

Consultants in Noise & Vibration
Building Regulations Certification Sound Insulation Testing

REPORT TITLE: NOISE ASSESSMENT FOR MECHANICAL SERVICES PLANT TO SERVE A
PROPOSED CHANGE OF USE TO HOT FOOD TAKEAWAY AT 6 WEST STREET,
LONG SUTTON, SPALDING, LINCOLNSHIRE PE12 9BN

REPORT REF: 21129-002

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SUMMARY

- This report provides a noise assessment for mechanical services plant to serve a proposed change of use to hot food takeaway at 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN.
- The plant (equipment) includes a supply air system fan and oven extract system fan plus external air conditioning and cold room condenser units.
- The noise assessment is conducted with reference to British Standard BS4142:2014, as per the guidance for noise assessments of South Holland District Council Local List document – *A Guide to the Validation of Planning Applications 2019*.
- Full title of the current edition of this standard is BS4142:2014+A1:2019 “*Methods for rating and assessing industrial and commercial sound*”. Reference throughout this report to BS4142:2014 relates to this current edition document. Note that as an aid to clarity, and for consistency with South Holland District Council’s Local Plan plus Local List document, this report retains use of the well-established term “*noise*” as opposed to the replacement term “*sound*” of BS4142:2014.
- In accordance with the noise assessment procedures of BS4142:2014 a survey has been carried out externally to the rear of the site, to establish pre-existing background noise levels during the range of operational times of the plant, as representative of at neighbouring noise sensitive (residential) properties.
- Based on results of the noise survey and acoustic calculations using plant manufacturer’s data, noise from the plant (with the specified noise reduction treatment fitted) is calculated to comply with noise limits set with reference to British Standard BS4142:2014.
- The noise reduction treatments comprise high performance atmosphere side duct silencers (attenuators) to the supply air system fan and oven extract system fan. Full specification details for the noise reduction treatments are provided in Section 6.1 of the report.
- The report also considers vibration from the proposed plant. Location of the plant is not directly or otherwise structurally linked to any neighbouring buildings, therefore there will be no plant vibration transfer to noise sensitive (residential) properties. Notwithstanding this, it is recommended the plant be installed using proprietary vibration isolators, as good practice and to minimise any vibration from the plant to the development itself. Outline specification details for suitable vibration isolators are provided in Section 6.2 of the report.

1. INTRODUCTION

New mechanical services plant (equipment) is to be installed to serve a proposed change of use to hot food takeaway at former TSB bank branch 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN. The plant includes a supply air (fresh air) system fan, oven extract system fan plus external air conditioning and cold room condenser units.

Philip Acoustics has been commissioned to assess noise from the proposed new mechanical services plant. The assessment is to determine specifications for noise reduction treatment and vibration isolation measures to the plant to protect the amenity of neighbouring occupiers and comply with the requirements of the Local Planning Authority (South Holland District Council).

This report presents results of the noise assessment and includes:

- Noise assessment methodology & criteria (*with reference to South Holland District Council noise policy / guidance and British Standard BS4142:2014*);
- Measurement survey of pre-existing background noise levels;
- Details of proposed plant including noise data & positions;
- Calculation & assessment of plant noise levels;
- Consideration of vibration from the plant;
- Specification as necessary for noise reduction treatments & vibration control measures.

2. NOISE ASSESSMENT METHODOLOGY & CRITERION (BS4142:2014)

South Holland District Council planning policy is with reference to South East Lincolnshire Local Plan 2011-2036 adopted March 2019.

Item 5 of Policy 30: *Pollution* from Chapter 7.4: *Pollution* of the South East Lincolnshire Local Plan relates to noise and vibration associated with development proposals. The section of Policy 30 including item 5 noise and vibration is reproduced below:

Policy 30: Pollution

Development proposals will not be permitted where, taking account of any proposed mitigation measures, they would lead to unacceptable adverse impacts upon:

1. health and safety of the public;
2. the amenities of the area; or
3. the natural, historic and built environment;

by way of:

4. air quality, including fumes and odour;
5. noise including vibration;
6. light levels;
7. land quality and condition; or
8. surface and groundwater quality.

Supporting paragraphs (reasoned justification) to Policy 30 include reference to noise and the requirement for noise assessments associated with development proposals.

South Holland District Council Local List document – *A Guide to the Validation of Planning Applications 2019* identifies information the Council normally requires to validate and determine a planning application. This includes the requirement for a noise impact assessment associated with certain types of application, including the introduction of new fixed plant to a commercial site.

The Local List document (noise assessment section) refers to various documents and British Standards as sources of further guidance, including British Standard BS4142:2014 as being relevant / applicable for the assessment of noise from new plant.

Full title of the current edition of the standard is BS4142:2014+A1:2019 “*Methods for rating and assessing industrial and commercial sound*”. Unless stated otherwise, reference throughout this report to BS4142:2014 relates to this current edition standard

As an aid to clarity, and as consistent with wording of South Holland District Council’s Local Plan plus Local List document, this report retains use of the well-established term “*noise*” as opposed to the replacement term “*sound*” of BS4142:2014.

BS4142:2014 provides a well-established methodology to assess the likely effect (impact) to people regarding noise of an “*industrial*” nature from commercial or other developments. Consequently, in requesting noise assessments for mechanical services plant, including equipment such as extraction/ventilation systems and condenser units serving such as hot food takeaways or similar, many Local Planning Authorities refer to BS4142:2014.

In this scenario of new mechanical services plant, the BS4142:2014 assessment method requires that source noise data for the plant is established, and pre-existing background noise levels be measured. The assessment is then carried out by comparing the overall plant noise Rating Level with background noise levels, at assessment positions (normally to outside nearest residential properties or similar).

The (plant noise) Rating Level in this scenario is the Specific Noise Level of the plant plus with any corrections applied to account for subjective characteristics of the noise that might mean it is more noticeable and potentially have more impact.

The BS4142:2014 assessment method then provides guidance on the likely noise impact (effect) to people depending on the magnitude of the excess of the (plant noise) Rating Level over the pre-existing 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 any specific guidance on suitable noise limits / criteria or standards including for proposed new plant / equipment, only guidance on how to determine the likelihood of adverse impact.

In terms of likelihood of adverse (noise) impact, BS4142:2014 advises the following dependent upon context:

- i) **Where the (plant noise) Rating Level is around +10dB or more above the background, this is likely to be an indication of significant adverse impact;**
- ii) **Where the (plant noise) Rating Level is around +5dB above the background then this is likely to be an indication of adverse impact;**
- iii) **Where the (plant noise) Rating Level does not exceed the background then this is an indication of low impact.**

It is important to note 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 pre-existing background is the lowest / least likely noise impact categorisation of BS4142:2014.

Different Local Planning Authorities interpret and apply the guidance of BS4142:2014 differently, some require the noise Rating Level of proposed new plant / equipment be not higher than +5dB above the pre-existing background level, majority require not higher than the background and some require a certain amount below the background. Some do not have a set requirement and consider each situation individually.

It is the author's experience that most Local Authorities for this context of new plant to serve an existing, albeit proposed change of use commercial premises, apply the guidance of BS4142 with a requirement that the noise Rating Level of plant be not higher than the pre-existing background noise; applicable to positions outside windows of nearest noise sensitive (residential) properties and applicable to the representative lowest pre-existing background noise.

Based on the above and with consideration of context that the proposed plant is to serve an existing, albeit changed use commercial property, it is appropriate to apply the guidance of BS4142:2014 with the common requirement that the noise Rating Level of proposed plant shall not exceed existing background noise levels.

It is the author's experience of undertaking many noise surveys and assessments of noise from ventilation fans and condenser units in similar scenarios and contexts to that as at 6 West Street, Long Sutton that at this level, noise from the plant would not be of adverse impact on, or otherwise detrimentally affect, the amenity of neighbouring noise sensitive (residential) properties.

Additional clarification points in respect to the noise assessment and criterion are provided below:

a) **Plant Operating Conditions**

The assessment and noise criterion is cautiously/robustly applied to all proposed plant items operating cumulatively at full (100%) duty and during times as relevant; all plant operating during opening times of the premises, and with the cold room condenser unit operable over 24 hours.

b) **Rating Noise Level**

The noise criterion is applied in terms of a noise Rating Level (L_{Ar,T_r} dB) and thus with any corrections (such as for tonal character noise) applied as necessary to the plant noise at the assessment position as per the BS4142:2014 assessment methodology.

c) **Assessment Position**

As per normal noise assessment procedures / convention (plus with reference to BS4142:2014), the plant noise criterion is applied to an assessment position directly outside windows of nearest noise sensitive (residential) properties; see Section 3.2 of the report.

d) **Background Noise Level**

The noise criterion is applied to the measured representative minimum pre-existing background noise level $L_{A90,T}$ dB as representative of at the assessment position for times of operation of the plant.

e) **Very Low Background Noise Levels**

In accordance with the guidance of BS4142:2014; for scenarios of very low background noise it is generally unreasonable / unnecessary to apply a plant noise limit relative to the background level, in terms of ensuring amenity protection such that noise from plant / equipment does not cause disturbance or is otherwise of adverse impact.

This simply due to that there is a lower threshold level at which plant noise would become inaudible / not noticeable to occupants within nearby residential properties and thus it being unreasonable and unnecessary to further reduce the plant noise below that level.

BS4142:2014 advises "Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

Where background levels are very low it is instead appropriate to apply a minimum (lower level) threshold cap plant Rating Level limit of L_{Ar,T_r} 30dB at assessment positions. BS4142:1997 advised that noise Rating Levels of below 35dB be considered very low. Thus a minimum threshold cap plant noise limit (Rating Level) set at L_{Ar,T_r} 30dB is significantly below (i.e. as 5dB betterment) to this guidance and for scenarios of very low background noise levels (i.e. regardless of the low background noise) will maintain surety of protection for the occupants of nearby residential properties from loss of amenity due to noise disturbance.

3. BACKGROUND NOISE SURVEY

To assess noise from the proposed new plant as per the BS4142:2014 methodology and criterion it is necessary to establish pre-existing background noise levels during the range of operational times for the plant. Details of the background noise survey are provided below.

3.1 Survey Instrumentation

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

3.2 Survey Details & Procedure

The supply air system, oven extract system and air conditioning condenser unit will operate as required during opening times of the premises (proposed 11am to 11pm). The cold room condenser unit is required to be operable over a 24-hour period.

An attended noise survey was carried out for the period approximately 9:30pm to 5am of Monday 18 October 2021 through Tuesday 19 October 2021 so as to include sample late evening and night periods as “worse-case” when representative minimum (lowest) levels of background noise will occur for various operational times of the plant.

Weather conditions were monitored and were suitable for the background noise survey, i.e. not affecting or otherwise influencing the survey measurements. Weather conditions were dry (nil precipitation) and with calm / light wind (wind speed circa 0 to 1m/s recorded).

Location of the site, plant and noise sensitive properties is indicated on a site location aerial image, site block plan and proposed layout plan / elevations drawings in Appendix B. Nearest noise sensitive (residential) properties are:

- Terrace houses adjacent (not attached) at 8 to 12 West Street, 8 West Street is nearest of these to the site;
- First floor flat above ground floor commercial premises S&D Bookmakers adjacent (not attached) at 4 West Street;
- Flats within Spurgeon House to the opposite side of West Street.

The background noise survey position was externally to the rear of the site conducted in accordance with the procedural guidance of BS4142:2014 (in free-field conditions with the microphone set at 1.5m above ground level) and selected as being best practicably accessible / representative of outside the rear elevations of adjacent neighbouring residential properties nearest to the plant. The noise survey position is indicated on the site block plan in Appendix B.

Measurements of background noise were recorded continually in terms of consecutive 15-minute samples of overall $L_{A90,T}$ dB values ($T=15$ minutes) through the survey duration.

3.3 Survey Results, Observations & Plant Noise Limit

Existing late evening and night period background levels are very low and principally due to local / distant road traffic through Long Sutton and in the general area around Long Sutton, including distant traffic on the A17 circa 900m west and south of the site.

There is also some faintly / barely noticeable noise from distant unidentified mechanical services plant / equipment operating through the late evening and night, expected to be serving commercial and retail premises in the area.

Background noise reduces gradually through the late evening and is lowest during the middle of the night before then gradually starting to rise after about 4am. This noise level profile is normal for this type of location where there is a significant reduction in local and distant traffic during the late evening and night.

Complete raw data results of the background noise survey are provided in Appendix C.

Summary of measured representative minimum background noise levels and the associated plant noise limit requirements are shown in Table 1.

The background noise levels and noise limits are split into opening hours values (range 11am to 11pm) and night period values such that all plant as operating during opening hours is assessed using representative minimum background noise during that time range (i.e. late evening up to 11pm), whilst the cold room condenser unit operable over 24-hours is assessed using the typical representative minimum background noise during the middle of the night.

Description	Plant Operating Times	Representative Minimum Background Noise Level $L_{A90, 15 \text{ min}}$	Plant Noise Limit (Rating Level)
Assessment to outside noise sensitive properties	All Plant: Operating during opening hours (range 11am to 11pm)	33dB	$L_{A,T} \leq 33\text{dB}$
	Cold Room Condenser Unit: Operable over 24 hours (including during the night)	26dB (occurs circa 1am to 4am)	$L_{A,T} \leq 30\text{dB}$ (minimum threshold cap 30dB applicable)

Table 1: Measured representative minimum background noise & associated plant noise limits

4. NOISE FROM MECHANICAL SERVICES PLANT

The proposed new mechanical services plant consists of the following items and is indicated on the layout drawings in Appendix B:

- **Supply Air System Fan:** S&P CBM/6-320/240-550W low pressure type centrifugal fan, located internally within the building with fresh air intake via ducting (with silencer – see Section 6.1 of the report) from an inlet cowl aperture to the main flat roof area of the building;
- **Oven Extract System Fan:** S&P TCBTx2/4-450 Contra-Foil type cased axial fan, located internally within the building with exhaust to atmosphere via filters and ducting (with silencer – see Section 6.1 of the report) to a high-level discharge aperture above roof eaves level to the rear of the building;
- **Air Conditioning Condenser Unit:** Mitsubishi FDC100VNX, located at ground floor to the rear elevation of the building;
- **Cold Room Condenser Unit:** Tecumseh SILAJ4519Z-FZ, located at ground floor to the rear elevation of the building (adjacent to air conditioning unit).

Copy of available manufacturer's noise data for the proposed plant items is provided in Appendix D.

Summary of noise data for the plant items in terms of equivalent overall dBA and linear dB octave band sound power levels is shown in Table 2. The summary noise data is without any noise reduction treatment applied (i.e. is for un-silenced manufacturer noise data).

Description	Overall dBA	Octave Band Centre Frequency (Hz) Lin dB							
		63	125	250	500	1k	2k	4k	8k
Supply Air System Fan: S&P CBM/6-320/240-550W ⁽¹⁾ (Inlet – induct sound power level)	79	82	81	79	76	74	70	67	63
Oven Extract System Fan: S&P TCBTx2/4-450 ⁽²⁾ (Outlet – induct sound power level)	92	89	91	95	88	87	81	73	68
Air Conditioning Unit: Mitsubishi FDC100VNX ⁽³⁾	58	63	61	59	55	53	46	45	41
Cold Room Unit: Tecumseh SILAJ4519Z-FZ ⁽³⁾	59	61	59	57	55	54	51	47	41
Note ⁽¹⁾: Sound power level overall dBA & linear dB octave band values for supply air system fan S&P CBM/6-320/240-550W based on limited available manufacturer noise data which is in terms of overall sound pressure level 67dBA at 1.5m from the fan inlet side (free field) & example operating curve. Note ⁽²⁾: Manufacturer octave band noise data for oven extract system fan S&P TCBTx2/4-450 is in terms of "A-Weighted" dBA octave band values. The values stated above are equivalent linear dB octave band values (i.e. not "A-Weighted"). Note ⁽³⁾: No manufacturer octave band noise data available for air conditioning & cold room condenser units, linear dB octave band sound power levels for these units are based on octave band sound pressure level measurements undertaken by the author of these & similar make & models of condenser units as installed at other premises.									

Table 2: Summary plant noise data (sound power levels based on manufacturers' noise data)

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To calculate the overall noise contribution from the plant to assessment positions outside nearest noise sensitive residential) properties a spreadsheet noise model calculation has been used.

The model takes account of the accumulation of noise from the worse-case scenario of all plant items operating simultaneously, distance between the plant locations and assessment positions, acoustic directivity, acoustic reflections and any natural / default line of sight acoustic screening.

The calculation model also takes account of the specified noise reduction treatment applied to the plant items (as specified in Section 6.1 of the Report).

Noise model calculation details are provided in Appendix E.

The noise model overall calculated noise Rating Levels from the plant to the assessment positions outside nearest noise sensitive properties compared with the noise limits are shown in Table 3. Noise from the plant to other residential properties in the vicinity that are farther away, and/or more screened from the site and plant locations will be lower.

Description	Plant Operating Times	Plant Overall Noise Level (Rating Level)	Noise Limit (Rating Level)	Comment
<u>Assessment Position A:</u> Nearest house adjacent at 8 West Street	All Plant: Operating during opening hours (range 11am to 11pm)	$L_{A,T,r}$ 32dB	$L_{A,T,r} \leq 33$ dB	Complies
	Cold room condenser unit: Operable over 24 hours (including during the night)	$L_{A,T,r}$ 22dB	$L_{A,T,r} \leq 30$ dB	Complies
<u>Assessment Position B:</u> First floor flat above commercial premises adjacent at 4 West Street	All Plant: Operating during opening hours (range 11am to 11pm)	$L_{A,T,r}$ 32dB	$L_{A,T,r} \leq 33$ dB	Complies
	Cold room condenser unit: Operable over 24 hours (including during the night)	$L_{A,T,r}$ 22dB	$L_{A,T,r} \leq 30$ dB	Complies
<u>Assessment Position C:</u> Flats within Spurgeon House, opposite side of West Street	All Plant: Operating during opening hours (range 11am to 11pm)	$L_{A,T,r}$ 23dB	$L_{A,T,r} \leq 33$ dB	Complies
	Cold room condenser unit: Operable over 24 hours (including during the night)	$L_{A,T,r}$ 10dB	$L_{A,T,r} \leq 30$ dB	Complies

Table 3: Noise from proposed plant to assessment positions

With noise reduction treatment fitted as detailed in Section 6.1, the plant complies with the noise limits.

Although the specified noise reduction treatments will tend to suppress any tonal noise characteristics of the supply air fan system and oven extract fan system, plus noise of the air conditioning and cold room condenser units is nominally broadband in nature, the assessment cautiously includes a +2dBA correction as BS4142:2014, added to the overall calculated plant noise levels – to give the plant noise Rating Levels, to account that residual noise from the plant could potentially have a just perceptible tonal characteristic.

5. VIBRATION FROM MECHANICAL SERVICES PLANT

Location of the plant is not directly or otherwise structurally linked to any neighbouring properties / buildings, therefore there will be no plant vibration transfer to noise sensitive (residential) properties.

Notwithstanding this, it is recommended the plant be installed using proprietary vibration isolators, as good practice and to minimise any vibration from the plant to the development itself.

Outline specification details for suitable vibration isolators are provided in Section 6.2 of the report.

6. SPECIFICATIONS FOR NOISE & VIBRATION TREATMENTS

This report is based on the proposed plant items (make and models) as detailed in Section 4. If during later design stages, during installation or as part of future plant / equipment replacement, an alternative make and model of plant item is selected then it is important that noise levels for the alternative item be checked/ verified by Philip Acoustics or another acoustic consultant to ensure the treatments specified below remain valid and noise emissions remain compliant with the noise limits.

6.1 Noise

To comply with the noise criterion limits it is necessary to specify noise reduction treatment to some of the plant items. Specification details for the treatment is provided in Sections 6.1.1 to 6.1.3 and are as included in the noise model calculation in Appendix E.

Note that Philip Acoustics can only advise on noise and vibration issues and therefore it is recommended that professional advice from others may need to be sought to confirm suitability of treatments with regard to non-acoustic issues such as airflow rates and system pressure drop. Suppliers for the specified silencers would be able to assist with guidance on these aspects.

6.1.1 Supply Air System Fan

A high-performance silencer (attenuator) is required to be fitted within the supply air system fan atmosphere side ductwork, internally within the building nominally as indicated on the annotated layout drawing in Appendix F.

The silencer is required to reduce noise externally to atmosphere from the supply air system fan by at least 21dBA in overall terms, with good low to mid frequency performance. Specification for the silencer is provided in Table 4.

Note: The limits provided in Table 4 for regenerated noise are associated with ventilation issues including airflow rate and pressure drop and are intended to be used by the silencer supplier to aid selection of an appropriately sized (cross sectional area) silencer for the supply air system.

Description	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Supply Air System Fan: S&P CBM/6-320/240-550W low pressure type centrifugal fan								
Silencer Minimum Insertion Loss (dB)	5	11	18	25	25	20	20	20
Regenerated Noise Limits Lw (dB)	≤60	≤60	≤51	≤41	≤40	≤40	≤40	≤40

Table 4: Specification details for Supply Air Fan System atmosphere side silencer

A typically suitable high-performance silencer would be sourced from a specialist acoustic hardware supplier and be of rectangular or square cross-section splitter baffle type, approximately 1m to 1.5m length with transition pieces to connect to the supply air system fan ductwork.

6.1.2 Oven Extract System Fan

As for the supply air system, a high-performance silencer (attenuator) is also required to be fitted within the oven extract system fan atmosphere side ductwork internally within the building, nominally as indicated on the annotated layout drawing in Appendix F.

The silencer is required to reduce noise externally to atmosphere from the oven extract system fan by at least 30dBA in overall terms, with very good low to mid frequency performance. Specification for the silencer is provided in Table 5.

Note: The limits provided in Table 5 for regenerated noise are associated with ventilation issues including airflow rate and pressure drop and are intended to be used by the silencer supplier to aid selection of an appropriately sized (cross sectional area) silencer for the oven extract fan system.

Description	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Oven Extract System Fan: S&P TCBTx2/4-450 Contra-Foil type cased axial fan								
Silencer Minimum Insertion Loss (dB)	8	16	30	35	35	30	20	20
Regenerated Noise Limits Lw (dB)	≤60	≤60	≤55	≤43	≤42	≤41	≤43	≤40

Table 5: Specification details for Oven Extract Fan System atmosphere side silencer

A typically suitable high-performance silencer would be sourced from a specialist acoustic hardware supplier and be of rectangular or square cross-section splitter baffle type, approximately 1.5m to 2m length with transition pieces to connect to the oven extract system fan ductwork.

The normal build-up of deposits inside kitchen / oven extract ductwork can degrade the performance of silencers over time. It is important therefore to clean the inside of the oven extract system silencer at regular intervals depending up on the level of deposit build up. This cleaning would normally take place during routine extract ductwork cleaning (usually an insurance requirement and done at same time as cleaning of the fan unit etc.).

6.1.3 Air Conditioning & Cold Room Condenser Units

The proposed air conditioning and cold room condenser units located externally to the rear elevation wall of the building as indicated on the layout drawings in Appendix B do not require noise reduction treatment.

6.2 Vibration

As detailed in Section 5, it is recommended as good practice that the plant is installed using proprietary vibration isolators. Outline specification detail for typically suitable vibration isolators are provided below.

6.2.1 Supply Air Fan & Oven Extract Fan

It is recommended the supply air system fan and oven extract system fan be installed using rubber type vibration isolator hangers or mounts having a nominal static deflection $\geq 5\text{mm}$ under the installed total weight of the fan units. Four isolators are normally required per fan, one for each corner support position of a fan unit. The hangers or mounts should only take weight of the fans; ductwork either side of the fans (including silencers) should be supported by other separate rubber or neoprene vibration isolator hangers / mountings.

The fans should also have ductwork flexible connections fitted. To be effective the flexible connections need to be "loose" (not taught) when installed and would be typically formed using rubber or neoprene sheet material, standard size flexible connections are available from most duct component suppliers.

6.2.2 Air Conditioning & Cold Room Condenser Units

It is recommended the air conditioning and cold room condenser units are installed mounted on the ground using proprietary rubber or neoprene turret type vibration isolator mountings. The isolators should be selected to each have a static deflection $\geq 3\text{mm}$ under weight of the condenser units.

Suitable turret type vibration isolators are approximately 25 to 30mm high and are available in various load capacities. Four isolators are required per unit (one to each corner mounting foot of a condenser unit).

A P P E N D I X A

Noise Survey Instrumentation

Site: 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN**Report:** 21129-002 Appendix A (page 1 of 1)**Date:** January 2022**NOISE SURVEY INSTRUMENTATION**Instrumentation Used:

- Rion sound level meter type NL-31 Class 1 serial number 00903983, Rion preamplifier type NH-21 serial number 33991, Rion microphone type UC-53A serial number 317502, Rion microphone windshield type WS-10, Rion microphone extension cable type EC-04A and tripod / boom arrangement;
- Bruel & Kjaer calibrator type 4231 serial number 2326801 (UKAS certified).
- Speedtech Instruments Skymaster model SM-28 serial number 19370 (sample weather conditions data).

Instrumentation Calibration Certification:

Description	Type Number	Manufacturer	Date of Calibration Expiration	Calibration Certificate Number
Sound Level Meter, s/n 00903983	NL-31	Rion	25/02/2022	TCRT20/1110
Microphone s/n 317502	UC-53A	Rion		
Preamplifier s/n 33991	NH-21	Rion		
Calibrator s/n 2326801	4231	Bruel & Kjaer	29/08/2022	UCRT20/1829

Instrumentation On-Site Calibration Check:

Description	Calibrator Reference Level	Measured Level	Comment
Before survey measurements	94.0dB	94.0dB	Pass
After survey measurements		94.0dB	Pass (nil significant drift)

A P P E N D I X B

Aerial Image, Site Block Plan & Proposed Layout Plan / Elevation Drawings

Site: 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN

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Date: January 2022

AERIAL IMAGE

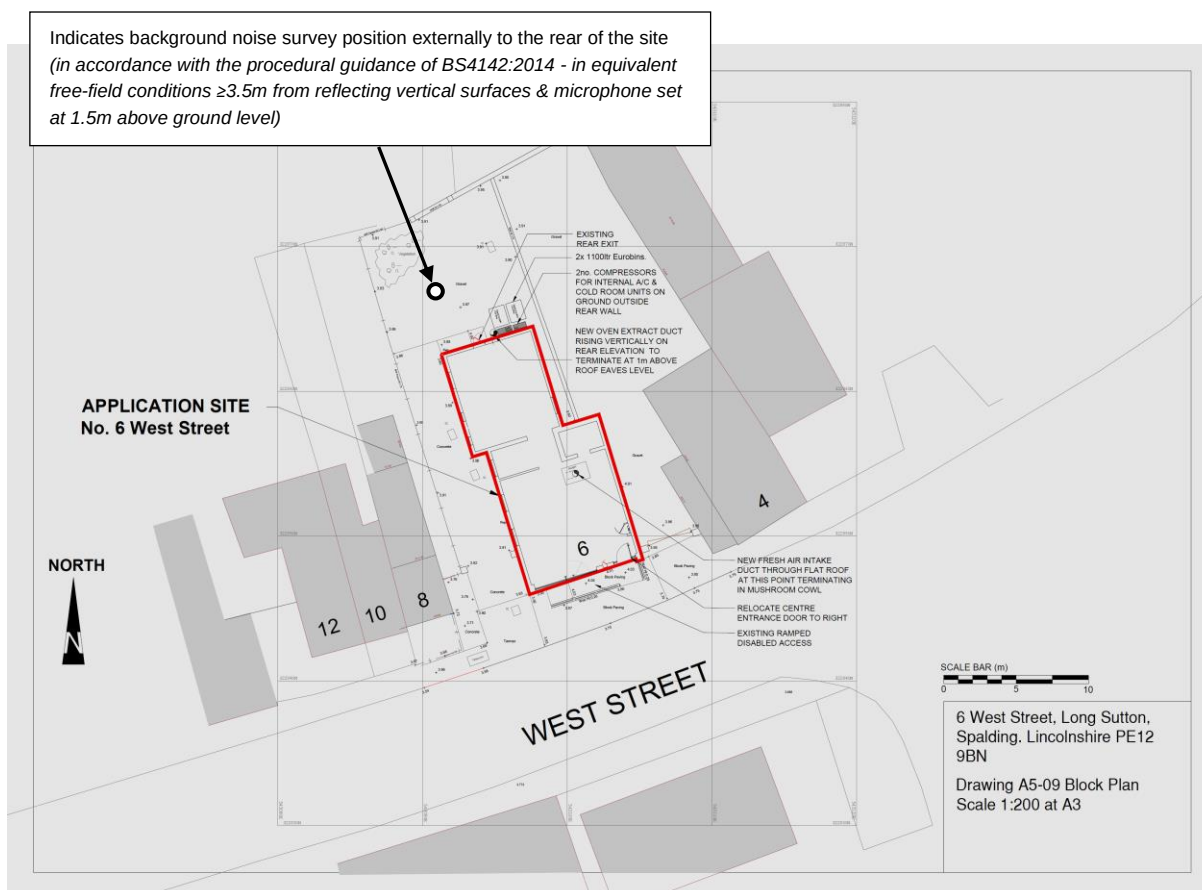


Site: 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN

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SITE BLOCK PLAN

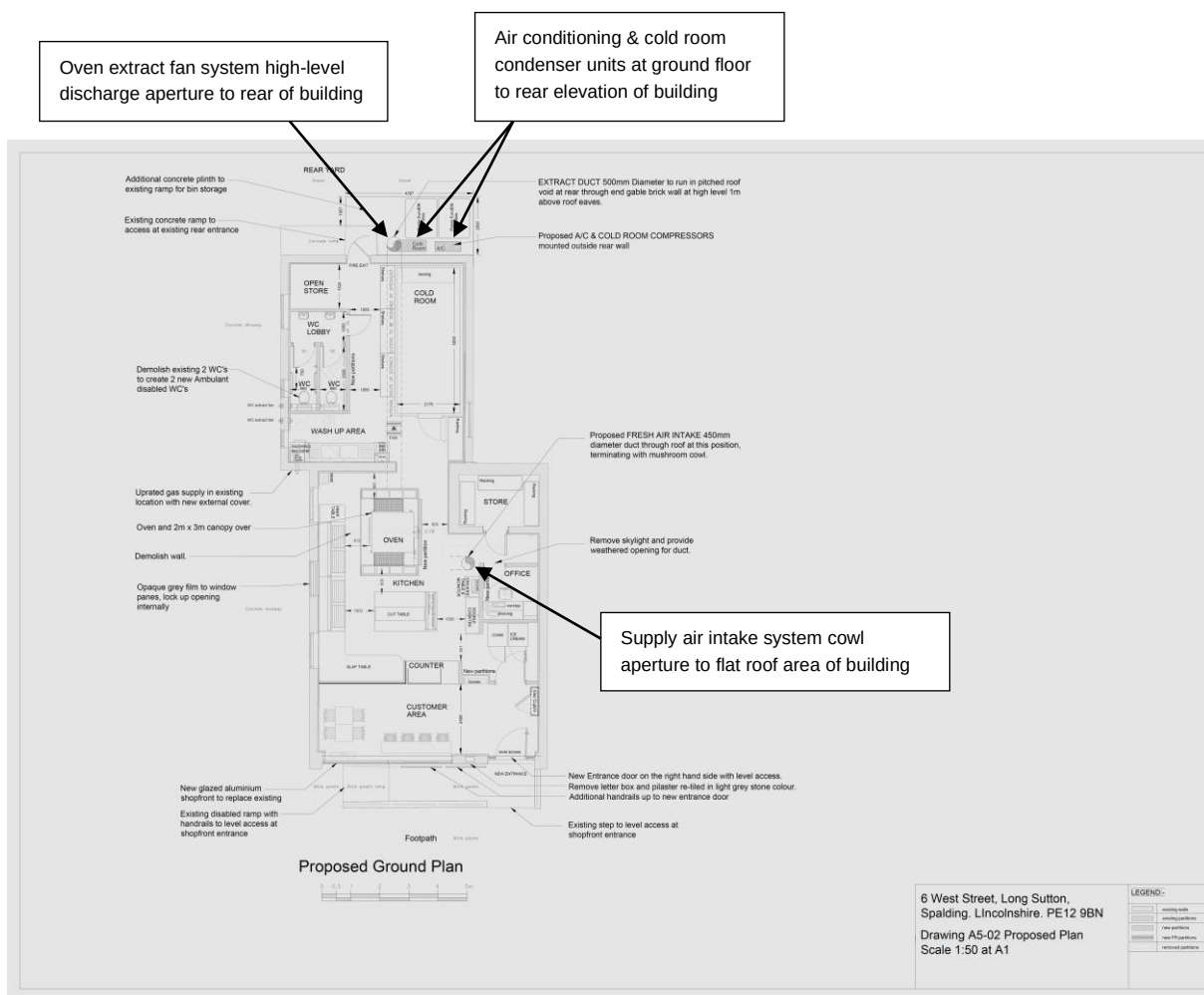


Site: 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN

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PROPOSED LAYOUT PLAN DRAWING

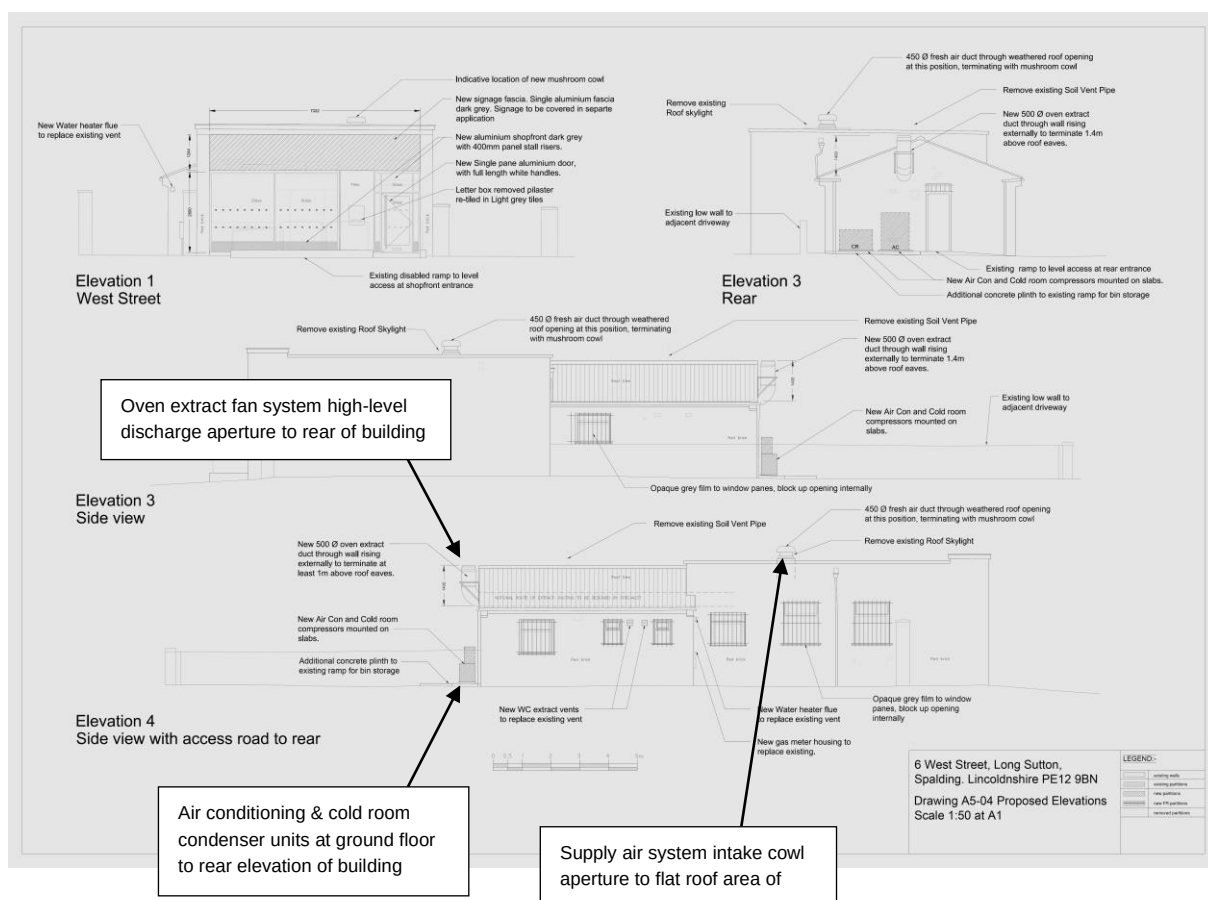


Site: 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN

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Date: January 2022

PROPOSED ELEVATIONS DRAWING



APPENDIX C

Background Noise Survey Results

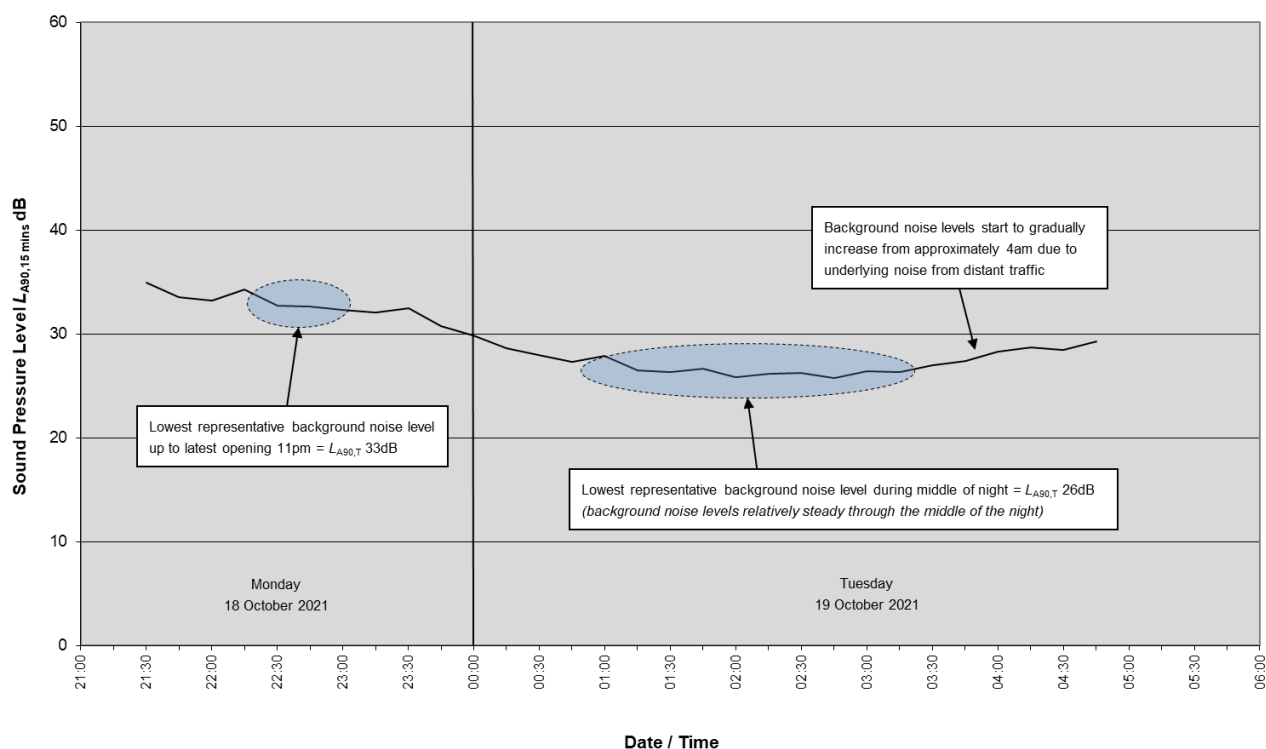
Site: 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN

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Date: January 2022

BACKGROUND NOISE SURVEY RESULTS

Raw Data Background Noise Survey Results (measurement position – externally to rear of site)



A P P E N D I X D

Manufacturer's Noise Data For Plant

Site: 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN

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MANUFACTURER'S NOISE DATA FOR PLANT

Supply Air System Fan: S&P CBM/6-320/240-550W

LOW PRESSURE CENTRIFUGAL FANS

CBM Range



Range of double inlet direct drive low pressure centrifugal fans manufactured from **galvanised sheet steel**.

All the models are fitted with forward curved centrifugal impellers manufactured from galvanised sheet steel.

Available, depending upon the model, with single phase or three phase motors, in 4 or 6 poles.

Motors

All standard motors (1) are IP10, Class B, equipped with thermal protection and ball bearings greased for life.

Electrical supply:

Single phase 230V-50Hz (capacitor fitted on the fan housing).

Three phase 230/400V-50Hz .

(See characteristics chart).

(1) Except CBM-380/580 fitted with an aluminium housing classed motor IP44 class F.

Additional Information

Mounting feet as accessory, allowing 4 different positions.

On request

Aluminium housing closed motors, IP44, class F (T version).

Coupling flange fitted at the fan outlet (B version).

APPLICATIONS



Incorporation in ventilation cabinets



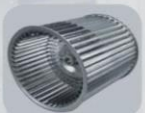
Air conditioning equipment

Anti-vibration mounts



All motors are fitted with support including rubber anti-vibration mounts **reducing the noise** transmitted to the installation

Impeller dynamically balanced



Impeller **dynamically balanced**, according to ISO 1940 standard, providing vibration free operation

Technical characteristics

Before installation check that the product electrical characteristics listed on the data plate label (Voltage, power, frequency etc) match those of the intended electrical supply.

Model	Motor power (W)	Motor power (PK)	Equiv. in inches	Poles	Speed (r.p.m.)	Capacitor (µF / V)	Maximum current absorbed 230/1/50 (A)	Maximum current absorbed 230-400/3/50 (A)	Airflow (m³/h)	Sound pressure level * (dB(A))	Weight (kg)
CBM/6-180/180-72W	72	1/10	7/7	6	960	4/400	1,0	—	1400	56	9
CBM/4-180/180-147W	150	1/5	7/7	4	1350	6/400	1,5	—	1565	59	10
CBM/6-240/180-122W	120	1/6	9/7	6	900	8/500	2,1	—	2430	63	15
CBM/6-240/180-245W	250	1/3	9/7	6	920	10/450	2,45	—	2680	65	16
CBM/6-240/240-122W	120	1/6	9/9	6	850	8/500	2,1	—	2500	61	16
CBM/6-240/240-245W	250	1/3	9/9	6	900	10/450	2,75	—	2900	63	17
CBM/4-240/240-373W	370	1/2	9/9	4	1350	10/400	3,8	—	2650	65	19
CBM/6-270/200-245W	250	1/3	10/8	6	900	10/400	3,0	—	3480	65	18
CBM/6-270/200-373W	370	1/2	10/8	6	970	15/400	4,0	—	4000	68	19
CBM/4-270/200-373W	370	1/2	10/8	4	1300	12/400	5,0	—	3150	66	21
CBM/6-270/270-245W	250	1/3	10/10	6	900	10/400	3,0	—	3550	63	20
CBM/6-270/270-373W	370	1/2	10/10	6	900	15/400	4,0	—	4500	67	21
CBM/4-270/270-550W	550	3/4	10/10	4	1400	15/400	5,9	—	3540	66	23
CBM/6-320/240-550W	550	3/4	12/9	6	900	18/400	5,8	—	4700	67	28
CBM/6-320/240-1100W (trif.)	1100	1,5 (3f)	12/9	6	900	—	—	7,0/4,2	7000	75	28
CBM/6-320/320-550W	550	3/4	12/12	6	900	18/400	5,8	—	5250	66	30
CBM/6-320/320-1100W (trif.)	1100	1,5 (3f)	12/12	6	900	—	—	7,0/4,0	7900	78	30
CBM-RTC/6-380/380-2200W (trif.)	2200	3 (3f)	15/15	6	940	—	—	10,4/6,0	9000	70	45

* Measured at 1,5 meters at the fan inlet side in free field.

Manufacturer data in terms of overall dBA sound pressure level at 1.5m distance (free field) from fan inlet side

Site: 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN

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Date: January 2022

MANUFACTURER'S NOISE DATA FOR PLANT

Oven Extract System Fan: S&P TCBTx2/4-450

CONTRA ROTATING CASSED AXIAL FANS
TCBBx2 / TCBTx2 Series

TECHNICAL CHARACTERISTICS
Before installation check that the product electrical characteristics listed on the data plate label (voltage, power, frequency, etc.) match those of the intended electrical supply.

Model	Speed (rpm)	Diameter (mm)	Maximum absorbed power (W)	Maximum absorbed current (A)		Sound pressure level* (dB(A))	Maximum air volume (m³/h)	Weight (kg)	Speed controller RMB/T	Variable frequency inverter			
				to 230 V	to 400 V					VFTM		VFKB	
										1/230V**	3/400V	1/230V**	3/400V
SINGLE PHASE													
TCBBx2/4-450	1420	450	1316	5,7	-	74	7.430	42	RMB-8	-	-	-	-
TCBBx2/4-500	1370	500	1957	9,0	-	76	9.950	50	RMB-10	-	-	-	-
TCBBx2/4-560	1370	560	2972	13,6	-	78	13.930	66	-	-	-	-	-
TCBBx2/4-630	1400	630	3671	16,3	-	79	16.560	80	-	-	-	-	-
THREE PHASE													
TCBTx2/4-450	1430	450	1309	5,2	3	74	7.250	42	RMT-5	VFTM MONO 1,1	VFTM TRI 1,1	VFKB 27	VFKB 45
TCBTx2/4-500	1390	500	1700	5,8	3,4	76	9.800	50	RMT-5	VFTM MONO 1,1	VFTM TRI 1,5	VFKB 27	VFKB 45
TCBTx2/4-560	1390	560	3173	10,0	5,8	78	15.170	66	-	VFTM MONO 2,2	VFTM TRI 3	-	VFKB 48
TCBTx2/4-630	1445	630	4014	-	7,4	79	17.810	80	-	-	VFTM TRI 4	-	VFKB 48

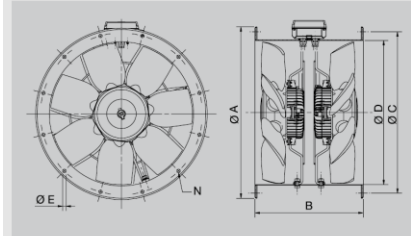
* Sound pressure level, measured in free field condition at a distance equivalent of three times the diameter of the impeller or a minimum of 1.5 meters whichever is the greater.
** Only for fans fitted with three phase motors 230/400V.

ACOUSTIC CHARACTERISTICS
The sound levels -NPS- shown in the technical characteristic chart, correspond to the value of sound pressure dB(A), measured in free field conditions at a distance equivalent to three times the diameter of the impeller with a minimum of 1.5 meters.
The following table shows the sound power level spectrums in dB(A) measured with the fan ducted, at both inlet and discharge sides.

Model	Air volume m³/h	63	125	250	500	1000	2000	4000	8000	Global
450 Inlet	6.600	46	73	85	82	85	79	72	64	90
	5.850	46	73	84	81	83	79	71	64	88
	4.300	58	70	80	80	83	79	71	64	87
450 Outlet	6.600	63	75	86	85	87	82	74	67	92
	5.850	53	73	85	84	87	81	74	67	91
	4.300	58	70	82	83	86	82	74	67	90
500 Inlet	9.000	48	78	87	85	87	81	74	67	92
	7.500	52	76	85	85	85	80	73	65	90
	6.000	60	73	83	82	85	80	73	66	89
500 Outlet	9.000	65	76	87	88	90	84	77	70	94
	7.500	62	75	86	87	88	83	76	69	92
	6.000	59	72	86	85	88	83	76	69	92

Model	Air volume m³/h	63	125	250	500	1000	2000	4000	8000	Global
560 Inlet	13.720	50	85	87	88	91	85	78	73	95
	10.800	57	79	83	86	89	84	78	72	93
	9.000	63	79	81	86	89	84	78	72	92
560 Outlet	13.720	74	86	85	91	94	88	81	75	97
	10.800	70	82	84	88	92	87	81	74	95
	9.000	74	81	85	89	92	87	81	74	95
630 Inlet	17.500	51	85	91	89	93	87	80	74	97
	15.400	55	85	85	88	91	86	80	73	95
	12.000	64	80	84	88	90	86	80	73	94
630 Outlet	17.500	73	87	88	93	95	89	83	77	99
	15.400	71	87	86	91	94	89	83	76	98
	12.000	67	84	86	90	94	89	84	76	97

DIMENSIONS (mm)



Model	Ø A	B	Ø C	Ø D	Ø E	Number of holes N
450	537	375	500	450	12	8
TCBBx2/4-500	595	520	560	500	12	12
TCBTx2/4-500	595	375	560	500	12	12
560	645	520	620	560	12	12
630	725	520	690	630	12	12

Manufacturer noise data is in terms of overall (global) dBA & A weighted octave band sound power level values. Noise data applicable for max air volume condition used in noise assessment.

www.solerpalau.com Cylindrical cased axial flow fans TCBBx2 / TCBTx2 2

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MANUFACTURER'S NOISE DATA FOR PLANT

Air Conditioning Condenser Unit: Mitsubishi FDC100VNX

Outdoor unit		
FDC100VNX		
Outdoor Unit		FDC100VNX
Cooling (Nominal)	kW	10.00
Cooling Range	kW	4.00 to 11.20
E.E.R (Energy Label)		4.00 (A)
Heating (Nominal)	kW	11.20
Heating Range	kW	4.00 to 12.50
C.O.P (Energy Label)		4.34 (A)
Exterior Dimensions (H x W x D)	mm	1300 x 970 x 370
Net Weight	mm	105
Sound Pressure Level	dB(A)	50
ELECTRICAL DATA		
Power Source Rating MCB	A	32
Mains Power To	Outdoor	1Phase 220-240V 50Hz, 1Phase 2
Interconnecting Wires		3+E
Running Current - Cooling	A	11.1
Running Current - Heating	A	11.4
Start Current	A	24
Power Input - Cooling	kW	2.50
Power Input - Heating	kW	2.58
INSTALLATION/REFRIGERANT		
Ref. Max Piping size	Liquid	3/8"(9.52)
	Gas	5/8"(15.88)
Ref. Max Piping Length	m	100
Vertical Height Difference (Max) - Outdoor Unit Above Indoor Unit	m	30
Outdoor Unit Below Indoor Unit	m	15
Refrigerant Amount Precharged	kg	4.5
For Pipe Length Up To	m	30
Additional Refrigerant	g/m	60

Manufacturer noise data is in terms of free field overall dBA sound pressure level at 1m distance from the unit

Site: 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN

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MANUFACTURER'S NOISE DATA FOR PLANT

Cold Room Condenser Unit: Tecumseh SILAJ4519Z-FZ


Tecumseh

Condensing unit
Voltage Code : FZ

High Temp. Commercial (HP)

SILAJ4519Z-FZ

220 - 240V 1~ 50 Hz

R452A / R404A / R448A / R449A

SILAJ4519Z-FZ

Conditions	Frequency	Nominal Cooling Capacity		Sound Power ISO3745 / ISO 3743-1
		Watts	BTU/h	
EN13215 / R452A	50 Hz	4467	15234	59 dBA
EN13215 / R404A	50 Hz	4550	15515	59 dBA
EN13215 / R448A	50 Hz	4319	14729	59 dBA
EN13215 / R449A	50 Hz	4322	14736	59 dBA

* EN13215 : T°Ambient 32.0°C / T°Evap. 5.0°C / T°Return gas temp. 20.0°C
 T°Subcooling. 3.0K

Net Weight (Kg)	74.0
Expansion device	Expansion_Valve
Air Flow (m³/h)	1650
Compo Data Sheet	224ST-FZ
Elec Comp Type	CSR
Current (Amp)	
Load Rated Amp	10.2
Max Cont Current	15.5
Lock Rotor Amp	45
Fan	
Speed (rpm)	546
Power (W)	65.0
Diameter (mm)	360
Protection	Overload
IP Level	IP44
Condenser	360/14100
Liquid Receiver	
Capacity (L)	2.35
Maximum Pressure (Bars)	32.0
Suction Line	
Suction Type	Tube / Tube
For Tubing Out Diam	15.9 (5/8")
Suction Connection Type	Brased
Liquid Line	
Liquid Line Type	Tube
For Tubing Out Diam	9.5 (3/8")
Liquid Connection Type	Brased
Connection Type	TT
Fan Guard	maille < à 8mm

Note : Tecumseh reserves the right to change information contained in this document without notification.

Selection program - V4.6, 2019137 - 03/10/2019

Manufacturer noise data is in terms of overall dBA sound power level for the unit

APPENDIX E

Noise Model Calculation For Plant

Site: 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN

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Date: January 2022

NOISE MODEL CALCULATION FOR PLANT

ASSESSMENT POSITION A: Nearest house adjacent at 8 West Street

NOISE CONDITION: Opening hours; all plant items operating full duty

NOISE MITIGATION: Silencers to supply air system fan & oven extract system fan (see Section 6.1 Report 21129-002)

Plant & Description	Overall dBA	Lin dBA at Octave Band Centre Frequency Hz							
		63	125	250	500	1k	2k	4k	8k
SUPPLY AIR SYSTEM INTAKE APERTURE: S&P CBM/6-320/240-550W Fan									
Sound power level L _w dB; induct L _w	79	82	81	79	76	74	70	67	63
Duct Loss; duct length from fan to aperture, allow =2m 450mm Ø		0	0	0	0	0	0	0	0
Duct Loss; duct bends from fan to aperture, allow 1 x radius bend 450mm Ø		0	0	0	-1	-2	-3	-3	-3
Duct Loss; aperture end reflection, equivalent area 450mm Ø		-10	-6	-2	0	0	0	0	0
Noise Mitigation; atmosphere side silencer to system (rectangular splitter baffle type)		-5	-11	-18	-25	-25	-20	-20	-20
Sound power level L _w dB; external aperture outlet L _w	56	67	64	59	50	47	47	44	40
Distance; free-field hemispherical correction for ≈11m from aperture to assessment position		-29	-29	-29	-29	-29	-29	-29	-29
Screening; nil line of sight screening correction applicable		0	0	0	0	0	0	0	0
Directivity; ≥90° off-axis aperture directivity applicable, limit to -10dB		-1	-2	-3	-4	-6	-10	-10	-10
Reflections / Non Free-Field; nil correction applicable for roof level intake aperture		0	0	0	0	0	0	0	0
Individual contribution at assessment position	23	37	33	27	17	12	8	5	1
OVEN EXTRACT SYSTEM DISCHARGE APERTURE: S&P TCBTX2/4-450 Fan									
Sound power level L _w dB; induct L _w	92	89	91	95	88	87	81	73	68
Duct Loss; duct length from fan to aperture, allow =6m 500mm Ø		0	0	0	-1	-1	-1	-1	-1
Duct Loss; duct bends from fan to aperture, allow 1 x radius bend 500mm Ø		0	0	0	-1	-2	-3	-3	-3
Duct Loss; aperture end reflection, equivalent area 500mm Ø		-9	-5	-2	0	0	0	0	0
Noise Mitigation; atmosphere side silencer to system (rectangular splitter baffle type)		-8	-16	-30	-35	-35	-30	-20	-20
Sound power level L _w dB; external aperture outlet L _w	59	72	70	63	51	49	47	49	44
Distance; free-field hemispherical correction for ≈9m from aperture to assessment position		-27	-27	-27	-27	-27	-27	-27	-27
Screening; nil line of sight screening correction applicable		0	0	0	0	0	0	0	0
Directivity; ≥90° off-axis aperture directivity applicable, limit to -10dB		-1	-2	-3	-4	-6	-10	-10	-10
Reflections / Non Free-Field; nil correction applicable for roof level discharge aperture		0	0	0	0	0	0	0	0
Individual contribution at assessment position	29	44	41	33	20	16	10	12	7
AIR CONDITIONING CONDENSER UNIT: Mitsubishi FDC100VNX									
Sound power level L _w dB	58	63	61	59	55	53	46	45	41
Noise Mitigation; non applied		0	0	0	0	0	0	0	0
Distance; free-field hemispherical correction for ≈11m from unit to assessment position		-29	-29	-29	-29	-29	-29	-29	-29
Screening; complete line of sight screening correction applicable, limit to -15dB		-7	-9	-11	-13	-15	-15	-15	-15
Directivity; nil directivity correction applicable for this source type		0	0	0	0	0	0	0	0
Reflections / Non Free-Field; +3dB correction applied for unit at low level adjacent rear wall		3	3	3	3	3	3	3	3
Individual contribution at assessment position	19	30	27	23	16	12	5	4	0
COLD ROOM CONDENSER UNIT: Tecumseh SILAJ4519Z-FZ									
Sound power level L _w dB	59	61	59	57	55	54	51	47	41
Noise Mitigation; non applied		0	0	0	0	0	0	0	0
Distance; free-field hemispherical correction for ≈10m from unit to assessment position		-28	-28	-28	-28	-28	-28	-28	-28
Screening; complete line of sight screening correction applicable, limit to -15dB		-7	-9	-11	-13	-15	-15	-15	-15
Directivity; nil directivity correction applicable for this source type		0	0	0	0	0	0	0	0
Reflections / Non Free-Field; +3dB correction applied for unit at low level adjacent rear wall		3	3	3	3	3	3	3	3
Individual contribution at assessment position	20	29	25	21	17	14	11	7	1
Cumulative contribution all sources at assessment position	30	45	42	34	24	20	15	14	9

The overall cumulative sound pressure (noise) level at the assessment position due to all plant items operating is 30dBA. For only the cold room condenser unit operating during the middle of the night, the noise level of plant at the assessment position is 20dBA.

Although the specified noise reduction treatment will tend to suppress any tonal characteristics of the plant, plus noise from the A/C & Cold Room condenser units is generally broadband in nature, a +2dBA penalty (correction) as per the assessment guidance of BS4142:2014 is cautiously added to the overall calculated plant noise levels to give plant noise Rating Levels ($L_{A,T,r}$ dB values) to account that residual noise from the plant could potentially have a just perceptible tonal characteristic at the assessment position (although considered unlikely in practice).

Site: 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN

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Date: January 2022

NOISE MODEL CALCULATION FOR PLANT

ASSESSMENT POSITION B: First floor flat above commercial premises adjacent at 4 West Street

NOISE CONDITION: Opening hours; all plant items operating full duty

NOISE MITIGATION: Silencers to supply air system fan & oven extract system fan (see Section 6.1 Report 21129-002)

Plant & Description	Overall dBA	Lin dBA at Octave Band Centre Frequency Hz							
		63	125	250	500	1k	2k	4k	8k
SUPPLY AIR SYSTEM INTAKE APERTURE: S&P CBM/6-320/240-550W Fan									
Sound power level Lw dB; induct Lw	79	82	81	79	76	74	70	67	63
Duct Loss; duct length from fan to aperture, allow =2m 450mm Ø		0	0	0	0	0	0	0	0
Duct Loss; duct bends from fan to aperture, allow 1 x radius bend 450mm Ø		0	0	0	-1	-2	-3	-3	-3
Duct Loss; aperture end reflection, equivalent area 450mm Ø		-10	-6	-2	0	0	0	0	0
Noise Mitigation; atmosphere side silencer to system (rectangular splitter baffle type)		-5	-11	-18	-25	-25	-20	-20	-20
Sound power level Lw dB; external aperture outlet Lw	56	67	64	59	50	47	47	44	40
Distance; free-field hemispherical correction for ≈7m from aperture to assessment position		-25	-25	-25	-25	-25	-25	-25	-25
Screening; nil line of sight screening correction applicable		0	0	0	0	0	0	0	0
Directivity; ≥90° off-axis aperture directivity applicable, limit to -10dB		-1	-2	-3	-4	-6	-10	-10	-10
Reflections / Non Free-Field; nil correction applicable for roof level intake aperture		0	0	0	0	0	0	0	0
Individual contribution at assessment position	27	41	37	31	21	16	12	9	5
OVEN EXTRACT SYSTEM DISCHARGE APERTURE: S&P TCBTX2/4-450 Fan									
Sound power level Lw dB; induct Lw	92	89	91	95	88	87	81	73	68
Duct Loss; duct length from fan to aperture, allow =6m 500mm Ø		0	0	0	-1	-1	-1	-1	-1
Duct Loss; duct bends from fan to aperture, allow 1 x radius bend 500mm Ø		0	0	0	-1	-2	-3	-3	-3
Duct Loss; aperture end reflection, equivalent area 500mm Ø		-9	-5	-2	0	0	0	0	0
Noise Mitigation; atmosphere side silencer to system (rectangular splitter baffle type)		-8	-16	-30	-35	-35	-30	-20	-20
Sound power level Lw dB; external aperture outlet Lw	59	72	70	63	51	49	47	49	44
Distance; free-field hemispherical correction for ≈9m from aperture to assessment position		-30	-30	-30	-30	-30	-30	-30	-30
Screening; nil line of sight screening correction applicable		0	0	0	0	0	0	0	0
Directivity; ≥90° off-axis aperture directivity applicable, limit to -10dB		-1	-2	-3	-4	-6	-10	-10	-10
Reflections / Non Free-Field; nil correction applicable for roof level discharge aperture		0	0	0	0	0	0	0	0
Individual contribution at assessment position	26	41	38	30	17	13	7	9	4
AIR CONDITIONING CONDENSER UNIT: Mitsubishi FDC100VNX									
Sound power level Lw dB	58	63	61	59	55	53	46	45	41
Noise Mitigation; non applied		0	0	0	0	0	0	0	0
Distance; free-field hemispherical correction for ≈10m from unit to assessment position		-28	-28	-28	-28	-28	-28	-28	-28
Screening; complete line of sight screening correction applicable, limit to -15dB		-6	-8	-9	-11	-14	-15	-15	-15
Directivity; nil directivity correction applicable for this source type		0	0	0	0	0	0	0	0
Reflections / Non Free-Field; +3dB correction applied for unit at low level adjacent rear wall		3	3	3	3	3	3	3	3
Individual contribution at assessment position	21	32	28	25	19	14	6	5	1
COLD ROOM CONDENSER UNIT: Tecumseh SILAJ4519Z-FZ									
Sound power level Lw dB	59	61	59	57	55	54	51	47	41
Noise Mitigation; non applied		0	0	0	0	0	0	0	0
Distance; free-field hemispherical correction for ≈11m from unit to assessment position		-29	-29	-29	-29	-29	-29	-29	-29
Screening; complete line of sight screening correction applicable, limit to -15dB		-6	-8	-9	-11	-14	-15	-15	-15
Directivity; nil directivity correction applicable for this source type		0	0	0	0	0	0	0	0
Reflections / Non Free-Field; +3dB correction applied for unit at low level adjacent rear wall		3	3	3	3	3	3	3	3
Individual contribution at assessment position	20	29	26	22	18	14	10	6	0
Cumulative contribution all sources at assessment position	30	45	41	35	25	21	16	14	9

The overall cumulative sound pressure (noise) level at the assessment position due to all plant items operating is 30dBA. For only the cold room condenser unit operating during the middle of the night, the noise level of plant at the assessment position is 20dBA.

Although the specified noise reduction treatment will tend to suppress any tonal characteristics of the plant, plus noise from the A/C & Cold Room condenser units is generally broadband in nature, a +2dBA penalty (correction) as per the assessment guidance of BS4142:2014 is cautiously added to the overall calculated plant noise levels to give plant noise Rating Levels ($L_{A,T,r}$ dB values) to account that residual noise from the plant could potentially have a just perceptible tonal characteristic at the assessment position (although considered unlikely in practice).

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NOISE MODEL CALCULATION FOR PLANT

ASSESSMENT POSITION C: Flats within Spurgeon House, opposite side of West Street

NOISE CONDITION: Opening hours; all plant items operating full duty

NOISE MITIGATION: Silencers to supply air system fan & oven extract system fan (see Section 6.1 Report 21129-002)

Plant & Description	Overall dBA	Lin dBA at Octave Band Centre Frequency Hz							
		63	125	250	500	1k	2k	4k	8k
SUPPLY AIR SYSTEM INTAKE APERTURE: S&P CBM/6-320/240-550W Fan									
Sound power level Lw dB; induct Lw	79	82	81	79	76	74	70	67	63
Duct Loss; duct length from fan to aperture, allow =2m 450mm Ø		0	0	0	0	0	0	0	0
Duct Loss; duct bends from fan to aperture, allow 1 x radius bend 450mm Ø		0	0	0	-1	-2	-3	-3	-3
Duct Loss; aperture end reflection, equivalent area 450mm Ø		-10	-6	-2	0	0	0	0	0
Noise Mitigation; atmosphere side silencer to system (rectangular splitter baffle type)		-5	-11	-18	-25	-25	-20	-20	-20
Sound power level Lw dB; external aperture outlet Lw	56	67	64	59	50	47	47	44	40
Distance; free-field hemispherical correction for ≈22m from aperture to assessment position		-35	-35	-35	-35	-35	-35	-35	-35
Screening; nil line of sight screening correction applicable		0	0	0	0	0	0	0	0
Directivity; ≥90° off-axis aperture directivity applicable, limit to -10dB		-1	-2	-3	-4	-6	-10	-10	-10
Reflections / Non Free-Field; nil correction applicable for roof level intake aperture		0	0	0	0	0	0	0	0
Individual contribution at assessment position	17	31	27	21	11	6	2	-1	-5
OVEN EXTRACT SYSTEM DISCHARGE APERTURE: S&P TCBTX2/4-450 Fan									
Sound power level Lw dB; induct Lw	92	89	91	95	88	87	81	73	68
Duct Loss; duct length from fan to aperture, allow =6m 500mm Ø		0	0	0	-1	-1	-1	-1	-1
Duct Loss; duct bends from fan to aperture, allow 1 x radius bend 500mm Ø		0	0	0	-1	-2	-3	-3	-3
Duct Loss; aperture end reflection, equivalent area 500mm Ø		-9	-5	-2	0	0	0	0	0
Noise Mitigation; atmosphere side silencer to system (rectangular splitter baffle type)		-8	-16	-30	-35	-35	-30	-20	-20
Sound power level Lw dB; external aperture outlet Lw	59	72	70	63	51	49	47	49	44
Distance; free-field hemispherical correction for ≈33m from aperture to assessment position		-38	-38	-38	-38	-38	-38	-38	-38
Screening; nil line of sight screening correction applicable		0	0	0	0	0	0	0	0
Directivity; ≥90° off-axis aperture directivity applicable, limit to -10dB		-1	-2	-3	-4	-6	-10	-10	-10
Reflections / Non Free-Field; nil correction applicable for roof level discharge aperture		0	0	0	0	0	0	0	0
Individual contribution at assessment position	17	33	30	22	9	5	-1	1	-4
AIR CONDITIONING CONDENSER UNIT: Mitsubishi FDC100VNX									
Sound power level Lw dB	58	63	61	59	55	53	46	45	41
Noise Mitigation; non applied		0	0	0	0	0	0	0	0
Distance; free-field hemispherical correction for ≈10m from unit to assessment position		-38	-38	-38	-38	-38	-38	-38	-38
Screening; complete line of sight screening correction applicable, limit to -15dB		-13	-15	-15	-15	-15	-15	-15	-15
Directivity; nil directivity correction applicable for this source type		0	0	0	0	0	0	0	0
Reflections / Non Free-Field; +3dB correction applied for unit at low level adjacent rear wall		3	3	3	3	3	3	3	3
Individual contribution at assessment position	7	15	11	9	5	3	-4	-5	-9
COLD ROOM CONDENSER UNIT: Tecumseh SILAJ4519Z-FZ									
Sound power level Lw dB	59	61	59	57	55	54	51	47	41
Noise Mitigation; non applied		0	0	0	0	0	0	0	0
Distance; free-field hemispherical correction for ≈11m from unit to assessment position		-38	-38	-38	-38	-38	-38	-38	-38
Screening; complete line of sight screening correction applicable, limit to -15dB		-13	-15	-15	-15	-15	-15	-15	-15
Directivity; nil directivity correction applicable for this source type		0	0	0	0	0	0	0	0
Reflections / Non Free-Field; +3dB correction applied for unit at low level adjacent rear wall		3	3	3	3	3	3	3	3
Individual contribution at assessment position	8	13	9	7	5	4	1	-3	-9
Cumulative contribution all sources at assessment position	21	35	32	25	14	10	6	4	0

The overall cumulative sound pressure (noise) level at the assessment position due to all plant items operating is 21dBA. For only the cold room condenser unit operating during the middle of the night, the noise level of plant at the assessment position is 8dBA.

Although the specified noise reduction treatment will tend to suppress any tonal characteristics of the plant, plus noise from the A/C & Cold Room condenser units is generally broadband in nature, a +2dBA penalty (correction) as per the assessment guidance of BS4142:2014 is cautiously added to the overall calculated plant noise levels to give plant noise Rating Levels ($L_{A,T,r}$ dB values) to account that residual noise from the plant 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 F

Noise Reduction Treatment For Plant

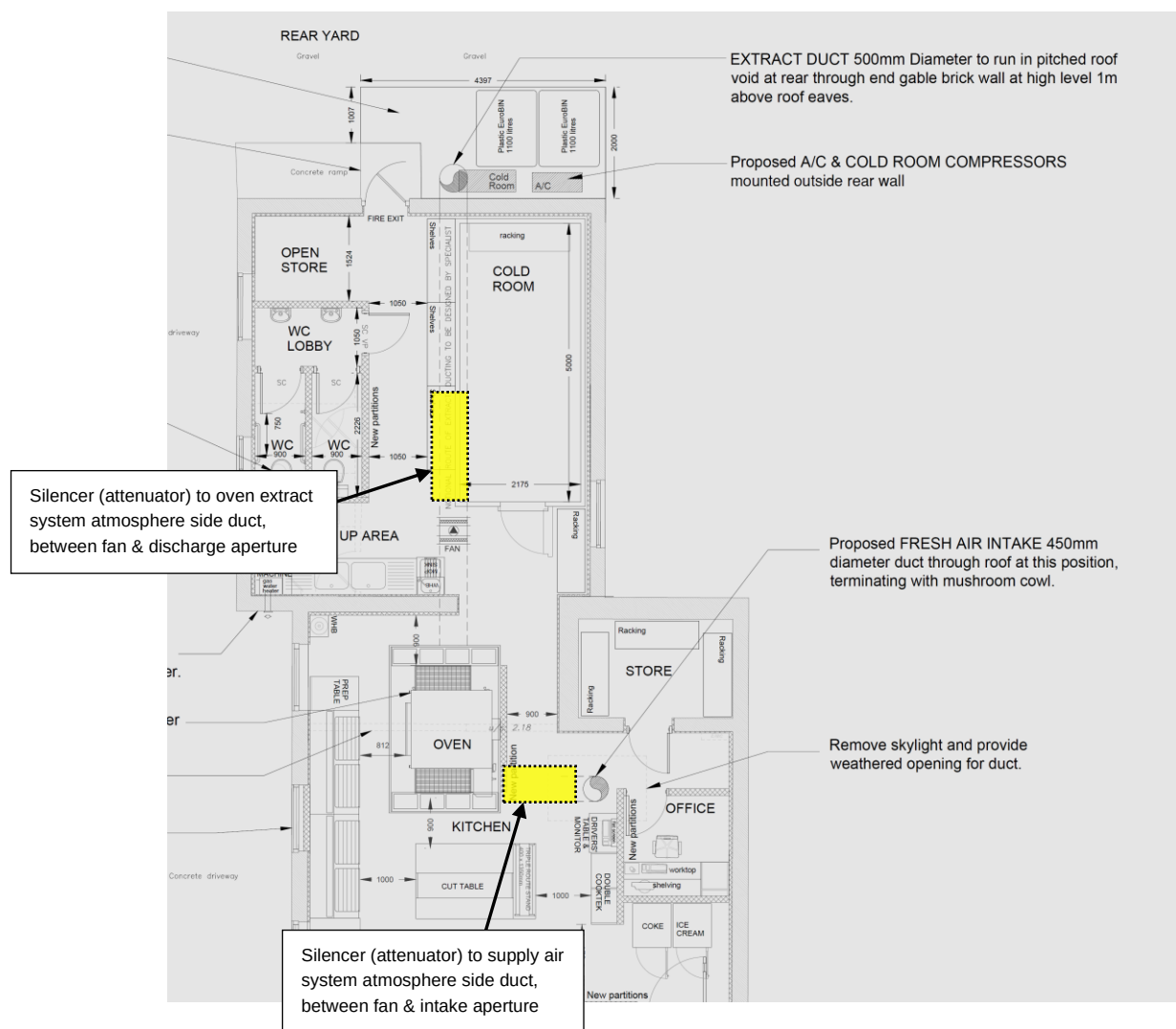
Site: 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN

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Date: January 2022

NOISE REDUCTION TREATMENT FOR PLANT

Annotated Part-Copy Plan Layout Drawing Indicating Noise Reduction Treatment To Plant



Site: 6 West Street, Long Sutton, Spalding, Lincolnshire PE12 9BN

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NOISE REDUCTION TREATMENT FOR PLANT

The data sheet below shows for information and as example an acoustic hardware supplier's typical rectangular cross-section splitter baffle high performance silencer, of the type as suitable (at appropriate length and splitter baffle configuration) to comply with the specified minimum insertion loss (noise reduction) for the supply air fan and oven extract fan systems.

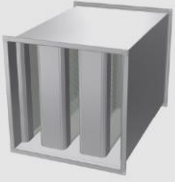
Most other acoustic hardware suppliers and some ventilation system suppliers are also able to provide this same and/or equivalent type of rectangular cross-section splitter baffle type silencer for fitment into ventilation fan system ductwork and as compliant with the specified minimum insertion loss performance.

R02 Rectangular Silencers

R02 - 4 - Attenuator

Available in seven standard lengths R02 4 Rectangular Duct Mounted Silencers have excellent attenuation properties, achieved with sound absorbing infill splitters, retained in the attenuator casing by a perforated liner. The resistance to airflow is a function of the face velocity and length. It is not recommended to select the R02 4 Silencers with a face velocity above 3.5 metres per second without asking advice regarding re-generated self noise. We can advise on the selections and can perform system analysis to ensure the correct unit is specified.

- High performance rectangular duct silencer
- Seven standard lengths
- Many connection options
- Cross section dimensions in 1mm increments
- System pressure within ducted systems to 1500 Pa
- Special lengths on request



Insertion Loss (dB) - Centre Band Frequency

Product Code	Length (mm)	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
R02 - 4 - 600	600	5	8	12	23	30	30	23	18
R02 - 4 - 900	900	6	10	16	30	37	37	30	24
R02 - 4 - 1200	1200	7	13	22	38	47	47	40	29
R02 - 4 - 1500	1500	8	16	26	42	49	49	45	32
R02 - 4 - 1800	1800	9	18	31	46	50	49	47	34
R02 - 4 - 2100	2100	11	20	36	50	50	50	50	41
R02 - 4 - 2400	2400	12	22	40	50	50	50	50	47

Insertion loss data is derived from continual testing to BS4718 and other standards in independent UKAS certified laboratories, which includes where appropriate, re-generated or self noise testing in both forward and reverse flow conditions. If you request system analysis from our technicians all predictions will be assessed using the relevant certified insertion loss data together with relevant dynamic corrections.

Dimensional Data

Code	A Min	A Max	B Min	B Max	C Min	C Max
R02 - 4	100	1200	100	1200	400	2400

Resistance to Airflow (Pa)

Product Code	1.0m/s	1.5m/s	2.0m/s	2.5m/s	3.0m/s
R02 - 4 - 600	15	23	33	43	60
R02 - 4 - 900	15	23	34	44	61
R02 - 4 - 1200	16	24	35	46	63
R02 - 4 - 1500	16	25	35	48	67
R02 - 4 - 1800	17	25	35	50	68
R02 - 4 - 2100	18	26	36	51	68
R02 - 4 - 2400	18	26	38	52	69

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Typically suitable silencer 1.2m length as compliant with the specified minimum insertion loss for the supply air system

Typically suitable silencer 1.8m length as compliant with the specified minimum insertion loss for the oven extract system