Urban Stormwater Management Manual for Malaysia
(Manual Saliran Mesra Alam)

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INTRODUCTION
INTRODUCTION

- Malaysian economy has gone through rapid structural change since 1957.

- Urban growth is dynamic in accordance with the rapid economic growth and industrialization.

- This will change the hydrologic cycle and influence on the runoff pattern.

- In 1971, Malaysia suffered serious damage over the whole country due to the flood.

- Government gave the Department of Irrigation and drainage (DID) the task of planning Implementation of Urban Drainage work as part of overall flood mitigation programs.
Flood

- Major problem in Malaysia

Landuse For Urbanization

- Forest to agriculture
- Agriculture to urban areas

Increase Flood prone areas

- 29,800 sq.km (about the size of Selangor + Perak)
TYPES OF FLOOD

**Major Flooding**
the main river overtop and cause widespread flooding of long duration

**Flash Flood**
a short duration flood that is very localized

- Flood condition varies from state to state.
- Flood level varies from 0.2m up to 5m (extreme cases).
- Size of flood <100 ha. to a few thousand ha.
FLASH FLOOD DEFINITION

- Usually occur in urban areas
- Caused by short, intense, localized thunderstorms that occurs < 3 hours

- Flood water rise almost immediately during the storm and water will recede within 6 hours after the rain
CAUSES OF FLOODING

- Short, intense localised thunderstorms, the type of storm usually experienced in the evening
- Rapid and Uncontrolled Development in catchment areas resulting in Heavy Siltation
- Obstructions in River Flow System that Reduce in River Flow Capacity
- Limited available space for River Improvement works to handle the ever increasing flood flow due to escalating urbanisation process
- Insufficient internal drainage systems within the town area → undercapacity
PAST DRAINAGE PRACTICE
PAST DRAINAGE PRACTICE

1975

Conveyance oriented

- Rapid disposal
- Localised in nature
- Single function (quantity control)
- Hard engineering
CONVEYANCE ORIENTED – HARD STRUCTURE
Widening of The River Channel
Widening and deepening at the town city center is not applicable due to land accusation too high.
CONVEYANCE ORIENTED – HIGH COST

ALLOCATION FOR FLOOD MITIGATION PROJECTS

5 YEARS MALAYSIAN PLAN

Allocation for Flood Mitigation Programmed
WHY WE NEEDS STORMWATER MANAGEMENT
WHY WE NEEDS STORMWATER MANAGEMENT

- a) **Urbanisation** – Land use Change
- b) **Flash Flood locations** the whole nations Increasing
- c) **Government allocation** to mitigate flood increase
- d) **Water Pollution**
- e) **Water Scarcity**
CHANGES IN HYDROLOGY AND RUNOFF DUE TO DEVELOPMENT

- **Natural Ground Cover**
  - 25% shallow infiltration
  - 25% deep infiltration
  - 10% runoff
  - 40% evapotranspiration

- **10%-20% Impervious Surface**
  - 21% shallow infiltration
  - 21% deep infiltration
  - 20% runoff
  - 38% evapotranspiration

- **35%-50% Impervious Surface**
  - 20% shallow infiltration
  - 15% deep infiltration
  - 30% runoff
  - 35% evapotranspiration

- **75%-100% Impervious Surface**
  - 10% shallow infiltration
  - 5% deep infiltration
  - 55% runoff
  - 30% evapotranspiration
IMPACT OF UNCONTROLLED DEVELOPMENT
Flow Characteristics
Rural and Urbanised Catchment

Flow

Urbanised
Developed

Rural
Undeveloped

Time
URBAN STORMWATER MANAGEMENT MANUAL for MALAYSIA
Urban Stormwater Design References for Malaysia:

1975
Planning and Design Procedures No. 1: Urban Drainage Design Standards and Procedures for Peninsular Malaysia

2000
URBAN STORMWATER MANAGEMENT MANUAL FOR MALAYSIA (MANUAL SALIRAN MESRA ALAM MALAYSIA)

2011
Urban Stormwater Management Manual for Malaysia
25 years later ...

2000

Control at source

- Flow control (water storage)
- Quality control
- Sediment control
The following 11 years

2011

MSMA 2nd Edition

- Control at source
- Improvement in the aspect of WQ
- More practical

Download URL: http://water.gov.my
OBJECTIVE STORM WATER MANAGEMENT IN MALAYSIA

- Ensure the safety of the public

- Control nuisance flooding and provide the safe passage of less frequent and larger flood events

- Stabilize the land form and control erosion

- Optimize the land available for urban development

- Minimize the environmental impact of urban runoff on water quality

- Enhance the Urban Landscape
MSMA COMPONENT

1. Quantity Control
2. Quality Control
3. Erosion and Sediment Control
4. Operation and Maintenance
5. Esthetical Value
3 PHASES

1. Stormwater Quantity Control
   - Flash Flood

2. Erosion and Sediment Control
   - Mud Flood

3. Stormwater Quality Control
   - Polluted Rivers
• conveyance systems must be sized for the total increase in flows resulting from urbanisation
• downstream conveyance systems often have insufficient capacity
• traditional hard lined open conveyance systems can be a hazard to the public during and after rain due to high flow velocities
• urban pollutants are transported to downstream areas

• In addition to the traditional conveyance-oriented approach, a potentially effective and preferable approach to stormwater management is the storage-oriented approach.
• The principal elements and techniques used in a storage-oriented system are stormwater detention facilities and retention facilities.
QUANTITY CONTROL – New Concepts

- Onsite Detention (OSD)
- Detention Pond
  - dry pond
  - Wet pond
- Surface flow
- Property Drainage
- Pavement drainage
- Open Drain / Swale
- Pipe drain
- Engineered / Bio-engineered Waterways
QUANTITY CONTROL – Control At Source

“control at source” METHOD IN THE NEW DEVELOPMENT WILL PROVIDE THE COUNTRY AS ZERO (FLASH) FLOOD COUNTRY IN THE NEAR FUTURE (preventive)
$Q_{\text{post development}} \leq Q_{\text{pre-development}}$
Storage - OSD

Apply for area < 5 ha
(individual OSD 0.1 ha)
Storage - Pond

Recommended: Dry Pond 5-0 ha  
Recommended: Wet Pond > 10 ha

Dry Pond

Detention Pond
Storage - Pond
Conveyance Facilities: Pavement Drainage

PERSPECTIVE

Grate
Walkway
Pavement
Access Cover
Walkway
Pavement
Grate
Walkway
Pavement

a) Grate
b) Curb Opening
c) Combination

SECTION

Curb
Grate
Gulter

Curb
Grate
Opening

Curb
Grate
Opening

Gulter

Curb
Grate

Walkway
Pavement

Access Cover
Walkway
Pavement

Walkway
Pavement

a) Grate
b) Curb Opening
c) Combination
Conveyance Facilities: Drains and Swales

(a) Uncovered Open Drain
- 0.5 m minimum
- 1.2 m maximum
- 0.6 m maximum
- Varies

(b) Covered Open Drain
- Grate or solid cover
- 0.5 m minimum
- 1.2 m maximum
- 0.6 m maximum
- Varies

Lined Drains
(b) Drainage Modular
- 2%
- 500
- Closed Turfing

Swale
- 4
- 1

(a) Underground Pipeline
- Varies
- (Min. 2 m)
- 1:30
- 1:50
- 1:50
- Varies
- 1:20
- 1:40
- 1:40

Composite Swale
- Top Soil
- Clean River Sand Surround
- 2 Nos Single Module Enclosed in Geotextile

Remain
Conveyance Facilities: Engineered Waterways
Conveyance Facilities: Engineered Waterways

Engineered Channel

Grassed Channel
Conveyance Facilities: Bioengineered Channel

(a) With Stabilisation Measures

(b) With Increased Capacity

TRM Technique

Gabion Mattress
Reinforced Grass

Sand Filled Mattress
Reinforced Grass
QUALITY CONTROL

For Water Pollution

Temporary BMPs

ESCP

Sediment Control
- Sediment Basin
- Sediment Trap

Permanent BMPs

Treatment Measures
- Infiltration
- Bioretention System
- Swales
- GPT
- Water quality ponds/Wetlands

Treatment Trains
What is ESCP?

An ESCP is a plan that details temporary measures that will be implemented during the construction phase.
Submission ESCP

• The Erosion Sedimentation Control Plan (ESCP) shall be submitted for **project area more than 1 ha**.

• The plans must be prepared based on construction activities staging which covers land grading & earthworks (pre-bulk grading plan) and construction stage (post-bulk grading plan).

• For project area **less than 1 ha**, the developer shall submitted Best Management Practices Plan to control soil erosion and siltation onsite.

• The plan must prepared by PE and CPESC holder

• And the consultant responsible to make sure all the BMPs constructed and well maintained.
ESCP

- Temporary BMPs Facilities
- To minimize erosion and sail delivery away from construction site.
- No land clearing shall be allowed for the construction site before the installation of sediment control facilities onsite

GUIDELINES FOR EROSION AND SEDIMENT CONTROL IN MALAYSIA

DID, 2010
QUALITY CONTROL: Temporary BMPs

Sediment Control

Silt Fence

Silt Pond

Check Dam
## QUALITY CONTROL: Permanent BMPs

### GROSS POLLUTANT TRAPS (GPT)

<table>
<thead>
<tr>
<th>Type</th>
<th>Group</th>
<th>Description and Function</th>
<th>Catchment Area Range</th>
<th>Purpose-built or Proprietary</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPT Type 1</td>
<td>Floating Debris Traps (booms)</td>
<td>Litter capture on permanent waterbodies</td>
<td>&gt; 200 ha</td>
<td>Proprietary and purpose built (on-line installation)</td>
</tr>
<tr>
<td></td>
<td>Trash Racks &amp; Litter Control Devices</td>
<td>Hard or soft litter capture devices on drains</td>
<td>2 – 400 ha</td>
<td>usually purpose built from modular components (on-line installation)</td>
</tr>
<tr>
<td>GPT Type 2</td>
<td>Sediment Basin and Trash Rack Traps (SBTR)</td>
<td>Sediment and litter capture for drains or pipes</td>
<td>5 – 2000 ha</td>
<td>Proprietary and purpose built (on-line or off-line installation)</td>
</tr>
<tr>
<td>GPT Type 3</td>
<td>Litter Control, Sediment Basin, Oil and Grease Trap</td>
<td>Litter, sediment and oil and grease, capture for drains or pipes</td>
<td>2 – 40 ha</td>
<td>Proprietary (on-line installation)</td>
</tr>
</tbody>
</table>
QUALITY CONTROL: Permanent BMPs

Infiltration Trench
Kawalan Kualiti: WATER QUALITY PONDS AND WETLANDS

(a) Plan

(b) Profile

Water Quality Pond / Constructed Wetlands
CONSTRUCTED - WETLAND

UPPER NORTH 5

UPPER NORTH 6

UPPER NORTH 7
The outflow of Putrajaya Lake into Sungai Langat
Conclusion

- Stormwater Management Manual for Malaysia (MSMA) is a solution to flood, water resources and river pollution to Malaysia as a long term measure.

- Reduced government expenditure on flood mitigation project.

- As a basic of the development of “town in the garden concept” to become livable cities.
http://www.water.gov.my

Download

MSMA 2nd Edition
THANKS YOU

terima kasih
Rainwater detention & Vertical Green at Display Center

• SP Setia is one of the few developers conversant with Green Roof and Vertical Green Technology (Greenery on the walls of buildings).

•
• Pond and infiltration Trench
• CONTOH PERLAKSANAAN MSMA

• Structural Measure

Engineered Waterway

Senawang, Negeri Sembilan
CONTOH PERLAKUSANAAN MSMA

- Kolam Takungan

Pemilihan kolam sebagai kawalan kuantiti dan pada masa yang sama boleh dijadikan alternatif kepada sumber air.