CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Malaysia is one of the countries located at Southeast Asia, near the equator which is humid and hot all the year. The location of Malaysia at equator zone gives Malaysia experience tropical climate with two type of monsoon season which are the northeast and southwest through the year. Northeast occur during November to May bring moisture and more rainfall. Where southwest give wind blowing monsoon within May to September. These results give average rainfall in Malaysia in 2500mm with average temperature 27°C a year.

Seasonal variation give effect on rainfall pattern depend on geography of Malaysia that surrounded by mountain. This condition give two different climate which is depend on highland and lowland region. As a result, both condition cause temperature raging between 23°C to 32°C through the year with humidity between 75% and 80% and annually receive rainfall between 2000mm to 4000mm with 150 to 200 rainy days.

From this rainfall pattern, the data will be used to construct temporal pattern using rainfall intensity-duration-frequency (IDF) curves. Rainfall intensity –duration-frequency (IDF) should be up to date in line with the changes of rainfall pattern due to global warming effect and temperature changes. Rainfall intensity-duration-frequency (IDF) is one of the most important tools in hydrology and hydraulic design use by engineer in planning, designing, and operate rainwater infrastructure like drainage
structure and flood elevation in urban and rural area (Le Minh Nhat, et al., 2007). Failing in implant the IDF estimation in design can cause public safety or fund at risk.

Those data from rainfall data was use in frequency analysis method to develop intensity-duration-frequency (IDF) curve. To use this method, local history data was needed to get maximum annual rainfall depth corresponding to various duration. Latest duration data will be taken within period of 5 minutes to 120 hours with different return periods 2, 5, 10, 20, 50 and 100 years. The IDF curve will show the infinite number of rainfall event with different average intensity and duration with same return period. For a specific return period, the average intensity will decrease as the duration increase. As the result, for same duration, the average intensity is higher for longer return periods than the shorter one (Akan et al., 2003).

1.2 PROBLEM STATEMENT

All rainwater design in Malaysia must refer to the Urban Storm Water Management Manual 2nd edition (MSMA 2) to follow standard. Based on observation in MSMA 2, the data of IDF curve for Pahang was updated until 2009. The climate change in Malaysia in storm rainfall intensity may affect the data by change of latest addition data (MSMA, 2012).

To get more accurate analysis, it necessary to estimate reliable rainfall intensity by comparing the IDF curve by using different theoretical distribution function in developing rainfall intensity and return period from rainfall data. Method being use for IDF graph in MSMA only Gumbel distribution using data until 2009 and never be compared before. Gumbel may suitable for condition in Malaysia but not been approved until it compared with other method. Beside data given in MSMA is updated to 2009, while until 2014 lot of change happen during that period of time.

New MSMA 2 has covered limited location which provided the parameter for intensity calculation. Average location provided in MSMA is 2 locations for each district while rainfall station for each district average in 10 stations each district. Department Irrigation and Drainage (DID) should provide more location area for value
of intensity. For district not covered in MSMA need to use nearest district intensity parameter to calculate intensity for design drainage. That way may affect the value of intensity should be use for that location area and design drainage for that location.

1.3 OBJECTIVES

The objectives of this study are:
  i. To calculate missing data for each station.
  ii. To develop IDF curve for every district in Pahang.
  iii. To compare differences values of IDF curves using Gumbel distribution and Log-Pearson Type III distribution.

1.4 SCOPE OF STUDY

This study was conducted in Pahang area using rainfall data from 1990-2014 to develop IDF curves. The duration of IDF curve from 5, 15, 60, 180, 360, 720, 1440 minutes until 72 hours and the return period including 2, 5, 10, 20, 50 and 100 years. The data collections are from Department of Irrigation and Drainage (DID).

In this study, arithmetic formula was used to find the missing data for each station. The best station was selected based on number of missing data which the lesser missing data, the best station was selected. Few stations were selected to represent each district. To calculate missing data, station within area 100 km radiuses was considered to use in formula arithmetic. To ensure data fit, the Komolgorov Smirnov (KS) was done.

1.5 SIGNIFICANT OF STUDY

All the water rain design in Malaysia use MSMA as reference for engineer to design. Method use in MSMA to determine the intensity of rainfall is Gumbel distribution and never be compared with other method. To test the reliable of this curve to be used as reference, it needs to be compare with other method to see the reliability of the IDF curve in MSMA. By developing new IDF curve can plant awareness to