Joint IES-SIA-MEWR Seminar on

NEA & PUB Submission Guidelines, Requirements & Regulations

Date	:	18 November 05 (Friday)
Time	:	8.30 am – 5.00 pm
Venue	:	IES Auditorium, 70 Bukit Tinggi Road, Singapore 289758
CPD Programme	:	7 PDUs
Organised by	:	C & S Engineering Technical Committee, IES
Coordinated by	:	Er. Chong Kee Sen & Mr. Teo Yen Pai
Fees *	:	$160.00 (IES / IES student / SIA members), $190.00 (non-members)

10% discount will be given to those who register before 5 Nov 05, limited seat of 160 pax.

** inclusive of 5% GST, seminar materials, buffet lunch and 2 tea-breaks*

Pickup point to IES by mini bus (max capacity of 11 pax per trip) is also provided at 8:45am and 9:00am sharp at the Caltex Petrol Station at Dunearn Road. Please refer to attached map.

Programme:

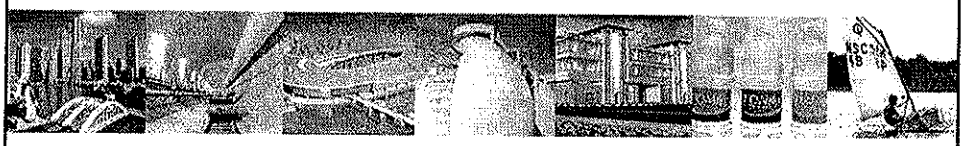
8:30 am – 9.00 am	Registration
9:05 am – 9.15 am	**Opening Address** by President of IES, Er. A/Prof Foo Say Wei
9:15 am – 9:35 am	**Drainage requirements & common issues raised at pre-building plan consultation sessions** by Mr. Tay Boon Hai, 3PN Dept, PUB
9:40 am – 10:10 am	**Closing the Water Loop with NEWater** by Mr. Melvin Koh, WSN Dept, PUB
10:15 am – 10:30 am	Questions & Answers
10:30 am – 10:50 am	**Tea break**
10:50 am – 11:20 am	**Water Conservation - Water Efficient Buildings** by Mr. Yap Kon Fo, 3PN Dept, PUB
11:25 am – 11:55 pm	**Mandatory E-application of SIP/DIP from 1 Jan 2006** by Mr. Anselm Gonsalves, CBPU
12:00 pm – 12:30 pm	**Common mistakes made on PC plan submissions** by Mr Lee Aik Beng, CBPU
12:35 pm – 12:50 pm	Questions & Answers
12:50 pm – 2:00 pm	**Lunch**
2:00 pm – 2:30 pm	**Updates on 2005 COPEH** by Mr. Yip Ngai Yin, Environmental Health Div
2:35 pm – 3:05 pm	**Construction Site, Roof Gutters and Dengue Control Measures** by Mr. Mohd Zulkefli, Environmental Health Div
3:10 pm – 3:20 pm	Questions & Answers
3:20 pm – 3:40 pm	**Tea break**
3:40 pm – 4:10 pm	**Regulations on Constructions Noise and Control Measures** by Mr. Ang Kok Kiat, PCD
4:15 pm – 4:45 pm	**Practical Earth Control Measures at Construction Sites** by Dr. Chew Soon Hoe, NUS
4:50 pm – 5:00 pm	Questions & Answers

Drainage requirements & common issues raised at pre-building plan consultation sessions

by

Mr. Tay Boon Hai
3PN Dept, PUB

Water for All
Conserve, Value, Enjoy
PUB



Drainage Requirements and Common Issues Raised at Pre-Consultation Sessions

Principles of Designing a Drainage System

✓ Ensure platform levels of the development site are not lower than the road level/ ground level at the outlet discharge point or the specific minimum platform level imposed by the Department (whichever is higher)

✗ Platform levels within the development site lower than the adjacent road / ground levels at the outlet discharge point.

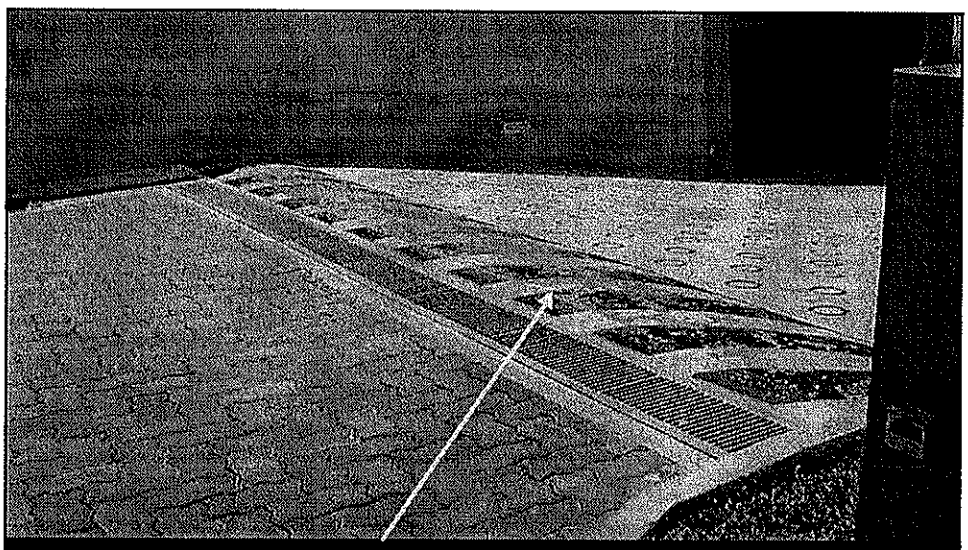
Principles of Designing a Drainage System

✓ Provide crest levels at all openings (eg ventilation openings, stairways, pipelines, voids, rampdown etc to basement served by pumped drainage system.

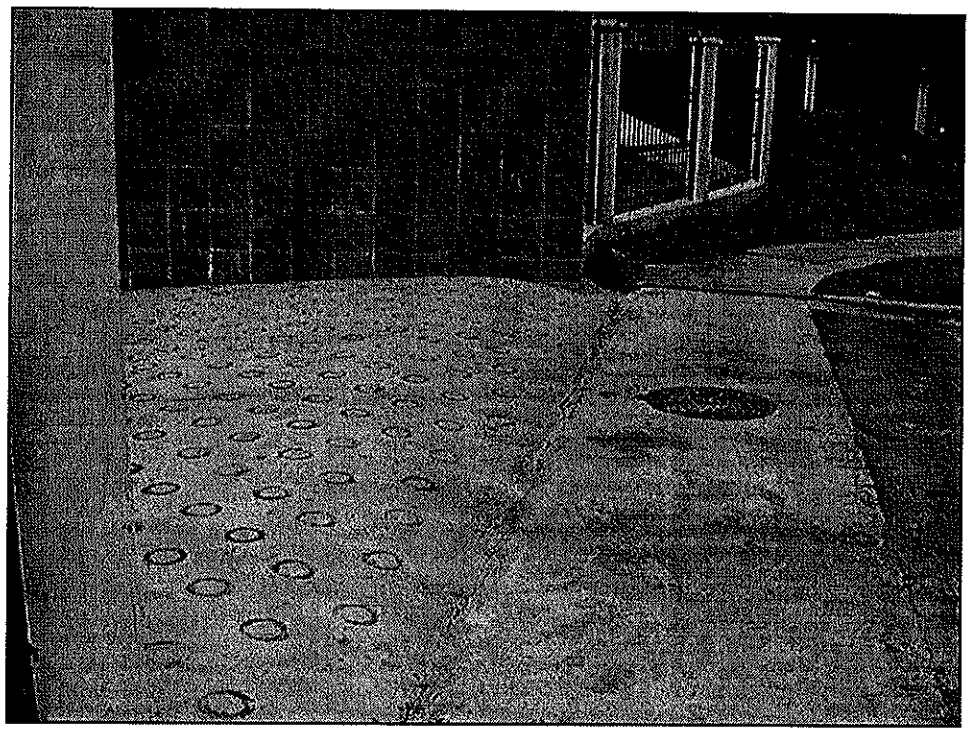
✗ The crest level does not comply with the requirements as specified in the Code of Practice on Surface Water Drainage.

✗ No crest level provided

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A CREST LEVEL need not be provided in the form of a hump !



Principles of Designing a Drainage System

- Select the outlet discharge point at the roadside/outlet drain where the adjacent road/ground level is the lowest.
- The existing outlet discharge point(s) at the development site shall be adopted.
- If the roadside drain is located on a sloping road, the proposed internal drain should be connected to the downstream end of the roadside drain fronting the development site.

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Principles of Designing a Drainage System



For development with basement not fully covered, keep the catchment area to the minimum. Runoff from RWDPs should be discharged to 1st storey drain and not into the basement pump sump.

✗ Runoff from basement discharges by gravity to roadside/outlet drain which is on higher ground level.

✗ Runoff from roofs, rainwater down- pipes and all premises at and above ground level discharges into the basement.

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Principles of Designing a Drainage System



Ensure runoff within a development site is drained off by internal drains and is not discharged into adjacent premises.

Water for All : Conserve, Value, Enjoy

Principles of Designing a Drainage System



Design the drainage system for safety and ease of maintenance besides adequate capacity.

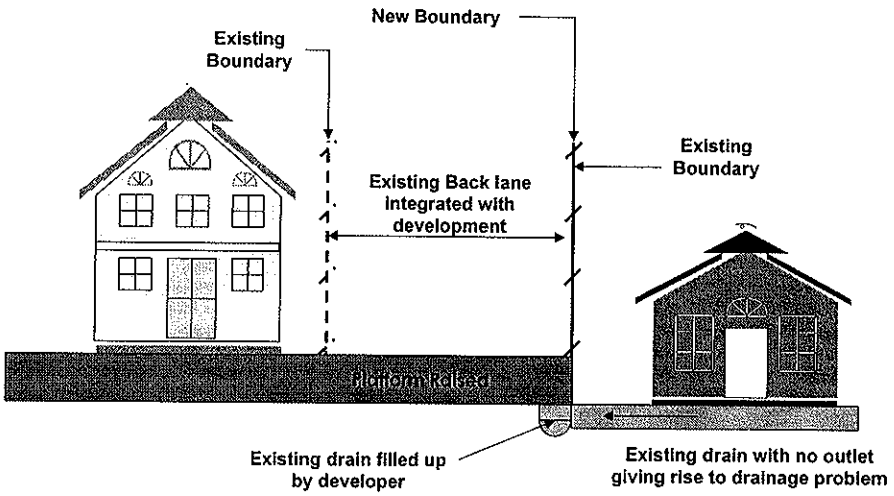
Principles of Designing a Drainage System



Do not alter or realign existing roadside/outlet/ common drains unless approval is given by PUB.

For example integration of back lane into development

Integration of back lane into development



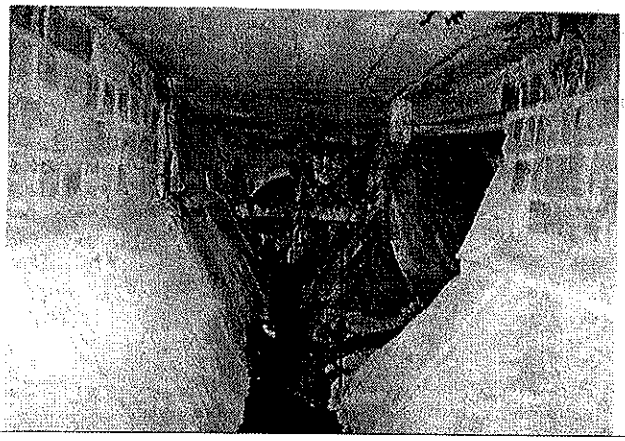
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Principles of Designing a Drainage System

- All services shall undercross the drains at minimum 1.0m (1.5m for earth drains) below the invert levels of the drains.
- QPs shall seek PUB's approval for proposals on services overcrossing.
- PUB will consider services overcrossing if the Services Providers request it and the services pipes overcrossing drain will not affect the flow or cause maintenance problem.

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Services Across Drain



Debris trapped by overcrossing pipe

SOME COMMON ISSUES RAISED DURING WALK-IN PRECONSULTATION SESSIONS

Can the Drainage Reserve be Realigned ?

A drainage reserve (DR) may be realigned subject to the following conditions:-

a) The drain diversion is technically feasible.

b) Maintenance access to the upstream and downstream DR is not affected.

c) Concurrence from SLA/URA.

Can the Common Drain at the rear of the property be fenced -In within the Lot ?

Obtain clearance from Environmental Health Department (EHD), as the cleansing maintenance of common drains come under the purview of EHD.

Obtain clearance from URA as the land-use Authority.

Required Size of Entrance Culvert/Roadside Drain

QP is to write to PUB for the required size of proposed entrance culvert/roadside drain before submitting the plan to CBPU for registration.

Must Existing Roadside Drain be Realigned to Abut the New Road Reserve Line?

- The existing roadside drain can be retained if it is not required by LTA to be realigned to abut the new Road Reserve Line.
- If the existing roadside drain is to be realigned, it shall be constructed to the required drain size.

Can an existing box drain be used as an entrance culvert?

No objection provided the PE (Civil) certifies and endorses in the plan that the existing box drain is capable of withstanding vehicular loadings or the intended loadings.

Can PUB allow for a change of the existing drainage discharge points within the development site

No objection provided the proposal will not significantly change the existing drainage overland flow pattern of the site and give rise to flooding problems.

Avoid diverting flow from one catchment to another as this may overload an existing drain which will result in flooding.

Can the owner build ponds to collect rainwater for gardening and washing of the building premises

- PUB allows rainwater collection for non-portable use
- Waterborne fee will be levied if the rainwater collection pond/tank size exceeds 20 cu m and the used rainwater is discharged into sewers.

The design of the rainwater collection system shall also comply with NEA's guidelines on mosquito prevention in rainwater collection system.

Frequently Asked Questions on Building Plan Matters

A list of the Frequently Asked Questions (FAQs) can be found at the PUB web site at the following address

http://www.pub.gov.sg under FAQs

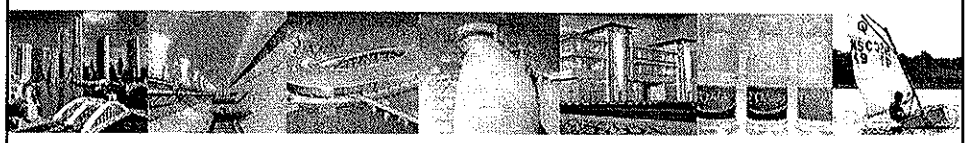
THANK YOU

Closing the Water Loop with NEWater

by

Mr. Melvin Koh
WSN Dept, PUB

Water for All
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PUB



Joint IES-SIA-MEWR Seminar
18 Nov 2005

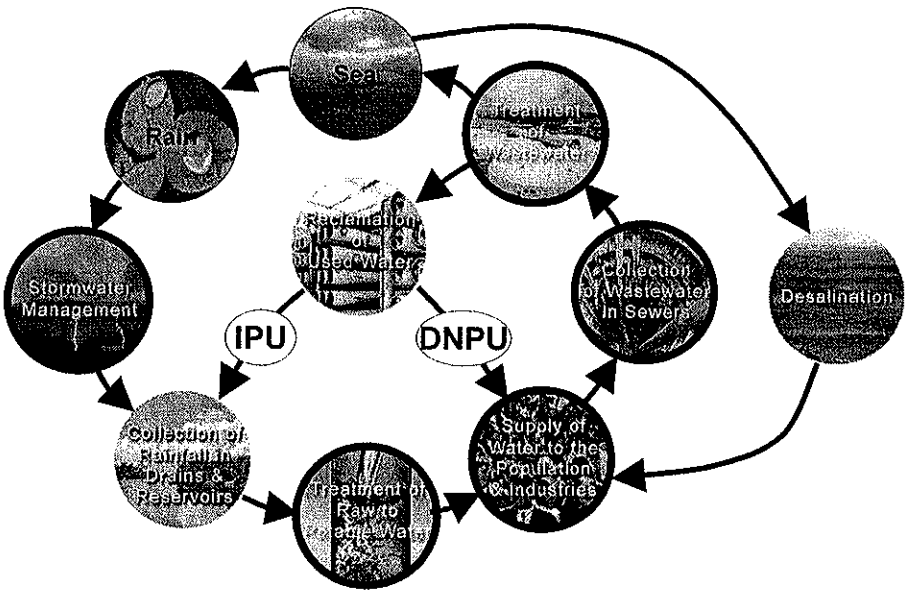
Closing the Water Loop with NEWater

– Melvin Koh

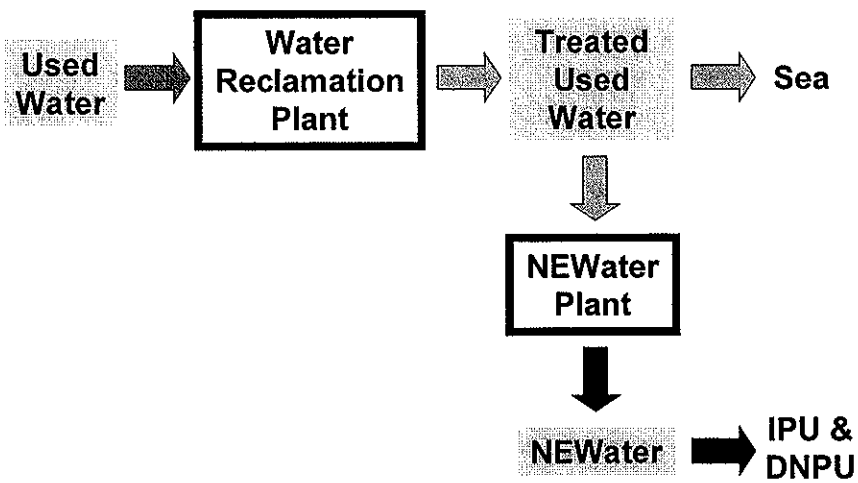
Scope

- The Role of NEWater
- How is NEWater produced?
- What is its quality?
- Who is using NEWater?
- How is NEWater supplied?
- Take home messages

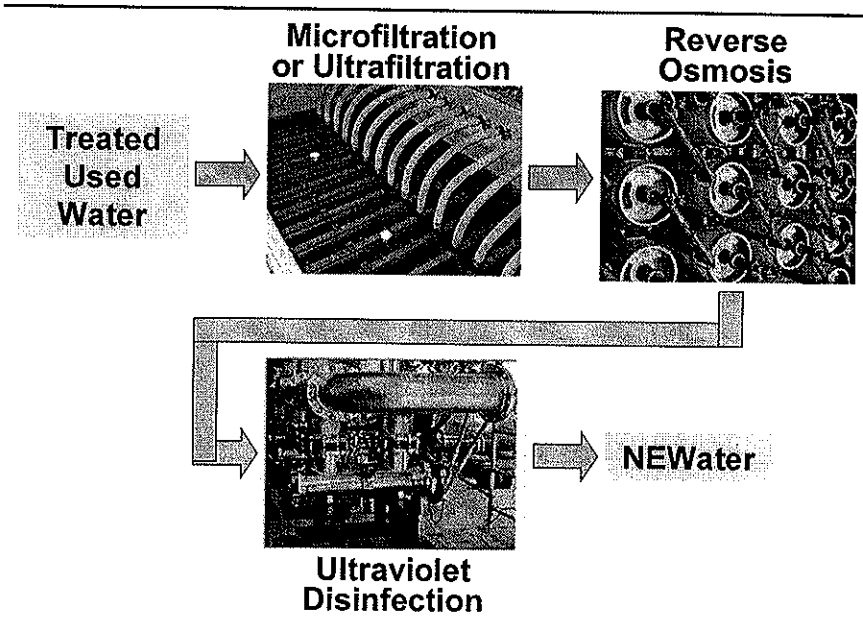
The Role of NEWater



How is NEWater Produced?



How is NEWater Produced?



What is its quality?

- Well-within WHO and USEPA guidelines for drinking water
- Comprehensive testing program
  - ✓ Physical, inorganic, organics
  - ✓ Pesticides & herbicides
  - ✓ Radionuclides
  - ✓ Wastewater signature compounds
  - ✓ Synthetic and natural hormones
  - ✓ 239 parameters (*WHO: 113; USEPA: 96*)

What is its quality?

Parameters	Local reservoirs	PUB water	NEWater	USEPA / WHO
Turbidity (NTU)	0.5 - 11	< 0.1	<0.1	< 5
TDS (mg/L)	117 - 154	150	< 100	< 500 / 1000
Pb (mg/L)	< 0.013	0.002	< 0.002	< 0.01
Hg (mg/L)	< 0.00003	< 0.00003	< 0.00003	< 0.001
Hormones (µg/L)	ND	ND	ND	NS
PCBs (µg/L)	ND	ND	ND	< 0.5
Dioxin (pg/L)	ND	ND	ND	< 30
TOC (mg/L)	2.6 – 6.2	1.9 – 3.5	< 0.5	NS
TC (cfu/100 mL)	3 - 967	ND	ND	ND
Enterovirus	ND	ND	ND	ND

ND – Not detected NS – Not specified

What is its quality?

NEWater is…

…high-grade water produced from treated used water using advanced water purification membrane technology

…of a quality that exceeds drinking water standards stipulated by USEPA and WHO

…suitable for Indirect Potable Use

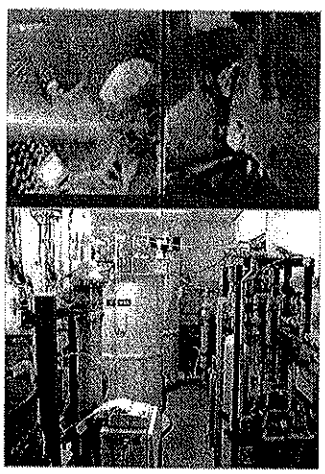
…suitable for Direct Non-Potable Use

Who is using NEWater?

- Daily demand of 72,000 m^3 per day
- About 200 have signed Agreements
- About 70 customers are already using NEWater
  - ✓ Process use by wafer fabrication plants and high-end electronic industries
  - ✓ Production of demineralised water for boilers
  - ✓ Air-con cooling towers in commercial and institutional buildings
  - ✓ General washing

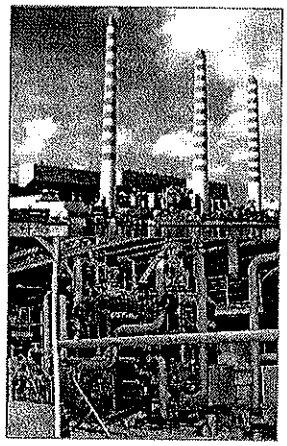
Who is using NEWater?

- Wafer Fabrication Plants
  - ✓ NEWater TOC < 0.1 mg/L
    - Better control over Ultra Pure Water quality
  - ✓ Savings from..
    - Less regeneration of ion-exchange resins
    - Reduced frequency of RO cleaning
    - Competitive price



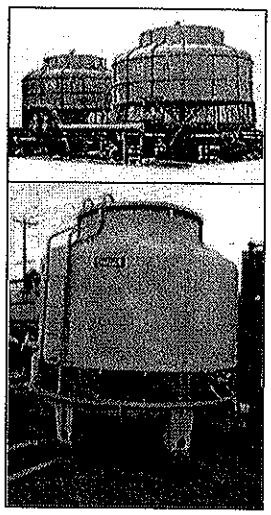
Who is using NEWater?

- Power Stations
  - ✓ Better control over quality of Demineralised Water
  - ✓ Savings from..
    - Less O&M costs
    - Competitive price



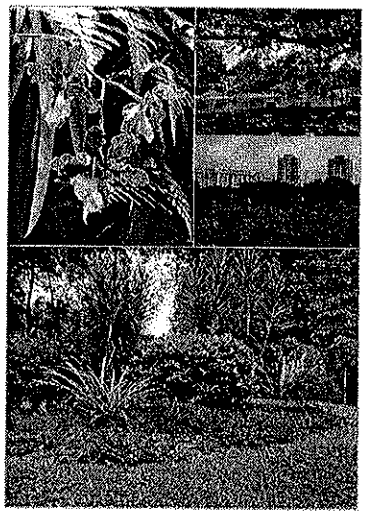
Who is using NEWater?

- Commercial Buildings
  - ✓ Air-con cooling towers
  - ✓ 30% of PUB water demand
  - ✓ Savings from..
    - Less water bled off from cooling towers
    - Less algal growth
    - Competitive price

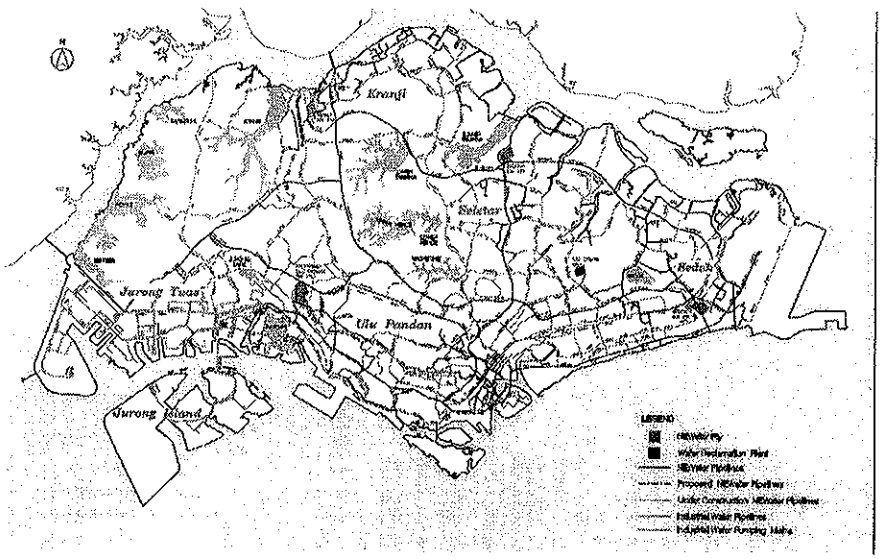


Who is using it?

- Landscaping & Washing
  - ✓ Savings from..
    - Competitive price



How is NEWater supplied?

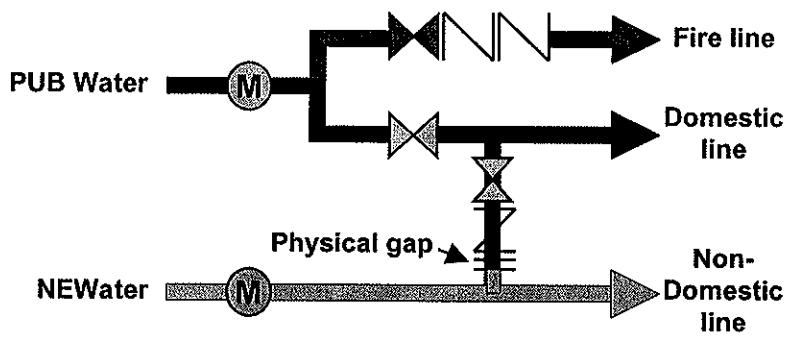


How is NEWater supplied?

- Since 2002, all <u>new</u> industrial and commercial premises have to provide separate pipes for NEWater supply
- Standards & Requirements
  - ✓ Public Utilities (Water Supply) Regulations
  - ✓ Singapore Standard CP48: Code of Practice for Water Services

How is NEWater supplied?

- For existing premises…



Take home messages

- NEWater frees up more PUB Water for drinking
- NEWater is suitable for DNPU
- Significant cost savings can be enjoyed by switching from PUB Water to NEWater for non potable use
- To enquire about NEWater for DNPU, contact us at…

  PUB_NEWater_Demand_Centre@pub.gov.sg

Water for All
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PUB



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18 Nov 2005

Closing the Water Loop with NEWater

– Melvin Koh

Water Conservation - Water Efficient Buildings

by

Mr. Yap Kon Fo
3PN Dept, PUB

Water for All
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PUB



Water For All: Conserve, Value, Enjoy

By Mr Yap Kon Fo

Senior Manager (Community Relations)

3PN Department of PUB

Brief Overview

- PUB
- Water Cycle
- 4 National Taps
- Water Conservation - WEB
- Our 3P Approach

Background of PUB

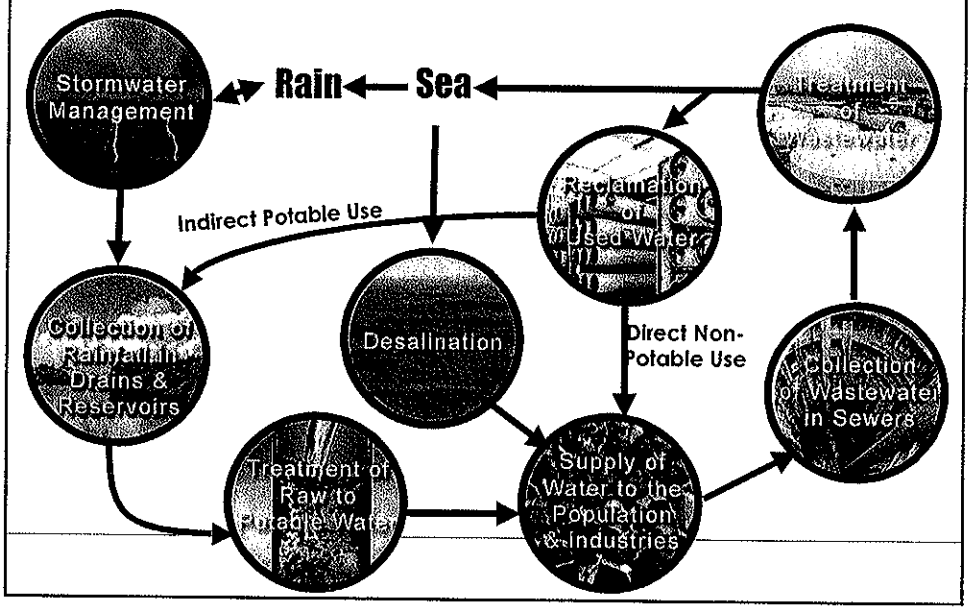
1 Oct 1995 - Corporatisation of electricity and gas (PUB with Water Dept only)

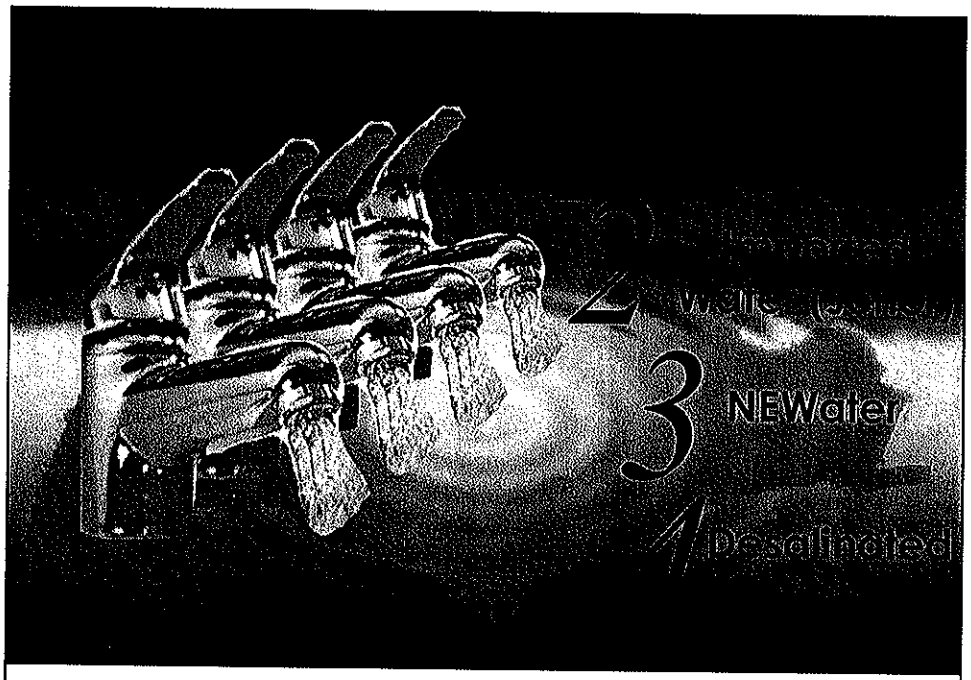
1 April 2001- PUB was reconstituted to become a comprehensive water authority

1 Oct 2004 - PUB –Water for All: Conserve, Value, Enjoy

Managing the complete water cycle

From sourcing, collection, purification and supply of drinking water, to treatment of used water and turning it into NEWater, as well as drainage of stormwater





...Our Strategies

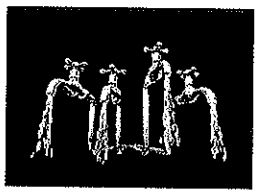
achieving a sustainable water management

2 – Pronged Approach

Develop water sources to meet needs

"Water for All"

4 National Taps



Local catchment (reservoirs)

Imported water (Johor)

NEWater

Desalinated water

Curb water demand

"Conserve, Value, Enjoy"

3P Approach



"Conserve Water"

"Value Our Waters"

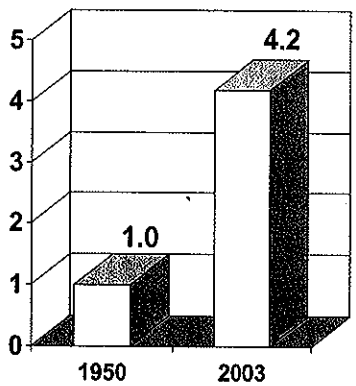
"Enjoy Our Waters"

Singapore's Water Supply

Total population	4.2 million
Water Demand	1.3 mil m^3/day (300 mgd ~ 550 Olympic pools)

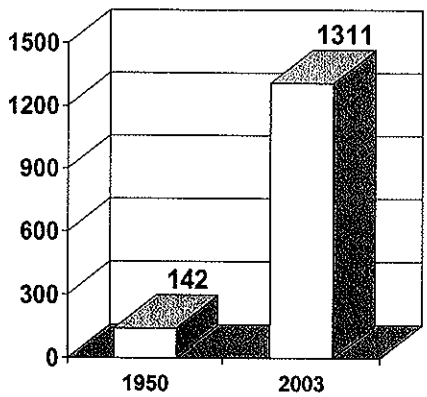
Growing Demand

Population (millions)

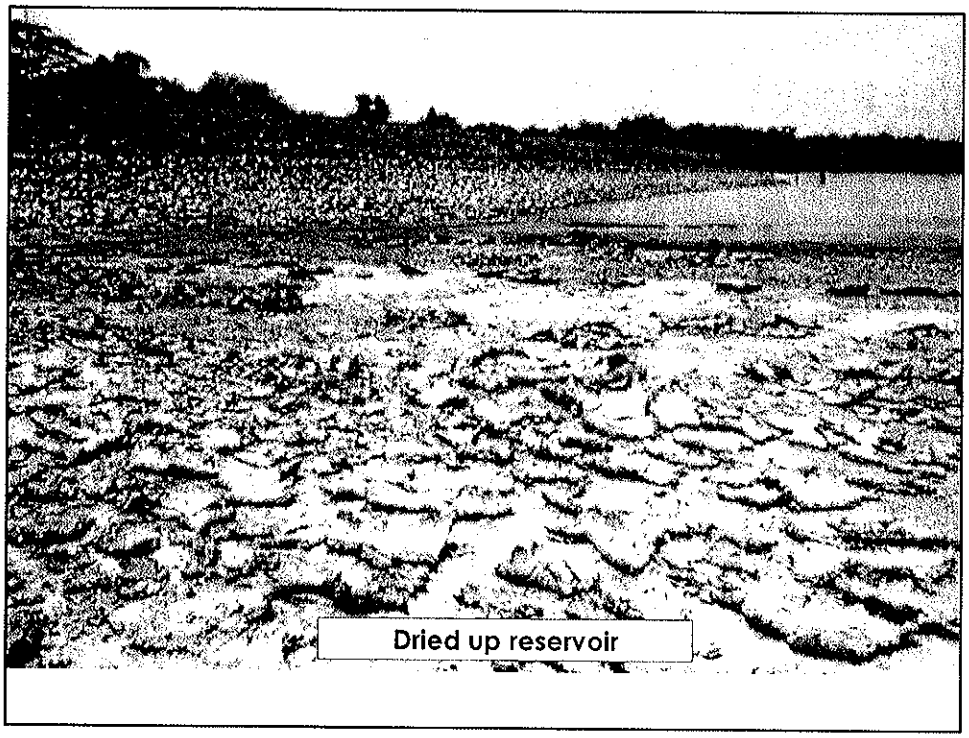


4.2 Times

Daily Water Consumption (thousand cubic metres)



9.2 Times



Dried up reservoir



Water rationing in 1963

Water Conservation - General

Total Approach In Demand Management

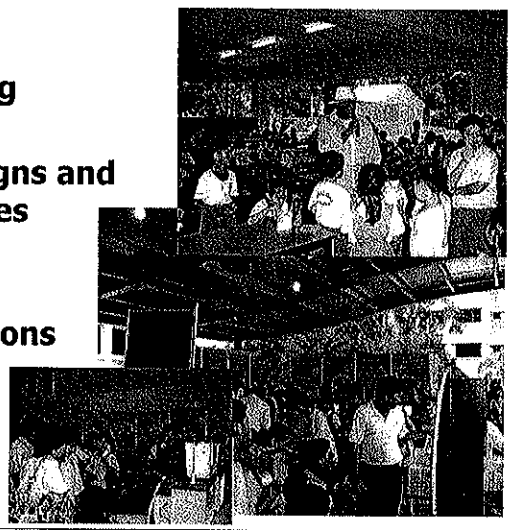
- **PUB Supply Network**
  - UFW Control
- **Customers' Premises**
  - Water Conservation

Water Conservation Plan

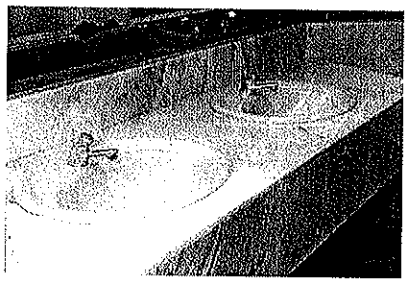
- Public Education and Publicity Programme
- Mandatory Installation of Water Saving Devices
- Fiscal Policy
- Water Auditing
- Water Substitution/Recycling
- Water Efficient Homes Programme
- Water Efficient Buildings Programme

Public Education and Publicity Programme

- Educating Our Young
- Save Water Campaigns and Publicity Programmes
- Working with Grassroots/Institutions



Mandatory Installation of Water Saving Devices

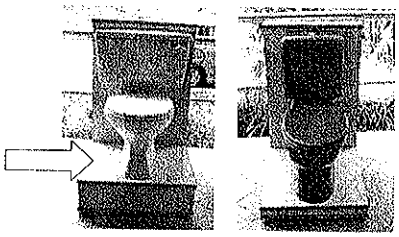


Since 1983

- Self-Closing Delayed-Action Taps
- Constant Flow Regulators

Since 1997

- Low Capacity Flushing Cistern



9 litre flushing cistern 4.5 litre flushing cistern

Water Audit

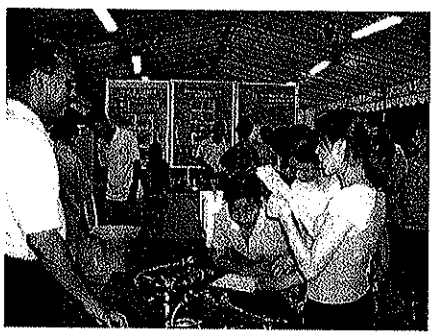
- Market-Oriented Programme
  - Gather Industries' Feedback
  - Implementation of Water Conservation measures
- Large Customers ≥ 5000 m^3/mth
  - Annual Visits
- Customers: 1000 – 5000 m^3/mth
  - Request them to self conduct or engage LP to conduct
  - Carry out random spot checks

Water Substitution/Recycling

- All application for water supply are submitted to PUB for approval
- Encourage substitution with NEWater, High Grade Industrial Water, Industrial Water and Seawater
- Encourage recycling of process water

Water Efficient Homes Programme

- 3Ps – community driven programme
- Install WSDs and adopt good water saving habits
- DIY Water Saving Kits
- Mobile exhibitions
- Can save up to 5%
- 2003
  - 65 constituencies launched
  - some 230,000 households installed WSDs

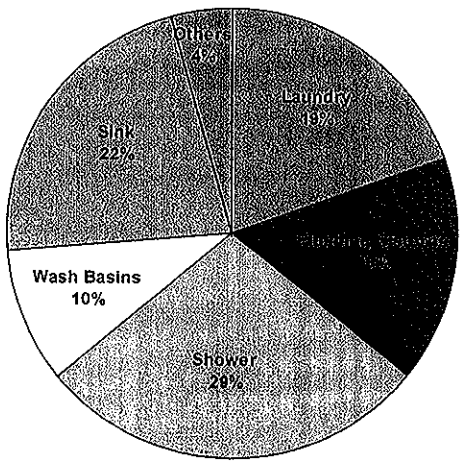


Progress so far.....

- 65 out of 84 constituencies in Singapore have participated
- >700,000 water saving kits has been distributed
- Saving of 5% in participating households

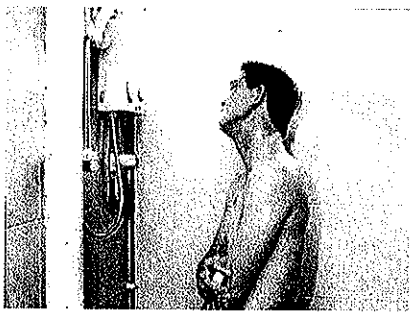


Water Usage Per Day In A Surveyed Household



When soaping in the shower...





Don't let the water run...



Turn off the tap...

And take shorter showers!



When brushing your teeth...

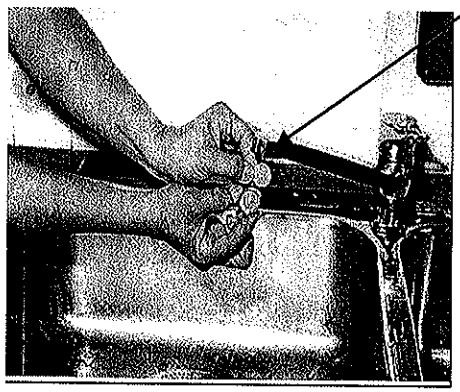




Don't let the water run...



Use a mug/tumbler instead...

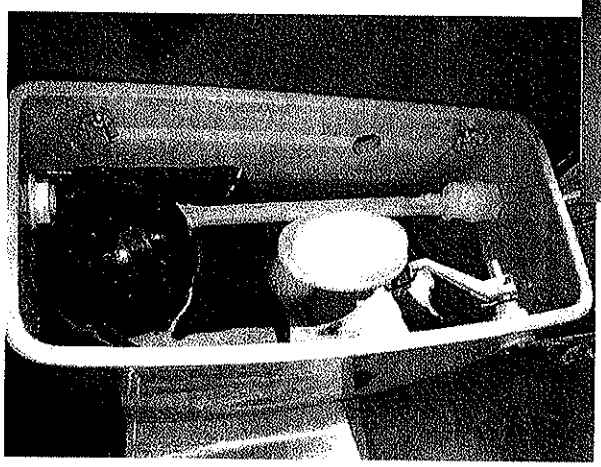


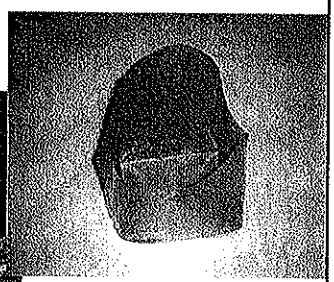
Thimble



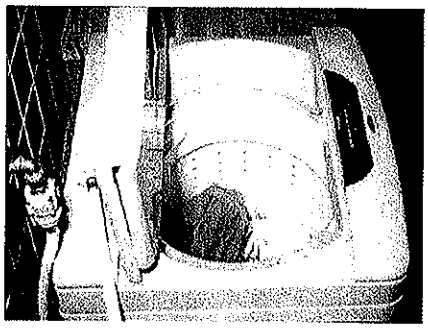
Thimbles installed at taps in new HDB blocks since 1995

Cistern Water Saving Bag





When using the washing machine...



Don't use a half load...



Use a full load instead...

When washing the car...



Don't use a running hose...



Use a bucket of water instead...

When watering the plants...



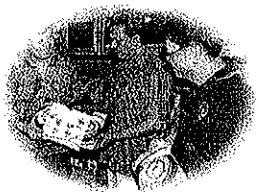
Don't use a running hose...

Use a watering can instead...

Water Conservation - WEB

WEB

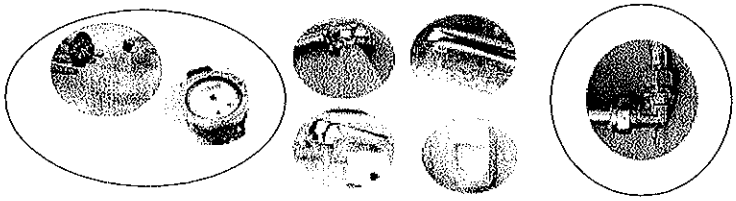
Water Efficient Building



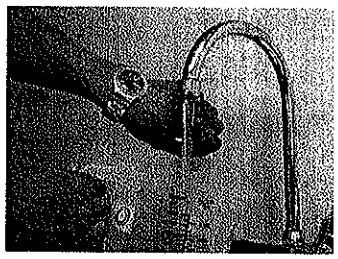
Govt/Statutory Bodies

Commercial/Industrial

Review | Reduce (Recycle & Reuse) | Repair

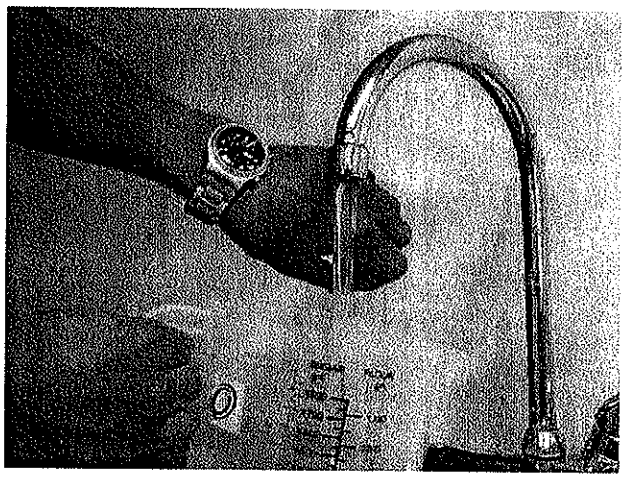


Water Controller

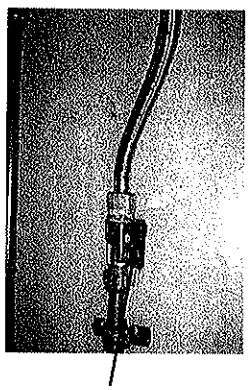


- Check for leak
  - Meter reading
  - Meter test
- Conduct water audit
- Check on Water Saving Devices

How to measure flow rate



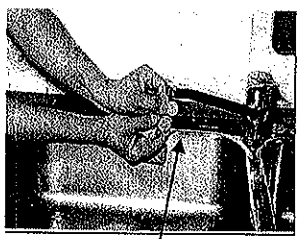
Ways To Adjust Flow Rates At Taps



Adjusting mini-ball valve



Install thimble at flexible hose



Install thimble at aerator of tap

Measures To Conserve Water

- Adopt Water Efficient flow rates
- Take water meter readings regularly
- Conduct regular meter test to check for leaks
- Check for leaking fittings regularly

Water Efficient Buildings

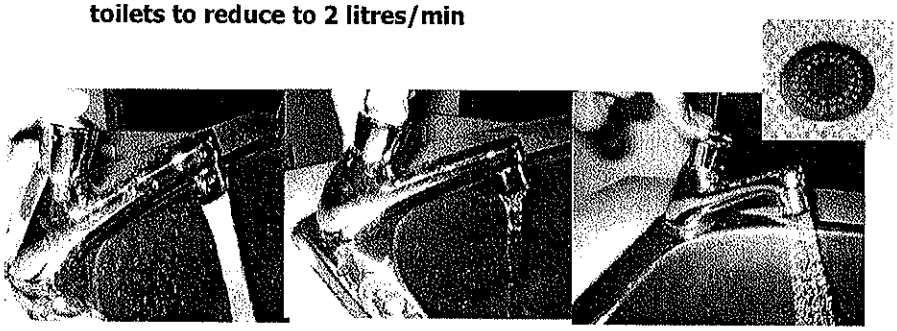
Reduction of Max Allowable Flowrates

Area of Usage	Maximum Allowable Flowrate (litres/min)		Water Efficient Flow Rate (litres/min)
	Existing	New	
Basin Tap & Self Closing Delayed Action Basin Tap	8	6	2 (toilets) 4 (others)
Sink / Kitchen Tap and Wash Area	12	8	6
Shower Tap & Self-Closing Delayed Action Shower Tap	12	9*	7
Other Areas	12	8	6

~~* Except for hotels remains at 12 litres / min~~

2 Litres/Min Flowrate at Washbasin Taps in Toilets

- **Encourage flow rate at wash basin taps at staff & public toilets to reduce to 2 litres/min**



8 l/min
(Turbulence)

2 l/min
(Laminar)

2 l/min with Thimble
(Spray)

Take Water Meter Readings Regularly

- **Regularly – daily/weekly/fortnightly**
- **Monitor the water consumption on a plotted graph**
- **Any sudden increase may indicate a leak in the system**
- **Investigate immediately**
- **Take prompt action to repair leaks, if any**

Conduct Regular Water Meter Test to Check for Leaks

- During off peak period when there is no consumption or consumption is negligible
- Ensure that all the tanks are isolated/fully filled
- Watch the water meter to see if the counter moves
- A movement on the counter means that there is a leak somewhere
- Further investigation to locate possible leak

3P Partnership

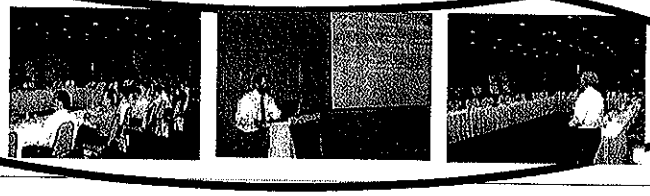
People :



Private :



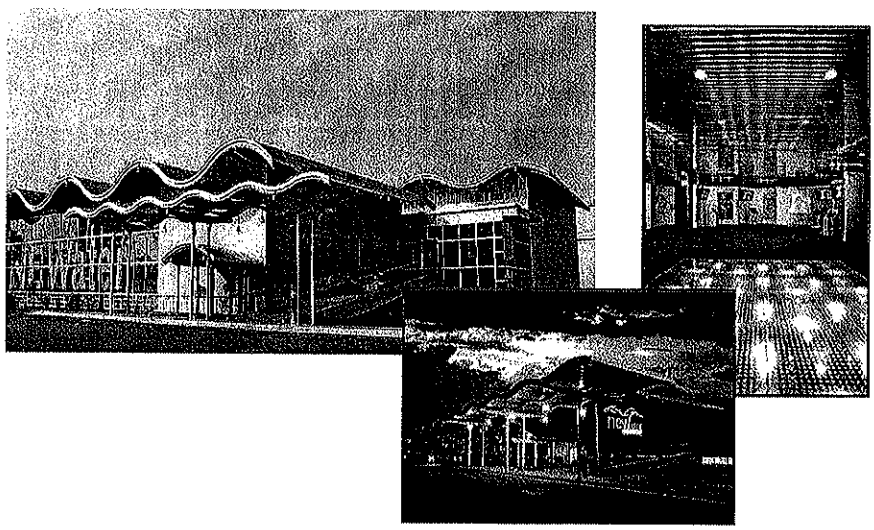
Public :



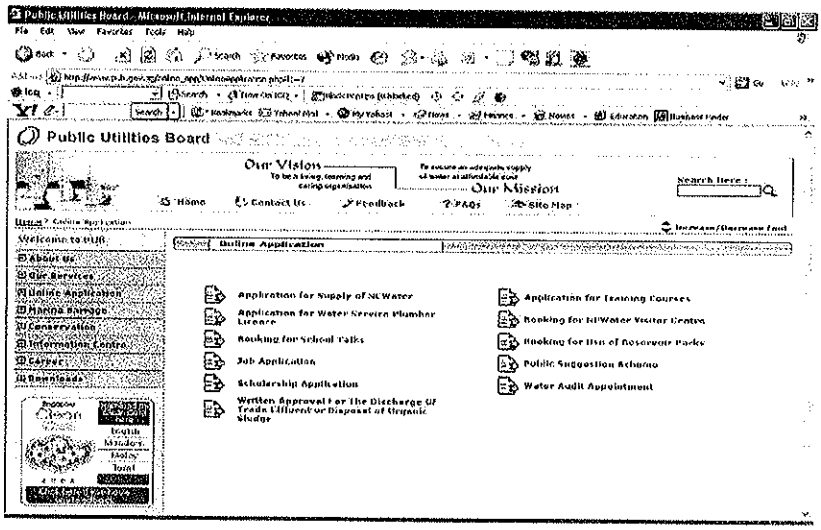
Be a Water Ambassador

- Adopt good water saving habits.
- Reduce water usage by installing water saving devices.
- Encourage families, relatives and friends to conserve water.
- Do not litter.
- Notify PUB-One at Tel: 1800-2846600 to report any water leakages, water wastage, dirty drains, choked sewers etc.

NEWater Visitor Centre



http://www.pub.gov.sg



Thank You

Mandatory E-application for SIP/DIP from 1 Jan 2006

by

Mr. Anselm Gonsalves
CBPU

Mandatory E-Application For Sewerage And Drainage Interpretation Plan (SIP/DIP) wef 1 Jan 2006

Contents

- Brief introduction of SIP/DIP
- Background information on application systems
- E- application system, IT requirements and website
- E-application procedure

Introduction

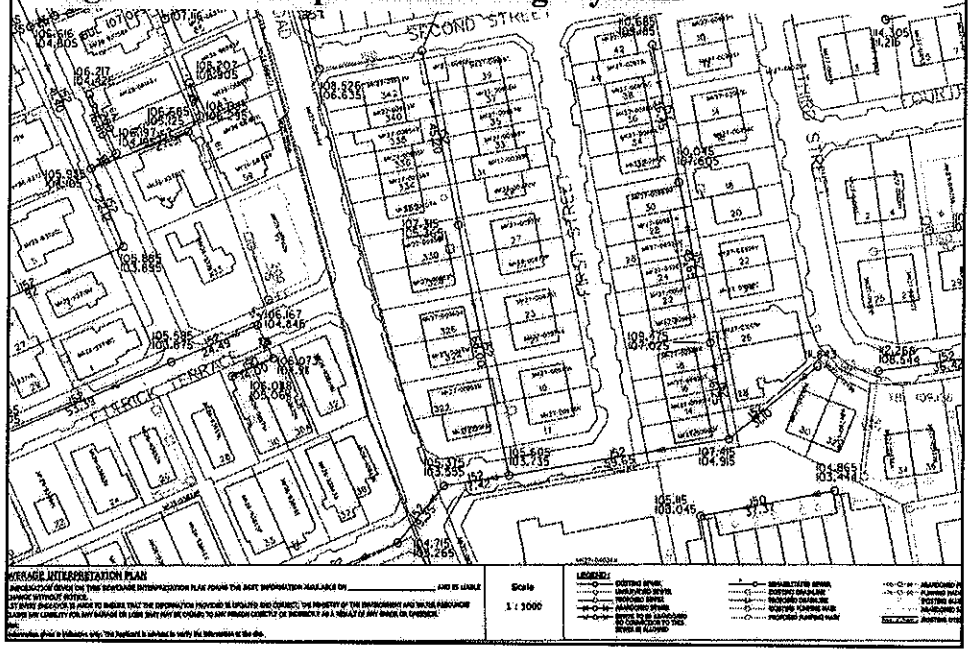
- **Architects, engineers, registered surveyors, and contractors apply to CBPU for the SIP and DIP**

  - to ensure that developments do not encroach on public sewers and drainage reserves

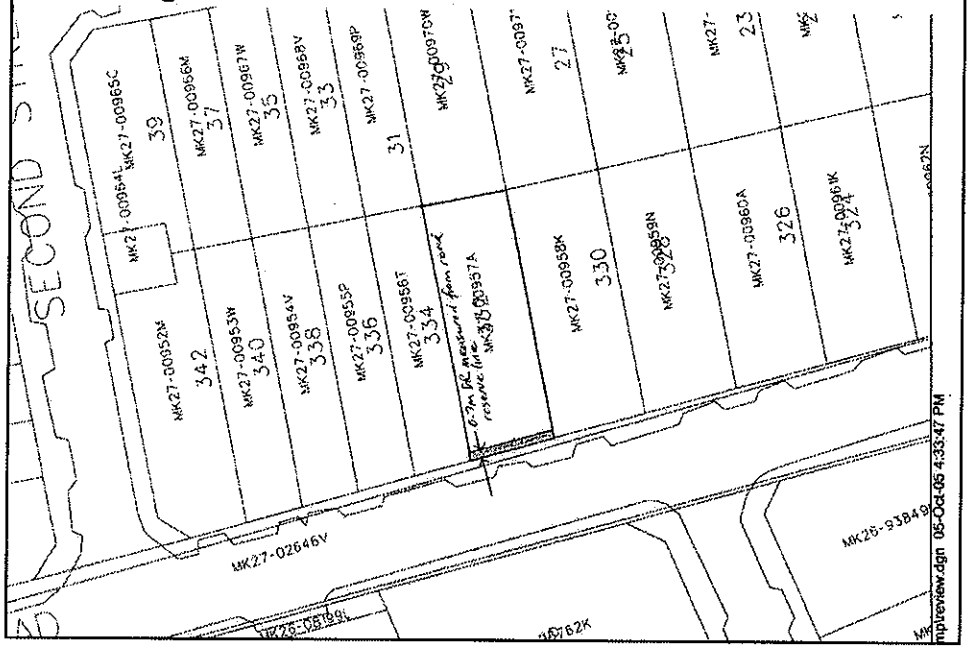
  - confirm point of sewer connection for the development

  - to ascertain the position and alignment of public sewer and drainage reserve on site

SIP shows the sizes, reduced levels and indicative alignment of the public sewerage system



DIP shows the width and indicative alignment of the drainage reserves



Application Systems

•CBPU processes on average 600 SIP and DIP applications a month

•Electronic Application

- via Internet from NEA eShop hosted in Yellow Pages Singapore website

-application fee is $20 inclusive of GST(5%)

- e- payment by cashcard or credit-card

- constitute 90%of applications

Application Systems

- **Manual Application**
  - by post, courier or hand-delivered
  - application fee is $22 inclusive of GST(5%)
  - Payment by cheque to order of NEA
  - constitute 10% of applications only
  - Reasons for not switching to e-application are inertia to change and un-availability of cashcard or credit card

E-Application System

- **Mandatory from 1 Jan 2006**
- **Rationale**
  - majority of architects, engineers and contractors are already using on-line system (90%)
  - not resource efficient for CBPU to maintain a dual system
  - on-line system is reliable, cheaper and user-friendly
  - support from professional bodies and industry partners to mandate e-application system for SIP/DIP
  - IT kiosk set up at NEA Service Centre(2nd storey, ENV Building) for applicants without Internet access

E-Application System

- **Roll Out Plan**
  - circular issued on 12 Sept 2005 to professional bodies and industry associations to notify their members
  - advisory added in SIP/DIP replies and announcements placed in the CBPU and YPS websites on deadline for implementation of e-application system
  - conduct hands-on training sessions at the NEA Service Centre IT kiosk for applicants without Internet access to familiarise them with the e-application system

IT Requirements for E-Application System

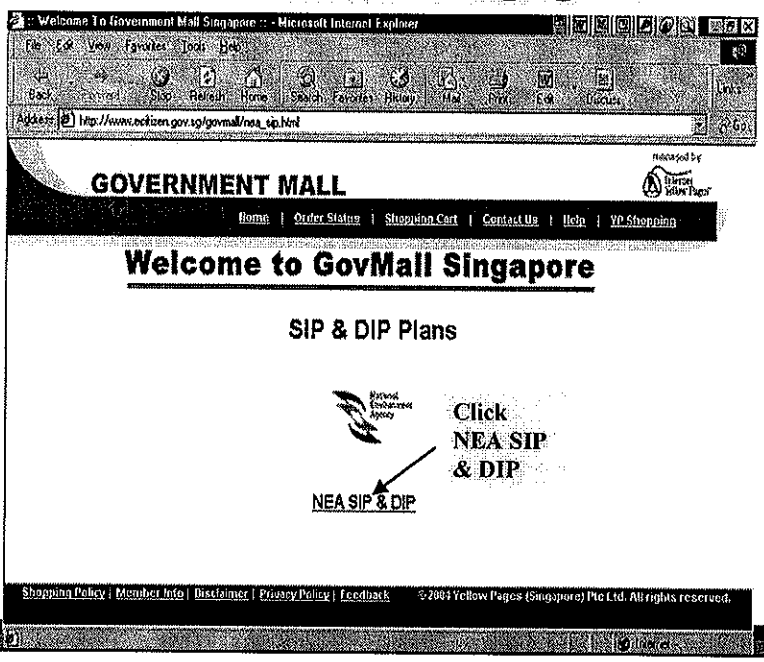
- **Hardware**
  - PC with internet account (*Singnet, PacNet, Cyberway*)
  - External Modem (*56kbps minimum)*
  - Cashcard Reader (*for cashcard payment only*)
- **Software**
  - Internet Browser (*IE 5.0 or above)*/ Netscape (version 6.0 or above)
  - eWallet software (*for cashcard payment only- can be downloaded free of charge from Netrust website*)

Website for E-Application System

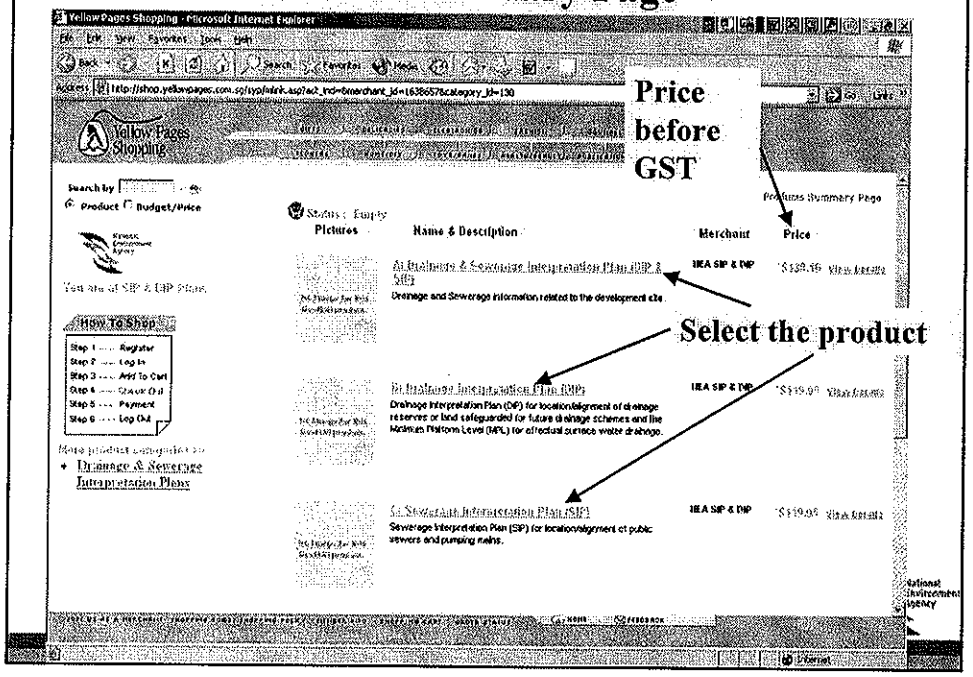
- **Yellow Pages Singapore**
  - http://www.ecitizen.gov.sg/govmall/nea_sip.html
- **CBPU**
  - http://www.nea.gov.sg/info/cbpu

  (*click on the hyperlink for SIP/DIP application*)

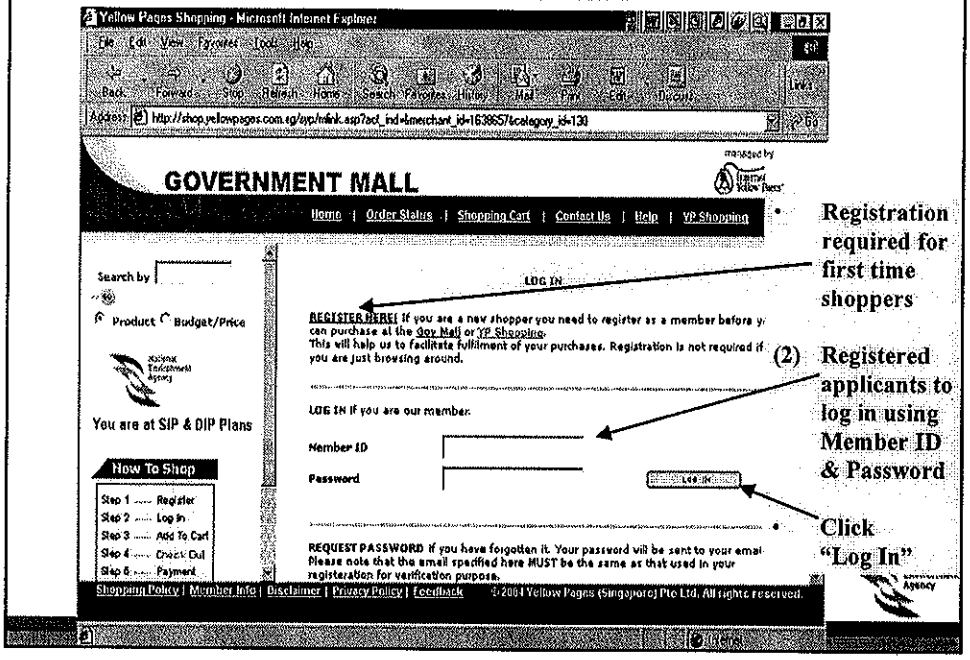
NEA E-Shop Webpage



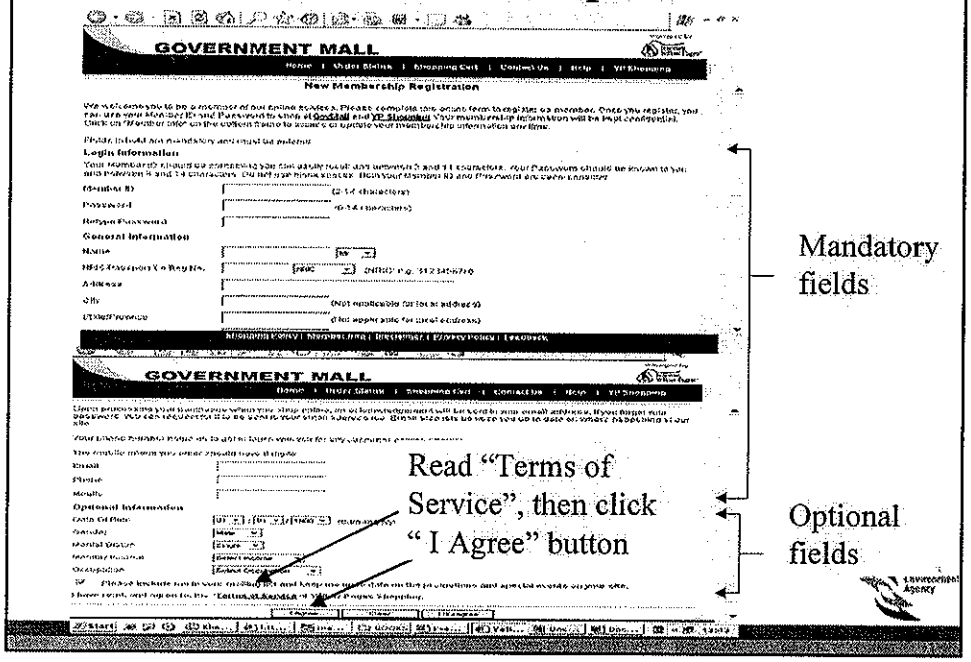
Product Summary Page



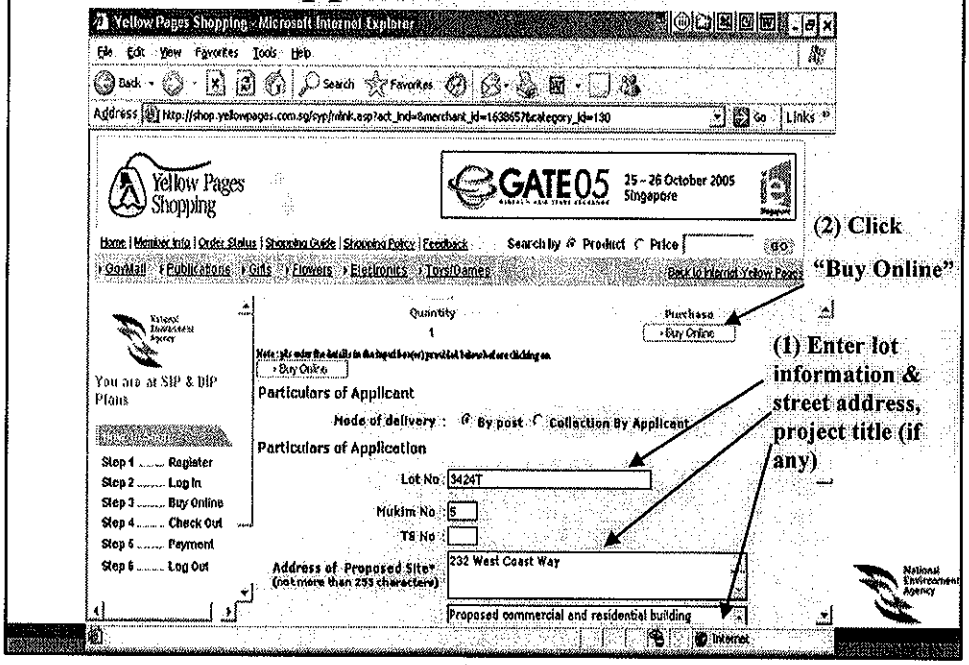
Log In Page



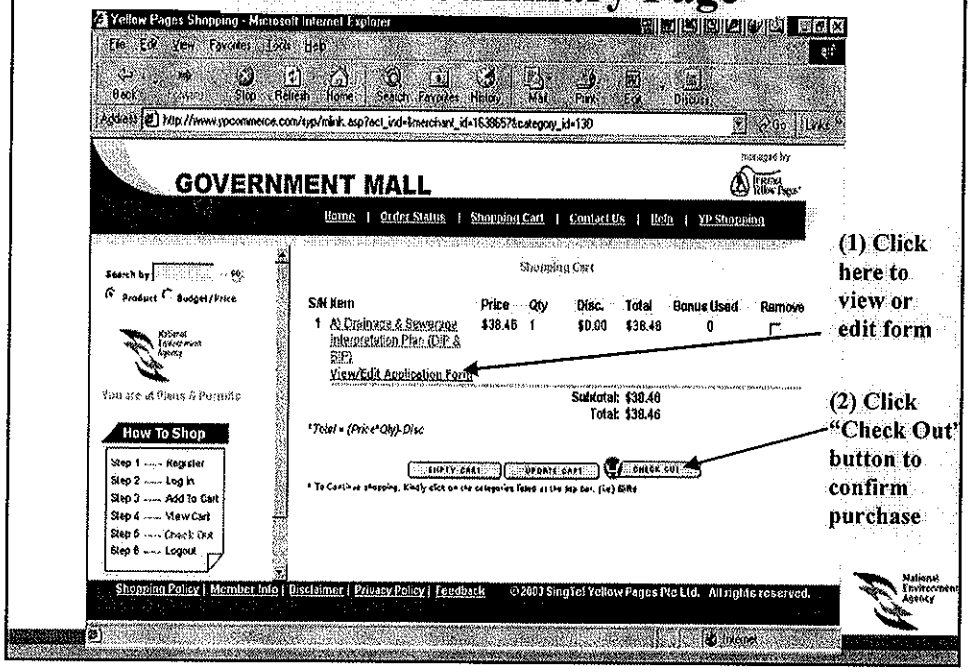
Registration Template



Application Form



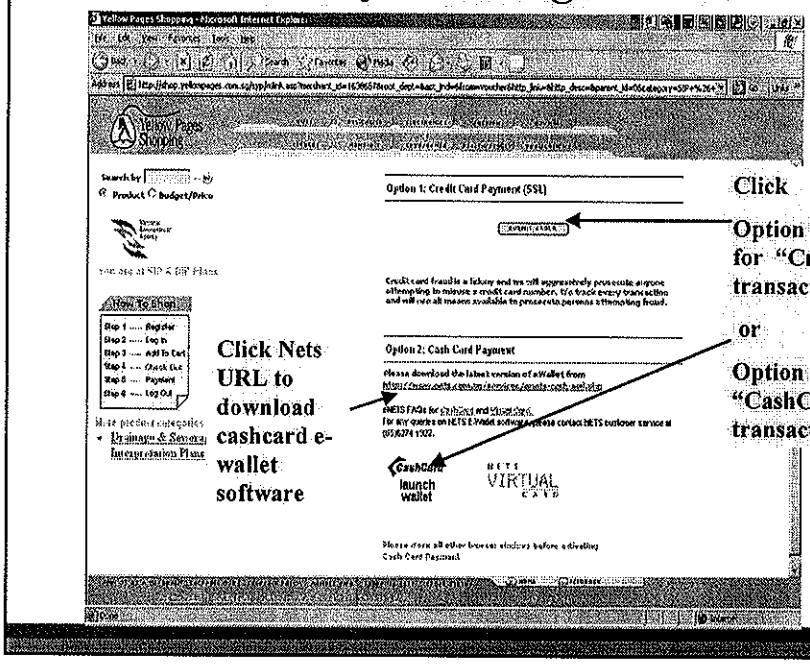
Purchase Summary Page



(1) Click here to view or edit form

(2) Click "Check Out" button to confirm purchase

E-Payment Page



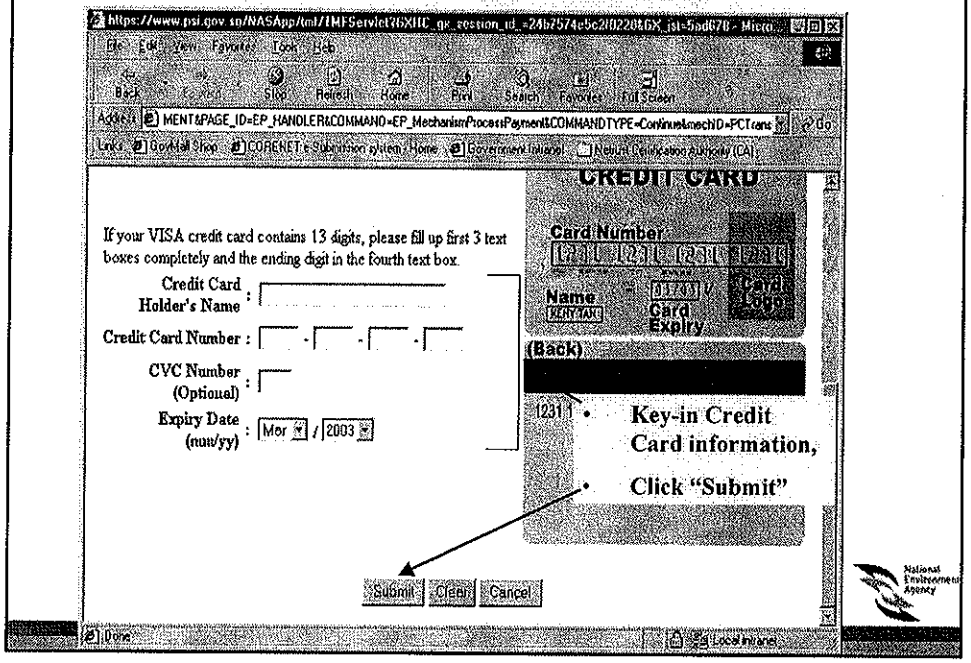
Click Nets URL to download cashcard e-wallet software

Click Option One button for "Credit Card" transaction

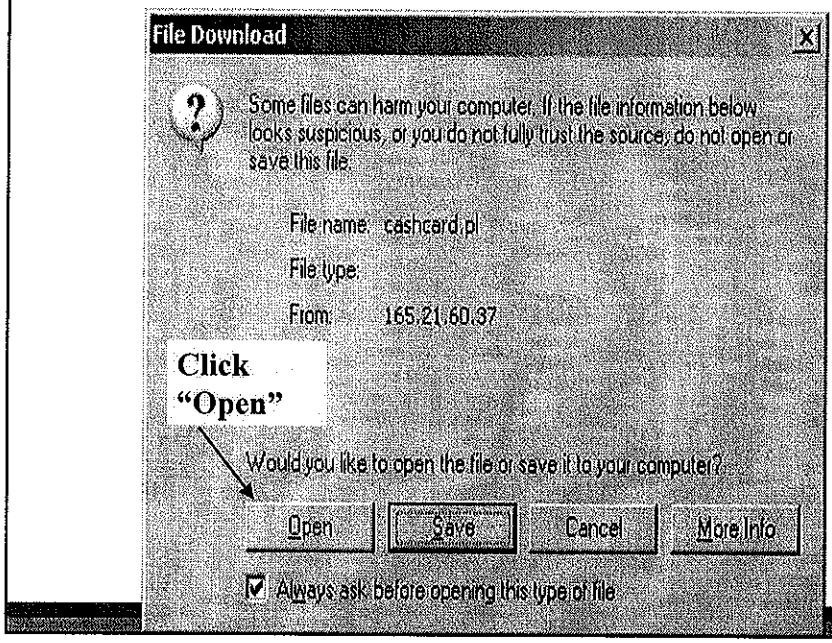
or

Option 2 icon for "CashCard" transaction

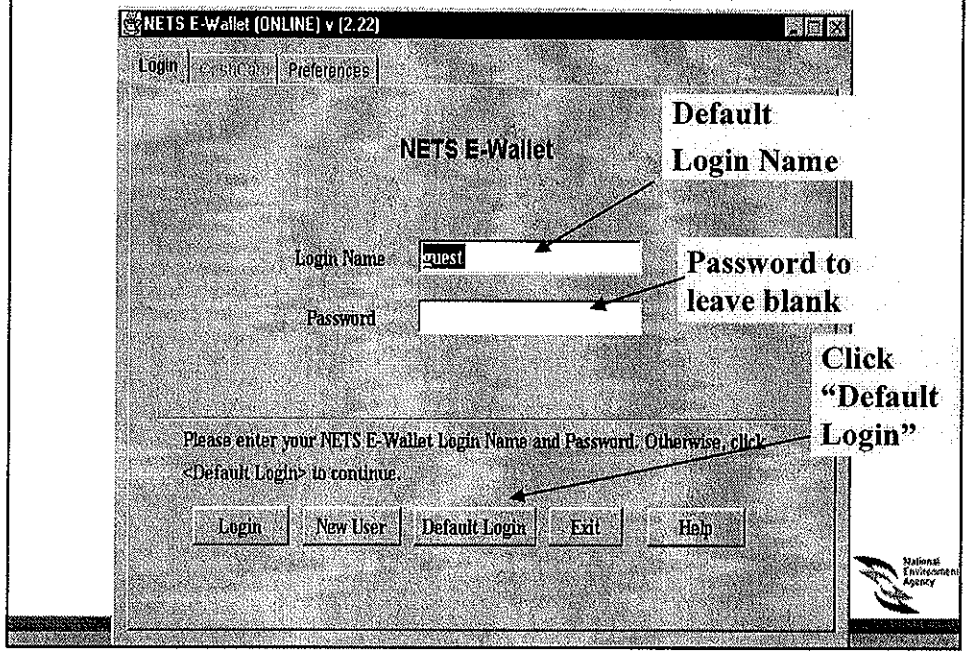
Credit Card Transaction



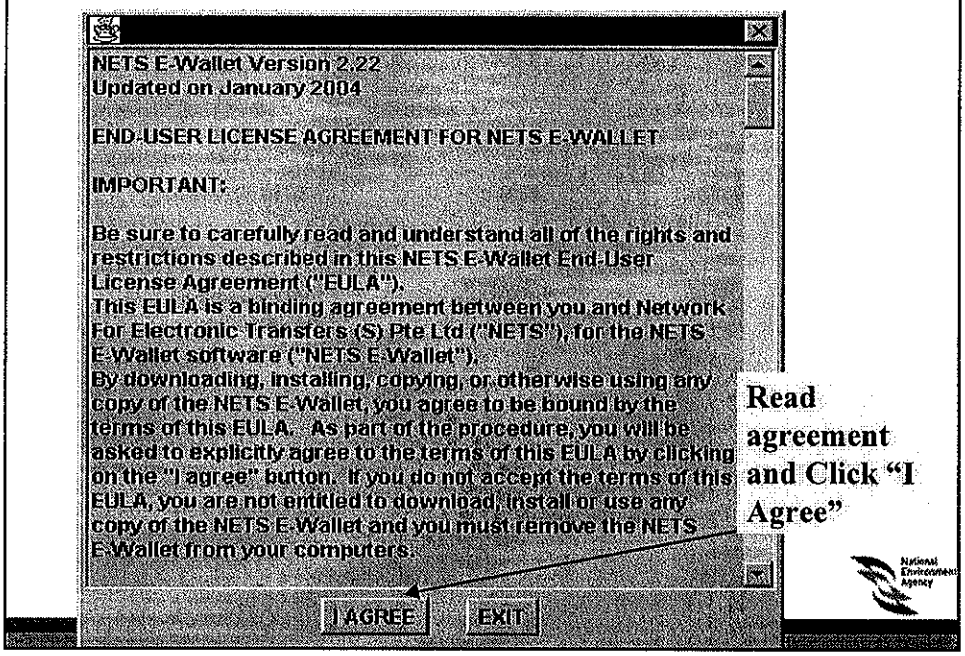
Cash Card Transaction



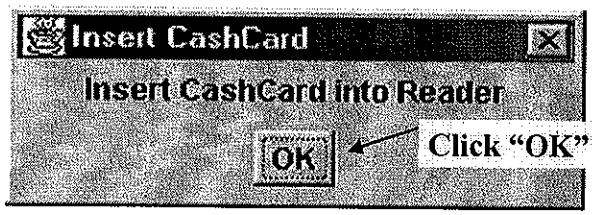
Cash Card Transaction



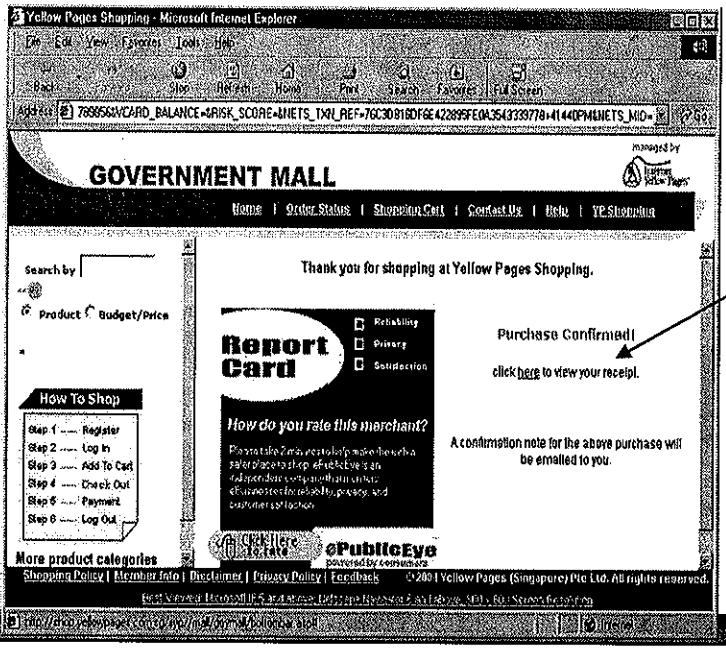
Cash Card Transaction



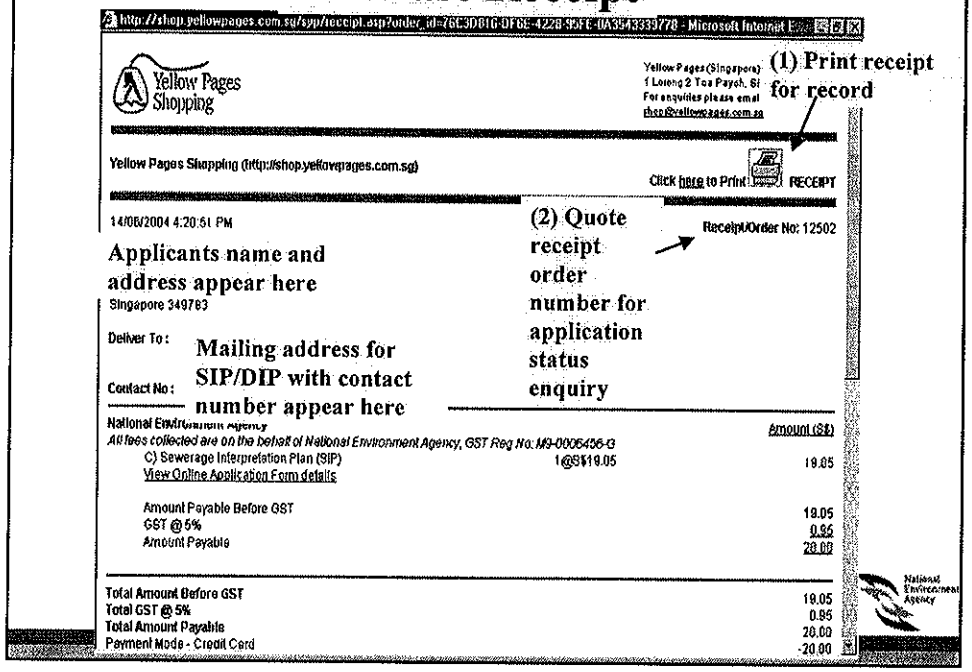
Cash Card Transaction



Purchase Confirmation Page



Purchase Receipt



E-Application System(Recap)

- **Mandatory from 1 Jan 2006**
- **On-line system is reliable, cheaper and user-friendly**
- **Applicants without Internet access can make use of the IT kiosk at NEA Service Centre(2nd storey, ENV Building) to apply for SIP/DIP online**

Thank You



Common mistakes made on PC plan submissions

by

Mr Lee Aik Beng
CBPU

PC Plan Submission
Common Mistakes

PC Plan Submission

Scope

- Industrial development
- Farm development
- Warehouse development

PC Plan Submission

Submission Procedure

- Developer applies to CBPU and obtains clearance on the use of industrial land
- Developer engages QP for DC/BP, submission.
- Developer engages competent consultants for DP, PCS and QRA, where applicable

PC Plan Submission

Submission Procedure

- QP prepares DC/BP plans and seeks waivers, if required
- QP checks and submits DC/BP plan to CBPU
- CBPU checks and clears DC/BP plan

PC Plan Submission

Submission Procedure

- Submission of DP, PCS and QRA
- CBPU checks and clears DP and PCS submission
- CBPU liaises with SCDF, MOM, SPF & JTC to vet and clear QRA submission

Common Mistakes

DC Stage

QPs did not submit DC plans for checking for compliance with

- Drainage reserve/Min. platform level
- Public sewer setback
- Health & safety buffer
- Nuisance buffer
- Building height constraint

Common Mistakes

BP Submission - General

- BP plan is submitted before DC plan submission
- The use of the respective areas not indicated
- The sources of trade effluent generation, air pollution & noise emission not indicated.
- Trade effluent drainline system not segregated from sanitary system

Common Mistakes

BP Submission - Chemicals & Oil

- Fail to indicate the goods/materials handled in the loading/unloading areas.
- Fail to indicate the goods/materials stored in the stores, warehouses or storage tanks
- Fail to show compliance of the containment requirement for storage tank

Common Mistakes

BP Submission - Technical Details

- Fail to indicate the location of the trade effluent treatment plant, air pollution control equipment, fuel burning equipment and its chimney/exhaust stack and to endorse their details will be submitted separately for approval before installation

Common Mistakes

BP Submission - Technical Detail

- Include the layout or outline of the trade effluent treatment plant, air pollution control equipment, fuel burning equipment and its chimney/exhaust stack on BP while their details have yet to be submitted for acceptance/clearance

Common Mistakes

BP for A&A Works

- Fail to indicate full project reference no. (eg BP001, BP002, etc) on BP
- Fail to explain discrepancy. (eg. Submit A&A plan without main BP)
- Fail to highlight the amendment on BP
- Fail to indicate the use of new area created by A&A works

Thank you

Knowledge Sharing



Updates on 2005 COPEH

By

Mr. Yip Ngai Yin

Environmental Health Div

CODE OF PRACTICE ON ENVIRONMENTAL HEALTH

REVISIONS TO COPEH 1998

ENVIRONMENTAL HEALTH DEPARTMENT
NATIONAL ENVIRONMENT AGENCY

INTRODUCTION

COPEH Overview :-

- provides the guidelines to address environmental health concerns in the ***design of buildings***;
- spells out the objectives to be met;
- and stipulates the minimum basic design criteria.

QPs may exercise flexibility and creativity to meet the stated requirements, so long as design outcomes satisfy the stated objectives.

OVERVIEW

SECTIONS

- Refuse Storage And Collection System
- Public Toilet
- Food Retail Outlet
- Supermarket ***new***
- Food Catering Outlet
- Market
- Swimming Pool
- Dormitory ***new***
- Anti-Mosquito Breeding ***new***
- Premises With Cattle ***new***

1 REFUSE STORAGE AND COLLECTION SYSTEM

SECTION 1 – Refuse Storage And Collection System

SCOPE

- Provides the guidelines and requirements for design of
  - refuse chute,
  - refuse chute chamber,
  - refuse room,
  - refuse bin centre, and
  - pneumatic refuse conveyance system.



SECTION 1 – Refuse Storage And Collection System

SALIENT CHANGES

- New guidelines introduced for siting of refuse chute opening and refuse bin centre to address smell nuisance and unsightliness.
- New requirement to render refuse room and refuse bin centre pest-proof against birds and rodents.



1 REFUSE STORAGE AND COLLECTION SYSTEM

1.3 Refuse Chute

Additional Requirement – (b) & (c):

- The chute shall terminate at the roof of a building. The chute shall be ventilated at the top with at least two openings of not less than 0.1 sq m each.
- If the roof is to be used as a roof terrace/garden, particular attention shall be paid to the siting of the refuse chute, the location of its openings and the maintenance requirements so as to minimise any smell nuisance. Ventilation openings shall be located at least 2.1 m above roof level.

Rationale:

- To minimise smell nuisance.



1 REFUSE STORAGE AND COLLECTION SYSTEM

1.5 Refuse Room

Additional Requirement – (f):

- The refuse room shall be rendered pest-proof against birds and rodents.

1.6 Refuse Bin Centre

Additional Requirement – (g):

- The bin centre shall be adequately ventilated and rendered pest-proof against birds and rodents.

Rationale:

- To pest-proof against birds and rodents.



1 REFUSE STORAGE AND COLLECTION SYSTEM

1.6 Refuse Bin Centre

Additional Requirement – (h):

- The entrance and ventilation openings of the bin centre shall face away from any residential premises in the vicinity.
- Aesthetic screening shall be provided where practical, to further minimise nuisance.

Rationale:

- To minimise smell nuisance and unsightliness.

2 PUBLIC TOILET

SECTION 2 – PUBLIC TOILETS

SCOPE

- Stipulates the provision requirement for number of sanitary fittings and accessories in public toilets
- Provides the design guidelines and requirements for
  - WCs, urinals, wash hand basin and taps;
  - toilet accessories;
  - ventilation

SECTION 2 – PUBLIC TOILETS

SALIENT CHANGES

- Increased sanitary fitting provision requirements for female toilets in shopping place, eating establishment, cinema, theatre, etc.
- New requirement to provide water tap point coupled with spring nozzle in each cubicle with squatting WC pan.

SECTION 2 – PUBLIC TOILETS

SALIENT CHANGES

- Revised requirements for sanitary fittings (WCs, urinals and wash-hand basins).
- Revised requirements for toilets accessories (soap dispenser, hand-dryer, paper towel dispenser, litterbins and toilet paper holder).
- Additional requirements for ventilation.

2 Public Toilet

2.3 General Design Criteria

New Requirement – (b):

- The design of the toilet's main entrance shall preferably be such that it can do away with a door, and the cubicles, urinals and mirrors shall be sited away from the line of sight from the main entrance.

Rationale:

- To achieve a 'no-touch' or 'hands-free' design to lower cross contamination of germs.

2 Public Toilet

2.4 Sanitary Fittings

New Requirement – 2.4.2:

- Water closet pans shall be the pedestal type.

Rationale:

- To encourage pedestal type WCs as they are drier and cleaner than squatting type.
- Elderly and overweight are not encumbered by the pedestal type WCs.



2 Public Toilet

2.4 Sanitary Fittings

New Requirement – 2.4.2:

- Where there is more than one cubicle, at least one squatting type WC pan is to be provided.
- A water tap point coupled with spring nozzle shall be provided within every cubicle where a squatting WC pan is provided.
- The cubicle, where a squatting WC pan is provided, should be kerbed such that water will not flow out of the boundary of the cubicle. The cubicle floor shall be properly graded towards the gully trap within the cubicle.

Rationale:

- Cater to cultural needs.



2 Public Toilet

2.4 Sanitary Fittings

Existing Requirement:

- Wash-hand basins shall be under-counter.

Additional Requirement – 2.4.3:

- Other designs are allowed provided that they can minimise the problem of water spilling over from the basin to the counter. For basins that sit on top of the counter or are stand-alone, these shall be deep enough to prevent water splashing out of the basins when in use.
- All wash hand basin taps shall have their flow rate suitably adjusted to minimise splashing and shall be self-closing delayed-action taps (mechanical or sensor type) taps. Care shall be taken to position the tap such that it prevents splashing of water outside the basin.

Rationale:

- To allow for flexibility in basin design & layout, but keep in mind the main concern of water splashing & spillage.



2 Public Toilet

2.5 Accessories

New Requirement:

- The soap dispenser shall be positioned near to the basins. The dispenser shall have a transparent window so that the level of soap in the dispenser is clearly visible.
- A minimum of one hand-dryer blower and/or paper towel dispenser shall be provided near the wash hand basin area.

Rationale:

- Encourage proper habit of washing hands.
- Minimise wetting of toilet floor and basin area.



2 Public Toilet

2.5 Accessories

New Requirement:

- A minimum of one litterbin shall be provided near the wash hand basin area. A sanitary bin for the disposal of sanitary pads shall be provided in each WC cubicle in the female toilet.

Rationale:

- Facilitate proper waste disposal.

2 Public Toilet

Appendix 2

	Categories of Places	Number of Sanitary Facilities						
		Female				Male		
		WC (old)	WC (new)	WHB (old)	WHB (new)	WC	UR	WHB
(1)	**SHOPPING PLACE/ SUPERMARKET/ WET MARKET**							
	Not more than 350 sq m	1*	1*	1*	1*	-	-	-
	351 sq m to 700 sq m	1	2	1	1	1	1	1
	701 sq m to 1,000 sq m	2	3	1	2	1	2	1
	1,001 sq m to 1,500 sq m	3	4	2	3	1	3	2
	1,501 sq m to 3,000 sq m	4	5	3	3	2	3	3
	3,001 sq m to 5,000 sq m	6	7	4	4	3	4	4
	Every additional 2,000 sq m or less in excess of 5,000 sq m	1	2	1	1	1	1	1

2 Public Toilet

Appendix 2

	Categories of Places	Number of Sanitary Facilities						
		Female				Male		
		WC (old)	WC (new)	WHB (old)	WHB (new)	WC	UR	WHB
(3)	**CONFERENCE HALL/ CINEMA/ THEATRE (seating capacity)** **CONVENTION HALL/ EXHIBITION HALL (capacity)**							
	Not more than 150 persons	2	3	1	2	1	2	1
	151 to 300 persons	4	6	2	4	2	3	2
	301 to 450 persons	5	9	3	6	2	4	3
	451 to 600 persons	6	12	4	8	3	5	4
	601 to 900 persons	8	14	5	10	3	7	5

2 Public Toilet

Appendix 2

	Categories of Places	Number of Sanitary Facilities				
		Female		Male		
		WC	WHB	WC	UR	WHB
(3)	**CONFERENCE HALL/ CINEMA/ THEATRE (seating capacity)** **CONVENTION HALL/ EXHIBITION HALL (capacity)**					
	Every additional 300 persons or less in excess of 900 persons	1	1	1	1	1
	Every additional 100 persons or less in excess of 900 persons	1	1			
	Every additional 150 persons or less in excess of 900 persons			1	1	1

Rationale:

- Higher provisions to cater for peak usage by large crowd.

2 Public Toilet

Appendix 2

	Categories of Places	Number of Sanitary Facilities						
		Female			Male			
		WC	WHB	BR	WC	WHB	UR	BR
(10)	**CONSTRUCTION SITE**							
	Every 25 male workers or less				1	1	1	1
	Every 25 female workers or less	1	1	1				
	CONSTRUCTION SITE/ DORMITORY							
	(a) Construction site with living quarters/ dormitories							
	Every 15 male workers or less				1	1	1	1
	Every 15 female workers or less	2	1	1				
	(b) Construction site without living quarters,							
	Every 25 male workers or less, up to 500 male workers				1	1	1	1
	Every 25 female workers or less, up to 500 male workers	2	1	1				

Rationale:

- Stipulate requirement for both dormitory and construction site.

2 Public Toilet

For further reference:

- <A Guide to Better Public Toilet Design & Maintenance>

http://www.nea.gov.sg/cms/ehd/public_toilet_guide.pdf



3 FOOD RETAIL OUTLET



SECTION 3 – FOOD RETAIL OUTLET

SCOPE

- Stipulates the general design criteria and provision requirements to ensure high standard of food hygiene and cleanliness in the premises.
- Provides the design guidelines and requirements for ventilation and air exhaust system.



SECTION 3 – FOOD RETAIL OUTLET

SALIENT CHANGES

- New requirement for ventilation and air exhaust system to address smell, noise and other public health nuisances.
- Provides guidelines for mist generating system and fan.

3 FOOD RETAIL OUTLET

3.2 General Design Criteria

New Requirement – (d):

- No manhole or overhead sanitary wastepipe shall be sited in the area where food is prepared or cooked.
- No inspection chamber or grease trap shall be sited within the areas where food is prepared, cooked, stored or served; or other areas where they are likely to give rise to nuisance, health or hygiene hazards during maintenance.

Rationale:

- Requirements from SSWCOP.

3 FOOD RETAIL OUTLET

3.2 General Design Criteria

New Requirement – (i):

- A storage room shall be provided, where practical, for the storage of large equipment such as additional chairs, tables etc.

Rationale:

- Chairs and tables stacked in common passageway and toilet.



3 FOOD RETAIL OUTLET

3.2 General Design Criteria

New Requirement – (m):

- Where there are 6 or more individual stalls, a minimum of one hand-washing basin in the refreshment area with liquid soap dispenser and paper towel dispenser/hand dryer shall be provided.
- A minimum of one litterbin shall be provided at the wash hand basin area.

Rationale:

- To encourage and facilitate hand washing for patrons.



3 FOOD RETAIL OUTLET

3.2 General Design Criteria

New Requirement – (o):

- All mist generating systems and fans installed shall be in accordance with the requirements stated in Appendix 6.

Rationale:

- Risk of transmission of Legionella Disease caused by faulty mist generating systems and fans or improper maintenance.

3 FOOD RETAIL OUTLET

3.3 Ventilation And Air Exhaust Systems

Removed Requirement:

- Fumes, smoke, oil mist, grease, steam and odour from the cooking range shall be exhausted either by an air cleaning system or a hood and flue system.
- The air cleaning system shall be fitted with a fire retardant filter media that is able to withstand high cooking heat and have a high adsorption capacity even under humid conditions.
- In the case of the hood and flue system, it shall be fitted with a grease filter that is able to withstand high cooking heat, and extractor fan.
- The flue shall discharge at a point above roof and away from neighbouring premises.

3 FOOD RETAIL OUTLET

3.3 Ventilation And Air Exhaust Systems

New Requirement – (a):

- All fumes from the cooking range shall be extracted immediately and treated with an air cleaning system. The air cleaning system shall capture particulate matters, grease, oil, water vapour and smell causing compounds such that there is:
- No visible black smoke and fumes (white or otherwise) from the exhaust;
- No emission of grease or oil from the exhaust as evident by the deposition on the grating or in the surrounding area of the exhaust;
- No intense/ irritating smell of frying, charbroiling, roasting and such other cooking in the vicinity of exhaust.

Rationale:

- Outcome-based guidelines.



3 FOOD RETAIL OUTLET

3.3 Ventilation And Air Exhaust Systems

New Requirement – (b) & (c):

- The air cleaning system shall not cause noise nuisance.
- The cleaned air shall be exhausted outdoors by a hood and flue or other extractor fan system at or above the roof, facing away and aesthetically screened from the immediate neighbouring premises, such that it will not cause smell or other public health nuisance. Where it is not practical to exhaust the fumes at or above the roof, an alternate location of the discharge point in the outdoors may be selected, facing away and aesthetically screened from the immediate neighbouring premises.

Rationale:

- Address nuisance issues to neighbouring premises.



3 FOOD RETAIL OUTLET

3.3 Ventilation And Air Exhaust Systems

New Requirement – (i):

- For approval of building plans for premises with foodshop(s), a qualified person shall ensure that the exhaust and ventilation system complies with the above requirements and all applicable guidelines stipulated under Section 6.2 of the latest edition of Singapore Standard CP 13.

4 SUPERMARKET

SECTION 4 – SUPERMARKET

**New section*

SCOPE

- Stipulates the general design criteria and provision requirements for food preparation and servery area, to ensure high standard of food hygiene and cleanliness.
- Provides the guidelines for provision of commercial sinks, food stores, storage cabinet, etc.

5 FOOD CATERING OUTLET

SECTION 5 – FOOD CATERING OUTLET

SCOPE

- Stipulates the general design criteria and provision requirements for kitchen area, to enhance hygiene during food preparation.
- Provides the guidelines for provision of cold stores, storage cabinet, loading bay, etc.

SALIENT CHANGES

- Revised requirement for loading bay.



6 MARKET



SECTION 6 – MARKET

SCOPE

- Stipulates the design criteria for drainage system to ensure premises is kept dry and clean.
- Provides the guidelines on requirements for service counter, tap point & sink, loading bay etc.

SALIENT CHANGES

- Revised requirement for drainage system.

7 SWIMMING POOL

SECTION 7 – SWIMMING POOL

SCOPE

- Stipulates the design criteria for water circulation system to ensure water quality remains safe during pool operation.
- Provides the guidelines for landscaping around pool to curtail possibility of pool water contamination.
- Suggest guidelines on safety features in pool design.

SECTION 7 – SWIMMING POOL

SALIENT CHANGES

- Revised requirements for landscaping around pool.
- New suggested guidelines on safety features in pool design.

7 SWIMMING POOL

7.3 Suggested Guidelines On Safety Features In Pool Design And Landscaping

Guideline – (a) :

- The pool bottom of the shallow area and steps of the swimming pool shall be of non-slip finish. Grip tiles used along the edges of the pools shall also be non slippery and smooth to avoid injuries to users.

Rationale:

- Safety measure to prevent slipping at the steps and pool edge.



7 SWIMMING POOL

7.3 Suggested Guidelines On Safety Features In Pool Design And Landscaping

Guideline – (i) :

- Where the pool bottom transits to a steeper slope, the transition shall be marked on the bottom and walls of the pool by a stripe of dark contrasting colour at least 15cm wide.

Rationale:

- Safety measure to forewarn pool users of differential depth.



8 DORMITORIES

SECTION 8 – DORMITORY

**New section*

SCOPE

- Provide the design criteria for provision of living space, toilet and sanitary facilities.

8 DORMITORIES

8.1 Design Criteria

Requirement – (a) & (b):

- If the dormitory does not provide a separate space for cupboards/lockers room, the minimum room space shall be 4 sq. m per person (assuming a height of 2.4m).
- If the dormitory provides a separate space for cupboards/lockers room, the minimum room space shall be 3 sq. m per person (assuming a height of 2.4m).

Rationale:

- Overcrowding in dormitories.

8 DORMITORIES

8.1 Design Criteria

Requirement – (d):

- Adequate number of toilets and sanitary fittings shall be provided in accordance with Section 2 of the COPEH.

Rationale:

- Sanitary provisions for workers.

9 ANTI-MOSQUITO BREEDING



SECTION 9 – ANTI-MOSQUITO BREEDING

**New section*

SCOPE

- Address building designs that may be potential mosquito breeding habitats.



9 ANTI-MOSQUITO BREEDING

9.1 Objective

- During the design of any building or structures, the QP shall take into consideration and avoid features that may result in water stagnation and become potential breeding habitat for mosquitoes.
- Any part of a building where water stagnation may occur shall be provided with permanent and safe access for maintenance purpose.

9 ANTI-MOSQUITO BREEDING

9.2 Roof Gutter

- With effect from 1 Nov 2005, no roof gutters shall be installed for any new developments.

9.3 Air-Conditioning Tray

- No tray or receptacle shall be placed beneath and/or on top of any air-conditioning unit so as to avoid creating a condition favourable for mosquito breeding.

10 PREMISES WITH CATTLE

SECTION 10 – PREMISES WITH CATTLE

**New section*

SCOPE

- Stipulates that living quarters or dormitories shall not be sited in stable, cattle-sheds, etc.

10 PREMISES WITH CATTLE

Requirement:

- Living quarters or dormitories shall not be sited in stables, cattle-sheds, or any building used or intended to be used for the keeping of buffaloes, cows, oxen, sheep, goats and horses, etc.

Rationale:

- Reiterate the Cattle Act.

APPENDIX 6: MIST GENERATING SYSTEM AND FAN

MIST GENERATING SYSTEM AND FAN

Requirements:

- The design of the system shall be such that the water is drained off during the standby conditions to avoid proliferation of bacteria in stagnant water.
- Fans shall be installed at such a height and manner that the intense stream of mist (as it leaves the nozzle) is not blown directly at a person's face.
- The system shall be equipped with a UV lamp or such other antimicrobial device after the filter, to disinfect the water and minimize the proliferation of microbial activities.
- Records of any remedial or maintenance work, inspection or test carried out shall be kept and made available for inspection.

~ END ~

Construction Site, Roof Gutters and Dengue Control Measures

By

Mr. Mohd Zulkefli

Environmental Health Div

Construction Site, Roof Gutters and Dengue Control Measures

Mohd Zulkefli

Manager (Operation Planning)
Environmental Health Department

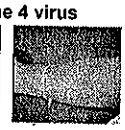
Scope of Presentation

- Overview on Dengue & its situation
- Dengue Control Measures
  - Roof Gutters
  - Construction Site

What is Dengue Fever?

- A viral infection that is caused by one of the 4 virus types (Dengue 1, 2, 3, 4)
- No drug
- No vaccine
- Dengue fever (DF) / Dengue haemorrhagic fever (DHF)

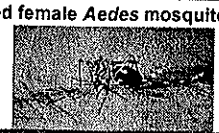




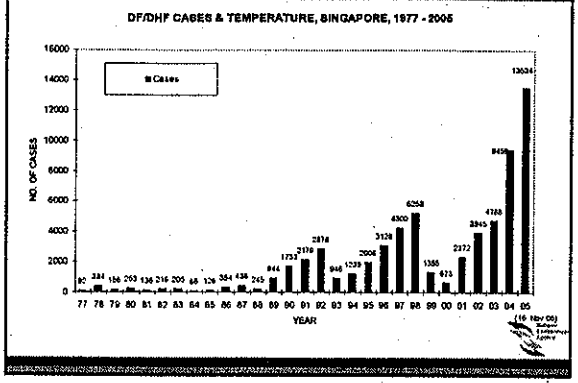
How it transmitted?

- By the bite of an infected female *Aedes* mosquito





Dengue Situation in Singapore



Factors Affecting Dengue

- 4 factors
  - *Aedes* mosquito population
  - Human immunity
  - Virus types
  - Temperature

Aedes Mosquito Population

- Highly adapted to the urban environment
- Need only small amount of clean stagnant water to breed
- 7-day cycle

Human Immunity

- 4 serotypes (Den -1, -2, - 3, -4; antigenically different)
- No cross immunity (antibodies against 1 Den serotype will not confer immunity against the other 3 but may have a higher risk leading to DHF)
- Primary infection may also lead to DHF but at a lower risk
- No vaccine



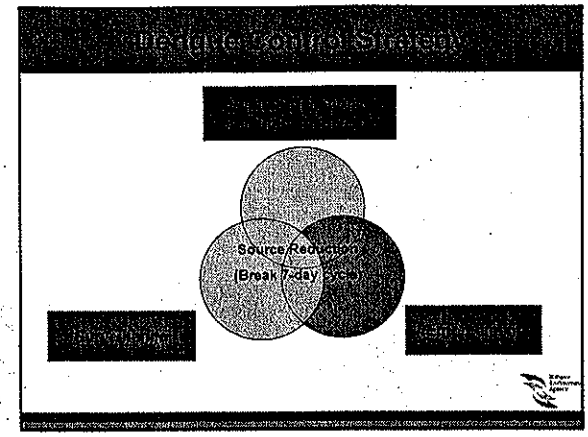


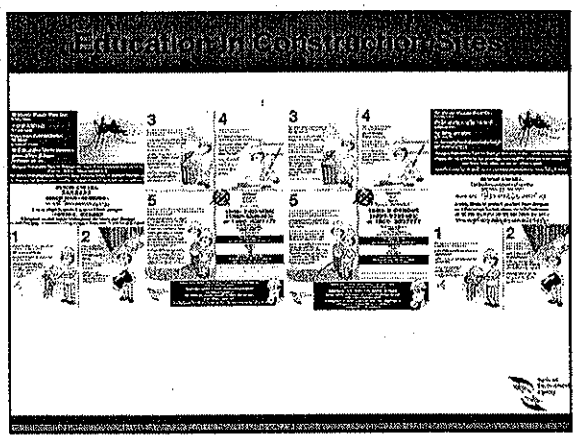
Virus Types

- 2001- 2003 : DEN 2 predominant
- 2004 : DEN 1 predominant
- 2005 : DEN 1 still predominant but DEN 3 emerging

Factors Affecting Dengue

- *Aedes* mosquito population
- ~~Human immunity~~
- ~~Virus type~~
- ~~Temperature~~





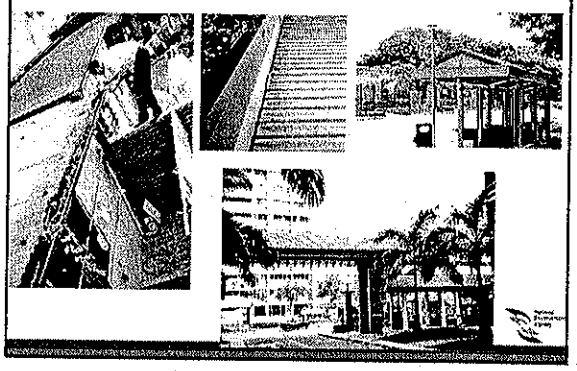
Law Enforcement

- Construction sites found breeding mosquitoes :-
  - $1,000 for 1st offence
  - $2,000 for 2nd offence
  - Go to the court. Max. $10,000 fine and/or 6months' jail.

Law Enforcement

- Construction sites served with an order
  - Any premises which failed to comply with orders served:-
    - $2,000 for 1st offence
    - $4,000 for 2nd offence
    - $5,000 for 3rd offence
    - Go to court. Max. $50,000 fine and/or 6 months' jail.
- Stop Work order could be served for sites with poor housekeeping that resulted to mosquito breeding.

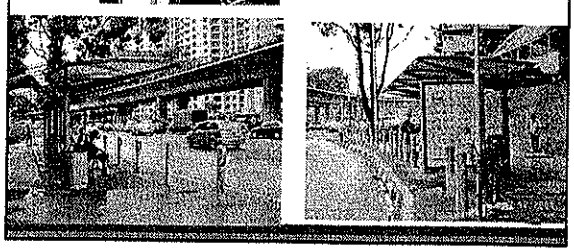
Structural Habitats



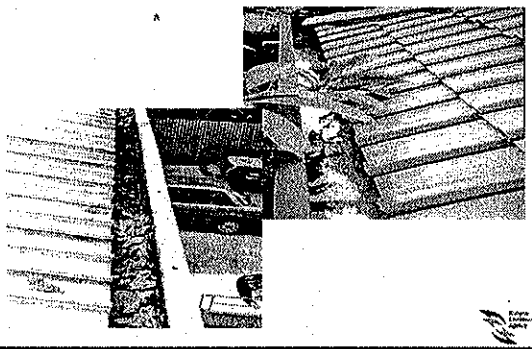


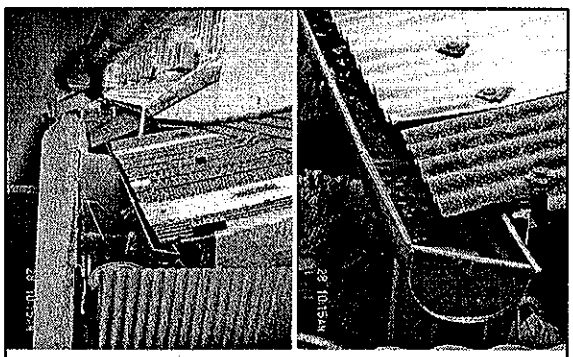
Old LTA Bus Stop

Newly Designed LTA Bus Shelters



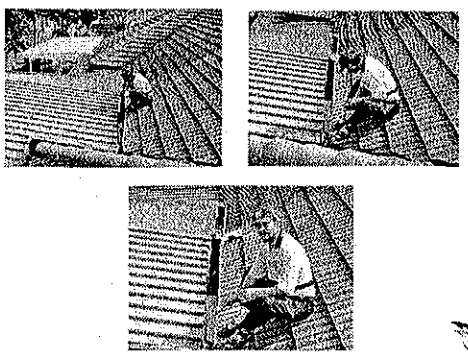
Roof Gutters

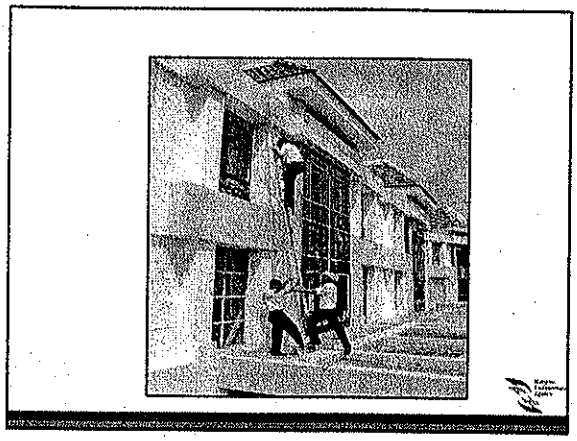


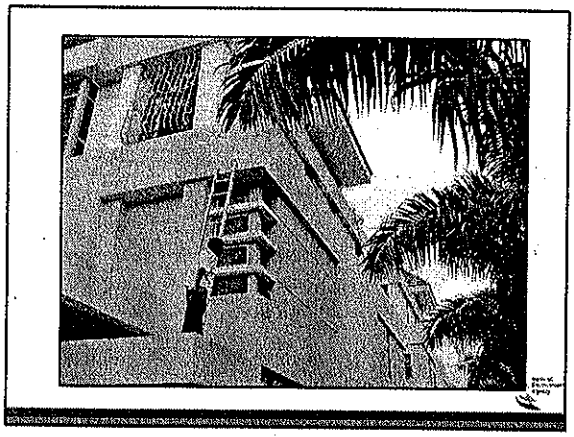


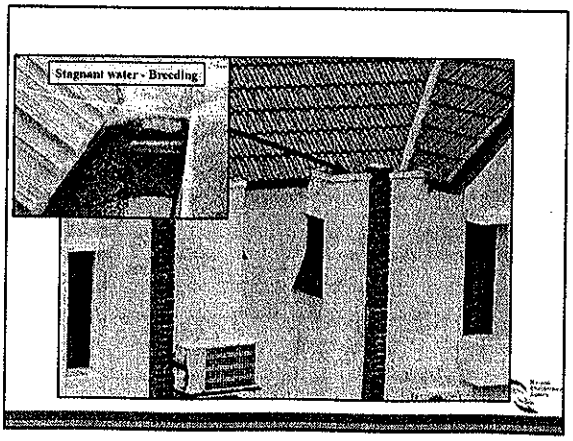
Difficult to Access Roof Gutters

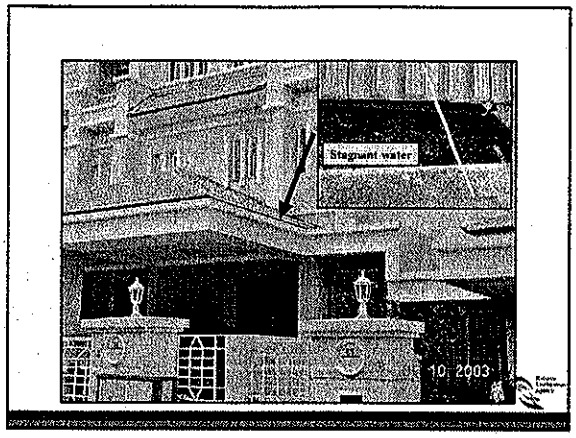
Pitched Roof Gutters

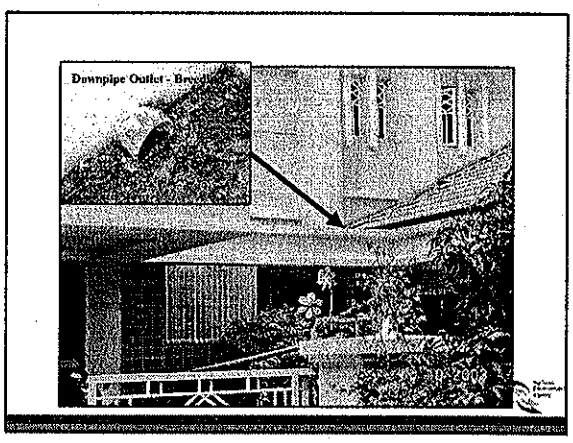







Stagnant water - Breeding

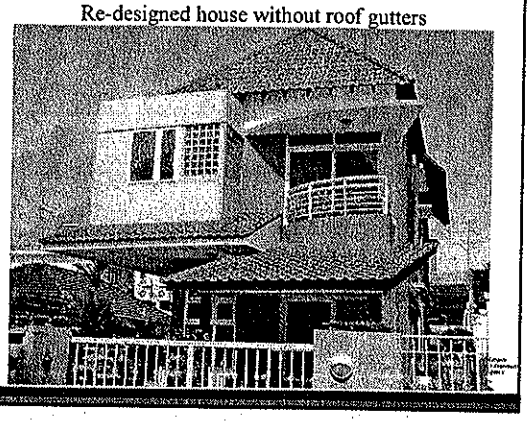




Roof Gutters Requirement

- Wef 1Nov 05
  - The use of roof gutters for new development has been banned
  - Implemented through the development control (DC) and Building plan(BP) on environmental health (EH) approval process
- Existing Gutters
  - owners of the premises need to have a regular maintenance programme
  - Strongly advised to remove where possible

Re-designed house without roof gutters



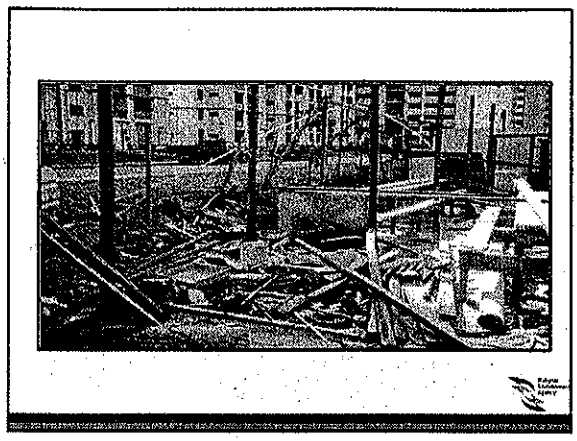
Mosquito Control @ worksite

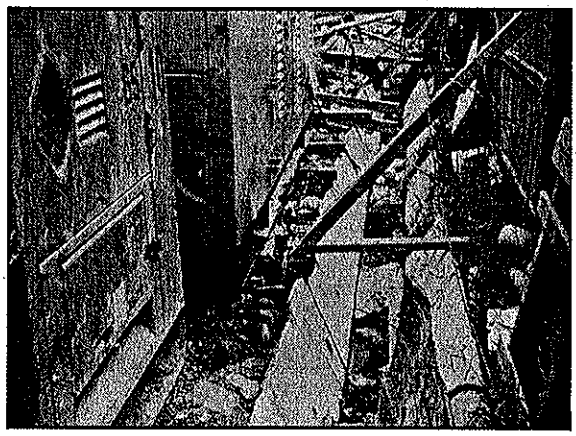
- Engagement of Environmental Control Officer (ECO)

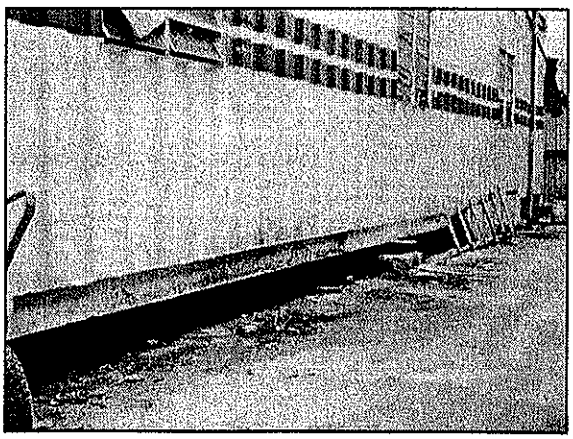
Contract Sum of Construction Works	Type of ECO required
$10 million & below	Not Required
Exceed $10 million but not exceeding $50 million	Part-Time ECO
Exceed $50 million	Full-Time ECO

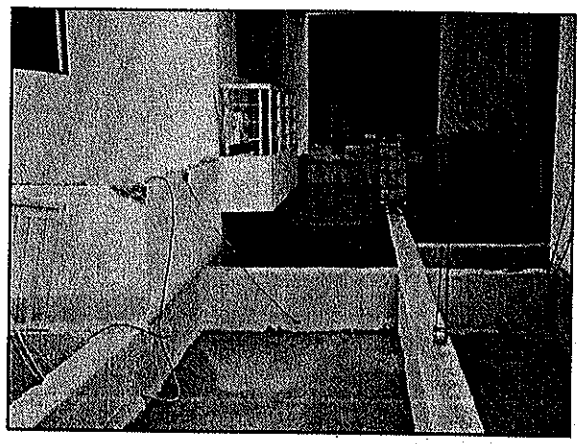
- Engagement of Competent Pest Control Operator (PCO)
- Primarily => Source Reduction i.e prevent water stagnation that could lead mosquito breeding
- Thermal fogging to de done when necessary especially if there is a built up of adult mosquito or there is a disease outbreak.

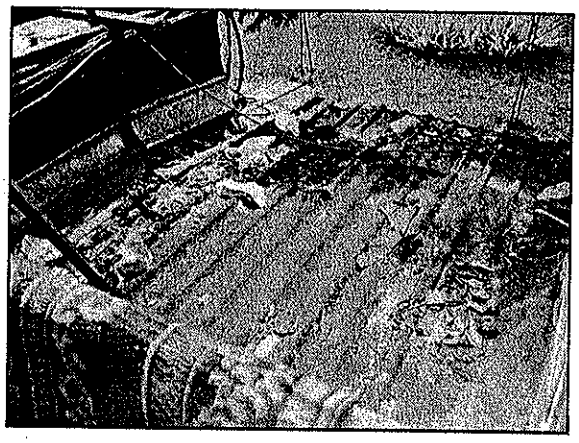
BREEDING IN CONSTRUCTION SITES

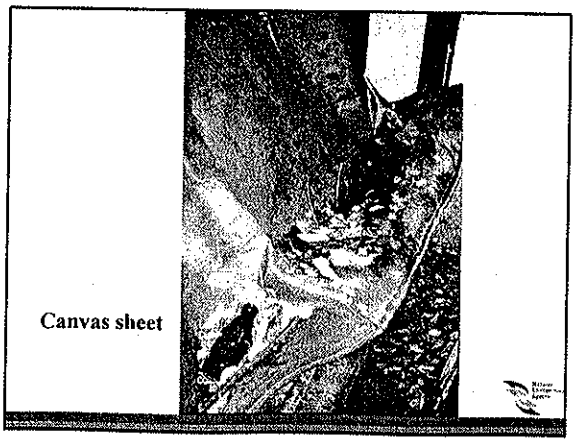




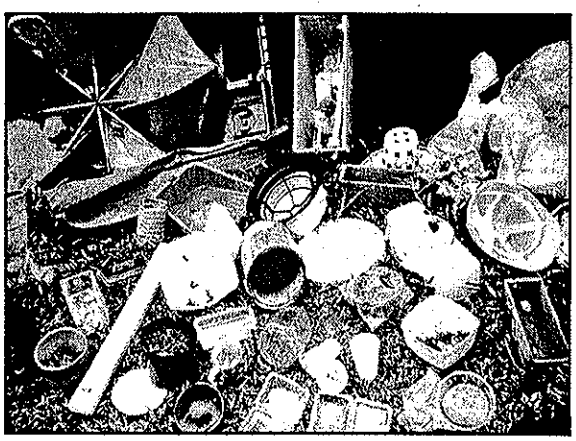


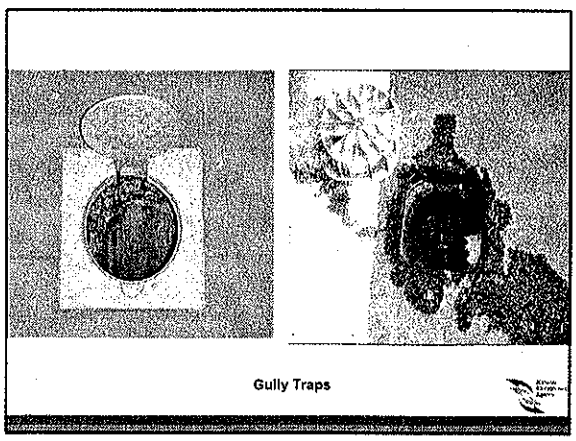




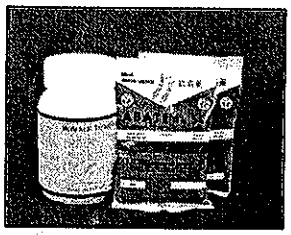

Canvas sheet






Gully Traps

Sand Granular Insecticides



Sand granular insecticides are sold at:

i) Supermarkets (*e.g. NTUC, Carrefour*)

ii) Plant nurseries (*e.g. Far East Flora*)

iii) DIY stores

Estimated Price: $3.50 & above (*depending on packaging*)

Sand Granular Insecticides

BTI Insecticides

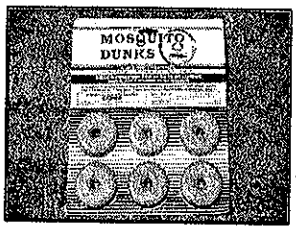
Bti insecticides are sold at:

i) Supermarkets (*e.g. NTUC, Carrefour*)

ii) Plant nurseries (*e.g. Far East Flora*)

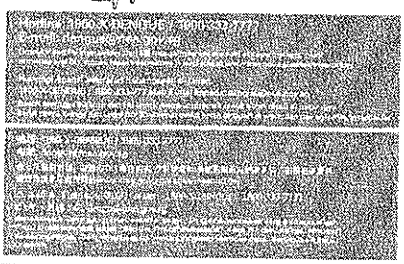
iii) DIY stores

Estimated Price: $22.80 (*for a packet of 6*)



Bti insecticides

www.dengue.gov.sg



Conclusion

- Legislation is useful for recalcitrant offenders and emergency situation but alone is insufficient
- Community understanding of importance of mosquito prevention thro' sustained public education and communication plan

Conclusion

- To maintain high level of vigilance
  - Remains receptive & vulnerable to the introduction of diseases, endemic in Southeast Asian region



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Regulations on Constructions Noise and Control Measures

by

Mr. Ang Kok Kiat

PCD

Regulations on Construction Noise and Control Measures

IES-SIA-MEWR Joint Seminar on
NEA & PUB Submission Guidelines,
Requirements & Regulations
18 Nov 2005

Ang Kok Kiat
Pollution Control Department
National Environment Agency

SCOPE

- Regulatory and Enforcement Regimes on Noise at Construction Sites
- Typical Problems Observed
- Public Complaints on Construction Noise
- Measures to Minimise Construction Noise Nuisance

Regulatory Requirements

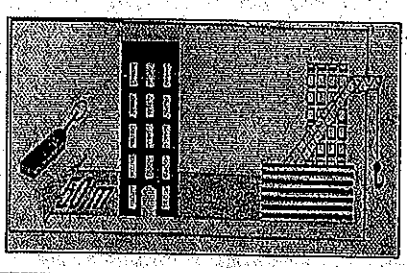
- NEA regulates noise at construction sites through:
  - Environmental Pollution Control Act (EPCA)
  - EPC (Control of Noise at Construction Sites) Regulations
- Permissible noise limits tightened in Oct 2001
  - Construction sites within 150 m from residential premises required to further reduce noise

Current Permissible Noise Limits

Types of affected buildings	7am - 7pm	7pm - 10pm	10pm - 7am
(a) Hospital, schools, institutions of higher learning, homes for aged sick, etc	60 dBA (Leq 12 hr)	50 dBA (Leq 12 hr)	
	75 dBA (Leq 5 min)	55 dBA (Leq 5 min)	
(b) Residential buildings located less than 150m from the construction site	75 dBA (Leq 12 hr)	65 dBA (Leq 1 hr)	55 dBA (Leq 1 hr)
	90 dBA (Leq 5 min)	70 dBA (Leq 5 min)	60 dBA (Leq 5 min)
(c) Buildings other than those in (a) and (b) above	75 dBA (Leq 12 hr)	65 dBA (Leq 12 hr)	
	90 dBA (Leq 5 min)	70 dBA (Leq 5 min)	

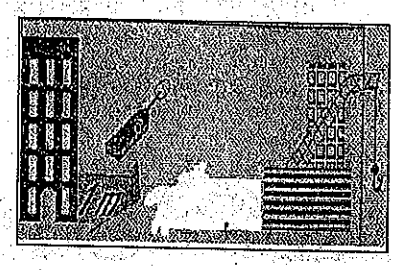
Control of Noise At Construction Sites

- In the day (7am - 7pm), noise is measured at 50 m from the boundary of the construction site



Control of Noise At Construction Sites

- In the night, noise is measured at 1m from outside the affected premises



1

Noisy Construction Activities

- Typical noisy construction activities that would **exceed** the permissible noise limits

Evening noise limits (7pm – 10pm)

– Piling, blasting, demolition, concreting, percussion equipment, e.g. pneumatic hammers

Night time noise limits (10pm – 7am)

– Erection & dismantling of formwork, tying & fixing of steel bars, operation of cranes, loading & unloading of construction materials

Penalties for Violations

- Penalties for violations of permissible noise limits with effect from May 2005

1st offence: compound fine of $2,000
2nd offence: compound fine of $3,500
3rd offence: compound fine of $5,000
4th offence: court case (max fine of $10,000; max fine of $500 per day for continuing offence)
5th offence: court case (max fine of $20,000; max fine of $1,000 per day for continuing offence)
6th offence: Restrict construction work from 10pm to 7am

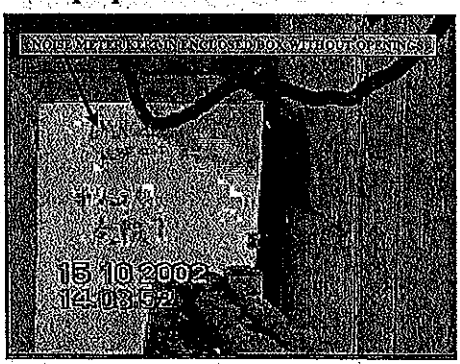
Enforcement Regime

- Notice served to construction companies to:
  - Install sound level meters at 1-metre from nearest affected building
  - Submit weekly noise measurements to NEA
  - Maintain and operate sound level meter
  - Inform NEA on factors influencing noise level and reasons on incidents of noise limit exceedance
- Surprise inspections for problematic sites

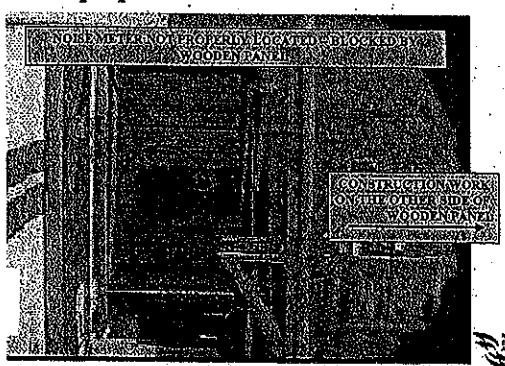
Typical Problems Observed

- Sound level meters not installed according to requirements in NEA's Notice, e.g. not in direct line of sight of construction activities
- Sound level meters not calibrated

Improper Noise Meter Installation



Improper Noise Meter Installation



2

Improper Noise Meter Installation

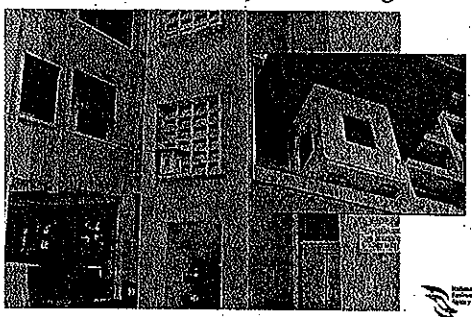


Improper Noise Meter Installation



Proper Installation of Sound Level Meter

Noise meter located at façade of building



Public Complaints on Construction Noise

- No. of construction sites decreasing since 2001
  - 4668 (2001); 4430 (2002); 3975 (2003); 3814 (2004)
- No. of public complaints on construction noise increasing since 2001
  - 5300 (2001); 4959 (2002); 5258 (2003); 5628 (2004)

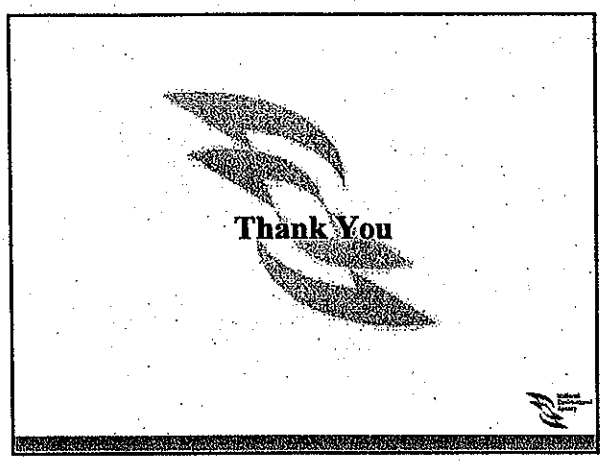
Public Complaints on Construction Noise

- Breakdown of complaints
  - 68% on noise from 7pm to 7am
  - 17% on noise from 7am to 7pm on Sun and public holidays
  - 15% on noise from 7am to 7pm on weekdays

Measures to Minimise Construction Noise Nuisance

- Scheduling of noisy activities to day time
- Refrain from noisy works on Sun, Public Holidays
- Use of screens or noise barriers
- Open and maintain channel of communication
- Constantly update affected residents on construction schedule

3



4

Practical Earth Control Measures at Construction Sites

by

Dr. Chew Soon Hoe
NUS

PRACTICAL EARTH CONTROL MEASURES AT CONSTRUCTION SITES

by Dr. Chew Soon Hoe
Assistant Dean, Dept. of Civil Engineering, National University Singapore
and Leong Kwok Wing
PE (Calif.), CPESC, CPSWQ (USA)

A) KNOW YOUR BMPs? SITE PREPARATION

1) What is B M P?
(..Best Management Practices..)
a) Practice that monitors erosion on slopes
b) Principles of erosion & sediment control
c) Management techniques in cleaning rivers
d) Program/system/method/
product that reduces pollution, effective erosion & sediment control
e) Accounting practices used in project control.

2) Common reasons erosion & sediment control practices are
NOT effective are :
a) lack of knowledge & when to use the right BMP
b) lack of local enforcement & monitoring
c) contractor & subcontractor not following plans
d) insufficient engineers on construction site
e) no environment impact study is carried out

3) Development designs that closely follow site topography minimizing "cuts & fills" is a good site preparation BMP?:
True/False

4) Sequencing construction activity to reduce the amount & duration of soil exposed to erosion by wind, rain, runoff & vehicle tracking is good site preparation BMP?:
True/False

5) Construction that DOES NOT limit clearing, timely installation of erosion & sediment control measures and vegetation is good BMP?
True/False

6) Stockpile of topsoil, other natural resources and saves money is poor site preparation BMP?
True/False

7) Buffer zones are strips of established vegetation used on slopes & around ponds to provide filter to reduce soil erosion & runoff velocities?
True/False

8) Stabilized construction entrances & wheel wash that reduces sediment transported onto paved roads by site vehicles is poor BMP?
True/False

9) Which of the following does NOT measure turbidity in water?

a) Nephelometer
b) Colorimeter
c) Weight of dried filtrate divided by overall sample weight
d) Turbidity Tube – Secchi disk technique
e) None of the above

B) KNOW YOUR BMPS? RUNOFF CONTROLS

1) Construction generally involves the removal of vegetation & the increase concrete areas thereby increasing runoff volume & velocity?
True/False

2) Runoff control BMP uses structures to .....(reduce/increase) runoff velocities and safely transport stormwater in manner that .....(reduces/increases) erosion & sediment transport.

3) Energy equation $\underline{E = MV^2}$ where
E is Erosive energy, M is Mass density of water,
V is velocity runoff.
Reduce velocity 50%, energy increases 400%?
True/False

4) To reduce runoff energy by: .....
a) *(Increase/decrease)* runoff volume
b) *(Increase/decrease)* runoff velocity
c) *(divert/concentrate)* runoff to less erodible areas
d) *(spread/concentrate)* runoff over wide area

C) KNOW YOUR BMPs? EROSION CONTROL

Erosion associated with water can occur in the following ways:

1) ..... erosion is the dislodging of soil particles by raindrop impacts.
(Shoreline, Gully, Sheet, River, Splash)

2) ..... erosion is the deep and wide depression caused by concentrated flows.
(Shoreline, Gully, Sheet, River, Splash)

3) Erosion is the ..... and transportation of soil particles
(detachment, addition, flow delivery, erosion,) by actions of wind, water and man.

4) Most construction site erosion will result from raindrop impact and .....
(gully, waterfall, stream, runoff, stormwater)

5) In general, erosion ..... (*increases/decreases*) with increasing rainfall and ..... (*increases/decreases*) with increasing vegetative cover.

6) Sediment control is more cost-efficient than erosion control practices.
True/False

7) Vegetation can reduce erosion by more than 90%.
True/False

8) Biotechnical erosion control combines plants and engineering structures.
True/False.

9) List soil type most erodible-to-least erodible:
....., ..., ..., ... *(sands, clays, gravel, silt):*

10) What topographic factors have the greatest impact on the magnitude of erosion?
Slope length & .....
(.Soil type, steepness, grass cover, flow velocity.)

12) ..... is formula to compute average annual soil loss rates as a result of erosion expected on field slopes ie. tons/ha/yr.
(Charlie, Stokes, RUSLE, Rational, Kirsk)

D) KNOW YOUR BMP? SEDIMENT CONTROL

1) What is eroded material suspended in wind or water called ?
(....gravel, sand, sediment, slurry, silt....)

2) Sediment control measures is to "filter-out" soil particles in suspension from wind/runoff water?
True/False

3) Silt barriers should be inspected & maintained before rainstorm events and within 24 hrs of storm event.
True/False

4) Construction sites should have less than 50 ppm of TDS at any point-of-discharge.
True/False

5) High concentrations of total suspended solids TSS in the water can :
Which of the following is true ?
   a) Modify light penetration impacting organisms and eggs
   b) Can clog-up or damage sensitive fish gills
   c) Decrease macrophyte & plankton life
   d) Reduced photosynthesis lowering daytime release of O2
   e) All of the above

6) In lakes & streams, the 3 major group of particles contributing to TSS are algae, ... and silt.
(....sediment, detritus, urea, pesticides, lead...)

THANK YOU FOR YOUR PARTICIPATION
PLEASE MARK YOUR NEIGHBOUR'S PAPER