Drainage Services Department Practice Note No. 1/2004

Design Rainfall Depth for Temporary Works within the Dry Season

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1. SCOPE

1.1 The Practice Note sets out a guideline on estimating design rainfall depth for temporary flow diversion and temporary works to be carried out during dry season months.

2. GENERAL

2.1 For construction works which may affect the capacity of the existing stormwater drainage systems, there is a DSD Technical Circular No. 14/2000 providing guidance on the basic principles to be applied when assessments are made on the adequacy of the design of the proposed temporary flow diversions and temporary works during various periods throughout the year. Historical rainfall information is provided in the Circular for consideration in the assessment of potential drainage impacts and the level of risk due to such works.

2.2 In the past, DSD often required contractors to provide and maintain a flow capacity in the affected stormwater drainage system to accommodate the rainfall depth of certain return period, e.g. 10 years. It is noted that the statistics of rainfall data for assessing design rainfall depth is based on annual maximum rainfall data which is always dominated by the wet season. As a result, adopting such design rainfall depth for works to be carried out in dry season will not correctly reflect the flooding risk in the dry season and this approach may often lead to over-design and wastage.

2.3 In Hong Kong, there is a very distinct dry season from November to the following March with comparatively lower rainfall intensity than in the wet season. For the design rainfall depth in wet season, estimate should be made based on the frequency analysis of annual maximum rainfall as stipulated in the Stormwater Drainage Manual (SDM) because the annual maximum rainfall usually occurs in wet season. For construction works during the dry season, the guidelines in this Practice Note should be followed.

3. GUIDELINES / RECOMMENDED PRACTICE

3.1 With the assistance from the Hong Kong Observatory, an extreme frequency analysis of rainfall depth has been carried out for the following two periods:

a) Whole Dry Season from November to the following March (5 months)
b) Core Dry Season from December to the following February (3 months)

3.2 Extreme 1-, 2-, 4- and 6-hour rainfall depths corresponding to various return periods for the Whole Dry Season and Core Dry Season are computed and summarized in Tables 1 and 2 (Annex A). The analysis is derived from Gumbel's method using clock hourly rainfall data recorded at the Hong Kong Observatory Headquarters (from 1884 to 1939 and from 1947 to 2003).

3.3 The rainfall depths shown in Tables 1 and 2 (Annex A) should be used for the planning and design of temporary flow diversions and temporary works that may affect the stormwater drainage systems during the Whole Dry Season and Core Dry Season respectively. In general, the design methodology of the SDM should be adopted. The catchment characteristics of the concerned stormwater drainage systems should be considered in choosing the appropriate rainstorm durations. The flood protection standard stated in the SDM for different categories of stormwater drainage systems should be adopted, unless it exceeds the capacity of the existing drainage system, which should be adopted under such circumstance. As typhoon is less likely to occur during the

dry season, a 2-year design extreme sea level shown in the Table 8 of the SDM may be used for designing the temporary works.

3.4 Contractors should plan their work within the shorter Core Dry Season with a smaller design rainfall depth or within the Whole Dry Season but with a larger design rainfall depth. Designers should ensure that the programme of works is realistic and with adequate provision to mitigate adverse drainage impact due to unplanned extension of construction periods into months of more rainfall. If appropriate, the contractor should be asked to submit plans of contingency measures to meet situations had the works to be extended beyond the dry season months for approval before commencement of the works.

3.5 Designers should also note that there could be exceptionally severe rainstorm events happening within the Core Dry Season. Some of the highest historic annual maximum rainfall depths in the Whole Dry Season and the Core Dry Season at the Hong Kong Observatory are attached in Tables 3 and 4 respectively. If appropriate, designers should identify the possible flood risk and ensure that contingency plans and measures are in place and can be timely implemented in case there is rainfall greater than the designed rainfall depth for dry season months.

4. REFERENCE DOCUMENTS

4.1 Drainage Services Department (2000). DSD Technical Circular No. 14/2000 – Temporary Flow Diversions and Temporary Works Affecting Capacity in Stormwater Drainage Systems, Drainage Services Department

4.2 Drainage Services Department (2000). Stormwater Drainage Manual, Drainage Services Department.

5. ANNEX A

Table 1 - Extreme Rainfall Depths (mm) Corresponding to Various Return Periods for Whole Dry Season (Nov-Mar) (Using Gumbel's method) at Hong Kong Observatory

Table 2 - Extreme Rainfall Depths (mm) Corresponding to Various Return Periods for Core Dry Season (Dec-Feb) (Using Gumbel's method) at Hong Kong Observatory

Table 3 - Top 15 Highest Historic Annual Maximum Rainfall Depth (mm) in Whole Dry Season (Nov-Mar) at Hong Kong Observatory

Table 4 - Top 15 Highest Historic Annual Maximum Rainfall Depth (mm) in Core Dry Season (Dec-Feb) at Hong Kong Observatory

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Annex A

Table 1: Extreme Rainfall Depths (mm) Corresponding to Various Return Periods for Whole Dry Season (Nov-Mar) (Using Gumbel's method) At Hong Kong Observatory (Based on hourly rainfall data, 1884-1939; 1947-2003)

Duration	Return Period (Years)						
	2	5	10	20	50	100	200
6 hours	35.0	58.8	74.5	89.7	109.2	123.9	138.5
4 hours	30.1	51.4	65.5	79.1	96.6	109.7	122.7
2 hours	22.9	39.8	51.0	61.8	75.7	86.2	96.6
1 hour	16.0	26.6	33.5	40.2	48.9	55.4	61.9

Table 2: Extreme Rainfall Depths (mm) Corresponding to Various Return Periods for Core Dry Season (Dec-Feb) (Using Gumbel's method) At Hong Kong Observatory (Based on hourly rainfall data, 1884-1939; 1947-2003)

Duration	Return Period (Years)						
	2	5	10	20	50	100	200
6 hours	19.6	35.6	46.1	56.2	69.4	79.2	89.0
4 hours	16.8	30.2	39.1	47.7	58.7	67.0	75.3
2 hours	12.7	23.0	29.9	36.5	45.0	51.4	57.7
1 hour	8.7	15.2	19.5	23.7	29.1	33.1	37.1

Table 3: Top 15 Highest Historic Annual Maximum Rainfall Depth (mm) in Whole Dry Season (Nov-Mar)
At Hong Kong Observatory (1884-1939; 1947-2003)

Rank	Duration							
	1 hour		2 hours		4 hours		6 hours	
	Year	Rainfall	Year	Rainfall	Year	Rainfall	Year	Rainfall
1	2001	52.5	2001	91.8	2001	108.1	2001	124.1
2	1931	51.7	1986	90.9	1986	102.2	1974	123.5
3	1986	50.1	1931	84.1	1974	102.1	1986	109.2
4	1914	44.2	1897	73.4	1991	100.8	1900	104.9
5	1902	42.9	1887	70.4	1897	93.2	1897	104.4
6	1897	41.1	1991	64.5	1902	92.3	1991	101.2
7	1887	39.9	1902	63.2	1931	85.5	1902	97.8
8	2000	38.3	1900	60.5	1900	84.6	1887	93.4
9	1995	37.8	1974	54.5	1887	83.7	1931	85.6
10	1929	37.8	1914	54.2	1949	67.1	1949	81.1
11	1991	37.2	1995	51.9	1979	64.9	1979	73.0
12	1936	35.6	1979	48.2	1914	61.4	1912	71.9
13	1965	34.6	1936	47.0	1995	55.7	1920	69.8
14	1934	33.0	1982	45.6	1912	52.4	1954	63.9
15	1989	31.9	2000	43.2	1929	52.1	1914	63.6

Table 4: Top 15 Highest Historic Annual Maximum Rainfall Depth (mm) in Core Dry Season (Dec-Feb)
At Hong Kong Observatory (1884-1939; 1947-2003)

Rank	Duration							
	1 hour		2 hours		4 hours		6 hours	
	Year	Rainfall	Year	Rainfall	Year	Rainfall	Year	Rainfall
1	1931	51.7	1931	84.1	1974	102.1	1974	123.5
2	1989	31.9	1974	54.5	1931	85.5	1931	85.6
3	1974	27.9	1997	38.7	1997	48.4	1932	62.7
4	1899	24.6	1989	36.1	1932	41.0	1997	53.3
5	1955	21.8	1958	33.8	1971	40.0	1971	50.7
6	1997	21.7	1899	32.5	1989	39.1	1948	47.8
7	1937	19.6	1955	32.5	1955	38.3	1955	45.0
8	1905	18.4	1948	28.0	1948	37.6	1989	44.4
9	2000	18.2	1924	27.7	1913	36.8	1913	43.4
10	1923	17.3	1932	26.2	1958	35.6	1958	41.5
11	1932	17.3	1937	24.4	1924	34.6	1895	40.7
12	1958	17.0	1912	24.0	1899	33.8	1994	40.2
13	1924	16.8	1926	24.0	1923	33.5	1923	39.5
14	1965	15.9	1908	23.6	1926	32.1	1956	39.4
15	1948	15.8	1907	23.3	1912	31.3	1924	39.0