

Evaluation of ES-2re dummy FE model under side impact sled tests with side airbag condition

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Abstract

The ES-2re dummy is used in the FMVSS No.214 for side impact test and finite element (FE) model of ES-2re dummy has been developed and widely used for evaluating the effects of countermeasures for side impact crashes. An anthropometric device should be validated across the various loading conditions, and result in similar interaction forces between vehicle compartment or restraint systems and kinematics due to the interactions. This study evaluated the validity of ES-2re dummy FE model under the side impact sled tests with respect to an actual ES-2re dummy. The side impact sled test was conducted at a velocity of 4.3m/s using ES-2re dummy. The impacting wall with 100mm pelvic offset had a same fixture as Lessley's et al. and consisted of an adjustable matrix of 15 individual plates, each supported by a load cell. Also a custom large volume, dual inflator side airbag was deployed in the sled test. Interacting forces between the dummy and the moving wall were measured by using the load cells attached to the wall. Dummy instrumentation included accelerometers, load cells, and linear displacement transducers in multiple locations of the dummy. The responses of ES-2re dummy FE model were compared to those observed in the test of ES-2re dummy. Wall reaction forces, accelerations of dummy, loads of inside of the dummy and chest deflection. The FE dummy model showed the good correlation with the actual dummy in terms of interaction forces and kinematics of dummy. This study implies that the validity of usage of the ES-2re FE model to reduce the number of actual tests by using a hardware dummy model.