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Twyman House, Camden Road NW1 9LR
Discharge of Planning Conditions (Noise)

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Revision	Date	Notes	Author	Checked	Approved
Ver.3.0	22-05-13	E656A Planning Conditions Discharge - Noise	SP	ND	ND

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1 INTRODUCTION

1.1 Entran Ltd have been commissioned by Taylor Wimpey Limited to undertake a noise survey and assessment for the purposes of discharging a noise related conditions attached to the planning permission to redevelop Twyman House, Camden Road, London NW1 9LR for office/cafe and residential purposes. Principally, the conditions relate to existing transport related sources as well as potential noise from building services. Figure 1 shows the site in relation to the above noise sources.

1.2 The site is 0.86 acres in size and is located within central Camden Town, in the London Borough of Camden. The local area is predominantly residential with mixed-use retail with residential above and commercial buildings along Camden Road. The existing site on Twyman House comprises of a 6 storey office block fronting Camden Road with a lower ground level which is accessible from the rear of the building. The office block resembles typical construction techniques of the 1950's/1960's with a concrete encased steel structure, brick cladding, a flat roof and crittal type steel windows. The site has excellent public transport links and is located only a short distance from Camden Road overground train station.

1.3 The site benefits from an implementable planning permission under reference 2011/2072/P for redevelopment of the site with the erection of a part 4/7/8 storey building, including lower ground level, comprising 54 residential units (Use Class C3) (16 x one bed, 20 x two bed, 15 x three bed and 3 x four bed), 96 sqm of either retail/professional & financial services/cafe (Use Classes A1/A2/A3) at part lower ground floor level fronting canal and 111 sqm of retail/cafe use at part ground floor level fronting Camden Road, with associated hard and soft landscaping, cycle storage and 3 x disabled car parking bays off Bonny Street, following the conversion of Pulse House and demolition of Twyman House.

1.4 Previously (May 2012), Entran reported on the how the conditions attached to the planning permission could be discharged. The May 2012 report (relevant information is reproduced within this report) suggested window specifications to meet with the noise level criteria outlined in one of the noise related planning condition (condition 12, see below). Due to heat gain considerations, an application was made to LB Camden to relax the daytime noise level criteria by 5 dB and the night-time by 3 dB with relation to Condition 12. This application was granted (19 February 2013, 2012/5589/P) after evidence based discussions with the Council's Environmental Health Department (Mr H Bhatti). Subsequent to the April 2013 report, another Environmental Health Officer, Mr M Houska requested additional information on 13 May 2013. This report is therefore an update to Entran's pervious noise reports.

1.5 This Report is necessarily technical in nature and contains terminology relating to acoustics and noise. Therefore, a glossary together with a brief introduction to the subject of noise has been provided in Appendix A.

2 NOISE ASSESSMENT CRITERIA

Planning Condition - Noise

2.1 The London Borough of Camden Council have stipulated the following planning conditions (noise):

Condition 11

Noise levels at a point 1 metre external to sensitive facades shall be at least 5dB(A) less than the existing background measurement (LA90), expressed in dB(A) when all plant/equipment (or any part of it) is in operation unless the plant/equipment hereby permitted will have a noise that has a distinguishable, discrete continuous note (whine, hiss, screech, hum) and/or if there are distinct impulses (bangs, clicks, clatters, thumps), then the noise levels from that piece of plant/equipment at any sensitive façade shall be at least 10dB(A) below the LA90, expressed in dB(A).

Condition 12

Prior to commencement on the relevant part of the development hereby approved details of sound insulation and noise control measures shall be submitted to and approved in writing by the Local Planning Authority. The sound insulation and noise control measures shall achieve the following internal noise targets (in line with BS 8233:1999):

Bedrooms (23.00-07.00 hrs) 30 dB LAeq, and 45 dB Lmax (fast)
Living Rooms (07.00-23.00 hrs) 30 dB LAeq,
Kitchens, bathrooms, WC compartments and utility rooms
(07.00 –23.00 hrs) 45 dB LAeq

The sound insulation and noise control measures shall be carried out strictly in accordance with the details so approved and implemented prior to the first occupation of the development and shall be maintained as such thereafter.

Update for Condition 12

LB Camden (letter dated 19 February 2013)has formally granted the application to relax condition 12 and therefore the above noise levels relaxed by 5 dB during the day and 3 dB during the night.

Condition 13

Before any A1/A2/A3 use commences an acoustic report, prepared by a suitably qualified professional, detailing any plant with an external breakout and demonstrating how the Council's noise requirements (as set out in condition 10) will be met, shall be submitted to and approved by the Council in writing. The plant shall be provided with the necessary acoustic isolation and sound attenuation as recommended in the acoustic report and shall be maintained in accordance with the manufacturer's specifications. The acoustic isolation shall thereafter be maintained in effective order to the satisfaction of the Council

National Planning Policy

2.2 The National Planning Policy Framework (NPPF) published on March 27th 2012 sets out the Government's economic, environmental and social planning policies for England. It attempts to summarise in a single document all previous national planning policy advice. Taken together, these policies articulate the Government's vision of sustainable development, which should be interpreted and applied locally to meet local aspirations.

2.3 The NPPF sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

2.4 Under Section 11; Conserving and enhancing the natural environment, the following is stated:

> The planning system should contribute to and enhance the natural and local environment by:
>
> *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability*

2.5 The document goes on to state:

> *Planning policies and decisions should aim to:*

- avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;

- mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;

- recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and

- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason

2.6 As stated above, this document makes reference to avoiding noise generation from new developments that would adversely impact on health and quality of life. It effectively supersedes Planning Policy Guidance (PPG) 24, but does not set absolute criteria. As a result, the guidance and criteria in other relevant documents have been adopted, as a point of specific reference.

2.7 The guidance from the WHO (Vol. 2, Issue 1, 1995 and Guidelines for Community Noise, 1999) is that in order to avoid sleep disturbance the period noise level (L_{Aeq}) should not exceed 30 dB internally and individual noise events should not exceed 45 dB L_{Amax}.. Section 3.4 of the WHO Guidelines, states that for good sleeping conditions, indoor noise levels should not exceed approximately 45 dB L_{Amax} more than 10-15 times/night. In order to assess internal noise levels, WHO guidance suggests facade insulation levels of about 15 dB(A) where windows are partially open, and a reduction of 33 dB(A) (PPG24, Annex 6) for closed thermal double-glazing for road traffic.

2.8 The latest WHO guidelines (Night Noise Guidelines for Europe, 2009) are applicable to Member States of the European Region and represent an extension to, as well as an update of, the previous WHO Guidelines for Community Noise. Based on the scientific evidence on thresholds of night noise exposure indicated by $L_{night,outside}$ as defined in the Environmental Noise Directive (2002/49/EC), the latest WHO guidance recommends an $L_{night,outside}$ of 40 dB as a target for the night noise guideline (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the

elderly. An $L_{night,outside}$ value of 55 dB is recommended as an interim target for countries where the NNG cannot be achieved in the short term for various reasons, and where policy-makers choose to adopt a stepwise approach.

2.9 The $L_{night,outside}$ is the A-weighted long-term average sound level determined over all nights of the year, where the night is the 8-hour period between 2300-0700 hours. The target noise level excludes sound reflected from a building façade, therefore, a 3 dB façade correction must also be allowed in the case of measurements or predictions at building facades. The receptor height is typically 3.8 to 4.2m above ground level, i.e. as applicable first floor bedrooms, but in the case of areas with single storey dwellings a height of not less than 1 .5m is applicable.

2.10 BS 8233:1999 'Sound insulation and noise reduction for buildings - Code of Practice' similarly recommends a good design standard for bedrooms to be 30 dB L_{Aeq} or a reasonable standard to be 35 dB, and individual noise events should not normally exceed 45 dB L_{Amax} as a reasonable internal standard. The BS design criteria for living rooms are 40 dB L_{Aeq} as a reasonable standard and 30 dB L_{Aeq} as a good standard.

2.11 With respect to external noise levels, reference is made to WHO guidance that states "general daytime outdoor noise levels of less than 55 dB L_{Aeq} are desirable to prevent any significant community annoyance". Application of a similar limit to external garden areas used for amenity purposes would, therefore, prevent significant community annoyance due to rail noise. In this case, the level of 55 dB(A) is a free-field value, i.e. it does not include façade reflection factors.

2.12 However, in considering the application of an outdoor criterion of 55 dB L_{Aeq}, which is derived from the earlier World Health Organisation (WHO) guidance, it is important to take account of the feasibility of achieving such a level. A recent review of 'Health effect-based noise assessment methods: A review and feasibility study' (NPL Report CMAM 16, 1998) reported the following:

"Perhaps the main weaknesses of both WHO-inspired documents is that they fail to consider the practicality of actually being able to achieve any of the stated guideline values. ..... We know from the most recent national survey of noise exposure carried out in England and Wales (Sargent 93) that around 56% of the population are exposed to daytime noise levels exceeding 55 L_{Aeq}

and that around 65% are exposed to night-time noise levels exceeding 45 L_{Aeq} (as measured outside the house in each case). ..... The percentages exposed above the WHO guideline values could not be significantly reduced without drastic action to virtually eliminate road traffic noise and other forms of transportation noise (including public transport) from the vicinity of houses. The social and economic consequences of such action would be likely to be far greater than any environmental advantages of reducing the proportion of the population annoyed by noise. In addition, there is no evidence that anything other than a small minority of the population exposed at such noise levels find them to be particularly onerous in the context of their daily lives."

3 ENVIRONMENTAL NOISE MEASUREMENTS

3.1 Daytime and night-time sample noise levels were monitored on 16/17 April 2012. Statistical noise data was gathered on Camden Road and on Bonny Street as well as short samples on Camden Street. Further surveys were undertaken on a weekend period (early hours of Sunday Morning between 0000 and 0200 hrs), at the request of Mr Houska. Measurement locations for both surveys are shown on Figure 1.

3.2 The purpose of the noise monitoring was to provide sufficient acoustic information to undertake an assessment in accordance with WHO/BS8233, to determine the extents of the mitigation measures necessary to satisfy internal noise criteria. Both the noise surveys of April 2012 and May 2013 measured ambient noise levels form all sources (e.g. traffic, road hubbub, late night music, rail movements, building services noise, pedestrian noise etc).

3.3 All noise measurements were undertaken by an experienced consultant competent in environmental noise monitoring, and, in accordance with the principles of BS 7445: 2003: *Description and measurement of environmental noise*.

3.4 All acoustic measurement equipment used during the noise surveys conformed to Type 1 specification of British Standard 61672: 2003: *Electroacoustics. Sound level meters*. Part 1 *Specifications*. A full inventory of this equipment is shown in Table 1 below:

Table 3.1: Inventory of Acoustic Measurement Equipment

Item	Make & Model	Serial Number
Sound Level Meter	Larson Davis 824	1309
Preamplifier	PRM902	1812
Microphone	GRAS 40AE	28488
Calibrator	Larson Davis Cal200	3724
Sound Level Meter	Larson Davis 824	1419
Preamplifier	PRM902	2448
Microphone	GRAS 40AE	31817
Calibrator	Larson Davis Cal200	3723

3.5 The noise measurement equipment used during the surveys were calibrated at the start and end of the measurement period. All equipment has been calibrated by an accredited calibration laboratory within the two years preceding the measurements (calibration certificates are produced in Appendix B). No significant drift in calibration was found to have occurred on the sound level meter both during the survey as well as the calibration interval.

3.6 The microphone was positioned at a height of 1.7 m in a free-field location, i.e. excluding the effect of reflections from buildings or structures and on hard ground. Weather conditions during the survey period were suitable for environmental noise surveys.

3.7 The summary results of the noise survey are presented below (detailed surveys are presented in Appendix B) and the measurement locations are shown in Figure 1. Apart from transportation related sources, there were no other significant noise sources. It is noted that traffic noise dominates the ambient noise climate. This was confirmed by attended noise survey in May 2013; results are presented in Table 3.3. It is noted that the noise climate is dominated on Camden Road.

Table 3.2: Noise Measurement Results (April 2012)

Location	Time Period	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
		dB			
Location 1, Camden Road	Day	70.3	82.0	72.1	63.9
	Night	66.5	75.6	68.8	55.0
Location 2, Bonny Street	Day	66.5	78.4	68.8	56.8
	Night	57.7	77.9	58.4	49.8
Location 3, Camden Street	Day	70.3	86.3	73.9	61.5

Table 3.3: Noise Measurement Results (May 2013), Camden Road (Location 1)

Time	$L_{Aeq,T}$ dB	L_{Amax} dB	$L_{A10,T}$ dB	$L_{A90,T}$ dB	Observations
00:00:44	65.1	75.2	68.4	55.8	Traffic noise dominant; music from PH just perceptible between traffic events; minimum contribution to overall climate
00:10:44	68.9	80.2	73.3	59.0	Frequent buses; noise form other building services not perceptible; music perceptible in between traffic events or when traffic lights stop traffic; cars with loud radios; train on rail bridge just perceptible between traffic events; emergency Vehicle
00:20:44	65.3	72.7	69.3	52.9	Idling vehicles; pedestrians talking; music perceptible between traffic events; noise climate dominated by traffic noise

00:30:44	66.1	81.5	69.9	55.5	Increased number of taxis, buses; patrons leaving PH; music more perceptible with opening doors; noise climate dominated by traffic noise
00:40:44	62.8	78.0	63.9	54.5	Patrons leaving PH; traffic events; music perceptible in between traffic events; noise climate still dominated by road traffic noise
00:50:44	65.6	80.0	69.7	54.6	Patrons leaving PH; traffic events; music perceptible in between traffic events; noise climate still dominated by road traffic noise; other building services noise not perceptible; train event on bridge just perceptible over traffic
01:00:44	65.8	83.3	69.6	56.2	2 cars with loud radios; music stopped at 01.00 promptly; patrons leaving; noise climate dominated by road traffic noise, buses, taxis pick-up/drop-off
01:10:44	64.7	77.2	67.8	54.6	No music; pedestrians noise; buildings services still not perceptible; traffic noise from buses, taxis
01:20:44	64.4	78.1	65.6	52.5	No music; 2 drunken revellers walking from rail station; Camden Road still busy though traffic less intense
01:30:44	66.3	83.0	67.2	51.5	No Music; building services noise still not perceptible; traffic noise
01:40:44	63.9	78.8	65.6	50.5	No Music; building services noise still not perceptible; traffic noise
01:50:44	64.5	79.9	67.5	51.5	No Music; building services noise still not perceptible; traffic noise

3.8 As expected, the measured weekend noise levels in May 2013 are not significantly different to that measured in April 2012 (weekday). This is due, in the main, to the dominance of traffic noise on the overall noise climate. Music from the Grand Union Public House was perceptible in between traffic events especially when doors were opened for patron egress/ingress. However, such was the dominance of traffic noise; the music did not contribute significantly, if at all, to the overall noise climate. There were no other licensed premises in the immediate vicinity of Twyman House. It was noted that are existing residential premises adjacent to the public house and Twyman House.

3.9 It was not possible to directly measure music noise levels without contamination from other sources. However, very short $L_{Aeq,T}$ frequency samples (less than 10 seconds) were undertaken and presented below for completeness.

Table 3.4 Short Sample Octave Data

Frequency											Observations
16Hz	31.5Hz	63Hz	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz	8KHz	16KHz	
69.1	72.2	72.7	73.6	70.3	67.3	66.5	63	57.8	56.3	42.3	00:12; 8 second music sample, doors open
65.8	73.9	77.6	68.7	65.8	63.5	65.2	61.8	55.7	49.9	38.7	00:22; 5 second music sample; door shut
66.9	71	70.6	72	66.9	65.2	65.3	62.3	57.2	53.9	43.7	00:31; 10 second music sample
74.7	77.3	81.4	71.5	66	64.2	64.9	62.1	56.3	50	38.6	00:55; 5 second music sample plus bus
66.5	78.9	79.5	69.9	65.3	63.1	68.9	66.6	62	60.4	52.1	01:05; 10 second sample; patrons leaving
68	73.8	80.6	71.1	66	63.1	64.1	61.5	56.6	50.6	41.1	01:15; no music, light traffic

3.10 It is noted from the above that although there is a low frequency component to the music, it is not dissimilar to the traffic noise spectrum; the majority of the low frequency at the site is from diesel buses and taxis.

4 ASSESSMENT & DISCHARGE OF PLANNING CONDITIONS - NOISE

4.1 The noise measurement data gathered on and adjacent to the development site has been utilised to determine potential noise levels at the façade of the proposed development. The night-time $L_{Aeq,T}$ was measured at 65.5 dB during May 2013 survey and 66.6 dB during April 2012 survey. Noise levels from other building services was not perceptible at the application site nor any other noise source apart from that mentioned in Section 3 of this report. The higher measured data was processed using the computer model IMMI2012 and together with other pertinent site data such as the topography, existing or natural acoustical screens such as mounds/buildings etc, noise levels were computed across the development site.

4.2 The daytime and night-time noise levels on a floor by floor basis are presented in Table 4.1. Receptor locations are presented in Figure 2.

Table 4.1 External Façade Noise Levels

Receptor Point	Description	Facade	Floor	Day	Night
				$L_{Aeq,T}$ dB	
R1	Courtyard Block A	NE	Ground	54.8	45.5
		NE	First	54.8	45.6
		NE	Second	54.8	45.7
		NE	Third	54.9	45.8
		NE	Fourth	55.0	46.1
		NE	Fifth/Sixth	55.5	46.9
R2	Block B Facing Bonny St	NW	Ground	62.8	53.4
		NW	First	62.7	53.4
		NW	Second	62.5	53.2
		NW	Third	62.1	52.9
		NW	Fourth	61.7	52.6
		NW	Fifth/Sixth	61.4	52.5
R3	Block B Facing Camden Road	SE	Ground	73.0	69.8
		SE	First	72.9	69.7
		SE	Second	72.6	69.3
		SE	Third	72.1	68.8
		SE	Fourth	71.5	68.2
		SE	Fifth/Sixth	70.9	67.6
R4	Block B Facing Canal 11m from Camden Rd	SW	Ground	69.9	66.3
		SW	First	69.9	66.2
		SW	Second	69.7	66.0
		SW	Third	69.3	65.6
		SW	Fourth	68.9	65.2
		SW	Fifth/Sixth	68.5	64.7
R5	Block B Facing Canal 14m from Camden Rd	SW	Ground	68.6	64.7
		SW	First	68.5	64.6
		SW	Second	68.4	64.5
		SW	Third	68.2	64.2
		SW	Fourth	67.9	63.9

		SW	Fifth/Sixth	67.6	63.5
R6	Block B Facing Canal 20m from Camden Rd	SW	Ground	62.9	58.8
		SW	First	62.9	58.7
		SW	Second	62.8	58.6
		SW	Third	62.6	58.4
		SW	Fourth	62.4	58.2
		SW	Fifth/Sixth	62.2	57.9
R7	Block A facing Canal 30m from Camden Rd	South	Ground	62.9	61.8
		South	First	62.9	61.8
		South	Second	62.9	61.7
		South	Third	62.8	61.6
		South	Fourth	62.4	61.5
		South	Fifth/Sixth	62.3	61.3
R8	Block B Facing Courtyard (adjacent to Block A)	NE	Ground	56.4	47.1
		NE	First	56.4	47.1
		NE	Second	56.4	47.1
		NE	Third	56.3	47.2
		NE	Fourth	56.4	47.4
		NE	Fifth/Sixth	56.5	48.0
R9	Block B Facing Courtyard (adjacent to disabled Car park bays)	NE	Ground	60.7	51.4
		NE	First	60.7	51.3
		NE	Second	60.5	51.2
		NE	Third	60.3	50.9
		NE	Fourth	59.9	50.7
		NE	Fifth/Sixth	59.6	50.7

4.3 In its explanation of the noise limits that define the boundary between NEC B and NEC C, PPG24 states that: *'Because noise should be taken into account when determining planning applications in NEC B, it has been assumed that the minimum amelioration measure available to an occupant at night will be to close bedroom windows'.*

4.4 Therefore, in order to assess the acoustic performance of the proposed dwellings, it is appropriate in the first instance to explore the level of protection that will be afforded by the performance of the glazing elements.

4.5 Table 1 in Annex 6 of Planning Policy Guidance Note (PPG) 24: 1994: Planning and Noise, upon which PPG24 is broadly based, provides examples of typical noise reductions for a dwelling façade with windows. The table shows various levels of noise reduction provided by different glazing configurations and for different noise sources. The values shown are the level difference (in dBA) between the outside and the inside of a typical dwelling and to represent worst case, it is assumed that the outside level is a façade measurement.

4.6 For a road traffic noise spectrum (RTRA), PPG 24 states that standard thermal double glazing (e.g. 4mm glass, 4mm airgap, 4mm glass or similar mass) will provide a façade sound insulation performance of 33 dB(A).The daytime and night-time internal noise levels with closed windows on a floor by floor basis are presented in Table 4.2. It is noted that the measured music spectrum was not dissimilar to the measured traffic spectrum.

Table 4.2 Internal Noise Levels (thermal double glazed windows)

Receptor Point	Description	Facade	Floor	Day	Night
				$L_{Aeq,T}$ dB	
R1	Courtyard Block A	NE	Ground	21.8	12.5
		NE	First	21.8	12.6
		NE	Second	21.8	12.7
		NE	Third	21.9	12.8
		NE	Fourth	22.0	13.1
		NE	Fifth/Sixth	22.5	13.9
R2	Block B Facing Bonny St	NW	Ground	29.8	20.4
		NW	First	29.7	20.4
		NW	Second	29.5	20.2
		NW	Third	29.1	19.9
		NW	Fourth	28.7	19.6
		NW	Fifth/Sixth	28.4	19.5
R3	Block B Facing Camden Road	SE	Ground	40.0	36.8
		SE	First	39.9	36.7
		SE	Second	39.6	36.3
		SE	Third	39.1	35.8
		SE	Fourth	38.5	35.2
		SE	Fifth/Sixth	37.9	34.6
R4	Block B Facing Canal 11m from Camden Rd	SW	Ground	36.9	33.3
		SW	First	36.9	33.2
		SW	Second	36.7	33.0
		SW	Third	36.3	32.6
		SW	Fourth	35.9	32.2
		SW	Fifth/Sixth	35.5	31.7
R5	Block B Facing Canal 14m from Camden Rd	SW	Ground	35.6	31.7
		SW	First	35.5	31.6
		SW	Second	35.4	31.5
		SW	Third	35.2	31.2
		SW	Fourth	34.9	30.9
		SW	Fifth/Sixth	34.6	30.5
R6	Block B Facing Canal 20m from Camden Rd	SW	Ground	29.9	25.8
		SW	First	29.9	25.7
		SW	Second	29.8	25.6
		SW	Third	29.6	25.4
		SW	Fourth	29.4	25.2
		SW	Fifth/Sixth	29.2	24.9
R7	Block A facing Canal 30m from Camden Rd	South	Ground	29.9	28.8
		South	First	29.9	28.8
		South	Second	29.9	28.7
		South	Third	29.8	28.6
		South	Fourth	29.4	28.5

		South	Fifth/Sixth	29.3	28.3
R8	Block B Facing Courtyard (adjacent to Block A)	NE	Ground	23.4	14.1
		NE	First	23.4	14.1
		NE	Second	23.4	14.1
		NE	Third	23.3	14.2
		NE	Fourth	23.4	14.4
		NE	Fifth/Sixth	23.5	15.0
R9	Block B Facing Courtyard (adjacent to disabled Car park bays)	NE	Ground	27.7	18.4
		NE	First	27.7	18.3
		NE	Second	27.5	18.2
		NE	Third	27.3	17.9
		NE	Fourth	26.9	17.7
		NE	Fifth/Sixth	26.6	17.7

4.7 The above assessment indicates that mitigation measures in the form of closed thermal double windows will be sufficient for all façades bar Camden Road/partial SW Canal side facade to reduce internal noise levels to be within BS8233's 'good' criteria as well within Council's planning condition 12 (as amended). For the façade facing Camden Road and 10m of the façade facing the Canal (as measured from the Camden Road), acoustic windows will be necessary. In order to achieve the necessary attenuation for the Camden Road facade (an attenuation of 37 dB Rw), a typical window arrangement of 6/4/4 will be necessary (please note these arrangements are examples only, window suppliers may have their proprietary solutions as long as they meet with the attenuation figure of 37 dB Rw). Twyman House will benefit from 'whole house' ventilation and if necessary, windows can remain closed to keep out noise. Additional information on internal noise levels requested by Mr Bhatti (EHO, LB Camden is presented in Appendix C). The above calculated noise levels will apply to any space (e.g. living room, bedroom or bathroom) facing the noise sources (e.g. traffic noise, music, pedestrians/patrons etc) along Camden Road, Camden Street and Bonny Street.

4.8 If the above window arrange also apply for all bedrooms at night, then L_{Amax} levels will also be within the criteria outlined in Condition 12 (as amended, though the L_{Amax} criterion is unchanged from the original permission).

Façade & Internal Wall/floors

4.9 At the request Mr Houska, further assessment of the proposed sound insulation of walls and floors has been undertaken. The wall and floor types used for the proposed development are presented in Appendix D. The sound insulation of the proposed constructions has been calculated using the methodology outlined in BS EN 12354:2000

'Estimation of Acoustic Performance of Buildings from the performance of Elements (Parst1 & 2)' and the propriety software 'INSUL' (version 7). Summary results of the calculated sound insulation values are presented in Table 4.3 (acoustic representation details are presented in Appendix D).

Table 4.3 Summary Noise Insulation Calculations

Wall/Floor Type	Rw dB	$D_{nT,w}$ dB	C; Ctr
1 & 2	>80	>80	-5;-12
3	77	79	-7;-13
4	54	56	-3;-9
5	63	65	-1;-5
6	63	65	-1;-5
7	47	49	-4;-6
8	47	49	-1;-4
9	>80	>80	-3;-9
10	78	80	-2;-9
11_1	56	58	-2;-4
11_2	50	52	-4;-6
11_a	73	75	-1;-5
Floor Separating retail & residential use	>80	>80	-1;-7
Floor Separating retail & residential use (impact)	-	48 $L_{nT,w}$	-

4.10 All of the above constructions will meet with criteria outlined in the current Building Regulations (Approved Document E). Apart from the retail space use, all other aspects of the development are for residential use.

Retail Space

4.11 For the homogenous floor separating the retail space (whether it be retail use or café use), the airborne and impact sound insulation is designed to ensure the noise levels from the ground floor units do not transmit through to the residential aspects by providing a structurally massive 250mm concrete floor as well as an independent ceiling. Further, all perimeter gaps will be sealed with an acoustic sealant. Therefore, atypical noise levels of around 70 dB in the retail space will not exceed the target level of 30 dB in any residential space.

4.12 The glazing strategy presented above will also ensure that noise breakout from the retail space via glass or doors within the façade will not exceed the noise condition criteria (e.g. atypical noise breakout at 65 dB will still meet the day and night-time criteria).

4.13 Wall Type 4 will separate the retail units from the kitchens of the residential accommodation (other livings are designed to be well away from the retail units). Wall Type 4 will provide an attenuation of 56 dB Rw. With atypical noise levels of 70 dB in the retail space, noise levels in adjacent kitchen areas will be less than 30 dB.

Lift Noise

4.14 The lift shaft adjacent to any living space will consist of 2 layers of sound bloc, cavity, mineral fibre wool and a 150mm concrete shear wall (Wall type 5). This will provide an attenuation of 63 dB Rw.

4.15 The lift (Orona 3G1015) is a machine-room-less-gearless (MRL) model. The lift speed will be 1 m/s. The lift car wall will be constructed form sheet steel panels and manufactured to eliminate vibration/drumming during lift operation. The measured maximum noise level of the lift operation within the lift shaft will be 90 dB L_{Amax} and 80 dB $L_{Aeq,T}$. This will ensure that noise levels within the living spaces of the residential accommodation will not exceed a target level of 35 dB L_{Amax} and 20 dB $L_{Aeq,T}$.

4.16 In terms of vibration, the lift operation will not exceed $0.1m/s^{1.75}$ (Vibration Dose Value, BS6472:2008 'Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting)'.

4.17 In order to achieve the above, the following standard design measures will be adopted:

- All mechanical items likely to transmit significant levels of vibration into the building structure shall be mounted on vibration isolating mountings.

- Lift guide rails shall be continuously welded, accurately machined and aligned for verticality and parallelness, so as to give a smooth flat bearing surface throughout their length. Lift guide rails shall not be fixed to walls of apartments.

- Air pressure relief ducts from the lift shaft shall not be ducted through the spaces adjacent to residential accommodation.

Internal Mechanical Ventilation

4.18 The internal ventilation strategy to the residential aspects of the development has been designed by Ingleton Wood LLP. The ventilation strategy will incorporate low-speed Titon HRV1.75 or similar units with suitably designed ductwork (no breakout) and balance air velocities. Their design has been designed to meet with the current Building Regulations and noise levels to be within recommended noise levels for domestic buildings (typically, NR25 in bedrooms, NR30 in living rooms/kitchens and NR40 in bathrooms/lobbies).

4.19 By way of an example, ventilation related noise levels in a typical bedroom are shown in Table 4.4.

Table 4.4. Typical Bedroom Ventilation Noise

ITEM		Details				OCTAVE BANDS					
				63	125	250	500	1K	2K	4K	8K
FAN SWL (manufacturer)	**HRV1.75**			**19**	**19**	**18**	**26**	**19**	**14**	**18**	**22**
		size	length								
duct losses	**Rect/circ**	mm	m								
D1	c	110	5	3	3	2	2	2	2	2	2
		size	No.								
bends	**Rect/circ**	mm	off								
B1	c	110	1					1	2	3	3
Branches		Ratio									
		0									
Transitions		Area 1	Area 2								
Other losses 1			(optional)								
Other losses 2			(optional)								
Outlet size:	Rect/circ	B (or dia)	W								
B x H (mm)	c	110									
End reflection		95.0332	cm^2	19	15	10	6	2			
Total losses				22	18	12	7	5	4	5	5
		SWL leaving		-3	1	6	19	14	11	14	18
DIRECT											
Air to outlet				0	0	0	0	0	0	0	0
Distance		1.5	m	-15	-15	-15	-15	-15	-15	-15	-15

Directivity		1	type	9	9	9	9	9	9	9	9
Total direct				-6	-6	-6	-6	-6	-6	-6	-6
		Direct SPL		-9	-4	1	13	9	5	8	12
REVERBERANT											
Room : W x L		5.7	2.7								
x H		2.2	m								
Room volume		33.858	m^3	-1	-1	-1	-1	-1	-1	-1	-1
Air to room				0	0	0	0	0	0	0	0
Rev time		0.45	secs	-3	-3	-3	-3	-3	-3	-3	-3
Total reverberant				-5	-5	-5	-5	-5	-5	-5	-5
		Reverberant SPL		-8	-4	1	14	10	6	9	13
		COMBINED SPL		**-5**	**-1**	**4**	**17**	**12**	**8**	**11**	**15**
CRITERION											
input the		**NC**	**or NR**								
appropriate level :			**25**	55	44	35	29	25	22	20	18
		REQUIRED I.L.		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Breakout (manufacturer)				14	14	20	30	21	17	19	23
Breakout at 1.5m				**3**	**3**	**9**	**19**	**10**	**6**	**8**	**12**
Ceiling Attenuation SRI (no ceiling for worst-case assumption)				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Combined Reverberant & Direct SPL		**24 dB(A)**									

4.20 As can be seen from Table 4.4, a worst-case (without ceiling attenuation) resultant noise level from ventilation units will be less than NR25. Given that the glazing attenuation will be 37 dB facing Camden Road/Grand Canal and 33 dB elsewhere, cumulative internal noise levels are likely to remain below 30 dB in bedrooms.

Building Services Noise – Plant Room

4.21 The proposed development will have items of mechanical services plant at the lower ground level facing Camden Road or the Bonny Street façade. Conditions 11/13 of the planning permission states that noise from mechanical services must be at least 10 dB below the $L_{A90,T}$ if the plant contains either a distinguishable discrete note (whine, hiss, screech, hum) or an intermittent noise signature (bangs, clicks, clatters, thumps).

4.22 On worst-case basis, noise from mechanical plant should be designed to be 10 dB below the $L_{A90,T}$. The measurement survey indicates that the lowest background is 51 dB $L_{A90,T}$ on Camden Road and 49 dB $L_{A90,T}$ on Bonny Street.

4.23 Further details on the plant room have emerged since the production of pervious reports. The plant room next to the substation has been designed as 200mm thick RC walls with 50mm cavity and 102.5mm face brick external leaf and 300mm thick RC slab over with landscape and paving slabs over. Such Walls will give an attenuation of at least 80 dB Rw. Therefore the plant louvre will be weakest link in the façade at 37 dB Rw.

4.24 The plant room will contain four Potterton Paramount Three 115 condensing boilers in addition to two Baxi Senertec condensing CHP units. The boilers and ancillary units are rated at 60 dB(A) at 1m (each) and the CHP units and ancillary equipment at 45 dB(A) at 1m (each). The reverberant sound pressure in the plant room has therefore been calculated at 72 dB(A) (including directivity corrections). As the louvre will be the weakest link in the plant room façade (less than $3m^2$), the external noise level at 1m from the louvre is expected to be less than 35 dB(A). Allowing for a tonal penalty of 5 dB (without corrections for residual noise) will result in a rating level of 40 dB(A). Therefore noise levels from the plant will below the criteria set out in condition 11/13 as measured at the nearest proposed dwelling. It also follows that if the nearest proposed dwelling will be within the criteria then all existing neighbouring dwellings, which are much further away, will be within the criteria.

5 CONCLUSIONS

5.1 Ambient noise levels adjacent to the development site known as the Twyman House, Camden Road NW1 9LR have been measured and assessed in order to discharge planning conditions attached to the planning permission.

5.2 The noise assessment indicates that mitigation measures in the form of closed thermal double windows (**4mm-4mm-4mm**) will be sufficient for all façades bar Camden Road/partial SW Canal side facade to reduce internal noise levels to be within BS8233's 'good' criteria as well within Council's planning **Condition 12 (as amended)**. For the façade facing Camden Road and 10m of the façade facing the Canal (as measured from the Camden Road), acoustic windows will be necessary. In order to achieve the necessary attenuation for the Camden Road facade (an attenuation of 37 dB Rw), a typical window arrangement of **6/4/4 mm** will be necessary to discharge *condition 12 (as amended)*. If the above window arrange also apply for all bedrooms at night, then L_{Amax} levels will also be within the criteria outlined in **Condition 12 (as amended)**. Twyman House will benefit from 'whole house' ventilation and if necessary, windows can remain closed to keep out noise. This type of glazing will also ensure that other ambient noise sources (e.g. music from licensed premises) will be within the criteria outlined in Condition 12.

5.3 The proposed construction of the façades, walls and the floor separating the retail unit from residential accommodation has been calculated. The calculations show that the level of attenuation afforded by the proposed constructions are sufficient for the purposes of the criteria outlined in Condition 12.

5.4 An assessment of the internal mechanical plant noise shows that the cumulative noise levels from ambient noise sources will be within the criteria outlined in Condition 12.

5.5 The proposed development will have items of mechanical services plant in the plant room. Conditions 11/13 of the planning permission states that noise from mechanical services must be at least 10 dB below the $L_{A90,T}$ if the plant contains either a distinguishable discrete note (whine, hiss, screech, hum) or an intermittent noise signature (bangs, clicks, clatters, thumps). The assessment of the plant noise shows that noise rating levels will be below the criatria set out in Conditions 11/13 at the nearest proposed dwellings as well as at the nearest existing dwelling.

Figure 1 Noise Monitoring Locations

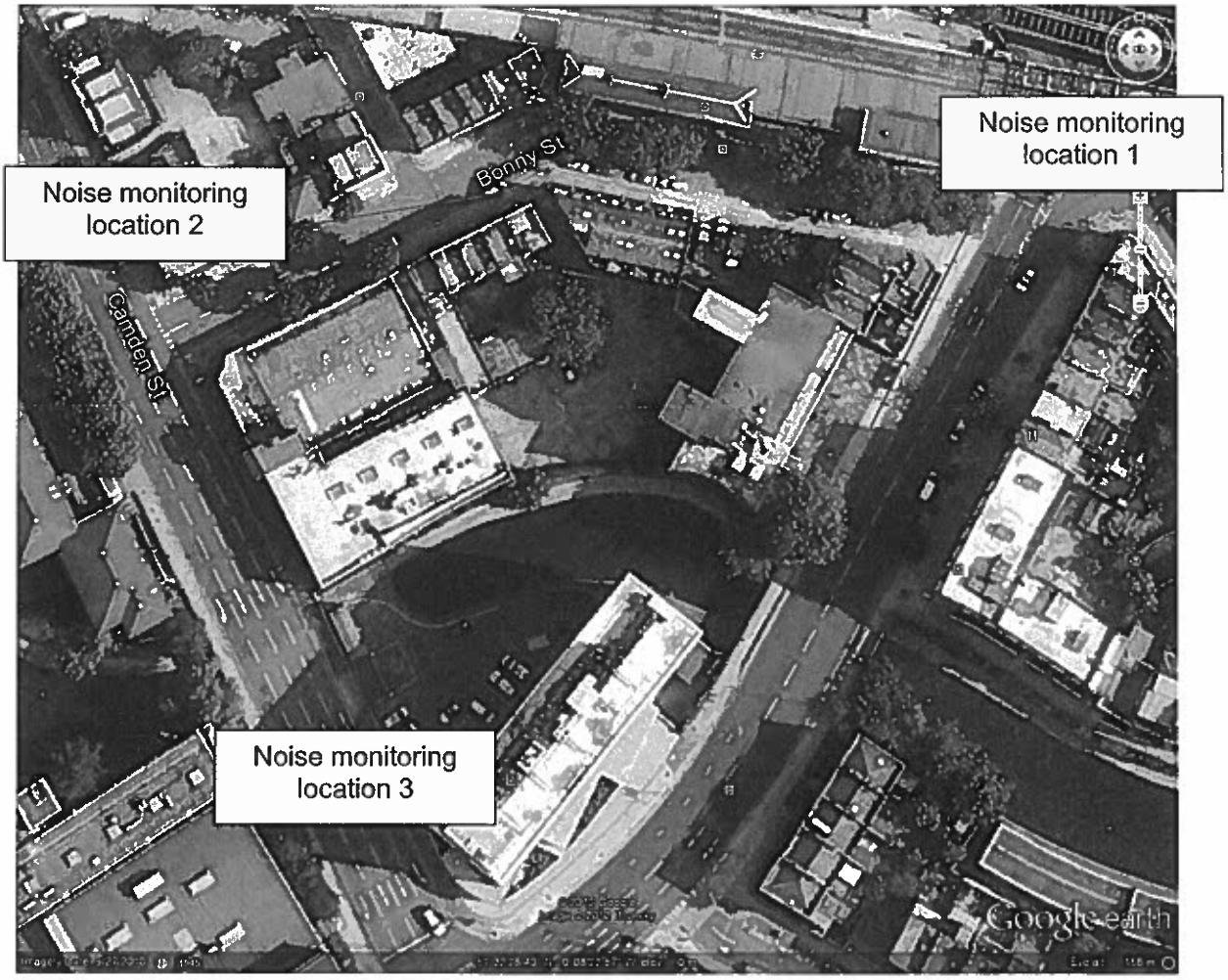
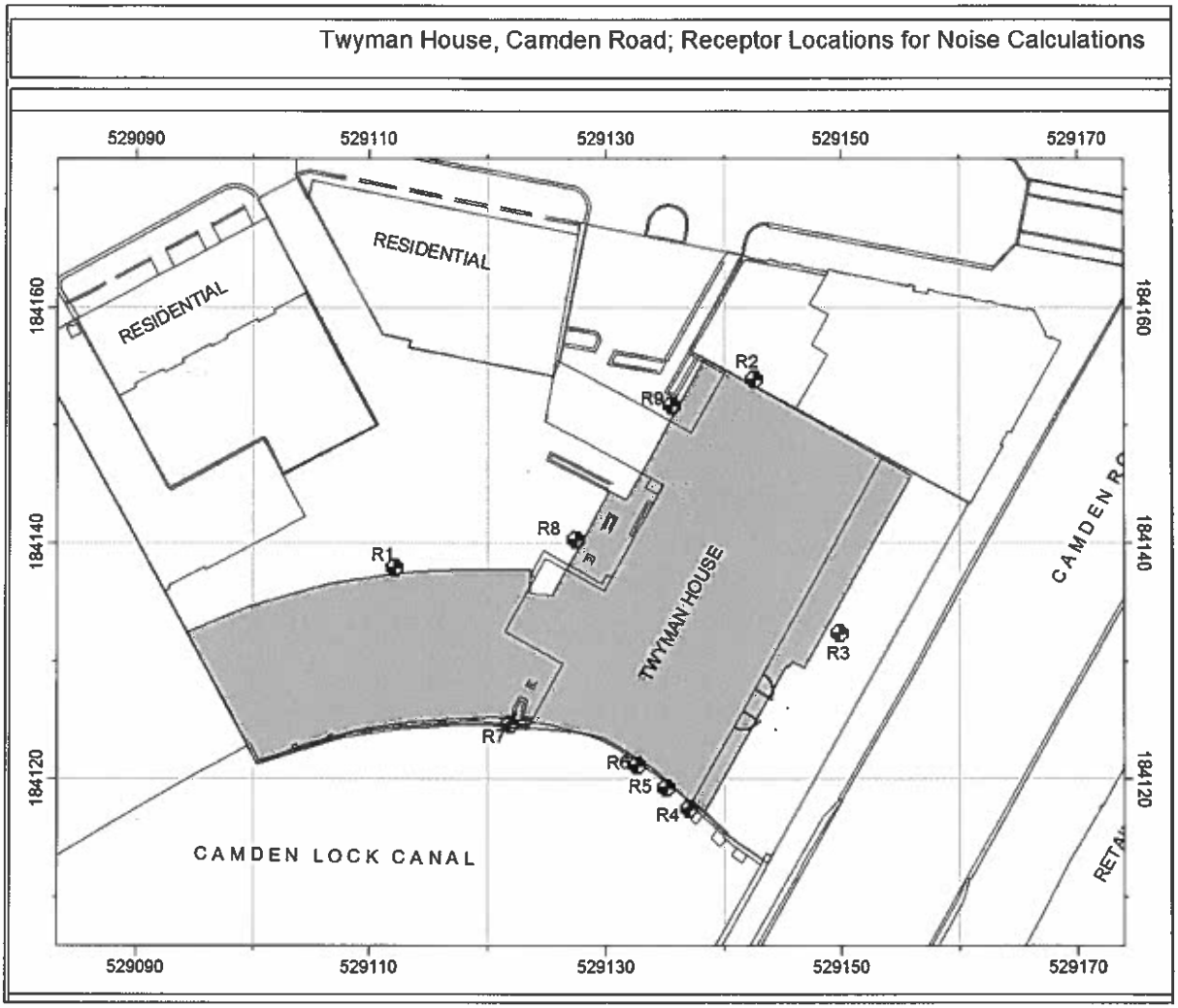


Figure 2 Receptor Locations for Noise Calculations



APPENDIX A – INTRODUCTION TO NOISE

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB.

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs. For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest.

In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}. This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 5 minutes during the night. The noise levels are commonly symbolised as $_{A90(1hour)}$ and $L_{A90(5mins)}$. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

Table A1: Glossary of Terms

Term	Definition
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Residual Noise Level	The ambient noise remaining at a given position in a given situation when specified sources are suppressed to a degree such that they do not contribute to the ambient noise level ($L_{Aeq,T}$)
Specific Noise Level	The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source (the noise source under investigation) over a given time interval ($L_{Aeq,T}$)
Rating Noise Level	The specific noise level plus any adjustment for the characteristic features of the noise ($L_{Ar,Tr}$).

APPENDIX B – NOISE SURVEY & EQUIPMENT DETAILS

Calibration Certificates

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 30 June 2010 CERTIFICATE NUMBER: **129560**

BS EN ISO 9001:2000 APPROVED BY LRQA

CERT No 953910

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Approved Signatory

P.K.Clark
M.A.Frost
R.J.Wade

Customer	**VANGUARDIA LIMITED**
Order No	**408**
Equipment Description	**PRECISION ACOUSTIC CALIBRATOR**
Manufacturer	**LARSON DAVIS**
Model	**CAL200**
Serial No	**3723**
Ident No	**SPL A**
Date Of Calibration	**30 JUNE 2010**

INSTRUMENT CONDITION

Adjustments were not required to return the instrument to a calibrated condition.

Repairs were not carried out.

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22°C ± 3°C and 45% ± 15% RH.

STABILITY

The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
All reference instruments are traceable to recognised National Standards.
The attached results are a true record of the levels required to return the instrument to the original stated manufacturer's specification and accuracy where known.

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 30 June 2010 CERTIFICATE NUMBER: **129561**

BS EN ISO 9001:2000 APPROVED BY LRQA

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Customer	**VANGUARDIA LIMITED**
Order No	**408**
Equipment Description	**PRECISION ACOUSTIC CALIBRATOR**
Manufacturer	**LARSON DAVIS**
Model	**CAL200**
Serial No	**3724**
Ident No	**SPL A**
Date Of Calibration	**30 JUNE 2010**

INSTRUMENT CONDITION

Adjustments were not required to return the instrument to a calibrated condition.

Repairs were not carried out.

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22ºC ± 3ºC and 45% ± 15% RH.

STABILITY

The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
All reference instruments are traceable to recognised National Standards.
The attached results are a true record of the levels required to return the instrument to the original stated manufacturer's specification and accuracy where known.

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 30 June 2010 CERTIFICATE NUMBER: **129563**

BS EN ISO 9001:2000 APPROVED BY **LRQA**

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Customer	**VANGUARDIA LIMITED**
Order No	**408**
Equipment Description	**SOUND LEVEL METER**
Manufacturer	**LARSON DAVIS**
Model	**824**
Serial No	**824A1309**
Ident No	**THREE**
Date Of Calibration	**30 JUNE 2010**

INSTRUMENT CONDITION

Adjustments were not required to return the instrument to a calibrated condition.

Repairs were not carried out.

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22°C ± 3°C and 45% ± 15% RH.

STABILITY

The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
All reference instruments are traceable to recognised National Standards.
The attached results are a true record of the levels required to return the instrument to the original stated manufacturer's specification and accuracy where known.

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 30 June 2010 CERTIFICATE NUMBER: **129557**

BS EN ISO 9001:2000 APPROVED BY **LRQA**

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Customer	**VANGUARDIA LIMITED**
Order No	**408**
Equipment Description	**SOUND LEVEL METER**
Manufacturer	**LARSON DAVIS**
Model	**824**
Serial No	**824A1419**
Ident No	**SPL A**
Date Of Calibration	**30 JUNE 2010**

INSTRUMENT CONDITION

Adjustments were not required to return the instrument to a calibrated condition.

Repairs were not carried out.

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22°C ± 3°C and 45% ± 15% RH.

STABILITY

The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
All reference instruments are traceable to recognised National Standards.
The attached results are a true record of the levels required to return the instrument to the original stated manufacturer's specification and accuracy where known.

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 28 May 2012 CERTIFICATE NUMBER: **138016**

BS EN ISO 9001:2008 APPROVED BY **LRQA**

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Electronically Authorised Document

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Customer	**VANGUARDIA CONSULTING**
Order No	**CLAIRE DERBYSHIRE**
Equipment Description	**PRECISION ACOUSTIC CALIBRATOR**
Manufacturer	**LARSON DAVIS**
Model	**CAL200**
Serial No	**3724**
Ident No	**SPL A**
Date Of Calibration	**25 MAY 2012**

INSTRUMENT CONDITION

Adjustments Made	**NO**
Repairs Made	**NO**

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22°C ± 3°C and 45% ± 15% RH.

STABILITY

The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
All reference instruments are traceable to recognised National Standards.
The attached results are a true record of the levels required to return the instrument to the original stated manufacturer's specification and accuracy where known.

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 28 May 2012 CERTIFICATE NUMBER: **138018**

BS EN ISO 9001:2008 APPROVED BY **LRQA**

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Customer	**VANGUARDIA CONSULTING**
Order No	**CLAIRE DERBYSHIRE**
Equipment Description	**PRECISION ACOUSTIC CALIBRATOR**
Manufacturer	**LARSON DAVIS**
Model	**CAL200**
Serial No	**3723**
Ident No	**SPL A**
Date Of Calibration	**25 MAY 2012**

INSTRUMENT CONDITION

Adjustments Made	**NO**
Repairs Made	**NO**

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22ºC ± 3ºC and 45% ± 15% RH.

STABILITY

The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
All reference instruments are traceable to recognised National Standards.
The attached results are a true record of the levels required to return the instrument to the original stated manufacturer's specification and accuracy where known.

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 26 July 2012 CERTIFICATE NUMBER: **138826**

BS EN ISO 9001:2008 APPROVED BY **LRQA**

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Electronically Authorised Document

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Customer	**SPL ACOUSTICS LTD**
Order No	**RAPO-0050**
Equipment Description	**SOUND LEVEL METER**
Manufacturer	**LARSON DAVIS**
Model	**824**
Serial No	**824A1419**
Ident No	**SPL A**
Date Of Calibration	**26 JULY 2012**

INSTRUMENT CONDITION

Adjustments Made	**NO**
Repairs Made	**NO**

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22°C ± 3°C and 45% ± 15% RH.

STABILITY

The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
All reference instruments are traceable to recognised National Standards.
The attached results are a true record of the levels required to return the instrument to the original stated manufacturer's specification and accuracy where known.

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 28 May 2012 CERTIFICATE NUMBER: **138015**

BS EN ISO 9001:2008 APPROVED BY **LRQA**

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Electronically Authorised Document

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R.J.Wade

Customer	**VANGUARDIA CONSULTING**
Order No	**CLAIRE DERBYSHIRE**
Equipment Description	**SOUND LEVEL METER**
Manufacturer	**LARSON DAVIS**
Model	**824**
Serial No	**824A1309**
Ident No	**THREE**
Date Of Calibration	**25 MAY 2012**

INSTRUMENT CONDITION

Adjustments Made	**NO**
Repairs Made	**NO**

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22°C ± 3°C and 45% ± 15% RH.

STABILITY

The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
All reference instruments are traceable to recognised National Standards.
The attached results are a true record of the levels required to return the instrument to the original stated manufacturer's specification and accuracy where known.

Location 1 Camden Road

Date	Time	LAeq	LAmax	LA10	LA90
16 April 12	07:00:00	68.1	77.6	70.6	64.2
16 April 12	08:00:00	67.3	74.6	69.6	63.8
16 April 12	09:00:00	70.2	85.3	72.5	65.7
16 April 12	10:00:00	70.7	83.5	72.5	66.2
16 April 12	11:00:00	70.8	81.6	72.7	65.3
16 April 12	12:00:00	71.2	78.3	72.9	64.5
16 April 12	13:00:00	71.5	88.5	73.2	66.5
16 April 12	14:00:00	71.2	78.3	73.0	63.6
16 April 12	15:00:00	71.2	85.4	73.0	63.5
16 April 12	16:00:00	71.2	79.2	72.9	62.5
16 April 12	17:00:00	70.2	82.7	72.3	66.7
16 April 12	18:00:00	71.2	81.5	72.8	63.5
16 April 12	19:00:00	70.6	86.5	72.3	63.5
16 April 12	20:00:00	69.7	87.0	71.7	62.4
16 April 12	21:00:00	68.9	79.6	71.1	60.5
16 April 12	22:00:00	68.0	82.1	70.5	59.5
16 April 12	23:00:00	66.9	75.0	69.5	57.5
17 April 12	00:00:00	65.9	74.3	68.9	54.5
17 April 12	01:00:00	64.5	76.7	67.8	52.2
17 April 12	02:00:00	63.6	74.0	67.2	53.6
17 April 12	03:00:00	64.0	76.7	67.4	50.5
17 April 12	04:00:00	64.7	74.4	67.7	53.2
17 April 12	05:00:00	67.5	75.7	70.1	58.1
17 April 12	06:00:00	70.3	77.7	72.0	60.5

Location 2 Bonny Street

Date	Time	LAeq	LAmax	LA10	LA90
16 April 12	07:00:00	64.7	80.4	67.8	55.6
16 April 12	08:00:00	66.6	81.2	69.7	57.6
16 April 12	09:00:00	67.7	80.8	70.8	59.0
16 April 12	10:00:00	67.6	79.8	71.2	59.7
16 April 12	11:00:00	67.9	76.5	71.4	59.6
16 April 12	12:00:00	67.5	78.5	70.9	59.5
16 April 12	13:00:00	67.8	80.2	71.1	58.6
16 April 12	14:00:00	65.8	80.9	69.1	56.5
16 April 12	15:00:00	65.5	77.7	68.8	56.8
16 April 12	16:00:00	64.9	76.5	68.2	56.6
16 April 12	17:00:00	65.1	80.1	68.4	57.8
16 April 12	18:00:00	71.3	79.8	72.5	58.6
16 April 12	19:00:00	64.5	75.6	67.5	55.8
16 April 12	20:00:00	62.2	74.6	65.4	53.5
16 April 12	21:00:00	60.5	74.6	63.8	52.4
16 April 12	22:00:00	60.3	76.6	64.2	50.9
16 April 12	23:00:00	58.8	78.7	62.3	50.2
17 April 12	00:00:00	57.6	79.4	60.2	49.3
17 April 12	01:00:00	55.7	74.5	56.6	48.9
17 April 12	02:00:00	54.3	77.8	54.9	49.2
17 April 12	03:00:00	54.1	74.6	53.8	49.1
17 April 12	04:00:00	53.5	75.6	53.9	49.3
17 April 12	05:00:00	58.8	80.0	60.8	50.1

17 April 12	06:00:00	61.9	82.3	65.1	51.9

Location 3 Camden Street

Date	Time	LAeq	LAmax	LA10	LA90
16 April 12	1100	70.3	82.5	73.6	60.5
16 April 12	1200	71.3	86.7	73.9	62.6
16 April 12	1300	70.1	89.2	74.2	62.1
16 April 12	1500	69.8	85.4	73.9	60.5
16 April 12	1600	69.6	87.6	74.1	61.7

APPENDIX C – ADDITIONAL INFORMATION REQUESTED BY MR BHATTI (EHO, LB CAMDEN)

entran environmental & transportation

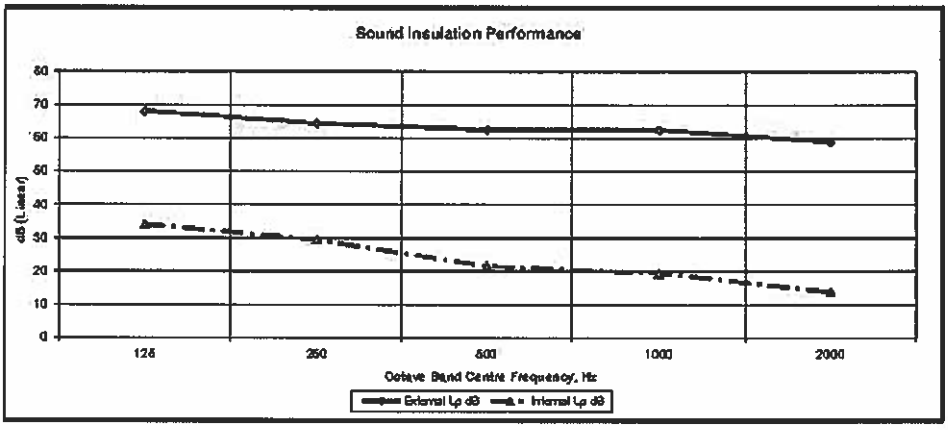
Reference: E656/BS8233-01

Project	Twyman House	Date	22-Jan-2013
Façade	SW Canal Façade	By	SP
Room	Gnd Floor (See Entran Noise Report)	Checked	ND

Night-time

Symbol	Description	Ref	Units	Single
S_T	Total façade area of room		m^2	10.8
S_{wi}	Area of windows in façade		m^2	5.5
S_{ew}	Area of external wall in façade		m^2	5.3
S_R	Area of ceiling exposed to external noise		m^2	0.0
S	Total area of elements through which sound enters room		m^2	10.8
A_0	Reference absorption area given in BS EN 20140-10		m^2	0.0
	A-weighted free-field equivilent sound pressure level at measurement position		dB	66.3
	Total propogation and angle of view correction from measurement to façade		dB	0.0
$L_{A,eff}$	A-weighted free-field equivilent sound pressure level outside façade		dB	66.3
$L_{12.5HzC}$	Normalised road traffic noise spectrum derived from BS1793-3		dB	
$L_{lin,ff}$	Linear free-field equivilent sound pressure level outside façade		dB	71.6
R_{wi}	Sound reduction index of windows	39	dB	
R_{ew}	Sound reduction index of the external wall	5	dB	
R_R	Sound reduction index of the roof/ceiling		dB	
α	Room average alpha co-efficients (acoustically soft furnished room)		-	
S_{room}	Room surface area		m2	
A	Equivilent absorption area of room		m^2	
$L_{lin,i}$	Linear internal reverberant sound pressure level in room		dB	35.7
	A-weighting Network			
$L_{A,i}$	A-weighted internal reverberant sound pressure level in room		dB(A)	25.7
	Internal Criteria		dB(A)	30.0
	Excess over criteria		dB(A)	-4.3

Octave Band Centre Frequency, Hz				
125	250	500	1000	2000
2	-2	-4	-4	-7
68	65	63	63	59
28	29	35	37	39
41	44	48	55	55
0	0	0	0	0
0.50	0.50	0.50	0.50	0.50
92	92	92	92	92
46	46	46	46	46
34	30	22	20	14
-16	-9	-3	0	1
18	21	19	20	15



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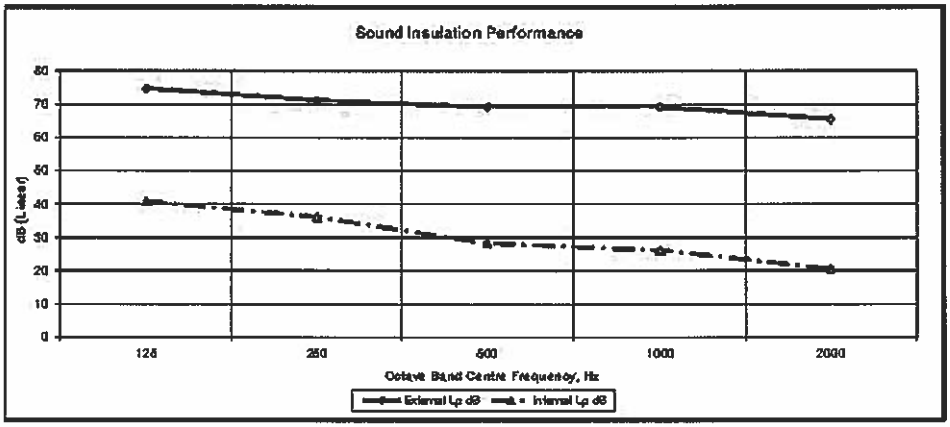
environmental & transportation

Reference: B656/BS8233-01

Project	Twyman House	Date	22-Jan-2013
Façade	SE Camben Rd Façade	By	SP
Room	Gnd Floor (See Entran Noise Report)	Checked	ND

Daytime

Symbol	Description	Ref	Units	Single	Octave Band Centre Frequency, Hz				
					125	250	500	1000	2000
S_f	Total façade area of room		m^2	10.8					
S_{wi}	Area of windows in façade		m^2	5.5					
S_{ew}	Area of external wall in façade		m^2	5.3					
S_R	Area of ceiling exposed to external noise		m^2	0.0					
S	Total area of elements through which sound enters room		m^2	10.8					
A_0	Reference absorption area given in BS EN 20140-10		m^2	0.0					
	A-weighted free-field equivilent sound pressure level at measurement position		dB	73.0					
	Total propogation and angle of view correction from measurement to façade		dB	0.0					
$L_{eq,ff}$	A-weighted free-field equivilent sound pressure level outside façade		dB	73.0	125	250	500	1000	2000
$L_{TRAFFIC}$	Normalised road traffic noise spectrum derived from BS1793-3		dB		2	-2	-4	-4	-7
$L_{eq,ff}$	Linear free-field equivilent sound pressure level outside façade		dB	78.1	75	71	69	69	66
R_{wi}	Sound reduction index of windows	59	dB		28	29	35	37	39
R_{ew}	Sound reduction index of the external wall	5	dB		41	44	48	55	55
R_R	Sound reduction index of the roof/ceiling		dB		0	0	0	0	0
a	Room average alpha co-efficients (acoustically soft furnished room)		-		0.50	0.50	0.50	0.50	0.50
S_{room}	Room surface area		m2		92	92	92	92	92
A	Equivilent absorption area of room		m^2		46	46	46	46	46
$L_{eq,i}$	Linear Internal reverberant sound pressure level in room		dB	42.4	41	36	28	26	21
	A-weighting Network				-16	-9	-3	0	1
$L_{eq,i}$	A-weighted internal reverberant sound pressure level in room		dB(A)	22.4	25	27	25	26	22
	Internal Criteria		dB(A)	35.0					
	Excess over criteria		dB(A)	-2.6					



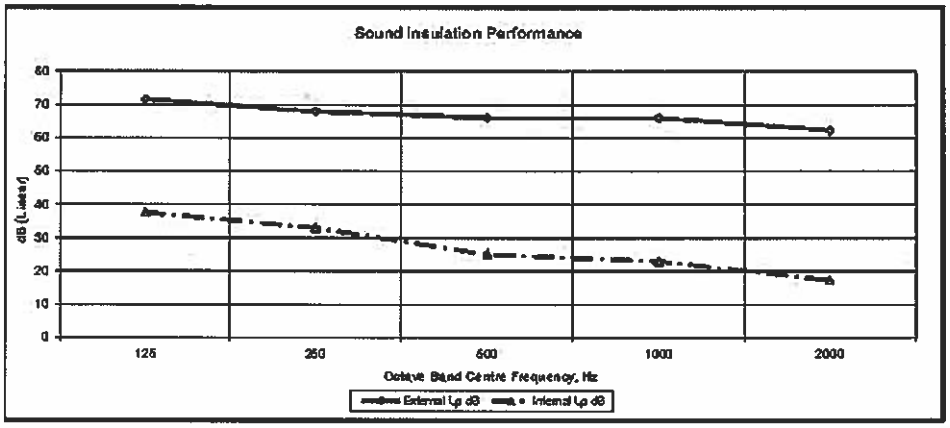
entran

Reference: E656/BS8233-01

Project	Twyman House	Date	22-Jan-2013
Façade	SE Camden Rd Façade	By	SP
Room	Gnd Floor (See Entran Noise Report)	Checked	ND

Night-time

Symbol	Description	Ref	Units	Single	Octave Band Centre Frequency, Hz				
					125	250	500	1000	2000
S_T	Total façade area of room		m^2	10.8					
S_{wi}	Area of windows in façade		m^2	5.5					
S_{ew}	Area of external wall in façade		m^2	5.3					
S_R	Area of ceiling exposed to external noise		m^2	0.0					
S	Total area of elements through which sound enters room		m^2	10.8					
A_0	Reference absorption area given in BS EN 20140-10		m^2	0.0					
	A-weighted free-field equivilent sound pressure level at measurement position		dB	69.8					
	Subtended angle of view correction at window façade		dB	0.0					
$L_{eq,ff}$	A-weighted free-field equivilent sound pressure level outside façade		dB	69.8					
$L_{nt,spec}$	Normalized road traffic noise spectrum derived from BS1793-3		dB		2	-3	-4	-4	-7
$L_{eq,ff}$	Linear free-field equivilent sound pressure level outside façade		dB	74.9	72	68	66	66	62
R_{wi}	Sound reduction index of windows	59	dB		28	29	35	37	39
R_{ew}	Sound reduction index of the external wall	5	dB		41	44	48	55	55
R_R	Sound reduction index of the roof/ceiling		dB		0	0	0	0	0
a	Room average alpha co-efficients (acoustically soft furnished room)		-		0.50	0.50	0.50	0.50	0.50
S_{room}	Room surface area		m2		92	92	92	92	92
A	Equivilent absorption area of room		m^2		46	46	46	46	46
$L_{eq,i}$	Linear internal reverberant sound pressure level in room		dB	39.2	38	33	25	23	17
	A-weighting Network				-16	-9	-3	0	1
$L_{eq,i}$	A-weighted internal reverberant sound pressure level in room		dB(A)	29.2	22	24	22	23	18
	Internal Criteria		dB(A)	30.0					
	Excess over criteria		dB(A)	-0.8					



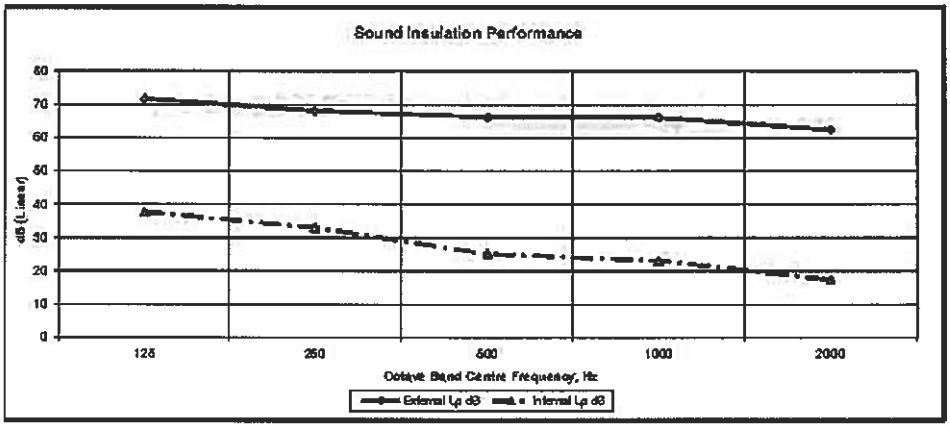
entran
environmental & transportation

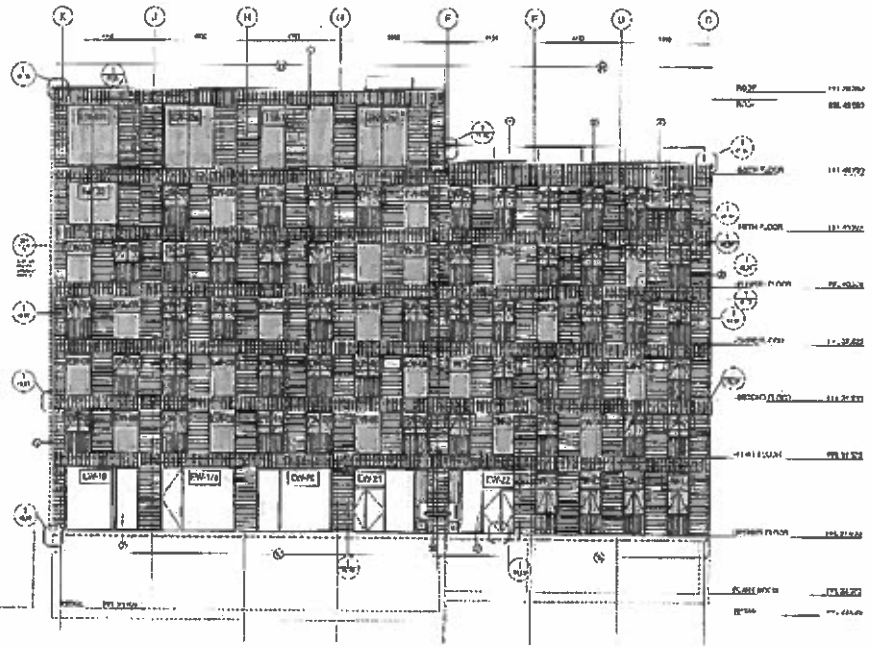
Reference: E656/BS8233-01

Project	Twyman House	Date	22-Jan-2013
Façade	SW Canal Façade	By	SP
Room	Gnd Floor (See Entran Noise Report)	Checked	ND

Daytime

Symbol	Description	Ref	Units	Single	Octave Band Centre Frequency, Hz				
					125	250	500	1000	2000
S_f	Total façade area of room		m^2	10.8					
S_{wi}	Area of windows in façade		m^2	5.5					
S_{we}	Area of external wall in façade		m^2	5.3					
S_c	Area of ceiling exposed to external noise		m^2	0.0					
S	Total area of elements through which sound enters room		m^2	10.8					
A_0	Reference absorption area given in BS EN 20140-10		m^2	0.0					
	A-weighted free-field equivilent sound pressure level at measurement position		dB	69.9					
	Total propogation and angle of view correction from measurement to façade		dB	0.0					
$L_{eq,E}$	A-weighted free-field equivilent sound pressure level outside façade		dB	69.9	125	250	500	1000	2000
$L_{10,18hr}$	Normalized road traffic noise spectrum derived from BS1793-3		dB		2	-2	-4	-4	-7
$L_{eq,E}$	Linear free-field equivilent sound pressure level outside façade		dB	75.0	72	68	66	66	63
R_{wi}	Sound reduction index of windows	59	dB		28	29	35	37	39
R_{we}	Sound reduction index of the external wall	5	dB		41	44	48	55	55
R_c	Sound reduction index of the roof/ceiling		dB		0	0	0	0	0
a	Room average alpha co-efficients (acoustically soft furnished room)		-		0.50	0.50	0.50	0.50	0.50
S_{surf}	Room surface area		m2		92	92	92	92	92
A	Equivilent absorption area of room		m^2		46	46	46	46	46
$L_{eq,i}$	Linear Internal reverberant sound pressure level in room		dB	39.3	38	33	25	23	17
	A-weighting Network				-16	-9	-3	0	1
$L_{eq,i}$	A-weighted internal reverberant sound pressure level in room		dB(A)	29.3	22	24	22	23	18
	Internal Criteria		dB(A)	35.0					
	Excess over criteria		dB(A)	-5.7					





CAMDEN ROAD (EAST) ELEVATION

FOR CONSTRUCTION

WILLMOTT DIXON

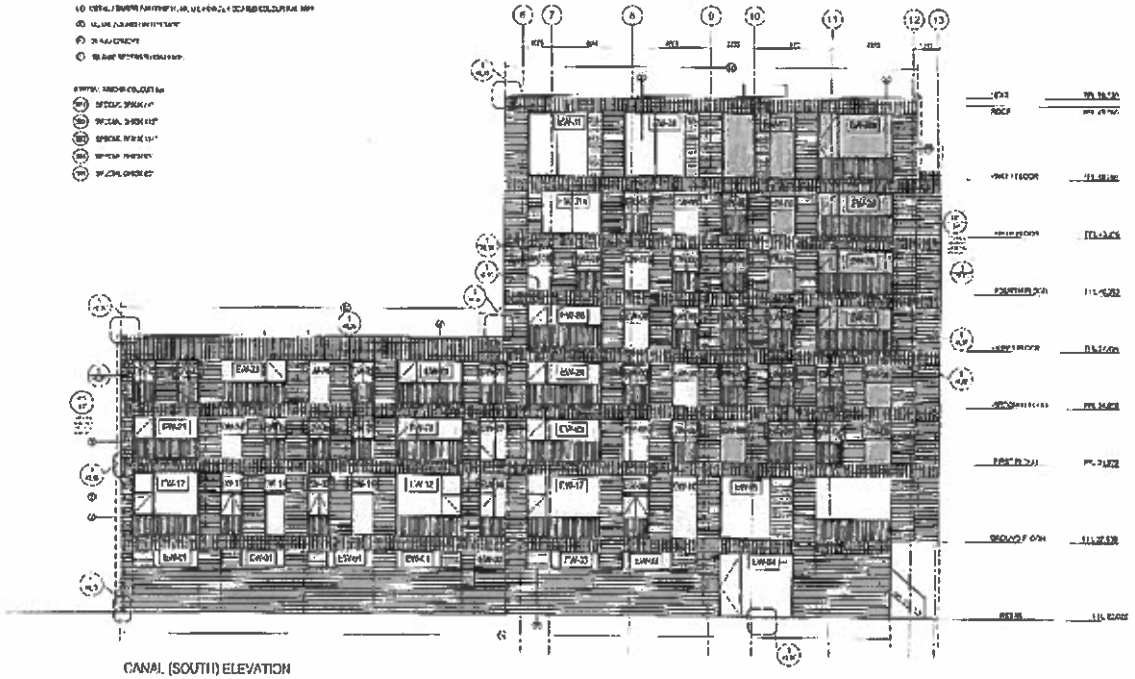
TWYMAN HOUSE

TAYLOR WIMPEY
CENTRAL LONDON

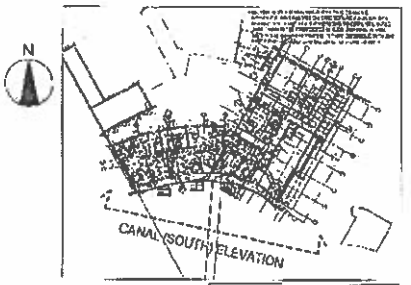
CAMDEN ROAD (EAST)
ELEVATION

12307 30 01-03

sprunt



CANAL (SOUTH) ELEVATION



FOR CONSTRUCTION

WILLMOTT DIXON

TWYMAN HOUSE

TAYLOR WIMPEY
CENTRAL LONDON

CANAL (SOUTH)
ELEVATION

17007_20_03-C1

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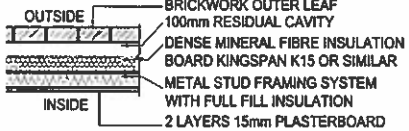
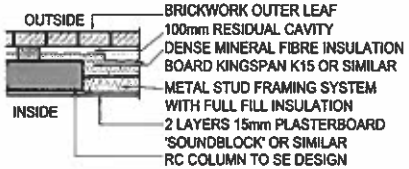
APPENDIX D – WALL TYPES & INSUL DETAILS

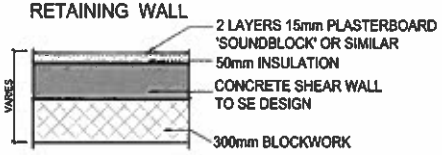
PE 1
ICKWORK WITH METAL STEEL FRAME STEM



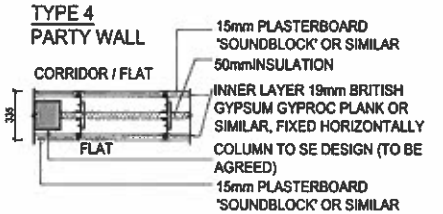
PE 2
ICKWORK WITH CONCRETE COLUMN



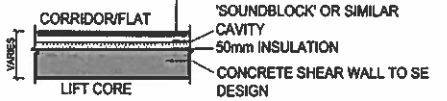
TYPE 3
RETAINING WALL



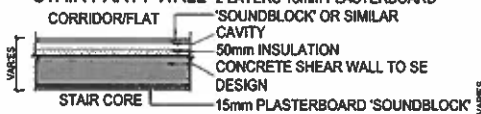
TYPE 4
PARTY WALL



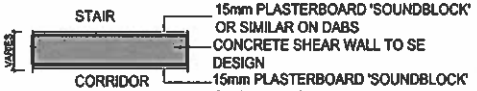
TYPE 5
LIFT PARTY WALL



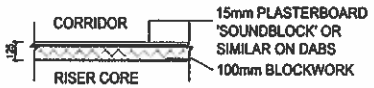
TYPE 6
STAIR PARTY WALL



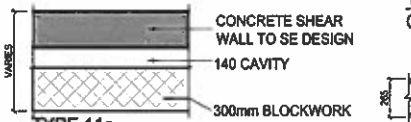
TYPE 7
STAIR/CORRIDOR PARTY WALL



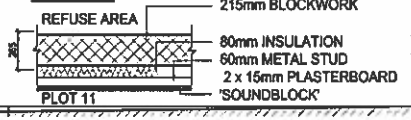
TYPE 8
RISER/CORRIDOR WALL



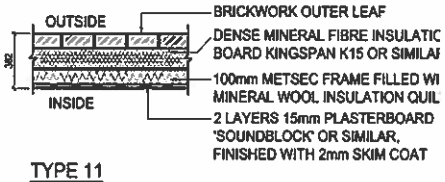
TYPE 9
EXTERNAL PARTY WALL



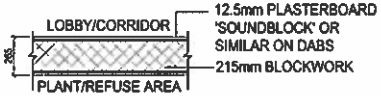
TYPE 11a



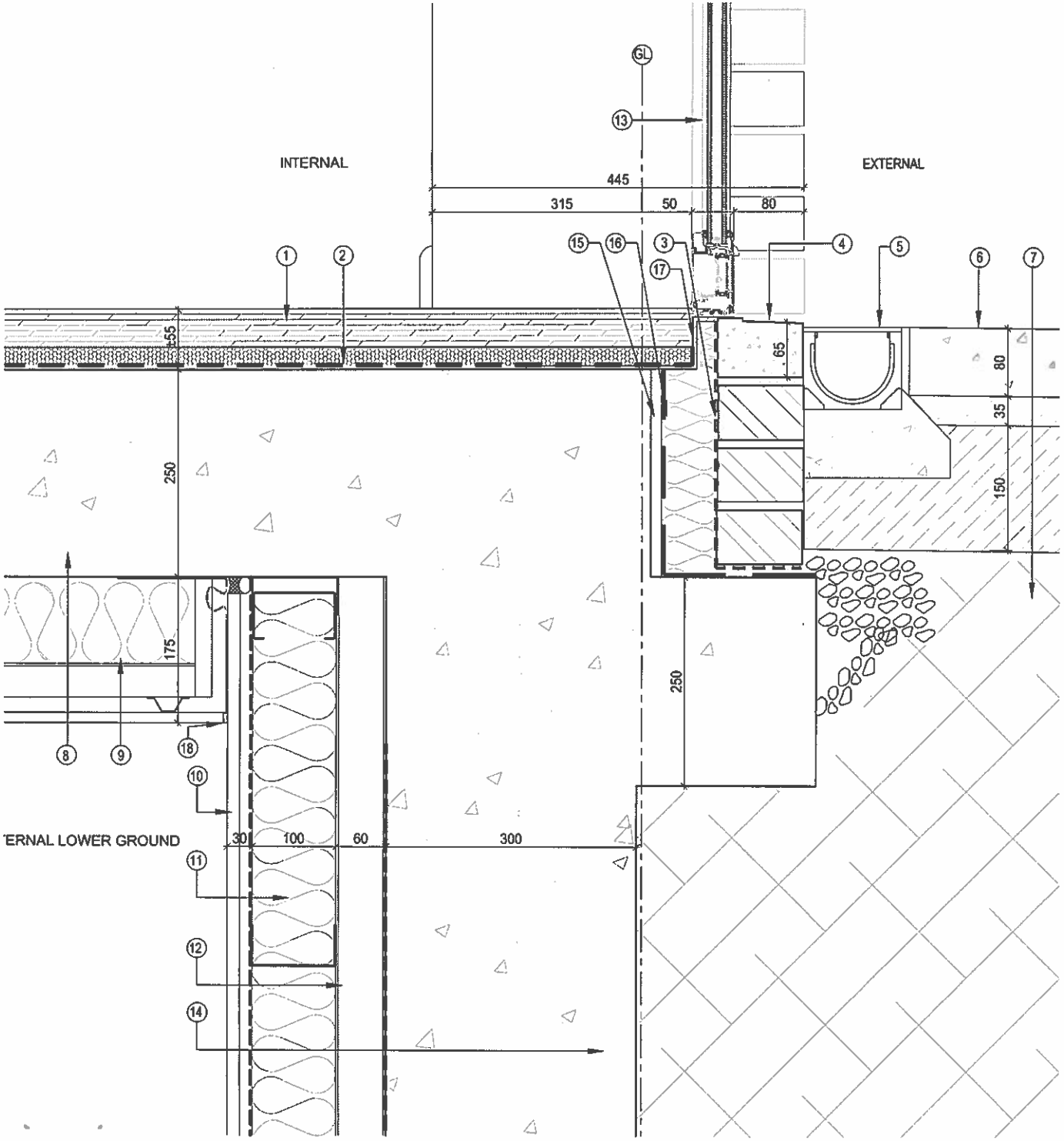
TYPE 10
EXTERNAL PARTY WALL (BLOCK A)



TYPE 11
CORRIDOR WALL



TYPE 11 (0) - NO PLASTERBOARD
TYPE 11 (1) - PLASTERBOARD TO 1 SIDE
TYPE 11 (2) - PLASTERBOARD TO BOTH SIDES



KEY:

1. ENTRANCE MATTING ON MS GAL.TRAY
2. INSULATION ON SEPARATING MEMBRANE
3. DPC
4. PRECAST CONCRETE CILL
5. PRECAST GULLY WITH METAL GRATING BY ACO DRAIN OR SIMILAR APPROVED
6. "LA LINEA" 200X200X80MM PAVING BLOCK BY MARSHAL ON 35MM SAND ON 150MM WELL COMPACT SUB BASE
7. GRAVEL INFILL
8. 250mm R.C. SLAB
9. SUSPENDED CEILING ON PROPRIETARY FRAMING -BY OTHERS IN RETAIL AREAS
10. 2x15mm PLASTERBOARD 'SOUNDBLOCK' (BY OTHERS IN RETAIL AREA TBC)
11. 100mm 'C' CHANNELS WITH KINGSPAN K15 INSULATION TO SPEC.
12. 60mm 'I' STUD GYPFRAME METAL STUD PARTITION
13. COMPOSITE DOUBLE GLAZED ENTRANCE DOOR WITH LEVEL ACCESS THRESHOLD
14. WATERPROOF CONCRETE AS PER ENGINEERS DETAIL
15. 12mm CEMENT PARTICLE BOARD WITH BREATHER MEMBRANE
16. INTEGRITANK DPM TO LAP UP AND OVER METSEC UPSTAND
17. Z FIXING CLIP TO WINDOW MANUFACTURE SPEC.
18. ALL CEILINGS TO EXTERNAL WALLS JOINTS TO HAVE ACOUSTIC SEALANT TO COMPLY WITH PART 'E' OF BUILDING REGS. AND AIR PERMEABILITY

REV	BY	DATE	DESCRIPTION
C1	NA	05.12.12	MB ISSUE FOR CONSTRUCTION

STATUS
FOR CONSTRUCTION

CONTRACTOR

PROJECT
TWYMAN HOUSE

CLIENT
TAYLOR WIMPEY
CENTRAL LONDON

DRAWING TITLE
THRESHOLD DETAIL
GROUND FLOOR - BLOCK B/C

DATE CREATED	SCALE
05.12.12	1:5@A3
DRAWN / AMENDED BY	CHECKED
SPRUNT4	MB

DRAWING NO & REVISION
12387_48_05-C1

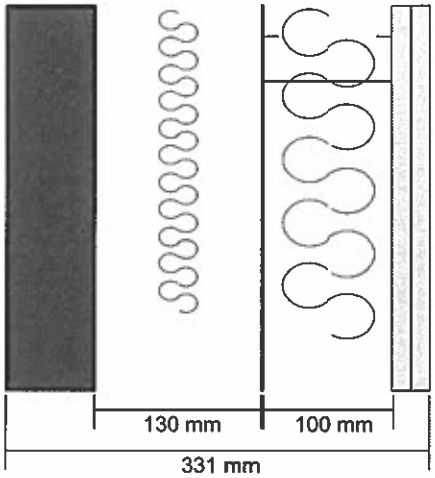
sprunt
SPRUNT The Quadrangle, 2nd Floor, 180 Wardour Street, London W1F 8FY
T +44 (0)20 7287 1153 F +44 (0)20 7287 3675
www.sprunt.net

Sound Insulation Prediction (v7.0.7)

- Key No. 1521

Margin of error is generally within Rw +/- 3 dB

File Name: Wall Type 1.ixl



Rw	85 dB
C	-5 dB
C_{tr}	-12 dB

System description

Panel 1 Outer layer: 1 x 70.0 mm Brick- (m=112.0 kg/m2, fc=393 Hz, Damping=0.00) Profile

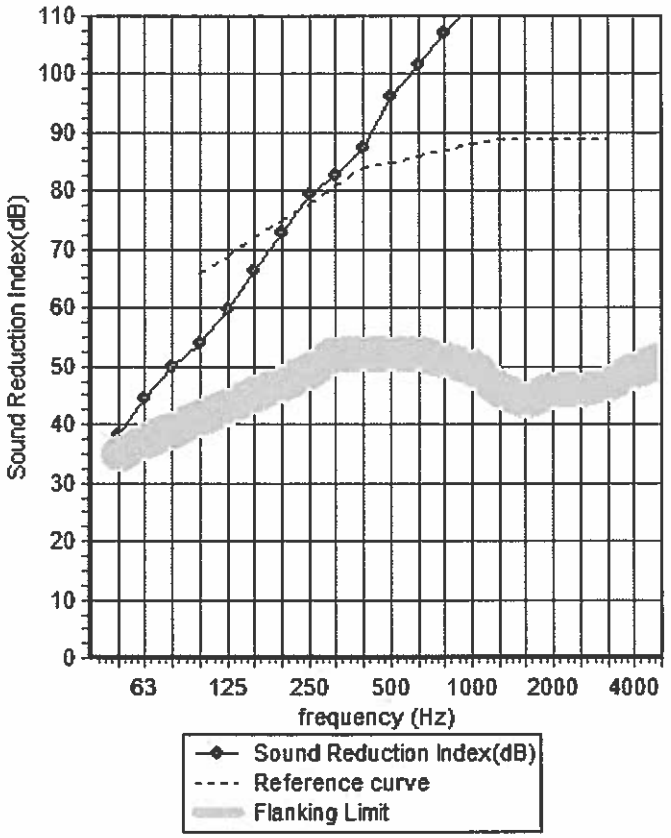
Cavity: None @ 600 mm , Infill Rockwool (60kg/m3) Thickness 30 mm
Panel 2 Inner layer: 1 x 0.6 mm Steel- (m=4.7 kg/m2, fc=20833 Hz, Damping=0.01) Profile

Cavity: Steel stud @ 600 mm , Infill fibreglass (22kg/m3) Thickness 75 mm
Panel 3 Inner layer: 2 x 15.0 mm Gyproc SoundBloc 15mm- (m=25.2 kg/m2, fc=2246 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =27 Hz , 120

frequency (Hz)	TL(dB)	TL(dB)
50	38	
63	45	42
80	50	
100	54	
125	60	58
160	66	
200	73	
250	79	76
315	83	
400	88	
500	96	92
630	102	
800	107	
1000	112	110
1250	117	
1600	120	
2000	121	121
2500	124	
3150	130	
4000	135	133
5000	140	

Panel Size 2.7x4 m

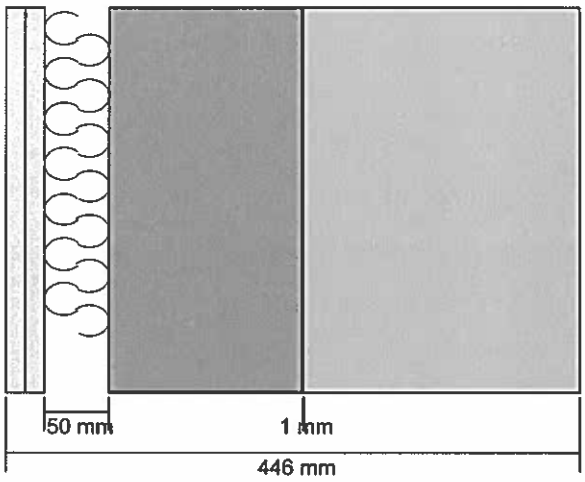


Sound Insulation Prediction (v7.0.7)

- Key No. 1521

Margin of error is generally within Rw +/- 3 dB

File Name: Wall Type 3.ixl



Rw	77 dB
C	-7 dB
C_{tr}	-13 dB

System description

Panel 1 Outer layer: 2 x 15.0 mm Gyproc SoundBloc 15mm- (m=25.2 kg/m2, fc=2246 Hz, Damping=0.01) Profile

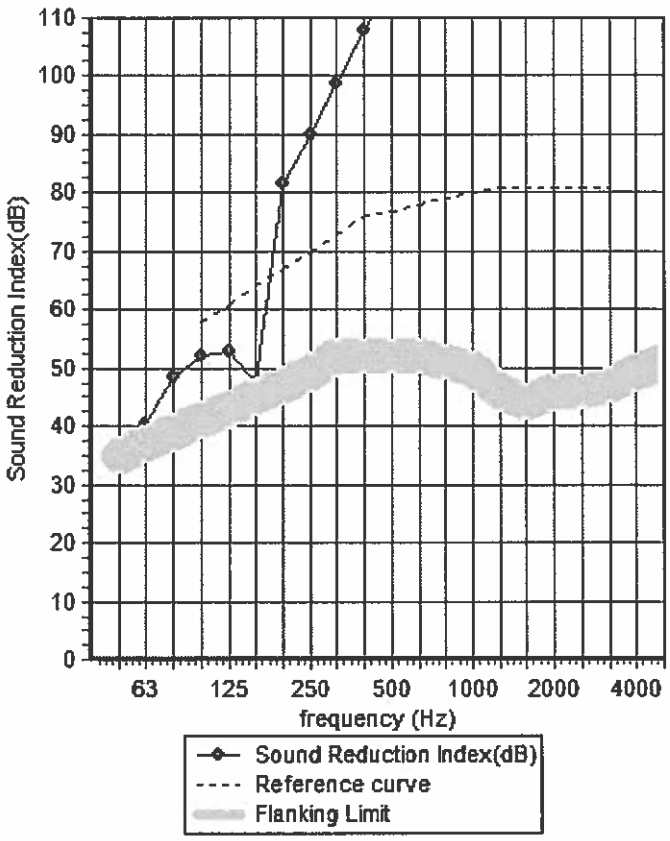
Cavity: None @ 600 mm , Infill fibreglass (10kg/m3) Thickness 50 mm
Panel 2 Inner layer: 1 x 150.0 mm Concrete- (m=351.0 kg/m2, fc=199 Hz, Damping=0.01) Profile

Cavity: None @ 600 mm
Panel 3 Inner layer: 1 x 215.0 mm mm Concrete Block- (m=409.6 kg/m2, fc=142 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =54 Hz , 163

frequency (Hz)	TL(dB)	TL(dB)
50	34	
63	41	37
80	48	
100	52	
125	53	50
160	47	
200	82	
250	90	86
315	99	
400	108	
500	116	112
630	125	
800	134	
1000	142	138
1250	150	
1600	154	
2000	155	156
2500	160	
3150	168	
4000	177	172
5000	185	

Panel Size 2.7x4 m

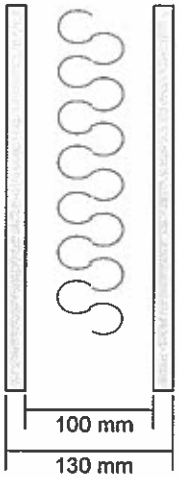


Sound Insulation Prediction (v7.0.7)

- Key No. 1521

Margin of error is generally within Rw +/- 3 dB

File Name: Wall Type 4.ixl



Rw	54 dB
C	-3 dB
C_{tr}	-9 dB

System description

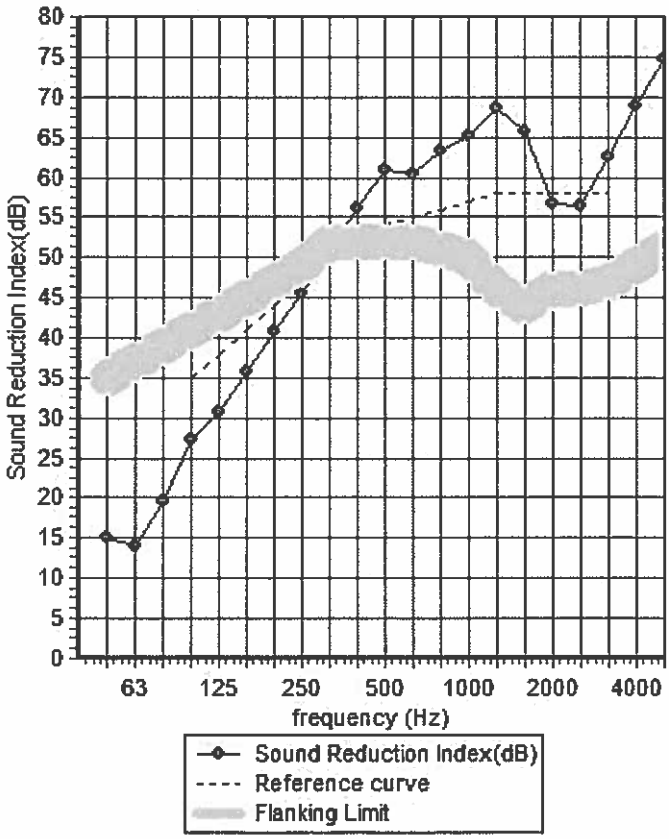
Panel 1 Outer layer: 1 x 15.0 mm Gyproc SoundBloc 15mm- (m=12.6 kg/m2, fc=2246 Hz, Damping=0.01) Profile

Cavity: None @ 600 mm , Infill Rockwool (33kg/m3) Thickness 50 mm
Panel 2 Inner layer: 1 x 15.0 mm Gyproc SoundBloc 15mm- (m=12.6 kg/m2, fc=2246 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =64 Hz

frequency (Hz)	TL(dB)	TL(dB)
50	15	
63	14	16
80	20	
100	27	
125	31	30
160	36	
200	41	
250	46	44
315	51	
400	56	
500	61	59
630	60	
800	63	
1000	65	65
1250	69	
1600	66	
2000	57	58
2500	56	
3150	63	
4000	69	66
5000	75	

Panel Size 2.7x4 m

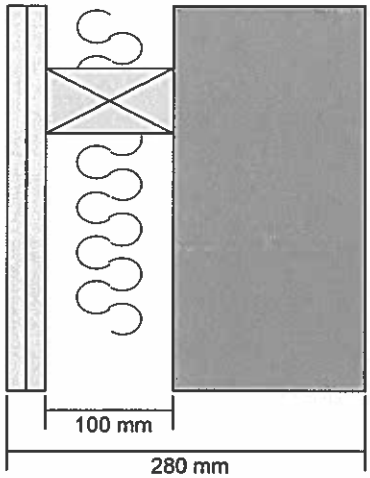


Sound Insulation Prediction (v7.0.7)

- Key No. 1521

Margin of error is generally within Rw +/- 3 dB

File Name: Wall Type 5_lift.ixl



Rw	63 dB
C	-1 dB
C_{tr}	-5 dB

System description

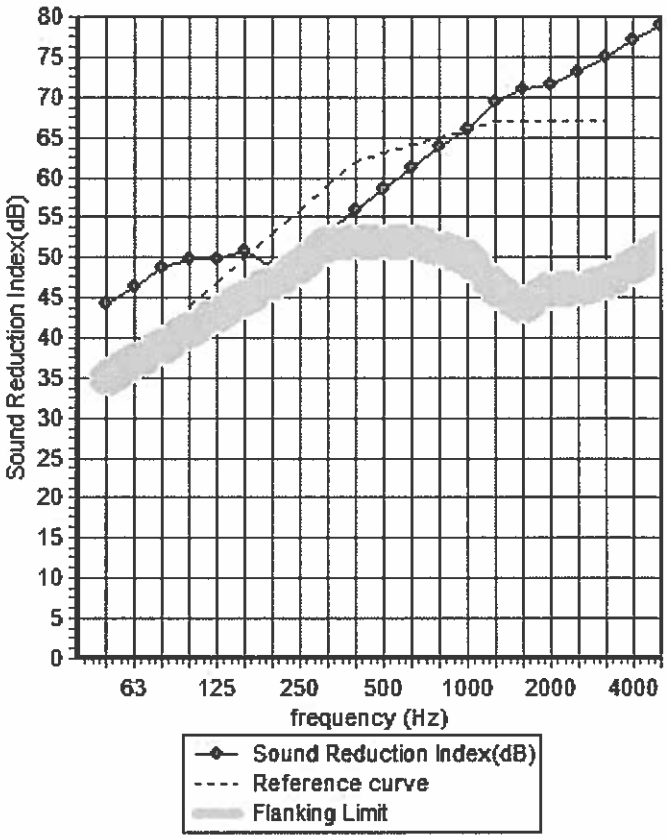
Panel 1 Outer layer: 2 x 15.0 mm Gyproc SoundBloc 15mm- (m=25.2 kg/m2, fc=2246 Hz, Damping=0.01) Profile

Cavity: Timber stud @ 600 mm , Infill Rockwool (33kg/m3) Thickness 50 mm
Panel 2 Inner layer: 1 x 150.0 mm Concrete- (m=351.0 kg/m2, fc=199 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =33 Hz

frequency (Hz)	TL(dB)	TL(dB)
50	44	
63	46	46
80	49	
100	50	
125	50	50
160	51	
200	49	
250	51	51
315	53	
400	56	
500	59	58
630	61	
800	64	
1000	66	66
1250	70	
1600	71	
2000	72	72
2500	73	
3150	75	
4000	77	77
5000	79	

Panel Size 2.7x4 m

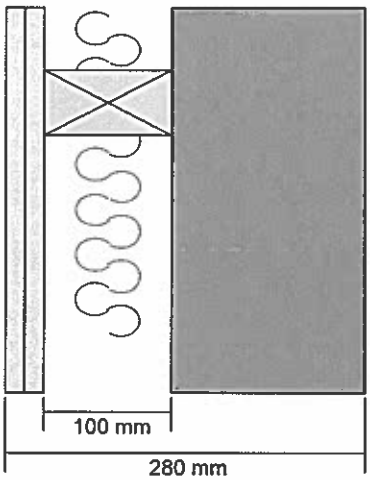


Sound Insulation Prediction (v7.0.7)

- Key No. 1521

Margin of error is generally within Rw +/- 3 dB

File Name: Wall Type 6_Stairs.ixl



Rw	63 dB
C	-1 dB
C_{tr}	-5 dB

System description

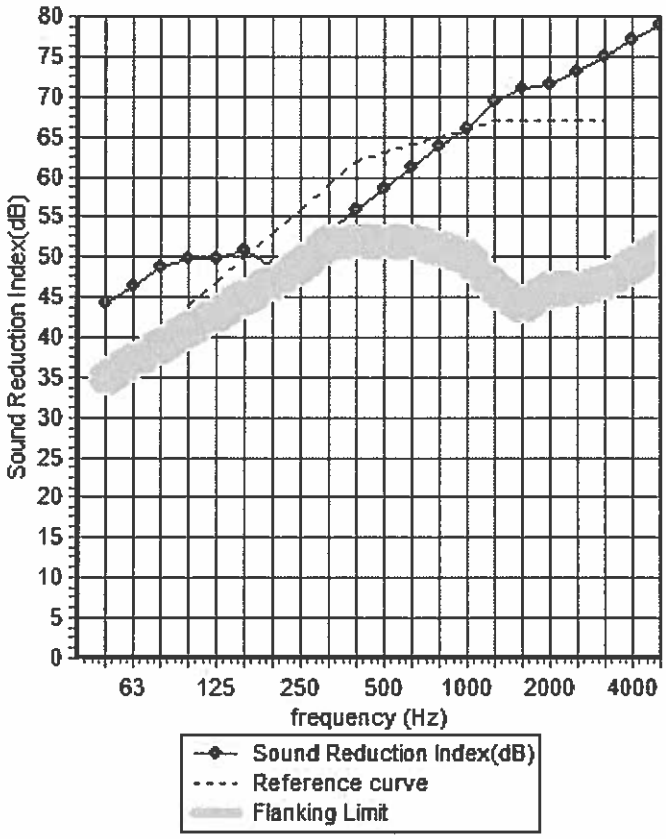
Panel 1 Outer layer: 2 x 15.0 mm Gyproc SoundBloc 15mm- (m=25.2 kg/m2, fc=2246 Hz, Damping=0.01) Profile

Cavity: Timber stud @ 600 mm , Infill Rockwool (33kg/m3) Thickness 50 mm
Panel 2 Inner layer: 1 x 150.0 mm Concrete- (m=351.0 kg/m2, fc=199 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =33 Hz

frequency (Hz)	TL(dB)	TL(dB)
50	44	
63	46	46
80	49	
100	50	
125	50	50
160	51	
200	49	
250	51	51
315	53	
400	56	
500	59	58
630	61	
800	64	
1000	66	66
1250	70	
1600	71	
2000	72	72
2500	73	
3150	75	
4000	77	77
5000	79	

Panel Size 2.7x4 m

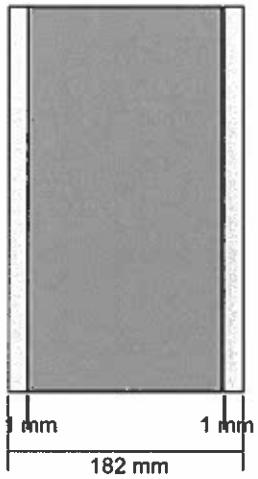


Sound Insulation Prediction (v7.0.7)

- Key No. 1521

Margin of error is generally within Rw +/- 3 dB

File Name: Wall Type 7.ixl



Rw	47 dB
C	-4 dB
C_{tr}	-6 dB

System description

Panel 1 Outer layer: 1 x 15.0 mm Gyproc SoundBloc 15mm- (m=12.6 kg/m2, fc=2246 Hz, Damping=0.01) Profile

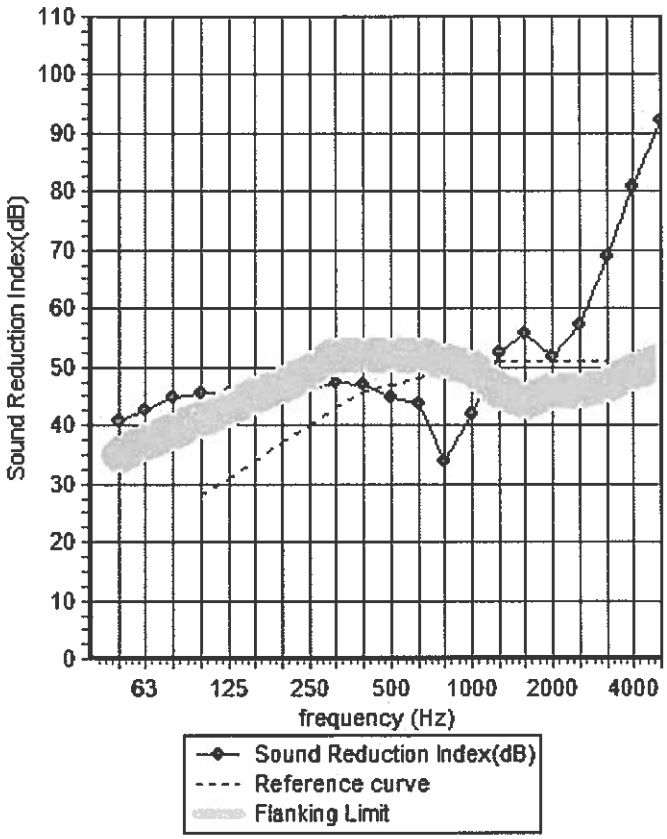
Cavity: None @ 600 mm
Panel 2 Inner layer: 1 x 150.0 mm Concrete- (m=351.0 kg/m2, fc=199 Hz, Damping=0.01) Profile

Cavity: None @ 600 mm
Panel 3 Inner layer: 1 x 15.0 mm Gyproc SoundBloc 15mm- (m=12.6 kg/m2, fc=2246 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =628 Hz , 650

frequency (Hz)	TL(dB)	TL(dB)
50	41	
63	43	42
80	45	
100	46	
125	45	46
160	46	
200	45	
250	46	46
315	47	
400	47	
500	45	45
630	44	
800	34	
1000	42	38
1250	53	
1600	56	
2000	52	54
2500	57	
3150	69	
4000	81	73
5000	92	

Panel Size 2.7x4 m

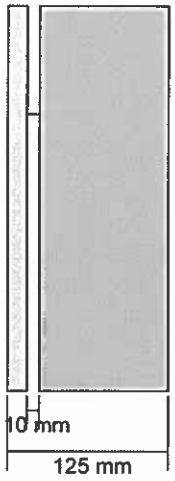


Sound Insulation Prediction (v7.0.7)

- Key No. 1521

Margin of error is generally within Rw +/- 3 dB

File Name: Wall Type 8.ixl



Rw	47 dB
C	-1 dB
C_{tr}	-4 dB

System description

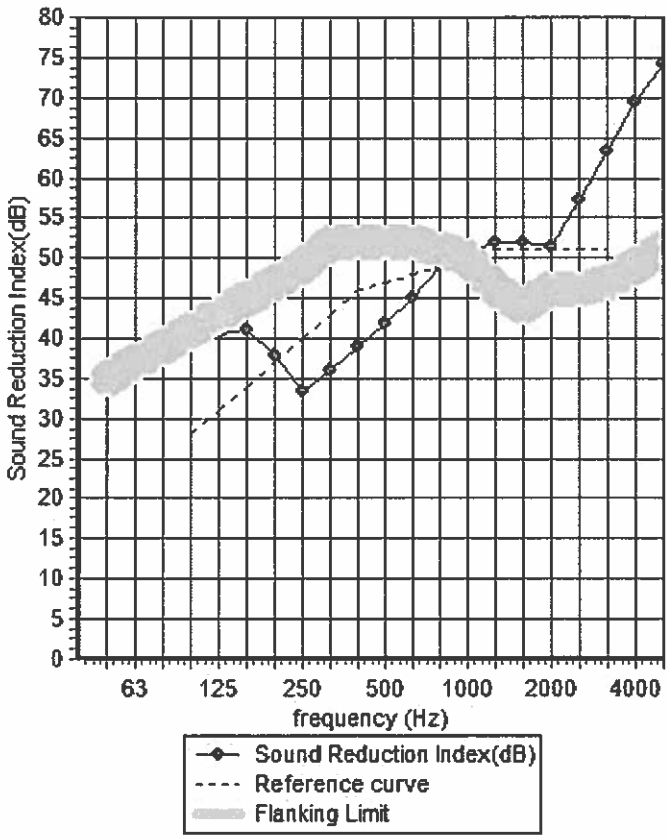
Panel 1 Outer layer: 1 x 15.0 mm Gyproc SoundBloc 15mm- (m=12.6 kg/m2, fc=2246 Hz, Damping=0.01) Profile

Cavity: Point connections @ 600 mm
Panel 2 Inner layer: 1 x 100.0 mm mm Concrete Block- (m=188.0 kg/m2, fc=309 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =175 Hz

frequency (Hz)	TL(dB)	TL(dB)
50	36	
63	37	37
80	39	
100	40	
125	40	40
160	41	
200	38	
250	33	35
315	36	
400	39	
500	42	41
630	45	
800	49	
1000	51	50
1250	52	
1600	52	
2000	51	53
2500	57	
3150	63	
4000	69	67
5000	74	

Panel Size 2.7x4 m

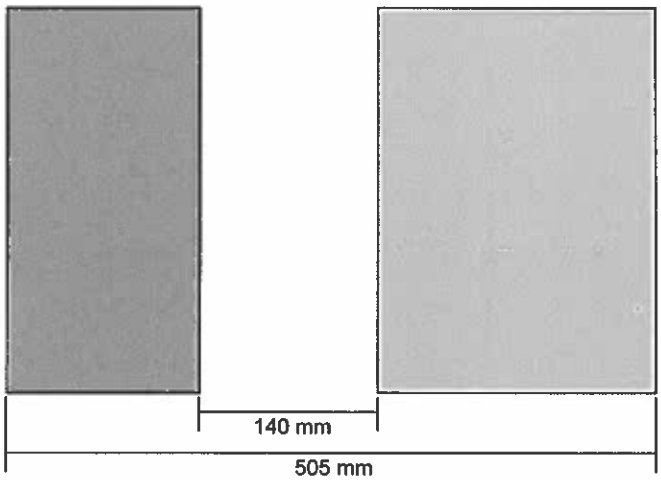


Sound Insulation Prediction (v7.0.7)

- Key No. 1521

Margin of error is generally within Rw +/- 3 dB

File Name: Wall Type 9.ixl



Rw	84 dB
C	-3 dB
C_{tr}	-9 dB

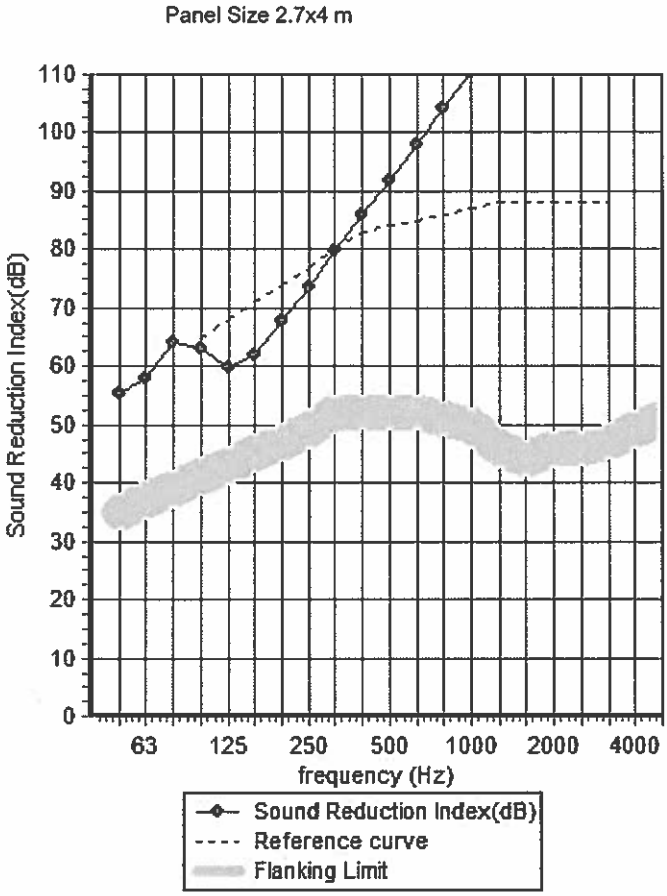
System description

Panel 1 Outer layer: 1 x 150.0 mm Concrete- (m=351.0 kg/m2, fc=199 Hz, Damping=0.01) Profile

Cavity: None @ 600 mm
Panel 2 Inner layer: 1 x 215.0 mm mm Concrete Block- (m=409.6 kg/m2, fc=142 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =12 Hz

frequency (Hz)	TL(dB)	TL(dB)
50	56	
63	58	58
80	64	
100	63	
125	60	61
160	62	
200	68	
250	74	71
315	80	
400	86	
500	92	89
630	98	
800	104	
1000	110	108
1250	116	
1600	123	
2000	129	127
2500	135	
3150	141	
4000	148	145
5000	154	

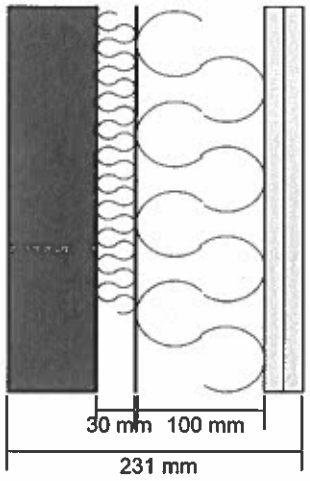


Sound Insulation Prediction (v7.0.7)

- Key No. 1521

Margin of error is generally within Rw +/- 3 dB

File Name: Wall Type 10.ixl



Rw	78 dB
C	-2 dB
C_{tr}	-9 dB

System description

Panel 1 Outer layer: 1 x 70.0 mm Brick- (m=112.0 kg/m2, fc=393 Hz, Damping=0.00) Profile

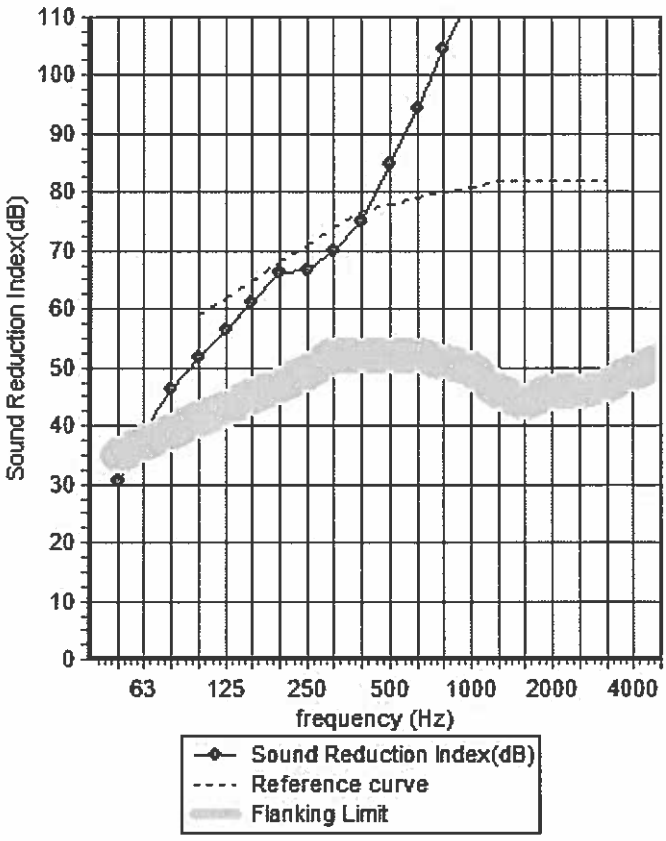
Cavity: None @ 600 mm , Infill Rockwool (60kg/m3) Thickness 30 mm
Panel 2 Inner layer: 1 x 0.6 mm Steel- (m=4.7 kg/m2, fc=20833 Hz, Damping=0.01) Profile

Cavity: None @ 600 mm , Infill fibreglass (22kg/m3) Thickness 100 mm
Panel 3 Inner layer: 2 x 15.0 mm Gyproc SoundBloc 15mm- (m=25.2 kg/m2, fc=2246 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =36 Hz , 184

frequency (Hz)	TL(dB)	TL(dB)
50	31	
63	39	35
80	46	
100	52	
125	56	55
160	61	
200	66	
250	67	67
315	70	
400	75	
500	85	79
630	95	
800	104	
1000	114	109
1250	123	
1600	131	
2000	135	130
2500	127	
3150	135	
4000	142	139
5000	148	

Panel Size 2.7x4 m

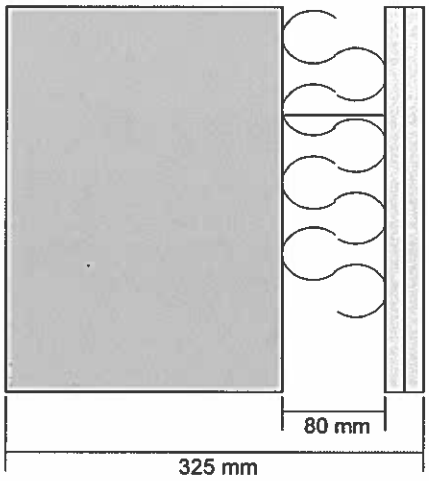


Sound Insulation Prediction (v7.0.7)

- Key No. 1521

Margin of error is generally within Rw +/- 3 dB

File Name: Wall Type 11a.ixl



Rw	73 dB
C	-1 dB
C_{tr}	-5 dB

System description

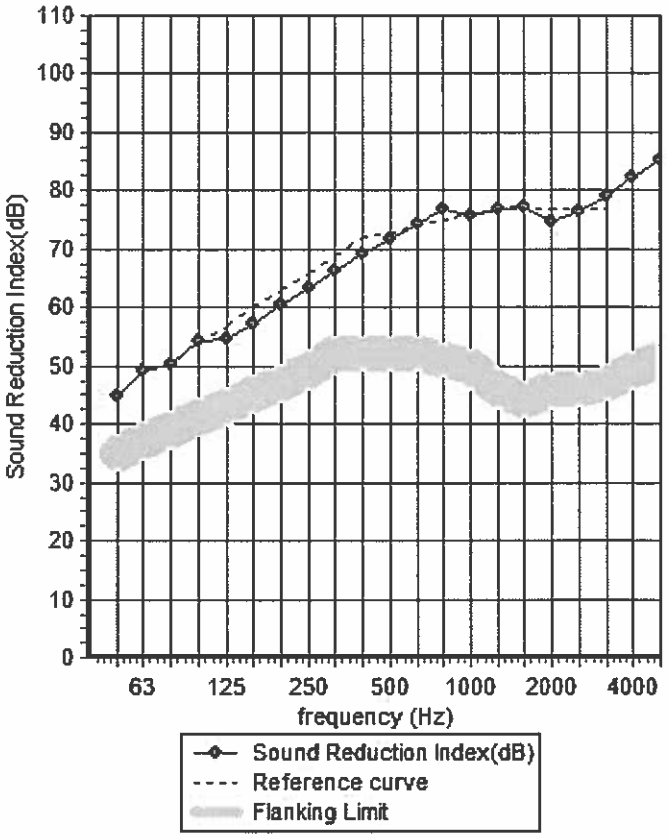
Panel 1 Outer layer: 1 x 215.0 mm mm Concrete Block- (m=409.6 kg/m2, fc=142 Hz, Damping=0.01) Profile

Cavity: Point connections @ 600 mm , Infill Rockwool (33kg/m3) Thickness 80 mm
Panel 2 Inner layer: 2 x 15.0 mm Gyproc SoundBloc 15mm- (m=25.2 kg/m2, fc=2246 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =37 Hz

frequency (Hz)	TL(dB)	TL(dB)
50	45	
63	49	47
80	50	
100	54	
125	55	55
160	57	
200	61	
250	64	63
315	66	
400	69	
500	72	71
630	74	
800	77	
1000	76	76
1250	77	
1600	77	
2000	75	76
2500	76	
3150	79	
4000	82	82
5000	85	

Panel Size 2.7x4 m

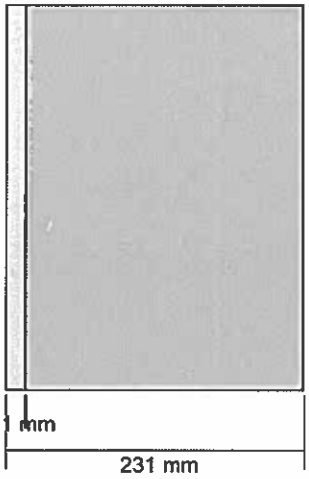


Sound Insulation Prediction (v7.0.7)

- Key No. 1521

Margin of error is generally within Rw +/- 3 dB

File Name: Wall Type 11_1.ixl



Rw	56 dB
C	-2 dB
C_{tr}	-4 dB

System description

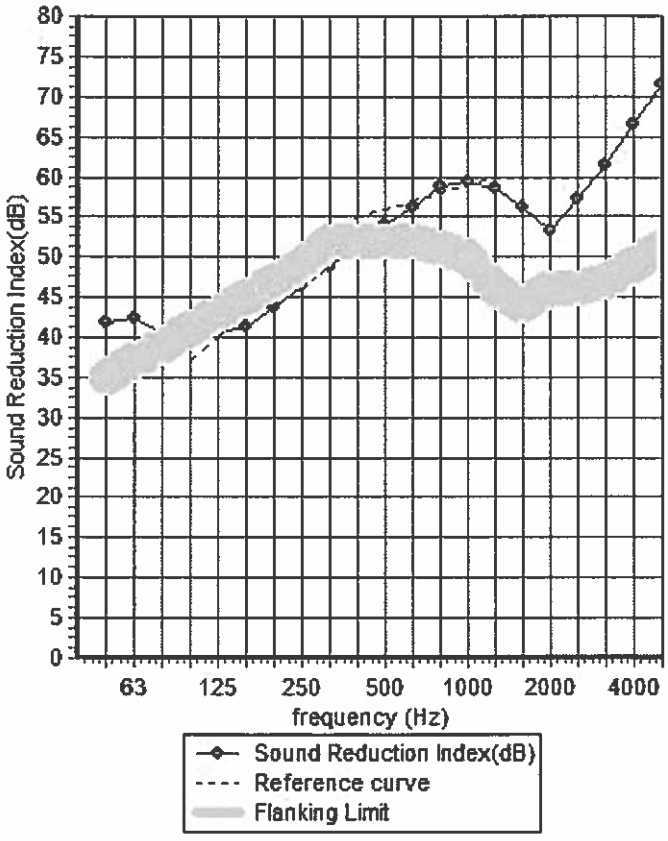
Panel 1 Outer layer: 1 x 15.0 mm Gyproc SoundBloc 15mm- (m=12.6 kg/m2, fc=2246 Hz, Damping=0.01) Profile

Cavity: Point connections @ 600 mm
Panel 2 Inner layer: 1 x 215.0 mm mm Concrete Block- (m=409.6 kg/m2, fc=142 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =544 Hz

frequency (Hz)	TL(dB)	TL(dB)
50	42	
63	42	42
80	40	
100	42	
125	40	41
160	41	
200	44	
250	46	46
315	49	
400	52	
500	54	53
630	56	
800	59	
1000	59	59
1250	59	
1600	56	
2000	53	55
2500	57	
3150	61	
4000	66	65
5000	72	

Panel Size 2.7x4 m

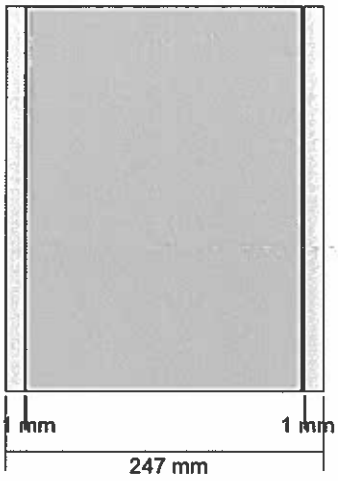


Sound Insulation Prediction (v7.0.7)

- Key No. 1521

Margin of error is generally within Rw +/- 3 dB

File Name: Wall Type 11_2.ixl



Rw	50 dB
C	-4 dB
C_{tr}	-6 dB

System description

Panel 1 Outer layer: 1 x 15.0 mm Gyproc SoundBloc 15mm- (m=12.6 kg/m2, fc=2246 Hz, Damping=0.01) Profile

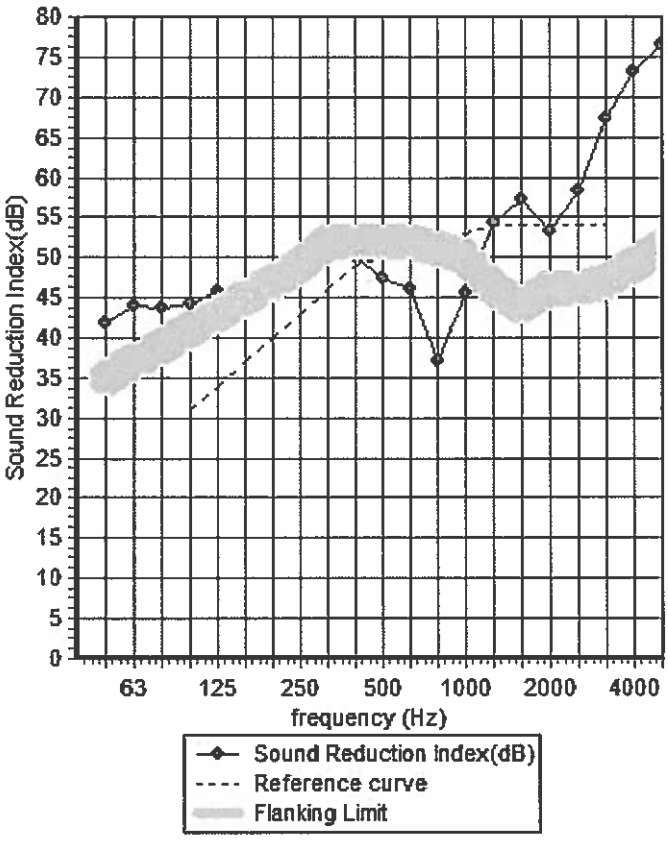
Cavity: Point connections @ 600 mm
Panel 2 Inner layer: 1 x 215.0 mm mm Concrete Block- (m=409.6 kg/m2, fc=142 Hz, Damping=0.01) Profile

Cavity: Point connections @ 600 mm
Panel 3 Inner layer: 1 x 15.0 mm Gyproc SoundBloc 15mm- (m=12.6 kg/m2, fc=2246 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =628 Hz , 647

frequency (Hz)	TL(dB)	TL(dB)
50	42	
63	44	43
80	44	
100	44	
125	46	45
160	46	
200	48	
250	50	49
315	50	
400	50	
500	47	48
630	46	
800	37	
1000	46	41
1250	54	
1600	57	
2000	53	56
2500	58	
3150	67	
4000	73	71
5000	76	

Panel Size 2.7x4 m

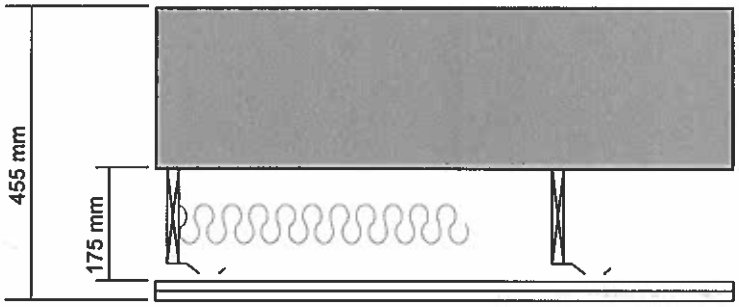


Sound Insulation Prediction (v7.0.7)

- Key No. 1521

Margin of error is generally within Rw +/- 3 dB

File Name: Floor_retail_Residential_no floor cover_airborne.ixl



Rw	82 dB
C	-1 dB
C_{tr}	-7 dB

System description

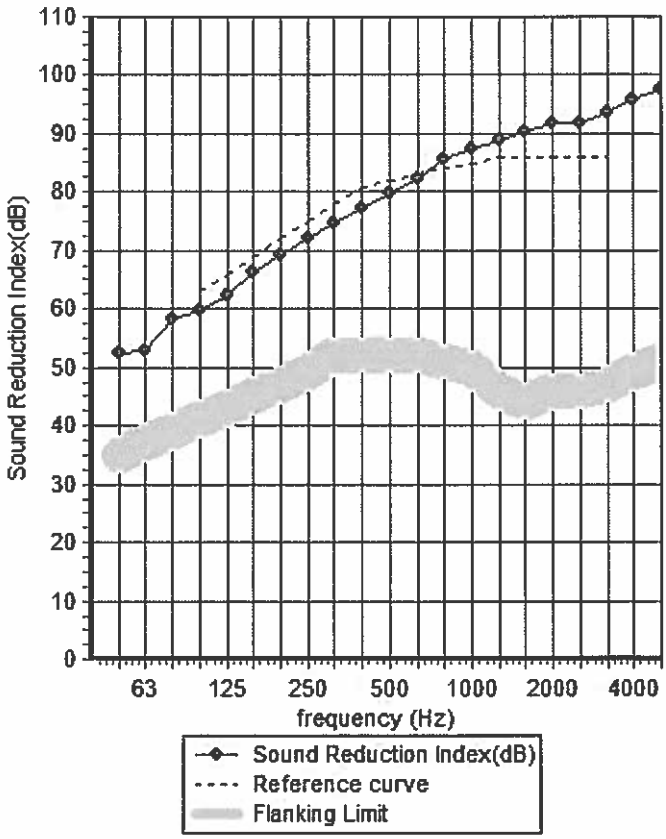
Panel 1 Outer layer: 1 x 250.0 mm Concrete- (m=585.0 kg/m2, fc=120 Hz, Damping=0.01) Profile

Cavity: Resilient clip or channel @ 1 mm , Infill fibreglass (22kg/m3) Thickness 75 mm
Panel 2 Inner layer: 2 x 15.0 mm Gyproc SoundBloc 15mm- (m=25.2 kg/m2, fc=2246 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =25 Hz

frequency (Hz)	TL(dB)	TL(dB)
50	53	
63	53	54
80	58	
100	60	
125	62	62
160	66	
200	69	
250	72	71
315	75	
400	77	
500	80	79
630	82	
800	86	
1000	87	87
1250	89	
1600	91	
2000	92	91
2500	92	
3150	94	
4000	96	95
5000	98	

Panel Size 2.7x4 m

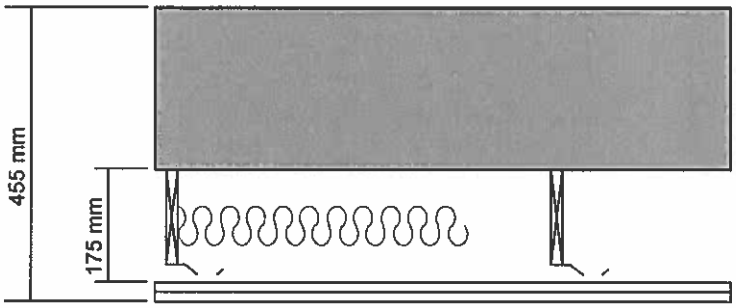


Impact Sound Prediction (v7.0.7)

- Key No. 1521

Margin of error for Impact Sound Prediction is generally within Ln,w +/- 5 dB

File Name: Floor_retail_Residential_no floor cover.ixl



Ln,w 48 dB
C_1 -10 dB

System description

Floor Cover: Custom floor covering
Panel 1 Outer layer: 1 x 250.0 mm Concrete- (m=585.0 kg/m2, fc=120 Hz, Damping=0.01) Profile

Joists: 19.0 mm x163.0 mm @ 600 mm (490.0 (kg/m3), Youngs Modulus =5(GPa), Damping=0.04)
Cavity: Resilient clip or channel, Infill fibreglass (22kg/m3) Thickness 75 mm
Panel 2 Inner layer: 2 x 15.0 mm Gyproc SoundBloc 15mm- (m=25.2 kg/m2, fc=2246 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =29 Hz

frequency (Hz)	Ln(dB)	Ln(dB)
50	39	
63	42	46
80	41	
100	38	
125	37	42
160	36	
200	37	
250	42	46
315	42	
400	42	
500	42	47
630	42	
800	42	
1000	42	47
1250	42	
1600	41	
2000	43	47
2500	44	
3150	40	
4000	38	43
5000	36	

Panel Size 2.4x2.4 m