

Q&A

31Q2: Would you know the breakdown of the different pipe materials used in Japan for potable water delivery (Polyethylene, poly vinyl chloride, ductile iron, steel) and how these materials performed during the most recent earthquake/tsunami? (Mr. G.S. U.S.A)

A1: We interviewed *Mr. ARIMURA Gensuke* who is owner of Water Works Network News. He knows so much more about trends of the polyethylene pipe in the Japanese waterworks.

(1) The features of polyethylene pipes for waterworks

The Polyethylene pipe (PE) of D200mm is maximum pipe in Japan. Japan Waterworks Association (JWWA) certificates polyethylene pipe by D150mm as JWWA standard. There is a great demand for PE from D100mm to D 150mm. Because, the small and middle scale water supply utilities use from D150mm to D 200mm pipes as main conveyance pipe and distribution pipe. PE pipe is increasing the share instead of the asbestos cement pipe, PVC pipe and cast iron pipe, because of high earthquake-resistance and production and transport efficiency. When waterworks utilities renew the old pipes, they want to install PE pipe.

i) Advantage

Because the advantages of the PE are lightness, elasticity, flexibility, PE pipe can roll-up for easy transport and reduce the number of pipe joints. Moreover, it is far easier to joint pipes, which is called electro fusion jointing. Even unskilled persons can connect pipes. It takes only 30minutes and the period of pipe laying become short. The strength of the connection part is stronger than that of the pipe body. PE pipe is corrosion inhibiting, so it is suitable for installation in seaside district. The water supply utilities suffered from pipe corrosion long time have been using PE pipe for distribution network in part of the seaside.

ii) Disadvantage

PE pipe does not tolerate organic solvent, oil and sunlight. Therefore, some water supply utilities don't use PE pipe due to taking into account the risk of pollution accident.

(2) Type of PE pipe and installations

High-density polyethylene (HDPE) has been used in water distribution pipe. On the other hand, two layer Polyethylene pipe has been used in service pipe only. Over the D200mm

of the water distribution PE pipe is not produced, because pipe thickness becomes thick and higher cost. Seventy percent of the cost for pipe installation is construction cost, which is mainly labor cost. The remaining thirty percent is material cost. As the construction period of PE pipe installation is shorter than other pipes, the construction cost is more economical than that of the DIP(ductile iron pipe) etc. The total length of PE distribution pipe is from 20,000km to 30,000km in Japan that have 650,000km distribution pipe totally. PE pipe is increasing rapidly. In Fukuyama City: Hiroshima prefecture, water pipe up to D150mm is all PE pipe. In addition, they have installed PE pipe about 40km annually. Niigata City and other cities also are using PE distribution pipe.

(3) The PE pipe damage situation from the Great Hanshin Awaji Earthquake in 1995

PE pipe has been used in the distribution systems of gas utilities in Japan. PE gas pipe has proven earthquake resistance. At that time, two layer polyethylene pipe has been used only in water service pipe. Based on the result of gas PE pipe, HDPE was accepted the use for water distribution system after the earthquake.

* The demand for PE pipe has been increasing over the past fifteen years in Europe.

(4) Damage of pipelines from the Great East Japan Earthquake on March 11, 2011

It should be considered separately in 311-mega earthquake, because post-disaster situation is different between a maritime area and internal region. Most of the areas affected by the tsunami are maritime area. On the other hand, there has been seen damaged pipe in internal region. For example, old asbestos cement pipes, which installed about forty years ago, were broken, taper socket joint (TS-type) of PVC pipe was gone off and VP pipe was cracked.

Post-disaster situation of the pipe in Sendai City is as below. Dada is before 7 April; A strong aftershocks was occurred on 7 April. Further breakdown of damaged pipe will become clear later

Devastated area	Number of broken cases	Total length
Wakamiya district	279	3,500km
Izumi district	164	
Taihaku district	121	
Miyagino district	111	
Wakabayashi district		
Total	675	

*Types of water distributing pipes: Ductile cast iron pipe, Steel pipe and PVC. Total PVC length is about 800km. The half of PVC pipe has taper socket joint. The rest is VPRR (rubber ring type joint).

*Data of PE pipe will become clear later.

A2: In case of Chiba Prefecture (Intensity 5 lower: The Japan Meteorological Agency criterion)

****This information was sent from Mr. HORIE Yoshitsugu, Japan Water Research Center***

Pipeline in Namekawa-Takaoka small scale water supply utility, Narita City use HDPE pipes which are D150mm, D100mm and D75mm diameter and 29 km length. And also they use two layer PE pipes which are D50mm, D40mm, D30mm and D25mm diameter and 12km length. These PE pipes were no damage by the Great Earthquake and Tsunami.

A3: In case of Yokohama city (Intensity 5 lower: The Japan Meteorological Agency)

****This information was sent from Mr. Nakanosono kenji, Yokohama Water corporation.***

PE pipe is installed in water-supply pipe of Yokohama water waterworks bureau use two layer-PE pipes D50mm and less for service pipe of which length is 32km. Other materials of service pipes are 41km of galvanized steel pipe, 25km of VP and 725km of PVC. The damages by the great earthquake occurred only in bend and screw part of old galvanized steel pipe (without lining). PE pipe and other materials had no damages. Now Yokohama city waterworks Bureau doesn't use galvanized steel pipe.

(Interviewer and editor: Mr. HORIE Toshiki, Ms. YAMAMOTO Keiko, 2011)