

CHAPTER I

INTRODUCTION

1.1 General

Currently, in Malaysia we have not practice in design of bridge for earthquake situation is not practices. Currently in our code of practice BS 5400, it did not have allocation or rules in earthquake design consideration for bridge structure. Eventhough our country does not have earthquake event occurred very frequently, we must aware that our neighbouring countries such as Indonesia and Philippines is an active earthquake region. Therefore we must take into attention and consideration when we start to design bridge so that the effect of earthquake damage from earthquake event in our neighbouring countries can be minimized to our structures especially bridge.

Eventhough our bridge structure might just get small vibration due to earthquake from our near region country, it may also contribute to some side effect in long term period if it happened for many times. This situation might cause cracking and collapse to our bridge. So ,in solving this problem we need a code of practice that considered earthquake loading in design process. In this research , we try to compare two codes of practice AASHTO-ACI and BS 5400 for bridge design resist of seismic loading. The design of a highway bridge, like most other civil engineering project, is dependent on certain standards and criteria. Naturally, the critical importance of highway bridges in a modern

transportation system would imply a set of rigorous design specification to ensure the safety and overall quality of the constructed project.

1.2 General Specifications

In general specifications, we imply an overall design code covering the majority of structures in a given transportation system. In the United States bridge engineers use Ashton's standard Specification for Highway Bridges and, in similar fashion or trends, German bridge engineer utilize the DIN standard and British and Malaysia designers the BS 5400 code. In general, countries like German and United Kingdom which have developed and maintained major highway systems for a great many years possess their own national bridge standards. The AASHTO Standard Specification, however, have been accepted by many countries as the general code by which bridges should be designed.

This does not mean that the AASHTO code is accepted in its entirety by all transportation agencies. Indeed, even within the United States itself, state transportation departments regularly issue amendments to the AASHTO code. These amendments can offer additional requirements to certain design criteria or even outright exceptions.

1.3 Problem Statement

According to the latest information we get, most bridge engineers in Malaysia are using BS 5400 code for guideline in design bridge project. This is because our bridge engineer got their basic knowledge or tertiary education from European countries like United Kingdom , New Zealand , and others countries that practices BS 5400 as a code of practice. That is they use BS 5400 code as a common practice in our country. Eventhough they already knew that BS 5400 does not have seismic consideration in their practice calculation design, they just ignored this case because in their opinion our country is outside seismic activity

area. They forgot our country is near to our country neighbour such as Sumatera (Indonesia) and Philipinnes that still have an active earthquake location center. However, we received vibration due to earthquake measuring 4.3 Richter scale in Penang Island , Kelantan , Perak and Kedah. This event was occurred caused by earthquake in Aceh (Indonesia). Some of our building structure like column , wall and slab are cracking due to this vibration from Aceh earthquake. Based on Malaysia Meteorological Services statement and other source, a reading value of earthquake for peninsular Malaysia as 0.075 g (75 gal) and for Sabah is 0.15 g (150 gal). These value is considered low vibration by some engineer and is not concern for a safety of bridge structure but for others person that concern of it this value can caused collapsed to our building or bridge if it happened frequently.

Therefore , a need to review our practice design code and also our construction method especially in design of bridge is much needed so as to protect bridge structure from the undesired damaging effect due to this natural disaster. The aim of this research is to compare our currently code of practice (BS 5400) with AASHTO-Seismic Design Code in term of efficiency in design a bridge in Malaysia. It also investigate which two code much applicable is to be applied in our country. The way to compare these two codes are by trying to redesign our existing bridge structure by using the different code of practices. In our case , we use American code of practice in redesigning our bridge structure. After that, we analyze and determine which code is much better for our country in design.

1.4 Objectives

The aims of this research are as follow :

- a) To investigate codes of practices suitable for our bridge structure design.
- b) To determine whether current codes of practice in Malaysia (BS 5400) is still practical for now or instead.
- c) To determine the existing capacity of bridges in resisting low intensity seismic loading due to near earthquake source.
- d) To compute the cost of using the different codes of practices.
- e) To determine the Time History Analysis Response(Time-acceleration) due to earthquake event using both codes of practices.

1.5 Scope of study

The scope of the research are limited to certain things as follow :

- a) Bridge component of structure ; Deck , Girder , Pier and Abutment.
- b) In Malaysia high risk seismic location.(e.g : Sabah and Penang Island)
- c) Compare in term of size of components and cost .(e.g : Volume of concrete and amount of steel that will be required)

1.6 Organization of Thesis

Extensive literature reviews are available in Chapter 2. Background theory and Principles of bridge engineering are described in Chapter 3.

1.7 Unit Conversion

Both SI Metric and Imperial Units are used throughout this thesis.