

High-Speed Wheelset Dynamic Load Test Facility Completed

On February 26, 2021, a new test facility was completed at RTRI. This test stand is capable of reproducing high-speed train running (maximum 500 km/h) and the load acting to the bogie (Fig.1 and 2), and, with this facility, durability and performance of Shinkansen's wheel and axle can be evaluated. It will be utilized to evaluate the durability of wheelset and bogie parts and to analyze the mechanism of wheelset damage development.

[Outline of the test facility]

- Instead of running a test bogie on a track, this facility is capable of reproducing 500 km/h running by rotating the wheelsets of a test bogie on its high-speed roller.
- Capable of reproducing vertical vibration of a track by shaking the roller vertically.
- The loading frame that simulates a carbody is shaken by the vibration exciters and reproduces vertical and lateral vibration of a running train carbody and the load acting to the bogie. (Fig. 2)
- Simulates the torque acting to the wheelset during acceleration and deceleration.*
- Capable of testing bogies for different gauges as it has rollers of Shinkansen gauge and conventional gauge.

*Simulating the torque to move a carbody in the longitudinal direction with a flywheel.

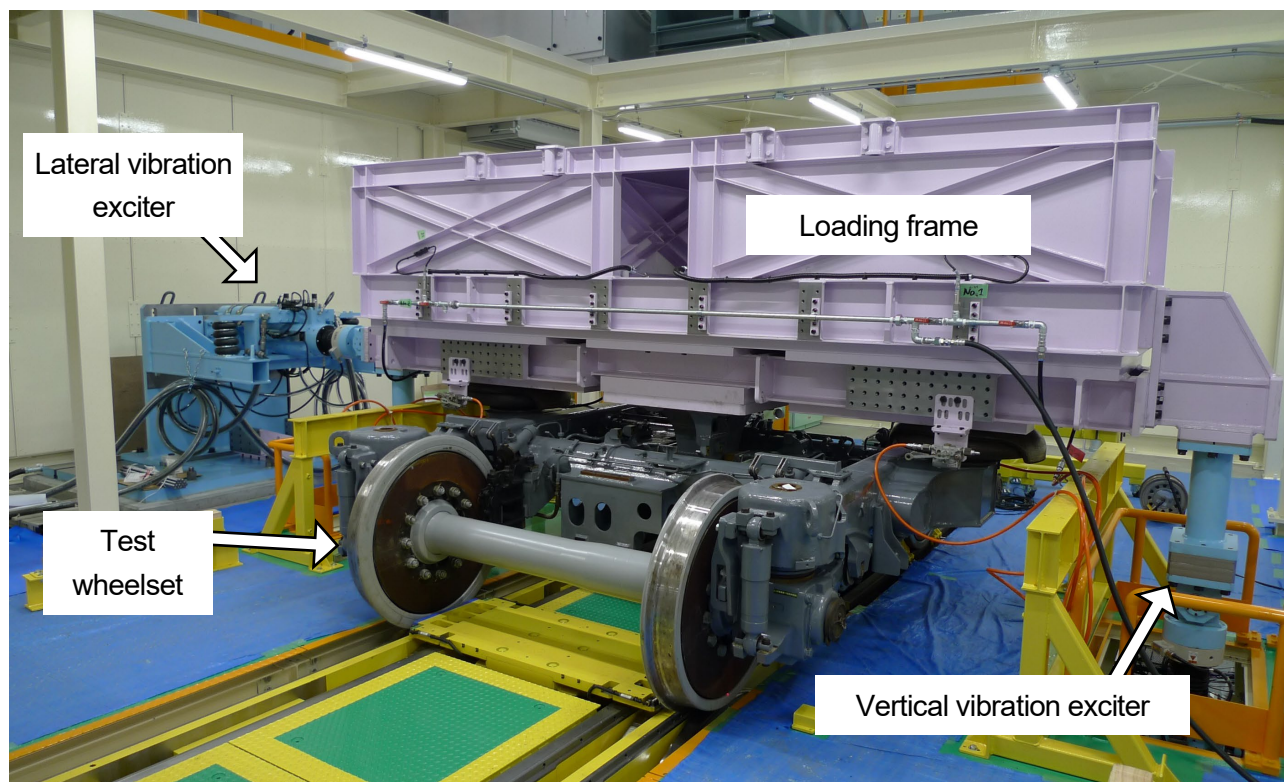


Fig. 1 High-speed wheelset dynamic load test facility

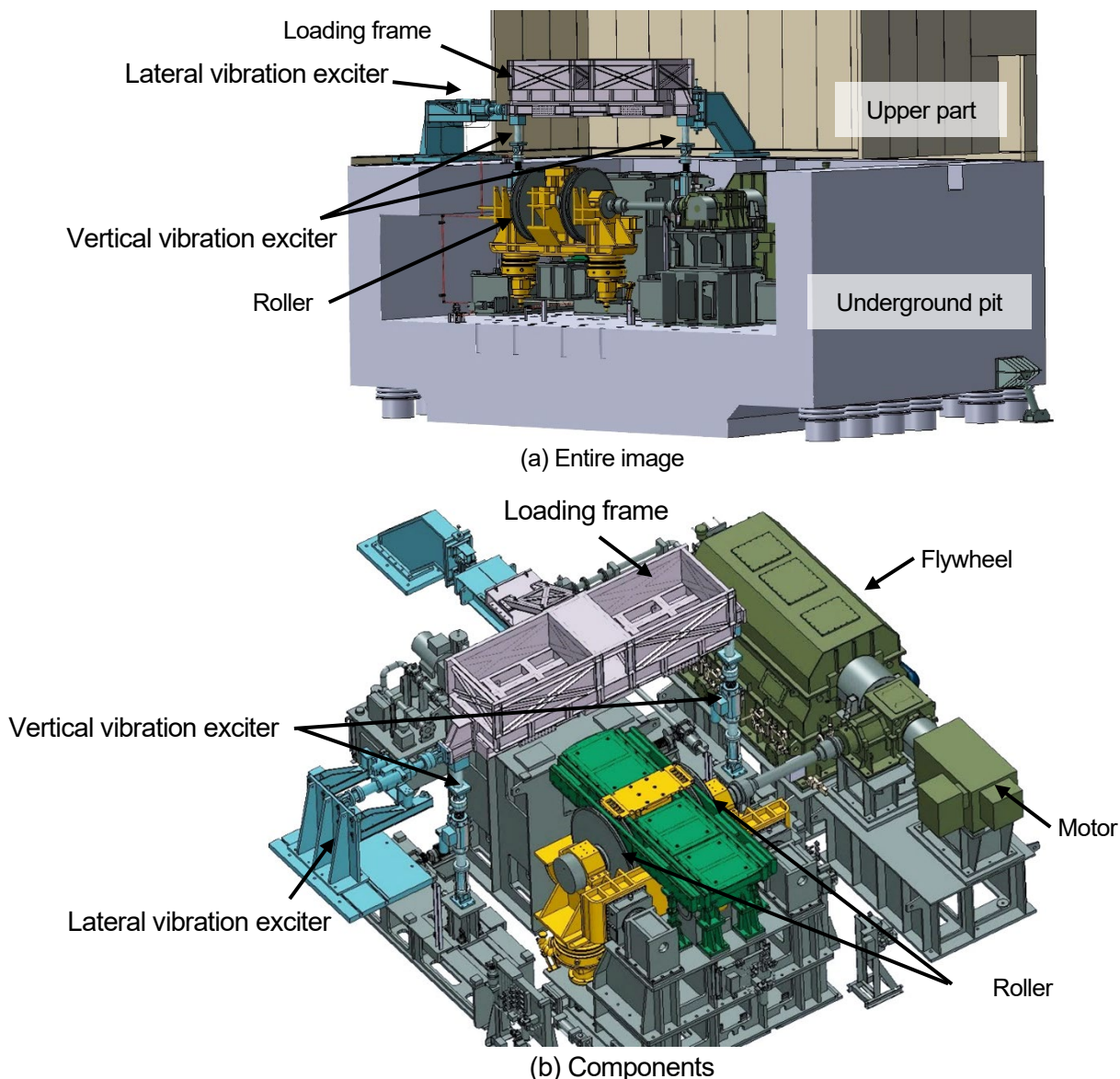


Fig. 2 Configuration of high-speed wheelset dynamic load test facility

Table 1 Specification of high-speed wheelset dynamic load test facility

Component	Function	Specification
Roller	Simulating train running	<ul style="list-style-type: none"> Gauge: 1067mm and 1435mm Maximum speed: 500km/h Vertical vibration : -15 to +15mm
Loading frame	Applying vertical load	<ul style="list-style-type: none"> Static load: 80kN~200kN
Vertical vibration exciter	Simulating vibration by train running	<ul style="list-style-type: none"> 2 vertical and 1 lateral vibration exciters Amplitude : -100 to +100mm Load : -100 to +100kN per exciter Different patterns of vibrations can be reproduced.
Lateral vibration exciter		

Flywheel	Applying the force by train motions during acceleration and deceleration	<ul style="list-style-type: none">• Under 300km/h: maximum 150kN• Over 300km/h: maximum 110kN
Others	Different-sized bogies can be tested.	<ul style="list-style-type: none">• Wheelbase: 1500~3000mm• Air suspension interval: 1750~2600mm

【Tests and evaluations using the test facility】

(1) Durability assessment

Using this test facility, durability of the components of a wheelset and a bogie can be evaluated under the conditions close to running tests with an actual vehicle. The results of the evaluation will be utilized in the research to assess the service life of these components and in extending inspection intervals for the purpose of achieving labor-efficient maintenance.

(2) Performance assessment

Vibration property and thermal property of the components of a wheelset and a bogie will be evaluated under the loading conditions simulating real train running or harder conditions. The results will be used to improve the bogie performance.

(3) Damage cause analysis

Through the tests on this facility under the conditions simulating the vehicle load and acceleration/deceleration torque, causes of damage to the components will be analyzed and effects of preventive measures will be verified.