



Project

Environmental Noise Assessment of the Relocation of a Fan Coil Unit at
Park Street Village Stores, Stoke by Nayland

Client

Park Street Village Stores
Stoke by Nayland

Author

Keiron Durrant BSc (Hons) MSc MIOA

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Sound Acoustics Limited, Drishaig, Collimer Close, Chelmondiston, Suffolk IP9 1HX

www.sound-acoustics.co.uk facebook.com/soundacousticsltd

Registered Office: Drishaig, Collimer Close, Chelmondiston IP9 1HX. Registered Company No. 5340816. VAT Registration No. 866 9098 61.



Summary

Sound Acoustics Ltd has assessed the noise impact of an existing fan coil unit (FCU) at the rear of Park Street Village Stores, Stoke by Nayland. The unit is to be relocated to the side of the shop facing the neighbouring Park House to the south-east. There is also residential use above and to the side of the shop. See Figure 1 for site location.

The unit is a JE Hall International Fusion JEHR-0140-B2-M-1 manufactured in August 2017. The unit is serviced every year and is in good working condition. The unit serves refrigerated storage in the shop. In situ measurements were taken in free-field conditions at 1m and 6m and were $L_{Aeq,2mins}$ 55.6 dB and 42.6 dB respectively with an ambient level of $L_{Aeq,2mins}$ 37.2 dB immediately afterwards. There are no characteristics that require a penalty to be applied using the BS4142:2014 methodology.

The unit will be approximately 19.5m from the window in the gable end of Park House and the predicted daytime level outside the house is $L_{Aeq,15mins}$ 22.9 dB allowing for distance, screening and on-time corrections (detailed in the report). At night-time the level is predicted to drop to $L_{Aeq,15mins}$ 19.9 dB due to less on-time.

Background levels were surveyed between 8th and 10th December. Background levels during the day and at night respectively (excluding periods of bad weather) were as follows:

Lowest background levels = $L_{A90,15min}$ 31 dB and $L_{A90,15min}$ 22 dB

Average background levels = $L_{A90,15min}$ 36 dB and $L_{A90,15min}$ 28 dB

Mode background levels = $L_{A90,15min}$ 34 dB and $L_{A90,15min}$ 25 dB

The predicted ACU level at the 2nd floor of Park House is below all background levels for the respective periods. Levels will be even quieter at the 1st and ground floors due to greater screening. The screening to the windows of the residential above and to the side of the shop will be even greater.

The outcome of the assessment points to this proposal being entirely acceptable on grounds of noise and compliant with Condition 9 set by the Local Authority.

Keiron Durrant

Principal Consultant

Introduction

Sound Acoustics Ltd has been asked by the client to assess the noise impact of the existing fan coil unit (FCU) at the rear of Park Street Stores, Stoke by Nayland. The unit is to be relocated to the side of the shop facing the neighbouring Park House to the south-east. There is also residential use above and to the side of the shop. See Figure 1 for site location.

The unit is a JE Hall International Fusion JEHR-0140-B2-M-1 manufactured in August 2017. The unit is serviced every year and is in good working condition. The unit serves refrigerated storage in the shop. The manufacturer's data shows an A-weighted sound pressure level in free field conditions of 52 dB at 1m and 32 dB at 10m.

The unit will be located below the window of the shop WC. There will be no view of the unit from any residential window. The 2nd floor gable end window of Park House is below the boundary brick wall when viewed from the proposed unit location. The windows of the habitable rooms of residential above and to the side of the shop are completely screened by the building, being on different facades. The screening to these locations will therefore be greater.

It is normal that a BS4142:2014 noise survey and assessment accompanies applications of this nature in order to minimise the likelihood of complaints from people within dwellings. Babergh District Council have set the following condition:

9. ON GOING REQUIREMENT FOR DEVELOPMENT: CONDENSER SOUND EMISSION

The rating level of sound emitted from the condenser shall not exceed the typical background sound levels between the hours of 0700-2300 (taken as a 15 minute LA90 at the nearest sound sensitive premises) and shall not exceed the existing background sound level between 2300-0700 (taken as a 15 minute LA90 at the nearest/any sound sensitive premises). All measurements shall be made in accordance with the methodology of BS4142 (2014) (Methods for rating and assessing industrial and commercial sound) and/or its subsequent amendments. Where access to the nearest sound sensitive property is not possible, measurements shall be undertaken at an appropriate location and corrected to establish the noise levels at the nearest sound sensitive property.

Reason - In the interests of residential amenity.

This report details our assessment methodology and assessment outcome.

Assessment Criteria (BS4142:2014)

BS4142:2014 is the British Standard which describes how to rate and assess industrial and commercial sound.

The BS4142:2014 assessment methodology involves applying penalties to the measured or published noise level to allow for tonal noise and other characteristics that are likely to make the noise more annoying and then comparing the resulting rating level to the background noise.

According to the standard, where the specific sound is neither tonal nor impulsive but is readily distinctive above the residual acoustic environment, a penalty of 3 dB can be applied.

Where the specific sound is tonal a penalty of 2, 4 or 6 dB should be applied.

Where the specific sound is impulsive a penalty of 3, 6 or 9 dB should be applied.

Where the specific sound is intermittent and readily distinctive a penalty of 3 dB should be applied.

Where tonal and impulsive characteristics are present the penalties can be added in a linear fashion if they are each likely to affect perception and response. If one is dominant then only a single penalty might be necessary.

The more the rating noise is above the background noise the higher the likelihood of complaint and conversely, the more the rating noise is below the background noise the lower the likelihood of complaint. Where the rating noise does not exceed the background level, this is normally an indication of the specific sound source having a low impact.

Reference should be made to the standard for a complete understanding but the assessment section will outline the steps in the BS4142:2014 process relevant to this installation.

Noise Survey

Noise levels were surveyed on Friday 8th December to Sunday 10th December 2023 using a Norsonics Type 118 meter. The Type 118 meter is fully calibrated to traceable standards every two years by Campbell Associates (last carried out in August 2022). Calibration certificates are available on request. Field calibration was performed before and after the surveys and there was no drift in calibration noise levels.

The weather on the Friday was 8 to 10 °C with no precipitation and a light wind (forecast south-westerly at around 8 to 10 mph). The weather was forecast to change to rain and windy at around 06:00hrs on the Saturday morning for 24 hours with a return to calm conditions around 06:00hrs on the Sunday.

The FCU was observed between 12:30 and 13:30hrs and was found to be running at around 10 minutes per hour. The indoor refrigeration units have doors and so the on time of the FCU will be dependent on how often the doors are opened. The shop had a steady flow of customers and the doors were being opened regularly. Measurements of the FCU running were taken at 2 different distances (see Figure 1) and were as follows:

1m	$L_{Aeq,2mins}$	55.6 dB
6m	$L_{Aeq,2mins}$	42.6 dB
ambient level	$L_{Aeq,2mins}$	37.2 dB

The FCU is located against the building and adjacent to a fence and so the above fan levels have an acoustic reflection already included and this data can therefore be transposed to the proposed location which will also see the FCU set against the building.

Measurements were paused whenever there was passing traffic. Distant traffic is represented by the ambient level taken after the FCU had stopped. This can be subtracted from the FCU level at 6m to give $L_{Aeq,2mins}$ 41.1 dB. The level at 1m is significantly above the ambient and doesn't need to be corrected. There were no distinguishable features noted. It is understood the FCU is serviced at the recommended intervals and appears to be running correctly.

The meter was then set to measure background noise at a location close to the oil tank (see Figure 1). This was fully screened from the road by the building and is considered to be

representative of the background noise at the rear of all neighbouring dwellings. The microphone was placed at a height of 1.5m in free field conditions and the meter was placed in a waterproof case. There was a view of the FCU at approximately 8m and so the 3 wheelie bins were placed in a row to form a makeshift screen between the FCU and the microphone. The reading on the meter was observed and the FCU running for a few minutes every 15 minutes didn't affect the readings. It can be expected that the FCU would hardly be running outside of shop hours due to the doors not being opened.

The full background noise data is shown in Appendix A. It can be seen that there is a change in noise level that corresponds with forecast weather changes. Noise data between 13:30hrs on the 8th and 06:00hrs on the 9th and between 06:15hrs and 09:15hrs on the 10th will be used in the assessment. This includes the dead of night when there are clearly periods of no car passes and the early Sunday morning period. Despite the poor weather conditions at times the selected data is considered to be suitable for the assessment and this is shown by the extremely low background levels obtained.

Background levels during the day and at night respectively (excluding periods of bad weather) were as follows:

Lowest background levels = $L_{A90,15min}$ 31 dB and $L_{A90,15min}$ 22 dB

Average background levels = $L_{A90,15min}$ 36 dB and $L_{A90,15min}$ 28 dB

Mode background levels = $L_{A90,15min}$ 34 dB and $L_{A90,15min}$ 25 dB

Condition 9 states:

The rating level of sound emitted from the condenser shall not exceed the typical background sound levels

In this case, mode, as the most occurring number, is considered to represent typical. These are positioned somewhere between lowest and average levels and are considered to be sensible.

N.B. L_{A90} is the level exceeded for 90% of the time and reflects the background noise during the measurement duration and is often used for assessing plant noise (see next section). The L_{Aeq} or the equivalent continuous level can be regarded as an average.

BS4142:2014 Noise Assessment

BS4142:2014 requires the sound to be assessed over 15 minutes for night-time and 1 hour for daytime. Condition 9 asks for both periods to be assessed to 15 minutes.

The FCU has been measured at 6m at $L_{Aeq,2mins}$ 42.6 dB including building reflection and ambient noise. This has been corrected to $L_{Aeq,2mins}$ 41.1 dB by subtracting the ambient level (logarithmically). The manufacturer states an A-weighted sound pressure level in free field conditions of 52 dB at 1m and 32 dB at 10m. At 6m this would be 36.4 dB meaning there is a difference of 4.7 dB between manufacturer's data and measured data. This is to be expected because the FCU is located close to the ground (the top of the unit is approx. 790mm above the ground) and adjacent to the building and a timber fence. This means that the sound is quadrupled compared to spherical spreading which results in a theoretical 6 dB increase (3 dB for each doubling). The two sets of data therefore correspond closely once this is taken into account.

There are a number of corrections that need to be applied to the data as follows:

Screening of -5 dB due to the brick wall removing line of sight between the unit and the 2nd floor window of Park House once it is in the proposed location (this must be ground mounted as proposed)

Distance correction of -10.2 dB for attenuation from the measured level at 6m to 19.5m being the distance between the proposed location and the 2nd floor window of Park House

On time correction of -3 dB for day and -6 dB for night corresponding to a robust assumption of 50% on-time during the day and 25% on-time during the night (witnessed daytime on-time of no more than 20%).

The resultant levels are therefore as follows:

Daytime = $L_{Aeq,15mins}$ 22.9 dB (41.1 dB - 5 dB - 10.2 dB - 3dB)

Night-time = $L_{Aeq,15mins}$ 19.9 dB (41.1 dB - 5 dB - 10.2 dB - 6dB)

This is considered robust since the FCU is moving from a location in a corner (quadrupled sound energy) to against a wall (doubled sound energy) and there would be a 3 dB reduction in theory. This has not been included in the assessment as a safety factor.

The plant noise had a smooth spectrum and there were no characteristics that would be perceptible at the receptors. There are no penalties that need to be applied using the BS4142:2014 methodology.

The BS4142 assessment for 2nd floor Park House during the daytime is as follows:

Specific sound level = $L_{Aeq,15mins}$ 22.9 dB
Acoustic feature correction = 0 dB
Rating level = $L_{Aeq,15mins}$ 22.9 dB
Background sound level = $L_{A90,15mins}$ 34 dB
Excess of rating over background level = -11.1 dB

The assessment indicates a low likelihood of adverse impact at the receptors.

Uncertainty: Any uncertainty is generally in favour of the client since robust assumptions have been used throughout the assessment (i.e. the levels are more likely to be lower than higher). The assessment has been carried out to the 2nd floor and the FCU level will be even lower at 1st and ground floors.

The BS4142 assessment for 2nd floor Park House during the night-time is as follows:

Specific sound level = $L_{Aeq,15mins}$ 19.9 dB
Acoustic feature correction = 0 dB
Rating level = $L_{Aeq,15mins}$ 19.9 dB
Background sound level = $L_{A90,15mins}$ 25 dB
Excess of rating over background level = -5.1 dB

The assessment indicates a low likelihood of adverse impact at the receptors.

Uncertainty: As for daytime assessment.

The residential above and to the side of the shop have no habitable rooms on the same façade as the FCU and will therefore benefit from significant screening likely to be in the region of 15 to 20 dB. As such the noise levels from the FCU will be even lower at these locations.

Assessment Conclusion/Discussion

Sound Acoustics Ltd has assessed the noise impact of the existing fan coil unit (FCU) at the rear of Park Street Village Stores, Stoke by Nayland being moved to the side of the shop facing the neighbouring Park House to the south-east.

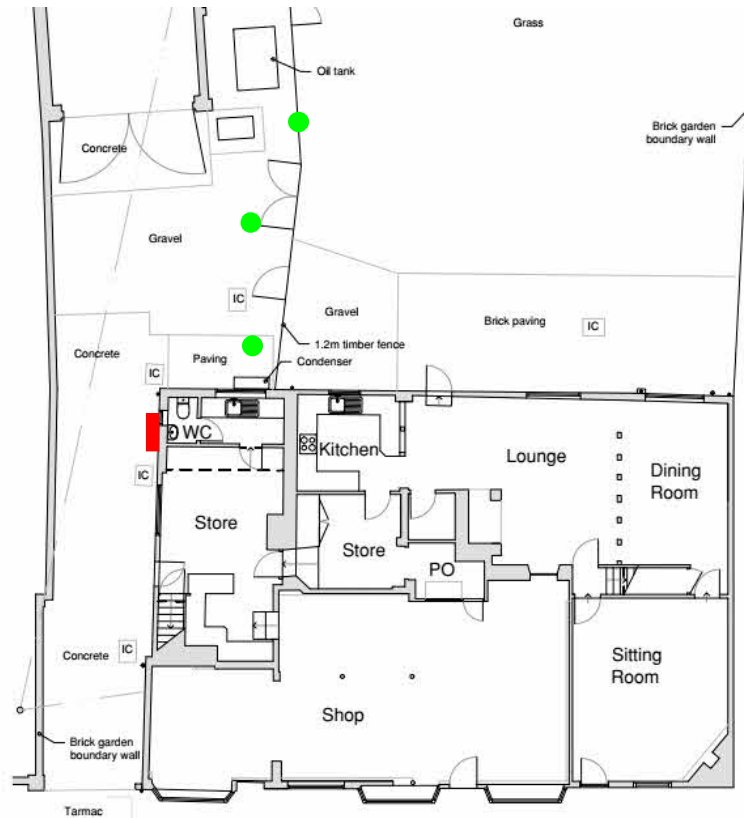
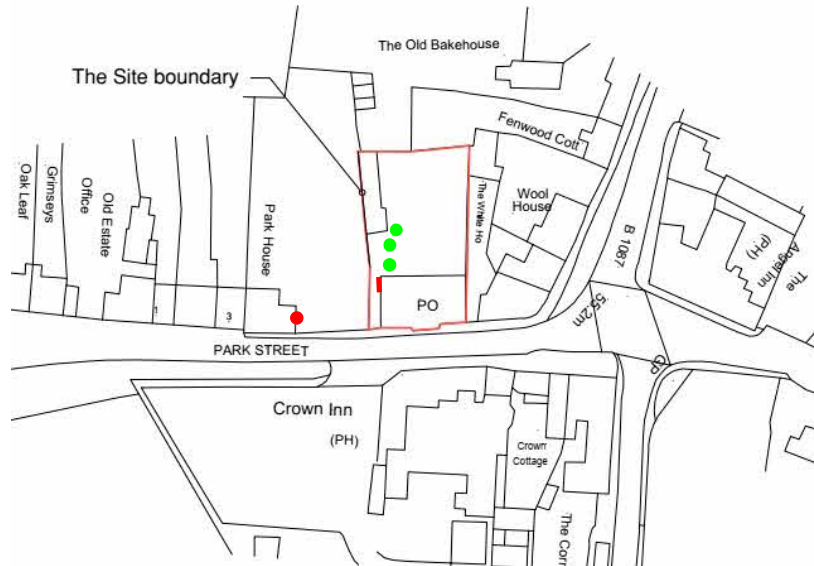
The BS4142:2014 assessment has found that the rating level of the FCU will be significantly below the background noise during the day (-11.1 dB) and comfortably below the background noise during the night (-5.1 dB).

With such levels it is highly unlikely that the FCU would be audible outside Park House or any other dwelling. Although the residential above and to the side of the shop are closer than Park House they will benefit from significant screening attenuation (likely to be around 15 to 20 dB) and the FCU noise levels will not be any higher than at Park House.

The outcome of this robust assessment points to this proposal being entirely acceptable on grounds of noise and compliant with Condition 9 set by Babergh District Council.

Figure 1 – Site and Survey Locations

● = survey position ■ = proposed FCU position ● = assessment position



Appendix A – Survey Data

Date	Time	LA90, dB	Date	Time	LA90, dB
08/12/2023	13:30	36	09/12/2023	00:30	27
08/12/2023	13:45	36	09/12/2023	00:45	27
08/12/2023	14:00	38	09/12/2023	01:00	27
08/12/2023	14:15	39	09/12/2023	01:15	22
08/12/2023	14:30	39	09/12/2023	01:30	24
08/12/2023	14:45	40	09/12/2023	01:45	23
08/12/2023	15:00	39	09/12/2023	02:00	23
08/12/2023	15:15	40	09/12/2023	02:15	25
08/12/2023	15:30	41	09/12/2023	02:30	24
08/12/2023	15:45	42	09/12/2023	02:45	23
08/12/2023	16:00	40	09/12/2023	03:00	23
08/12/2023	16:15	39	09/12/2023	03:15	24
08/12/2023	16:30	40	09/12/2023	03:30	23
08/12/2023	16:45	39	09/12/2023	03:45	26
08/12/2023	17:00	41	09/12/2023	04:00	25
08/12/2023	17:15	40	09/12/2023	04:15	25
08/12/2023	17:30	37	09/12/2023	04:30	25
08/12/2023	17:45	39	09/12/2023	04:45	25
08/12/2023	18:00	39	09/12/2023	05:00	26
08/12/2023	18:15	38	09/12/2023	05:15	31
08/12/2023	18:30	39	09/12/2023	05:30	29
08/12/2023	18:45	36	09/12/2023	05:45	32
08/12/2023	19:00	38	09/12/2023	06:00	35
08/12/2023	19:15	37	09/12/2023	06:15	34
08/12/2023	19:30	36	09/12/2023	06:30	34
08/12/2023	19:45	34	09/12/2023	06:45	43
08/12/2023	20:00	34	09/12/2023	07:00	43
08/12/2023	20:15	33	09/12/2023	07:15	46
08/12/2023	20:30	32	09/12/2023	07:30	46
08/12/2023	20:45	31	09/12/2023	07:45	48
08/12/2023	21:00	32	09/12/2023	08:00	47
08/12/2023	21:15	31	09/12/2023	08:15	45
08/12/2023	21:30	32	09/12/2023	08:30	45
08/12/2023	21:45	32	09/12/2023	08:45	45
08/12/2023	22:00	34	09/12/2023	09:00	47
08/12/2023	22:15	33	09/12/2023	09:15	47
08/12/2023	22:30	33	09/12/2023	09:30	47
08/12/2023	22:45	33	09/12/2023	09:45	50
08/12/2023	23:00	31	09/12/2023	10:00	49
08/12/2023	23:15	33	09/12/2023	10:15	49
08/12/2023	23:30	37	09/12/2023	10:30	48
08/12/2023	23:45	29	09/12/2023	10:45	47
09/12/2023	00:00	30	09/12/2023	11:00	44
09/12/2023	00:15	28	09/12/2023	11:15	42

Appendix A –Survey Data Continued

Date	Time	LA90, dB	Date	Time	LA90, dB
09/12/2023	11:30	42	09/12/2023	22:30	48
09/12/2023	11:45	40	09/12/2023	22:45	49
09/12/2023	12:00	40	09/12/2023	23:00	49
09/12/2023	12:15	39	09/12/2023	23:15	50
09/12/2023	12:30	38	09/12/2023	23:30	49
09/12/2023	12:45	40	09/12/2023	23:45	48
09/12/2023	13:00	41	10/12/2023	00:00	47
09/12/2023	13:15	40	10/12/2023	00:15	46
09/12/2023	13:30	41	10/12/2023	00:30	48
09/12/2023	13:45	45	10/12/2023	00:45	49
09/12/2023	14:00	41	10/12/2023	01:00	50
09/12/2023	14:15	44	10/12/2023	01:15	48
09/12/2023	14:30	43	10/12/2023	01:30	46
09/12/2023	14:45	43	10/12/2023	01:45	47
09/12/2023	15:00	46	10/12/2023	02:00	45
09/12/2023	15:15	49	10/12/2023	02:15	44
09/12/2023	15:30	45	10/12/2023	02:30	44
09/12/2023	15:45	45	10/12/2023	02:45	43
09/12/2023	16:00	43	10/12/2023	03:00	43
09/12/2023	16:15	42	10/12/2023	03:15	43
09/12/2023	16:30	43	10/12/2023	03:30	41
09/12/2023	16:45	46	10/12/2023	03:45	39
09/12/2023	17:00	46	10/12/2023	04:00	42
09/12/2023	17:15	45	10/12/2023	04:15	44
09/12/2023	17:30	46	10/12/2023	04:30	43
09/12/2023	17:45	44	10/12/2023	04:45	40
09/12/2023	18:00	45	10/12/2023	05:00	42
09/12/2023	18:15	44	10/12/2023	05:15	41
09/12/2023	18:30	44	10/12/2023	05:30	39
09/12/2023	18:45	43	10/12/2023	05:45	38
09/12/2023	19:00	41	10/12/2023	06:00	36
09/12/2023	19:15	41	10/12/2023	06:15	31
09/12/2023	19:30	42	10/12/2023	06:30	30
09/12/2023	19:45	44	10/12/2023	06:45	32
09/12/2023	20:00	47	10/12/2023	07:00	34
09/12/2023	20:15	47	10/12/2023	07:15	32
09/12/2023	20:30	46	10/12/2023	07:30	34
09/12/2023	20:45	45	10/12/2023	07:45	32
09/12/2023	21:00	47	10/12/2023	08:00	34
09/12/2023	21:15	48	10/12/2023	08:15	36
09/12/2023	21:30	49	10/12/2023	08:30	34
09/12/2023	21:45	48	10/12/2023	08:45	39
09/12/2023	22:00	50	10/12/2023	09:00	35
09/12/2023	22:15	48	10/12/2023	09:15	38