

Water Quality Tests

History of Water Quality Testing Laboratory

Established on April 5, 1949 as the first self-testing entity for tap water quality in Japan, the Osaka Municipal Waterworks Bureau's Water Quality Testing Laboratory boasts a history that spans more than half a century. To date, the Laboratory has accomplished countless achievements in the field of tap water quality management. Its achievements include the introduction of water quality inspection for the Lake Biwa and Yodo River basins, the source of raw water for Osaka City, and breakpoint pre-chlorination technology, the development of methods of analysis of trihalomethane and malodorous substances, studies into micro-organic substance treatment technology, and the introduction of advanced water purification technology.

Branch offices to carry out water quality management of water purification and other processes were established at the Niwakubo Water Purification Plant on August 1, 1957 and at the Toyono Water Purification Plant on June 17, 1968.

Acquisition of waterworks GLP certification

The Laboratory was Japan's first institution that acquired Good Laboratory Practice certification for waterworks (Waterworks GLP) and has been working to ensure precision in water quality inspections and tests, thereby communicating the highly reliable results of water quality inspections to customers. (Certification acquired on December 26, 2005)



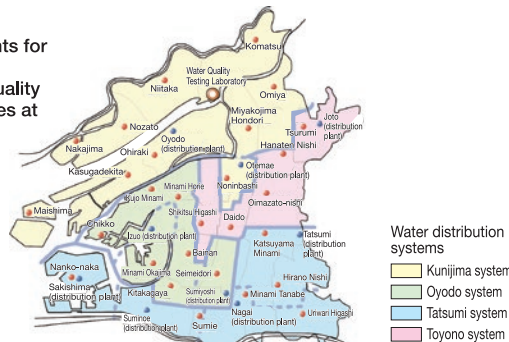
Water quality inspections at faucets

(Daily inspections) Inspection of water quality at faucets is carried out using remote water quality inspection devices installed at a total of 37 locations in each water distribution system, monitoring and measuring the color, cloudiness, toxicity and residual effects of disinfection continuously around the clock. (Fig. 3)

Details of daily inspection at faucets

Inspection name	Number of measuring locations	Number of measuring items	Remarks
Water quality inspection plan (daily inspection)	37 locations determined in Osaka City (marked with ●)	3 items	Inspection conducted at least once a day on color, cloudiness, toxicity and residual effects of disinfection (Item 1 (a), Paragraph 1, Article 15 of Waterworks Law Enforcement Regulations)
		3 items	Water temperature, pH value, electrical conductivity

Fig. 3 Water intake points for daily inspections (Remote water quality monitoring devices at 37 locations)



Water quality management at purification plants

The purpose of water quality management is to ensure that water transmitted to Osaka City from water purification plants conforms to water quality standards and that water purification is properly implemented. In addition, extraordinary water quality inspections are conducted when raw water has become highly cloudy due to heavy rain, when there is an abnormal water shortage, when a raw water contamination accident has occurred, or when irregularities are discovered in water purification processes, and the results are promptly reflected in water purification treatment.

Details of water quality inspections at water purification plants

Inspection name	Number of measuring items	Number of measuring items	Measuring frequency
Purification plant water quality management plan	Water purification processes at each water purification plant (raw water to purified water)	Water quality standard items, water quality management target items, etc. (over 200 items, including 91 items and agricultural chemicals)	Once a day to once a year

Osaka City Waterworks and Water Quality Management Plan

To ensure the safety of tap water, it is necessary to conduct appropriate water quality measurement in all processes, from raw water to each faucet, on a process-by-process basis. In this respect, the Water Quality Testing Laboratory studies the characteristics of water quality fluctuations in each process for each water quality item, and it formulated a plan on water quality management that designates the items of comprehensive water quality measurement spanning all processes, water intake locations, and measurement frequency. As shown below, the water quality management plan comprises four plans, including the Water Quality Inspection Plan, which each waterworks entity is required to formulate under Paragraph 6, Article 15 of the Waterworks Law Enforcement Regulations.

Fig. 1 Structure of Water Quality Management Plan

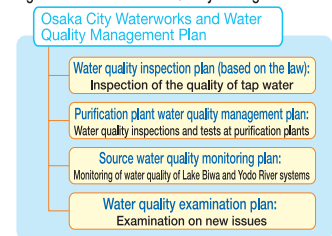
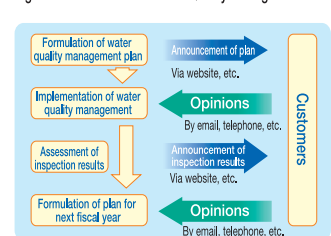


Fig. 2 Announcement of Water Quality Management Plan



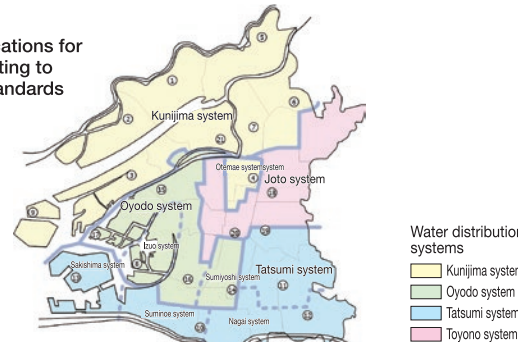
Water quality inspections relating to water quality standards

<Water quality inspections relating to water quality standards> Apart from daily inspections, to check representative water quality for each distribution system, Osaka City has designated a total of 21 water taps and conducts inspections at each such location. Together with the inspections it conducts at exits of purification plants, the City conducts inspections on all the water quality standard items. (Fig. 4) In addition, of the water quality management target items, inspection is also conducted on items associated with the possibility of fluctuations in density in water distribution and supply systems, along with the water quality standard items.

Details of water quality inspections relating to water quality standards at water supply taps

Inspection name	Number of measuring locations	Number of measuring items	Measuring frequency	Remarks
Water quality inspection plan (water quality inspections relating to water quality standards)	21 locations designated in Osaka City (1~21)	56 items, including water quality standard items and water quality management target items	Once a month to once every 3 months	Water quality inspections to check for compliance with water quality standards under Article 4 of the Waterworks Law

Fig. 4 Water intake locations for inspections relating to water quality standards (21 locations)



Source water quality monitoring

The Lake Biwa and Yodo River basins, the sources of raw water for Osaka City, are monitored to grasp the condition of water quality while surveys are conducted in order to contribute to the prediction of future water sources and raw water quality. The Water Examination Laboratory works in collaboration with other waterworks entities that also use Lake Biwa and the Yodo River as water sources to monitor, investigate and research* water quality. In addition, Osaka City conducts independent surveys on industrial waste water released into the Uji and Yodo River basins. In the event of a raw water accident occurring at the source, the established liaison structure is used to promptly acquire accurate information and to put measures in place at water purification plants.

Details of periodic inspections concerning water source quality monitoring

Inspection name	Number of measuring locations	Number of measuring items	Measuring frequency
Lake Biwa survey*	5	27 items	Once a month to once every 2 months
Yodo River mainstream survey*	8	58 items and 114 types of agricultural chemicals	Once a month to once every 2 months
Yodo River tributary survey*	5	48 items and 114 types of agricultural chemicals	Once every 2 months to once every 3 months
Industrial waste water survey	9	56 items	Once every 3 months to once every 6 months

Fig. 5 Source water rivers and industrial waste water intake locations



Water quality testing of industrial water

Water quality is tested to check that industrial water supplied for use to industries in Osaka City is of appropriate quality. Regular testing is carried out at the Higashi Yodo River Water Purification Plant (daily and monthly).

Other tests

Various other tests and inspections are conducted, including tests on water purification maintenance and management and on chemicals, materials and equipment related to safety of tap water.

- Quality testing of waterworks chemicals (aluminum sulfate, caustic soda, sodium hypochlorite, concentrated sulfuric acid, etc.)
- Quality testing of materials and equipment (granular activated carbon, filtration sand, gravel, etc.)
- Testing of waste water from specific water purification plants (waste water testing pursuant to Clean Water Act and Sewage Act, etc.)
- Water flow testing at waterworks facilities, such as distribution reservoirs
- Testing for leakage (judging whether the water is tap water)
- Contracted testing (commissioned testing based on the Osaka City Waterworks Bureau Contracted Water Quality Testing Handling Regulations)
- Water quality testing in response to customer inquiries



Research on tap water quality

To ensure the safety of tap water both at present and in the future, concerning substances contained in raw water for tap water with a minute concentration and substances that may be generated as byproducts in the processes of purification treatment or water distribution/supply, Osaka City gathers and examines information on their impact on the health and convenience of people. For items that require additional research, the City works to establish measuring methods and formulate measures to grasp the status of their presence and reduce them.

Major research target items	Research method
Microorganism indicators	• Gathering information
Infectious microorganisms	• Development and application of measurement methods
Endocrine disruptors (environmental hormones)	• Understanding the status of presence of target items (identifying the presence and concentration in raw water, etc.)
Agricultural chemicals	• Understanding behavior in advanced water purification processes, etc.
Residual organic pollutants	• Establishment of reduction measures
Organic synthetic compounds	• Verification of tap water safety
Disinfection byproducts	
Items requiring examination of water quality standards	

List of major precision analysis devices owned by the Water Quality Testing Laboratory

Analysis device name	Target substance	Number of units owned
Inductively coupled plasma mass spectrometer	Metals, including lead	3
Gas chromatograph mass spectrometer	Agricultural chemicals and organic substances including disinfection byproducts	4
Purge trap gas chromatograph mass spectrometer	Chloroform and other volatile organic substances	1
Head space gas chromatograph mass spectrometer	Chloroform and other volatile organic substances	5
Liquid chromatograph mass spectrometer	Agricultural chemicals and organic substances including environmental hormones	5
Atom light absorption photometer	Metals including iron	3
Mercury meter	Mercury	3
Gas chromatograph	Organic chlorine substances such as PCB	1
High-speed liquid chromatograph	Anionic surfactant and non-ionic surfactant	2
Post column high-speed liquid chromatograph	Organic substances including agricultural chemicals	1
Post column ion chromatograph	Negative ion types including bromates and chlorides	3
Post column ion chromatograph	Cyan, etc.	2
Full organic carbon meter	Organic substances quantities	3
Full organic halogen analyzer	Organic halogen quantities	2
Scanning-type electron microscope	Solids	1
Epi-illumination fluorescent microscope	Microorganisms such as cryptosporidium	3
ATP meter	Total bacteria content	1
Infrared spectrometer	Plastics	1
PCR device	Microorganism	2
Full-automatic solid phase extraction device	Organic substances such as agricultural chemicals	8
Total nitrometer	Total nitrogen	1
Micro-plate reader	Bioassay such as environmental hormones	1