CHP and boiler house, South Tyneside District Hospital

Noise impact assessment for Planning Condition no. 5

5514.2B

12th November 2018

Revision B

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2 Summary

2.1 This report has been prepared in response to Planning Condition no. 5 of Planning Application ST/0754/16/FUL for the development of a CHP and boiler house at South Tyneside District Hospital.

2.2 Planning Condition no. 5 requires the sound power level of the flue should be approved by the Local Planning Authority.

2.3 The original proposed sound power level 80 dB L_{WA} is considered as the upper limit which is likely acceptable by the Local Planning Authority.

2.4 The sound power level of the flue outlet is calculated based on the latest boiler and CHP noise data provided by the mechanical engineer.

2.5 The calculated sound power level of the flue is below the proposed upper limit without additional mitigation measures. Therefore, it is considered that the requirement of the Planning Condition no. 5 is satisfied.

3 Introduction

3.1 A development consisting of a CHP and a boiler house accommodation has been proposed at South Tyneside District Hospital. The site location is shown in Figure 1.

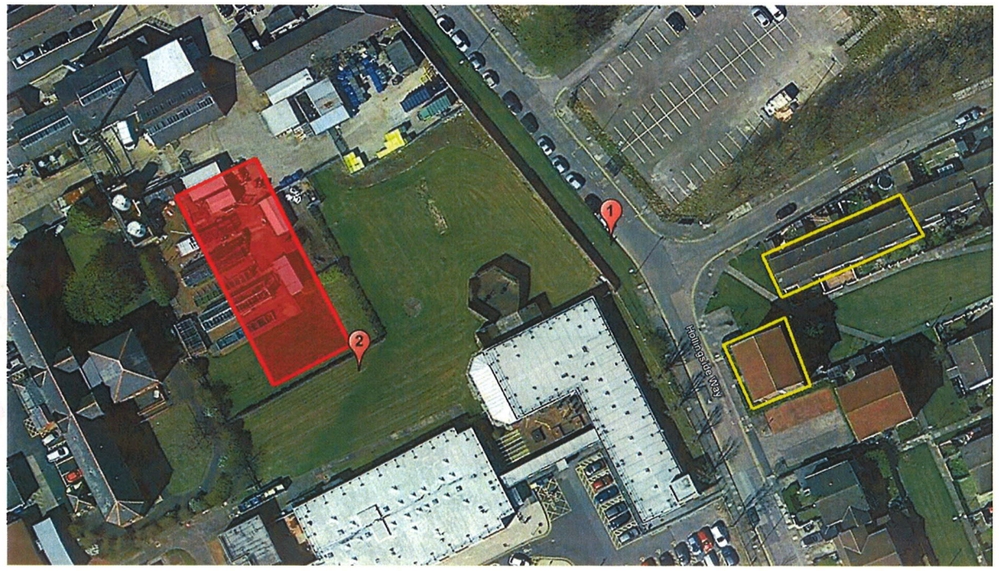


Figure 1: Site location (highlighted in red)

3.2 This report presents the calculation of the sound power level of the flue outlet in support of a Planning Application ref. ST/0754/16/FUL to address Planning Condition no. 5.

3.3 This assessment is based on the plant details identified by the mechanical engineers.

4 Planning condition no.5

4.1 Planning Condition no. 5 associated with Application ref. ST/0754/16/FUL for this development is shown in Figure 2.

> 5 Prior to the erection of the flue hereby approved, a detailed specification of the proposed flue, including its sound power level, shall be submitted to and approved in writing by the Local Planning Authority, and the approved scheme shall be implemented and retained thereafter.
>
> To safeguard the amenities of neighbouring residents, in accordance with Development Management Policy DM1 of the South Tyneside Local Development Framework.

Figure 2: Screenshot of Planning Condition no. 5

4.2 The sound power level limit of 80 dB L_{WA} of the flue has been proposed by Apex Acoustics in the original noise assessment report, Reference 1, when the noise data was not available at that stage.

4.3 Therefore, 80 dB L_{WA} is considered as the upper limit which is likely acceptable by the Local Planning Authority.

5 Noise sources and calculation methodology

5.1 **Source noise levels**

5.2 It is understood from the mechanical engineer that the boilers and the exhaust gas from the CHP are ducted to the flue. The manufacturer and models of the plant are shown in Table 1. Noise data for the boilers and the exhaust of the CHP are shown in Table 2 and Table 3.

Plant	Manufacturer	Model	No. proposed
Boiler - HRX92.1	Serie	92	2
Boiler - HRX515.1		515	1
Boiler - HRX520.1		520	1
Boiler - K590X		520*	1
CHP exhaust	Ener-G	530M	1

* The K590X is understood to have the same motor as HRX520.1. Therefore, the noise data of HRX520.1 is used to represent the noise level of K590X.

Table 1: Proposed boilers

5.3 Manufacturer supplied sound power levels of the boilers are shown in Table 2.

Boiler	dB L_{WA}	Single-octave band centre frequency (Hz) Sound power levels, dB(A)					
		125	250	500	1k	2k	4k
HRX92.1	77	65	68	71	71	70	67
HRX515.1	84	70	73	76	77	77	76
HRX520.1	84	70	73	76	77	77	76
K590X	83	70	71	75	76	77	75

Table 2: Manufacturers sound power levels

5.4 The spectrum of the CHP exhaust gas with the integrated silencer at 1 m is shown in Table 3.

dB(A)	Octave band centre frequency / Hz A-weighted sound pressure level / dB					
	125	250	500	1 k	2 k	4 k
58	48	53	51	44	44	43

Table 3: Sound pressure levels from exhaust gas silencer at 1 m

5.5 The sound power level from the exhaust gas silencer is determined by :

$$L_{wA} = L_{pA} + 20*\text{Log}(r) + 8$$

where L_{pA} is the sound pressure levels indicated in Table 3; r is 1 m.

5.6 **Calculation methodology**

5.7 The noise attenuation from the boilers to the flue outlet is calculated based on CIBSE guide, Reference 2.

5.8 The details of the duct measured from the architect's drawings, Reference 3, are shown below:

- All the ducts have round sections;
- The diameter of duct is around 700 mm; and
- The distance from the boilers and the CHP to the top of the flue is around 28 m.

5.9 It is assumed that there are two bends from the boilers and CHP to the flue.

5.10 The noise attenuation due to the length of the duct, number of bends and end reflection are determined based on the CIBSE guidance as shown in Table 4.

Parameter	Single-octave band centre frequency (Hz) Attenuations, dB					
	125	250	500	1000	2000	4000
Due to length, dB	2.8	2.8	2.8	2.8	2.8	2.8
Due to no. of bends, dB	4	6	6	6	6	6
End reflection, dB	6	2	1	0	0	0

Table 4: Attenuation from boiler to flue outlet

6 Calculated sound power level of the flue

6.1 The sound power level at the outlet of the flue is calculated by the plant sound power levels minus the attenuation as shown in Table 4.

6.2 The breakdown and total calculated sound power levels of the boilers and CHP exhaust are shown in Table 5.

Parameter	dB L_{wA}	Single-octave band centre frequency (Hz) Sound power level, dB					
		125	250	500	1000	2000	4000
HRX92	68	52	58	61	62	61	59
HRX92	68	52	58	61	62	61	59
HRX520	74	57	62	66	68	69	67
K590	74	57	62	66	68	69	67
HRX515	73	57	60	65	67	68	66
CHP exhaust	54	43	50	49	43	43	42
Total	**79**						

Table 5: Calculated sound power level of the flue

7 Assessment

7.1 The calculated sound power level at the outlet of the flue is 79 dB L_{WA}, this is below the proposed upper limit in the original noise assessment.

7.2 Therefore, the requirement of Planning Condition no. 5 is considered to be satisfied.

8 Conclusion

8.1 The calculated sound power level of the flue is below the proposed upper limit without additional mitigation measures.

8.2 Therefore, it is considered that the requirement of the Planning Condition no. 5 is satisfied.

9 References

1 Sound impact assessment, CHP and boiler house accommodation, South Tyneside District Hospital, report reference 5514.1, revision B, issued date 25th July 2016, Apex Acoustics Ltd.

2 CIBSE Guide B5 Noise and vibration control for HVAC, 2002.

3 CHP, Boiler House and Ancillary Accom, Proposed Ground Floor Plan, drawing no. A(00)GAP001, revision 6,; Proposed Elevations 1 of 2, drawing no. A(00)GAE001, revision 2, _space architects.