

Improvement of Distribution Pipes

Planning of projects

Water supply and distribution pipes in Osaka City have been brought up to form an extensive lifeline that is not less than approximately 5,000 km through nine water works expansion projects that have been implemented since the establishment of waterworks and six projects for improvement of water distribution pipes that have been promoted since fiscal 1965.

In the fourth Water Distribution Pipe Improvement Project, in particular, which began in fiscal 1992, a comprehensive network that covers all water supply and distribution pipes was developed as a pipeline system, which has a lifeline function equipped with a certain level of safety and reliability.

After the Great Hanshin-Awaji Earthquake, Osaka City examined the state of waterworks facilities from the perspective of earthquake resistance and formulated the Osaka City Waterworks and Earthquake-resistance Measures Reinforcement Plan 21 (Basic Concept) in March 1996 as Osaka's long-term concept to be promoted with sights set on the 21st Century. And the City was faced with the urgent task of implementing earthquake countermeasures based on the Plan.

Thus, the City reviewed the fourth Water Distribution Pipe Improvement Project and launched the fifth Water Distribution Pipe Improvement Project for ten years from 1997 to 2006 to expand and reinforce earthquake resistance measures covering a total length of 710 km with a total project budget of 170 billion yen. In the fifth and sixth Water Distribution Pipe Improvement Projects, the City, while continuing to implement the basic measures of the fourth Water Distribution Pipe Improvement Project, implemented enhanced pipeline-related initiatives toward the establishment of a highly reliable water supply system, such as raising the target earthquake resistance levels for pipelines and expanding the target range, formulating an effective plan for improving the earthquake resistance of pipelines in conformity with the recovery strategy, and reinforcing the pipeline network systems, in line with the principles of the Osaka City Waterworks and Earthquake-resistance Measures Reinforcement Plan 21 (Basic Concept).

In view of the current situation where many aged pipelines are still remaining despite steady progress in pipeline renewals through the past six Water Distribution Pipe Improvement Projects and where the threat of the great Nankai Trough earthquake is imminent, the City launched the Urgent 10-year Plan for Improving Earthquake Resistance of Pipelines, a 10-year project starting from fiscal 2018 covering a total length of 1,000 km with a total budget of 190 billion yen, with the aim of substantially accelerating the work of earthquake-proofing of pipelines and renewing the entire pipeline network, thereby responding to the residents' needs for safety and security.

Project contents (Urgent 10-year Plan for Improving Earthquake Resistance of Pipelines)

(1) Updating of aging pipelines

<STEP 1> Early elimination of cast iron pipes

In the first half of the project period, place priority on renewing cast iron pipes, which are particularly aged and expected to be seriously affected by the earthquake, thereby minimizing the damage on pipelines in the event of the imminent great Nankai Trough earthquake.

<STEP 2 > Promoting updating of aged pipes

In the second half of the project period, establish a new pipeline updating system by introducing a public-private cooperative method, and significantly accelerate the replacement of remaining cast iron pipes and old ductile cast iron pipes, which do not meet the quake-resistance standards, thereby curbing the increase in aging pipes.

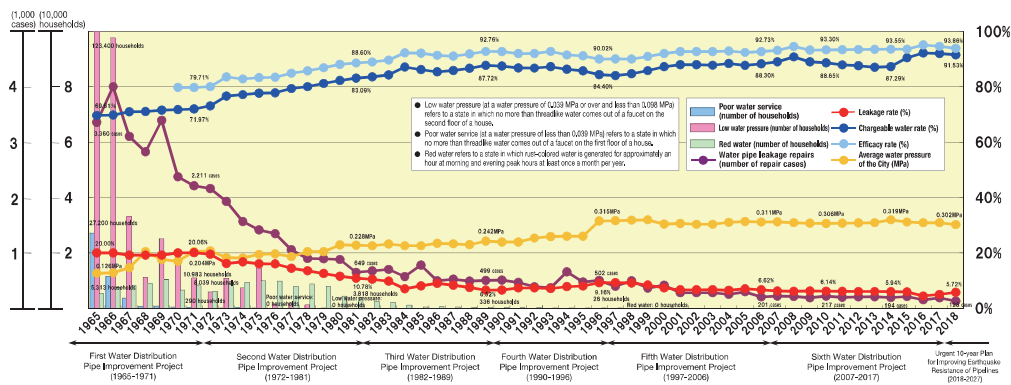
(2) Earthquake-proofing of important water supply facilities

In line with the updating of aging pipelines, replace all the pipes on the routes from the water source distribution reservoirs to important water supply facilities (disaster medical institutions, wide-area shelters) with quake-resistant pipes.

Figure: Updating of large-diameter pipeline (PIP method)



Effects of distribution pipe improvement



History of water distribution pipe improvement projects

Project	First Water Distribution Pipe Improvement Project	Second Water Distribution Pipe Improvement Project	Third Water Distribution Pipe Improvement Project	Fourth Water Distribution Pipe Improvement Project	Fifth Water Distribution Pipe Improvement Project	Sixth Water Distribution Pipe Improvement Project	Urgent 10-year Plan for Improving Earthquake Resistance of Pipelines
Business year	FY 1965-1971	FY 1972-1981	FY 1982-1989	FY 1990-1996	FY 1997-2006	FY 2007-2017	FY 2018-2027
Project length	1,072 km	1,835 km	384 km	349 km	630 km	742 km	1,000 km
Project cost	16.1 billion yen	80.7 billion yen	52.1 billion yen	74.5 billion yen	137.6 billion yen	126.5 billion yen	190.0 billion yen
Project contents	<ul style="list-style-type: none"> Improving poor water service resulting from a rapid increase in water demand and the insufficient water supply capacity of old pipes Repairing fire hydrants, gate valves and the like 	<ul style="list-style-type: none"> Eliminating poor water service, low water pressure, and pipes that frequently cause red water or water leakage Repairing or replacing old pipes, mainly small-diameter pipes (300 mm or less) 	<ul style="list-style-type: none"> Focusing on large- and medium-diameter pipes (400 mm or over), eliminating red water and improving pipeline functions (water supply capacity, joints, etc.) and safety 	<ul style="list-style-type: none"> Promoting systematic improvement of aging pipelines Reinforcing trunk line networks Enhancing mutual water supply between water distribution systems Introduction of advanced water distribution management systems 	<ul style="list-style-type: none"> Systematic renewal of aging pipelines Reinforcing reliability of pipeline systems Introduction of advanced water distribution management systems 	<ul style="list-style-type: none"> Strategic renewal of aging pipelines Reinforcing lifeline system functions Projects related to urban development 	<ul style="list-style-type: none"> Updating of aging pipelines Earthquake-proofing of pipe routes to important water supply facilities
Project effects	<ul style="list-style-type: none"> Sharp decrease in the number of households with poor water service in summer FY1965: 27,200 FY1971: 290 Rise in average water pressure of the City 1.55 kg/cm² → 2.10 kg/cm² Improvement in efficacy rate FY1964: 72.5% FY1971: 79.7% 	<ul style="list-style-type: none"> Poor water service was mostly eliminated by FY1976. Low water pressure was mostly eliminated by FY1980. Reduction in the number of households suffering red water FY1971: 8,039 FY1981: 3,818 Improvement in efficacy rate FY1971: 79.7% FY1981: 88.6% 	<ul style="list-style-type: none"> Reduction in the number of households suffering red water FY1989: 336 Improved earthquake resistance of water distribution pipes (Earthquake-proofing rate) FY1981: 75% FY1989: 79% Improvement in efficacy rate FY1981: 88.6% FY1989: 92.8% 	<ul style="list-style-type: none"> (Earthquake-proofing rate of pipelines*) FY1990: 80% FY1996: 83% *Rate of cast iron pipes, ductile cast iron pipes and steel pipes with mechanical joints 	<ul style="list-style-type: none"> (Earthquake-proofing rate of pipelines*) FY1996: 75% FY2006: 84% *Rate of ductile cast iron pipes and steel pipes 	<ul style="list-style-type: none"> (Earthquake-proofing rate of pipelines*) FY2006: 14% FY2017: 29% *Rate of ductile cast iron pipes and steel pipes with a separation prevention function 	<ul style="list-style-type: none"> (Rate of major pipelines meeting the quake-resistance standards) FY2017: 67% FY2027: 96% (Earthquake-proofing of important water supply pipelines) FY2027: Completion of earthquake-proofing of pipelines connected to disaster medical institutions and wide-area shelters

Major ductile cast iron earthquake-resistant joints (general pipelines)

