**MEBS6000 Utility Services**

http://www.hku.hk/mech/msc-courses/MEBS6000/index.html

# Self-Evaluation Exercise on Lifts and Escalators

1. A building is served by four lifts with a round trip time of 200 seconds. The building population is 400 persons and each car has a rated car capacity of 10 passengers. Calculate the up-peak interval, up-peak handling capacity and percentage population served.

   [Ans.: 50 s; 48 persons per 5 minutes; 12%]

2. A lift system comprising four cars of rated speed 1.6 m/s and rated car capacity of 10 persons have door opening times of 3.0 seconds and door closing times of 4.0 seconds. The flight time between adjacent floors of interfloor distance 3.5 m is 4.5 seconds. Assuming passengers can enter/exit at 1.2 seconds (average time), calculate the round trip time (RTT). Assume that the highest floor reached is 10 and the number of stops is 9. If the lift speed is increased to 2.5 m/s, what are the changes to the three elements of the RTT equation?

   [Ans.: 156.1 s; 148.2 s]

3. A proposed office building has a lift system consisting of 4 lift cars at rated speed 2.5 m/s and rated car capacity of 10 persons. Assuming the following data, calculate the round trip time (RTT), up-peak interval (UPPINT) and up peak handling capacity (UPPHC). Comment on the quality of lift service and handling capacity.

   | | |
   |---|---|
   | Number of storeys of the building | = 12 |
   | Number of floors above the main lobby, $N$ | = 11 |
   | Interfloor distance, $d_f$ | = 3.4 m |
   | Door opening time, $t_o$ | = 2.5 seconds |
   | Door closing time, $t_c$ | = 3.0 seconds |
   | Single floor flight time, $t_f$ (1) | = 4.0 seconds |
   | Passenger transfer time, $t_p$ | = 1.2 seconds |
   | Lift car capacity factor | = 80% |

   [Ans.: 103.1 s; 25.8 s; 93.1 persons]

4. In a subway station, during peak periods, it was observed that passengers stood stationary on the right hand side of a 1000 mm escalator at a density of one passenger on every step. The left hand side was occupied by a walking column of passengers at a density of one person every third step. Assuming the escalator was running at 0.8 m/s and the speed of the walking passengers was 0.7 m/s, what is the passenger flow rate off the escalator? The step depth of the escalator is 400 mm and the following equation is given.

   Escalator theoretical handling capacity, $C_e = 60 \times V \times k \times s$ (persons/minute)

   where $V$ = speed along the incline (m/s)
   $k$ = average density of people (people/step)
   $s$ = number of escalator steps per metre (for step depth 400 mm, $s = 2.5$)

   [Ans.: 195 persons/minute]