3.12. Rating Level.

British Standard 4142 – Section 10.k.

2.12.1. Specific Noise Level.

As detailed within section 2.9.3. the specific noise level at the assessment position detailed within section 2.4. and located 1m from the nearest noise sensitive façade is

Night Time – 23:00 to 07:00
The specific noise level was calculated as $L_{Aeq,5min}$ 22 dB with reference to an absolute level of 2×10^{-5} Nm^{-2} as a result of the normal operation of the refrigeration units under normal ambient conditions.

Day Time – 07:00 to 23:00
The specific noise level at the assessment position was calculated as found to be $L_{Aeq,1hour}$ 32 dB with reference to an absolute level of 2×10^{-5} Nm^{-2} as a result of the normal operation of the refrigeration and air conditioning units under normal ambient conditions.

2.12.2. Acoustic Features.

With consideration to the observations made and experience of the refrigeration and air conditioning sources detailed within section 2.3. it was considered appropriate not to apply a character correction.

2.12.3. Rating Level.

The rating level at the assessment located 1m from the nearest noise sensitive façade is found by adding the specific noise level and the character correction together.

Night Time – 23:00 to 07:00
The rating level during the nighttime at the assessment position will be $L_{Aeq,5min}$ 22 dB with reference to an absolute level of 2×10^{-5} Nm^{-2}.

Day Time – 07:00 to 23:00
The rating level during the daytime at the assessment position will be $L_{Aeq,1hour}$ 32 dB with reference to an absolute level of 2×10^{-5} Nm^{-2}.

3.13. Background Noise Levels.

British Standard 4142 – Section 10.l.

3.13.1. Recorded Noise Levels.

In line with the requirements of British Standard 4142 [reference 1] and the details within British Standard 7445 the following background noise levels were measured at position 1 as detailed in section 2.4. and are summarized in tables 5 and 6 below.

Table 5 – Background Broad Band Levels.

Time Period	Environmental Levels						
	$L_{Aeq,5\ Min}$	$L_{eq,5\ Min}$	$L_{Max,5\ Min}$	$L_{Min,5\ Min}$	$L_{A90,5\ Min}$	$L_{A50,5\ Mi}$	$L_{A10,\ 5\ Min}$
00:00 – 01:00	55	76	78	53	48	58	66
01:00 – 02:00	52	66	76	49	44	52	65
02:00 – 03:00	51	67	70	45	41	51	59
03:00 – 04:00	50	64	74	43	41	48	55
Sound Pressure Level (dB) re 2×10^{-5} Nm^{-2}							

Table 6 – Background Frequency Levels.

Time Period	Octave Band Center Frequency (Hz)						
	63	125	250	500	1000	2000	4000
00:00 – 01:00	76	58	59	46	46	41	43
01:00 – 02:00	65	59	57	49	42	42	38
02:00 – 03:00	67	58	53	45	45	43	36
03:00 – 04:00	62	59	51	45	45	40	38
Sound Pressure Level - $L_{eq,5\ Min}$ (dB) re 2×10^{-5} Nm^{-2}							

2.13.2. Meaurement Time Interval.

Measurements of the background noise levels were taken over a continuous 5 minute period and did not include a contribution of the specific source levels. The measurements were considered to have included all reasonable temporal and level variations of the background noise levels and other none specific sources.

3.13.3. Equivalent Location.

The background measurements were taken at position 1 as detailed in section 3.4. As the assessment position was influenced by other sources that would not be present once the specific source is installed reference is made to the guidance given in section 7.4. of British Standard 4142 [reference 1]. It is considered that position 1 is equivalent to the assessment position in terms of the recorded background noise levels.

2.13.4. Background Noise Levels

For average background noise levels during the following periods are taken from the above table. It should be noted that whereas the night time background noise levels have been measured the day time background noise levels have been estimated.

Night Time – 23:00 to 07:00

The average background noise level during the night time period is unlikely to fall below a value of $L_{A90,5min}$ 41 dB with reference to an absolute level of 2×10^{-5} Nm^{-2}.

Day Time – 07:00 to 23:00

The average background noise level during the day time period is unlikely to fall below a value of $L_{A90,5min}$ 60 dB with reference to an absolute level of 2×10^{-5} Nm^{-2}.

3.14. Rating Level and Assessment.

British Standard 4142 – Section 10.m.

3.14.1.Rating Level.

Night Time – 23:00 to 07:00
The rating noise level at the assessment position was calculated as $L_{Aeq,5min}$ 22 dB with reference to an absolute level of 2×10^{-5} Nm^{-2} as a result of the normal operation of the refrigeration unit under normal ambient conditions.

The average background noise level during the night time period is unlikely to fall below a value of $L_{A90,5min}$ 41 dB with reference to an absolute level of 2×10^{-5} Nm^{-2}.

Day Time – 07:00 to 23:00
The rating noise level at the assessment position was calculated as $L_{Aeq,1hour}$ 32 dB with reference to an absolute level of 2×10^{-5} Nm^{-2} as a result of the normal operation of the refrigeration and air conditioning units under normal ambient conditions.

The average background noise level during the day time period is unlikely to fall below a value of $L_{A90,5min}$ 60 dB with reference to an absolute level of 2×10^{-5} Nm^{-2}.

2.14.2.Assessment.

In line with the guidance of section 8 of British Standard 4142 [reference 1] the rating level of the refrigeration units operating under maximum load conditions at the assessment position described in section 2.4. is that the likelihood of complaints is described below.

Night Time – 23:00 to 07:00	Complaints Unlikely
Day Time – 07:00 to 23:00	Complaints Unlikely

3.15. Night Time – 23:00 to 07:00

The following is an executive summary of section 3 of the report with reference to the example detailed within Appendix A of British Standard 4142 [reference 1]

3.15.1.Quantity:	Calculated Specific Noise at Assessment Position:	$L_{Aeq,5min}$ = 22 dB.
Relevant Clause:	Section 6.3 of British Standard 4142.	
Commentary:	The specific noise is calculated at the assessment position by applying the appropriate corrections	
3.15.2.Quantity:	Character Correction:	+ 0 dB.
Relevant Clause:	Table 1 of British Standard 4142.	
Commentary:	Observations on site and experience of these units indicated that the source is unlikely to attract a correction	
3.15.3.Quantity:	Rating Level:	$L_{Aeq,5min}$ = 22 dB.
Relevant Clause:	Section 8 of British Standard 4142.	
Commentary:	The rating level is calculated by adding the calculated specific noise Level and character correction together.	
3.15.4.Quantity:	Background Noise Level:	$L_{A90,5min}$ = 41 dB.
Relevant Clause:	Section 7 of British Standard 4142.	
Commentary:	The background noise level was measured at an equivalent position to ensure no contribution from the existing equipment.	
3.15.5.Quantity:	Excess of Rating over Background:	-19 dB.
Relevant Clause:	Section 9 of British Standard 4142.	
Commentary:	The numerical difference between the background noise level and the rating level at the assessment position.	
3.15.6.Quantity:	Assessment:	Complaints Unlikely
Relevant Clause:	Section 9 of British Standard 4142.	
Commentary:	Indicates the likelihood of complaints from the specific source at the nearest noise sensitive property within the vicinity.	

3.16. Day Time – 07:00 to 23:00

The following is an executive summary of section 3 of the report with reference to the example detailed within Appendix A of British Standard 4142 [reference 1]

3.16.1. Quantity:	Calculated Specific Noise at Assessment Position:	$L_{Aeq,5min}$ = 32 dB.
Relevant Clause:	Section 6.3 of British Standard 4142.	
Commentary:	The specific noise is calculated at the assessment position by applying the appropriate corrections	
3.16.2. Quantity:	Character Correction:	+ 0 dB.
Relevant Clause:	Table 1 of British Standard 4142.	
Commentary:	Observations on site and experience of these units indicated that the source is unlikely to attract a correction	
3.16.3. Quantity:	Rating Level:	$L_{Aeq,5min}$ = 32 dB.
Relevant Clause:	Section 8 of British Standard 4142.	
Commentary:	The rating level is calculated by adding the calculated specific noise Level and character correction together.	
3.16.4. Quantity:	Background Noise Level:	$L_{A90,5min}$ = 60 dB.
Relevant Clause:	Section 7 of British Standard 4142.	
Commentary:	The background noise level was measured at an equivalent position to ensure no contribution from the existing equipment.	
3.16.5. Quantity:	Excess of Rating over Background:	-28 dB.
Relevant Clause:	Section 9 of British Standard 4142.	
Commentary:	The numerical difference between the background noise level and the rating level at the assessment position.	
3.16.6. Quantity:	Assessment:	Complaints Unlikely
Relevant Clause:	Section 9 of British Standard 4142.	
Commentary:	Indicates the likelihood of complaints from the specific source at the nearest noise sensitive property within the vicinity.	

4. DELIVERY NOISE

Based on the experience at other sites it is possible to assess the impact of deliveries in terms of noise on the local community using the following methods.

4.1. Typical Delivery Noise

The following noise levels were measured at a similar site with a standard delivery. The measurement position was located at a position where the rear of the lorry and goods entrance to the site were both 10 meters away.

4.1.1. Lorry Arrival (4 minutes)

The delivery vehicle arrived at site and maneuvered into position.

4.1.2. Preparation (5 minutes)

The driver signed in at the office and the rear yard was opened up and cleared. The ramp of the refrigerated lorry was lowered into position.

4.1.3. Delivery (18 minutes)

17 roll cages were unloaded from the rear of the vehicle and wheeled one at a time into the rear store area through the delivery door.

4.1.4. Empty Roll Cages (11 minutes)

21 empty roll cages were loaded onto the rear of the vehicle one at a time.

4.1.5. Lorry Departure (3 minutes)

The lorry maneuvered and departed from the site.

4.1.6. Delivery Noise Levels

Details	Environmental Levels						
	$L_{Aeq,1\ hour}$	$L_{eq,1\ hour}$	$L_{AMax,1\ hour}$	$L_{AMin,1\ hour}$	$L_{A90,1\ hour}$	$L_{A50,1\ hour}$	$L_{A10,\ 1\ hour}$
Delivery	53	63	84	57	48	56	69
Background	53	61	72	56	48	55	65
Sound Pressure Level (dB) re 2×10^{-5} Nm^{-2}							

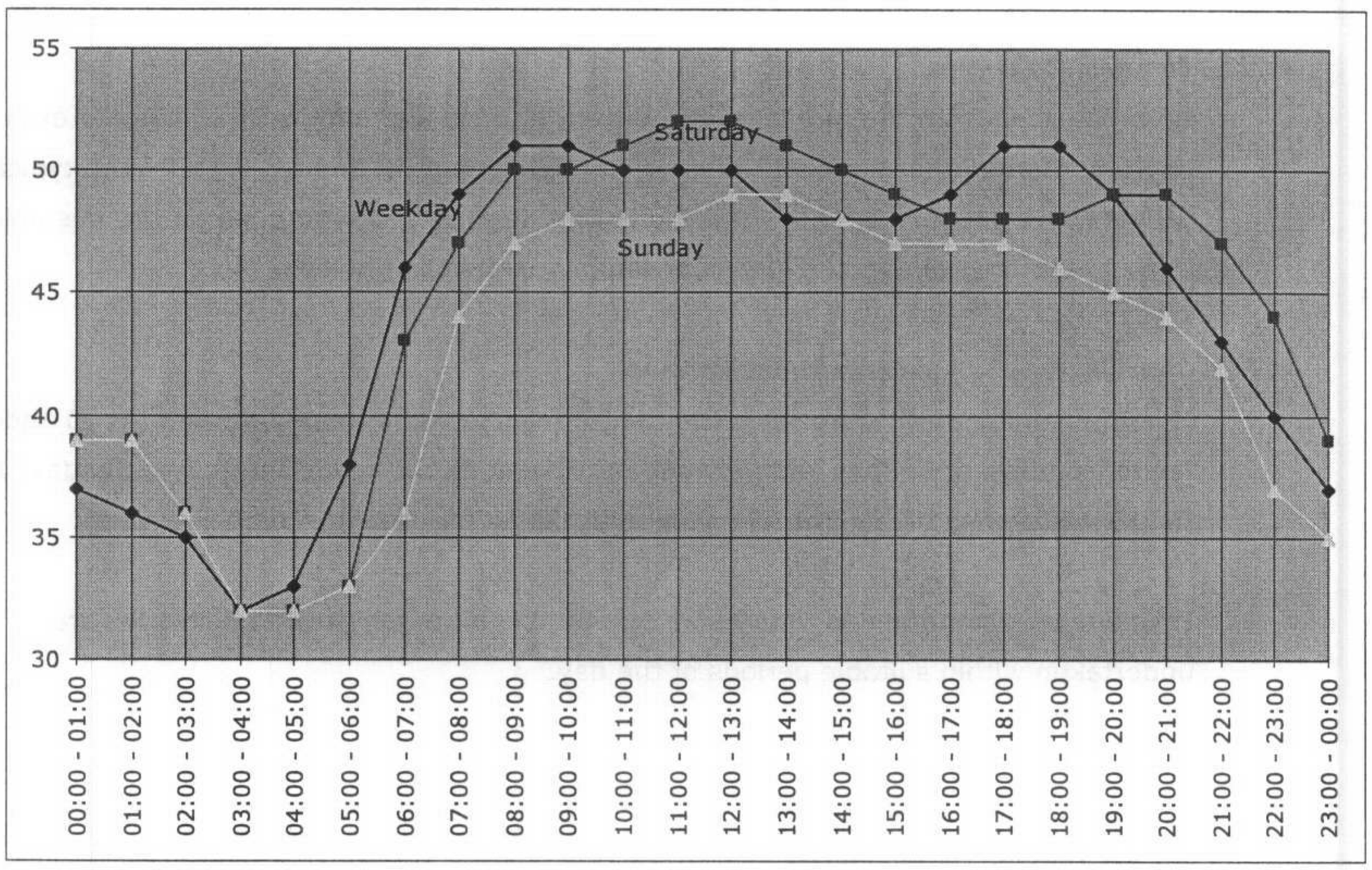
Note: The levels have been corrected to hourly values.

4.1.7. Delivery Impact

In specific measurement taken of a similar delivery it can be seen that during periods when the background noise levels are high due to traffic etc. deliveries have little or no impact on the overall levels but that there is an increase the peak levels (L_{Max}).

4.2. Background Noise Levels

4.2.1. Weekly Profile.



Note: Horizontal Axis - Hourly period of the day.
Vertical Axis - Hourly L_{90}.

4.2.2. From the measurements taken on site the above graph details the likely background noise levels on different days of the week. The above are based on KR Associates experience at other sites where full weekly noise measurements have been undertaken. Note should be made of the morning and evening peaks that exist Monday to Friday the later peak on Saturday morning and the generally lower levels on Sunday.

4.3. Method One – Comparison to Background

4.3.1. Standard

BS4142:1997 is not suitable for assessing delivery noise. However using the underlying principles of the BS4142 the likelihood of complaints can be assessed in relation to the difference between the source noise and the underlying background noise level. A source noise that results in a bigger difference with the background noise level is more likely to give rise to complaint than a smaller difference.

4.3.2. Times of Deliveries

It can be seen from the profile of deliveries that a smaller difference is likely to exist in the daytime than during the night time period. By comparing the L_{Max} level from a typical delivery it is the opinion of KR Associates that during the daytime period there is unlikely to be a detrimental effect to the local amenity in terms of noise.

4.3.3. Conclusion – Comparison to Background

It is the opinion of KR Associates that deliveries should be made between 06:00 and 23:00 hours Mondays to Fridays and between 07:00 and 22:00 hours Saturdays, Sundays and Bank Holidays as this follows the general profile of the background noise levels.

It would be recommended that as far as possible large refrigerated deliveries are undertaken within suitable periods of the day.

4.4. Method Two - PPG 24 [reference 5]

4.4.1. Though Planning and Policy Guidance number 21 does not give specific advice on delivery noise it does offer useful reference information that indicates if planning permission should be granted by way of 4 planning categories. However, it should be noted that reference to this standard is only for guidance as it is not specifically designed for this purpose of assessing delivery noise.

4.4.2. Day Time Assessment

It is predicted that using the guidance in the table in Annex 1 of PPG 24 during a typical day the delivery noise will result in the following levels.

PPG 24 – Planning and Noise. [Reference 5]				
Item	Description	Value	Units	Reference
1	Corrected Level ($L_{Aeq,16hour}$ – 07:00 to 23:00)	56	dB	NEC Table
2	Noise Exposure Category Rating (NEC B)	55 - 63	dB	Annex 1 [Ref 5]
3	Conclusion – The calculated level falls within Category B for road traffic sources. 'Noise should be taken into account when determining planning application and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.'			

4.4.3. Night Time Assessment

It is predicted that using the guidance in Note 1 of Annex 1 of PPG23 a delivery at night will result in the following assessment

PPG 24 – Planning and Noise. [Reference 5]				
Item	Description	Value	Units	Reference
1	Corrected Level ($L_{AMax,8hour}$– 23:00 to 07:00)	84	dB	Note 1 PPG 24
2	Noise Exposure Category Rating (NEC C)	82	dB	Annex 1 [Ref 5]
3	Conclusion – The calculated level falls within Category C for road traffic sources. 'Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there is no alternate quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.'			

4.4.4. Conclusion – PPG 24.

It can therefore be concluded from the investigation using the general guidance available in PPG that controlled deliveries are unlikely to cause a problem in the day time but are likely to cause a problem during the night time. Any deliveries at night should be carefully considered and only undertaken if specific site or operations conditions apply.

4.5. Method Three - Criteria for Community Noise [Reference 4]

4.5.1. The extensive report written by Berlund and Linvall which forms the basis of the World Health Organization guidance on community noise can be used as it contains absolute levels that are required to avoid complaints.

4.5.2. Day Time

Average Level Criteria.

World Health Organization - Guidelines for Community Noise. [Reference 4]				
Item	Description	Value	Units	Reference
1	Corrected Level ($L_{Aeq,16hour}$ – 06:00 – 22:00)	39	dB	BS4142 [Ref 4]
2	Criteria – Externally 1m bedroom window	50	dB	Table 4.1.
4	Conclusion – The proposed level falls below the requirements of this absolute level.			

4.5.3. Night Time

Average Level Criteria

World Health Organization - Guidelines for Community Noise. [Reference 4]				
Item	Description	Value	Units	Reference
1	Corrected Level ($L_{Aeq,8hour}$ – 22:00 – 06:00)	39	dB	BS4142 [Ref 4]
2	Criteria – Externally 1m bedroom window	45	dB	Table 4.1.
4	Conclusion – The proposed level falls below the requirements of this absolute level.			

Maximum Level Criteria

World Health Organization - Guidelines for Community Noise. [Reference 4]				
Item	Description	Value	Units	Reference
1	Corrected Level ($L_{AMax,8hour}$ – 22:00 – 06:00)	76	dB	BS4142 [Ref 4]
2	Criteria – Externally 1m bedroom window	60	dB	Table 4.1.
4	Conclusion – The proposed level falls above below the requirements of this absolute level.			

4.5.4. Conclusion – Criteria for Community Noise

It would be concluded that deliveries should be undertaken during the day time only as night time maximum levels do not fall within the requirements of the Criteria for Community Noise recommended absolute levels.

4.6. Management Policy

4.6.1. From experience at other sites it is the opinion of KR Associates that good management of deliveries can significantly reduce the impact on the local amenity in terms of noise. Therefore consideration should be given at this development to the following.

4.6.2. Surfaces

As far is practical and with consideration to the Health and Safety implication all surfaces over which roll cages are to be pushed should be as smooth as possible. Particular attention should be made to any kerbs, changes in surface height and entrance door thresholds. A smooth even surface can go a long way to reducing noise especially from empty cages.

4.6.3. Empty Cages

Empty cages should be moved and stored one at a time to prevent cages rattling against each other.

4.6.4. Delivery Schedule

Deliveries that are made when the general area is quiet should as far as possible be as small as possible with consideration given to the possibility of making deliveries through the front of the store. This could include the early morning milk delivery. Further more large deliveries should be scheduled for appropriate times and no more than one delivery should be made at any one time.

4.6.5. Staff Training

As part of the ongoing training all staff should be made aware of the potential sensitive nature of this site and care should be taken when handling a delivery especially during early morning or late night deliveries.

APPENDIX A - REFERENCE DOCUMENTS.

A.1. BS 4142 [Reference 1].

British Standard 4142:1997.

Method for rating industrial noise affecting mixed residential and industrial areas.

A.1.1. This document is used to rate external noise and to give an indication if complaints are likely to be received. This document is not widely used for the assessment of music noise but the guidance contained within the document is very useful and the spirit of the standard is widely used.

A.1.2. Background Noise Level.

The background noise level is the sound pressure level of the residual noise at an assessment position measured as an $L_{A90,t}$ (The level which ignores the top 90% of the levels).

A.1.3. Rating Noise Level.

The corrected specific sound pressure level of the source measured as an $L_{Aeq,t}$. A correction is applied for the influence of the background residual noise level and a character correction for distinctive noises such as bass thumps, screech etc.

A.1.4. Section 9 gives an indication of the likelihood of complaints based on the assessment level, which is the numerical difference between the background noise level and the rating level. i.e. the higher the difference the greater likelihood there is of complaints.

a) If the rating level is more than 10 dB below the background level then there is a positive indication that complaints are unlikely.

b) A difference of around +5 dB is of marginal significance

c) A difference of around +10 dB or more indicates that complaints are likely.

A.1.5. It should be noted that compliance with the requirements of BS4142:1997 does not in itself negate a tort and does not give an assessment of public, private or statutory nuisance or the specific requirements of a planning condition or any other specific site criteria.

A.2. BS 7445:1991 [Reference 2]

British Standard 7445 – Part 1 : 1991.

Description and measurement of environmental noise – Part 1. Guide to quantities and procedures.

A.2.1. Though this standard does not specify limits of environmental noise it details how to measure and present valid data for environmental noise levels.

A.2.2. Section 3 of the standard defines the descriptors for environmental noise including equivalent continuous level and the percentile level. The standard clearly details the required time intervals for any measurements, the position of any measurements and the observations to be made during the measurements. The type of instrumentation is also clarified, as is the calibration procedure before, during and after the measurements.

A.3. Statutory Nuisance [Reference 3].

Environmental Protection Act 1990 and Noise and Statutory Nuisance Act 1993.

A.3.1. Section 79 of the act contains a list of statutory nuisance, one of which is noise from premises such as to be prejudicial to health or a nuisance (s79(g)). If the Local Authority are satisfied that a noise nuisance exists, or is likely to occur, or likely to recur, then they are obliged to serve a noise abatement notice under section 80 of the act. This will require the abatement of the nuisance, or prohibiting or restricting its occurrence, or requiring the execution of such works or steps as are necessary. They will also specify the time within which the notice is to be complied with.

A.3.2. The notice is served upon the person or persons responsible except in the cases where the person responsible cannot be found or the nuisance has not yet occurred, then it is served upon the owner or occupier of the premises.

A.3.3. The recipient of the notice has 21 days right of appeal to the magistrates court, after which time he is deemed to have accepted the notice. The grounds for appeal are contained within the Statutory Nuisance Appeals Regulations 1990.

A.4. Guidelines for Community Noise [Reference 4]

World Health Organization, Geneva

Berglund and Linvall Report

A.4.1 This document is based on the document published by Berglund and Linvall in 1995 which is the result of extensive research by an expert task force and focuses on all aspects Community Noise. This document is wide ranging and deals with many varied aspects of community noise.

A.4.2 The document is summarized in table 4.1 contained on page 47 of the document which states that to avoid reasonable sleep disturbance or annoyance the 8 hour L_{Aeq} should not exceed 45 dB and the equivalent L_{AMax} level should not exceed 60 dB in the same 8 hour period.

A.4.3 Design Considerations

Specific advise is given in section 5.6.2 relating to the design of residential dwellings. Potential site should be evaluated to determine whether they are prone to noise problems. This evaluation should be consistent with national and local land use planning guidelines. Adequate soundproofing against outdoor noise is important in residential as well as commercial properties, and should be re-evaluated when they are rebuilt or renovated.

A.5. PPG 24 [Reference 5]

Department of the Environment – Planning and Policy Guidance 24

Planning and Noise

A.5.1 This document gives guidance to local authorities in England on the use of their planning powers to minimize the adverse impact of noise and builds on the advice previously contained within the department of Environment Circular 10/73.

a) Outlines the considerations to be taken into account in determining planning applications both for noise-sensitive developments and for those activities which will generate noise

b) Advises on the use of conditions to minimize the impact of noise.

A.5.2 Noise Exposure Categories (NEC's)

When assessing a proposal for residential development near a source of noise, local planning authorities should determine into which of the following four categories the site falls.

NEC A $L_{Aeq,t}$ < 55 dB (07:00 - 23:00) – Road Traffic / Mixed Sources

Noise need not be considered as a determining factor in granting planning permission.

NEC B $L_{Aeq,t}$ 55 to 63 dB (07:00 - 23:00) – Road Traffic / Mixed Sources

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

NEC C $L_{Aeq,t}$ 63 to 72 dB (07:00 - 23:00) – Road Traffic / Mixed Sources

Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there is no alternative quieter sites available, conditions should be imposed to ensure to commensurate level of protection against noise.

NEC D $L_{Aeq,t}$ > 72 dB (07:00 - 23:00) – Road Traffic / Mixed Sources

Planning permission should normally be refused.

APPENDIX B – DEFINITIONS AND SYMBOLS.

B.1. Equivalent Continuous A – Weighted Sound.

The value of the A-Weighted sound pressure level in decibels of continuous steady sound that within a specified time interval has the same mean-squared sound pressure as a sound that varies with time. Reference should be made to the equation (1) in section 3.1 of British Standard 4142 [reference 1].

B.2. Specific Noise Source.

The noise source under investigation for assessing the likelihood of complaints.

B.3. Reference Time Interval.

The specified interval over which an equivalent continuous A-Weighted sound pressure is determined.

B.4. Specific Noise Level.

The equivalent continuous A-Weighted sound pressure level at the assessment position produced by the specific noise source over a given time reference.

B.5. Measurement Time Interval.

The total time over which the measurements are taken.

B.6. Rating Level.

The specific noise level plus any adjustments for the characteristic features of the noise at the assessment position.

B.7. Ambient Noise.

Totally encompassing sound at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

B.8. Residual Noise.

The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

B.9. Residual Noise Level.

The equivalent continuous A-Weighted sound pressure level of the residual noise.

B.10. Background Noise Level.

The A-Weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval.