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Dr.Quek's Tips on MSMA
Design Storm
Presented By: Ir. Dr. Quek Keng Hong

WELOME TO

"10 Common Mistakes by Engineers in Applying MSMA"

Video 1- Choice of Design Storm

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)?

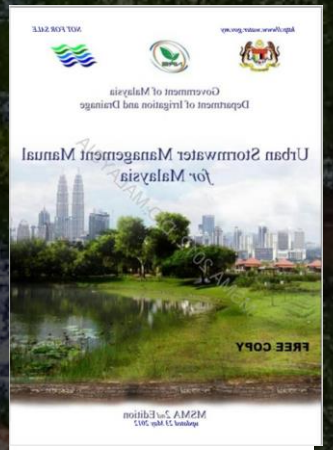
9. Detention Basin- How to optimize the required detention storage?

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

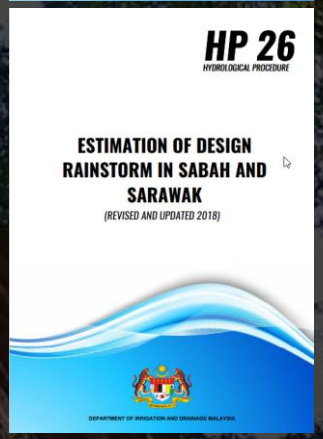
- **How to Correctly Determine the Design Storm in MSMA?**

1. Choice of design storm data:

a. MSMA (2000)- 1990
b. MSMA (2011)- 2000
c. HP1 (2021)- 2019
d. HP26 (2018)- 2016







2. Which storm guideline has the most up-to-date storm data?

Answer: HP1 & HP26

Reasons:

1. More up-to-date Data: Up to 20 years of additional storm data, more stations, 10/20 km grids.
2. Other Considerations: Better temporal patterns, CCF (Climate Change Factor), ARF (Areal Reduction Factor).

3. Why is it important to determine the design storm accurately?

Choice of Storm Data affects:

Computed Peak Discharge (for sizing of drainage structures like bridges, culverts and On-Site Detention Basin)
Computed Hydrographs (for design of detention basin)

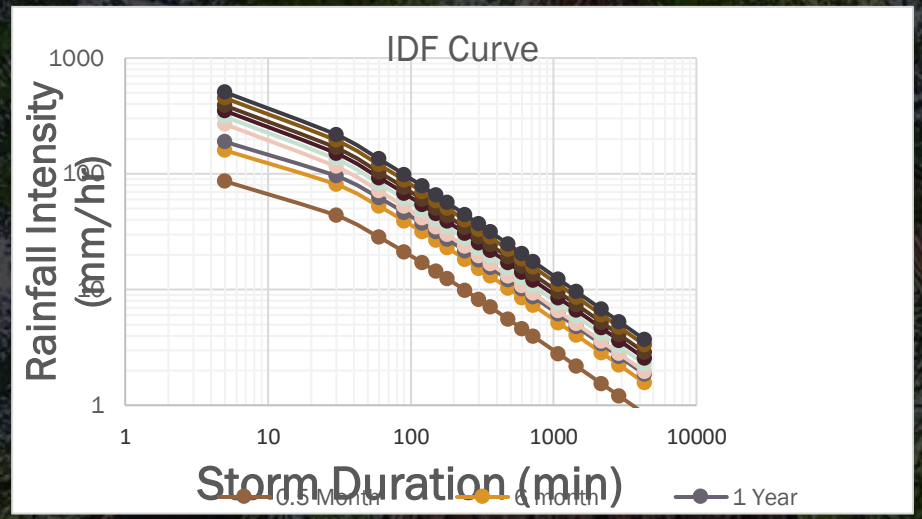
If design storm is wrong, so will the computed peak discharge and hydrographs, and the resulting drainage structure wrongly sized.

4. Case Study- Compute design storm using MSMA (2011) and HP1/HP26

Compute the design storm IDF curve for the following station using MSMA (2011) and HP1 (2021):

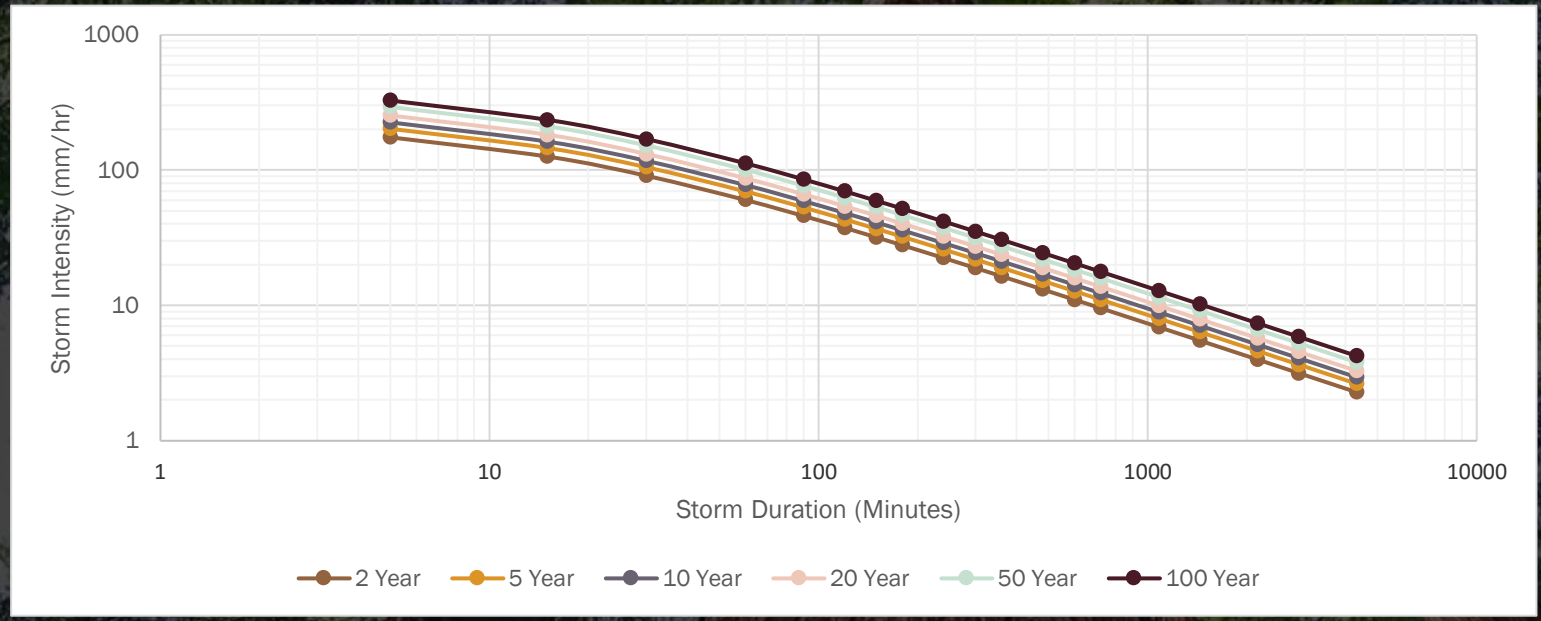
Station Name: Air Terjun Sg.Batu
Station No: 3317001

4.1 Case Study- Computed design storm IDF using MSMA (2011):



Location:3	Station Name:	Air Terjun Sg.Batu	Station No:	3317001	Duration (min):	5	30	60	90	120	150	180	240	300	360	480	600	720	1080	1440	2160	2880	4320
ARI (T) YR	ARI (T) MTH	λ (lambda)	κ (kappa)	θ (theta)	η (eta)	0.083333	0.5	1	1.5	2	2.5	3	4	5	6	8	10	12	18	24	36	48	72
0.04	0.5	75.9351	0.2475	0.2664	0.8668	85.966	43.551	28.179	21.119	17.015	14.315	12.395	9.833	8.193	7.047	5.543	4.593	3.937	2.788	2.179	1.538	1.201	0.846
0.5	6	75.9351	0.2475	0.2664	0.8668	159.011	80.555	52.123	39.063	31.473	26.478	22.927	18.189	15.154	13.034	10.252	8.497	7.282	5.156	4.031	2.846	2.221	1.565
1	12	75.9351	0.2475	0.2664	0.8668	188.769	95.631	61.878	46.373	37.363	31.433	27.217	21.593	17.990	15.473	12.171	10.087	8.645	6.121	4.785	3.378	2.637	1.858
2	24	72.992	0.162	0.171	0.871	269.114	115.602	71.175	52.219	41.573	34.706	29.888	23.540	19.522	16.736	13.105	10.830	9.262	6.533	5.096	3.587	2.795	1.965
5	60	72.992	0.162	0.171	0.871	312.178	134.101	82.565	60.575	48.226	40.260	34.671	27.307	22.646	19.414	15.203	12.563	10.745	7.579	5.911	4.161	3.242	2.280
10	120	72.992	0.162	0.171	0.871	349.276	150.038	92.377	67.774	53.957	45.045	38.791	30.552	25.337	21.721	17.009	14.056	12.021	8.479	6.613	4.655	3.627	2.551
20	240	72.992	0.162	0.171	0.871	390.783	167.868	103.354	75.828	60.369	50.398	43.401	34.183	28.348	24.302	19.031	15.726	13.450	9.487	7.399	5.208	4.058	2.854
50	600	72.992	0.162	0.171	0.871	453.317	194.730	119.893	87.962	70.029	58.462	50.346	39.653	32.884	28.191	22.076	18.243	15.602	11.005	8.583	6.042	4.708	3.310
100	1200	72.992	0.162	0.171	0.871	507.188	217.871	134.141	98.415	78.351	65.410	56.329	44.366	36.792	31.541	24.699	20.411	17.456	12.313	9.603	6.760	5.267	3.704

4.2 Case Study- Computed design storm IDF using HP1 (2021):



Location:	Station No:	0230671RF (3317001)	Station Name:	Air Terjun Sg. Batu, WP Kuala Lumpur	Duration (min):	18	5	15	30	60	90	120	150	180	240	300	360	480	600	720	1080	1440	2160	2880	4320
ARI (T) YR	ARI (T) MTH	λ (lambda)	κ (kappa)	θ (theta)	η (eta)	0.3	0.08	0.25	0.5	1	1.5	2	2.5	3	4	5	6	8	10	12	18	24	36	48	72
2	24	64.5274	0.1583	0.2495	0.8080	116.8	175.2	126.2	90.9	60.1	45.8	37.4	31.8	27.8	22.4	18.9	16.4	13.1	11.0	9.5	6.9	5.5	4.0	3.1	2.3
5	60	64.5274	0.1583	0.2495	0.8080	135.1	202.5	145.9	105.1	69.5	53.0	43.2	36.8	32.1	25.9	21.8	18.9	15.1	12.7	11.0	8.0	6.3	4.6	3.6	2.6
10	120	64.5274	0.1583	0.2495	0.8080	150.7	226.0	162.8	117.3	77.6	59.1	48.3	41.0	35.9	28.9	24.3	21.1	16.9	14.2	12.3	8.9	7.1	5.1	4.1	2.9
20	240	64.5274	0.1583	0.2495	0.8080	168.2	252.2	181.7	130.9	86.6	66.0	53.9	45.8	40.0	32.2	27.2	23.6	18.8	15.8	13.7	9.9	7.9	5.7	4.5	3.3
50	600	64.5274	0.1583	0.2495	0.8080	194.4	291.6	210.0	151.3	100.1	76.3	62.3	52.9	46.3	37.2	31.4	27.3	21.8	18.3	15.8	11.5	9.1	6.6	5.2	3.8
100	1200	64.5274	0.1583	0.2495	0.8080	217.0	325.4	234.4	168.9	111.7	85.1	69.5	59.1	51.6	41.6	35.0	30.4	24.3	20.4	17.7	12.8	10.2	7.4	5.8	4.2

4.3 Case Study- Compare MSMA (2011) and HP1 (2021) Storm intensities:

For ARI of 100 year, storm duration of 30 min:
MSMA (2011), intensity i= 217.9 mm/hr (A)
HP1 (2021), intensity i= 168.9 mm/hr (B)

The ratio of A/B = 1.29

For ARI of 100 year, storm duration of 18 min:
MSMA (2011), intensity i= 296.5 mm/hr (A)
HP1 (2021), intensity i= 217.0 mm/hr (B)

The ratio of A/B = 1.37

5. Why HP1 (2021) is lower than MSMA (2011) in the Case Study:

Storm IDF data is a random process.

Some values higher due to climate change i.e., global warming.

But some (like in this case) may be lower due to longer period of record which gives more accurate prediction of design storms.

Thus, it proved the importance of computing using all available guidelines and compare the values before adoption.

6. Conclusion:

What advantages of using HP1/26?

1. More up-to-date Data: Up to 20 years of additional storm data, more stations, HP1/26 provide 10/20 km grids.

2. Other Considerations: More accurate temporal patterns, CCF (Climate Change Factor), ARF (Areal Reduction Factor).

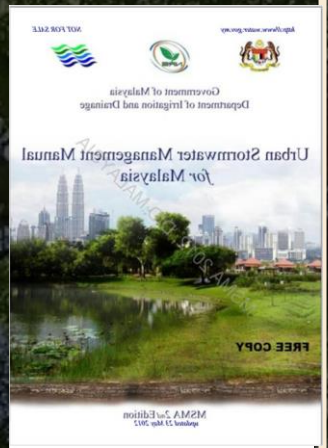
In conclusion, it is recommended to apply HP1/26 storm data.

7. Get this Free Tool for Computation of Design Storm:

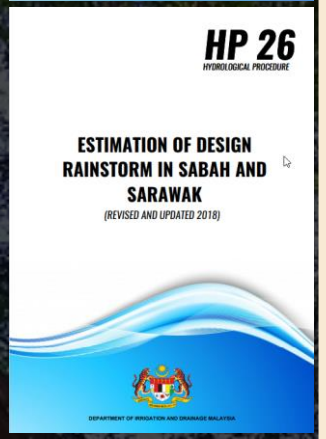
MSMAware includes the entire storm databases from MSMA2 (2011), HP1 (2021) and HP26 (2018)

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

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







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Benefits of Attending MSMA Workshops:

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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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