EXTERNAL NOISE & VIBRATION INTRUSION TO A NEW RESIDENTIAL DEVELOPMENT AT 33-41 WICKLOW STREET, LONDON WC1X 9JX

Report Reference: 120903-001A

Date: October 2012

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Site Address:	**33-41 Wicklow Street** **London** **WC1X 9JX**
Client:	**BWH UK** **41 Egerton Gardens** **Ilford** **Essex** **IG3 9HR**
Report Reference:	**120903-001**
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Date:	**October 2012**

ACA ACOUSTICS

CONTENTS

0. SUMMARY

- The client, BWH UK, propose to construct a new residential development on disused land at 33-41 Wicklow Street, London WC1X 9JX.

- ACA Acoustics Limited has been commissioned by BWH UK to assess noise and vibration incident on the proposed development site. The assessment is required by the Local Planning Authority (London Borough of Camden) to assist their consideration of a planning application for the development.

- A noise survey has been carried out at the site over nominally a 48-hour period between Monday 1st October and Wednesday 3rd October 2012. Results have been used to assess the site's separate daytime, evening and night time LAeq noise levels in accordance with London Borough of Camden's Local Development Framework Policy DP28.

- Existing ambient noise levels incident on the site of the proposed development are comprised of trains passing on the adjacent railway, distant traffic on local routes and low level pedestrian activity in the area.

- Noise levels at the site are within the range of values requiring attenuation measures to be implemented as defined by London Borough of Camden's Policy DP28.

- As the site is within the range of values shown in Table B of Policy DP28 then in accordance with the Policy it is necessary to propose a scheme for façade sound insulation to ensure that noise levels inside rooms of the proposed new residential properties are reasonable and comply with guidance noise limits in British Standard BS8233:1999 "*Sound insulation and noise reduction for buildings – Code of practice*". A scheme of noise insulation measures is included in this report.

- Vibration measurements have been carried out at the proposed development site over a representative period during daytime hours by ACA Acoustics Limited. Measurements include vibration from trains passing on the adjacent line and within the tunnel below the site. Results of the survey have been used to assess vibration levels at the site in terms of Vibration Dose Values (VDV) in accordance with procedures in British Standard BS6472-1:2008 "*Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting*" and specific requirements of London Borough of Camden.

- Vibration levels at the site are within the range of values where it is considered adverse comment is probable as defined in BS6472 and above the range of values set out in Table C of Policy DP28.

- Although vibration levels are at a level above the range of values at which, in accordance with London Borough of Camden's Policy DP28, planning permission would not normally be granted, it is ACA Acoustics Limited's opinion that the site is suitable for residential development subject to implementation of a very high performance scheme of vibration isolation measures to ensure that vibration levels within the completed structure are reasonable and achieve the guidance limits of BS6472 and Policy DP28. A scheme of vibration isolation measures is included in this report.

- In summary it is recommended that the site is suitable for residential development, subject to implementation of noise insulation and vibration isolation measures as set out in this report.

1. INTRODUCTION

ACA Acoustics Limited has been commissioned by BWH UK to carry out a survey and assessment of external noise and vibration at the site of a proposed residential development at 33-41 Wicklow Street, London, WC1X 9JX.

The noise and vibration survey and assessment is required by the Local Planning Authority (London Borough of Camden Council) to assist their consideration of a planning application for the development.

The objective of the assessment is to determine the impact that existing noise and vibration sources would have on the proposed new development in accordance with London Borough of Camden Council's Local Development Framework Policy DP28 "*Noise and Vibration*", Planning Policy Guidance 24: Planning and Noise (referred to as PPG24; to which Policy DP28 makes reference) along with British Standards BS8233:1999 "*Sound insulation and noise reduction for buildings – Code of practice*" and BS6472-1:2008 "*Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting*" (to which PPG24 makes reference).

This report presents results of the noise and vibration survey and assessment along with recommendation for sound insulation and vibration isolation measures such that noise and vibration levels within the proposed residential development comply with guideline limits and includes:

- Description of the site and development proposals;
- Confirmation of London Borough of Camden Council planning consent requirements for noise and vibration;
- Measurement and assessment of existing ambient noise levels at the site;
- Measurement and assessment of existing vibration levels at the site;
- Review of sound insulation and vibration isolation measures required to comply with London Borough of Camden Council's limits.

2. LONDON BOROUGH OF CAMDEN COUNCIL PLANNING CONSENT REQUIREMENTS

The proposed noise and vibration measurement and assessment methodology is based on ACA Acoustics Limited's experience of undertaking noise assessments for similar developments.

A review of relevant parts of each of the routinely used planning guidance documents and British Standards is provided below.

2.1 Camden Development Policies 2010-2025: Local Development Framework – Policy DP28

Policy DP28 of London Borough of Camden Council's Local Development Framework states that "*the Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for … development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided*".

Paragraph 28.3 of the supporting text to Policy DP28 advises that "*where uses sensitive to noise are proposed to an existing source of noise … the Council will require an acoustic report to ensure compliance with PPG24: Planning and noise*". Discussion of Planning Policy Guidance 24 (PPG24) is provided below.

In addition to the requirements of PPG24, London Borough of Camden have specific requirements for noise and vibration thresholds, set out in Tables A to E of paragraph 28.4. Copy of Policy DP28 and the associated supporting text is included in Appendix B.

ACA Acoustics Limited has carried out an assessment of general (traffic and train) noise and vibration to the proposed residential development in accordance with Policy DP28.

2.2 Planning Policy Guidance 24: Planning and Noise (PPG24)

PPG24 has been used extensively at the planning stage of many new residential developments to determine the suitability of the land for residential development and what noise insulation measures are required.

The document provides a simple mechanism for determining whether noise should be a major factor when granting planning permission and considering suitable planning conditions for a development. The method introduces the concept of Noise Exposure Categories (NEC) to rate the importance of noise in the planning process. The objective of the noise survey and assessment is to determine the noise impact that existing sources would have on the proposed residential development and advise on any mitigating measures to ensure that noise levels inside rooms of new residential properties are reasonable and comply with guidance limits for noise intrusion advised in British Standard BS8233:1999 "*Sound insulation and noise reduction for buildings – Code of practice*" (to which PPG24 makes reference).

PPG24 has recently been withdrawn; however no replacement technical guidance document has been issued by central Government to date.

In March 2010 the Department for Environment, Food and Rural Affairs (Defra) issued Noise Policy Statement for England (referred to as NPSE). This sets out policy aims that are intended to be considered by Local Planning Authorities when development their own Local Policies relating to noise. Stated aims of NPSE are:

"*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy of sustainable development:*

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life.*"

Paragraph 2.8 of NPSE states that "*in the longer term, the Government hopes that existing policies could be reviewed (on a prioritised basis), and revised if necessary, so that the policies and any noise management measures being adopted accord with the vision, aims and principles of the NPSE*".

It is acknowledged that Local Authorities will need significant time to establish and issue new policies relating to noise to replace PPG24 and therefore the author considers that although withdrawn, continued use of the methodology of PPG24, and in particular consideration of internal noise level limits provided in BS8233, in the interim period will allow Local Authorities to readily evaluate the effect of existing noise sources on proposed new residential developments.

London Borough of Camden's Policy DP28 states that assessment should be carried out in accordance with guidelines set out in PPG24 with the results compared against criteria set out in Tables A to E (which in turn are based on the guidance in PPG24); in view of the above ACA Acoustics Limited considers that although withdrawn, continued use of the PPG24 methodology in this situation remains valid.

2.3 British Standard BS8233:1999

In advising guidance on permissible noise levels inside residential dwellings and appropriate noise mitigation measures PPG24 makes frequent reference to British Standard BS8233:1999 "*Sound insulation and noise reduction for buildings – Code of practice*". Guidance limits for internal noise within living rooms and bedrooms, taken from Table 5 of BS8233, are shown in Table 1 below:

Room	Reference Time	Design Range – LAeq, T	
		Good	Reasonable
Living Rooms	Daytime (07:00 – 23:00)	30dB	40dB
Bedrooms	Night time (23:00 – 07:00)	30dB	35dB
		LAFmax ≤45dB	

Table 1: BS8233 guideline internal noise levels

ACA Acoustics Limited's standard approach is to design noise to bedrooms to the lower "good" limit of Leq 30dBA and to the mid-range of maximum Leq 35dB for living rooms.

2.4 World Health Guidance

The World Health Organisation's guidance "*Community Noise 1999*" recommends a limit of Leq 30dBA for bedrooms at night as preventing sleep disturbance to vulnerable people.

The levels advised in The World Health Organisation's guidance correlate very well with those in BS8233 described above.

2.5 British Standard BS6472-1:2008

For the assessment of ground-borne vibration, particularly where proposed residential sites are close to railway lines, PPG24 refers to BS6472:1992 "*Guide to evaluation of human exposure to vibration in buildings (1-80Hz)*". Following issue of PPG24, BS6472:1992 has been superseded by BS6472-1:2008 "*Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting*".

BS6472-1 provides detailed guidance on levels of vibration which may cause adverse comment. For intermittent vibration, as in the case of trains, the standard recommends vibration is assessed in terms of Vibration Dose Values (VDV). This takes account of the severity of the vibration for each event (trains passing), the frequency and also the duration of vibration events to give separate day and night time VDV levels for comparison with guideline limits.

The significance for human response to vibration within residential dwelling, taken from Table 1 of BS6472-1, is shown in Table 2 below:

Reference Time	Low probability of adverse comment $m.s^{-1.75}$	Adverse comment possible $m.s^{-1.75}$	Adverse comment probable $m.s^{-1.75}$
Daytime (07:00 – 23:00)	0.2 – 0.4	0.4 – 0.8	0.8 – 1.6
Night time (23:00 – 07:00)	0.1 – 0.2	0.2 – 0.4	0.4 – 0.8

Table 2: BS6472-1 assessment result criteria

3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

The site is currently of a disused car parking area at 33-41 Wicklow Street, London WC1X 9JX. The site is bordered to the north by Wicklow Street, to the east by a small enclosed play area with residential properties beyond, to the south by a residential property and to the west by a wall with shear drop to railway cuttings. A railway tunnel runs directly below the site.

The proposed development is for a terrace of two dwelling-houses and four residential flats to be constructed.

The development is to be formed on a concrete raft foundation with metal frame structure and brick-appearance outer cladding, typically as Wienerberger's Corium Cladding System.

Noise levels incident on the site are primarily due to trains passing on the adjacent lines, trains within the underground tunnel, traffic on surrounding roads and low level pedestrian activity within the local area. During the author's visits to site to set up and collect the logging noise equipment then noise from nearby commercial properties was not considered to be audible nor dominant.

4. NOISE SURVEY

4.1 Noise Measurement and Assessment Procedure

To assess the impact of existing noise sources, noise samples were recorded at the development site generally in accordance with procedures set out in PPG24.

A single noise measurement position was selected as being worse case representative of the nearest part of the proposed residential façade overlooking the adjacent railway lines. Other parts of the development will be set back further from the railway lines and with greater screening provided by the new building itself.

The noise survey was carried out over nominally a 48-hour period between 1st October and 3rd October 2012. The weather included dry and calm periods during the survey. Noise measurements were recorded in terms of 5-minute samples of overall LAeq and LAFmax values.

In addition to the long-term measurements, short-term noise samples of octave band values for various train passes and ambient noise inbetween were also obtained to provide frequency content information of noise levels to assist with later acoustic calculations.

4.2 Instrumentation

The following equipment was used during the noise survey; the sound level meters were calibrated before and after the survey measurements using the UKAS certified calibrator:

Equipment	Serial Number
Logging Noise Measurements: Rion sound level meter type NL-31 Class 1 complete with weatherproof and lockable outdoor environmental kit	00773045
Short-term Octave Band Samples: Bruel & Kjaer sound level meter type 2260 complete with Bruel & Kjaer microphone type 4187	2627604 2625249
Bruel & Kjaer calibrator type 4231 (UKAS Certified)	02326801
Microphone extension cable and telescopic boom arrangements	-

Table 3: Equipment used

4.3 Noise Measurement Results and Observations

Complete LAeq and LAFmax value results of the noise survey over the 48-hour period are provided in graphical form in Appendix C.

Summary of the 12-hour daytime, 4-hour evening and 8-hour night-time period noise levels are shown in Table 4 below.

Description	Daytime (07:00 – 19:00) Leq (12 hour)	Evening (19:00 – 23:00) Leq (4 hour)	Night Time (23:00 – 07:00) Leq (8 hour)
1st – 2nd October 2012	65.9dBA	65.8dBA	61.8dBA
2nd – 3rd October 2012	65.5dBA	65.6dBA	61.1dBA

Table 4: Summary noise survey results for daytime, evening and night time periods

During the survey visits subjectively noise levels at the development site are comprised of passing trains on the adjacent lines, trains within the underground tunnel, distant traffic on local routes and pedestrian activity within the area.

Based on measurements of LAFmax values it is established that night time LASmax values at the site occasionally exceed 82dB during the early period to around 1am and from around 5.30am to 7am.

5. NOISE ASSESSMENT

London Borough of Camden Council's Policy DP28 assesses the impact of noise in terms of daytime LAeq, 12 hours (07:00 – 19:00), evening LAeq, 4 hours (19:00 – 23:00) and night time LAeq, 8 hours (23:00 – 07:00).

Equivalent free-field noise levels at the location of the proposed façade of the new development, compared with the noise limits specified in Policy DP28 are shown in Table 5 below.

Description	LAeq (dB)	Camden Policy DP28 Category
1st – 2nd October 2012		
Daytime	65.9	Table B – Attenuation Required
Evening	65.8	
Night time	61.8	
2nd – 3rd October 2012		
Daytime	65.5	Table B – Attenuation Required
Evening	65.6	
Night time	61.1	

Table 5: LAeq noise level and corresponding Policy DP28 Table requirement

Noise levels during daytime, evening and night time periods are within the range of values shown in Table B of Policy DP28, requiring attenuation measures to be considered.

It is recommended that internal noise levels should be designed to not exceed limits set out in BS8233; at this level amenity of future residents would not be compromised.

In summary it is considered the site is suitable for residential development providing that appropriate noise mitigation measures are incorporated into the scheme design to ensure noise levels inside rooms of the new residential properties are acceptable and achieve the guideline limits in BS8233. Recommendations for the noise mitigation measures are provided in Section 8 of this report.

6. VIBRATION SURVEY

6.1 Measurement Procedure

To assess vibration from trains passing the site vibration was measured in terms of rms acceleration, Vibration Dose Values (VDV) and peak particle velocity. This was carried out using an accelerometer fixed to a mounting block located at ground floor level at the location of the proposed new development.

Due to the type of meter and the location of the site it was not considered secure enough to leave the vibration monitoring equipment unattended; therefore a manned vibration survey was carried out during a busy daytime period.

In accordance with Section 3.5 of BS6472-1 "*where the vibration conditions are constant or repeated regularly, only one representative sample, of duration τ seconds, needs to be measured. If the vibration dose value determined is VDVb/d,τ then the total vibration dose value for the day, VDVb/d,day will be given by…*

$VDVb/d,day = (tday/t\tau)^{0.25} \times VDVb/d,\tau$"

Vibration levels have been taken to be at this maximum daytime level throughout the duration of train passes (operating times confirmed by measured LAFmax noise measurements). It is anticipated that vibration levels during late evening periods will likely be lower when train numbers will reduce and therefore the assessment can be considered to be robust and levels of vibration incident on the new dwellings will consequently be lower than those predicted.

Vibration levels were measured as 30 second samples in the vertical (Z-Axis) and horizontal direction (X- and Y-Axis) through the entire measurement period.

6.2 Instrumentation

The following equipment was used to measure vibration levels during the survey:

Equipment	Serial Number
Rion vibration meter type VM-54	00360146
Rion accelerometer type PV-83CW	0063644
Extension cable and steel mounting block arrangement	-

Table 6: Equipment used

6.3 Measurement Results and Observations

The measured vibration levels in terms of VDV values are shown in graphical format in Appendix D.

In addition to logging of VDV values, short-term samples of FFT acceleration were recorded for a number of overground and underground train passes to provide frequency content of the vibration to assist with later acoustic calculations. Print-outs from example train passes are included in Appendix D.

Vibration levels in the vertical direction (Z-Axis) are higher than levels in the horizontal direction (X- and Y-Axis). This is normal for ground-borne vibration due to train sources affecting adjacent residential sites.

7. VIBRATION ASSESSMENT

The Vibration Dose Values (VDV) shown in Appendix D are used to assess the likelihood of adverse comment about vibration in residential buildings.

Daytime and night time VDV have been calculated for the site in accordance with procedures outlined in Annex B of BS6472-1. The calculated day and night time VDV for the site are shown in Table 7 below; note that as discussed in Section 6, vibration measurements were carried out over a busy daytime period and have been taken to be equivalent to those measured throughout the period of train passes. Vibration levels will likely be lower during evening periods when number of train passes will be lower and therefore the assessment can be considered to be robust and levels of vibration incident on the new dwellings will consequently be lower than those predicted:

Description	X-Axis VDV $m.s^{-1.75}$	Y-Axis VDV $m.s^{-1.75}$	Z-Axis VDV $m.s^{-1.75}$	Comments
Daytime	0.41	0.53	0.99	Vibration is within the range of adverse comment probable
Night Time	0.24	0.31	0.59	Vibration is within the range of adverse comment probable

Table 7: Summary vibration survey VDV results for daytime and night time periods

Measured vibration levels at the proposed development site are within the range of values where adverse comment is probable when assessed to BS6472-1. These are above the range of values stated within Table C of London Borough of Camden Council's Policy DP28 where planning would not normally be granted.

While vibration levels at the site are above the limits set out in Table C of Policy DP28, it is considered that implementing a high performance scheme of vibration isolation within the construction of the new development will ensure that internal vibration levels inside rooms of the new development do not exceed the range of values of BS6472-1 at which there is a low probability of adverse comment, correlating with the limits of Policy DP28 Table C.

This approach is consistent with Policy DP28 of London Borough of Camden Council's Local Development Framework which states that "*the Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for … development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided*". Implementation of a high performance scheme of isolation should be considered as appropriate attenuation measures and thus the proposed development would be deemed to comply with the Policy.

It is of worth considering that there are various existing residential properties within the vicinity of the proposed development, including a residential property immediately to the south, similar distance to the adjoining railway lines and similarly over the underground railway tunnel.

Whilst it is acknowledged that existing residential properties may not be retrospectively assessed for noise or vibration intrusion, presence of these properties does establish the nature of the area. This proposed development would therefore not be introducing a noise- or vibration-sensitive use to an area where there are no existing noise sensitive uses.

By achieving internal vibration levels not exceeding those of Policy DP28 Table C it is therefore considered that although external vibration levels are above London Borough of Camden Council's typical maximum threshold, amenity of future residents would not be compromised and the site should be considered suitable for residential use.

8. SCHEME OF FAÇADE SOUND INSULATION

By following the calculation procedures outlined in BS EN ISO 12354-3:2000 and Section 6.7 of BS8233:1999 a specification for the acoustic performance of façade elements has been established.

Copy of example acoustic calculations for daytime noise intrusion to a typical living room and night time noise intrusion into a bedroom within the façade of the development directly overlooking the railway lines are provided in Appendix E. The calculations use ACA Acoustics Limited's in-house computer calculation model based on BS EN ISO 12354-3 and BS8233. The calculations confirm that intrusive noise levels into rooms of the proposed residential dwellings will comply with guidance limits in British Standard BS8233 as set out in Section 2.3 of this report.

An item by item scheme for noise insulation measures to the proposed residential dwellings is provided below.

8.1 Walls

External walls are likely to be brick-slip outer cladding on metal frame system with insulation and dry lining to the inside face. To achieve internal LAFmax noise criteria within bedrooms due to train passes overnight, it is recommended that a high specification construction is used, such as the Kingspan Architectural Façade System Assembly Reference E6k100 comprising of one layer 19mm Gyproc Plank plasterboard and one layer 15mm Gyproc Wallboard or equivalent. It is anticipated that the proposed Wienerberger Corium Cladding System would achieve similar sound insulation performance to the Kingspan system subject to similar build-up of the internal insulation and dry lining.

Values in Table 8 below show the expected sound insulation performance for this type of lightweight wall construction. Laboratory test results from BRE confirm this wall construction will provide minimum Rw 57dB.

Description	Octave Band Centre Frequency – Hz (dB)						Rw
	125	250	500	1k	2k	4k	(dB)
Wall	38	43	50	56	60	60	57

Table 8: Brick-slip cladding and metal frame external wall Sound Reduction Index R dB

8.2 Glazing

Values in Table 9 on the following page show a specification schedule of minimum sound insulation performance required for different areas of the proposed development.

Note that there are many permutations of possible configurations and different glazing suppliers will tend to use their own preferred configuration. Providing that the overall Rw performance and the individual octave band performance are not less than those shown in Table 9 then any alternative configuration can be used.

Description	Octave Band Centre Frequency – Hz (dB)						Rw (dB)	Comments
	125	250	500	1k	2k	4k		
Bedrooms – Front, Rear & Elevation B	29	35	45	56	52	56	47	Secondary glazing such as 4/16/4 IGU outer window, 150mm cavity, 6mm inner
Bedrooms – Elevation A	27	26	31	40	42	46	37	Double glazing such as 4/16/6 IGU
Living Rooms – Front, Rear & Elevation B	27	26	31	40	42	46	37	Double glazing such as 4/16/6 IGU
Living Rooms – Elevation A & non-habitable rooms	24	20	26	35	38	40	31	Double glazing such as 4/16/4 IGU

Table 9: Specification for glazing Sound Reduction Index R dB

For all living rooms and bedrooms, the window frames will need to have effective acoustic seals all around. Effective seals are rubber or neoprene beaded “P” or “O” profile type that compress all around on closure of the windows. Plastic type or brush type weathering seals are not classed as effective acoustic seals.

8.3 Ventilation Scheme

It is anticipated that it will be necessary to incorporate an acoustic ventilation scheme into the design such that residents are able to have background ventilation without necessarily needing to open windows.

To control night time LAFmax noise levels into bedrooms it is necessary for background ventilation to be provided by mechanical system incorporating inline silencing; in-window or through-wall type ventilators would not provide sufficient acoustic performance.

It is therefore anticipated that whole-house ventilation systems such as MVHR (mechanical ventilation heat recovery) or equivalent would be provided to each dwelling.

It is important that any self-noise (i.e. noise from the fans) must not cause internal noise levels to exceed the design requirements. To achieve these limits then it is recommended that the overall noise from any mechanical ventilation system will need to be no higher than LAeq 30dB within living rooms (daytime) and LAeq 25dB within bedrooms (night time) to allow for accumulation of noise sources.

9. SCHEME OF VIBRATION ISOLATION

As discussed in Section 7, ground-borne vibration at the development site is currently significantly above maximum permissible limits. Vibration levels within upper floors of any structure developed on the site has the potential to be even higher than those measured at ground floor level.

Based on the measured overall VDV and dominant forcing frequencies identified in the FFT measurements for train passes, it is recommended that any vibration isolation measures should provide minimum 85% isolation with a natural frequency no higher than 10Hz.

To achieve the above specification it is recommended that the entire concrete raft foundation and structure is isolated from the adjoining ground using proprietary vibration isolation material such as "*Sylomer*" provided by Total Vibration Solutions or equal and approved.

Contact details:
Total Vibration Solutions; Tel: 01706 260 220

Exact specification of product thickness, deflection, etc. is dependent on calculation of loading over the concrete raft.

Copy of data sheet for typical example within the *Sylomer* range is provided in Appendix F.

APPENDIX A

Layout Drawing of the Proposed Development

Rear elevation

elevation side A

side B elevation

A

6 Bike cycle storage

1 Flight of 18 steps risers 170 going 250

Space for temporary bed with screen.

Kitchen/Living/Dining 26.5m²

750 mm space between furniture

750 mm space between furniture

kitchen/dining/living 24m²

750 mm space around windows

store

Shallow fall in floor for floor drainage for an accessible ground level shower.

Store

House2 107m²

Bedroom 1 14.5m²

store

refuse store 3No. 11000 L bins to accomodate waste, recycling

mailboxes

HOUSE 1 101m²

Bedroom 4 8.7m²

1 Flight of 18 steps risers 170 going 250

Entrance

Externally lit and Covered entrance

Level access over threshold

Entrance

Externally lit and Covered entrance

Entrance

Level access over threshold

1 Flight of 18 steps risers 170 going 250

A

elevation front

PROPOSED Ground Floor Plan @1:100

0 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

NOTES

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4. Contractor to check all dimensions on site & report any discrepancies to architect

rev.	date		drn	aud
E	02.10.12	UPDATED TO CLIENT'S REQUIREMENTS	BC	KV
D	23.08.12	LAYOUT UPDATED	BC	KV
C	28.02.12	LAYOUT UPDATED	BC	KV
B	22.07.11	WINDOWS UPDATED	MH	KV
A	08.04.11	REMOVAL OF OVAL/REVSIED PLAN	MH	KV

drawing status

PLANNING

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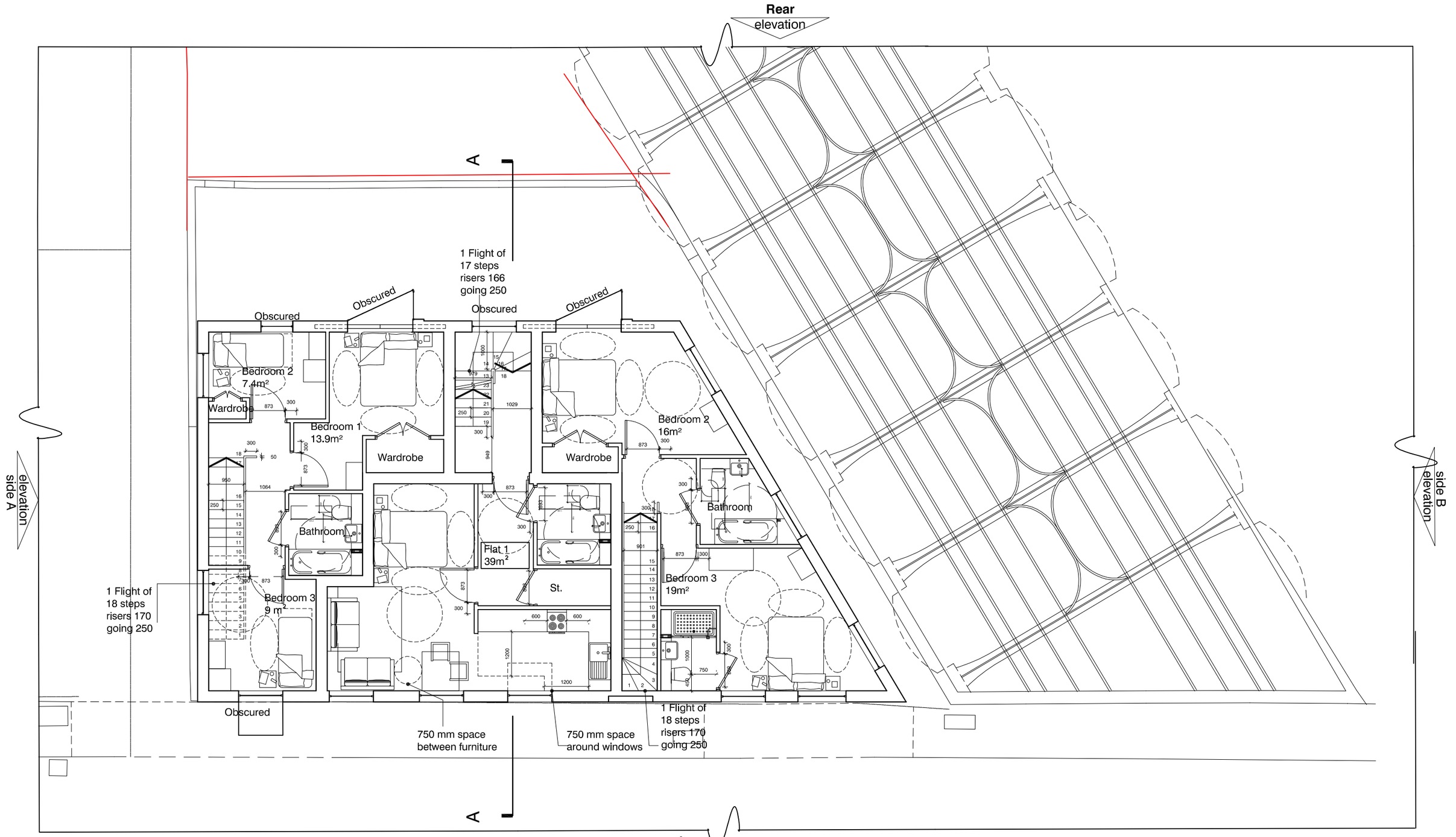
project	drawn	audited	scale	date
33 WICKLOW STREET, KINGS CROSS.	MH	KV	1:100 @ A3	NOV 10
drg title PROPOSED Ground Floor Plan	**job no.** 1026		**drg.no.** PL 04	**rev** E

FILE: XREF's:



PROPOSED
First Floor Plan @1:100

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rev.	date		drn	aud
E	02.10.12	UPDATED TO CLIENT'S REQUIREMENTS	BC	KV
D	23.08.12	LAYOUT REVISED	BC	KV
C	28.02.12	LAYOUT REVISED	BC	KV
B	08.04.11	REMOVAL OF OVAL/REVSIED PLAN	MH	KV
A	22.07.11	WINDOWS UPDATED	MH	KV

drawing status

PLANNING

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project	drawn	audited	scale	date
WICKLOW STREET, KINGS CROSS.	MH	KV	1:100 @ A3	NOV 10
drg title PROPOSED First Floor Plan	**job no.** 1026		**drg.no.** PL05	**rev** E

FILE: XREF's:

Rear elevation

side A elevation

side B elevation

front elevation

A

A

1 Flight of 17 steps risers 165 going 250

Obscured

Obscured

Obscured

Obscured

Bedroom2 8m²

Bedroom1 13m²

Bedroom1 12m²

FLAT2 71.9m²

FLAT 3 70m²

Store

St.

Kichen/Living Dining 30.8m²

Bedroom2 11m²

kichen/living dining 31m²

Obscured 750 mm space between furniture

Obscured

750 mm space around windows

750 mm space between furniture

PROPOSED
Second Floor Plan
@1:100

0 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

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D	23.08.12	LAYOUT UPDATED	BC	KV
C	28.02.12	LAYOUT UPDATED	BC	KV
B	22.07.11	WINDOWS UPDATED	MH	KV
A	08.04.11	REMOVAL OF OVAL/REVISED PLAN	MH	KV

drawing status

PLANNING

studio V Architects

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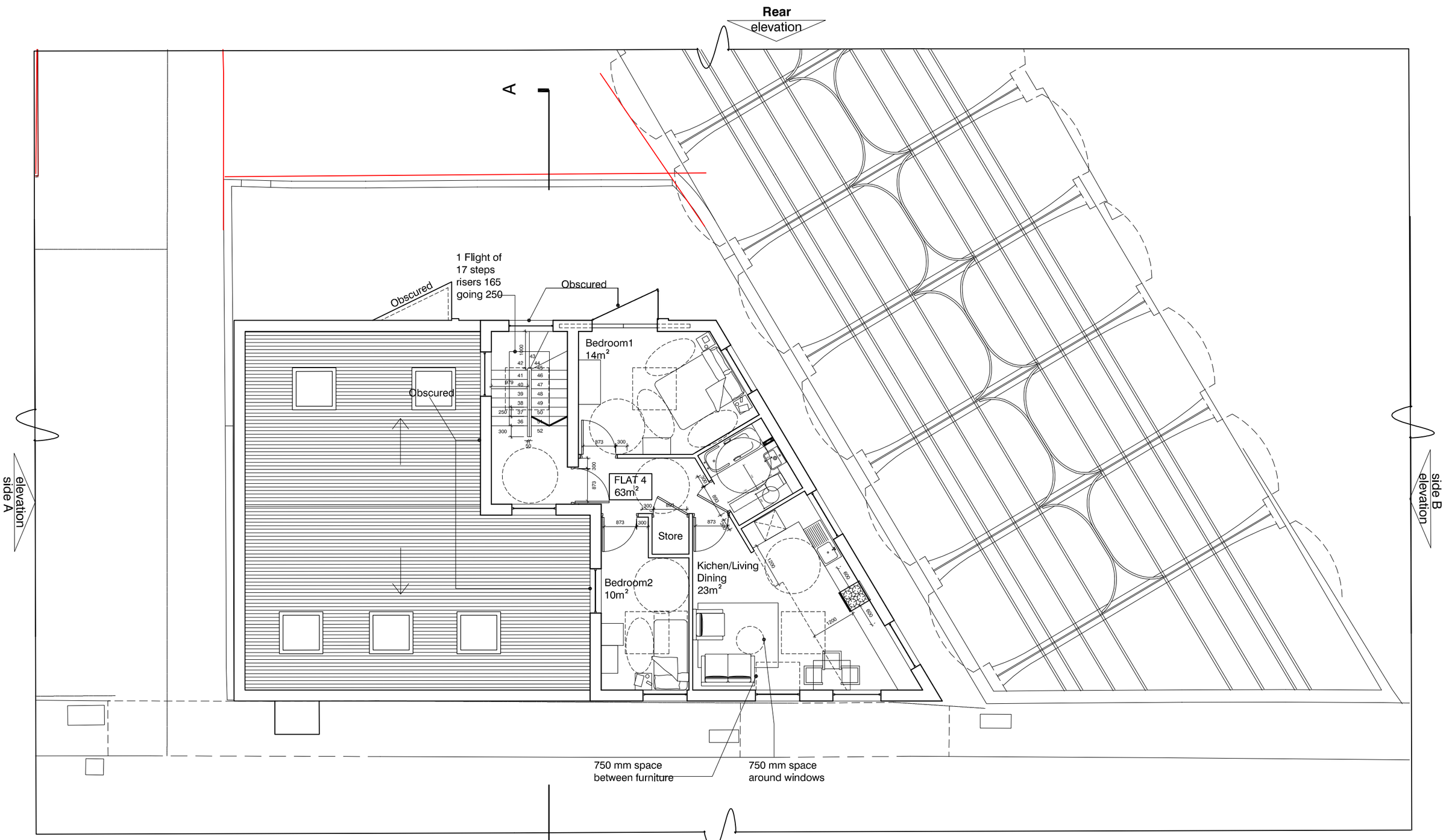
project	drawn	audited	scale	date
33 WICKLOW STREET, KINGS CROSS.	MH	KV	1:100 @ A3	NOV 10
drg title PROPOSED Second Floor Plan	**job no.** 1026		**drg.no.** PL06	**rev** E

FILE: XREF's:



PROPOSED
Third Floor Plan @1:100

NOTES
1. This drawing is copyright of Studio V Architects Ltd
2. Figured dimensions for construction purposes only
3. Drawing is scaleable for planning purposes
4. Contractor to check all dimensions on site & report any discrepancies to architect

rev.	date		drn	aud
E	02.10.12	UPDATED TO CLIENT'S REQUIREMENTS	BC	KV
D	23.08.12	LAYOUT REVISED	BC	KV
C	28.02.12	LAYOUT REVISED	BC	KV
B	22.07.11	STORES ADDED, WINDOW PLACMENT UPDATED	MH	KV
A	08.04.11	REMOVAL OF OVAL/REVISED PLAN	MH	KV

drawing status

PLANNING

0 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

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project	drawn	audited	scale	date
33 WICKLOW STREET, KINGS CROSS.	MH	KV	1:100 @ A3	NOV 10
drg title PROPOSED Third Floor Plan	**job no.** 1026		**drg.no.** PL07	**rev** E

FILE: XREFs: E

APPENDIX B

London Borough of Camden – Local Development Framework Policy DP28

DP28. Noise and vibration

28.1 Noise and vibration can have a major effect on amenity and health and therefore quality of life. Camden's high density and mixed-use nature means that disturbance from noise and vibration is a particularly important issue in the borough. Camden's Core Strategy recognises the importance of this issue for Camden's residents and policy DP28 contributes to implementing a number of Core Strategy policies, including CS5 – *Managing the impact of growth and development*, CS9 – *Achieving a successful Central London*, CS11 – *Promoting sustainable and efficient travel* and CS16 – *Improving Camden's health and well-being*.

DP POLICY

DP28 – Noise and vibration

The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for:

a) development likely to generate noise pollution; or

b) development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.

Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted.

The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds.

The Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact.

28.2 The effect of noise and vibration can be minimised by separating uses sensitive to noise from development that generates noise and by taking measures to reduce any impact. Noise sensitive development includes housing, schools and hospitals as well as offices, workshops and open spaces, while noise is generated by rail, road and air traffic, industry, entertainment (e.g. nightclubs, restaurants and bars) and other uses.

28.3 The Council will only grant planning permission for development sensitive to noise in locations that experience noise pollution, and for development likely to generate noise pollution, if appropriate attenuation measures are taken, such as double-glazing. Planning permission will not be granted for development sensitive to noise in locations that have unacceptable levels of noise. Where uses sensitive to noise are proposed close to an existing source of noise or when development that generates noise is proposed, the Council will require an acoustic report to ensure compliance with PPG24: *Planning and noise*. A condition will be imposed to require that the plant and equipment which may be a source of noise pollution is kept working efficiently and within the required noise limits and time restrictions. Conditions may also be imposed to ensure that attenuation measures are kept in place and effective throughout the life of the development.

28.4 In assessing applications, we will have regard to the Noise and Vibration Thresholds, set out below. These represent an interpretation of the standards in PPG24 and include an evening period in addition to the day and night standards contained in the PPG, which provide a greater degree of control over noise and vibration during a period when noise is often an issue in the borough.

Table A: Noise levels on residential sites adjoining railways and roads at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	74 dB L_{Aeq},12h	72 dB L_{Aeq},12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	74 dB L_{Aeq},4h	72 dB L_{Aeq},4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	66 dB L_{Aeq},8h	66 dB L_{Aeq},8h

Table B: Noise levels on residential streets adjoining railways and roads at and above which attenuation measures will be required

Noise description and location of measurement	Period	Time	Sites adjoining railways	Sites adjoining roads
Noise at 1 metre external to a sensitive façade	Day	0700-1900	65 dB L_{Aeq},12h	62 dB L_{Aeq},12h
Noise at 1 metre external to a sensitive façade	Evening	1900-2300	60 dB L_{Aeq},4h	57 dB L_{Aeq},4h
Noise at 1 metre external to a sensitive façade	Night	2300-0700	55 dB L_{Aeq},1h	52 dB L_{Aeq},1h
Individual noise events several times an hour	Night	2300-0700	>82 dB L_{Amax} (S time weighting)	>82 dB L_{AMAX} (S time weighting)

Table C: Vibration levels on residential sites adjoining railways and roads at which planning permission will not be granted

Vibration description and location of measurement	Period	Time	Vibration levels
Vibration inside critical areas such as a hospital operating theatre	Day, evening and night	0000-2400	0.1 VDV ms-1.75
Vibration inside dwellings	Day and evening	0700-2300	0.2 to 0.4 VDV ms-1.75
Vibration inside dwellings	Night	2300-0700	0.13 VDV ms-1.75
Vibration inside offices	Day, evening and night	0000-2400	0.4 VDV ms-1.75
Vibration inside workshops	Day, evening and night	0000-2400	0.8 VDV ms-1.75

Where dwellings may be affected by ground-borne regenerated noise internally from, for example, railways or underground trains within tunnels, noise levels within the rooms should not be greater than 35dB(A)max

Table D: Noise levels from places of entertainment on adjoining residential sites at which planning permission will not be granted

Noise description and measurement location	Period	Time	Sites adjoining places of entertainment
Noise at 1 metre external to a sensitive façade	Day and evening	0700-2300	L_{Aeq}, 5m shall not increase by more than 5dB*
Noise at 1 metre external to a sensitive façade	Night	2300-0700	L_{Aeq}, 5m shall not increase by more than 3dB*
Noise inside any living room of any noise sensitive premises, with the windows open or closed	Night	2300-0700	L_{Aeq}, 5m (in the 63Hz Octave band measured using the 'fast' time constant) should show no increase in dB*

* As compared to the same measure, from the same position, and over a comparable period, with no entertainment taking place

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dBL_{Aeq},

Key evidence and references

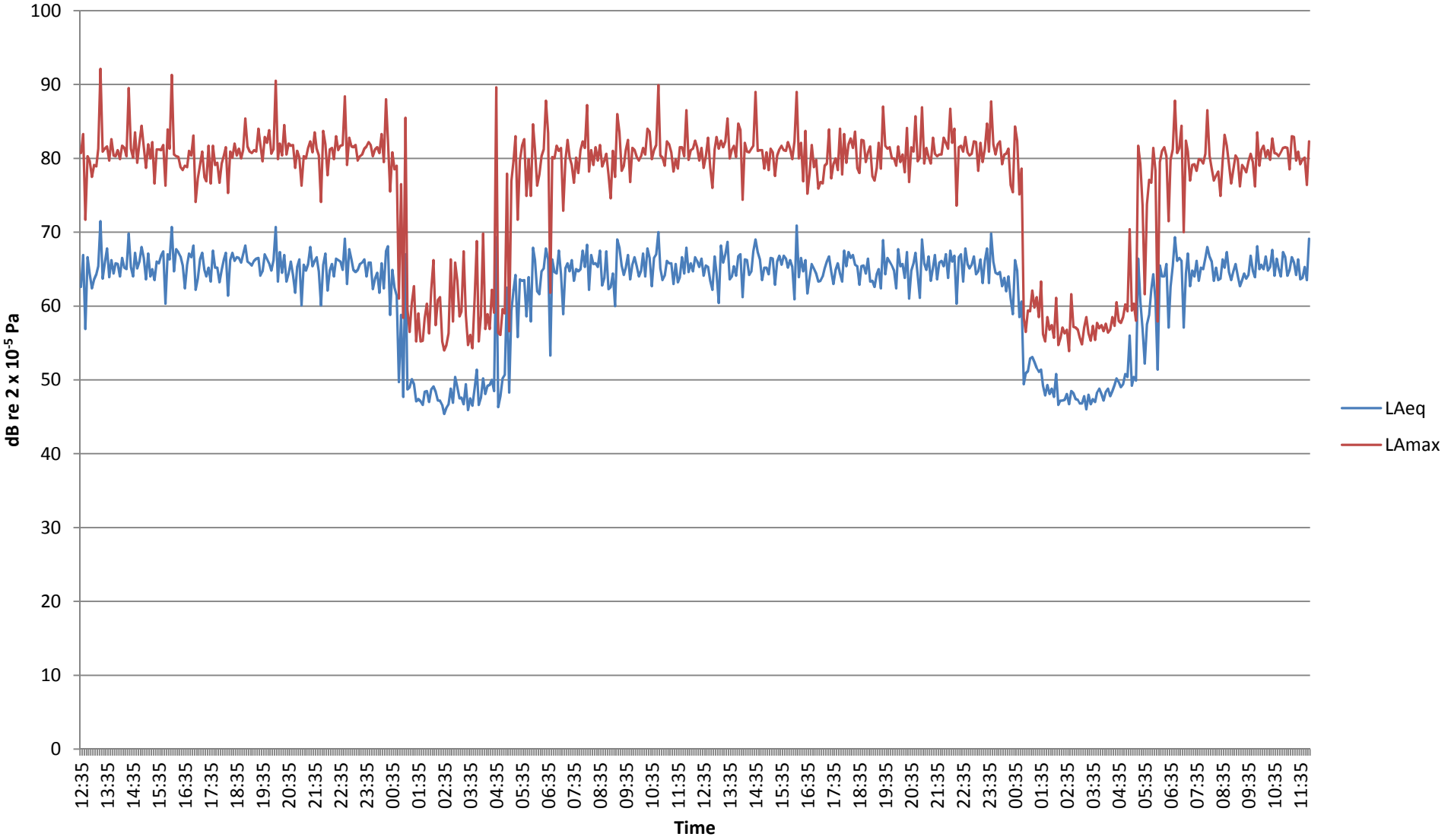
- Camden's Noise Strategy, 2002
- The London Plan (Consolidated with Alterations since 2004), 2008
- Planning Policy Guidance 24: Planning and noise

APPENDIX C

Noise Survey Results

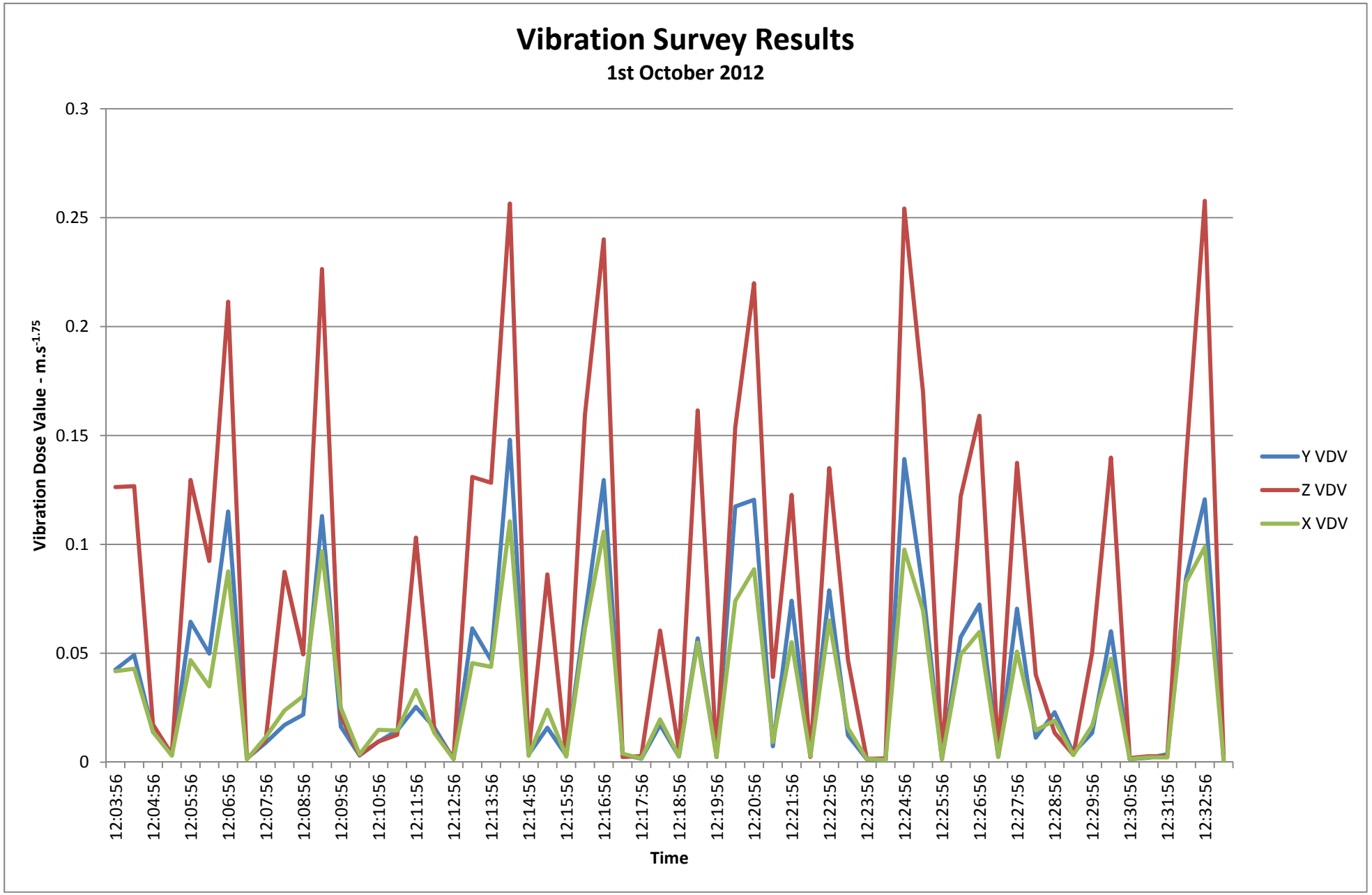
Noise Survey Results

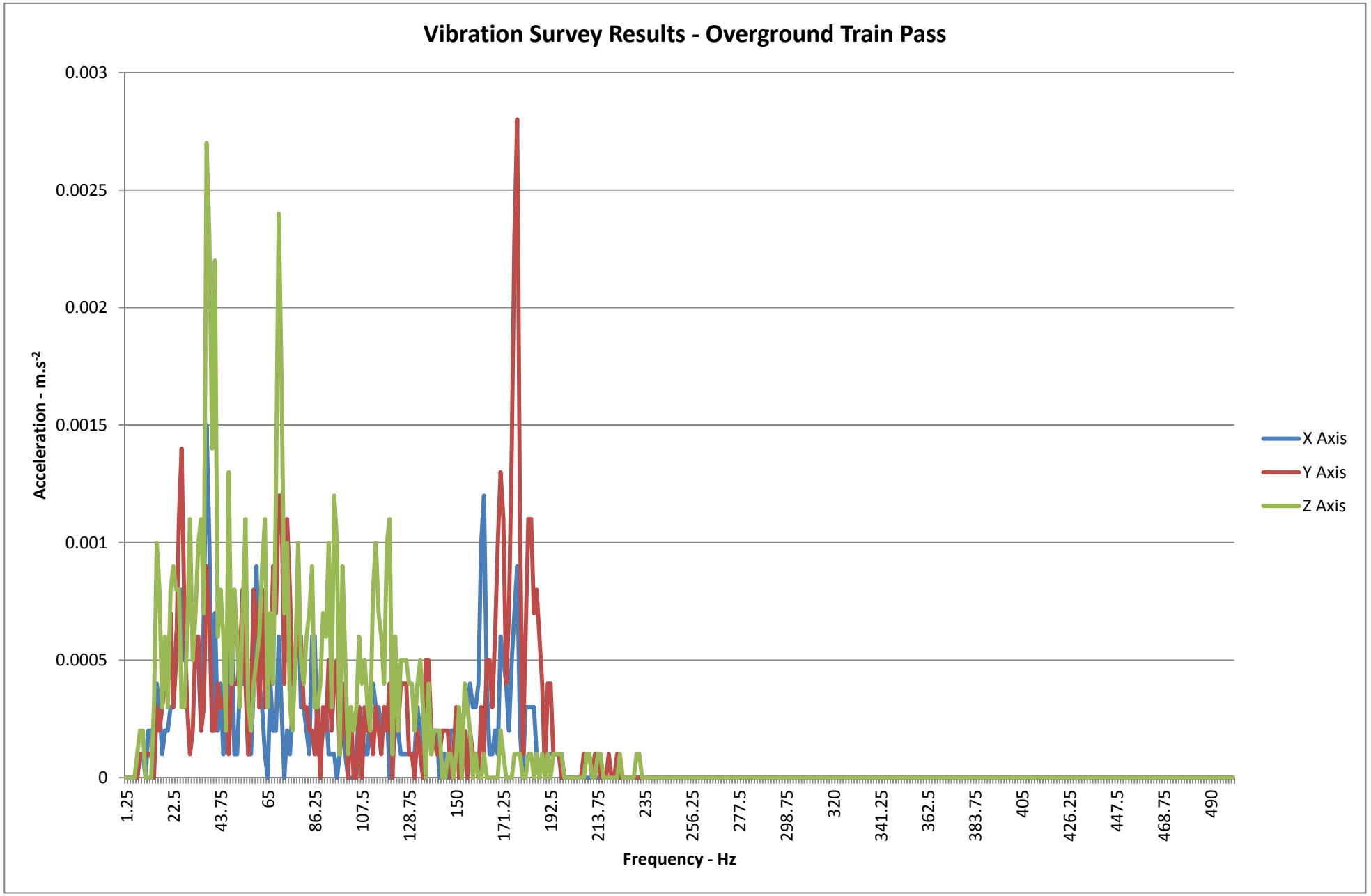
Monday 1 October - Wednesday 3 October 2012

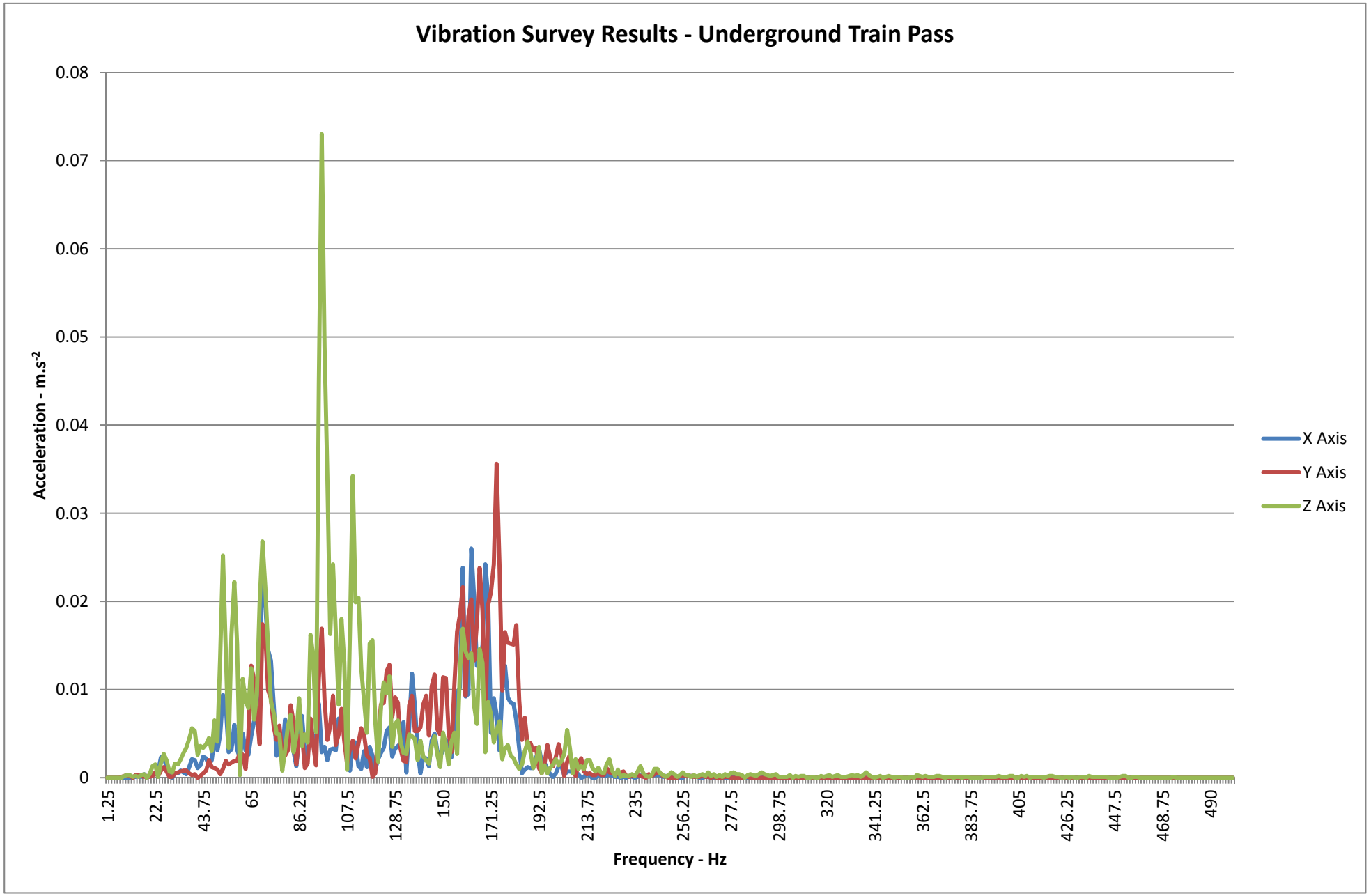


APPENDIX D

Vibration Survey Results


Vibration Survey Results
1st October 2012
Vibration Dose Value - m.s-1.75
0.3
0.25
0.2
0.15
0.1
0.05
0
12:03:56
12:04:56
12:05:56
12:06:56
12:07:56
12:08:56
12:09:56
12:10:56
12:11:56
12:12:56
12:13:56
12:14:56
12:15:56
12:16:56
12:17:56
12:18:56
12:19:56
12:20:56
12:21:56
12:22:56
12:23:56
12:24:56
12:25:56
12:26:56
12:27:56
12:28:56
12:29:56
12:30:56
12:31:56
12:32:56
Time
Y VDV
Z VDV
X VDV


Vibration Survey Results - Overground Train Pass
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Acceleration - m.s-2
1.25
22.5
43.75
65
86.25
107.5
128.75
150
171.25
192.5
213.75
235
256.25
277.5
298.75
320
341.25
362.5
383.75
405
426.25
447.5
468.75
490
Frequency - Hz
X Axis
Y Axis
Z Axis


Vibration Survey Results - Underground Train Pass
Acceleration - m.s-2
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1.25
22.5
43.75
65
86.25
107.5
128.75
150
171.25
192.5
213.75
235
256.25
277.5
298.75
320
341.25
362.5
383.75
405
426.25
447.5
468.75
490
Frequency - Hz
X Axis
Y Axis
Z Axis

APPENDIX E

Façade Sound Insulation – Acoustic Calculations

Project: 33-41 Wicklow Street, London WC1X

BS EN ISO 12354-3 - FAÇADE SOUND INSULATION CALCULATION

Room Reference: House 2 - Kitchen/Dining/Living

Measured Lp at Façade:

	dBA	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Leq,ff	65.9	65	67	64	62	54

Façade 1:

Element	Construction	Area (m^2)
Wall (area including glazing)	Metsec frame with brick slip cladding (Kingspan ref E6c100)	27.1
Windows	4-16-6 IGU Schuco	5
Ventilation	Whole-house heat recovery ventilation	1
Doors	4-16-6 glazed door, well sealed	3.8
Roof / Ceiling		0

Element Sound Reduction Index

		Sound Reduction Index (R) - dB				
Surface	Area (m^2)	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Walls	27.1	38	43	50	56	60
Windows	5	27	26	31	40	42
Ventilation	1	50	55	60	65	70
Doors	3.8	27	26	31	40	42
Roof / Ceiling	0					

Room Volume (m^3):	62
Façade Area (m^2):	30.9
Roof Area - Exposed Side (m^2):	0

Reverberation Time

		Reverberation Time - Seconds				
Room Type:	Living Room	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
RT in Furnished Room		0.7	0.6	0.5	0.5	0.5

CALCULATED EQUIVALENT INTERNAL SOUND PRESSURE LEVEL - LAeq

	dBA	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Leq,2	**34.9**	**39.7**	**41.5**	**32.6**	**21.7**	**11.6**

ACA Acoustics Limited

Hamilton House, Mabledon Place, Bloomsbury, London WC1H 9BB
Email: info@aca-acoustics.co.uk
Office: 0207 554 8567
Fax: 0207 554 8501
www.aca-acoustics.co.uk

Project: 33-41 Wicklow Street, London WC1X

BS EN ISO 12354-3 - FAÇADE SOUND INSULATION CALCULATION

Room Reference: House 2 - Bedroom 2

Measured Lp at Façade:

	dBA	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Leq,ff	61.8	61	63	60	58	49

Façade 1:

Element	Construction	Area (m^2)
Wall (area including glazing)	Metsec frame with brick slip cladding (Kingspan ref E6c100)	19.3
Windows	6-150-4 secondary glazing	5.7
Ventilation	Whole-house heat recovery ventilation	1
Doors		0
Roof / Ceiling		0

Element Sound Reduction Index

		Sound Reduction Index (R) - dB				
Surface	Area (m^2)	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Walls	19.3	38	43	50	56	60
Windows	5.7	29	35	45	56	52
Ventilation	1	50	55	60	65	70
Doors	0					
Roof / Ceiling	0					

Room Volume (m^3):	42
Façade Area (m^2):	19.3
Roof Area - Exposed Side (m^2):	0

Reverberation Time

		Reverberation Time - Seconds				
Room Type:	Bedroom	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
RT in Furnished Room		0.4	0.35	0.3	0.3	0.3

CALCULATED EQUIVALENT INTERNAL SOUND PRESSURE LEVEL - LAeq

	dBA	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Leq,2	**20.8**	**31.5**	**27.2**	**14.6**	**4.6**	**-4.5**

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www.aca-acoustics.co.uk

Project: 33-41 Wicklow Street, London WC1X

BS EN ISO 12354-3 - FAÇADE SOUND INSULATION CALCULATION

Room Reference: House 2 - Bedroom 2

Measured Lp at Façade:

	dBA	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Lmax	85	84	87	83	80	72

Façade 1:

Element	Construction	Area (m^2)
Wall (area including glazing)	Metsec frame with brick slip cladding (Kingspan ref E6c100)	19.3
Windows	6-150-4 secondary glazing	5.7
Ventilation	Whole-house heat recovery ventilation	1
Doors		0
Roof / Ceiling		0

Element Sound Reduction Index

		Sound Reduction Index (R) - dB				
Surface	Area (m^2)	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Walls	19.3	38	43	50	56	60
Windows	5.7	29	35	45	56	52
Ventilation	1	50	55	60	65	70
Doors	0					
Roof / Ceiling	0					

Room Volume (m^3):	42
Façade Area (m^2):	19.3
Roof Area - Exposed Side (m^2):	0

Reverberation Time

		Reverberation Time - Seconds				
Room Type:	Bedroom	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
RT in Furnished Room		0.4	0.35	0.3	0.3	0.3

CALCULATED EQUIVALENT INTERNAL SOUND PRESSURE LEVEL - LAMAX

	dBA	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz
Lmax	**44.3**	**54.5**	**51.2**	**37.6**	**26.6**	**18.5**

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APPENDIX F

Typical Noise & Vibration Mitigation Treatments

BRE CERTIFICATION CERTIFICATE 118/06 SUPPLEMENT 6

118/06/S2
DATE OF ISSUE
June 2007

PRODUCT

Kingspan Offsite Architectural Façade Systems with Brick Slip or Render on Board external faces

SUPPLIED BY

Kingspan Metl-Con Ltd
Sherburn
Malton
North Yorkshire
Y017 8PQ

Tel: 01944 712000
Fax: 01944 711085
E-mail: info@kingspanoffsite.co.uk
Web site: www.kingspan.com

Summary

This supplement relates to two types of external faces utilised in the Kingspan Offsite Architectural Façade System and must be read in conjunction with Certificate 118/06, which gives general information and requirements relating to that system, Building Regulations, quality control and conditions of certification.

The two types of external faces are:

l) StoVentec render on board cladding
m) Baggeridge Brick Slip cladding

CONFIRMATION

For and on behalf of BRE Certification

Director,
BRE Certification Ltd

Date: June 2007

Table 3 –Calculated Weighted Sound Reduction Index (R_w) and Fire Resistance – E2/E6 series walls (see clause 1.1.3 of Certificate 118/06)

Kingspan Assembly ref	External face	Calculated Weighted Sound Reduction Index R_w ($C;C_{tr}$) (dB)(1)	Fire Resistance in minutes(1) and (maximum storey height limitation (m))(4)	
			Wall < 1m from boundary(2)	Wall 1m or more from boundary(3)
E2a100	Tested with rainscreen Macfox bracket and rail only	43(-3;-8)	n/a	30
E2b100	Tested with rainscreen Macfox bracket and rail only	46(-2;-8)	n/a	60
E2c100	Tested with rainscreen Macfox bracket and rail only	45(-2;-7)	n/a	30
E2d100	Tested with rainscreen Macfox bracket and rail only	47(-2;-8)	n/a	30
E2e100	Tested with rainscreen Macfox bracket and rail only	Not tested	n/a	60
E6a100	Brick slip finish	53(-4;-11)	30 (4.0m)	30 (4.0m)
E6b100	Brick slip finish	57(-5;-13)	90	90
E6c100	Brick slip finish	56(-3;-10)	30 (4.0m)	30 (4.0m)
E6d100	Brick slip finish	57(-5;-12)	60	90
E6e100	Brick slip finish	58(-4;-12)	90	90
E6i100	Brick slip finish	57(-5;-13)	90	90
E6k100	Brick slip finish	57(-6;-14)	90	90

(8) The calculated weighted sound reduction index and the fire resistance values, based on tests, above have been based on stud centres of 600mm. Advice should be sought from Kingspan Metl-Con Ltd for values for studs spaced at centres less than 600mm.
(9) Fire risk from either side – integrity and insulation for the period stated
(10) Fire risk from inside the building only – integrity for the period stated, and insulation 15min
(11) Height limited owing to the high temperature recorded in the steel studs

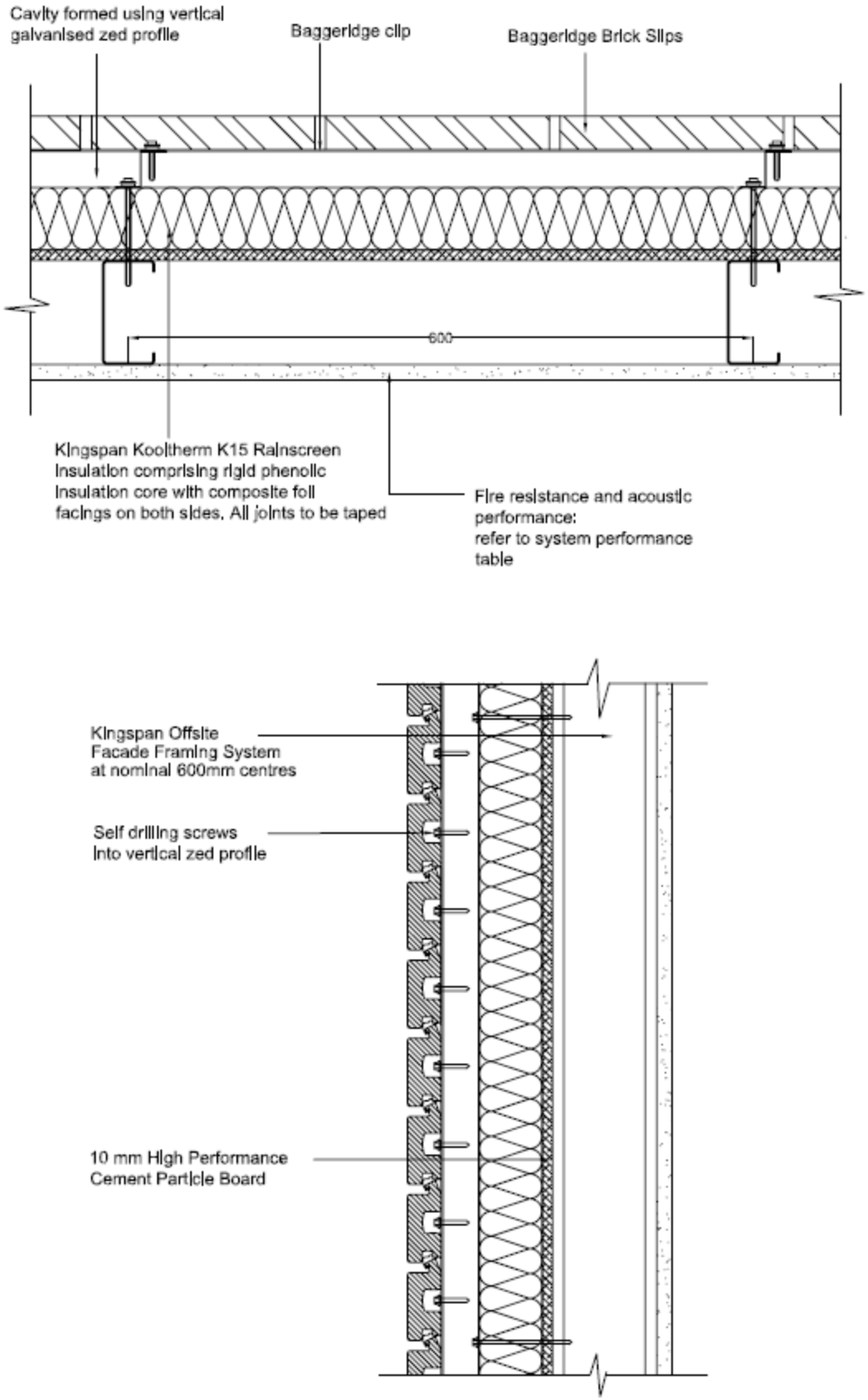


Figure 2: Baggeridge Brick Slip external face

MRXBOX95-LOFT

Whole House Heat Recovery Solutions

Nuaire's new range of XBOX95 heat recovery systems offer high efficiency in a compact, loft designed unit.

This concept provides optimised balanced (supply & extract) mechanical ventilation with heat recovery. Tempered air is delivered into 'living' areas whilst extracting moisture laden air from 'wet' areas, creating comfortable well ventilated homes.

Ultra Efficient Ventilation

Using the latest generation of low watt DC fans and motors, counter flow heat exchanger combined with easy accessible controls.

The system will quietly and efficiently provide the dwelling with fresh filtered air all year round, creating a healthier living environment.

SAP APPENDIX Q nuaire ELIGIBLE

Helping you meet Code for Sustainable Homes level 3 or above

SAP Appendix Q Guide

Application	Specific Fan Power(W/l/s)	Heat Exchange Efficiency	Energy Saving Trust Best Practice Performance Compliant
Kitchen + 1 Wet Room	0.69	92%	Yes
Kitchen + 2 Wet Rooms	0.76	92%	Yes
Kitchen + 3 Wet Rooms	0.85	90%	Yes

CARBON TRUST STANDARD
REDUCING CO2 YEAR ON YEAR

MRXBOX95-WALL

Whole House Heat Recovery Solutions

Nuaire's new range of XBOX95 heat recovery systems offer high efficiency in a very compact unit.

This concept provides optimised balanced (supply & extract) mechanical ventilation with heat recovery. Tempered air is delivered into 'living' areas whilst extracting moisture laden air from 'wet' areas, creating comfortable well ventilated homes.

Ultra Efficient Ventilation

Using the latest generation of low watt DC fans and motors, counter flow heat exchanger combined with easy accessible controls.

The system will quietly and efficiently provide the dwelling with fresh filtered air all year round, creating a healthier living environment.

Helping you meet Code for Sustainable Homes level 3 or above

SAP Appendix Q Guide

Application	Specific Fan Power(W/l/s)	Heat Exchange Efficiency	Energy Saving Trust Best Practice Performance Compliant
Kitchen + 1 Wet Room	0.59	92%	Yes
Kitchen + 2 Wet Rooms	0.68	91%	Yes
Kitchen + 3 Wet Rooms	0.83	90%	Yes

SAP APPENDIX Q nuaire ELIGIBLE

CARBON TRUST STANDARD
REDUCING CO2 YEAR ON YEAR

Sylomer® SR 110
Product datasheet

by getzner sylomer®

Material mixed cellular polyurethane
Colour brown

Standard dimensions on stock

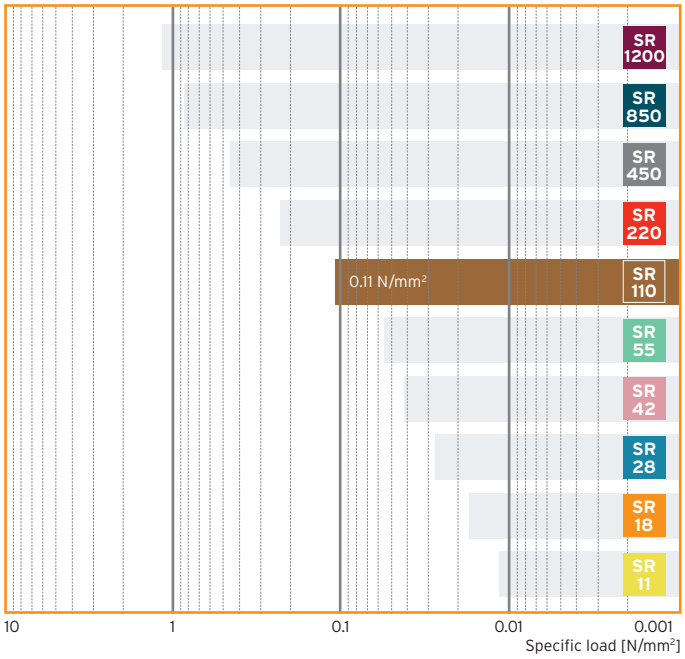
Thickness: 12.5 mm with Sylomer® SR 110 – 12
25 mm with Sylomer® SR 110 – 25
Rolls: 1.5 m wide, 5.0 m long
Stripes: max. 1.5 m wide, up to 5.0 m long

Other dimensions (also thickness), as well as stamped and molded parts on request.

Area of application	Compression load	Deflection
	depending on form factor, values apply to form factor 3	
Static range of use (static loads)	up to 0.11 N/mm²	approx. 10 %
Operating load range (static plus dynamic loads)	up to 0.16 N/mm²	approx. 20 %
Load peaks (short term, infrequent loads)	up to 3 N/mm²	approx. 70 %

Standard Sylomer® range

Static range of use



Material properties		Test methods	Comment
Mechanical loss factor	$\eta = 0.13$	DIN 53513*	depending on frequency, load and amplitude
Rebound elasticity	55 %	DIN 53573	tolerance +/- 10 %
Compression set	< 5 %	EN ISO 1856	50 %, 23 °C, 70 h, 30 min after unloading
Static shear modulus	0.22 N/mm²	DIN ISO 1827*	at specific load of 0.11 N/mm²
Dynamic shear modulus	0.42 N/mm²	DIN ISO 1827*	at specific load of 0.11 N/mm², 10 Hz
Coefficient of friction (steel)	$\mu_S = 0.5$	Getzner Werkstoffe	dry
Coefficient of friction (concrete)	$\mu_B = 0.7$	Getzner Werkstoffe	dry
Abrasion	1100 mm³	DIN 53516	load 10 N, bottom surface
Operating temperature	-30 bis 70 °C		short term higher temperatures possible
Specific volume resistance	> 10^{11} Ω·cm	DIN IEC 93	dry
Thermal conductivity	0.08 W/(mK)	DIN 52612/1	
Flammability	B2 B, C and D	DIN 4102 EN ISO 11925-2	normal flammable passed

* Tests according to respective standards

All information and data is based on our current knowledge. The data can be applied for calculations and as guidelines, are subject to typical manufacturing tolerances and are not guaranteed. We reserve the right to amend the data.

Further information can be found in VDI Guideline 2062 (Association of German Engineers).
Further characteristic values on request.

www.getzner.com
getzner
the good vibrations company

Load deflection curve

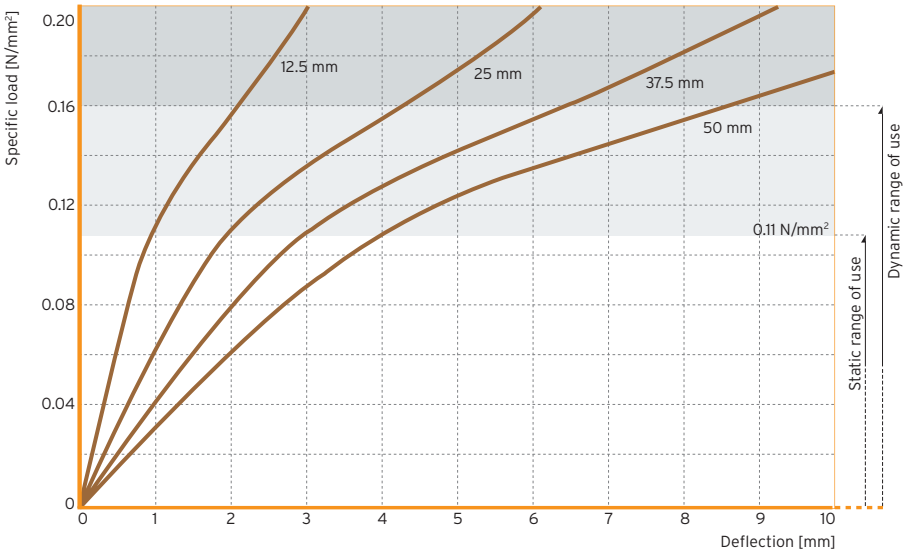


Figure 1: Quasistatic load deflection curve measured with a loading rate of 0.011 N/mm²/s

Testing between flat steel-plates; recording of the 3rd loading; testing at room temperature

Form factor 3

Modulus of elasticity

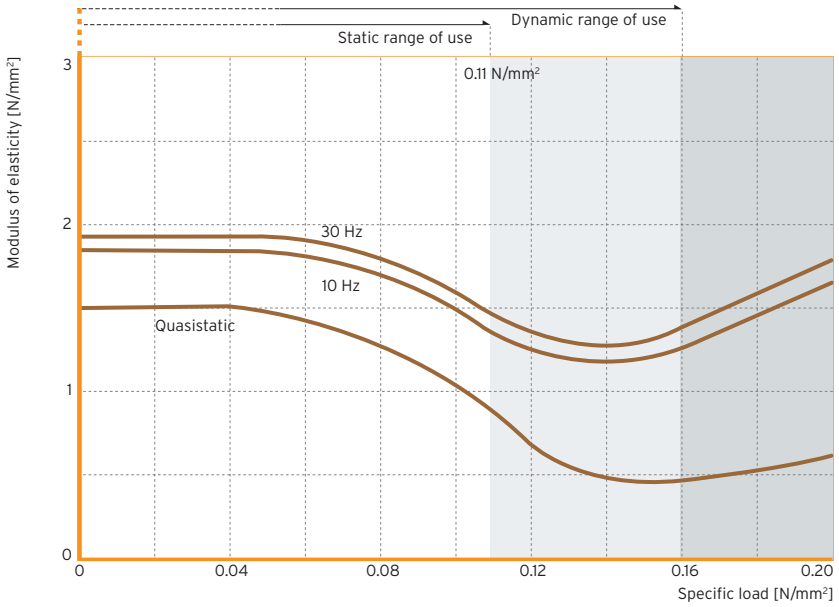


Figure 2: Load dependency of the static and dynamic modulus of elasticity

Quasistatic modulus of elasticity as a tangent modulus taken from the load deflection curve; dynamic modulus of elasticity due to sinusoidal excitation with a velocity level of 100 dBv re. $5 \cdot 10^{-8}$ m/s (equal to an oscillating range of 0.22 mm at 10 Hz and 0.08 mm at 30 Hz, see also in the glossary)

Test according to DIN 53513

Form factor 3

Natural frequency

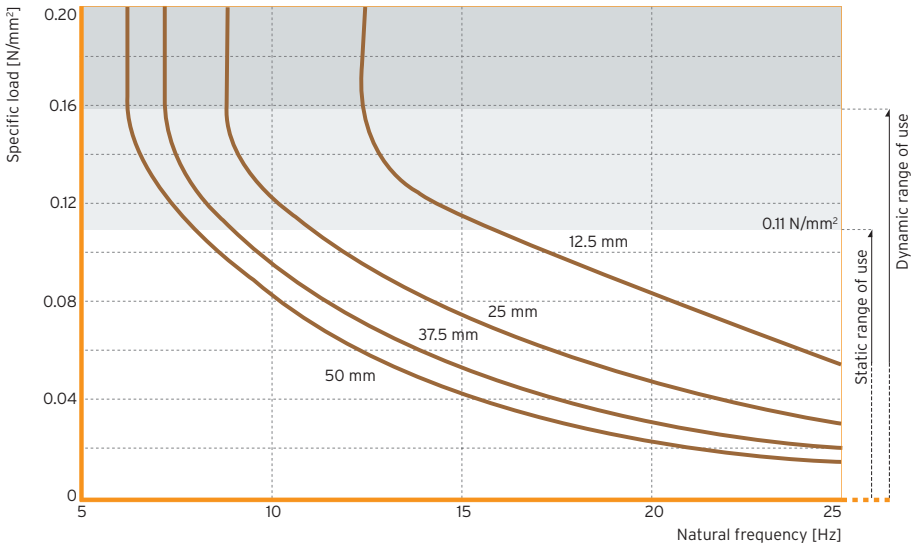


Figure 3: Natural frequency of a single-degree-of-freedom system (SDOF system) consisting of a fixed mass and an elastic bearing consisting of Sylomer® SR 110 based on a stiff subgrade

Parameter: Thickness of elastomeric bearing

Form factor 3

Vibration isolation efficiency

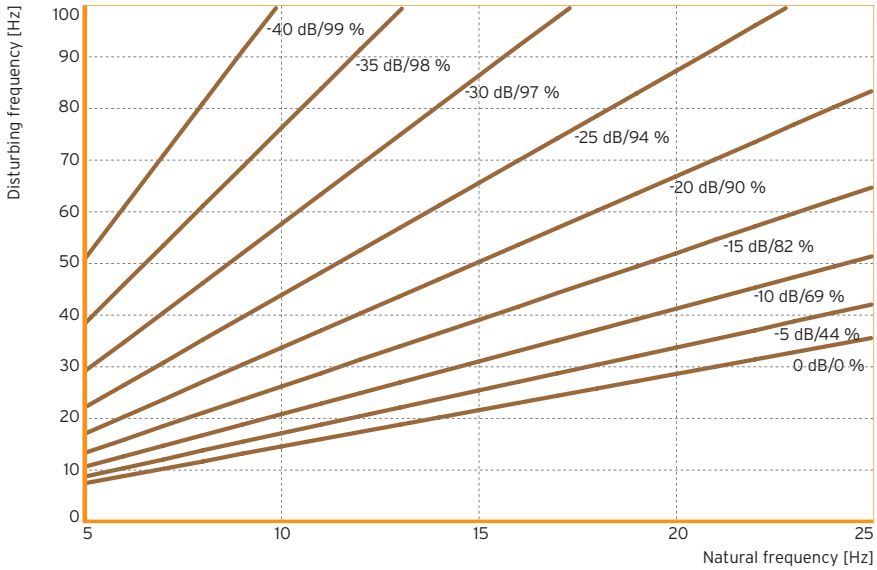


Figure 4: Reduction of the transmitted mechanical vibrations by implementation of an elastic bearing consisting of Sylomer® SR 110

Parameter: Factor of transmission in dB, isolation rate in %

Influence of the form factor

In the figures below one can find correction varying form factors.

Figure 5: Static load range

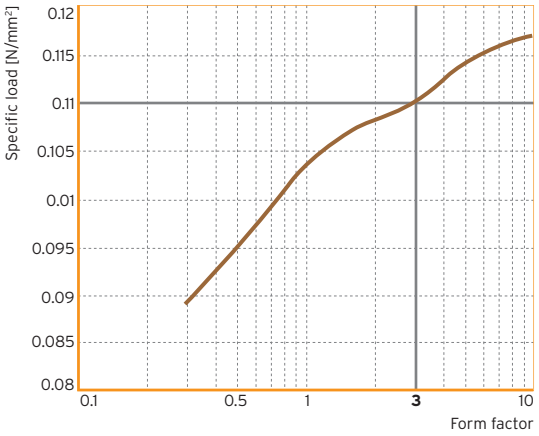


Figure 6: Deflection*

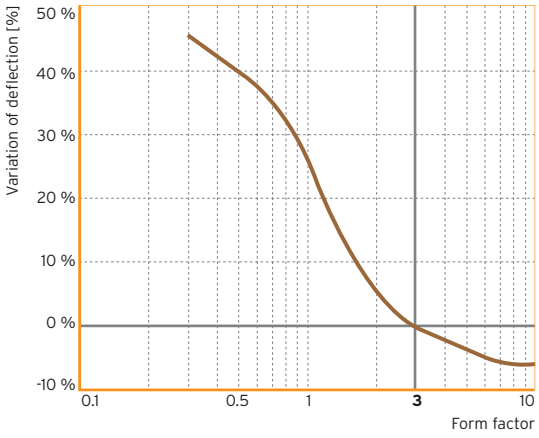


Figure 7: Dynamic modulus of elasticity at 10 Hz*

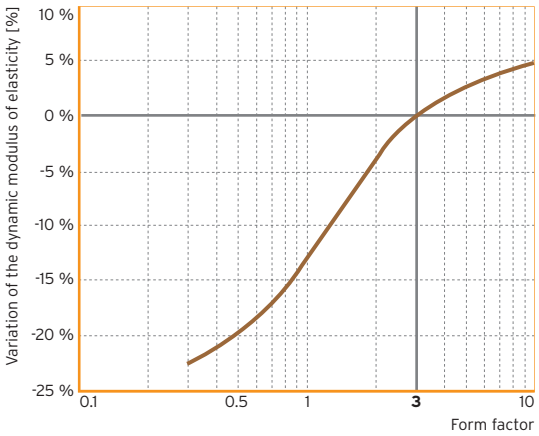
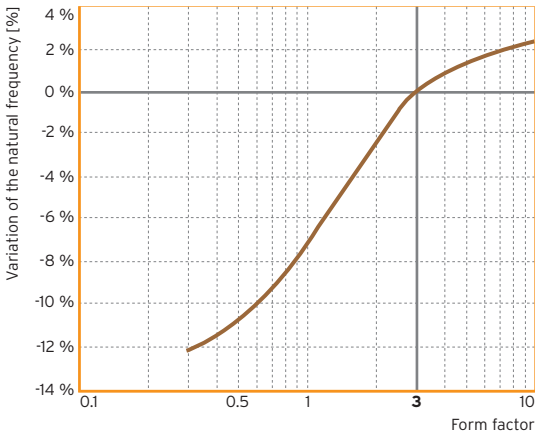


Figure 8: Natural frequency*



* Reference value: specific load 0.11 N/mm², form factor 3

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