GUARDIAN ANGEL SECONDARY EDUCATION RESOURCE CENTRE

NASoM was invited by the School Management , of the Guardian Angel Education resource centre, , to present a noise report covering the noise emissions inside the centre. Special attention given to the noise caused by the Road Traffic and its effect inside the classrooms.

7/2/2022

Contents

Scope of the Noise report

The report, is to study the noise level of the emissions inside the centre, transmitted by the road traffic. And access whether the noise immission interfere with communication of speech or concentration, during indoor or outdoor, learning activities.

General Information about The Basis of The Report

1. ***BSI 4142:2018*** : Methods for rating and assessing sound *affecting mixed residential and industrial areas*

The standard state the 'Ambient Noise', is measured at the receptor's *outdoor location*. If the noise requires any adjustment for the characteristic features of the sound it will be added to the SSL. and then it is termed the, 'rating noise level (L_{Ar}).'

2. ***Excess of rating over background sound level*** = **L_{Ar}** less ***$L_{A90,T}$*** :

The standard defines the likelihood of complaints by the excess of the rating level above the background noise level as follows:
A difference of + 5dB is of marginal significance
A difference of +10 dB or more indicates that complaints are likely.

3. ***Background sound level***, $L_{A90,T}$:

A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, *T*, measured using time weighting, *F*, and quoted to the nearest whole number of decibels. If this is not possible measure at an alternative location where the residual sound is comparable to the assessment location(s). A detailed justification for considering this should be reported.

4. ***WHO- Noise levels and speech intelligibility*** :

Speech in relaxed conversation is 100% intelligible in background noise levels of about **35 dBA**, and can be understood fairly well in background levels of **45 dBA.** The signal to noise ration should be at least 15dB(A).
For children with some form of hearing impairment, audiologists recommend a difference of **20-30dB** between voice and background noise.

5. ***Specific noise level*** :

The traffic noise was measure outside and inside the classrooms facing the main road; **Map 1.** The traffic speed during monitoring varied approximately between 40 to 60 km/h. The noise measurement inside the classrooms was carried out first; with windows and door closed, and then, with windows open. Windows must be open at intervals for fresh air intake. The noise level of slow-moving traffic is lower than that of fast moving.

6. ***Parameters affecting the road traffic noise immission in the complex*** :

The volume and mix of the road traffic traversing the north and south bound lanes; vehicle speed; distance from the road to the classrooms; classrooms elevation in reference to the road and acoustic screening between the classroom and the road.
The traffic velocity on the north bound lanes tends to be faster than that on the south bound lanes. The south bound lane is nearest to the classrooms. During the noise monitoring it was observed that the traffic mix was mainly of private vehicles and light commercial vehicles; **Map 2**. The traffic speed varied between 40 km/h to 60 km/h, depending to circumstances.

7. ***The effect of acoustic barriers and distance that mitigate noise levels*** :

The effectiveness of trees as sound barriers varies enormously. A study by Huddurt in 1990 shows that in some instances noise can he reduced by 6 dB over a distance of 30 meters Leonard and Parr (1970) and Reethof (1973) found that a dense belt of trees and shrubs between 15-30 m wide could reduce sound levels by as much as 6-8 dB.

The trees which were a barrier between the road and classes 1 & 2 were uprooted and furthermore, the boundary wall was relocated closer to the classrooms by an average of 7- meters. ***Map 3.***

8. ***Classroom info :***

Classrooms 1 & 2 are the most exposed to the road traffic. Distance from the road varies between- 16 & 25 meters
Classrooms 3 & 4 are less expose to noise due to acoustic screening. Distance from the road approx. 42 meters
Classrooms 5, 8 & 9 have medium dense acoustic screening, but the classes elevation is above the perimeter wall.
Classes 8 , 9 and 5 are approximately 29 meters and 48 meters from the road respectively.
The classrooms end elevation in reference to the road, varies between: < 2meters to >2meters; **Map 2**

The road end elevation is approx. 1.5 meters above classes 1 to 4 and 2 meters below classes 5,8,9; (Map 3 & 4.)

Map 1 Guardian Angel complex site

Table 1 Classroom's location- distance from road and end elevation

Class	Distance from road (m)	*Acoustic screening %	Class end to road approx. elevation (m)
1	16	5%	<1.5
2	25	10%	<1.5
3	39	15%	<1.0
4	46	20%	<1.0
5	48	20%	>2.0
6	54	75%	>2.0
8	31	10%	>1.5
9	26	09%	>1.5
M/P	83	70%	>2.0

*The acoustic screening percentages are based on the LAeq readings

Map 2 Road end elevation in reference to the classrooms

Map 3 –Road end elevation and Acoustic barrier

From forefront of Class 1

Road end elevation

The trees were uprooted and the boundary wall was relocated towards the classes by about 7 meters

From forefront of Class 2 & 3

Road end elevation

From the forefront of Class 8 & 9

NOISE MEASURING INSTRUMENTS AND WEATHER CONDITIONS

Measuring instruments specification:
Sound Level Meter
Make: Cirrus
Model : CK 171A
Class : 1
Octave band analyser: 1:1
Data logger

Acoustic Calibrator
Make: Cirrus
Model: CR515
Class: 1

Field calibration
Before Offset 0.76
After offset 0.80

Weather Conditions

Wind conditions (applicable to all tests)
Wind speed
Speed less than Force 2 (Beaufort scale), Wind direction: variable

Weather conditions
Calm
Occasional clouds

Precipitation
none

Dates of inspection visits and residual noise determination

Table 1- Visiting time – Noise monitoring outside classroom				
Location C/Rooms	Time		Duration	Date
	On	Off	minutes	2022
1	12:29	12:40	11.00	Jan 14
3	12:49	13:03	14.00	
4	13:04	13:14	10.00	
2	12:24	12:45	21.00	Jan 19
9	12:50	13:19	28.00	
5	13:20	13:56	21.00	
Meeting point	13:57	14:25	20.00	
Classroom 6	14:26	14:55	28.0	
Visiting time – Noise monitoring inside classroom				
location	Time		Duration	Date
C/Rooms	On	Off	minutes	2022
2	08:12	08:27	15:00	Jan 28
8	08:34	08:46	12:00	

Specific noise level and method of determination

The specific noise level is the continuous A-weighted sound pressure level at the assessment position over a given reference time interval that is produced by the noise source that is being investigated (road traffic) for assessing the likelihood of complaints. The specific noise was monitored as denoted in table 2. This was assumed to be representative of any longer-term fluctuations in the specific sound.

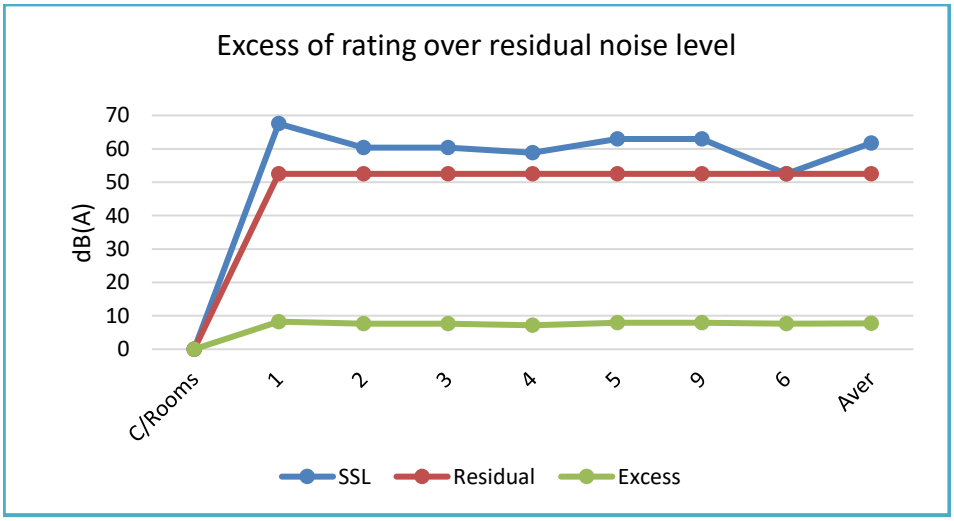
Residual noise levels and method of determination

The **residual noise** level is the continuous A-weighted sound pressure level of the ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree that it does not contribute to the background noise. The **residual noise** level was measure outside **Classroom 6;** as the residual sound is comparable to the assessment locations. The residual sound level was determined over a similar representative time period when the specific sound source was not significant.

Excess of the rating level over the residual noise level

The difference between the excess of rating over the residual (background noise) at each location as in Table 2

Table 2			dB(A)
C/Rooms	LAr	Residual	Excess
1	67.5	52.5	8.26
2	60.3	52.5	7.69
3	60.3	52.5	7.69
4	58.8	52.5	7.15
5	62.9	52.5	7.91
9	62.9	52.5	7.91
6	52.5	52.5	7.61
Aver	61.1	52.5	7.75



Rating noise level *(Lar)= SSL + noise character correction if necessary.*
Excess of rating level over background noise = Lar – L90 (Residual noise)

Excess of rating level = SSL (Ls) = $10\log(10^{la}/_{10} - 10^{Lr}/_{10})$ ≈7.75 dB(A)

La= Ambient noise; Lr= residual noise(background noise) 61.1 & 52.5

Table 3 Specific noise level measure outside the classrooms									
Location C/Rooms	Time		Duration	dB(A)				Date	
	On	Off	minutes	L_{Aeq}	L_{A90}	L_{A10}	L_{Max}	2020	Noise accessor observations
1	12:29	12:40	11.00	67.5	57.6	68.1	87.4	Jan 14	Road traffic noise was predominant during the monitoring sessions
3	12:49	13:03	14.00	60.3	56.7	62.2	78.7		
4	13:04	13:14	10.00	58.5	54.5	59.8	84.3		
2	12:24	12:45	21.00	59.2	54.4	61.7	76.5	Jan 19	Road traffic noise was predominant during the monitoring sessions
9	12:50	13:19	28.00	62.7	58.8	63.4	90.6		
5	13:20	13:56	21.00	59.5	57.5	60.9	75.4		
Meeting point	13:57	14:25	20.00	54.5	51.0	56.5	78.2		
Aver. noise level	14:26	14:55	28.0	**61.1**	**56.6**	**62.5**			
Classroom 6- residual noise (*LA90,T*)				*52.2*	*47.7*	*54.2*	*71.3*		Traffic noise not significant

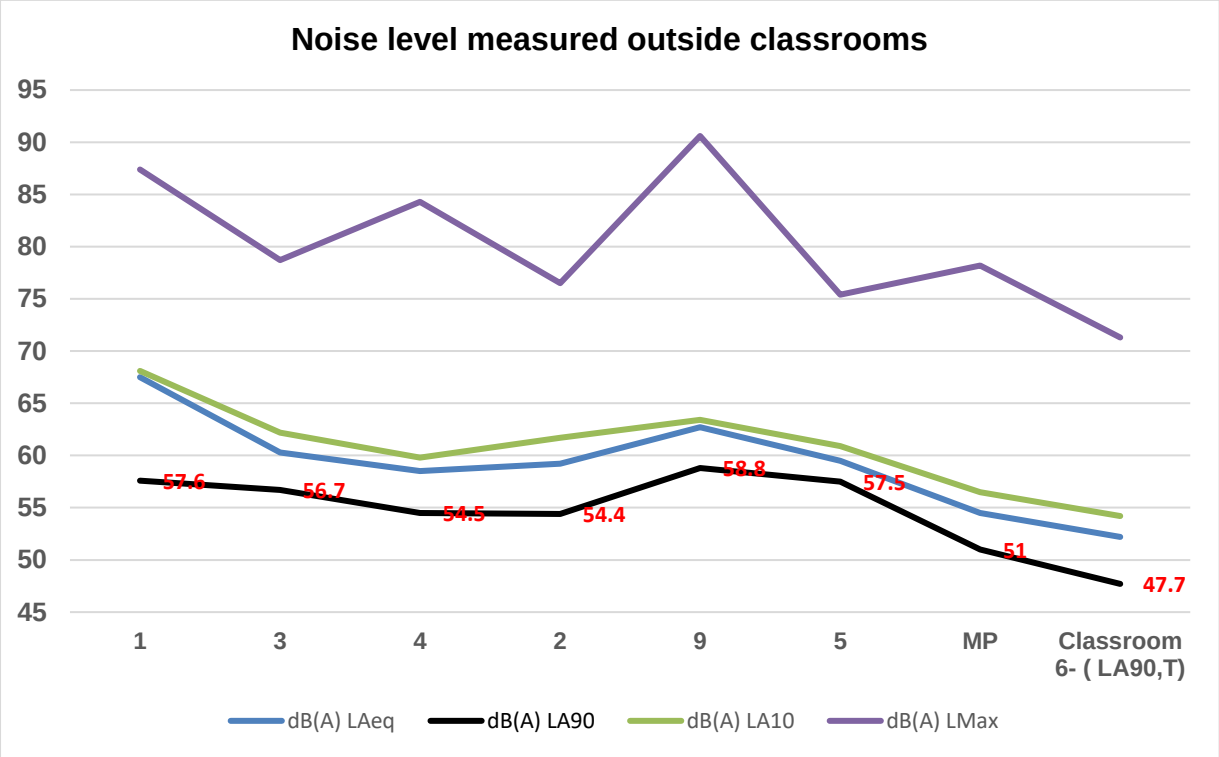
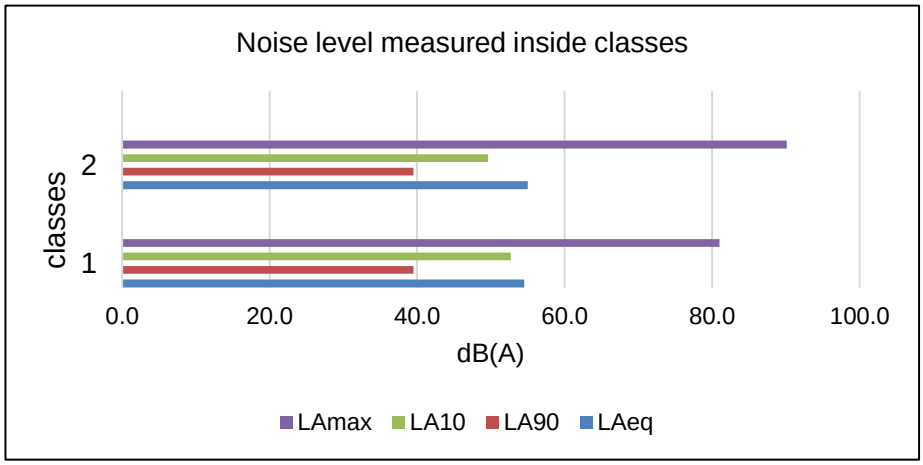


Table 4- Noise level inside classes dB(A)				
Classes	LAeq	LA90	LA10	LAmax
2	54.5	39.5	52.7	81.0
8	55.0	39.5	49.6	90.1



Conclusion

WHO**-** Noise levels and speech intelligibility:
Speech in relaxed conversation is 100% intelligible in background noise levels of about **35 dBA**, and can be understood fairly well in background levels of **45 dBA.** The signal to noise ration should be at least 15dB(A).
For children with some form of hearing impairment, audiologists recommend a difference of **20-30dB** between voice and background noise

BSI 4142:2018 :
The standard defines the likelihood of complaints by the excess of the rating level above the background noise level as follows:
A difference of + 5dB is of marginal significance
A difference of +10 dB or more indicates that complaints are likely.

The road traffic noise immission in the classrooms, exceeds, WHO guidelines; regarding noise levels and speech intelligibility. Furthermore, the excess rating of 8 dB(A) indicates a likelihood of adverse impact to the effective communication and concentration in the classrooms.

John Fenech

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References:
Acoustics in Schools NEU guidance for members, reps and local officers
https://neu.org.uk/media/826/view
WHO- Guideline Values Interference with communication
https://www.who.int/docstore/peh/noise/Comnoise-1.pdf

Classroom 01

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Measurement Summary Report

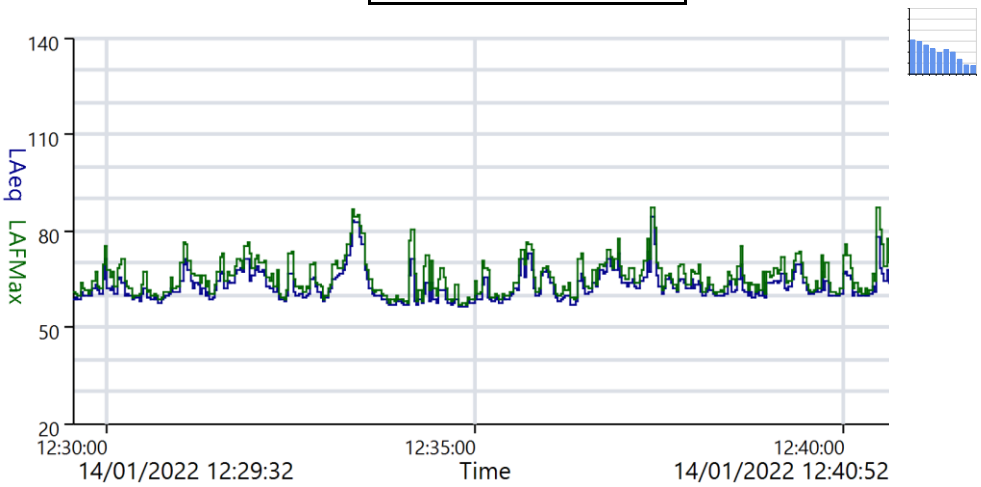
Name	Class 01			
Time	14/01/2022 12:29:32	**Person**	**Place**	**Project**
Duration	00:11:20	Darlene Borg Head of School	Guardian Angel Secondary School	Measuring traffic noise at classroom facade
Instrument	G080702, CR:171A			

Calibration

Before	14/01/2022	Offset	-0.76	**After**	14/01/2022	Offset	-0.80

Basic Values	
LAeq	67.5 dB
LAE	95.8 dB
LAFMax	87.4 dB

Statistical Levels (Ln)	
LAF1	80.4 dB
LAF5	70.9 dB
LAF10	68.1 dB
LAF50	60.9 dB
LAF90	57.6 dB
LAF95	56.8 dB
LAF99	55.8 dB



Classroom 02

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Measurement Summary Report

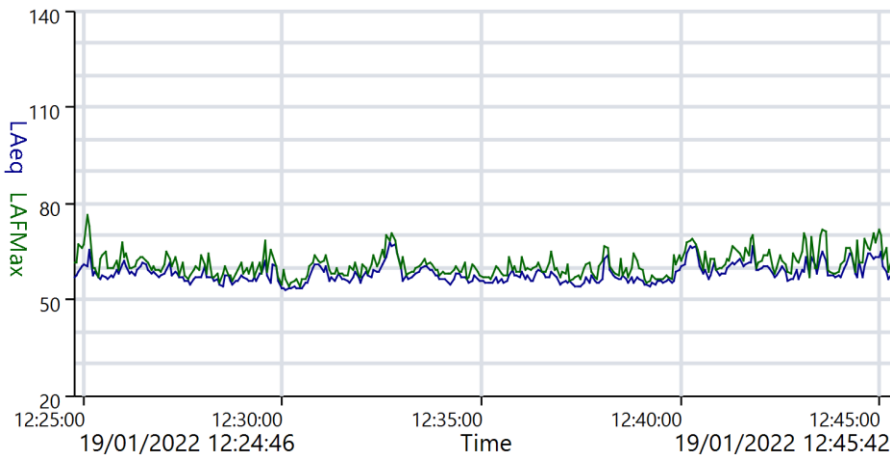
Name	Class 02			
Time	19/01/2022 12:24:46	**Person**	**Place**	**Project**
Duration	00:20:56	Darlene Borg Head of School	Guardian Angel Sec. School	Measuring traffic noise at classroom facade
Instrument	G080702, CR:171A			

Calibration

Before	19/01/2022	Offset	-0.75	**After**	19/01/2022	Offset	-0.59

Basic Values	
LAeq	59.2 dB
LAE	90.2 dB
LAFMax	76.5 dB

Statistical Levels (Ln)	
LAF1	67.5 dB
LAF5	63.9 dB
LAF10	61.7 dB
LAF50	57.0 dB
LAF90	54.4 dB
LAF95	53.7 dB
LAF99	52.2 dB



Classroom 03

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Measurement Summary Report

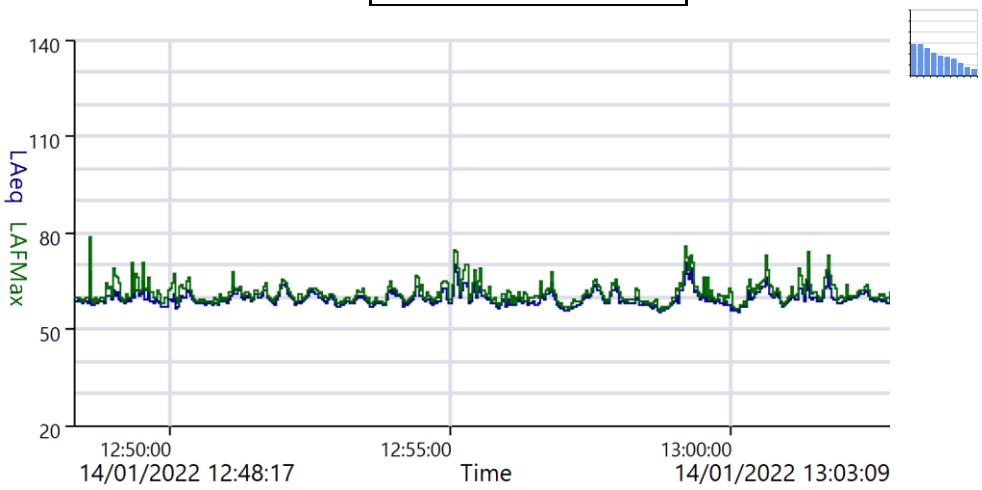
Name	Classroom 03			
Time	14/01/2022 12:48:17	**Person**	**Place**	**Project**
Duration	00:14:52	Darlene Borg Head of School	Guardian Angel Secondary School	Measuring traffic noise at classroom facade
Instrument	G080702, CR:171A			

Calibration

Before	14/01/2022	Offset	-0.76	**After**	14/01/2022	Offset	-0.80

Basic Values	
LAeq	60.3 dB
LAE	89.8 dB
LAFMax	78.7 dB

Statistical Levels (Ln)	
LAF1	67.8 dB
LAF5	63.6 dB
LAF10	62.2 dB
LAF50	58.8 dB
LAF90	56.7 dB
LAF95	56.1 dB
LAF99	54.9 dB



Classroom 04

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Measurement Summary Report

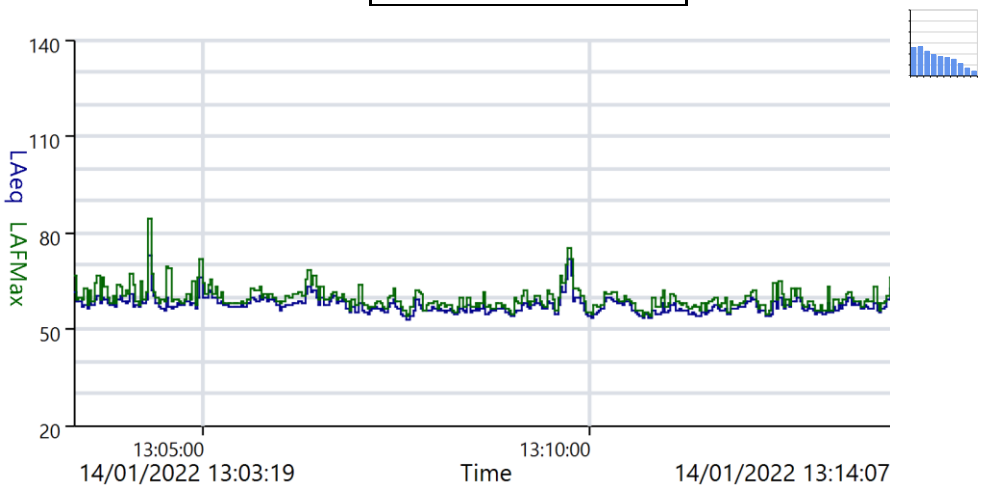
Name	Class 04			
Time	14/01/2022 13:03:19	**Person**	**Place**	**Project**
Duration	00:10:48	Darlene Borg Head of School	Guardian Angel Secondary School	Measuring traffic noise at classroom facade
Instrument	G080702, CR:171A			

Calibration

Before	14/01/2022	Offset	-0.76	**After**	14/01/2022	Offset	-0.80

Basic Values	
LAeq	58.5 dB
LAE	86.6 dB
LAFMax	84.3 dB

Statistical Levels (Ln)	
LAF1	65.3 dB
LAF5	61.0 dB
LAF10	59.8 dB
LAF50	56.7 dB
LAF90	54.5 dB
LAF95	54.0 dB
LAF99	53.1 dB



Classroom 09

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Measurement Summary Report

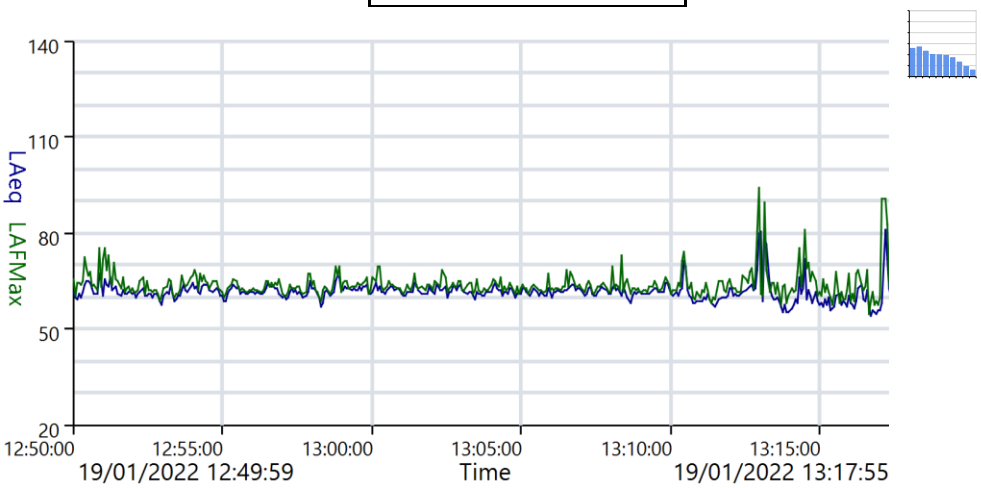
Name	Report 09			
Time	19/01/2022 12:49:59	**Person**	**Place**	**Project**
Duration	00:27:56	Darlene Borg Head of School	Guardian Angel Sec. School	Measuring traffic noise at classroom facade
Instrument	G080702, CR:171A			

Calibration

Before	19/01/2022	Offset	-0.75	**After**	19/01/2022	Offset	-0.59

Basic Values	
LAeq	62.7 dB
LAE	94.9 dB
LAFMax	90.6 dB

Statistical Levels (Ln)	
LAF1	66.9 dB
LAF5	64.3 dB
LAF10	63.4 dB
LAF50	61.3 dB
LAF90	58.8 dB
LAF95	57.2 dB
LAF99	54.5 dB



Classroom 05

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Measurement Summary Report

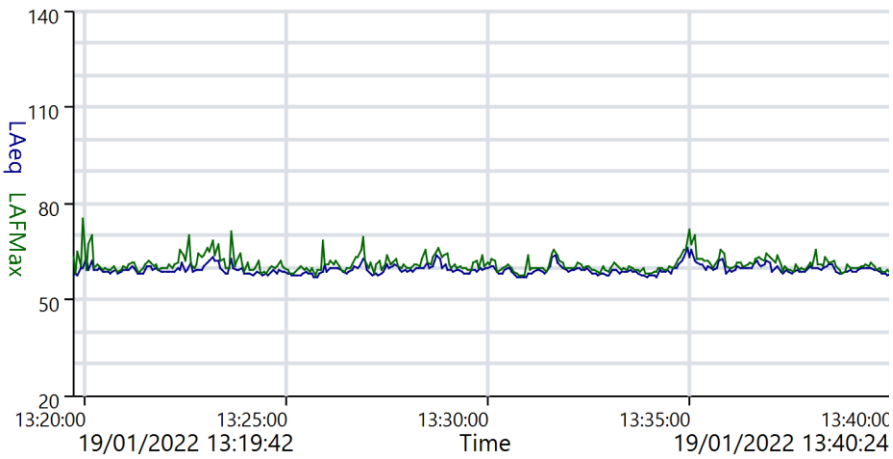
Name	Class 05			
Time	19/01/2022 13:19:42	**Person**	**Place**	**Project**
Duration	00:20:42	Darlene Borg Head of School	Guardian Angel Sec. School	Measuring traffic noise at classroom facade
Instrument	G080702, CR:171A			

Calibration

Before	19/01/2022	Offset	-0.59	**After**	19/01/2022	Offset	-0.49

Basic Values	
LAeq	59.5 dB
LAE	90.4 dB
LAFMax	75.4 dB

Statistical Levels (Ln)	
LAF1	64.9 dB
LAF5	62.0 dB
LAF10	60.9 dB
LAF50	58.8 dB
LAF90	57.5 dB
LAF95	57.1 dB
LAF99	56.5 dB



Classroom 06

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Measurement Summary Report

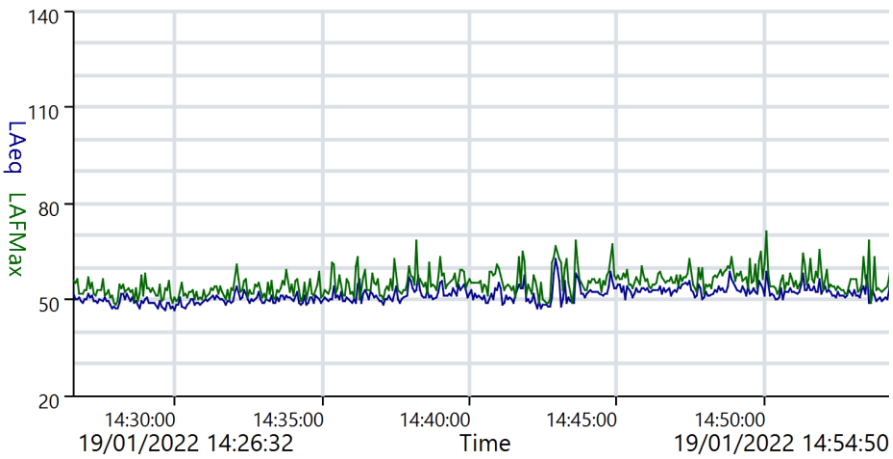
Name	Report 06			
Time	19/01/2022 14:26:32	**Person**	**Place**	**Project**
Duration	00:28:18	Darlene Borg Head of School	Guardian Angel Sec. School	Measuring noise Background noise Classroom 06
Instrument	G080702, CR:171A			

Calibration

Before	19/01/2022	Offset	-0.41	**After**	19/01/2022	Offset	-0.48

Basic Values	
LAeq	52.2 dB
LAE	84.5 dB
LAFMax	71.3 dB

Statistical Levels (Ln)	
LAF1	60.3 dB
LAF5	55.7 dB
LAF10	54.2 dB
LAF50	50.5 dB
LAF90	47.7 dB
LAF95	47.1 dB
LAF99	46.0 dB



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Measurement Summary Report

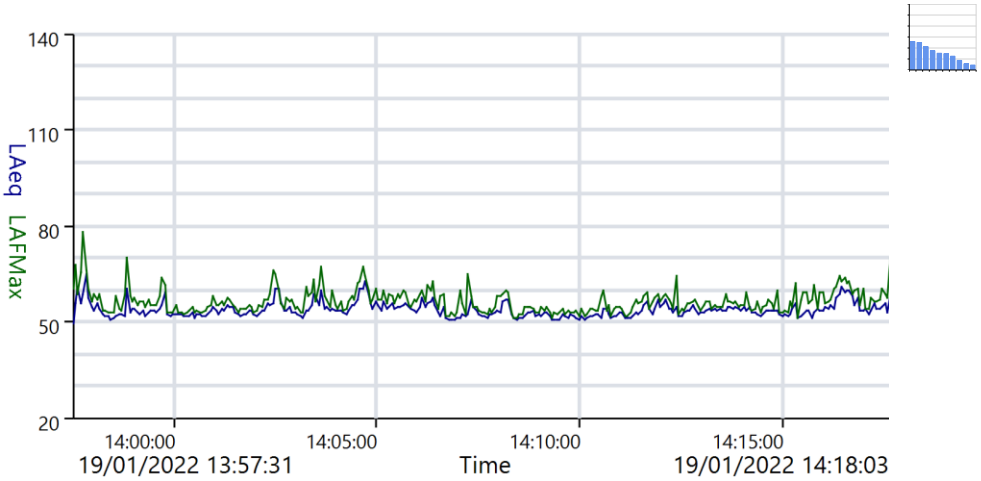
Name	Report MP			
Time	19/01/2022 13:57:31	**Person**	**Place**	**Project**
Duration	00:20:32	Darlene Borg Head of School	Guardian Angel Sec. School	Measuring noise At meeting place
Instrument	G080702, CR:171A			

Calibration

Before	19/01/2022	Offset	-0.49	**After**	19/01/2022	Offset	-0.41

Basic Values	
LAeq	54.5 dB
LAE	85.4 dB
LAFMax	78.2 dB

Statistical Levels (Ln)	
LAF1	61.8 dB
LAF5	58.2 dB
LAF10	56.5 dB
LAF50	53.0 dB
LAF90	51.0 dB
LAF95	50.7 dB
LAF99	50.0 dB



Classroom 2

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Measurement Summary Report

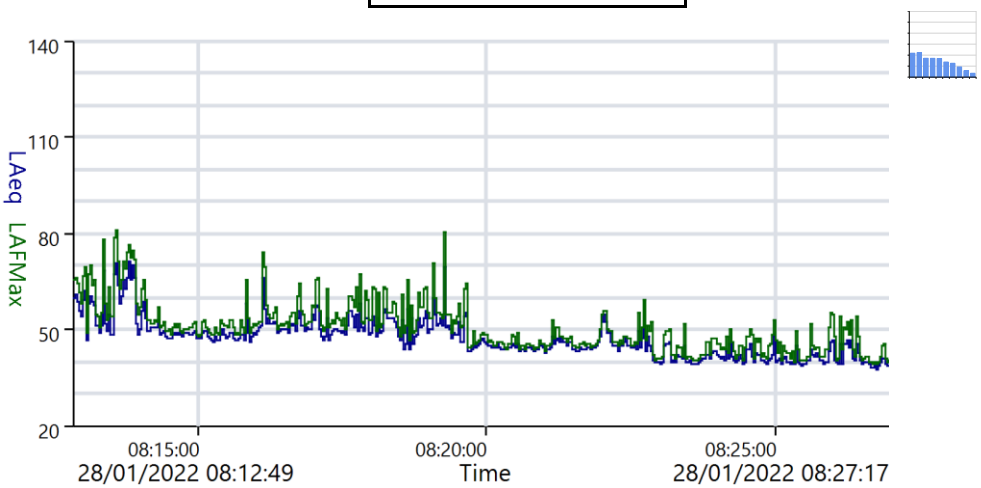
Name	Class 02			
Time	28/01/2022 08:12:49	**Person**	**Place**	**Project**
Duration	00:14:28	Darlene Borg Head of School	Guardian Angel Sec School	Measuring the background noise in Classroom 2
Instrument	G080702, CR:171A			

Calibration

Before	28/01/2022	Offset	-1.11	**After**	28/01/2022	Offset	-1.18

Basic Values	
LAeq	54.4 dB
LAE	83.8 dB
LAFMax	81.0 dB

Statistical Levels (Ln)	
LAF1	67.0 dB
LAF5	56.6 dB
LAF10	52.7 dB
LAF50	46.0 dB
LAF90	39.5 dB
LAF95	38.9 dB
LAF99	38.1 dB



Notes

The noise was measured with the windows in the open & closed position

08:12- 08:18 door open - 52.7 dB(A)

08:18- 08: 23 Window open & door closed - 48dB(A)

08:23- 08:27 Door & windows closed - 44dB(A)

During the noise measurement traffic was travelling at low speed.

Classroom 08

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Noise Abatement Society of Malta

Measurement Summary Report

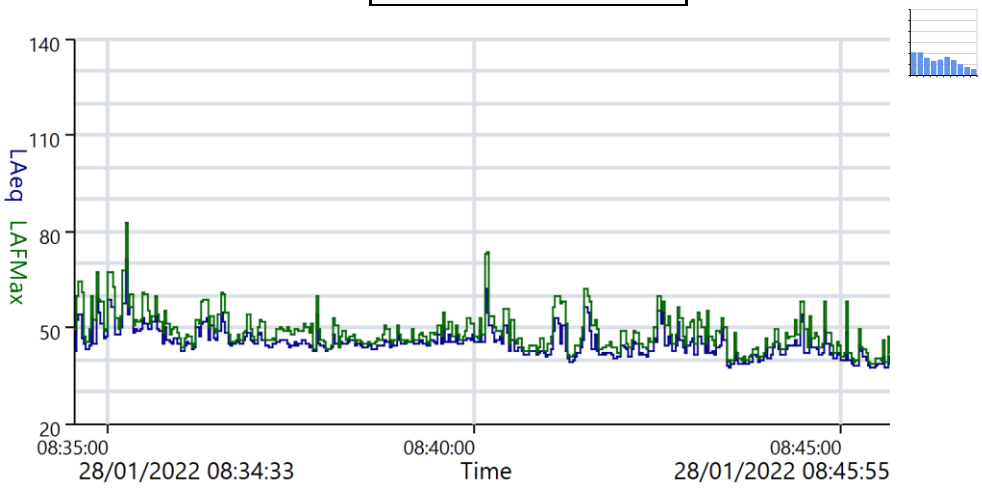
Name	Class 08			
Time	28/01/2022 08:34:33	**Person**	**Place**	**Project**
Duration	00:11:22	Darlene Borg Head of School	Guardian Angel Sec School	Measuring the background noise In classroom 8
Instrument	G080702, CR:171A			

Calibration

Before	28/01/2022	Offset	-1.18	**After**	Offset

Basic Values	
LAeq	55.0 dB
LAE	83.3 dB
LAFMax	90.1 dB

Statistical Levels (Ln)	
LAF1	58.6 dB
LAF5	52.7 dB
LAF10	49.6 dB
LAF50	44.1 dB
LAF90	39.5 dB
LAF95	38.5 dB
LAF99	37.3 dB



Notes

The noise was measured with the windows in the open and closed position

08:35- 08:39 door open - 52.7 dB(A)

08:39- 08: 42 Window open & door closed - 48dB(A)

08:42- 08:45 Door & windows closed - 44dB(A)

During the noise measurement traffic was travelling at low speed.