

REPORT  
PROJECT: 102435-5.2.2

ENVIRONMENTAL NOISE IMPACT ASSESSMENT  
MIXED USE DEVELOPMENT  
667 BANK STREET, OTTAWA, ONT.

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Prepared for Vincent P. Colizza Architect Inc.  
by IBI Group  
August 31, 2016

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# 1 INTRODUCTION

On behalf of our client, a study has been prepared to determine the impact of the roadway traffic on the proposed mixed use development at 667 Bank Street. The 5 storey building is bounded by Bank Street to the west, Clemow Avenue to the south, an existing residential building to the east and open space to the north, as shown on **Figure 1**.

The purpose of this noise assessment is to determine the expected noise levels for the residential units. The results will then be analyzed based on the City of Ottawa criteria to determine whether mitigation is required.







## 2 BACKGROUND

### 2.1 Noise Sources

The proposed development is primarily subject to road noise from Bank Street and to a lesser extent from the Queensway. The adjacent Clemow Avenue is a local road and is not considered a noise source. Aircraft noise from the Ottawa International airport and rail noise are not factors as the airport and rail lines are not in close proximity to the study area.

### 2.2 Sound Level Limits for Road Traffic

Sound level criteria for road traffic are taken from the City of Ottawa Environmental Noise Control Guidelines January 2016 hereafter referred to as 'the guidelines'. Noise levels are expressed in the form Leq (T) which refers to a weighted level of a steady sound carrying the same total energy in the time period T (in hours) as the observed fluctuation sound.

#### 2.2.1 OUTDOOR SOUND LEVEL CRITERION

The recommended sound level for the outdoor living area (OLA) for the daytime period between 07:00 and 23:00 hours is 55 dBA Leq (16). The outdoor living area is located 3 meters from the building façade at the centre of the unit and the noise level is taken 1.5 meters above ground level.

If the Leq sound level is less than or equal to the above criteria then no further action is required by the developer. If the sound level exceeds the criteria by less than 5 dBA then the developer may either provide a warning clause to prospective purchasers or install physical attenuation. For sound levels greater than 5 dBA above the criteria control measures are required to reduce the noise levels.

#### 2.2.2 INDOOR SOUND LEVEL CRITERION

For the purpose of assessing indoor sound, the sound levels are calculated at the outside building face which allows for noise attenuation from normal house construction techniques.

As stated in Table 1.10 of the City of Ottawa Environmental Noise Control Guidelines, the recommended indoor sound level limits measured at the exterior building face are:

- bedrooms – 23:00 to 07:00 – 50 dBA Leq (8)
- other areas – 07:00 to 23:00– 55 dBA Leq (16)

No control measures are necessary if the outdoor sound level is less than or equal to 50 dBA Leq (8) for nighttime or 55 dBA Leq (16) for daytime.

If the outdoor sound level is between 50 or 60 dBA Leq (8) for nighttime or 55 and 65 dBA Leq (16) for daytime, alternate means of ventilation are required as well as a warning clause. Alternate means of ventilation usually consists of a forced air heating system with the ducts sized for future installation of central air conditioning.

When the outdoor sound level is above 60 dBA Leq (8) for nighttime or above 65 dBA Leq (16) for daytime central air conditioning is required and the building components (walls, windows, etc.) must be designed to achieve indoor sound level criteria.

Typically for the purpose of assessing indoor sound levels at the nighttime, the outdoor sound levels are observed at the plane of the bedroom window assumed to be located at 4.5 metres above the ground and 2.5 meters above the ground for daytime.

### 3 ROADWAY NOISE

As stated in Section 2.1, the major source of traffic noise is Bank Street. At this location, Bank Street is a four lane roadway with off peak street parking and a posted speed limit of 40 km/hr. From Table B of the Guidelines, this section of Bank Street will fall under a 4-Lane Major Collector classification (4-UMCU). The Queensway is located approximately 330 meters north of the site and consists of a total of eight lanes at this location. Per the Guidelines, the AADT for the Queensway is based on 18,333 vehicles per lane. Table 3.1 summarizes the traffic and road parameters used in this report.

**TABLE 3.1  
TRAFFIC AND ROAD DATA SUMMARY**

	BANK STREET	QUEENSWAY
Annual Average Daily Traffic (AADT)	24,000	146,664
Posted Speed Limit (km/hr)	40	100
% Medium Trucks	7%	7%
% Heavy Trucks	5%	5%
% Daytime Traffic	92%	92%

#### 3.1 Calculation Methods

Roadway noise was calculated using the STAMSON 5.04 computer program from the Ontario Ministry of the Environment.

Calculations are conducted at the noise receiver locations shown on Figure 1. Receiver A represents the living rooms and bedrooms for Units 100 and 200 and the living room for Unit 300. Receiver B represents the bedroom for Unit 300 and Receivers C and D are for Unit 400. A copy of the floor plan at the second level is included in the **Appendix**. Noise calculations are conducted for all floors.

The STAMSON program cannot calculate noise levels at a distance less than 15 meters from the source, as the building is 11.5 meters from the centerline of Bank Street, the noise is calculated for Receiver A at 15 meters and a noise divergence calculation is performed to account for the shorter distance. Noise from the Queensway is calculated without any allowance for building obstructions and is added to the Bank Street noise levels.

There is no analysis for the first floor of the building which is designated as retail and is not considered a noise sensitive land use per the Guidelines. For the residential development, the proposed balconies are too small to meet the requirement of an outdoor living area (OLA) per the Guidelines so that outdoor noise analysis will not be conducted for this development. Results of the analysis of noise levels at building face are summarized on Table 3.2.



**TABLE 3.2  
 NOISE LEVELS AT BUILDING FACE**

RECEIVER	FLOOR	ROADWAY	DISTANCE SOURCE-RECEIVER (M)	SEGMENT ANGLE		NOISE LEVEL (dBA)	
				LEFT	RIGHT	DAYTIME	NIGHTTIME
A	2 <sup>nd</sup>	Bank	11.5	-90	90	70.29	62.69
		Queensway	330	-90	0		
B	2 <sup>nd</sup>	Bank	20.0	0	90	66.73	59.13
		Queensway	330	-90	90		
C	2 <sup>nd</sup>	Bank	24.0	-90	0	63.68	56.08
D	2 <sup>nd</sup>	Queensway	337	-30	90	61.21	53.61
A	3 <sup>rd</sup>	Bank	11.5	-90	90	70.43	62.83
		Queensway	330	-90	0		
B	3 <sup>rd</sup>	Bank	21.0	-30	-90	66.40	58.80
		Queensway	333	-90	90		
C	3 <sup>rd</sup>	Bank	24.0	-90	0	63.68	56.08
D	3 <sup>rd</sup>	Queensway	337	-30	90	62.55	54.95
A	4 <sup>th</sup>	Bank	11.5	-90	90	70.62	63.02
		Queensway	330	-90	0		
B	4 <sup>th</sup>	Bank	21.0	-30	-90	67.27	59.68
		Queensway	333	-90	90		
A	5 <sup>th</sup>	Bank	11.5	-90	90	70.87	63.27
		Queensway	330	-90	0		
B	5 <sup>th</sup>	Bank	21.0	-30	-90	68.27	60.67
		Queensway	333	-90	90		

As shown, the noise criteria from Section 2.2.2 is exceeded at all receiver locations.



## 4 ABATEMENT MEASURES

### 4.1 Warning Clauses and Ventilation

The daytime sound levels at Receivers A and B which represent Units 100, 200 and 300 exceed 65 dBA for all floors requiring a Type 'D' noise warning clause. Mandatory central air conditioning is also required for these units as well as a review of building components which is addressed in Section 4.2.

At Receiver locations C and D, the daytime noise level exceeds 55 dBA but is less than 65dBA requiring a Type 'C' warning clause. Alternative means of ventilation is required which usually consists of a forced air heating system with the ducts sized for future installation of central air conditioning. A review of building components is not required, all components are to comply with the Ontario Building Code.

### 4.2 Building Components

An analysis of the required building components for Units 100, 200 and 300 has been conducted using the Sound Transmission Class (STC) Method. Calculations were completed using the highest noise levels from Table 3.2. Calculations are included in the **Appendix**.

With the use of masonry and metal exterior walls, the required STC rating for windows and glazed balcony doors has been determined and summarized in Table 4.1.

**TABLE 4.1  
 BUILDING COMPONENT REVIEW**

UNIT	ROOM TYPE	STC RATING
		WINDOWS AND GLAZED DOORS
100	Living	32
100	Bed	28
200	Living	30
200	Bed	25
300	Living	32
300	Bed	22

# 5 SUMMARY

## 5.1 Warning Clauses

A clause regarding noise must appear on Agreements of Purchase and Sale and any leases as listed below:

- Units 100, 200 and 300 (all floors) - Type 'D'
- Unit 400 (all floors) - Type 'C'

<b>TYPE 'D'</b>	"This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the city's and the ministry of the environment's noise criteria."
<b>TYPE 'C'</b>	"This dwelling unit has been fitted with a forced air heating system and the ducting, etc. was sized to accommodate central air conditioning. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of the Environment's noise criteria. (Note: the location and installation of the outdoor air conditioning device should be done so as to comply with noise criteria of MOE Publication NPC-216, residential air conditioning devices and thus minimize the noise impacts both on and in the immediate vicinity of the subject property."

## 5.2 Ventilation Requirements and Building Components

Units 100, 200 and 300 (all floors) require mandatory central air conditioning. Unit 400 (all floors) require alternative means of ventilation. STC rating for windows and glazed balcony doors for units 100, 200 and 300 is shown on Table 4.1.

Prepared by:



Lance Erion, P. Eng.  
Associate

# APPENDIX



Filename: A2Bank.te                      Time Period: Day/Night 16/8 hours  
 Description: Rec A 2nd Floor Bank Street

Road data, segment # 1: Bank Street (day/night)

```
-----
Car traffic volume : 19430/1690 veh/TimePeriod *
Medium truck volume : 1546/134 veh/TimePeriod *
Heavy truck volume : 1104/96 veh/TimePeriod *
Posted speed limit : 40 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)
```

\* Refers to calculated road volumes based on the following input:

```
24 hr Traffic Volume (AADT or SADT): 24000
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 7.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 92.00
```

Data for Segment # 1: Bank Street (day/night)

```
-----
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 15.00 / 15.00 m
Receiver height : 6.20 / 6.20 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00
```

Results segment # 1: Bank Street (day)

Source height = 1.50 m

ROAD (0.00 + 68.73 + 0.00) = 68.73 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	68.73	0.00	0.00	0.00	0.00	0.00	0.00	68.73

Segment Leq : 68.73 dBA

Total Leq All Segments: 68.73 dBA

Results segment # 1: Bank Street (night)

-----  
Source height = 1.50 m

ROAD (0.00 + 61.13 + 0.00) = 61.13 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.00	61.13	0.00	0.00	0.00	0.00	0.00	0.00	61.13

-----

Segment Leq : 61.13 dBA

Total Leq All Segments: 61.13 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.73  
(NIGHT): 61.13

Filename: A2Queen.te                      Time Period: Day/Night 16/8 hours  
 Description: Rec A 2nd Floor Queensway

Road data, segment # 1: Queensway (day/night)

-----  
 Car traffic volume : 118739/10325 veh/TimePeriod \*  
 Medium truck volume : 9445/821 veh/TimePeriod \*  
 Heavy truck volume : 6747/587 veh/TimePeriod \*  
 Posted speed limit : 100 km/h  
 Road gradient : 1 %  
 Road pavement : 1 (Typical asphalt or concrete)

\* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 146664  
 Percentage of Annual Growth : 0.00  
 Number of Years of Growth : 0.00  
 Medium Truck % of Total Volume : 7.00  
 Heavy Truck % of Total Volume : 5.00  
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Queensway (day/night)

-----  
 Angle1 Angle2 : -90.00 deg 0.00 deg  
 Wood depth : 0 (No woods.)  
 No of house rows : 0 / 0  
 Surface : 1 (Absorptive ground surface)  
 Receiver source distance : 330.00 / 330.00 m  
 Receiver height : 6.20 / 6.20 m  
 Topography : 1 (Flat/gentle slope; no barrier)  
 Reference angle : 0.00

Results segment # 1: Queensway (day)

-----  
 Source height = 1.50 m

ROAD (0.00 + 59.79 + 0.00) = 59.79 dBA  

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.52	84.41	0.00	-20.39	-4.22	0.00	0.00	0.00	59.79

 -----

Segment Leq : 59.79 dBA

Total Leq All Segments: 59.79 dBA



Results segment # 1: Queensway (night)

-----  
Source height = 1.50 m

ROAD (0.00 + 52.20 + 0.00) = 52.20 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.52	76.81	0.00	-20.39	-4.22	0.00	0.00	0.00	52.20

-----

Segment Leq : 52.20 dBA

Total Leq All Segments: 52.20 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.79  
(NIGHT): 52.20

**Noise Calculations Receiver A**

**Bank Street Noise at Building Face**

Daytime noise at 15 m - all floors - 68.73 dBA

Daytime noise at 11.5 m

Origin	Distance	d1	15 m
	Noise	n1	68.73 dBA
Receiver	Distance	d2	11.5 m
	Noise (est.)		69.88 dBA

Note: Noise (est.) =  $n1 - 10\log(d2/d1)$

Nighttime noise at 15 m - all floors - 61.13 dBA

Nighttime noise at 11.5 m

Origin	Distance	d1	15 m
	Noise	n1	61.13 dBA
Receiver	Distance	d2	11.5 m
	Noise (est.)		62.28 dBA

**Combined Bank Street and Queensway Noise at Building Face**

2nd Floor

Daytime	antilog(L/10)		Nighttime	antilog(L/10)	
Bank	69.88	9727472.24	Bank	62.28	1690440.93
Queensway	59.79	952796.16	Queensway	52.20	165958.69
Total		10680268.40	Total		1856399.62
10Log		7.028582167	10Log		6.268671471
Combined		<b>70.29 dBA</b>	Combined		<b>62.69 dBA</b>

3rd Floor

Daytime	antilog(L/10)		Nighttime	antilog(L/10)	
Bank	69.88	9727472.24	Bank	62.28	1690440.93
Queensway	61.17	1309181.92	Queensway	53.56	226986.49
Total		11036654.16	Total		1917427.42
10Log		7.042837434	10Log		6.282718933
Combined		<b>70.43 dBA</b>	Combined		<b>62.83 dBA</b>

4th Floor

Daytime	antilog(L/10)		Nighttime	antilog(L/10)	
Bank	69.88	9727472.24	Bank	62.28	1690440.93
Queensway	62.57	1807174.13	Queensway	54.97	314050.87
Total		11534646.36	Total		2004491.80
10Log		7.062004284	10Log		6.302004284
Combined		<b>70.62 dBA</b>	Combined		<b>63.02 dBA</b>

5th Floor

Daytime	antilog(L/10)		Nighttime	antilog(L/10)	
Bank	69.88	9727472.24	Bank	62.28	1690440.93
Queensway	63.97	2494594.73	Queensway	56.38	434510.22
Total		12222066.96	Total		2124951.16
10Log		7.087144659	10Log		6.327348952
Combined		<b>70.87 dBA</b>	Combined		<b>63.27 dBA</b>

Filename: B2.te                    Time Period: Day/Night 16/8 hours  
Description: Rec B 2nd Floor

Road data, segment # 1: Bank Street (day/night)

-----  
Car traffic volume : 19430/1690 veh/TimePeriod \*  
Medium truck volume : 1546/134 veh/TimePeriod \*  
Heavy truck volume : 1104/96 veh/TimePeriod \*  
Posted speed limit : 40 km/h  
Road gradient : 1 %  
Road pavement : 1 (Typical asphalt or concrete)

\* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Bank Street (day/night)

-----  
Angle1 Angle2 : 0.00 deg 90.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 20.00 / 20.00 m  
Receiver height : 6.20 / 6.20 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00

Road data, segment # 2: Queensway (day/night)

-----  
Car traffic volume : 118739/10325 veh/TimePeriod \*  
Medium truck volume : 9445/821 veh/TimePeriod \*  
Heavy truck volume : 6747/587 veh/TimePeriod \*  
Posted speed limit : 100 km/h  
Road gradient : 1 %  
Road pavement : 1 (Typical asphalt or concrete)

\* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 146664  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00



Data for Segment # 2: Queensway (day/night)

```

-----
Angle1  Angle2      : -90.00 deg   90.00 deg
Wood depth      :      0      (No woods.)
No of house rows :      0 / 0
Surface         :      1      (Absorptive ground surface)
Receiver source distance : 330.00 / 330.00 m
Receiver height :      6.20 / 6.20 m
Topography      :      1      (Flat/gentle slope; no barrier)
Reference angle :      0.00
-----

```

Results segment # 1: Bank Street (day)

Source height = 1.50 m

ROAD (0.00 + 64.47 + 0.00) = 64.47 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	68.73	0.00	-1.25	-3.01	0.00	0.00	0.00	64.47

Segment Leq : 64.47 dBA

Results segment # 2: Queensway (day)

Source height = 1.50 m

ROAD (0.00 + 62.80 + 0.00) = 62.80 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.52	84.41	0.00	-20.39	-1.21	0.00	0.00	0.00	62.80

Segment Leq : 62.80 dBA

Total Leq All Segments: 66.73 dBA

Results segment # 1: Bank Street (night)

Source height = 1.50 m

ROAD (0.00 + 56.87 + 0.00) = 56.87 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.00	61.13	0.00	-1.25	-3.01	0.00	0.00	0.00	56.87

Segment Leq : 56.87 dBA

Results segment # 2: Queensway (night)

-----  
Source height = 1.50 m

ROAD (0.00 + 55.21 + 0.00) = 55.21 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.52	76.81	0.00	-20.39	-1.21	0.00	0.00	0.00	55.21

-----

Segment Leq : 55.21 dBA

Total Leq All Segments: 59.13 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.73  
(NIGHT): 59.13

Filename: C2bank.te                      Time Period: Day/Night 16/8 hours  
 Description: Rec C 2nd Floor

Road data, segment # 1: Bank Street (day/night)

```
-----
Car traffic volume   : 19430/1690  veh/TimePeriod  *
Medium truck volume : 1546/134   veh/TimePeriod  *
Heavy truck volume  : 1104/96    veh/TimePeriod  *
Posted speed limit  : 40 km/h
Road gradient       : 1 %
Road pavement      : 1 (Typical asphalt or concrete)
```

\* Refers to calculated road volumes based on the following input:

```
24 hr Traffic Volume (AADT or SADT): 24000
Percentage of Annual Growth         : 0.00
Number of Years of Growth           : 0.00
Medium Truck % of Total Volume      : 7.00
Heavy Truck % of Total Volume       : 5.00
Day (16 hrs) % of Total Volume      : 92.00
```

Data for Segment # 1: Bank Street (day/night)

```
-----
Angle1  Angle2           : -90.00 deg  0.00 deg
Wood depth           : 0 (No woods.)
No of house rows    : 0 / 0
Surface              : 2 (Reflective ground surface)
Receiver source distance : 24.00 / 24.00 m
Receiver height      : 6.20 / 6.20 m
Topography           : 1 (Flat/gentle slope; no barrier)
Reference angle      : 0.00
```

Results segment # 1: Bank Street (day)

Source height = 1.50 m

ROAD (0.00 + 63.68 + 0.00) = 63.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	68.73	0.00	-2.04	-3.01	0.00	0.00	0.00	63.68

Segment Leq : 63.68 dBA

Total Leq All Segments: 63.68 dBA

Results segment # 1: Bank Street (night)

-----  
Source height = 1.50 m

ROAD (0.00 + 56.08 + 0.00) = 56.08 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	61.13	0.00	-2.04	-3.01	0.00	0.00	0.00	56.08

-----

Segment Leq : 56.08 dBA

Total Leq All Segments: 56.08 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.68  
(NIGHT): 56.08



Filename: D2Queen.te                      Time Period: Day/Night 16/8 hours  
 Description: Rec D 2nd Floor

Road data, segment # 1: Queensway (day/night)

```
-----
Car traffic volume   : 118739/10325 veh/TimePeriod *
Medium truck volume : 9445/821   veh/TimePeriod *
Heavy truck volume  : 6747/587   veh/TimePeriod *
Posted speed limit  : 100 km/h
Road gradient       : 1 %
Road pavement      : 1 (Typical asphalt or concrete)
```

\* Refers to calculated road volumes based on the following input:

```
24 hr Traffic Volume (AADT or SADT): 146664
Percentage of Annual Growth       : 0.00
Number of Years of Growth         : 0.00
Medium Truck % of Total Volume    : 7.00
Heavy Truck % of Total Volume     : 5.00
Day (16 hrs) % of Total Volume    : 92.00
```

Data for Segment # 1: Queensway (day/night)

```
-----
Angle1  Angle2           : -30.00 deg  90.00 deg
Wood depth           : 0 (No woods.)
No of house rows    : 0 / 0
Surface              : 1 (Absorptive ground surface)
Receiver source distance : 337.00 / 337.00 m
Receiver height      : 6.20 / 6.20 m
Topography           : 1 (Flat/gentle slope; no barrier)
Reference angle      : 0.00
```

Results segment # 1: Queensway (day)

Source height = 1.50 m

```
ROAD (0.00 + 61.21 + 0.00) = 61.21 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
-----
-30    90    0.52 84.41  0.00 -20.53 -2.67  0.00  0.00  0.00  61.21
-----
```

Segment Leq : 61.21 dBA

Total Leq All Segments: 61.21 dBA

Results segment # 1: Queensway (night)

-----  
Source height = 1.50 m

ROAD (0.00 + 53.61 + 0.00) = 53.61 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-30	90	0.52	76.81	0.00	-20.53	-2.67	0.00	0.00	0.00	53.61

-----

Segment Leq : 53.61 dBA

Total Leq All Segments: 53.61 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.21  
(NIGHT): 53.61

Filename: B3.te                      Time Period: Day/Night 16/8 hours  
Description: Rec B 3rd Floor

Road data, segment # 1: Bank Street (day/night)

-----  
Car traffic volume : 19430/1690 veh/TimePeriod \*  
Medium truck volume : 1546/134 veh/TimePeriod \*  
Heavy truck volume : 1104/96 veh/TimePeriod \*  
Posted speed limit : 40 km/h  
Road gradient : 1 %  
Road pavement : 1 (Typical asphalt or concrete)

\* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Bank Street (day/night)

-----  
Angle1 Angle2 : 30.00 deg 90.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 21.00 / 21.00 m  
Receiver height : 9.20 / 9.20 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00

Road data, segment # 2: Queensway (day/night)

-----  
Car traffic volume : 118739/10325 veh/TimePeriod \*  
Medium truck volume : 9445/821 veh/TimePeriod \*  
Heavy truck volume : 6747/587 veh/TimePeriod \*  
Posted speed limit : 100 km/h  
Road gradient : 1 %  
Road pavement : 1 (Typical asphalt or concrete)

\* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 146664  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Queensway (day/night)

-----  
Angle1 Angle2 : -90.00 deg 90.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 1 (Absorptive ground surface)  
Receiver source distance : 333.00 / 333.00 m  
Receiver height : 9.20 / 9.20 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00

Results segment # 1: Bank Street (day)

-----  
Source height = 1.50 m

ROAD (0.00 + 62.49 + 0.00) = 62.49 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
30	90	0.00	68.73	0.00	-1.46	-4.77	0.00	0.00	0.00	62.49

-----

Segment Leq : 62.49 dBA

Results segment # 2: Queensway (day)

-----  
Source height = 1.50 m

ROAD (0.00 + 64.13 + 0.00) = 64.13 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.43	84.41	0.00	-19.24	-1.04	0.00	0.00	0.00	64.13

-----

Segment Leq : 64.13 dBA

Total Leq All Segments: 66.40 dBA

Results segment # 1: Bank Street (night)

-----  
Source height = 1.50 m

ROAD (0.00 + 54.90 + 0.00) = 54.90 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
30	90	0.00	61.13	0.00	-1.46	-4.77	0.00	0.00	0.00	54.90

-----

Segment Leq : 54.90 dBA



Results segment # 2: Queensway (night)

-----  
Source height = 1.50 m

ROAD (0.00 + 56.53 + 0.00) = 56.53 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.43	76.81	0.00	-19.24	-1.04	0.00	0.00	0.00	56.53

-----

Segment Leq : 56.53 dBA

Total Leq All Segments: 58.80 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.40  
(NIGHT): 58.80

Filename: C3bank.te                      Time Period: Day/Night 16/8 hours  
 Description: Rec C 3rd Floor

Road data, segment # 1: Bank Street (day/night)

```
-----
Car traffic volume   : 19430/1690  veh/TimePeriod  *
Medium truck volume : 1546/134   veh/TimePeriod  *
Heavy truck volume  : 1104/96    veh/TimePeriod  *
Posted speed limit  : 40 km/h
Road gradient       : 1 %
Road pavement      : 1 (Typical asphalt or concrete)
```

\* Refers to calculated road volumes based on the following input:

```
24 hr Traffic Volume (AADT or SADT): 24000
Percentage of Annual Growth         : 0.00
Number of Years of Growth           : 0.00
Medium Truck % of Total Volume      : 7.00
Heavy Truck % of Total Volume       : 5.00
Day (16 hrs) % of Total Volume      : 92.00
```

Data for Segment # 1: Bank Street (day/night)

```
-----
Angle1  Angle2           : -90.00 deg  0.00 deg
Wood depth           : 0 (No woods.)
No of house rows    : 0 / 0
Surface             : 2 (Reflective ground surface)
Receiver source distance : 24.00 / 24.00 m
Receiver height     : 9.20 / 9.20 m
Topography          : 1 (Flat/gentle slope; no barrier)
Reference angle     : 0.00
```

Results segment # 1: Bank Street (day)

Source height = 1.50 m

ROAD (0.00 + 63.68 + 0.00) = 63.68 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	68.73	0.00	-2.04	-3.01	0.00	0.00	0.00	63.68

Segment Leq : 63.68 dBA

Total Leq All Segments: 63.68 dBA

Results segment # 1: Bank Street (night)

-----  
Source height = 1.50 m

ROAD (0.00 + 56.08 + 0.00) = 56.08 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	61.13	0.00	-2.04	-3.01	0.00	0.00	0.00	56.08

-----

Segment Leq : 56.08 dBA

Total Leq All Segments: 56.08 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.68  
(NIGHT): 56.08

Filename: D3Queen.te                      Time Period: Day/Night 16/8 hours  
 Description: Rec D 3rd Floor

Road data, segment # 1: Queensway (day/night)

-----  
 Car traffic volume : 118739/10325 veh/TimePeriod \*  
 Medium truck volume : 9445/821 veh/TimePeriod \*  
 Heavy truck volume : 6747/587 veh/TimePeriod \*  
 Posted speed limit : 100 km/h  
 Road gradient : 1 %  
 Road pavement : 1 (Typical asphalt or concrete)

\* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 146664  
 Percentage of Annual Growth : 0.00  
 Number of Years of Growth : 0.00  
 Medium Truck % of Total Volume : 7.00  
 Heavy Truck % of Total Volume : 5.00  
 Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Queensway (day/night)

-----  
 Angle1 Angle2 : -30.00 deg 90.00 deg  
 Wood depth : 0 (No woods.)  
 No of house rows : 0 / 0  
 Surface : 1 (Absorptive ground surface)  
 Receiver source distance : 337.00 / 337.00 m  
 Receiver height : 9.20 / 9.20 m  
 Topography : 1 (Flat/gentle slope; no barrier)  
 Reference angle : 0.00

Results segment # 1: Queensway (day)

-----  
 Source height = 1.50 m

ROAD (0.00 + 62.55 + 0.00) = 62.55 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-30	90	0.43	84.41	0.00	-19.32	-2.54	0.00	0.00	0.00	62.55

-----

Segment Leq : 62.55 dBA

Total Leq All Segments: 62.55 dBA



Results segment # 1: Queensway (night)

-----  
Source height = 1.50 m

ROAD (0.00 + 54.95 + 0.00) = 54.95 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-30	90	0.43	76.81	0.00	-19.32	-2.54	0.00	0.00	0.00	54.95

-----  
Segment Leq : 54.95 dBA

Total Leq All Segments: 54.95 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.55  
(NIGHT): 54.95

Filename: B4.te                    Time Period: Day/Night 16/8 hours  
Description: Rec B 4th Floor

Road data, segment # 1: Bank Street (day/night)

-----  
Car traffic volume : 19430/1690 veh/TimePeriod \*  
Medium truck volume : 1546/134 veh/TimePeriod \*  
Heavy truck volume : 1104/96 veh/TimePeriod \*  
Posted speed limit : 40 km/h  
Road gradient : 1 %  
Road pavement : 1 (Typical asphalt or concrete)

\* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24000  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 1: Bank Street (day/night)

-----  
Angle1 Angle2 : 30.00 deg 90.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 2 (Reflective ground surface)  
Receiver source distance : 21.00 / 21.00 m  
Receiver height : 12.20 / 12.20 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00

Road data, segment # 2: Queensway (day/night)

-----  
Car traffic volume : 118739/10325 veh/TimePeriod \*  
Medium truck volume : 9445/821 veh/TimePeriod \*  
Heavy truck volume : 6747/587 veh/TimePeriod \*  
Posted speed limit : 100 km/h  
Road gradient : 1 %  
Road pavement : 1 (Typical asphalt or concrete)

\* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 146664  
Percentage of Annual Growth : 0.00  
Number of Years of Growth : 0.00  
Medium Truck % of Total Volume : 7.00  
Heavy Truck % of Total Volume : 5.00  
Day (16 hrs) % of Total Volume : 92.00

Data for Segment # 2: Queensway (day/night)

-----  
Angle1 Angle2 : -90.00 deg 90.00 deg  
Wood depth : 0 (No woods.)  
No of house rows : 0 / 0  
Surface : 1 (Absorptive ground surface)  
Receiver source distance : 333.00 / 333.00 m  
Receiver height : 12.20 / 12.20 m  
Topography : 1 (Flat/gentle slope; no barrier)  
Reference angle : 0.00

Results segment # 1: Bank Street (day)

-----  
Source height = 1.50 m

ROAD (0.00 + 62.49 + 0.00) = 62.49 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
30	90	0.00	68.73	0.00	-1.46	-4.77	0.00	0.00	0.00	62.49

-----  
Segment Leq : 62.49 dBA

Results segment # 2: Queensway (day)

-----  
Source height = 1.50 m

ROAD (0.00 + 65.52 + 0.00) = 65.52 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.34	84.41	0.00	-18.03	-0.85	0.00	0.00	0.00	65.52

-----  
Segment Leq : 65.52 dBA

Total Leq All Segments: 67.27 dBA

Results segment # 1: Bank Street (night)

-----  
Source height = 1.50 m

ROAD (0.00 + 54.90 + 0.00) = 54.90 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
30	90	0.00	61.13	0.00	-1.46	-4.77	0.00	0.00	0.00	54.90

-----  
Segment Leq : 54.90 dBA

Results segment # 2: Queensway (night)

---

Source height = 1.50 m

ROAD (0.00 + 57.93 + 0.00) = 57.93 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.34	76.81	0.00	-18.03	-0.85	0.00	0.00	0.00	57.93

---

Segment Leq : 57.93 dBA

Total Leq All Segments: 59.68 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.27  
(NIGHT): 59.68



Filename: B5.te                    Time Period: Day/Night 16/8 hours  
Description: Rec B 5th Floor

Road data, segment # 1: Bank Street (day/night)

-----  
Car traffic volume    : 19430/1690    veh/TimePeriod    \*  
Medium truck volume : 1546/134     veh/TimePeriod    \*  
Heavy truck volume  : 1104/96      veh/TimePeriod    \*  
Posted speed limit   :     40 km/h  
Road gradient        :     1 %  
Road pavement        :     1 (Typical asphalt or concrete)

\* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24000  
Percentage of Annual Growth        : 0.00  
Number of Years of Growth         : 0.00  
Medium Truck % of Total Volume    : 7.00  
Heavy Truck % of Total Volume     : 5.00  
Day (16 hrs) % of Total Volume    : 92.00

Data for Segment # 1: Bank Street (day/night)

-----  
Angle1    Angle2                    : 30.00 deg    90.00 deg  
Wood depth                        :     0        (No woods.)  
No of house rows                  :     0 / 0  
Surface                            :     2        (Reflective ground surface)  
Receiver source distance         : 21.00 / 21.00 m  
Receiver height                    : 15.20 / 15.20 m  
Topography                        :     1        (Flat/gentle slope; no barrier)  
Reference angle                    :     0.00

Road data, segment # 2: Queensway (day/night)

-----  
Car traffic volume    : 118739/10325 veh/TimePeriod    \*  
Medium truck volume : 9445/821     veh/TimePeriod    \*  
Heavy truck volume  : 6747/587     veh/TimePeriod    \*  
Posted speed limit   :    100 km/h  
Road gradient        :     1 %  
Road pavement        :     1 (Typical asphalt or concrete)

\* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 146664  
Percentage of Annual Growth        : 0.00  
Number of Years of Growth         : 0.00  
Medium Truck % of Total Volume    : 7.00  
Heavy Truck % of Total Volume     : 5.00  
Day (16 hrs) % of Total Volume    : 92.00

Data for Segment # 2: Queensway (day/night)

```

-----
Angle1  Angle2      : -90.00 deg   90.00 deg
Wood depth      :      0      (No woods.)
No of house rows :      0 / 0
Surface         :      1      (Absorptive ground surface)
Receiver source distance : 333.00 / 333.00 m
Receiver height  : 15.20 / 15.20 m
Topography      :      1      (Flat/gentle slope; no barrier)
Reference angle  :      0.00
  
```

Results segment # 1: Bank Street (day)

Source height = 1.50 m

ROAD (0.00 + 62.49 + 0.00) = 62.49 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
30	90	0.00	68.73	0.00	-1.46	-4.77	0.00	0.00	0.00	62.49

Segment Leq : 62.49 dBA

Results segment # 2: Queensway (day)

Source height = 1.50 m

ROAD (0.00 + 66.94 + 0.00) = 66.94 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.25	84.41	0.00	-16.82	-0.65	0.00	0.00	0.00	66.94

Segment Leq : 66.94 dBA

Total Leq All Segments: 68.27 dBA

Results segment # 1: Bank Street (night)

Source height = 1.50 m

ROAD (0.00 + 54.90 + 0.00) = 54.90 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
30	90	0.00	61.13	0.00	-1.46	-4.77	0.00	0.00	0.00	54.90

Segment Leq : 54.90 dBA

Results segment # 2: Queensway (night)

-----  
Source height = 1.50 m

ROAD (0.00 + 59.34 + 0.00) = 59.34 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.25	76.81	0.00	-16.82	-0.65	0.00	0.00	0.00	59.34

-----

Segment Leq : 59.34 dBA

Total Leq All Segments: 60.67 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.27  
(NIGHT): 60.67

**Unit 100 Living/Dining Room - 5th Floor**

Reverse Evaluation of Sound Transmission Class (STC) for Building Components

1.0	Free field sound level	70.87	dB(A)	Noise source	
	Correction for reflections	3	dB(A)	Road	
	Outdoor sound level	73.87	dB(A)	Indoor Quarters	
	Indoor sound level (Daytime)	45	dB(A)	Living	
	Required Noise Reduction (NR)	28.87	dB	Subtract indoor from outdoor sound level	
2.0	Sound angle of incidence	0 to 90 degrees		C <sub>1</sub> Correction from Table 7.7	0 dB
				Sum	28.87 dB

	Component:	Wall		STC	50 dB
3.0	Noise spectrum type	D - Mixed Road Traffic, Distant Aircraft		C <sub>4</sub> from Table 7.10	7 dB
	Component category	d. Sealed thick window, or exterior wall, or roof/ceiling		Correction	-7 dB
4.0	Room floor area	34.6 m <sup>2</sup>	43.64162 % of floor area		
	Component Area	15.1 m <sup>2</sup>			
	Room absorption category	Intermediate		C <sub>3</sub> from Table 7.9	-4 dB
				Correction	4 dB
5.0	Noise reduction if only this component transmits sound				47 dB
6.0	Required noise reduction (from Step 1)				29 dB
7.0	Term C <sub>2</sub> : Subtract the Required NR from the Noise Reduction for this component				18 dB
8.0	Determine from Table 7.8 the corresponding value of total transmitted sound energy				5 %

	Component:	Window		After step 2	28.87 dB
9.0	Transmits	95 % of total sound energy		C <sub>2</sub> from Table 7.8	0 dB
10.0	Room floor area	34.6 m <sup>2</sup>	38.15029 % of floor area		
	Component Area	13.2 m <sup>2</sup>			
	Room absorption category	Intermediate		C <sub>3</sub> from Table 7.9	-4 dB
11.0	Noise spectrum type	D - Mixed Road Traffic, Distant Aircraft		C <sub>4</sub> from Table 7.10	7 dB
	Component category	d. Sealed thick window, or exterior wall, or roof/ceil.			
				STC=NR+C <sub>1</sub> +C <sub>2</sub> +C <sub>3</sub> +C <sub>4</sub>	Required STC 32

Tables from Environmental Noise Assessment in Land Use Planning, dated 1999, published by the MOE



Unit 100 Bedroom - 5th Floor

Reverse Evaluation of Sound Transmission Class (STC) for Building Components

1.0	Free field sound level	63.27	dB	Noise source	Road
	Correction for reflections	3	dB	Indoor Quarters	Sleeping
	Outdoor sound level	66.27	dB		
	Indoor sound level (Night time)	40	dB		
	Required Noise Reduction (NR)	26.27	dB	Subtract indoor from outdoor sound level	
2.0	Sound angle of incidence	0 to 90 degrees		C <sub>1</sub> Correction from Table 7.7	0 dB
				Sum	26.27 dB

Component:	Wall		STC	50	dB
3.0	Noise spectrum type	D - Mixed Road Traffic, Distant Aircraft	C <sub>4</sub> from Table 7.10	7	dB
	Component category	d. Sealed thick window, or exterior wall, or roof/ceiling	Correction	-7	dB
4.0	Room floor area	14.4 m <sup>2</sup>	22.91667 % of floor area		
	Component Area	3.3 m <sup>2</sup>			
	Room absorption category	Very Absorptive	C <sub>3</sub> from Table 7.9	-5	dB
			Correction	5	dB
5.0	Noise reduction if only this component transmits sound			48	dB
6.0	Required noise reduction (from Step 1)			26	dB
7.0	Term C <sub>2</sub> : Subtract the Required NR from the Noise Reduction for this component			22	dB
8.0	Determine from Table 7.8 the corresponding value of total transmitted sound energy			5	%

Component:	Window		After step 2	26.27	dB
9.0	Transmits	95 % of total sound energy	C <sub>2</sub> from Table 7.8	0	dB
10.0	Room floor area	14.4 m <sup>2</sup>	43.75 % of floor area		
	Component Area	6.3 m <sup>2</sup>			
	Room absorption category	Very Absorptive	C <sub>3</sub> from Table 7.9	-5	dB
11.0	Noise spectrum type	D - Mixed Road Traffic, Distant Aircraft	C <sub>4</sub> from Table 7.10	7	dB
	Component category	d. Sealed thick window, or exterior wall, or roof/ceiling			
			STC=NR+C <sub>1</sub> +C <sub>2</sub> +C <sub>3</sub> +C <sub>4</sub>	Required STC	28

Tables from Environmental Noise Assessment in Land Use Planning, dated 1999, published by the MOE

**Unit 200 Living/Dining Room - 5th Floor**

Reverse Evaluation of Sound Transmission Class (STC) for Building Components

<b>1.0</b>	Free field sound level	<u>70.87</u> dBA	Noise source	
	Correction for reflections	<u>3</u> dBA	Road	▼
	Outdoor sound level	<u>73.87</u> dBA	Indoor Quarters	
	Indoor sound level (Daytime)	<u>45</u> dBA	Living	▼
	Required Noise Reduction (NR)	<u>28.87</u> dB	Subtract indoor from outdoor sound level	
<b>2.0</b>	Sound angle of incidence	0 to 90 degrees ▼	C <sub>1</sub> Correction from Table 7.7	<u>0</u> dB
			Sum	<u>28.87</u> dB

	Component:	Wall ▼	STC	<u>50</u> dB
<b>3.0</b>	Noise spectrum type	D - Mixed Road Traffic, Distant Aircraft ▼	C <sub>4</sub> from Table 7.10	<u>7</u> dB
	Component category	d. Sealed thick window, or exterior wall, or roof/ceiling ▼	Correction	<u>-7</u> dB
<b>4.0</b>	Room floor area	<u>31.7</u> m <sup>2</sup> 36.2776 % of floor area		
	Component Area	<u>11.5</u> m <sup>2</sup>		
	Room absorption category	Intermediate ▼	C <sub>3</sub> from Table 7.9	<u>-6</u> dB
			Correction	<u>6</u> dB
<b>5.0</b>	Noise reduction if only this component transmits sound			<u>49</u> dB
<b>6.0</b>	Required noise reduction (from Step 1)			<u>29</u> dB
<b>7.0</b>	Term C <sub>2</sub> : Subtract the Required NR from the Noise Reduction for this component			<u>20</u> dB
<b>8.0</b>	Determine from Table 7.8 the corresponding value of total transmitted sound energy			<u>5</u> %

	Component:	Window ▼	After step 2	<u>28.87</u> dB
<b>9.0</b>	Transmits	95 % of total sound energy	C <sub>2</sub> from Table 7.8	<u>0</u> dB
<b>10.0</b>	Room floor area	<u>31.7</u> m <sup>2</sup> 20.50473 % of floor area		
	Component Area	<u>6.5</u> m <sup>2</sup>		
	Room absorption category	Intermediate ▼	C <sub>3</sub> from Table 7.9	<u>-6</u> dB
<b>11.0</b>	Noise spectrum type	D - Mixed Road Traffic, Distant Aircraft ▼	C <sub>4</sub> from Table 7.10	<u>7</u> dB
	Component category	d. Sealed thick window, or exterior wall, or roof/ceil. ▼		
		STC=NR+C <sub>1</sub> +C <sub>2</sub> +C <sub>3</sub> +C <sub>4</sub>	Required STC	<u>30</u>

Tables from Environmental Noise Assessment in Land Use Planning, dated 1999, published by the MOE

**Unit 200 Bedroom - 5th Floor**

Reverse Evaluation of Sound Transmission Class (STC) for Building Components

1.0	Free field sound level	63.27	dB	Noise source	Road
	Correction for reflections	3	dB	Indoor Quarters	Sleeping
	Outdoor sound level	66.27	dB		
	Indoor sound level (Night time)	40	dB		
	Required Noise Reduction (NR)	26.27	dB	Subtract indoor from outdoor sound level	
2.0	Sound angle of incidence	0 to 90 degrees		C <sub>1</sub> Correction from Table 7.7	0 dB
				Sum	26.27 dB

Component:	Wall	STC	50 dB
3.0	Noise spectrum type	D - Mixed Road Traffic, Distant Aircraft	C <sub>4</sub> from Table 7.10 7 dB
	Component category	d. Sealed thick window, or exterior wall, or roof/ceiling	Correction -7 dB
4.0	Room floor area	13.3 m <sup>2</sup>	31.57895 % of floor area
	Component Area	4.2 m <sup>2</sup>	
	Room absorption category	Very Absorptive	C <sub>3</sub> from Table 7.9 -8 dB
			Correction 8 dB
5.0	Noise reduction if only this component transmits sound		51 dB
6.0	Required noise reduction (from Step 1)		26 dB
7.0	Term C <sub>2</sub> : Subtract the Required NR from the Noise Reduction for this component		25 dB
8.0	Determine from Table 7.8 the corresponding value of total transmitted sound energy		5 %

Component:	Window	After step 2	26.27 dB
9.0	Transmits	95 % of total sound energy	C <sub>2</sub> from Table 7.8 0 dB
10.0	Room floor area	13.3 m <sup>2</sup>	24.81203 % of floor area
	Component Area	3.3 m <sup>2</sup>	
	Room absorption category	Very Absorptive	C <sub>3</sub> from Table 7.9 -8 dB
11.0	Noise spectrum type	D - Mixed Road Traffic, Distant Aircraft	C <sub>4</sub> from Table 7.10 7 dB
	Component category	d. Sealed thick window, or exterior wall, or roof/ceil	
		STC=NR+C <sub>1</sub> +C <sub>2</sub> +C <sub>3</sub> +C <sub>4</sub>	Required STC 25

Tables from Environmental Noise Assessment in Land Use Planning, dated 1999, published by the MOE



Unit 300 Living/Dining Room - 2nd Floor

Reverse Evaluation of Sound Transmission Class (STC) for Building Components

1.0	Free field sound level	70.29	dB(A)	Noise source	
	Correction for reflections	3	dB(A)	Road	
	Outdoor sound level	73.29	dB(A)	Indoor Quarters	
	Indoor sound level (Daytime)	45	dB(A)	Living	
	Required Noise Reduction (NR)	28.29	dB	Subtract indoor from outdoor sound level	
2.0	Sound angle of incidence	0 to 90 degrees		C <sub>1</sub> Correction from Table 7.7	0 dB
				Sum	28.29 dB

	Component:	Wall		STC	50 dB
3.0	Noise spectrum type	D - Mixed Road Traffic, Distant Aircraft		C <sub>4</sub> from Table 7.10	7 dB
	Component category	d. Sealed thick window, or exterior wall, or roof/ceiling		Correction	-7 dB
4.0	Room floor area	38.4 m <sup>2</sup>	70.3125 % of floor area		
	Component Area	27 m <sup>2</sup>			
	Room absorption category	Intermediate		C <sub>3</sub> from Table 7.9	-3 dB
				Correction	3 dB
5.0	Noise reduction if only this component transmits sound				46 dB
6.0	Required noise reduction (from Step 1)				28 dB
7.0	Term C <sub>2</sub> : Subtract the Required NR from the Noise Reduction for this component				18 dB
8.0	Determine from Table 7.8 the corresponding value of total transmitted sound energy				5 %

	Component:	Window		After step 2	28.29 dB
9.0	Transmits	95 % of total sound energy		C <sub>2</sub> from Table 7.8	0 dB
10.0	Room floor area	38.4 m <sup>2</sup>	40.625 % of floor area		
	Component Area	15.6 m <sup>2</sup>			
	Room absorption category	Intermediate		C <sub>3</sub> from Table 7.9	-3 dB
11.0	Noise spectrum type	D - Mixed Road Traffic, Distant Aircraft		C <sub>4</sub> from Table 7.10	7 dB
	Component category	d. Sealed thick window, or exterior wall, or roof/ceil			
				STC=NR+C <sub>1</sub> +C <sub>2</sub> +C <sub>3</sub> +C <sub>4</sub>	Required STC 32

Tables from Environmental Noise Assessment in Land Use Planning, dated 1999, published by the MOE



**Unit 300 Bedroom - 2nd Floor**

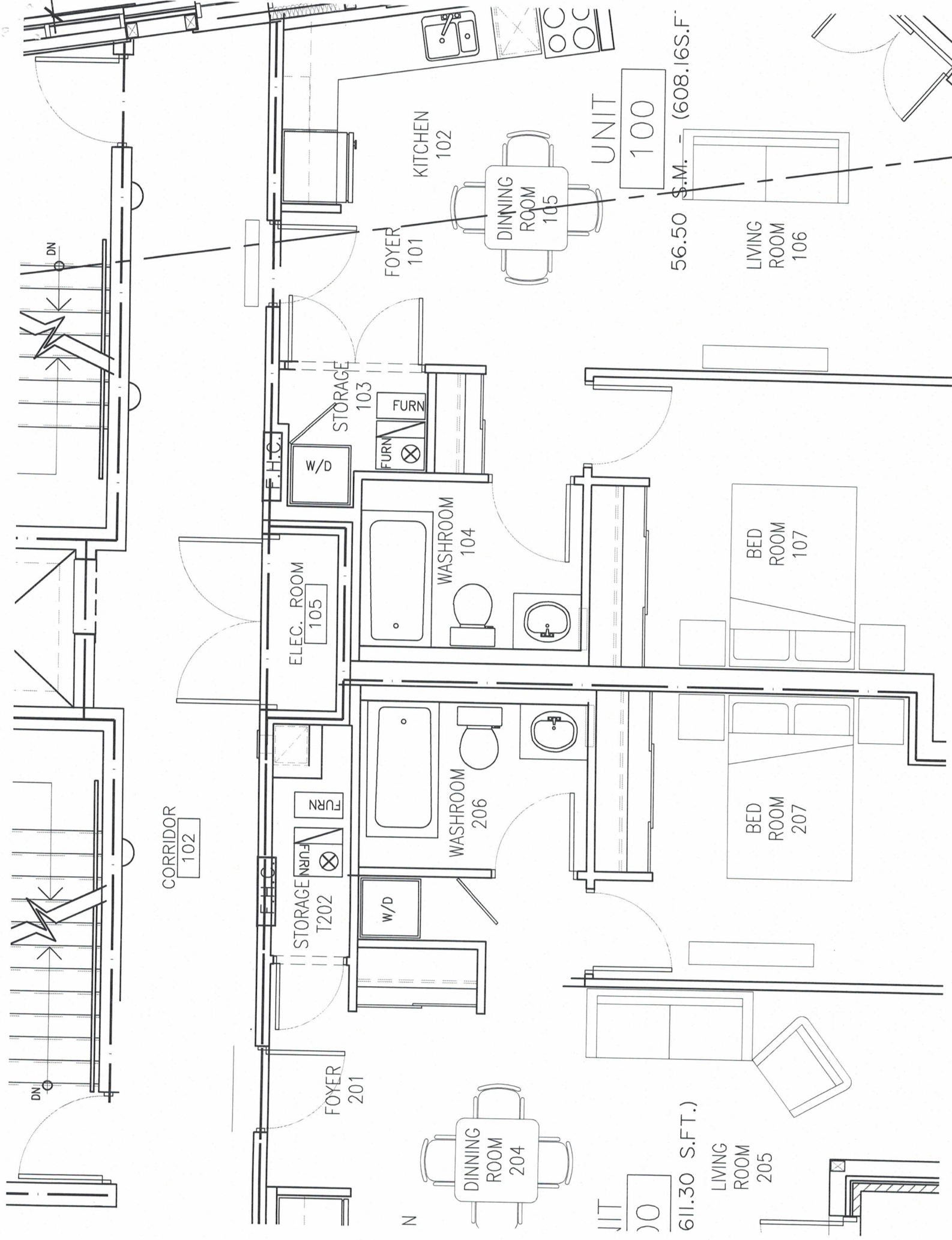
Reverse Evaluation of Sound Transmission Class (STC) for Building Components

1.0	Free field sound level	59.13	dB	Noise source	Road
	Correction for reflections	3	dB	Indoor Quarters	Sleeping
	Outdoor sound level	62.13	dB		
	Indoor sound level (Night time)	40	dB		
	Required Noise Reduction (NR)	22.13	dB	Subtract indoor from outdoor sound level	
2.0	Sound angle of incidence	60 to 90 degrees		C <sub>1</sub> Correction from Table 7.7	3 dB
				Sum	25.13 dB

	Component:	Wall		STC	50 dB
3.0	Noise spectrum type	D - Mixed Road Traffic, Distant Aircraft		C <sub>4</sub> from Table 7.10	7 dB
	Component category	d. Sealed thick window, or exterior wall, or roof/ceiling		Correction	-7 dB
4.0	Room floor area	12.8 m <sup>2</sup>	79.6875 % of floor area		
	Component Area	10.2 m <sup>2</sup>			
	Room absorption category	Very Absorptive		C <sub>3</sub> from Table 7.9	-10 dB
				Correction	10 dB
5.0	Noise reduction if only this component transmits sound				53 dB
6.0	Required noise reduction (from Step 1)				22 dB
7.0	Term C <sub>2</sub> : Subtract the Required NR from the Noise Reduction for this component				31 dB
8.0	Determine from Table 7.8 the corresponding value of total transmitted sound energy				5 %

	Component:	Window		After step 2	25.13 dB
9.0	Transmits	95 % of total sound energy		C <sub>2</sub> from Table 7.8	0 dB
10.0	Room floor area	12.8 m <sup>2</sup>	14.0625 % of floor area		
	Component Area	1.8 m <sup>2</sup>			
	Room absorption category	Very Absorptive		C <sub>3</sub> from Table 7.9	-10 dB
11.0	Noise spectrum type	D - Mixed Road Traffic, Distant Aircraft		C <sub>4</sub> from Table 7.10	7 dB
	Component category	d. Sealed thick window, or exterior wall, or roof/ceil			
				STC=NR+C <sub>1</sub> +C <sub>2</sub> +C <sub>3</sub> +C <sub>4</sub>	Required STC 22

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FOYER  
101

KITCHEN  
102

DINING  
ROOM  
105

LIVING  
ROOM  
106

STORAGE  
103

WASHROOM  
104

BED  
ROOM  
107

ELEC. ROOM  
105

CORRIDOR  
102

WASHROOM  
206

BED  
ROOM  
207

STORAGE  
T202

FOYER  
201

DINING  
ROOM  
204

LIVING  
ROOM  
205

56.50 S.M. (608.16 S.F.)

611.30 S.F.T.

N