# Introduction

This document is intended to show the measurement, assumption, and calculations of an elevator in an office building.

# Measurements

Measurements we did for the elevator, consisting measurement of travel all floors and travel between each floor, and the loading time.

## All floors

This table shows the time it takes for an elevator to get from the first floor to sixth floor, and the time to get from sixth floor back to the first floor. With the time taken of loading passengers.

|  |  |  |
| --- | --- | --- |
| all-floors | | |
| **Laps** | **Time** |  |
| **1** | 0:05.7 | Loading |
| **2** | 0:09.3 | 1-6 |
| **3** | 0:05.8 | Loading |
| **4** | 0:08.8 | 6-1 |
| **5** | 0:05.7 | Loading |

## Per floor

This table shows the time takes to travel between each floor, and the time takes to load passenger.

|  |  |  |
| --- | --- | --- |
| per-floor | | |
| **Laps** | **Time** |  |
| **1** | 0:05.8 | Loading |
| **2** | 0:05.1 | travel 1-2 |
| **3** | 0:05.9 | Loading |
| **4** | 0:05.0 | travel 2-3 |
| **5** | 0:05.8 | Loading |
| **6** | 0:05.3 | travel 3-4 |
| **7** | 0:0.5.9 | Loading |
| **8** | 0:04.8 | travel 4-5 |
| **9** | 0:05.9 | Loading |
| **10** | 0:04.9 | travel 5-6 |
| **11** | 0:05.8 | Loading |

# Assumption

1. Assuming the acceleration and deceleration is constant
2. Assuming the acceleration and deceleration are equal.
3. Assuming the distance between each floor is 4 meters.
4. Assuming the maximum velocity will meet at the middle between two floor.
5. Assuming the elevator will reach max speed at halfway when it traveling between one floor(travel 4m), from a full stop to a full stop

# Calculation

This section will go into detail about how the acceleration and max velocity is calculated based on the measurements and assumptions.

## Acceleration

Using formula : a = d / (t^2) \*2

d : half of distance traveled between two floor

d = 4/2 = 2m

t: average time took to travel halfway of floor

t = 5/2 = 2.5s

Result:

a = [2/(2.5^2)]\*2 = 0.64 m/s^2

Acceleration is 0.64 m/s^2

## Velocity

Using formula: v = a \* t

Based on the assumption, the elevator will reach max speed halfway when it travel between two floor next to each other(4m apart), and the acceleration and deceleration is the same.

Time taken to reach max speed would be half of the time taken to travel between the floors

t = 5/2 = 2.5s

a = 0.64 m/s^2, as we get in previous

v = 2.5 \* 0.64 = 1.6m/s

Velocity is 1.6m/s