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Noise Assessment for Ladbrokes Ltd –
A Desktop Noise Assessment of premises located at 304 - 306 Oxford Road, Manchester.

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Summary

It has been proposed to re-develop the ground floor premises of the retail unit located at 304 – 306 Oxford Road, Manchester into a Ladbrokes Betting Shop. Above the existing retail unit is a vacant residential flat which may or may not be tenented in the future.

Manchester City Council have provided R R Planning with a list of requirements, one of which relates to noise control and is detailed below. It must also be noted that this paragrapth makes no mention of a request for a background noise survey to be conducted within the vicinity of 304 – 306 Oxford Road.

"In terms of the proposed uses, the study should identify the acoustic treatment and measures that will limit the breakout of noise in accordance with a noise study of the premises. The scheme proposed shall include measures such as acoustic lobbies at access and egress points of the premises, acoustic treatment of the building structure, sound limiters linked to sound amplification equipment, and specified maximum internal noise levels."

In regards to potential noise egress that may emanante from the proposed Ladbrokes Betting shop on nearby residential dwellings, *British Standard 4142:1997 Method for rating industrial noise affecting mixed residential and industrial areas* provides an assessment method. The primary source of noise that would be assessed from such an establishment using this assessment method is noise from air conditioning units. However, air condtioning and the subsequent air conditioning units which were originally proposed to be located to the rear of the premises has since been removed from the design specification. As such only a desktop acoustic analysis of the premises is to be conducted at this stage.

The first floor space above the proposed Ladbrokes is a vacant flat, should it once again be used as a dwelling, then *British Standard 8233:1999 Sound insulation and noise reduction for buildings – Code of practice*, provides guidance and recommendations on suitable internal noise levels within varying types of buildings

with differing functions and uses. Within table 5 of this standard; *Indoor ambient noise levels in spaces when they are unoccupied*, recommended noise limits for habitable rooms within dwellings are specified. Two different design ranges are provided for, Reasonable and Good. The Good design range is the more stringent of the two.

Table 1 states the BS 8233 criteria to be met;

Criterion	Typical Situations	Design range $L_{Aeq,T}$ dB	
		Good	Reasonable
Reasonable resting/sleeping conditions	Living Rooms Bedrooms	30 30	40 35

The existing separating structural floor is wooden joists with British Gypsum Fireline Plasterboard directly fixed to the underside with a suspended tile-in-grid ceiling below. On the top of the joists are fixed floorboards. This construction as well as the other separting partitions, both internal and external have been modelled for their acoustic performance using the commercially available software, *Insul*, which is produced by Marshall Day Acoustics.

The remaining construction details are as follows;

- The shop front elevation consists of masonry piers approximately 450mm thick with modern alumininum recessed door entrance. The glazing specification is to be 8.4mm thick laminated glass.
- The separating walls between occupiers to be blockwork.
- Existing internal structural columns and walls to be masonry.
- To the rear of the premises the single storey WC block and corridor is of a masonry construction approximately 250mm thick with no glazed windows.
- New internal partitions to form the comms room and disabled WC are plasterboard stud partitions with 12.7mm Gyproc Fireline plasterboard to both sides.

Table 2 details the results of these constructions. R_w is the Weighted Sound Reduction Index and is a single number quantity which characterises the airborne sound insulating properties of a material or building element over a range of frequencies, $D_{nT,w}$ is the Weighted Standardised Level Difference and is the difference in the airborne sound level between a pair of rooms, i.e. the sound attenuating performance of the separating partition in the field is assessed and its $D_{nT,w}$ calculated. All examples modelled were 2.7m x 4m.

Construction Detailing	Weighted Sound Reduction Index (R_W) dB	Weighted Standardised Level Difference ($D_{nT,w}$) dB
Timber joists with 12.5mm British Gypsum Fireline Board directly fixed to the underside of the joists. Timber floorboards fitted to top side of joists with suspended tile-in-grid ceiling below.[1]	36dB	38dB
The shop front elevation consists of masonry piers approximately 450mm thickwith modern alumininum recessed door entrance. The glazing specification is to be 8.4mm thick laminated glass and is provided here.	36dB	38dB
The separating walls between occupiers to be blockwork. A thickness of 140mm has been assumed here.	51dB	53dB
Existing internal structural columns and walls to be masonry. Single leaf brick masonry is assumed.	47dB	49dB
To the rear of the premises the single storey WC block and corridor is of a masonry construction approximately 250mm thick with no glazed windows. Double leaf brick is modelled here.	55dB	57dB
New internal partitions to form the comms room and disabled WC are plasterboard stud partitions with 12.7mm Gyproc Fireline plasterboard to both sides. With a 75mm 33kg/m^3 Rockwool quilt in the cavity the results are;	48dB	50dB
New internal partitions to form the comms room and disabled WC are plasterboard stud partitions with 12.7mm Gyproc Fireline plasterboard to both sides. With an empty cavity the results are;	38dB	40dB

Table 2: Calculated results for existing and proposed construction elements.

Note 1 – The plenum depth and acoustic specification of the existing and/or proposed ceiling tile is not known, therefore the acoustic model was undertaken modelling the construction given here. It can therefore be assumed that the actual performance should be improved upon the results provided here.

Ladbrokes Internal Ambient Noise Levels

On December 21st an internal ambient noise survey was undertaken at the Ladbrokes Betting Shop in the High Street, Erdington, Birmingham to ascertain typical noise levels generated. The sources of noise in the betting shop are customers talking which at times becomes raised banter, but the main continuous noise source is the racing commentary.

By entering this typical noise measurement data together with the performance data for the existing separating partitions at Oxford Road into the Building Research Establishment (BRE) Noise Ingress Calculator, which is a Macro spreadsheet that allows noise ingress to be calculated, we can predict noise ingress into the adjoining premises.



Figure 1: Internal Ambient Noise Measurement, Ladbrokes, High Street, Erdington, Birmingham

The L_{Aeq} measured in the Erdington Ladbrokes was 66.2dB(A). The L_{eq} spectral data is in the appendix at the rear of this report. Using this noise level as a guide it is recommended that the internal level should not increase above 70dB(A).

Based upon similar noise levels of 66.2dB(A) being generated in the Oxford Road Ladbrokes, that would produce an internal ambient noise level, L_{Aeq}, in the flat above the betting shop using the construction known of 26.9dB(A) L_{Aeq}. This is still within BS 8233 Good guidelines of less than 30dB and should be treated as a worst case scenario as the performance of the tile-in-grid ceiling is not known and hence was not included in the model.

Similarly for the other constructions and the calculation of the internal ambient noise levels in the spaces on the otherside of those partitions based upon the measured Ladbrokes internal noise level of 66.2dB(A); the 140mm concrete blockwork would produce an internal ambient noise level on the otherside of 11.2dB(A), single leaf brick 15.6dB(A), double leaf brick 6dB(A) and 8.4mm laminated glass 26.7dB(A).

These are predicted theoretical levels to the adjoining spaces above and to the sides, a more accurate result would be achieved if the room dimensions of the adjoining spaces were known.

Conclusions

The predicted theoretical results based upon the existing and proposed construction detailing and with reference to the internal noise survey undertaken within one of Ladbrokes' typical high street betting shops would indicate that noise should not be an issue.

The racing commentary should not be an issue, if concerns were to be raised further regarding the commentary becoming audible in the space above, floor mounted loudspeakers may be considered as an alternative.

Attention to potential noise egress out of the front of the shop has been considered with the redesign of the entrance area which now incorporates a lobbied doorway.

To control noise between internal spaces it is recommended that a 75mm to 100mm Rockwool quilt, 33kg/m^3 be placed in the cavity between the proposed 12.7mm Gyproc Fireline Plasterboard stud partitions.

Attention to quality of workmanship should be maintained. All holes/gaps should be sealed with an acoustic mastic based sealant. Flanking transmission, which is the passage of sound through the building structure by indirect means should also be considered, therefore a further reduction in the floors performance of 5dB may also be considered.

Armstrong, who are a tile manufacturer, do not provide full spectral data for there products, however a data sheet for one of their products has been attached for reference. This particular tile has an R_w 18dB. This would further improve the ceiling construction that has been modelled previously.

In further reference to standards, *BS 8233: 1999 Sound Insulation and noise reduction for buildings – Code of practice;* the ceiling/floor structure with an Armsrong Tegular suspended tile-in-grid ceiling fitted below should provide sufficient noise attenuation between the retail unit and the dwelling above.

Further analysis, should it be required, could be conducted with data obtained following an environmental noise survey. However, the façade constructions to the front and rear of the shop and the type and function of the rear internal spaces should not create an adverse external noise egress.

Appendix

Frequency [Hz]	Leq [dB]
8	61.1
16	61.7
31.50	60.1
63	55.3
125	60.1
250	67.3
500	63.2
1000	61.0
2000	58.3
4000	50.6
8000	41.8
16000	28.2
A	66.2

Acoustics Glossary of Terms

$L_{Aeq,T}$ – Equivalent continuous sound pressure level. This is the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that within a specified time interval, T, has the same mean squared sound pressure as a sound that varies with time.

L_{A10} – The A-weighted mean square sound pressure level that is exceeded for 10% of the time.

L_{A90} – The A-weighted mean square sound pressure level that is exceeded for 90% of the time. This is referred to as the background noise level.

L_{Amin} – The lowest A-weighted noise level recorded during a noise event.

L_{Amax} – The highest A-weighted noise level recorded during a noise event.

L_{Ar} – This is the specific noise level plus any adjustment for the characteristic features of the noise.

R_w – Weighted Sound Reduction Index; Single number quantity which characterises the airborne sound insulating properties of a material or building element over a range of frequencies in the laboratory.

C – C is the Spectrum Adaptation term used to represent A-weighted Pink Noise

C_{tr} – C_{tr} is the Spectrum Adaptation term used to represent A-weight Urban Road Traffic Noise.

$D_{nT,w}$ – Weighted Standardised Level Difference; A single number quantity which characterises the airborne sound insulation between rooms.