Dynamic Compression Tests of Aluminum-alloy Structure for Railway Vehicles Considering Buckling and Shear Fracture

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Two types of impact compression tests were conducted to investigate the crushing characteristics of a double-skinned aluminum-alloy carbody structure used in a conventional railway vehicle. One of the two tests is an overall compression test in which the overall specimen's end face is compressed. Another one is a local compression test in which part of its end face is compressed. As a result of the tests, buckling was the main cause of failure in the overall compression test, whereas shear crushing was the main cause of failure in the local compression test. Finite element analyses were conducted in which several material rupture laws were used to compare with the test results. According to the comparison of the analyses and the tests, the results of the analyses applying the ESI-Wilkins-Kamoulakos model agree with those of the tests.