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ACOUSTIC CONSULTANTS

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By email: Giovanni.iasevoli@tower8.co.uk
Reference: Hotel Russell, London
Project No: 1414864

Dear Giovanni,

Further to our recent site visits to measure the acoustic properties of the hotel, please find below our initial comments on the existing acoustic performance, and outline advice on the measures that may be incorporated into the design of the proposed renovation.

1. Acoustic Criteria

At a meeting held at EPR on 25th November 2014 we discussed the acoustic criteria to which the hotel will be designed.

1.1 Plant noise

In terms of plant noise outside the hotel that affects the hotel only (generally the plant in the central area) I understand that the intention is to make the situation no worse than it currently is (i.e. noise levels outside bedroom windows to be no higher than existing).

For plant noise inside the hotel, I suggest that reference is made to the CIBSE Environmental Design Guide A which provides criteria for plant noise in rooms. In this case, I suggest the following:

Bedrooms: NR25

Corridors/back-of-house areas: NR40

All other occupied areas: NR35

1.2 Sound insulation

The sound insulation requirements for spaces where the existing use is retained will also be considered against the existing performance of the building structure. The site testing done on the 5th and 6th of January will help with setting these requirements.

Any new walls and floors will be designed to the typical standard of similar existing separating elements. Whilst Approved Document 'E' of the Building Regulations does cover rooms for residential purpose (hotels, hostels, halls of residence) as well as dwelling houses and flats, our interpretation is that this standard only needs to be used and complied with for new-build premises or where rooms for residential purpose are being formed by change of use in a building that previously has not had consent for that use. I suggest that the project's Building Control Officer is consulted regarding this development.

1.3 Noise break-in from outside

Again, I understand there is a desire to design the building to maintain the existing acoustic environment but also to consider what would need to be done to achieve the design criteria found in published guidance.

BS8233:2014 *Guidance on Sound Insulation and Noise Reduction in Buildings* provides advice on the internal noise levels that need to be achieved in rooms used for resting or sleep. These are as follows:

- Resting 35 dB $L_{Aeq,16hour}$
- Sleeping (or daytime resting) 35 dB $L_{Aeq,16hour\ (07:00-23:00)}$ and 30 dB $L_{Aeq,8hour(23:00-07:00)}$

2. Surveys

In recent weeks, there have been two survey visits to the hotel to establish the acoustic environment of the existing premises.

2.1 External Plant noise

The first survey was overnight from the 15th to the 16th December 2014. This was to establish the current level of plant noise affecting windows that overlook the central area of the hotel. A survey position on the fourth floor was used as the worst-case location (i.e. nearest position that is located overlooking the existing plant.

The findings of this survey are that noise levels outside the worst-affected bedroom windows that overlook this area are typically around 70dB(A).

2.2 Internal sound insulation

During the 5th and 6th of January 2015, measurements were taken of the sound insulation between bedrooms at the front and rear of the premises. The results of these tests (and the standard that would be required by Approved Document 'E' for change of use of an existing building) are shown in the following table:

Table 1 – Results of site sound insulation tests

Source Room	Receiver Room	Test Element	Rating Obtained	AD-E requirement	AD-E Result
236 Bathroom	235	Wall / Airborne	**55 dB $D_{nT,w} + C_{tr}$**	**≥43 dB $D_{nT,w} + C_{tr}$**	**Pass**
236	235 Bathroom	Wall / Airborne	**51 dB $D_{nT,w} + C_{tr}$**	**≥43 dB $D_{nT,w} + C_{tr}$**	**Pass**
236	237	Wall / Airborne	**53 dB $D_{nT,w} + C_{tr}$**	**≥43 dB $D_{nT,w} + C_{tr}$**	**Pass**
236	235 Bathroom	Wall / Airborne	**52 dB $D_{nT,w} + C_{tr}$**	**≥43 dB $D_{nT,w} + C_{tr}$**	**Pass**
219	218	Wall / Airborne	**46 dB $D_{nT,w} + C_{tr}$**	**≥43 dB $D_{nT,w} + C_{tr}$**	**Pass**
219	220	Wall / Airborne	**49 dB $D_{nT,w} + C_{tr}$**	**≥43 dB $D_{nT,w} + C_{tr}$**	**Pass**
236	336	Floor / Airborne	**46 dB $D_{nT,w} + C_{tr}$**	**≥43 dB $D_{nT,w} + C_{tr}$**	**Pass**
136	236	Floor / Airborne	**53 dB $D_{nT,w} + C_{tr}$**	**≥43 dB $D_{nT,w} + C_{tr}$**	**Pass**
219	319	Floor / Airborne	**44 dB $D_{nT,w} + C_{tr}$**	**≥43 dB $D_{nT,w} + C_{tr}$**	**Pass**
219	119	Floor / Airborne	**42 dB $D_{nT,w} + C_{tr}$**	**≥43 dB $D_{nT,w} + C_{tr}$**	**Fail**
336	236	Floor / Impact	**46 dB $L'_{nT,w}$**	**≤64 dB $L'_{nT,w}$**	**Pass**
236	136	Floor / Impact	**32 dB $L'_{nT,w}$**	**≤64 dB $L'_{nT,w}$**	**Pass**
319	219	Floor / Impact	**34 dB $L'_{nT,w}$**	**≤64 dB $L'_{nT,w}$**	**Pass**
219	119	Floor / Impact	**35 dB $L'_{nT,w}$**	**≤64 dB $L'_{nT,w}$**	**Pass**
Wharncliffe conference room	119	Floor / Airborne	**51 dB $D_{nT,w} + C_{tr}$**	**≥43 dB $D_{nT,w} + C_{tr}$**	**Pass**

As can be seen from the results above, the wall tests all comfortably met the requirements of Approved Document 'E' and are an appropriate standard for this type of hotel. The results of the airborne tests on floors vary more than the walls, with one of the tests failing to meet the requirement of Approved Document 'E'.

The impact tests onto the floors all met the requirement of Approved Document 'E'.

2.3 External noise levels

A meter was placed in room 236 on the front (West facing) façade with the microphone on an extended pole through the window so that the microphone was at least 1.5m from the façade of the building. The meter was left to run throughout the evening and through the night into the next morning. The summary of the data is shown below:

Table 2 – Noise survey data from constant noise monitor

Period	Noise Level
Night-time average (23:00 – 07:00 hrs)	$L_{Aeq,8hour}$ 67.5 dB
Night-time instantaneous (23:00 – 07:00 hrs)	Highest L_{AFmax} 100.8 dB Typical highest L_{AFmax} 83 dB

Further measurements were taken externally on the morning of the 6th January 2015 to establish the likely daytime noise levels at the different facades of the building. A summary of the calculated levels is shown below:

Table 3 – Calculated expected noise levels outside each facade

Facade	Daytime average (07:00-23:00hrs) Noise Level ($L_{Aeq,16hour}$)
North	65.3 dB
East	67.5 dB
South	67.7 dB
West	73.8 dB

3. Assessment

3.1 External Plant noise

To achieve a noise environment outside the windows that is no worse than the existing situation, the combined noise level of any new additional plant needs to have a noise level of no more than 60dB(A) outside any bedroom window. This is so that when this noise level is added to the existing level of 70 dB(A), the cumulative noise level does not increase.

The current proposal (details provided in the Elementa Acoustic Sketchbook and data from Mitsubishi received from Elementa spreadsheet "P14-116-C57-06 Existing VRF acoustic calculations Mitsubishi") have been assessed. The data shows that the new units will need to be in low noise mode and have the attenuation package fitted to meet the 60 dB(A) criterion.

However, if all existing plant is to be removed (meaning external noise levels will be significantly reduced), and replaced with new I suggest that the manufacturer's data for the new plant must show that the noise level of that plant is no higher than the manufacturer's data for the existing plant. It is likely in this case that the attenuation package and low noise mode will not be needed for the currently proposed plant.

A further factor that needs to be considered is that it is likely that the existing plant was not operating at full/design/anticipated load during the survey due to the external temperature being lower than can be expected during other times of the year. Therefore, if existing external levels can be expected to increase during the year, so can the allowable level for new plant whilst still maintaining the criterion of not making the present situation worse.

As further data becomes available from the manufacturer we will continue to assess.

3.2 Internal Sound insulation

As can be seen from the test results in Table 1, above, all of the tests (apart from one airborne floor test) meet the requirements of Approved Document 'E'. Whilst it is expected that this development does not need to comply with the test requirements of Approved Document 'E', in the absence of any Brand Standard for the hotel it is proposed that the test requirements of Approved Document 'E' form the design intent for the hotel.

Therefore, if this floor is to be upgraded to meet the Approved Document 'E' standard, the suggestion is that during strip-out, the floor is inspected to check for any obvious weaknesses. If this is not possible, it may be instead be beneficial to increase the mass of the floor surface (given the difficulties of increasing the sound insulation of the ceiling) by adding a layer of plywood or similar to the floor finish.

Options for this need to be discussed in further detail to take account of other non-acoustic design requirements. The chosen treatment may need to be applied to all other floors of a similar existing design, although it is noted that other apparently similar floor constructions have better levels of sound insulation.

The result of the test from the Wharncliffe Room to the bedroom above meets the requirement of Approved Document 'E'. However, the result confirms the existing situation where complaints have been received from the occupiers of these bedrooms when an event is taking place in the Function Rooms.

If the intent is to significantly improve the sound insulation between these spaces, there are potential methods of doing this, although they involve installing a further ceiling (which is unlikely to be acceptable for non-acoustic reasons) or lifting the floor of each bedroom and installing further sound insulation within the existing floor zone. An example of the type of construction includes the British Gypsum SI Floor system.

3.3 Break-in

An assessment of noise break-in through the front façade has been done to calculate the improvement that can be achieved through the use of secondary glazing.

Noise levels outside the façade of the hotel are very high, with both the average noise levels over the day and night and the instantaneous noises (sirens, horns etc.) needing careful design to help achieve the proposed criteria.

Information from this assessment has been used along with data collected from external noise measurements on the other facades to calculate the required glazing systems. The assessments have used the criteria in section 1.3, above as targets to be achieved.

In summary, the following advice is provided for consideration:

Table 4 – Suggested glazing solutions to meet the proposed internal noise criteria

Facade	Suggested glazing
North	New minimum 6mm pane installed at least 75mm from the existing window
East	No improvements suggested
South	No improvements suggested, although the noise levels in these rooms maybe slightly exceeding the proposed criteria[1]
West	New minimum 6mm pane installed at least 100mm from the existing window

1 – The exceedances here are likely to be up to 2dB(A). This increase from the suggested criterion would not normally be noticeable to the occupants of the rooms.

The above information assumes that the sound insulation of the ventilation paths will be effectively controlled. Further information on this can be provided as the design progresses.

Yours sincerely

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