



Glass Systems Factory, Baglan Way, Port Talbot

Acoustic Assessment for BREEAM Pol05

28th March 2023

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1. INTRODUCTION

1.1. Overview

inacoustic has been commissioned to undertake an acoustic assessment for the proposed Glass Systems Factory Development on Land at Baglan Way, Port Talbot, to provide advice at RIBA Stage 4 and to demonstrate compliance with BREEAM New Construction 2018 (UK) Hea05 and Pol05 acoustic credits.

This assessment reviews the proposed architectural design and available plant information, and provides acoustic advice in order to achieve the requirements of noise related Planning Conditions and compliance with BREEAM Pol05. The assessment of compliance with Hea05 has been carried out separately for the office block.

This assessment is also intended to assist in the discharge of Planning Condition 12 applied to Application No. P2022/0470.

This noise assessment is necessarily technical in nature; therefore a glossary of terms is included in Appendix A to assist the reader.

This report has been prepared by Victor R. Valeron, who is a corporate Member of the Institute of Acoustics (IOA) with a BEng degree in Audio and Video and a Master's Degree in Environmental and Architectural Acoustics, with over 15 years of experience. The report has also been reviewed by Neil Morgan, who is a corporate Member of the Institute of Acoustics (IOA) with a Master's Degree in Applied Acoustics, with over 20 years of experience. Victor Valeron BEng MSc MIOA and Neil Morgan MSc MIOA therefore qualify as a Suitably Qualified Acousticians (SQA) as defined in the BREEAM UK New Construction 2018 technical manual.

1.2. Scope and Objectives

The scope of the noise assessment can be summarised as follows:

- A sound monitoring survey was undertaken at a discrete locations representative of the closest noise-sensitive receptors to the Site;
- A 3-dimensional noise modelling exercise, in order to quantify the potential noise generation of the proposed plant and fixed installations;
- An assessment of potential noise impacts with respect to the prevailing acoustic conditions at existing off-site receptors; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of BS4142:2014+A1:2019¹.

¹ British Standard 4142: 2014+A1:2019 *Method for rating and assessing commercial sound*. BSI

2. GUIDANCE AND STANDARDS

2.1. Planning Condition 12

Decision Notice from Neath Port Talbot County Borough Council, dated 15 June 2022, applied to Application No. P2022/0470 includes the following noise-related Planning Condition:

Condition 12

Prior to commencement of the superstructure of the development hereby approved, the applicant shall submit a scheme detailing how the specified sound rating levels within the noise impact assessment will be achieved. The scheme shall include specific details of any sound attenuation equipment that may be necessary to achieve the stipulated sound rating levels set within the report. The development shall be constructed in accordance with the details hereby approved, and retained as such thereafter.

2.2. BS4142:2014+A1:2019

BS4142:2014² sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS4142:2014 states: *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs"*. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- *"Typically, the greater this difference, the greater the magnitude of the impact."*
- *"A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."*
- *"A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."*
- *"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

During the daytime, the assessment is carried out over a reference time period of 1-hour, with a reference period of 15-minutes used for the night-time assessment. The periods associated with day

² British Standard 4142: 2014 +A1:2019 Method for rating and assessing commercial sound. BSI

or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

2.3. Relative Change in Ambient Noise Level

In circumstances where a noise environment may be altered by addition or removal of a noise source, considered to be largely anonymous or within the prevailing acoustic character of an area, for example, changes to traffic quantum or patterns, it is normal to consider the relative change in ambient noise level. The assessment, therefore, considers this phenomenon to add context.

The impact scale adopted in this assessment is shown in Table 1 below, which relates to established human responses to noise, in line with 'Table 7-12 Effect Descriptors' of the IEMA Guidelines.

TABLE 1: IMPACT SCALE FOR COMPARISON OF FUTURE NOISE AGAINST EXISTING NOISE

Noise Level Change dB(A)	Subjective Response	Significance
Less than 1.0	Not perceptible	Negligible
1.0 – 2.9	Barely perceptible	Minor impact
3.0 – 4.9	Noticeable	Moderate impact
5.0 – 9.9	Up to a doubling or halving of loudness	Substantial impact
10.0 or more	More than a doubling or halving of loudness	Major impact

The criteria above reflect the key benchmarks that relate to human perception of sound. A change of 3 dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10 dB(A) change in noise represents a doubling or halving of the subjective perception of loudness. The difference between the minimum perceptible change and the doubling or halving of the loudness is split to provide greater definition to the assessment of changes in noise level. It is considered that the criteria specified in Table 1 provide a good indication as to the likely significance of changes in noise levels in this case and can be used to inform the context in which the sound occurs in order to assess the impact of noise from the proposed development.

2.4. BREEAM UK New Construction 2018

BREEAM UK New Construction 2018 is the technical manual that describes an environmental performance standard against which new, non-domestic buildings in the UK can be assessed and achieve a BREEAM New Construction rating.

2.4.1. Pol05 Reduction of Noise Pollution

The aim of Pol 05 is to reduce the likelihood of noise arising from fixed installations on the new development affecting nearby noise-sensitive buildings. For the proposed development, there is one credit available. The noise impact assessment must be carried out by a suitably qualified acoustician.

Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800m radius of the assessed site, a noise impact assessment compliant with BS 4142:20141 should be commissioned. Noise levels must be measured or determined for:

- Existing background noise levels
- Noise rating level from the assessed building

The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise-sensitive development, must be at least 5dB lower than the background noise throughout the day and night.

If the noise sources from the assessed building are greater than the levels described above, measures should be installed to attenuate the noise at its source to a level where it will comply with the criterion.

3. SITE DESCRIPTION

3.1. Site and Surrounding Area

The site is located on a parcel of land located between Baglan Way and Moor Road, Port Talbot.

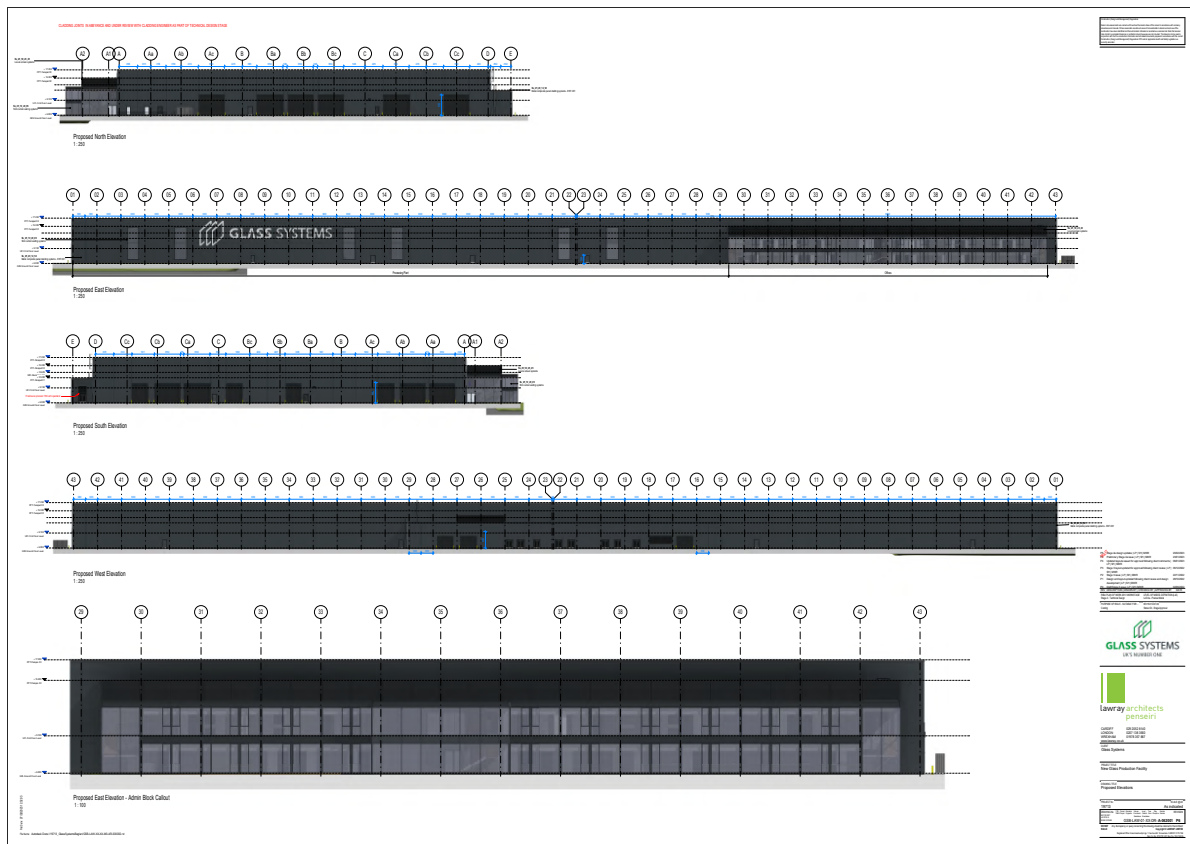
The Proposed Development area relative to significant off-site features in the area is shown in Figure 1, below.

The prevailing ambient sound environment throughout the area was noted to be dominated by road traffic noise arising from vehicles using the M4 motorway, with localised contributions arising from nearby industries and local road traffic.

FIGURE 1: SITE AND SURROUNDING AREA



FIGURE 3: PROPOSED ELEVATIONS



4. ENVIRONMENTAL NOISE SURVEY

4.1. Overview

The prevailing noise conditions in the area have been determined by an environmental noise survey conducted between Tuesday 15th and Wednesday 23rd June 2021.

A summary of the environmental noise survey is presented below. Further details of the survey are included in the Noise Assessment prepared in support of the Planning Application (inacoustic's document '21-055 v4' dated 26th May 2022).

4.2. Survey Results

The measurements are described in Table 2, with an aerial photograph indicating their locations shown in Figure 4.

TABLE 2: MEASUREMENT POSITION DESCRIPTION

Measurement Position	Description
MP1	A largely unattended free-field measurement of sound representative of the nearest noise sensitive receptors to Moor Road. The measurement was undertaken at a height of 1.5 metres above local ground level. The sound environment was dominated by noise arising from road traffic using the M4 motorway, with occasional contributions from local road traffic movements.
MP2	A largely unattended free-field measurement of sound representative of the nearest noise sensitive receptors to the M4 corridor. The measurement was undertaken at a height of 1.5 metres above local ground level. The sound environment was dominated by noise arising from road traffic using the M4 motorway, with occasional contributions from local road traffic movements.

FIGURE 4: MEASUREMENT POSITIONS



The summarised results of the environmental noise measurements are presented in Table 3.

TABLE 3: SUMMARY OF NOISE MEASUREMENT RESULTS

Measurement Position	Period	Noise Level, dB			
		L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFMax}
MP1	Day 23:00 - 07:00	54	45	54	67
	Night 23:00 - 07:00	50	43	51	66
MP2	Day 23:00 - 07:00	56	49	57	68
	Night 23:00 - 07:00	52	42	53	67

In addition to the environmental noise survey, a source noise measurement exercise was undertaken at the existing Glass Systems Port Talbot premises at Units 9, 19 and 21 Baglan Industrial Estate on Thursday 22nd July 2021, to inform likely noise emission levels associated with the new facility.

5. NOISE ASSESSMENT

5.1. Overview

This assessment focus on the likelihood of noise arising from fixed installations on the new development affecting nearby noise-sensitive buildings, in order to assess compliance with the requirements of BREEAM Pol05.

It is noted that Pol05 requires the noise level from the assessed building, as measured in the locality of the nearest or most exposed noise-sensitive development, to be at least 5dB lower than the background noise throughout the day and night.

The objective of the noise assessment in support of the planning application (inacoustic's document '21-055 v4' dated 26th May 2022) aimed to ensure that rating sound levels did not exceed the prevailing background sound levels. Therefore, compliance with the more stringent BREEAM criteria will ensure that requirements of Planning Condition 12 are also satisfied.

5.2. Source Data and Operational Assumptions

5.2.1. Processing Area

The following noise information has been provided with regards to the noise emissions from the processing plant:

- Blower Room has Sound Power Level of 120 dB(A), but a noise reduction kit will be provided. Noise reduction cabin around the chiller $L_p=85\text{dB(A)}$. Blower room, including air inlets/louvres/noise attenuation. Single blower system, complete with required ducting, ducting supports & insulation suitably connected to noise cabin.
- Noise level during the breaking process at the glass breaking station, broken glass conveyor and remnant glass disposal for float glass can be up to 100 dB. A soundproof enclosure for 2 containers including automatic switching and filling level monitoring is also included. Waste glass containers provided by the customer are enclosed in a soundproof enclosure, so that the noise created by the disposal of pieces of broken glass from the conveyor belt into the respective container for broken glass is damped extensively. Inacoustic assumes that this station is located within the main building and that the noise levels from the breaking and waste stations will not exceed 85 dB(A) outside of the acoustic enclosure.
- For the rest of the plant, the information provided states that '*it will include clad with sufficient insulating material, so that the noise level in the surrounding area is kept very low*'. The use of 'noise-optimised' drying zone fan is also mentioned.

Based on the above, Inacoustic has predicted that the noise level within the main processing building will not exceed an internal reverberant level of 87 dB(A). This is in line with the highest reverberant levels measured at the existing Glass Systems Port Talbot premises, and are therefore considered robust.

The input data set out in Table 4 has been considered within the assessment:

TABLE 4: NOISE SOURCE ASSUMPTIONS – PROCESSING PLANT

Plant	Octave Band Sound Power Level, Hz (dB)								dB(A)
	63	125	250	500	1k	2k	4k	8k	
Cumulative Internal Reverberant Level Processing Area	82	82	79	78	82	80	80	80	87

A total of 3no. compressors will be included within the 'Plant and Services' building area are as follow:

- Kaeser Compressor DSD205SFC: 73 dB(A)
- Kaeser Compressor DSD145 (x2): 69 dB(A)

It has been assumed that all processes will occur simultaneously on a 24-hour basis.

It is understood that the extraction system serving the furnaces will not discharge to the environment, but the rejected air/heat will be recirculated into the building. The extraction/discharge system serving the furnaces into the building will be designed by the furnace/enclosure manufacturers to not exceed 85dB(A) within the space.

5.2.2. Office Block

Mechanical plant will be located on the roof of the Administration and Staff Accommodation building to provide ventilation, cooling and heating to the office areas.

The following noise emission data have been provided by the M&E Engineers. A 1.5m parapet around the office roof edge is included in the noise model, as shown in the architectural drawings.

TABLE 5: NOISE SOURCE ASSUMPTIONS – OFFICE PLANT

Plant	Quantity	Sound Power Level per unit, L _{WA} (dB)
Air Handling Unit	2	63 (Outdoor Air Inlet) 80 (Exhaust Air) 57 (Case Breakout)
VRF external condenser units (PURY-EM300YNW-A1)	6	86.5/80.0 (Heating/Cooling 100% capacity)
External DX condenser units for AHU coils (PUHZ-ZRP250YKA3)	4	70/67 (Heating/Cooling, based on 62/59 SPL@1m)

It has been assumed that office plant will be operational during the daytime period (07:00-23:00) only.

5.3. Mitigation by Design - Building Envelope

Based on an iterative assessment of the noise model, the following sound reduction performance of the external building fabric are recommended.

TABLE 6: SOUND REDUCTION INDEX OF BUILDING COMPONENTS

Component	Octave Band Sound Reduction Index R, Hz (dB)								R _w
	63	125	250	500	1k	2k	4k	8k	
Composite Wall Panels	10	10	24	32	37	43	46	55	33
Composite Roof Panels	10	10	24	32	37	43	46	55	33
Glazed Areas	30	26	21	28	41	38	37	37	33
Roller Shutter Door (closed)	15	10	12	18	13	20	35	41	18

The Location of the various façade systems have been taken from Lawray Architects' elevation drawing VB02803-LAW-XX-XX-DR- A-06201 Revision P3 and GSB-LAW-01-XX-DR- A-062001 Revision P6.

As an example only, Euroclad Elite System are capable of achieving the above performance for the building panels. Double glazing, such as 6mm/12mm/4mm and standard roller shutter doors can also achieve the values presented in Table 6.

Performance specifications are frequency specific. Overall performance values are given for guidance purposes only. It is the responsibility of the contractor/manufacture to recommend and provide appropriate systems.

It is understood that a weather louvre of approximately 11m width by 2m high will be set up at high level on the south west side of the main processing building and a weather louvre of approximately 2m width by 2m high on the south east side of the 'Plant and Services' building. No specific acoustic mitigation is considered necessary for these louvres.

No other external plant or ventilation openings associated with the manufacturing and processing area are considered in the assessment.

It is noted that roller shutter doors need to remain closed in order to achieve the BREEAM PoI05 targets. Alternative means of ventilation should be provided.

5.4. Noise model

In order to assess the impact on noise at the noise-sensitive receptors (NSRs), and advise on potential noise mitigations, a 3-dimensional noise model has been produced. Cadna/A software package has been used, which undertakes its calculations in accordance with guidance given in ISO9613³, which considers a worst-case downwind propagation to all receptors.

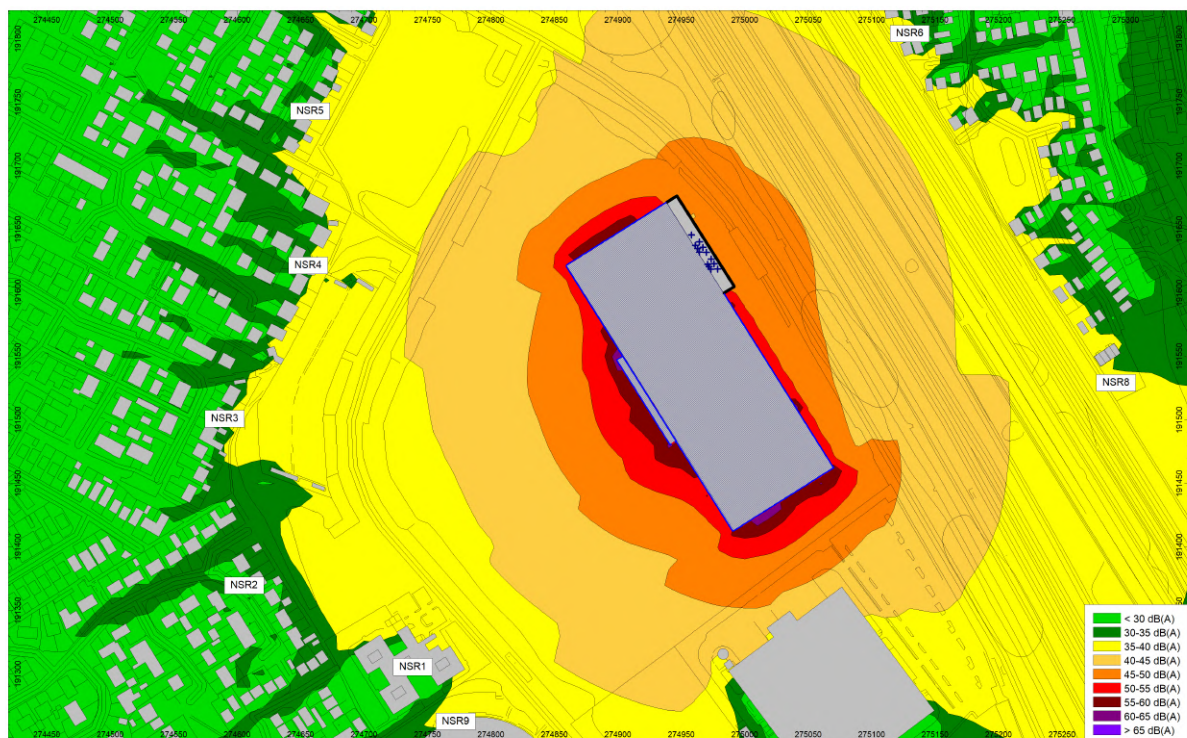
Given that the land between the development and nearest receptors is largely soft, the ground factor within the calculation software has been set to 0.5 as a worst-case, with 2 orders of reflection. Full octave frequency spectra have been used in the calculations.

In order to accurately model the land surrounding the development, an AutoCAD DXF drawing was produced, which was based on data provided by the Ordnance Survey.

5.4.1. Specific Sound Level Map

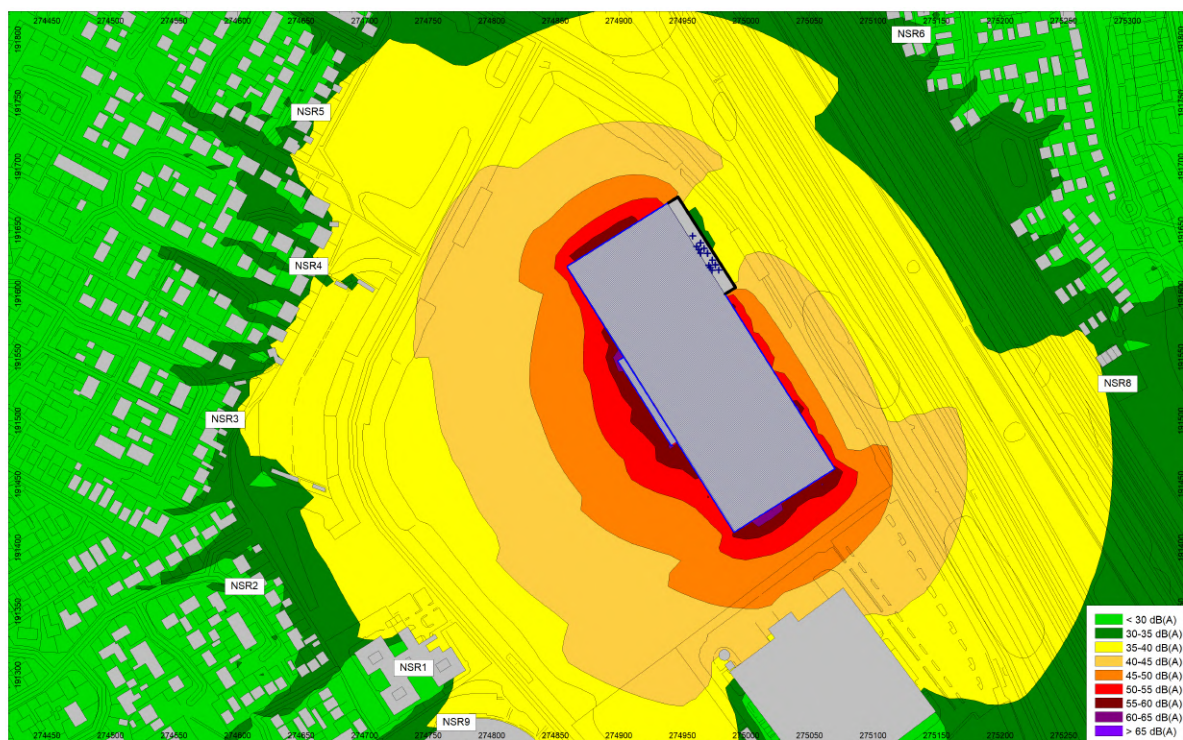
Sound maps at 4m high of the predicted daytime and night-time specific sound levels arising from cumulative typical operations at the closest receptors to the Site can be seen in Figure 5 and Figure 6.

FIGURE 5: SPECIFIC SOUND LEVEL MAP - DAYTIME



³ ISO 9613-1:1993 and ISO 9613-2:1996: Acoustics - Attenuation of sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere and Part 2: General method of calculation

FIGURE 6: SPECIFIC SOUND LEVEL MAP – NIGHT-TIME



5.4.2. Specific Sound Level Summary

The predicted specific sound levels arising from operations at the closest receptors to the Site, as shown on Figure 5 and Figure 6 can be seen below in Table 7.

TABLE 7: PREDICTED SPECIFIC SOUND LEVEL SUMMARY

Position	Specific Sound Level at Façade dB(A)	
	Daytime (07:00-23:00)	Night-time (23:00-07:00)
1	37	37
2	34	34
3	36	35
4	37	37
5	36	35
6	38	33
7	39	32
8	38	35
9*	38	38

**Denotes non-residential receptor (Port Talbot Resource Centre)*

5.5. Assessment

5.5.1. Rating Penalty Principle

Section 9 of BS4142:2014+A1:2019 describes how the rating sound level should be derived from the specific sound level, by determining a rating penalty.

BS4142:2014+A1:2019 states:

“Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

- a) subjective method;*
- b) objective method for tonality;*
- c) reference method.”*

Given that the Proposed Development is not operational, the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014+A1:2019, which states:

“Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed.

Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources.”

BS4142:2014+A1:2019 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

Tonality

A rating penalty of +2 dB is applicable for a tone which is *“just perceptible”*, +4 dB where a tone is *“clearly perceptible”*, and +6 dB where a tone is *“highly perceptible”*.

Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is *“just perceptible”*, +6 dB where it is *“clearly perceptible”*, and +9 dB where it is *“highly perceptible”*.

Intermittency

BS4142:2014+A1:2019 states that when the *“specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time ... if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.”*

Other Sound Characteristics

BS4142:2014+A1:2019 states that where *“the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied.”*

5.5.2. Rating Penalty Assessment

Considering the content of Section 5.5.1, an assessment of the noise source associated with the Development, in terms of whether any rating penalties are applicable, has been detailed in Table 8.

TABLE 8: RATING PENALTY ASSESSMENT

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
Plant Noise / Noise Breakout	0 dB	0 dB	0 dB	0 dB	The plant is expected to operate continuously. As such intermittency is not expected to be present. Tonal and impulsive sounds are likely to be present at source, within the building. However, on the basis of the predicted results, which make robust allowances for plant noise, it is considered that such activities would be at a level typically regarded as barely perceptible at the receiver position, due to the attenuation provided by the building fabric, the distances involved and the background/residual sound environment. Therefore, no penalties are considered applicable

In summary, no rating penalty has been included in the assessment.

5.5.3. Uncertainty

BS4142:2014+A1:2019 requires that the level of uncertainty in the measured data and associated calculations is considered in the assessment. The Standard recommends that steps should be taken to reduce the level of uncertainty.

Measurement Uncertainty

BS4142:2014+A1:2019 states that measurement uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

- “ ...
- b) the complexity and level of variability of the residual acoustic environment;*
 - “ ...
 - d) the location(s) selected for taking the measurements;*
 - “ ...
 - g) the measurement time intervals;*
 - h) the range of times when the measurements have been taken;*
 - i) the range of suitable weather conditions during which measurements have been taken;*
 - “ ...
 - k) the level of rounding of each measurement recorded; and*
 - l) the instrumentation used.”*

Each of the measurement uncertainty factors outlined above have been considered and discussed in Table 9.

TABLE 9: MEASUREMENT UNCERTAINTY FACTORS

Measurement Uncertainty Factor Reference	Level of Uncertainty	Discussion
b)	0 dB	Residual acoustic environment is relatively constant, hence no correction for a complex residual acoustic environment.
d)	0 dB	The measurements were undertaken at locations considered to be robustly representative of the closest noise-sensitive receptors to the site.
g)	0 dB	Measurement time intervals were set in accordance with BS4142:2014+A1:2019, hence no further correction needs to be made.
h)	0 dB	Background measurements were undertaken over continuous 10-day period.
i)	0 dB	The measurement was accompanied by the deployment of a weather station, which enabled detailed observations of the weather conditions.
k)	0 dB	Measured values were rounded to 0.1 dB, therefore rounding would not have had a significant impact on the overall typical background sound levels.
l)	0 dB	The acoustic measurement equipment accorded with Type 1 specification of British Standard 61672, and were deployed with appropriate wind shields.

In summary, no uncertainty budget has been included in the assessment, to account for measurement uncertainty.

Calculation Uncertainty

BS4142:2014 states that calculation uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

- “ ...
- b) uncertainty in the operation or sound emission characteristics of the specific sound source and any assumed sound power levels;*
 - c) uncertainty in the calculation method;*
 - d) simplifying the real situation to “fit” the model (user influence on modelling); and*
 - e) error in the calculation process.”*

Each of the calculation uncertainty factors outlined above have been considered and discussed in Table 10, below.

TABLE 10: CALCULATION UNCERTAINTY FACTORS

Calculation Uncertainty Factor Reference	Level of Uncertainty	Discussion
b)	0 dB	Sound levels have been based on outline information provided and a reasonable worst-case measured source levels from an existing site incorporating older technology.
c)	0 dB	Calculations were undertaken in accordance with ISO 9613-2, which is considered a “ <i>validated method</i> ” by BS4142:2014+A1:2019.
d)	0 dB	The real situation has not been simplified for the purposes of this assessment.
e)	±1 dB	ISO 9613-2 indicates that there is a ±3 dB accuracy to the prediction method, dependent upon input variables and propagation complexities.

In summary, a ±1 dB uncertainty budget has been considered in the assessment, for calculation uncertainty.

The overall uncertainty is considered to be small enough that it would not affect the conclusions of the assessment.

5.5.4. Rating Sound Level

Incorporating the rating penalties detailed in 5.5.2 with the predicted specific sound levels, as detailed in Table 7, the rating sound levels have been derived and have been detailed in Table 11 below.

TABLE 11: RATING SOUND LEVELS

NSR	Cumulative Specific Sound Level, dB(A)		Rating Sound Level, dB(A)	
	Day	Night	Day	Night
1	37	37	37	37
2	34	34	34	34
3	36	35	36	35
4	37	37	37	37
5	36	35	36	35
6	38	33	38	33
7	39	32	39	32
8	38	35	38	35
9	38	38	38	38

5.5.5. BS4142:2014+A1:2019 Assessment

The rating sound level, as calculated from the predicted specific sound level, has been assessed in accordance with BS4142:2014+A1:2019, at all NSRs.

The resultant assessment summary, during the daytime period, can be seen in Table 12.

TABLE 12: DAYTIME BS4142:2014+A1:2019 ASSESSMENT SUMMARY

NSR	Rating Sound Level (dB)	Daytime Background Sound Level (dB)	Excess of Rating over Daytime Background Sound Level (dB)
1	37	45	-8
2	34	45	-11
3	36	45	-9
4	37	45	-8
5	36	49	-13
6	38	49	-11
7	39	49	-10
8	38	49	-11
9	38	45	-7

The resultant assessment summary, during the night time period assuming office plant non-operational, can be seen in Table 13.

TABLE 13: NIGHT TIME BS4142:2014+A1:2019 ASSESSMENT SUMMARY

NSR	Rating Sound Level (dB)	Night-time Background Sound Level (dB)	Excess of Rating over Night Time Background Sound Level (dB)
1	37	43	-6
2	34	43	-9
3	35	43	-8
4	37	43	-6
5	35	42	-7
6	33	42	-9
7	32	42	-10
8	35	42	-7
9	38	43	-5

It can be seen that the Development, in its assessed form is likely to have a '*low impact*' at the nearest noise-sensitive receptors both during the day and during the night. Rating sound levels are predicted to be at least 5dB below the prevailing background sound levels.

Considering the context, the differential between the predicted specific noise levels at the NSRs and the measured ambient $L_{Aeq,T}$ sound levels in the area would ensure that no increase in the prevailing ambient sound level would occur as a results of the development operations.

The results of the noise model demonstrate compliance, at design stage, with BREEAM PoI05 Reduction of Noise Pollution. Therefore, up to 1 BREEAM credit can be awarded.

6. CONCLUSION

inacoustic has been commissioned to undertake an acoustic assessment for the proposed Glass Systems Factory Development on Land at Baglan Way, Port Talbot, to provide advice at RIBA Stage 4 and to demonstrate compliance with BREEAM New Construction 2018 (UK) Hea05 and Pol05 acoustic credits.

This assessment reviews the proposed architectural design and available plant information, and provides acoustic advice in order to achieve the requirements of noise related Planning Conditions and compliance with BREEAM Pol05. The assessment of compliance with Hea05 has been carried out separately for the office block.

Based on the available plant noise information, the sound mitigation advice presented in Section 5.3 and the results of the noise modelling demonstrate compliance, at design stage, with BREEAM Pol05 Reduction of Noise Pollution. Therefore, up to 1 BREEAM credit can be awarded.

This technical noise assessment also provides details of how the sound rating levels specified at planning stage will be achieved, demonstrating compliance with requirements of Planning Condition 12. Therefore, it is recommended that Planning Condition 12 applied to Application No. P2022/0470 can be discharged on the basis of the information provided on this noise assessment.

This report has been prepared by Victor Valeron BEng MSc MIOA and reviewed by Neil Morgan MSc MIOA, both Suitably Qualified Acousticians (SQA) as defined in the BREEAM UK New Construction 2018 technical manual.

7. APPENDICES

7.1. Appendix A – Definition of Terms

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20 μ Pa (20x10 ⁻⁶ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20 μ Pa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE 14: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10} , the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq} .

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1\text{hour}}$ dB and $L_{A90,15\text{mins}}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

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