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Noise and Vibration Consultants

# PROPOSED HOTEL DEVELOPMENT, CHIPPING

## NOISE ASSESSMENT

**On behalf of:**

**53N Bowland Ltd**

Report No. 21911.01Av1
August 2013

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## NOISE ASSESSMENT

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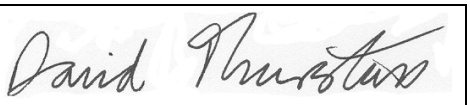

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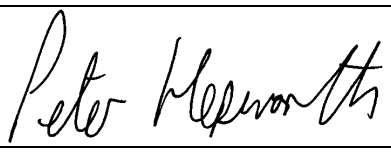

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## 1.0 INTRODUCTION

1.1 Hepworth Acoustics has been commissioned by 53N Bowland Ltd to carry out a noise impact assessment in connection with the conversion of Kirk Mill into a restaurant bar on the ground floor with a hotel on the first and second floors.

1.1 The hotel reception, restaurant bar with orangery, and kitchen will be located on the ground floor. The hotel bedrooms will be located on the first and second floors.

1.2 The assessment has therefore included:

- An inspection of the proposed building;
- Recommendations for the control of noise transfer to the hotel bedrooms above, and noise breakout via the glazed roofs of the restaurant/bar areas where necessary.
- Recommendations for the control of noise transfer from the plant room, riser shafts and lift shafts.

1.3 A description of noise units and noise characteristics is provided in Appendix I.

## 2.0 DESCRIPTION OF THE PREMISES AND PROPOSALS

2.1 The Kirk Mill building is a Grade 2 listed former mill located on Malt Kiln Brow, Chipping. The building has timber joist floors throughout with large solid masonry walls.

2.2 The proposals are for a Living Ventures brand restaurant/bar to operate in the ground floor space. It is proposed to have a new build restaurant area with a fully glazed roof on the western end of the building. A new build orangery with a partially glazed roof is also proposed on the southern end of the building.

2.3 The ground floor will also include the hotel reception, kitchen, store and plant rooms. It is proposed to have 18 hotel bedrooms on the first and second floors.

## 3.0 SOURCE NOISE LEVELS

3.1 The proposed restaurant/bar on the ground floor has been assessed on the basis that it will have similar trading noise levels to those that exist at the Botanist restaurant/bar in Alderley Edge. As with the Botanist in Alderley Edge, it is proposed the restaurant/bar will have background music played at modest noise levels for the majority of the time with live music played at higher noise levels between 20:00 and 23:00 on some evenings in the bar area.

3.2 Hepworth Acoustics has previously visited the Botanist in Alderley Edge in order to measure trading noise levels during busy periods. Noise levels have been measured between 17:00 and 18:00 on a Friday evening to represent the busiest trading times with background music. Noise levels have also been taken later in the evening between 22:00 and 23:00 during a period of live music. The measured trading noise levels were as follows:

**Table 1: Botanist, Alderley Edge Trading Noise Levels (dB)**

| Description | Octave band centre frequency (Hz) | | | | | | | A |
|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | |
| Busy weekday evening | 67 | 72 | 73 | 79 | 79 | 75 | 66 | 82 |
| Busy evening during live music | 89 | 89 | 84 | 86 | 87 | 80 | 73 | 89 |

## 4.0 ASSESSMENT OF POTENTIAL NOISE IMPACT & RECOMMENDATIONS

***Noise Transmission to Hotel Bedrooms above***

4.1 In our experience, in order to provide a good standard of noise control for the hotel bedrooms it will be necessary to limit noise transmission from the bar/restaurant below to no more than NR15 in terms $L_{eq}$. For the avoidance of doubt, NR15 is equivalent to the following octave band noise levels:

**Table 2: Bar Restaurant Transmitted Noise Limit in Hotel Bedrooms in $L_{eq}$ (dB)**

| Description | Octave band centre frequency (Hz) | | | | | | | A | NR |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | | |
| Transmitted noise limit in $L_{eq}$ | 47 | 35 | 26 | 19 | 15 | 12 | 9 | 26 | 15 |

4.2 The existing timber joist separating floor construction does not provide a high degree of sound insulation. Therefore, it will be necessary to improve the sound insulation of the separating floor (and flanking walls and columns) as much as is practicable. It will also be necessary to electronically limit music noise levels in the bar/restaurant below in order to adequately control noise in bedrooms.

4.3 Given the limitations of the existing timber joist floor, we make the following recommendations to provide the best feasible improvements in terms of sound insulation:

- A new proprietary acoustic floating floor system must be installed within all hotel bedrooms as follows:
    - Make good or replace the existing timber floor boards and ensure they are tightly butted-up and sealed with caulk;
    - Install an acoustic cradle and batten system (e.g. the New Era system available from VA Hutchison Flooring tel. 01243 841 175) with mineral

wool between the battens, overlaid with two layers of 19mm Gyproc plasterboard plank or equivalent and 20mm t&g flooring boards;

- Partition walls must be built off the base floor (but effectively isolated with an appropriate neoprene sole strip), and the new floating floor constructed within each room separately, with the floor effectively isolated with neoprene edge strips at the perimeter;

- Install an acoustic ceiling in the bar/restaurant area of the existing building, formed of at least three layers of 15 mm Gyproc SoundBloc plasterboard suspended via proprietary acoustic hangers with a minimum cavity of 300mm and at least 200 mm mineral wool (minimum density of 33 kg/$m^3$) in the cavity. Joints should be staggered and well sealed. There must be no penetrations in the acoustic ceiling and all services must run underneath the ceiling. Any drop rods for services that pass through the ceiling must be fixed via appropriate anti-vibration fixings and the holes well sealed with mastic.

- All flanking walls and any columns to be retained in the bar/restaurant trading area should be independently lined with at least three layers of 15mm Gyproc SoundBloc mounted onto independent timber or metal studs with mineral wool (minimum density 33 kg/$m^3$) in the cavity. The timber or metal studs must not be rigidly connected to the existing walls/columns - ideally there would be no ties to the existing masonry walls/columns, but if such ties are necessary appropriate resilient wall ties must be used. Joints should be staggered and well sealed. If necessary, one layer of SoundBloc can be replaced with minimum 15mm plywood to allow fixtures/fittings.

- The independent wall/column linings should be installed prior to installation of the acoustic ceiling. Such linings should continue above the height of the acoustic ceiling, which should be installed to form a good seal with the wall/column linings.

- PA system loudspeakers should be mounted via proprietary anti-vibration mounts and not rigidly connected to the building structure. Loudspeakers should be orientated downwards

and towards the centre of the trading area (i.e. away from the acoustic ceiling and wall linings). Bass bins should not be installed.

4.4 Based upon the above recommendations, our calculations predict that the likely resulting sound level difference between the bar/restaurant and hotel bedrooms will be such that the following maximum permissible noise levels will apply for the bar/restaurant in order to comply with the NR15 criterion in bedrooms:

**Table 3: Maximum permissible bar/restaurant noise levels in $L_{eq}$ (dB)**

| Description | Octave band centre frequency (Hz) | | | | | | | A |
|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | |
| Noise limit in bar/restaurant | 80 | 82 | 81 | 81 | 81 | 75 | 77 | 85 |

4.5 The above noise limits are fairly modest and typical of premises with a relaxed environment with background music at low levels. A suitable electronic noise limiter will need to be installed in any music system to ensure that music noise levels do not exceed these noise levels.

***Noise Break-out***

4.6 There is a potential issue with noise break out from the glazed roofs of the new build areas of the restaurant and the orangery through the bedroom windows in to the bedrooms.

4.7 For the purposes of assessing the potential impact of trading noise break-out from the building, the busy evening trading noise levels (with background music) have been adopted as the source noise levels.

4.8 We understand all existing windows are to be retained and that secondary glazing will be installed through out the building.

4.9 The following measures are recommended to control break-out from the trading area to within the adopted noise control criterion:

- The seals around the existing windows must be improved to become airtight.
- The inner window of the secondary glazed system should be formed of a double glazed window of 10mm glass 12-20mm cavity 6mm glass, with a minimum cavity of 150mm to the existing window.
- We recommend that all new windows in the building are unopenable.
- There must be no 'straight through' type ventilation openings from trading areas. Any ventilation ducts must be fitted with suitable in-line attenuators.
- The construction of the new glazed roofs needs to adequately control break-out of noise from the restaurant/bar areas to bedroom windows above. We therefore recommend all glazed panels in the roofs are formed of double glazed units of 10mm glass 12-20mm cavity 6mm glass.

4.10 The requirement to adequately control the impact of noise transmission from the bar/restaurant on hotel bedrooms above can be ensured with an appropriate planning condition requiring a scheme of noise control measures to be submitted and approved by the local planning authority.

**Plant Room and Walls Adjacent to Riser Shafts, Lift Shafts, etc**

4.11 The hotel bedroom above the plant room will require the same floor construction as described in paragraph 4.3. We recommend an acoustic ceiling formed of at two layers of 15 mm Gyproc SoundBloc plasterboard suspended via proprietary acoustic hangers with a minimum cavity of 300mm and at least 200 mm mineral wool (minimum density of 33 kg/m3) in the cavity. Joints should be staggered and well sealed.

4.12 We recommend that all existing masonry walls in the plant room are independently lined e.g. 2 layers of 15mm Gyproc SoundBloc screwed to a metal frame which is independent with at least 50mm mineral wool quilt or batts in the cavity.

4.13 Some hotel bedrooms, on all floors, will adjoin risers from the ground floor. Such shafts can result in transmission of noise and vibration into bedrooms i.e. mechanical noise and/or music. Similarly some rooms will adjoin lift shafts.

4.14 We assume shafts are of masonry construction, in which case we recommend that the hotel rooms are provided with an independent wall liner e.g. 2 layers of 15mm Gyproc SoundBloc screwed to a metal frame which is independent of the shaft wall, and with at least 50mm mineral wool quilt or batts in the cavity.

4.15 We note that some hotel bedrooms have a window where the lift shaft passes the room we recommend this is filled in with dense blockwork prior to the independent lining being fitted.

4.16 In addition, lift motor equipment, mechanical services in risers from the restaurant bar, and equipment in the plant room, should be acoustically isolated from the shaft walls and building frame to prevent structure-borne transmission of vibration via the masonry floor and walls.

**Mill Wheel**

4.17 It is proposed to keep the mill wheel as feature in the finished building. We recommend that the openings on the ground and first floor are covered with well sealed double glazed windows formed of 10mm glass 12-20mm cavity 6mm glass.

## 5.0 SUMMARY

5.1 Hepworth Acoustics has been commissioned by 53N Bowland Ltd to carry out a noise impact assessment in connection with the proposed conversion of Kirk Mill into a restaurant/bar on the ground floor with hotel bedrooms and the first and second floor. The assessment has included consideration of measures necessary to adequately control trading area noise break-out from the restaurant and orangery glazed roof areas on the ground floor and adequately controlling noise transmission to the hotel bedrooms above.

5.2 We have recommended improvements to the sound insulation of the building. We have also recommended substantial improvements to the sound insulation between the ground floor space and hotel bedrooms above to ensure that transmitted noise levels are adequately controlled.

5.3 The assessment has established that a suitable scheme of sound insulation works will adequately control noise transmission from the bar/restaurant areas of the hotel to the bedrooms. The requirements for a scheme of sound insulation can be incorporated in a suitably worded planning condition.

## Appendix I – Noise Units and Indices

### a) Sound Pressure Level and the decibel (dB)

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

### b) Frequency and hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kilohertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20,000 Hz. However, the upper frequency limit gradually reduces as a person gets older.

### c) Glossary of Terms

When a noise level is constant and does not fluctuate over time, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The indices used in this report are described below.

$L_{eq}$ This is the 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, $L_{eq}$ is the level of a continuous noise which has the same total energy as the real fluctuating noise, measured over the same time period.

NR This describes curves of octave band noise levels based on the equal loudness contours of the human ear. The curve is named after the 1 kHz value, i.e. NR20.