

**Countermeasures Against Flow-Induced Vibration of Train in Tunnel
by Use of Modifications of Train Shapes**

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As the maximum speed of high-speed trains increases, flow-induced vibration of trains in tunnels has become a subject of discussion in Japan. In this paper, we report the result of a study on use of modifications of train shapes as a countermeasure for reducing an unsteady aerodynamic force by running tests and a wind tunnel test. First, we conducted a statistical analysis of running test data to identify exterior parts of a train which cause the unsteady aerodynamic force. Next, we developed a wind tunnel test to measure the unsteady aerodynamic force acting on a train in a tunnel and examined train shapes with a particular emphasis on the exterior parts identified by the statistical analysis. The wind tunnel test showed that fins under the car body are effective to reduce the unsteady aerodynamic force. Finally, we tested the fins by a running test and confirmed its effectiveness.