

# **Damage to Railway System**

## **East Japan Railway Company**

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Figure 1 shows a railway route map and a layout plan of the major structures of the shinkansen (bullet train) line in the area around Niigata. The earthquake caused operations to be suspended between Echigo Yuzawa and Niigata on the Joetsu Shinkansen line and on some sections of local lines. As of the writing of this report (October 28), aftershocks continue and some roads into the disaster-stricken area remain blocked. Although investigations are not yet complete, the major damage identified so far is described below.

### **Shinkansen**

#### Civil engineering structures:

Civil engineering structures that suffered damage and details of the damage are outlined below.

#### **Tunnels**

Four tunnels (Uonuma, Myoken, Takiya and Horinouchi)

Badly damaged are the Uonuma and Myoken tunnels. Details of the damage are shown in Photos 2 and 3.

#### **Viaducts**

Three viaducts (No. 1 Wanazu, No. 3 Wanazu and Muramatsu)

Cover concrete fell away from the head of piers. (Photo 4) Of the eight piers of this viaduct, only one was heavily damaged while the seven others suffered light damage. (Photo 5)

#### **Bridges**

One bridge (Uonogawa bridge) (Photo 6)

Reinforcing bars bulged out and cover concrete fell away on the intermediate section (at the bar anchoring point) of the pier.

#### Track:

Fasteners were damaged and the rails were displaced over a length of about 900 m near the point where bullet train 'Toki 325' derailed on the shinkansen line. (Photos 1 and 7) There were no damaged fasteners and no displaced rail ahead of the first car of the derailed train. The track slab was not heavily damaged, although the concrete has been chipped by the derailed cars.

## Local lines

Many structures related to local railway lines, including civil engineering structures and tunnels, were damaged in the vicinity of the seismic center. Damaged civil engineering structures included failed embankments and subsidence or outward flowing of base courses. (Photos 8 and 9)

## Others

It was not only the railway system that suffered damage. Structures at the Sinanogawa hydraulic power plants (the Ojiya and Sente plants) near the seismic center were damaged and the dam of the regulating reservoir cracked along the top.



Photo 1 Last car of derailed bullet train Toki 325



Fig. 1 Location map (sketch map)

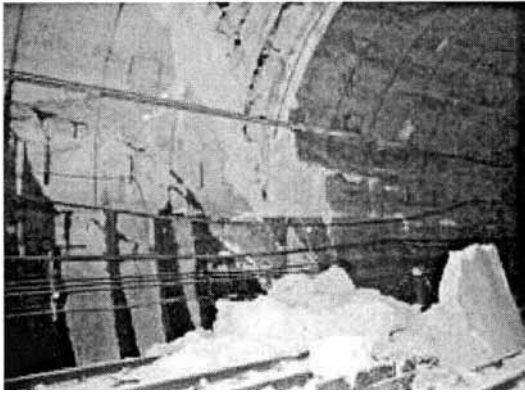


Photo 2 Uonuma tunnel between Urasa and Nagaoka



Photo 3 Myoken tunnel between Urasa and Nagaoka

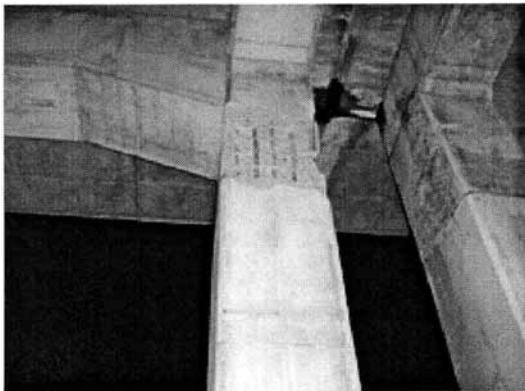


Photo 4 Muramatsu viaduct between Urasa and Nagaoka



Photo 5 No. 3 Wanazu viaduct between Urasa and Nagaoka



Photo 6 Uonogawa bridge between Urasa and Nagaoka



Photo 7 Track condition near the derailment point



Photo 8 Joetsu line between Echigo Kawaguchi and Ojiya



Photo 9 Shinetsu line between Echigo Hirota and Nagatori