Identifying Acoustic Leaks

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St Andrews Hall is a 14th Century building in central Norwich, England, and is owned by Norwich City Council. The hall is a popular venue for concerts and other licensed events but in recent years has had problems with noise from events. Residential flats approximately 35 meters from the hall have experienced unacceptable sound levels limiting the use of the hall especially for amplified music. A sound limiter is installed to cut off power to the stage and PA system when internal levels reach set limits. The limits are low which makes the venue unpopular with many artists.

This has led to a significant loss of income for the council which is required for the upkeep of an important building for the city.

In order to reduce break out noise secondary glazing has been installed on the first and second floor of the hall opposite the flats. These windows can be seen in figure one below.
In addition the main entrance to the main hall was given an acoustic seal and an internal acoustic door has been installed.

The result of the acoustic treatment is approximately 1dB improvement at the nearest noise sensitive property.

Acoustic Camera Measurements

In order to identify acoustic leaks on the main façade as shown in figure 1 additional loudspeakers were placed in the hall playing pink noise to give an internal reverberant sound pressure level of 105dB(A). The acoustic camera was then pointed towards the façade to see if leaks could be detected.

Results

Measurement from distance

Two main areas could be seen where sound was leaking from the hall. The first was a side window closest to the camera in figure 2. The second was from the top of the windows on the main façade. In order to identify this the acoustic camera was moved closer to the hall.

Figure 1: St Andrews Hall

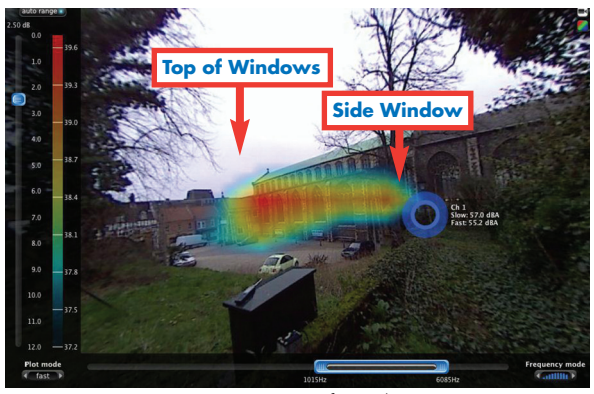

Figure 2: Acoustic camera image from distance

Measurement of side window

The camera was placed approximately 5m from the side window. This window shows an obvious acoustic leak as can be seen in figure 3. This window has not received secondary glazing and from the acoustic camera it can be seen it has a significant contribution to the sound level at the nearest

Figure 3: Acoustic camera image of side window

residential receptors. An improvement would be seen if this window was secondary glazed.

Measurement of door to main hall

The inner acoustic door was closed and the external door closed fully. From 1kHz onwards a leak could be seen in figure 4 where the seal was missing on the external door (figure 5). On the internal acoustic door it was discovered that there was a seal missing as can be seen in figure 6.

Fixing these seals would improve the sound insulation with minimal cost.

Figure 4

Figure 5: Seal missing on external door

Figure 6: Internal acoustic door not sealed

Measurement of Windows on main façade

Placing the acoustic camera close to the main façade it could be seen that the sound was leaking from the far end of the building. This can be seen in figure 7.

By using the virtual microphone with the camera (the blue circle seen on the screen) it can be placed on any part of the screen to hear this area in isolation. A significant leak could be heard and seen to the far end of the building. Notice the bird on the video file?

The acoustic camera was placed close to the façade at the far end of the building and significant acoustic leak was identified above the window on the far end of the building.

The construction of the building is masonry with large wooden beams laid across the top of the walls to support the roof. The leak could be pinpointed to a major beam located above the window in figure 8 above. Of the leaks detected this is the most significant acoustic leak at the hall and the

main contributor to higher levels than expected at the receivers. To a lesser extent a leak was detected on the second window from the left in figure 8.

Figure 7: Measurement at main façade

Figure 8: Acoustic leak pinpointed

Conclusions

The main leak above in figure 8 needs further investigation. A cherry picker/ working platform is required to access the pin pointed areas. It is likely that repairing the masonry will improve the sound insulation significantly.

The acoustic camera was able to identify significant acoustic leaks which were not apparent from subjective assessment.