



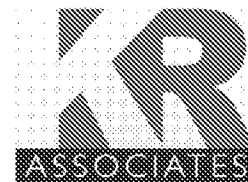
4193

Rating of Industrial Noise affecting Mixed Industrial and Residential Areas

British Standard 4142:1997

Site Name: Barnham Road Express
Address: 28 Barnham Road, Barnham,
Bognor Regis. PO22 0ES.

Customer Name: Tesco Stores Ltd
Address: Tesco House, Delamere Road,
Cheshunt, Hertfordshire. EN8 9SL.



KR Associates (UK) Ltd

Unit 2, Vancouver Wharf,
Hazel Road, Southampton, SO19 7BN.

Report Reference: KR03906
Report Version: v1.0
Version Date: 10th July 2014
Test Date: 9th July 2014
Consultant: Mr. R. M. Scrivener

 4193 Accredited to ISO/IEC 17025:2005	Schedule of Accreditation Issued by United Kingdom Accreditation Service 21 – 47 High Street, Feltham, Middlesex, TW13 4UN.		
	KR Associates (UK) Ltd Issue No: 007 Issue Date: 25 May 2012		
Material / Products Tested	Type of Tests / Properties Measured / Range of measurements	Standard specification/ Equipment/Techniques used	Location Code
Building Elements Partitions, walls, floors & facades	Field measurements of airborne sound insulation i.e. Level difference and related factors	The Building Regulations 2010 Approved Document E:2003 (Incorporating 2004 & 2010 amendments)	Any suitable customer site
Floors	Field measurement of impact sound insulation i.e. Impact Sound Pressure Level and related factors	The Building Regulations 2010 Approved Document E:2003 (Incorporating 2004 & 2010 amendments)	Any suitable customer site
Environmental Noise	Method for Rating industrial noise affecting mixed residential and industrial areas	BS 4142:1997	Any suitable customer site
Buildings	Building Air Leakage Tests	BS EN 13829:2001 ATTMA Technical Standard 1:2007	Any suitable customer site
Dwellings Non-dwellings	Building Air Leakage Tests	ATTMA TSL1:2010 ATTMA TSL2:2010	Any suitable customer site

Version Control

Version Number	Version Date	Details	Author
KR03906 v1.0 (Full)	10 th July 2014	Initial Issue of Report	Mr. R. M. Scrivener

Declaration

This report has been prepared in line with the relevant test procedure and the scope of accreditation issued to KR Associates (UK) Ltd by the United Kingdom Accreditation Services on 25th May 2012. The report has been checked and released for issue by the relevant Technical Authority of KR Associates (UK) Ltd.


10th July 2014

Mr. R. M. Scrivener, MSc, MIOA



1	EXECUTIVE SUMMARY	5
1.1	INSTRUCTION	5
1.2	SCOPE OF REPORT.....	5
1.3	SUMMARY OF RESULTS (UKAS)	5
1.3.1	Rating Levels	5
1.3.2	Background Noise Levels.....	5
1.3.3	BS4142:1997 Assessment	5
1.4	CONCLUSIONS.....	5
1.4.1	British Standard 4142:1997	5
1.4.2	Impact on Local Amenity.....	5
2	TEST PROCEDURE	6
2.1	SCOPE OF REPORT.....	6
2.2	SCOPE OF BS 4142:1997.....	6
2.3	SPECIFIC NOISE LEVELS	6
2.3.1	Assessment Position.....	6
2.3.2	Manufacturers Data.....	6
2.3.3	Calculations.....	6
2.4	BACKGROUND NOISE LEVELS.....	7
2.4.1	Assessment Position.....	7
2.4.2	Equivalent Position.....	7
2.5	RATING LEVELS (CHARACTER CORRECTION)	7
2.6	ASSESSMENT AND CONCLUSION.....	7
3	CRITERIA	8
3.1	BS4142:1997	8
3.2	NATIONAL PLANNING POLICY FRAMEWORK ("NPPF")	8
3.3	NOISE POLICY STATEMENT FOR ENGLAND ("NPSE").....	8
4	CALCULATION OF LEVELS AT ASSESSMENT POSITION	9
4.1	MAXIMUM SOUND POWER LEVELS – BS EN 13487:2003	9
4.1.1	Day Time Levels – 07:00 to 23:00.....	9
4.1.2	Night Time Levels – 23:00 to 07:00.....	9
4.2	CALCULATIONS - ISO 9613:1996	9
4.2.1	Source Directivity (D_c)	9
4.2.2	Geometric Divergence (A_{div})	10
4.2.3	Ground Absorption (A_{gr}).....	10
4.2.4	Atmospheric Absorption (A_{atm}).....	10
4.2.5	Barrier Effect (A_{bar}).....	10
4.3	DAY TIME CALCULATIONS (07:00 TO 23:00)	11
4.3.1	Source 1 – (Searle (350 rpm) 2 Fan Condenser)	11
4.3.2	Source 2 – (Mitsubishi Heavy Sales Floor AC)	11
4.3.3	Source 3 – (Mitsubishi Heavy Sales Floor AC)	11
4.3.4	Source 4 – (Mitsubishi Heavy Cash Office AC).....	12
4.4	NIGHT TIME CALCULATIONS (23:00 TO 07:00)	12
4.4.1	Source 1 – (Searle (350 rpm) 2 Fan Condenser)	12
5	ASSESSMENTS	13
5.1	DAY TIME (16 HOUR - 07:00 TO 23:00)	13
5.2	NIGHT TIME (8 HOUR – 23:00 TO 07:00)	14
6	CONCLUSIONS.....	15
6.1	BS 4142:1997	15
7	APPENDIX A - BS 4142:1997 INFORMATION TO BE REPORTED	16
7.1	A) SOURCE UNDER INVESTIGATION.....	16
7.2	B) SUBJECTIVE IMPRESSION OF SOURCE AT ASSESSMENT POSITION	16
7.3	C) RELATIVE POSITIONS	16
7.4	D) NOISE MEASUREMENT EQUIPMENT CALIBRATION.....	17



7.5	E) NOISE MEASUREMENT EQUIPMENT OPERATION TEST	17
7.6	F) WEATHER CONDITIONS	17
7.7	G) DATE AND TIME OF MEASUREMENTS	17
7.8	H) SPECIFIC NOISE LEVELS	17
7.9	I) MEASUREMENT TIME INTERVAL.....	18
7.10	J) REFERENCE TIME INTERVAL	18
7.11	K) RATING LEVELS.....	18
7.12	L) BACKGROUND NOISE LEVELS	18
7.13	M) EXCESS OF RATING OVER BACKGROUND LEVEL	18
8	APPENDIX B – SITE LAYOUT / PHOTOGRAPHS.....	19
8.1	SITE LOCATION	19
8.2	ASSESSMENT POSITION	20
8.3	BACKGROUND MEASUREMENT POSITION	21
8.4	SUPPLIED DRAWINGS.....	22
9	APPENDIX C - BACKGROUND NOISE LEVELS	23
9.1	16:00 WEDNESDAY 9 TH JULY TO 07:00 THURSDAY 10 TH JULY	23
9.2	07:00 THURSDAY 10 TH JULY TO 12:00 THURSDAY 10 TH JULY.....	24
9.3	MINIMUM LEVELS TABLE.....	25
9.4	WEATHER DATA	25
10	APPENDIX D – SOUND POWER LEVELS	26
10.1	DAY TIME (07:00 – 23:00).....	26
10.1.1	<i>Searle (350 rpm) 2 Fan Condenser.....</i>	<i>26</i>
10.1.2	<i>Mitsubishi Heavy Sales Floor AC</i>	<i>27</i>
10.1.3	<i>Mitsubishi Heavy Sales Floor AC</i>	<i>28</i>
10.1.4	<i>Mitsubishi Heavy Cash Office AC</i>	<i>29</i>
10.2	NIGHT TIME (23:00 – 07:00).....	30
10.2.1	<i>Searle (350 rpm) 2 Fan Condenser.....</i>	<i>30</i>
11	APPENDIX E – MINIMUM BACKGROUND ASSESSMENT (OUTSIDE UKAS SCOPE OF ACCREDITATION)	31
11.1	MAXIMUM SOURCE DATA	31
11.2	MINIMUM BACKGROUND NOISE LEVELS	31
11.3	MAXIMUM AMBIENT TEMPERATURES.....	31
11.4	REVISED SOURCE NOISE LEVELS	31
11.5	REVISED ASSESSMENTS	32
11.5.1	<i>Day Time (Minimum 1 hour – 22:00 to 23:00).....</i>	<i>32</i>
11.5.2	<i>Night Time (Minimum 5 minute – 02:00 to 03:00)</i>	<i>33</i>
12	APPENDIX F – ADDITIONAL ASSESSMENTS (OUTSIDE UKAS SCOPE OF ACCREDITATION)	34
12.1	GUIDELINES FOR COMMUNITY NOISE (WORLD HEALTH ORGANISATION)	34
12.1.1	<i>Criteria</i>	<i>34</i>
12.1.2	<i>Assessment – Day Time 07:00 to 23:00</i>	<i>34</i>
12.1.3	<i>Assessment – Night Time 23:00 to 07:00.....</i>	<i>35</i>
12.2	NIGHT NOISE GUIDELINES (WORLD HEALTH ORGANISATION - EUROPE)	36
12.2.1	<i>Criteria</i>	<i>36</i>
12.2.2	<i>Assessment – Night time 23:00 to 07:00</i>	<i>37</i>
13	REFERENCES.....	38
13.1	BRITISH STANDARD 4142: 1997	38
13.2	BRITISH STANDARD 13487: 2003.....	38
13.3	INTERNATIONAL STANDARD ORGANISATION 9613 – PART 1: 1993.....	38
13.4	INTERNATIONAL STANDARD ORGANISATION 9613 – PART 2: 1996.....	38
13.5	WORLD HEALTH ORGANISATION GUIDELINES FOR COMMUNITY NOISE: 1999	38
13.6	WORLD HEALTH ORGANISATION EUROPE NIGHT NOISE GUIDELINES 2009.....	38



1 EXECUTIVE SUMMARY

1.1 Instruction

KR Associates (UK) Ltd have been instructed by Tesco Stores Ltd to undertake an environmental noise survey at the proposed store at 28 Barnham Road in Barnham, Bognor Regis to support the planning application for the proposed refrigeration and air conditioning units.

1.2 Scope of Report

British Standard 4142:1997 details the method for rating the noise of an industrial nature from proposed source and is based on the margin by which it exceeds a background noise level to determine if complaints are likely to be received.

1.3 Summary of Results (UKAS)

1.3.1 Rating Levels

British Standard 4142:1997	Day Time	Night Time
Section 8	07:00 – 23:00	23:00 – 07:00
Rating Noise Levels	$L_{Aeq,1\text{ hours}}$ 41 dB	$L_{Aeq,5\text{ minutes}}$ 24 dB

1.3.2 Background Noise Levels

British Standard 4142:1997	Day Time	Night Time
Section 7	07:00 – 23:00	23:00 – 07:00
Background Noise Levels	$L_{A90,15\text{ hours}}$ 44 dB	$L_{A90,8\text{ hours}}$ 32 dB

1.3.3 BS4142:1997 Assessment

British Standard 4142:1997	Day Time	Night Time
Section 9	07:00 – 23:00	23:00 – 07:00
Assessment	-3	-8
Likelihood of Complaints	below 'Marginal Significance'	below 'Marginal Significance'

1.4 Conclusions

1.4.1 British Standard 4142:1997

The British Standard 4142:1997 assessments, which are covered by the KR Associates (UK) Ltd scope of accreditation from the United Kingdom Accreditation Service ("UKAS"), indicates that the proposed plant will be unlikely to give rise to complaints from local residents.

1.4.2 Impact on Local Amenity

The additional assessments, which are not covered by the KR Associates (UK) Ltd scope of accreditation from UKAS, indicate that there is unlikely to be an adverse impact in terms of noise on the local residential properties.



2 TEST PROCEDURE

2.1 Scope of Report

This report sets out to determine if the installation of 1 number Searle (350 rpm) 2 Fan Condenser, 2 number Mitsubishi Heavy Sales Floor Air Conditioning Units and 1 number Mitsubishi Heavy Cash Office Air Conditioning Unit associated with the operation of the store will result in noise levels that will have a detrimental effect on the local residents or be likely to give rise to complaints in the future.

2.2 Scope of BS 4142:1997

In the assessment of the proposed plant, consideration has been given to the scope of British Standard 4142:1997, which in section 1, details the lower limits for the rating and background noise levels:

“The method is not suitable for assessing the noise....when the background and rating noise are both very low.... Note. For the purposes of this standard, background noise levels below 30 dB and rating levels below 35 dB are considered to be very low.”

It is considered that both the background noise levels and the rating noise levels fall within the scope of British Standard 4142:1997, though the rating levels at night are below the criteria defined in note 1 of section 1.

2.3 Specific Noise Levels

2.3.1 Assessment Position

The assessment position was established as the residential property on Saxby Close located between 27.7m and 29.6m from the proposed refrigeration and air conditioning sources within the dedicated plant area.

2.3.2 Manufacturers Data

As the proposed refrigeration and air conditioning equipment has yet to be installed the sound power levels, established in accordance with British Standard 13487: 2003, were used to calculate the specific noise levels. A copy of test certificates for the plant equipment is detailed in Appendix D.

2.3.3 Calculations

The specific noise levels are calculated at the assessment position located at the residential property on Saxby Close using the calculations detailed within ISO 9613 Part 1 and 2: 1996. These calculations take the manufacturers sound power levels, account for a variety of factors including source directivity, distance, atmospheric absorption, ground absorption and the effects of any barriers and determine the resultant noise levels at the assessment position.



2.4 Background Noise Levels

2.4.1 Assessment Position

In line with the requirements of British Standard 4142:1997 the background noise levels should be measured at the assessment position. The residential façade was not accessible at the time of testing.

2.4.2 Equivalent Position

The background noise levels were measured at the equivalent position located on a lamp post on Saxby Close between 16:00 on 9th July and 12:00 on 10th July.

2.5 Rating Levels (Character Correction)

A character correction of +5 dB is added to the specific noise level to establish the rating level if any of the following is present at the assessment position.

BS4142:1997 – Section 8.2 Character Correction		Unlikely to be audible by local residents	Correction
Distinguishable, Discrete Continuous Note	Whine	Unlikely to be audible or present	+0 dB
	Hiss	Unlikely to be audible or present	
	Screech	Unlikely to be audible or present	
	Hum	Unlikely to be audible or present	
Distinguishable Impulses	Bangs	Unlikely to be audible or present	+0 dB
	Clicks	Unlikely to be audible or present	
	Clatters	Unlikely to be audible or present	
	Thumps	Unlikely to be audible or present	
Irregularity attracting attention		Unlikely to be audible or present	+0 dB

The source level is likely to be inaudible at the assessment position as it is at least 10 dB(A) below the corresponding background noise level measured using the same measurement index.

Noise Levels	Day Time	Night Time
Time Period	22:00 – 23:00	02:00 – 03:00
Minimum Background Noise Levels	$L_{Aeq,1\text{ hour}}$ 47 dB	$L_{Aeq,5\text{ minutes}}$ 35 dB
Maximum Specific Noise Levels	$L_{Aeq,1\text{ hour}}$ 38 dB	$L_{Aeq,5\text{ minutes}}$ 22 dB

2.6 Assessment and Conclusion

The rating level is subtracted from the background level to determine the assessment level during the day time and night time periods. The assessment level is then compared against one of the three distinct categories within British Standard 4142:1997 to determine the likelihood of complaints from the proposed plant.



3 CRITERIA

3.1 BS4142:1997

British Standard 4142:1997 defines 3 distinct categories based on the calculated assessment level:

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

A difference of around +5dB is of marginal significance.

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

In determining a suitable criteria care needs to be taken to ensure an *“unreasonable burden”* is not placed on the proposed development and that the rating and background levels fall within the scope of British Standard 4142:1997.

3.2 National Planning Policy Framework (“NPPF”)

The National Planning Policy Framework sets out the Governments planning policies for England and how these are expected to be applied. In reference to noise in the environment, paragraph 123 states:

“Planning Policies and decisions should aim to:

Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;

Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;

Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established...”

3.3 Noise Policy Statement for England (“NPSE”)

The Noise Policy Statement for England provides the following guidance:

SOAEL – Significant Observed Adverse Effect Level: This is the level above which significant adverse effects on health and quality of life occur...

Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of the Government policy on sustainable development.”



4 CALCULATION OF LEVELS AT ASSESSMENT POSITION

4.1 Maximum Sound Power Levels – BS EN 13487:2003

4.1.1 Day Time Levels – 07:00 to 23:00

Sound Power Levels BS EN ISO 13487:2003	Octave Band Centre Frequency (Hz)							Sum (A)	Units
	63	125	250	500	1000	2000	4000		
Searle (350 rpm) 2 Fan Condenser	77.9	70.3	65.3	63.8	59.6	51.1	46.5	64.0	dB
Mitsubishi Heavy Sales Floor AC	85.0	81.0	70.0	63.0	65.0	63.0	58.0	71.1	dB
Mitsubishi Heavy Sales Floor AC	85.0	81.0	70.0	63.0	65.0	63.0	58.0	71.1	dB
Mitsubishi Heavy Cash Office AC	78.0	73.0	63.0	55.0	55.0	53.0	50.0	62.5	dB
Sound Power Levels, L_w , BS EN ISO 13487:2003. Reference 1 x 10 ⁻¹² watts.									

4.1.2 Night Time Levels – 23:00 to 07:00

Sound Power Levels BS EN ISO 13487:2003	Octave Band Centre Frequency (Hz)							Sum (A)	Units
	63	125	250	500	1000	2000	4000		
Searle (350 rpm) 2 Fan Condenser	68.3	64.7	59.8	57.7	52.2	44.0	39.0	58.5	dB
Sound Power Levels, L_w , BS EN ISO 13487:2003. Reference 1 x 10 ⁻¹² watts.									

4.2 Calculations - ISO 9613:1996

4.2.1 Source Directivity (D_c)

A correction is made to account for the location of the source and the effect of additional reflective surfaces excluding the ground and is contained within section 6 of ISO 9613 - Part 2:1996.

Number of Surfaces	Correction in dB (D_c)
No Reflective Surfaces	+0 dB
1 Reflective Surface	+3 dB
2 Reflective Surfaces	+6 dB
3 Reflective Surfaces	+9 dB



4.2.2 Geometric Divergence (A_{div})

A correction is made for the distance between the source and assessment position using the following formula defined in section 7.1 of ISO 9613-Part 2:1996.

Formula	Symbols
$A_{div} = 20 \cdot \log_{10} (d/d_0) + 11$	A_{div} = Reduction due to Geometric Divergence (dB) d = Distance from source to receiver (m) d_0 = reference distance (1m)

4.2.3 Ground Absorption (A_{gr})

A correction is made for the effect of the ground between the source and receiver depending on whether it is considered hard or soft ground.

Type of ground	Correction in dB (A_{gr})
Hard Ground	+ 3 dB
Soft Ground	+ 0 dB

4.2.4 Atmospheric Absorption (A_{atm})

As the source was less than 100m from the receiver position (assessment position) no correction was made for atmospheric absorption.

4.2.5 Barrier Effect (A_{bar})

A correction is made for any barrier in the direct line of site between the source and the assessment position and is detailed in section 7.4 of ISO 9613-Part 2:1996. For clarity the K_{met} meteorological correction has been ignored and C_2 equals 40 and C_3 equals 1.

Formula	Symbols
$A_{bar} = 10 \cdot \log_{10} [3 + (40 \cdot \delta / \lambda) - A_{gr}]$ *Note1 where $\delta = a + b - r$ and $\lambda = c / f$	A_{bar} = Effective barrier attenuation (dB) A_{gr} = Total Ground Absorption (dB) *Note 1: Only apply the A_{gr} correction if $A_{gr} > 0$ δ = Path difference (m) a = Distance from source to barrier head (m) b = Distance from barrier head to assessment position (m) r = Distance from source to assessment position (m) λ = Wavelength of sound (m) c = Speed of sound – Assumed to be 342 ms^{-1} f = Octave band centre frequency (Hz)



4.3 Day Time Calculations (07:00 to 23:00)

4.3.1 Source 1 – (Searle (350 rpm) 2 Fan Condenser)

Searle (350 rpm) 2 Fan Condenser	Octave Band Centre Frequency (Hz)							Sum (A)	Units
	63	125	250	500	1000	2000	4000		
Sound Power Levels (L_w)	77.9	70.3	65.3	63.8	59.6	51.1	46.5	64.0	dB
Directivity (D_c)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	--	dB
Geometric Divergence (A_{div})	-40.4	-40.4	-40.4	-40.4	-40.4	-40.4	-40.4	--	dB
Atmospheric Absorption (A_{atm})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	dB
Ground Absorption (A_{gr})	3.0	3.0	3.0	3.0	3.0	3.0	3.0	--	dB
Barrier Correction (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	dB
Resultant Noise Levels (L_p)	43.5	35.9	30.9	29.4	25.2	16.7	12.1	31	dB
L_w - Sound Power Levels, L_w . BS EN ISO 13487:2003. Reference 1×10^{-12} watts. L_p - Sound Pressure Levels. Reference $2 \times 10^{-5} \text{ Nm}^{-2}$									

4.3.2 Source 2 – (Mitsubishi Heavy Sales Floor AC)

Mitsubishi Heavy Sales Floor AC	Octave Band Centre Frequency (Hz)							Sum (A)	Units
	63	125	250	500	1000	2000	4000		
Sound Power Levels (L_w)	85.0	81.0	70.0	63.0	65.0	63.0	58.0	71.1	dB
Directivity (D_c)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	--	dB
Geometric Divergence (A_{div})	-40.1	-40.1	-40.1	-40.1	-40.1	-40.1	-40.1	--	dB
Atmospheric Absorption (A_{atm})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	dB
Ground Absorption (A_{gr})	3.0	3.0	3.0	3.0	3.0	3.0	3.0	--	dB
Barrier Correction (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	dB
Resultant Noise Levels (L_p)	50.9	46.9	35.9	28.9	30.9	28.9	23.9	37	dB
L_w - Sound Power Levels, L_w . BS EN ISO 13487:2003. Reference 1×10^{-12} watts. L_p - Sound Pressure Levels. Reference $2 \times 10^{-5} \text{ Nm}^{-2}$									

4.3.3 Source 3 – (Mitsubishi Heavy Sales Floor AC)

Mitsubishi Heavy Sales Floor AC	Octave Band Centre Frequency (Hz)							Sum (A)	Units
	63	125	250	500	1000	2000	4000		
Sound Power Levels (L_w)	85.0	81.0	70.0	63.0	65.0	63.0	58.0	71.1	dB
Directivity (D_c)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	--	dB
Geometric Divergence (A_{div})	-39.9	-39.9	-39.9	-39.9	-39.9	-39.9	-39.9	--	dB
Atmospheric Absorption (A_{atm})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	dB
Ground Absorption (A_{gr})	3.0	3.0	3.0	3.0	3.0	3.0	3.0	--	dB
Barrier Correction (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	dB
Resultant Noise Levels (L_p)	51.1	47.1	36.1	29.1	31.1	29.1	24.1	37	dB
L_w - Sound Power Levels, L_w . BS EN ISO 13487:2003. Reference 1×10^{-12} watts. L_p - Sound Pressure Levels. Reference $2 \times 10^{-5} \text{ Nm}^{-2}$									



4.3.4 Source 4 – (Mitsubishi Heavy Cash Office AC)

Mitsubishi Heavy Cash Office AC	Octave Band Centre Frequency (Hz)							Sum (A)	Units
	63	125	250	500	1000	2000	4000		
Sound Power Levels (L_w)	78.0	73.0	63.0	55.0	55.0	53.0	50.0	62.5	dB
Directivity (D_c)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	--	dB
Geometric Divergence (A_{div})	-39.8	-39.8	-39.8	-39.8	-39.8	-39.8	-39.8	--	dB
Atmospheric Absorption (A_{atm})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	dB
Ground Absorption (A_{gr})	3.0	3.0	3.0	3.0	3.0	3.0	3.0	--	dB
Barrier Correction (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	dB
Resultant Noise Levels (L_p)	33.9	30.3	25.4	23.3	17.8	9.6	4.6	24	dB

L_w - Sound Power Levels, L_w . BS EN ISO 13487:2003. Reference 1×10^{-12} watts. L_p - Sound Pressure Levels. Reference $2 \times 10^{-5} \text{ Nm}^{-2}$

4.4 Night Time Calculations (23:00 to 07:00)

4.4.1 Source 1 – (Searle (350 rpm) 2 Fan Condenser)

Searle (350 rpm) 2 Fan Condenser	Octave Band Centre Frequency (Hz)							Sum (A)	Units
	63	125	250	500	1000	2000	4000		
Sound Power Levels (L_w)	68.3	64.7	59.8	57.7	52.2	44.0	39.0	58.5	dB
Directivity (D_c)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	--	dB
Geometric Divergence (A_{div})	-40.4	-40.4	-40.4	-40.4	-40.4	-40.4	-40.4	--	dB
Atmospheric Absorption (A_{atm})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	dB
Ground Absorption (A_{gr})	3.0	3.0	3.0	3.0	3.0	3.0	3.0	--	dB
Barrier Correction (A_{bar})	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	dB
Resultant Noise Levels (L_p)	33.9	30.3	25.4	23.3	17.8	9.6	4.6	24.1	dB

L_w - Sound Power Levels, L_w . BS EN ISO 13487:2003. Reference 1×10^{-12} watts. L_p - Sound Pressure Levels. Reference $2 \times 10^{-5} \text{ Nm}^{-2}$

5 ASSESSMENTS

5.1 Day Time (16 hour - 07:00 to 23:00)

	Rating Industrial Noise affecting Mixed Industrial and Residential Areas			
4193	British Standard 4142:1997 Day Time (07:00 to 23:00)			
Source	Operating Times		Source Position	
Searle (350 rpm) 2 Fan Condenser	24 hours per day		Located within dedicated plant area	
Mitsubishi Heavy Sales Floor AC	07:00 to 23:00 only			
Mitsubishi Heavy Sales Floor AC				
Mitsubishi Heavy Cash Office AC				
Assessment Position	Residential property on Saxby Close			
Background Position	Lamp post on Saxby Close			
Distance	29.6m from the edge of the source to the assessment position.			
Item	Calculation	Clause	Commentary	
Specific Noise Level <i>L</i> _{eq, 1 hour}	41 dB	6.3	Specific noise level was calculated from measurements made at 1m ISO 9613:1996 ^[3] .	
Acoustic Feature Correction	+ 0 dB	8.2.	Reference section 8.2 of BS4142:1997.	
Rating Level	41 dB	8.3.	The acoustic feature correction is added to the specific noise level to obtain the rating level.	
Background Noise Level	44 dB	7.1.	The background noise level was measured at an equivalent position.	
Assessment Level	-3 dB	9	The background level is subtracted from the rating level. (Numerical values)	
Conclusion BS 4142:1997 ^[1]	Complaint Likely – Assessment of around +10 dB Complaints Marginal – Assessment of around +5 dB Complaints Unlikely – Assessment of around -10 dB or less			
Assessment	-3 dB			
Conclusion	The assessment level is below 'Marginal Significance'			
Test Laboratory:	4193			
Report Reference:	KR03906 / 01			
Test Date:	9 th July 2014 – 10 th July 2014			
Approval Date:	10 th July 2014			

5.2 Night Time (8 hour – 23:00 to 07:00)



4193

Rating Industrial Noise affecting Mixed Industrial and Residential Areas

British Standard 4142:1997 Night Time (23:00 to 07:00)



Source	Operating Times		Source Position
Searle (350 rpm) 2 Fan Condenser	24 hours per day		Located within dedicated plant area
Assessment Position	Residential property on Saxby Close		
Background Position	Lamp post on Saxby Close		
Distance	29.6m from the edge of the source to the assessment position.		
Item	Calculation	Clause	Commentary
Specific Noise Level $L_{Aeq,5 \text{ minutes}}$	24 dB	6.3	Specific noise level was calculated from measurements made at 1m ISO 9613:1996 ^[3] .
Acoustic Feature Correction	+ 0 dB	8.2.	Reference section 8.2 of BS4142:1997.
Rating Level	24 dB	8.3.	The acoustic feature correction is added to the specific noise level to obtain the rating level.
Background Noise Level	32 dB	7.1.	The background noise level was measured at an equivalent position.
Assessment Level	-8 dB	9	The background level is subtracted from the rating level. (Numerical values)
Conclusion BS 4142:1997 ^[1]	Complaint Likely – Assessment of around +10 dB Complaints Marginal – Assessment of around +5 dB Complaints Unlikely – Assessment of around -10 dB or less		
Assessment	-8 dB		
Conclusion	The assessment level is below 'Marginal Significance'		
Test Laboratory:	4193		
Report Reference:	KR03906 / 02		
Test Date:	9 th July 2014 – 10 th July 2014		
Approval Date:	10 th July 2014		



6 CONCLUSIONS

6.1 BS 4142:1997

The British Standard 4142:1997 assessments, which are covered by the KR Associates (UK) Ltd scope of accreditation from the United Kingdom Accreditation Service ("UKAS"), indicates that the proposed plant will be unlikely to give rise to complaints for local residents. It should be noted that the night time assessment falls outside the scope of British Standard 4124:1997 as defined in section 1 – note 1.

7 APPENDIX A - BS 4142:1997 INFORMATION TO BE REPORTED

7.1 A) Source under Investigation

1)	Description of Source	Type	Manufacturer	Model
	Searle (350 rpm) 2 Fan Condenser	2 Fan Condenser	Searle (350 rpm)	MGA124 EC
	Mitsubishi Heavy Sales Floor AC	Sales Floor AC	Mitsubishi Heavy	FDC 100 VN
	Mitsubishi Heavy Sales Floor AC	Sales Floor AC	Mitsubishi Heavy	FDC 100 VN
	Mitsubishi Heavy Cash Office AC	Cash Office AC	Mitsubishi Heavy	SRK 25 ZG
2)	Description of Source	Source Location	Hours of Operation	Mode of Operation
	Searle (350 rpm) 2 Fan Condenser	Rear of site	24 hours per day	Continuously On Demand
	Mitsubishi Heavy Sales Floor AC	Rear of site	07:00 to 23:00	Continuously On Demand
	Mitsubishi Heavy Sales Floor AC	Rear of site	07:00 to 23:00	Continuously On Demand
	Mitsubishi Heavy Cash Office AC	Rear of site	07:00 to 23:00	Continuously On Demand
	Description of Premises	Site is a former public house that is currently under construction. Area is mostly residential with commercial properties on the main road. Railroad is less than 100m from both site and residents.		

7.2 B) Subjective Impression of Source at Assessment Position

1)	Dominance	The sources will not be the dominant noise source at the assessment positions
	Audibility	The sources will not be audible at the assessment position
	Residual Noise Sources	Residual noise caused by road traffic

7.3 C) Relative Positions

1)	Assessment Position	Residential property on Saxby Close		
		BS 4142:1997 Criteria	Details	Compliance with Criteria
		Section 5	1.0m from façade (external)	Assessment position is valid
2)	Source Measurement	The source sound power levels were supplied by the client. It is believed the sound power levels were established in accordance with BS EN 13487:2003		
	Justification	The site has yet to be developed or the source installed.		
	Background Measurement	Measured on a lamp post on Saxby Close (Equivalent Position)		
3)	Justification	BS 4142:1997 Criteria	Details	Compliance with Criteria
		Section 5.3	3.5m to any reflecting surface	Does comply with Criteria
		Section 5.3 – Note 1	Height 1.2m to 1.5m	Does comply with Criteria
		Section 5.3 – Note 2	1 st floor 1m to facade	Does comply with Criteria
		Section 5.3 – Note 3	Measurement Height	Does comply with Criteria
			Distance to Reflecting Surface	Does comply with Criteria
		In order to record remote background levels the noise meter had to be left in a secure position. The position represented the assessment position with the constraints of the site.		
4)	Relative Distances	The plant is located approximately 27.7m - 29.6m from the proposed assessment position.		

7.4 D) Noise Measurement Equipment Calibration

1)	Type	Sound Level Meter	Microphone	Calibrator
		NL - 32	UC - 53A	NC - 74
2)	Manufacturer	Rion	Rion	Rion
3)	Serial Number	00503252	32866	34304655
4)	Certificate Number	Certificate: 06680	Certificate: 06680	Certificate: 06672
	Verification Date	15 th August 2013	15 th August 2013	20 th August 2012

7.5 E) Noise Measurement Equipment Operation Test

1)	Ref. Level of Calibrator	94 dB@1000Hz
2)	Meter Reading Before	94 dB – Meter operation checked. Meter in good working order
	Meter Reading After	94 dB – Meter operation checked. Meter in good working order.

7.6 F) Weather Conditions

1)	Wind Speed	0.1 ms-1 to 6.7 ms-1
	Wind Direction	NW
2)	Temperature Inversion	Unlikely to have occurred during the measurement period
3)	Precipitation	Not within the measurement period – See Appendix C
4)	Fog	No fog within the measurement period

7.7 G) Date and Time of Measurements

1)	Source Measurements	14 th May 2013
	Background Measurements	9 th July 2014 – 10 th July 2014

7.8 H) Specific Noise Levels

1)	Residual Noise Level	Day Time (07:00 – 23:00)	Night Time (23:00 to 07:00)
		Manufacturers Data Supplied	Manufacturers Data Supplied
2)	Residual Noise Level	Not required	Not required
	Method of Determination	Not Applicable	
3)	Specific Noise Level	L _{Aeq, 1 hour} 41 dB	L _{Aeq, 5 minutes} 24 dB
	Method of Determination	Calculated using the supplied manufacturers sound power levels	
4)	Justification	The source has yet to be installed so the manufacturers data was used	
5)	Correction Applied	Not Applicable	Not Applicable

7.9 I) Measurement Time Interval

1)	Source Measurements	$T_m = 5$ minutes	
	Background Measurements	Day Time	Night Time
		(07:00 – 23:00)	(23:00 to 07:00)
		$T_m = 16$ hours	$T_m = 8$ hours

7.10 J) Reference Time Interval

1)	Reference Time Interval	Day Time	Night Time
		(07:00 – 23:00)	(23:00 to 07:00)
		$T_r = 1$ hour	$T_r = 5$ minutes

7.11 K) Rating Levels

1)	Specific Noise Level	Day Time	Night Time
		(07:00 – 23:00)	(23:00 to 07:00)
		$L_{Aeq,1\text{ hour}} 41$ dB	$L_{Aeq,5\text{ min}} 24$ dB
2)	Acoustic feature correction	+ 0 dB	+ 0 dB
	Justification	It was not appropriate to add the character correction to the specific noise level	
3)	Rating Level	$L_{Aeq,1\text{ hour}} 41$ dB	$L_{Aeq,5\text{ min}} 24$ dB

7.12 L) Background Noise Levels

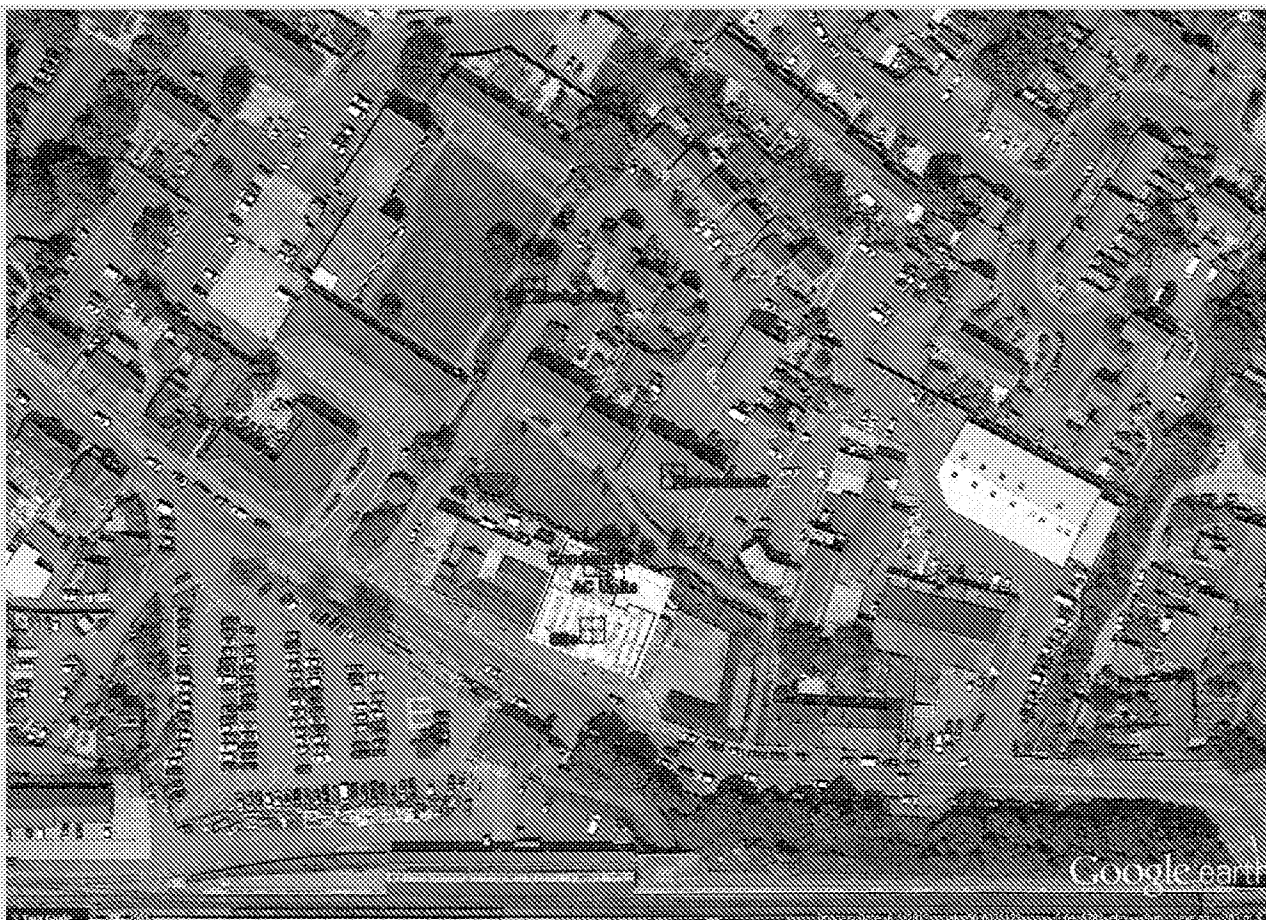
1)	Background Noise Levels	Day Time	Night Time
		(07:00 – 23:00)	(23:00 to 07:00)
		$L_{A90,16\text{ hour}} 44$ dB	$L_{A90,8\text{ hour}} 32$ dB
	Assessment Position	Residential property on Saxby Close	

7.13 M) Excess of Rating over Background Level

1)	Assessment	Day Time	Night Time
		(07:00 – 23:00)	(23:00 to 07:00)
		-3 dB	-8 dB
2)	Conclusion	below 'Marginal Significance'	below 'Marginal Significance'

8 APPENDIX B – SITE LAYOUT / PHOTOGRAPHS

8.1 Site Location



Proposed Source

Location:

Latitude:

50.831435°

Longitude:

-0.639811°

Elevation:

0.0m



Front view of site



West view of Barnham Road

8.2 Assessment Position



Assessment position 1:

Latitude:

50.831781°

Longitude:

-0.639522°

Elevation:

4.5m



Residential properties behind site

8.3 Background Measurement Position



Background Measurement:	Latitude:	50.832197°	Longitude:	-0.640019°	Elevation:	4m
-------------------------	-----------	------------	------------	------------	------------	----

Background Position:	Lamp post on Saxby Close
----------------------	--------------------------

Justification:	Residential façade not accessible
----------------	-----------------------------------

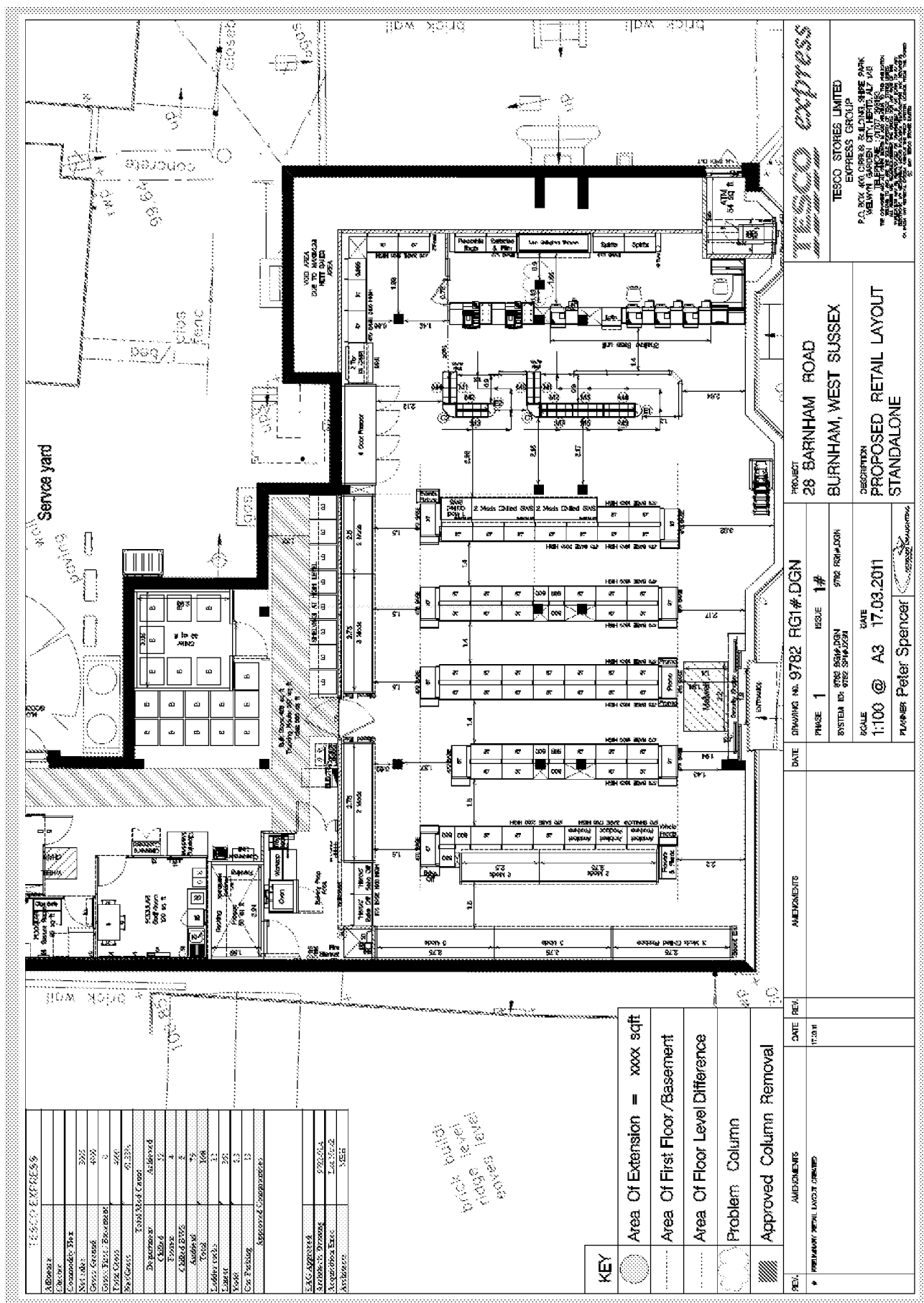


Lamp post on Saxby close



View of Saxby Close leading to Saxby Court

8.4 Supplied Drawings





9 APPENDIX C - BACKGROUND NOISE LEVELS

9.1 16:00 Wednesday 9th July to 07:00 Thursday 10th July

Time Period	L _{Max}	Minimum 5 minute			1 Hour			Day and Night		
		L _{Aeq,5 min}	L _{A10, 5 min}	L _{A90, 5 min}	L _{Aeq, 1 hour}	L _{A10, 1 hour}	L _{A90, 1 hour}	L _{Aeq, t}	L _{A10, t}	L _{A90, 16hours}
07:00 – 08:00	--	--	--	--	--	--	--	51.5	51.9	44.0
08:00 – 09:00	--	--	--	--	--	--	--			
09:00 – 10:00	--	--	--	--	--	--	--			
10:00 – 11:00	--	--	--	--	--	--	--			
11:00 – 12:00	--	--	--	--	--	--	--			
12:00 – 13:00	--	--	--	--	--	--	--			
13:00 – 14:00	--	--	--	--	--	--	--			
14:00 – 15:00	--	--	--	--	--	--	--			
15:00 – 16:00	--	--	--	--	--	--	--			
16:00 – 17:00	76.4	49.1	48.6	43.8	52.7	53.4	44.6			
17:00 – 18:00	69.4	49.8	49.6	44.0	52.3	53.7	45.3			
18:00 – 19:00	74.4	49.8	50.7	44.6	52.2	52.7	45.5			
19:00 – 20:00	72.2	45.3	46.0	43.2	49.9	49.7	44.0			
20:00 – 21:00	70.8	45.1	46.4	43.1	50.0	49.0	43.6			
21:00 – 22:00	69.4	43.2	45.2	42.7	48.1	48.5	43.1			
22:00 – 23:00	70.2	44.3	45.7	42.7	47.0	47.1	42.9			
23:00 – 00:00	67.1	38.5	39.8	32.4	43.5	45.4	34.2	43.2	44.6	31.6
00:00 – 01:00	58.0	34.9	36.6	30.3	38.5	40.5	31.6			
01:00 – 02:00	51.5	30.7	32.4	28.1	35.3	37.2	29.8			
02:00 – 03:00	52.0	34.7	36.0	29.0	37.4	39.1	30.8			
03:00 – 04:00	54.4	34.4	36.7	30.5	38.0	39.7	31.3			
04:00 – 05:00	59.3	35.4	36.7	31.3	38.1	40.1	32.3			
05:00 – 06:00	70.5	41.9	41.5	34.0	46.1	46.8	36.3			
06:00 – 07:00	74.5	43.6	45.7	38.5	48.8	49.5	39.9			
Sound Pressure Levels, dB. Reference level of 2 x 10 ⁻⁵ Nm ⁻²										



9.2 07:00 Thursday 10th July to 12:00 Thursday 10th July

Time Period	L _{max}	Minimum 5 minute			1 Hour			Day and Night		
		L _{Aeq, 5 min}	L _{A10, 5 min}	L _{A90, 5 min}	L _{Aeq, 1 hour}	L _{A10, 1 hour}	L _{A90, 1 hour}	L _{Aeq, t}	L _{A10, t}	L _{A90, 16hours}
07:00 – 08:00	78.0	47.5	47.9	41.9	52.6	49.7	42.7			
08:00 – 09:00	77.3	48.0	48.9	42.2	53.1	54.9	43.7			
09:00 – 10:00	69.4	46.4	47.2	42.4	50.5	50.2	43.6			
10:00 – 11:00	67.7	47.1	47.2	42.1	50.6	51.6	43.1			
11:00 – 12:00	68.8	48.8	49.2	43.1	51.4	52.0	44.4			
12:00 – 13:00	--	--	--	--	--	--	--			
13:00 – 14:00	--	--	--	--	--	--	--			
14:00 – 15:00	--	--	--	--	--	--	--			
15:00 – 16:00	--	--	--	--	--	--	--			
16:00 – 17:00	--	--	--	--	--	--	--			
17:00 – 18:00	--	--	--	--	--	--	--			
18:00 – 19:00	--	--	--	--	--	--	--			
19:00 – 20:00	--	--	--	--	--	--	--			
20:00 – 21:00	--	--	--	--	--	--	--			
21:00 – 22:00	--	--	--	--	--	--	--			
22:00 – 23:00	--	--	--	--	--	--	--			
23:00 – 00:00	--	--	--	--	--	--	--			
00:00 – 01:00	--	--	--	--	--	--	--			
01:00 – 02:00	--	--	--	--	--	--	--			
02:00 – 03:00	--	--	--	--	--	--	--			
03:00 – 04:00	--	--	--	--	--	--	--			
04:00 – 05:00	--	--	--	--	--	--	--			
05:00 – 06:00	--	--	--	--	--	--	--			
06:00 – 07:00	--	--	--	--	--	--	--			
Sound Pressure Levels, dB. Reference level of $2 \times 10^{-5} \text{ Nm}^{-2}$										



9.3 Minimum Levels Table

Time	L _{Max}	Minimum 5 minute		Minimum 1 hour		Minimum Day and Night	
		L _{Aeq,t}	L _{A90,t}	L _{Aeq,t}	L _{A90,t}	L _{Aeq,t}	L _{A90,t}
07:00 – 23:00	78.0	43.2	41.9	47.0	42.7	55.0	44.0
23:00 – 07:00	70.5	30.7	28.1	35.3	29.8	43.2	31.6
	dB t = 1 hour	dB, t = 5 minutes		dB, t = 1 hour		dB, t = 16 and 8 hours	
Sound Pressure Levels, dB. Reference level of 2 x 10 ⁻⁵ Nm ⁻²							

9.4 Weather Data

	Time	Temperature			Atmosphere			Wind	
		Temp	Dew	RH%	QNH	Vis	Rain	Direction	Speed
9 th July – 10 th July	06:00	10.0	9.0	94%	1019	10.0	--	Variable	1.0
	09:00	14.0	11.0	82%	1020	10.0	--	NW	4.6
	12:00	18.0	10.0	59%	1019	10.0	--	NW	6.7
	15:00	20.0	10.0	52%	1019	10.0	--	NW	6.7
	18:00	20.0	9.0	49%	1018	10.0	--	NW	6.7
	21:00	19.0	9.0	52%	1019	10.0	--	NW	5.1
	00:00	14.0	11.0	82%	1020	10.0	--	NW	4.6
	03:00	10.0	7.0	72%	1018	10.0	--	NW	2.6
3 hour time period		°C	°C	% RH	mBar	km	--	Degrees	ms ⁻¹

10 APPENDIX D – SOUND POWER LEVELS

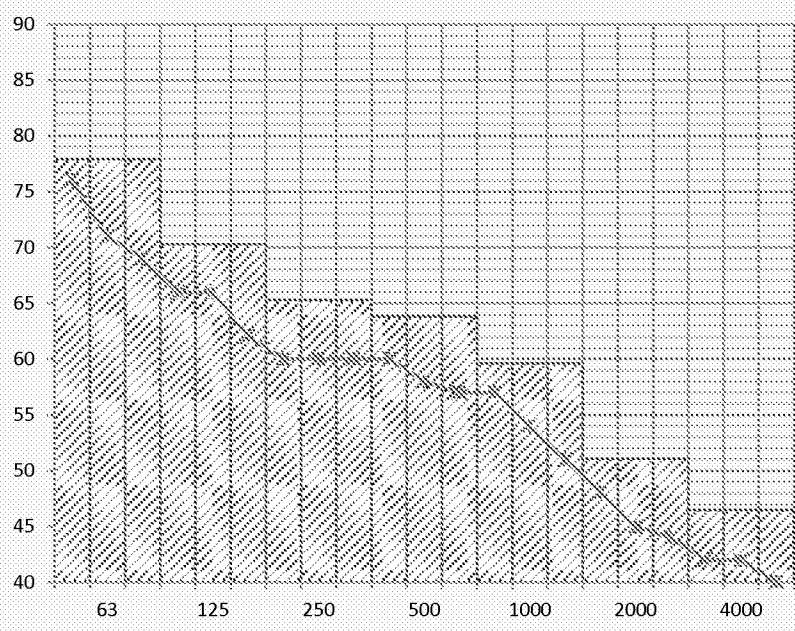
10.1 Day Time (07:00 – 23:00)

10.1.1 Searle (350 rpm) 2 Fan Condenser

Heat Exchangers – Forced Convection Air Cooled Refrigerant Condensers and Dry Coolers – Sound Measurements

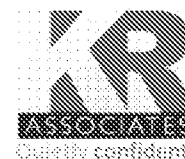
British Standard 13487: 2003 (Engineering Grade – BS EN ISO 3744:2010)

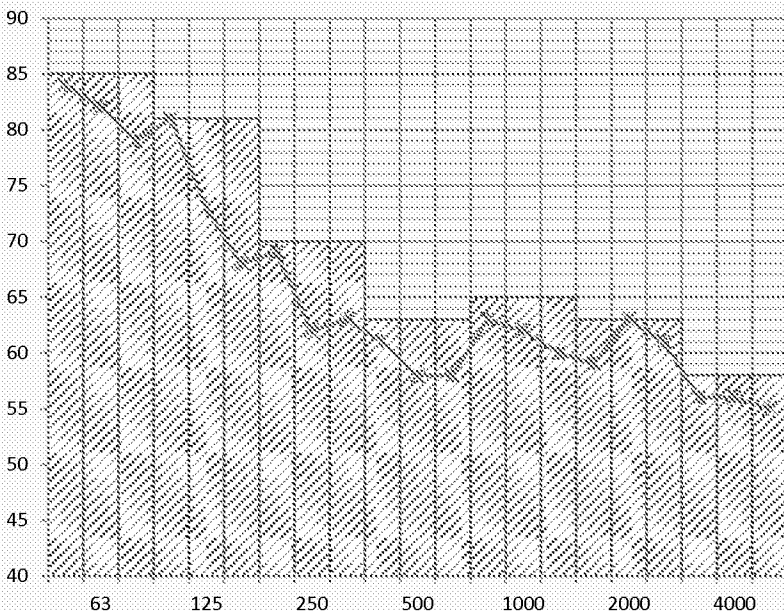


Manufacturer		Model	Conditions						
Searle (350 rpm)		MGA124 EC	Not provided by Manufacturer						
Location of Tests		Not provided by Manufacturer							
Date of Tests		14 th May 2013							
Background Noise Correction, K ₁		Not provided by Manufacturer							
Environmental Correction, K ₂		Not provided by Manufacturer							
Frequency (Hz)	L _w								
50	76								
63	71								
80	69								
100	66								
125	66								
160	62								
200	60								
250	60								
315	60								
400	60								
500	58								
630	57								
800	57								
1000	54								
1250	51								
1600	48								
2000	45								
2500	44								
3150	42								63
4000	42	78	70	65	64	60	51	47	
5000	40	Sound Power Level, L _w . Reference 1 x 10 ⁻¹² watts							
L _w (A)		64 dB		Sound power level (Engineering Grade). Reference 1 x 10 ⁻¹² watts					
Test Laboratory:		4193 – Tests not covered by KR Associates (UK) Ltd scope of accreditation							
Report Reference:		KR03906 / 03							
Test Date:		14 th May 2013							
Approval Date:		20 th May 2013							

Heat Exchangers – Forced Convection Air Cooled Refrigerant Condensers and Dry Coolers – Sound Measurements

British Standard 13487: 2003 (Engineering Grade – BS EN ISO 3744:2010)

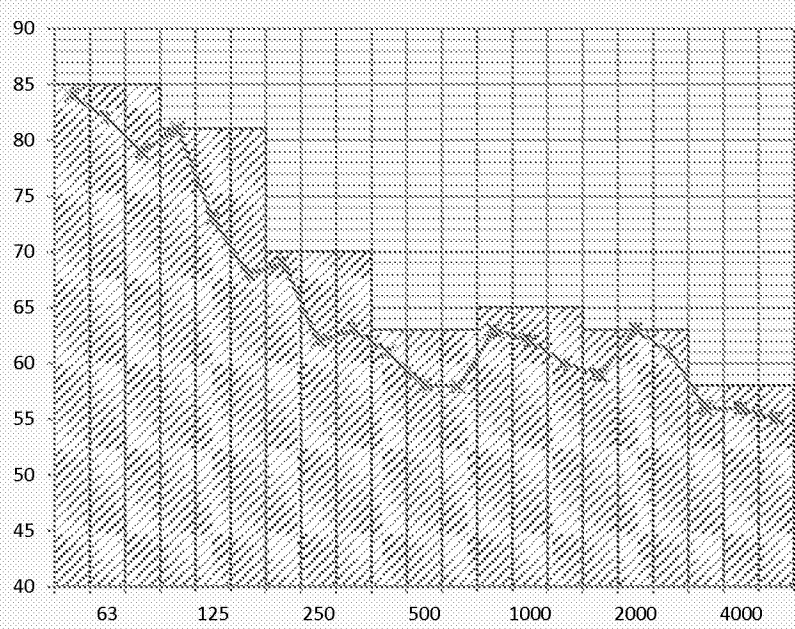


Manufacturer		Model	Conditions						
Mitsubishi Heavy		FDC 100 VN	Not provided by Manufacturer						
Location of Tests		Not provided by Manufacturer							
Date of Tests		14 th May 2013							
Background Noise Correction, K ₁		Not provided by Manufacturer							
Environmental Correction, K ₂		Not provided by Manufacturer							
Frequency (Hz)	L _{W(A)}								
50	84								
63	82								
80	79								
100	81								
125	73								
160	68								
200	69								
250	62								
315	63								
400	61								
500	58								
630	58								
800	63								
1000	62								
1250	60								
1600	59								
2000	63								
2500	61								
3150	56								63
4000	56	85	81	70	63	65	63	58	
5000	55	Sound Power Level, L _W , Reference 1 x 10 ⁻¹² watts							
L _{W(A)}		71 dB		Sound power level (Engineering Grade). Reference 1 x 10 ⁻¹² watts					
Test Laboratory:		4193 - Tests not covered by KR Associates (UK) Ltd scope of accreditation							
Report Reference:		KR03906 / 04							
Test Date:		14 th May 2013							
Approval Date:		20 th May 2013							

Heat Exchangers – Forced Convection Air Cooled Refrigerant Condensers and Dry Coolers – Sound Measurements

British Standard 13487: 2003 (Engineering Grade – BS EN ISO 3744:2010)

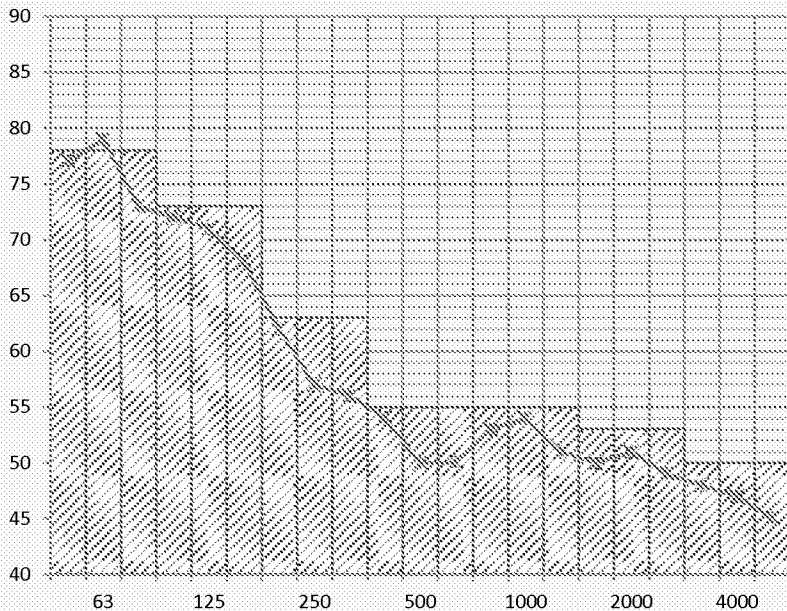


Manufacturer		Model	Conditions						
Mitsubishi Heavy		FDC 100 VN	Not provided by Manufacturer						
Location of Tests		Not provided by Manufacturer							
Date of Tests		14 th May 2013							
Background Noise Correction, K ₁		Not provided by Manufacturer							
Environmental Correction, K ₂		Not provided by Manufacturer							
Frequency (Hz)	L _w								
50	84								
63	82								
80	79								
100	81								
125	73								
160	68								
200	69								
250	62								
315	63								
400	61								
500	58								
630	58								
800	63								
1000	62								
1250	60								
1600	59								
2000	63								
2500	61								
3150	56								
4000	56								
5000	55								
		Octave Band Centre Frequency (Hz)							
		63	125	250	500	1000	2000	4000	
		85	81	70	63	65	63	58	
		Sound Power Level, L _w . Reference 1 x 10 ⁻¹² watts							
L _w (A)		71 dB		Sound power level (Engineering Grade). Reference 1 x 10 ⁻¹² watts					
Test Laboratory:		4193 - Tests not covered by KR Associates (UK) Ltd scope of accreditation							
Report Reference:		KR03906 / 05							
Test Date:		14 th May 2013							
Approval Date:		20 th May 2013							

Heat Exchangers – Forced Convection Air Cooled Refrigerant Condensers and Dry Coolers – Sound Measurements

British Standard 13487: 2003 (Engineering Grade – BS EN ISO 3744:2010)



Manufacturer		Model	Conditions						
Mitsubishi Heavy		SRK 25 ZG	Not provided by Manufacturer						
Location of Tests		Not provided by Manufacturer							
Date of Tests		14 th May 2013							
Background Noise Correction, K ₁		Not provided by Manufacturer							
Environmental Correction, K ₂		Not provided by Manufacturer							
Frequency (Hz)	L _w								
50	77								
63	79								
80	73								
100	72								
125	71								
160	68								
200	62								
250	57								
315	56								
400	54								
500	50								
630	50								
800	53								
1000	54								
1250	51								
1600	50								
2000	51								
2500	49								
3150	48	Octave Band Centre Frequency (Hz)							
4000	47	63	125	250	500	1000	2000	4000	
5000	45	78	73	63	55	55	53	50	
		Sound Power Level, L _w . Reference 1 x 10 ⁻¹² watts							
L _w (A)		63 dB		Sound power level (Engineering Grade). Reference 1 x 10 ⁻¹² watts					
Test Laboratory:		4193 - Tests not covered by KR Associates (UK) Ltd scope of accreditation							
Report Reference:		KR03906 / 06							
Test Date:		14 th May 2013							
Approval Date:		20 th May 2013							

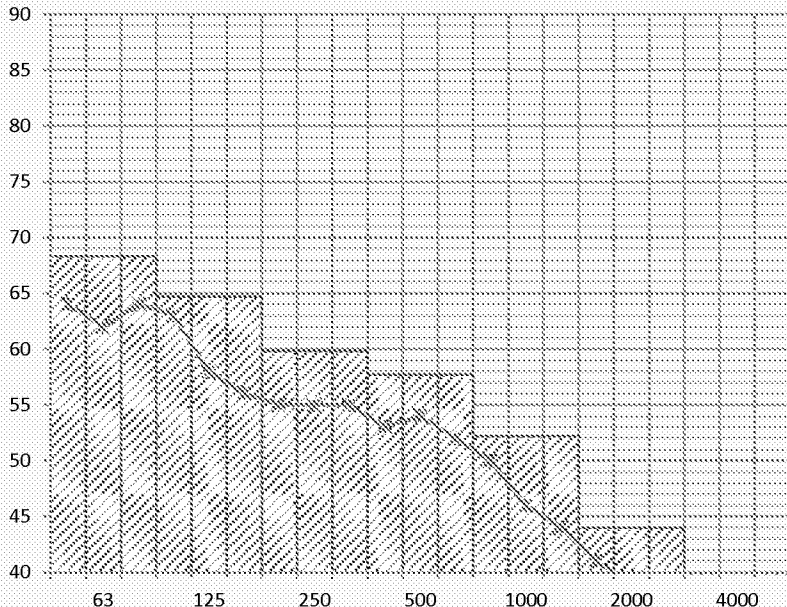
10.2 Night Time (23:00 – 07:00)

10.2.1 Searle (350 rpm) 2 Fan Condenser

Heat Exchangers – Forced Convection Air Cooled Refrigerant Condensers and Dry Coolers – Sound Measurements

British Standard 13487: 2003 (Engineering Grade – BS EN ISO 3744:2010)



Manufacturer		Model	Conditions						
Searle (350 rpm)		MGA124 EC	Not provided by Manufacturer						
Location of Tests		Not provided by Manufacturer							
Date of Tests		14 th May 2013							
Background Noise Correction, K ₁		Not provided by Manufacturer							
Environmental Correction, K ₂		Not provided by Manufacturer							
Frequency (Hz)	L _w								
50	64								
63	62								
80	64								
100	63								
125	58								
160	56								
200	55								
250	55								
315	55								
400	53								
500	54								
630	52								
800	50								
1000	46								
1250	44								
1600	41								
2000	39								
2500	37								
		Octave Band Centre Frequency (Hz)							
3150	34	63	125	250	500	1000	2000	4000	
4000	36	68	65	60	60	58	44	39	
5000	32	Sound Power Level, L _w . Reference 1 x 10 ⁻¹² watts							
L _w (A)		59 dB		Sound power level (Engineering Grade). Reference 1 x 10 ⁻¹² watts					
Test Laboratory:		4193 – Tests not covered by KR Associates (UK) Ltd scope of accreditation							
Report Reference:		KR03906 / 07							
Test Date:		14 th May 2013							
Approval Date:		20 th May 2013							



11 APPENDIX E – MINIMUM BACKGROUND ASSESSMENT (OUTSIDE UKAS SCOPE OF ACCREDITATION)

11.1 Maximum Source Data

The assessments under British Standard 4142:1997 are based on the maximum noise levels from the plant at an ambient temperature of 32°C during the day time period 07:00 to 23:00 hours and 25°C during the night time period 23:00 to 07:00 hours. In line with the specific requirements of British Standard 4142:1997 the 16 hour day time and 8 hour night time background noise levels are therefore used to give a fair and representative assessment.

11.2 Minimum Background Noise Levels

It is the requirement of some Local Authorities to use the minimum 1 hour background noise level during the day time and the minimum 5 minute background noise level during the night time. The following assessments are based on these background noise levels and use the proposed source levels that are likely to exist during these quiet periods.

British Standard 4142:1997	Day Time (Lowest 1 hour Reading)	Night Time (Lowest 5 minute Reading)
Section 7	22:00 – 23:00	02:00 – 03:00
Background Noise Levels	$L_{A90,1\text{ hour}} 43\text{dB}$	$L_{A90,5\text{ min}} 28\text{ dB}$

11.3 Maximum Ambient Temperatures

The following table indicates the maximum ambient temperatures that are likely to exist on not more than 3 days every year.

Day Time Period																Night Time Period							
07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	01	02	03	04	05	06
25	27	28	29	30	31	32	32	32	32	32	31	30	28	26	25	25	23	22	22	22	22	22	23
Maximum Ambient Temperature °C																							

11.4 Revised Source Noise Levels

The following noise levels are determined from the maximum ambient temperature that is likely to exist in the hour when the minimum background noise levels are likely to exist. Overall, as the ambient temperatures drop the refrigeration and air conditioning equipment will not have to work as hard to reject the overall duty.

British Standard 4142:1997	Day Time (Lowest 1 hour Reading)		Night Time (Lowest 5 minute Reading)	
Section 8 Rating Noise Levels	22:00 – 23:00		02:00 – 03:00	
	Ambient Temperature	25 °C	Ambient Temperature	22 °C
	$L_{Aeq,1\text{ hours}} 38\text{ dB}$		$L_{Aeq,1\text{ hours}} 22\text{ dB}$	

11.5 Revised Assessments

11.5.1 Day Time (Minimum 1 hour – 22:00 to 23:00)

	Rating Industrial Noise affecting Mixed Industrial and Residential Areas			
4193	British Standard 4142:1997 Day Time (07:00 to 23:00)			
Source	Operating Times		Source Position	
Searle (350 rpm) 2 Fan Condenser	24 hours per day		Located within dedicated plant area	
Mitsubishi Heavy Sales Floor AC	07:00 to 23:00 only			
Mitsubishi Heavy Sales Floor AC				
Mitsubishi Heavy Cash Office AC				
Assessment Position	Residential property on Saxby Close			
Background Position	Lamp post on Saxby Close			
Distance	27.7m – 29.6m from the edge of the source to the assessment position.			
Item	Calculation	Clause	Commentary	
Specific Noise Level $L_{Aeq,1hour}$	38 dB	6.3	Specific noise level was calculated from measurements made at 1m ISO 9613:1996 ^[3] .	
Acoustic Feature Correction	+ 0 dB	8.2.	Reference section 8.2 of BS4142:1997.	
Rating Level	38 dB	8.3.	The acoustic feature correction is added to the specific noise level to obtain the rating level.	
Background Noise Level	43 dB	7.1.	The background noise level was measured at an equivalent position.	
Assessment Level	-5 dB	9	The background level is subtracted from the rating level. (Numerical values)	
Conclusion BS 4142:1997 ^[1]	Complaint Likely – Assessment of around +10 dB Complaints Marginal – Assessment of around +5 dB Complaints Unlikely – Assessment of around -10 dB or less			
Assessment	-5 dB			
Conclusion	The assessment level is below 'Marginal Significance'			
Test Laboratory:	4193			
Report Reference:	KR03906 / 11			
Test Date:	9 th July 2014 – 10 th July 2014			
Approval Date:	10 th July 2014			

11.5.2 Night Time (Minimum 5 minute – 02:00 to 03:00)



4193

Rating Industrial Noise affecting Mixed Industrial and Residential Areas

British Standard 4142:1997 Night Time (23:00 to 07:00)



Source	Operating Times		Source Position
Searle (350 rpm) 2 Fan Condenser	24 hours per day		Located within dedicated plant area
Assessment Position	Residential property on Saxby Close		
Background Position	Lamp post on Saxby Close		
Distance	27.7m – 29.6m from the edge of the source to the assessment position.		
Item	Calculation	Clause	Commentary
Specific Noise Level $L_{Aeq,5 \text{ minutes}}$	22 dB	6.3	Specific noise level was calculated from measurements made at 1m ISO 9613:1996 ^[3] .
Acoustic Feature Correction	+ 0 dB	8.2.	Reference section 8.2 of BS4142:1997.
Rating Level	22 dB	8.3.	The acoustic feature correction is added to the specific noise level to obtain the rating level.
Background Noise Level	28 dB	7.1.	The background noise level was measured at an equivalent position.
Assessment Level	-6 dB	9	The background level is subtracted from the rating level. (Numerical values)
Conclusion BS 4142:1997 ^[1]	Complaint Likely – Assessment of around +10 dB Complaints Marginal – Assessment of around +5 dB Complaints Unlikely – Assessment of around -10 dB or less		
Assessment	-6 dB		
Conclusion	The assessment level is below 'Marginal Significance'		
Test Laboratory:	4193		
Report Reference:	KR03906 / 12		
Test Date:	9 th July 2014 – 10 th July 2014		
Approval Date:	10 th July 2014		

12 APPENDIX F – ADDITIONAL ASSESSMENTS (OUTSIDE UKAS SCOPE OF ACCREDITATION)

12.1 Guidelines for Community Noise (World Health Organisation)

12.1.1 Criteria

At the beginning of the document published by the World Health Organisation (“WHO”) entitled “Criteria for Community Noise” there is the following statement.

“This document is not a formal publication of the World Health Organisation and all rights are reserved by the Organisation. This document may, however, be freely reviewed, abstracted, reproduced or translated in part, but not for sale or for use in conjunction with commercial purposes.”

Specific Environment	Critical health effect(s)	$L_{Aeq,1dB}$	Time Base (Hours)	$L_{Amax, fast} dB$
Outside Bedrooms	Sleep disturbance, window open (Outdoor Values)	45	8	60
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside Bedrooms	Sleep disturbance, night time	30	8	45

12.1.2 Assessment – Day Time 07:00 to 23:00

World Health Organisation

Guidelines for Community Noise

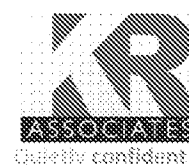
Published in 1999 by Birgitta Berglund, Thomas Lindvall and Kee-Tai Goh

Source	Operating Times		Source Position
Searle (350 rpm) 2 Fan Condenser	24 hours per day		Located within dedicated plant area
Mitsubishi Heavy Sales Floor AC	07:00 to 23:00 only		
Mitsubishi Heavy Sales Floor AC			
Mitsubishi Heavy Cash Office AC			
Assessment Position	Residential property on Saxby Close		
Item	L _{Aeq,16 hours}		Commentary.
Sound Pressure Level 1m from residential facade	41 dB(A)		External 1m from the residential façade.
Sleep disturbance windows open (Outdoor Values)	45 dB (A)	--	Absolute Criteria for serious annoyance.
Dwellings, Indoors	--	50 dB	Absolute External Criteria.
Compliance with Criteria	Yes	Yes	The calculated levels fall below the absolute criteria levels.

12.1.3 Assessment – Night Time 23:00 to 07:00

World Health Organisation Guidelines for Community Noise

Published in 1999 by Birgitta Berglund, Thomas Lindvall and Kee-Tai Goh



Source	Operating Times		Source Position
Searle (350 rpm) 2 Fan Condenser	24 hours per day		Located within dedicated plant area
Assessment Position	Residential property on Saxby Close		
Item	$L_{Aeq,8\text{ hours}}$	$L_{Amax,fast}$	Commentary
Sound Pressure Level 1m from residential facade	41 dB	48 dB	External 1m from the residential façade.
Sleep disturbance windows open (Outdoor Values)	45 dB	60 dB	Absolute External Criteria.
Compliance with Criteria	Yes	Yes	The calculated levels fall below the absolute criteria levels.

12.2 Night Noise Guidelines (World Health Organisation - Europe)

12.2.1 Criteria

The work of the original WHO document detailed above was extended by a joint report published in 2009 by the World Health Organisation and the European Union.

“The goal of the NNGL project was to provide and expand scientific advice to the European Commission and its Member States in developing future legislation in the area of night noise exposure, control and surveillance. The key objective of the project was to reach a consensus of experts and key stakeholders on the following subjects:

a) Guideline values for night noise to protect the public from adverse health effects.....”

Section 7 of the final implementation report details the levels for which there are no observed effects:

“...the observed effects thresholds are provided: the level above which an effect starts to occur or shows itself to be dependent on the exposure level.”

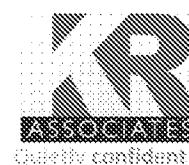
Effect of Noise	Description	Indicator	Threshold , dB
Biological Effects	EEG awakening	L _{Amax,inside}	35
	Motility, onset of motility	L _{Amax,inside}	32
	Changes in duration of various stages of sleep, in sleep structure and fragmentation of sleep	L _{Amax,inside}	35
Sleep Quality	Waking up in the night and/or too early in the morning	L _{Amax,inside}	42
	Increased average motility when sleeping	L _{Night,outside}	42
Well Being	Self-reported sleep disturbance	L _{Night,outside}	42
	Use of somnifacient drugs	L _{Night,outside}	40
Medical Conditions	Environmental insomnia	L _{Night,outside}	42

12.2.2 Assessment – Night time 23:00 to 07:00

World Health Organisation Europe

Night Noise Guidelines

Published in 2009 – ISBN 978 92 890 4173 7



Source	Operating Times		Source Position
Searle (350 rpm) 2 Fan Condenser	24 hours per day		Located within dedicated plant area
Assessment Position	Residential property on Saxby Close		
Item	L _{Aeq,8 hours}	L _{Amax,fast}	Commentary
Sound Pressure Level 1m from residential facade	41 dB	48 dB	External 1m from the residential facade
Well Being (Lowest)	40 dB	--	Absolute Criteria. Use of somnifacient drugs
Biological Effects (Lowest)	--	47	Absolute Criteria. Motility, onset of Motility.
Biological Effects (Lowest)	Yes	Yes	The calculated levels fall below the absolute criteria levels.



13 REFERENCES

13.1 British Standard 4142: 1997

Rating industrial noise affecting mixed residential and industrial areas.

13.2 British Standard 13487: 2003

Heat Exchangers – Forced air convection air cooled refrigerant condensers and dry coolers – Sound measurement.

13.3 International Standard Organisation 9613 – Part 1: 1993

Acoustics – Attenuation of sound propagation outdoors.

Part 1 - Part 1: Calculation of the absorption of sound by the atmosphere.

13.4 International Standard Organisation 9613 – Part 2: 1996

Acoustics – Attenuation of sound during propagation outdoors.

13.5 World Health Organisation Guidelines for Community noise: 1999

Published by Birgitta Berglund, Thomas Lindvall, Dietrich Schwela and Kee-Tai Goh.

13.6 World Health Organisation Europe Night Noise Guidelines 2009

-end-