

# CHAPTER 1

## INTRODUCTION

### 1.1 Background and Overview

The bridge is a construction of wood, steel, concrete, and other materials that provide passage over an obstacle such as river, road, railway and so on. The bridge is a structure built from various materials and the selection of building materials for bridges made based on the type of structure and form a bridge to be built. Bridge which connect the two places that are separated by a building or other structure such as rivers, straits, roads, railways without covering the structure or underneath routes.

The bridge can also be classified according to the function and use of the bridge. Bridge in the past more to connect the two places that allow human passage, but now mostly built for vehicle passage such as cars and trucks. Bridge function not only to support loads from vehicles and pedestrians but also be used to allow trains through. Furthermore, the other function of bridge to put plumbing such as gas pipes, electricity pipes, water supply pipes and petroleum pipelines. The purpose to put the pipeline plumbing on the bridge is to facilitate the delivery and maintenance of pipelines. In addition, the bridge also has the high aesthetical value and able to attract the attention of visitors.

Construction of the bridge is a work of civil and structural engineering that involves the design, supervision and construction. Bridge construction process is to provide the infrastructure in different specialties such as road construction, bridge and tunnel construction work. This combined expertise involving knowledge of building materials, physical ability and experience to ensure that the design can be used and safely. Bridge construction process also involves planning work, research to provide new

infrastructure needs and the use of computer technology such as ANSYS to predict the state of the structure when receiving load conditions from wind and vehicle.

There are several type of bridge which is beam, cable-stayed, truss, suspension, and arch. Other type of bridge also included cantilever and moveable bridges. The election of type of beam depends on the length, the load that bridge will support and estimate cost to build the bridge. For example, Beam Bridge is the simplest bridge construction and only for short distance, hence with new technology engineer can link a number of span together to create longer bridge.

## **1.2 Problem Statement**

In the past, to study the behaviour of box girder bridge in elastic range are almost impossible because it designs procedures are to complex. However, because high speed developments in matrix, mathematical programming and computer techniques, the problem had been overcome by using various software programs in the design.

In bridge design shear force and maximum moment are important value. This value will determine how many steel and it size to sustain bending moment force. Since the design procedure are complex human error can be occurring which cause the value not accurate or maybe differ then it supposed to be. By getting right value, the decision to determine what and total of material can be done more accurately thus reducing the cost for construction. Since it is modelling, the material and force value can be change until satisfy.

## **1.3 Objective**

The objectives of the study are:

- i) To carry out structural analysis of finite element modelling of box girder by using finite element software (Ansys + CivilFEM).
- ii) To identify force-moment interaction diagram of girder box using finite element computer program.

#### **1.4 Scope of Study**

- i) In order to achieve the above objective for this type of bridge, the scope of this study is as follow:
- ii) The aim of this study is to better understanding the behaviour of concrete box girder bridge by using finite element software (Ansys+CivilFEM).
- iii) Development of the finite element modelling for box girder bridge using the 2D finite element analysis.
- iv) Literature review on journal, thesis that had been done and code of practice that related to force-moment interaction diagram and structural analysis of concrete bridge box girder in finite element.
- v) Analyse complex engineering structures using Finite Element Software.

#### **1.5 Expected Outcome**

This research claims to find out the behaviours and passing code checking of 2D concrete bridge box girder. The behaviours are deformation, deflection, 2D axial and bending, shear and torsion and lastly cracking checking according to Eurocode 2.

#### **1.6 Significant Study**

The research that is being done focuses more on concrete bridge box girder behaviour. The analysis of concrete girder box behaviour and passing code checking are also being carried out. All deformation, deflection, 2D axial and bending, shear and torsion and lastly cracking checking according to Eurocode 2.