

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 INTRODUCTION**

In Malaysia, thunderstorms are a common phenomenon which occurs throughout the year but are most likely to happen during the inter-monsoon periods, namely April to May and October to November; frequently occur during the afternoon and early evening of the day over the sea. Despite their small sizes, all thunderstorms are very dangerous because of the present of gust wind which is defined as the sudden drastic increase in wind speed in a short period of time that will cause serious damages if not taken precautions.

Thunderstorm gusts can be severe and able to inflict major damage to high buildings and was caused by the downburst of wind emanating from thunderstorm cloud. By the definition of the World Meteorological Organization, thunderstorm is defined as one or more sudden electrical discharges, manifested with flashes of lightning and a sharp thundering sound. Thunderstorms are capable of producing hail, heavy rain, frequent lightning and strong gusty winds which can cause casualties such as lightning are responsible for many fires each year, heavy rain can lead o flash flooding and landslides, and strong straight-line winds which are capable of knocking down tress, power lines and mobile homes.

Thunderstorms are formed thru a convection process which is defined as the transport of heat energy, since because of the atmosphere is heated unevenly or unstable, an imbalance occurred which thunderstorms are attempting to correct. There

are three main stages within thunderstorms cycle: Cumulus stage, mature stage and dissipating stage.

Firstly, a cumulus stage is the starting point of the formation of thunderstorms. During the day, the earth's surfaces are constantly heated by the sun, the warm air from the surfaces will rise due to its lighter than cool air known as an updraft. If the air is moist, then the warm air will condense into a cumulus cloud. The cloud will continue to grow as long as warm air below continues to rise.

Next is the mature stage, when the cumulus cloud becomes very large, the water in the cloud which is held by the rising warm air will eventually become too large and heavy, thus rain will start to fall. Meanwhile, cool air starts to enter the cloud and since cool air particles are heavier than warm air, the cool air will start to descend in the cloud known as the downdraft. The downdraft pulls the heavy water in the cloud making it rain.

Lastly, after for a while, the thunderstorms will start to dissipate. This stage is the dissipating stage. This only occurs when the downdraft of the cool air in the cloud begins to dominate over the updraft. Since the warm air can no longer rise, cloud droplets can no longer form. The downdraft hitting the ground creates an outflow boundary. This can cause a downburst which is defined as a rapidly descending of air beneath a small area of a thunderstorm. The strong winds can reach to a very high speed that can cause significant damage along its path and is extremely dangerous to aviation. A straight line wind will push debris in the same direction the wind is blowing hence the term straight line.

## 1.2 PROBLEM STATEMENT

Every year, severe thunderstorms affected communities across the Malaysia causing fatalities, crops and property destroyed, and disrupting businesses. Recently numbers of damages and injuries due to thunderstorms in the past few years had increases in Malaysia. Due to the lack of awareness among the public increases and the number of people who are involved with wind engineering activities in Malaysia are still inadequate.

The lack of information regarding thunderstorms hazards are needed in order to gain the initiative against preventing and reducing the risk factor causes by thunderstorm. There are very little emphasizes of design building structure such as roof and cladding to minimize wind-induced damaged to buildings. Several factors are found which said to be contribute to the damage to the building component, one of it is said the failure of the lack on consideration to wind effect during design stage.

Thus, a gust factors are needed to be obtain throughout within Peninsular Malaysia as to get the estimation of the strength of wind within the proximity of area and the relation of the thunderstorms with any recent cases to prove. Continuously design of buildings while not considering the potential gust factors accordingly to area may cause damages or hazards in the future.