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Dr.Quek's Tips on MSMA
Choice of Design
Discharge Computation
Presented By: Ir. Dr. Quek Keng Hong

WELOME TO

"10 Common Mistakes by Engineers in Applying MSMA"

Video 2- Choice of Design Discharge Computation

Presented by: Ir. Dr. Quek Keng Hong



You can watch the Youtube Video at:
http://video2.msmam.com

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Topics Covered in Dr. Quek's Video on "10 Common Mistakes by Engineers in Applying MSMA" Series:

1. Choice of Design Storm- Where to get up-to-date design storm data?
2. Choice of Peak Discharge- What limitations of various computation methods?
3. Hydrological Procedures- Which can still be applied for rural catchments?
4. Rational Method- What limitation to catchment size?
5. Time-Area Method- How to apply Time-Area Method correctly?

Topics Covered in Dr. Quek's Video on "10 Common Mistakes by Engineers in Applying MSMA" Series (Continued):

6. Runoff Routing Method- Which free software can be used and what data required?

7. Detention- Detention Basin or On-Site Detention (OSD)?

8. On-Site Detention (OSD)- How to optimize the required SSR (Site Storage Requirement)?

9. Detention Basin- How to optimize the required detention storage?

10. Erosion and Sediment Control Plan (ESCP)- How to apply ESCP Correctly?

- **How to Correctly Determine the Method of Computation of Peak Dischage in MSMA?**

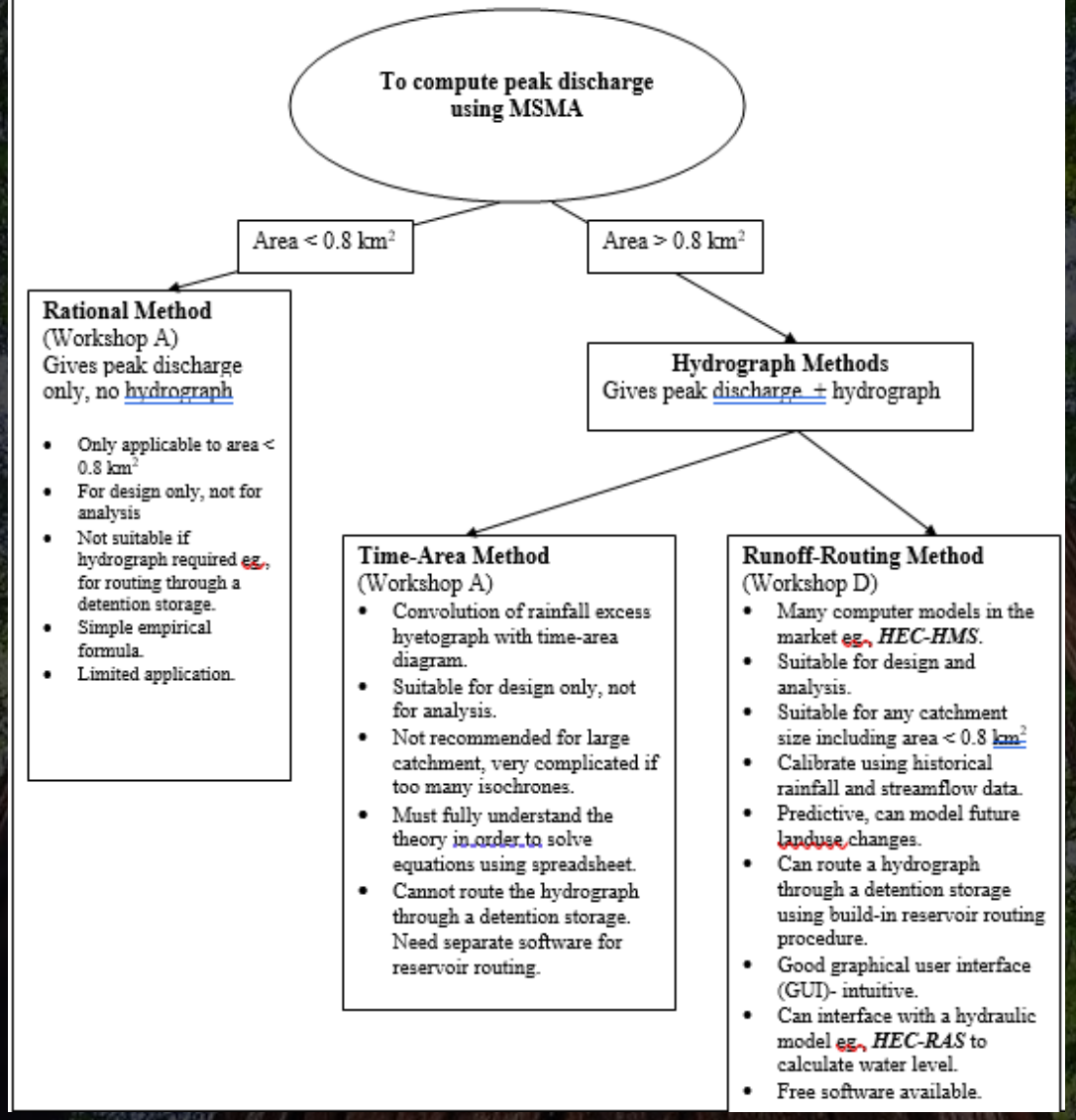
  For area < 80 ha can use the Rational Method

  For area > 80 ha must use the Hydrograph Method e.g., Time-Area Method and Runoff Routing Method.

- **How to Correctly Determine the Method of Computation of Peak Dischage in MSMA?**

Note: For area < 80 ha you can also use the Hydrograph Method e.g., Time-Area Method and Runoff Routing Method.

AN ILLUSTRATION OF METHOD OF COMPUTION OF PEAK DISCHARGE AND HYDROGRAPH IN MSMA



- **How to Apply the Rational Method in MSMA?**

Relates the peak discharge to the storm intensity of the same ARI, catchment area and runoff coefficient.

$$Q = \frac{C \cdot i \cdot A}{360}$$

where

Q	is the peak flow (m^3/s)
C	is the runoff coefficient given in Table 2.5 in MSMA (2011)
i	is the average rainfall intensity (mm/hr)
A	is the drainage area (ha)

- **Pros & Cons of the Rational Method**

Pro:
1. Easy to compute.

Cons:
1. Empirical method.
2. Ignore catchment storage effect.
3. Ignore rainfall temporal pattern.
4. No hydrograph.
5. Limited to area less than 80 ha.

- **How to Apply the Hydrograph Method in MSMA?**

Two methods available:

1. Time-Area Method

2. Runoff Routing Method.

Note: Hydrographs are required for detention basin design.

- **Pros & Cons of the Time-Area Method**

Pros:
1. Can be applied to medium to small catchment size including less than 80 ha.
2. Can estimate hydrograph.

Cons:
1. Accuracy depends on the skill of the user.
2. Difficulty in the determination of Isochrones and the Time-Area curve.
3. More complicated computation i.e., convolution.

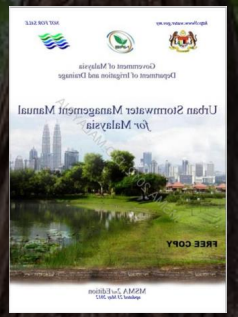
Pros & Cons of Runoff Routing Method

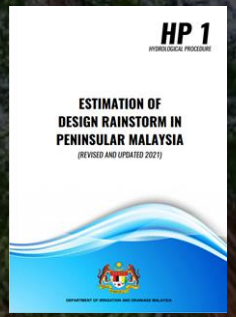
Pros:
1. Can be applied to large to small catchment size including less than 80 ha.
2. Can estimate hydrograph.
3. Computer modelling.
4. Consider rainfall-runoff processes.
5. More accurate estimates due to calibration.
6. Free software available e.g., HEC-HMS

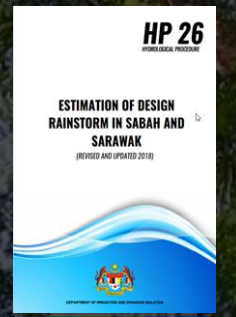
Cons:
1. Higher level of skill of the user.
2. Need data for calibration.
3. Need training.

- **What Storm Data to be used for the Computation of Peak Discharge?**

MSMA (2011)
HP1 (2021)
HP26 (2018)







As covered in Video 1- HP1 & HP26 are recommended as these have more up-to-date data.

- **What Storm Data to be used for the Computation of Peak Discharge?**

  The accuracy of the computed discharge is dependent on the accuracy of the storm data.

  If design storm is wrong, so will the computed peak discharge and hydrographs, and the resulting drainage structure sized.

- **Case Study- Design of 200 km Railway Track**

  Rational Method
  Runoff Routing Method

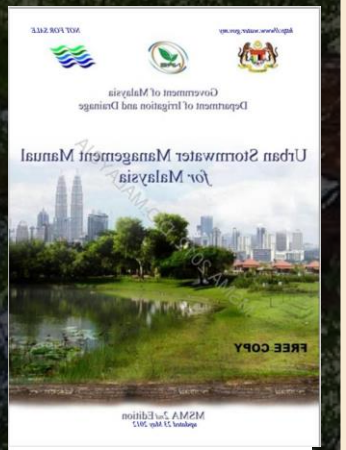
  Results: Rational Method seriously overestimated the peak discharges, resulting in over-estimation of embankment levels ranging from 1-3 m in certain stretches!

Bonus 1: Computation of Rational Method:

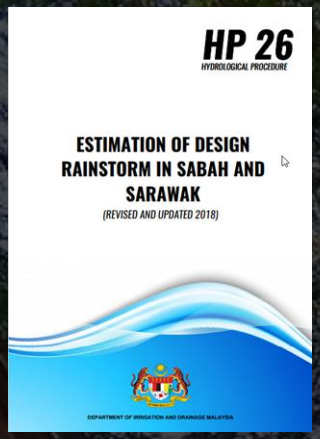
MSMAware includes the entire storm databases from MSMA2 (2011), HP1 (2021) and HP26 (2018)

Watch Video:
http://RationalMethodVideo.msmaware.com

Download the Demosheet:
http://RationalMethodDemo.msmaware.com







Bonus 2: Computation of Design Storm:

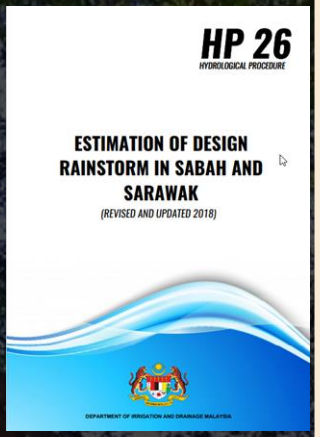
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SPECIAL OFFER 1:



You can Signup MSMAware for free now:

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SPECIAL OFFER 4:



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Free spreadsheet templates (Storm, Rational Method, Time-Area Method, OSD) for the first 88 requests each month at:

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Can I contact Dr. Quek if I have any question?

Answer: **YES!**

Email: workshops@msmam.com

Call/WhatsApp: (6) 012-2812590

Please check our Facebook page at: http://fb.msmam.com

Benefits of Attending MSMA Workshops:

1. Practical hands-on training workshops using spreadsheet templates and real case studies.

2. Conducted by a trainer with 3 decades of experience as a consultant in drainage design and hydrology.

3. Compliance with authority's requirements on MSMA.

Benefits of Attending MSMA Workshops (Continued):

4. Learn to optimise your design of drainage structures while complying with MSMA.

5. Receive valuable spreadsheet templates which you can bring back for your work.

6. Bonuses- spreadsheet templates, software and resource material on MSMA.

Benefits of Attending MSMA Workshops (Continued):

7. Free signup of MSMAware Free Version.

8. Lifetime access to gDrive to download resource material, worked examples, tools and spreadsheets on MSMA.

9. Sign up for Facebook page- http://fb.msmam.com - like it and you will receive future posts on MSMA.

Benefits of Attending MSMA Workshops (Continued):

10. New material will be uploaded to the shared gDrive folder at regular intervals. This will be announced on Facebook page or via emails.

11. Workshops accredited by BEM- Gain up to 7 CPD Hours per day for PE renewal.

12. Workshops accredited by HRD Corp and are claimable from HRD Corp.

How to Contact Us?

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