

Abstract

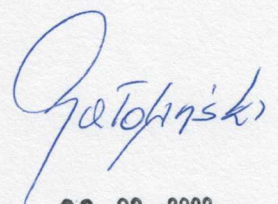
The main aim of the study was to demonstrate the impact of the repair technology of the car's longitudinal member made of DP steel on the gas cushion activation and its interaction with the moving phantom head during a frontal collision. A characteristic feature of this work is an attempt to present the problem in a broader way than that proposed so far. Taking into account the drop in body stiffness in the crash test conditions, the operation of the safety devices of the passive vehicle and their interaction with the movement of the phantom.

In the course of experimental tests, based on the stringer model made of DP 1000 steel, a decrease of 25% in its compressive strength was demonstrated after making a GMAW welded joint on it. The impact of this phenomenon on the operation of the SRS system and the deformation of the vehicle itself was estimated in the context of post-collision repairs and the secondary contribution of the repaired vehicles in a collision. It has been shown that the decrease in the strength of the side member is closely related to the change in the activation time of the gas cushion and its interaction with the moving body of the passenger during a frontal collision.

The changes in the activation time of the gas cushion caused by the change in the strength of the front side member and the new contact time of the phantom's head with the gas cushion were determined. The obtained results of the space-time analysis, taking into account changes in the strength of the stringer, indicated significant disturbances in the synchronization of the gas cushion with the moving head of the phantom. The performed modeling showed that in the extreme case, the moving phantom head reached the point where it should be in contact with the gas cushion by 4.3 ms too early.

The indirect observation of the crash test at a speed of 23 km / h, where the contact of the phantom's head with the gas cushion was about 2 ms too early, causing a significant increase in the delay affecting the head, indicates the correctness of the thesis, about a significant deterioration in the quality of safety of the passive vehicle due to sheet metal repairs car side member made of DP steel.

The conducted research and analyzes confirmed the thesis that the use of GMAW welding methods in post-production processes for sheet metal repairs of a car longitudinal member made of DP steel may disturb the original strength properties of this structure, causing a significant deterioration of the quality level of passive safety of the vehicle.



02. 02. 2022