MATRIX ACOUSTIC DESIGN CONSULTANTS

Proposed Poultry Units
Deeping Poultry Farm
Main Road
Deeping St Nicholas
Spalding
PE11 3BW

PLANT NOISE ASSESSMENT

Acoustics Report M1642/R01
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1. Introduction

This acoustic report documents a plant noise assessment for the extract fans on the proposed poultry units at Deeping Poultry Farm, Spalding; Figure 1.

The report is divided into the following sections:

- Section 2: Overview of the Development
- Section 3: BS4142:2014
- Section 4: Background Noise survey
- Section 5: Plant Noise Assessment
- Section 6: Conclusion
- Appendix A: Noise monitor and weather station data
- Appendix B: Calculations
- Appendix C: Fan noise data

2. Overview of the Development

The proposal is for a six poultry units at Deeping Poultry Farm, Spalding; Figure 1. The new units will be located south of eight existing poultry units.

The only plant associated with the development will be ridge mounted extract fans on both the existing and proposed poultry units; Figure 2. The fans will all be by the same manufacturer and of the same type, namely Ziehl-Abegg FC063-6 units; see Appendix C for manufacturers' data sheet.

The closest dwellings, labelled A - D in figure 1, are between 760m and 1320m from the centre of the poultry development. There will be an unobstructed noise path between the duct terminations and all four assessed dwellings dwellings.

The proposed development is within context of the existing poultry units at Deeping Poultry Farm.

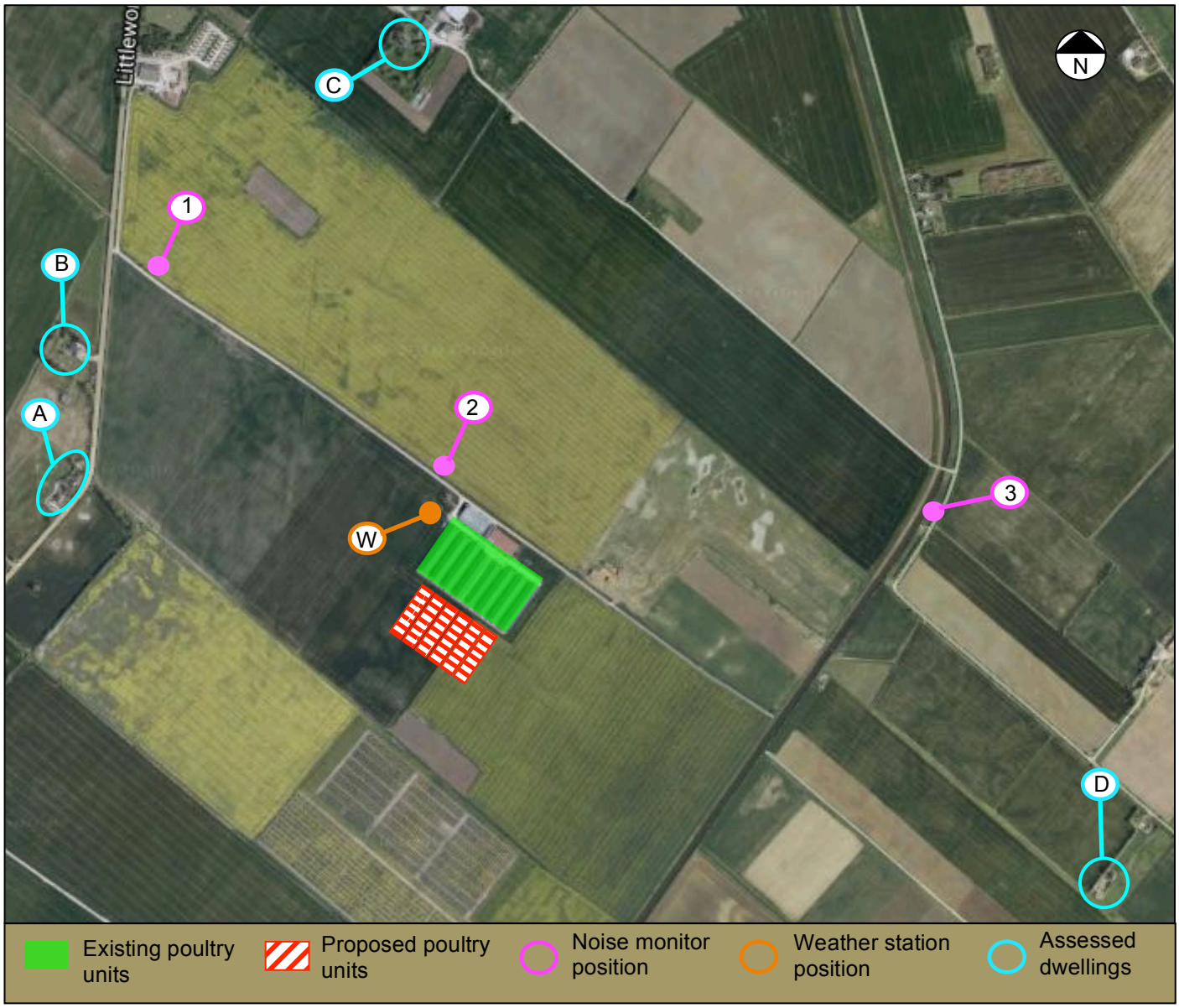


Figure 1. Aerial view (source: www.google.com) showing footprint of proposed free range egg laying unit, nearest noise sensitive dwellings and noise monitor and weather station positions

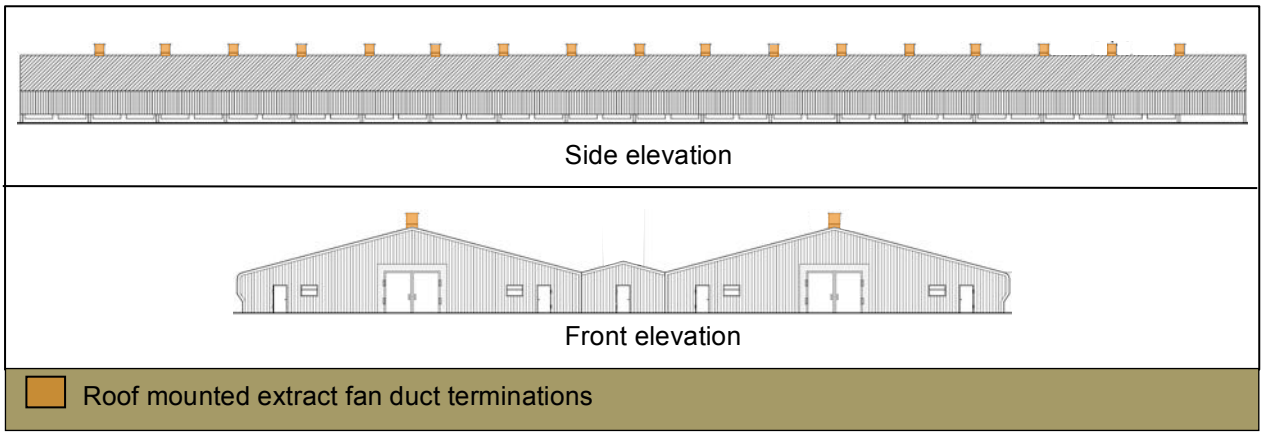


Figure 2. Side and front elevations of proposed poultry units

3. BS4142:2014

The plant noise assessments detailed in this report has been conducted in accordance of BS4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound'.

3.1 BS4142:2014

BS4142:2014 provides a methodology to assess the impact of industrial and commercial noise affecting dwellings, whereby the 'typical' background noise level is deducted from the industrial noise Rating Level (industrial noise corrected to account for the 'on-time' and noise character of the noise source; see sections 3.2 and 3.3 below). The following guidance is given based on the established difference:

- A difference of around +10dB or more is likely to be an indication of significant adverse impact
- A difference of +5dB is likely to be an indication of an adverse impact
- 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

Where background noise and Rating Levels are low, BS4142:2014 states that *'absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night'*. Low background noise and rating levels are not defined. However, in BS4142:1997 it states that '*background noise levels below 30dB and rating levels below about 35dB are considered to be very low'*.

The absolute industrial noise can be assessed internally within a dwelling rather than externally if this corresponds to the location that will be occupied during the operation of the industrial noise. Typically this will result in the industrial noise being assessed within the nearest bedroom (with windows open) during the night period (23:00 – 07:00hrs).

3.2 On-time correction

To take account of industrial/commercial noise sources that do not operate continually an 'on-time' correction is applied using:

$$- 10 \log (r/r_{ref})$$

Where:

r_{ref}. = reference time (1hr between 07:00 – 23:00hrs and 15 minutes between 23:00 – 07:00hrs)

r = total 'on-time' during the reference period

Note that the shorter reference time interval between 23:00 – 07:00hrs is designed to penalise industrial/commercial noise events that occur during the night.

3.3 Noise character correction

BS4142 provides four noise character correction categories with associated penalties that must be applied when determining the Rating Level, namely:

- **Tonality:**
  - Not perceptible = 0dB
  - Just perceptible = +2dB
  - Clearly perceptible = +4dB
  - Highly perceptible = +6dB

- **Impulsivity:**
  - Not perceptible = 0dB
  - Just perceptible = +3dB
  - Clearly perceptible = +6dB
  - Highly perceptible = +9dB
- **Intermittency:** +3dB if the intermittency of operation is readily distinctive against the residual noise environment
- **Other:** +3dB applied if the specific sound is neither tonal or impulsive but features noise characteristics that are readily distinctive against the residual noise environment

4. Background Noise Survey

- **Survey dates**: 30th November – 1st December 2016
- **Weather;** Table A2, Appendix A:
  - Precipitation: Dry
  - Wind Speed: Highest recorded wind speed of 3.5m/sec
- **Noise monitor locations:** with the microphone attached to a tripod the noise monitor was located at Positions 1 - 3 as shown in Figure 1
- **Weather station location:** Weather station, mounted on a tripod, located at position W; Figure 1
- **Equipment:**
  - Weather Station: Kestrel type 4000
  - Noise monitor: Brüel & Kjær Type 2238 (Positions 1 & 2) and Brüel & Kjær Type 2260 (Position 3)
- **Monitor configuration:**
  - Weather station: Configured to measure the average wind speed and temperature over consecutive 10-minute periods
  - Noise Monitors: configured to measure consecutive 15-minute samples of noise.
- **Calibration:** calibrated before and after the survey using a Brüel & Kjær Type 4231 calibrator with no deviations found

All noise measurements are free-field. Full tabulated results are given in Table A1, Appendix A.

The weather conditions will not have adversely affected the noise measurements.

4.1 Survey observations

During the setting up and collection of the noise monitors it was observed that the dominant noise source affecting the area was road traffic on the busy A1175, with the traffic noise levels being significantly higher at Position 1.

Other noise sources noted were tractors ploughing fields.

No noise emissions from the existing Deeping Poultry Farm were observed.

4.2 Typical background noise level, L_{A90}, at Dwellings A - D

Figure 3 - 5 shows the variation of the measured maximum ($L_{Amax,F}$), ambient (L_{Aeq}) and background (L_{A90}) noise levels recorded at Positions 1 – 3 respectively.

The variation in the recorded ambient and background noise levels follows the same pattern at each measurement position. This indicates that the same noise source affects all three locations, which was observed to be road traffic on the A1175.

The highest noise levels were recorded at Position 1; this will be due to its proximity to the A1175.

Figure 3. Position 1 noise monitor data (free-field)

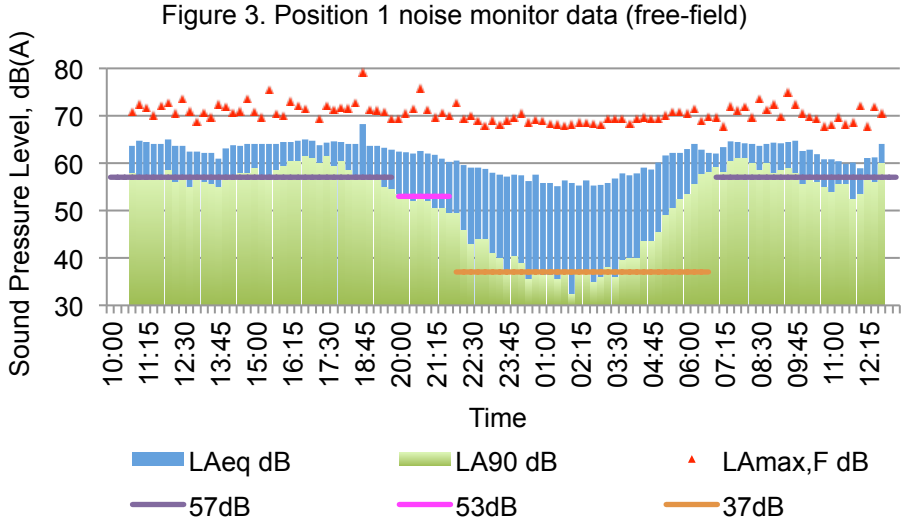


Figure 4. Position 2 noise monitor data (free-field)

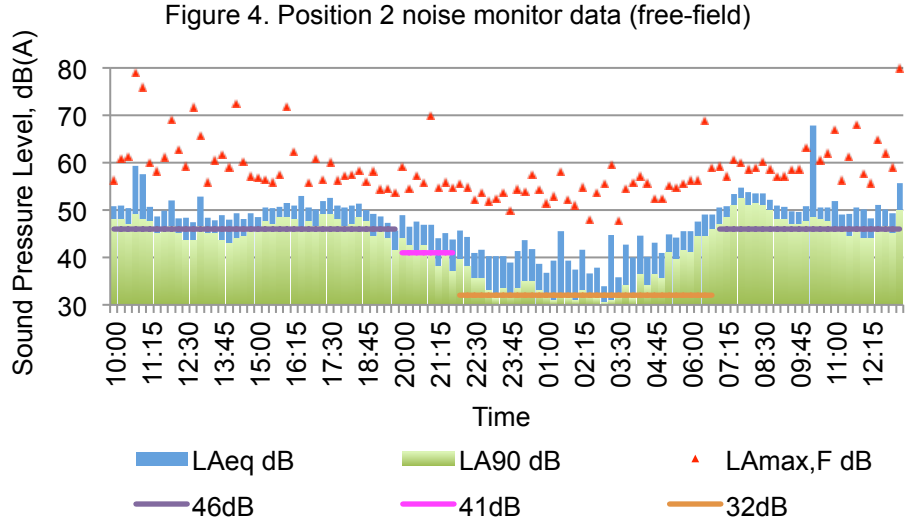
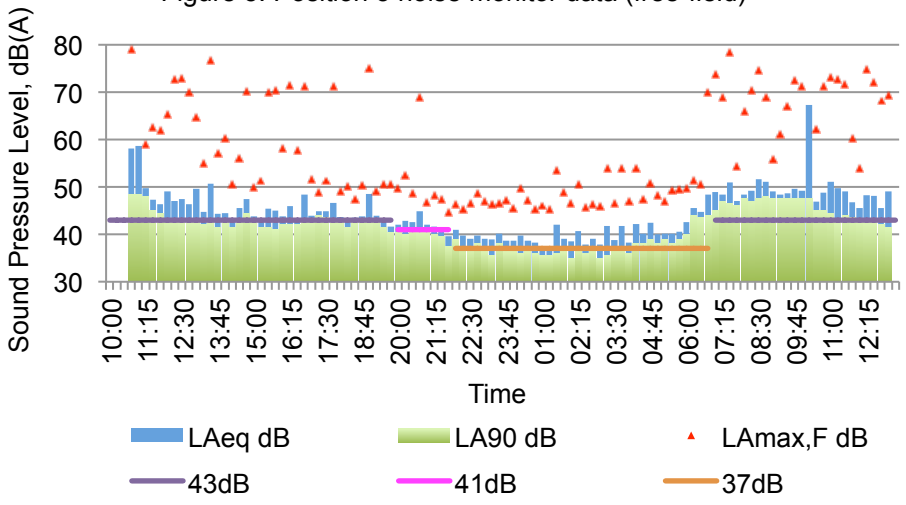


Figure 5. Position 3 noise monitor data (free-field)



The levels recorded, with regard to the noise monitor's proximity to the A1175, are considered to be representative to those that will occur at:

- Position 1: Dwellings A & B
- Position 2: Dwelling C
- Position 3: Dwelling D

From the measurement data typical day, evening and night background noise levels at Positions 1 – 3 have been established; Figures 3 - 5:

- Position 1 (Dwellings A & B)
  - Day (07:00 – 20:00hrs): L_{A90} 57dB
  - Evening (20:00 – 23:00hrs): L_{A90} 53dB
  - Night (23:00 – 07:00hrs): L_{A90} 37dB
- Position 2 (Dwelling C)
  - Day (07:00 – 20:00hrs): L_{A90} 46dB
  - Evening (20:00 – 23:00hrs): L_{A90} 41dB
  - Night (23:00 – 07:00hrs): L_{A90} 32dB
- Position 3 (Dwelling D)
  - Day (07:00 – 20:00hrs): L_{A90} 43dB
  - Evening (20:00 – 23:00hrs): L_{A90} 41dB
  - Night (23:00 – 07:00hrs): L_{A90} 37dB

For the purposes of our assessment we have used the lower typical background noise levels established at Position 2 for both Dwellings C and D

5. Plant Noise Assessment

5.1 Calculation of aggregate extract fan noise at Dwellings A - D

The full calculation of the extract fan noise is provided in Tables B1 – B8, Appendix B with the resultant aggregate BS4142 Rating and Assessment Levels given in Table 1.

5.2 Fan noise data

- **Fan type:** Ziehl-Abegg FC063-6
- **Duct termination:** Roof mounted
- **Total number of fans:**
  - Existing units: 15 per shed for the two shorter middle units and 17 per shed for the remaining six units
  - Proposed units: 17 per shed
- **Sound pressure level:** 53dB(A) at 7m, 45° lateral; see Appendix C for manufacturers data sheet

5.3 Extract fan operation

The extract fans are thermostatically controlled, with the total number of fans operating at any one time dependent on the livestock's ventilation requirements, which is dictated by the external temperature.

To maintain the ideal or 'set' temperature the fans are operated in Stages. Stage 1 will be triggered when the internal temperature rises 1°C above the set temperature; further Stages are activated with further 0.5°C increments.

The highest Stage (100% extract fans operating) will typically only be triggered when the external temperature is above 23°; this is not expected to be exceeded between 09:00 – 20:00hrs.

During the evening and night the external temperature will fall; the highest expected percentage of extract fans required to maintain the set temperature are 50% and 20% respectively.

The calculation has therefore been based on:

- Day (07:00 – 20:00hrs): 100% extract fans operating
- Evening (20:00 – 23:00hrs): 50% extract fans operating
- Night (23:00 – 07:00hrs): 20% extract fans operating

5.4 Derivation of aggregate Specific Level

The individual noise level of each proposed extract fan has been calculated at Dwellings A - D; Figure 1. The following corrections have been applied to the manufacturers extract fan noise data; Appendix C

- **Directivity correction:** correction to convert the fan noise data from the manufacturers stated level at 45° from the termination to 90° (the propagation angle for the assessed dwellings), determined using the corrections given in Figure 11.2, p322, Noise Control in Building Services, SRL Ltd. For the calculation a typical axial frequency spectra has been used
- **Reflections:** 3dB added to account for reflections off the poultry shed roof
- **Distance correction:** 20 x log (d_1/d_0), where d_1 = distance between receptor and the proposed extract fan and d_0 = measurement distance used for manufacturers reference extract fan (7m). Note that, inline with the limitations of distance losses stated in ISO 9613-2, the distance between the noise source and receiver has been capped at 1km
- **Ground absorption correction:** ISO 9613-2: Attenuation of sound during propagation outdoors, Formula 10:

$$A_{gr} = 4.8 – (2h_m/d)[17 + (300/d)]$$

Where,

h_m = mean height of the propagation path above ground
d = distance from source to receptor

- **Atmospheric attenuation:** ISO 9613-2: Attenuation of sound during propagation outdoors, Formula 8:

$$A_{atm} = \alpha d/100$$

Where,

α = is the atmosphere attenuation coefficient for a temperature of 10°C and 70% relative humidity
d = distance from source to receptor

In accordance with ISO 9613-2 the attenuation at 500Hz has been used as only the dB(A) value of the extract fans is known

Note that for the assessment it has been assumed that the fans are operating continuously and consequently no ‘on-time’ correction has been applied

The aggregate of the extract fan noise at the dwellings is the Specific Level.

Tables B1 – B8, Appendix B provide the full calculations with the resultant aggregate Specific Level for both the existing and proposed poultry units at Dwellings A - D.

5.5 Rating Level

To establish the Rating Level the following BS4142 character corrections have been applied to the Specific Level:

- **Tonality:**
  - Correction: 0dB
  - Reason: the proposed units, like the majority of modern extract fans, are not expected to be tonal.
- **Impulsivity:**
  - Correction: 0dB
  - Reason: The proposed extract fans will not contain an impulsive noise element such as bangs or a very sudden jump in sound output due to quick start-up/change in fan speed.
- **Intermittency:**
  - Correction: 0dB
  - Reason: It is possible on occasion that two or more extract fans will start/stop at the same time. However, the greatest expected increase/decrease in the aggregate fan noise is 3dB, which will only occur if the total number of fans operating doubles/halves. A 3dB increase/decrease is a just perceptible change in noise, which would not incur a BS4142 intermittency penalty (i.e. the change or 'intermittency' would not be 'readily distinctive against the residual noise environment').
- **Other**
  - Correction: 3dB
  - Reason: allows for any potential 'other' noise characteristics of the fans.

The resultant individual Rating Levels for the existing and proposed developments together with the aggregate Rating Levels are provided in Table 1.

5.6 Assessment Level

We define Assessment Level = RL – min L_{A90} dB, where:

RL = aggregate Rating Level, dB(A)

L_{A90} dB = the typical background noise level, L_{A90}, derived from the noise survey data

Table 1 provides the resultant extract fan Assessment Levels at Dwellings A - D.

As can be seen at each of the assessed dwellings the Assessment Levels are significantly, i.e. more than 10dB, below zero during the day, evening and night. Where the Rating Level is at parity with the background BS4142 states that the Specific Level will have a low impact. On this basis we conclude that the noise impact of the extract fans externally will be negligible.

With all calculations there is a level of uncertainty, which in this case we do not expect to be greater than +/-3dB. This small level of uncertainty is not considered to have any significance to the outcome of the assessment.

Table 1. Typical background and calculated Rating and Assessment Levels at Dwellings A - D; Figure 1

Dwelling	100% extract fans operating					50% ridge extract fans operating					20% ridge extract fans operating				
				Day: 07:00 - 20:00hrs					Evening : 20:00 - 23:00hrs					Night : 20:00 - 07:00hrs	
	Rating Level, dB Existing	Rating Level, dB Porposed	[A] Rating Level, dB Aggregate	[B] Typical L_{A90} dB	[A] - [B] Assessment Level, dB	Rating Level, dB Existing	Rating Level, dB Proposed	[C] Rating Level, dB Aggregate	[D] Typical L_{A90} dB	[C] - [D] Assessment Level, dB	Rating Level, dB Existing	Rating Level, dB Proposed	[E] Rating Level, dB Aggregate	[F] Typical L_{A90} dB	[E] - [F] Assessment Level, dB
A	26	25	29	57	-31	23	22	26	53	-30	19	19	22	37	-18
B	24	23	27	57	-33	22	21	25	53	-31	18	17	21	37	-19
C	23	22	26	46	-23	21	19	23	41	-20	17	16	20	32	-15
D	23	22	26	43	-20	21	19	23	41	-20	17	16	20	32	-15

6. Conclusion

A noise survey has been conducted to determine the typical background noise levels at the nearest noise dwellings (Dwellings A - D, Figure 1) to Deeping Poultry Farm, Spalding.

The extract fan noise as a result of both the existing and proposed poultry units have been assessed in accordance with BS4142:2014.

Via calculation (Appendix B) it has been demonstrated that at the nearest dwellings, Dwellings A – D, Figure 1, the highest aggregate Rating Level will be significantly below the typical background during the day, evening and night.

BS4142:2014 states that the Specific Level will have a low impact when the Rating Level is at parity to the typical background. On this basis we conclude that the noise impact externally will be negligibleß.

Table A1. Noise monitor data (free-field)

Start Time	Position 1			Position 2			Position 3			Start Time	Position 1			Position 2			Position 3		
	$L_{Amax,F}$ dB	L_{Aeq} dB	L_{A90} dB	$L_{Amax,F}$ dB	L_{Aeq} dB	L_{A90} dB	$L_{Amax,F}$ dB	L_{Aeq} dB	L_{A90} dB		$L_{Amax,F}$ dB	L_{Aeq} dB	L_{A90} dB	$L_{Amax,F}$ dB	L_{Aeq} dB	L_{A90} dB	$L_{Amax,F}$ dB	L_{Aeq} dB	L_{A90} dB
10:00				56.4	50.8	48.0				23:45	69.1	57.2	37.4	49.9	38.9	32.5	47.3	38.7	36.5
10:15				61.0	50.9	48.0				00:00	69.6	57.6	40.4	54.5	41.3	33.5	45.5	38.7	36.5
10:30				61.4	50.4	47.0				00:15	70.6	57.5	38.9	53.9	43.6	35.0	49.9	39.7	36.0
10:45	70.8	63.7	57.9	79.0	59.3	49.0	79.2	58.1	48.5	00:30	68.7	56.2	35.4	57.4	41.8	35.0	47.2	38.7	36.5
11:00	72.4	64.7	57.4	76.0	57.6	48.0	81.1	58.6	48.5	00:45	69.2	57.6	36.9	54.4	38.7	33.0	45.3	38.3	36.0
11:15	71.8	64.4	57.4	60.0	50.7	47.5	59.0	49.8	48.0	01:00	68.9	55.8	36.4	51.5	36.8	32.0	46.1	37.3	35.5
11:30	70.2	64.0	57.4	58.3	48.7	45.0	62.6	47.3	45.0	01:15	68.4	55.8	36.4	53.0	39.4	31.0	45.3	37.5	35.5
11:45	72.1	64.0	57.4	61.2	49.9	46.0	62.1	46.4	44.5	01:30	68.3	55.2	35.4	58.1	45.5	32.5	53.5	42.1	36.0
12:00	72.7	65.0	58.4	69.0	52.0	46.5	65.4	49.0	43.0	01:45	68.0	56.3	37.4	52.2	39.3	31.5	48.9	39.1	36.5
12:15	70.5	63.7	55.9	62.9	48.3	45.0	72.9	47.0	43.0	02:00	68.2	55.8	32.4	51.1	37.4	31.0	46.6	38.5	35.0
12:30	73.7	63.7	57.4	59.3	48.4	43.5	73.0	47.4	42.5	02:15	68.6	55.3	37.4	54.9	41.7	33.0	50.5	40.7	37.0
12:45	70.9	62.4	54.9	71.8	47.4	43.5	70.1	46.4	42.5	02:30	68.5	56.3	37.4	48.0	36.7	32.0	45.8	37.8	36.0
13:00	68.8	62.5	56.9	65.7	52.9	46.5	64.8	49.6	42.5	02:45	68.4	55.3	34.9	53.7	37.8	31.5	46.4	39.1	36.5
13:15	70.7	62.2	55.9	56.0	48.4	45.0	55.2	44.8	42.0	03:00	68.1	55.4	35.9	55.5	34.0	30.5	46.0	37.9	35.0
13:30	69.8	62.2	55.4	60.5	47.9	45.0	76.8	50.7	42.5	03:15	69.3	55.8	37.9	59.6	44.7	31.0	54.1	41.8	35.5
13:45	72.5	61.0	54.9	61.7	48.9	43.5	57.2	44.4	41.5	03:30	69.4	56.7	35.9	47.8	35.8	32.0	46.6	38.8	37.0
14:00	71.9	63.1	56.9	59.0	48.0	43.0	60.4	44.5	42.5	03:45	69.4	57.8	39.4	54.6	42.7	34.0	54.0	41.8	37.0
14:15	70.7	63.8	57.4	72.4	49.3	44.0	50.7	43.1	41.5	04:00	68.4	57.5	39.9	55.8	40.0	31.5	47.1	38.3	36.0
14:30	71.0	63.7	57.9	60.3	48.1	44.5	56.1	45.6	43.0	04:15	69.5	57.8	39.9	57.2	44.6	36.5	54.1	42.2	38.0
14:45	73.6	64.1	57.9	57.2	49.3	46.0	70.3	47.5	44.5	04:30	69.7	59.1	43.4	55.7	40.1	34.0	47.4	40.2	38.0
15:00	70.8	64.0	58.9	56.9	48.5	45.5	50.0	43.8	42.5	04:45	69.3	58.6	43.4	52.5	43.1	36.5	50.8	42.4	39.0
15:15	69.8	64.1	57.4	56.5	50.5	47.5	51.4	42.8	41.5	05:00	69.5	60.2	45.4	52.5	41.0	35.5	48.2	40.0	38.0
15:30	75.5	64.1	56.4	56.0	50.4	47.0	70.0	45.4	41.5	05:15	70.1	61.6	48.9	55.2	44.9	41.0	47.1	40.2	39.0
15:45	70.4	64.1	58.4	57.4	50.7	48.5	70.4	45.0	41.0	05:30	70.8	62.2	50.4	54.7	44.2	39.5	49.4	40.2	38.0
16:00	70.0	64.5	59.4	71.9	51.5	48.5	58.3	43.8	42.0	05:45	70.8	62.2	52.4	55.5	45.6	41.5	49.6	40.5	39.0
16:15	73.1	64.5	60.4	62.3	50.9	48.0	71.5	46.0	42.0	06:00	70.5	63.0	53.4	56.3	45.6	41.0	49.9	42.6	40.0
16:30	72.1	64.8	60.4	80.1	53.0	46.0	57.9	43.1	42.0	06:15	71.5	64.1	55.4	56.3	47.6	44.5	51.5	45.6	44.0
16:45	71.5	65.0	61.4	55.8	50.6	47.5	71.4	48.4	43.0	06:30	68.9	62.8	57.5	68.9	49.1	44.5	50.6	44.8	43.5
17:00	80.7	64.8	60.9	61.0	50.1	46.5	51.8	44.0	43.0	06:45	69.9	62.2	57.9	58.9	49.1	46.0	70.2	48.4	44.0
17:15	69.4	63.8	59.9	56.5	51.9	49.0	48.9	44.9	44.0	07:00	69.7	62.0	59.2	59.3	50.5	47.0	73.8	48.9	45.0
17:30	72.1	64.3	61.4	60.2	52.6	49.0	51.4	44.9	43.5	07:15	67.8	63.4	58.1	57.2	50.8	48.5	69.0	48.4	47.0
17:45	71.4	64.6	59.4	56.4	50.9	48.0	71.3	46.7	42.5	07:30	72.0	64.6	60.4	60.7	53.4	51.0	78.4	51.0	46.5
18:00	71.7	64.4	60.4	57.3	50.5	46.5	49.0	43.6	42.5	07:45	71.2	64.4	60.9	60.0	54.7	52.5	54.3	47.1	46.0
18:15	71.6	64.0	58.4	57.6	51.0	47.0	50.1	43.0	41.5	08:00	71.9	64.2	60.9	58.7	53.8	51.0	66.0	48.4	47.5
18:30	72.8	64.0	57.4	58.4	51.3	48.5	47.5	43.5	42.5	08:15	69.7	64.1	59.9	58.9	53.5	51.5	70.6	49.2	47.0
18:45	79.2	68.3	57.4	56.1	50.0	47.5	50.4	43.8	43.0	08:30	73.7	63.6	58.4	60.3	53.5	51.0	74.7	51.6	47.5
19:00	71.4	63.6	56.4	58.2	49.2	44.5	75.0	48.5	42.5	08:45	71.4	64.1	59.9	58.7	52.2	50.0	68.9	51.1	48.0
19:15	71.2	63.6	56.4	54.5	48.7	45.5	49.0	44.0	43.0	09:00	72.4	64.3	57.9	57.0	51.0	48.0	55.8	49.0	47.5
19:30	70.8	63.3	54.9	54.6	47.3	44.0	50.5	42.9	41.5	09:15	69.9	64.2	58.4	57.2	50.7	48.0	61.1	48.4	47.5
19:45	69.4	62.9	54.4	53.6	45.7	41.5	50.7	41.6	40.5	09:30	75.0	64.4	58.9	58.5	49.7	47.0	67.2	48.6	47.5
20:00	69.3	62.4	53.4	59.2	48.9	44.0	49.9	42.1	40.5	09:45	72.5	64.8	57.9	58.6	49.6	47.0	72.6	49.6	47.5
20:15	70.6	62.3	52.9	54.6	46.5	42.5	52.4	42.8	40.0	10:00	70.5	62.6	55.4	63.3	50.8	47.5	71.2	49.2	47.5
20:30	71.5	62.1	51.9	57.3	47.6	41.5	48.6	42.6	41.0	10:15	69.9	62.8	56.4	85.7	67.9	48.5	86.2	67.3	47.5
20:45	75.8	62.6	52.9	55.8	46.9	42.5	68.9	44.9	40.5	10:30	69.3	61.9	55.9	60.6	50.5	48.0	62.3	46.9	45.0
21:00	71.3	62.1	51.9	70.0	46.9	41.5	46.8	42.0	40.5	10:45	67.8	60.8	54.9	62.1	50.6	47.5	71.2	48.8	45.0
21:15	69.7	61.7	50.4	54.7	44.1	38.0	48.2	41.6	40.0	11:00	68.1	60.8	53.9	67.0	51.9	46.0	73.3	51.1	44.5
21:30	70.7	61.0	50.4	55.9	45.2	40.5	47.5	40.6	39.5	11:15	69.8	60.4	55.4	56.4	49.0	45.5	72.9	49.8	42.5
21:45	70.0	60.3	49.4	54.7	43.8	37.0	44.8	39.6	37.5	11:30	68.2	59.9	55.4	61.3	49.2	44.5	71.6	49.0	44.0
22:00	72.7	60.6	49.4	55.5	45.7	39.5	46.4	40.9	39.0	11:45	68.7	60.1	52.4	68.1	50.6	45.5	60.4	46.8	43.5
22:15	69.3	59.6	45.9	54.9	44.3	38.0	45.4	39.7	37.5	12:00	72.2	58.9	53.4	57.7	50.1	44.0	54.0	45.5	43.0
22:30	70.0	59.1	42.9	52.3	40.9	35.5	46.7	39.1	37.0	12:15	67.8	61.1	56.4	55.7	48.3	44.0	74.8	48.2	42.5
22:45	68.9	59.0	43.9	53.7	41.6	35.5	48.6	39.7	38.0	12:30	71.9	61.2	55.9	64.9	51.1	45.5	72.2	48.1	42.5
23:00	68.0	58.8	43.9	51.9	40.3	33.0	47.0	39.1	36.5	12:45	70.6	64.1	59.9	62.0	50.1	46.5	68.3	45.6	42.0
23:15	69.1	58.0	40.9	52.5	40.3	31.5	46.5	39.0	35.5	13:00				59.0	49.4	45.0	69.4	49.0	41.5
23:30	68.1	57.6	39.9	53.7	40.3	33.5	46.6	40.1	38.0	13:15				80.0	55.7	50.0			

Table A2. Weather station data								
Start Time	Wind Speed, m/s	Temp, °C	Start Time	Wind Speed, m/s	Temp, °C	Start Time	Wind Speed, m/s	Temp, °C
09:50	1.2	2.3	19:00	1.1	2.1	04:10	1.4	2.6
10:00	1.6	2.0	19:10	0.4	2.1	04:20	2.3	3.4
10:10	1.9	2.3	19:20	1.0	1.7	04:30	2.4	3.4
10:20	1.9	2.4	19:30	1.3	1.4	04:40	1.7	3.1
10:30	0.7	2.7	19:40	0.9	1.3	04:50	0.8	2.7
10:40	2.2	3.0	19:50	0.9	1.2	05:00	1.8	2.6
10:50	1.7	3.1	20:00	1.1	1.4	05:10	1.8	2.8
11:00	2.1	3.2	20:10	0.9	1.9	05:20	1.5	3.2
11:10	1.9	3.7	20:20	0.4	1.8	05:30	1.5	2.9
11:20	1.6	4.0	20:30	0.9	2.3	05:40	2.0	3.5
11:30	1.8	4.4	20:40	1.0	2.0	05:50	1.7	2.8
11:40	1.3	4.9	20:50	0.9	2.2	06:00	0.7	2.5
11:50	2.1	5.1	21:00	1.8	2.4	06:10	1.4	3.4
12:00	1.9	5.4	21:10	1.7	2.5	06:20	1.2	3.1
12:10	1.8	5.3	21:20	1.6	2.8	06:30	1.7	3.5
12:20	1.3	5.8	21:30	1.5	2.3	06:40	1.2	3.6
12:30	1.3	6.1	21:40	1.8	2.4	06:50	1.7	3.1
12:40	1.6	6.0	21:50	1.1	2.2	07:00	1.4	2.1
12:50	2.7	6.2	22:00	1.7	2.5	07:10	0.5	1.9
13:00	2.3	6.2	22:10	1.7	2.5	07:20	1.2	1.9
13:10	2.5	6.6	22:20	2.4	3.0	07:30	1.0	1.9
13:20	1.3	6.9	22:30	1.2	2.8	07:40	1.1	1.9
13:30	1.8	7.0	22:40	1.5	2.7	07:50	0.9	1.7
13:40	1.1	6.6	22:50	1.8	2.9	08:00	0.0	1.0
13:50	0.6	6.9	23:00	1.4	2.6	08:10	0.0	0.7
14:00	1.2	6.9	23:10	0.7	2.1	08:20	0.6	0.5
14:10	1.7	6.9	23:20	1.6	2.1	08:30	0.0	1.8
14:20	1.5	6.5	23:30	0.8	1.6	08:40	1.7	3.0
14:30	1.5	6.4	23:40	0.6	1.6	08:50	1.8	3.9
14:40	1.4	6.3	23:50	1.1	2.0	09:00	2.9	4.1
14:50	1.6	6.1	00:00	1.5	2.3	09:10	1.6	4.0
15:00	1.2	6.1	00:10	1.0	1.8	09:20	1.8	4.2
15:10	1.4	5.9	00:20	0.9	1.6	09:30	2.1	4.5
15:20	1.1	5.4	00:30	1.1	1.8	09:40	1.4	4.9
15:30	1.1	5.1	00:40	1.3	2.0	09:50	1.7	5.1
15:40	1.3	4.7	00:50	1.6	2.0	10:00	1.7	5.3
15:50	0.7	4.0	01:00	1.4	2.1	10:10	1.2	5.6
16:00	0.4	3.4	01:10	1.3	2.3	10:20	1.4	5.7
16:10	1.0	3.7	01:20	0.6	1.7	10:30	1.6	6.1
16:20	0.6	3.2	01:30	1.0	1.7	10:40	1.6	6.9
16:30	0.5	3.7	01:40	0.7	1.8	10:50	2.7	7.3
16:40	1.2	3.4	01:50	1.7	2.1	11:00	2.4	7.6
16:50	1.4	3.1	02:00	2.1	2.0	11:10	2.4	7.8
17:00	1.0	3.4	02:10	1.4	1.7	11:20	3.0	8.0
17:10	1.2	3.5	02:20	1.0	2.1	11:30	2.5	8.4
17:20	1.1	3.4	02:30	1.1	2.2	11:40	1.6	8.4
17:30	1.9	3.4	02:40	1.9	2.1	11:50	3.5	8.4
17:40	1.3	2.4	02:50	0.9	2.0	12:00	1.7	8.7
17:50	0.7	2.1	03:00	1.2	2.2	12:10	2.3	8.6
18:00	0.8	2.6	03:10	0.9	2.1	12:20	2.0	8.6
18:10	0.9	2.9	03:20	1.3	2.6	12:30	0.4	8.5
18:20	1.4	2.3	03:30	1.3	2.5	12:40	1.6	8.4
18:30	0.6	2.2	03:40	2.0	3.1	12:50	2.1	8.2
18:40	0.9	2.2	03:50	1.4	2.8	13:00	1.6	8.2
18:50	1.1	2.0	04:00	1.3	2.0	13:10	2.6	8.4

Table B1. Calculation of aggregate extract fan noise from existing poultry units at Dwelling A

Extract fan: Ziehl-Abegg FC063-6

		Octave Band Centre Frequency, Hz							dB(A)
		63	125	250	500	1k	2k	4k	
Existing	[A] Sound Pressure Level, L_n, at 45° sideways from the centre of fan at 7m:	62	52	54	48	49	45	39	53
	[B] Directivity correction (45° to 90°):	1	1.5	3	4.5	18	18	18	
	[C] Reflection off poultry shed roof:	3	3	3	3	3	3	3	
	[A] - [B] + [C] L_p at 90° sideways from the centre of fan at 7m:	64	53	54	47	34	30	24	49

Fan	Direct distance, m	Shed 1	2	3	4	5	6	7	8	Distance correction, dB	Shed 1	2	3	4	5	6	7	8	Ground absorption, dB	Shed 1	2	3	4	5	6	7	8
1		711.0	737.2	763.9	788.0	812.4	838.0	866.3	893.1		40.1	40.4	40.8	41.0	41.3	41.6	41.9	42.1		4.5	4.5	4.5	4.5	4.6	4.6	4.6	4.6
2		713.0	739.1	765.8	789.8	814.2	839.7	868.0	894.7		40.2	40.5	40.8	41.0	41.3	41.6	41.9	42.1		4.5	4.5	4.5	4.5	4.6	4.6	4.6	4.6
3		715.1	741.2	767.7	791.7	816.0	841.5	869.7	896.3		40.2	40.5	40.8	41.1	41.3	41.6	41.9	42.1		4.5	4.5	4.5	4.5	4.6	4.6	4.6	4.6
4		717.3	743.2	769.7	793.6	817.9	843.2	871.4	897.9		40.2	40.5	40.8	41.1	41.4	41.6	41.9	42.2		4.5	4.5	4.5	4.5	4.6	4.6	4.6	4.6
5		719.5	745.3	771.7	795.6	819.8	845.0	873.1	899.6		40.2	40.5	40.8	41.1	41.4	41.6	41.9	42.2		4.5	4.5	4.5	4.5	4.6	4.6	4.6	4.6
6		721.7	747.4	773.8	797.6	821.7	846.9	874.9	901.3		40.3	40.6	40.9	41.1	41.4	41.7	41.9	42.2		4.5	4.5	4.5	4.5	4.6	4.6	4.6	4.6
7		724.0	749.6	775.9	799.6	823.7	848.8	876.8	903.1		40.3	40.6	40.9	41.2	41.4	41.7	42.0	42.2		4.5	4.5	4.5	4.5	4.6	4.6	4.6	4.6
8		726.3	751.9	778.0	801.7	825.7	850.7	878.6	904.9		40.3	40.6	40.9	41.2	41.4	41.7	42.0	42.2		4.5	4.5	4.5	4.5	4.6	4.6	4.6	4.6
9		728.6	754.1	780.2	803.9	827.8	852.7	880.5	906.7		40.3	40.6	40.9	41.2	41.5	41.7	42.0	42.2		4.5	4.5	4.5	4.5	4.6	4.6	4.6	4.6
10		731.0	756.5	782.5	806.0	829.9	854.7	882.5	908.6		40.4	40.7	41.0	41.2	41.5	41.7	42.0	42.3		4.5	4.5	4.5	4.5	4.6	4.6	4.6	4.6
11		733.5	758.8	784.8	808.2	832.0	856.7	884.5	910.5		40.4	40.7	41.0	41.2	41.5	41.8	42.0	42.3		4.5	4.5	4.5	4.6	4.6	4.6	4.6	4.6
12		736.0	761.2	787.1	810.5	834.2	858.8	886.5	912.4		40.4	40.7	41.0	41.3	41.5	41.8	42.1	42.3		4.5	4.5	4.5	4.6	4.6	4.6	4.6	4.6
13		738.5	763.6	789.4	812.8	836.4	860.9	888.6	914.4		40.5	40.8	41.0	41.3	41.5	41.8	42.1	42.3		4.5	4.5	4.5	4.6	4.6	4.6	4.6	4.6
14		741.1	766.1	791.8	815.1	838.6	863.1	890.7	916.4		40.5	40.8	41.1	41.3	41.6	41.8	42.1	42.3		4.5	4.5	4.5	4.6	4.6	4.6	4.6	4.6
15		743.7	768.6	794.3	817.5	840.9	865.3	892.8	918.5		40.5	40.8	41.1	41.3	41.6	41.8	42.1	42.4		4.5	4.5	4.5	4.6	4.6	4.6	4.6	4.6
16		746.4	771.2	796.7			867.5	895.0	920.6		40.6	40.8	41.1			41.9	42.1	42.4		4.5	4.5	4.5			4.6	4.6	4.6
17		749.1	773.8	799.3			869.8	897.2	922.7		40.6	40.9	41.2			41.9	42.2	42.4		4.5	4.5	4.5			4.6	4.6	4.6
1		1.4	1.4	1.5	1.5	1.5	1.6	1.6	1.7		2.6	2.2	1.9	1.5	1.2	0.9	0.5	0.2									
2		1.4	1.4	1.5	1.5	1.5	1.6	1.6	1.7		2.6	2.2	1.8	1.5	1.2	0.9	0.5	0.2									
3		1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7		2.5	2.2	1.8	1.5	1.2	0.8	0.5	0.2									
4		1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7		2.5	2.1	1.8	1.5	1.1	0.8	0.5	0.2									
5		1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7		2.5	2.1	1.7	1.4	1.1	0.8	0.5	0.1									
6		1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7		2.4	2.1	1.7	1.4	1.1	0.8	0.4	0.1									
7		1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7		2.4	2.0	1.7	1.4	1.1	0.8	0.4	0.1									
8		1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7		2.4	2.0	1.7	1.3	1.0	0.7	0.4	0.1									
9		1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7		2.3	2.0	1.6	1.3	1.0	0.7	0.4	0.1									
10		1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7		2.3	2.0	1.6	1.3	1.0	0.7	0.3	0.0									
11		1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7		2.3	1.9	1.6	1.3	1.0	0.7	0.3	0.0									
12		1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7		2.2	1.9	1.5	1.2	0.9	0.6	0.3	0.0									
13		1.4	1.5	1.5	1.5	1.6	1.6	1.7	1.7		2.2	1.9	1.5	1.2	0.9	0.6	0.3	0.0									
14		1.4	1.5	1.5	1.5	1.6	1.6	1.7	1.7		2.2	1.8	1.5	1.2	0.9	0.6	0.2	-0.1									
15		1.4	1.5	1.5	1.6	1.6	1.6	1.7	1.7		2.1	1.8	1.4	1.1	0.8	0.5	0.2	-0.1									
16		1.4	1.5	1.5			1.6	1.7	1.7		2.1	1.8	1.4			0.5	0.2	-0.1									
17		1.4	1.5	1.5			1.7	1.7	1.8		2.1	1.7	1.4			0.5	0.2	-0.1									

Atmospheric attenuation, dB

Sound pressure level at dwelling, dB

BS4142 character correction								0		
								0		
								0		
								3		
100% fans operating	Specific Level, dB							23		
	Rating Level, dB							26		
50% fans operating[Note 1]	Specific Level, dB							20		
	Rating Level, dB							23		
20% fans operating[Note 2]	Specific Level, dB							16		
	Rating Level, dB							19		

Note 1: Assumned only odd numbered fans operating

Note 2: Assumned only 3, 8 & 13 numbered fans operating

Table B2. Calculation of aggregate extract fan noise from proposed poultry units at Dwelling A

Extract fan: Ziehl-Abegg FC063-6

		Octave Band Centre Frequency, Hz							dB(A)
		63	125	250	500	1k	2k	4k	
Proposed	[A] Sound Pressure Level, L_p, at 45^0 sideways from the centre	62	52	54	48	49	45	39	53
	[B] Directivity correction (45° to 90°):	1	1.5	3	4.5	18	18	18	
	[C] Reflection off poultry shed roof:	3	3	3	3	3	3	3	
	[A] - [B] + [C] L_p at 90° sideways from the centre of fan at 7m:	64	53	54	47	34	30	24	49

Fan	Direct distance, m							Distance correction, dB							Ground absorption, dB						
		Shed						Shed							Shed						
		1	2	3	4	5	6	1	2	3	4	5	6		1	2	3	4	5	6	
1		694.4	723.7	753.9	782.8	813.3	844.1	39.9	40.3	40.6	41.0	41.3	41.6		4.5	4.5	4.5	4.5	4.6	4.6	
2		695.4	724.6	754.7	783.6	814.1	844.8	39.9	40.3	40.7	41.0	41.3	41.6		4.5	4.5	4.5	4.5	4.6	4.6	
3		696.4	725.6	755.7	784.5	814.9	845.6	40.0	40.3	40.7	41.0	41.3	41.6		4.5	4.5	4.5	4.5	4.6	4.6	
4		697.5	726.6	756.6	785.4	815.8	846.4	40.0	40.3	40.7	41.0	41.3	41.6		4.5	4.5	4.5	4.5	4.6	4.6	
5		698.6	727.6	757.6	786.3	816.7	847.3	40.0	40.3	40.7	41.0	41.3	41.7		4.5	4.5	4.5	4.5	4.6	4.6	
6		699.8	728.8	758.7	787.3	817.6	848.2	40.0	40.3	40.7	41.0	41.3	41.7		4.5	4.5	4.5	4.5	4.6	4.6	
7		701.1	729.9	759.8	788.4	818.6	849.2	40.0	40.4	40.7	41.0	41.4	41.7		4.5	4.5	4.5	4.5	4.6	4.6	
8		702.3	731.1	760.9	789.5	819.6	850.2	40.0	40.4	40.7	41.0	41.4	41.7		4.5	4.5	4.5	4.5	4.6	4.6	
9		703.7	732.4	762.1	790.6	820.7	851.2	40.0	40.4	40.7	41.1	41.4	41.7		4.5	4.5	4.5	4.5	4.6	4.6	
10		705.1	733.7	763.4	791.8	821.8	852.3	40.1	40.4	40.8	41.1	41.4	41.7		4.5	4.5	4.5	4.5	4.6	4.6	
11		706.5	735.0	764.7	793.0	823.0	853.4	40.1	40.4	40.8	41.1	41.4	41.7		4.5	4.5	4.5	4.5	4.6	4.6	
12		708.0	736.4	766.0	794.3	824.2	854.6	40.1	40.4	40.8	41.1	41.4	41.7		4.5	4.5	4.5	4.5	4.6	4.6	
13		709.5	737.9	767.4	795.6	825.5	855.8	40.1	40.5	40.8	41.1	41.4	41.7		4.5	4.5	4.5	4.5	4.6	4.6	
14		711.1	739.4	768.8	797.0	826.7	857.1	40.1	40.5	40.8	41.1	41.4	41.8		4.5	4.5	4.5	4.5	4.6	4.6	
15		712.8	740.9	770.3	798.4	828.1	858.3	40.2	40.5	40.8	41.1	41.5	41.8		4.5	4.5	4.5	4.5	4.6	4.6	
16		714.5	742.5	771.8	799.8	829.5	859.7	40.2	40.5	40.8	41.2	41.5	41.8		4.5	4.5	4.5	4.5	4.6	4.6	
17		714.5	744.2	773.3	801.3	830.9	861.0	40.2	40.5	40.9	41.2	41.5	41.8		4.5	4.5	4.5	4.5	4.6	4.6	
1	Atmospheric attenuation, dB	1.3	1.4	1.4	1.5	1.5	1.6	2.8	2.4	2.0	1.6	1.2	0.8								
2		1.3	1.4	1.4	1.5	1.5	1.6	2.8	2.4	2.0	1.6	1.2	0.8								
3		1.3	1.4	1.4	1.5	1.5	1.6	2.8	2.4	2.0	1.6	1.2	0.8								
4		1.3	1.4	1.4	1.5	1.5	1.6	2.8	2.4	2.0	1.6	1.2	0.8								
5		1.3	1.4	1.4	1.5	1.6	1.6	2.8	2.4	1.9	1.6	1.2	0.8								
6		1.3	1.4	1.4	1.5	1.6	1.6	2.8	2.3	1.9	1.5	1.1	0.8								
7		1.3	1.4	1.4	1.5	1.6	1.6	2.7	2.3	1.9	1.5	1.1	0.7								
8		1.3	1.4	1.4	1.5	1.6	1.6	2.7	2.3	1.9	1.5	1.1	0.7								
9		1.3	1.4	1.4	1.5	1.6	1.6	2.7	2.3	1.9	1.5	1.1	0.7								
10		1.3	1.4	1.5	1.5	1.6	1.6	2.7	2.3	1.9	1.5	1.1	0.7								
11		1.3	1.4	1.5	1.5	1.6	1.6	2.7	2.3	1.8	1.5	1.1	0.7								
12		1.3	1.4	1.5	1.5	1.6	1.6	2.6	2.2	1.8	1.4	1.1	0.7								
13		1.3	1.4	1.5	1.5	1.6	1.6	2.6	2.2	1.8	1.4	1.0	0.7								
14		1.4	1.4	1.5	1.5	1.6	1.6	2.6	2.2	1.8	1.4	1.0	0.6								
15		1.4	1.4	1.5	1.5	1.6	1.6	2.6	2.2	1.8	1.4	1.0	0.6								
16		1.4	1.4	1.5	1.5	1.6	1.6	2.5	2.1	1.7	1.4	1.0	0.6								
17		1.4	1.4	1.5	1.5	1.6	1.6	2.5	2.1	1.7	1.4	1.0	0.6								

BS4142 character correction		0 0 0 3
100% fans operating	Specific Level, dB	22
	Rating Level, dB	25
50% fans operating[Note 1]	Specific Level, dB	19
	Rating Level, dB	22
20% fans operating[Note 2]	Specific Level, dB	16
	Rating Level, dB	19

Note 1: Assumned only odd numbered fans operating

Note 2: Assumned only 3, 8 & 13 numbered fans operating

Table B3. Calculation of aggregate extract fan noise from existingpoultry units at Dwelling B

Extract fan: Ziehl-Abegg FC063-6

		Octave Band Centre Frequency, Hz							dB(A)
		63	125	250	500	1k	2k	4k	
Existing	[A] Sound Pressure Level, L_p, at 45^0 sidewavs from the centre of fan at 7m:	62	52	54	48	49	45	39	53
	[B] Directivity correction (45° to 90°):	1	1.5	3	4.5	18	18	18	
	[C] Reflection off poultry shed roof:	3	3	3	3	3	3	3	
	[A] - [B] + [C] L_p at 90° sideways from the centre of fan at 7m:	64	53	54	47	34	30	24	49

Direct distance, m

Fan	Shed 1	2	3	4	5	6	7	8
1	801.2	829.3	857.4	882.8	908.8	936.5	965.7	994.2
2	801.4	829.5	857.6	882.9	908.9	936.6	965.8	994.3
3	801.6	829.7	857.8	883.1	909.1	936.8	966.0	994.4
4	801.9	829.9	858.0	883.4	909.3	936.9	966.2	994.6
5	802.2	830.2	858.3	883.6	909.5	937.2	966.4	994.8
6	802.6	830.6	858.6	883.9	909.8	937.4	966.7	995.0
7	803.0	830.9	859.0	884.3	910.2	937.7	967.0	995.3
8	803.4	831.4	859.4	884.7	910.6	938.1	967.3	995.6
9	803.9	831.8	859.9	885.2	911.0	938.5	967.7	995.9
10	804.5	832.4	860.4	885.6	911.4	938.9	968.1	996.3
11	805.1	832.9	860.9	886.2	911.9	939.3	968.5	996.7
12	805.7	833.5	861.5	886.7	912.5	939.8	969.0	997.2
13	806.4	834.2	862.1	887.3	913.1	940.4	969.6	997.7
14	807.1	834.9	862.8	888.0	913.7	941.0	970.1	998.2
15	807.9	835.6	863.5	888.7	914.4	941.6	970.7	998.8
16	808.7	836.4	864.3			942.2	971.4	999.4
17	809.6	837.2	865.1			942.9	972.0	1000.0

Distance correction, dB

Fan	Shed 1	2	3	4	5	6	7	8
1	41.2	41.5	41.8	42.0	42.3	42.5	42.8	43.0
2	41.2	41.5	41.8	42.0	42.3	42.5	42.8	43.0
3	41.2	41.5	41.8	42.0	42.3	42.5	42.8	43.0
4	41.2	41.5	41.8	42.0	42.3	42.5	42.8	43.1
5	41.2	41.5	41.8	42.0	42.3	42.5	42.8	43.1
6	41.2	41.5	41.8	42.0	42.3	42.5	42.8	43.1
7	41.2	41.5	41.8	42.0	42.3	42.5	42.8	43.1
8	41.2	41.5	41.8	42.0	42.3	42.5	42.8	43.1
9	41.2	41.5	41.8	42.0	42.3	42.5	42.8	43.1
10	41.2	41.5	41.8	42.0	42.3	42.6	42.8	43.1
11	41.2	41.5	41.8	42.0	42.3	42.6	42.8	43.1
12	41.2	41.5	41.8	42.1	42.3	42.6	42.8	43.1
13	41.2	41.5	41.8	42.1	42.3	42.6	42.8	43.1
14	41.2	41.5	41.8	42.1	42.3	42.6	42.8	43.1
15	41.2	41.5	41.8	42.1	42.3	42.6	42.8	43.1
16	41.3	41.5	41.8			42.6	42.8	43.1
17	41.3	41.6	41.8			42.6	42.9	43.1

Ground absorption, dB

Fan	Shed 1	2	3	4	5	6	7	8
1	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6
2	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6
3	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6
4	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6
5	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6
6	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6
7	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6
8	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6
9	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6
10	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6
11	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6
12	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6
13	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
14	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
15	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
16	4.6	4.6	4.6			4.6	4.6	4.6
17	4.6	4.6	4.6			4.6	4.6	4.6

Atmospheric attenuation, dB

Fan	Shed 1	2	3	4	5	6	7	8
1	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
2	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
3	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
4	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
5	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
6	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
7	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
8	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
9	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
10	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
11	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
12	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
13	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
14	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
15	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.9
16	1.5	1.6	1.6			1.8	1.8	1.9
17	1.5	1.6	1.6			1.8	1.8	1.9

Sound pressure level at dwelling, dB

Fan	Shed 1	2	3	4	5	6	7	8
1	1.4	1.0	0.6	0.3	0.0	-0.3	-0.6	-0.9
2	1.4	1.0	0.6	0.3	0.0	-0.3	-0.6	-0.9
3	1.4	1.0	0.6	0.3	0.0	-0.3	-0.6	-0.9
4	1.3	1.0	0.6	0.3	0.0	-0.3	-0.6	-0.9
5	1.3	1.0	0.6	0.3	0.0	-0.3	-0.6	-0.9
6	1.3	1.0	0.6	0.3	0.0	-0.3	-0.6	-0.9
7	1.3	1.0	0.6	0.3	0.0	-0.3	-0.6	-0.9
8	1.3	1.0	0.6	0.3	0.0	-0.3	-0.6	-0.9
9	1.3	1.0	0.6	0.3	0.0	-0.3	-0.6	-1.0
10	1.3	1.0	0.6	0.3	0.0	-0.3	-0.6	-1.0
11	1.3	0.9	0.6	0.3	0.0	-0.3	-0.7	-1.0
12	1.3	0.9	0.6	0.3	0.0	-0.3	-0.7	-1.0
13	1.3	0.9	0.6	0.3	0.0	-0.3	-0.7	-1.0
14	1.3	0.9	0.6	0.3	0.0	-0.3	-0.7	-1.0
15	1.3	0.9	0.6	0.3	0.0	-0.4	-0.7	-1.0
16	1.3	0.9	0.6			-0.4	-0.7	-1.0
17	1.2	0.9	0.5			-0.4	-0.7	-1.0

BS4142 character correction		0 0 0 3
100% fans operating	Specific Level, dB	21
	Rating Level, dB	24
50% fans operating[Note 1]	Specific Level, dB	19
	Rating Level, dB	22
20% fans operating[Note 2]	Specific Level, dB	15
	Rating Level, dB	18

Note 1: Assumned only odd numbered fans operating

Note 2: Assumned only 3, 8 & 13 numbered fans operating

Table B4. Calculation of aggregate extract fan noise from proposed poultry units at Dwelling B

Extract fan: Ziehl-Abegg FC063-6

		Octave Band Centre Frequency, Hz							dB(A)
		63	125	250	500	1k	2k	4k	
Proposed	[A] Sound Pressure Level, L_p, at 45^0 sideways from the centre	62	52	54	48	49	45	39	53
	[B] Directivity correction (45° to 90°):	1	1.5	3	4.5	18	18	18	
	[C] Reflection off poultry shed roof:	3	3	3	3	3	3	3	
	[A] - [B] + [C] L_p at 90° sideways from the centre of fan at 7m:	64	53	54	47	34	30	24	49

Fan		Direct distance, m							Distance correction, dB							Ground absorption, dB					
		Shed							Shed							Shed					
		1	2	3	4	5	6		1	2	3	4	5	6		1	2	3	4	5	6
1		823.1	853.1	883.8	913.4	944.6	975.2		41.4	41.7	42.0	42.3	42.6	42.9		4.6	4.6	4.6	4.6	4.6	4.6
2		822.3	852.4	883.1	912.7	943.8	974.5		41.4	41.7	42.0	42.3	42.6	42.9		4.6	4.6	4.6	4.6	4.6	4.6
3		821.6	851.7	882.4	912.0	943.2	973.8		41.4	41.7	42.0	42.3	42.6	42.9		4.6	4.6	4.6	4.6	4.6	4.6
4		820.9	851.0	881.7	911.3	942.5	973.2		41.4	41.7	42.0	42.3	42.6	42.9		4.6	4.6	4.6	4.6	4.6	4.6
5		820.3	850.4	881.1	910.7	941.9	972.6		41.4	41.7	42.0	42.3	42.6	42.9		4.6	4.6	4.6	4.6	4.6	4.6
6		819.7	849.8	880.6	910.2	941.3	972.1		41.4	41.7	42.0	42.3	42.6	42.9		4.6	4.6	4.6	4.6	4.6	4.6
7		819.1	849.2	880.0	909.6	940.8	971.5		41.4	41.7	42.0	42.3	42.6	42.8		4.6	4.6	4.6	4.6	4.6	4.6
8		818.6	848.7	879.5	909.1	940.3	971.1		41.4	41.7	42.0	42.3	42.6	42.8		4.6	4.6	4.6	4.6	4.6	4.6
9		818.2	848.3	879.1	908.7	939.9	970.6		41.4	41.7	42.0	42.3	42.6	42.8		4.6	4.6	4.6	4.6	4.6	4.6
10		817.8	847.9	878.7	908.3	939.4	970.2		41.4	41.7	42.0	42.3	42.6	42.8		4.6	4.6	4.6	4.6	4.6	4.6
11		817.4	847.5	878.3	907.9	939.1	969.9		41.3	41.7	42.0	42.3	42.6	42.8		4.6	4.6	4.6	4.6	4.6	4.6
12		817.1	847.2	878.0	907.6	938.7	969.6		41.3	41.7	42.0	42.3	42.5	42.8		4.6	4.6	4.6	4.6	4.6	4.6
13		816.8	846.9	877.7	907.3	938.4	969.3		41.3	41.7	42.0	42.3	42.5	42.8		4.6	4.6	4.6	4.6	4.6	4.6
14		816.6	846.6	877.4	907.0	938.2	969.0		41.3	41.7	42.0	42.3	42.5	42.8		4.6	4.6	4.6	4.6	4.6	4.6
15		816.4	846.4	877.2	906.8	938.0	968.8		41.3	41.7	42.0	42.2	42.5	42.8		4.6	4.6	4.6	4.6	4.6	4.6
16		816.3	846.3	877.1	906.6	937.8	968.6		41.3	41.6	42.0	42.2	42.5	42.8		4.6	4.6	4.6	4.6	4.6	4.6
17		816.3	846.2	877.0	906.5	937.6	968.5		41.3	41.6	42.0	42.2	42.5	42.8		4.6	4.6	4.6	4.6	4.6	4.6
1	Atmospheric attenuation, dB	1.6	1.6	1.7	1.7	1.8	1.9	Sound pressure level at dwelling, dB	1.1	0.7	0.3	0.0	-0.4	-0.7							
2		1.6	1.6	1.7	1.7	1.8	1.9		1.1	0.7	0.3	0.0	-0.4	-0.7							
3		1.6	1.6	1.7	1.7	1.8	1.9		1.1	0.7	0.3	0.0	-0.4	-0.7							
4		1.6	1.6	1.7	1.7	1.8	1.8		1.1	0.7	0.3	0.0	-0.4	-0.7							
5		1.6	1.6	1.7	1.7	1.8	1.8		1.1	0.7	0.4	0.0	-0.4	-0.7							
6		1.6	1.6	1.7	1.7	1.8	1.8		1.1	0.7	0.4	0.0	-0.3	-0.7							
7		1.6	1.6	1.7	1.7	1.8	1.8		1.1	0.7	0.4	0.0	-0.3	-0.7							
8		1.6	1.6	1.7	1.7	1.8	1.8		1.1	0.8	0.4	0.0	-0.3	-0.7							
9		1.6	1.6	1.7	1.7	1.8	1.8		1.1	0.8	0.4	0.0	-0.3	-0.7							
10		1.6	1.6	1.7	1.7	1.8	1.8		1.1	0.8	0.4	0.0	-0.3	-0.7							
11		1.6	1.6	1.7	1.7	1.8	1.8		1.1	0.8	0.4	0.0	-0.3	-0.7							
12		1.6	1.6	1.7	1.7	1.8	1.8		1.2	0.8	0.4	0.0	-0.3	-0.7							
13		1.6	1.6	1.7	1.7	1.8	1.8		1.2	0.8	0.4	0.0	-0.3	-0.7							
14		1.6	1.6	1.7	1.7	1.8	1.8		1.2	0.8	0.4	0.0	-0.3	-0.7							
15		1.6	1.6	1.7	1.7	1.8	1.8		1.2	0.8	0.4	0.1	-0.3	-0.7							
16		1.6	1.6	1.7	1.7	1.8	1.8		1.2	0.8	0.4	0.1	-0.3	-0.7							
17		1.6	1.6	1.7	1.7	1.8	1.8		1.2	0.8	0.4	0.1	-0.3	-0.7							

BS4142 character correction		0 0 0 3
100% fans operating	Specific Level, dB Rating Level, dB	20 23
50% fans operating[Note 1]	Specific Level, dB Rating Level, dB	18 21
20% fans operating[Note 2]	Specific Level, dB Rating Level, dB	14 17

Note 1: Assumned only odd numbered fans operating

Note 2: Assumned only 3, 8 & 13 numbered fans operating

Table B5. Calculation of aggregate extract fan noise from existingpoultry units at Dwelling C

Extract fan: Ziehl-Abegg FC063-6

		Octave Band Centre Frequency, Hz							dB(A)
		63	125	250	500	1k	2k	4k	
Existing	[A] Sound Pressure Level, L_p, at 45^0 sideways from the centre of fan at 7m:	62	52	54	48	49	45	39	53
	[B] Directivity correction (45° to 90°):	1	1.5	3	4.5	18	18	18	
	[C] Reflection off poultry shed roof:	3	3	3	3	3	3	3	
	[A] - [B] + [C] L_p at 90° sideways from the centre of fan at 7m:	64	53	54	47	34	30	24	49

Fan	Direct distance, m									Distance correction, dB									Ground absorption, dB							
	Shed									Shed									Shed							
	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	
1	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
2	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
3	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
4	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
5	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
6	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
7	996.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
8	991.2	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
9	986.4	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
10	981.6	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		42.9	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
11	976.8	995.4	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		42.9	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
12	972.0	990.7	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		42.9	43.0	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
13	967.2	986.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		42.8	43.0	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
14	962.5	981.4	999.9	1000.0	1000.0	1000.0	1000.0	1000.0		42.8	42.9	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
15	957.8	976.7	995.4	1000.0	1000.0	1000.0	1000.0	1000.0		42.7	42.9	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4
16	953.1	972.1	990.8			1000.0	1000.0	1000.0		42.7	42.9	43.0			43.1	43.1	43.1		4.6	4.6	4.6			4.6	4.6	4
17	948.4	967.5	986.3			1000.0	1000.0	1000.0		42.6	42.8	43.0			43.1	43.1	43.1		4.6	4.6	4.6			4.6	4.6	4

Fan	Atmospheric attenuation, dB									Sound pressure level at dwelling, dB								
	Shed									Shed								
	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8	
1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
2	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
3	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
4	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
5	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
6	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
7	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
8	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-0.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-0.8	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
10	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-0.8	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
11	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-0.7	-0.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
12	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-0.7	-0.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
13	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-0.6	-0.8	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
14	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-0.6	-0.8	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
15	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9		-0.5	-0.7	-0.9	-1.0	-1.0	-1.0	-1.0	-1.0	
16	1.8	1.8	1.9			1.9	1.9	1.9		-0.5	-0.7	-0.9			-1.0	-1.0	-1.0	
17	1.8	1.8	1.9			1.9	1.9	1.9		-0.4	-0.6	-0.8			-1.0	-1.0	-1.0	

BS4142 character correction		0 0 0 3
100% fans operating	Specific Level, dB	20
	Rating Level, dB	23
50% fans operating[Note 1]	Specific Level, dB	18
	Rating Level, dB	21
20% fans operating[Note 2]	Specific Level, dB	14
	Rating Level, dB	17

Note 1: Assumned only odd numberec fans operating

Note 2: Assumned only 3, 8 & 13 numbered fans operating

Table B6. Calculation of aggregate extract fan noise from proposed poultry units at Dwelling C

Extract fan: Ziehl-Abegg FC063-6

		Octave Band Centre Frequency, Hz							dB(A)
		63	125	250	500	1k	2k	4k	
Proposed	[A] Sound Pressure Level. L_p, at 45^0 sideways from the centre of fan	62	52	54	48	49	45	39	53
	[B] Directivity correction (45° to 90°):	1	1.5	3	4.5	18	18	18	
	[C] Reflection off poultry shed roof:	3	3	3	3	3	3	3	
	[A] - [B] + [C] L_p at 90° sideways from the centre of fan at 7m:	64	53	54	47	34	30	24	49

Fan	Direct distance, m: Shed 1	2	3	4	5	6	Distance correction, dB: Shed 1	2	3	4	5	6	Ground absorption, dB: Shed 1	2	3	4	5	6
1	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
2	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
3	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
4	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
5	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
6	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
7	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
8	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
9	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
10	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
11	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
12	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
13	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
14	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
15	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
16	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
17	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	4.6	4.6	4.6	4.6	4.6	4.6
1	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
2	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
3	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
4	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
5	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
6	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
7	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
8	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
10	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
11	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
12	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
13	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
14	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
15	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
16	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						
17	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0						

Atmospheric attenuation, dB

Sound pressure level at dwelling, dB

BS4142 character correction		0 0 0 3
100% fans operating	Specific Level, dB	19
	Rating Level, dB	22
50% fans operating[Note 1]	Specific Level, dB	16
	Rating Level, dB	19
20% fans operating[Note 2]	Specific Level, dB	13
	Rating Level, dB	16

Note 1: Assumned only odd numbered fans operating

Note 2: Assumned only 3, 8 & 13 numbered fans operating

Table B7. Calculation of aggregate extract fan noise from existingpoultry units at Dwelling D

Extract fan: Ziehl-Abegg FC063-6

		Octave Band Centre Frequency, Hz							dB(A)
		63	125	250	500	1k	2k	4k	
Existing	[A] Sound Pressure Level, L_p, at 45^0 sideways from the centre of fan at 7m:	62	52	54	48	49	45	39	53
	[B] Directivity correction (45° to 90°):	1	1.5	3	4.5	18	18	18	
	[C] Reflection off poultry shed roof:	3	3	3	3	3	3	3	
	[A] - [B] + [C] L_p at 90° sideways from the centre of fan at 7m:	64	53	54	47	34	30	24	49

Fan	Direct distance, m									Distance correction, dB									Ground absorption, dB								
		Shed								Shed									Shed								
		1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
1		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
2		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
3		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
4		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
5		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
6		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
7		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
8		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
9		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
10		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
11		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
12		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
13		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
14		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
15		1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0	43.1	43.1	43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
16		1000.0	1000.0	1000.0			1000.0	1000.0	1000.0	43.1	43.1	43.1			43.1	43.1	43.1		4.6	4.6	4.6			4.6	4.6	4.6
17		1000.0	1000.0	1000.0			1000.0	1000.0	1000.0	43.1	43.1	43.1			43.1	43.1	43.1		4.6	4.6	4.6			4.6	4.6	4.6

Fan	Atmospheric attenuation, dB									Sound pressure level at dwelling, dB								
1		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
2		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
3		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
4		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
5		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
6		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
7		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
8		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
9		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
10		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
11		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
12		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
13		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
14		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
15		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
16		1.9	1.9	1.9			1.9	1.9	1.9	-1.0	-1.0	-1.0			-1.0	-1.0	-1.0	
17		1.9	1.9	1.9			1.9	1.9	1.9	-1.0	-1.0	-1.0			-1.0	-1.0	-1.0	

BS4142 character correction		0 0 0 3
100% fans operating	Specific Level, dB	20
	Rating Level, dB	23
50% fans operating[Note 1]	Specific Level, dB	18
	Rating Level, dB	21
20% fans operating[Note 2]	Specific Level, dB	14
	Rating Level, dB	17

Note 1: Assumned only odd numbered fans operating

Note 2: Assumned only 3, 8 & 13 numbered fans operating

Table B8. Calculation of aggregate extract fan noise from proposed poultry units at Dwelling D

Extract fan: Ziehl-Abegg FC063-6

		Octave Band Centre Frequency, Hz							dB(A)
		63	125	250	500	1k	2k	4k	
Proposed	[A] Sound Pressure Level, L_n, at 45° sideways from the centre of fan	62	52	54	48	49	45	39	53
	[B] Directivity correction (45° to 90°):	1	1.5	3	4.5	18	18	18	
	[C] Reflection off poultry shed roof:	3	3	3	3	3	3	3	
	[A] - [B] + [C] L_p at 90° sideways from the centre of fan at 7m:	64	53	54	47	34	30	24	49

Fan	Direct distance, m (Shed)							Distance correction, dB (Shed)							Ground absorption, dB (Shed)						
	1	2	3	4	5	6		1	2	3	4	5	6		1	2	3	4	5	6	
1	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
2	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
3	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
4	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
5	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
6	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
7	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
8	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
9	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
10	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
11	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
12	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
13	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
14	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
15	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
16	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	
17	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0		43.1	43.1	43.1	43.1	43.1	43.1		4.6	4.6	4.6	4.6	4.6	4.6	

Fan	Atmospheric attenuation, dB (Shed)							Sound pressure level at dwelling, dB (Shed)						
	1	2	3	4	5	6		1	2	3	4	5	6	
1	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
2	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
3	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
4	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
5	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
6	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
7	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
8	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
9	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
10	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
11	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
12	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
13	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
14	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
15	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
16	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
17	1.9	1.9	1.9	1.9	1.9	1.9		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	

BS4142 character correction		0 0 0 3
100% fans operating	Specific Level, dB	19
	Rating Level, dB	22
50% fans operating[Note 1]	Specific Level, dB	16
	Rating Level, dB	19
20% fans operating[Note 2]	Specific Level, dB	13
	Rating Level, dB	16

Note 1: Assumned only odd numbered fans operating

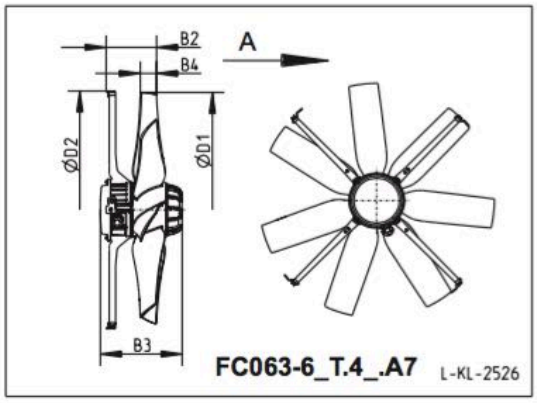
Note 2: Assumned only 3, 8 & 13 numbered fans operating

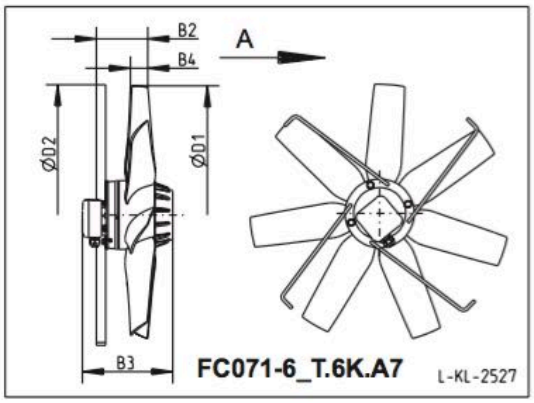
Chimney fans

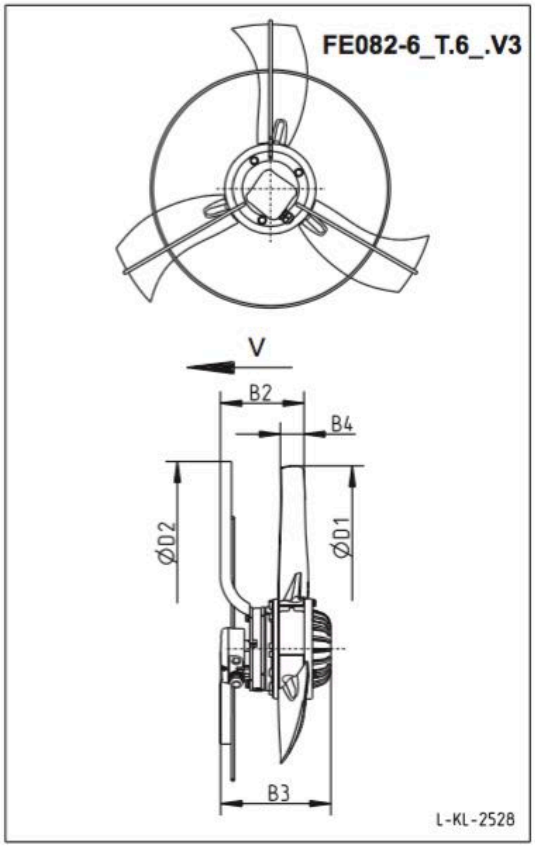
Technical details and dimensions

Technical Details													Sound
Diameter	Phase	Dimensions					Speed	Power	Current		Capacitor	Max Amb	Pressure
mm		B3	B4	B2	D1	D2	rpm	input (W)	rated	max	mf	°C	LpA(dB(A))
630	single	217.5	43	134,5	627	633	880	600	2,7	2,7	12	70	53
710	single	245.5	47	139,5	703	709	850	890	4,1	4,6	16	60	57
820	single	245.5	55	184,0	820	840	770	770	3,8	4,4	16	70	55
630	three	197,5	43	134,5	627	633	890	590	1,3	1,3	-	60	53
710	three	245,5	47	139,5	703	709	890	890	1,8	1,8	-	70	57
820	three	220,5	55	184,0	820	840	910	780	1,7	1,7	-	60	55

Maximum currents under motor speed control are up to 15% higher than running currents.
Acoustic pressure level taken, free blowing at a distance of 7m on the output side, 45 degrees to the axis of the fan.
Mounting brackets for the 630 mm and 820 mm diameters are available as accessories.







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