

**EMSWORTH
BAPTIST CHURCH**

**NOISE IMPACT
ASSESSMENT**

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NOISE IMPACT ASSESSMENT
EMSWORTH BAPTIST CHURCH



AUDIT SHEET

REVISION	DESCRIPTION	DATE	ISSUED BY	REVIEWED BY
0	Report to support planning application – issue to Client & design team for coordination	04 June 2010	GB	BJ

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EXECUTIVE SUMMARY

- o The potential impacts of noise have been considered at an early stage of the design process. Reference has been made to other well established and recognised guidance for noise assessment.
- o A noise survey was carried out and it was observed that the ambient noise climate consisted primarily of local road traffic noise, which occasionally included heavy good vehicles and buses which present low frequency noise.
- o Noise generated by new mechanical plant serving the building will need to be controlled to achieve acceptable levels of environmental noise to surrounding areas. It is anticipated that the Local Authority would require plant noise emission to the surroundings to be limited in accordance with Guidelines in BS 4142. Based on the measured levels of background noise obtained for the area, plant noise rating limits have been proposed. Precise details of the final selection of equipment are unknown at this stage so a detailed assessment with respect to the proposed limit criteria cannot be undertaken. However, on the basis of experience of addressing noise control for similar plant schemes, it is anticipated that the limits can be achieved by selection of suitably rated equipment and implementing, where necessary, noise control measures to externally located mechanical equipment, including atmospheric attenuators to air handling units, enclosures, acoustically rated louvres, and screens.
- o It has been identified that music events to be held within the church poses a noise source with the potential to impact on the amenity of the surrounding area. An assessment has been carried out and accordingly recommendations has been made regarding the acoustic requirements of the building's external envelope. This will ensure that criteria are achieved to the nearest residential premises and therefore minimize noise disturbance during the music events.
- o Overall, it is concluded that with appropriately specified building envelopes, noise intrusion can be limited to provide suitable conditions for worship within the church. Emission of noise generated by future operation of the church can be controlled by design and specification to protect the existing amenity for the community in noise sensitive areas neighbouring the site.
- o On this basis noise should not pose an obstacle to granting planning permission for the redevelopment of Emsworth Baptist church.

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1. INTRODUCTION

Proposals are in place for the development of a new building for Emsworth Baptist Church. The potential impacts of noise have been considered at an early stage of the design process, under two broad categories;

- i. Plant noise; and
- ii. Music noise break out.

This report presents an assessment of noise impacts and where necessary, outlines proposals for noise mitigation. The purpose is to highlight the acoustic design issues for the scheme and offer indicative noise control concepts to demonstrate compliance in principle so as to support the application for planning permission.

A glossary of acoustical terms used throughout the report has been provided in Annex A. Details of the baseline noise survey are presented in Annex B. Extract from stage D acoustic report regarding the acoustic design requirements of the building's external envelop is presented in Annex C.

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2. **APPROPRIATE GUIDANCE & STANDARDS**

This section considers relevant guidance on the assessment of noise for the church and where appropriate sets out suitable objective noise criteria.

Reference is made to well established and recognised guidance including:

- o British Standard 4142:1997 *'Rating industrial noise affecting mixed residential and industrial areas'*.
- o *Guidelines for Community Noise - World Health Organization*
- o British Standard 8233:1999 *'Sound insulation and noise reduction for buildings – Code of Practice'*.

2.1 **Building services plant noise emissions**

Noise generated by new mechanical plant serving the building will need to be controlled to achieve acceptable levels of environmental noise to all nearest residential premises.

Local Authority policies on protecting communities from noise are generally guided by the advice contained in Planning Policy Guidance Note 24 (PPG24). Where a potential 'new' noise source, which is industrial or commercial in nature, is introduced to a mixed commercial and residential area, PPG 24 suggests that the likelihood of noise complaints be assessed using BS 4142: 1997 *"Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas"*

The general principle of the BS 4142 assessment criteria is that noise nuisance can be avoided provided there is no significant change in the prevailing background noise conditions at any surrounding noise sensitive premises once the new equipment is operational.

The BS4142 assessment criteria explicitly state that where the specific noise level of any new plant is 10 dB above the background noise level, complaints are likely. Where the new noise is 5 dB above the background noise level, it is considered to be of marginal significance according to BS 4142. The standard concludes that where the noise level of the plant is 10 dB below background noise, it is considered a positive indication that complaints about noise should not occur. To avoid noise complaints, Local Authorities throughout the UK generally stipulate that new plant be controlled to 5 dB or more below prevailing background noise levels.

2.2 **Music break out**

There are no specific regulatory or standards documents which define appropriate levels of activity noise emission from a church. The aim ultimately is to avoid nuisance to surrounding residential areas. Reference can be made to residential noise criteria recommended by the World Health Organisation and in BS8233. In specific respect to music noise, guidance can be taken from the Noise Act. Section 5 proposes objective noise targets to be achieved to enable both assessment and design of the building.

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3. BASELINE NOISE SURVEY

An acoustic survey was carried out at the site to establish the prevailing environmental noise conditions local to the site so as to enable assessment of the impact that the new plant installation could potentially have. Both qualitative observations and objective measurement data were recorded.

3.1 Local noise conditions

It was observed that the ambient noise climate consisted primarily of local road traffic noise, which occasionally included heavy good vehicles and buses which present low frequency noise.

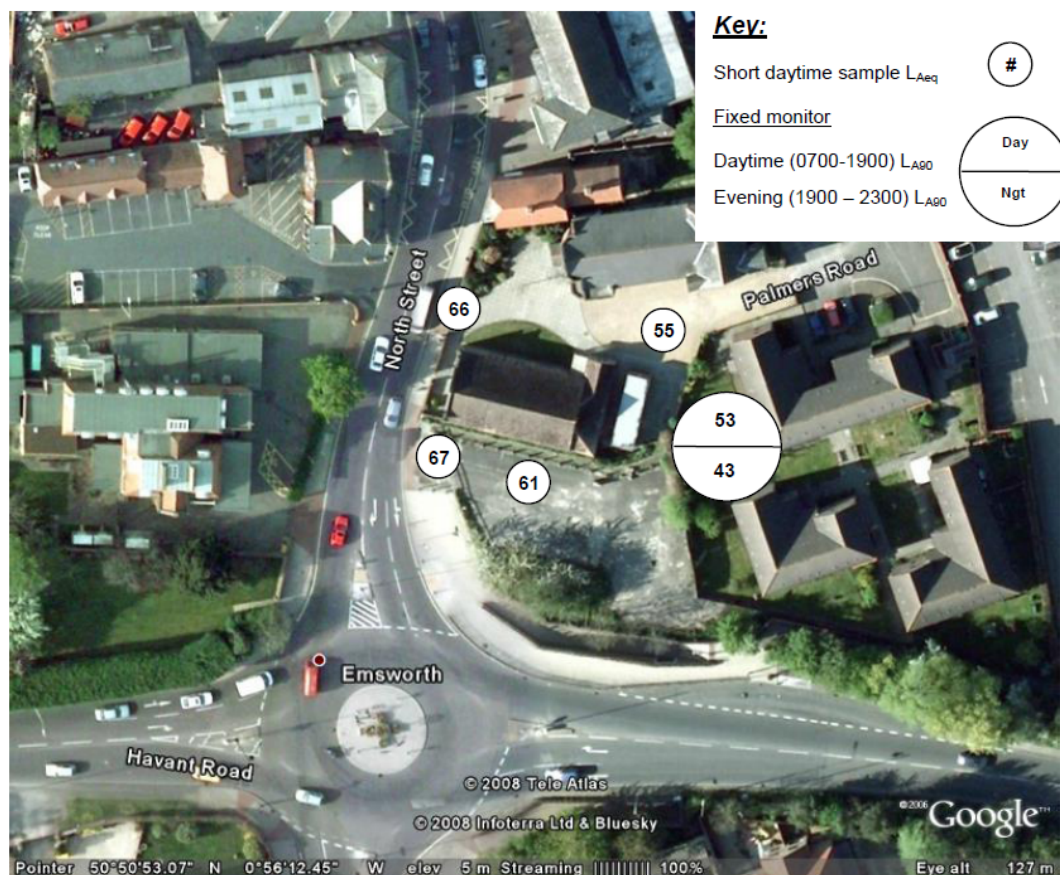
3.2 Results Summary

3.2.1 External noise

Baseline noise measurements were taken at the site to establish the prevailing environmental noise conditions during both day and night. Additionally, attended supplementary measurements were made at a series of location around the site during daytime hours.

The full survey results are provided in Appendix B. For ease of reference, a summary of the results are presented in Figure 2.

Figure 1. Summary of measured noise levels



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4. CONTROL OF NOISE EMISSION FROM SCHEME

The following presents an assessment and outline of mitigation measures likely to be needed for the control of noise from the scheme to the surrounding environs.

4.1 Noise sensitive locations

Noise sensitive property has been identified at the following locations;

- Residential premises to the east of the building's eastern facade at a distance of approximately 11m.

4.2 Building services noise emissions

4.2.1 Proposed mechanical services plant

The building services systems have been developed during stage D and will include:

- o **Air Handling Unit.** An air handling unit will be enclosed in a plantroom within the church to serve the auditorium, and other areas requiring enhanced rates of air change.
- o **Extract fans.** Toilets and kitchen will be provided with extract ventilation to each space to remove smells etc.
- o **Condensing boiler plant.** This will provide heating for the Auditorium, hot water calorifer and space heating.

That plant will operate at night only during the summer for cooling purposes. However its operation will be limited to only when the temperature inside the building is above 19 °C and the external temperature is greater than 16 °C.

4.2.2 Proposed plant noise rating limits

After liaison with Larn Read of Havant Borough Council (HBC) on the 21st May 2010 it was established that the local council requires plant noise emissions to the nearest residential premises to be limited in accordance with guidance in BS 4142: "1990 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas".

Based on the noise data measured on site, the typical minimum L_{A90} background level during daytime was found to be 43 dB(A). It is proposed that rating noise level from new plant be limited to 33 L_{Aeq} dB(A) at 1m from the nearest residential facade. A control level of less than this would overly onerous and is beyond the scope of BS 4142. A plant noise rating limit of less than 33 dB(A) is deemed to be "very low" according to the standard.

The proposed limit above will also apply during night time at times when the plant will be operational. As it has been mentioned above this will be limited only during the summer time and under certain conditions.

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4.2.3 Practical control measures

The above criteria could be readily achieved provided the following noise control measures which have been recommend during stage D design are met;

1. Low noise equipment (e.g. Air Handling Units, DX cooling condensers) will be selected where practically possible.
2. AHU's and extract fans to incorporate ducted splitter attenuators (or "silencers") to fresh air intakes and exhaust ducts.

The fresh air inlets and exhaust air outlets will need to be attenuated with conventional ducted silencers. The unit casing can be manufactured to provide sound reduction properties, typically incorporating double skins and mineral fibre based insulation. It is recommended that noise emissions from the AHU to be limited to NR 60 inside the plantroom.

3. AHU enclosures to be sound insulated to limit fan noise breakout from casing
4. All equipment to be vibration isolated.
5. Boilers would be selected to ensure their noise emissions achieve the proposed noise criteria.

The precise specification of attenuators and any of the proposed measures above is subject to detailed design.

4.3 Music noise

It is anticipated that Havant Borough Council would require that neighbouring residents are protected from unnecessary noise from church activities including music events to be held within the auditorium.

4.3.1 Music noise breakout

As mentioned in Section 2, there are guidance references on the subject but there is no UK standardised limit for this type of situation. To enable both assessment and design of the buildings, it is useful to set an objective noise level target.

It is considered for this situation that protection is given to occupants not only in their dwelling but also in their garden.

The World Health Organisation (WHO) indicate from research findings that an environmental noise level of 50 to 55 dB(A) or less is desirable for outdoor amenity space. This provides a useful base reference but this is on the basis of what is commonly referred to as anonymous noise; noise from a variety of urban sources, rather than specific individual source. It would not be an appropriate criterion for music noise. Generally a specific noise source should be controlled to a lower level than to overall ambient noise such that it is masked and less

noticeable. The Noise Act 1996 deals with music noise and suggests a noise level of less than 34 dB(A) inside dwellings is unlikely to lead to complaints. This equates to an outdoor noise level of 44 dB(A) on the basis that a partially open window will generally give around 10 dB or more sound attenuation.

Therefore the intention is be to achieve 44 dB L_{Aeq} 15min just within the garden nearest to the new building. This assumes that no events will be taking place during the night time period (23:00-07:00).

An acoustic assessment have been undertaken considering the criteria above on which the acoustic design of the proposed external envelope is based. In appendix an extract of the acoustic stage D report is included in which the acoustic requirements of the external envelop are listed.

A key design requirement to achieving the satisfactory control of noise breakout from the auditorium is for the windows to remains closed. Also the walls and doors between the auditorium and the foyer will be of a high sound insulation performance. This will help to mitigate noise levels inside the auditorium breaking out via the openable windows in the foyer.

All ventilation penetration to the buildings external envelope will be acoustically treated.

5. CONCLUSIONS

- o The potential impacts of noise have been considered at an early stage of the design process. Reference has been made to other well established and recognised guidance for noise assessment.
- o Overall, it is concluded that with appropriately specified building envelopes, noise intrusion can be limited to provide suitable conditions for worship within the church. Emission of noise generated by future operation of the church can be controlled by design and specification to protect the existing amenity for the community in noise sensitive areas neighbouring the site.
- o On this basis noise should not pose an obstacle to granting planning permission for the development of a new building for the Emsworth Baptist church.

APPENDIX A - GLOSSARY OF ACOUSTICAL TERMS USED**Decibel (dB)**

The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithm's are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

Octave and Third Octave Bands

The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

A-Weighting

The 'A' weighting is a correction term applied to the frequency range in order to mimic the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third octave band frequencies. An 'A' weighted value would be written as dB(A).

 L_{eq}

The L_{eq} is a parameter defined as the equivalent continuous sound pressure level. Over a defined time period 'T', it is the sound pressure level equivalent to the acoustic energy of the fluctuating sound signal. The $L_{eq,T}$ can be seen to be an "average" sound pressure level over a given time period (although it is not an arithmetic average). Typically the $L_{eq,T}$ will be an 'A' weighted noise level in dB(A). It is commonly used to describe all types of environmental noise sources.

Background Noise Level L_{90}

The $L_{90,T}$ is a parameter defined as the sound pressure level exceeded for 90% of the measurement period 'T'. It is a statistical parameter and can not be directly combined to other acoustic parameters. It is generally used to describe the prevailing background noise level or underlying noise level.

Rating Level

The specific noise level of the source plus any adjustment for characteristic features of the noise.

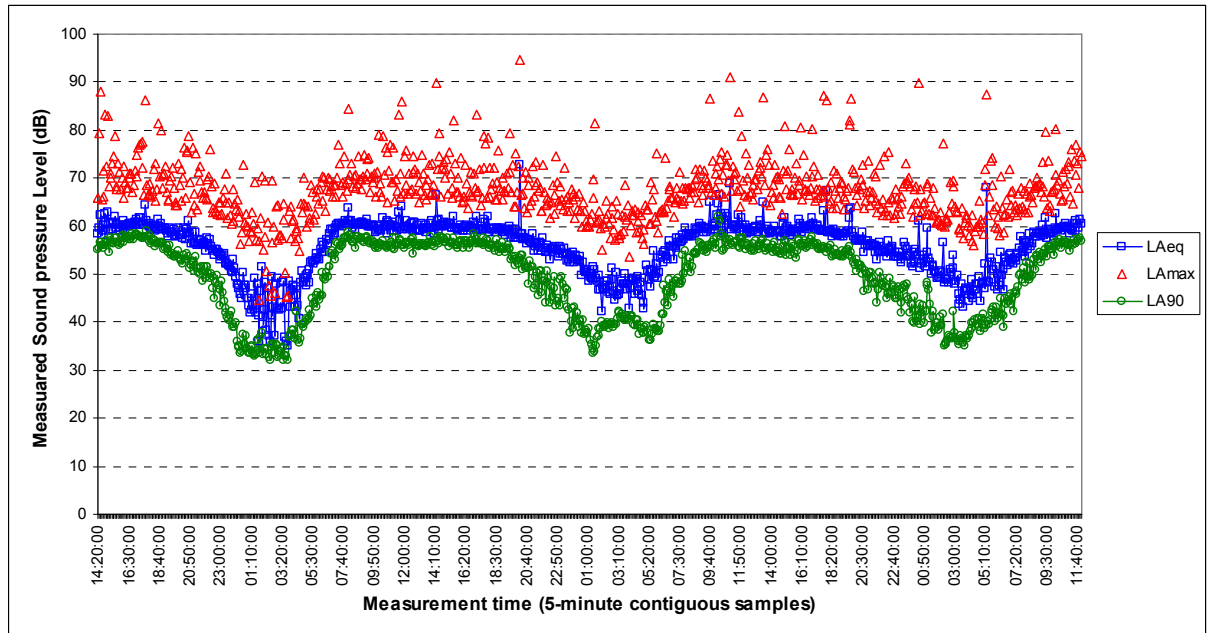
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APPENDIX B –ENVIRONMENTAL NOISE SURVEY

Background noise survey measurements



APPENDIX C –EXTRACT FROM STAGE D ACOUSTIC REPORT

The following residential premises have been identified as being the nearest to the church:

- Residential premises to the east of the building's eastern facade at a distance of approximately 11m.

Events that have been taking place in church involved singing, instrument playing, and occasionally reproduced music. The same character events expected to continue taking place by church within the new building.

A series of acoustic measurements were made inside the existing church during both unoccupied and fully occupied conditions. The highest noise levels measured from the centre of the auditorium during a full rehearsal with full band and vocals are approximately L_{Aeq} 82 dB and are presented in the table 1 below.

Table 1 – Measured music noise levels during a typical event

	Octave band frequency (Hz) levels in dB								
	63	125	250	500	1000	2000	4000	8000	dB(A)
L_{eq}	81	85	80	82	77	70	63	60	82

It should be noted that the music levels will not be constant and they will vary subject to the different event types ie just instrumental music, instrumental music with vocals etc. These (music levels) inside the church could be as high as 90 dB (A) L_{Aeq} 15min. If the later exceeded then noise criteria to the nearest residencies will also be exceeded.

In order noise levels emitted from the building to meet criteria set in 3.1 above the following sound insulation design criteria for the auditorium's envelope are required:

Table 2 – Sound reduction indices of the external envelope

Façade component	Octave band frequency (Hz) levels in dB						R _w
	125	250	500	1000	2000	4000	
Wall	31	36	43	49	55	59	47
Glazing	25	22	33	41	44	44	36
Roof terminals	15	22	29	33	33	NA	31
Doors*	34	37	38	38	41	42	40
Roof	26	34	43	56	70	80	45

*Lobby set up should be considered to minimize noise levels break out particularly during music events.