

Memorandum

Date: 09.04.20
Project: Residential Development at Gran Central Granville
Document Reference: SY191237-VTMEVTL01-1
Client Reference: Starryland Australia Pty Ltd
C/- PDS Group
Level 1, 63 York Street
Sydney NSW 2000

Vertical Transport Memo

The proposed development at Gran Central Granville is proposed to have two lifts per tower, operating in duplex, serving 43 and 84 apartments in Building A and B respectively.

In order to propose the number of lifts required, Northrop refers to the CIBSE Guide D: 2015 guideline for lift analysis. CIBSE Guide D: 2015 stated that the design criteria for lift simulation is recommended to follow the draft ISO as shown below.

Table 4.3 Draft ISO recommendations for use with provisional ISO simulation method (ISO, 2015)

Building type and typical traffic mix	Typical range of required handling capacity (HC5) (%)	Typical range of required average waiting time (s)
Office:		
— pure uppeak (100 % incoming)	12–15	20–30
— mixed uppeak (85% incoming, 10% outgoing, 5% interfloor)	11–14	25–35
— lunch 40% incoming, 40% outgoing, 20% interfloor or 45% incoming, 45% outgoing, 10% interfloor	11–14	30–45
Hotel:		
— morning two-way (35 % incoming, 65 % outgoing)	11–13	30–45
— evening two-way (50 % incoming, 50 % outgoing)	11–13	30–45
Residential:		
— morning two-way (15 % incoming, 85 % outgoing)	6–8	30–65
— evening two-way (50 % incoming, 50 % outgoing)	6–8	30–65

CIBSE Guide D: 2015 also stated that quality of service is normally assessed in simulation by considering *waiting time* (a passenger based indicator) rather than *interval* (a system based indicator).

The average waiting time Northrop obtained from simulation is as follow:

- Building A (Morning) = 44.6s
Building A (Evening) = 37.2s

- Building B (Morning) = 61.6s
Building B (Evening) = 58.3s

The average waiting time obtained is with 6% handling capacity. The handling capacity is the number of persons the lift system can accommodate within a 5-minute period.

Referring to the draft ISO table above, the results are within the recommended range. Therefore, the number of lifts proposed are acceptable.

A handwritten signature in black ink, appearing to read "Herry Thiauw".

Herry Thiauw | B (Eng) Elec MIEAust

Electrical Engineer

Northrop Consulting Engineers Pty Ltd

Date	Rev	Issue	Author	Verifier
09.04.20	1	Council Review	H. Thiauw	S. Burgess

ANALYSIS DATA

Analysis Type	Simulation
Measurement system	Metric
Dispatcher Algorithm	Group Collective Traffic mode: Auto
Time slice between simulation calculations (s)	0.10
No of time slices between screen updates	10
No of simulations to run for each configuration	10
No of learning runs	0
Random number seed for passenger generator	1
Energy Model	Off

BUILDING DATA

Floor Name	Floor Height (m)	No of people	Area (m ²)	Area/person	Entrance Floor
Bsmt 1	4.30	0	-	-	No
Ground	5.00	0	-	-	Yes
Level 1	3.30	9	-	-	No
Level 2	3.30	9	-	-	No
Level 3	3.30	9	-	-	No
Level 4	3.10	18	-	-	No
Level 5	3.10	19	-	-	No
Level 6	3.10	19	-	-	No
Level 7	3.10	19	-	-	No
Level 8	3.10	19	-	-	No
Level 9	3.10	19	-	-	No
Level 10	3.10	19	-	-	No
Level 11	3.10	19	-	-	No
Level 12	3.10	19	-	-	No
Level 13	3.10	19	-	-	No
Level 14	3.10	19	-	-	No
Level 15	3.10	19	-	-	No
Level 16	3.10	19	-	-	No
Level 17	3.10	19	-	-	No
Level 18	3.10	19	-	-	No
Level 19	3.10	19	-	-	No
Level 20	3.10	19	-	-	No
Level 21	3.10	19	-	-	No
Level 22	3.10	18	-	-	No
Level 23		18	-	-	No

Absenteeism (%) 0.00

ELEVATOR DATA

No of Elevators	SPECIFIED	2
Type	Single Deck	
Capacity (kg)	SPECIFIED	1450
Car area (m ²)	AUTO	
Door Pre-opening Time (s)	AUTO	
Door Open Time (s)	AUTO	
Door Close Time (s)	AUTO	
Door Dwell 1 (s)	3.00	
Door Dwell 2 (s)	2.00	
Speed (m/s)	SPECIFIED	2.50
Acceleration (m/s ²)	AUTO	
Jerk (m/s ³)	AUTO	
Start Delay (s)	0.50	
Levelling Delay (s)	0.00	
Home Floor	Ground	



PASSENGER DATA

Arrangement	Conventional for Single Deck elevators
Template	Constant traffic (% building pop per 5 mins)
Demand (% pop per 5 mins)	6.00
Incoming (%)	50.00
Outgoing (%)	50.00
Interfloor (%)	0.00
Start Time (hrs:mins)	11:00
End Time (hrs:mins)	11:15
Passenger Mass (kg)	75
Passenger Area (m²)	0.21
Loading Time (s)	1.20
Unloading Time (s)	1.20
Stair Factor (%)	0.00
Capacity Factor by Mass (%)	80.00
Capacity Factor by Area (%)	100.00
Floor Name	Entrance Bias
Ground	100.00



SIMULATION RESULTS

Based on average of all runs over complete duration of the simulation

No. of Elevators	Speed (m/s)	Acceln (m/s ²)	Jerk (m/s ³)	Elevator Capacity (kg)	Door Type	Door Times Pre-Open, Open, Close (s)	Average Waiting Time (s)	Longest Waiting Time (s)	Average Transit Time (s)	Longest Transit Time (s)	Average Time to Dest (s)	Longest Time to Dest (s)
2	2.50	0.80	1.60	1450	CO 1100mm	0.00, 1.80, 2.90	37.2	117.3	48.2	110.7	85.4	191.8

ANALYSIS DATA

Analysis Type	Simulation
Measurement system	Metric
Dispatcher Algorithm	Group Collective Traffic mode: Auto
Time slice between simulation calculations (s)	0.10
No of time slices between screen updates	10
No of simulations to run for each configuration	10
No of learning runs	0
Random number seed for passenger generator	1
Energy Model	Off

BUILDING DATA

Floor Name	Floor Height (m)	No of people	Area (m ²)	Area/person	Entrance Floor
Bsmt 1	4.30	0	-	-	No
Ground	5.00	0	-	-	Yes
Level 1	3.30	9	-	-	No
Level 2	3.30	9	-	-	No
Level 3	3.30	9	-	-	No
Level 4	3.10	18	-	-	No
Level 5	3.10	19	-	-	No
Level 6	3.10	19	-	-	No
Level 7	3.10	19	-	-	No
Level 8	3.10	19	-	-	No
Level 9	3.10	19	-	-	No
Level 10	3.10	19	-	-	No
Level 11	3.10	19	-	-	No
Level 12	3.10	19	-	-	No
Level 13	3.10	19	-	-	No
Level 14	3.10	19	-	-	No
Level 15	3.10	19	-	-	No
Level 16	3.10	19	-	-	No
Level 17	3.10	19	-	-	No
Level 18	3.10	19	-	-	No
Level 19	3.10	19	-	-	No
Level 20	3.10	19	-	-	No
Level 21	3.10	19	-	-	No
Level 22	3.10	18	-	-	No
Level 23		18	-	-	No

Absenteeism (%) 0.00

ELEVATOR DATA

No of Elevators	SPECIFIED	2
Type	Single Deck	
Capacity (kg)	SPECIFIED	1450
Car area (m ²)	AUTO	
Door Pre-opening Time (s)	AUTO	
Door Open Time (s)	AUTO	
Door Close Time (s)	AUTO	
Door Dwell 1 (s)	3.00	
Door Dwell 2 (s)	2.00	
Speed (m/s)	SPECIFIED	2.50
Acceleration (m/s ²)	AUTO	
Jerk (m/s ³)	AUTO	
Start Delay (s)	0.50	
Levelling Delay (s)	0.00	
Home Floor	Ground	

PASSENGER DATA

Arrangement	Conventional for Single Deck elevators
Template	Constant traffic (% building pop per 5 mins)
Demand (% pop per 5 mins)	6.00
Incoming (%)	15.00
Outgoing (%)	85.00
Interfloor (%)	0.00
Start Time (hrs:mins)	11:00
End Time (hrs:mins)	11:15
Passenger Mass (kg)	75
Passenger Area (m²)	0.21
Loading Time (s)	1.20
Unloading Time (s)	1.20
Stair Factor (%)	0.00
Capacity Factor by Mass (%)	80.00
Capacity Factor by Area (%)	100.00
Floor Name	Entrance Bias
Ground	100.00



SIMULATION RESULTS

Based on average of all runs over complete duration of the simulation

No. of Elevators	Speed (m/s)	Acceln (m/s ²)	Jerk (m/s ³)	Elevator Capacity (kg)	Door Type	Door Times Pre-Open, Open, Close (s)	Average Waiting Time (s)	Longest Waiting Time (s)	Average Transit Time (s)	Longest Transit Time (s)	Average Time to Dest (s)	Longest Time to Dest (s)
2	2.50	0.80	1.60	1450	CO 1100mm	0.00, 1.80, 2.90	44.6	132.0	50.7	130.1	95.3	210.8

ANALYSIS DATA

Analysis Type	Simulation
Measurement system	Metric
Dispatcher Algorithm	Group Collective Traffic mode: Auto
Time slice between simulation calculations (s)	0.10
No of time slices between screen updates	10
No of simulations to run for each configuration	10
No of learning runs	0
Random number seed for passenger generator	1
Energy Model	Off

BUILDING DATA

Floor Name	Floor Height (m)	No of people	Area (m ²)	Area/person	Entrance Floor
Bsmt 1	4.30	0	-	-	No
Ground	5.00	0	-	-	Yes
Level 1	3.30	10	-	-	No
Level 2	3.30	10	-	-	No
Level 3	3.30	10	-	-	No
Level 4	3.10	23	-	-	No
Level 5	3.10	26	-	-	No
Level 6	3.10	26	-	-	No
Level 7	3.10	26	-	-	No
Level 8	3.10	26	-	-	No
Level 9	3.10	26	-	-	No
Level 10	3.10	26	-	-	No
Level 11	3.10	26	-	-	No
Level 12	3.10	26	-	-	No
Level 13	3.10	26	-	-	No
Level 14	3.10	26	-	-	No
Level 15	3.10	26	-	-	No
Level 16	3.10	26	-	-	No
Level 17	3.10	26	-	-	No
Level 18	3.10	26	-	-	No
Level 19	3.10	26	-	-	No
Level 20	3.10	26	-	-	No
Level 21	3.10	26	-	-	No
Level 22	3.10	23	-	-	No
Level 23	3.10	23	-	-	No
Level 24		23	-	-	No

Absenteeism (%) 0.00

ELEVATOR DATA

No of Elevators	SPECIFIED	2
Type	Single Deck	
Capacity (kg)	SPECIFIED	1450
Car area (m ²)	AUTO	
Door Pre-opening Time (s)	AUTO	
Door Open Time (s)	AUTO	
Door Close Time (s)	AUTO	
Door Dwell 1 (s)	3.00	
Door Dwell 2 (s)	2.00	
Speed (m/s)	SPECIFIED	2.50
Acceleration (m/s ²)	AUTO	
Jerk (m/s ³)	AUTO	
Start Delay (s)	0.50	
Levelling Delay (s)	0.00	
Home Floor	Ground	



PASSENGER DATA

Arrangement	Conventional for Single Deck elevators
Template	Constant traffic (% building pop per 5 mins)
Demand (% pop per 5 mins)	6.00
Incoming (%)	50.00
Outgoing (%)	50.00
Interfloor (%)	0.00
Start Time (hrs:mins)	11:00
End Time (hrs:mins)	11:15
Passenger Mass (kg)	75
Passenger Area (m²)	0.21
Loading Time (s)	1.20
Unloading Time (s)	1.20
Stair Factor (%)	0.00
Capacity Factor by Mass (%)	80.00
Capacity Factor by Area (%)	100.00
Floor Name	Entrance Bias
Ground	100.00

SIMULATION RESULTS

Based on average of all runs over complete duration of the simulation

<i>No. of Elevators</i>	<i>Speed (m/s)</i>	<i>Acceln (m/s²)</i>	<i>Jerk (m/s³)</i>	<i>Elevator Capacity (kg)</i>	<i>Door Type</i>	<i>Door Times Pre-Open, Open, Close (s)</i>	<i>Average Waiting Time (s)</i>	<i>Longest Waiting Time (s)</i>	<i>Average Transit Time (s)</i>	<i>Longest Transit Time (s)</i>	<i>Average Time to Dest (s)</i>	<i>Longest Time to Dest (s)</i>
2	2.50	0.80	1.60	1450	CO 1100mm	0.00, 1.80, 2.90	58.3	191.8	69.0	167.3	127.3	296.2

ANALYSIS DATA

Analysis Type	Simulation
Measurement system	Metric
Dispatcher Algorithm	Group Collective Traffic mode: Auto
Time slice between simulation calculations (s)	0.10
No of time slices between screen updates	10
No of simulations to run for each configuration	10
No of learning runs	0
Random number seed for passenger generator	1
Energy Model	Off

BUILDING DATA

Floor Name	Floor Height (m)	No of people	Area (m ²)	Area/person	Entrance Floor
Bsmt 1	4.30	0	-	-	No
Ground	5.00	0	-	-	Yes
Level 1	3.30	10	-	-	No
Level 2	3.30	10	-	-	No
Level 3	3.30	10	-	-	No
Level 4	3.10	23	-	-	No
Level 5	3.10	26	-	-	No
Level 6	3.10	26	-	-	No
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Level 8	3.10	26	-	-	No
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Level 13	3.10	26	-	-	No
Level 14	3.10	26	-	-	No
Level 15	3.10	26	-	-	No
Level 16	3.10	26	-	-	No
Level 17	3.10	26	-	-	No
Level 18	3.10	26	-	-	No
Level 19	3.10	26	-	-	No
Level 20	3.10	26	-	-	No
Level 21	3.10	26	-	-	No
Level 22	3.10	23	-	-	No
Level 23	3.10	23	-	-	No
Level 24		23	-	-	No

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Door Pre-opening Time (s)	AUTO	
Door Open Time (s)	AUTO	
Door Close Time (s)	AUTO	
Door Dwell 1 (s)	3.00	
Door Dwell 2 (s)	2.00	
Speed (m/s)	SPECIFIED	2.50
Acceleration (m/s ²)	AUTO	
Jerk (m/s ³)	AUTO	
Start Delay (s)	0.50	
Levelling Delay (s)	0.00	
Home Floor	Ground	



PASSENGER DATA

Arrangement	Conventional for Single Deck elevators
Template	Constant traffic (% building pop per 5 mins)
Demand (% pop per 5 mins)	6.00
Incoming (%)	15.00
Outgoing (%)	85.00
Interfloor (%)	0.00
Start Time (hrs:mins)	11:00
End Time (hrs:mins)	11:15
Passenger Mass (kg)	75
Passenger Area (m²)	0.21
Loading Time (s)	1.20
Unloading Time (s)	1.20
Stair Factor (%)	0.00
Capacity Factor by Mass (%)	80.00
Capacity Factor by Area (%)	100.00
Floor Name	Entrance Bias
Ground	100.00

SIMULATION RESULTS

Based on average of all runs over complete duration of the simulation

<i>No. of Elevators</i>	<i>Speed (m/s)</i>	<i>Acceln (m/s²)</i>	<i>Jerk (m/s³)</i>	<i>Elevator Capacity (kg)</i>	<i>Door Type</i>	<i>Door Times Pre-Open, Open, Close (s)</i>	<i>Average Waiting Time (s)</i>	<i>Longest Waiting Time (s)</i>	<i>Average Transit Time (s)</i>	<i>Longest Transit Time (s)</i>	<i>Average Time to Dest (s)</i>	<i>Longest Time to Dest (s)</i>
2	2.50	0.80	1.60	1450	CO 1100mm	0.00, 1.80, 2.90	61.6	188.2	65.4	156.3	127.0	293.3