11 DAMAGE TO LIFELINES

11.1 Electricity

The electric supply to the earthquake stricken area was shutdown following the earthquake. Except heavily damaged areas, the electricity was restored after three days following the earthquake. The electricity distribution system in the region is done through poles and high-voltage transmission lines. Concrete poles were either inclined as a result of partial bearing failure of the surrounding ground or collapsed (Figure 11.1). The poles having transformers mounted on were particularly suffered more and also the poles were inclined in heavily liquefied areas. Nevertheless, the repair works on electricity distribution system could be accomplished in a short period of time.

The main transmission lines are elevated and supported through 40-50m high steel pylons. In-spite of wide spread ground liquefaction or slope failures, there was no damage to pylons seen during the author's investigations or reports by various investigation groups.

Figure 11.1: Damage to electric transmission lines (Pictures from various web-sites)

11.2 Water Network

The water networks were particularly damaged in Ojiya city, Tokamachi and Kawaguchi towns. The damage to water network is generally associated with pipe breakage at joints (Figure 11.2).

Figure 11.2: Damage to water network

11.3 Natural Gas Network

The natural gas systems consist of spherical storage tanks and distribution network. There was almost no damage to spherical gas storage tanks all over the epicentral region although slight damage could be seen at their foundations and connection pipes (Figure 11.3). Although the region is less populated and the networks are not so extensive, the gas supply could not be in operation in Ojiya and Kawaguchi. Since permanent ground deformations due to either soil liquefaction or associated with and faulting did take place, the regional gas company together with help from other gas companies of Japan have been now checking the gas pipe network block by block. The natural gas system is expected to be fully in operation after 1 month according to local gas company officials.

Figure 11.3: Non-damaged spherical gas tanks

11.4 Sewage

The sewage systems were heavily damaged by the liquefaction of back-fill soil (Figure 11.4). The uplift of manholes could be observed even in Teradomari town along Japan Sea. The uplift of manholes was as much as 1000mm. This implies both long-duration large ground shaking. The local authorities now have been checking the sewage system and replacing the sections underwent uplift or ruptured. Since the permanent ground deformations occurred due to lateral spreading of ground as a result of liquefaction, the joints of the sewage system suffer some leakage and need repairs

Figure 11.4: Damage to sewage systems

11.5 Telecommunications

Telecommunication system suffered the same problem due to heavy telecommunication traffic. Besides the conventional telephone system, the mobile telephone systems of Docomo, J-Phone and AU are used widespread. Particularly Docomo system suffered from heavy telecommunication traffic following the earthquake. However, the systems become normal next day.