

NSR ID	Description	Land Use	Existing/ Planned NSR	No. of Floor	Assessment Floor	Assessment Level (mPD)	Ground-borne Noise Criteria, dB(A)	Tunnel Elevation (mPD)	Tunnel Diameter (m)	Distance between Tunnel and Receiver (m)	No. of Hydraulic Breakers used on site	No. of Hand-held Breakers used on site	No. of Drilling Rig used on site	Ground-borne Noise Impact from Hydraulic Breakers, dB(A)	Ground-borne Noise Impact from Hand- held Breakers, dB(A)	Ground-borne Noise Impact from Drilling Rig, dB(A)	Ground-borne Noise of each Activity, dB(A)
							Daytime										
LPT	Village House, Leng Pei Tsuen	Residential	Existing	1	G/F	28.3	65	-7.5	11.0	24.8	0	0	4	0	0	34	34
STS	Village House, Sze Tei Shan	Residential	Existing	1	G/F	26.3	65	-13.4	11.0	28.7	0	0	4	0	0	34	34

- Investigation

Building Coupling Loss (BCF)

Building Type		Limit	Building Coupling Loss (dB)					
			16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz
1	Large Masonry Building on Pile	Lower	-6	-7	-11	-13	-14	-12
2	Large Masonry Building on Spread Footings	Lower	-12	-14	-14	-13	-11	-10
3	1 to 2 Storey Residential	Lower	-4	-5	-5	-4	-3	-1
4	Building Foundation on Rock Layer		0	0	0	0	0	0

Note(s):

- 1) Reference: Saurenman, H., Nelson, J., Wilson, G. 1982, Handbook of Urban Rail Noise and Vibration Control, US Department of Transportation Urban Mass Transportation Administration (Figure 8.12)
- 2) For conservative assessment, the lower limit adjustment factors (**BOLD**) will be used in the study

Building Vibration Response (BVR)

Building Structure Attenuation (BSA) ⁽¹⁾

	Frequency					
	16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz
Floor Attenuation Factor, dB	0	0	0	0	0	0

Building Structure Resonance (BSR) ⁽²⁾

	Frequency					
	16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz
Floor and Wall Resonance, dB	6	6	6	6	6	6

Building Vibration Response (BVR) at Ground Floor

	Frequency					
	16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz
Building Vibration Response, dB	6	6	6	6	6	6

Note(s):

1) Reference: Saurenman, H., Nelson, J., Wilson, G. 1982, Handbook of Urban Rail Noise and Vibration Control, US Department of Transportation Urban Mass Transportation Administration (Figure 8.12)

2) Reference: Hanson, C., Towers, D., Meister, L. 2006, Transit Noise and Vibration Impact Assessment Final Report, US Department of Transportation Urban Mass Transportation Administration.

Conversion from Vibration to Noise (CTN)

	Octave Band Centre Frequency (Hz)					
	16	31.5	63	125	250	500
K_{rad} (dB)	0.0	0.0	0.0	0.0	0.0	0.0
A weighting correction	-56.7	-39.4	-26.2	-16.1	-8.6	-3.2
CTN (for vibration), dB	-56.7	-39.4	-26.2	-16.1	-8.6	-3.2

For L_v vibration level reference to 1μ in/s

Reverberant Sound Pressure Level, L_A (dBA) = L_v (VdB ref 1μ in/s) + CTN

CTN = K_{rad} + A-weighting Correction

Conversion Factors for Multiple Vibration Sources

No. of Equipments Used Concurrently	Multiple Source Correction, dB(A)
1	0
2	3
3	5
4	6
5	7
>=6	*

Note(*): Multiple Source Correction, dB(A), for no. of equipments used concurrently more than or equal to 6 should be determined by standard acoustic principle.

Conversion Factors for Construction Equipments

Construction Equipments	Construction Site	Vibration (RMS) at Reference Distance of 5.5m from source (mm/s)
Drilling Rig	Salisbury Road Overrun Tunnel	0.536
Hydraulic Breaker	TST site	0.298
Handheld Breaker	New World Centre site	0.279

Ref: Appendix 7-1 of Kowloon Southern Link EIA Report

Conversion from Hydraulic Breaker to Handheld Breaker, dB(A)

$$= 20 \times \text{Log} (\text{Vibration (RMS) of Handheld Breaker} / \text{Vibration (RMS) of Hydraulic Breaker})$$

$$= 20 \times \text{Log} (0.279/0.298)$$

$$= -0.6 \text{ dB(A)}$$

Conversion from Hydraulic Breaker to Drilling Rig, dB(A)

$$= 20 \times \text{Log} (\text{Vibration (RMS) of Drilling Rig} / \text{Vibration (RMS) of Hydraulic Breaker})$$

$$= 20 \times \text{Log} (0.536/0.298)$$

$$= +5.1 \text{ dB(A)}$$

Agreement No. CE45/2008 (CE)
Liantang/ Heung Yuen Wai Boundary Crossing Point
and Associated Works
- Investigation

Appendix 4.5f

NSR ID.: LPT		Village House, Leng Pei Tsuen		Building Type:		3				
		NSR distance: 24.8 m								
		Assessment Floor: G/F								
Items	Description	Octave Band Frequency, Hz								
		16	31.5	63	125	250	500			
a)	Source Vibratory Velocity (Based on site measurement with an excavator-mounted breaker operating at distance Ro=5.5m)	mm/s	=	0.05886	0.06816	0.06195	0.05033	0.06225	0.12091	
b)	Source Vibratory Velocity	in/s	=	2.32E-03	2.68E-03	2.44E-03	1.98E-03	2.45E-03	4.76E-03	
c)	Vibration Velocity (ref. 10 ⁻⁶ in/s)	20 log (V/Vref)	=	67	69	68	66	68	74	
d)	Distance Attenuation r= 24.8 m	-20 log (r/ro)	=	-13	-13	-13	-13	-13	-13	
e)	Soil Damping Loss (Soil) (Dampng loss limited to no greater than 40dB in any frequenc band)	dB	=	-4.2	-8.3	-16.6	-33	-40	-40	
f)	Building Coupling Loss	dB	=	-4	-5	-5	-4	-3	-1	
g)	Building Vibration Response	dB	=	6	6	6	6	6	6	
h)	Conversion from Vibration to Noise	dB	=	-56.7	-39.4	-26.2	-16.1	-8.6	-3.2	
i)	Multiple Vibration Soures (C _{multi})	dB	=	0	0	0	0	0	0	
j)	Predicted Noise Level for Hydraulic Breaker (c+d+e+f+g+h+i)	dB(A)	=	-5	9	13	6	9	22	
									Predicted Noise Level for Hydraulic Breaker	23.2 dB(A)
									Corrected Noise Level for Drill Rig	28.3 dB(A)
NSR ID.: STS		Village House, Sze Tei Shan		Building Type:		3				
		NSR distance: 28.7 m								
		Assessment Floor: G/F								
Items	Description	Octave Band Frequency, Hz								
		16	31.5	63	125	250	500			
a)	Source Vibratory Velocity (Based on site measurement with an excavator-mounted breaker operating at distance Ro=5.5m)	mm/s	=	0.05886	0.06816	0.06195	0.05033	0.06225	0.12091	
b)	Source Vibratory Velocity	in/s	=	2.32E-03	2.68E-03	2.44E-03	1.98E-03	2.45E-03	4.76E-03	
c)	Vibration Velocity (ref. 10 ⁻⁶ in/s)	20 log (V/Vref)	=	67	69	68	66	68	74	
d)	Distance Attenuation r= 28.7 m	-20 log (r/ro)	=	-14	-14	-14	-14	-14	-14	
e)	Soil Damping Loss (Soil) (Dampng loss limited to no greater than 40dB in any frequenc band)	dB	=	-3.5	-6.8	-13.6	-27.1	-40	-40	
f)	Building Coupling Loss	dB	=	-4	-5	-5	-4	-3	-1	
g)	Building Vibration Response	dB	=	6	6	6	6	6	6	
h)	Conversion from Vibration to Noise	dB	=	-56.7	-39.4	-26.2	-16.1	-8.6	-3.2	
i)	Multiple Vibration Soures (C _{multi})	dB	=	0	0	0	0	0	0	
j)	Predicted Noise Level for Hydraulic Breaker (c+d+e+f+g+h+i)	dB(A)	=	-5	9	15	10	8	21	
									Predicted Noise Level for Hydraulic Breaker	22.5 dB(A)
									Corrected Noise Level for Drill Rig	27.6 dB(A)