Learning from Earthquakes

Report of the January 15, 1993 Kushiro-oki Earthquake

The Shimizu Corporation sent 13 research engineers to Hokkaido to investigate damage caused by the Kushiro-oki earthquake, which occurred on January 15, 1993, offshore of Kushiro in Hokkaido. This report briefly describes the Kushiro-oki earthquake and the engineers' damage survey.

The Kushiro-oki earthquake occurred at 8:08 PM, Friday, January 15, 1993, and registered 7.8 on the Japan Meteorological Agency (JMA) scale. The focus was located at longitude 42° 51′ N and latitude 144° 23′ E, with a depth of 107 km. Kushiro city is located only 14 km from the epicenter. The event is considered to be an intra-plate earthquake within the Pacific Plate. Ground motions were recorded by the Port and Harbor Institute (PHRI) of the Ministry of Construction: a peak ground acceleration of 922 cm/sec² was recorded in the east-west direction, the duration of strong motion was approximately 30 seconds.

Two persons were killed as a result of the earthquake, one was hit by a falling ceiling light, the other was killed by toxic gas poisoning. Sixty-six persons were seriously injured and 661 persons were reported to have minor injuries. The total economic loss due to the earthquake is estimated at about 180 million dollars.

Major roads were closed at 18 locations due to failure of embankments. In Kushiro, 6 houses collapsed, 33 were severely damaged, and 557 were partially damaged. Several houses were damaged or endangered due to landslides or slope failures which occurred in the residential area of Kushiro. Little structural damage was reported to buildings in Kushiro, except for shear cracks in the reinforced concrete columns of older buildings. Port facilities were most severely damaged in Kushiro. Widespread liquefaction occurred in the port zone.

Gas pipelines were severely damaged in Kushiro, cutting the supply to 9,355 customers. Supply was restored to all customers within 23 days after the earthquake. Numerous water-pipe breaks occurred: 4,000 customers in Kushiro were without water. Water supply was restored within a few days after the earthquake. In Hokkaido, 57,200 customers lost electric power after the event. Power was restored to almost all customers the day after the earthquake.

News of the Profession

NCEER Establishes Highway Seismic Research Council

The National Center for Earthquake Engineering Research (NCEER) has established a Highway Seismic Research Council to provide technical and operational advice on the center's highway and bridge program, and specifically, on those aspects of the program that fulfill the requirements of the two Federal Highway Administration (FHWA) contracts that the center was awarded last fall. The contracts, totaling $14.2 million, are for seismic vulnerability studies of the national highway system.

The council is comprised of recognized academic, public, and private sector leaders in the fields of seismology, earthquake engineering, and highway and bridge design, and include representatives from the FHWA, American Association of State Highway and Transportation Officials (AASHTO), Transportation Research Board (TRB), United States Army Corps of Engineers (USACE), and the National Earthquake Hazards Reduction Program (NEHRP) agencies which include the Federal Emergency Management Agency (FEMA), National Institute of Standards and Technology (NIST), National Science Foundation (NSF), and the United States Geological Survey (USGS). The council members are divided into a technical group, which will advise on technical or scientific issues, and a coordination group, which will provide input on issues of technology transfer and coordination with end-users including state transportation agencies and federal agencies involved in reducing earthquake hazards.

NCEER'S highway and bridge program was initiated in September 1989 to examine the seismic vulnerability of short and medium span bridges in regions of low-to-moderate seismicity, and to develop design, retrofit, and repair methodologies for such bridge structures. In September 1992, the program was expanded to include highways, tunnels, and long span bridges, as a result of NCEER's receipt of the two FHWA contracts.