

NOISE IMPACT ANALYSIS

of

**CHANGE OF USE
FROM A5 TO A4 USAGE
AND INSTALLATION OF EXTERNAL PLANT**

at

**4 NEW STATION STREET,
LEEDS.**

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CONTENTS

1.0	Summary and Conclusions	3
2.0	Planning Requirements on Noise	4
2.1	PPG 24: 'Planning and Noise'	4
2.2	BS 4142: 1997	4
2.3	BS 8233: 1999	5
3.0	Sound from Proposed Development	5
3.1	Plant Items	5
3.2	Activity Noise at Ground Floor	6
3.3	Predicted Sound Levels at Flats	6
4.0	Background Sound Measurements	7
5.0	Noise Impact Assessment	7
6.0	Sound Limits Inside Premises	8
7.0	Vibration Isolation of Speakers and Plant Items	9

1.0 **Summary and Conclusions**

Change of use is proposed from A5 to A4 at the ground floor and basement of 4 New Station Street, Leeds. The first floor above the proposed A4 usage is occupied as residential flats which will remain. The Local Planning Authority has called for a prediction and assessment of the noise generated by the proposed development as affecting the flats.

The plant items to be installed at the premises have been specified and noise data is available from the manufacturers. The predicted sound levels at the flats are compared with the measured background levels in accordance with BS 4142, and with guidance on interior sound levels given in BS 8233.

- 1.1 The outdoor sound level at the nearest flat windows caused by plant items proposed at the development is predicted at 44 dB LA_{eq} (1-hour).
- 1.2 The existing background levels have been measured at the premises during a weekday daytime at 62 dBA and at night around the proposed closing time of 12.30am at 55 dBA (dB LA₉₀ values).
- 1.3 After adding a correction of 5 dB as appropriate for the character of the plant sound, the predicted sound levels are rated at 13 dB below the daytime background and 6 dB below the night background levels. It is concluded that complaints are unlikely.
- 1.4 It is recommended that a limit of 82 dB LA_{eq} is set on the sound levels inside the ground floor of the premises, with a sound frequency spectrum as described in this report. This will ensure that the interior sound level inside the first floor flats does not exceed 30 dB LA_{eq}, which is recommended in BS 8233 as providing “good resting and sleeping conditions”. If higher sound levels are required at the ground floor then tests would be recommended to quantify the existing sound insulation of the separating floor, followed by reinforcement of the ceiling mass if found necessary.
- 1.5 It is recommended that speakers used for music systems in the ground floor premises, and the outdoor plant items, are supported on anti-vibration mounts to reduce the possibility of structure-borne sound reaching the flats.

2.0 **Planning Requirements on Noise**

An email dated 3rd February 2012 from the Planning Officer to the applicant calls for a survey and report on the proposed sound insulation to protect nearby residential properties from noise.

The acceptance criteria of the LPA are not quantified in the correspondence. As a starting point this report uses the guidance given in PPG24 and the standards to which it refers.

2.1 **PPG 24: 'Planning and Noise'**

Guidance to local authorities on noise affecting dwellings was issued in 1994 as Planning Policy Guidance 24: 'Planning and Noise'. PPG24 refers to the noise rating method of BS 4142 and recommendations on interior sound levels given in BS 8233. These documents are summarised below.

2.2 **BS 4142: 1997**

The method recommended by BS 4142 is to measure outdoor sound levels at noise-sensitive premises during the emission of noise from the commercial premises under investigation and measure the background level at the same location in the absence of the commercial noise. A correction factor is applied if appropriate to the measured levels for some specific factors which affect its acceptability, described as “a distinguishable, discrete, continuous note (whine, hiss, screech, hum, etc.) or if there are distinct impulses in the noise (bangs, clicks, clatters, or thumps), or if the noise is irregular enough in character to attract attention”. The corrected measured level, the rating level, is compared with the background.

- complaints are likely if the rating level exceeds the background by around 10 dBA or more,
- a difference of around 5 dBA is 'of marginal significance',
- if the rating level is more than 10 dB below the background level then this is a positive indication that complaints are unlikely.

2.3 **BS 8233: 1999**

Whereas BS 4142 considers outdoor sound levels caused by commercial sound sources, BS 8233 provides recommendations on interior sound levels inside dwellings:

living rooms	30 dB LA _{eq}	for good resting conditions
	40 dB LA _{eq}	for reasonable resting conditions
bedrooms	30 dB LA _{eq}	for good sleeping conditions
	35 dB LA _{eq}	for reasonable sleeping conditions

3.0 **Sound from Proposed Development**

3.1 **Plant Items**

The plant items with external sound emissions to be installed at the premises will be three outdoor condenser units for air conditioning and one outdoor condenser for cellar refrigeration. These plant items will be located in an existing bin storage area in a former passage at the ground floor of the premises. The passage has wooden doors with louvres across its elevation onto New Station Street and is fully enclosed by masonry on all other sides and above. The sound levels of the plant items have been described by their manufacturers as:

Function	Model Reference	Quantity	Sound Level
Air conditioning	Mitsubishi SRC63ZK-S	3 off	63 dBA(SWL)
Cellar chiller	Qualitair ICUS 30	1 off	NR61 @ 3m

The masonry surfaces of the ground floor area will reflect plant sound. It is assumed that there will be only a small loss of sound energy in this area, estimated at 3 dBA, since the masonry surfaces almost completely surround it. The plant sound will radiate towards New Station Street through the existing wooden louvres. These will provide sound attenuation estimated at 15 dBA since their open area is around 5% of the total area of the doors and louvres. In order to reach the windows of flats at the first floor, the sound will turn through 90° then travel the short outdoor distance of 3m to the nearest windows.

3.2 **Activity Noise at Ground Floor**

Sound will be generated inside the ground floor premises and will transmit to the first floor flats through the sound insulation of the separating floor. There is no change in this situation except the nature of the ground floor sound sources. The proposed A4 usage will feature background music only, there will be no music for dancing, live music or DJs. This report quantifies limits which are recommended on sound levels inside the ground floor premises in order to maintain sound levels at the residential first floor within the guidance of BS 8233.

The sound insulation of the existing separating floor is assumed to comply with the minimum requirements of the Building Regulations Approved Document E.

3.3 **Predicted Sound Levels at Flats**

The three air conditioning condensers each have a sound power level of 63 dBA. The cellar chiller has a sound pressure level of NR61 at a distance of 3m in free field conditions, which corresponds to a sound power level of 75 dBA. The total sound power level of all four plant items operating together is 76 dBA. The sound energy loss within the enclosed area is estimated at 3 dBA.

The attenuation of the wooden louvres in the elevation towards New Station Street is estimated to provide an indoor-to-outdoor sound difference of 15 dBA, giving a sound power level of 58 dBA radiating outdoors.

The sound pressure level at the nearest flat windows at 3m distance with two reflective planes (building elevation and road) is given by the formula:

$$\begin{aligned} \text{SPL} &= \text{SWL} - 20 \log (\text{distance}) - 5 \text{ dB} \\ &= 58 - 20 \log 3 - 5 \\ &= 44 \text{ dBA outdoors at the flat windows onto New Station Street.} \end{aligned}$$

It is assumed that all plant items may operate together for the assessment periods of one hour during daytime and five minutes at night.

There are no airborne sound paths from the location of the proposed plant items to the rear of the building. Flat windows in the rear elevation will not be affected by plant sound. There are no side elevations since the building forms a central part of a terrace.

4.0 **Background Sound Measurements**

Background sound levels were measured at the premises at night on Thursday 23rd February and during the afternoon of Wednesday 29th February 2012. A measurement position was used in New Station Street directly under the flat windows. Climatic conditions during the measurement periods were dry with no wind, being suitable for outdoor sound readings. The results were taken using a Bruel & Kjaer type 2260 precision sound level meter for which current calibration certificates are held.

Background levels dB LA₉₀:

Daytime 15.30-16.30	61.8 dBA
Night 2230-2330	55.4 dBA

5.0 **Noise Impact Assessment**

Noise Rating Level

The rating method of BS 4142 calls for a 5 dB correction to be added when the character of the commercial noise contains certain features, as summarised in 2.2 of this report. The condensers will operate intermittently and may have tonal characteristics, and for this reason 5 dB must be added to the specific noise level shown in 3.3.

Comparison With Background

The predicted noise rating level of 49 dB is compared with the background levels of 62 dBA during the daytime and 55 dBA measured at night around the proposed closure time of midnight to 12.30am.

The predicted noise rating level is 13 dB below the measured daytime background and 6 dB below the measured night background levels.

BS 4142 Conclusions

It is concluded from the BS 4142 rating that complaints are unlikely at any time of day or night from the residents of the flats about noise from the plant items proposed at the premises.

6.0 Sound Limits Inside Premises

It is suggested as a starting point that the design target for sound from the interior of the premises reaching the flats through the separating floor should not exceed the value of 30 dB LA_{eq} suggested in BS 8233 for “good resting and sleeping conditions”. In situations where sound from licensed premises includes loud music then a more stringent standard applies in which limits are set at the specific sound frequencies of bass music (*Good Practice Guide on the Control of Noise from Pubs and Clubs*). This more stringent standard is not believed to apply here since music will be a background feature only played through a low power system with no specific bass speakers.

For the purpose of design, which needs a sound frequency spectrum, the target of 30 dB LA_{eq} is equated to NR20. The sound level difference across the separating floor is taken as being 45 dB (D_w). The sound limits inside the ground floor premises are calculated as:

Sound pressure levels dB linear:

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
In premises	76	72	71	71	73	75	76	78
Floor loss	25	33	40	47	53	58	62	65
First floor NR20	51	39	31	24	20	17	14	13

From this calculation the suggested limit on interior sound within the ground floor premises is **82 dB LA_{eq}** with a sound frequency spectrum of:

Sound pressure levels, dB linear, Leq:

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Limit in premises	76	72	71	71	73	75	76	78

These values appear realistic, being very similar to the results measured recently inside a bar/restaurant on Cloth Hall Street, Leeds when all its tables were occupied by diners during a Friday evening from 21.30 to 22.00. Music was being played through a fixed speaker system as background feature. There was no DJ or dancing. The overall sound level in the restaurant was 80 dB LA_{eq} with a sound frequency spectrum similar to the limits calculated above, particularly at mid and low frequencies.

If higher limits are required then tests would be recommended to quantify the existing sound insulation of the separating floor, followed by reinforcement of the ceiling mass if found necessary.

7.0 **Vibration Isolation of Speakers and Plant Items**

The predictions of sound reaching the flats assume that it will be airborne. Some secondary vibration is often present in the cases of speakers and the mounts of plant items, and it is important to prevent such vibration travelling directly to the structure of the building. It is recommended that all speakers and condensers should incorporate anti-vibration mounts to cater for this requirement. A working arrangement for speakers is to place them on pads of flexible foam (not rigid expanded polystyrene) supporting them off the brackets or shelves on which they are located, or to be suspended on anti-vibration hangers which are commercially available for this purpose. The outdoor condensers are likely to be fitted with anti-vibration mounts as a standard feature of their construction, but this should be checked.
