Water for All
Conserve, Value, Enjoy

PUB



PUB Technical Briefing



Water for All
Conserve, Value, Enjoy
PUB



Requirements for the Security and Maintenance in the Design and Installation of Water Storage Tanks

Tan Kah Kyee
Principal Engineer
Water Supply Network Department, PUB

CONTENTS

1) Gaps in Water Tanks

2) Obstructions to Maintenance

3) Non Potable Water Pipes Directly Above or Running Through Water Tank

4) Tightened Security Measures for Water Tanks

5) Amendment no. 4 Requirements

1. GAPS IN WATER TANKS

PUB REQUIREMENTS

Singapore Standard CP48:2005 – Code of Practice for Water Services

3.1.2 Storage tanks shall be **watertight** and constructed of non-corrodible or corrosion-resistant material. The material shall not impart a taste or odour to the water and shall not have any adverse effect on the quality of the water, and where necessary, the storage tanks shall be coated externally with a good quality weather-resisting paint. Lead lined tanks shall not be used.

3.1.12 The inspection manhole covers of a storage tank shall be close-fitted and hinged or chained to the tank. The inspection manhole covers of a storage tank shall be properly closed, secured and locked. The covers, hinges and chains shall be of non-corrodible or corrosion-resistant materials. **All gaps in the water tank including gaps on the inspection manhole covers and between the covers and the tank shall be properly sealed to prevent the ingress of any animal, insect or foreign material.**

6.4.9 Water tanks shall be maintained in a satisfactory condition for the safe storage and conveyance of potable water. The water tanks shall also be **watertight.**

6.4.12 Water tank inspection manhole covers shall be close-fitted, properly closed and hinged or chained so that they would not be misplaced. **All gaps in the water tank including gaps on the inspection manhole covers and between the covers and the tank shall be properly sealed to prevent the ingress of any animal, insect or foreign material.**

PUB REQUIREMENTS

Public Utilities (Water Supply) Regulations

7. Every storage tank for storing water supplied by the Board for potable purposes shall be **watertight**, of adequate strength, properly supported and shall be constructed of copper, glass reinforced polyester, concrete or other corrosion resisting materials and shall not have any adverse effect on the quality of water contained therein.

BACKGROUND

- Received cases of ingress of insects into water storage tanks resulting from gaps between the roof cover and the wall of concrete water storage tanks

- Such gaps are vulnerable and susceptible to ingress of any animal, insect or foreign material.

- Two recent cases in 2014 and 2015.

CHIRONOMID LARVAE FORMATION IN WATER TANKS IN YISHUN

Case Background

• Apr 2015 - Case of chironomid larvae formation in water tanks in a cluster of 8 blocks in Yishun.

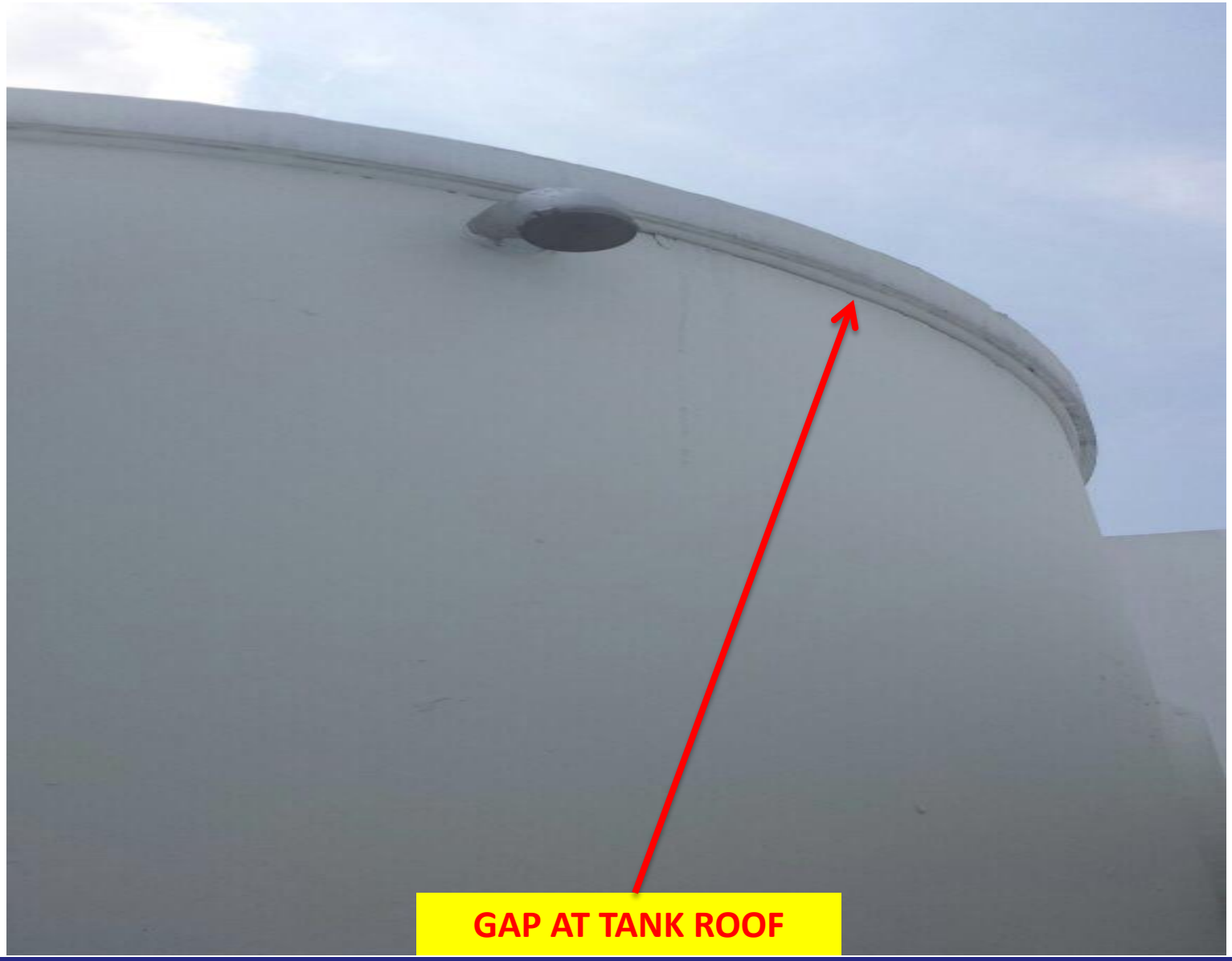
• Newly completed HDB blocks with 50% occupancy.

• Found water tanks had gaps between tank wall and roof which allowed midges to enter and lay eggs in water tank.

CONCRETE WATER TANK



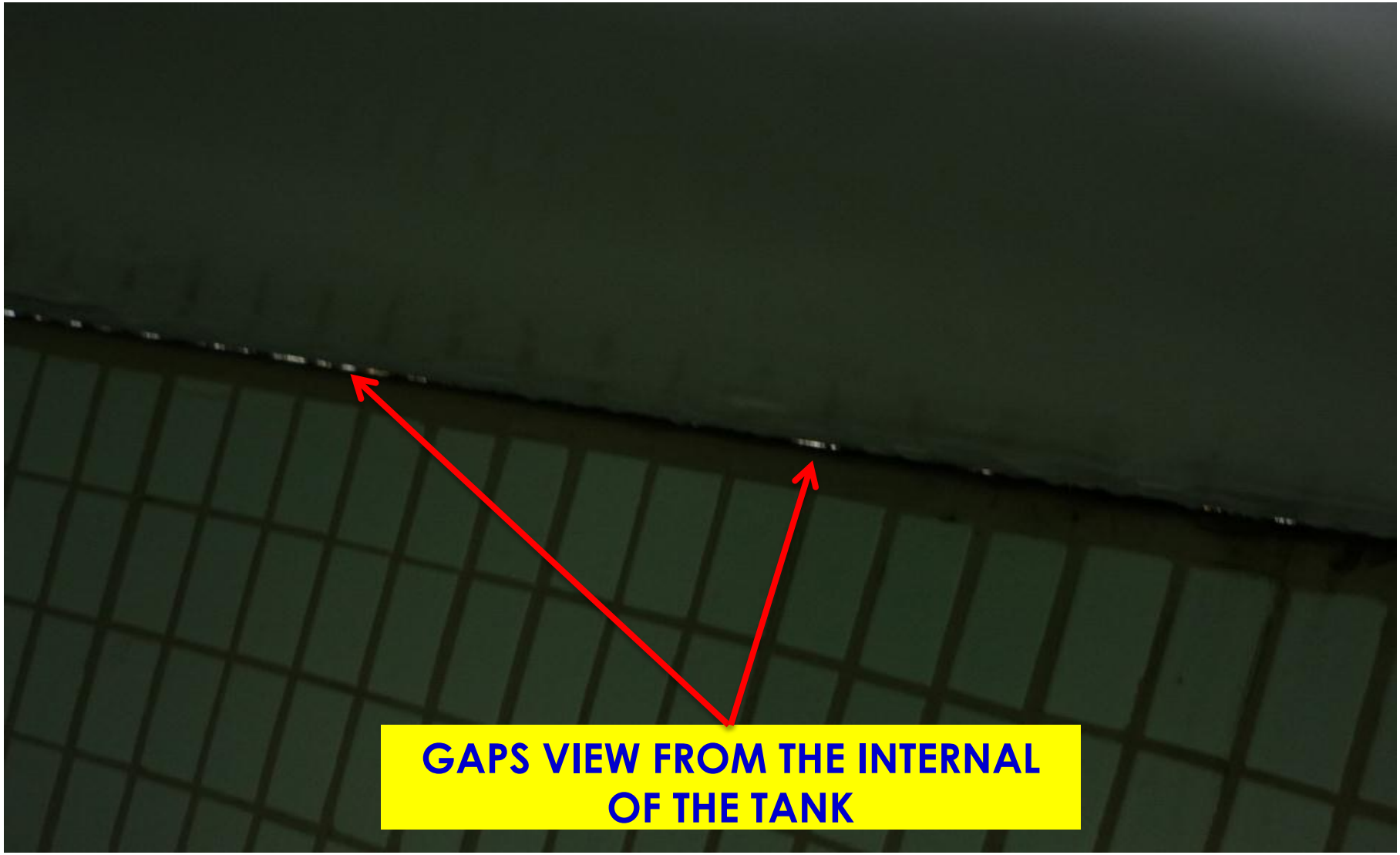
CONCRETE WATER TANK



CONCRETE WATER TANK



CONCRETE WATER TANK



MOSQUITO BREEDING IN WATER TANKS IN WOODLANDS

Case Background

• Jan 2014 – NEA found adult mosquitoes and larvae in rooftop water tanks at 2 blocks in Woodlands

• Found water tanks had gaps between tank wall and roof which allowed adult mosquitoes to enter the tanks

• Water Tanks at other surrounding blocks had no gaps/issues



Water tank with gap

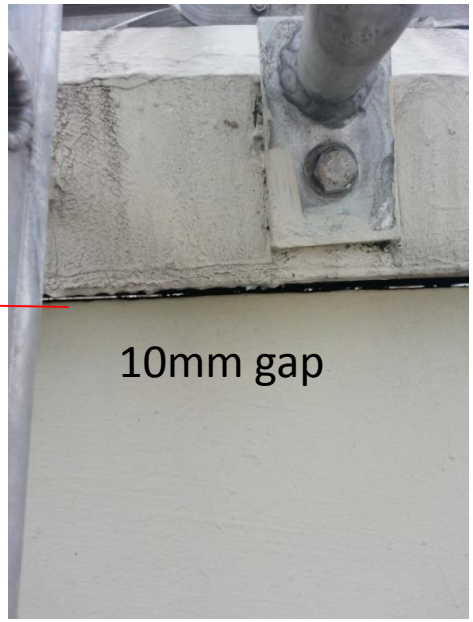




Photo of similar water tank with no gaps at nearby block

SUMMARY

- Ensure water storage tanks are watertight, with no gaps that may cause ingress of any animal, insect or foreign material.
- Keep an active look out for gaps and openings during your inspection of water storage tanks
- To seal/rectify such gaps and openings immediately
- All air vents and overflow and warning pipes must be properly screened with non-corrodible or corrosion-resistant stainless steel mosquito-proof netting of aperture size not exceeding 0.65mm

PUB will not hesitate to take stern punitive action on any licensed water service plumber or professional engineer who fails to comply with the above requirements.

2. Obstructions to Maintenance

PUB REQUIREMENTS

Singapore Standard CP48:2005 – Code of Practice for Water Services

3.3.3 Storage tanks shall be fixed in such positions that will enable the interiors to be readily inspected and cleaned, and where they will not be exposed to high temperature. **Adequate spacing of at least 0.6 m shall be provided all round the tank for maintenance and inspection purposes.**

3.3.5 **Proper permanent access to the storage tank shall be provided.** The water tank inspection manhole shall be located as close to or within two tank panels away from the access ladder to the tank. Where a tank is fixed in the roof space, sufficient provision shall be made by a trapdoor or otherwise, sufficiently large for access to the tank and to enable it to be inspected, cleaned and repaired or replaced.

BACKGROUND

- Structures found to be installed directly above the water tanks – obstructs inspection of tanks

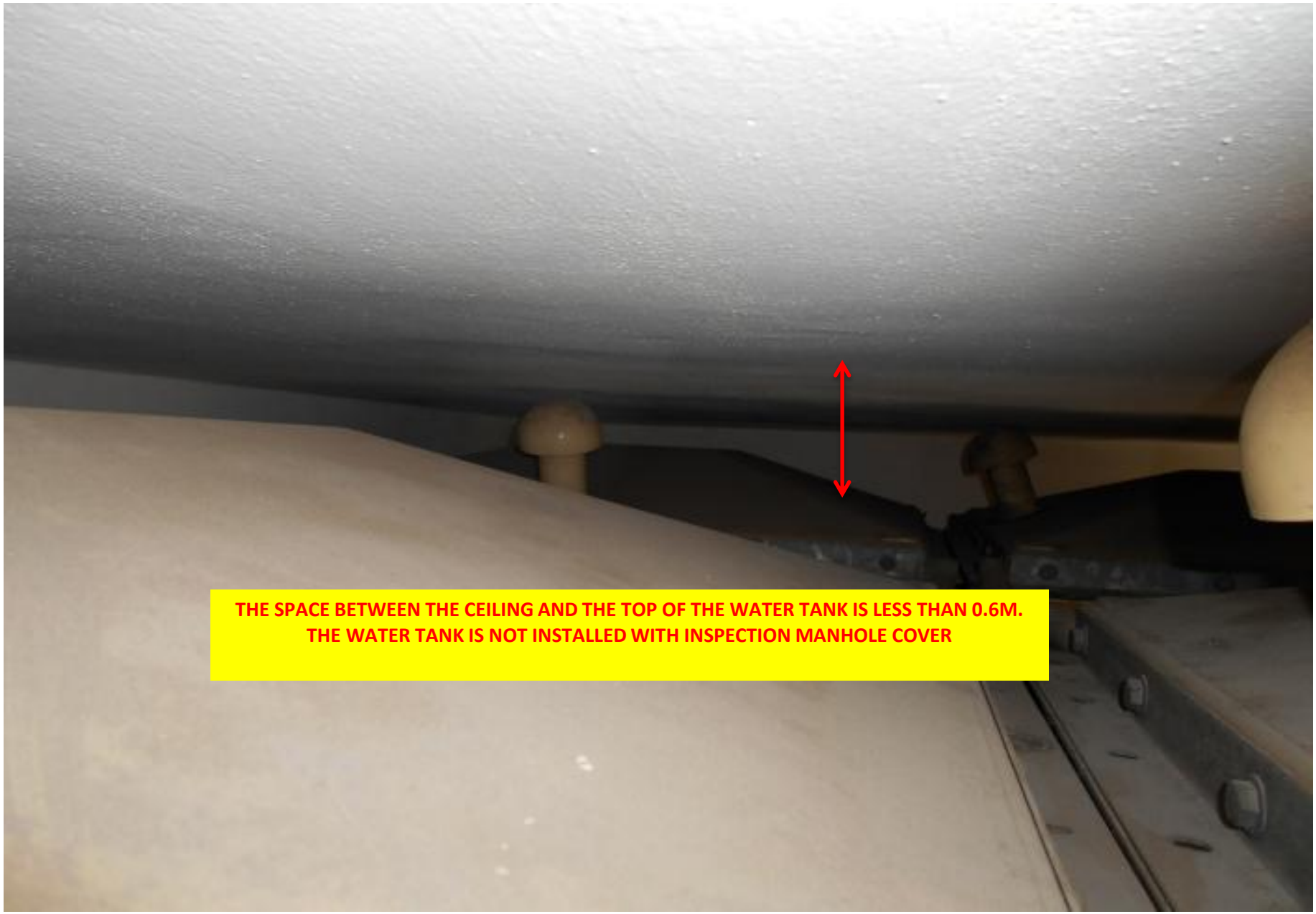
- Water tank access covers blocked and could not be opened fully – prevents access into tanks

- Insufficient space for maintenance around and on top of the water tanks




T4



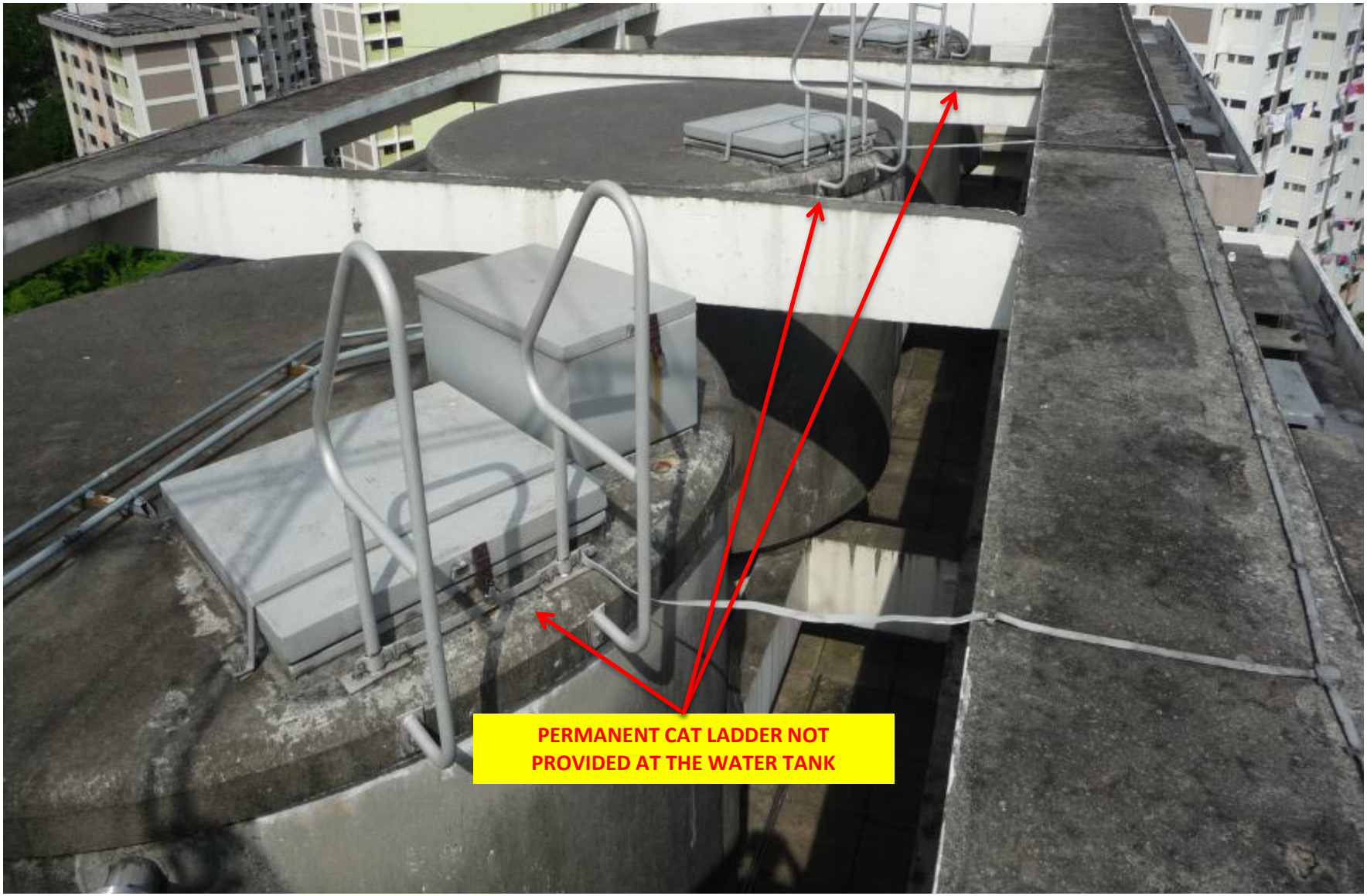

THE SPACE BETWEEN THE CEILING AND THE TOP OF THE WATER TANK IS LESS THAN 0.6M.
THE WATER TANK IS NOT INSTALLED WITH INSPECTION MANHOLE COVER


21/06/2012

BACKGROUND

- No proper permanent access to the water tanks
- Water tanks inspection manhole inaccessible
- Prevents inspection and cleaning of tank
- Safety concerns


PERMANENT CAT LADDER NOT
PROVIDED AT THE WATER TANK


PERMANENT CAT LADDER NOT
PROVIDED AT THE WATER TANK

SUMMARY

- The Public Utilities (Water Supply) Regulations require building owners to engage a licensed water service worker to inspect, clean and disinfect the water tanks if necessary, and certify that the tanks are fit for storage of water annually.

- Pose a challenge for Town Councils/MCSTs/building owners to maintain and secure the water tanks:-
  - Insufficient spaces to carry out proper maintenance of the water tanks
  - Inspection manhole inaccessible

- Ensure water tanks are installed with a clearance of 0.6m all around the tank

- Proper access - Require entry into the tanks to inspect, wash and clean the tanks prior to disinfection. Ensure cat ladders installed near to inspection covers for easy access.

3. Non Potable Water Pipes Directly Above or Running Through Water Tank

PUB REQUIREMENTS

Singapore Standard CP48:2005 – Code of Practice for Water Services

3.1.15 No storage tank and its associated water pipes and pumps (where applicable) shall be installed in such a position that :

- it is directly **below any sanitary pipe, floor trap, sewer pipe, reclaimed water pipe, waste pipe or any other pipes conveying fluids that may cause contamination to the water in the storage tanks**;

- the water contained in it is contaminated or liable to contamination;

6.4.13 No sanitary pipe, floor trap, sewer pipe, reclaimed water pipe or waste pipe shall over-cross or be above the water tanks.

BACKGROUND

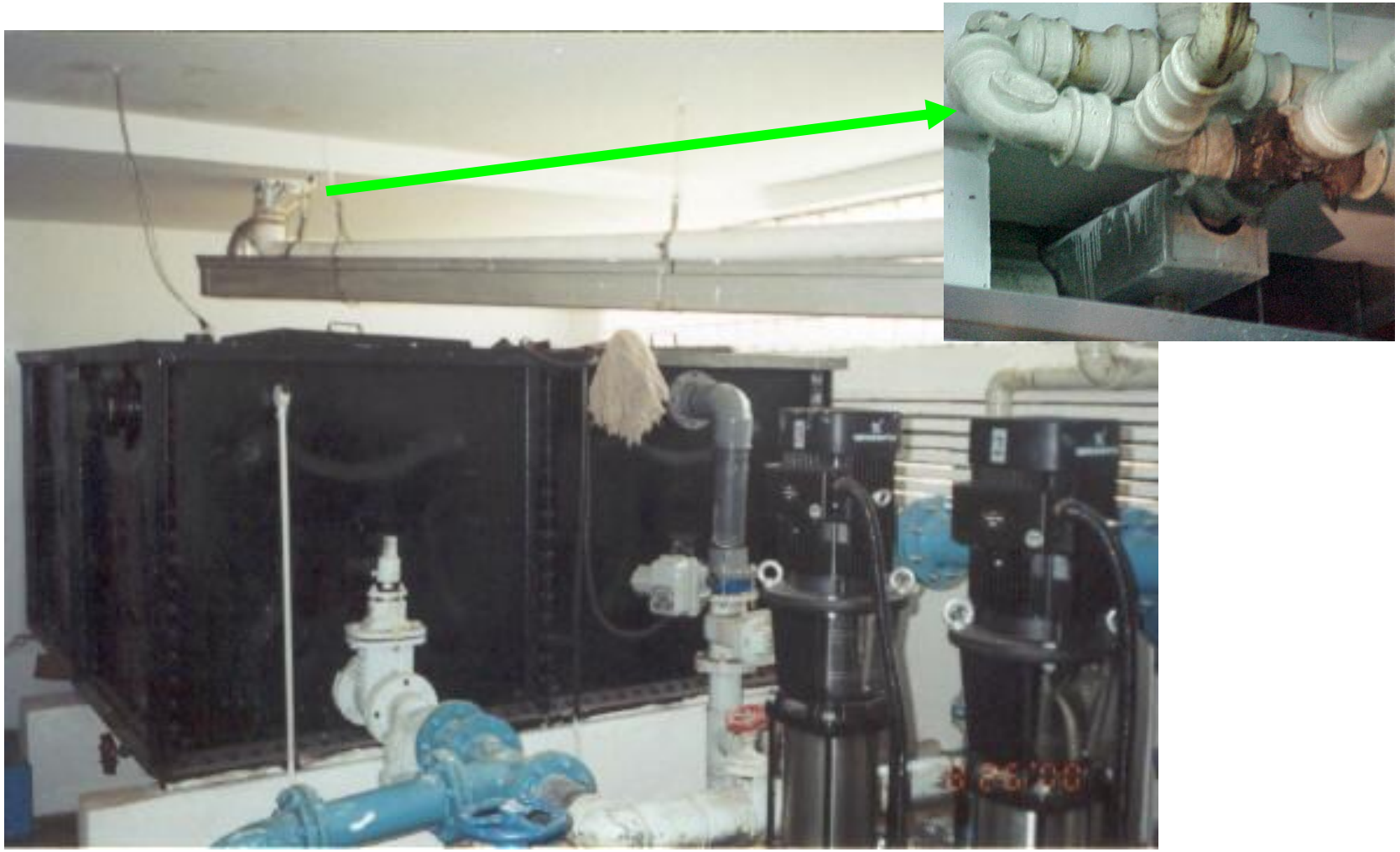
- 22 Aug 2000 – high number of patients from either residents of Sherwood Towers (adjoining Bukit Timah Plaza) or office workers from Bukit Timah Plaza, suffered from abdominal pain, diarrhoea and vomitting. More than 120 fell sick.

- Found waste water from a corroded sanitary pipe seeped into a water tank below the sanitary pipe.

- The cause of the contamination was not just the corroded sewer pipe above the water tank but also the poor maintenance of the water tank.

- The roof panels of the tanks were installed with gaps in them and the manhole cover was displaced.

Sewer pipe above water tanks



DANGER
CONFINED SPACE





DRY RISER PIPE RUN THROUGH THE LOW LEVEL WATER TANK



GAP AT THE WATER TANK WHERE THE DRY RISER PIPE RUN THROUGH


DRY RISER PIPE INSIDE THE
LOW LEVEL WATER TANK


DRY RISER PIPE INSIDE THE
LOW LEVEL WATER TANK

SUMMARY

- For new developments, sanitary pipe, floor trap, sewer pipe, reclaimed water pipe, waste pipe or any other pipes conveying fluids that may cause contamination to the water in the storage tanks above potable water tanks is not allowed to be installed above water tanks. The mandatory design and installation requirements such as this have also been incorporated in the PU (Water Supply) Regulations and the SS CP 48 to ensure that water tanks are designed and built to be as contamination-proof as possible.

- For existing development, diversion of sanitary pipes is required. If not possible to divert, a fibreglass tray has to be installed below the sanitary pipe.

4. TIGHTENED SECURITY MEASURES FOR WATER TANKS

Watertight security at water tanks here

Incident in which 5 boys dumped washing powder into a tank has sparked fears, but town councils say checks are in place

By **SUE-ANN CHIA** *and* **NATALIE SOH**

A SINGLE act of carelessness by a worker working in Block 124, Paya Lebar Way, has left people wondering whether water supplies here are safe.

That careless person left both the water tank on the rooftop and the trapdoor access unlocked, allowing five boys to enter and dump about 1 kg of washing powder into the tank as a prank.

The result was that 64 out of 80 households had soapy water running from their taps.

Others now worry if the same, or worse, might happen to them.

Said housewife Lim Swee Ling, 40, who lives in Aljunied Crescent: "I'm quite worried this will happen in my block because children can be playful and hard to control."

The alarm was first sounded by Mr Henry Lim, who wrote to the Forum page, noting that it exposed how lax security here was.

He wrote: "This is a grave loophole in our homeland security... The thought that the culprits could have been terrorists is sending chills down my spine."

The danger, he feared, could have been worse — someone dropping more malicious contaminants into the water.

But spokesmen from the various town councils said adequate security checks were in place. Generally, they said, all water tanks and trapdoors in Housing Board blocks are locked.

And, indeed, a random check by The Straits Times on 50 blocks in seven neighbourhoods around the island confirmed that: All the blocks had padlocks on the trapdoors to the roof.

As for the tampering incident in Block 124, the spokesman for the Marine Parade Town Council said the unlocked trapdoor was a "one-off incident". But she could not identify who that careless culprit was, as "many people have access to the roof".

These, she said, include lift technicians, plumbers and staff from the town council and the Housing Board.

Investigations by the town council, however, pointed to carelessness by one of these people as the likely cause of the security breach.

She added that the council had checked all locks after that, and has stepped up inspections from monthly to fortnightly.

Besides, the council is also implementing a "rooftop access-card system".

Under this system, technicians going onto the roof will have to sign in on a slip of paper. They have to record the date, the time in and out, and the purpose of entry.

Other town councils also said they carried out frequent checks.

A spokesman for the Bishan-Toa Payoh Town Council said that even before the incident, it was trying out a new "electronic and magnetic door-access system" to the rooftops, pump rooms and switch rooms.

When a technician uses his access card, it is registered automatically on the town council's computer system.

So far, it is being tried out on three blocks in Toa Payoh, but will be introduced, in phases, to all blocks in the town council's constituency.

A Jurong Town Council spokesman said it was considering adopting a similar system, but was currently evaluating its cost and feasibility.

Mr Boey Kok Lap, estate manager for Potong Pasir Town Council, said checks were performed almost daily and three dozen locks were kept at all times, in case any of the old locks get worn out.

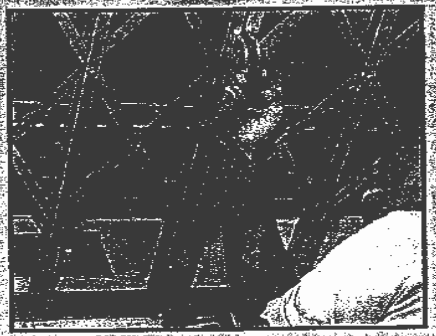
He said: "The locks are very crucial as we want to make sure that nobody can go up there and put in insecticide or even kerosene."

Residents, in the meantime, say they will be more alert. Retiree Koh Yew Hock, 68, said: "If I see that it is not locked, I will inform the town council." — ADDITIONAL REPORTING BY LOW SIOK HWEE



PICTURES: TAN SUAN ANN

Water tanks and trapdoors in HDB blocks are locked, say spokesmen for various town councils.



A random check by The Straits Times on 50 blocks found that all had padlocks on trapdoors to the roof.

FEAR OF CHILDISH PRANKS:...

'I'm quite worried this will happen in my block because children can be playful and hard to control.'

— Housewife Lim Swee Ling, 40, on the recent incident in which five boys dumped washing powder into a water tank

...AND TERROR ATTACKS

'This is a grave loophole in our homeland security... The thought that the culprits could have been terrorists is sending chills down my spine.'

— Forum page letter writer Henry Lim, on how lax security is here

Water for All: Conserve, Value, Enjoy
PUB

The Straits Times
28 August 2002

Five boys arrested for water-tank prank

They allegedly poured washing powder into a block's water tank, contaminating the water supply of 64 households there

By LEE HUI CHIEH

RESIDENTS of Block 124, Paya Lebar Way, found soapy water gushing from their taps on Monday afternoon, after washing powder was dumped into their water tank on the rooftop.

Five boys, students aged between 11 and 14, have been arrested for the deed, which left up to 64 of the 80 households without clean running water for about three hours.

Apparently, the boys had filched the washing powder from an unlocked cabinet on the block's topmost 21st floor.

They got to the rooftop via a trap door, which residents say had not been padlocked since Sunday.

Miss Tabita Anna, 26, an Indonesian maid working in a ninth-floor unit, was among the first to detect the mischief at 5.40 pm.

"I was washing the dishes after I'd finished cooking dinner, but the water had a lot of bubbles and smelled strongly of detergent," she told The Straits Times.

She rang her employer, who rang the town council.

A plumber dispatched by the town council found two 1 kg packets of washing powder, both half-emptied, near the two water tanks on the rooftop. He cut off the tank's water supply, which was found to contain soapy water.

Town council staff then flushed out the down-feed pipes so that residents could get clean water from the second tank.

While many lined up with pails to collect water from a void-deck tap, others chose to go elsewhere.

Said Mrs Lorna Fong, a housewife in her 30s: "I was about to cook, but I then couldn't, so I packed my whole family to my country club to shower and to have dinner."

Police approached four of the boys on Monday night in a food centre at Block 79, Circuit Road, after a resident gave them a description of some children playing on the rooftop earlier that day.

They fled on seeing the cops, but one of them, an 11-year-old, was caught. He led the police to his accomplices later that night.

The fifth boy, 12, was detained yesterday morning.

The police have classified the case as theft and a rash act.

A spokesman for Marine Parade Town Council said that an internal investigation would be conducted to ascertain how the boys managed to gain access to the rooftop and the water tank.

The incident has spooked some residents. Said Mrs Fong: "I don't really trust the water any more. It's scary. How do we know what people put inside it?"



PHOTOS: AZIZ HUSSIN



Access to the rooftop water tank was made easier by the fact that the trap door leading to it (left) had not been padlocked. One resident, Mrs Lorna Fong (above), said she had to take her whole family out to shower and have dinner as a result of the incident.

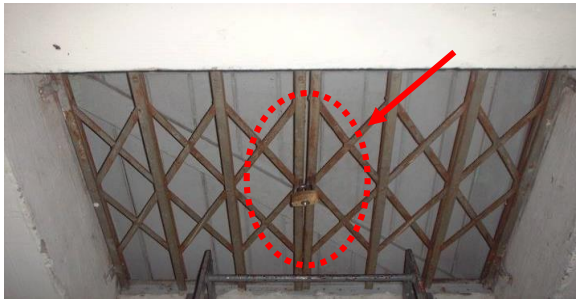
ENHANCING SECURITY OF WATER TANKS

PROVISIONS INTRODUCED IN THE PUBLIC UTILITIES (WATER SUPPLY) REGULATIONS SINCE 2002 TO TIGHTEN WATER TANK SECURITY

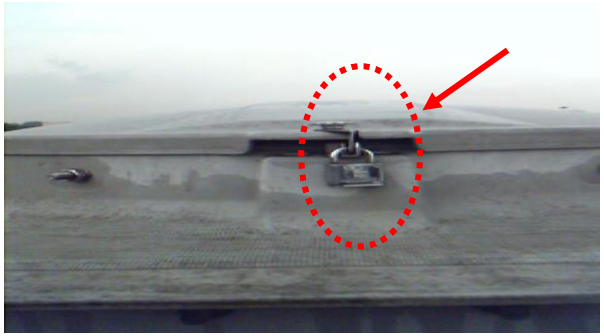
TCs/MCSTs/Building Owners are responsible for ensuring security of the water tanks

Regulation 14
Public Utilities (Water Supply) Regulations

- Only authorised personnel have access to water tanks & premises where they are located.
- Water tanks & premises where they are located are properly & securely locked at all times
- Checks are conducted regularly on the tanks & proper records kept
- Notify PUB immediately of any unauthorised access to tanks



Access to tank secured



Tank cover secured



News

Body found in Woodlands block water tank. Fearing contamination, residents...

Rush to get clean water

"What I heard from PUB is that the water that flows out of taps after 11am is most likely residual water from their taps. PUB said the degree of contamination of this residual water is quite low."

– Mr Vikram Nair, MP for the ward

The Straits Times
17 May 2011



We wish our Buddhist readers a happy Vesak Day

PLANE MAKES EMERGENCY LANDING IN S'PORE AFTER ENGINE FIRE

Panicking passengers cry: God, save our flight!

the new paper

TUESDAY MAY 17 2011

WOODLANDS RESIDENTS (BELOW) COLLECT OWN WATER AFTER DEAD BODY FOUND IN BLOCK'S WATER TANK

One resident says:

I used the water to make soup!

Doctors say...

Bloody fight near Jurong mall leaves man in hospital



Maid worked for family on 6th storey

Arrested

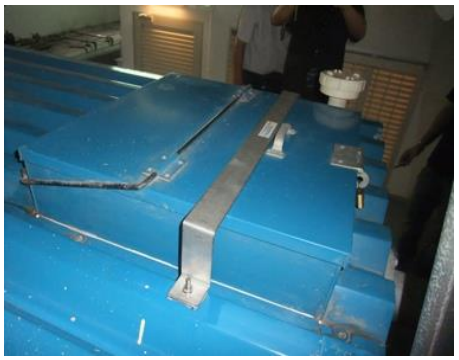
Queue

SORRY

TIGHTENED SECURITY MEASURES

- **Operational measures for key control & management – From 1 Jul 2011**
  - Restrict keys access to TC/MCST/MA staff and Emergency Personnel.
  - Separate master keys/key-alike for water tanks covers and access in groups of buildings
  - Keys to be housed separately
  - Identification for authorised workers at rooftop/tank areas
  - Spot checks carried out on works and tank areas
- **Infrastructure measures to secure water tank covers and access – by 31 Dec 2011**
  - Brackets for tank covers
  - Replacing locks with high security locksets/padlocks with non-duplicable keys



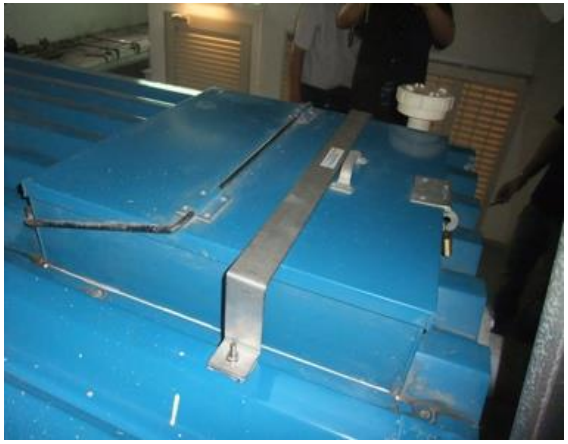




NEW MEASURES TO TIGHTEN WATER TANK SECURITY



SECURE ALL TANK COVERS BY BOLTING/FASTENING





SECURE TANK COVERS BY BOLTING/FASTENING

CONCRETE TANKS

- Base piece installed onto concrete tanks by raw bolting.
- Qualified Engineer or Tank Specialist consulted to avoid damage to water-proofing.

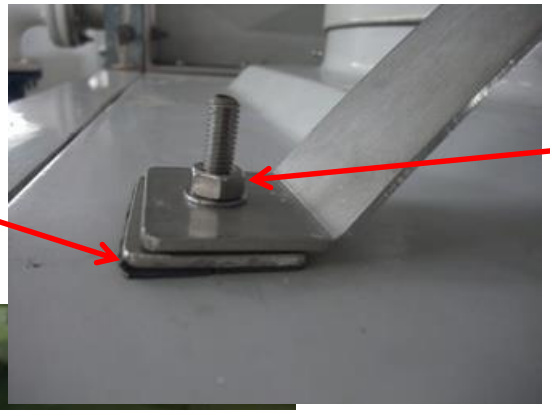




SECURE TANK COVERS BY BOLTING/FASTENING

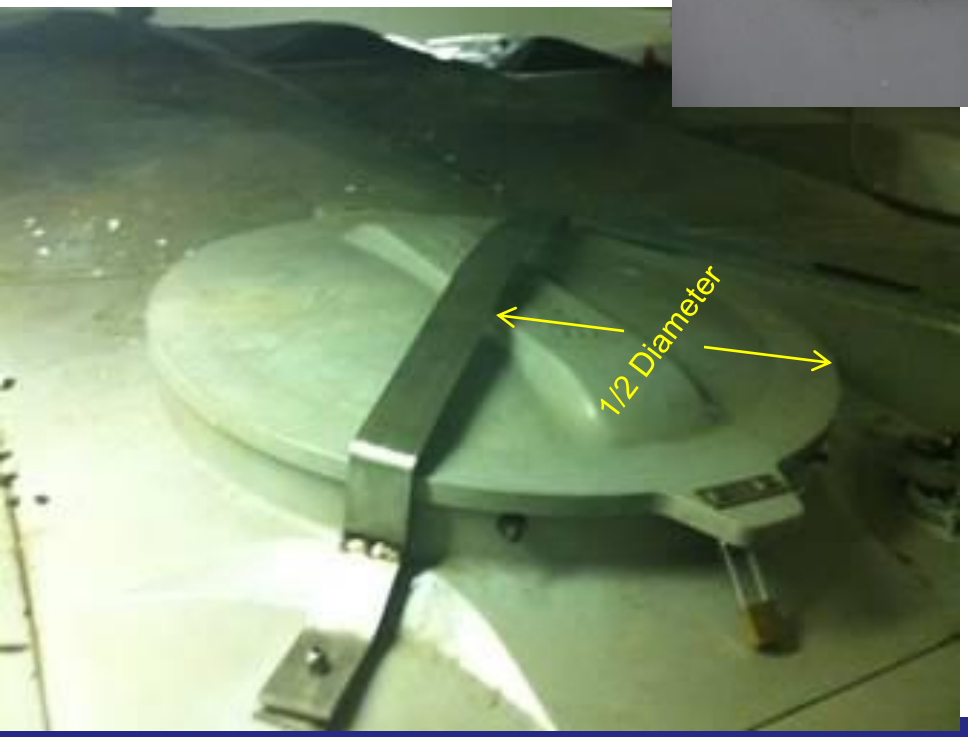
FIBRE REINFORCED POLYESTER (FRP) & GLASS REINFORCED POLYESTER (GRP) TANKS

Base piece installed onto FRP/GRP tank using 2.3 mm thick 3M VHB Tape



Use tapered round nut





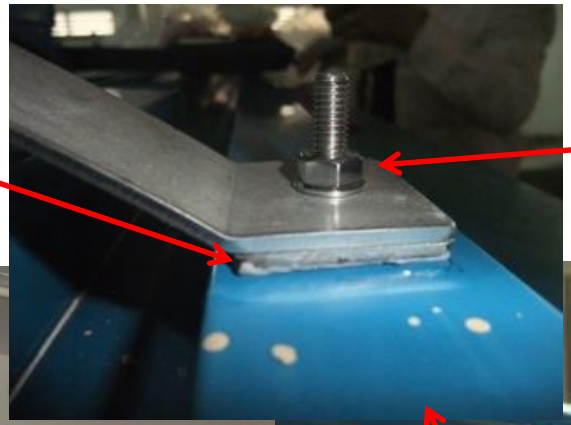
- Brackets follow contour of tanks closely.
- Clearance between bracket & tank cover must not be more than 5 mm.
- To be installed ½ the length or diameter of the water tank.

SECURE TANK COVERS BY BOLTING/FASTENING

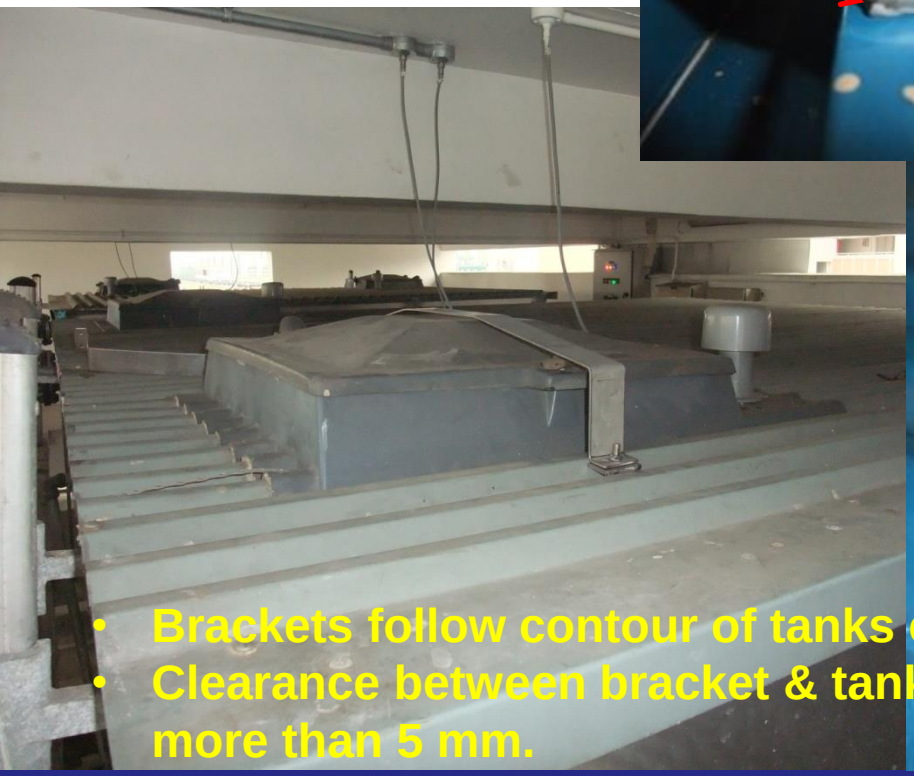
STAINLESS STEEL TANKS



Base piece installed onto SS tank using 2.3 mm thick 3M VHB Tape



Hexagonal nut to be replaced by tapered round nut





- **Brackets follow contour of tanks closely.**
- **Clearance between bracket & tank cover must not be more than 5 mm.**

How did they get access? Youths play dangerously on Bedok HDB rooftop

Posted on 26 December 2014 | 1,886 views | 2 comments



Sky-high vandalism: Crude message scrawled on rooftop wall of Toa Payoh block 85A

Posted on 07 May 2014 | 25,930 views | 44 comments



SUMMARY

- There is a need for longer term measures to tighten the security of water storage tanks

- Explore use of alarm systems and remote monitoring as well as other technological solutions to enhance security

- Explore segregation of water tanks area from other services/activities
  => included in Amendment No. 4

5. AMENDMENT NO.4 REQUIREMENTS

Singapore Standard CP 48 : 2005

Code of practice for water services

AMENDMENT NO. 4

December 2014

PUB

Water for All : Conserve, Value, Enjoy

Your Ref :
Our Ref : WSN 92802/49
Date : 20 Mar 15

Please address any correspondence to Water Supply (Network) Department
Tel : 67313406 Fax : 67313023
Email : ramahad_singh@pub.gov.sg

To Relevant Professional Institutes, Associations, Societies, Statutory Boards, Government Organisations, Developers, Qualified Persons, Professional Engineers, Licensed Water Service Plumbers, Suppliers, Testing Laboratories.

Dear Sir/Madam

SINGAPORE STANDARD CP 48:2005 – CODE OF PRACTICE FOR WATER SERVICES - AMENDMENT NO. 4

This circular is to inform you of the latest amendments to the Singapore Standard CP 48:2005 – Code of Practice for Water Services.

2 The amendments (cited as "Amendment No. 4, December 2014") have been uploaded by SPRING Singapore at the Singapore Standards eShop website. You can access the amendments at the following link: http://www.singaporestandardseshop.sg/Search/DownloadFile.aspx?fn=1502041443 50CP%2048-2005_Amd%204.pdf. A copy of the amendments is also attached.

3 In addition, we will also like to highlight Section 7.2(i) of SS CP 48:2005, which outlines the requirement of installation of private water meters to measure water consumption at various water usage areas to monitor and track the water consumption at these areas for water usage and leakage control management.

4 All Professional Engineers and Licensed Water Service Plumbers are reminded to take note of the amendments to SS CP:48 and ensure compliance.

5 I would appreciate it very much if you could bring the contents of this circular to the attention of your members/staff. Please do not hesitate to contact Mr Christopher Chua at 67313669 or email christopher_chua@pub.gov.sg if you need further clarification.

Thank you.

Yours faithfully

RAMAHAD SINGH
CHIEF ENGINEER (WATER DEMAND MANAGEMENT & INSPECTORATE)
for DIRECTOR
WATER SUPPLY (NETWORK) DEPARTMENT
Encs.

40 Scotts Road #22-01 Environment Building Singapore 228231 Republic of Singapore
Tel: 62358888 Fax: 67313020 Website: www.pub.gov.sg

Applied to water service plan submissions submitted to PUB on or after the date of the circular (i.e. 20 Mar 2015) or earlier if we were consulted on water tank security.

Amendment No. 4 to Singapore Standard CP 48:2005

Clause 3.1.19

3.1.19 For water tanks in developments other than landed residential premises:

— the water tanks and their ancillary equipment shall be housed in an adequately secured and locked dedicated tank/pump room or located within an adequately secured and locked enclosure. **The room/enclosure housing the water tanks and their ancillary equipment shall be segregated from other services such as services for telecommunications, lifts or fire-fighting.**

— **all water tank covers and access doors and openings to the rooms/enclosures housing the water tanks and their ancillary equipment shall be securely locked with high-quality, strong and durable hinges, latches and locks with non-duplicable keys (i.e. patented keys that cannot be duplicated without proper authorisation).**

— **all water tank covers shall be adequately secured by bolting or fastening with stainless steel brackets/fasteners that are integrated with the tanks or otherwise fastened onto the tanks with non-corrodible or corrosion-resistant tapered round nuts.**

— **where a fencing enclosure is used to house the water tanks and/or its ancillary equipment, the material for the fencing enclosure shall be of welded-mesh or expanded-mesh with mesh openings no larger than 75 mm (height) x 25 mm (width). The height of the fencing enclosure shall not be less than 2.5 m above the highest ground level and shall be reinforced with 300 mm outriggers. Where a ceiling exists over the enclosure, the enclosure shall extend from floor to ceiling.**

— the discharge of the overflow pipes from water tanks shall be within the secured and locked dedicated tank/pump room, enclosure or area and the overflow pipes shall not protrude outside the secured and locked room, enclosure or area. Proper drainage and facilities shall be provided to cater for overflow to ensure no ponding of water or flooding.

— any overflow warning alarm shall be installed for the water tanks. A warning pipe is not required.

Amendment No. 4 to Singapore Standard CP 48:2005

Clause 3.3.5

3.3.5 Proper permanent access to the storage tank shall be provided. Where a tank is fixed in the roof space, sufficient provision shall be made by a trapdoor or otherwise, sufficiently large for access to the tank and to enable it to be inspected, cleaned and repaired or replaced.

Replaced by:

3.3.5 Proper permanent access to the storage tank shall be provided. **The water tank inspection manhole shall be located as close to or within two tank panels away from the access ladder to the tank.** Where a tank is fixed in the roof space, sufficient provision shall be made by a trapdoor or otherwise, sufficiently large for access to the tank and to enable it to be inspected, cleaned and repaired or replaced.

Amendment No. 4 to Singapore Standard CP 48:2005

Clause 4.2.1

4.2.1 Float-operated valves

Float-operated valves installed in storage tanks should be fitted in such a position as to discharge at a level higher than the overflowing level by not less than the diameter of the overflow pipe unless there is an effective means of preventing the siphonage of water back through the valve.

Replaced by:

4.2.1 Float-operated valves

Float-operated valves installed in storage tanks shall be fitted in such a position as to discharge at a level higher than the overflowing level by not less than the diameter of the overflow pipe unless there is an effective means of preventing the siphonage of water back through the valve.

The float-operated valves when installed, shall not compromise the water tightness of the storage tanks or their security and safety against unauthorised access, ingress of any animal, insect or foreign material into the tanks or the contamination or pollution of the water contained in the tanks.

Amendment No. 4 to Singapore Standard CP 48:2005

Clause 6.4.11

6.4.11 All vents and pipe ends shall be properly covered with non-corrodible or corrosion-resistant nettings to prevent the ingress of any animal, insect or foreign matter into the tanks. These nettings shall be in good condition and not tampered with.

Replaced by:

6.4.11 All vents and pipe ends shall be properly covered with non-corrodible or corrosion-resistant **stainless steel** nettings to prevent the ingress of any animal, insect or foreign matter into the tanks. These nettings shall be in good condition and not tampered with.

THANK YOU

Water for All
Conserve, Value, Enjoy
PUB



Enhancements to the Procedure for Water Service Work

Lee Cai Jie
Senior Engineer
Water Supply Network Department, PUB

Outline of Presentation

- Current Procedure for Water Service Work
- Enhanced Measures to the Current Procedure for Water Service Work

Current Procedure for Water Service Work

- Since Nov 2001, a simplified procedure for water supply application was adopted by PUB

Water service workers to notify PUB before commencement of work via Notification of Water Service Work form

Water service workers to certify that water service installation is completed according to Act, Regulations, etc after completion via Certificate of Satisfactory Completion of Water Service Work (CSC) form

Enhanced Measures to the Current Procedure for Water Service Work

1. Enhancements to the existing Notification of Water Service Work and Certification of Satisfactory Completion forms

2. Indication of joining methods in schematic drawings

3. Enhanced water sampling by PEs/LPs for new developments

Targeted timeline for implementation:

For all notification of water service work submitted to PUB from <u>Q3 2016</u>

Enhancements to the Existing Notification of Water Service Work and Certification of Satisfactory Completion forms

Notification of Water Service Work by Licensed Water Service Plumber
(To be submitted as early as possible before commencement of work)
To : Director, Water Supply (Network) Department Date :

*Notification No:		*Customer No:	
Project Description			
Location	Lot / Plot No Address		

Nature of Work (Please tick where applicable):

New Service	( )	Extension	( )	Upgrading of meter	( )
Relay Service	( )	Sub-meter	( )	Relocation of meter	( )
Additions /Alterations	( )	Repair	( )	Cleaning & Sterilisation of Water Storage Tank	( )
Temporary Supply	( )	Others _____	( )		

Estimated Water Requirement (m^3/mth)	PUB Water (m^3/mth)	
	NEWater (m^3/mth)	
Commencement Date :	Expected Completion Date :	
Platform Level of Development (mRL)		
Reduced Level of Highest Direct Supply Water Fitting (mRL)		

Particulars of Customer

Name			
Name of Company			
Address			
Tel No		Fax No	

Particulars of Licensed Water Service Plumber

Name			
Residential Address			
Mailing Address (if different from above)			
Tel No (O)		Tel No (H)	
Fax No		Pager / HP No	
Licence No		I/C No	

I, the undersigned, hereby certify that the water service installation at the premises is designed in full compliance with the Public Utilities Board's requirements including the Public Utilities (Water Supply) Regulations, Singapore Standard CP 48 - Code of Practice for Water Services, other Authorities' requirements and other statutory requirements. I also confirm that potable water storage tanks shall not be located below sanitary pipes and other non-potable water pipes. All the water fittings to be installed in the water service installation are of types that comply with standards prescribed / stipulated by PUB and all water conservation measures will be adopted.

2. The site plan, the water schematic drawings and the breakdown of water requirement, if any, of the above development are attached herewith.

Signature of Licensed Water Service Plumber
** For official use only.*

Layout to be changed

Certificate of Satisfactory Completion of Water Service Work By Licensed Plumber

To : Director, Water Supply (Network) Department Date :

Notification No			
Project Description*			
Location	Lot / Plot No Address		
Commencement Date :		Completion Date :	
Water Utility Account No			

Particulars of Licensed Plumber

Name			
Residential Address			
Mailing Address (if different from above)			
Tel No (O)		Tel No (H)	
Fax No		Pager / HP No	
Licence No		I/C No	

*Note – For cleaning and sterilisation of water storage tanks, a copy of the PUBWT01 – Inspection & Certification of Water Storage Tanks duly completed and certified must be attached.

I, the undersigned, confirm that, to the best of my knowledge and belief, the water service installation work was carried out in accordance with the Public Utilities Board's requirements including the Public Utilities (Water Supply) Regulations, Singapore Standard CP 48 – Code of Practice for Water Services, Authorities' requirements and other statutory requirements. I also confirm that potable water storage cisterns have not been located below sanitary pipes and other non-potable water pipes. All the water fittings installed in the water service installation are of the types that comply with standards prescribed / stipulated by PUB and all water conservation measures have been adopted. I further certify that the said water service installation and the associated electrical devices and equipment have been tested and are safe and acceptable for operation.

Signature of Licensed Water Service Plumber

Indication of Joining Methods in Schematic Drawings

Schematic drawings to indicate clearly the joining methods (i.e. brazed joints, press fitting, compression joint, mechanical joint, etc)

PIPE MATERIALS, JOINTING AND TEST PRESSURES

EXTERNAL PIPES (BURIED OR EXPOSED)

NOMINAL BORE (mm)	MATERIAL	TYPE OF JOINTS	TEST PRESSURE
DIA 75 AND ABOVE	DUCTILE IRON TO BS EN545 WITH CEMENT INTERNAL LINING	FLANGED	1200 kPa
BELOW DIA 75	STEEL PIPES TO SS 367 WITH uPVC LINING	SCREW JOINTS TO BS 21 THREADS	

INTERNAL PIPES

NOMINAL BORE (mm)	MATERIAL	TYPE OF JOINTS	TEST PRESSURE
DIA 75 AND ABOVE	DUCTILE IRON TO BS EN545 WITH CEMENT INTERNAL LINING	FLANGED	700 kPa
BELOW DIA 75 (SUBJECT TO LOAD)	COPPER TUBES TO BS EN1057	CAPILLARY FITTINGS	
BELOW DIA 28 (EXPOSED)	COPPER TUBES TO BS EN1057	COMPRESSION FITTINGS	
BELOW DIA 75 EMBEDDED IN ALL FORMS OF MASONARY AND/OR NOT SUBJECTED TO LOAD	COPPER TUBES TO BS EN1057	CAPILLARY FITTINGS	
HOSEREEL PIPES (ALL SIZES) AFTER THE HOSEREEL TANK	GALVANISED STEEL	SCREW JOINTS TO BS 21 THREADS	1200 kPa
HYDRANT PIPES (ALL SIZES)	DUCTILE IRON TO BS EN545 WITH CEMENT INTERNAL LINING	FLANGED	

(ALL WATER FITTINGS USED IN WATER SERVICE INSTALLATION SHALL COMPLY WITH STANDARDS STIPULATED BY PUB)

Typical indication of water fitting material in schematic drawings

Enhanced Water Sampling by PEs/LPs for New Developments – Developments with Potable Water Tanks

Existing Requirements

- CP 48 stipulated for water service worker to carry out chemical and bacteriological analyses for potable water tanks upon cleaning and sterilisation of water tanks, before putting the tanks to use

- CP 48 also stipulated chemical and bacteriological analyses to be carried out for service pipes upon cleaning and sterilisation

Enhancement

- In addition to the existing requirements, water service workers are to conduct water sampling for **at least one potable water tank and one tap/mixer per development** in accordance with the sampling parameters stipulated by PUB, upon the cleaning and sterilisation of the water service installations.

- The water sampling shall be carried out by water service workers **prior to the application of the Temporary Occupation Permit (TOP) for the development**

Enhanced Water Sampling by PEs/LPs for New Developments – Developments w/o Potable Water Tanks

Existing Requirements

- CP 48 stipulated for water service worker to carry out chemical and bacteriological analyses for service pipes upon cleaning and sterilisation

Enhancements

- In addition to the existing requirements, water service workers are to conduct water sampling for **at least one tap/mixer per development development** in accordance with the sampling parameters stipulated by PUB, upon the cleaning and sterilisation of the water service installations.

- The water sampling shall be carried out by water service workers **prior to the application of the Temporary Occupation Permit (TOP) for the development**

Any query or feedback on the proposed enhancements to the existing simplified procedure for water supply?



Thank You

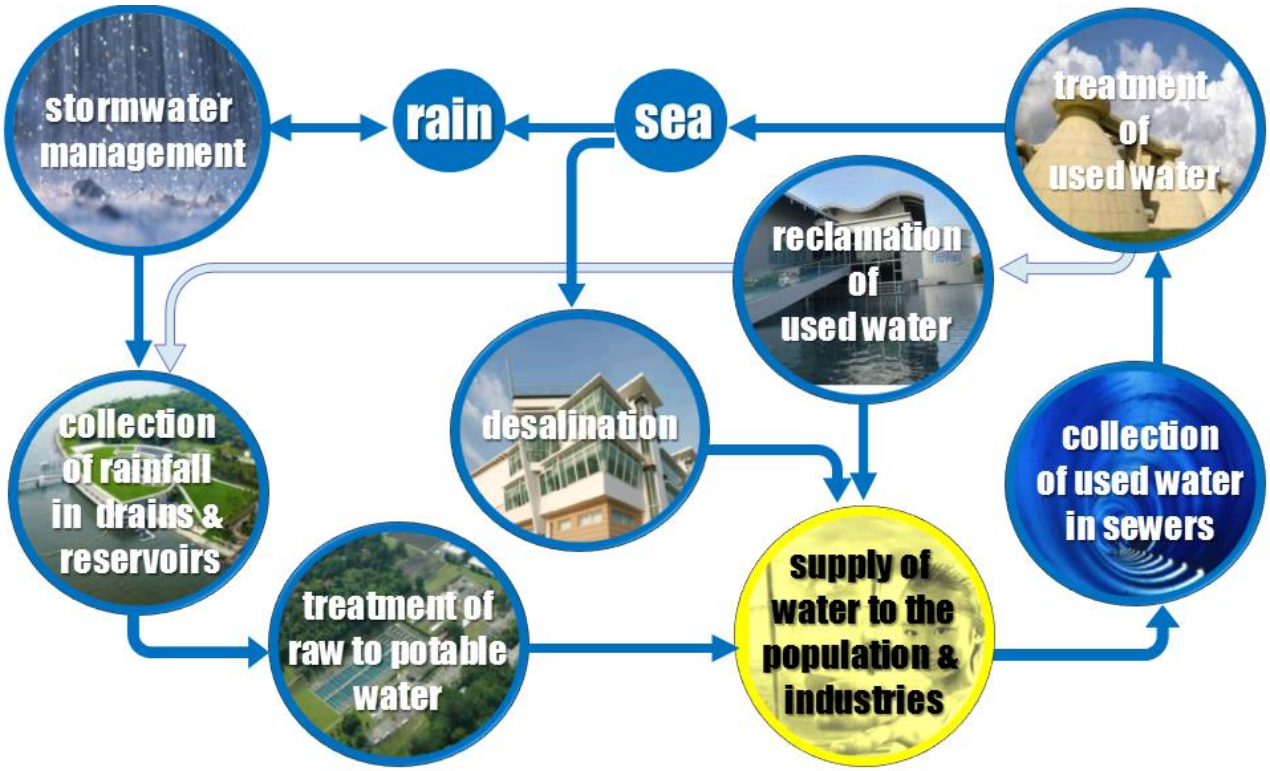
Water for All
Conserve, Value, Enjoy
PUB



Managing the Water Distribution Network with a Smart Water Grid

Pan Ju Khuang
Engineer
Water Supply Network Department, PUB

Our Mission:
Deliver Good Water 24/7 to Customers

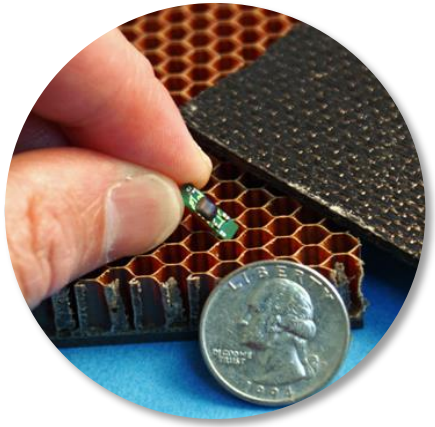


5,490 km of potable water pipelines

1.45 million customers

1.48 million meters

Rapid Growth in Infocomm Technology



Smaller, Cheaper Sensors



Internet of Things



Big Data Analytics

Anticipating Future Trends



Rising Water Demand



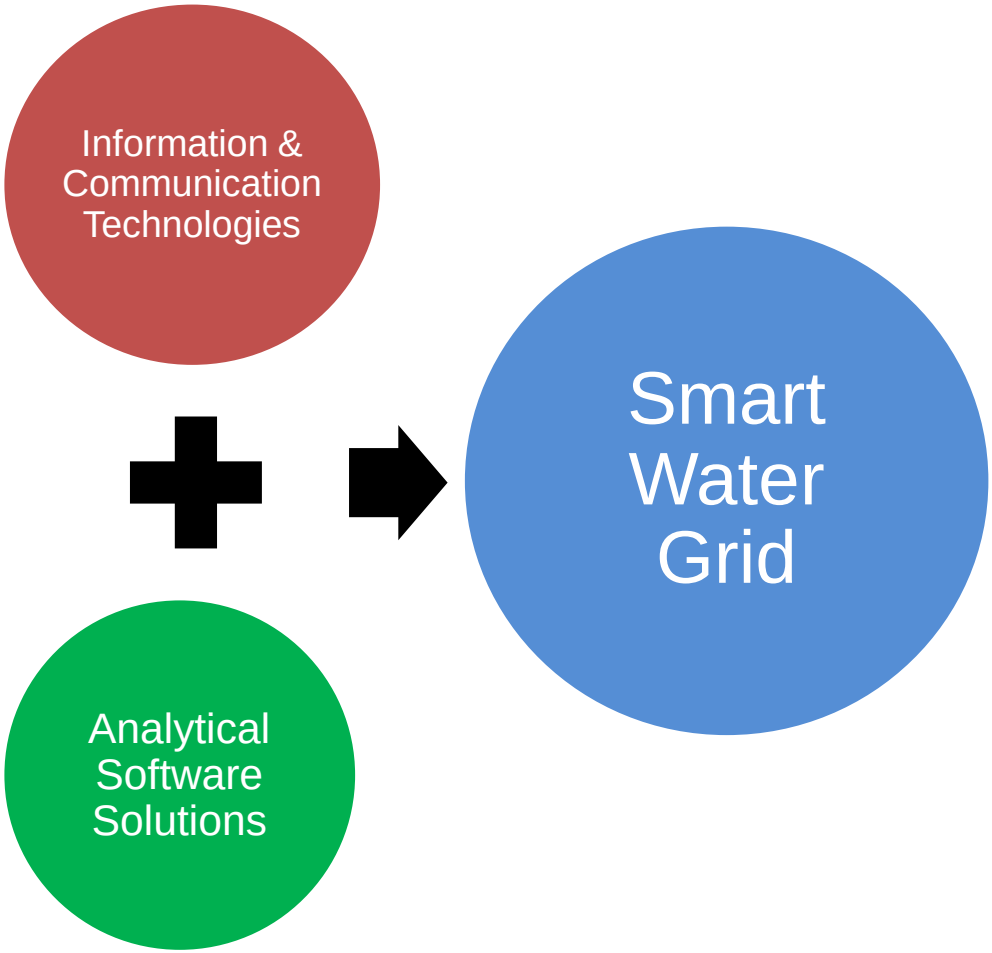
Growing Asset Base, Increasing Congestion



Shrinking Labour Force

Technology as an Enabler:

The Value of a Smart Water Grid



- ✓ Safeguard Public Health
- ✓ Save on Manpower
- ✓ Optimize Asset Lifetime
- ✓ Conserve Limited Resources
- ✓ Real-time Customer Management

Global Smart Water Grid Market

$35.9 billion

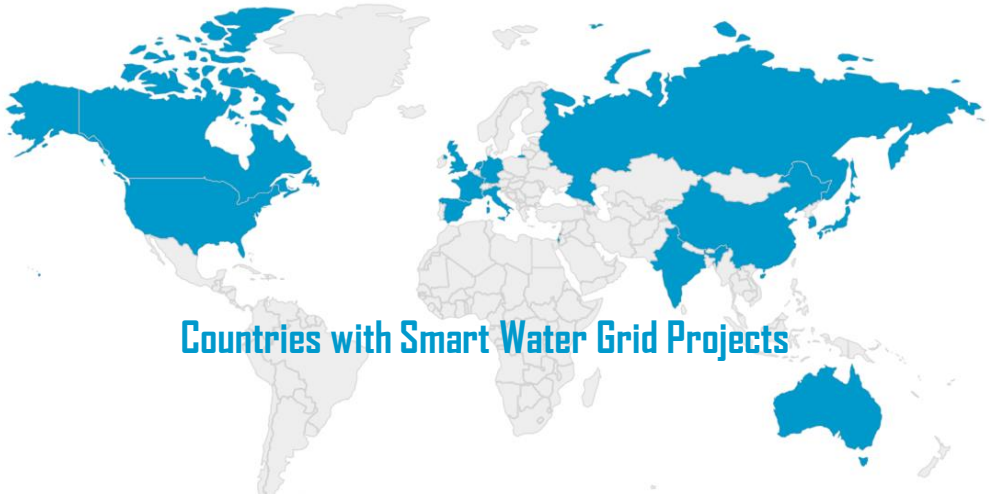
Global investment in smart water infrastructure over the next decade

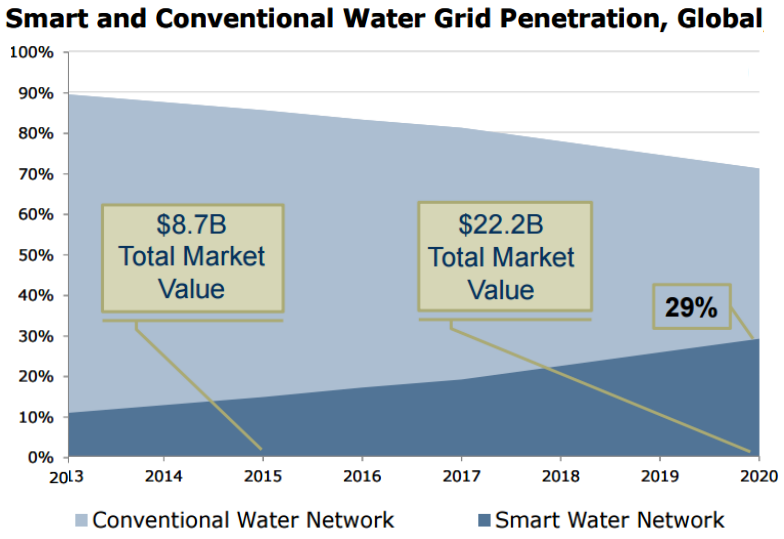
(Northeast Group, Oct 2015)

$27.5 billion

Potential savings per year from implementing smart water infrastructure globally

(Northeast Group, Oct 2015)





(Frost & Sullivan, 2012)

Optimizing the Lifespan of our Assets

Objectives



To plan, design, operate and manage our assets cost-effectively

Challenges



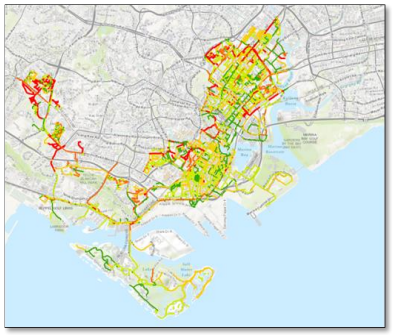
- Pipelines are buried
- Network is interconnected
- We need to ensure 24/7 reliable supply

Gaps in Current Technologies



Most condition assessment technologies are intrusive and will disrupt pipeline operations

Technology Roadmap



Tools for preemptive and predictive maintenance of our pipelines

Saving Manpower through System Pressure & Leak Management

Objectives



Enhance incident management to minimize impact to customers

Challenges



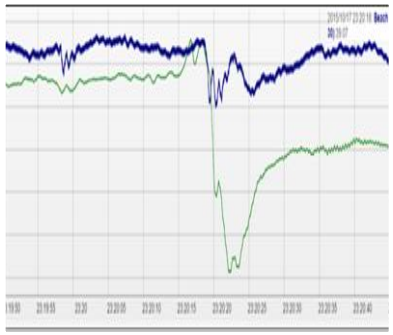
Traditional leak detection methods are labour intensive

Gaps in Current Technology



- Leak detection in large transmission mains
- False alerts

Technology Roadmap



- Expand sensor coverage in the network
- Develop advanced software filters to better identify leaks

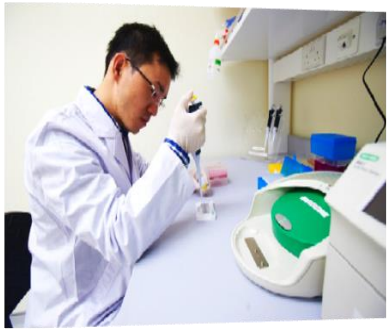
Safeguarding Public Health by Monitoring Water Quality

Objectives



Ensure safe water delivery to customers

Challenges



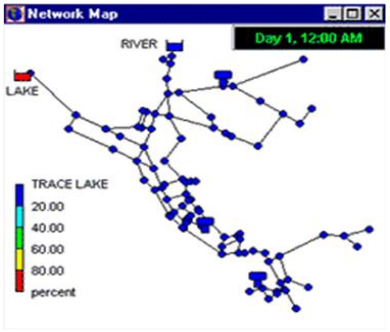
Need for early detection before water quality deviation reaches customers

Gaps in Current Technology



- Difficulty in validating sensors and data analytics tools in “live” network
- Number of false alerts
- Detecting more contaminants, faster

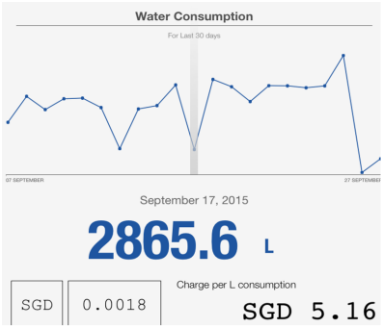
Technology Roadmap



Real-time water quality model with accurate event detection and source-tracing

Real-time Customer Management

Objective



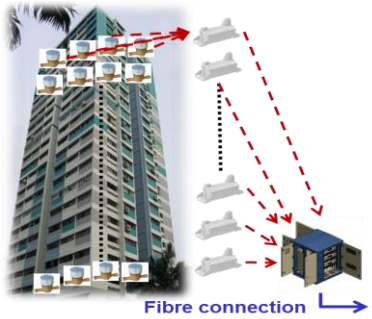
- To know water consumption real-time or on-demand
- Developing targeted water conservation measures
- Automate the meter reading process

Challenges



Low frequency of manual meter readings

Gaps in Current Technology



- Implementation costs remain high
- AMR reliability (accuracy and reading availability)
- Need to protect components against moisture ingress and high temperature

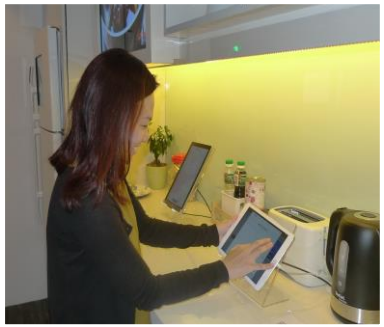
Technology Roadmap



To identify feasible and cost-effective solutions for large scale roll out of AMR to customers' premises

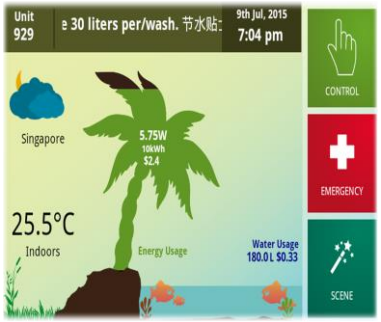
Saving Every Drop of Water

Objectives



To induce behavioural change to reduce domestic water consumption with smart water efficient gadgets, fittings & technologies

Challenges



- Reliability and cost of monitoring consumption patterns
- Challenging to instil behavioural change

Gaps in Current Technology



- Cost effectiveness of smart water-efficient gadgets
- Trade off between battery life and data resolution of smart water meters
- Difficulty in disaggregating water uses

Technology Roadmap



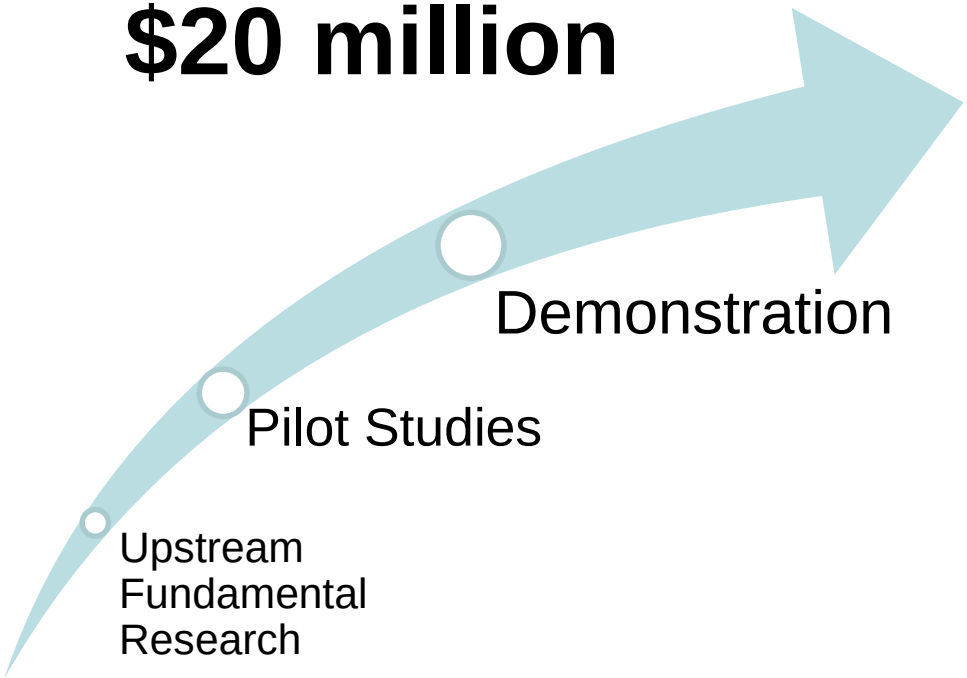
To determine impact of Home Water Management Systems on behavioural change and water savings

Singapore & PUB

A Test Bed for Smart Water Technologies

Annual R&D Budget:

$20 million



Upcoming SWG Tenders:

- **Expand real-time monitoring in our Water Supply Network** *~300 more sensors*
- **Condition Assessment in the city area** *~7.5km of pipelines*
- **Leak Detection in Large Mains** *~150 km of pipelines*

smart water showcase @ SIWW 2016 (10-14 July)

1) Smart Water Pavilion

Details

- **Date / time**: 11-13 July, 9.30 am – 5.30 pm
- **Venue**: Level 1, MBS

Why you should visit

- See how PUB has adopted smart technologies within the water loop & learn about PUB's needs

- Projects cover following areas:
  - ✓ Stormwater management
  - ✓ Source
  - ✓ Water Distribution Network
  - ✓ Customer Interface
  - ✓ Used Water Network
  - ✓ Future interest areas

Alternatively, be part of the smart water solution providers that surround PUB's exhibit! Contact Shengwei (yeo_sheng_wei@pub.gov.sg) for more info

2) Smart Water Forum

Details

- **Date / time**: 12 July, 2.00 pm – 5.00 pm
- **Venue**: Level 1, MBS

Why you should attend

- **Focus:** share knowledge, case studies / best practices and network with global utilities / adopters.

- **Conduct**: 4 sessions + networking, covering
  - Smart watershed management
  - Smart water treatment
  - Smart water grid
  - Cyber security for smart infrastructure

- **Cost:** Free to attend

Thank you






Contact Details:
Pan Ju Khuan (pan_ju_khuan@pub.gov.sg)

SINGAPORE QUALITY AWARD for business excellence 2008 WINNER

INNOVATION EXCELLENCE AWARD 2006 WINNER

Water for All
Conserve, Value, Enjoy
PUB



QUESTIONS & ANSWERS

Water for All
Conserve, Value, Enjoy

PUB



THANK YOU!