

Measures against earthquakes

Lessons learned from the past earthquakes

Learning from earthquakes in the past, JR East has employed the following three anti-earthquake measures:

- ① Stopping trains immediately (emergency train stop measures)
- ② Preventing structural damage (seismic reinforcement measures)
- ③ Minimizing secondary accidents following derailment (preventive measures against trains deviating from tracks)

① Early Earthquake Alert System

JR East has installed seismographs along coastal and Shinkansen railway lines for the detection of primary tremors (P-waves). Our present system allows us to stop trains as soon as primary tremors are detected. For conventional lines, our Early Earthquake Alert System was introduced for the Tokyo metropolitan area in December 2007 and in all other areas in April 2009. The system enables trains in any section of track to be stopped in the case of a major earthquake, utilizing information obtained from our Shinkansen seismographs and from any advance announcements given by the Japan Meteorological Agency. Furthermore, early detection of earthquake occurrence by seismographs and of interruptions of electric transmission have enabled us to more promptly detect earthquakes and start emergency braking about one second earlier. JR East strengthened its observations for possible occurrences of earthquakes, by additionally installing its seismometers at 30 locations for earthquakes with epicenters potentially situated directly beneath the Tokyo metropolitan area and those in inland areas of its service area.

② Seismic reinforcement of elevated bridges

In response to the 1995 Great Hanshin-Awaji Earthquake, JR East has been taking a number of seismic reinforcement measures. By the end of March 2008, we had reinforced all of our elevated Shinkansen viaduct support columns and Shinkansen bridge columns. On our conventional lines, by the end of March 2009 we had reinforced all other columns in the Southern Kanto and Sendai areas except in places that required additional construction work. Currently, we are reinforcing elevated bridge columns susceptible to failure due to bending by strong earthquake motion, aiming to further improve our safety levels against earthquakes. Based on the effects of the Great East Japan Earthquake, and to be prepared for the possible occurrence of an earthquake with an epicenter directly beneath the Tokyo metropolitan area, JR East is also employing additional measures, including greater reinforcement of its embankments, advanced plans for the seismic reinforcement of its elevated bridge columns, and the increased expansion of its ranges for these measures.

③ Prevention of secondary accidents after derailment

During the Niigata Chuetsu Earthquake in 2004, one of our Joetsu Shinkansen trains was derailed while running. Fortunately, this derailment did not lead to any injury to either our passengers or our train crews. Learning from the events surrounding this earthquake, JR East has taken numerous measures aimed to improve our Shinkansen trains and tracks. For our railcars, we have installed an L-shaped car guide on the bogies to restrict lateral movement of the car body. For ground facilities, we are improving the shape of joint bars to lessen the impact of wheels on rail joints in the case of a derailment and implementing countermeasures to prevent the overturning of railcars and the lateral movement of rails if metal rail fasteners are damaged by a derailment.

Nevertheless, at the time of the Great East Japan Earthquake in March 2011, one of our trains in test operation derailed after its regular inspection. This showed that further investigations are needed in order to improve our safety measures.