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

Dear Giovanni,

The following information is intended to be included in the Tender release for the Hotel Russell. This document deals with the acoustic issues which need to be addressed during the design, refurbishment/construction and commissioning of the Hotel.

## 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

For plant noise outside the hotel that affects the hotel only (generally the plant in the central area) 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, reference is made to the CIBSE Environmental Design Guide A which provides criteria for plant noise in rooms. In this case, the following criteria are deemed suitable:

Bedrooms: NR25

All other occupied public areas: NR35

Corridors/back-of-house areas: NR40

## 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 benchmark testing done on the 5th and 6th of January will help with setting these requirements.

Any new walls and floors must 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, 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.

## 1.3 Noise break-in from outside

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

The ambient noise levels around the hotel have been measured.

### 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 $D_{nT,w} + C_{tr}$	$\geq 43$ dB $D_{nT,w} + C_{tr}$	Pass
236	235 Bathroom	Wall / Airborne	51 dB $D_{nT,w} + C_{tr}$	$\geq 43$ dB $D_{nT,w} + C_{tr}$	Pass
236	237	Wall / Airborne	53 dB $D_{nT,w} + C_{tr}$	$\geq 43$ dB $D_{nT,w} + C_{tr}$	Pass
236	235 Bathroom	Wall / Airborne	52 dB $D_{nT,w} + C_{tr}$	$\geq 43$ dB $D_{nT,w} + C_{tr}$	Pass
219	218	Wall / Airborne	46 dB $D_{nT,w} + C_{tr}$	$\geq 43$ dB $D_{nT,w} + C_{tr}$	Pass
219	220	Wall / Airborne	49 dB $D_{nT,w} + C_{tr}$	$\geq 43$ dB $D_{nT,w} + C_{tr}$	Pass
236	336	Floor / Airborne	46 dB $D_{nT,w} + C_{tr}$	$\geq 43$ dB $D_{nT,w} + C_{tr}$	Pass
136	236	Floor / Airborne	53 dB $D_{nT,w} + C_{tr}$	$\geq 43$ dB $D_{nT,w} + C_{tr}$	Pass
219	319	Floor / Airborne	44 dB $D_{nT,w} + C_{tr}$	$\geq 43$ dB $D_{nT,w} + C_{tr}$	Pass
219	119	Floor / Airborne	42 dB $D_{nT,w} + C_{tr}$	$\geq 43$ dB $D_{nT,w} + C_{tr}$	Fail
336	236	Floor / Impact	46 dB $L'_{nT,w}$	$\leq 64$ dB $L'_{nT,w}$	Pass
236	136	Floor / Impact	32 dB $L'_{nT,w}$	$\leq 64$ dB $L'_{nT,w}$	Pass
319	219	Floor / Impact	34 dB $L'_{nT,w}$	$\leq 64$ dB $L'_{nT,w}$	Pass
219	119	Floor / Impact	35 dB $L'_{nT,w}$	$\leq 64$ dB $L'_{nT,w}$	Pass
Wharncliffe conference room	119	Floor / Airborne	51 dB $D_{nT,w} + C_{tr}$	$\geq 43$ 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 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 P14-116-SK20 Rev 1-Mar'15) has been assessed. The results of this assessment are as follows.

##### 3.1.1 Units in External façade lightwells (adjacent to the street)

The data shows that the new and relocated units will create acceptable noise levels to both the street and to adjacent windows of the hotel.

##### 3.1.2 Units in First Floor courtyard area

- Mitsubishi A/C units. To help control noise to acceptable levels, these must be fitted with the attenuation package as shown in the Elementa Acoustic Sketchbook referenced above.
- AHU01: Banqueting. To control noise to acceptable levels, this AHU needs to be fitted with attenuators on the Supply and Extract sides. At this stage, I suggest the use of an attenuator with the following insertion loss performance:

**Table 4: Insertion loss requirements for AHUs**

	Octave band centre frequency Hz - dB						
	63	125	250	500	1k	2k	4k
Insertion loss (dB)	8	13	20	28	33	29	23

This can typically be met with the use of a 900mm long splitter attenuator with approximately 33% open area. The performance requirement needs to be confirmed by the Tenderer when demonstrating the measures required to meet the requirements in section 1.1 above.

- AHU02: Palm Court. To control noise to acceptable levels, this AHU needs to be fitted with attenuators on the Supply and Exhaust sides. At this stage, I suggest the use of an attenuator with the insertion loss provided in Table 4. The performance requirement needs to be confirmed by the Tenderer when demonstrating the measures required to meet the requirements in section 1.1 above.
- AHU Bar/Lounge. To control noise to acceptable levels, this AHU needs to be fitted with attenuators on the Supply and Exhaust sides. At this stage, I suggest the use of an attenuator with the insertion loss provided in Table 4. The performance requirement needs to be

confirmed by the Tenderer when demonstrating the measures required to meet the requirements in section 1.1 above.

### 3.1.3 Units on roof

- The A/C units on the roof do not require the attenuation package to be installed.

### 3.1.4 Cross-talk attenuation

In hotel bedrooms, a common cause of noise transfer between rooms is through the common ductwork serving the extract systems in bathrooms. At this stage, allowance must be made for the use of cross-talk attenuators in extract systems. The use of a 600mm long attenuator on the line of the each wall between rooms, or a 900mm long attenuator on the line of the floor between rooms will be appropriate. The performances are provided in the table below:

**Table 5: Insertion loss requirements for Cross-talk attenuators**

	Octave band centre frequency Hz - dB						
	63	125	250	500	1k	2k	4k
600mm attenuator Insertion loss (dB)	7	10	16	21	26	23	19
900mm attenuator Insertion loss (dB)	8	13	20	28	33	29	23

### 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.

The proposed constructions for the hard refurbishment areas are as follows:

- Where timber floors are to be used, a layer of 6mm Regupol 4515 Multi-acoustic layer will be installed between the timber floor and the base floor
- New ceilings in the bedrooms and lounges of the hard refurbishment areas will be 1 layer of 12.5mm plasterboard with 50mm Isover insulation in the cavity
- New ceilings in the bathrooms of the hard refurbishment areas will be 1 layer of 12.5mm plasterboard
- New partitions between guestrooms will be twin stud partitions with two layers of 12.5mm dense board (e.g. BG Soundbloc) either side and 50mm mineral wool in the cavity.
- Acoustic backboxes (or similar approved by the Acoustic Consultant) to be installed all electrical fittings in adjoining plasterboard partitions

The result of the test from the Wharnccliffe 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.

During the strip-out of the structure, inspections will be made of the existing constructions to check whether improvements are required.

### 3.3 Noise Break-in

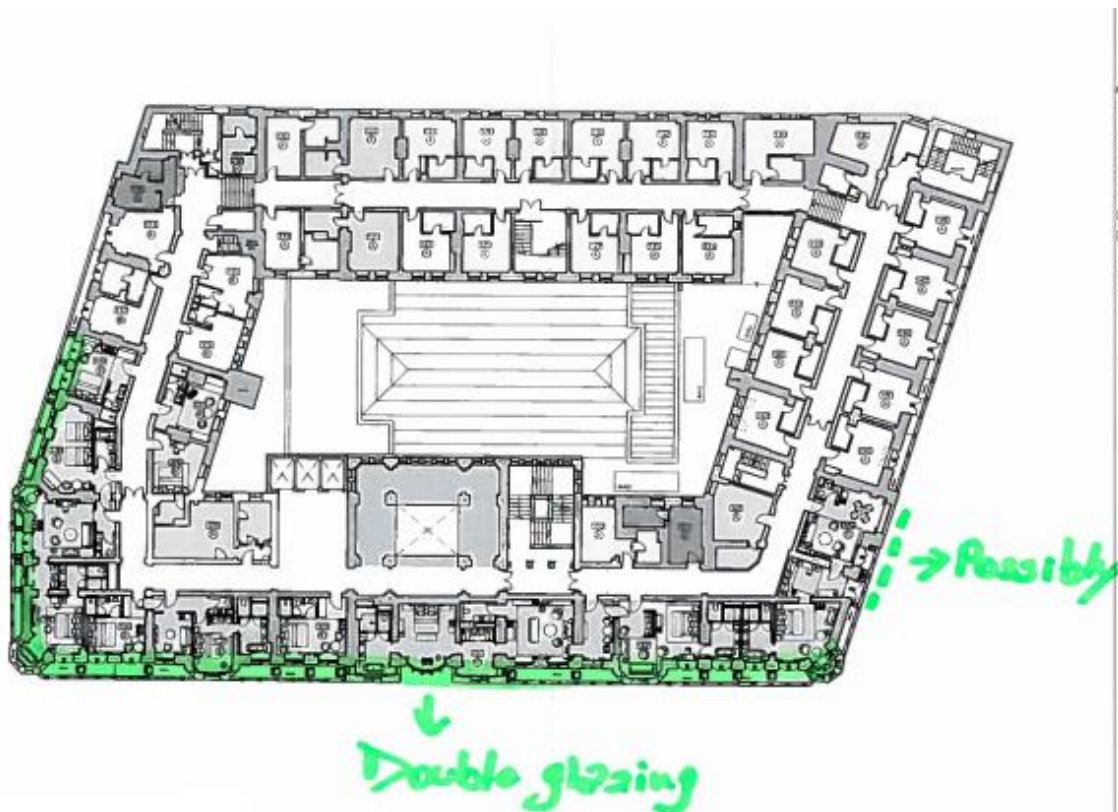
An assessment of noise break-in through the front façade has been done to calculate the improvement that can be achieved through the use of secondary glazing.

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.

Figure 1 of this report shows the location of the secondary glazing required to achieve acceptable internal noise levels. The use of a 6mm pane installed at least 100mm from the existing windows is suggested.

**Figure 1 – Extent of improved glazing**



#### 3.4 Control of reverberation in public spaces

To create a comfortable environment in the public spaces, the intention is to control the reverberant noise level with the use of absorbent surfaces. In the absence of specific guidance which suggests criteria for this, we suggest that the Reverberation Time in the public spaces is in the range 0.8-1.0 seconds at 500Hz Octave Band.

The most critical areas are the Reception Area, and the Palm Court. To help achieve the above criterion, the following advice is provided:

- Reception Area: 15m<sup>2</sup> of the rear wall of reception (and nearby walls if insufficient space is available to meet this number) must be covered in an absorption product which has a Class C rating or better according to BS EN ISO 11654:1997.
- Palm Court: 25m<sup>2</sup> of an absorption product which has a Class C rating or better according to BS EN ISO 11654:1997 is required. To be effective, this will need to be evenly distributed around the space. Account has been taken of the effect of the soft furnishings that are likely to be in this space. It is assumed that there will be 20 upholstered chairs and rugs on the floor.



### 3.5 Doors in Public Areas

All replacement doors must be solid core timber with effective compression seals. Where doors face onto areas used for music or public speaking, it is suggested that these doors are at least 54mm thick solid core timber.

Yours sincerely

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