

Investigation of measures for protecting sewerage facilities from earthquakes

Whole term

2004.11~2005. 9

Text P.155~P.160

(Purpose)

Sewerage is an essential lifeline in modern cities, and an uninterrupted sewer service is required for adequate removal of sewage waste. Following a major earthquake or similar disaster, disruptions to the sewerage system prevent households from using their toilets, having a serious impact on people's lives. To avoid this, the integrity of sewerage systems must be secured. In this context, the Niigata Chuetsu Earthquake in October 2004 was the most damaging disaster to affect sewerage facilities since the Hanshin-Awaji (Kobe) Earthquake of 1995. In particular, more than 1,400 instances of manholes rising or sinking occurred, probably due to liquefaction, resulting in serious damage to attached sewer pipelines. This investigation was carried out to assess the damage caused to sewerage facilities from the Niigata Chuetsu Earthquake and to identify rehabilitation needs along with appropriate methods for preventing future earthquake damage.

(Results)

1. Sewer Pipes

Damage to sewerage pipes occurred in one prefecture, six cities, twelve towns and three villages, affecting 0.5 km of pipeline and 213 manholes in local¹ sewerage systems and 151.6 km of pipeline and 2,506 manholes in prefectural² sewerage systems. Most of the damages were road surface collapse and raised manholes resulting from liquefaction of construction backfill. In this region, regulations for backfilling do not require any specific seismic measures, so liquefaction damage to pipeline facilities is an ongoing concern. Sunken roadway fill and protruding manholes can obstruct traffic, impede rescue and recovery work, and generally reduce the reliability of the lifeline. For this reason, it is necessary to assume that liquefaction of backfill soil may occur even if there is no liquefaction hazard in the general area, and liquefaction countermeasures need to be applied according to the importance of the facilities in question.

2. Treatment Plant and Pump Stations

Damage occurred at 12 treatment plants, with sewage treatment capability being affected only at the Hori-nouchi Treatment Plant (local sewerage system). Although damage occurred at 12 pump stations, sewage transfer was only interrupted in two places, the Ryuukou Pump Station and the Ugaji Pump Station. This Niigata Earthquake did not result in major structural damages, so presents no imperative to undertake major revisions to current practices. However, there is still a need to further consider joints in pipelines and pipes within treatment plants with a view towards maintaining function.

(Future Plans)

The "Technical Advisory Committee for the Protection of Sewerage Facilities from Earthquakes" (Chairman: Prof. Kazuhiro Tanaka, Nihon University) has been established comprising academics and representatives of the Ministry of Land, Infrastructure and Transport; local authorities; and related groups. The committee's objective is to promote the adoption of appropriate anti-earthquake measures for sewerage facilities and is currently undertaking investigations. The committee will publish a major report of its findings.

1 : A sewerage system covering a single town or city operated by the city or town authority

2 : A sewerage network covering multiple towns or cities and operated by the prefecture government.

Investigation under the responsibility of the Ministry of Land, Infrastructure and Transport.

Researchers : Nobuyuki Horie, Masahiro Kabata, Kazuki Iida

key words

Niigata Chuetsu Earthquake, Sewerage facility damage, Liquefaction