

Analysis of Rainfall Patterns to be Used for Planning and Design of Sewerage Facilities

(Study period: Fiscal 2015 and 2016)

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1. Rainfall pattern used in sewerage projects

Construction of storage facilities etc. may be considered as one of the inundation countermeasures. In planning / designing such facilities, the amount of rainfall may be determined using rainfall pattern ("design rainfall pattern") created in accordance with the procedure provided in the Sewerage System Planning / Design Manual¹⁾. In this procedure, the amount is determined with the intensity of rainfall for each time of concentration based on the rainfall intensity equation used in the plan, which does not necessarily aim to reproduce actual rainfall pattern. Therefore, since change in the rainfall situation is pointed out in recent years, design rainfall pattern may be greatly different from actual rainfall pattern. Then, aiming to determine proper rainfall pattern, NILIM first compared the total amount of rainfall based on design rainfall pattern and actual rainfall pattern and analyzed the difference and its factors in order to check the consistency between design rainfall pattern and actual rainfall pattern and examine issues and solutions.

2. Comparison between design rainfall pattern and actual rainfall pattern

We collected actual rainfall data (Meteorological Agency's observation data) on inland flood damage that occurred from 2004 to 2012 in 29 cities²⁾ across the country. To determine whether damage is caused by inland flood, we referred to the Statistical Survey on Flood Damage, published by the MLIT in the same year. We compared the total amount of rainfall based on design rainfall pattern and actual rainfall pattern and analyzed the difference and its factors. Figure 1 provides the results of checking the difference of the total amount of rainfall in design rainfall pattern and actual rainfall pattern for the target 132 rainfalls. In 93 rainfalls (70%), the total rainfall of design rainfall pattern is lower than the value of actual rainfall pattern. In addition, in the design rainfall pattern, rainfall reduces at the beginning and end of rainfall when the maximum intensity of rainfall is set to the middle of duration of rainfall, while in more than half of the actual rainfall patterns, rainfall intensity increased at locations away from the source location of the maximum intensity of rainfall (Fig. 2). Therefore, it was found that the average rainfall intensity increased accordingly and that the total rainfall of design rainfall pattern was less than the

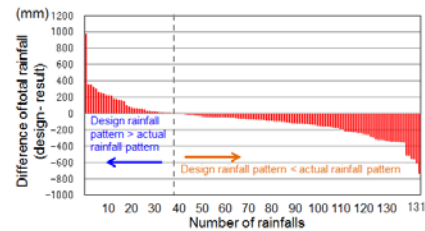


Figure 1: Example of rainfall pattern showing actual total rainfall exceeding design rainfall

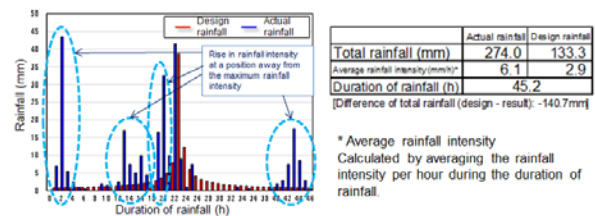


Figure 2: Example of rainfall pattern showing actual total rainfall exceeding design rainfall

value of actual rainfall pattern. Note that for the rainfalls without the characteristics mentioned, we are going to analyze the difference and factors. As suggested from the above, when designing storage facilities based on the design rainfall pattern, if it is particularly found that the total rainfall of design rainfall pattern is lower than the value of the actual rainfall pattern as the result of comparison with the actual rainfall pattern with the comparable peak rainfall intensity observed in the target area, it would be necessary to check the factors of difference and examine the validity of the design rainfall pattern. In the future, we are going to analyze the relationship of consistency between duration of rainfall, design rainfall pattern, and actual rainfall pattern, and study the issues and solutions concerning the method of setting rainfall patterns.

[Reference]

- 1) Japan Sewage Works Association (2009): Sewerage Facilities Planning / Design Guidelines and Manual - 2009 version -
- 2) MATSUURA Tatsuro, YOKOTA Toshihiro (2015): "Calculation of Rainfall Intensity Equation Considering Rainfall Characteristics and Analysis of the Capability of the Present Project", Collection of Presentations in the 52nd Japan Annual Technical Conference on Sewerage, pp. 398-340