



Plan for Restoration of Sewer Pipelines Damaged by Earthquakes in Yokohama

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Key words: BCP, earthquake, agreement with private companies



1. Introduction



Port Town Yokohama

The City of Yokohama Information

Land Area	435 km ²	Population	3.7 million
Wastewater Treatment Plants	11	Total Pipe Length	11,800 km
Sludge Treatment Centers	2	Manholes	534,207
Major Pumping Stations	26	Sewerage Service Rate	99.9 %
Annual (Daily) Quantity of Sewage Treated	578,000,000m ³ (1,580,000m ³ /d)		
Construction of sewerage began in the 1950s.			



Cave-in due to broken sewer



Protruding manhole due to soil liquefaction

Japan is often subjected to major earthquakes. Earthquake damage to sewerage facilities severely affects not only the citizens, in using the toilets, but also the transportation systems. Yokohama developed the Sewerage Business Continuity Plan (BCP) to enable safe and efficient recovery from disaster in 2013.

2. Basic issues

Priorities in the Sewerage BCP

- 1 Ensure the transportation functions (First priority is protecting human life)
- 2 Ensure the availability of toilet functions in evacuation shelters
- 3 Eliminate sewage overflow

To ensure that operations are launched speedily and to facilitate a disaster response outside of working hours, a system of role-sharing has been put in place whereby each staff member is assigned to one of the following three units on the basis of experience and location of residence

Role-sharing of staff

- | | |
|----------------|---|
| 1 Headquarters | The overall sewerage system |
| 2 Shelter Unit | Survey and restoration of sewer pipelines related to the evacuation shelters |
| 3 Survey Unit | Surveying sewer pipelines throughout the city during the primary survey period and restoration work |

3. Post-quake response

With regard to post-quake survey and restoration work, the purpose, systems, work methods, reporting and contact methods, and other aspects have been planned in as much detail as possible. Agreements have been made with 10 private companies and a system set up for surveys to be set in motion automatically, arranged according to a time line.

Survey Classification and Summary

- | | |
|----------------------|---|
| Emergency inspection | Ascertain the damage to transportation systems |
| Emergency survey | Confirm availability of toilets in evacuation shelters |
| Zero-order survey | Ascertain the damage over the city for the next stage of survey |
| Primary survey | Identify second stage survey sites
Determine the need for emergency restoration work |

4. Pre-quake measures

BCP assumptions are based on just one scenario. Staff must respond flexibly to the situation.

Pre-quake measures (education and training) are essential

Education and Training

- | | |
|------------------|---|
| Map exercise | Role-playing in information gathering and communication and contact during disaster |
| On-site training | Inspections involving the opening of manholes for visual inspection |



Map exercise



On-site training

Post-quake response have been identified to improve the BCP's effectiveness. We will continue to improve the plan through measures such as rectifying gaps in materials and equipment.

Example equipment purchased



Equipment storage warehouse



Emergency vehicles



Motor-assisted bicycle

5. Conclusion

These efforts have been organized into a detailed timeline of action before and after an earthquake and compiled into a manual. Sewer pipelines are important resources that are directly linked to ensuring the toilet functions and the public health in case of disaster. It is necessary for city officials and related organizations to work together to overcome various challenges and strengthen the crisis management system so that even in case of disaster we can continue to provide the sewerage services to the citizens.