

# CHAPTER 1

## INTRODUCTION

### 1.1. Background

Train is the most economic of land transportation compare to other moda of land transportation. In one movement or in one trip, by using one locomotive, that mean use one machine and use one driver, train can carry more or less 500 people or tons of goods. To be able to move fastly and savely, train need special track, and called railway. As has been broadly known, railway structure consist of two rail beam, fastener, sleeper, ballast layer, and subgrade.

Trains in Indonesia commonly still using ballast layer or ballasted track which the ballast becomes an important structure to keep the rails in place if there is a train running upper it. Meanwhile, in other countries such as France, Germany, Japan, England, and Switzerland already applied non-ballasted track or not using ballast layer. Which is non-ballasted track can be operated for high speed trains.

Non-ballasted track, also called ballastless track, is the railway track whose bed is composed of concrete and bituminous mixture, etc. Generally, non-ballasted track is made up of steel rail, railway fasteners and slab. Non-ballasted track's railway sleeper is formed by concrete casting. Instead of ballast bed, steel rail and

railway sleeper is laid on the concrete track. There is no doubt that non-ballasted track is the advanced track technology in the world. Slab track is one of the most important types of non-ballast track structure.

The Advantages of Slab Track System such as :

- Allows higher speed
- Reduction of construction height
- High values for cant and cant deficiency allow small horizontal radius
- No track maintenance like tamping and aligning
- Reduces the wear down of rail
- Higher availability
- Constant elasticity
- Excellent riding comfort at high speed
- Reduction of vibration
- Reduced secondary airborne noises
- Improved load distribution-thus reduced dynamic load of subsoil
- Traffic ability by road vehicles, especially rescue vehicles in tunnels important for rescue concept
- No problems with vegetation control which is essential for a ballasted structure
- A snaking railway route with extreme track parameters

- No ballast swirling at high speed or flying ballast
- High driving comfort
- Cleaning of tracks in stations
- Significantly reduced dynamic stress on subsoil

### **1.2. Problem Statement**

Based from background that explained above, so the problem statement are as follows:

1. Using rail types UIC 54 and UIC 60,
2. Using concrete as sleeper for ballasted track,
3. Using precast slab track system for calculation non-ballasted track from Austria,
4. Not to do the calculation of railway geometry.

### **1.3. Objective of the study**

From the above description, the objectives of the study are as follows:

1. To design and calculate railway construction using ballast layer or ballasted track,
2. To design and calculate railway construction not using ballast layer or non-ballasted track.

#### **1.4. Scope of the study**

To achieve those objectives, the study began with reviewing all of the literatures especially pertaining on railway construction. Study will continue with Methodology, where methods to fulfil the objectives will be describe, continue with equations will used on ballasted track and non-ballasted track. Design and calculation of railway design will given in chapter 4 and chapter 5 will give a conclusions and recommendations of the study.