

### 2.2.10. Lifelines

In relation to lifeline facilities and networks, at the time of earthquake, two kinds of damage to the citizen's life and the city itself can be considered. One is no access to lifelines for ordinary daily use (e.g., no access to drinking water, electricity, gas and telecommunications) due to damaged lifeline facilities and networks, in general. The other is that, due to damaged lifeline facilities and networks, occurrence of secondary disasters (e.g., fires, electric shock, explosions, etc.) may take place. For these reasons, lifeline management agencies have to establish disaster management systems to minimise the damage in the event of an earthquake.

In the study, a wide-range of data has been gathered from lifeline-related agencies and companies (water, gas, electricity, telecommunication). Since the comprehensive database set-up initiated by this Study is the first of its kind in Tehran, a lack of quality and missing data can be observed. However, basic data, including information on the systems' main networks, were set up. In the report, these preliminary data can be seen on the maps of each lifeline system.

Since May 1999, the Study Team has collected lifeline data. Details of data collection for lifelines are shown in Table 2.2.15. Unfortunately, limited data has been gathered for the Study, and, therefore, future improvement of the database is strongly suggested. In general, all lifeline agencies somehow relate each other. For example, if the telecommunication company does not have a self-generated system, and if the electric company cannot supply electricity, all the telecommunication systems will be non-operational. This problem can be applied to the water and gas companies as well. Therefore, the exchange of information and cooperation between agencies is important to reduce the problem.

**Table 2.2.15 Collected data from lifeline agencies**

Lifeline Data	Related Agency	Necessary Data			
		Map			Data Table
		Own Sub-districts Map	Main Network Map	Main Distribution Map	Length of Local Distribution Line
Water	Tehran Province Water & Sewage Co.				×
	Format	Paper	AutoCAD File	AutoCAD File	-
Gas	National Iranian Gas Co.				
	Format	Paper	Paper	Paper	Paper
Electricity	Power Generation & Transmission Co.			×	
	Format	Paper	AutoCAD File	-	Paper
Telecommunications	Telecommunications Co. of IRAN			×	
	Format	Paper	-	-	Paper

Received

×

Not Received

### **(1) Waterworks**

Water resources are used for drinking water, washing, and sanitation, as well as for fire fighting activities. Service water, which is supplied by a multitude of dam facilities, is well developed by circuiting the entire Tehran area with both a main network and distribution network (refer to the Figure 2.2.32). Therefore, it can be considered that the Tehran Water Network has a strong structure against disaster. However, to secure the supply for citizens, it is necessary to reconstruct the pipes, which may be vulnerable against damage. In the data collection process, it was found that for the damage analysis of the water distribution network, detailed information for the pipeline network (including type, material, diameter of pipe, etc.) was not available. Furthermore, information on the material of joints used in the network must be prepared to ensure more accurate analysis. However, only a main network map with locations of purification plants, reservoirs, and valves were prepared by the Tehran Water and Sewage Co. In the Study, only information on pipe length was available for Tehran, without any classification of material. Therefore, a very limited analysis could be undertaken from the data received. In the future, necessary data should be prepared in order to assess the actual situation of the water network based on GIS. This information can be used to carry out a detailed analysis using PGA and seismic intensities from the Study.

### **(2) Natural Gas**

Tehran's natural gas network is considered to be vulnerable, since the opening and shutting processes of gas valves is manually operated (by hand) in different jurisdictions by representatives of the National Iranian Gas Co. The natural gas network in Tehran is an indispensable lifeline resource, providing heat for the citizens of Tehran, but it is also a dangerous resource, with a high potential to cause secondary disasters such as fires, explosions, etc. Therefore, it is urgently necessary to establish facilities to automatically control operating valves in coordination with seismographs. The National Iranian Gas Co. prepared rather detailed data, compared to other lifeline agencies. However, this data does not include information on the material of network joints. For future use, joints data should be added to the existing database to ensure a more detailed damage analysis. The network of natural gas is shown in Figure 2.2.33.

### **(3) Electricity**

The electric power supply network of Tehran has a rather strong network system, except for the distribution lines to the very last distributing destinations. These lines are aerial, and half of the cables are varied underground. On the other hand, many lines are directly varied without any ditches or boxes, and, at the time of a disaster, recovery efforts for these lines will take longer and will be more costly compared with aerial lines, in general.

According to the discussion with Tehran's Power Generation and Transmission Co., electric power supply facilities are currently being structurally strengthened. Since detailed information on the structure of facilities cannot be collected, the Study team expects to improve and update the database in the near future.

The high voltage electric power supply network is shown in Figure 2.2.34.

### **(4) Telecommunications**

From past earthquake experience, the mobile telephone network was seriously focused on as an important infrastructure to facilitate communication at the time of a disaster. The ability for city agencies and systems to effectively communicate can minimize the damage due to an earthquake. Compared to other countries, Tehran's mobile telephone network is rather lagged behind. Iran is experiencing a transitional period to a strengthened telecommunications network.

Laying underground telephone network cables is progressing in Iran. However, similar to the electric power network, at the time of a disaster, recovery efforts may take longer and be more costly since it will be necessary to find the location of damaged underground lines.

The main telecommunications network is shown on Figure 2.2.35.



Figure 2.2.33

### Lifeline (Gas)

