Direct Water Service System to Super High-rise Buildings and Situation of Introduction Thereof

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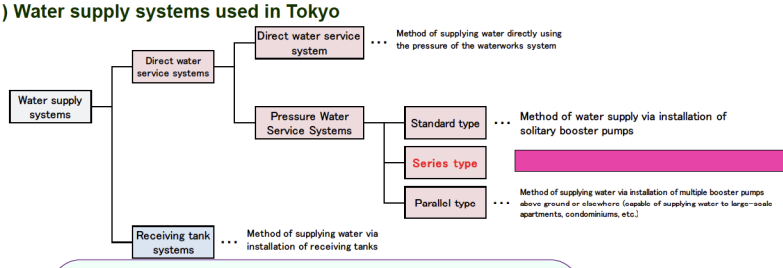
INTRODUCTION

- In order to serve customer needs for high-quality tap water, the Tokyo Metropolitan Government has established its own water quality management targets and introduced an advanced water treatment system that combines biological activated carbon and ozonation for all water at major water treatment plants.
- Tokyo also promotes the spread of a "direct water service system" that supplies safe, high-quality tap water directly to water taps, and as a result over 90% of newly constructed buildings use the direct water service system.
- Aiming for still further propagation of the direct water service system, Tokyo since 2009 has implemented a "Pressure Water Service System (series type)," the product of technical study of water supply systems that feature the installation of multiple booster pumps in series.
- Today, it is even possible to implement direct water supply systems in super high-rise buildings, which previously were unable to use the direct water service system.
- This paper reports on the contents of the technical study conducted for the implementation of the "Pressure Water Service System (series type)," as well as on the successful implementation of such a system.

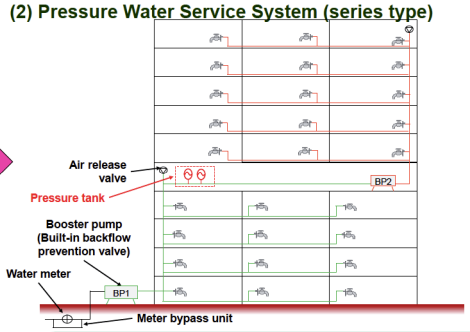
Pressure Water Service System (series type)

(1) Water supply systems used in Tokyo



➢ Advantages of the direct water service system
- Direct supply of safe, high-quality water (no degradation of water quality in a receiving tank)
- Effective utilization of installation space for receiving tank facilities and similar
- Reduced cost burden on users for equipment maintenance
- Better energy conservation through effective use of water pressure in the waterworks system (reduced environmental burden)

(2) Pressure Water Service System (series type)



◆ Pressure Water Service System (series type)
System supplies water using booster pumps installed in series between buildings and elsewhere.
Water can be directly supplied to high stories though a standard-type Pressure Water Service System.

Technical issues and the verification of solutions

(1) Technical issues in implementation

➢ When booster pumps are simply arranged in series, pressure fluctuation (pulsation) occurs due to time lag in the linked operation of multiple booster pumps when water is used

➢ In this situation, domestic standards (JWWA B 130) for delivery pressure fluctuation (flow rate fluctuations, suction pressure fluctuations, transient pressure fluctuations at pump start and stop, etc.) are not satisfied

(2) Study and verification of solutions

➢ As a solution, a method was adopted wherein pressure tanks to absorb pressure fluctuations (pulsations) were installed* on the primary side (suction side) of booster pumps in the second and subsequent stages. The optimal capacity of the pressure tanks was tested.

➢ Generic 39-liter pressure tanks were used in the interest of maintenance concerns, and an 84-item test was conducted based on domestic standards

➢ In terms of results, 78 liters of pressure tanks (39-liter x 2) successfully satisfied all test items based on domestic standards

* Pressure tank method: Method that controls pressure variations by supplementing water supply pressure, depending on the amount of water retained in the pressure tanks

Table: Pressure tank capacity test results

Test flowrate	Test items	Pressure tank capacity		
		None	39 L	78 L
0→30 L/min	Test of transient pressure fluctuations at pump start and stop	×	○	○
	Suction pressure fluctuation test	×	×	○
0→40 L/min	Test of transient pressure fluctuations at pump start and stop	×	×	○
	Suction pressure fluctuation test	×	×	○

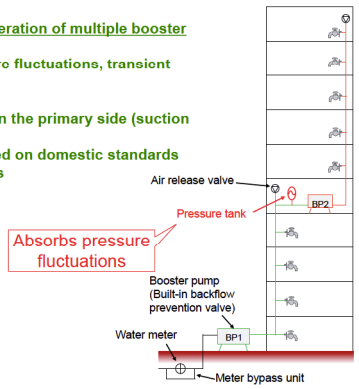


Figure 1: Conceptual image of test equipment (pressure tank method)

Implementation and direct water supply status (as of the end of March 2017)

- Series-type systems implemented in 85 buildings

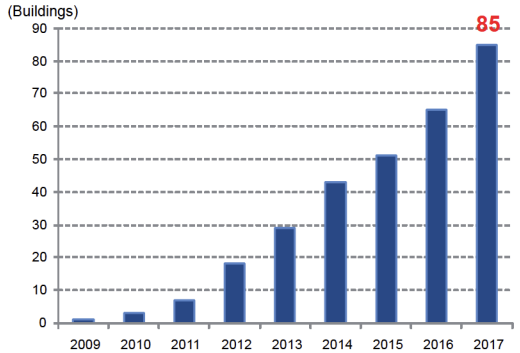
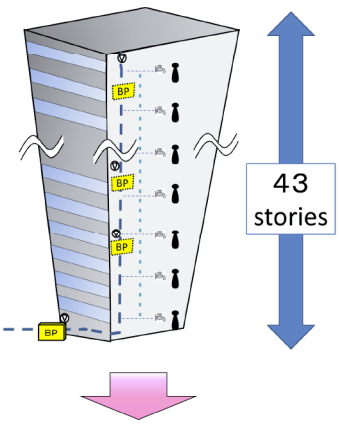


Figure 2: Pressure Water Service System (series type) installations

- The highest number of floors served by a direct water service system in 43 stories. In this case, 4 booster pumps were installed in series.



- Direct water service systems are adopted in over 90% of newly built buildings
- PR promoting transitions from receiving tank systems to direct water service systems

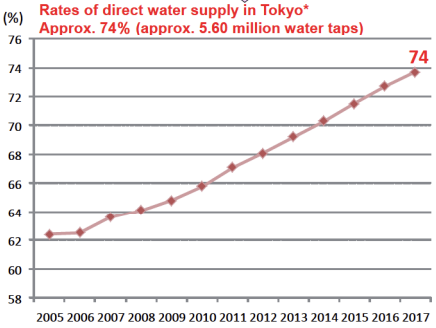


Figure 3: Changes in the rate of direct water supply

*Rate of direct water supply = (Number of direct water supply connections / number of water supply service connections) x 100

"Stable supply of safe, tasty waster" "Lower environmental burden through effective energy use"

References
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