

Hung Hom Sidings

Hourly or Daily Active Construction Area Estimate

Total works area = 13872 m²

Zone 6 - North Fan Area

Activity 1 - Piling (for noise enclosure & box culvert), ID no. 11120Z600050

Plant	Percentage of Usage (%)	Plan Size				Area in term of Time of Usage (m ²)
		B (m)	L (m)	No. of Item	Area(m ²)	
Pipe pile rig	90	2.3	6	2	27.6	24.84
Crawler crane	90	4.5	8	2	72	64.8
Backhoe	50	3.2	8	2	51.2	25.6
Dump truck	50	2.4	10	1	24	12
Drill rig	20	2.3	6	2	27.6	5.52
Total:						132.76
Activity 1	Percentage of Usage Area to Works Area:					1.0%

Activity 2 - Excavation, ID no.11120Z600060

Plant	Percentage of Usage (%)	Plan Size				Area in term of Time of Usage (m ²)
		B (m)	L (m)	No. of Item	Area(m ²)	
Backhoe	70	3.2	8	1	25.6	17.92
Dump truck	30	2.4	10	1	24	7.2
Total:						25.12
Activity 2	Percentage of Usage Area to Works Area:					0.2%

Activity 3 - Box culvert diversion, ID no.11120Z600070

Plant	Percentage of Usage (%)	Plan Size				Area in term of Time of Usage (m ²)
		B (m)	L (m)	No. of Item	Area(m ²)	
Backhoe	80	3.2	8	1	25.6	20.48
Lorry with crane/grab	80	2.6	10	1	26	20.8
Bar bender and cutter#	-	-	-	-	-	-
Concrete pump truck	30	2.4	10	1	24	7.2
Concrete mixer truck	30	2.4	10	1	24	7.2
Total:						55.68
Activity 3	Percentage of Usage Area to Works Area:					0.4%

Zone 7 - South External Area

Activity 1 - Site Clearance, Demolition & Site Investigation, ID no.11120Z700010

Plant	Percentage of Usage (%)	Plan Size				Area in term of Time of Usage (m ²)
		B (m)	L (m)	No. of Item	Area(m ²)	
Backhoe with hydraulic breaker	90	3.2	8	2	46.08	41.472
Lorry with crane/grab	80	2.6	10	1	20.8	16.64
Dump truck	80	2.4	10	1	19.2	15.36
Drill rig	30	2.3	6	1	4.14	1.242
Crawler crane	60	4.5	8	1	21.6	12.96
Total:						87.674
Activity 1	Percentage of Usage Area to Works Area:					0.6%
Combined Percentage						2.2%

<30%, OK

Notes:

No dust generated machine

- All plant that would generate dust emissions during their operation (e.g. excavator) have been included in estimating the active work areas.
- Since the plants do not normally operate continuously throughout the 12-hour working period, an adjustment by "Percentage of Usage (%)" was adopted for each plant/activity to reflect its estimated hours of operation on a typical working day.
- The actual dust emission area for each plant/activity was estimated and given as "Area", by taking account the maximum area of dust emissions which could be created by the plant/activity at any time instant.
- The actual dust emission area for each hour, which is given as "Area in term of Time of Usage" was estimated by taking account the "Percentage of Usage (%)" of each plant/activity. (i.e. Area in term of Time of Usage (m²) = Area (m²) x Percentage of Usage (%))
- "Percentage of Usage Area to Works Area" means the percentage of total actual active area for each plant/activity over the total works area (i.e. Percentage of Usage Area to Works Area (%) = Total Area in term of Time of Usage for each plant/activity (m²) / Total Works Area (m²))
- Justification provided above are for the purpose of assessment only. Actual figures would be defined during detailed design stage.

Hung Hom Sidings

Yearly Active Construction Area Estimate - Apr 14 to Mar 15

Total works area = 13872 m²

Zone 6 - North Fan Area

Activity 1 - Utilities Diversion, ID no.11120Z600030

From	1-Apr-14	To	10-Jun-14	Duration:	2.3	months
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Plant	Percentage of Usage (%)	Plan Size				Area in term of Time of Usage (m ²)
		B (m)	L (m)	No. of Item	Area(m ²)	
Backhoe	60	3.2	8	1	25.6	15.36
Air compressor#	-	-	-	-	-	-
Hand held breaker	80	0.5	1	1	0.5	0.4
Lorry with crane/grab	60	2.6	10	1	26	15.6
Welder/generator#	-	-	-	-	-	-
					Total:	31.36
Activity 1		Percentage of Usage Area to Works Area:				0.2%
		Percentage of Yearly Usage:				0.04%

Activity 2 - Sheet Piling, ID no.11120Z600040

From	11-Jun-14	To	11-Aug-14	Duration:	2.0	months
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Plant	Percentage of Usage (%)	Plan Size				Area in term of Time of Usage (m ²)
		B (m)	L (m)	No. of Item	Area(m ²)	
Backhoe with hydraulic breaker	90	3.2	8	2	51.2	46.08
Pipe pile rig	10	2.3	6	1	13.8	1.38
Air compressor#	-	-	-	-	-	-
Hand held breaker	10	0.5	1	1	0.5	0.05
Lorry with crane/grab	90	2.6	10	2	52	46.8
Welder/generator#	-	-	-	-	-	-
					Total:	94.31
Activity 2		Percentage of Usage Area to Works Area:				0.7%
		Percentage of Yearly Usage:				0.11%

Activity 3 - Piling (for noise enclosure & box culvert), ID no.11120Z600050

From	11-Jun-14	To	13-Dec-14	Duration:	6.1	months
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Plant	Percentage of Usage (%)	Plan Size				Area in term of Time of Usage (m ²)
		B (m)	L (m)	No. of Item	Area(m ²)	
Pipe pile rig	90	2.3	6	2	27.6	24.84
Crawler crane	90	4.5	8	2	72	64.8
Backhoe	50	3.2	8	2	51.2	25.6
Dump truck	50	2.4	10	1	24	12
Drill rig	20	2.3	6	2	27.6	5.52
					Total:	132.76
Activity 3		Percentage of Usage Area to Works Area:				1.0%
		Percentage of Yearly Usage:				0.48%

Activity 4 - Excavation, ID no.11120Z600060

From	14-Nov-14	To	14-Feb-15	Duration:	3.0	months
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Plant	Percentage of Usage (%)	Plan Size				Area in term of Time of Usage (m ²)
		B (m)	L (m)	No. of Item	Area(m ²)	
Backhoe	70	3.2	8	1	25.6	17.92
Dump truck	30	2.4	10	1	24	7.2
					Total:	25.12
Activity 4		Percentage of Usage Area to Works Area:				0.2%
		Percentage of Yearly Usage:				0.05%

Activity 5 - Box culvert diversion, ID no.11120Z600070

From	15-Dec-14	To	22-May-15	Duration:	5.2	months
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Plant	Percentage of Usage (%)	Plan Size				Area in term of Time of Usage (m ²)
		B (m)	L (m)	No. of Item	Area(m ²)	
Backhoe	80	3.2	8	1	25.6	20.48
Lorry with crane/grab	80	2.6	10	1	26	20.8
Bar bender and cutter#	-	-	-	-	-	-
Concrete pump truck	30	2.4	10	1	24	7.2
Concrete mixer truck	30	2.4	10	1	24	7.2
					Total:	55.68
Activity 5		Percentage of Usage Area to Works Area:				0.4%

Percentage of Yearly Usage: **0.17%**

Activity 6 - Pile Cap (for noise enclosure), ID no.11120Z600080

From	16-Feb-15	To	31-Mar-15	Duration:	1.4	months	
Plant	Percentage of Usage (%)	Plan Size				Area in term of Time of Usage (m ²)	
		B (m)	L (m)	No. of Item	Area(m ²)		
Backhoe	50	3.2	8	1	25.6	12.8	
Lorry with crane/grab	50	2.6	10	1	26	13	
Bar bender and cutter#	-	-	-	-	-	-	
Concrete pump truck	30	2.4	10	1	24	7.2	
Concrete mixer truck	30	2.4	10	1	24	7.2	
Total:						40.2	
Activity 6						Percentage of Usage Area to Works Area:	0.3%
						Percentage of Yearly Usage:	0.03%

Zone 7 - South External Area

Activity 1 - Site Clearance, Demolition & Site Investigation, ID no.11120Z700010

From:	1-Sep-14	To:	10-Mar-15	Duration:	6	months	
Plant	Percentage of Usage (%)	Plan Size				Area in term of Time of Usage (m ²)	
		B (m)	L (m)	No. of Item	Area(m ²)		
Backhoe with hydraulic breaker	90	3.2	8	2	46.08	41.472	
Lorry with crane/grab	80	2.6	10	1	20.8	16.64	
Dump truck	80	2.4	10	1	19.2	15.36	
Drill rig	30	2.3	6	1	4.14	1.242	
Crawler crane	60	4.5	8	1	21.6	12.96	
Total:						87.674	
Activity 1						Percentage of Usage Area to Works Area:	0.6%
						Percentage of Yearly Usage:	0.32%

Combined Yearly Percentage	1.2%
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<6%, OK

Notes:

No dust generated machine

- All plant that would generate dust emissions during their operation (e.g. excavator) have been included in estimating the active work areas.
- Since the plants do not normally operate continuously throughout the 12-hour working period, an adjustment by "Percentage of Usage (%)" was adopted for each plant/activity to reflect its estimated hours of operation on a typical working day.
- The actual dust emission area for each plant/activity was estimated and given as "Area", by taking account the maximum area of dust emissions which could be created by the plant/activity at any time instant.
- The actual dust emission area for each hour, which is given as "Area in term of Time of Usage" was estimated by taking account the "Percentage of Usage (%)" of each plant/activity. (i.e. Area in term of Time of Usage (m²) = Area (m²) x Percentage of Usage (%))
- "Percentage of Usage Area to Works Area" means the percentage of total actual active area for each plant/activity over the total works area (i.e. Percentage of Usage Area to Works Area (%) = Total Area in term of Time of Usage for each plant/activity (m²) / Total Works Area (m²))
- "Percentage of Yearly Usage" means the percentage of duration of each plant/activity over the year (12 months) (i.e. Percentage of Yearly Usage (%) = Percentage of Usage Area to Works Area for each plant/activity (%) x Duration (months) / 12 (months))
- Justification provided above are for the purpose of assessment only. Actual figures would be defined during detailed design stage.

Calculation of Watering Efficiency

With reference to Cowherd et al., "Control of Open Fugitive Dust Sources, EPA-450/3-88-008, U.S. Environmental Protection Agency, Research Triangle Park, NC, percentage of dust mitigation efficiency is calculated from Equation (3-2) :

$$C = 100 - \frac{0.8 p d t}{i}$$

Where

- p = Potential average hourly daytime evaporation rate, mm/hr = 0.25916 ^[1]
d = Average hourly daytime traffic rate per hour = 71/hr ^[2]
I = Application intensity = 0.39 gal per yard = 1.8 L/m² ^[3]

Note:

- [1] p = 0.0049 x 52.8898 inch where 52.8898 inch is equivalent to the total evaporation of 1343.4mm obtained from Hong Kong Observatory (http://www.weather.gov.hk/cis/normal/1971_2000/normals_e.htm)
[2] Estimated by Engineer
[3] The assumptions provided are for the purpose of assessment predictions only. Actual figures would be defined in the detailed design stage.

By applying the Equation (3-2) with the above assumptions,

$$\text{Dust suppression efficiency} = 100 - 0.8 \times (0.25916 \times 71 \times t) / 1.8 \quad [t = \text{time between application, hr}]$$

Therefore,

For watering once per hour (i.e. t=1 hour), the estimated dust suppression efficiency is 91.7%

EPA-450/3-88-008

CONTROL OF OPEN FUGITIVE DUST SOURCES

FINAL REPORT

by

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This report has been reviewed by the Emission Standards Division of the Office of Air Quality Planning and Standards, EPA, and approved for publication. Mention of trade names or commercial products is not intended to constitute endorsement or recommendation for use. Copies of this report are available through the Library Services Office (MD-35), U.S. Environmental Protection Agency, Research Triangle Park NC 27711, or from National Technical Information Services, 5285 Port Royal, Springfield VA 22161.

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3.3.3 Surface Treatments

3.3.3.1 Watering. The control efficiency of unpaved road watering depends upon (a) the amount of water applied per unit area of road surface, (b) the time between reapplications, (c) traffic volume during that period, and (d) prevailing meteorological conditions during the period. While several investigations have estimated or studied watering efficiencies, few have specified all the factors listed above.

An empirical model for the performance of watering as a control technique has been developed.⁸ The supporting data base consists of 14 tests performed in four states during five different summer and fall months. The model is:

$$C = 100 - \frac{0.8 p d t}{i} \quad (3-2)$$

where: C = average control efficiency, percent

P = potential average hourly daytime evaporation rate, mm/h

d = average hourly daytime traffic rate, (h⁻¹)

i = application intensity, L/m²

t = time between applications, h

Estimates of the potential average hourly daytime evaporation rate may be obtained from

$$P = \begin{array}{l} 0.0049 \times (\text{value in Figure 3-2}) \text{ for annual conditions} \\ 0.0065 \times (\text{value in Figure 3-2}) \text{ for summer conditions} \end{array}$$

An alternative approach (which is potentially suitable for a regulatory format) is shown as Figure 3-3. This figure is adapted from 11 field tests conducted at a coal-fired power plant. Measured control efficiencies did not correlate well with either time or vehicle passes after application. However, this is believed due to reduced evening evaporation (logistics delayed the start of testing until 3 p.m. and testing continued through the early evening). Surface moisture grab samples were taken throughout the testing period, and not surprisingly, these show a strong correlation with control efficiency.

Figure 3-3 shows that between the average uncontrolled moisture content and a value of twice that, a small increase in moisture content results in a large increase in control efficiency. Beyond this point, control efficiency grows slowly with increased moisture content. Although