Learning from Earthquakes

The Magnitude 8.2, Hokkaido Toho-okı, Earthquake

At 10:22 pm, Japan Standard time, on October 4, 1994, a moment magnitude 8.2 earthquake occurred approximately 170 km to the east of the coast of the Nemuro Peninsula. The epicenter of the earthquake was located at North 43° 22', East 147° 40'. The fault dimensions were estimated at 100 to 150 km long and 40 to 50 km wide; the focal depth was estimated at approximately 30 km. The most severe damage occurred on the Kuril Islands (Newsletter, Nov. 1994). This report summarizes the damage observed in Hokkaido.

The intensity of the earthquake, as measured on the Japan Meteorological Agency Scale, was reported to be 6 in Kushiro-city, Nemuro-city, Hamanaka-town, Atsukeshitown, Wakemi-town, and Nakashibetsu-town, and 5 in Nemuro-city, Hiroo-city, and Uraoka-town. The Building Research Institute of the Ministry of Construction reported peak horizontal and vertical ground velocities of 3.92 and 1.89 m/sec, respectively, recorded at the Kushiro Meteorological Observatory, a distance of 269 km from the epicenter. At the Hiro-town municipal building, a distance of 375 km from the epicenter, a peak horizontal ground velocity of 2.78 m/sec was recorded, the peak vertical velocity there was 0.94 m/sec.

There were no deaths directly attributed to the earthquake; however, 342 persons were injured, 12 of them seriously. The majority of the injuries occurred in Nakashibetsu-town (101) and

Kushiro-city (49). The total number of reported cases of damage to constructed facilities included: 2024 residences, 1,427 civil structures, 169 harbor and fishing facilities and 191 educational facilities. Numerous residences were without water and electric service; however, the disruption of gas service was limited. One fire was reported in Kushiro-city.

Damage to buildings from the earthquake appeared to be lighter than the damage suffered as a result of the January 15, 1993, Kushiro-okı Earthquake. Most of the damage to buildings in Kushiro could be classified as nonstructural. This included fallen exterior tile cladding, broken window glass, damage to expansion joints due to impact, displaced furniture and lockers, light cracking of interior partition walls (reinforced concrete or concrete blocks), displaced desktop computers, and overturned bookshelves. A steel silo collapsed at Nakahara Meadows, Bokkai-cho. Steel bracing fractured in the school gymnasium ceilings.

Other specific cases of reported damage to buildings included:

(1) The 2-story, reinforced concrete Nemuro city hospital suffered moderate damage. Shear failure was observed in short columns and structural walls. Flexural and shear cracks were observed in other columns.

(2) The Nemuro city municipal building, a 3-story reinforced concrete building, suffered only minor damage. Shear cracks were found in a nonstructural reinforced concrete wall.

(3) The ceiling of the Nemuro Cultural Center collapsed.

(4) Shear cracks were observed in the columns of the 3-story, rein-
forced concrete Nakashibetsu-town hospital.

(5) The Nakashibetsu Cultural Center, a 3-story reinforced concrete structure built in 1962, suffered moderate damage. Shear failure was observed in two columns. Shear failure of a nonstructural reinforced concrete wall was also observed.

(6) The reinforced concrete Kushiro Technical High School building, which was damaged during the 1993 Kushiro-okı earthquake and subsequently retrofitted using structural walls, survived with only minor cracking.

(7) The 3-story reinforced concrete Bokkai-okı-town municipal building, built in 1966, suffered moderate damage, with shear failure observed in 3 columns.

Approximately 13,000 residences in Nakashibetsu-town and Rausu-town, both in Nemuro county, were reported without power after the earthquake. Power was restored to all but approximately 1,800 residences by 8:00 am on October 5.

Gas lines suffered only moderate damage as a result of the earthquake. Breaks were reported at 20 locations in Kushiro-city, but problems were found at only 10 locations. The limited damage to gas lines can be attributed to mitigation measures taken by the gas companies after the 1993 Kushiro-okı earthquake. The utilities converted the steel pipes and joints to shock-resistant polyethylene pipes. Gas companies also promoted the use of automatic shut-off devices in gas lines: the number of automatic shut-off devices in use increased from 10 to 20 percent over the last two years. More than 350 shut-off devices were activated during this earthquake.
The Hokkaido Toho-oki Earthquake

Learning From Earthquakes

Magnitude 7.0 Earthquake Hits the Philippines November 15, 1994

Approximately 74 deaths had been reported as of November 17, most of them children swept away from houses in fishing villages along the coast. Many homes were destroyed by the tsunami. Damage to structures has also been reported in the area of Puerto Galera, a major tourist area on the northern Mindoro coast.

Eighteen bridges were damaged or destroyed, and extensive road damage due to liquefaction and lateral spreading occurred. The main pier at Calapan Harbor was heavily damaged, limiting ferry access to the area. The power barge which supplies electrical power for much of Mindoro was dislodged from its moorings; it ran aground 2 km from its original site. This resulted in extensive power outages throughout Mindoro. Damage to government infrastructure is reported to be restricted to the island of Mindoro and is estimated to total $4 million.

As of November 16, Philvolcs had monitored 980 aftershocks. They expect that aftershocks will continue to be felt in Manila for about 1-2 weeks. Philvolcs has also voiced a concern that Taal Volcano, approximately 70 km north of Mindoro and currently showing signs of abnormal activity, may become more unstable as a result of the recent seismic activity along the Lubang fault.

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