

Overview of Current In-Building Water Supply System Management in Japan - Introduction of a Manual for Safety Management of these Systems -

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1. Introduction

In 2005, WHO published Water Safety Plans (WSP) with the subtitle – Managing drinking water quality, from catchment to consumer.¹ According to the WSP and other documents, to assure drinking water safety, several issues should be considered. These include:

- 1) Source water pollution prevention;
- 2) Treatment prior to distribution;
- 3) Protection during distribution;
- 4) Safe storage and distribution within buildings.

Of these, 1), 2), 3) can be regarded to function as barriers, where activities are designed to minimize the likelihood of contaminants entering the water supply or reduce or eliminate contaminants already present in the supply.

With the multiple barriers approach, each barrier provides an incremental reduction in the risk of water becoming unsafe.

If there is a failure at one point, the other barriers continue to provide protection.

In Japan 1) to 3) are controlled by the water supplier (public sectors) in common with other countries , and therefore the regulator can specify compliance requirements to the water supplier. As a result, it is not so difficult to keep safe management in these respects. However 4) may be outside the responsibility of the water supplier, and may thus be implemented by building managers. In addition as this is the final step, failure is not permitted.

So in-building water supply should be considered as a critical step to supply safe drinking water to the consumer.

In-building water supply systems with water tanks have been controlled by the Water Works Law in Japan since 1977. Since then owners of systems and/or building

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¹ Water Safety Plans, WHO/SDE/WSH/05.06 ,2005

managers have tried to manage them more safely. To keep these systems - over one million – safe, it is required that the owner should manage them safely. However, as owners normally do not have enough knowledge on the maintenance of such systems, a maintenance manual on in-building water supply systems for owners with a little knowledge on this issue is desirable.

2. Overview

2-1 Current status of In-Building Water Supply Systems with Water Storage Tanks in Japan

2-1-1 Tank volume Over 10 m³

Regulated by Water Works Law article 34-2;

The owner of the system is responsible for safety management of the system;

Technical maintenance protocol required including;

Regular Inspection (at least once a year);

Regular Tank cleaning (at least once a year);

Pollution control procedure should be introduced if necessary.

Table -1 Status of Inspection of Water storage tanks (Data; MLHW)
(Water Storage Tanks over 10m³)

	1999	2000	2001	2002	2003	2004
Number of tanks	184,401	190,150	194,278	196,381	201,809	206,451
Number of inspected tanks	157,781	162,186	165,034	165,408	167,497	166,839
Ratio (%)	85.6	85.3	84.9	84.2	83.0	80.8

Table-2 Status of non-compliance

	1999	2000	2001	2002	2003	2004
Number of non-complying tanks	65,318	68,386	70,816	68,598	62,431	47,625
Ratio (%)	41.9	42.2	42.9	41.5	37.3	36.2

2-1-2 Tank volume less than 10m³

Not regulated by Water Works Law;

Some Local Governments control them by local regulations.

Table-3 Current Situation of small scale In-Building Water Supply System Management
(Tank Volume; Less than 10m³)

	2000	2001	2002	2003	2004
Number of tanks	745,414	754,319	768,426	890,470	907,055
Number of inspected tanks	24,381	24,657	25,156	31,159	26,411
Number of non-complying tanks	12,918	12,060	11,047	14,041	9,498
Ratio (%)	53.0	48.9	43.9	45.0	36.0

As shown in these tables , the ratio of non-compliance remains at a high level despite the existing regulations. In my study, some 10,000 systems that were found to have non-complying tanks as a result of the previous year's inspection are surveyed. Of these systems, some 50% have not been improved in regard to the previous year's non-compliance.

2-2 Examples of non-compliance

Examples of non-complying tanks are as followings:

- 1 Sewage flow into water tank from sewage tank;
- 2 Animal Carcasses are found in water tanks;
- 3 Because of decay of water tanks' manholes, rainwater or sewage may flow into water tanks

This is caused by poor design of plumbing system, incorrect installation, alterations and inadequate maintenance.

Fortunately the ratio of such severe violations is very low at 0.2%; however we should try to improve this situation. There are two main measures for improvement. One is to change a tank system to direct connection. Whilst this may be effective, in some cases it may require a whole system alteration for high pressure supply. Another is to improve

the maintenance level of tank supply systems. In this case it is important to improve the building owners and/or managers' knowledge.

This study focused on preparing an in-building water supply system maintenance manual for building managers.

3. Introduction of the Maintenance Manual

The manual consists of the following articles;

1 Maintenance protocol

A building owner/manager is advised to prepare the maintenance protocol including:

- 1) Maintenance target;
- 2) Regular inspection of a whole system and each component;
- 3) Regular cleaning;
- 4) Emergency stop water supply;
- 5) Keeping documents on maintenance;
- 6) Cost for maintenance.

2 Selection of Water Tank Cleaning and Inspection Firm

- 1) Free available information of water tank cleaning and inspection firms;
- 2) Cleaning and inspection in the presence of building manager;
- 3) Hearing of the results of cleaning/inspection;
- 4) Receiving an improvement plan;
- 5) Combination of building manager, relevant firms, water supplier and government.

Other issues which should be considered together with the implementation of the maintenance manual are;

- 1) To introduce a recognition system of buildings with good maintenance; this may raise the value of the building.
- 2) To strengthen the relationship between building managers, cleaning/inspection firms, plumbers, water suppliers and government.

It is hoped that many owners/managers of in-buildings water supply systems and relevant specialists can become familiar with this manual in the near future. As a result maintenance levels of in-building water supply systems would be improved and then a step towards the goal of Safe Drinking Water Supply to All will be achieved.

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[1] Water Safety Plans,
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Water Safety Plan

Risk Management and Assessment
From Catchment to Consumer

Three Components

- 1) System assessment
- 2) Risk Management
- 3) Maintenance Protocol



WHO Guidelines for
Drinking –water Quality
3rd.Ed.
(Sept. 2000)

Issues should be considered

According to the WSP and other documents,
Issues to assure drinking water safety :

- 1) Source water pollution prevention;
- 2) Treatment prior to distribution;
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The Multiple Barriers Approach

Issues 1), 2), 3) can be regarded to function as barriers, where activities are designed to minimize the likelihood of contaminants entering the water supply or reduce or eliminate contaminants already present in the supply.

Each barrier provides an incremental reduction in the risk of water becoming unsafe.

A critical step to supply safe drinking water

- In Japan 1) to 3) are controlled by the water supplier (public sectors)
- It is not so difficult to keep safe management.
- 4) may be outside the responsibility of the water supplier, and may thus be implemented by building managers
- **This is final step, failure is not permitted.**
- So **In-building Water Supply** should be considered as a critical step to supply safe drinking water to the consumer.

Current status of In-Building Water Supply Systems with Water Storage Tanks in Japan

Tank volume Over 10 m³

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- 2) Technical maintenance protocol required including;
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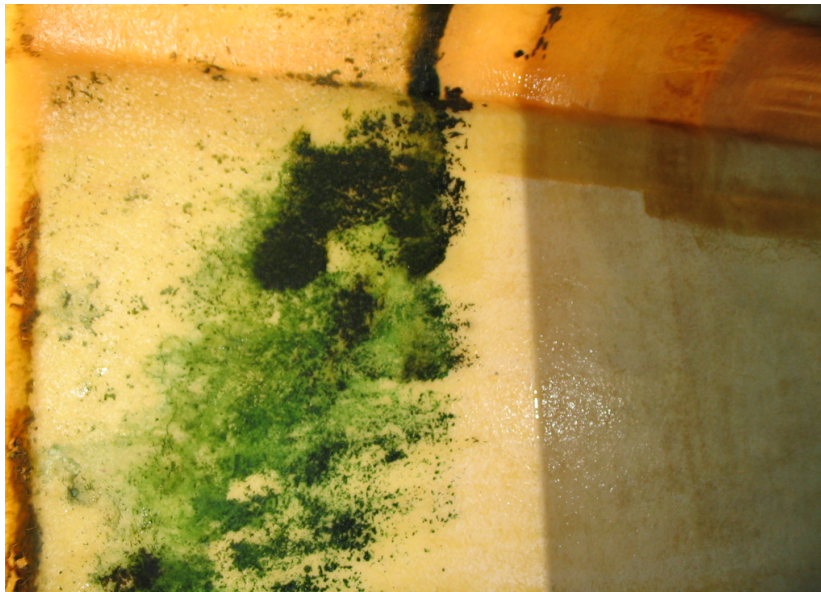
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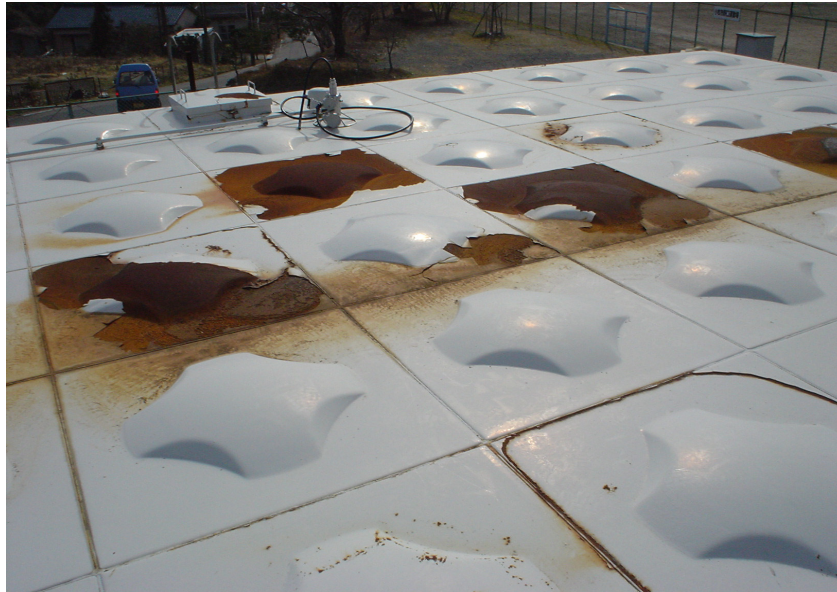
EX. 1 Cross connection



EX. 2 Algae in a Tank



EX.3 Decay of a ROOF



Two main measures for improvement

1) To change a tank system to direct connection, this may be effective in some cases it may require whole system alteration for high pressure supply

2) To improve maintenance level of tank supply systems

it is important to improve building owners and/or managers' knowledge.

Water Tanks on Roofs in Okinawa



Water Tanks in Shingapore





Introduction of the Maintenance Manual

1 Maintenance protocol

A building owner/manager is advised to prepare the maintenance protocol including

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Other issues together with implementation of maintenance manual

- 1) To introduce **recognition system** of buildings with good maintenance, this may raise the value of the building
- 2) To strengthen **relationship** between building managers, cleaning/inspection firms, plumbers, water suppliers and government

(参考) 横浜市給水管理適合施設表示制度

- 目的：設置者の管理意識を高め、安全で衛生的な受水槽水を確保する
平成6年6月から実施
当初（市が認定）
⇒平成16年度に表示制度に改正
⇒検査機関（協定）に移行
- 管理の良好な施設が自ら表示できる。
- 給水管理適合施設表示マーク（プレート）・有効期限シールの交付
- 施設利用者に見える場所に掲示



表示プレート