

Ground-borne noise due to piling work for main building (while touching bedrock)

Receiver	YMCA of Hong Kong	Marco Polo Hong Kong Hotel	Hankow Centre	Bo Yip Building	HKCC (Concert Hall)	HKCC (Grand Theatre)	HKCC (Studio Theatre)	Hong Kong Space Museum (Recording Studio)	Hong Kong Space Museum (Sky Theatre)
Source Strength (p.p.v), mm/s (base ramming)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Source Strength distance, m	10	10	10	10	10	10	10	10	10
p.p.v to rms conversion factor	4	4	4	4	4	4	4	4	4
ref velocity, m/s	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08
Distance	120	65	110	125	175	250	155	265	265
p.p.v at receiver, m/s	3.6E-05	9.1E-05	4.1E-05	3.4E-05	2.0E-05	1.2E-05	2.5E-05	1.1E-05	1.1E-05
rms velocity, m/s	9.0E-06	2.3E-05	1.0E-05	8.5E-06	5.1E-06	3.0E-06	6.1E-06	2.7E-06	2.7E-06
Lv, VdB	51.0	59.0	52.1	50.5	46.1	41.4	47.7	40.7	40.7
Distance	110	50	110	140	150	225	130	250	250
p.p.v at receiver, m/s	4.1E-05	1.3E-04	4.1E-05	2.9E-05	2.6E-05	1.4E-05	3.2E-05	1.2E-05	1.2E-05
rms velocity, m/s	1.0E-05	3.4E-05	1.0E-05	7.2E-06	6.5E-06	3.5E-06	8.0E-06	3.0E-06	3.0E-06
Lv, VdB	52.1	62.4	52.1	49.0	48.1	42.8	50.0	41.4	41.4
Distance	95	60	95	140	135	205	110	225	225
p.p.v at receiver, m/s	5.1E-05	1.0E-04	5.1E-05	2.9E-05	3.0E-05	1.6E-05	4.1E-05	1.4E-05	1.4E-05
rms velocity, m/s	1.3E-05	2.6E-05	1.3E-05	7.2E-06	7.6E-06	4.0E-06	1.0E-05	3.5E-06	3.5E-06
Lv, VdB	54.1	60.0	54.1	49.0	49.5	44.0	52.1	42.8	42.8
Distance	75	80	75	130	140	200	110	215	215
p.p.v at receiver, m/s	7.3E-05	6.6E-05	7.3E-05	3.2E-05	2.9E-05	1.7E-05	4.1E-05	1.5E-05	1.5E-05
rms velocity, m/s	1.8E-05	1.7E-05	1.8E-05	8.0E-06	7.2E-06	4.2E-06	1.0E-05	3.8E-06	3.8E-06
Lv, VdB	57.1	56.3	57.1	50.0	49.0	44.4	52.1	43.4	43.4
Distance	65	95	65	110	160	215	125	215	215
p.p.v at receiver, m/s	9.1E-05	5.1E-05	9.1E-05	4.1E-05	2.3E-05	1.5E-05	3.4E-05	1.5E-05	1.5E-05
rms velocity, m/s	2.3E-05	1.3E-05	2.3E-05	1.0E-05	5.9E-06	3.8E-06	8.5E-06	3.8E-06	3.8E-06
Lv, VdB	59.0	54.1	59.0	52.1	47.3	43.4	50.5	43.4	43.4
Distance	80	105	65	85	185	240	150	230	230
p.p.v at receiver, m/s	6.6E-05	4.4E-05	9.1E-05	6.1E-05	1.9E-05	1.3E-05	2.6E-05	1.4E-05	1.4E-05
rms velocity, m/s	1.7E-05	1.1E-05	2.3E-05	1.5E-05	4.7E-06	3.2E-06	6.5E-06	3.4E-06	3.4E-06
Lv, VdB	56.3	52.7	59.0	55.5	45.4	42.0	48.1	42.5	42.5
Overall Lv, VdB	63.6	66.4	64.3	59.5	55.6	50.9	58.2	50.3	50.3
Lv to dB(A) conversion correction (for mid frequency)	-25.0	-25	-25	-25	-25	-25	-25	-25	-25
Noise level, dB(A)	38.6	41.4	39.3	34.5	30.6	25.9	33.2	25.3	25.3
Path factor corr (coupling for foundation - large masonry on piles)	-10.0	-10	-10	-10	-10	-10	-10	-10	-10
Noise level, dB(A) after corr	28.6	31.4	29.3	24.5	20.6	15.9	23.2	15.3	15.3
number of structure level for correction	5.0	7.0	5.0	3.0	1.0	1.0	4.0	1.0	0.0
receiver factor corr	-4.0	-6.0	-4.0	0.0	4.0	4.0	-2.0	4.0	6.0
Noise level, dB(A) after corr	24.6	25.4	25.3	24.5	24.6	19.9	21.2	19.3	21.3
Utilisation	80%	80%	80%	80%	80%	80%	80%	80%	80%
utilisation corr	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Noise level, dB(A) after corr	24	24	24	24	24	19	20	18	20

Ground-borne noise due to normal piling work for main building

Receiver	YMCA of Hong Kong	Marco Polo Hong Kong Hotel	Hankow Centre	Bo Yip Building	HKCC (Concert Hall)	HKCC (Grand Theatre)	HKCC (Studio Theatre)	Hong Kong Space Museum (Recording Studio)	Hong Kong Space Museum (Sky Theatre)
Source Strength (p.p.v), mm/s (base ramming)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Source Strength distance, m	10	10	10	10	10	10	10	10	10
p.p.v to rms conversion factor	4	4	4	4	4	4	4	4	4
ref velocity, m/s	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08
Distance from Source 1	120	65	110	125	175	250	155	265	265
p.p.v at receiver, m/s	1.9E-05	4.8E-05	2.2E-05	1.8E-05	1.1E-05	6.4E-06	1.3E-05	5.9E-06	5.9E-06
rms velocity, m/s	4.8E-06	1.2E-05	5.5E-06	4.5E-06	2.7E-06	1.6E-06	3.3E-06	1.5E-06	1.5E-06
Lv, VdB	45.5	53.5	46.7	45.0	40.6	36.0	42.2	35.2	35.2
Distance from Source 2	110	50	110	140	150	225	130	250	250
p.p.v at receiver, m/s	2.2E-05	7.2E-05	2.2E-05	1.5E-05	1.4E-05	7.5E-06	1.7E-05	6.4E-06	6.4E-06
rms velocity, m/s	5.5E-06	1.8E-05	5.5E-06	3.8E-06	3.4E-06	1.9E-06	4.3E-06	1.6E-06	1.6E-06
Lv, VdB	46.7	57.0	46.7	43.5	42.6	37.4	44.5	36.0	36.0
Distance from Source 3	95	60	95	140	135	205	110	225	225
p.p.v at receiver, m/s	2.7E-05	5.4E-05	2.7E-05	1.5E-05	1.6E-05	8.6E-06	2.2E-05	7.5E-06	7.5E-06
rms velocity, m/s	6.8E-06	1.4E-05	6.8E-06	3.8E-06	4.0E-06	2.2E-06	5.5E-06	1.9E-06	1.9E-06
Lv, VdB	48.6	54.6	48.6	43.5	44.0	38.6	46.7	37.4	37.4
Distance from Source 4	75	80	75	130	140	200	110	215	215
p.p.v at receiver, m/s	3.9E-05	3.5E-05	3.9E-05	1.7E-05	1.5E-05	8.9E-06	2.2E-05	8.0E-06	8.0E-06
rms velocity, m/s	9.7E-06	8.8E-06	9.7E-06	4.3E-06	3.8E-06	2.2E-06	5.5E-06	2.0E-06	2.0E-06
Lv, VdB	51.7	50.8	51.7	44.5	43.5	38.9	46.7	38.0	38.0
Distance from Source 5	65	95	65	110	160	215	125	215	215
p.p.v at receiver, m/s	4.8E-05	2.7E-05	4.8E-05	2.2E-05	1.3E-05	8.0E-06	1.8E-05	8.0E-06	8.0E-06
rms velocity, m/s	1.2E-05	6.8E-06	1.2E-05	5.5E-06	3.1E-06	2.0E-06	4.5E-06	2.0E-06	2.0E-06
Lv, VdB	53.5	48.6	53.5	46.7	41.8	38.0	45.0	38.0	38.0
Distance from Source 6	80	105	65	85	185	240	150	230	230
p.p.v at receiver, m/s	3.5E-05	2.4E-05	4.8E-05	3.2E-05	1.0E-05	6.8E-06	1.4E-05	7.3E-06	7.3E-06
rms velocity, m/s	8.8E-06	5.9E-06	1.2E-05	8.1E-06	2.5E-06	1.7E-06	3.4E-06	1.8E-06	1.8E-06
Lv, VdB	50.8	47.3	53.5	50.0	39.9	36.5	42.6	37.1	37.1
Overall Lv, VdB	58.1	61.0	58.8	54.0	50.1	45.5	52.7	44.8	44.8
Lv to dB(A) conversion correction (for mid frequency)	-25.0	-25	-25	-25	-25	-25	-25	-25	-25
Noise level, dB(A)	33.1	36.0	33.8	29.0	25.1	20.5	27.7	19.8	19.8
Path factor corr (coupling for foundation - large masonry on piles)	-10.0	-10	-10	-10	-10	-10	-10	-10	-10
Noise level, dB(A) after corr	23.1	26.0	23.8	19.0	15.1	10.5	17.7	9.8	9.8
number of structure level for correction	5.0	7.0	5.0	3.0	1.0	1.0	4.0	1.0	0.0
receiver factor corr	-4.0	-6.0	-4.0	0.0	4.0	4.0	-2.0	4.0	6.0
Noise level, dB(A) after corr	19.1	20.0	19.8	19.0	19.1	14.5	15.7	13.8	15.8
Utilisation	80%	80%	80%	80%	80%	80%	80%	80%	80%
utilisation corr	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Noise level, dB(A) after corr	18	19	19	18	18	13	15	13	15

Ground-borne noise due to piling work for signal tower/trees

Receiver	YMCA of Hong Kong	Marco Polo Hong Kong Hotel	Hankow Centre	Bo Yip Building	HKCC (Concert Hall)	HKCC (Grand Theatre)	HKCC (Studio Theatre)	Hong Kong Space Museum (Recording Studio)	Hong Kong Space Museum (Sky Theatre)
Source Strength (p.p.v), mm/s (boring)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Source Strength distance, m	10	10	10	10	10	10	10	10	10
p.p.v to rms conversion factor	4	4	4	4	4	4	4	4	4
ref velocity, m/s	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08	2.54E-08
Distance from Source 1	120	35	125	175	110	190	100	235	235
p.p.v at receiver, m/s	1.9E-05	1.2E-04	1.8E-05	1.1E-05	2.2E-05	9.7E-06	2.5E-05	7.0E-06	7.0E-06
rms velocity, m/s	4.8E-06	3.1E-05	4.5E-06	2.7E-06	5.5E-06	2.4E-06	6.3E-06	1.8E-06	1.8E-06
Lv, VdB	45.5	61.6	45.0	40.6	46.7	39.6	47.9	36.8	36.8
Distance from Source 2	125	60	140	200	65	145	65	215	215
p.p.v at receiver, m/s	1.8E-05	5.4E-05	1.5E-05	8.9E-06	4.8E-05	1.4E-05	4.8E-05	8.0E-06	8.0E-06
rms velocity, m/s	4.5E-06	1.4E-05	3.8E-06	2.2E-06	1.2E-05	3.6E-06	1.2E-05	2.0E-06	2.0E-06
Lv, VdB	45.0	54.6	43.5	38.9	53.5	43.1	53.5	38.0	38.0
Distance from Source 3	100	65	115	180	90	155	65	205	205
p.p.v at receiver, m/s	2.5E-05	4.8E-05	2.1E-05	1.0E-05	3.0E-05	1.3E-05	4.8E-05	8.6E-06	8.6E-06
rms velocity, m/s	6.3E-06	1.2E-05	5.1E-06	2.6E-06	7.4E-06	3.3E-06	1.2E-05	2.2E-06	2.2E-06
Lv, VdB	47.9	53.5	46.1	40.3	49.3	42.2	53.5	38.6	38.6
Distance from Source 4	60	90	75	140	125	180	85	190	190
p.p.v at receiver, m/s	5.4E-05	3.0E-05	3.9E-05	1.5E-05	1.8E-05	1.0E-05	3.2E-05	9.7E-06	9.7E-06
rms velocity, m/s	1.4E-05	7.4E-06	9.7E-06	3.8E-06	4.5E-06	2.6E-06	8.1E-06	2.4E-06	2.4E-06
Lv, VdB	54.6	49.3	51.7	43.5	45.0	40.3	50.0	39.6	39.6
Overall Lv, VdB	56.2	63.1	53.8	47.2	55.9	47.5	57.9	44.4	44.4
Lv to dB(A) conversion correction (for mid frequency)	-25.0	-25	-25	-25	-25	-25	-25	-25	-25
Noise level, dB(A)	31.2	38.1	28.8	22.2	30.9	22.5	32.9	19.4	19.4
Path factor corr (coupling for foundation - large masonry on piles)	-10.0	-10	-10	-10	-10	-10	-10	-10	-10
Noise level, dB(A) after corr	21.2	28.1	18.8	12.2	20.9	12.5	22.9	9.4	9.4
number of structure level for correction	5.0	7.0	5.0	3.0	1.0	1.0	4.0	1.0	0.0
receiver factor corr	-4.0	-6.0	-4.0	0.0	4.0	4.0	-2.0	4.0	6.0
Noise level, dB(A) after corr	17.2	22.1	14.8	12.2	24.9	16.5	20.9	13.4	15.4
Utilisation	80%	80%	80%	80%	80%	80%	80%	80%	80%
utilisation corr	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Noise level, dB(A) after corr	16	21	14	11	24	16	20	12	14

Summary of Separation Distance between NSRs and Noise Source

Distance % NSR & Source	YMCA of Hong Kong	Marco Polo Hong Kong Hotel	Hankow Centre	Bo Yip Building	HKCC (Concert Hall)	HKCC (Grand Theatre)	HKCC (Studio Theatre)	Hong Kong Space Museum (Recording Studio)	Hong Kong Space Museum (Sky Theatre)
Main Building Piling Source 1	120	65	110	125	175	250	155	265	265
Main Building Piling Source 2	110	50	110	140	150	225	130	250	250
Main Building Piling Source 3	95	60	95	140	135	205	110	225	225
Main Building Piling Source 4	75	80	75	130	140	200	110	215	215
Main Building Piling Source 5	65	95	65	110	160	215	125	215	215
Main Building Piling Source 6	80	105	65	85	185	240	150	230	230
Tree/Signal Tower Piling Source 1	120	35	125	175	110	190	100	235	235
Tree/Signal Tower Piling Source 2	125	60	140	200	65	145	65	215	215
Tree/Signal Tower Piling Source 3	100	65	115	180	90	155	65	205	205
Tree/Signal Tower Piling Source 4	60	90	75	140	125	180	85	190	190

Predicted Ground-borne Noise Impact for Different Scenario

Scenario	YMCA of Hong Kong	Marco Polo Hong Kong Hotel	Hankow Centre	Bo Yip Building	HKCC (Concert Hall)	HKCC (Grand Theatre)	HKCC (Studio Theatre)	Hong Kong Space Museum (Recording Studio)	Hong Kong Space Museum (Sky Theatre)
With concurrent normal piling for main building and piling for signal tower/trees	20	23	20	19	25	18	21	16	18
With concurrent piling for main building (touching bedrock) and piling for signal tower/trees	24	26	25	24	27	21	23	19	21
With concurrent piling for main building (touching bedrock)	24	24	24	24	24	19	20	18	20