

TRAFFIC ANALYSIS FOR

1-2 MURRAY ROSE AVENUE SOP - SITE 2

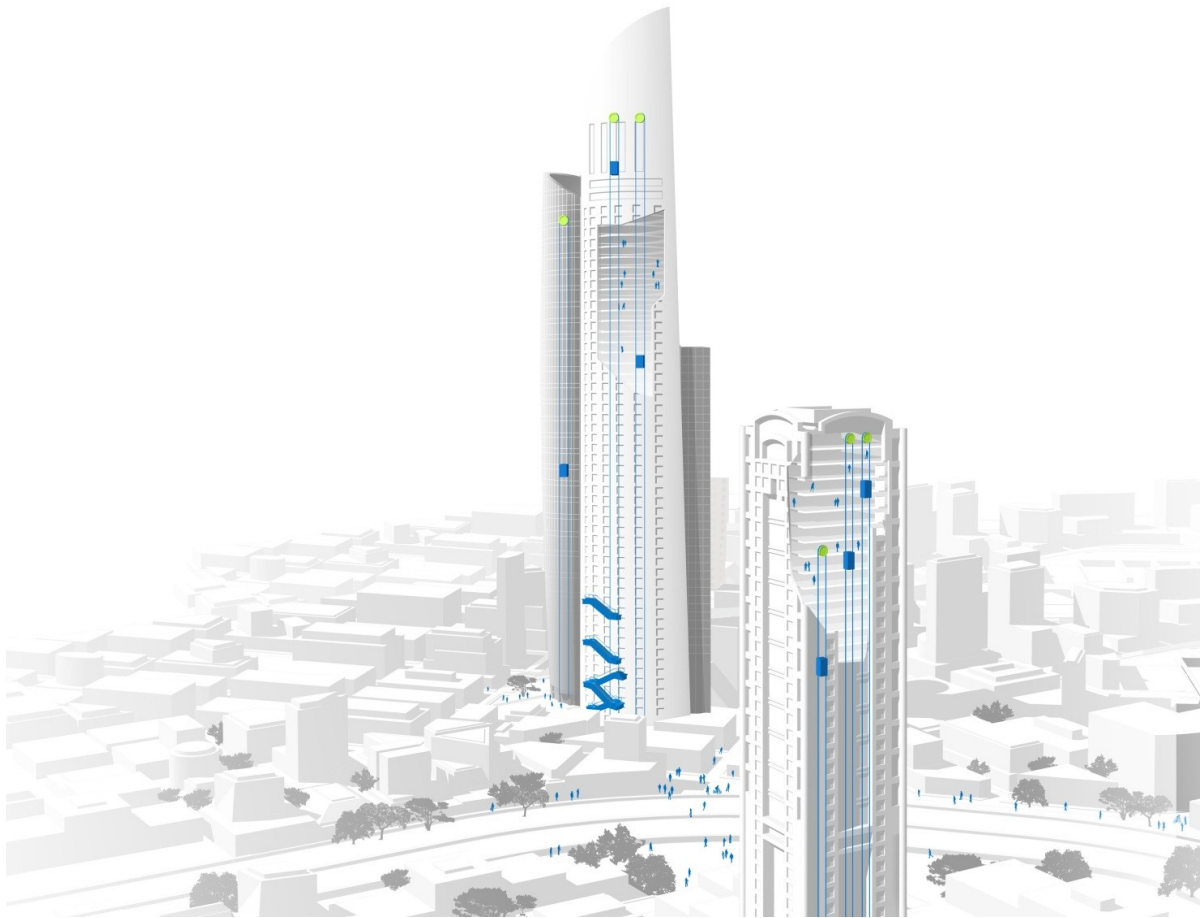




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1. SUMMARIES

1.1. SERIAL SIMULATION SUMMARY

People flow in 1-2 Murray Rose Avenue SOP - Site 2 is analyzed. The building has 18 floors and the travel height is 53.4 meters. The assumed population is 365 persons.

Table 1. Simulation results

Group control: GA (Conventional)

Elevator group: 1-2 Murray Rose Avenue SOP - Site 2

Traffic Type	Arrival rate (%/5min)	CLF (% of rated load)	WT (s)	TTD (s)	IS	Rating
Two way	9	13	20	50	0.7	Excellent (Residential)

DISCLAIMER

The results of the report are valid exploring theoretical vertical-traffic planning scenarios which involve KONE products, services, and planning tools such as KONE TrafCal and KONE Building Traffic Simulator™. The results of the report are sensitive to the parameter values used and data which is used as input, and can be interpreted incorrectly by persons lacking up-to-date training by KONE. Therefore, results should not be interpreted as any kind of representation or warranty of the performance of any actual elevator installation. KONE shall in no event be liable for any damage caused by or incurred in connection with the use of the results. The user shall have no right to make copies of, or reproduce, disassemble, decompile, reverse engineer or modify the results of the report or disclose it to any third party.

2. BUILDING ANALYSIS

2.1. BUILDING DATA

Table 2. Building and population definitions: 1-2 Murray Rose Avenue SOP - Site 2

Floor	Height	Travel h.	Population	Entry	DOP		L1	L2	L3
14	3.4	53.4	6	-	0				
13	3.4	50	6	-	0				
12	3.1	46.9	14	-	0				
11	3.1	43.8	17	-	0				
10	3.1	40.7	21	-	0				
9	3.1	37.6	23	-	0				
8	3.1	34.5	15	-	0				
7	3.1	31.4	32	-	0				
6	3.1	28.3	33	-	0				
5	3.1	25.2	36	-	0				
4	3.1	22.1	36	-	0				
3	3.1	19	36	-	0				
2	3.1	15.9	33	-	0				
1	3.1	12.8	29	-	0				
0	3.9	8.9	14	85	0	→			
-1	3.1	5.8	14	5	0	→			
-2	3	2.8	0	5	0	→			
-3	2.8	0	0	5	0	→			

Table 3. Building and population definitions: 1-2 Murray Rose Avenue SOP - Site 2

Building type:	Residential	
Populated floors:	Populated floors	-1-14
	Number of populated floors	16
	Total population	365
Entrance floors:	Entrance floors	-3-0
	Number of entrance floors	4
Totals:	Number of floors	18
	Total travel (m)	53.4
	Typical floor height (m)	3.1



2.2. SELECTING ELEVATOR SPEED

Nominal Travel Time is obtained by dividing the travel height by the elevator rated speed. It gives a rough estimation of the maximum time it takes to ride inside the car from the bottom floor to the top floor.

Table 4. Elevator speed information

Group	No of Elevators	Floors / Stops	Load (kg/persons)	Speed (m/s)	NTT (s)	Travel Height (m)	Speed rating
1-2 Murray Rose Avenue SOP - Site 2	3	-3-14 / 18	1275 / 16	1.8	30.5	53.4	Good

2.3. ELEVATOR DATA

Table 5. Elevator parameters

Elevator group	1-2 Murray Rose Avenue SOP - Site 2
Number of elevators	3
Rated speed (m/s)	1.8
Acceleration (m/s ²)	0.5
Jerk (m/s ³)	1.2
Start delay (s)	0.7
Advance opening distance (m)	0.1
Advance opening speed (m/s)	0.3
Rated capacity	16
Bypass load	13
Door opening time (s)	2.0
Door closing time (s)	2.9 - 3.8
Photocell delay (s)	0.9
Average one way passenger transfer time (s)	0

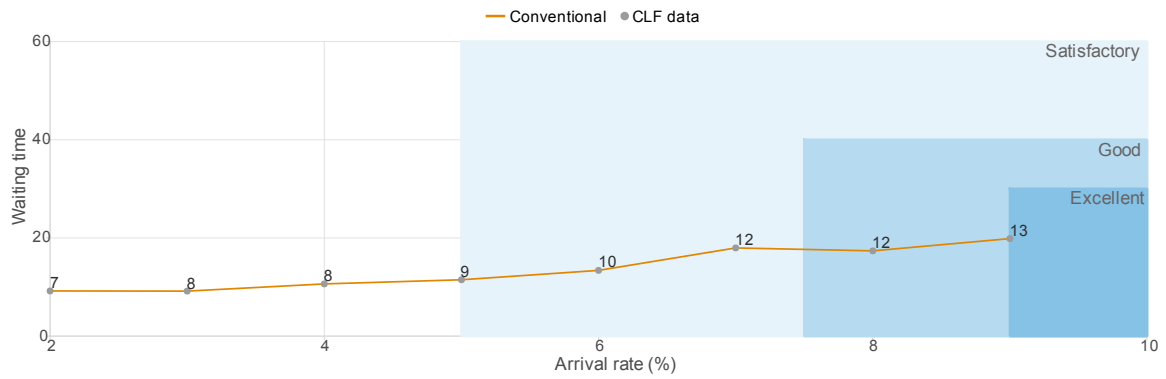
3. STEPWISE SERIAL SIMULATIONS

Passenger arrival rate is increased in stepwise manner in serial simulation model. For each arrival rate at least one hour simulation is performed to get enough accuracy. Average Waiting Time and Average Time to Destination can be compared against KONE has quality of service criteria (see KONE recommendations). Values of Average Car Load Factor are shown beside the curves. The values can be used to determine Handling Capacity.

Table 6. Simulation settings

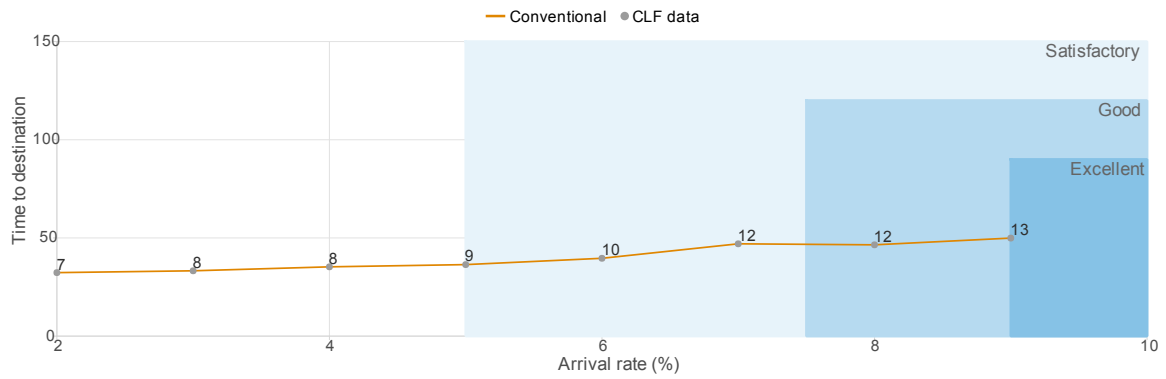
Name	Site 2 - 3 x 16 Pas 1
Excluded from begin (s)	300
Included from end (s)	0
Traffic start time	00:00:00
Traffic end time	01:00:00
Number of simulation steps	8
First arrival (% of base level)	2
Last arrival (% of base level)	9.5
Step arrival (% of base level)	1
Arrival intensities (% of population/300s)	2, 3, ..., 10
Arrival intensities (persons/300s)	7, 11, ..., 35

Two way: Waiting time results



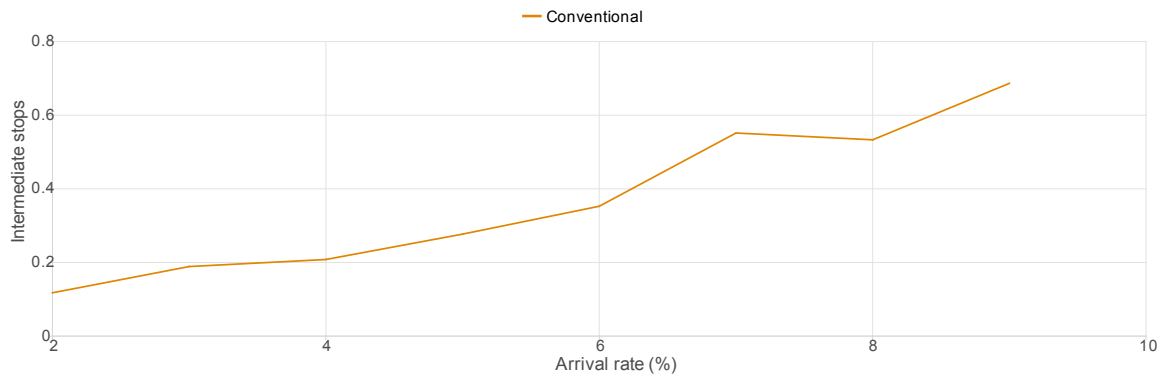
Arrival Rate (%)	Arrival rate (persons)	Conventional
2	7	9.2
3	10	9.2
4	14	10.6
5	18	11.5
6	21	13.4
7	25	18.0
8	29	17.4
9	32	19.9

Two way: Time to destination results



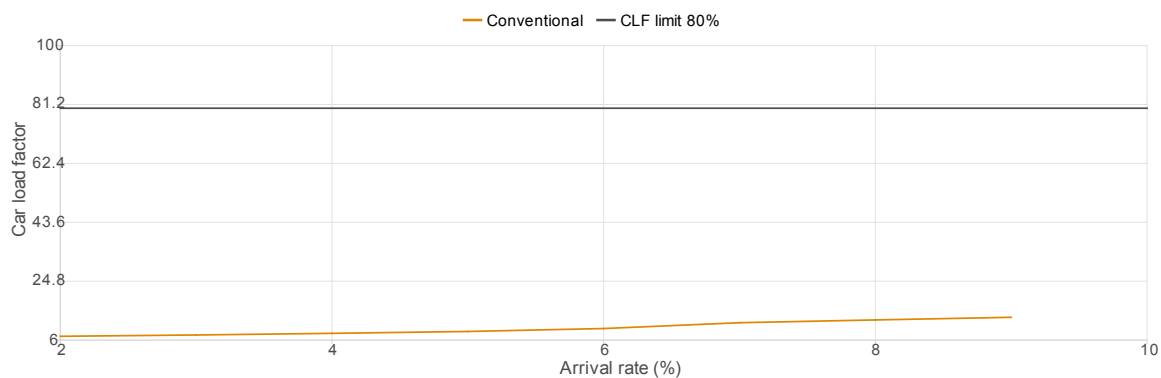
Arrival Rate (%)	Arrival rate (persons)	Conventional
2	7	32.3
3	10	33.3
4	14	35.3
5	18	36.4
6	21	39.6
7	25	47.0
8	29	46.5
9	32	49.9

Two way: Intermediate stops results



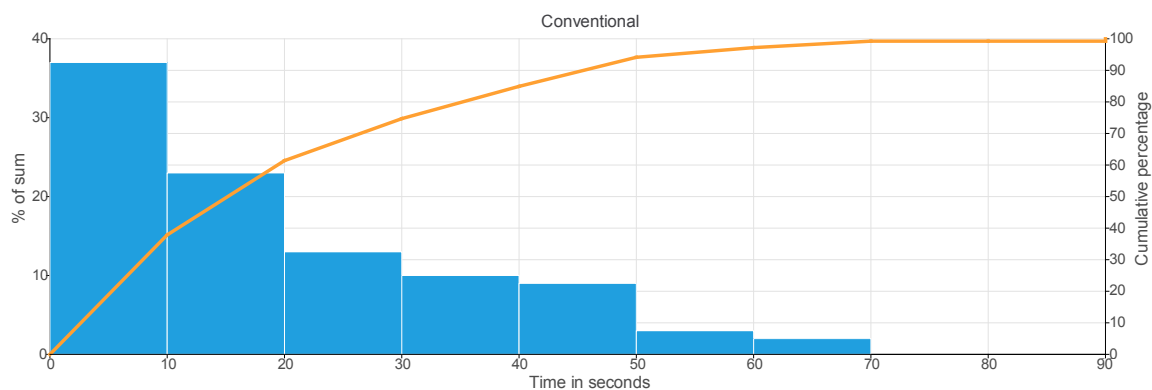
Arrival Rate (%)	Arrival rate (persons)	Conventional
2	7	0.1
3	10	0.2
4	14	0.2
5	18	0.3
6	21	0.4
7	25	0.6
8	29	0.5
9	32	0.7

Two way: Car load factor results



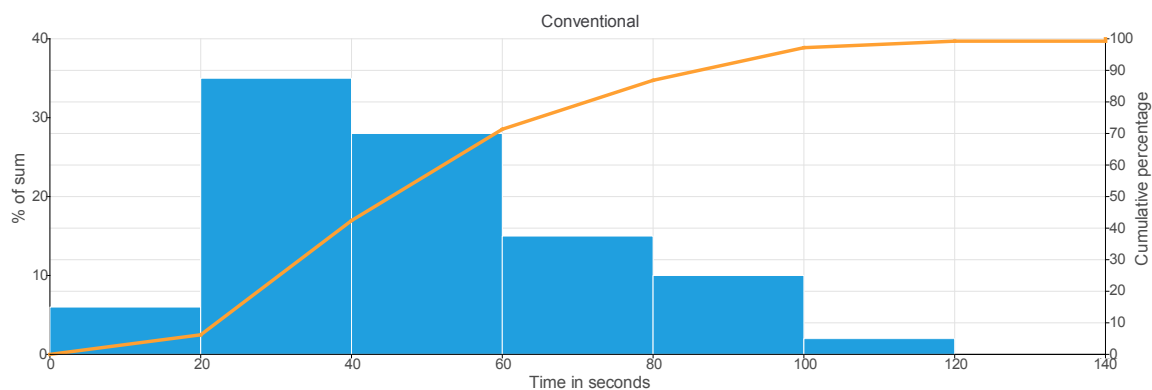
Arrival Rate (%)	Arrival rate (persons)	Conventional
2	7	7.2
3	10	7.6
4	14	8.2
5	18	8.8
6	21	9.7
7	25	11.6
8	29	12.4
9	32	13.3

Two way: Waiting time [9 %] distribution



Value (s)	Waiting time count	Waiting time (%)	Cumulative (%)
10	140	37.1	37.1
20	87	23.1	60.2
30	50	13.3	73.5
40	41	10.9	84.3
50	34	9.0	93.4
60	12	3.2	96.6
70	8	2.1	98.7
80	3	0.8	99.5
90	2	0.5	100

Two way: Time to destination [9 %] distribution



Value (s)	Time to destination count	Time to destination (%)	Cumulative (%)
20	25	6.8	6.8
40	132	35.7	42.4
60	106	28.6	71.1
80	57	15.4	86.5
100	38	10.3	96.8
120	9	2.4	99.2
140	3	0.8	100

4. ELEVATOR PLANNING GUIDELINES

4.1. KONE RECOMMENDATIONS

Quality of service is rated as 3-5 stars in single tenant offices, multi tenant offices, hotels and residential buildings. Elevator group gets the rating, if Average Waiting Time and Average Time To Destination are below the given limits at the given arrival rates (% of population in 5 mins) in both traffic situations. Two traffic situations, defined by percentages of incoming, outgoing and inter-floor passengers, are given for each building type. Interval criteria can be applied to analytical up-peak calculations.

Table 7. Satisfactory ratings for Handling Capacity and Quality of Service

Building type	Traffic type	5HC	INT	WT	TTD
Single tenant	(100%, 0%, 0%)	13%	40s	40s	120s
Single tenant	(40%, 40%, 20%)	11%	-	40s	120s
Multi tenant	(100%, 0%, 0%)	11%	40s	40s	120s
Multi tenant	(45%, 45%, 10%)	10%	-	40s	120s
Hotel	(100%, 0%, 0%)	10%	40s	40s	120s
Hotel	(50%, 50%, 0%)	-	-	-	-
Residential	(100%, 0%, 0%)	5%	100s	60s	150s
Residential	(50%, 50%, 0%)	-	-	-	-

Table 8. Good ratings for Handling Capacity and Quality of Service

Building type	Traffic type	5HC	INT	WT	TTD
Single tenant	(100%, 0%, 0%)	15%	32s	30s	100s
Single tenant	(40%, 40%, 20%)	12%	-	30s	100s
Multi tenant	(100%, 0%, 0%)	12%	32s	30s	100s
Multi tenant	(45%, 45%, 10%)	11%	-	30s	100s
Hotel	(100%, 0%, 0%)	12%	32s	30s	100s
Hotel	(50%, 50%, 0%)	-	-	-	-
Residential	(100%, 0%, 0%)	7,5%	80s	40s	120s
Residential	(50%, 50%, 0%)	-	-	-	-

Table 9. Excellent ratings for Handling Capacity and Quality of Service

Building type	Traffic type	5HC	INT	WT	TTD
Single tenant	(100%, 0%, 0%)	17,00 %	25s	25s	80s
Single tenant	(40%, 40%, 20%)	15,00 %	-	25s	80s
Multi tenant	(100%, 0%, 0%)	15,00 %	25s	25s	80s
Multi tenant	(45%, 45%, 10%)	12,00 %	-	25s	80s
Hotel	(100%, 0%, 0%)	15,00 %	25s	25s	80s
Hotel	(50%, 50%, 0%)	-	-	-	-
Residential	(100%, 0%, 0%)	9,00 %	25s	30s	90s
Residential	(50%, 50%, 0%)	-	-	-	-

Nominal travel time recommendations are used as guideline for selecting rated speed of elevator.

Table 10. KONE ratings for Nominal Travel Time

Building type	Satisfactory	Good	Excellent
Office	25 - 32s	20 - 25s	12 - 20s
Hotel	25 - 32s	20 - 25s	12 - 20s
Residential	32 - 50s	25 - 32s	20 - 25s

4.2. BASIC PLANNING PARAMETERS

Cycle time is the time for an elevator to move from one floor to the next adjacent floor, measured from the instant that the doors start to close at the departure floor to the instant the doors start to close at the arrival floor (provided that no passengers have entered or left the car).

Door-to-door time (or **performance time**) is the time for an elevator to move from one floor to the next adjacent floor, measured from the instant that the doors start to close at the departure floor to the instant the doors are open 800 mm at the arrival floor.

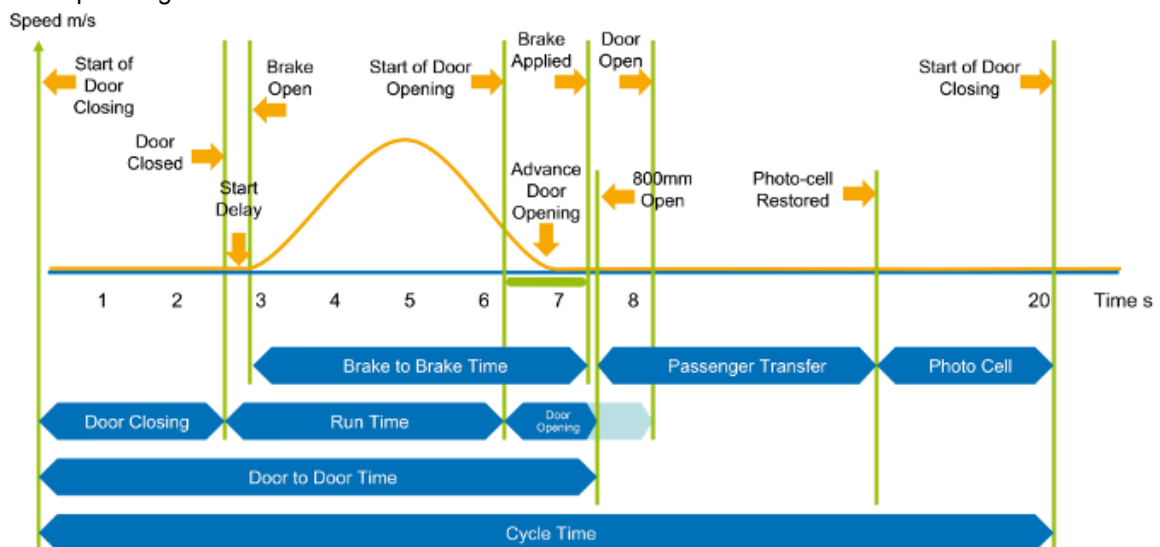
Advance door opening is the initiation of door opening whilst a car is slowing into a floor, under normal operating conditions, usually when the car is in a door zone of plus or minus 150 mm of floor level and such that the car is substantially level at the floor before passengers can attempt to exit.

Door opening time is the period of time measured from the instant of the elevator car being at a floor and when the doors are open 800 mm.

Door closing time is the period of time measured from the instant that the elevator door close push button is pressed (or the first visible door movement) until the door interlocks are made up.

Basic door time (or **Door Dwell 1**) is the time, in seconds, that the doors will wait until closing if the passenger detection beam across the door entrance is not broken.

Photocell delay (or **Door Dwell 2**) is the time, in seconds, that the doors will wait until closing after the broken passenger detection beams are cleared.

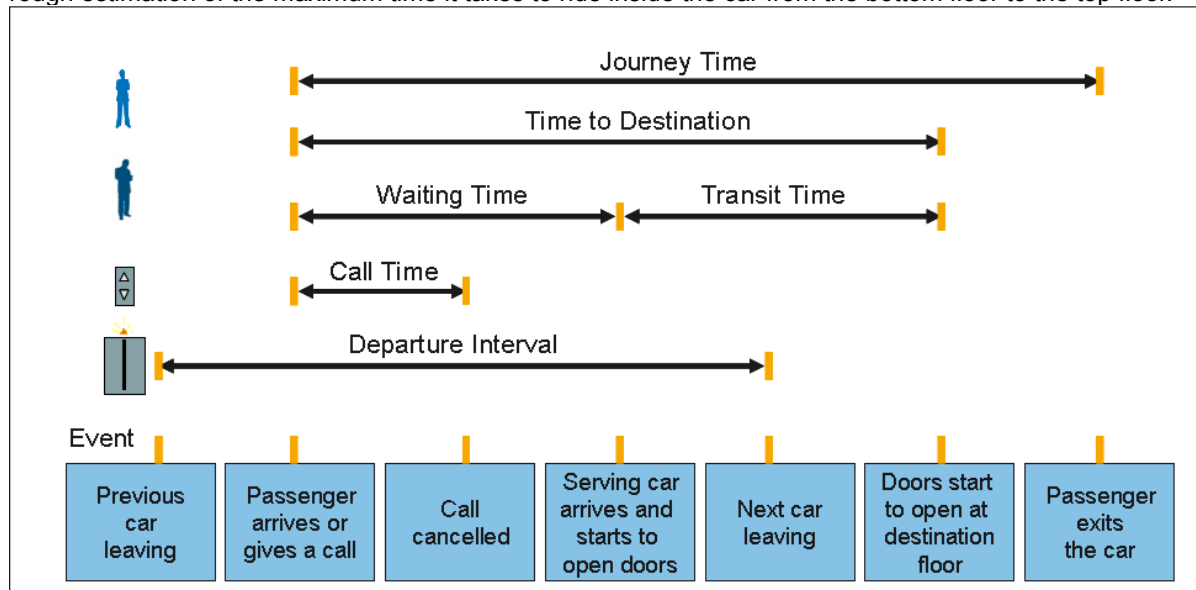


Handling Capacity (HC5) shows how many passengers the elevator system can transport in five minutes, normally in up-peak with 80% load factor. Usually Handling Capacity is given in relative units, percent of population in 5 minutes. Relative value of Handling Capacity is obtained by dividing the absolute value (persons/5 minutes) by the total population at the served floors (%HC5).

Car Load Factor (CLF) is maximum load during the round trip of elevator divided by the rated load (usually the maximum occurs at the main floor). CLF is averaged over round trips.

Interval (INT) shows the average frequency how often an elevator leaves the lobby during up-peak. It is obtained by dividing the round trip time by the number of elevators in group. (Not recommended to be used as performance criteria with up-peak boosters)

Nominal Travel Time (NTT) is obtained by dividing the travel height by the elevator rated speed. It gives a rough estimation of the maximum time it takes to ride inside the car from the bottom floor to the top floor.





Each parameter definition below considers an individual passenger. Average value of parameter is usually used as service quality criterion.

Call Time (CT): Time from when a passenger registers a landing call until the responding elevator cancels the call at the deceleration point.

Waiting Time (WT): Time from when a passenger either registers a landing call, or joins a queue, until the responding elevator begins to open its doors at the boarding floor

Time to Destination (TTD): Time from when a passenger either registers a landing call, or joins a queue, until the responding elevator begins to open its doors at the destination floor

Journey Time (JT): Time from when a passenger either registers a landing call or joins a queue until the passenger alights at the destination floor

Intermediate Stops (IS): The number of stops elevator makes between the boarding and destination floor of a passenger.

Intermediate Load (IL): Maximum number of passengers inside the car during passenger journey.