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Application of
Rational Method
Presented By: Ir. Dr. Quek Keng Hong

WELOME TO

"10 Common Mistakes by Engineers in Applying MSMA"

Video 4- Application of the Rational Method

Presented by: Ir. Dr. Quek Keng Hong



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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?

- **When Can You Apply the Rational Method in MSMA?**

1. Limits for the Rational Method in MSMA:

For area < 80 ha use the Rational Method
For area > 80 ha use the Time-Area Method

- 2. The following JPS Guidelines can be used to determine the storm intensities in computing the peak discharge via the Rational Method:

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







HP1 & HP26 have more up-to-date data.

Details in Video 1

3. 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.

4. Case Study- Apply the Rational Method to compute the peak discharge:

Design storm based on MSMA (2011) and HP1
Area = 19 ha
Tc = 18 min
Station Name: Air Terjun Sg.Batu
Station No: 3317001

5. Case Study- Computed design discharge in Rational Method using design storm based on MSMA (2011):

Case No	Location:	Station Name:	Air Terjun Sg.Batu	Station No:	3317001	Duration (min):	18	A (ha)	C (Table 2.5)	Landuse	Q (m3/s)	ARF	CCF	Q (m3/s)
	ARI (T) YR	ARI (T) MTH	λ (lambda)	κ (kappa)	θ (theta)	η (eta)	0.3				MSMA (2011)	MSMA (2000)		MSMA (2011)
1	20	240	72.992	0.1620	0.1710	0.8710	228.5	19	0.4	park	4.82	1	1	4.82
2	50	600	72.992	0.1620	0.1710	0.8710	265.0	19	0.75	Semi-D	10.49	1	1	10.49
3	100	1200	72.992	0.1620	0.1710	0.8710	296.5	19	0.95	Commercial	14.87	1	1	14.87
4	50	600	72.992	0.1620	0.1710	0.8710	265.0	19	0.6	Custom C	8.39	1	1	8.39
5	50	600	72.992	0.1620	0.1710	0.8710	194.7	6000	0.75	Semi-D	2434.1	0.8020	1	1952.17
6	50	600	72.992	0.1620	0.1710	0.8710	147.8	6000	0.75	Semi-D	1847.3	0.8350	1	1542.53
7	50	600	72.992	0.1620	0.1710	0.8710	311.7	6000	0.75	Semi-D	3896.1	1	1	3896.12

6. Case Study- Computed design discharge in Rational Method using design storm based on HP1 (2021):

Case No	Location:	Station No:	0230671RF (3317001)	Station Name:	Air Terjun Sg. Batu, WP Kuala Lumpur	Duration (min):	18	A (ha)	C (Table 2.5)	Landuse	Q (m3/s)	ARF	Median CCF	Q (m3/s)
	ARI (T) YR	ARI (T) MTH	λ (lambda)	κ (kappa)	θ (theta)	η (eta)	0.3				MSMA (2011)	Region 3 (West Central)	Region 5 (Wilayah Persekutuan)	MSMA (2011)
1	20	240	64.5274	0.1583	0.2495	0.8080	168.2	19	0.4	park	3.55	1	1.23	4.37
2	50	600	64.5274	0.1583	0.2495	0.8080	194.4	19	0.75	Semi-D	7.70	1	1.29	9.93
3	100	1200	64.5274	0.1583	0.2495	0.8080	217.0	19	0.95	Commercial	10.88	1	1.32	14.36
4	50	600	64.5274	0.1583	0.2495	0.8080	194.4	19	0.6	Custom C	6.16	1	1.29	7.94
5	50	600	64.5274	0.1583	0.2495	0.8080	151.3	6000	0.75	Semi-D	1891.4	0.8624	1.29	2104.19
6	50	600	64.5274	0.1583	0.2495	0.8080	119.9	6000	0.75	Semi-D	1498.9	0.8638	1.29	1670.24
7	50	600	64.5274	0.1583	0.2495	0.8080	220.8	6000	0.75	Semi-D	2760.1	1	1.29	3560.49

7. Case Study- Compare storm intensities computed using MSMA (2011) and HP1 (2021):

For ARI of 100 year, storm duration of 18 min:

MSMA (2011), intensity i= 296.5 mm/hr (A)
HP1 (2021), intensity i= 217 mm/hr (B)

The ratio of A/B = 1.37

8. Case Study- Compare peak discharge computed using Rational Method with design storm based on MSMA (2011) and HP1 (2021):

For C of Commercial landuse:

MSMA (2011), Qp= 14.87 m3/s (A)
HP1 (2021), Qp= 10.88 m3/s (B)

The ratio of A/B = 1.37

9. Conclusion

The peak discharge estimated by HP1 may or may not be higher than MSMA (2011) depending on the relative magnitudes of the storm intensities.

If the storm intensity computed using HP1 for a particular station is lower than MSMA (2011), then the corresponding peak discharge will be lower, and vice versa.

Due to global warming effect, it is likely that the latest storm intensities are on a rising trend.

10. Free Spreadsheet Templates

You can download the free spreadsheets templates for computing Rational Method used in the Case Study.

See Special Offer No. 4 later.

SPECIAL OFFER 1:



You can Signup MSMAware for free now:

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Download Free Spreadsheet Templates:

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

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Answer: **YES!**

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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.

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