MATRIX ACOUSTIC DESIGN CONSULTANTS

**Proposed Poultry Units**
**Ditchford Bank Farm**
**Hanbury**
**Bromsgrove**
**B60 4HS**

NOISE IMPACT ASSESSMENT

Acoustics Report M2113/R01
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To: Ian Pick Associates Ltd
Station Farm Office
Wansford Road
Nafferton
Driffield
East Yorkshire
YO25 8NJ

By: Paul Smith BSc MIOA

**Brookfield Coach House**
**Weston Lane**
**Bath BA1 4AG**

**M: 07765 518035**
**T: 01225 667 470**
**E: mail@matrixacoustics.co.uk**

## 1. Introduction

This acoustic report documents a noise impact assessment for the proposed poultry units at Ditchford Bank Farm, Hanbury, Bromsgrove; Figure 1 and 2.

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: Noise Impact Assessment
- Section 6: Conclusion
- Appendix A: Survey Data
- Appendix B: Calculations
- Appendix C: Fan noise data

## 2. Overview of the Development

The proposal is for 4 poultry units at Ditchford Bank Farm, Hanbury, Bromsgrove; Figure 1 and 2.

The closest dwellings, labelled A - C in Figure 1, are approximately between 435m - 755m from the proposed poultry unit.

For the noise impact assessment, the noise sources generated by the proposed scheme have been split into two categories, namely:

- **Plant noise:** The only plant associated with the development will be ventilation extract fans and a biomass boiler:
    - **Ventilation fans:** Manufacturers' data sheets for the fans are provided in Appendix C.
        - Roof mounted fans: 11 x Fancom 3680 fans per shed, arranged in two rows either side of the ridge; Figure 2. Existing Ditchford Farm barns will provide acoustic shielding (i.e., block the line of sight) of some of the duct terminations; there will be an unobstructed noise path between all the duct terminations and Dwellings B and C
        - Gable end fans: 9 x Fancom 34130 fans, located on the south gable end. Dwellings A and B will be fully acoustically shielded from the extract fan grilles by the sheds themselves.

      The ridge extract fans will typically provide the ventilation requirements on their own; the gable end fans are only needed if the ridge fans are not able to provide the required ventilation due to failure or during periods of high external temperatures.
    - **Biomass boiler:** The biomass boiler will be fully enclosed within a building, with an exhaust flue terminating at 10m above local ground; Figure 3.
- **Transport noise:** Transport noise includes commercial vehicles manoeuvring and loading/unloading on the concrete aprons to the north of the poultry units; Figure 1. An electric forklift will be used for the loading/unloading of HGVs. Vehicles will access the site via the access road as shown in Figure 1. Activities on the concrete apron will be fully shielded from Dwelling C by the sheds themselves.

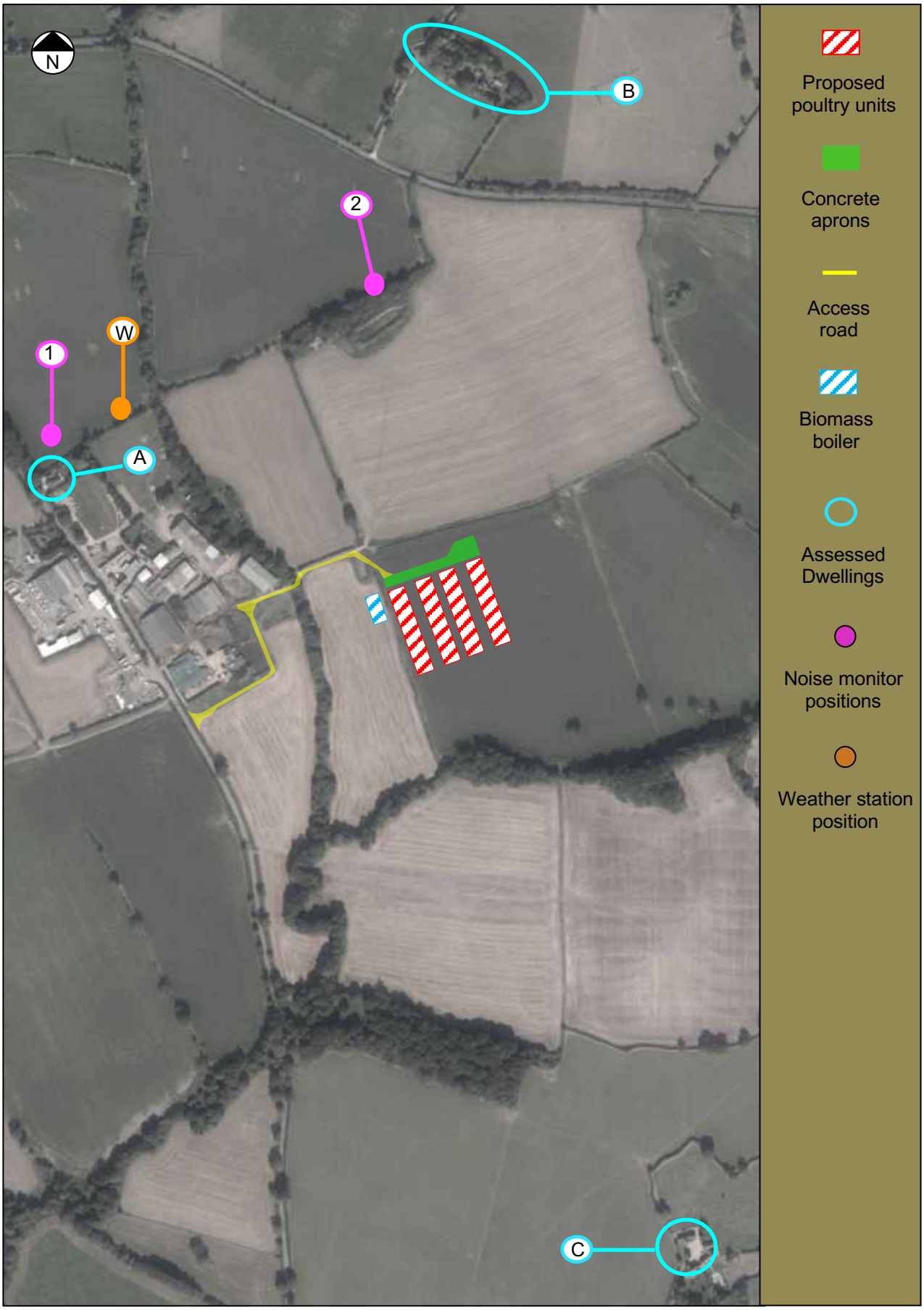



Figure 1. Aerial view (source: www.google.com) showing footprint of proposed poultry units, assessed dwellings and noise monitor and weather station positions

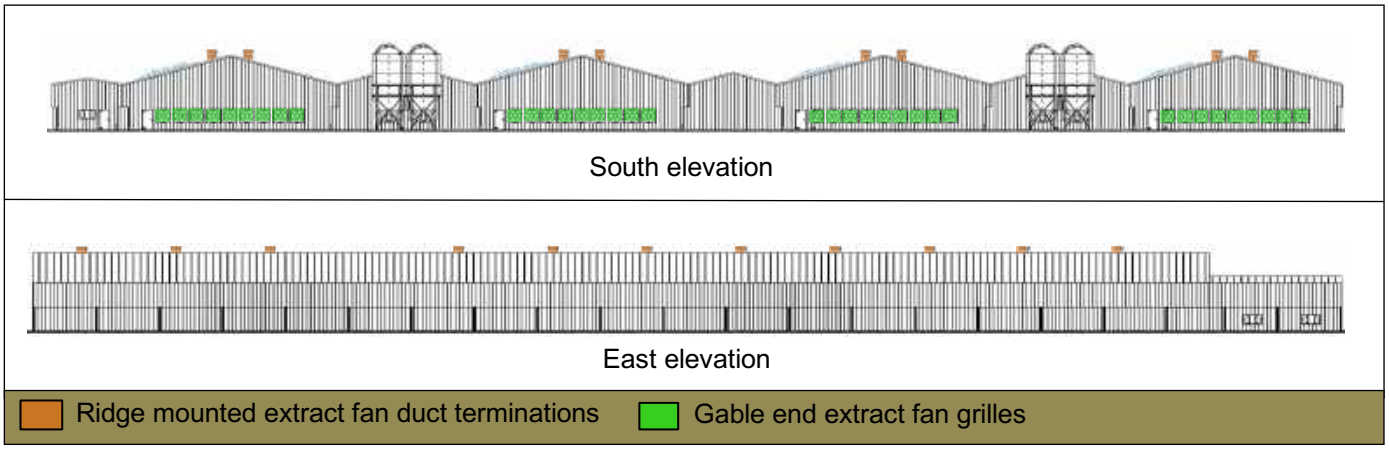



Figure 2. South and east elevations of proposed poultry unit

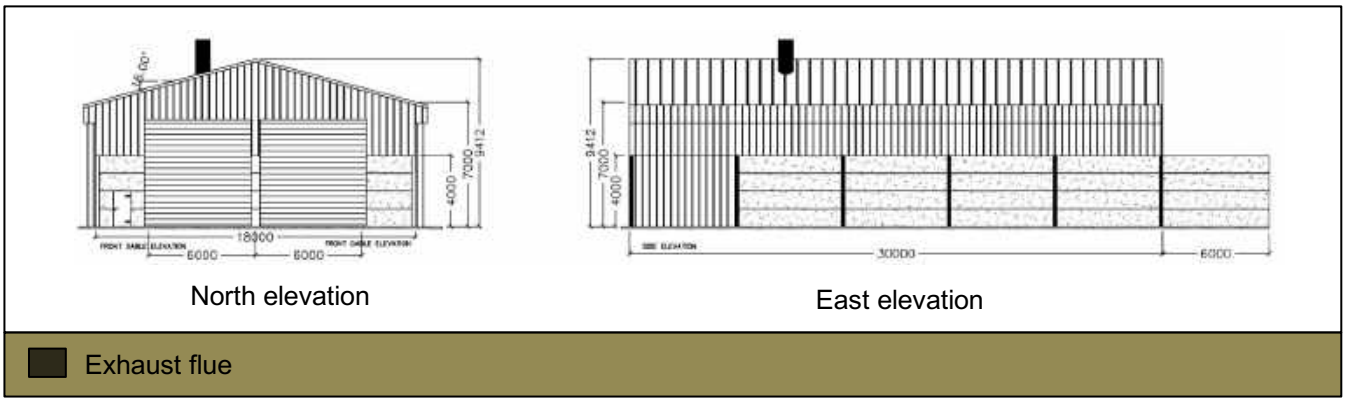



Figure 3. Elevations of proposed biomass boiler shed

## 3. BS4142:2014

The noise assessments detailed in this report of the plant and transport activities within the concrete apron have 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, depending on context
- A difference of +5dB is likely to be an indication of an adverse impact, depending on context
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on context

Context, as defined in BS4142:2014, includes the consideration of the following factors:

- The absolute level of the noise emissions
- Character and level of the residual sound compared to the character and level of the Specific Level
- Sensitivity of the receptor and any acoustic design measures (e.g. façade sound insulation, use of mechanical ventilation and acoustic screening) incorporated at premises used for residential purposes

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'*.

### 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**: Monday 22nd – Tuesday 23rd March 2021
- **Weather;** Table A2, Appendix A:
  - Precipitation: Dry
  - Wind Speed: Highest recorded wind speed of 3.2m/sec, with a median of 0.0m/s

  - Wind direction:
    - 12:00 – 01:00hrs: W
    - 01:00 - 13:00hrs: SW
  - The weather conditions will not have adversely affected the noise measurements.
- **Noise monitor locations:** With the microphones attached to tripod the noise monitors were located at Positions 1 and 2 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 4500
  - Noise monitors: Brüel & Kjær Type 2238 (Positions 1 & 2)
- **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:** Noise monitors 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 Tables A1 and A2, Appendix A.

## 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, farm activity noise (e.g., tractor movements) and bird song.

The general noise environment was considered quiet.

## 4.2 Typical background noise level, $L_{A90}$, at Dwellings A - C

Figures 4 and 5 show the variation in the measured maximum ($L_{Amax,F}$), ambient ($L_{Aeq}$) and background ($L_{A90}$) noise levels obtained at Positions 1 and 2 respectively.

As can be seen the noise levels follow the same general variation at both measurement positions. This indicates that they were exposed to the same noise environment.

The background and ambient noise levels are slightly higher at Position 1 than the corresponding values recorded at Position 2. This will be due to Position 1's closer distance to a road.

From the survey the typical background noise levels at Positions 1 and 2 have been established as:

- Position 1:
  - Day (07:00 – 20:00hrs): $L_{A90}$ 38dB
  - Evening and night (20:00 – 07:00hrs): $L_{A90}$ 32dB
  - Night (23:00 – 07:00hrs): $L_{A90}$ 28dB
- Position 2
  - Day (07:00 – 20:00hrs): $L_{A90}$ 37dB
  - Evening and night (20:00 – 07:00hrs): $L_{A90}$ 28dB
  - Night (23:00 – 07:00hrs): $L_{A90}$ 25dB

The above values determined at Position 1 are considered representative to the typical background noise levels that will occur at Dwelling A, whilst those established at Position 2 are considered representative to those that will occur at Dwellings B and C.

Figure 4. Position 1 noise monitor data (free-field)

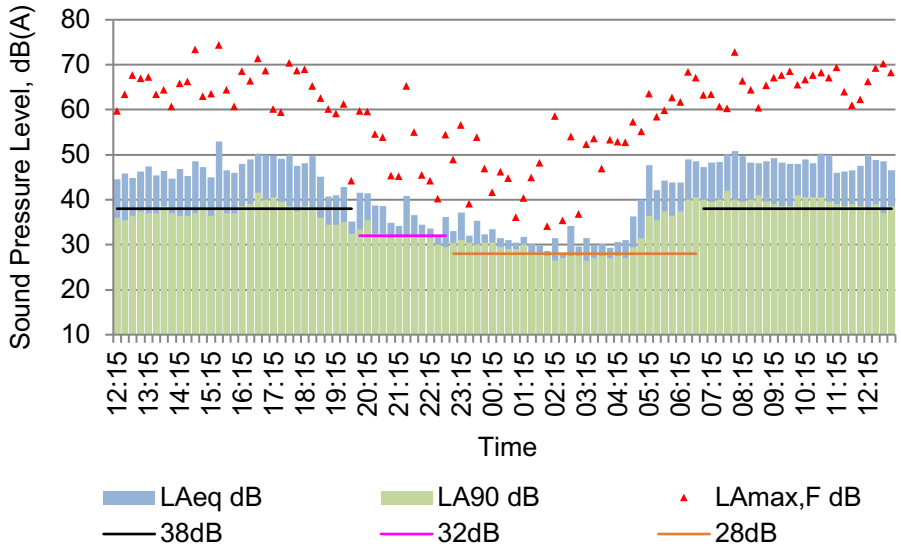
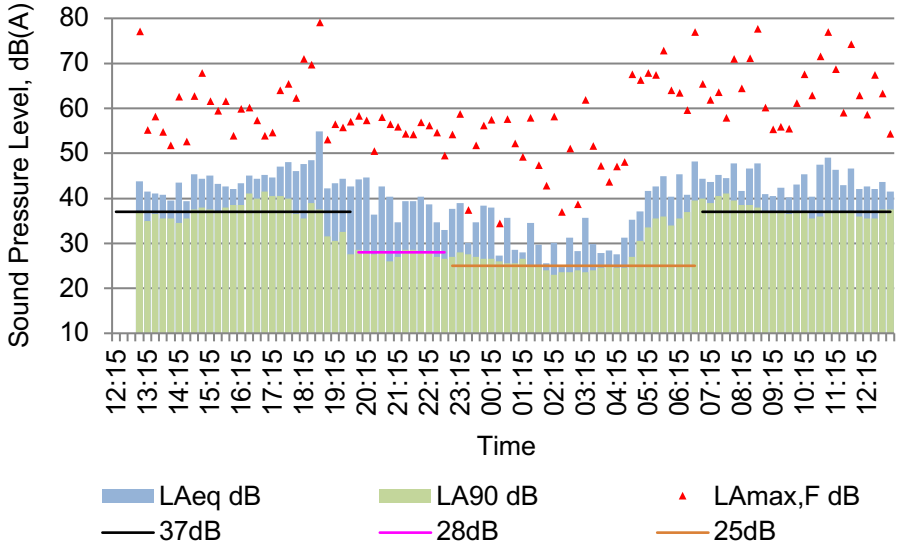



Figure 5. Position 2 noise monitor data (free-field)




## 5. Noise Impact Assessment

### 5.1 Calculation of aggregate extract fan and transport noise at Dwellings A - C

The full calculations of the extract fans, biomass boiler and transport noise are provided in Tables B1 – B6, Appendix B. The resultant BS4142 Rating and Assessment Level at Dwellings A - C are given in Table 2.

### 5.2 Source noise data

- **Extract fans:**
  - Ridge extract fan type:
    - Type: Fancom 3680

        - Duct terminations: ridge mounted ducts, terminating 8.2m above ground
        - Total number of fans: 11 per shed, arrange in two rows either side of the ridge
        - Sound pressure level: 70dB(A) at 2m, 45° lateral; see Appendix C for manufacturers data sheet
    - Gable end extract fans:
        - Type: Fancom 34130
        - Grille locations: South gable end
        - Total number of fans: 9 per shed
        - Sound pressure level: 75dB(A) at 2m, 45° lateral; see Appendix C for manufacturers data sheet

- **Transport noise:**
    - HGV movements: HGV manoeuvring on concrete apron - $L_{Aeq}$ 72dB & $L_{Amax,F}$ 80dB at 5m , HGV pass on access road – SEL 87dB at 5m; source levels derived by measurements made by Matrix Acoustics during poultry catching at Parton Poultry Farm, Herefordshire on 9/1/14
    - HGV loading/unloading using an electric forklift: $L_{Aeq}$ 63dB & $L_{Amax,F}$ 84dB at 5m; source levels derived by measurements made by Matrix Acoustics at B&Q Trowbridge on 13/6/17 of an electric forklift loading an HGV with laden pallets.
- **Biomass boiler:** Measurements by ourselves and MLM Acoustics of comparable sized biomass boiler systems operating at full capacity:
    - Noise level within biomass boiler room: 80dB(A)
    - Noise emissions from exhaust stack: 70dB(A) at 1m

## 5.3 Extract fan operation

The temperature within the sheds is determined by a combination of the heat generated by the birds themselves, the external temperature and the ventilation provided by the extract fans.

To provide sufficient ventilation of the bird generated heat, as required to maintain the ideal internal operating temperature of around 20°C, up to 25% of the roof extract fans will be required to operate (either intermittently or on variable speed).

With the influence of the external temperature additional extract fans may be required in order to maintain the ideal operating internal temperature. Here the fans are operated in Stages, triggered with each 1°C rise above the ideal internal temperature. The highest Stage will typically only be triggered when the internal temperature rises above 23°.

Normally the roof extract fans will provide sufficient extraction on their own; the gable end fans are only required during periods of extreme external temperatures or due to failure of the roof extract fans.

The operation of 100% of the roof extract fans, and additionally the gable end fans if required, are only expected to occur during the day period when the external temperatures have the potential to be higher.

During the evening and night, when the external temperature will fall, there will be a corresponding decrease in the number of roof extract fans needed above those for bird generated heat alone; the expected percentage of ridge extract fans required to maintain the set temperature are 50% and 25% for the evening and night periods respectively.

For the assessment the calculations have therefore reviewed the following scenarios:

- Day (07:00 – 20:00hrs): 100% roof and gable end extract fans operating (this is the worst-case scenario; typically the gable end fans will not be required to operate)

- Evening (20:00 – 23:00hrs): 50% roof extract fans operating
- Night (23:00 – 07:00hrs): 25% roof extract fans operating

## 5.4 Transport vehicle operation

Table 1 provides the proposed frequency and type of commercial vehicles over the 45day flock cycle (8 flocks per annum).

The majority of transport movements will only occur during the working day (07:00 – 20:00hrs). However, in order to avoid stressing the birds catching is typically undertaken during the night. Loading/unloading of the HGVs will be undertaken using an electric forklift on the concrete apron to the north of the poultry units.

Table 1. Proposed Commercial Traffic Generation

| Day | Activity | Vehicle Size | Proposed Frequency | Day | Activity | Vehicle Size | Proposed Frequency |
|---|---|---|---|---|---|---|---|
| 1 | Chick Delivery | 16.5m HGV | 3 | 25 | Feed Delivery | 16.5m HGV | 1 |
| 2 | | | | 26 | Feed Delivery | 16.5m HGV | 1 |
| 3 | | | | 27 | Feed Delivery | 16.5m HGV | 1 |
| 4 | | | | 28 | Carcass Collection | Box Van | 1 |
| 5 | | | | | Feed Delivery | 16.5m HGV | 1 |
| 6 | Feed Delivery | 16.5m HGV | 1 | 29 | Feed Delivery | 16.5m HGV | 1 |
| 7 | Carcass Collection | Box Van | 1 | 30 | Catching Gang | Mini Bus | 1 |
| 8 | Feed Delivery | 16.5m HGV | 1 | | Bird Removal (Thinning) | 16.5m HGV | 10 |
| 9 | | | | 31 | Feed Delivery | 16.5m HGV | 1 |
| 10 | Feed Delivery | 16.5m HGV | 1 | 32 | Feed Delivery | 16.5m HGV | 1 |
| 11 | | | | 33 | Feed Delivery | 16.5m HGV | 1 |
| 12 | Feed Delivery | 16.5m HGV | 1 | 34 | Feed Delivery | 16.5m HGV | 1 |
| | Gas Delivery | Tanker | 1 | 35 | Feed Delivery | 16.5m HGV | 1 |
| 13 | | | | 36 | Feed Delivery | 16.5m HGV | 1 |
| 14 | Carcass Collection | Box Van | 1 | 37 | Catching Gang | Mini Bus | 1 |
| | Feed Delivery | 16.5m HGV | 1 | | Bird Removal (Final Clearance) | 16.5m HGV | 10 |
| 15 | | | | 38 | Catching Gang | Mini Bus | 1 |
| 16 | Feed Delivery | 16.5m HGV | 1 | | Bird Removal (Final Clearance) | 16.5m HGV | 10 |
| 17 | | | | 39 | Carcass Collection | Box Van | 1 |
| 18 | Feed Delivery | 16.5m HGV | 1 | 40 | Manure Removal | 16.5m HGV | 9 |
| 19 | | | | 41 | Washing Gang | Mini Bus | 1 |
| 20 | Feed Delivery | 16.5m HGV | 1 | 42 | Washing Gang | Mini Bus | 1 |
| 21 | Carcass Collection | Box Van | 1 | | Gas Delivery | Tanker | 1 |
| | Feed Delivery | 16.5m HGV | 1 | 43 | Shavings Delivery | 16.5m HGV | 1 |
| 22 | Feed Delivery | 16.5m HGV | 1 | 44 | Dirty Water Removal | Tanker | 4 |
| 23 | Feed Delivery | 16.5m HGV | 1 | 45 | Chick Crumb | 16.5 HGV | 2 |
| 24 | Feed Delivery | 16.5m HGV | 1 | **Total per flock** | | | 85 |
| | Gas Delivery | Tanker | 1 | **Total per Annum (8 flocks)** | | | 680 |

## 5.5 Biomass boiler operation

The biomass boiler will be operated as required and therefore can be running day or night.

## 5.6 Derivation of aggregate Specific Level

The individual noise level of each noise source has been calculated at Dwellings A and B; Figure 1. The following corrections have been applied to the source noise data:

- **Directivity correction (extract fans only):**
  - Ridge fans: correction to convert the fan noise data from the manufacturers stated level at 45° lateral to 90° lateral (the propagation angle for the assessed dwellings), determined using the corrections given in Duct Directivity Index Applications (Day H. Hansen C & Bennett B, Acoustics Australia 96 Vol. 37 December (2009) No. 3). For the calculation a frequency spectra has been used
  - Gable end fans: correction to convert the fan noise data from the manufacturers stated level at 45° from the termination to the propagation angle for the assessed dwellings (ranges between 50° to 90°), determined using the corrections given in Figure 11.2, p322, Noise Control in Building Services, SRL Ltd. For the calculation a frequency spectra has been used
- **Reflections (extract fans only):** 3dB added to account for reflections off the poultry shed roof/gable end façade
- **Distance correction:** 20 x log ($d_1/d_0$), where $d_1$ = distance between receptor and the proposed extract fan and $d_0$ = reference distance. Note that for transport activities it has been assumed that they are occurring on the east apron for Dwelling A and the west apron for Dwelling B.
- **Shielding attenuation:** Where the line of sight between the noise source and dwelling is fully blocked by a solid barrier (e.g. by poultry units themselves) 10dB shielding correction has been applied in accordance with BS5228-1 2009.
- **Ground absorption correction:** ISO 9613-2: Attenuation of sound during propagation

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

  Where,

  $h_m$ = mean height of the propagation path above ground

  d = distance from source to receptor

  In accordance with ISO 9613-2 the ground absorption correction is assumed to be zero when the line of sight of the noise source is partially or fully blocked by a solid body (i.e. when a shielding correction is applicable)
- **Atmospheric attenuation:** ISO 9613-2: Attenuation of sound during propagation outdoors, Formula 8:

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

  Where,

  $\alpha$ = 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 are known
- **On-time correction:** The following on-times have been used:
  - Extract fans & biomass boiler: it has been assumed that the extract fans and biomass boiler are operating continuously and consequently no ‘on-time’ correction has been applied
  - Transport movements:

- Day (over any 1 hour period): 45-minutes for loading/unloading and 2 minutes for manoeuvring
- Night (over any 15-minute period): 15-minutes for loading/unloading and 2 minutes for manoeuvring

Tables B1 – B6, Appendix B provide the full calculations with the resultant aggregate Specific Levels at the Dwellings A - C.

## 5.7 Derivation HGVs access road movements Specific Level

The Specific Level of HGV movements on the access road have been calculated using:

$$L_{Aeq(T)} = SEL - 20 \times Log ((d_1/d_0) - A_{gnd} - A_{atmos} + 10 \times Log (N) - 10 \times Log (T)$$

Where,

SEL = Sound Exposure Level; measured level as given in Table B3
$d_1$ = distance between receptor and the noise source
$d_0$ = measurement distance from the noise source (5m)
$A_{gnd}$ = ground absorption correction as detailed is section 5.5
$A_{stmos}$ = atmospheric attenuation as detailed is section 5.5
N = number of HGV passes in time period T; 2/hr during the day (arriving and departing) and 1 with a 15-minute night assessment period
T = Time period in seconds; 3600 seconds during the day/evening periods and 900 seconds during the night

The calculation of the Specific Levels are given in Table B5, Appendix B.

## 5.8 Rating Level

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

- **Extract fans:** 0dB. The proposed extract fans will not contain impulsive noise elements and their noise emissions will be sufficiently low such that their intermittent operation will not being 'readily distinctive against the residual noise environment'; inhouse measurements of in situ Fancom units confirm that they are not tonal according to BS4142
- **Biomass Boiler:** 0dB. Inhouse measurements found that biomass boilers can be tonal within their enclosure. However, externally at the distances to the nearest receptors as assessed, it has been found that tonality was not identifiable. The biomass boiler will not contain an impulsive noise elements. The biomass boiler will be running for prolonged periods, with any starting/stopping being at a slow pace. Hence any intermittency in operation will not being 'readily distinctive against the residual noise environment'.
- **Stock collection/delivery**
  - HGV manoeuvring – 3dB to account for intermittency of operation.
  - Loading/unloading using a forklift – 6dB to account for potential 'highly perceptible' impulsive noise. Note that we have observed that with careful operation of the forklift (i.e. slowing loading crates) impulsive noise can be minimised. The operation noise will also be intermittent. However, as is standard practice, the total character corrections have been capped at 6dB

Note that it is a bit of a grey area with regard to the suitability of BS4142 assessments for determining the impact of transport movements on access roads. As a robust approach however, we have included HGV movements on the access road.

## 5.9 Assessment Level

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

RL = aggregate Rating Level, dB(A); see Appendix B
$L_{A90}$ dB = established typical background noise level, $L_{A90}$

Table 2 provides the resultant Assessment Levels at Dwellings A - C.

Table 2. Typical background and calculated Rating and Assessment Levels at Dwellings A - C; Figure 1

| Noise source | Dwelling; Figure 1 | Day: 07:00 - 20:00hrs | | | | | Evening: 20:00 - 23:00hrs | | | Night : 23:00 - 07:00hrs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 100% roof & gable end extract fans operating | | 100% roof extract fans operating | | | 50% roof extract fans operating | | | 25% roof extract fans operating | |
| | | Typical $L_{A90}$ dB | Rating Level, dB | Assessment Level, dB | Rating Level, dB | Assessment Level, dB | Typical $L_{A90}$ dB | Rating Level, dB | Assessment Level, dB | Typical $L_{A90}$ dB | Rating Level, dB | Assessment Level, dB |
| Extract fans | A | 38 | 26 | -12 | 24 | -14 | 32 | 22 | -10 | 28 | 20 | -8 |
| | B | 37 | 26 | -11 | 25 | -12 | 28 | 23 | -5 | 25 | 21 | -4 |
| | C | 37 | 38 | 1 | 23 | -14 | 25 | 20 | -5 | 25 | 18 | -7 |
| Biomass Boiler | A | 38 | 14 | -24 | 14 | -24 | 32 | 14 | -18 | 28 | 14 | -14 |
| | B | 37 | 7 | -30 | 7 | -30 | 28 | 7 | -21 | 25 | 7 | -18 |
| | C | 37 | 8 | -29 | 8 | -29 | 25 | 8 | -17 | 25 | 8 | -17 |
| HGV loading | A | 38 | 24 | -15 | 24 | -15 | 32 | 24 | -9 | 28 | 26 | -2 |
| | B | 37 | 21 | -16 | 21 | -16 | 28 | 21 | -7 | 25 | 24 | -2 |
| | C | 37 | 12 | -25 | 12 | -25 | 25 | 12 | -13 | 25 | 14 | -11 |
| HGV on access road | A | 38 | 17 | -21 | 17 | -21 | 32 | 17 | -15 | 28 | 20 | -8 |
| | B | 37 | 9 | -28 | 9 | -28 | 28 | 9 | -19 | 25 | 12 | -13 |
| | C | 37 | 6 | -31 | 6 | -31 | 25 | 6 | -19 | 25 | 9 | -16 |
| Aggregate | A | 38 | 28 | -10 | 27 | -11 | 32 | 27 | -5 | 28 | 28 | 0 |
| | B | 37 | 27 | -10 | 27 | -10 | 28 | 25 | -3 | 25 | 26 | 1 |
| | C | 37 | 38 | 1 | 23 | -14 | 25 | 21 | -4 | 25 | 20 | -5 |

Where the Rating Level is at parity with the typical background noise level (Assessment Level = 0 dB) BS4142 states that the Specific Level will have a low impact; an adverse impact is indicated where the Rating Level is ≥ 5dB and <10dB above the typical background noise level.

With the ventilation system operating at normal capacity, i.e., only the roof extract fans running, the aggregate Assessment Levels (extract fans + biomass boiler + transport activities) during the day and evening are at highest -3dB. For this scenario we therefore conclude that the noise impact will be low during both the day and evening.

With the contribution of the emergency gable end fans the Assessment Level increases to 1dB. Taking into consideration that a 1dB change in noise level is not perceptible (i.e., an Assessment Level of 1dB would be perceived as the same as 0dB), we conclude that with the operation of the gable end fans, the noise impact will also be low.

During the night (23:00 – 07:00hrs) both the typical background noise level and established Rating Levels (individual and aggregate) are very low. We therefore consider, in accordance with BS4142, that the absolute noise levels at Dwellings A - C during the night are of more relevance in determining the noise impact than the Assessment Levels in this case.

We consider it is reasonable to assume that the occupiers of the nearest dwellings will be within their houses during the night period. A room with an open window will provide 10 – 15dB sound reduction. Using the lower 10dB reduction the highest noise ingress would be:

- Ventilation fans only: Ridge extract fans: $L_{Aeq}$ 11dB
- Aggregate (transport + ventilation fans + biomass boiler): $L_{Aeq,5min}$ 14dB, $L_{Amax,F}$ 29B (maximum noise events generated by transport activities)

The above ambient noise ingress levels are very low, being below the lowest measured background noise level and >10dB below BS8233 $L_{Aeq}$ 30dB noise ingress limits for bedrooms (noise limit applicable to road traffic noise and continuous operating plant).

ProPG: Planning & Noise (2017) provides guidance with regard to maximum noise events and sleep quality. Where individual noise events do not normally exceed 45dB more than 10 times a night within a bedroom ProPG states that this represents a reasonable threshold below which the effects of individual noise events on sleep can be regarded as negligible; the maximum noise ingress levels generated by the transport activities fall significantly below this threshold.

We therefore conclude that during the night the noise emissions from the development will result in a **very low** noise impact.

## 5.10 Site management

Though a very low noise impact has been determined for the assessed noise sources, site management will still be important to minimise noise emissions. This should include:

- Drivers of HGVs instructed to avoid leaving engines running or excessive revving of engines.
- Forklift drivers instructed to move stock carefully, avoiding unnecessary scraping and to slowly lift/place crates in order to minimise impact noise
- Maintenance and repair of the concrete apron/access road to ensure that they are as smooth as practicable to minimise impact noise

## 5.11 Calculation uncertainty

With all calculations there is a +/-3dB level of uncertainty. This small level of uncertainty, which equates to a just perceptible change in noise level, has no impact of the assessment findings.

The difference between halving or doubling the number of fans operating (e.g. 50% to 100%) is 3dB. With smaller changes in the number of fans operating, for example, 50% to 70%, the change in aggregate noise emissions will be less than 2dB; this represents an imperceptible change in noise.

We therefore consider the used percentage of fans as suitably robust for the purpose of the assessment; it reflects the percentage of fans used in poultry units as advised by both operators and experts and would not result in a perceptible change in noise emissions with a 20 – 25% increase/decrease in the number of fans operating.

We have measured transport activity noise levels at various poultry and other commercial developments. These have returned results comparable to the source data used in this assessment. We therefore conclude that the source noise data is suitably robust and representative for the purpose of the assessment.

## 6. Conclusion

A noise survey has been conducted to determine the typical background noise levels at the nearest dwellings (Dwellings A - C, Figure 1) to the proposed poultry units at Ditchford Bank Farm, Hanbury, Bromsgrove; Figure 1 and 2.

The extract fan, biomass boiler and transport noise (HGV movements and loading/unloading using a forklift within the concrete apron) as a result of the proposed development have been assessed in accordance with BS4142:2014.

Via calculation (Appendix B) it has been demonstrated that the aggregate BS4142 noise impact of the extract fans, biomass boiler and transport activities during the day and evening will be **low**.

Due to the very low Rating Levels and typical background noise levels during the night the absolute noise emission levels have been assessed to review acceptability; this is in accordance with guidance given in BS4142.

During the night the aggregate ambient noise ingress via an open window of the ridge extract fans, air scrubber system, transport activities and incinerator have been established to be below the existing underlying noise environment and >10dB below BS8233's noise ingress limits for bedrooms (note the limits are applicable to road traffic and continuous operating plant).

The individual maximum noise events generated by the HGVs loading/unloading will result in noise ingress levels via an open window below $L_{Amax,F}$ 45dB. In accordance with ProPG (2017) this indicates a negligible noise impact with regard to sleep disturbance.

We therefore conclude that during the night the absolute noise levels will result in a **very low** noise impact.

Site management with regard to minimising noise emissions has been discussed.

On the basis that the proposed development will not result in an adverse noise impact at the nearest dwellings, we conclude that on noise grounds it is acceptable.

| Table A1. Noie monitor data (free-field) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Start Time | Position 1 | | | Position 2 | | | Start Time | Position 1 | | | Position 2 | | | |
| | $L_{Amax,F}$ 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 | |
| 12:15 | 59.8 | 44.5 | 36.0 | | | | 00:45 | 44.8 | 31.0 | 29.0 | 57.6 | 35.6 | 25.5 | |
| 12:30 | 63.4 | 45.8 | 35.5 | | | | 01:00 | 36.2 | 30.5 | 29.0 | 52.1 | 28.5 | 25.5 | |
| 12:45 | 67.7 | 44.9 | 36.5 | | | | 01:15 | 40.4 | 31.7 | 30.0 | 49.2 | 28.0 | 26.5 | |
| 13:00 | 67.0 | 46.3 | 37.5 | 77.1 | 43.8 | 37.0 | 01:30 | 45.0 | 30.2 | 28.0 | 57.8 | 34.5 | 25.0 | |
| 13:15 | 67.3 | 47.4 | 37.0 | 55.2 | 41.5 | 35.0 | 01:45 | 48.3 | 29.7 | 28.0 | 47.4 | 29.7 | 25.0 | |
| 13:30 | 63.5 | 45.4 | 37.0 | 58.2 | 41.0 | 36.5 | 02:00 | 34.1 | 28.6 | 27.5 | 42.8 | 25.5 | 24.0 | |
| 13:45 | 64.5 | 46.4 | 38.5 | 54.8 | 40.8 | 35.5 | 02:15 | 58.7 | 31.4 | 26.5 | 58.2 | 30.1 | 23.0 | |
| 14:00 | 60.8 | 44.7 | 37.0 | 51.8 | 39.5 | 35.5 | 02:30 | 35.5 | 28.2 | 27.0 | 37.0 | 24.7 | 23.5 | |
| 14:15 | 65.9 | 46.8 | 36.5 | 62.5 | 43.5 | 34.5 | 02:45 | 54.1 | 34.1 | 27.5 | 51.1 | 31.3 | 23.5 | |
| 14:30 | 66.3 | 45.3 | 36.5 | 52.6 | 39.3 | 35.5 | 03:00 | 36.8 | 29.6 | 27.5 | 38.6 | 28.2 | 24.0 | |
| 14:45 | 73.5 | 48.6 | 37.0 | 62.7 | 45.4 | 37.5 | 03:15 | 52.4 | 31.5 | 26.5 | 61.9 | 35.7 | 23.5 | |
| 15:00 | 63.1 | 47.2 | 38.0 | 67.8 | 44.3 | 38.0 | 03:30 | 53.7 | 29.8 | 27.0 | 51.6 | 29.8 | 24.0 | |
| 15:15 | 63.6 | 45.0 | 36.5 | 61.6 | 45.0 | 37.5 | 03:45 | 46.9 | 30.2 | 27.5 | 47.2 | 27.9 | 24.5 | |
| 15:30 | 74.4 | 52.9 | 38.0 | 59.4 | 43.2 | 37.0 | 04:00 | 53.3 | 29.3 | 27.0 | 43.7 | 28.4 | 25.0 | |
| 15:45 | 64.4 | 46.6 | 37.0 | 61.5 | 42.7 | 38.0 | 04:15 | 52.9 | 30.6 | 27.5 | 47.1 | 27.5 | 24.5 | |
| 16:00 | 60.7 | 46.0 | 37.0 | 53.9 | 42.1 | 38.5 | 04:30 | 52.8 | 31.0 | 27.0 | 48.1 | 31.2 | 24.5 | |
| 16:15 | 68.6 | 47.9 | 38.5 | 59.8 | 43.3 | 38.5 | 04:45 | 57.3 | 36.3 | 29.5 | 67.5 | 35.3 | 27.0 | |
| 16:30 | 66.5 | 49.0 | 39.0 | 60.2 | 45.1 | 41.0 | 05:00 | 55.2 | 40.0 | 31.5 | 66.2 | 37.1 | 30.5 | |
| 16:45 | 71.4 | 50.3 | 41.5 | 57.3 | 44.4 | 40.0 | 05:15 | 63.6 | 47.7 | 36.5 | 67.8 | 41.6 | 33.5 | |
| 17:00 | 68.8 | 50.0 | 40.0 | 53.9 | 45.2 | 41.5 | 05:30 | 58.5 | 42.1 | 35.5 | 67.4 | 42.6 | 35.5 | |
| 17:15 | 60.2 | 49.8 | 40.5 | 54.6 | 44.6 | 40.5 | 05:45 | 59.9 | 44.3 | 37.5 | 72.8 | 44.9 | 36.0 | |
| 17:30 | 59.5 | 49.1 | 39.5 | 64.0 | 47.0 | 40.5 | 06:00 | 62.8 | 43.8 | 36.5 | 64.0 | 40.4 | 34.0 | |
| 17:45 | 70.5 | 50.0 | 38.5 | 65.4 | 48.1 | 40.0 | 06:15 | 61.8 | 43.8 | 37.5 | 63.4 | 45.4 | 35.5 | |
| 18:00 | 68.8 | 47.5 | 37.5 | 62.3 | 46.0 | 36.5 | 06:30 | 68.5 | 49.0 | 40.0 | 59.5 | 40.8 | 37.0 | |
| 18:15 | 69.0 | 48.1 | 38.5 | 70.9 | 47.6 | 35.5 | 06:45 | 67.2 | 48.5 | 40.5 | 76.9 | 48.2 | 39.5 | |
| 18:30 | 65.3 | 49.6 | 38.0 | 69.7 | 48.4 | 39.0 | 07:00 | 63.3 | 47.3 | 40.0 | 65.4 | 44.3 | 40.0 | |
| 18:45 | 62.6 | 45.1 | 36.0 | 79.0 | 54.9 | 37.5 | 07:15 | 63.4 | 48.2 | 39.5 | 61.8 | 43.7 | 39.0 | |
| 19:00 | 60.2 | 40.7 | 34.5 | 53.0 | 42.2 | 31.5 | 07:30 | 60.7 | 48.4 | 40.0 | 63.6 | 45.2 | 40.5 | |
| 19:15 | 59.2 | 41.0 | 34.5 | 56.4 | 43.3 | 30.5 | 07:45 | 60.3 | 50.1 | 42.0 | 57.8 | 44.5 | 41.0 | |
| 19:30 | 61.4 | 42.9 | 35.0 | 55.7 | 44.3 | 32.5 | 08:00 | 72.9 | 50.8 | 40.0 | 70.9 | 47.8 | 39.5 | |
| 19:45 | 44.2 | 35.1 | 32.5 | 57.0 | 42.7 | 27.5 | 08:15 | 66.4 | 49.6 | 39.5 | 64.4 | 41.7 | 38.5 | |
| 20:00 | 59.8 | 41.6 | 33.5 | 58.3 | 44.2 | 28.5 | 08:30 | 64.4 | 48.2 | 40.0 | 71.1 | 46.6 | 38.5 | |
| 20:15 | 59.7 | 41.4 | 35.5 | 57.3 | 44.6 | 28.0 | 08:45 | 60.5 | 48.1 | 41.0 | 77.6 | 47.8 | 38.0 | |
| 20:30 | 54.7 | 38.7 | 32.5 | 50.4 | 36.4 | 27.5 | 09:00 | 65.4 | 48.6 | 39.5 | 60.1 | 40.9 | 37.0 | |
| 20:45 | 53.9 | 38.5 | 32.5 | 58.0 | 42.7 | 28.0 | 09:15 | 67.1 | 49.3 | 39.0 | 55.3 | 40.5 | 37.0 | |
| 21:00 | 45.4 | 34.8 | 31.5 | 56.4 | 40.3 | 26.0 | 09:30 | 67.8 | 48.2 | 38.5 | 55.9 | 42.4 | 37.0 | |
| 21:15 | 45.2 | 34.1 | 32.0 | 55.8 | 34.6 | 27.0 | 09:45 | 68.6 | 47.9 | 38.5 | 55.5 | 40.2 | 36.5 | |
| 21:30 | 65.3 | 40.9 | 32.0 | 54.3 | 39.4 | 28.5 | 10:00 | 65.6 | 48.0 | 41.0 | 61.2 | 43.1 | 37.0 | |
| 21:45 | 55.1 | 36.6 | 32.0 | 54.1 | 39.3 | 28.5 | 10:15 | 66.8 | 48.9 | 40.5 | 67.6 | 45.4 | 37.0 | |
| 22:00 | 45.5 | 34.5 | 32.0 | 56.8 | 40.4 | 28.0 | 10:30 | 67.8 | 48.1 | 40.5 | 62.9 | 40.3 | 35.5 | |
| 22:15 | 44.3 | 33.6 | 31.5 | 56.2 | 38.7 | 28.0 | 10:45 | 68.3 | 50.3 | 40.5 | 71.5 | 47.5 | 36.0 | |
| 22:30 | 40.3 | 32.0 | 30.0 | 54.6 | 34.7 | 27.0 | 11:00 | 67.1 | 50.0 | 39.5 | 76.9 | 49.0 | 37.0 | |
| 22:45 | 54.5 | 36.2 | 29.5 | 49.5 | 33.0 | 26.5 | 11:15 | 69.5 | 45.9 | 39.0 | 68.7 | 46.3 | 37.0 | |
| 23:00 | 48.9 | 33.0 | 30.5 | 54.2 | 37.7 | 27.0 | 11:30 | 64.0 | 46.3 | 38.5 | 59.0 | 42.9 | 37.0 | |
| 23:15 | 56.7 | 37.1 | 31.0 | 58.7 | 39.0 | 28.0 | 11:45 | 61.0 | 46.6 | 39.0 | 74.2 | 46.6 | 37.0 | |
| 23:30 | 39.2 | 32.0 | 30.5 | 37.4 | 30.1 | 27.5 | 12:00 | 62.4 | 47.6 | 38.5 | 62.8 | 42.0 | 36.0 | |
| 23:45 | 53.9 | 35.3 | 30.0 | 51.8 | 34.6 | 27.0 | 12:15 | 66.3 | 49.9 | 38.0 | 58.6 | 42.7 | 35.5 | |
| 00:00 | 47.0 | 32.3 | 30.5 | 56.1 | 38.4 | 26.5 | 12:30 | 69.3 | 48.8 | 39.0 | 67.4 | 42.0 | 35.5 | |
| 00:15 | 41.7 | 33.5 | 30.5 | 57.5 | 37.9 | 26.5 | 12:45 | 70.3 | 48.5 | 37.0 | 63.2 | 43.6 | 37.5 | |
| 00:30 | 46.3 | 31.5 | 29.5 | 34.4 | 27.2 | 26.0 | 13:00 | 68.3 | 46.6 | 38.5 | 54.3 | 41.5 | 37.5 | |

| 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 | Start Time | Wind Speed, m/s | Temp, °C |
| 12:30 | 1.7 | 8.1 | 18:40 | 0.0 | 4.5 | 00:50 | 0.0 | 0.1 | 07:00 | 0.0 | 5.5 |
| 12:40 | 2.2 | 8.4 | 18:50 | 0.0 | 3.2 | 01:00 | 0.0 | 0.7 | 07:10 | 0.0 | 5.8 |
| 12:50 | 1.2 | 8.1 | 19:00 | 0.0 | 2.6 | 01:10 | 0.0 | 1.2 | 07:20 | 0.0 | 6.0 |
| 13:00 | 1.6 | 7.7 | 19:10 | 0.0 | 2.0 | 01:20 | 0.0 | 1.7 | 07:30 | 0.0 | 6.2 |
| 13:10 | 1.8 | 8.3 | 19:20 | 0.0 | 2.8 | 01:30 | 0.0 | 1.9 | 07:40 | 0.0 | 6.5 |
| 13:20 | 0.7 | 7.9 | 19:30 | 0.0 | 2.0 | 01:40 | 0.0 | 2.2 | 07:50 | 0.0 | 6.8 |
| 13:30 | 3.2 | 8.2 | 19:40 | 0.0 | 1.1 | 01:50 | 0.0 | 2.4 | 08:00 | 0.0 | 7.0 |
| 13:40 | 1.5 | 8.5 | 19:50 | 0.0 | 1.3 | 02:00 | 0.0 | 2.6 | 08:10 | 0.0 | 7.1 |
| 13:50 | 2.3 | 8.7 | 20:00 | 0.0 | 1.3 | 02:10 | 0.0 | 2.9 | 08:20 | 0.0 | 7.2 |
| 14:00 | 1.0 | 9.1 | 20:10 | 0.0 | 1.4 | 02:20 | 0.0 | 3.1 | 08:30 | 0.4 | 7.6 |
| 14:10 | 1.9 | 8.3 | 20:20 | 0.0 | 1.3 | 02:30 | 0.0 | 3.2 | 08:40 | 0.0 | 7.9 |
| 14:20 | 1.6 | 8.4 | 20:30 | 0.0 | 0.7 | 02:40 | 0.0 | 3.8 | 08:50 | 0.4 | 7.8 |
| 14:30 | 1.9 | 9.0 | 20:40 | 0.0 | 0.9 | 02:50 | 0.0 | 3.7 | 09:00 | 1.1 | 8.0 |
| 14:40 | 0.6 | 8.6 | 20:50 | 0.0 | 0.6 | 03:00 | 0.0 | 3.8 | 09:10 | 0.0 | 8.5 |
| 14:50 | 1.6 | 8.5 | 21:00 | 0.0 | 0.3 | 03:10 | 0.0 | 3.9 | 09:20 | 0.0 | 8.4 |
| 15:00 | 2.3 | 9.0 | 21:10 | 0.0 | 0.4 | 03:20 | 0.0 | 3.9 | 09:30 | 0.0 | 8.6 |
| 15:10 | 1.8 | 8.7 | 21:20 | 0.0 | 1.3 | 03:30 | 0.0 | 4.1 | 09:40 | 1.2 | 8.6 |
| 15:20 | 2.9 | 8.9 | 21:30 | 0.0 | 0.5 | 03:40 | 0.0 | 4.5 | 09:50 | 0.4 | 8.9 |
| 15:30 | 1.6 | 8.6 | 21:40 | 0.0 | 0.3 | 03:50 | 0.0 | 4.4 | 10:00 | 0.0 | 9.2 |
| 15:40 | 0.5 | 8.8 | 21:50 | 0.0 | 0.2 | 04:00 | 0.0 | 4.5 | 10:10 | 0.9 | 9.3 |
| 15:50 | 2.8 | 9.2 | 22:00 | 0.0 | 0.4 | 04:10 | 0.0 | 4.5 | 10:20 | 0.0 | 9.6 |
| 16:00 | 2.9 | 8.9 | 22:10 | 0.0 | -0.1 | 04:20 | 0.0 | 4.4 | 10:30 | 0.0 | 9.9 |
| 16:10 | 1.0 | 8.7 | 22:20 | 0.0 | 0.6 | 04:30 | 0.0 | 4.3 | 10:40 | 0.5 | 10.3 |
| 16:20 | 1.7 | 8.9 | 22:30 | 0.0 | 0.0 | 04:40 | 0.0 | 4.2 | 10:50 | 0.4 | 10.2 |
| 16:30 | 1.5 | 9.5 | 22:40 | 0.0 | 0.5 | 04:50 | 0.0 | 4.3 | 11:00 | 1.1 | 10.4 |
| 16:40 | 3.1 | 8.7 | 22:50 | 0.0 | -0.3 | 05:00 | 0.0 | 4.2 | 11:10 | 0.5 | 10.6 |
| 16:50 | 1.9 | 9.3 | 23:00 | 0.0 | 0.2 | 05:10 | 0.0 | 4.3 | 11:20 | 1.2 | 10.4 |
| 17:00 | 1.8 | 9.2 | 23:10 | 0.0 | -0.6 | 05:20 | 0.0 | 4.5 | 11:30 | 1.0 | 10.2 |
| 17:10 | 1.8 | 9.6 | 23:20 | 0.0 | 0.0 | 05:30 | 0.0 | 4.6 | 11:40 | 0.0 | 10.7 |
| 17:20 | 1.2 | 9.1 | 23:30 | 0.0 | -0.5 | 05:40 | 0.0 | 4.8 | 11:50 | 1.0 | 11.6 |
| 17:30 | 1.4 | 8.9 | 23:40 | 0.0 | -1.6 | 05:50 | 0.0 | 4.6 | 12:00 | 0.9 | 11.3 |
| 17:40 | 2.6 | 8.8 | 23:50 | 0.0 | -1.6 | 06:00 | 0.0 | 4.6 | 12:10 | 0.8 | 12.5 |
| 17:50 | 0.8 | 8.7 | 00:00 | 0.0 | -1.4 | 06:10 | 0.0 | 4.5 | 12:20 | 0.8 | 10.7 |
| 18:00 | 0.0 | 8.2 | 00:10 | 0.0 | -0.5 | 06:20 | 0.0 | 4.8 | 12:30 | 0.5 | 11.9 |
| 18:10 | 0.0 | 7.0 | 00:20 | 0.0 | -1.4 | 06:30 | 0.0 | 5.0 | 12:40 | 1.3 | 13.4 |
| 18:20 | 0.0 | 6.8 | 00:30 | 0.0 | -0.6 | 06:40 | 0.0 | 5.2 | 12:50 | 1.5 | 13.2 |
| 18:30 | 0.0 | 5.0 | 00:40 | 0.0 | -0.3 | 06:50 | 0.0 | 5.4 | 13:00 | 0.0 | 12.8 |

Table B1. Calculation of extract fan Rating Levels at Dwelling A

| | Octave Band Centre Frequency, Hz | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | dB(A) |
| [A] Lp at 2m, 45° lateral: | 72 | 68 | 66 | 63 | 65 | 63 | 63 | 70 |
| [B] directivity correction: | 0 | 1.5 | 3 | 4.5 | 9 | 11 | 18 | |
| [C] Reflection off poultry shed roof/facade: | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| [A] - [B] + [C] $L_p$ at 7m: | 75.4 | 69 | 66 | 62 | 59 | 55 | 48 | 65 |

Roof Fans: Fancom 3680

| | Octave Band Centre Frequency, Hz | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | dB(A) |
| [A] Lp at 2m, 45° lateral: | 84 | 78 | 74 | 74 | 68 | 66 | 62 | 75 |
| [B] directivity correction: | 2.5 | 4.5 | 9 | 23 | 23 | 23 | 23 | |
| [C] Reflection off poultry shed roof/facade: | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| [A] - [B] + [C] $L_p$ at 7m: | 84.7 | 76 | 68 | 54 | 48 | 46 | 42 | 65 |

Gable End Fans: Fancom 34130

| Fan | Direct distance, m | | | | | | | | | Distance correction, dB | | | | | | | | | Shielding attenuation, dB | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Shed 1 | | Shed 2 | | Shed 3 | | Shed 4 | | | Shed 1 | | Shed 2 | | Shed 3 | | Shed 4 | | | Shed 1 | | Shed 2 | | Shed 3 | | Shed 4 | |
| | | Roof | Gable | Roof | Gable | Roof | Gable | Roof | Gable | | Roof | Gable | Roof | Gable | Roof | Gable | Roof | Gable | | Roof | Gable | Roof | Gable | Roof | Gable | Roof | Gable |
| 1 | | 496.0 | 502.7 | 521.5 | 527.5 | 544.4 | 549.9 | 571.5 | 576.4 | | 47.9 | 48.0 | 48.3 | 48.4 | 48.7 | 48.8 | 49.1 | 49.2 | | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2 | | 470.9 | 503.9 | 492.4 | 528.8 | 521.6 | 551.2 | 549.9 | 577.7 | | 47.4 | 48.0 | 47.8 | 48.4 | 48.3 | 48.8 | 48.8 | 49.2 | | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 3 | | 458.9 | 505.1 | 479.8 | 530.0 | 510.8 | 552.5 | 539.6 | 579.0 | | 47.2 | 48.0 | 47.6 | 48.5 | 48.1 | 48.8 | 48.6 | 49.2 | | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 4 | | 447.3 | 506.2 | 467.7 | 531.2 | 500.4 | 553.7 | 529.8 | 580.4 | | 47.0 | 48.1 | 47.4 | 48.5 | 48.0 | 48.8 | 48.5 | 49.3 | | 10 | 10 | 10 | 10 | 0 | 10 | 0 | 10 |
| 5 | | 436.1 | 507.4 | 456.0 | 532.4 | 490.4 | 555.0 | 520.4 | 581.7 | | 46.8 | 48.1 | 47.2 | 48.5 | 47.8 | 48.9 | 48.3 | 49.3 | | 10 | 10 | 10 | 10 | 0 | 10 | 0 | 10 |
| 6 | | 505.2 | 508.6 | 530.5 | 533.7 | 553.3 | 556.3 | 580.1 | 583.0 | | 48.0 | 48.1 | 48.5 | 48.5 | 48.8 | 48.9 | 49.3 | 49.3 | | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 7 | | 492.4 | 509.8 | 518.3 | 534.9 | 541.5 | 557.6 | 569.0 | 584.3 | | 47.8 | 48.1 | 48.3 | 48.5 | 48.7 | 48.9 | 49.1 | 49.3 | | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 8 | | 479.8 | 511.0 | 506.4 | 536.2 | 530.2 | 558.9 | 558.2 | 585.7 | | 47.6 | 48.1 | 48.1 | 48.6 | 48.5 | 48.9 | 48.9 | 49.3 | | 10 | 10 | 10 | 10 | 10 | 10 | 0 | 10 |
| 9 | | 467.7 | 512.2 | 494.9 | 537.4 | 519.2 | 560.2 | 547.8 | 587.0 | | 47.4 | 48.2 | 47.9 | 48.6 | 48.3 | 48.9 | 48.8 | 49.4 | | 10 | 10 | 10 | 10 | 0 | 10 | 0 | 10 |
| 10 | | 456.0 | | 483.8 | | 508.7 | | 537.8 | | | 47.2 | | 47.7 | | 48.1 | | 48.6 | | | 10 | | 10 | | 0 | | 0 | |
| 11 | | 444.7 | | 473.2 | | 498.6 | | 528.3 | | | 46.9 | | 47.5 | | 47.9 | | 48.4 | | | 10 | | 10 | | 0 | | 0 | |
| 1 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 | 1.1 | 1.1 | | 5.8 | 5.6 | 5.3 | 5.2 | 4.9 | 4.8 | 4.4 | 4.3 |
| 2 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.9 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 | | 6.3 | 5.6 | 5.8 | 5.2 | 5.3 | 4.8 | 4.8 | 4.3 |
| 3 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.9 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 | | 6.5 | 5.6 | 6.1 | 5.2 | 5.5 | 4.8 | 5.0 | 4.3 |
| 4 | | 0.0 | 0.0 | 0.0 | 0.0 | 4.4 | 0.0 | 4.4 | 0.0 | | 0.8 | 0.9 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | | 6.8 | 5.6 | 6.3 | 5.2 | 11.3 | 4.8 | 10.8 | 4.3 |
| 5 | | 0.0 | 0.0 | 0.0 | 0.0 | 4.3 | 0.0 | 4.4 | 0.0 | | 0.8 | 0.9 | 0.9 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 | | 7.0 | 5.6 | 6.6 | 5.2 | 11.5 | 4.8 | 10.9 | 4.3 |
| 6 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 1.0 | 0.8 | 1.0 | 0.9 | 1.1 | 0.9 | 1.1 | 1.0 | | 5.6 | 5.6 | 5.1 | 5.2 | 4.7 | 4.8 | 4.2 | 4.3 |
| 7 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 | 1.1 | 1.1 | | 5.8 | 5.5 | 5.3 | 5.0 | 4.9 | 4.6 | 4.4 | 4.2 |
| 8 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.4 | 0.0 | | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 | 1.1 | 1.1 | | 6.1 | 5.5 | 5.6 | 5.0 | 5.1 | 4.6 | 10.2 | 4.2 |
| 9 | | 0.0 | 0.0 | 0.0 | 0.0 | 4.4 | 0.0 | 4.4 | 0.0 | | 0.9 | 1.0 | 0.9 | 1.0 | 1.0 | 1.1 | 1.0 | 1.1 | | 6.3 | 5.5 | 5.8 | 5.0 | 11.0 | 4.6 | 10.4 | 4.1 |
| 10 | | 0.0 | | 0.0 | | 4.4 | | 4.4 | | | 0.9 | | 0.9 | | 1.0 | | 1.0 | | | 6.6 | | 6.0 | | 11.2 | | 10.6 | |
| 11 | | 0.0 | | 0.0 | | 4.4 | | 4.4 | | | 0.8 | | 0.9 | | 0.9 | | 1.0 | | | 6.8 | | 6.2 | | 11.4 | | 10.8 | |

Ground absorption, dB

Atmospheric attenuation, dB

Sound pressure level at dwelling, dB

| | | |
|---|---|---|
| BS4142 character correction | | 0 |
| Day (07:00 - 20:00hrs): | 100% roof & gable end extract fans operating | Specific Level, dB: 26 |
| | | Rating Level, dB: 26 |
| | 100% roof extract fans operating | Specific Level, dB: 24 |
| | | Rating Level, dB: 24 |
| Evening (20:00 - 23:00hrs): | 50% roof extract fans operating Note 1 | Specific Level, dB: 22 |
| | | Rating Level, dB: 22 |
| Night (23:00 - 07:00hrs): | 25% roof extract fans operating Note 2 | Specific Level, dB: 20 |
| | | Rating Level, dB: 20 |

Note 1: Assumed only odd numbered roof fans operating
Note 2: Assumed only 2, 4, 8 & 11 numbered roof fans operating

**Table B2. Calculation of extract fan Rating Levels at Dwelling B**

| | Octave Band Centre Frequency, Hz | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | dB(A) |
| [A] Lp at 2m, 45° lateral: | 72 | 68 | 66 | 63 | 65 | 63 | 63 | 70 |
| [B] directivity correction: | 0 | 1.5 | 3 | 4.5 | 9 | 11 | 18 | |
| [C] Reflection off poultry shed roof/facade: | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| [A] - [B] + [C] $L_p$ at 7m: | 75.4 | 69 | 66 | 62 | 59 | 55 | 48 | 65 |

Roof Fans: Fancom 3680

| | Octave Band Centre Frequency, Hz | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | dB(A) |
| [A] Lp at 2m, 45° lateral: | 84 | 78 | 74 | 74 | 68 | 66 | 62 | 75 |
| [B] directivity correction: | 2.5 | 4.5 | 9 | 23 | 23 | 23 | 23 | |
| [C] Reflection off poultry shed roof/facade: | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| [A] - [B] + [C] $L_p$ at 7m: | 84.7 | 76 | 68 | 54 | 48 | 46 | 42 | 65 |

Gable End Fans: Fancom 34130

| Fan | | Shed 1 | | Shed 2 | | Shed 3 | | Shed 4 | | | Shed 1 | | Shed 2 | | Shed 3 | | Shed 4 | | | Shed 1 | | Shed 2 | | Shed 3 | | Shed 4 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Roof | Gable | Roof | Gable | Roof | Gable | Roof | Gable | | Roof | Gable | Roof | Gable | Roof | Gable | Roof | Gable | | Roof | Gable | Roof | Gable | Roof | Gable | Roof | Gable |
| 1 | Direct distance, m | 713.3 | 728.6 | 698.5 | 713.9 | 687.1 | 702.5 | 674.6 | 690.0 | Distance correction, dB | 51.0 | 51.2 | 50.9 | 51.1 | 50.7 | 50.9 | 50.6 | 50.8 | Shielding attenuation, dB | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 |
| 2 | | 680.8 | 727.8 | 665.3 | 713.2 | 653.3 | 551.2 | 640.2 | 577.7 | | 50.6 | 51.2 | 50.4 | 51.0 | 50.3 | 48.8 | 50.1 | 49.2 | | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 |
| 3 | | 664.6 | 727.1 | 648.7 | 712.5 | 636.4 | 552.5 | 623.0 | 579.0 | | 50.4 | 51.2 | 50.2 | 51.0 | 50.1 | 48.8 | 49.9 | 49.2 | | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 |
| 4 | | 648.6 | 726.4 | 632.3 | 711.9 | 619.6 | 553.7 | 605.8 | 580.4 | | 50.2 | 51.2 | 50.0 | 51.0 | 49.8 | 48.8 | 49.6 | 49.3 | | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 |
| 5 | | 632.6 | 725.6 | 615.9 | 711.2 | 602.9 | 555.0 | 588.7 | 581.7 | | 50.0 | 51.2 | 49.8 | 51.0 | 49.6 | 48.9 | 49.4 | 49.3 | | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 |
| 6 | | 720.0 | 724.9 | 705.6 | 710.5 | 694.5 | 556.3 | 682.3 | 583.0 | | 51.1 | 51.2 | 51.0 | 51.0 | 50.8 | 48.9 | 50.7 | 49.3 | | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 |
| 7 | | 703.6 | 724.2 | 688.8 | 709.9 | 677.4 | 557.6 | 664.9 | 584.3 | | 50.9 | 51.2 | 50.7 | 51.0 | 50.6 | 48.9 | 50.4 | 49.3 | | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 |
| 8 | | 687.3 | 723.4 | 672.1 | 709.2 | 660.5 | 558.9 | 647.6 | 585.7 | | 50.7 | 51.2 | 50.5 | 51.0 | 50.4 | 48.9 | 50.2 | 49.3 | | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 |
| 9 | | 671.1 | 722.7 | 655.5 | 708.6 | 643.6 | 560.2 | 630.4 | 587.0 | | 50.5 | 51.2 | 50.3 | 51.0 | 50.2 | 48.9 | 50.0 | 49.4 | | 0 | 10 | 0 | 10 | 0 | 10 | 0 | 10 |
| 10 | | 655.0 | | 639.0 | | 626.7 | | 613.2 | | | 50.3 | | 50.1 | | 49.9 | | 49.7 | | | 0 | | 0 | | 0 | | 0 | |
| 11 | | 638.9 | | 622.6 | | 610.0 | | 596.1 | | | 50.1 | | 49.9 | | 49.7 | | 49.5 | | | 0 | | 0 | | 0 | | 0 | |
| 1 | Ground absorption, dB | 4.5 | 0.0 | 4.5 | 0.0 | 4.5 | 0.0 | 4.5 | 0.0 | Atmospheric attenuation, dB | 1.4 | 1.4 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | Sound pressure level at dwelling, dB | 7.7 | 2.0 | 7.9 | 2.2 | 8.1 | 2.4 | 8.3 | 2.5 |
| 2 | | 4.5 | 0.0 | 4.5 | 0.0 | 4.5 | 0.0 | 4.5 | 0.0 | | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 | 1.3 | 1.2 | 1.3 | | 8.2 | 2.0 | 8.4 | 2.2 | 8.6 | 4.5 | 8.8 | 4.1 |
| 3 | | 4.5 | 0.0 | 4.5 | 0.0 | 4.5 | 0.0 | 4.4 | 0.0 | | 1.3 | 1.3 | 1.2 | 1.3 | 1.2 | 1.3 | 1.2 | 1.2 | | 8.4 | 2.1 | 8.7 | 2.3 | 8.9 | 4.5 | 9.1 | 4.1 |
| 4 | | 4.5 | 0.0 | 4.4 | 0.0 | 4.4 | 0.0 | 4.4 | 0.0 | | 1.2 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | | 8.7 | 2.1 | 9.0 | 2.3 | 9.2 | 4.5 | 9.4 | 4.1 |
| 5 | | 4.4 | 0.0 | 4.4 | 0.0 | 4.4 | 0.0 | 4.4 | 0.0 | | 1.2 | 1.2 | 1.2 | 1.2 | 1.1 | 1.2 | 1.1 | 1.2 | | 8.9 | 2.2 | 9.2 | 2.4 | 9.4 | 4.5 | 9.7 | 4.2 |
| 6 | | 4.5 | 0.0 | 4.5 | 0.0 | 4.5 | 0.0 | 4.5 | 0.0 | | 1.4 | 1.2 | 1.3 | 1.2 | 1.3 | 1.2 | 1.3 | 1.1 | | 7.6 | 2.2 | 7.8 | 2.4 | 8.0 | 4.6 | 8.2 | 4.2 |
| 7 | | 4.5 | 0.0 | 4.5 | 0.0 | 4.5 | 0.0 | 4.5 | 0.0 | | 1.3 | 1.4 | 1.3 | 1.3 | 1.3 | 1.1 | 1.3 | 1.1 | | 7.9 | 2.0 | 8.1 | 2.2 | 8.2 | 4.6 | 8.4 | 4.2 |
| 8 | | 4.5 | 0.0 | 4.5 | 0.0 | 4.5 | 0.0 | 4.5 | 0.0 | | 1.3 | 1.4 | 1.3 | 1.3 | 1.3 | 1.1 | 1.2 | 1.1 | | 8.1 | 2.1 | 8.3 | 2.3 | 8.5 | 4.6 | 8.7 | 4.2 |
| 9 | | 4.5 | 0.0 | 4.5 | 0.0 | 4.5 | 0.0 | 4.4 | 0.0 | | 1.3 | 1.4 | 1.2 | 1.3 | 1.2 | 1.1 | 1.2 | 1.1 | | 8.3 | 2.1 | 8.6 | 2.3 | 8.8 | 4.6 | 9.0 | 4.1 |
| 10 | | 4.5 | | 4.5 | | 4.4 | | 4.4 | | | 1.2 | | 1.2 | | 1.2 | | 1.2 | | | 8.6 | | 8.8 | | 9.0 | | 9.3 | |
| 11 | | 4.5 | | 4.4 | | 4.4 | | 4.4 | | | 1.2 | | 1.2 | | 1.2 | | 1.1 | | | 8.8 | | 9.1 | | 9.3 | | 9.6 | |

| | | | |
|---|---|---|---|
| | | **BS4142 character correction** | 0 |
| **Day (07:00 - 20:00hrs):** | 100% roof & gable end extract fans operating | Specific Level, dB | 26 |
| | | Rating Level, dB | 26 |
| | 100% roof extract fans operating | Specific Level, dB | 25 |
| | | Rating Level, dB | 25 |
| **Evening (20:00 - 23:00hrs):** | 50% roof extract fans operating Note 1 | Specific Level, dB | 23 |
| | | Rating Level, dB | 23 |
| **Night (23:00 - 07:00hrs):** | 25% roof extract fans operating Note 2 | Specific Level, dB | 21 |
| | | Rating Level, dB | 21 |

Note 1: Assumed only odd numbered roof fans operating
Note 2: Assumed only 2, 4, 8 & 11 numbered roof fans operating

**Table B3. Calculation of extract fan Rating Levels at Dwelling C**

| | Octave Band Centre Frequency, Hz | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | dB(A) |
| [A] Lp at 2m, 45° lateral: | 72 | 68 | 66 | 63 | 65 | 63 | 63 | 70 |
| [B] directivity correction: | 0 | 1.5 | 3 | 4.5 | 9 | 11 | 18 | |
| [C] Reflection off poultry shed roof/facade: | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| [A] - [B] + [C] $L_p$ at 7m: | 75.4 | 69 | 66 | 62 | 59 | 55 | 48 | 65 |

Roof Fans: Fancom 3680

| | Octave Band Centre Frequency, Hz | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | dB(A) |
| [A] Lp at 2m, 45° lateral: | 84 | 78 | 74 | 74 | 68 | 66 | 62 | 75 |
| [B] directivity correction: | -0.5 | -1 | -1 | -1.5 | -1.5 | -1.5 | -1.5 | |
| [C] Reflection off poultry shed roof/facade: | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| [A] - [B] + [C] $L_p$ at 7m: | 87.7 | 82 | 78 | 78 | 73 | 71 | 67 | 79 |

Gable End Fans: Fancom 34130

| Fan | Direct distance, m | | | | | | | | | Distance correction, dB | | | | | | | | | | Shielding attenuation, dB | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Shed 1 | | Shed 2 | | Shed 3 | | Shed 4 | | | Shed 1 | | Shed 2 | | Shed 3 | | Shed 4 | | | | Shed 1 | | Shed 2 | | Shed 3 | | Shed 4 | | |
| | | Roof | Gable | Roof | Gable | Roof | Gable | Roof | Gable | | Roof | Gable | Roof | Gable | Roof | Gable | Roof | Gable | | | Roof | Gable | Roof | Gable | Roof | Gable | Roof | Gable | |
| 1 | | 775.3 | 761.4 | 773.1 | 758.9 | 772.4 | 757.9 | 773.8 | 759.1 | | 51.8 | 51.6 | 51.7 | 51.6 | 51.7 | 51.6 | 51.8 | 51.6 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2 | | 811.6 | 761.2 | 809.5 | 758.8 | 808.8 | 757.9 | 810.1 | 759.2 | | 52.2 | 51.6 | 52.1 | 51.6 | 52.1 | 51.6 | 52.2 | 51.6 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3 | | 829.8 | 761.1 | 827.8 | 758.7 | 827.1 | 757.9 | 828.4 | 759.2 | | 52.4 | 51.6 | 52.3 | 51.6 | 52.3 | 51.6 | 52.3 | 51.6 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 4 | | 848.1 | 760.9 | 846.1 | 758.7 | 845.4 | 757.9 | 846.7 | 759.3 | | 52.5 | 51.6 | 52.5 | 51.6 | 52.5 | 51.6 | 52.5 | 51.6 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 5 | | 866.3 | 760.8 | 864.4 | 758.6 | 863.7 | 757.9 | 865.0 | 759.4 | | 52.7 | 51.6 | 52.7 | 51.6 | 52.7 | 51.6 | 52.7 | 51.6 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 6 | | 765.7 | 760.6 | 763.7 | 758.6 | 763.1 | 757.9 | 764.7 | 759.5 | | 51.7 | 51.6 | 51.6 | 51.6 | 51.6 | 51.6 | 51.6 | 51.6 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 | | 783.9 | 760.5 | 781.9 | 758.5 | 781.3 | 757.9 | 782.9 | 759.6 | | 51.9 | 51.6 | 51.8 | 51.6 | 51.8 | 51.6 | 51.9 | 51.6 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 8 | | 802.1 | 760.4 | 800.2 | 758.4 | 799.6 | 757.9 | 801.1 | 759.7 | | 52.1 | 51.6 | 52.0 | 51.6 | 52.0 | 51.6 | 52.1 | 51.6 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9 | | 820.3 | 760.2 | 818.4 | 758.4 | 817.8 | 758.0 | 819.3 | 759.8 | | 52.3 | 51.6 | 52.2 | 51.6 | 52.2 | 51.6 | 52.2 | 51.6 | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 10 | | 838.5 | | 836.7 | | 836.1 | | 837.6 | | | 52.4 | | 52.4 | | 52.4 | | 52.4 | | | | 0 | | 0 | | 0 | | 0 | | |
| 11 | | 856.7 | | 854.9 | | 854.3 | | 855.8 | | | 52.6 | | 52.6 | | 52.6 | | 52.6 | | | | 0 | | 0 | | 0 | | 0 | | |
| 1 | Ground absorption, dB | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | Atmospheric attenuation, dB | 1.5 | 1.4 | 1.5 | 1.4 | 1.5 | 1.4 | 1.5 | 1.4 | Sound pressure level at dwelling, dB | | 6.8 | 21.8 | 6.9 | 21.9 | 6.9 | 21.9 | 6.9 | 21.9 |
| 2 | | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | | 1.5 | 1.4 | 1.5 | 1.4 | 1.5 | 1.4 | 1.5 | 1.4 | | | 6.4 | 21.8 | 6.4 | 21.9 | 6.4 | 21.9 | 6.4 | 21.9 |
| 3 | | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | | 1.6 | 1.4 | 1.6 | 1.4 | 1.6 | 1.4 | 1.6 | 1.4 | | | 6.1 | 21.8 | 6.2 | 21.9 | 6.2 | 21.9 | 6.1 | 21.9 |
| 4 | | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | | 1.6 | 1.4 | 1.6 | 1.4 | 1.6 | 1.4 | 1.6 | 1.4 | | | 5.9 | 21.8 | 5.9 | 21.9 | 5.9 | 21.9 | 5.9 | 21.9 |
| 5 | | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | | 1.6 | 1.4 | 1.6 | 1.4 | 1.6 | 1.4 | 1.6 | 1.4 | | | 5.7 | 21.8 | 5.7 | 21.9 | 5.7 | 21.9 | 5.7 | 21.9 |
| 6 | | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | | 1.5 | 1.4 | 1.5 | 1.4 | 1.4 | 1.4 | 1.5 | 1.4 | | | 7.0 | 21.8 | 7.0 | 21.9 | 7.0 | 21.9 | 7.0 | 21.9 |
| 7 | | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | | 1.5 | 1.4 | 1.5 | 1.4 | 1.5 | 1.4 | 1.5 | 1.4 | | | 6.7 | 21.8 | 6.8 | 21.9 | 6.8 | 21.9 | 6.7 | 21.9 |
| 8 | | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | | 1.5 | 1.4 | 1.5 | 1.4 | 1.5 | 1.4 | 1.5 | 1.4 | | | 6.5 | 21.8 | 6.5 | 21.9 | 6.5 | 21.9 | 6.5 | 21.9 |
| 9 | | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | | 1.6 | 1.4 | 1.6 | 1.4 | 1.6 | 1.4 | 1.6 | 1.4 | | | 6.3 | 21.8 | 6.3 | 21.9 | 6.3 | 21.9 | 6.3 | 21.9 |
| 10 | | 4.5 | | 4.5 | | 4.5 | | 4.5 | | | 1.6 | | 1.6 | | 1.6 | | 1.6 | | | | 6.0 | | 6.0 | | 6.1 | | 6.0 | | |
| 11 | | 4.5 | | 4.5 | | 4.5 | | 4.5 | | | 1.6 | | 1.6 | | 1.6 | | 1.6 | | | | 5.8 | | 5.8 | | 5.8 | | 5.8 | | |

| | | | |
|---|---|---|---|
| | | **BS4142 character correction** | 0 |
| **Day (07:00 - 20:00hrs):** | 100% roof & gable end extract fans operating | Specific Level, dB | 38 |
| | | Rating Level, dB | 38 |
| | 100% roof extract fans operating | Specific Level, dB | 23 |
| | | Rating Level, dB | 23 |
| **Evening (20:00 - 23:00hrs):** | 50% roof extract fans operating Note 1 | Specific Level, dB | 20 |
| | | Rating Level, dB | 20 |
| **Night (23:00 - 07:00hrs):** | 25% roof extract fans operating Note 2 | Specific Level, dB | 18 |
| | | Rating Level, dB | 18 |

Note 1: Assumed only odd numbered roof fans operating
Note 2: Assumed only 2, 4, 8 & 11 numbered roof fans operating

| Table B4. Calculation of HGVs loading/unloading BS4142 Assessment Level at Dwellings A - C | | | | | | | |
|---|---|---|---|---|---|---|---|
| Source noise levels | | | $L_{Aeq}$ dB | $L_{Amax}$ dB | | | |
| | HGV manoeuvring at 5m | | 72 | 80 | | | |
| | HGV loading/unloading using an electric forklift at 5m | | 63 | 84 | | | |
| | | | Dwelling A | | Dwelling B | | Dwelling C | |
| | Noise Event | | HGV manoeuvring | HGV loading/ unloading using a forklift | HGV manoeuvring | HGV loading/ unloading using a forklift | HGV manoeuvring | HGV loading/ unloading using a forklift |
| Corrections | | Distance, m | 471 | 471 | 596 | 596 | 878 | 878 |
| | | Distance correction, dB | 39.5 | 39.5 | 41.5 | 41.5 | 44.9 | 44.9 |
| | | Shielding correction, dB | 0 | 0 | 0 | 0 | 10 | 10 |
| | | Ground absorption, dB | 4.6 | 4.6 | 4.7 | 4.7 | 0.0 | 0.0 |
| | | Atmospheric attenuation, dB | 0.9 | 0.9 | 1.1 | 1.1 | 1.7 | 1.7 |
| BS4142 Specific Level | | | | | | | | |
| Day Period Specific Level | | On time, mins | 2 | 45 | 2 | 45 | 2 | 45 |
| | | On time correction, dB | -14.8 | -1.2 | -14.8 | -1.2 | -14.8 | -1.2 |
| | | Specific Level, dB | 12.2 | 16.8 | 9.9 | 14.4 | 0.7 | 5.2 |
| Night Period Specific Level | | On time, mins | 2 | 15 | 2 | 15 | 2 | 15 |
| | | On time correction, dB | -8.8 | 0.0 | -8.8 | 0.0 | -8.8 | 0.0 |
| | | Specific Level, dB | 18.3 | 18.0 | 15.9 | 15.7 | 6.7 | 6.4 |
| BS4142 Rating & Assessment Level | | | | | | | | |
| | | **BS4142 character corrections** | 3 | 6 | 3 | 6 | 3 | 6 |
| **Working Day Rating Level, dB** | | Noise event Rating Level | 15 | 23 | 13 | 20 | 4 | 11 |
| | | Aggregate Rating Level | 24 | | 21 | | 12 | |
| **Night Rating Level, dB** | | Noise event Rating Level | 21 | 24 | 19 | 22 | 10 | 12 |
| | | Aggregate Rating Level | 26 | | 24 | | 14 | |
| Noise ingress via open window (assumed 10dB sound insulation) | | | | | | | | |
| | | $L_{Aeq,15minutes}$ dB | 11 | | 9 | | 0 | |
| | | $L_{Amax,F}$ dB | 29 | | 27 | | 17 | |

| Table B5. Calculation of Rating & Assessment Levels of HGVs on the access road | | | | |
|---|---|---|---|---|
| | | Dwelling A | Dwelling B | Dwelling C |
| | HGV pass SEL dB | 87 | 87 | 87 |
| | Distance to dwelling, m | 310 | 670 | 929 |
| | Distance correction, dB | 35.8 | 42.5 | 45.4 |
| | Shielding attenuation, dB | 0 | 0 | 0 |
| | Ground absorption, dB | 4.5 | 4.7 | 4.7 |
| | Atmospheric attenuation, dB | 0.6 | 1.3 | 1.8 |
| Day (07:00 - 20:00hrs) | No. HGVs movements per | 2 | 2 | 2 |
| | No. HGVs correction, dB | 3 | 3 | 3 |
| | Time correction, dB | 35.6 | 35.6 | 35.6 |
| | Specific Level, dB | 13.5 | 6.0 | 2.6 |
| Night (23:00 - 07:00hrs) | No. HGVs movements per | 1 | 1 | 1 |
| | No. HGVs correction, dB | 0 | 0 | 0 |
| | Time correction, dB | 29.5 | 29.5 | 29.5 |
| | Specific Level, dB | 16.5 | 9.0 | 5.6 |
| | BS4142 character correction | 3 | 3 | 3 |
| Rating Level, dB | Day | 17 | 9 | 6 |
| | Night | 20 | 12 | 9 |

| Table B6. Calculation of biomass boiler noise emissions at Receptors A - C | | | | | | |
|---|---|---|---|---|---|---|
| Source noise levels: Biomass boiler at full capacity | | | Internal reverberant noise level: $L_{Aeq}$ dB | 80 | | |
| | | | Noise emissions 1m from exhaust stack termination: | 70 | | |
| | Dwelling | | | A | B | C |
| Biomass noise emissions | | | | | | |
| Noise emissions from the exhaust stack | Direct distance, m | | | 424 | 663 | 851 |
| | Corrections | Distance correction, dB | | 53 | 56 | 59 |
| | | Shielding attenuation, dB | | 10 | 10 | 0 |
| | | Ground absorption, dB | | 4.6 | 4.7 | 4.7 |
| | | Atmospheric attenuation, dB | | 0.8 | 1.3 | 1.6 |
| | Specific Level, dB | | | 2 | -2 | 5 |
| Noise radiating from the facades | Radiating façade | | | North | West | North | South |
| | Façade area, $m^2$ | | | 150 | 500 | 150 | 150 |
| | Distance, m | | | 412 | 413 | 633 | 843 |
| | Corrections | Façade sound reduction, | | 20 | 25 | 20 | 25 |
| | | Façade area correction, dB | | 22 | 27 | 22 | 22 |
| | | Distance correction, dB | | 60 | 60 | 64 | 66 |
| | | Shielding attenuation, dB | | 10 | 10 | 10 | 0 |
| | | Ground absorption, dB | | 0 | 0 | 0 | 4.7 |
| | | Atmospheric attenuation, | | 0.8 | 0.8 | 1 | 2 |
| | Specific Level, dB | | | 11 | 11 | 7 | 4 |
| Aggregate BS4142 Specific Level | | | | | | |
| | | | | 14 | | 7 | 8 |
| BS4142 Rating Level | | | | | | |
| | | | **BS4142 character correction** | 0 | | 0 | 0 |
| | | | **Rating Level, dB** | 14 | | 7 | 8 |

# AGRICULTURAL FANS

Fancom fans are specially developped for the use in livestock buildings and they have an IP66 classification. Fancom fans have an aluminium motor housing, synthetic or coated steel housing and synthetic fan blades. The fans combine high air flow capacity with low energy consumption and noise levels. The low energy consumption and superb controllability mean that the motors run at a lower temperature - which also benefits the durability.

## Complete fan

The complete fan from Fancom is extremely easy to mount either in or on a wall. The fans in the 35 to 56cm diameter series are supplied in a robust synthetic housing. Fans with diameters of 63, 71 and 80 cm are solidly housed in steel . The coated housing prevents corrosion.

## Modular fan

To mount fans underneath a chimney module Fancom's fans are supplied in a robust, shape retaining synthetic module with the Fancom quick mounting system. Fancom measuring and damping units complete the ventilation system. The control valve and air flow transmitter have been built into the same module which can be directly connected to the fan module.

## Central exhaust systems

Fancom has specially developed the 3480P and 3480D fans for central air exhaust systems and other installations which operate with high counter pressures. The maximum counter pressures are 270Pa, resp. 320Pa. This fan is notable for it large air displacement capacity. Noise production and energy consumption are, however, kept to a minimum.

| | Diameter | Voltage (+/- 10%) | Revolutions | Motor current (50Hz - 1ph) | Power (50Hz) | Axis power (50Hz) | Noise level (Db - beneden) | | Control | Airflow in m3/h<br>Pressure in Pa (Pascal) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TYPE | cm | V | RPM | A | W | W | dBA/2m | dBA/7m | | 0 | 30 | 50 | 100 | 150 | 200 | 250 | 300 | Debit max/pression max |
| 1435 | 35 | 200-240 | 1404 | 0.66 | 211 | 111 | 61 | 50 | T, E | 3940 | 3580 | 3250 | | | | | | 2660 / 78 |
| 1440 | 40 | 200-240 | 1347 | 1.19 | 273 | 165 | 54 | 53 | T, E | 5040 | 4630 | 4250 | | | | | | 3300 / 92 |
| 1445 | 45 | 200-240 | 1326 | 1.6 | 372 | 235 | 55 | 54 | T, E | 6690 | 6140 | 5760 | 4400 | | | | | 4310 / 102 |
| 1450 | 50 | 200-240 | 1317 | 2.08 | 474 | 314 | 66 | 65 | T, E | 8550 | 7900 | 7300 | 5780 | | | | | 5710 / 102 |
| 1450P | 50 | 200-240 | 1361 | 2.89 | 729 | 566 | 69 | 68 | T, E | 9720 | 9250 | 9070 | 7960 | | | | | 6900 / 128 |
| 1456 | 56 | 200-240 | 1366 | 3.16 | 740 | 569 | 70 | 59 | T, E | 12050 | 11250 | 10830 | 9250 | | | | | 8520 / 113 |
| 1656 | 56 | 200-240 | 954 | 2.03 | 486 | 378 | 66 | 65 | T, E | 10380 | 9250 | 8340 | | | | | | 8920 / 67 |
| 1463 | 63 | 200-240 | 1361 | 3.1 | 721 | 566 | 68 | 67 | T, E | 14690 | 13200 | 12280 | 9370 | | | | | 8990 / 101 |
| 1671 | 71 | 200-240 | 901 | 4.19 | 924 | 635 | 68 | 67 | T, E | 16030 | 15410 | 15320 | | | | | | 11820 / 92 |
| 1680 | 80 | 200-240 | 903 | 4.64 | 1091 | 756 | 69 | 68 | T, E | 20750 | 19050 | 17820 | 14160 | | | | | 13020 / 113 |
| 1692 | 92 | 200-240 | 906 | 4.54 | 1068 | 778 | 69 | 67 | T, E | 24400 | 21840 | 19040 | 12787 | | | | | 13340 / 103 |
| 3435 | 35 | Y400 Δ230 | 1426 | Y0.34 Δ0.59 | 157 | 116 | 51 | 50 | F | 3710 | 3400 | 3140 | | | | | | 2520 / 60 |
| 3440 | 40 | Y400 Δ230 | 1376 | Y0.42 Δ0.73 | 227 | 175 | 54 | 53 | F | 5120 | 4750 | 4370 | | | | | | 3430 / 96 |
| 3445 | 45 | Y400 Δ230 | 1297 | Y0.55 Δ0.95 | 312 | 220 | 65 | 54 | F | 6540 | 5910 | 5470 | | | | | | 4020 / 99 |
| 3450 | 50 | Y400 Δ230 | 1304 | Y0.72 Δ1.25 | 414 | 305 | 66 | 65 | F | 8240 | 7530 | 7010 | 5440 | | | | | 5240 / 105 |
| 3456 | 56 | Y400 Δ230 | 1364 | Y1.17 Δ2.03 | 657 | 567 | 70 | 59 | F | 11830 | 10920 | 10280 | 8480 | | | | | 7700 / 120 |
| 3656 | 56 | Y400 Δ230 | 936 | Y1.05 Δ1.83 | 384 | 322 | 65 | 54 | F | 10190 | 9080 | 8020 | | | | | | 6690 / 65 |
| 3463P | 63 | Y400 Δ230 | 1439 | Y2.75 Δ4.76 | 1351 | 1224 | 74 | 63 | F | 17530 | 16740 | 16270 | 15150 | 13030 | 12370 | 10240 | | 10240 / 250 |
| 3663 | 63 | Y400 Δ230 | 951 | Y1.38 Δ2.56 | 687 | 512 | 67 | 56 | F | 14150 | 12920 | 12080 | | | | | | 9000 / 97 |
| 3671 | 71 | Y400 Δ230 | 949 | Y1.89 Δ3.27 | 884 | 741 | 69 | 58 | F | 17970 | 16500 | 15450 | 12190 | | | | | 11320 / 110 |
| 3680 | 80 | Y400 Δ230 | 941 | Y2.03 Δ3.52 | 1047 | 850 | 70 | 59 | F | 22230 | 20555 | 19395 | 15010 | | | | | 14070 / 122 |
| 3480P | 80 | Y400 Δ230 | 1429 | Y4.58 Δ7.93 | 2208 | 2130 | 77 | 66 | F | 26650 | 27582 | 26870 | 25290 | 23580 | 21225 | 18355 | | 17440 / 266 |
| 3480D | 80 | Y400 Δ230 | 1436 | Y4.26 Δ7.38 | 1961 | 1520 | 69 | 58 | F | 21610 | 21130 | 20810 | 19990 | 19050 | 17920 | 16495 | 14770 | 11050 / 380 |
| 3692 | 92 | Y400 Δ230 | 936 | Y2.16 Δ3.74 | 1033 | 859 | 68 | 57 | F | 24870 | 22570 | 20840 | 15470 | | | | | 14110 / 116 |
| 3692P | 92 | Y400 Δ230 | 929 | Y3.64 Δ6.3 | 1660 | 1384 | 71 | 60 | F | 26090 | 26600 | 25680 | 22810 | 17820 | | | | 19200 / 187 |

**FANS** **GB** **FAN 34130 (400V 50HZ)**

| | |
|---|---|
| **Fan 34130 BOX 400V 50Hz** | **4305110** |
| **Fan 34130 BOX KIT 400V 50Hz** | **4305140** |

***Images***

**KIT**

**4305110** **4305140**

***Technical data***

| | | |
|---|---|---|
| Voltage: | **400** | [⏄V ac] +/-10% |
| Phase: | **3** | |
| Frequency: | **50** | [Hz] |
| Max. current: | **3,08** | [A] |
| Current (at 50 Pa and 400V): | **3,08** | [A] |
| Input power (at 50 Pa and 400V): | **1695** | [W] |
| Max. input power: | **1716** | [W] |
| Max. air volume: | **44650** | [$m^3$/h] |
| Max. pressure: | **70** | [pa] |
| Max. rotations: | **570** | [RPM] |
| Poles: | **4** | |
| Cos phi: | **0,81** | |
| Controllable: | **On / Off** | |
| Insulation class: | **F** | |
| Protection class: | **IP 55** | |
| Sound production (calculated): | **75 (64)** | [dB(A)] |
| Impeller: | **10 / 3 / N** | Type / n / system |
| Weight 4305110 (excl. pack.): | **65,3 / 144** | [Kg] / [lbs] |

- Air density 1,2 kg/m3, 1 Pa (Pascal) = 1N/m2 ~ 0,102 mm wk. (20°C).
- Sound production is measured according to "free field method" at a distance of 2 meter. (The value between brackets is the sound production at a distance of 7 meter).
- The above data is from a fully assembled fan with safety grid and shutter..
- According to AMCA 210 / ISO 5801.
- Images may differ slightly from reality.