Tutorial 2

1. A dozer tracked excavator and a pneumatic breaker are in use excavating and leveling a site approximately 300m from nearest house. Typical sound power level and percentage on time are shown in Table 1.

Items of plants	Sound Power Level	% on Time
Dozer	112 dBA	100%
Tracked Excavator	116 dBA	50%
Pneumatic Breaker	113 dBA	25%

Assuming ideal hemispherical radiations conditions:

a) Calculate the sound pressure level at the house for each of the plant
Ans:

i. Dozer : $L_p = L_w - 20\log_{10} r - 8$
$= 112 - 20 \log_{10} (300) - 8$
$= 54.46$ dBA

ii. Tracked Excavator : $L_p = L_w - 20\log_{10} r - 8$
$= 116 - 20 \log_{10} (300) - 8$
$= 58.46$ dBA

iii. Pneumatic Breaker : $L_p = L_w - 20\log_{10} r - 8$
$= 113 - 20 \log_{10} (300) - 8$
$= 55.46$ dBA

b) Calculate the neighbourhood equivalent continuous sound level $L_{Aeq\ 8hours}$ at the house over a typical 8 hour shift

Ans:

	Dozer	Tracked Excavator	Pneumatic Breaker
Sound Power Level, Lw	112 dBA	116dBA	113dBA
Distance & Correction, Kd	300 m -57·5	300m -57·5	300m -57·5
Screening Correction, Ks	-	-	-
Reflection Correction, Kr	-	-	-
% on time correction, K_T	100% 0	50% -3	25% -6
Equivalent continuous sound pressure level , Lp	54·5	55·5	49·5
Combined L_{AEq}	58·6		

c) If an earth bank is constructed which provided total screening for pneumatic breaker and partial screening for the dozer and excavator, what would be the $L_{Aeq\ 8hours}$?

Ans:

	Dozer	Tracked Excavator	Pneumatic Breaker
Sound Power Level, Lw	112 dBA	116dBA	113dBA
Distance & Correction, Kd	-57·5	-57·5	-57·5
Screening Correction, Ks	-5	-5	-10
Reflection Correction, Kr	-	-	-
% on time correction, K_T	100% 0	50% -3	25% -6
Equivalent continuous sound pressure level , Lp	49·5	50·5	39·5
Combined L_{AEq}	53·2		

2. Figure 2 shows a medium size civil engineering site on which various operations are in progress. The works are restricted to 12 h noise limit of 70dBA. $L_{Aeq\ 12hours}$ at point y which 1m outside a two storey building. The sound pressure level at 10m for each plant and percentage on time for each plant is shown in Table. Two operations are partially or totally screened.

Assuming ideal hemispherical radiations conditions:

	Batching Plant	Pneumatic Chipper	Compressor	Bulldozer	Sheet Piling air-hammer	Drop Piling Rig
LAeq at 10m (R)	76	86	76	82	93	87
Distance (R2)	210	200	150	190	100	250
Screening	Complete Full	0	Complete Full	0	Partial	0
Duration (% on time)	95%	30%	100%	65%	50%	80%

i. Calculate the sound pressure at point Y for each of the point level

Ans:

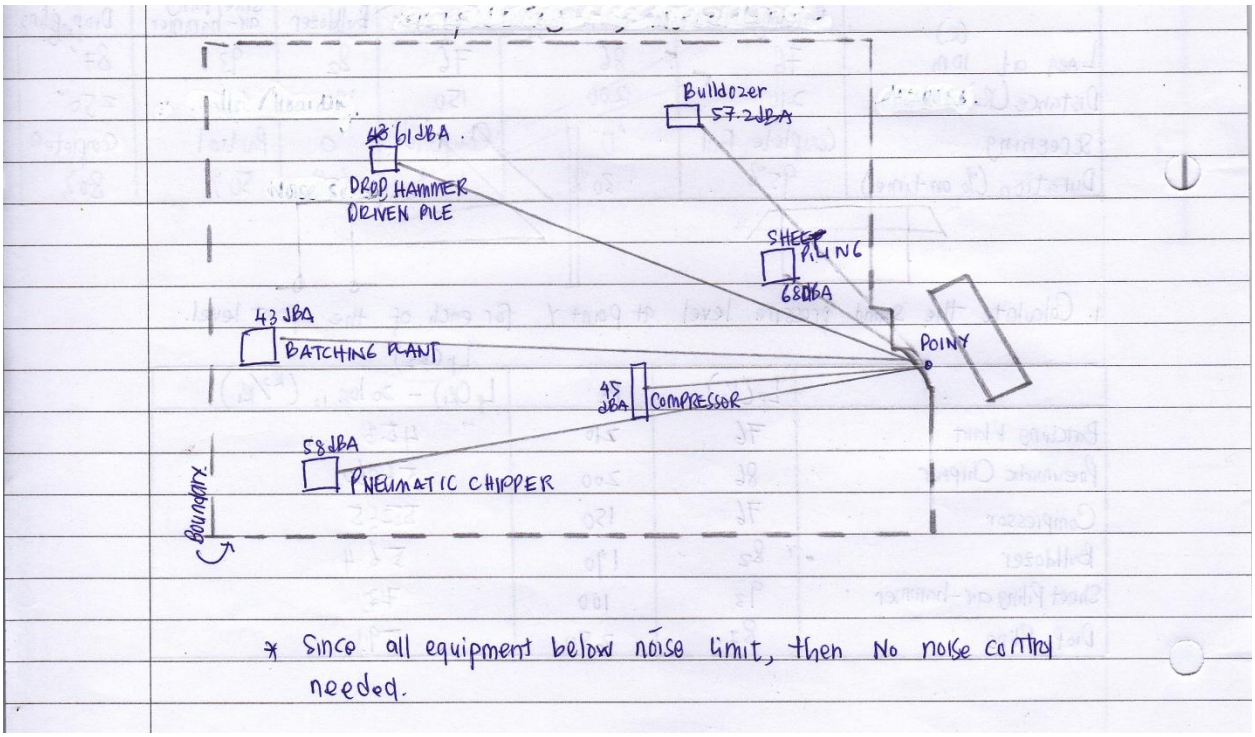
	Lp (R_1)	R_2	Lp (R_1) - 20 $\log_{10}$ (R_2/R_1)
Batching Plant	76	210	50
Pneumatic Chipper	86	200	60
Compressor	76	150	53
Bulldozer	82	190	56
Sheet Piling air-hammer	93	100	73
Drop Piling Rig	87	250	59

ii. Calculate the neighbourhood equivalent continuous sound level 12 hour at point Y

	Batching Plant	Pneumatic Chipper	Compressor	Bulldozer	Sheet Piling air-hammer	Drop Piling Rig
L_{Aeq} at 10m (R)	76	86	76	82	93	87
Distance & Correction, Kd	-26	-26	-24	-26	-20	-28
Screening Correction, Ks	-10	0	-10	0	-5	0
Reflection Correction, Kr	+3	+3	+3	+3	+3	+3
% on time correction, K_T	0	-5	0	-1·8	-3	-1
Equivalent continuous sound pressure level , Lp	43	58	45	57·2	68	61
Combined L_{AEq}	68					

iii. Indicate, using appropriate sketches, where the most effective noise control might be applied to meet the noise limit.

Noise limit = 70dBA $L_{Aeq\ 12h}$ at Point Y



3. Figure 3 shows sub-structure activities from a construction of 4 storey government office building. The project has obtained approval from local authority with work restricted to a 12-h noise limit of 50dBA $L_{Aeq\ 12hours}$ at point P, which is 1m outside for two storey primary school building. However, due to various operations are in progress, the site has just received complaints from the PTA of nearby primary school that the construction noise disturbs the student learning. The sound pressure level at 50m from each plant and % of time for each plant is shown in Table. The background noise level for the site is 40 dBA

Assuming ideal hemispherical radiations conditions:

i. Calculate the sound pressure level, Lp in dBA at point P for each items of equipment

Ans:

Frequency	Excavator 1	Excavator 2	Bulldozer	Piling
25	27·3	25·3	32·8	36·8
31·5	38·4	29·5	42·0	41·5
40	44·7	37·8	43·5	57·6
50	51·5	44·7	46·2	53·5
63	56·9	68·9	54·7	57·4
80	61·4	62·5	60·0	66·5
100	75·2	65·9	69·0	65·0
125	70·5	73·1	68·9	69·6
160	70·6	65·0	68·9	72·4
200	73·8	67·0	76·1	73·2
250	74·4	69·3	74·8	75·1
315	79·5	70·1	76·9	75·1
400	80·1	69·3	74·8	78·7
500	80·9	72·1	69·1	84·3
630	80·4	71·2	70·2	91·6
800	83·6	70·3	72·4	93·2
1000	86·6	71·6	74·6	91·2
1250	83·8	72·5	76·7	91·2
1600	88·3	72·6	79·5	90·0
2000	82·3	72·9	79·5	88·7
2500	82·1	71·3	79·7	87·7
3150	82·8	69·6	77·4	86·2
4000	80·3	66·0	76·0	85·0
5000	81·3	63·0	75·5	84·2
6300	77·5	60·3	79·9	82·8
8000	74·8	56·3	71·9	74·3
10000	71·2	51·6	67·0	70·8
12500	70·3	46·3	63·4	66·2
16000	63·3	46·6	52·8	60·4
20000	55·3	37·2	42·0	50·7
Lw	94·79dBA	83·22 dBA	89·08 dBA	100·08 dBA

	Excavator 1	Excavator 2	Bulldozer	Piling
% on time correction, K_T	95	30	60	65
Distance R2	101·24	141·55	125·6	81·49
Lp@50m (Lp(R1))	94·79	83·21	89·08	100·08
Lp@P (Lp(R2))	88·66	74·17	81·08	95·84

Lp at point P,

Excavator 1 = 88·66 dBA

Excavator 2 = 74·17 dBA

Bulldozer = 81·08 dBA

Piling = 95·84 dBA

ii· Calculate the equivalent continuous sound level $L_{Aeq\ 12hours}$ at point P

Ans: assume no screening...

	Excavator 1	Excavator 2	Bulldozer	Piling
Sound Power Level, Lw	94·79	83·22	89·08	100·08
Distance & Correction, Kd	-61·3	-9·04	-8	-4·24
Screening Correction, Ks	0	0	0	0
Reflection Correction, Kr	+3	+3	+3	+3
% on time correction, K_T	0	-5	-2	-1·8
Equivalent continuous sound pressure level , Lp	91·66	72·18	82·08	97·04
Combined L_{AEq}	98·26			

iii· Predict the anticipated community response at point P

Combined L_{Aeq} = 98·26 dBA (12 hours)

Impulsive = +5 dBA

Audible tone compound present = +5dB (A)

Duration of the sound = 100 - 56 = 0

108·26 dB (A)

Background noise , L_{90} = 40dB(A)

Lr = 108·26-40

= 68·26 dB(A)

Impact = Very strong

Community response = Vigorous community action (complaint)