



ACOUSTIC
CONSULTANTS LTD

Noise Impact Assessment

**Proposed Residential Development
Land at Dragon Parc, Abercanaid, Merthyr**

Reference: 9674/JA

Client:	Planning Consultant
	

Document Control

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1.0	1 st Issue	31/05/22	James Abbass AMIOA	Blake Lucas MIOA
Rev A	Site layout	21/11/22	James Abbass AMIOA	Blake Lucas MIOA
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The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above. The report is provided for the sole use of the named Client and is confidential to them and their professional advisors. No responsibility is accepted to other parties.

The report limits itself to addressing solely on the noise aspects as included in this report. We provide advice only in relation to noise and acoustics. It is recommended that appropriate expert advice is sought on all the ramifications (e.g., CDM, structural, condensation, fire, legal, etc.) associated with any proposals in this report or as advised and concerning the appointment. It should be noted that noise predictions are based on the current information as we understand it and on the performances noted in this report. Any modification to these parameters can alter the predicted level. All predictions are in any event subject to a degree of tolerance of normally plus or minus three decibels. If this tolerance is not acceptable, then it would be necessary to consider further measures.

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1. Introduction

Davies Homes appointed Acoustic Consultants Ltd to undertake an environmental noise assessment for the proposed development on vacant land at Dragon Parc, Abercanaid, Merthyr.

The presented report is based upon noise measured at the site and considers road traffic from the surrounding road networks, rail vehicle noise, along with industrial noise from the nearby industrial premises.

The site has a previous outline planning application. This report is for a new application for the site.

The report takes into consideration the local authority requirements and identifies relevant planning, and noise guidance. The report also presents environmental noise levels at the site, providing mitigation measures in support of a planning application.

The report assesses the suitability of the site with respect to Planning Policy Wales (PPW), TAN 11, British Standard 8233:2014 / WHO (1999), and British Standard 4142:2014+A1:2019.

The author of this report is an Associate Member of the Institute of Acoustics (AMIOA) with a recognised acoustic qualification with four years of experience in the field. The report has been checked by a Member of the Institute of Acoustics (MIOA) with a recognised acoustic qualification with over fourteen years of experience in the field.

2. The Site

2.1. Site Description

The proposed site is located in a mixed-use area, with existing residential dwellings to the south and west, along with industrial units to the west, north, and east. The vacant site is flanked by two main A roads travelling north/south; the A470 lies approximately 300 metres to the west making up most of the background noise across the site, and the A4060 lies approximately 320 metres to the east. There is also a local road to the immediate west of the site. This travels the whole west boundary. Noise from this road predominantly affects only the west side of the site.

There is a local railway line located approximately 50 metres to the east, set at a lower elevation than the proposed site. The line accommodates local train carriages travelling north/south through Merthyr Tydfil. The railway line sits in between the proposed site and the industrial sites to the east. Vehicles pass approximately every 20- to 30-minutes.

The predominant noise at the site is road traffic emanating from the A470 to the west. Industrial noise is audible around the boundaries of the site, only at the closest points to the industrial sites in question. Industrial noise differs from each location, and the sites are identified in the figure below.

The proposed site is highlighted in red below with the proposed site layout in the second figure.

Figure 1: Site location

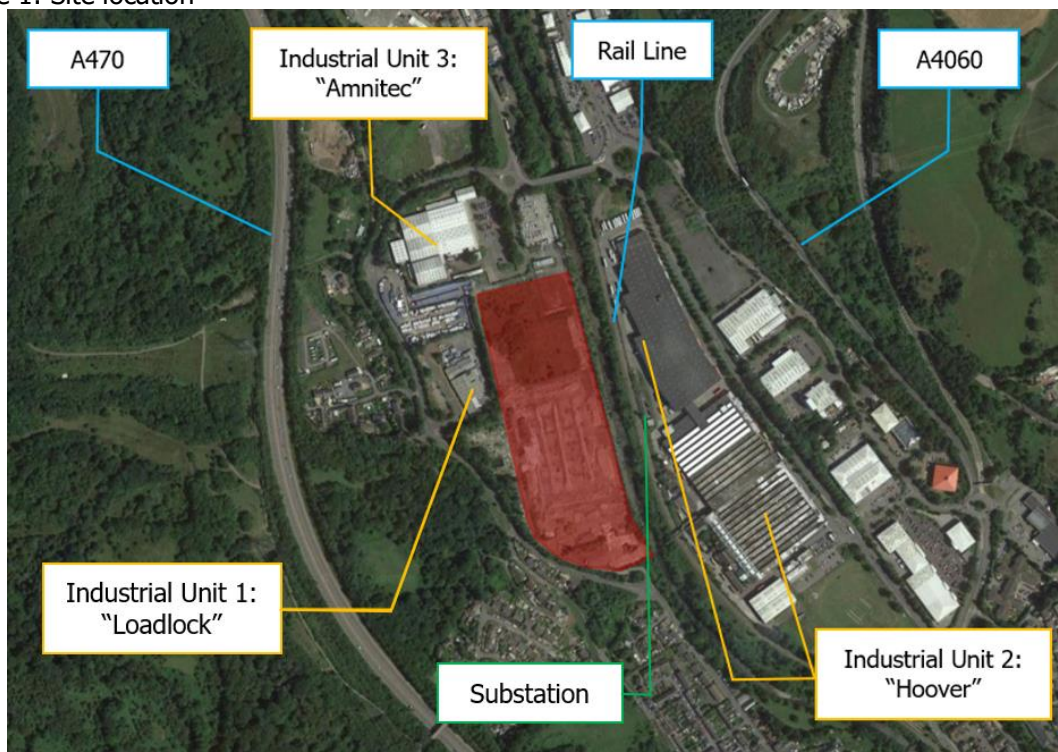


Figure 2: Site layout plan



Notes taken from our site visits regarding the nearby industrial units are as follows:

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2.2. Industrial Unit 1: Loadlock

This unit does not make frequent noise. During our site visit, one delivery of goods was observed and measured. The site contains a storage area to the south-west of the boundary, with an access road to the immediate west of the proposed site that is used by an electric forklift truck to manoeuvre goods. There is no plant noise audible from the site.

During an attended survey a delivery of goods was made by an HGV. A metal ramp belonging to the Loadlock site was installed to the rear of the HGV to allow the forklift to travel up to the container. The forklift loaded up a full capacity of goods, and then reversed down the ramp. The forklift then drove around the HGV and unloaded the goods about 5 to 10 metres away, along the access road along the boundary. The process was repeated. When fully unloaded, the ramp was removed, and the HGV started its engine and idled in position for 30-seconds before driving away. The whole process took approximately 45 minutes.

Noise characteristics include impulsivity from the movement of the forklift up and down the ramp, along with the loading and unloading of the goods on the forks.

2.3. Industrial Unit 2: Hoover

This unit produces frequent noise but does not pose an overbearing effect on the residual noise climate to the eastern boundaries. The northern portion of the industrial site houses HGV containers that are unloaded into their own garage-style unit with an open front; other than this the main structure of the unit is enclosed.

The containers are unloaded from HGVs arriving from the north. The HGV approaches an empty unit, and reverses into position to unload the container. The HGV then either drives out of the site without a container, or an electric tow truck manoeuvres a new container into position to load on to the HGV, before it then leaves the site. Noise characteristics from this process are impulsivity and impact noises from the loading of the container on to the HGV, however the characteristics do not have an overbearing effect on the residual noise climate. HGVs can also be heard idling on the access road, however, only for a short time before driving off.

The electric tow truck is frequently driving north/south along the near-side access road, manoeuvring containers from the north to the south portions of the site, or vice-versa. Noise from this process can be audible at the east boundary of the proposed site, consisting of the tow connections bouncing over road surfaces. However, the noise characteristics are not always audible, due to the slow speed the tow truck drives. It is considered that the containers are empty at this point.

No noise from the southern element of the Hoover site was audible during our surveys. There is no plant noise audible from the site.

2.4. **Industrial Unit 3: Amnitec**

This site has vans and HGVs entering and exiting the access road to the immediate north of the proposed site infrequently. The site itself is a manufacturing site, however, during our site visit, no storage area or loading/unloading of goods could be heard.

It was noted that the typical movement of a goods vehicle at the site is: the vehicle enters from the north and drives straight through to the carpark. A vehicle may idle its engine near the exit route, and close to the northern boundary of the proposed site for 30 to 60 seconds before exiting.

There is no plant noise audible from the site.

2.5. **Substation**

Noise from the substation is audible at the proposed site directly opposite its location for a span of approximately 30 metres along the boundary. Noise is audible with careful listening only and is not readily distinguishable over the residual noise climate.

3. Planning Policy

3.1. Planning Policy Wales

Planning Policy Wales (PPW) Edition 11 dated February 2021 sets out the land use planning policies of the Welsh Government. Section 1 states:

"1.1 Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales. PPW, the TANs¹, MTANs² and policy clarification letters comprise national planning policy. "

The most relevant statements for noise affecting a residential use are provided in Section 6.7 and summarised below:

"6.7.1 Clean air and an appropriate soundscape, contribute to a positive experience of place as well as being necessary for public health, amenity and well-being. They are indicators of local environmental quality and integral qualities of place which should be protected through preventative or proactive action through the planning system. Conversely, air, noise and light pollution can have negative effects on people, biodiversity and the resilience of ecosystems and should be reduced as far as possible."

6.7.4 The planning system should maximise its contribution to achieving the well-being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution alongside action to tackle high pollution hotspots. In doing so, it should consider the long-term effects of current and predicted levels of air and noise pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimise population exposure to air and noise pollution, and improve soundscapes, where it is practical and feasible to do so.

6.7.5 In taking forward these broad objectives the key planning policy principle is to consider the effects which proposed developments may have on air or soundscape quality and the effects which existing air or soundscape quality may have on proposed developments. Air Quality and soundscape influence choice of location and distribution of development and it will be important to consider the relationship of proposed development to existing development and its surrounding area and its potential to exacerbate or create poor air quality or inappropriate soundscapes. The agent of change principle says that a business or person responsible for introducing a change is responsible for managing that change.

In practice, for example, this means a developer would have to ensure that solutions to address air quality or noise from nearby pre-existing infrastructure, businesses or venues can be found and implemented as part of ensuring development is acceptable.

6.7.6 In proposing new development, planning authorities and developers must, therefore:

- address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas or areas where there are sensitive receptors;*
- not create areas of poor air quality or inappropriate soundscape; and*
- seek to incorporate measures which reduce overall exposure to air and noise pollution and create appropriate soundscapes.*

6.7.7 To assist decision making it will be important that the most appropriate level of information is provided and it may be necessary for a technical air quality and noise assessment to be undertaken by a suitably qualified and competent person on behalf of the developer.

6.7.8 Good design, for example setting back buildings from roads to avoid canyon effects and using best practice in terms of acoustic design to ensure the appropriate and intended acoustic environment of completed developments should be incorporated at an early consideration in the design and planning process. Other mitigation measures must be capable of being effectively implemented for their intended purpose, and could include those related to:

- traffic management and road safety;*
- ensuring progress towards a shift to low or zero emissions means of road transport, such as electrical charging points;*
- supporting low or zero emissions public transport;*
- providing active travel infrastructure; and*
- incorporating green infrastructure, where it can improve air quality by removing air pollution and aiding its dispersal, reduce real or perceived noise levels by absorbing and scattering noise and introducing natural sounds to soften man-made noise, provide areas of relative tranquillity, and reduce exposure by putting a buffer between sources of pollution and receptors.*

6.7.14 Proposed development should be designed wherever possible to prevent adverse effects to amenity, health and the environment but as a minimum to limit or constrain any effects that do occur. In circumstances where impacts are unacceptable, for example where adequate mitigation is unlikely to be sufficient to safeguard local amenity in terms of air quality and the acoustic environment it will be appropriate to refuse permission. Location of Commercial, Industrial and other Potentially Polluting Development.

6.7.19 The health imperative of good air quality and appropriate soundscapes in contributing to the overall character and quality of places and the health and well-being of people and wildlife should be fully recognised. It will not be appropriate to locate sensitive uses, such as hospitals, schools, care homes and housing adjacent to busy roads or other transport routes, where there are no connectivity benefits to be gained and where health and amenity impacts associated with increased exposure of people to pollution will be unacceptable. Whilst some uses may be appropriate with the aid of good design air quality and soundscape considerations can be overriding factors, especially for sensitive uses, if they cannot be adequately mitigated and impacts minimised.

6.7.20 Where sensitive developments need to be located close to existing transportation infrastructure for sustainable movement and access they should be designed, as far as practicable, to limit harmful substances and noise levels within and around those developments both now and in the future. This may include employing the principles of good acoustic design and the inclusion of active travel or travel management measures as part of development proposals. Such development, however, should preferably be located away from existing sources of significant noise, which may include aircraft noise or roads, particularly new roads or those with programmed route improvements.

6.7.21 Regard should be paid to current air quality and noise levels and the quality of the existing soundscape and account taken of any relevant local air quality action plan, noise action plan and/ or local or regional air quality strategy as part of development strategies and proposals in development plans and before determining planning applications. Soundscapes and Compatibility of Uses

6.7.24 The potential impacts of noise pollution arising from existing development, be this commercial, industrial, transport related or cultural venues (such as music venues, theatres or arts centres), must be fully considered to ensure the effects on new development can be adequately controlled to safeguard amenity and any necessary measures and controls should be incorporated as part of the proposed new development. This will help to prevent the risk of restrictions or possible closure of existing premises or adverse impacts on transport infrastructure due to noise and other complaints from occupiers of new developments. It will be important that the most appropriate level of information is provided and assessment undertaken."

PPW does not provide any quantifiable criteria and directs you to the Technical Advice Notes (TAN 11).

3.2. Technical Advice Note (Wales) - Noise

Planning Policy Wales (PPW) Edition 9 dated November 2016 sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes.

The relevant planning criteria for proposed residential development is in Technical Advice Note (Wales) 11 entitled "Noise" which was published in October 1997. The introduction states: *"This note provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business. It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources"*.

Table 1 provides Noise Exposure Categories, which relate to proposed residential developments near to a transportation noise source. Noise Exposure Categories, (NEC's) in relation to road traffic noise are addressed in ranges according to the free-field equivalent noise levels ($L_{Aeq, T}$) measured at the position of the proposed dwellings.

Table 1: TAN 11 Noise Exposure Categories

NOISE SOURCE	NOISE EXPOSURE CATEGORY			
	A	B	C	D
Road Traffic/Mixed Noise				
07.00 - 23.00 hrs	<55	55 – 63	63 – 72	>72
23.00 - 07.00 hrs	<45	45 – 57	57 – 66	>66

The Technical Advice Note (Wales) 11 gives advice to Local Planning Authorities on assessing proposals for residential developments near a source of noise, depending upon which of the four Noise Exposure Categories the proposed site falls into:

- NEC A. *Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.*
- NEC B. *Noise should be taken into account when determining planning applications and where appropriate, conditions imposed to ensure an adequate level of protection.*
- NEC C. *Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.*
- NEC D. *Planning permission should normally be refused.*

In addition, it states: *"Night-time noise levels (23.000 - 07.00): sites where individual noise events regularly exceed 82 dB L_{Amax} (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq, 8h}$ (except where the $L_{Aeq, 8h}$ already puts the site in NEC D)."*

4. Assessment Criteria

4.1. Transportation Noise Affecting Dwellings

British Standard 8233:2014 entitled "Guidance on sound insulation and noise reduction for buildings" came into effect on 28th February 2014. Section 7.7.2 Table 4 of the British Standard 8233:2014 provides internal ambient noise levels for dwellings from noise sources 'without a specific character'. The British Standard guideline states that noise levels should not exceed those as noted in Table 4 of the British Standard and this is summarised below:

Table 2: British Standard 8233:2014 Internal Noise Criteria

Activity	Location	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Resting	Living Room	35 dB $L_{Aeq,16\text{ hour}}$	-
Dining	Dining Room/area	40 dB $L_{Aeq,16\text{ hour}}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\text{ hour}}$	30 dB $L_{Aeq,8\text{ hour}}$

British Standard 8233:2014 Section 7.7.2 Note 7 states:

"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

It should be noted that where internal noise levels exceed the criteria in Table 1, it does not necessarily mean there will be unacceptable conditions within the habitable rooms.

Section 7.7.2 Note 4 of the British Standard states *"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values"*.

Section 3.4 of the "Guidelines for Community Noise" published by the World Health Organisation in 1999 (WHO 1999) states *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 L_{Amax} more than 10-15 times per night (Vallet & Verbey 1991)"*.

4.2. Industrial Noise Affecting Dwellings

For industrial and commercial noise, the most relevant guidance is provided within British Standard 4142:2014+A1:2019. The methods described in the British Standard use outdoor sound levels to assess the likely effects of sound upon people who might be inside or outside a dwelling or other premise used for residential purposes.

The initial estimate principle is that of establishing the 'difference' between the 'rating level' and the 'background sound level'. The 'rating level' is the 'specific sound level' of the source over a period of one hour during the day (07:00 to 23:00 hours) and over a period of 15 minutes during the night (23:00 to 07:00 hours). Clause 9 entitled 'Rating Level' 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."

An acoustic character correction should be added to the 'specific sound level' if it exhibits any tonality, impulsivity, other specific characteristics and/or intermittency at the assessment location. The value of the character correction varies, dependent on the prominence of the character of the sound source at the assessment location.

In Clause 11 of the Standard, entitled 'Assessment of the Impacts', it states:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9), and consider the following."

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB 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."*

It should be noted that the numerical outcome only represents the initial estimate of impact, as stated in the first paragraph of Clause 11, and that contextual matters should be considered before determining what the potential impact is.

4.3. **Amenity Spaces**

Section 7.7.3.2, Table 4 of the British Standard provides the following for external noise levels:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments."

5. Noise Monitoring

A partially attended baseline noise survey was undertaken at the site to obtain road traffic, rail noise, and industrial noise data on the 12th of May 2022 for approximately 24-hours. Two baseline monitoring stations were set up to the west and east boundaries of the site.

An attended noise monitoring exercise was undertaken at the site on the 13th of May 2022 to obtain specific industrial noise data from carefully selected positions around the site.

5.1. Monitoring Equipment

Sound Pressure Levels were measured using a Class 1 sound level meter with a half-inch condenser microphone, using the 'fast' setting. The equipment is checked regularly using a Quality System meeting the requirements of British Standard EN ISO/IEC 17025:2017 "General requirements for the competence of testing and calibration laboratories"; in accordance with British Standard EN 10012:2003 "Measurement management systems. Requirements for measurement processes and measuring equipment"; and traceable to the National Standards.

The equipment is checked using a Quality System to ensure it conforms with the requirements set out in British Standard 6472:1992, British Standard 7385-1:1990 and British Standard 7385-2:1993. All the recorded parameters were weighted as stated in the British Standard 6472 – 1:2008. This equipment was checked and calibrated by the manufacturers. This equipment was checked and calibrated as noted below and the certificates are available for inspection.

Table 3: Equipment and Calibration Status

Equipment Description / Manufacturer / Type	Serial Number	Date of Calibration	Calibration Certification Number
SLM, NTI, XL2	A2A-09705-E0	23/09/2021	39023
Pre-Amp, NTI, MA220	5332	23/09/2021	39023
Microphone, NTI, MC230A	A14374	23/09/2021	39022
Calibrator, NOR-1251	35230	23/09/2021	39021
SLM, Svantek, 977A	69510	09/03/2022	1501934-1
Pre-Amplifier, Svantek, SV12L	73650	09/03/2022	1501934-1
Microphone, ACO Pacific, 7052E	70151	09/03/2022	1501934-1
Calibrator, Larson Davis, CAL200	17892	09/03/2022	1501934-2

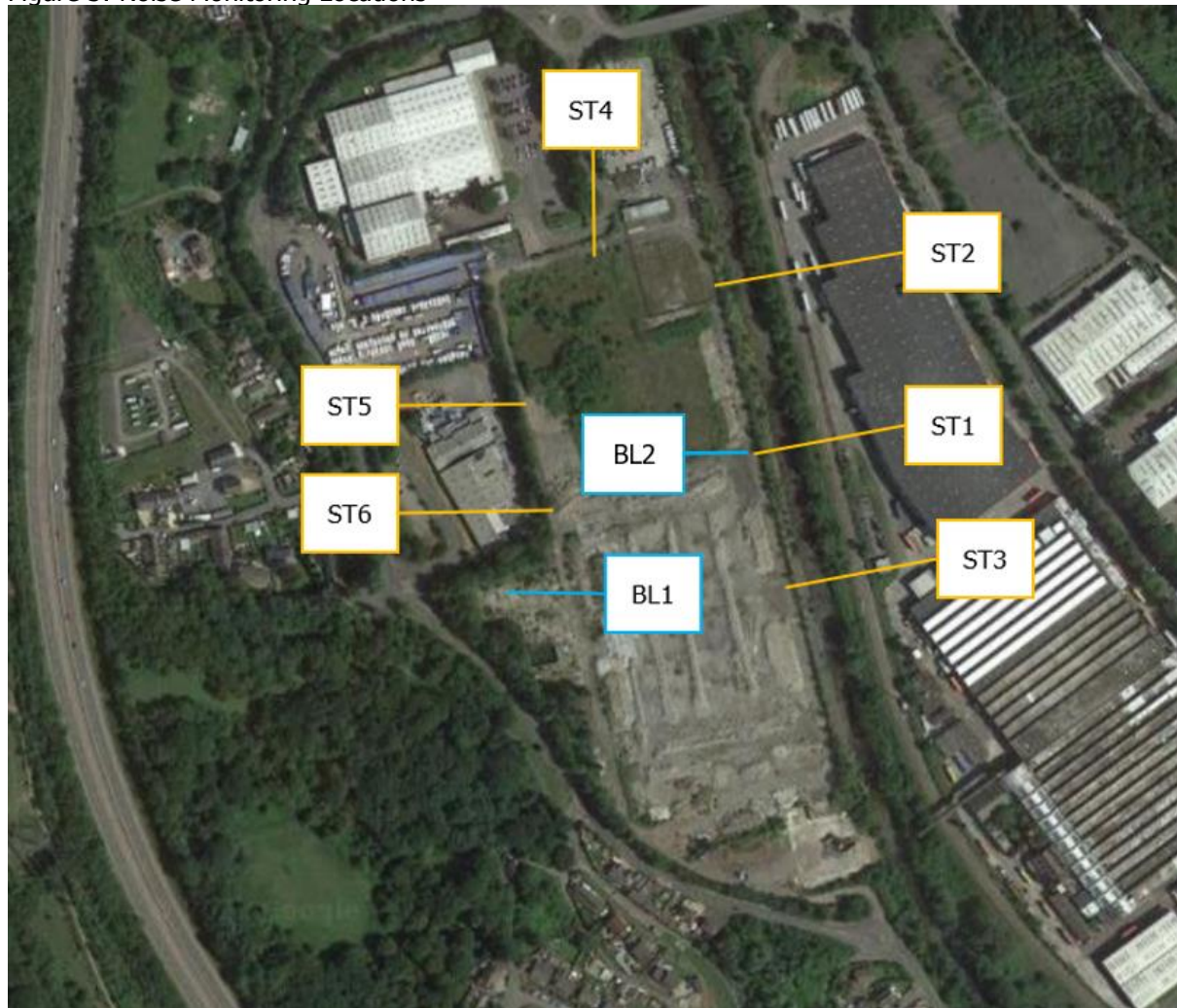
The measurement systems were checked before and after use with the calibrators, system A2A-09705-E0 measured a drift of -0.1dB after the survey, and system 69510 measured a drift of 0dB after the survey. These calibrations are not expected to adversely affect the data obtained.

5.2. Monitoring Procedure

Two baseline monitoring locations were chosen as provided in the figure below, noted as BL1 and BL2. The microphones were mounted on tripods 1.5 metres above the ground and in free field positions. The sound level meters were set to record 5-minute periods with a 1-second trace over a 24-hour period.

During the attended monitoring survey, several locations were chosen during the site visit based on industrial noise from the surrounding sites. These short-term locations are noted STx (x being the location number noted below). The microphones were mounted on tripods 1.5 metres above the ground and free field positions. The monitoring durations differed at each location, depending on the noise source.

Figure 3: Noise Monitoring Locations



5.3. Monitoring Location Notes

Detailed notes of industrial site noise are provided in Section 2 above. The following sub sections provide a brief outline of noise effecting each monitoring location noted in the figure above.

5.3.1. BL1 & BL2

Noise at BL1 was dominated by road traffic. Noise from the A470 made up the background noise climate, with the equivalent and maximum noise levels predominantly effected by the local road to the west.

Noise at BL2 was also affected by road traffic from the A470 along with the A4060. The road traffic noise made up the background noise climate, with the equivalent and maximum noise levels being made up of the industrial units to the east. Industrial noise notes are provided in Section 2 above.

5.3.2. ST1 to ST3

Industrial noise was the dominant elements of the equivalent and maximum noise levels as described in Section 2 above. Passing trains to the east were also audible at these locations.

5.3.3. ST4

Road traffic was the dominant factor at this location. This location was set up to obtain road traffic data to the north of the site. Noise from the Amnitec site was obtained at this location. The location was shielded from industrial noise to the Hoover site to the east.

5.3.4. ST5 and ST6

Noise from the Loadlock site was obtained at these locations. Industrial noise notes are provided in Section 2 above.

5.4. Weather Conditions

During the survey conditions were clear, dry, and calm. The weather conditions are not expected to have adversely affected the measured data.

Table 4: Weather Conditions During Survey

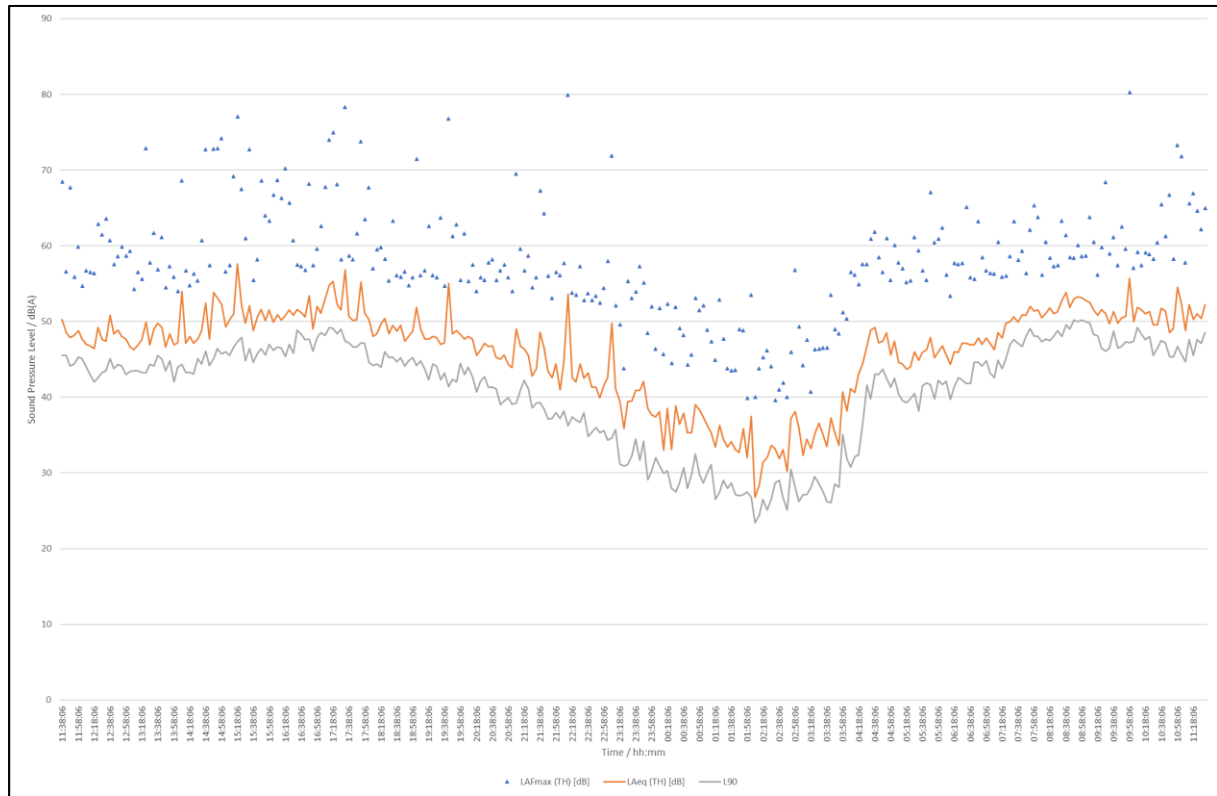
Survey Date	Wind Speed (m/s)	Prevailing Wind Direction	Average Air Temperature (°C)	Precipitation (time/hrs)	Cloud Cover (%)
12/05/2022	3 to 7	W	~ 12 to 15	0	~ 25
13/05/2022	≤ 7	W	~ 11 to 15	0	~ 25 to 50

5.5. Measured Noise Levels

5.5.1. BL1

The chart below provides the variation in noise levels over time at the monitoring location.

Chart 1: Variation in Noise Levels at 'BL1'



The table below provides the logarithmically averaged equivalent daytime $L_{Aeq,16hr}$, and night-time $L_{Aeq,8hr}$ levels, and the maximum, L_{Fmax} noise levels obtained at BL1.

Table 5: Octave Band Design Noise at Monitoring Location: 'BL1' (Free-Field Levels)

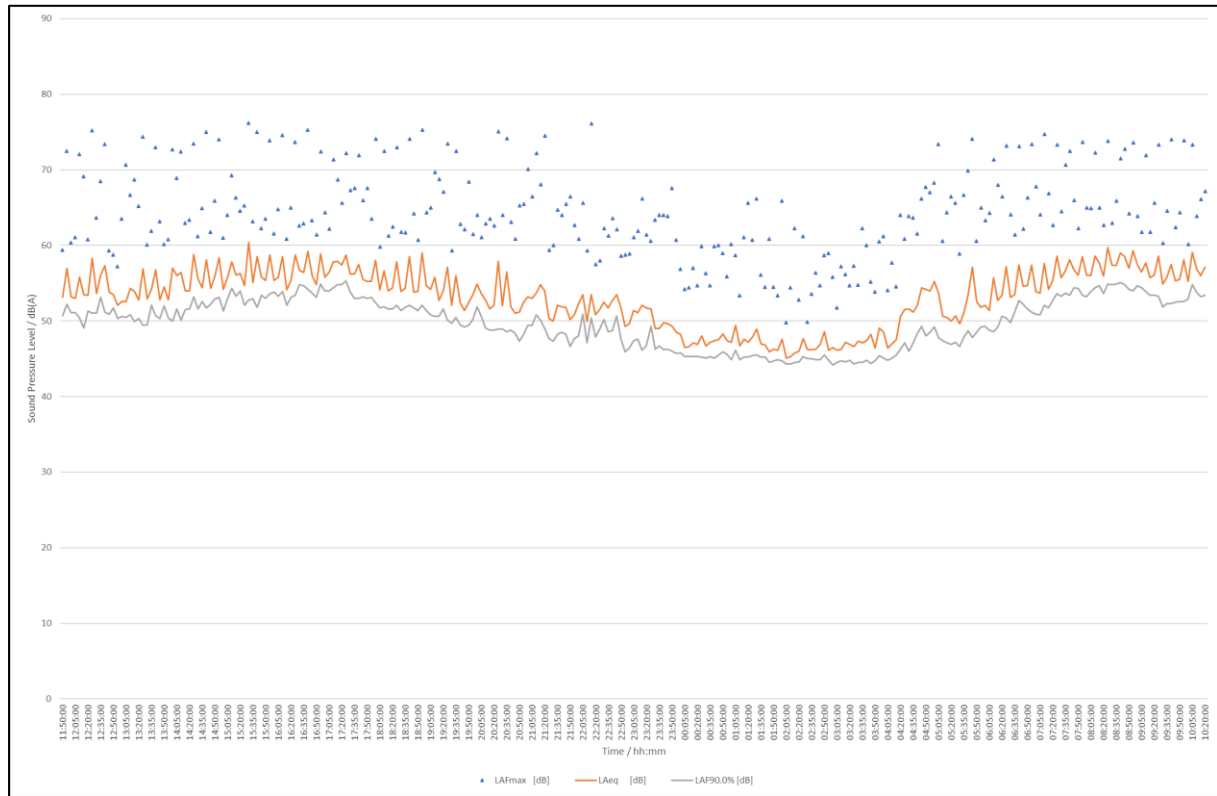
Parameter	Sound Pressure Level per Octave Band / dB								dB(A)
	63	125	250	500	1000	2000	4000	8000	
L_{eq16hr}	54	45	42	38	44	39	29	23	46
L_{eq8hr}	42	35	32	30	36	31	26	18	39
$L_{Fmax}^{(1)}$	45	36	35	36	42	59	44	34	61

¹⁾ 10th Highest L_{Fmax} occurring during the night-time period

5.5.2. BL2

The chart below provides the variation in noise levels over time at the monitoring location.

Chart 2: Variation in Noise Levels at 'BL2'



The chart above indicates that industrial noise effects the equivalent and maximum levels during the day only. The table below provides the logarithmically averaged equivalent daytime $L_{Aeq,16hr}$, and night-time $L_{Aeq,8hr}$ levels, and the maximum, L_{Fmax} noise levels obtained at BL2.

Table 6: Octave Band Design Noise at Monitoring Location: 'BL2' (Free-Field Levels)

Parameter	Sound Pressure Level per Octave Band / dB								dB(A)
	63	125	250	500	1000	2000	4000	8000	
L_{eq16hr}	55	51	49	51	54	46	40	38	56
L_{eq8hr}	50	46	44	45	48	43	38	33	51
$L_{Fmax}^{(1)}$	66	62	61	62	62	58	50	44	66

¹⁾ 10th Highest L_{Fmax} occurring during the night-time period

5.5.3. ST1 to ST6

The following table provides the measured spectral noise data from the noted short-term measurement locations.

Table 7: Measured Industrial Noise at Locations ST1 to ST6

ST Location	Source	Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	dB(A)
1	Tow Truck Maneuvering	50	47	44	46	47	39	32	27	50
2	HGV Container Being Loaded with Goods	50	48	45	45	48	36	27	22	49
3	Substation	52	45	43	44	49	35	27	25	50
4	A470	56	50	47	45	50	37	28	20	51
4	HGV Leaving Amnitec	60	58	53	49	51	40	32	25	54
5	Goods being Loaded / Unloaded from HGV. Tow truck mounting a new container	54	56	51	48	50	45	39	31	53
6	Goods being Moved Within Warehouse	53	44	42	44	47	41	34	26	49

5.5.4. ST1: Train Noise

The measured train, and those that typically pass on the line consist of two passenger train carriages. The measured octave band noise levels of a passing train measured from ST1, are provided in the table below. The sound exposure level (SEL) of a passing train is also provided.

The daytime and night-time octave band design noise levels due to a passing train are also provided in the table below. Information on passenger train movements through the Merthyr Tydfil station has been obtained by published online timetables (<http://www.realtimetrains.co.uk>). This was determined to be approximately 26 passenger trains during the day, and 6 during the night.

The daytime and night-time design noise levels are derived through the following processes, where Q is the number of trains passing over the noted period, as provided above:

- Daytime = $L_{Aeq(16hours)} = SEL - 47.6 + 10\log Q$ dB
- Night-time = $L_{Aeq(8hours)} = SEL - 44.6 + 10\log Q$ dB

Table 8: Octave Band Noise Levels of Passing Train at Monitoring Location: 'ST1' (Free-Field Levels)

Parameter	Sound Pressure Level per Octave Band / dB								dB(A)
	63	125	250	500	1000	2000	4000	8000	
Measured Leq17seconds	51	48	51	54	61	49	40	26	62
SEL	64	60	63	66	74	61	52	39	74
Leq16hr 26 trains	30	26	30	33	40	27	19	5	41
Leq8hr 6 trains	27	23	26	29	37	24	15	2	37

5.5.5. Background Noise Levels

The following table summarises the equivalent and statistical background noise levels measured from the two baseline monitoring locations. These will aid in the BS4142 assessment for industrial noise from the surrounding industrial premises.

Table 9: Summarised Background and Equivalent Noise Levels

Monitoring Location & Period	LA90,1hour		LAeq,1hour	
	Range	Mode	Range	Mode
BL1 Day (07:00 - 23:00)	38 – 49	44	46 – 53	49
BL2 Day (07:00 - 23:00)	48 – 55	52	52 – 58	57
ST4 Day (07:00 - 23:00)	--*	55	--*	53

*As the noted data is taken from a short-term measurement (45 minutes) a detailed range is not available.

6. Mixed Indoor Noise Assessment

This section considers the mixed noise affecting the site, specifically the measurements at BL1 and BL2 and train noise.

6.1. Noise Exposure Category

From the noise measurements noted above, this site falls into Noise Exposure Category B, which states the following:

"Noise should be taken into account when determining planning applications and where appropriate, conditions imposed to ensure an adequate level of protection."

6.2. Internal Ambient Noise Levels

Calculations for the internal ambient noise levels due to mixed noise (train noise and measurements at Locations B1 and B2) have been undertaken using the calculation method provided in Annex G Section G.2 of British Standard 8233:2014.

The calculations have been undertaken using the building façade construction specified below and the octave band free-field design equivalent noise levels and maximum noise levels taken from the measured noise spectra noted above. The calculations assume the following, based on typical room dimensions:

- Room size: 20m² to Living Rooms and 12m² to bedrooms
- Windows: 3m² to daytime rooms and 2m² to bedrooms
- Façade: 10m² to daytime rooms and 8m² to daytime bedrooms
- Vents: 1 to living rooms, 1 to bedrooms; all vents are open.

We advise that building elements, having the sound insulation performances noted below, be incorporated into the design of the façades including the windows, doors, floor, and the building roof.

Alternative constructions to those noted below could be used, however, they would need to be assessed to ensure they control external noise to within the BS 8233:2014 recommended internal ambient noise level criteria.

6.2.1. External Wall Construction

The proposed external walls to the whole development can be of a conventional construction comprising either masonry or lightweight metal/timber frame construction.

- The masonry construction could comprise at least two skins of block connected with wall ties (one of density 1850 kg/m³, 100mm cavity, 100mm block (density of 400 kg/m³). The inner skin of block would be lined and plastered, with mineral wool within the cavity.
- The lightweight construction could comprise a single frame (minimum 100mm) construction with two layers of plasterboard internally (mass $\geq$ 20 kg/m²), external façade of (mass $\geq$ 20 kg/m²) and 50 millimetre of mineral wool insulation within the cavity.

The constructions above are expected to achieve the following sound reduction indices as a minimum. Any alternative constructions should achieve the above-noted performance. The construction can be consistent across the development.

Table 10: Required Minimum Sound Insulation Performance of the External Wall

Type	Sound Reduction Index / dB per Octave Band (Hz)								R _w (dB)
	63	125	250	500	1k	2k	4k	8k	
Masonry	31	38	46	45	55	66	77	70	52
Lightweight	15	25	42	53	57	62	68	60	52

6.2.2. Roof Construction

The dwellings could have a roof constructed using traditional techniques, such as a timber construction with concrete/slate tiles (minimum mass per unit area of 30 kg/m²) with a loft space and a plasterboard ceiling above the habitable rooms.

The above construction is expected to achieve the following minimum sound reduction index. The construction can be consistent across the development.

Table 11: Required Minimum Sound Insulation Performance of Roof

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k	R _w
R (dB)	25	39	47	53	58	56	60	55	56

Any alternative constructions should achieve the above-noted performance.

6.2.3. Window Construction

The windows on all elevations could be openable. There should be no unattenuated vents or openings in the building façade, and an alternative method of ventilation provided which meets the requirements of Approved Document F for background ventilation.

The performance for each window based on the room type is provided below, other constructions may also achieve this level of sound attenuation. The supplier should provide test data confirming that the octave band sound reduction indices stated below for each window type are achievable.

The construction can be consistent across the development.

Table 12: Required Minimum Sound Insulation of Windows

R_w dB per Octave Band (Hz)								R_w	Typical Construction
63	125	250	500	1k	2k	4k	8k		
20	24	20	25	35	38	35	36	31	4/12/4

The glazing and ventilation supplier should confirm the above performance is achievable when tested to the current British Standards.

6.2.4. Ventilation Provisions

Trickle ventilation is sufficient to achieve the planning requirements. The vents are required to achieve the following element normalised level difference ($D_{n,e}$) in the open position.

Table 13: Required Minimum Sound Insulation Ventilation

D_{ne,w} (dB) per Octave Band (Hz)								D_{ne,w}	Typical Construction
63	125	250	500	1k	2k	4k	8k		
30	35	35	36	34	29	33	34	32	Standard Trickle

6.3. Effect of Mitigation Measures

Residential dwellings at the site could be constructed using standard methods and materials.

With the noted building fabric construction, and suitable ventilation provisions, the predicted internal noise levels within the proposed dwellings are within the criteria of British Standard 8233:2014 of 35 dB L_{Aeq} (16 hour) in the daytime rooms, and 30 dB L_{Aeq} (8 hour) and 45 dB $L_{Amax}(F)$ in the night-time rooms.

Two examples of the predictions for the worst-case room (bedroom) are provided in the following figures. The first prediction is with a cavity masonry external wall, and the second is with a lightweight construction external wall.

Figure 4: Worst-case BS8233 Prediction with a Masonry External Wall – Mixed Noise

Free Field Level at Façade									
Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Day $L_{eq}(16\text{ hour})$	55	51	49	51	54	46	40	38	56
Night $L_{eq}(8\text{ hour})$	50	46	44	45	48	43	38	33	51
Night-time $L_{max(10\text{ min})}$	66	62	61	62	62	58	50	44	65

Building Façade Construction									
External Element	D_{m}	63	125	250	500	1000	2000	4000	8000
Standard Trickle - XS13 4400 EA+XC13 412 Canopy - 32 Dnew	Number of	30	35	35	36	34	29	33	34
		1							
		0.00050	0.00016	0.00016	0.00013	0.00020	0.00063	0.00025	0.00020
2x100mm block plastered/render both sides 100mm void, 1880 Kg/m ³ + 400 kg/m ³ - 52 Rw	Area	31	38	46	45	55	66	77	70
		8							
		0.00032	0.00006	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000
Double Glazed: 4/12/4 - 31 Rw	Area	20	24	20	25	35	38	35	36
		2							
		0.00100	0.00040	0.00100	0.00032	0.00003	0.00002	0.00003	0.00003
Pitched Roof - 56 Rw	Area	25	39	47	53	58	56	60	55
		10							
		0.001581139	6.29463E-05	9.97631E-06	2.50594E-06	7.92447E-07	1.25594E-06	0.0000005	1.58114E-06

Calculations to BS EN 12354									
	63	125	250	500	1000	2000	4000	8000	
Sum	0.00339887	0.000682563	0.001178138	0.000456977	0.000232734	0.000646668	0.000282724	0.00025794	
10log sum	-24.6866543	-31.65857224	-29.28803932	-33.4010553	-36.3314069	-31.89318591	-35.48636748	-36.46288394	
10log S/A	3.33482019	3.334820194	4.553119777	5.63837353	6.298571529	4.162346317	2.980005251	2.980005251	
correction factor +3	3	3	3	3	3	3	3	3	

Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Day $L_{eq}(16\text{ hour})$	36.6	25.7	27.3	26.2	27.0	21.3	10.5	7.5	29.9
Night $L_{eq}(8\text{ hour})$	31.6	20.7	22.3	20.2	21.0	18.3	8.5	2.5	24.8
Night-time $L_{max(10\text{ min})}$	47.6	36.7	39.3	37.2	35.0	33.3	20.5	13.5	40.0

Figure 5: Worst-case BS8233 Prediction with a Lightweight External Wall – Mixed Noise

Free Field Level at Façade									
Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Day $L_{eq}(16\text{ hour})$	55	51	49	51	54	46	40	38	56
Night $L_{eq}(8\text{ hour})$	50	46	44	45	48	43	38	33	51
Night-time $L_{max(10\text{ min})}$	66	62	61	62	62	58	50	44	65

Building Façade Construction									
External Element	D_{m}	63	125	250	500	1000	2000	4000	8000
Standard Trickle - XS13 4400 EA+XC13 412 Canopy - 32 Dnew	Number of	30	35	35	36	34	29	33	34
		1							
		0.00050	0.00016	0.00016	0.00013	0.00020	0.00063	0.00025	0.00020
Double Glazed: 4/12/4 - 31 Rw	Area	20	24	20	25	35	38	35	36
		2							
		0.00100	0.00040	0.00100	0.00032	0.00003	0.00002	0.00003	0.00003
Pitched Roof - 56 Rw	Area	25	39	47	53	58	56	60	55
		10							
		0.001581139	6.29463E-05	9.97631E-06	2.50594E-06	7.92447E-07	1.25594E-06	0.0000005	1.58114E-06
Lightweight	R	15	25	42	53	57	62	68	60
	Area	8							
		0.012649111	0.001264911	2.52383E-05	2.00475E-06	7.98105E-07	2.52383E-07	6.33957E-08	0.0000004

Calculations to BS EN 12354									
	63	125	250	500	1000	2000	4000	8000	
Sum	0.01573025	0.001884078	0.001193328	0.000446333	0.000232267	0.00064682	0.00028278	0.00026154	
10log sum	-18.0326439	-27.24901032	-29.23239991	-33.50341223	-36.34012651	-31.89216584	-35.4851634	-36.45596517	
10log S/A	3.33482019	3.334820194	4.553119777	5.63837353	6.298571529	4.162346317	2.980005251	2.980005251	
correction factor +3	3	3	3	3	3	3	3	3	

Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Day $L_{eq}(16\text{ hour})$	43.3	30.1	27.3	26.1	27.0	21.3	10.5	7.5	30.2
Night $L_{eq}(8\text{ hour})$	38.3	25.1	22.3	20.1	21.0	18.3	8.5	2.5	25.0
Night-time $L_{max(10\text{ min})}$	54.3	41.1	39.3	37.1	35.0	33.3	20.5	13.5	40.3

7. Industrial Indoor Noise Assessment

7.1. Initial Assessment

A British Standard 4142:2014 assessment of the impact of industrial noise from the nearby commercial premises is provided below. To complete an assessment at the worst-case positions around the proposed site, we have considered different locations of north, east, and west; taken from our measurement locations noted BL1, BL2, and ST4, using the background L_{90} sound measurements.

7.1.1. Background Sound Level

Based on our measured data and site observations we understand that the nearby commercial premises operate during the daytime only. Therefore, the following considers noise levels between the hours of 07:00 and 23:00 hours only.

From the measured data we have determined the following typical background sound levels:

Table 14: Modal Background Sound Levels

Location	$L_{90,1\text{hour}}$ / dB(A)
North	53
East	57
West	49

7.1.2. Specific Sound Level

We have consolidated industrial noise into north, east and west areas around the site.

- Noise from the north considers HGV movements in and out of the Amnitec site.
- Noise from the west considers the worst-case operations from the Hoover site (whole operation of an HGV being loaded/unloaded of goods, and a tow truck unmounting the container from the back of an HGV)
- Noise from the east considers the delivery of goods at the Loadlock site, and the unloading of an HGV with an electric forklift and metal ramp on to the HGV container)

The measured specific sound levels of noise due to commercial activities are as follows:

Table 15: Specific Sound Levels

Location	$L_{Aeq,T}$ / dB(A)
North	54
East	50
West	53

7.1.3. Character Corrections

Character corrections should be added to the 'specific sound level' if it exhibits any *tonality, impulsivity, other specific characteristics and/or intermittency* at the assessment location. Based on our site visit and knowledge of such air handling units, corrections to be applied are as follows:

- **Tonality** – From our data, no tonal characteristics are present. No penalty correction has not been applied.
- **Impulsivity** – The commercial operations to the west are considered impulsive. +3 dB penalty applied. We do not consider impulsivity from the eastern premises to have an over-bearing effect against the residual noise at the eastern side of the site and therefore no character correction is applied.
- **Intermittency** – Intermittency is present from the commercial premises to the east and west, a +3 dB penalty applied. Intermittency is not considered from the northern premises.
- **Other Sound Characteristics** – No character corrections are required for other sound characteristics.

7.2. Initial Estimate of Impact

Considering the data and information provided above, the British Standard 4142:2014 initial estimate at the sensitive receiver location is as follows.

Table 16: British Standard 4142:2014 Initial Estimate

Parameter	North	East	West
Background Sound Level, $L_{A90,1\text{hour}}$	53 dB	57 dB	49 dB
Specific Sound Level $L_{Aeq,1\text{hour}}$	54 dB	50 dB	53 dB
Acoustic Character Correction	0 dB	+3 dB	+6 dB
Rating Level $L_{Ar,T}$	54 dB	53 dB	59 dB
Difference between rating and background level	+1 dB	-4 dB	+10 dB

This means that the rating sound level may result in a significant adverse impact on any proposed dwellings to the western boundary.

It also means that industrial noise effecting the northern and eastern boundaries could result in a low impact on any proposed dwellings, however, the noise monitored during our site visit and based on the character corrections applied means that noise from these sites is not expected to have a significant effect over the residual noise climate (provided in Section 5.5) at these locations.

However, it should be noted context of the site needs to be considered.

7.3. Context

Section 11 of British Standard 4142:2014, entitled 'Assessment of the Impacts', states the following regarding context.

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including:

"The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

- i) facade insulation treatment*
- ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
- iii) acoustic screening."*

It is therefore reasonable to state that, where the proposed dwelling is designed to achieve good acoustic conditions, i.e., BS8233, the noise impact can be considered low and acceptable. The dwellings should also incorporate ventilation measures to reduce the need for open windows for rapid/purge ventilation.

The design target is to achieve an internal ambient noise level which does not exceed the internal daytime noise criterion within a dwelling of 35 dB $L_{Aeq,16\text{hour}}$ during the day, within the habitable rooms.

7.3.1. Mitigation due to Industrial Noise at Western Site Boundary

On the basis of the above, and in accordance with BS4142:2014+A1:2019, any proposed dwellings overlooking the industrial units around the site should incorporate a mechanical ventilation system in order to reduce the need for windows to be open for rapid or purge ventilation.

This ventilation requirement must be incorporated into the façade design and supersede the advice in Section 6.2.4 where a dwelling overlooks any industrial site.

The following figures provide the indoor ambient noise level predictions for industrial noise to the west of the site, from the Loadlock unit. It should be noted that at the time of survey there was not fixed plant at any site around the proposed residential boundary. The predictions consider both masonry and lightweight external walls.

Figure 6: Internal Noise Level Prediction due to Industrial Noise: Masonry External Wall

Free Field Level at Façade									
Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Industrial Noise - West boundary Loadlock Site	54	56	51	48	50	45	39	31	53
Building Façade Construction									
External Element	63	125	250	500	1000	2000	4000	8000	
2x100mm block plastered/render both sides 100mm void, 1880 Kg/m ³ + 400 kg/m ³ - 52 Rw	31	38	46	45	55	66	77	70	
Area	8								
	0.00032	0.00006	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	
Double Glazed: 4/12/4 - 31 Rw	20	24	20	25	35	38	35	36	
Area	2								
	0.00100	0.00040	0.00100	0.00032	0.00003	0.00002	0.00003	0.00003	
Pitched Roof - 56 Rw	25	39	47	53	58	56	60	55	
Area	10								
	0.001581139	6.29463E-05	9.97631E-06	2.50594E-06	7.92447E-07	1.25594E-06	0.0000005	1.58114E-06	
Calculations to BS EN 12354									
	63	125	250	500	1000	2000	4000	8000	
Sum	0.00289887	0.000524449	0.001020024	0.000331383	3.36801E-05	1.72054E-05	3.21308E-05	2.674E-05	
10log sum	-25.3777124	-32.80296599	-29.9138967	-34.7967002	-44.72626186	-47.64336473	-44.93079034	-45.72838546	
10log S/A	3.33482019	3.334820194	4.553119777	5.63837353	6.298571529	4.162346317	2.980005251	2.980005251	
correction factor +3	3	3	3	3	3	3	3	3	
Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Industrial Noise - West boundary Loadlock Site	35.0	29.5	28.6	21.8	14.6	4.5	0.0	-8.7	23.7

Figure 7: Internal Noise Level Prediction due to Industrial Noise: Lightweight External Wall

Free Field Level at Façade									
Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Industrial Noise - West boundary Loadlock Site	54	56	51	48	50	45	39	31	53
Building Façade Construction									
External Element	63	125	250	500	1000	2000	4000	8000	
Double Glazed: 4/12/4 - 31 Rw	20	24	20	25	35	38	35	36	
Area	2								
	0.00100	0.00040	0.00100	0.00032	0.00003	0.00002	0.00003	0.00003	
Pitched Roof - 56 Rw	25	39	47	53	58	56	60	55	
Area	10								
	0.001581139	6.29463E-05	9.97631E-06	2.50594E-06	7.92447E-07	1.25594E-06	0.0000005	1.58114E-06	
Calculations to BS EN 12354									
	63	125	250	500	1000	2000	4000	8000	
Sum	0.01523025	0.001725965	0.001035215	0.000320738	3.32133E-05	1.73573E-05	3.21862E-05	2.71E-05	
10log sum	-18.1729298	-27.6296814	-29.84969609	-34.93848972	-44.78687604	-47.60518879	-44.92330668	-45.67030659	
10log S/A	3.33482019	3.334820194	4.553119777	5.63837353	6.298571529	4.162346317	2.980005251	2.980005251	
correction factor +3	3	3	3	3	3	3	3	3	
Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Industrial Noise - West boundary Loadlock Site	42.2	34.7	28.7	21.7	14.5	4.6	0.1	-8.7	25.0

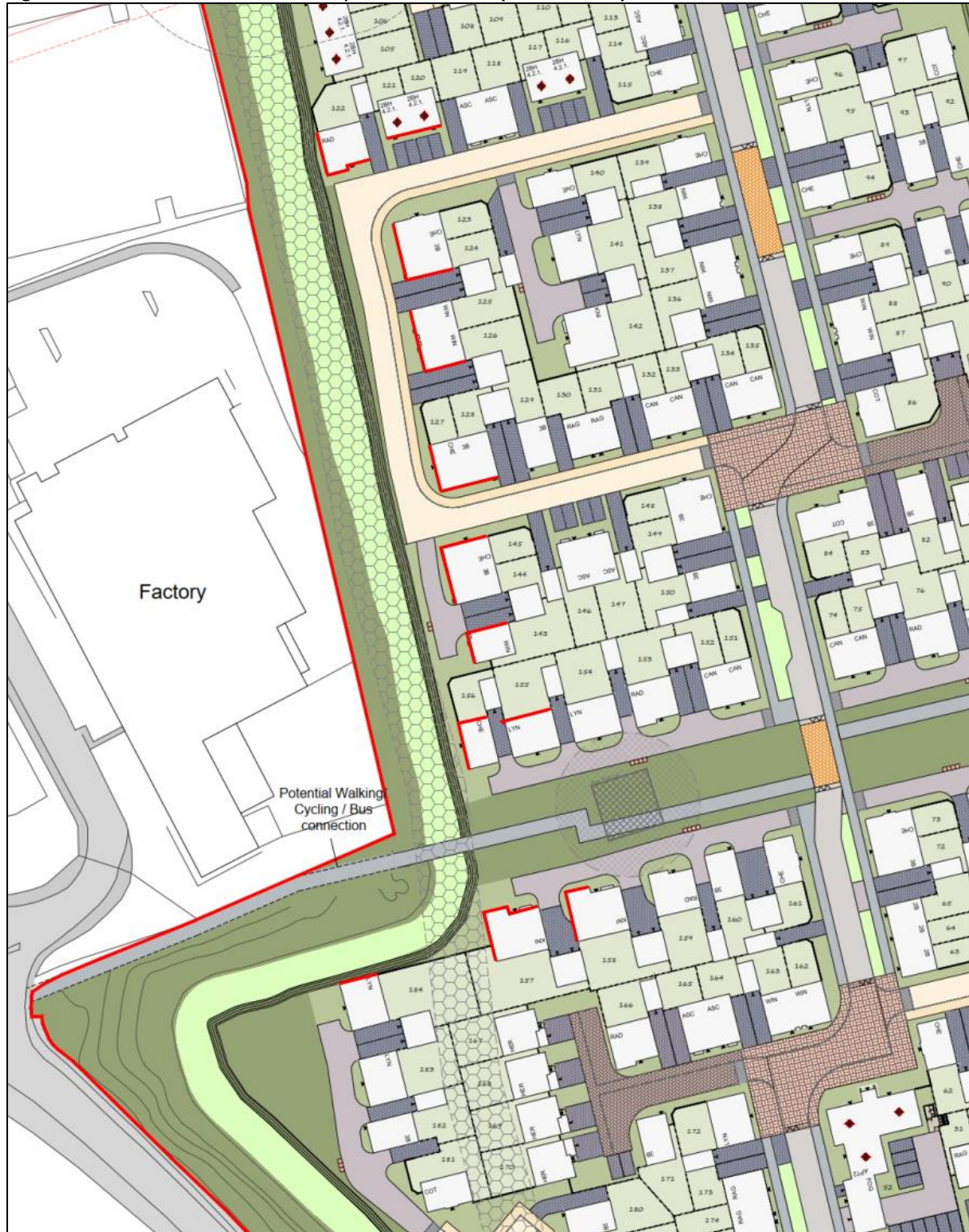
The predicted internal rating noise levels are 23.7 dB $L_{A,r}$, and 25dB $L_{A,r}$ (masonry and lightweight constructions respectively) at the western boundary of the site (monitoring location ST5), which meets both daytime and night-time requirements to habitable rooms set out in BS8233:2014.

Therefore, once context is considered and providing the building element specifications provided in Section 6.2 are implemented into the design, noise from commercial operations from the Loadlock site is acceptable at the proposed site.

7.3.2. Mitigation Areas due to Industrial Noise at Western Boundary

The following figure provides façades requiring the above noted mechanical ventilation system in order to reduce the need for windows to be open for rapid or purge ventilation as a minimum, noted in red. Local Authority should confirm this is acceptable.

Figure 8: Mechanical Ventilation Requirement Areas (noted in red)



7.4. Summary of Industrial Noise Assessment

When assessed in accordance with the methodology of the BS4142 initial estimate, industrial noise to the east and north boundaries falls within a low impact assessment to these closest boundary edges. However, industrial noise from the western unit, Loadlock, exceeds the existing daytime background noise by up to 10 dB. This means that the rating sound level may result in a significant adverse impact on any proposed dwellings most exposed to the unit's delivery and storage area.

However, when the context of the site (i.e., mitigation measures already specified above for road traffic noise in Section 6.2) is considered, and internal absolute levels due to commercial operations are predicted, it is clear good acoustic conditions can be achieved in accordance with BS8233:2014 criteria.

Further to this, we would consider that boundary fences would typically be installed around any proposed dwelling that lies adjacent to the industrial units. If this were completed to a certain specification of design and material mass (minimum 10kg/m²), noise from the Loadlock site at a dwelling could potentially be lower than predicted.

On this basis, noise from the industrial unit to the west (Loadlock) can be suitably controlled and is considered to be of a low impact on the proposed dwellings, and as such, the aims of PPW are considered to be met in terms of noise.

8. Amenity Space Noise Assessment

Section 7.7.3.2 of British Standard 8233:2014 is entitled 'Design criteria for external noise and states the following:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as inner-city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practical levels in these external amenity spaces, but should not be prohibited."

We would advise and expect that garden boundary fences are installed to all dwellings to minimise noise intrusion into the amenity spaces of all dwellings. Materials (except for structural posts) should have a minimum surface mass of 10kg/m² and be closed-boarded, with no gaps in the structures.

With the above considered, and referring back to the measured data, this indicates that noise levels within amenity spaces will be within the upper limit of 55 dB $L_{Aeq(16hr)}$.

9. Summary and Conclusions

Davies Homes appointed Acoustic Consultants Ltd to undertake an environmental noise assessment for the proposed development on vacant land at Dragon Parc, Abercanaid, Merthyr.

The presented report is based upon noise measured at the site and considers road traffic from the surrounding road networks, rail vehicle noise, along with industrial noise from the nearby industrial premises. At the time of writing, no site plans or layouts are available.

The measured data indicates that the site falls into NEC B. The report presents an assessment of road traffic and rail vehicle noise, along with an assessment of industrial noise at different locations around the site.

With standard building construction techniques and materials implemented into the design of any proposed dwellings, absolute indoor ambient noise level criteria as provided in BS8233:2014 can easily be met, and the aims of PPW achieved.

We would advise that garden boundary fences be installed to all dwellings, construction requirements as noted in Section 8. Noise data measured at the site indicates that noise level criteria within amenity spaces can be met as provided in BS8233:2014, and the aims of PPW achieved.

10. Appendix 1 – Glossary of Acoustic Terminology

A-weighted sound pressure p_A – value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network

A-weighted sound pressure level, L_{pA} – quantity of A-weighted sound pressure given by the following formula in decibels (dBA)

$$L_{pA} = 10 \log_{10} (p_A/p_0)^2$$

where:

p_A is the A-weighted sound pressure in pascals (Pa);
 p_0 is the reference sound pressure (20 μ Pa)

Background sound level, $L_{A90,T}$ – A-weighted sound pressure level that is exceeded by the residual sound assessment location for 90% of a given time interval, T, measured using weighting F and quoted to the nearest whole number of decibels

Break-in - noise transmission into a structure from outside.

Decibel (dB) – The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithms are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ – value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

$$L_{Aeq,T} = 10 \log_{10} \left\{ (1/T) \int_{t_1}^{t_2} [p_A(t)^2/p_0^2] dt \right\} \quad (1)$$

where:

p_0 is the reference sound pressure (20 μ Pa); and

$p_A(t)$ is the instantaneous A-weighted sound pressure (Pa) at time t

NOTE The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.

Facade level – sound pressure level 1 m in front of the façade. Facade level measurements of L_{pA} are typically 1 dB to 3 dB higher than corresponding free-field measurements because of the reflection from the facade.

Free-field level – sound pressure level away from reflecting surfaces. Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source).

Octave and Third Octave Bands – The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example, two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

Sound pressure level – Sound pressure level is stated on many of the charts. It is the amplitude of the acoustic pressure fluctuations in a sound wave, fundamentally measured in Pascals (Pa), typically from 20 micro-Pascals to 100 Pascals, but commonly simplified onto the decibel scale.

Sound reduction index, R – laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

Specific sound level, $L_s = L_{Aeq,T_r}$ – equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r .

Structure-borne noise – audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements

Rating level, L_{Ar,T_r} – Specific sound level plus any adjustment for the characteristic features of the sound.

Reverberation Time, T – The reverberation time is defined as the time taken for a noise level in an enclosed space to decay by 60 dB from a steady level, once the noise source has stopped. It is measured in seconds. Often a 60 dB decay cannot be measured so the reverberation time is measured over a lesser range and corrected back to the time for a 60 dB drop assuming a constant decay rate. Common parameters are T_{20} (time taken for a 20 dB decay multiplied by three) and T_{30} (time taken for a 30 dB decay multiplied by two).

Vibration Dose Value, VDV – measure of the total vibration experienced over a specified period of time.

Estimated Vibration Dose Value, $eVDV$ – estimation of the total vibration experienced over a specified period of time. This is usually based on the number of events and shortened measurement data.

Weighted sound reduction index, R_w – Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies. The weighted sound reduction index is used to characterize the insulation of a material or product that has been measured in a laboratory (see BS EN ISO 717-1).



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