Project	Land Between 76 And 78A Brighton Road – Detailed Facade Noise Calculations
To	Southern Rock Property
From	7th Wave Acoustics Ltd
Author	Jamie Pearson. Associate Consultant. BA (Hons) MIOA
Reviewer	Neil Anderson. Director. BEng (Hons) MIOA
Date	8th November 2024
Ref	1218.001M.2.0.JP

1 INTRODUCTION

7th Wave Acoustics has been appointed by Southern Rock Property to prepare a Technical Note to support the discharge of an acoustic related planning condition for Land Between 76 And 78A Brighton Road, Lancing, West Sussex.

The Local Planning Authority has granted planning permission[1] in February 2024 for *'proposed construction of 6no. townhouses and 2no. maisonettes (total 8no. dwellings), within four storey building.'*

The permission was subject to a number of planning conditions, with the following being pertinent to this Technical Note:

> 10. No development above slab level shall commence unless and until full details of the proposed noise protection scheme, including ventilation, has been submitted to and approved in writing by the Local Planning Authority. The approved scheme shall be implemented prior to first occupation of any dwelling and retained thereafter.
>
> **Reason**: *To protect future residents form excessive traffic noise from Brighton Road in accordance with the National Planning Policy Framework and policy 34 of the Adur Local Plan.*

This note should be read in conjunction with the main noise impact assessment report for the site (1198.001R.2.0.JP), herein referred to as the Noise Report.

2 SITE DESCRIPTION

Existing Site

The application site is located in Lancing, within the boundary of Adur and Worthing Councils (AWC), in a predominantly residential area.

The site comprises a wide swathe of grass embankment on the south side of Brighton Road (A259).

Residential properties are located beyond Brighton Road to the north. Beach Park caravan park sits directly to the south of the site. Existing residential dwellings are located directly to the east and west of the site.

The location of the site is identified in Figure A1 of Appendix A.

Proposed Development

The development proposals are to construct 8 no. residential units in a single terrace block comprising 6 no. townhouses and 2 no. apartments, with parking at ground floor level.

The floor plans for the proposed development are displayed in Figures A2 and A5 of Appendix A.

The proposed elevations are displayed in Figures A6 and A7 of Appendix A

3 NOISE CALCULATIONS

The calculation method described in Annex G of BS 8233:2014[2] has been used to predict noise levels inside habitable rooms within the highlighted dwellings.

The calculation method enables composite façade sound reductions to be calculated taking into consideration the sound reduction afforded by the external walls, roof and window elements plus any ventilation apertures in the façade.

The acoustic algorithm used to calculate the façade sound reduction and the internal noise levels is reproduced below.

$$L_{eq,2} = L_{eq,ff} + 10log_{10}\left(\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S}10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S}10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S}10^{\frac{-R_{rr}}{10}}\right) + 10log_{10}\left(\frac{S}{A}\right) + 3$$

Where:

$L_{eq,ff}$	is the equivalent, free-field, continuous sound pressure level outside the room elements under consideration;
A_0	is a reference absorption area of 10 m^2 and is independent of frequency;
$D_{n,e}$	is the insulation of the trickle ventilator measured according to BS EN ISO 10140;
S_{wi}	is the area in square metres (m^2) of the windows of the room;
R_{wi}	is the sound reduction index (octave band value) of the window;
S_{ew}	is the area in square metres (m^2) of the external wall of the room;
R_{ew}	is the sound reduction index (octave band value) of the external wall;
S_{rr}	is the area in square metres (m^2) of the ceiling of the room;
R_{rr}	is the sound reduction index (octave band values) of the roof/ceiling;
S_f	is the total façade area in square metres (m^2) of the room in question;
S	is the total area in square metres (m^2) of elements through which sound enters the room, i.e. $S_f + S_{rr}$;
A	is the equivalent absorption area of the receiving room being considered; and
+3	is a correction factor

<u>Construction Assumptions</u>

External Wall and Roof

Architectural plans have been used to derive details of the specific construction of the building envelope.

The assumed SRI of the wall and roof constructions are presented below in Table 3.1.

Glazing

The proposed glazing units for the development are to be provided by Velfac UK. The glazing specified on the front (north) and rear (south) façades provides an R_w value of 42 dB and 32 dB, respectively. The specification of the proposed glazing products are displayed in Figures A8 and A9 of Appendix A.

The sound reduction values in 1/1 octave bands for the glazing units are presented overleaf in Table 3.1.

Ventilation

The dwellings at the proposed development will utilise an Systemair VTR range mechanical ventilation with heat recovery (MVHR) systems, as shown in Figures A10 and A11 of Appendix A.

Passive vents, which introduce an additional pathway for external to internal noise transfer, are not proposed at any of the dwellings.

Table 3.1: Building Element Sound Reduction Index (SRI)

Building Element	Source	R_w	1/1-Octave Band Frequency, Sound Reduction Index, dB					
			125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Wall	BS 8233	50	40	44	45	51	56	56
Roof	BS 8233	43	28	34	40	45	49	49
Glazing [1]	Velfac	42	25	35	43	43	46	54
Glazing[2]	Velfac	32	20	19	29	38	39	35

Notes:
[1] glazing on front façade; and
[2] glazing on rear façade.

Free-field Noise Levels

The noise spectrums summarised below in Table 3.2 and 3.3 are the logarithmic averages of the octave band noise levels measured at the site during the daytime and night-time period. Details of the noise survey are presented in Section 5 of the Noise Report. The spectrums have been adopted for the road traffic noise source for the daytime and night-time periods and is adjusted according to the final receptor levels calculated in noise prediction model presented in Table 6.1 of the Noise Report.

The adopted daytime $L_{Aeq,\ 16hr}$, night-time $L_{Aeq,8hr}$ ambient noise levels and the night-time $L_{Amax,F}$ levels used for the purpose of these calculations have been derived from the baseline ambient noise levels obtained during the unattended monitoring survey, as presented in the Report. The highest calculated daytime and night-time noise levels on each façade have been adopted for each façade to provide a worst-case assessment.

The adopted external free-field noise levels for daytime ($L_{Aeq,\ 16hr}$) and night-time ($L_{Aeq,\ 8hr}$) are presented overleaf in Tables 3.2 and 3.3, respectively.

Table 3.2: Adopted Daytime External free-Field Noise Levels

Façade	1/1-Octave Band External Free-Field Noise Level, dB $L_{eq,T}$					
	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Front	67	65	63	67	65	58
Rear	49	47	45	49	47	40

Table 3.3: Adopted Night-time External free-Field Noise Levels

Façade	1/1-Octave Band External Free-Field Noise Level, dB $L_{eq,T}$					
	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Front	60	58	56	60	59	52
Rear	38	36	34	38	37	30

Assessment of Internal Levels

The guideline internal noise levels presented in BS8233:2014 and used as the assessment criteria in the Noise Report, for the daytime and night-time periods are 35 dB $L_{Aeq,16hr}$ and 30 dB $L_{Aeq,8hr}$.

Based on the calculated composite façade sound reductions, predicted ambient noise levels have been calculated inside a second floor bedroom on the front façade and inside a second-floor bedroom on the rear façade. The bedrooms were selected as they provide a worst-case assessment due to the room volume or area of glazing. The selected rooms are highlighted in Figure A4 of Appendix A. The results of the calculated internal noise levels for the daytime and night-time periods are summarised below in Table 3.4.

Table 3.4: Calculated Daytime and Night-Time Internal Noise Levels

Façade	Period	Room Assessed	Free-Field External Noise Level, dB $L_{Aeq,T}$	Calculated Internal Noise Level, dB $L_{Aeq,T}$	BS 8233 Guideline Level, dB $L_{Aeq,T}$	BS 8233 Guideline Level Achieved
Front	Daytime (07:00 to 23:00 hrs)	Bedroom 3 Unit F1	71	27	35	Yes
Rear		Bedroom 1 Unit F1	53	24		Yes
Front	Night-time (23:00 to 07:00 hrs)	Bedroom 3 Unit F1	64	20	30	Yes
Rear		Bedroom 1 Unit F1	42	14		Yes

Based on the calculated façade sound reductions, the noise predictions show that internal noise levels fall below the daytime and night-time guideline levels of 35 and 30dB $L_{Aeq,T}$ respectively.

World Health Organisation $L_{Amax,F}$ Noise Levels

Maximum $L_{Amax,F}$ noise levels generated at night have also been considered at the proposed development site.

WHO guideline noise criteria sets an internal sleep disturbance noise limit of 42 dB $L_{Amax,F}$ for the onset of critical health effects, which is a level which should not be exceeded on a regular basis. Based on an interpretation that for a noise to be regular, it needs to occur several (i.e. more than

two) times per hour, the $L_{Amax,F}$ noise needs to be based upon an average of at least 10-15 events that are typical in nature.

A summary of the representative external night-time $L_{Amax,F}$ noise levels is presented below in Table 3.5.

As per the derivation of the daytime and night-time $L_{Aeq,T}$ spectrums, the noise spectrums summarised below in Table 3.5 are the logarithmic averages of the $L_{Amax,F}$ octave band noise levels measured at the site during the night-time period. The spectrums have been adjusted according to the calculated receptor levels presented in Table 7.2 of the Noise Report.

Table 3.5: Summary of Representative External Night-Time Noise $L_{Amax,F}$ Noise Levels

Façade	1/1-Octave Band External Free-Field Noise Level, dB $L_{eq,T}$					
	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Front	85	81	77	76	75	70
Rear	63	59	55	54	53	48

An assessment of the calculated night-time $L_{Amax,F}$ noise levels inside the ground and first-floor bedrooms of the proposed dwelling, assuming closed windows, has been undertaken and is presented in Table 3.6 below.

Table 3.6: Calculated Internal $L_{Amax,F}$ Noise Levels

Façade	Period	Room Assessed	Free-Field External Noise Level, dB $L_{Amax,F}$	Calculated Internal Noise Level, dB $L_{Amax,F}$	WHO Guideline Level, dB $L_{Amax,F}$	BS 8233 Guideline Level Achieved
Front	Night-time (23:00 to 07:00 hrs)	Bedroom 3 Unit F1	82	42	42	Yes
Rear		Bedroom 1 Unit F1	60	36		Yes

Table 3.6 indicates that based on the assumed composite façade sound reductions, the calculated internal noise levels fall below WHO's internal sleep disturbance noise criterion of 42 dB $L_{Amax,F}$ with closed windows.

Summary

Based on the assumptions and calculations presented above, the final selected scheme of glazing and ventilation is considered suitable for the development. The details of the final glazing and ventilation systems are summarised below.

Glazing the Front (North) Façade

- Velfac glazing system providing an R_w value of 42 dB, as shown in Figure A8 of Appendix A.

Glazing the Rear (South) Façade

- Velfac glazing system providing an R_w value of 32 dB, as shown in Figure A9 of Appendix A

Ventilation System

- Systemair VTR range mechanical ventilation with heat recovery (MVHR) systems for all dwellings, as shown in Figures A10 and A11 of Appendix A.

Based on these specifications, no further noise mitigation measures are deemed to be required, satisfying the requirements of planning condition 10.

4 CONCLUSIONS

7th Wave Acoustics has been commissioned to undertake detailed façade noise calculations to discharge of an acoustic related planning condition for Land Between 76 And 78A Brighton Road, Lancing, West Sussex.

Detailed noise calculations have been undertaken to consider the suitability of the proposed glazing and ventilation products, for the protection against the ingress of external road traffic noise into habitable rooms.

The results of the assessment show that the internal ambient $L_{Aeq,T}$ noise levels calculated during 16-hour day and 8-hour night-time periods are predicted to meet BS 8233:2014's desirable guideline noise levels within the habitable rooms of the dwellings.

The night-time $L_{Amax,\ F}$ internal noise levels will also comply with the WHO limit of 42dB $L_{Amax,F}$ for the prevention of sleep disturbance.

The results have shown that desirable internal conditions can be achieved in all habitable rooms on the development with the proposed glazing and ventilation products. As such, no further noise mitigation measures are deemed necessary to satisfy the requirements of the planning condition 10.

5 REFERENCES

1. Adur District Council. Planning Permission. Land Between 76 And 78A Brighton Road, Lancing, West Sussex. AWDM/1247/23. 12th February 2024.
2. British Standard BS 8233: 2014: Guidance on Sound Insulation and Noise Reduction for Buildings

Appendix A – Figures

Figure A1: Site Plan

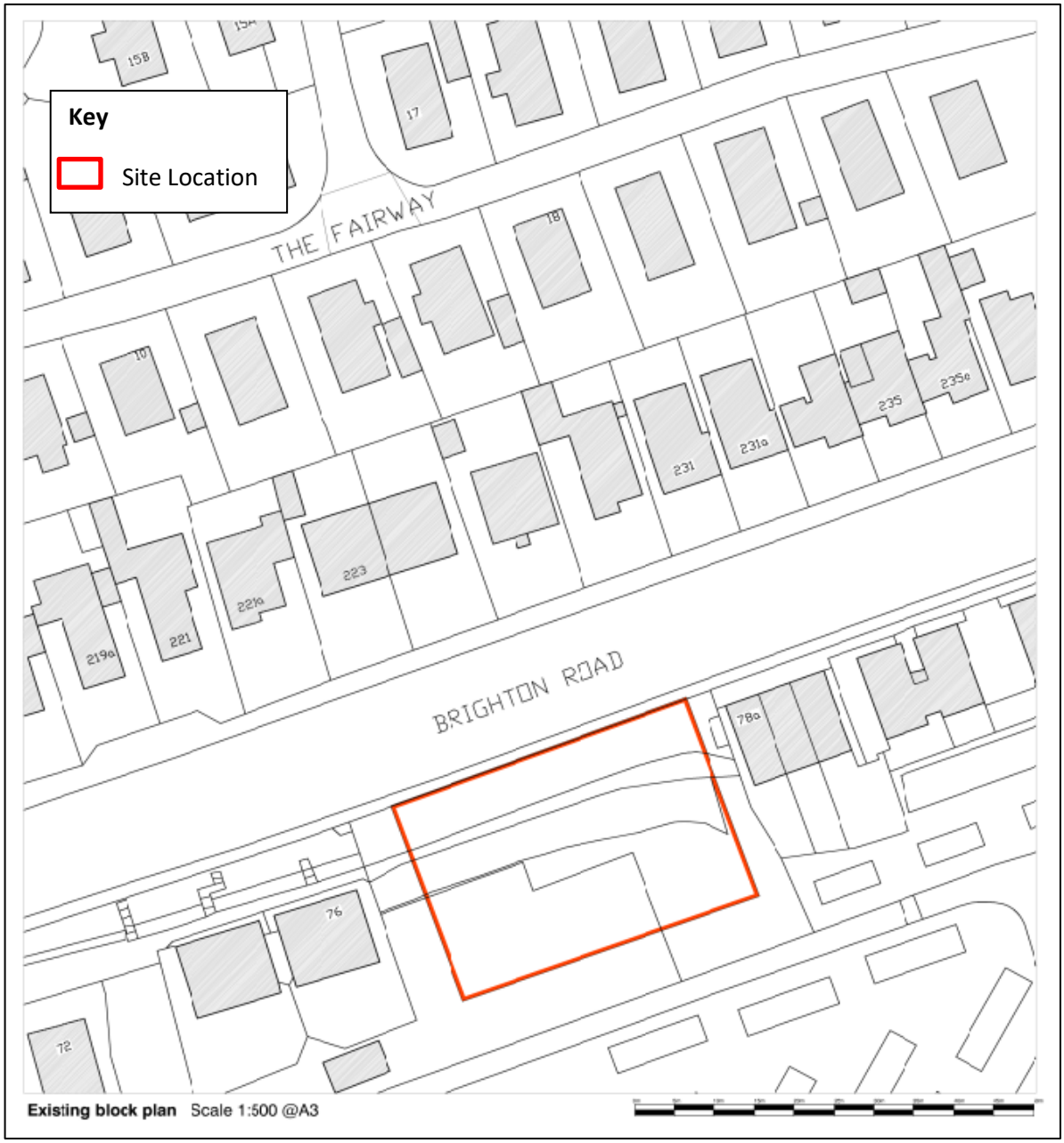


Figure A2: Proposed Ground and First Floor Plans



Figure A3: Proposed Second and Third Floor Plans

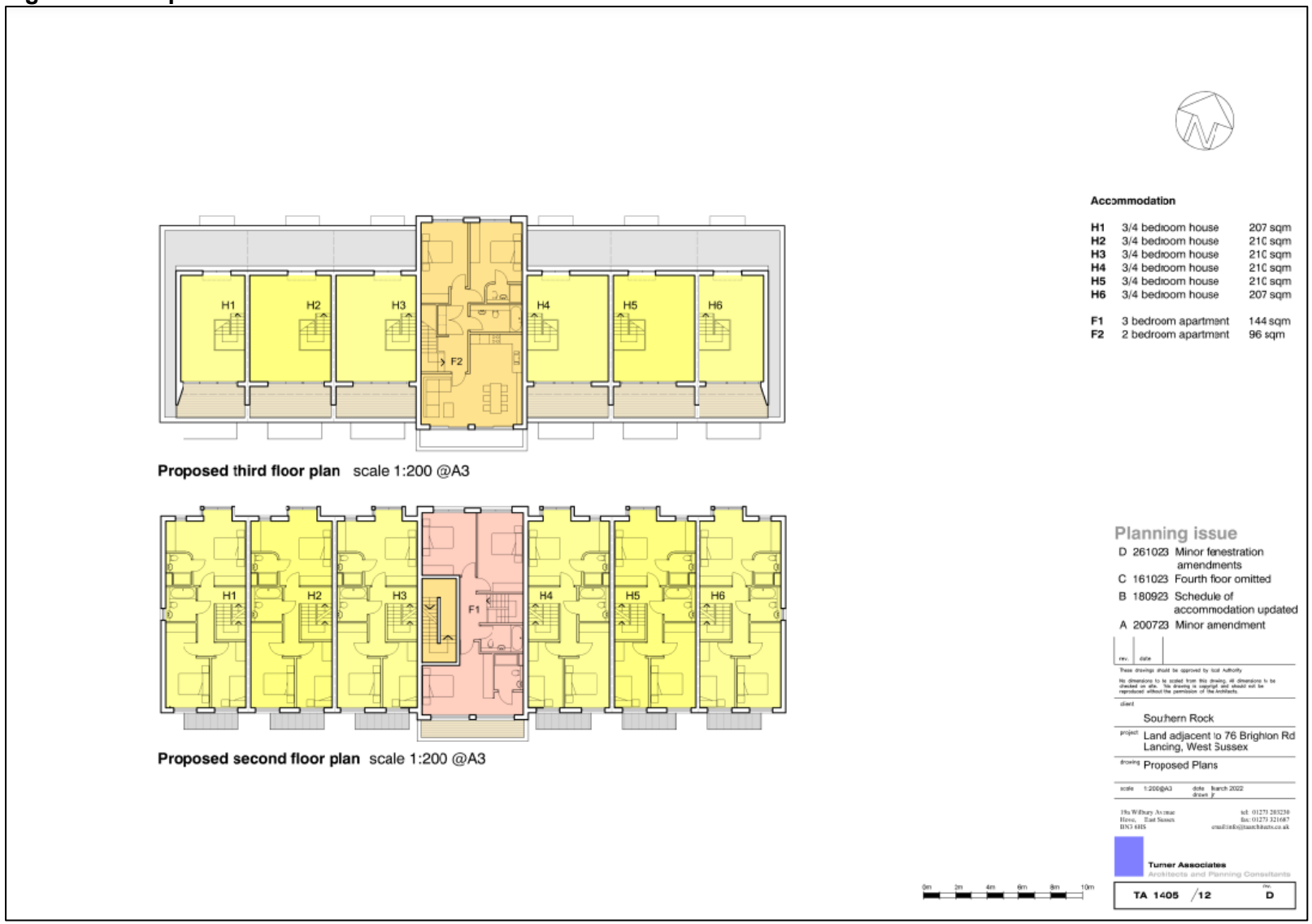


Figure A4: Proposed Apartment Layout

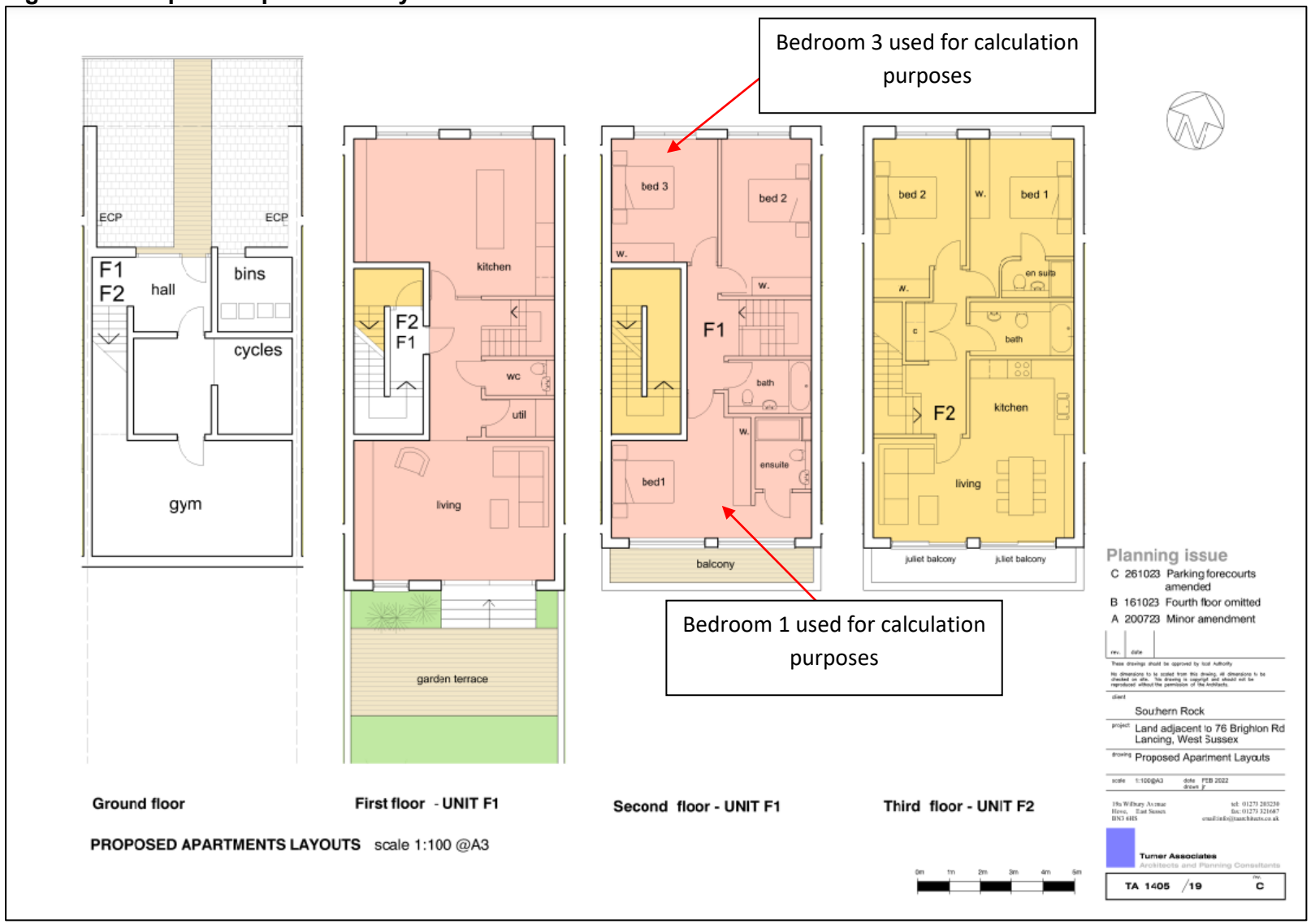


Figure A5: Proposed House Layout



Figure A6: Proposed Front/North Elevation



Figure A7: Proposed Rear/South Elevation



Figure A8: Glazing Specification – Front/North Façade

BM TRADA

Laboratory measurement to BS EN ISO 10140-2 - Airborne Sound Insulation of Building Elements

UKAS TESTING No. 1762

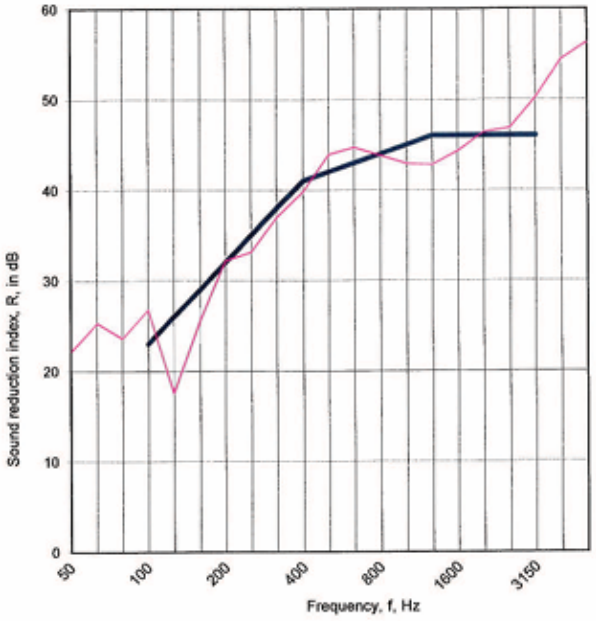
Test Specimen Name: Velfac 200i Energy
Client: Dovista A/S
Test Specimen Installed By: BM TRADA
Area of Specimen (S): 1.80 m^2
Temperature in Test Rooms: 17.4 °C
Static Pressure: 99710.0 Pa
Humidity in Test Rooms: 67.0 %
Test Specimen Description: Velfac 200i Energy side hung window. Glazing - 3/0.76/3-12-4-16-4/0.76/4 ENERGY SAFETY/CLEAR/SOUND SAFETY ENERGY WE GREY W.KRYPTON/ARGON (Ref. 48I221WG)

Reference Number: MTZ/F13032/01/P005
Date of Test: 18/06/2013

Source Room Volume: 82.00 m^3
Receive Room Volume: 63.00 m^3

f, Hz		R ,dB
50*		22.2
63*		25.3
80*		23.6
100		26.8
125		17.6
160		25.7
200		32.2
250		33.1
315		37.0
400		39.8
500		43.9
600		44.7
800		43.8
1000		42.9
1250		42.8
1600		44.3
2000		46.4
2500		46.8
3150		50.2
4000		54.4
5000	≥	56.3
AAD		-23.0

Frequency range for rating in accordance with ISO 717-1



R_w =	42 dB
R_w+C =	40 dB
R_w+C_{tr} =	35 dB

$C_{(50-3150)}$ =	-2	dB	$C_{tr\,(50-3150)}$ =	-8	dB
$C_{(50-5000)}$ =	-1	dB	$C_{tr\,(50-5000)}$ =	-8	dB
$C_{(100-5000)}$ =	-1	dB	$C_{tr\,(100-5000)}$ =	-7	dB

Martin Durham
Technical Officer

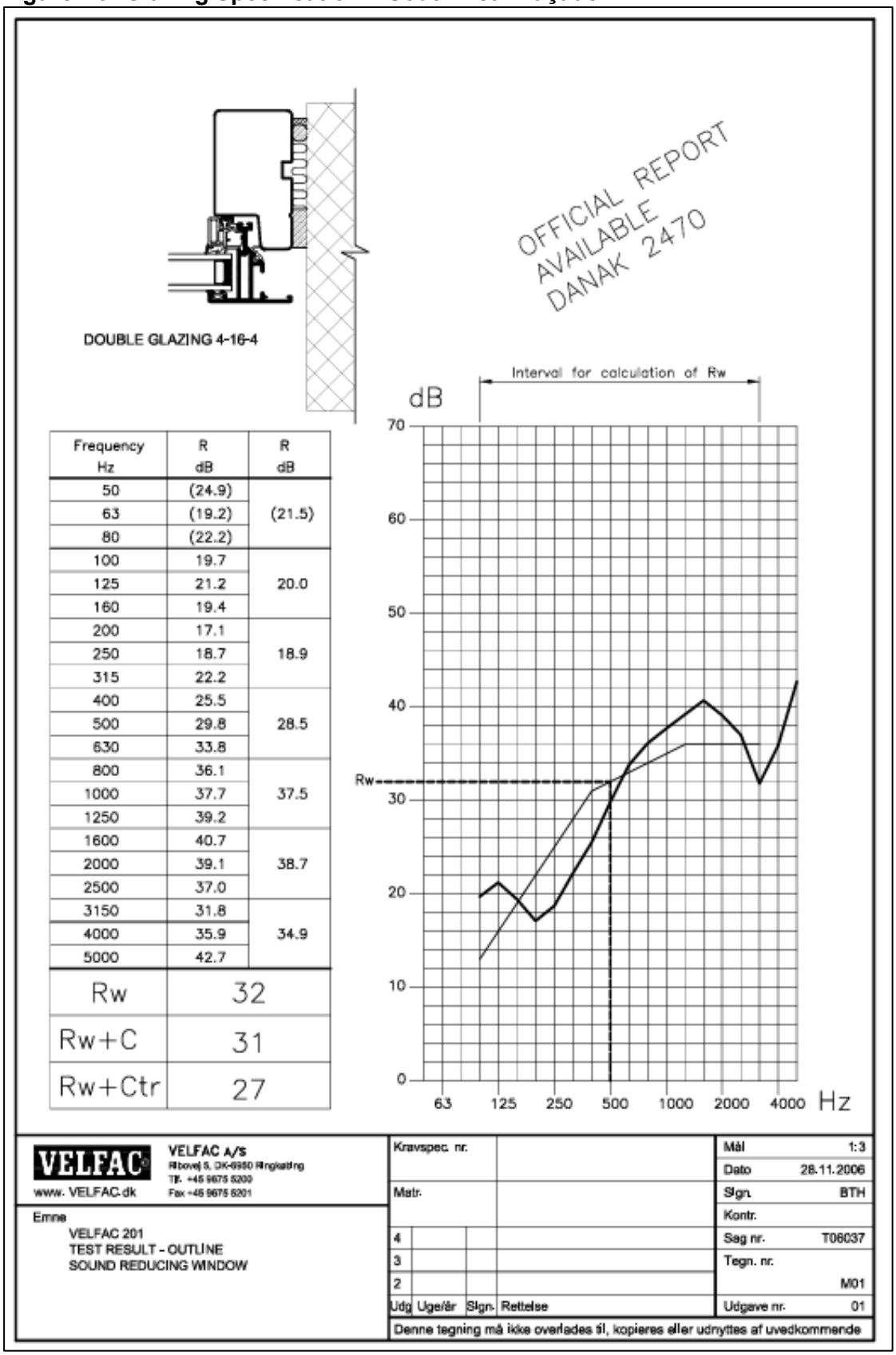
* indicates that the frequency is outside of our UKAS accreditation and is for information only

The legal validity of this report can only be claimed on presentation of the complete report

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Report Ref: Chilt/Z: 13032/01

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Figure A9: Glazing Specification – South/Rear Façade



Frequency Hz	R dB	R dB
50	(24.9)	(21.5)
63	(19.2)	
80	(22.2)	
100	19.7	20.0
125	21.2	
160	19.4	
200	17.1	18.9
250	18.7	
315	22.2	
400	25.5	28.5
500	29.8	
630	33.8	
800	36.1	37.5
1000	37.7	
1250	39.2	
1600	40.7	38.7
2000	39.1	
2500	37.0	
3150	31.8	34.9
4000	35.9	
5000	42.7	
Rw	32	
Rw+C	31	
Rw+Ctr	27	

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Emne
VELFAC 201
TEST RESULT - OUTLINE
SOUND REDUCING WINDOW

Kravspec. nr.				Mål	1:3
				Dato	28.11.2006
Matr.				Sign.	BTH
				Kontr.	
4				Sag nr.	T06037
3				Tegn. nr.	
2					M01
Udg	Uge/år	Sign.	Rettelse	Udgave nr.	01

Denne tegning må ikke overlades til, kopieres eller udnyttes af uvedkommende

Figure A10: Proposed MVHR System for Houses

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SAVE VTR 300/B L

Multiple control options to choose from
Item Number: 488827
Variant: Pleated Filters Standard kit

Filter kits:
246659 PF STD kit (F7/ePM1 60% supply and M5/ePM10 50% extract)
317696 PF OPT kit (accessory) (F8/ePM1 70% supply and M5/ePM10 50% extract)



Main features:
- **High energy-efficiency rotary heat exchanger with EC technology fans**
- **Demand control regulation with the built-in humidity sensor**
- **Moisture transfer function to minimize condensation in supply air during wintertime**
- **Multiple control options to choose from**
- **Connection board for easy access and connection of accessories**
- **Modbus communication RS-485 as standard**
- **DIBt, Passive House and Eurovent Certification**

SAVE VTR 200/B is designed for ventilated areas up to 240 m ^{2}. Left and right handed models are available.
SAVE VTR 300/B has white painted double skinned panels. The unit is equipped with a high efficiency variable speed rotating heat exchanger and a moisture transfer function that regulates the rotation speed of the rotor. Energy efficient fans with EC motors as well as low-pressure filters reduce the energy consumptions and ensures low SFP factor (Specific Fan Power) and sound level. The built-in humidity sensor in extract air can be used for demand control.

The unit can be operated in a variety of ways:
- SAVE LIGHT – control panel for basic functions such as airflow control, general alarm and filter change indication.
- SAVE TOUCH – control panel with touch screen and full access to all functions and settings. The home screen displays information such as airflow, temperature, air quality and active functions. You can select between MANUAL and AUTO mode or select preferred settings from the pre-configured user modes and much more.
- SAVE CONNECT – Home solutions by Systemair mobile application and Internet Access Module for wireless control of the SAVE unit. The mobile application mirrors functionality of SAVE TOUCH control panel and allows you to access all control functions on your smartphone.

Each control method is optional and have to be ordered separately as an accessory. The unit is prepared for control panel installation in the front door. The cable for external control panel installation is not included and has to be ordered separately.

Connection to an external cooker hood is available on the top of the unit. This makes the unit well suited for apartment buildings where the extract air from the cooker hood is challenging. The extract air from the cooker hood is by-passed, hence the heat exchanger is not exposed to extract air from the kitchen.
The unit comes with built-in electric reheater
External connection board that has prewired inputs and outputs allows easy installation and setup of external sensors as well as external heaters / coolers and other accessories.

Figure A11: Proposed MVHR Systems for Apartments

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SAVE VTR 250/B L 500W

Multiple control options to choose from
Item Number: 488825
Variant: Bag Filters Standard kit

Filter kits:
145923 BF STD kit (F7/ePM1 60% supply and M5/ePM10 55% extract)
145779 BF OPT kit 1 (accessory) (F8/ePM1 70% supply and M5/ePM10 55% extract)



Main features:
- **High energy-efficiency rotary heat exchanger with EC technology fans**
- **Demand control regulation with the built-in humidity sensor**
- **Moisture transfer function to minimize condensation in supply air during wintertime**
- **Multiple control options to choose from**
- **Connection board for easy access and connection of accessories**
- **Modbus communication RS-485 as standard**
- **DIBt, Passive House and Eurovent Certification**

SAVE VTR 250/B is adapted for ventilation of smaller houses and apartments with an area of 140 m². Left and right handed models are available.
SAVE VTR 250/B has white painted double skinned panels. The unit is equipped with a high efficiency variable speed rotating heat exchanger and a moisture transfer function that regulates the rotation speed of the rotor. Energy efficient fans with EC motors as well as low-pressure filters reduce the energy consumptions and ensures low SFP factor (Specific Fan Power) and sound level. The built-in humidity sensor in extract air can be used for demand control.

The unit can be operated in a variety of ways:
- SAVE LIGHT – control panel for basic functions such as airflow control, general alarm and filter change indication.
- SAVE TOUCH – control panel with touch screen and full access to all functions and settings. The home screen displays information such as airflow, temperature, air quality and active functions. You can select between MANUAL and AUTO mode or select preferred settings from the pre-configured user modes and much more.
- SAVE CONNECT – Home solutions by Systemair mobile application and Internet Access Module for wireless control of the SAVE unit. The mobile application mirrors functionality of SAVE TOUCH control panel and allows you to access all control functions on your smartphone.

Each control method is optional and have to be ordered separately as an accessory. The unit is prepared for control panel installation in the front door. The cable for external control panel installation is not included and has to be ordered separately.

Connection to an external cooker hood is available on the top of the unit. This makes the unit well suited for apartment buildings where the extract air from the cooker hood is challenging. The extract air from the cooker hood is by-passed, hence the heat exchanger is not exposed to extract air from the kitchen.
The unit comes with built-in electric reheater.
External connection board that has prewired inputs and outputs allows easy installation and setup of external sensors as well as for external heaters / coolers and other accessories.

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SAVE VTR 150/B L 500W

Multiple control options to choose from
Item Number: 488821
Variant: Pleated Filters Standard kit

Filter kits:
145777 PF STD kit (F7/ePM1 60% supply and M5/ePM10 50% extract)
145920 PF OPT kit 1 (accessory) (F8/ePM1 70% supply and M5/ePM10 50% extract)
153439 BF OPT kit 2 (accessory) (F7/ePM1 60% supply and M5/ePM10 55% extract)



Main features:
- **High energy-efficiency rotary heat exchanger with EC technology fans**
- **Demand control regulation with the built-in humidity sensor**
- **Moisture transfer function to minimize condensation in supply air during wintertime**
- **Multiple control options to choose from**
- **Connection board for easy access and connection of accessories**
- **Modbus communication RS-485 as standard**
- **Eurovent Certification**

SAVE VTR 150/B is adapted for ventilation of smaller houses and apartments with an area of 100 m². Left and right handed models are available. The unit can be installed in a kitchen cupboard or between cupboards and then covered with a custom furniture panel.
A duct from the cooker hood can be connected to a separate bypass duct on the unit, so the air from the cooker hood is led straight to the exhaust fan and not through the heat exchanger in the unit. Systemair offers several cooker hoods for a direct insertion into SAVE VTR 150/B and fast wiring to the connection box. The unit has a Cooker Hood function which can be activated via a cooker hood.
SAVE VTR 150/B has double-skinned fully insulated panels. The unit is equipped with a high efficiency variable speed rotating heat exchanger and a moisture transfer function that regulates the rotation speed of the rotor. Energy efficient fans with EC motors as well as low-pressure filters reduce the energy consumptions and ensures low SFP factor (Specific Fan Power) and sound level. The built-in humidity sensor in extract air can be used for demand control.

The unit can be operated in a variety of ways:
- SAVE LIGHT – control panel for basic functions such as airflow control, general alarm and filter change indication.
- SAVE TOUCH – control panel with touch screen and full access to all functions and settings. The home screen displays information such as airflow, temperature, air quality and active functions. You can select between MANUAL and AUTO mode or select preferred settings from the pre-configured user modes and much more.
- SAVE CONNECT – Home solutions by Systemair mobile application and Internet Access Module for wireless control of the SAVE unit. The mobile application mirrors functionality of SAVE TOUCH control panel and allows you to access all control functions on your smartphone.

Each control method is optional and have to be ordered separately as an accessory. 6 meter cable for the control panel is included with the unit.

The unit comes with built-in electric reheater.
External connection board that has prewired inputs and outputs allows easy installation and setup of external sensors as well as external heaters / coolers and other accessories.
Note: Continuous ventilation through the cooker hood is not allowed.