

## **Improving the Rigidity of Railway Vehicle Carbodies Using Ceiling Frames and Rails for Hand Straps**

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In this study, the authors have investigated how non-structural members of the carbody influence on the rigidity and the vibration characteristics of a railway vehicle. Additional ceiling frames and/or rails for hand straps have been attached to a test car, which is corresponding to a certain commuter type vehicle but is not equipped with interior or under floor equipments. Excitation tests of the test car have been performed on the rolling stock test plant, and the results have shown that the proposed reinforcing components have a large affect on the natural frequencies, vibration shapes and response accelerations of the carbody. The rails for hand straps have then been installed to another test car with interior panels and seats, and stationary excitation tests have been conducted in order to investigate the vibration characteristics of the carbody.