

Acoustic Associates Sussex Ltd

Noise Breakout Assessment for Planning Condition

Site: The Olive Branch Gospel Hall Yapton
Client: BGH Construction Ltd

Report by: Martyn Chambers BA (Hons), TechIOA

Date: 28/01/2020
Project: J2787
Issue 1



Sound Insulation Testing - Acoustic Design of Buildings - BS4142 - PPG24 - Schools Acoustics B893 -
Vibration - Expert Witness Testimony - Noise at Work - Air Tightness Testing - Auditorium Acoustics

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1 Introduction and Executive Summary

Acoustic Associates Sussex have been appointed to undertake a noise breakout assessment of the newly constructed Gospel Hall in Yapton, West Sussex. The site has gained conditional planning permission. Condition 10 of the planning reference Y/7/15/PL concerns noise:

“Before the use of the gospel hall commences, the building shall be insulated in accordance with a scheme to be submitted to and approved by the Local Planning Authority in order to secure an acceptable level of noise emanating from the building. The approved scheme shall be implemented and retained thereafter”.

To discharge the aforementioned condition Acoustic Associates Sussex has conducted an assessment of how the design, usage and subsequent propagation of sound from inside the newly constructed Gospel Hall will affect the surrounding noise sensitive receptors.

The assessment has used the following methodology

- Attendance of a service from the same organisation to measure representative noise levels and frequency spectra.
- Review of the construction detail and potential noise breakout from the site.
- Conduct a noise breakout test at the site using representative sound levels from a typical service.

Standards and guidance referenced for this assessment include:

- ISO9613 (Attenuation of sound during propagation outdoors) 1996
- Planning Noise Advice Document: Sussex, July 2015
- BS8233:2014 Guidance on sound insulation and noise reduction for buildings
- WHO1999 Guidelines for community noise

Acoustics Associates has conducted a subjective and objective assessment of noise breakout from the new hall. There is no amplified singing or music planned for the site. A worst case $L_{Aeq,1min}$ produced within the hall was deemed to be 75dB(A), based upon data gathered from another closely-similar congregation. At this level the sound has been judged to be inaudible inside the nearest residential properties at any time and therefore in line with bullet point 2 of section 3.2.3 of Sussex Planning Noise Advice Document, 2015. With these results this report concludes that there is no reason for planning condition 10 not to be discharged.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Context

The new gospel hall is on the north west of North End Road in Yapton. Around the location is residential housing. The closest house is located directly behind the new hall to the north east. A site plan can be seen in figure 1 below.



Figure 1: Site Plan

2.2 Usage of the Hall

The client has informed Acoustic Associates of what will be the general usage of the hall. Services can occur between 05:00 and 23:00 a typical service would be as follows:

- Unamplified hymn.
- Several amplified readings
- Second unamplified hymn.
- Prayer

No instruments or backing tracks are used for the service and the hymns will never use the venue's PA system. The client expects the congregation to be on average around 30 people for the new hall, though this number may increase over time.

2.3 Methodology.

Upon being approached by BGH Construction Ltd to help discharge the aforementioned condition Acoustic Associates Sussex recommended the following approach to ensuring the noise breakout from the hall would not prevent the discharge of Condition 10 of the planning approval.

1. Attend a service from the same organisation as that which will occupy the new hall. Measure sound pressure levels during the service, which Acoustic Associates Sussex were informed followed the same format that will take place in the new hall. The noise spectrum data recorded so it could be compared to the calculated sound reduction levels of the construction details provided using the software Insul.
2. Design Advice was given to ensure noise breakout from the hall would be in keeping with the aforementioned Standards and Guidance.

3. The final element was to conduct noise breakout tests from site using a representative sound spectrum played at a representative noise level.

3 Standards and guidance

3.1 BS8233: 2014: Guidance on sound insulation and noise reduction for buildings

BS8233 provides, at Section 7, Table 4, guidance for maximum internal ambient noise levels resulting from external anonymous noise sources. The guideline values are as below:

Table 4 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Figure 2: Guideline values for internal noise from external sources from BS8233:2014

In sub-clause 7.7.1 of that document, however, it is stated that these guideline values apply to cases where the external noise, as it affects the internal acoustic environment, is from sources without a specific character. Occupants can normally be more tolerant of noise without a specific character than, for example, that from neighbours which can trigger complex emotional reactions (e.g., in this case singing). In a further note to that sub-clause, it states:

NOTE Noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate.

The degree to which noise limits should be reduced is not identified within the Standard.

3.2 Sussex Planning Noise Advice Document, 2015

This document was produced with the involvement of a number of Local Authorities within Sussex and includes guidance with respect to noise from entertainment premises. The Design Criteria section of the document (section 3.2) contains the following relevant paragraphs.

- 3.2.1. People living near to places of entertainment have a right to enjoy reasonable standards of amenity. To protect that amenity, the LPA must be satisfied that the applicant has successfully addressed the issue of noise control.
- 3.2.2. It is likely that most planning applications for these types of premises will require a noise report. The level of detail required will depend on the location (i.e. the proximity to noise sensitive premises) and the nature of the proposed use. Early consultation with the local authority is strongly recommended.
- 3.2.3. To satisfy the LPA that the development is acceptable, the applicant should usually be able to demonstrate that the following criteria can be achieved:
- Where regular use of the proposed premises is planned, any amplified sound (including music and speech), should be inaudible within any nearby noise sensitive premises with or without one or more windows open.
 - Any other noise sources associated with the premises, such as patron noise, should also be inaudible inside residential properties.
 - If the noise report indicates that the above criteria would not be achievable, the development may still be considered but subject to restrictions on the hours of operation and/or frequency of use of the premises.

Figure 3: Extract from the Sussex Planning Noise Advice Document: 2015

3.3 WHO External Noise Criteria

With regard to outdoor amenity areas WHO (Guidelines for Community Noise, 1999) states the following:

To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB(A) on balconies, terraces and in outdoor living areas.

To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 50dB(A) on balconies, terraces and in outdoor living areas.

3.4 Methodology.

As can be seen from the extracts of the above standards and documents, defining Inaudibility is complex. There is no one definition as to what will and will not be deemed acceptable to different receptors. In cases such as this it is often the brief for consultants to propose a suitable criterion to ensure noise will not be a problem.

To meet the remit the current report has used the following process:

- Measure representative octave band levels from congregation with same service structure.
- Compare these measurements with the sound reduction level of the proposed construction detail.
- Offer design advice to ensure noise breakout from the hall would be in keeping with the aforementioned Standards and Guidance
- Measure the breakout levels to ensure they are compliant with section 3.2.3 of Sussex Planning Noise Advice Document, 2015.

4 Representative measurement survey.

On Friday the 13th of September 2019 Acoustic Associates Sussex Ltd. attended an evening service of an equivalent congregation at Chalcraft Lane, Bognor Regis. A measurement of the entire service was made as well as individual measurements of each section of the service. The service ran for 25 minutes and had 48 individuals in the congregation. The hymns, one at the start of service and one close to the end, were sung without amplification by the whole congregation. The readings and speeches that formed the centre section of the service were spoken into microphone, with the sound being amplified from ceiling mounted speakers.

4.1 Measurement information.

- Measurements carried out by: Martyn Chambers BA (Hons), PGDip: Acoustics, TechIOA
- Equipment used: 1x Norsonic 140 1 x Norsonic 118 (both class 1 sound level meters)

4.2 Measurement location photos



Figure 4: Hall layout



Figure 5: Measurement location

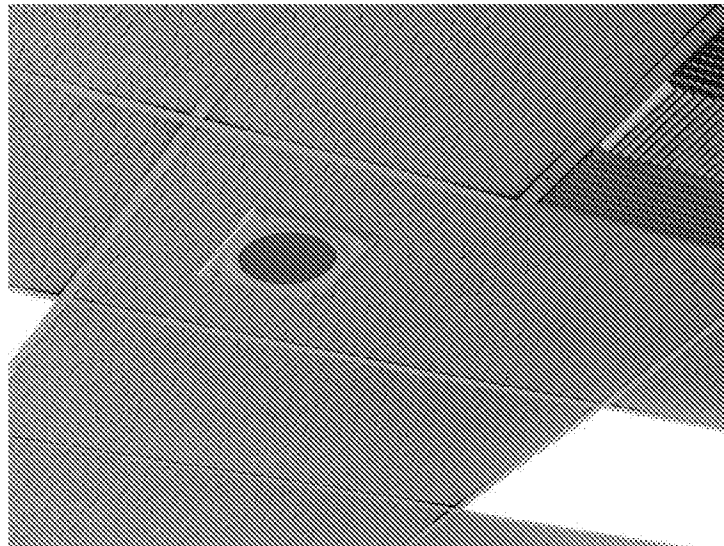


Figure 6: Ceiling speaker

4.3 Measurement Results:

Measurement	Duration	L _{Aeq}
First Hymn	59s	72.7
First amplified reading	10m 11s	62.4
Second amplified reading	6m 20s	62.5
Third amplified reading	3m 43s	68.6
Second Hymn	52s	74.4
Prayer	10s	64.2
Entire Service	24m 27s	66.2

Table 1: Measurement Results

5 Noise Breakout Assessment.

On Tuesday the 21st of January 2020 Acoustic Associates Sussex visited site to measure noise breakout from the site. Construction of the site was nearly complete. However, the internal doors had not yet been installed. The planned location of these are marked below in figure 7.

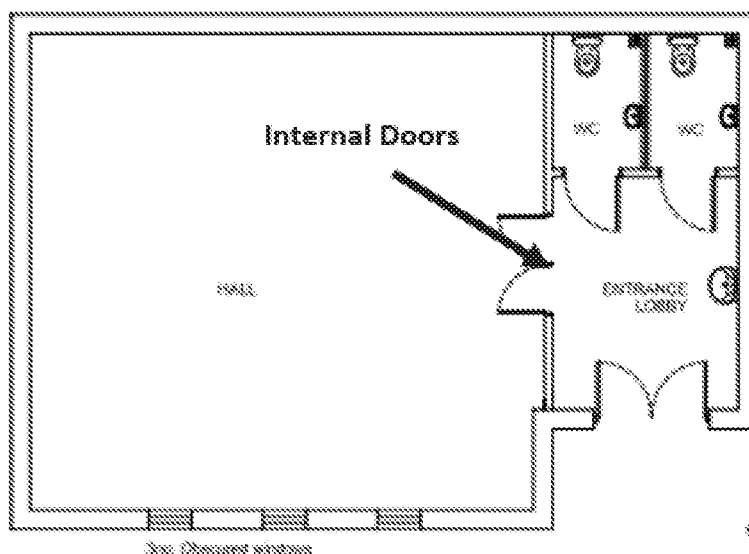


Figure 7: Floor Plan with Internal Doors Marked

The result of this is the sound lobby that would have been created by these doors is not present which will in turn worsen the results of the breakout test.

To conduct the noise breakout tests Acoustic Associates Sussex Acoustic brought its own PA system consisting of 2x Mackie Thump 12inch tops and a subwoofer. The methodology for the test was to play gospel music with a representative frequency profile at the level of loudest hymn measured during the monitored survey at Chalcraft Lane site. This was hymn 2, which was measured to be 74.4dB, shown in table 1. Once the PA system was set at the same approximate level, subjective listening tests and measurements were then made at the nearest noise sensitive locations. Following this the level of the representative music was then increased far above the level which would be regularly emanating from the hall. With the higher levels the process of subjective listening tests and measurements at the nearest noise sensitive locations was repeated. Following the second set of listening tests background noise measurements were taken at the same locations. Figure 8 below shows the measurement locations (RP's) and table 2 the recorded readings.



Figure 8: Measurement Locations (RP's)

Measurement	L _{Aeq,1min} dB
Representative Hall Measurement	75
RP 1 with Representative Level in Hall	54
RP2 with Representative Level in Hall	59
Increased Hall Measurement	87
RP 1 with Increased Level in Hall	55
RP2 with Increased Level in Hall	62
RP 1 Background	54
RP 2 Background	58

Table 2: Breakout Assessment Measurements

5.1 Subjective Assessment.

The sound levels shown in Table 2 are heavily influenced by the fluctuating levels of traffic passing the site. As the number of passing cars not always consistent to ascertain the impact from noise from the hall from these measurements alone. As such a subjective assessment was undertaken at the measurement locations.

5.1.1 RP 1 Subjective Assessment.

With both the representative music and the increased music level within the new hall the dominant noise at this noise measurement location was traffic noise. With the traffic noise both sound levels within the hall were inaudible. When there was a lull in the traffic the representative noise level within the hall was still inaudible at the RP. When the increased level was emitting from the hall and there was a lull in traffic, the representative music could be heard if an individual strained. Subjectively this would be classed as barely audible.

5.1.2 RP 2 Subjective Assessment.

As with RP1 the dominant sound at the location was traffic noise. Again, with the traffic noise both sound levels with the hall were inaudible. With a lull in traffic 1 member of the Acoustic Associates Sussex thought he could faintly hear the illustrative music within the hall when played at a representative level. When music was increased to the higher level with the hall it became audible at the RP.

6 Discussion

6.1 What causes sounds to be heard as noise

Response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact, for example, can depend on such factors as the margin by which a sound exceeds the background sound level, its absolute level, time of day and change in the acoustic environment, as well as local attitudes to the source of the sound and the character of the neighbourhood.

Not knowing when a sound might finish or anxiety over how long it may last will also impact a perception of sound, and may change the definition of sound into the category of unwanted sound or “noise”.

The weather also has an influence on how sounds are propagated with wind strength and direction, pressure and temperature fluctuations all being responsible for how sounds are perceived at distance.

6.2 Subjective discussion

6.2.1 Subjective Breakout Discussion

Subjectively, when the representative music at the approximate level to the loudest measured hymn, shown in table 1 was played within the new hall, it was only audible in one location, RP2. Even at this location it was only barely audible when there was a lull in traffic noise and only by one member of the Acoustic Associates Sussex team. If this assessment is then compared to bullet point 2 of section 3.2.3 of Sussex Planning Noise Advice Document, 2015, then it is highly likely that the breakout sound from within the hall would be inaudible inside the residence closest RP2. This would be true even with an open window, as the industry standard is to deduct 15dB(A) from a facade measurement. As the sound from the hall could at loudest be described ‘barely audible’ outside then a 15dB reduction to provide an inside level with an open window, then it is highly likely that the sound would be inaudible internally.

As the hall will be on occasion used for services at 5am a discussion must be had in regards to the lower noise levels due to the reduced traffic noise at these times. To account for this Acoustic Associates Sussex subjective assessment was firstly based around the lulls in the traffic and the audibility at these times. As discussed in the paragraph above, the noise from the hall was deemed to be inaudible inside the nearest residential properties with representative music playing.

The second method was to play the music at an unrepresentatively high level (13dBA, above the representative level) within the hall to compensate for the higher road traffic noise. At this level at RP1 even when there was a lull in traffic the sound was only barely audible externally and so would likely be inaudible inside a resident's property even at the unrepresentatively high level at any time of day or night.

At RP2 the higher level would be described as audible when there was a lull in traffic, so may possibly be just audible inside a resident's property. However, this is at unrepresentatively high levels and only when there was a dip in the traffic noise. When there is a lull in traffic noise the soundscape is likely to be more equivalent to the sound levels at 5am in the morning. While the unrepresentatively high levels may not be inaudible at these times, the representative music level was deemed to inaudible inside the nearest residential property even at the times when traffic noise was not the dominant sound. Logically it then follows that it would likely be inaudible inside the nearest residence at 5am.

6.2.2 Hall Usage Discussion

It should also be restated that the representative music level was based on the loudest hymn recorded during the monitored survey at Chalcraft Lane site. It is worth noting though these levels will not be reached by the hall for the full service. The service as a whole was measured to have an L_{Aeq} level of 66.2 dB(A), as shown in table 1. The internal sound level produced by the new hall will likely be lower still than this as the congregation is planned to be smaller, around 30 worshippers rather the 48 which were present when the discussed measurements took place. As such the levels used for this breakout tests are above the worse-case levels that would be created within the hall. Even with these worst-case levels the noise breakout has still been argued to be inaudible inside the closest residential property.

It should finally be noted that no amplified singing or music is planned within the hall. The planned ceiling speakers will only be used for readings during the service. As is shown in table 1 the levels for an amplified reading are below the levels produced by the congregation singing. Furthermore, the noise within the hall during a service are not bass heavy or intrusive sounds that will draw attention and cause a noise nuisance.

7 Recommendations and Mitigation Measures

The hall already incorporates many aspects of good acoustic design. For example, the entrance hall and windows being faced away from the nearest residential home. Furthermore, as shown throughout this document the noise produced by planned use of the hall is not inherently loud, so noise mitigation methods are not as crucial to its development. However, Acoustic Associates Sussex recommends a site Noise Management Plan drawn up with a complaints procedure from local residents put in place as part of the scheme.

8 Uncertainty

As discussed, road traffic noise made assessing the audibility of the representative music complex. In response the current assessment has mitigated for this by always using the worst-case levels. Which have been demonstrated to be inaudible inside the nearest residential property.

As discussed in section 5 the internal doors within the hall were not yet in place. It is likely that when they are installed the levels emitting from the hall will be reduced, as a sound lobby would have been created in the foyer, containing the sound within the main room.

As stated in section 2.2 the number of attendees to a congregation is initially thought to be around 30. This however is not a set number and so may increase. To remove this uncertainty the current report has taken this into account by using data from a congregation of 48.

9 Conclusions

To discharge the aforementioned condition Acoustic Associates Sussex has conducted an assessment of how the design, usage and subsequent propagation of sound from inside the newly constructed Gospel Hall will affect the surrounding noise sensitive receptors.

The assessment has used the following methodology

Attendance of a service from the same organisation to measure representative noise levels and frequency spectra.

Review of the construction detail and potential noise breakout from the site.

Conduct a noise breakout test at the site using representative sound levels from a typical service.

Standards and guidance referenced for this assessment include:

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