

REPORT TITLE: ACOUSTIC REPORT FOR A PROPOSED KITCHEN EXTRACT FAN SYSTEM
TO SERVE A CHANGE OF USE TO HOT FOOD TAKEAWAY (CLASS A5) AT
10 RAILS LANE, HAYLING ISLAND, HAMPSHIRE PO11 9LL

Havant Borough Council Planning Reference: APP/18/00176

REPORT REF: 18114-002

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DATE: June 2018

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SUMMARY

- Philip Acoustics has been commissioned to assess noise associated with a proposed kitchen extract fan system to be installed to serve a change of use to hot food takeaway (Class A5) at 10 Rails Lane, Hayling Island, Hampshire PO11 9LL. The assessment is requested by Havant Borough Council and is associated with a planning application for the change of use reference APP/18/00176.
- In accordance with the Council's noise assessment request, a noise limit (criterion) for the proposed kitchen extract fan system is set with reference to relevant British Standard BS4142:2014. Full title of this standard is BS4142:2014 *"Methods for rating and assessing industrial and commercial sound"*. Note that as an aid to clarity, this report retains use of the well-established term "noise" as opposed to the replacement term "sound" of BS4142:2014.
- In accordance with the assessment methodology of BS4142:2014, a noise survey has been carried out externally at the rear of the site to establish representative (and lowest) existing background noise levels during operational times of the proposed kitchen extract fan system at a position outside windows of the nearest residential properties. Nearest residential properties include flats over upper floor levels of the building itself.
- Based on noise model calculations using manufacturer's data, noise from the as proposed kitchen extract fan system (including with the developer's specified silencer) exceeds the noise limit criterion to outside the physically nearest residential windows of flats above the site itself.
- It is therefore recommended that a supplementary (additional) silencer be incorporated to within the kitchen extract fan system ductwork to ensure compliance with the noise limit criterion.
- Full specification details for the developer's specified silencer and also the supplementary (additional) silencer are provided in Section 6.1 plus Appendix G of the report. The silencers are by Systemair and "matched" to suit the proposed kitchen extract fan Systemair Multibox fan unit model MUB 062 560.
- The report also considers vibration from the kitchen extract fan system. Position of the kitchen extract fan unit is structurally linked, albeit indirectly, to residential flats over upper floor levels. Thus it is possible that extract fan vibration could transmit into these properties. It is therefore recommended the kitchen extract fan system be installed using suitable proprietary high performance vibration isolators as good practice and to mitigate potential vibration transfer to the residential flats. Specification details for suitable vibration isolators are provided in Section 6.2 of the report.

1. INTRODUCTION

A new kitchen extract fan system is proposed to be installed to serve a change of use development from retail shop (Class A1) to a hot food takeaway (Class A5) at 10 Rails Lane, Hayling Island, Hampshire PO11 9LL.

Philip Acoustics has been commissioned to assess noise from the proposed new kitchen extract fan system with reference to British Standard BS4142:2014. The assessment is to determine what specification for noise reduction (mitigation) treatment is required to the kitchen extract fan system to comply with the noise requirements of the Local Planning Authority which is Havant Borough Council.

This report presents results of the noise assessment and includes:

- Noise criterion;
- Measurement of existing background noise levels;
- Calculation of kitchen extract fan system noise levels;
- Consideration of vibration from the kitchen extract fan system;
- Specification as necessary for noise reduction treatments and vibration control measures.

2. NOISE CRITERION

Planning application for the change of use to a hot food takeaway (Class A5) is Havant Borough Council reference APP/18/00176.

As part of consultee comments associated with the planning application, the Council's Environmental Health case officer has requested that a noise report/survey (and associated assessment) be provided for the proposed new kitchen extract fan system.

The request is contained within an email from Emma Chisnall (Planning Officer – Development Management) to the applicant's planning representative (KKR Planning & Design Ltd) dated 09 May 2018. The Council's noise criterion requirement stated in the request is that existing noise levels should not be increased (as a result of operation of the proposed development's kitchen extract fan), in accordance with BS4142:2014.

Full title of the referenced British Standard is BS4142:2014 "*Methods for rating and assessing industrial and commercial sound*". Note that as an aid to clarity, this report retains use of the term "noise" as opposed to the replacement term "sound" of BS4142:2014.

BS4142:2014 (and previous editions) provides a well-established methodology to assess the likely impact to people regarding noise of an industrial nature from commercial developments. Consequently in requesting noise assessments for proposed new mechanical services plant including equipment such as kitchen extract fan systems then many Local Planning Authorities routinely make reference to BS4142.

The BS4142 assessment method in this scenario requires that source noise data for the kitchen extract fan system is determined and existing background noise levels be measured. The assessment is then carried out by comparing the kitchen extract fan system noise Rating Level with background noise levels, at assessment position(s).

The noise Rating Level in this scenario is the Specific Noise Level of the kitchen extract fan system plus with any corrections applied to account for subjective characteristics of the noise (such as tonality in the case of kitchen extract fan systems) that might mean it is more noticeable and potentially of more impact.

The BS4142 assessment method then provides guidance on the likely noise impact (effect) to people depending on the magnitude of the excess of the Rating Level over the background noise; the higher the excess the more likely there would be an adverse impact and correspondingly, the lower the excess (or no excess) the less likely there would be an adverse impact.

BS4142:2014 does not provide specific guidance on suitable noise limits / criteria or standards for proposed new plant/equipment (only an indication of the likelihood or otherwise of adverse noise impact).

BS4142:2014 does nevertheless advise that where the Rating Level is around +10dB above the background this is likely to be an indication of significant adverse impact. Where of the Rating Level is around +5dB above the background then this is likely to be an indication of adverse impact. Where of the Rating Level does not exceed the background then this is an indication of low impact. All of the above are dependent upon context.

It is important to note that the BS4142:2014 assessment methodology does not have a "no impact" indication categorisation. "Indication of low impact" for where the Rating Level does not exceed the background as described in the preceding paragraph is the lowest / least likely noise impact categorisation of BS4142:2014.

Different Local Planning Authorities apply the guidance of BS4142 differently, some require that the noise Rating Level of proposed new plant/equipment be not higher than +5dB above the existing background, some require not higher than the background, some require below the background noise. Some do not have any set requirement and consider each situation / proposed development individually.

It is the author's experience however that most Local Authorities for this context of proposed new equipment seek to apply the guidance of BS4142 with a requirement that the Rating Level of new equipment (such as kitchen extract fan systems) be not higher than the background noise; the requirement being applicable to positions outside windows of nearest noise sensitive (residential) properties and applicable to the representative and/or lowest background noise during operational times for the equipment.

The Council's requirement that existing noise levels should not be increased as a result of operation of the proposed development's kitchen extract fan is not a directly recognisable criterion for an assessment in accordance with the guidance and provisions of BS4142:2014.

Notwithstanding this, and with consideration of context that the proposed kitchen extract fan system is to serve an existing, albeit changed use, commercial property it is considered appropriate for this development to apply the guidance of BS4142:2014 with the commonly used noise criterion that the Rating Level be at or lower (i.e. not higher than), the lowest existing background noise outside windows of nearest noise sensitive (residential) properties during operational times.

It is the author's experience of undertaking many noise surveys and assessments of noise from kitchen extract fan systems and other plant/equipment in similar scenarios and contexts to that as at 10 Rails Lane that at this level, noise from the proposed new kitchen extract fan system would not be expected to be audible / disturbing or of impact to any adjacent residential occupiers.

Additional summary clarification points relevant to the assessment and noise criterion are provided below, and confirm the assessment is undertaken cautiously / robustly:

Kitchen Extract Fan Operating Conditions & Noise Level

It is noted that the extract fan is to be speed controlled and so will operate at below 100% duty (and with consequent lower noise levels) for much of time. However, the assessment and noise criterion is cautiously/robustly applied to the extract fan operating at full (100%) duty during opening times of the development. The noise criterion is applied in terms of a noise Rating Level and thus with any corrections (such as for tonal character noise) applied as necessary as per the BS4142:2014 assessment methodology.

Assessment Position

The noise criterion is applied to an assessment position directly outside of nearest windows of the nearest residential properties.

Background Noise Level

The noise criterion is cautiously/robustly applied to the representative lowest existing background noise at the assessment position for times of operation of the kitchen extract fan system.

3. BACKGROUND NOISE SURVEY

In order to assess noise from the proposed new kitchen extract fan system it is necessary to establish existing background noise levels representative of outside nearest residential properties during operational times for the system. Details of the background noise survey carried out are provided below.

3.1 Survey Instrumentation

Details of the instrumentation used for the background noise survey are provided in Appendix A. The sound level meters were calibration verified before and after the survey using the UKAS certified calibrator.

3.2 Survey Details & Procedure

The kitchen extract fan system will operate as required during opening times for the proposed change of use development nominally in the range 11am to 11pm.

In terms of the BS4142:2014 noise assessment and design/specification for noise reduction treatment to the kitchen extract fan system, then the most onerous condition is during the late evening of the range of opening right up to the closing time, as this is when existing background noise is lowest.

The background noise survey was therefore carried out fully attended by the author over the period approximately 9:00pm to 11:30pm of 22 May 2018 so as to include a sample late evening / early night period when representative lowest levels of background noise will occur for operational times of the kitchen extract fan system.

Weather was monitored during the survey and included clear dry (no precipitation) conditions with light wind speed (typically 0 to 2m/s) at the noise survey position, temperature was approximately 17°C reducing to 15°C through the survey period, again at the noise survey position.

Location of the kitchen extract fan system and nearest residential properties is indicated on a site location aerial image and proposed layout drawing in Appendix B. Nearest residential properties are flats over upper floor levels of the site itself and other adjacent ground floor commercial premises.

The background noise survey was undertaken at a single primary measurement position externally from the rear elevation first floor residential access walkway above the development site itself, selected as best practicably accessible and representative of directly outside nearest windows of the nearest residential flats.

Measurements of background noise were recorded continually as overall L_{A90} dB values over 15 minute periods for the survey duration.

In addition to the primary position noise survey, shorter term noise samples were also concurrently recorded at several times throughout the survey period at other secondary measurement positions from within the car park area to the rear of the site at 1.5m above ground level as a check and verification that background noise levels to other positions were not materially any different (any lower) than at the primary measurement position.

The primary and also sample secondary noise measurement positions are indicated on the site location aerial image in Appendix B.

3.3 Survey Results

Existing background noise levels at the rear of the development site outside the nearest adjacent residential properties are relatively low, and principally due to traffic, both locally including vehicles to and from the rear car park area (observed mostly to be cars of residents), plus with underlying noise of traffic generally on surrounding roads.

It is noted that despite the development site's close proximity to Hayling Island Sea Front and associated beach, no tidal / sea related noise was subjectively audible, observed or measured during the background noise survey. It is therefore considered weather and tidal / sea conditions during the survey are representative "worse-case" in terms of the noise assessment, i.e. with nil influence on background noise and thus resulting in typical lowest background noise conditions for this coastal / sea front location.

Background noise levels gradually reduced during the survey period, being lowest right up to the proposed development's latest closing time 11pm.

Raw data results of the primary position background noise survey are provided graphically in Appendix C. Summary of the lowest measured background noise level and associated noise limit (criterion) requirement are shown in Table 1. Sample measurements at other secondary positions were not materially different (not lower) than at the primary position.

Description	Kitchen Extract Fan System Operating Times	Representative Low Background Noise $L_{A90, 15min}$	Criterion: Noise Rating Level Limit
Representative of directly outside windows of the nearest adjacent residential properties	Operational during proposed development opening hours (in the range 11am to 11pm)	29dB (occurs just before latest closing time 11pm)	$\leq 29dBA$

Table 1: Measured background noise and associated kitchen extract fan system noise limit

4. NOISE FROM KITCHEN EXTRACT FAN SYSTEM

Assessment of noise from the as proposed kitchen extract fan system is provided in Section 4.1 and includes the developer's specified silencer. Further assessment of noise from the system plus with a recommended supplementary (additional) silencer fitted to further reduce noise levels is provided in Section 4.2.

4.1 Kitchen Extract Fan System As Proposed

The proposed new kitchen extract fan system is conventional and comprises the following items:

- **Kitchen Extract Fan**: Systemair Multibox fan unit model MUB 062 560 (fan diameter nominally 560mm) with speed regulator, located at high level internally within the rear store room area of the development. Fan unit mounted using vibration isolators and with flexible connections (see *Section 6.2 of report for vibration isolator specification*);
- **Atmosphere Side Of Extract Fan**: Matched Systemair MUB 062 SIL Multibox silencer 1200mm long, positioned immediately adjacent to the extract fan and located internally (see *Section 6.1 of report for the silencer's specification details*). Then, with nominal 450mm diameter ductwork out through the rear elevation wall of the building to a high level discharge aperture set below the parapet wall to the rear elevation first floor residential access walkway;
- **Room Side Of Extract Fan**: Associated 450mm ductwork to carbon filter units, Purified Air ESP (Electrostatic Precipitation) units and canopy over cook area.

Layout and location of the kitchen extract fan system is shown on the proposed layout drawing in Appendix B. A copy of the manufacturer's data sheet noise data for the Systemair Multibox fan unit model MUB 062 560 is provided in Appendix D. The manufacturer noise data for the extract fan is in terms of overall dBA as well as octave band dBA sound power levels.

Summary of in-duct sound power level data in terms of overall dBA and octave band dBA values for the outlet (extract side) of the fan is shown in Table 2.

Description	Overall dBA	Octave Band Centre Frequency (Hz) dBA							
		63	125	250	500	1k	2k	4k	8k
Systemair Multibox fan model MUB 062 560 (un-silenced data)	80	67	69	73	75	74	71	66	59

Table 2: Extract fan in-duct sound power level data (*extract outlet unsilenced*)

To calculate the overall noise contribution from the kitchen extract fan system to outside nearest residential windows a spreadsheet based noise model calculation has been used.

The model takes account of distance between the kitchen extract fan system discharge aperture location and nearest residential windows, acoustic directivity, acoustic reflections and any line of sight acoustic screening as well as duct losses; i.e. amount that noise reduces as it travels from the fan through the ductwork including "end reflection" out through the discharge aperture. The model also takes account of the developer's proposed silencer.

Noise model calculation details for the as proposed kitchen extract fan system are provided in Appendix E.

The noise model overall calculated noise Rating Levels from the as proposed kitchen extract fan system (with developer's specified silencer fitted) to outside the nearest residential windows compared with the noise limit (criterion) are summarised in Table 3.

The assessment positions A and B are indicated on the site location aerial image in Appendix B and represent the physically nearest residential windows (position A) plus also nearest residential windows with direct line of sight and "on-axis" directivity to the kitchen extract fan system aperture (position B).

Note that although the developer's specified silencer will tend to suppress any tonal noise characteristics of the kitchen extract fan system, plus results of the noise model calculation does not indicate presence of any strong or dominant tonal element at the assessment positions, the assessment cautiously includes a +2dBA correction (penalty) as per the guidance of BS4142:2014, added to the overall calculated system noise levels to account that residual noise from the system could potentially have a just perceptible tonal characteristic (although considered unlikely in practice).

Assessment Position	Kitchen Extract Fan System Operating Condition & Times	System Overall Noise Rating Level	Criterion: Noise Rating Level Limit	Comment
Position A: To outside physically nearest windows of residential flats at first floor above the site itself	Operating at full (100%) duty during opening hours (in range 11am to 11pm)	35dBA	≤ 29dBA	6dBA exceedance over criterion
Position B: To outside nearest windows of residential flats with direct line of sight and on-axis directivity to extract aperture	Operating at full (100%) duty during opening hours (in range 11am to 11pm)	29dBA	≤ 29dBA	Complies

Table 3: As proposed system noise Rating Levels to nearest residential windows

Table 3 shows that noise from the as proposed kitchen extract fan system with the developer's specified silencer exceeds the criterion by 6dBA to assessment position A outside the physically nearest residential windows of flats above the site itself.

It is therefore recommended that to comply with the noise criterion and thus the Council's requirement, noise from the kitchen extract fan system is further reduced by the use of a supplementary additional silencer.

Details for the recommended supplementary (additional) silencer are provided in Section 4.2.

4.2 Kitchen Extract Fan System With Recommended Supplementary Silencer

It is recommended the supplementary silencer is a circular type and thus can be readily incorporated (fitted) to within the as proposed kitchen extract fan system external circular ductwork.

It is recommended the supplementary silencer be a “matched” Systemair circular silencer type LDC-B 1200mm long, either a LDC-B 400-1200 (400mm diameter ductwork connection) or a LDC-B 500-1200 (500mm diameter ductwork connection).

Specification details for the recommended supplementary silencer are provided in Section 6.1 of the report.

Reason for specification of these two alternative silencers is to assist the kitchen extract system installer who can select which of these better suits fitment within the system external circular ductwork which is nominal 450mm diameter (i.e. with use of a duct reduction transition piece to suit the 400mm diameter silencer or alternatively with a duct increase transition piece to suit the 500mm diameter silencer).

Noise model calculation details for the as proposed kitchen extract fan system plus with the supplementary silencer fitted are provided in Appendix F. *Note the calculation cautiously incorporates the Systemair silencer model LDC-B 500-1200 as the fitted supplementary silencer, alternative silencer model LDC-B 400-1200 has slightly higher noise reduction performance.*

The overall calculated noise level from the as proposed kitchen extract fan system plus with the supplementary additional silencer fitted, to outside the nearest residential windows compared with the noise limit criterion is summarised in Table 4.

The assessment again cautiously includes a +2dBA correction (penalty) as per the guidance of BS4142:2014, added to the overall calculated system noise levels to account that residual noise from the system could potentially have a just perceptible tonal characteristic (although considered unlikely in practice).

Assessment Position	Kitchen Extract Fan System Operating Condition & Times	System Overall Noise Rating Level	Criterion: Noise Rating Level Limit	Comment
Position A: To outside physically nearest windows of residential flats at first floor above the site itself	Operating at full (100%) duty during opening hours (in range 11am to 11pm)	27dBA	≤ 29dBA	Complies
Position B: To outside nearest windows of residential flats with direct line of sight and on-axis directivity to extract aperture	Operating at full (100%) duty during opening hours (in range 11am to 11pm)	21dBA	≤ 29dBA	Complies

Table 4: System noise Rating Levels (with supplementary silencer) to nearest residential windows

Table 4 confirms that noise from the as proposed kitchen extract fan system with the developer’s specified silencer plus with the supplementary (additional) silencer fitted complies with the noise limit criterion.

5. VIBRATION FROM KITCHEN EXTRACT FAN SYSTEM

Position of the kitchen extract fan unit internally within the building is structurally linked, albeit indirectly (due to location within the rear store area), to residential flats over upper floor levels. Therefore it is possible that extract fan vibration could transmit into these properties.

It is therefore recommended the kitchen extract fan system be installed using suitable proprietary high performance vibration isolators as good practice and to mitigate potential vibration transfer to the residential flats. Specification details for suitable vibration isolators are provided in Section 6.2 of the report.

6. SPECIFICATIONS FOR NOISE & VIBRATION TREATMENTS

Whilst this report is based on the specific proposed make and model of kitchen extract fan as detailed in Section 4.1, if during installation or as part of routine equipment maintenance / replacement, an alternative make and model of extract fan is selected then it is important that noise levels for the alternative fan be checked by Philip Acoustics or another acoustic consultant to ensure the treatments specified below remain valid and noise emissions remain compliant with the Council's noise limit criterion.

6.1 Noise

Specification details for the developer's specified silencer and also the supplementary (additional) silencer are provided in Sections 6.1.1 and 6.1.2 respectively. Locations for the silencers are indicated on an annotated copy of the development proposed layout drawing in Appendix G. Copies of the supplier's data sheets for the silencers are also provided in Appendix G.

The normal build-up of deposits inside kitchen extract ductwork can degrade the performance of silencers over time. It is important therefore to clean the inside of the kitchen extract fan silencers at regular intervals. This cleaning should be at least every 6 to 12 months depending up on the level of deposit build up and would normally take place during routine kitchen extract ductwork cleaning (usually an insurance requirement and done at same time as cleaning of the fan itself). Cleaning is typically undertaken by scraping any heavy deposits from the inside of silencers using a non-sharp wooden or plastic implement and then cleaning off the remainder light deposits with mild detergent and a soft brush such that the cleaning process does not damage the internal lining of the silencers.

6.1.1 Developer Specified Silencer

The developer specified silencer is a Systemair MUB 062 SIL Multibox silencer 1200mm long, "matched" specifically for use with the proposed kitchen extract fan Systemair Multibox fan unit model MUB 062 560.

The silencer is a conventional square cross section splitter "baffle" type, noise reduction performance for the silencer is confirmed in Table 5:

Description	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Systemair MUB 062 SIL Multibox silencer 1200mm long								
Silencer Insertion Loss (dB)	9	12	20	30	36	32	25	18

Table 5: Specification details for Systemair MUB 062 SIL Multibox silencer 1200mm long

6.1.2 Supplementary (Additional) Silencer Specification

The recommended supplementary (additional) silencer is a circular Systemair silencer type LDC-B 400-1200 (400mm diameter ductwork connection) or a LDC-B 500-1200 (500mm diameter ductwork connection).

Both of these alternative silencers are 1200mm long conventional baffle (padded) circular type, suitable for fitment directly into associated circular type ductwork with an appropriate transition piece to suit the nominal 450mm diameter extract ductwork.

Noise reduction performance for both of these alternative silencers is confirmed in Table 6:

Description	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Systemair silencer type LDC-B 400-1200								
Silencer Insertion Loss (dB)	6	10	18	23	31	36	25	19
Systemair silencer type LDC-B 500-1200								
Silencer Insertion Loss (dB)	4	8	13	18	24	28	17	16

Table 6: Specification details for circular Systemair silencers type LDC-B 400-1200 & LDC-B 500-1200

6.2 Vibration

As detailed in Section 5, it is recommended the proposed kitchen extract fan system be installed using suitable proprietary high performance vibration isolators.

It is recommended that the kitchen extract fan unit itself be installed using high performance spring type vibration isolator hangers (or mounts) having a nominal static deflection minimum 12mm under the installed total weight of the fan unit and incorporating rubber or neoprene noise stop pads. A “set” of four isolators are normally required, one for each corner of the extract fan unit. The vibration isolator hangers (or mounts) should only take weight/load of the extract fan unit.

Suitable spring type vibration isolator hangers (or mounts) as per the specification details above are readily available from many acoustic hardware and ventilation system / ductwork accessory suppliers.

Alternatively, and as listed within the ventilation system accessories section of the Systemair online products catalogue, Systemair spring hanger (tension load spring damper) type ZSD_ AXC spring d set (*model selected to suit weight of the extract fan*) would be typically suitable.

Ductwork etc. attached to either side the fan unit is to be via flexible connections. To be effective the flexible connections need to be “loose” (not taught) when installed, standard size flexible connections are available from most duct suppliers.

In addition, it is advised that ductwork etc. to either side of the extract fan unit be mounted using proprietary rubber or neoprene type hangers/mountings as good practice and to mitigate any residual transmitted vibration via these attached system elements.

A P P E N D I X A

Noise Survey Instrumentation

Site: 10 Rails Lane, Hayling Island, Hampshire PO11 9LL

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NOISE SURVEY INSTRUMENTATION

Background Noise Survey 22 May 2018:

- Primary Position: Bruel & Kjaer sound level meter type 2238-E-F Class 1 serial number 2246376, Bruel & Kjaer preamplifier type ZC0030 and Bruel & Kjaer microphone type 4188 serial number 2231306, with Bruel & Kjaer outdoor microphone windshield kit type UA1404 including extension cable type AO0560 and telescopic boom/tripod arrangement;
- Sample Secondary Positions: Bruel & Kjaer sound level meter type 2260 Class 1 serial number 2497368, Bruel & Kjaer preamplifier type ZC0026 and Bruel & Kjaer microphone type 4189 serial number 2846933, with Bruel & Kjaer standard 100mm windshield and tripod;
- Bruel & Kjaer calibrator type 4231 serial number 2454786 (UKAS certified).
- Speedtech Instruments Skymaster model SM-28 serial number 19370 (for weather conditions data).

APPENDIX B

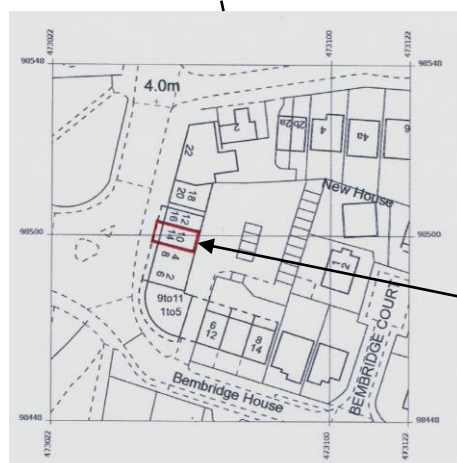
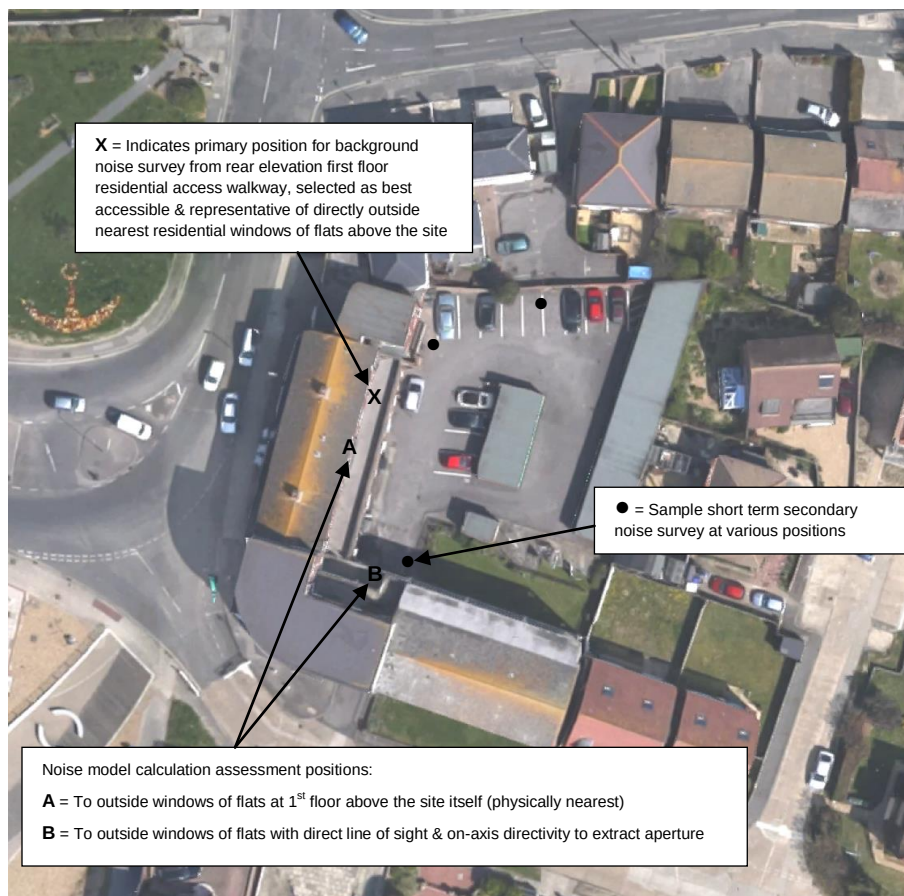
Site Location Aerial Image & Proposed Layout Drawing

Site: 10 Rails Lane, Hayling Island, Hampshire PO11 9LL

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SITE LOCATION AERIAL IMAGE



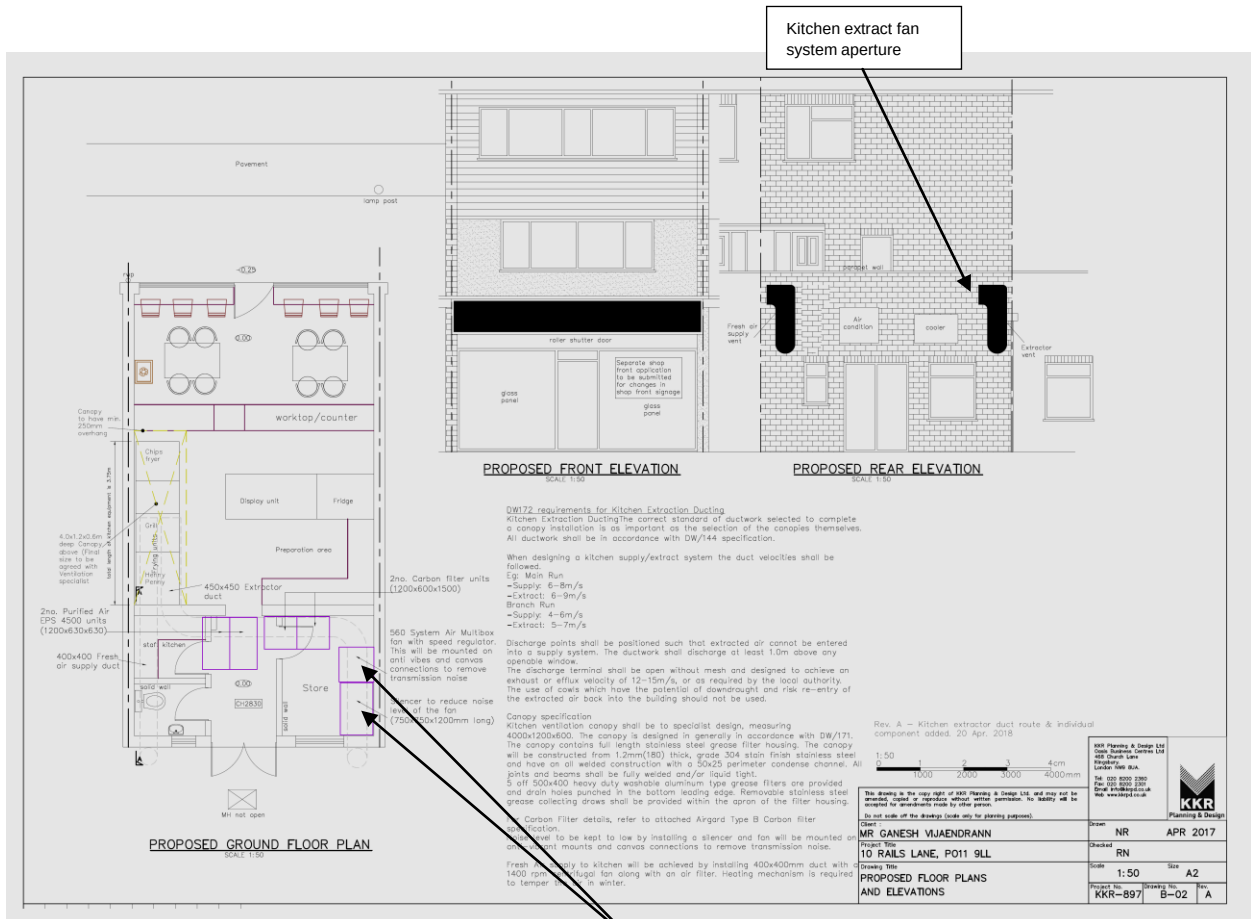
Indicates site location at 10 Rails Lane
(ground floor level)

Site: 10 Rails Lane, Hayling Island, Hampshire PO11 9LL

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PROPOSED LAYOUT DRAWING



Kitchen extract fan unit located internally within rear store area (plus with developer specified silencer) prior to extract duct penetration externally out through the rear elevation wall to high level aperture (below parapet level)

A P P E N D I X C

Background Noise Survey Results

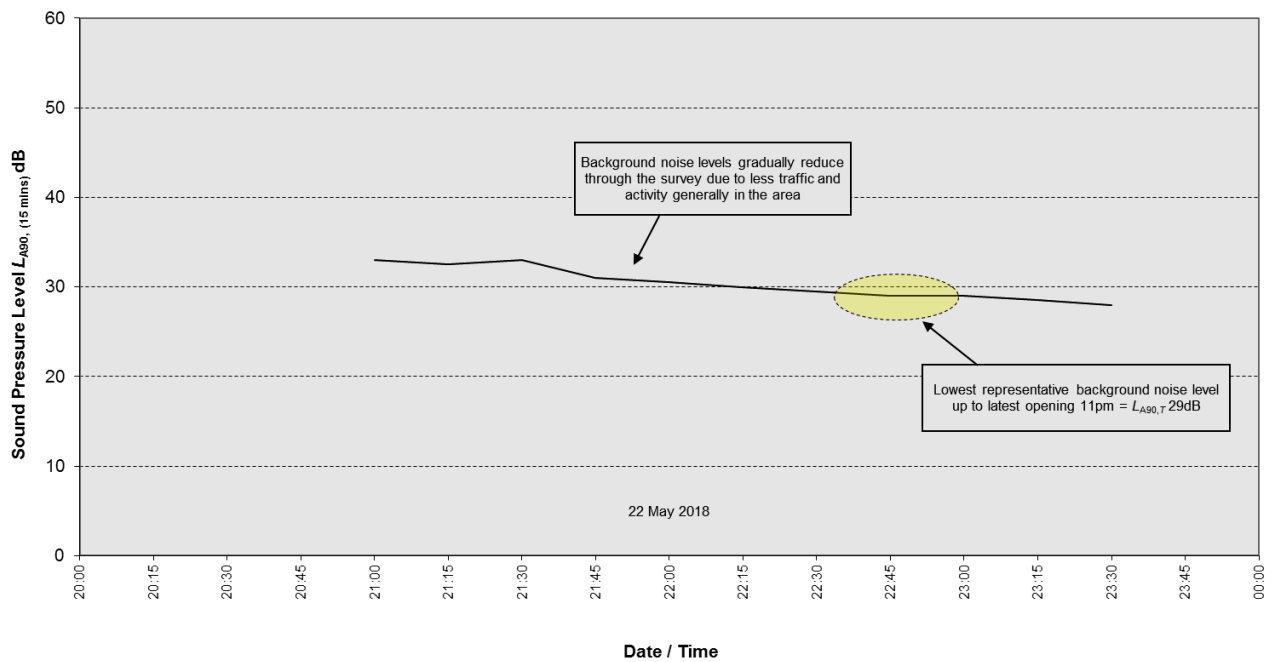
Site: 10 Rails Lane, Hayling Island, Hampshire PO11 9LL

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BACKGROUND NOISE SURVEY RESULTS

Raw Data Background Noise Survey Results At Primary Position Outside 1st Floor Flats To Rear Of 10 Rails Lane



A P P E N D I X D

Manufacturer's Noise Data For Kitchen Extract Fan

Site: 10 Rails Lane, Hayling Island, Hampshire PO11 9LL

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Date: June 2017

MANUFACTURER'S NOISE DATA FOR KITCHEN EXTRACT FAN

Systemair Multibox Fan Unit Model MUB 062 560



MUB 062 560D4-A2 IE2

Item no. 33543

Version: 4-pol; 50 Hz; 90° airflow




Description

- High efficient motor IE2
- Speed-controllable via frequency converter
- Integral cold conductor (PTC)
- Low sound level
- Flexible airflow direction due to removable panels
- Installation in any mounting position
- Easy to maintain and reliable




The MUB fans size 560D4-A2 are equipped with high efficient IE2 motors. The MUB fans have an impeller with backward curved blades, manufactured from aluminum. Speed control is only possible by using a frequency converter. Motor protection is done by cold conductors (PTC), which have to be connected to an external motor protection device. The casing consists of an aluminum frame with fiberglass reinforced plastic corners of PA6; highly shock-resistant. The double skin panels are manufactured from galvanized steel with 20 mm mineral wool insulation. To avoid condensation the profile is provided with a separate chamber to fix screws. The Multibox fans are delivered for straight through airflow but can easily be rebuilt due to removable panels. This allows flexible ventilation solutions. The MUB can also be used as extract- or supply air unit in air handling units. Installation in any mounting position is possible.

MUB with additional modules (filters, heaters etc.) are available as air handling units "K025, K042 or K062" on request!

Please note: Speed control by voltage, i.e. voltage transformers, is not possible!

In accordance with Commission Regulation (EC) no 640/2009 of the European Parliament - eco-design requirements for electric motors - the new international efficiency classes are binding as of 16 June 2011. These guidelines defined by CEMEP and EPACT are regarded as international standard for energy-saving high-efficiency motors for frequencies of 50 or 60 Hz and make the use of IE2 motors mandatory.

With this new and more efficient technology we offer our customers many advantages such as environmentally friendly operation, reduced energy consumption and hence lower emissions. IE2 motors have a higher efficiency even in part load operation and allow optimum adjustment to the operating point. In addition, the IE2 motors generate less noise and develop less heat, which has a positive influence on the efficiency and the cooling requirement of the motor. Please note: IE2 motors cannot be speed controlled by voltage, i.e. voltage transformers.

Document type: Product card
Document date: 2017-07-11
Generated by: Systemair Online Catalogue

Acoustics

Mid-frequency band, Hz

560D4	Hz	Tot	63	125	250	500	1k	2k	4k	8k
LwA Inlet	dB(A)	78	65	67	71	73	72	69	64	57
LwA Outlet	dB(A)	80	67	69	73	75	74	71	66	59
LwA Surrounding	dB(A)	63	50	52	56	58	57	54	49	42

Measuring point: qv = 1,79 m³/s, Ps = 717 Pa

APPENDIX E

Noise Model Calculation For Kitchen Extract Fan System As Proposed

Site: 10 Rails Lane, Hayling Island, Hampshire PO11 9LL

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Date: June 2017

NOISE MODEL CALCULATION

ASSESSMENT LOCATION A: Outside physically nearest windows of flats at 1st floor above site itself

NOISE CONDITION: Opening hours; kitchen extract fan system operating full (100%) duty

NOISE MITIGATION: Kitchen extract fan system as proposed including with developer specified silencer Systemair MUB 062 SIL Multibox silencer 1200mm long (see Section 6.1 of Report 18114-002)

Plant / Equipment & Description	Overall dBA	Lin dB at Octave Band Centre Frequency Hz							
		63	125	250	500	1k	2k	4k	8k
KITCHEN EXTRACT FAN SYSTEM Aperture: Helios Fan Model GBDEC 500	80	93	85	82	78	74	70	65	60
Sound power level L_w dB; induct L_w		0	0	0	-1	-2	-3	-3	-3
Duct Loss Bends; 1 x 450mm $\varnothing$ bend		0	0	0	0	0	0	0	0
Duct Loss Length; $\approx$ 1m x 450mm $\varnothing$ plain circular ductwork		-11	-6	-2	0	0	0	0	0
Duct Loss Aperture End Reflection; 450mm $\varnothing$ ductwork aperture		-9	-12	-20	-30	-36	-32	-25	-18
Attenuation; Systemair MUB 062 SIL Multibox silencer 1200mm long to system		0	0	0	0	0	0	0	0
Supplementary Attenuation; none applied		-18	-18	-18	-18	-18	-18	-18	-18
Distance; $\approx$ 3m from aperture to residential windows (hemispherical propagation)		-5	-5	-5	-5	-5	-5	-5	-5
Screening; line of sight screening applicable (aperture below parapet), limit to -5dB		-1	-2	-3	-4	-8	-10	-10	-10
Directivity: $\approx$ 90° aperture directivity applicable, limit to -10dB		3	3	3	3	3	3	3	3
Reflections; +3dB correction applied for aperture at high level to rear elevation wall		33	52	45	37	23	8	5	7
Individual contribution at assessment location									
Cumulative contribution at assessment position	33	52	45	37	23	8	5	7	9

The overall sound pressure level at the assessment position is 33dBA.

A +2dBA penalty (correction) as per the assessment provisions of BS4142:2014 is cautiously added to the calculated sound pressure level to give a kitchen extract fan system noise Rating Level of 35dBA, to account that residual noise from the system could potentially have a just perceptible tonal characteristic at the assessment position (although considered unlikely in practice).

Site: 10 Rails Lane, Hayling Island, Hampshire PO11 9LL

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Date: June 2017

NOISE MODEL CALCULATION

ASSESSMENT LOCATION B: Outside nearest windows of flats with direct line of sight & on-axis to extract aperture

NOISE CONDITION: Opening hours; kitchen extract fan system operating full (100%) duty

NOISE MITIGATION: Kitchen extract fan system as proposed including with developer specified silencer Systemair MUB 062 SIL Multibox silencer 1200mm long (see Section 6.1 of Report 18114-002)

Plant / Equipment & Description	Overall dBA	Lin dB at Octave Band Centre Frequency Hz							
		63	125	250	500	1k	2k	4k	8k
KITCHEN EXTRACT FAN SYSTEM Aperture: Helios Fan Model GBDEC 500	80	93	85	82	78	74	70	65	60
Sound power level L_w dB; induct L_w		0	0	0	-1	-2	-3	-3	-3
Duct Loss Bends; 1 x 450mm $\varnothing$ bend		0	0	0	0	0	0	0	0
Duct Loss Length; $\approx$ 1m x 450mm $\varnothing$ plain circular ductwork		-11	-6	-2	0	0	0	0	0
Duct Loss Aperture End Reflection; 450mm $\varnothing$ ductwork aperture		-9	-12	-20	-30	-36	-32	-25	-18
Attenuation; Systemair MUB 062 SIL Multibox silencer 1200mm long to system		0	0	0	0	0	0	0	0
Supplementary Attenuation; none applied		-31	-31	-31	-31	-31	-31	-31	-31
Distance; $\approx$ 14m from aperture to residential windows (hemispherical propagation)		0	0	0	0	0	0	0	0
Screening; nil line of sight screening correction applicable		0	0	0	0	0	0	0	0
Directivity; nil aperture directivity applicable, on-axis to windows		3	3	3	3	3	3	3	3
Reflections; +3dB correction applied for aperture at high level to rear elevation wall	27	45	39	32	19	8	7	9	11
Individual contribution at assessment location									
Cumulative contribution at assessment position	27	45	39	32	19	8	7	9	11

The overall sound pressure level at the assessment position is 27dBA.

A +2dBA penalty (correction) as per the assessment provisions of BS4142:2014 is cautiously added to the calculated sound pressure level to give a kitchen extract fan system noise Rating Level of 27dBA, to account that residual noise from the system could potentially have a just perceptible tonal characteristic at the assessment position (although considered unlikely in practice).

APPENDIX F

Noise Model Calculation For Kitchen Extract Fan System With Supplementary Silencer

Site: 10 Rails Lane, Hayling Island, Hampshire PO11 9LL

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Date: June 2017

NOISE MODEL CALCULATION

ASSESSMENT LOCATION A: Outside physically nearest windows of flats at 1st floor above site itself

NOISE CONDITION: Opening hours; kitchen extract fan system operating full (100%) duty

NOISE MITIGATION: Kitchen extract fan system as proposed including with developer specified silencer Systemair MUB 062 SIL Multibox silencer 1200mm long, plus also with a supplementary (additional) circular Systemair silencer fitted type LDC-B 400-1200 or LDC-B 500-1200 (see Section 6.1 of Report 18114-002)

Plant / Equipment & Description	Overall dBA	Lin dB at Octave Band Centre Frequency Hz							
		63	125	250	500	1k	2k	4k	8k
KITCHEN EXTRACT FAN SYSTEM Aperture: Helios Fan Model GBDEC 500									
Sound power level L _w dB; induct L _w	80	93	85	82	78	74	70	65	60
Duct Loss Bends; 1 x 450mm Ø bend		0	0	0	-1	-2	-3	-3	-3
Duct Loss Length; ≈ 1m x 450mm Ø plain circular ductwork		0	0	0	0	0	0	0	0
Duct Loss Aperture End Reflection; 450mm Ø ductwork aperture		-11	-6	-2	0	0	0	0	0
Attenuation; Systemair MUB 062 SIL Multibox silencer 1200mm long to system		-9	-12	-20	-30	-36	-32	-25	-18
Supplementary Attenuation; Systemair silencer type LDC-B 500-1200		-4	-8	-13	-18	-24	-28	-17	-16
Distance; ≈ 3m from aperture to residential windows (hemispherical propagation)		-18	-18	-18	-18	-18	-18	-18	-18
Screening; line of sight screening applicable (aperture below parapet), limit to -5dB		-5	-5	-5	-5	-5	-5	-5	-5
Directivity: ≈ 90° aperture directivity applicable, limit to -10dB		-1	-2	-3	-4	-8	-10	-10	-10
Reflections; +3dB correction applied for aperture at high level to rear elevation wall		3	3	3	3	3	3	3	3
Individual contribution at assessment location	25	48	37	24	5	-16	-23	-10	-7
Cumulative contribution at assessment position	25	48	37	24	5	-16	-23	-10	-7

The overall sound pressure level at the assessment position is 25dBA.

A +2dBA penalty (correction) as per the assessment provisions of BS4142:2014 is cautiously added to the calculated sound pressure level to give a kitchen extract fan system noise Rating Level of 27dBA, to account that residual noise from the system could potentially have a just perceptible tonal characteristic at the assessment position (although considered unlikely in practice).

Site: 10 Rails Lane, Hayling Island, Hampshire PO11 9LL

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Date: June 2017

NOISE MODEL CALCULATION

ASSESSMENT LOCATION B: Outside nearest windows of flats with direct line of sight & on-axis to extract aperture

NOISE CONDITION: Opening hours; kitchen extract fan system operating full (100%) duty

NOISE MITIGATION: Kitchen extract fan system as proposed including with developer specified silencer Systemair MUB 062 SIL Multibox silencer 1200mm long, plus also with a supplementary (additional) circular Systemair silencer fitted type LDC-B 400-1200 or LDC-B 500-1200 (see Section 6.1 of Report 18114-002)

Plant / Equipment & Description	Overall dBA	Lin dB at Octave Band Centre Frequency Hz							
		63	125	250	500	1k	2k	4k	8k
KITCHEN EXTRACT FAN SYSTEM Aperture: Helios Fan Model GBDEC 500									
Sound power level Lw dB; induct Lw	80	93	85	82	78	74	70	65	60
Duct Loss Bends; 1 x 450mm Ø bend		0	0	0	-1	-2	-3	-3	-3
Duct Loss Length; ≈ 1m x 450mm Ø plain circular ductwork		0	0	0	0	0	0	0	0
Duct Loss Aperture End Reflection; 450mm Ø ductwork aperture		-11	-6	-2	0	0	0	0	0
Attenuation; Systemair MUB 062 SIL Multibox silencer 1200mm long to system		-9	-12	-20	-30	-36	-32	-25	-18
Supplementary Attenuation; Systemair silencer type LDC-B 500-1200		-4	-8	-13	-18	-24	-28	-17	-16
Distance; ≈ 14m from aperture to residential windows (hemispherical propagation)		-31	-31	-31	-31	-31	-31	-31	-31
Screening; nil line of sight screening correction applicable		0	0	0	0	0	0	0	0
Directivity: nil aperture directivity applicable, on-axis to windows		0	0	0	0	0	0	0	0
Reflections; +3dB correction applied for aperture at high level to rear elevation wall		3	3	3	3	3	3	3	3
Individual contribution at assessment location	19	41	31	19	1	-16	-21	-8	-5
Cumulative contribution at assessment position	19	41	31	19	1	-16	-21	-8	-5

The overall sound pressure level at the assessment position is 19dBA.

A +2dBA penalty (correction) as per the assessment provisions of BS4142:2014 is cautiously added to the calculated sound pressure level to give a kitchen extract fan system noise Rating Level of 21dBA, to account that residual noise from the system could potentially have a just perceptible tonal characteristic at the assessment position (although considered unlikely in practice).

A P P E N D I X G

Details For Noise Reduction Treatment (Silencers)

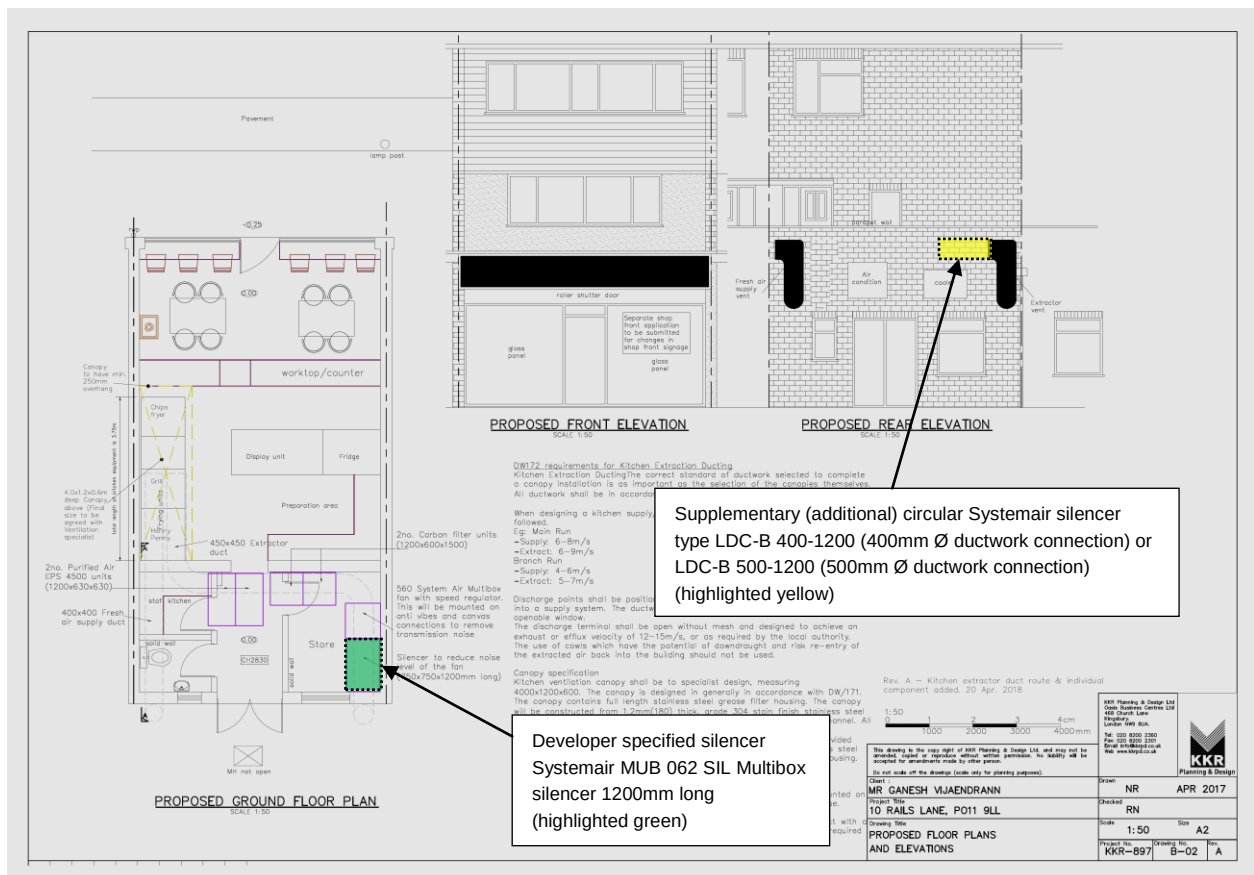
Site: 10 Rails Lane, Hayling Island, Hampshire PO11 9LL

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Date: June 2017

DETAILS FOR NOISE REDUCTION TREATMENTS (SILENCERS)

Annotated Layout Drawing Indicating Location Of Silencers



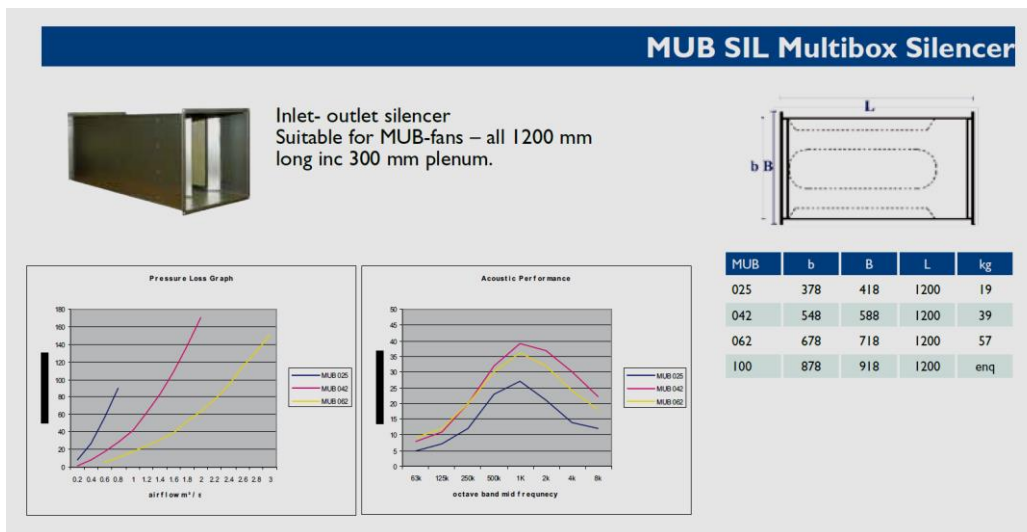
Site: 10 Rails Lane, Hayling Island, Hampshire PO11 9LL

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Date: June 2017

DETAILS FOR NOISE REDUCTION TREATMENTS (SILENCERS)

Data Sheet For Developer Specified Silencer Systemair MUB 062 SIL Multibox Silencer 1200mm long



Data Sheet For Supplementary (additional) Circular Systemair Silencer LDC-B 400-1200 or LDC-B 500-1200

