calibrate its behaviour under regulation conditions. This validation work has been carried out in both SMP and MPP versions of LS-DYNA R12.0.0 to ensure performance and accuracy.

Specifications

Element Type	LS-DYNA Release Version	Total Number of Elements	Timestep	Regulation Test	Regulation Speed
Shell	LS-DYNA 971 R12.0.0 SMP/MPP	1239920	1.0E-6	IIHS Side Impact Tests	60kph



