

Follow up Second Report on Plant Noise, 73 Grays Inn road, Holborn, London WC1.

Date of report	6th June 2018
Dates of visits.	31 st May 2018
Present:	Jonathan Law, Architect, new manager of Cibo, Shaun Murkett.
Location.	73 Grays Inn Road, London, WC1.
Purpose.	To conduct a plant noise survey and investigation.
Author of report.	Shaun Murkett BSc. C.Eng. MIEE. MIOA.

1 Executive summary

1.1 The management have refurbished this building with new external plant and other changes over the past two years. Planning permission has been granted for the installation of new external ventilation and extract plant. We conducted a comprehensive noise survey and report in August 2015 and made recommendations.

Accordingly, the management have commissioned a professional noise survey and report to inspect the works and to assess the potential impact of this new installation for the potential for noise break-out, and to confirm it meets all planning conditions. This new report addresses and gives professional advice on these matters.

1.2 The background noise levels have been measured near the residents at typical times of operation, and an inspection made of the new acoustic enclosures.

1.3 An assessment under BS 4142 has been made, and also regard to BS 8233, and it is has been confirmed that the noise from the plant is now well within the local authority criteria, as all the recommendations in the previous report have been followed.

1.4 The owners are well aware of the implications of the noise issues surrounding the ventilation and air conditioning plant, and have taken professional advice in commissioning this follow up report to investigate the noise situation. They have carefully put all our previous recommendations into place as quickly as possible in order to keep any disturbance from plant noise reaching nearby residents to the absolute minimum.

1.5 This final sound test now confirms that the plant systems are working correctly and there is no excessive noise breakout, and confirm that all the local authority noise planning criteria have been met. The planning conditions should now be formally cleared.

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Follow up Second Report on Plant Noise survey at 73 Grays Inn road, Holborn, London WC1

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2 Introduction and Background.

2.1 The management have refurbished this building as a new café restaurant. Planning permission has been granted for the installation of external plant including kitchen extract flue and external condensers, following enforcement action ref RS/PE/EN15/0459. The local authority had concerns over the potential for noise breakout to nearby residents from the new plant.

We conducted a comprehensive noise survey and report, issued in August 2015, and made recommendations, and which listed a schedule of works to resolve the issue.

Accordingly, the management have commissioned a follow up professional noise survey and report to inspect the works and to assess the potential impact of this new installation for the potential for noise break-out, and to confirm it meets all planning conditions. This new second report addresses and gives professional advice on these matters.

This noise survey and report was commissioned by the architect surveyor Jonathan Law on behalf of the freeholder owners. This report addresses those concerns and gives professional advice on these matters, and concludes that all is now acceptable.

2.2 History.

Parts of the original building dates back over one hundred and fifty years, although many additions were made in the 1950s and 1960s. The building has always been in commercial use, as shops and more recently as the Cibo café. Planning permission has been granted for new plant and retrospective application for plant, among other things, that has been added over the recent years. We issued a report in 2015 with some comprehensive recommendations, which have now been installed.

2.3 Location. (See the sketch map and photographs).

The large terraced building is located on the west side of the busy Grays Inn road, near the junction with Northington street. To the south adjoining is a dentist, with residential above, to the north adjoining is a solicitors. To the west at rear is a flat roof with new residential, and to the east over the road is commercial. The area is mixed commercial and residential with many shops, offices, and pubs in the area. There is also existing plant from other commercial premises nearby around.

2.4 Nearby residents. See layout map in appendix.

The nearest residents (no 1 on layout map) are located at first floor level, in flats at the rear to the west overlooking the plant on the flat roof of the building, at 8m distant from the units on the roof. There are also residents to the south west at 20 m away with line of sight to the units.

2.5 Mode of Operation

The café intends to start at 7 am in the morning and at present operates to around 5 pm, (but now closing early following complaints about plant noise), but proposes to operate to 10.30 pm. The main external plant is to be running manually, and will be on only during these hours.

2.6 Layout and construction of building. (See sketch map and photos).

The building is four stories high, with the plant located at the rear on the flat roof on the west side and with a flue up to above the top roof level. The construction is understood to be substantial 350mm brick walls, with supporting joists and timber floors.

2.7 Plant and location. (see photos and sketches)

There is a large kitchen extract system, with silencer and flue, and extending up in height to the top roof, at about 10m above. There is also a ventilation extract system running horizontally on the roof and joining the extract flue.. There is a large air conditioning external condenser, to the north, and also a much smaller Fujitsu chiller room condenser to the south near the party wall, now both enclosed in large acoustic enclosures.

3 Noise criteria and regulations.

3.1 General awareness of noise regulations.

The owner must be made aware of the importance of meeting any noise limits or regulations imposed by the Local Authority, and any conditions stated on the premises licence or planning permission referring to noise in particular. He must also be aware of the criteria which are used to judge acceptability. The following is a brief summary of the noise criteria, the legal position, and the consequences of not complying. Note that if specific conditions are attached to a planning permission then these are the conditions that must be met, irrespective of any of the general guidelines.

3.2 Local authority noise criteria. Generally to BS 4142.

The usual local authority guideline criteria for noise from industrial plant is given in the British Standard BS 4142. Essentially this relates how loud the plant is when measured or predicted near the residents, in dB L_{Aeq} relative to the underlying background noise, measured in dB L_{A90} . It gives an indication by a noise rating value as to the likelihood of complaints about plant noise from residents; if the source noise rating level, (including any correction for character), exceeds the background by more than 6 dBA then complaints are likely. It states that if the plant noise is at least 10 dBA below the background noise then this can be taken as an indication that complaints are unlikely. The usual criteria for local authorities is now for the plant noise to be at least 10 dBA below background, ie to have a rating value of below - 10 dBA. (Some local authorities also require an octave band analysis to ensure that each octave band of the predicted plant noise in dB L_{eq} is not above the measured background noise in dB L_{90}). Note that if the noise is 10 dBA below background it is generally accepted that this indicates inaudibility of the source noise compared to ambient background noise, and often a condition is stated in these terms.

3.3 LB Hackney usual noise regulations in planning permission for new plant.

The usual noise conditions on planning applications for new noise plant generally state that the noise of the plant at the residents should not exceed 10 dBA above the lowest measured ambient prevailing background noise, in dB L_{A90} , ie in accordance with BS 4142.

3.4 General noise criteria. Design targets and BS 8233

The guidelines for external noise intrusion into buildings is described in British Standard BS 8233, which defines what is defined as “good conditions” and “reasonable conditions of internal noise level in various spaces. The local authority follow these guidelines for acceptable values for proposed developments, and planning permission is often granted conditionally on proposals which can show in an acoustic consultants’ report that the building design will achieve the required design targets.

Residential

“Good conditions” are defined as no more than 30 dB L_{Aeq} in living rooms and bedrooms for day time, and night time. The design value for “reasonable conditions”, for the daytime ambient noise level inside residential lounges and living areas is 40 dB L_{Aeq}

For residential bedrooms at night the guideline design target is 35 dB L_{Aeq} , and with a 45 dB $L_{A Max}$. These internal noise levels are to include noise sources from inside and outside the building, including traffic noise, and any commercial noise source in adjacent buildings.

“Good conditions” are design targets to aim for, however most planning conditions generally stipulate achieving the “reasonable conditions” noise levels inside new developments. It is generally accepted that the noise attenuation through a slightly open window is of at least 10dBA. This requirement to meet BS 8233 has not been specified in these planning conditions, although it is good practice to be aware of the standards and to check if the plant will meet the guidelines.

4 Measurements and Observations. Thursday 31st May 2018 2- 4 pm

4.1 The follow up visit was made to meet the management, to inspect the premises and to investigate the layout of plant and relation to residents, and inspect new works, and measure the plant noise in the afternoon at the most sensitive time. The background noise was measured, with the plant on then turned off for a period then turned back on again.

4.2 Monitoring near the plant. (See photos)

The background noise early on in the survey in the afternoon was dominated by the noise of traffic from the main road Grays Inn road, and also other nearby plant noise. There were also overhead planes, sirens, and the occasional distant sound of construction work.

4.3 Monitoring positions.

Sound measurements and monitoring were made at the location listed below:-

A outside on the rear flat roof near the residents windows

4.4 Sound measuring equipment.

The main sound level meter, to measure the plant noise, a type 1 Bruel and Kjaer 2260 was used hand held up on the roof. The meter had wind protection fitted, and was set to measure in octave band mode to measure dB L_{Aeq} and dB L_{A90} , as well as other parameters.

The meters were calibrated before and after the survey. The meter was set to record in broad band environmental mode, including dB L_{Aeq} and dB L_{A90} in five minute periods. The weather at the start of the survey was about 19°C, dry, and with a slight breeze.

4.5 Subjective comments made at time of survey.

The background noise was dominated by traffic noise from the Grays Inn Road, and other plant from nearby.

The sound of the plant could not be clearly distinguished from the background noise of other plant nearby and general traffic and activity noise in the area.

The plant was turned off for a while and then on again and measurements made, and all were of a similar sound level.

5 Results and Analysis. (31st May 2018)

5.1 Sound monitoring near the residents on the roof, Location A

(see graphs at end of report).

The plant was measured with all plant on and running, then turned off for a while to measure background noise of other plant and then turned on again.

The Table below shows the results

Plant state	Sound level dBA L _{Aeq} 5 min	Sound level dBA L _{A90} 5 min
Plant on	53	52
Plant off	57	53
Plant on	53	52

Table 1 Showing results of background noise measurements with plant on and off
Measured near resident's windows overlooking flat roof.

Two graphs are shown at the end of the report to indicate the frequency spectra of plant on and plant off noise.

5.2 These measurements confirm the subjective opinion that the plant noise is indistinguishable from the general background noise of other nearby plant and traffic background noise, and meets the criteria.

5.3 Camden Council usual noise regulations in planning permission,

The usual noise conditions on planning applications for new noise plant generally state that the noise of the plant at the residents should not exceed 10 dBA above the lowest measured ambient prevailing background noise, in dB L_{A90}, ie in accordance with BS 4142.

It is indicated from the BS412 calculation that the plant noise is at least 16 dBA below the measured background noise, and this is therefore acceptable, with a good safety margin.

The new measurements indicate that the noise of the plant is now at least 10 dBA below the existing, as there was no increase in the existing dBA L_{a90} background noise level as indicated when the plant was turned on.

5.4 BS 8233 Assessment

The "reasonable conditions" design value for the ambient noise level inside lounges and living areas is 40 dB L_{Aeq} daytime..

For residential bedrooms the guideline acceptable design target is 35 dB L_{Aeq}, at night, and with a dB L_{Amax} of 45 dBA, to include noise sources from outside the building, including traffic. It is generally accepted that a partially open window will give a noise reduction of at least 10 dBA. This would then indicate that for external noise to be acceptable with a good safety margin, for daytime the external noise level would need to be less than 50 dB L_{Aeq} measured just outside the residents window, and for night time after 11pm the external noise should be less than 45 dB L_{Aeq}.

The predicted plant noise outside at the residents windows is 32 dBA, and this is much less than the requirement under BS 8233, and so meets the criteria with a good safety margin.

The new follow up measurements also indicate that this criteria has been achieved for the new plant, with acoustic enclosures.

6 Discussion.

6.1 The original noise issue with the new flue extract, and condensers systems was investigated and the potential for noise break out has been considered, with recommendations made in our report of August 2015. These have now been completed.

A follow up noise test and inspection has confirmed that this is now completed and acceptable.

Existing ambient and background noise levels have been monitored, on the roof near to the residents, at typical times of the day.

6.2 Monitoring at residents.

The existing ambient and background noise was monitored at the nearest noise sensitive residents. The plant noise was measured on then off then on again and there was insignificant difference in the noise levels. The noise climate was primarily other plant nearby and distant traffic noise.

6.3 BS 4142 Assessment.

BS 4142 is the main British standard used for assessing the likelihood of complaints with industrial noise. This can be used to give a guide as to the relative levels of each noise source and if this constitutes a possible noise problem. The basis of BS 4142 is an interpretation of the difference in level between the problem noise source measured in dB L_{Aeq} and the underlying background noise measured in dB L_{A90} .

It gives an indication of the likelihood of complaints about plant noise from residents; if the source noise exceeds the background by more than 6 dBA then complaints are likely, and up to 6 dBA there is marginal significance of complaints.

The results from the measurements and calculations demonstrates that the noise of the plant is acceptable, as there was no increase in background noise in dBA L_{A90} from the two separate measurements of the plant on compared to plant off. Generally the local authority noise criteria is for the source noise to be 10 dBA below the ambient background level, and so the result is acceptable, and meets all current planning regulations.

6.4 BS 8233 Assessment

The BS 8233 guidelines require that the predicted noise from external sources is ideally to be less than 50 dBA outside the nearest residents' window during the day. The assessment shows that with all the new plant running at maximum, as a worst case situation, the predicted noise level outside the nearest residents' window is 23 dBA. This is well within the acceptable levels with a good safety margin.

7 Conclusion and Recommendations.

7.1 The management have refurbished this building with new external plant and other changes over the past two years. Planning permission has been granted for the installation of new external ventilation and extract plant. We conducted a comprehensive noise survey and report in August 2015 and made recommendations.

Accordingly, the management have commissioned a professional noise survey and report to inspect the works and to assess the potential impact of this new installation for the potential for noise break-out, and to confirm it meets all planning conditions. This new report addresses and gives professional advice on these matters.

7.2 The background noise levels have been measured near the residents at typical times of operation, and inspection made of the new acoustic enclosures.

7.3 An assessment under BS 4142 has been made, and also regard to BS 8233, and it is has been confirmed that the noise from the plant is now well within the local authority criteria, as all the recommendations in this report have been followed.

7.4 The owners are well aware of the implications of the noise issues surrounding the ventilation and air conditioning plant, and have taken professional advice in commissioning this follow up report to investigate the noise situation. They have carefully put all our previous recommendations into place as quickly as possible in order to keep any disturbance from plant noise reaching nearby residents to the absolute minimum.

7.5 This final sound test now confirms that the plant systems are working correctly and there is no excessive noise breakout, and confirm that all the local authority noise planning criteria will have been met. The planning conditions should now be formally cleared.

Shaun Murkett 6th June 2018

Appendix 1 Glossary of Acoustic terms. (Industrial noise).

Annoyance	A feeling of displeasure associated with any agent or condition known or believed by an individual or a group to be adversely affecting them. Emotion associated with any noise perceived as irritating or a nuisance.
A-weighting	A frequency dependent correction or weighting that is applied to the measured or calculated frequency spectrum of a sound or noise to correlate with the varying sensitivity of the ear to sound of different frequencies. The ear is less sensitive to sound at low and very high frequencies, compared to the mid range frequencies. This A weighted response corresponds more closely to the frequency response of the human ear, at lower sound levels.
Ambient noise	All encompassing sound at a given place, usually a composite of sounds from many sources near and far. This is generally measured dBA $L_{Aeq T}$, as recommended in ISO 1996.
Background noise	Long term ambient noise or residual noise, generally expressed by dBA L_{Aeq} , as recommended in ISO 1996 and followed by PPG 24. (Still described in BS 4142 and many standards by dBA L_{A90} , and which is often stated to give a broader picture of the ambient background noise).
BS 4142: (1997)	This is the main British Standard used for assessing the likelihood of complaints with industrial noise. In essence if a noise source measured in L_{Aeq} exceeds the measured background noise L_{A90} by more than 6dBA then complaints are likely. If the predicted source noise is 10 dBA below background noise it is taken as a positive indication that complaints are unlikely. There are also loading factors for impulsive and tonal sounds.
BS 8233: (1999)	This British Standard covers control of noise from outside the building and noise from plant and services within the building. It gives basic design guidelines for target noise levels in various spaces, including homes and offices. These guidelines are primarily intended to guide the design of new or refurbished buildings, and were derived from the World Health Organisation documents,(ref WHO Community Noise Guidelines 1999),.
Decibel (dB)	Decibel. A unit of logarithmic ratio between a sound pressure and a known reference pressure (which corresponds to the threshold of hearing). For sound pressure level the reference quantity is $20\mu Pa$, the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1dB is only perceptible under controlled conditions, but a 3 dB change is easily perceptible.
dBA	“A” weighted dB. Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency, (pitch), in a similar way to the human ear. Measurements in dB(A) broadly agree with people’s assessments of loudness. An increase of 10 dB(A) corresponds roughly to doubling of the perceived loudness of a sound.

dB Lin	dB Linear. Un-weighted sound pressure level in dB, and is used as a more appropriate parameter to dBA when low frequencies predominate in the spectrum, and “A” weighting would under represent these low frequencies; as recommended in WHO 1999. This is of particular use when measuring music, as the dBA weighting would not give a fair representation of the low frequency content, which usually dominates modern music.
dB C	dB “C” weighted sound pressure level. The C weighting curve is closer to the linear response than the A weighting curve, and often used as an alternative to dB Linear.
Frequency . Spectrum	The range of audio frequency generally associated with the range human hearing from 20 Hz to 20 kHz., however by middle age most adults have reduced hearing ability at frequencies above 8 kHz. Usually shown graphically in octave bands, from 63 Hz to 8 k Hz.
Hertz (Hz)	Unit of frequency, equal to one cycle per second. Frequency is related to the pitch of a sound.
$L_{eq,T}$	Equivalent continuous sound pressure level. This is a time averaged level taken over a specified time period, which gives a measure of the average sound energy over that period. The equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over the same specified measurement period (T). It is measured with a fast time weighting, over periods such as one minute, 5 minutes, 15 minutes, 1 hour etc.
$L_{Aeq,T}$	“A” weighted equivalent continuous sound pressure level, over measurement period T. This is an average of the total sound energy measured over the time period. $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter. This is the preferred sound measurement parameter for most types of environmental noise as recommended by ISO 1996.
L_{max}	The highest linear un-weighted noise level recorded during a measurement period.
L_{Amax}	The highest or maximum A weighted noise level recorded during a measurement period.
L_n	This is the percentile sound level. Since the variation in sound level can be large over a long period of time, the sound level can be described statistically. Thus n refers to the percentage of the total measurement time for which that level is exceeded.
$L_{A10,T}$	The A weighted level of noise exceeded for 10% of the specified measurement period (T). It gives an indication of the upper limit of fluctuating noise such as that from road traffic. $L_{A10, 18h}$ is the arithmetic average of the 18 hourly $L_{A10, 1h}$ values from 06.00 to 24.00.
$L_{A90,T}$	The A weighted noise level exceeded for 90% of the specified measurement period (T) and used to be commonly taken to be the background noise level parameter in the UK. In BS 4142 it is still used to describe the nominal background noise level, although background noise level is now usually described by L_{Aeq} according to ISO 1996.

Noise	Undesired sound
Noise induced Temporary Threshold shift	Temporary hearing impairment occurring as a result of noise exposure, often phrased temporary threshold shift (adapted from ANSI 1994) The ears need a time to “recover” or settle, after exposure to high noise levels, and until that time will not perceive low sound levels as normally.
Noise level Octave bands	Level of undesired sound, usually measured in dB L_{Aeq} The frequency spectrum can be divided into a number of octave bands centered around the frequencies 32 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1kHz, 2kHz, 4kHz, 8kHz and 16kHz to encompass the range of human hearing. Third octave spectrum divides each of these octave bands into three frequency bands to give even greater detail of the distribution of the sound across the frequency spectrum.
Rating level	The noise level of an industrial noise source which includes an adjustment for the character of the noise. Used in BS 4142. (1997)
R_w	Single number rating used to describe the sound insulation of building elements. It is defined in BS 5821: (1984).
Sound level SPL	The level of sound measured, as Sound pressure level, usually in dBA. Sound pressure level, usually measured in dBA

Typical everyday sound levels

140 dBA	jet aircraft take off at 25m
130 - 135 dBA	gunshot from revolver at 1m
120 - 125 dBA	riveting workshop
110 -115 dBA	circular saw on hardwood at 0.5m, chainsaw at 0.5m
100 -110 dBA	police car, or ambulance, siren at 7m
100 -110 dBA	music festival at 30 m from stage
95 - 100 dBA	night club;
90 - 95 dBA	heavy lorry at 7m
90 - 95 dBA	bar or pub with music
85 - 90 dBA	power drill at 0.5m, food blender at 0.5m; car horn at 7m
80 - 85 dBA	inside London tube train
75 - 85 dBA	busy restaurant or café
75 - 80 dBA	vacuum cleaner at 1.5m
70 - 80 dBA	busy street
70 - 75 dBA	inside bus
70 - 75 dBA	passing car 40 mph at 7m
65 - 70 dBA	loud radio at 1m ; inside car at 50 - 60 mph
60 - 65 dBA	general office; supermarket
50 - 60 dBA	conversation between couple, at 1m
40 - 50 dBA	quiet office; quiet living room, day time
30 - 35 dBA	quiet bedroom, at night
20 - 25 dBA	empty concert hall or theatre
15 - 20 dBA	broadcast or recording studio
10 - 20 dBA	faintest audible sounds
0 dBA	threshold of hearing

WHO 1999	World Health Organisation . Guidelines for Community Noise 1999. This document sets out guideline limits on noise levels to prevent hearing damage, annoyance, and sleep disturbance in various situations, including residential, leisure, and workplace buildings.
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View of Cibo restaurant at
73 Grays Inn road, Holborn.



View of acoustic enclosure
around large chiller unit on roof.



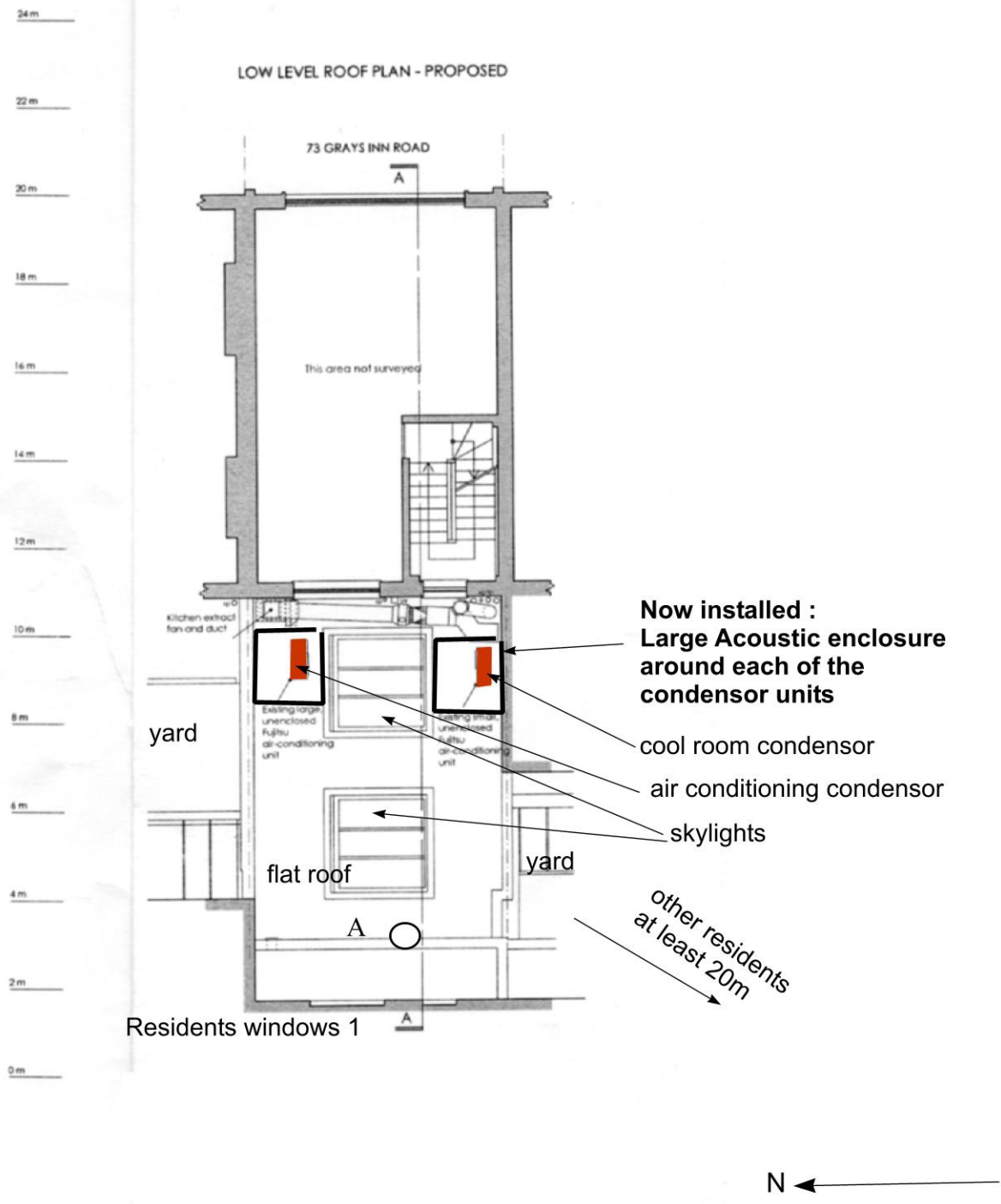
View of sound level meter
measuring background noise
near residents at rear, on flat roof.

Photographs of noise survey at 73 Grays Inn road, Holborn.©

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June 2018

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Key

Recommendations are shown in **bold**

Plant position



Sound level monitor point

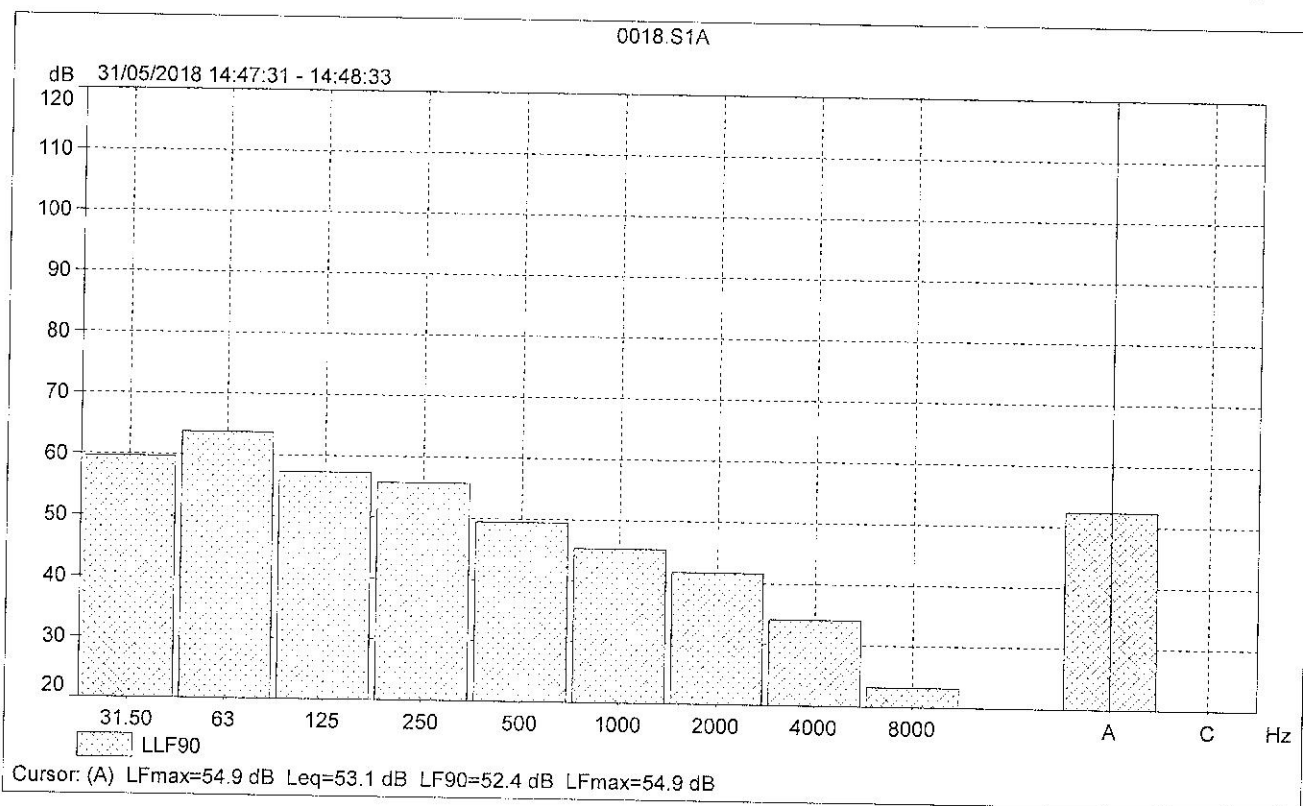


Layout of plant at rear of
73 Grays Inn Road,
showing recommendations
in place.

June 2018

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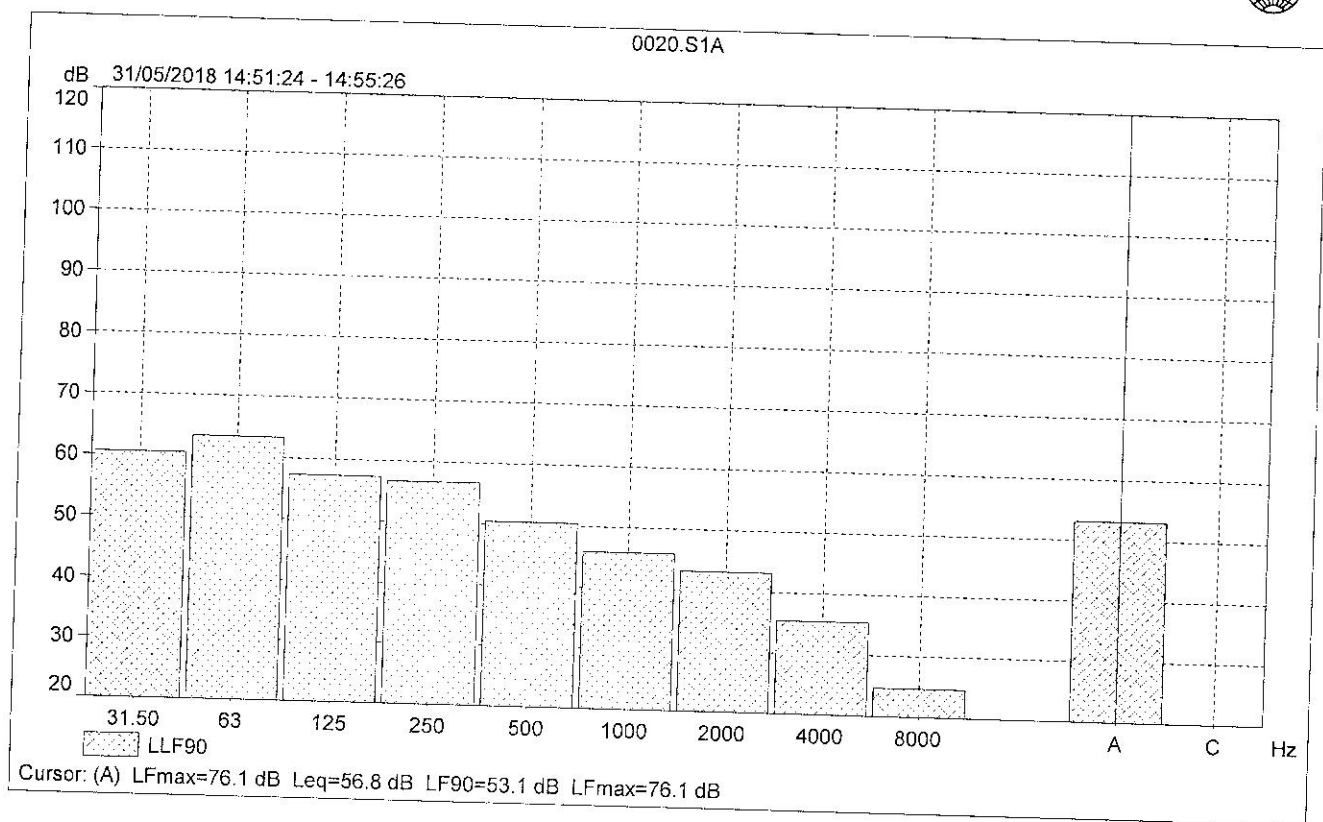


Ambient background noise dBL₉₀, Octave frequency spectrum,
measured near residents' windows on flat roof.
Cibo Restaurant 73 Grays Inn road, Holbourn, London, WC1
Location A.

31 May 2018,

All plant on

Sound level 53 dB LAeq, 5 min. 52 dBA LA90, 5 min.



Ambient background noise dBL₉₀, Octave frequency spectrum,
measured near residents' windows on flat roof .
Cibo Restaurant 73 Grays Inn road, Holbourn, London, WC1
Location A.

31 May 2018,

All plant off

Sound level 57 dB LAeq. 5 min. 53 dBA LA90. 5 min.