Bickerdike Allen Partners
Architecture Acoustics Technology

QUEEN'S CLUB GARDENS, W14

BAP'S SURVEY AND RECOMMENDATIONS AS TO A HIGH PERFORMANCE SPECIFICATION FOR PROPOSED FLOATING WOODEN FLOORING

2024 UPDATE

Report to

Queen's Club Gardens Ltd
The Estate Office
5 Zenobia Mansions
Queen's Club Gardens
London W14 9TD

A11617_01_RP001_3.0
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Bickerdike Allen Partners LLP is an integrated practice of Architects, Acousticians, and Construction Technologists, celebrating over 60 years of continuous practice.

Architects: Design and project management services which cover all stages of design, from feasibility and planning through to construction on site and completion.

Acoustic Consultants: Expertise in planning and noise, the control of noise and vibration and the sound insulation and acoustic treatment of buildings.

Construction Technology Consultants: Expertise in building cladding, technical appraisals and defect investigation and provision of construction expert witness services.

Contents

Page No.

Appendices

Appendix 1: Glossary of acoustic terminology

Appendix 2: Layout plans & photographs – prior to works

1.0 INTRODUCTION

1.1.1 Bickerdike Allen Partners LLP (BAP) are engaged by Queen's Club Gardens Limited (QCG), lessor of 551 Victorian mansion flats in W14, to update our 2013 report[1] with respect to the number of proprietary flooring products that are in our view capable of meeting the "good" performance standard in our report. This updated report supersedes our previous 2013 report, and contains accordingly a revised list of approved flooring products.

1.1.2 A list of currently approved products is presented For other products, test certificates should be obtained to show they meet the recommendation.

1.1.3 This report applies only to living rooms ("dry" rooms) e.g. bedrooms, sitting rooms, dining rooms and studies, and hallways above such living rooms ("dry" rooms).

1.1.4 In 2011 BAP carried out a survey of the building to familiarise ourselves with its construction and layout, so we could give appropriate advice. We were asked to make recommendations as to a high performance specification for future proposals to install isolated hard wood flooring, with the aim of providing protection to the landlord's position regarding their covenant to provide quiet enjoyment to the lessees collectively.

1.1.5 We were provided with a representative separating floor construction, Test Location (1) [See Appendix 2], where we understood that a lessee was considering the installation of new hard wood floors. Prior to our survey, we were asked to test a further floor, Test Location (2) [See Appendix 2], to increase the number of sample floors. We visited site to assess these floors on 20 May 2011 and provided a report dated 13 Jun 2011. We recorded the test results of BAP's airborne and impact sound insulation tests, and gave BAP's guidance for a hard wood floor specification on behalf of the lessor.

1.1.6 Acoustic terms and test procedures are described in Appendix 1.

1.1.7 This report has been prepared specifically in response to instructions received from Queen's Club Gardens Ltd. and is not intended for any other purpose. Survey work carried out in connection with this commission is limited in extent to the scope of those instructions.

[1] BAP Report A9692-R02-HGL dated 9 December 2013

2.0 TYPICAL SEPARATING FLOOR CONSTRUCTION

2.1.1 Copies of drawings and sketches provided are in Appendix 2, including a typical floor plan, a sketch of timber-joist/pugging construction, and an estate layout plan. Photographs of floors tested include a surface view of the pugging.

2.1.2 We are advised by Faraday Property Management Limited, surveyors for QCG, that some floors have no pugging in place and some lath and plaster ceilings have been replaced by plasterboard.

2.1.3 It is usual practice working on existing buildings to carry out sound insulation testing to assess sound insulation of constructions. Other than lifting floorboards (Appendix B (d) photographs), we did not open up any floors, ceilings or flanking walls to inspect their construction.

3.0 SOUND INSULATION TEST, 2011

3.1 Bickerdike Allen Partners are members of the Association of Noise Consultants (ANC) Registration Scheme for sound insulation pre-completion testing under the provisions of the Building Regulations 2010 and we are therefore qualified to undertake this sound insulation testing, though we appreciate Building Regulations do not apply in this case. BAP's testing was generally in accordance with the following standards,

- Airborne sound insulation tests of separating floor constructions generally in accordance with BS EN ISO 140-4, rated in accordance with BS EN ISO 717-1.
- Impact sound insulation tests of separating floor constructions generally in accordance with BS EN ISO 140-7, rated in accordance with BS EN ISO 717-2.

3.2 BAP's detailed test results, airborne sound insulation of the existing separating floors, and of impact sound insulation with and without the existing carpets and underlay fitted are summarised in Table 1 below. Airborne sound insulation is 41-49 dB $D_{nT,w}+C_{tr}$. Basic floor impact sound insulation (tapping machine on floorboards) is in the range 58-63 dB $L'_{nT,w}$. With carpet and underlay installed the performance was 40-48 dB $L'_{nT,w}$ indicating about 15 dB improvement associated with the representative carpet and underlay. (Note that for airborne sound insulation tests, the higher the number the better, and for impact sound insulation tests, the lower the number the better.)

	Test Location (1)		Test Location (2)	
	Living Room *Test A*	**West Side Bedroom *Test B***	**North Front Bedroom *Test C***	**East Side Bedroom *Test D***
Airborne Insulation dB $D_{nT,w}+C_{tr}$	46	49	42	41
Impact Insulation Test 1 (floorboards) dB $L'_{nT,w}$	59	58	62	63
Impact Insulation Test 2 (carpet and underlay) dB $L'_{nT,w}$	45	40	47	48
Improvement – reduction in impact transmission ΔL_w (carpet & underlay) dB ΔL_w =Test 1-Test 2	14	18	15	15

Table 1: Sound Insulation Test Results of Floors – Prior to Works

3.3 A first comparison can be made with current numerical values for new-build flats today, under Approved Document E to the current Building Regulations 2010, as a "reasonable" standard for separating floors,

- A minimum value of 45 dB $D_{nT,w}+C_{tr}$ airborne sound insulation.
- A maximum value of 62 dB $L'_{nT,w}$ impact sound insulation.

3.4 For airborne sound insulation, results are variable. Existing floors tested at Test Location (1) were better than current standards for new purpose-designed flats today, and existing floors tested at Test Location (2) were worse. (A difference of 4-8 dB between the flats.)

3.5 For impact sound insulation of the basic floor construction on floorboards, the measured results are similar or marginally better than current standards for new purpose-designed flats today.

3.6 For impact sound insulation of the basic floor construction with carpet and underlay installed, the measured results are significantly better than the current standard for new purpose-designed flats today. (A difference of 14-22 dB.)

4.0 FINDINGS OF OUR SAMPLE MEASUREMENTS

4.1 The impact sound insulation with carpet and underlay is about 45 dB $L'_{nT,w}$. It would be ideal to achieve this standard with a replacement hard wood floor finish, but it is not feasible to achieve

this same high standard even with a high performance acoustic floating floor. Therefore, if it is deemed that Lessees are to have this option, a lesser standard of impact sound insulation will result. We understand, under the Landlords Licence, that even if the technical guidance were met, and in the event complaints occurred, the hard floors would then have to be carpeted.

4.2 Current Building Regulations for new flats today require 62 dB $L'_{nT,w}$ impact sound insulation (see para. 3.3) to achieve a "reasonable" standard. The (now withdrawn) Code for Sustainable Homes (CfSH) sets -8dB betterment for the highest number of credits for new homes, 54 dB $L'_{nT,w}$ impact sound insulation. We recommended this 54 dB $L'_{nT,w}$ impact sound insulation as a "good" standard. It may be necessary to review this figure if Lessees' experience suggests that it is not sufficient. Alternatively, representatives of the Lessees could listen to the noise of footsteps on such a floor.

4.3 The existing standard at Test Location (1) Queen's Club Gardens, from our initial survey, is 58-59 dB $L'_{nT,w}$ impact sound insulation. This is what we would expect for a timber joist floor, with pugging and lath and plaster ceiling, and no flanking /other defect. With no acoustic work this would meet the current reasonable standard, but not BAP's recommended good standard of 54 dB $L'_{nT,w}$.

5.0 RECOMMENDED PERFORMANCE SPECIFICATION

5.1.1 We recommend a high performance proprietary floating floor with a laboratory impact sound reduction of 23 dB ΔL_w (tested as method in Robust Details™ Appendix D[2]) installed in strict accordance with the manufacturer's guidance, and the new floor when tested should meet the good standard of ≤54 dB $L'_{nT,w}$.

* This test method applies to samples on a concrete base floor, rather than a timber joist floor. Significantly lower ΔL_w values are expected for the latter, but currently not all manufacturers can supply this data. In addition to meeting the recommended figure, the floating floor should be of a type which the manufacturer recommends for use on timber floors.

Betterment to Building Regulations Impact Sound Insulation "reasonable" standard	**Recommended "good" standard**
62 dB $L'_{nT,w}$ – 8 dB	54 dB $L'_{nT,w}$
Proprietary floating floor with an impact sound reduction of 23 dB ΔL_w	

Table 1: Summary of BAP's recommendations

[2] https://www.robustdetails.com/patterns/

6.0 LIST OF APPROVED PRODUCTS

6.1.1 A list of approved proprietary flooring products is given below, manufacturer's should be contacted for current details and installation advice.

6.1.2 Instacoustics

Insta House
Ivanhoe Road
Hogwood Business Park
Finchampstead
Wokingham
Berkshire
RG40 4PZ
Tel: 0118 932 8811
enquiries@instagroup.co.uk
https://www.instacoustic.co.uk/

InstaCoustic **Acoustic Flooring System 108** (9 mm MDF, 8 mm sound barrier pads, 6 mm IN1 decoupling fibre) (thickness 14 mm without board, 23 mm with board)

6.1.3 Sound Reduction Systems Ltd

Sound Reduction Systems Ltd
Adam Street, Off Lever Street
Bolton
Lancashire
BL3 2AP
Tel: 01204 380074
info@soundreduction.co.uk
https://www.soundreduction.co.uk/

SRS Acoustic Underlay System — **Acoustilay 8** (12 mm thickness)
SRS Acoustic Underlay System — **Acoustilay 15** (15 mm thickness)
SRS Acoustic Underlay System — **Acoustilay 3** (10 mm thickness)

6.1.4 Cellecta Ltd

Cellecta ltd
Bounty House
Norman Close
Rochester
Kent
ME2 2NF
Tel: 01634 296 677

technical@cellecta.co.uk
https://www.cellecta.co.uk/

ScreedBoard 28 (20 mm ScreedBoard 20, 8 mm Fibrefon 8 resilient layer)
Deckfon Batten 70 (70mm deep battens including 10mm foam with min 18mm t&g flooring board)
Deckfon Batten 45 (45mm deep battens including 10mm foam with min 18mm t&g flooring board)
Rubberfon Cradles (Acoustic levelling cradles on 10mm recycled rubber crumb resilient pad, 65 or 40 mm battens with min 18 mm t&g flooring boards)
Gobi C2-25 (Rubberfon cradle system with underfloor heating)
Mojave S1-10 (43mm overlay system, for undefloor heating incorporating fibrefon 10 resilient layer)

6.1.5 A. Proctor Group Ltd.

Proctor Group
The Haugh
Blairgowrie
PH10 7ER
Tel: 01250 872 261
contact@proctorgroup.com
https://proctorgroup.com/

Profloor ExcelDeck 31 (18 mm T&G chipboard and 13 mm resilient layer) (31 mm thickness)

6.1.6 Rockwool UK

Rockwool UK
Pencoed
Bridgend
CF35 6NY
Tel: 01656 862 621
technical.solutions@rockwool.com
https://www.rockwool.com/uk

Rockwool RockFloor Slabs 1x25 mm (18 mm chipboard, 25 mm flanking strip) (thickness 25 mm without board, 43 mm with board)
Rockwool RockFloor Slabs 2x25 mm (18 mm chipboard, 25 mm flanking strip) (thickness 50 mm without board, 68 mm with board)

6.1.7 Other products may be able to achieve the required result. Detailed acoustic test evidence should be obtained from the manufacturer.

7.0 ALTERNATIVE "BEFORE AND AFTER" TEST OPTION

7.1.1 There are other proprietary acoustic products which have not been tested in a laboratory to test for compliance with the ≥23 dB ΔL_w performance specification. Examples of suppliers include Isomass & Hush Acoustics.

7.1.2 It is feasible that products are available which can achieve the recommended on-site performance standard of ≤54 dB $L'_{nT,w}$. We would recommend that, if this option is chosen, that before and after acoustic testing is carried out and recommendations reviewed by a suitably qualified acoustic consultant. The before tests will provide information on the existing performance of the floor.

7.1.3 Floors which retain the existing pugging and lathe and plaster will provide a higher level of sound insulation performance compared to those where the pugging has been removed and/or the ceiling has been replaced with standard plasterboard. The "before" tests will test this objectively and must feed into the selection of acoustic floor system.

7.1.4 Test bodies conducting "before" acoustic testing should have UKAS accreditation (or a European equivalent) for field measurements. Members of the ANC Registration Scheme[3] are also deemed as suitably qualified to carry out acoustic testing.

7.1.5 Bickerdike Allen[4] are member of the ANC Registration Scheme and can provide a quotation to carry out the testing.

7.1.6 Testing must be done in accordance with: BS EN ISO 140-4:1998; BS EN ISO 140- 7:1998; BS EN ISO 717-1:1997; BS EN ISO 717-2:1997; BS EN 20354:1993. When calculating sound insulation test results, no rounding should occur in any calculation until required by the relevant Standards, the BS EN ISO 140 series and the BS EN ISO 717 series.

7.1.7 Proposals for acoustic floor systems should be review by a Suitably Qualified Acoustician (SQA) based on the results of the before testing. An SQA should be an individual who holds a recognised acoustic qualification and membership of an appropriate professional body. The primary professional body for acoustics in the UK is the Institute of Acoustics. They must also be able to demonstrate a minimum of three years relevant experience (within the last five years). Such experience must clearly demonstrate a practical understanding of factors affecting acoustics in relation to construction and the built environment; including, acting in an advisory

[3] https://www.association-of-noise-consultants.co.uk/sound-testing-member-companies/
[4] www.bickerdikeallen.com Tel :0207 625 4411, mail@bickerdikeallen.com

capacity to provide recommendations for suitable acoustic performance levels and mitigation measures.

7.1.8 Proprietary underlay materials are intended to improve the airborne and impact sound insulation of lightweight floors, particularly in conversions, by providing a cushioning layer to reduce footfall noise and by the addition of mass and damping to the floor. The underlay material will normally be glued down so that it remains in place for the life of the building. These products may also be referred to as "Bonded Resilient Floor Coverings" or "Bonded Resilient Overlays". Impact testing must NOT be carried out directly on top of these proprietary underlay materials. This is not representative of the finished floor construction.

7.1.9 It is imperative that manufacturer's recommendations are following with regards to compatibility with floor finishes as well as correct installation instructions. Some products may not be suitable for use with a tiled floor finish.

7.1.10 If a proprietary underlay product is being used the "after" test must be carried out with the floor finish installed. Alternatively, if this is not practicable, impact tests may be undertaken on proprietary underlay materials by placing a rigid board beneath the tapping machine. The board can be of any rigid material such as MDF or plywood and at least 8 mm thickness so as to be similar in density and hardness to most commercially available laminate flooring materials. The area of the board should be at least 50% larger than the profile of the tapping machine e.g. 1.0 m x 0.5 m.

7.1.11 If there is some uncertainty as to how the product(s) will perform on site sample testing can be carried out on a representative sample of the proposed materials. It must be noted that the results from sample testing are indicative. The sample may not be representative of the finished floor including important acoustic detailing around room perimeters and any penetrations through the floor. It is imperative that manufacturer's recommended installation instructions are followed including the installation of additional acoustic materials such as flanking strips. Despite a "pass" under a sample test, Queen's Club Gardens Limited reserves the right to request final "after" testing when the complete floor has been installed.

7.1.12 "After" testing should be carried out in the same methodology as above. If following installation of the hard floor, the post acoustic tests fail to meet the required performance standard, by

Queen's Club Gardens Limited reserves the right to enforce carpet and underlay to be re-installed.

8.0 LIMITATIONS

8.1.1 This report provides an assessment and recommendations based solely on acoustic performance considerations. Please note that this report does not address any non-acoustic design issues, including but not limited to compliance with structural integrity, fire safety requirements, or other regulatory standards outside the scope of acoustic considerations. Any decisions or designs based on this report should be further evaluated for compliance with these additional requirements by relevant specialists

9.0 FAQS

7.1 Could you clarify the sound insulation terms: dB $L'_{nT,w}$; dB $D_{nT,w}$ and C_{tr}?

See attached Appendix A Glossary of Acoustic Terms and Test Procedures.

7.2 Could you confirm if any of the suggested products for acoustic insulation are suitable for ceramic, marble or tiled floor?

Some of the products are. It is imperative that manufacturer's recommendations are following with regards to compatibility with floor finishes as well as correct installation instructions.

7.3 If such products were to be used in the flats, would it be necessary for there to be any additional treatment of the floorboards or the void beneath the floorboards?

The occupant should ascertain the existing construction for consistency with the typical examples stated in BAP's Report.

7.4 Is it too simple to say that the standard of 54 dB means a 20% increase in noise from the rate with carpet and underlay at 45 dB?

Yes, in noise terms 3 dB difference is perceptible and 10 dB difference is twice as loud. BAP Report (para. 4.2) recommended representatives of the Lessees could listen to an example, as the character would also change.

7.5 If 54 dB is adopted as standard, can the suggested acoustic products be applied across the board in all flats and suggested to each applicant who wants to have hard flooring, or would it be necessary to have "before and after" sound insulation readings in each flat?

The performance specification and examples do not in-principle require before and after tests. Whether results are successful will depend on workmanship, particularly any bridging of the floating floor that might occur. If there are complaints we expect a floor could then be tested to investigate if workmanship is an issue. This 2024 version of the report presents an option to use "before and after" testing for non-approved floor products.

7.6 An enquiry from a ground floor flat owner, with no basement flat below, enquiring about QCG Ltd's policy for such a flat with regard to acoustic insulation, wanting to install hard flooring in a ground floor flat – should the same products suggested in BAP's Report be required where there is no flat below, or can the requirements be relaxed to the minimum acoustic insulation, or are further noise tests necessary?

Though such flats do not have downstairs neighbours who might be disturbed, there is a risk of structure-borne impact sound transferring both upwards via common walls and laterally via

separating walls, which did not occur previously, in addition to risk of an increase in transmitted airborne noise when changing from carpet to hard floors. These types of noise can result in complaints though the risk is much smaller than with an intermediate floor. We would therefore recommend floating floors be installed at ground/ basement level where there is no flat beneath, but the specification need not be as high. We would recommend use of a product which can achieve not less than 17 dB ΔL_w.

7.7 In the flats where you conducted tests there were basement flats as well as flats at ground, first, second and third floors. If different considerations are given to flats at the lowest level – basement or, in some cases, ground floor, would this also be the case with top floor flats?

Hard floor finishes in top floor flats are the same as the general case considered in this report. The design should meet the high performance specification for a proprietary floating floor with an impact sound reduction of 23 dB ΔL_w, as with the examples recommended in this report, and when installed it should meet the 54 dB $L'_{nT,w}$ recommended “good” standard.

10.0 SUMMARY

10.1.1 BAP have updated the recommendations for a performance specification to meet a "good" standard. We recommend an impact sound reduction of at least 23 dB ΔL_w (tested in a standard test for concrete floors), and the new floor covering when tested should meet the "good" standard of 54 dB $L'_{nT,w}$.

10.1.2 In this review we considered alternative products and available acoustic test information, and revised the proprietary acoustic floating flooring systems that meet the specification. This report supersedes our previous list and our 2013 report.

10.1.3 We have provided copies of details of approved proprietary flooring products for installation on the timber floors at Queen's Club Gardens, for reference by lessees, their professionals and contractors.

Diogo Pereira
for Bickerdike Allen Partners LLP

David Trew
Partner

APPENDIX 1
GLOSSARY OF ACOUSTIC TERMINOLOGY

The Decibel, dB

The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0 dB (which corresponds to a reference sound pressure of 2 x 10^{-5} Pascals) and the threshold of pain is around 120 dB.

The sound energy radiated by a source can also be expressed in decibels. The sound power is a measure of the total sound energy radiated by a source per second, in watts. The sound power level, L_w is expressed in decibels, referenced to 10^{-12} watts.

Frequency, Hz

Frequency is analogous to musical pitch. It depends upon the rate of vibration of the air molecules that transmit the sound and is measure as the number of cycles per second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is normally divided up into discrete bands. The most commonly used bands are octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency, and one-third octave bands, in which each octave band is divided into three. The bands are described by their centre frequency value and the ranges which are typically used for building acoustics purposes are 63 Hz to 4 kHz (octave bands) and 100 Hz to 3150 Hz (one-third octave bands).

A-weighting

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).

Environmental Noise Descriptors

Where noise levels vary with time, it is necessary to express the results of a measurement over a period of time in statistical terms. Some commonly used descriptors follow.

Statistical Term	Description
$L_{Aeq, T}$	The most widely applicable unit is the equivalent continuous A-weighted sound pressure level (LAeq, T). It is an energy average and is defined as the level of a notional sound which (over a defined period of time, T) would deliver the same A-weighted sound energy as the actual fluctuating sound.
L_{A90}	The level exceeded for 90% of the time is normally used to describe background noise.
$L_{Amax,T}$	The maximum A-weighted sound pressure level, normally associated with a time weighting, F (fast), or S (slow)

Sound Transmission in Rooms

Sound energy is reflected from the room surfaces and this gives rise to reverberation. At short distances from a sound source, the sound level will fall off at a rate of 6 dB per doubling of distance, as it would in the open air – this is known as the direct field. Beyond a certain distance, the effect of reverberation takes over and the level ceases to fall off significantly with distance from the source. This is known as the reverberant field. For receiver positions in this part of the room, sound levels can be reduced by applying sound absorbing finishes to the surfaces of the room. A 3 dB reduction can normally be obtained by doubling the absorption present, which corresponds to halving the reverberation time (see below).

Sound Insulation - Airborne

Voices, hi-fi systems, television and radio sound and musical instruments are all sources of airborne sound. They excite the air around them and the vibration in the air is transmitted to surrounding surfaces, such as walls, ceilings and floors. This sets these constructions into vibration and this vibration is radiated in neighbouring rooms as sound. Energy is lost in the transmission path and this is referred to as transmission loss or, more generally, sound insulation. The most simple measure of sound insulation is the sound level difference, D, which is the arithmetic difference between the sound level, in dB, in the source room and the sound level in the receiving room.

Other measures of sound insulation include the sound reduction index, R, which is a measure of the acoustical performance of a partition, obtained in a laboratory, and the standardised level difference, D_{nT}, which is used mainly in the sound insulation of domestic separating walls and separating floors. The relevant test procedures are laid down in BS EN ISO 140. A single figure "weighted" result can be obtained from one-third octave band test results by using a curve-fitting procedure laid down in BS EN ISO 717. The subscript "w" is added to the relevant descriptor (eg $D_{nT,w}$).

The sound reduction index, R, is used in the specification of components, such as partitions, doors and windows. It is important to bear in mind that the performance of components in the field is usually lower than can be obtained in a laboratory. The transmission of sound via other components common to both rooms ("flanking transmission") can reduce the apparent sound reduction index (R') significantly.

Sound Insulation - Impact

In the case of impact sound, the building construction is caused to vibrate as a result of a physical impact. Footsteps on floors are the most obvious example. The vibration is radiated as sound in neighbouring rooms. Impact insulation is measured using a standard tapping machine, which drops weights cyclically onto a floor. The sound pressure level is measured in the receiving room below and the result is known as the impact level, Li for laboratory tests and L'i for field tests.

The Building Regulations

The Building Regulations of 1965 were the first to cover sound insulation of separating walls and floors. They required the provision of "adequate sound insulation" in new dwellings and offered several deemed-to-satisfy constructions. In 1972, the Regulations were revised and, in addition to deemed-to-satisfy constructions, they introduced deemed-to-satisfy numerical performance requirements for airborne and impact sound. In 1985 a major revision was made to the Regulations. Approved Document E gave more detailed constructional specifications for separating walls and separating floors and new numerical performance standards were given – though the requirements were commensurate with the former deemed-to-satisfy provisions. These Regulations were the first to govern building in Inner London. Prior to this the London Building Act of 1939 was in force, but, as this did not include provisions for sound insulation, reference was usually made to the Building Regulations.

In 2003 further amendments were made to Part E of the Building Regulations. For domestic separating walls, separating floors and stairs, the normal way of satisfying the requirement is to meet given numerical standards, which are to be demonstrated by pre-completion testing.

Numerical Performance Standards

The current (2003) Approved Document numerical performance standards are tabulated below. Note that the better the airborne sound insulation, the higher the value. Conversely the better the impact sound insulation, the lower the value.

DWELLING HOUSES AND FLATS		**Airborne standard $D_{nT,w} + C_{tr}$ dB**	**Impact standard $L'_{nT,w}$ dB**
Purpose-built dwelling houses and flats	Walls	At least 45	N/A
	Floors and stairs	At least 45	Up to 62
Dwelling houses & flats formed by material change of use	Walls	At least 43	N/A
	Floors and stairs	At least 43	Up to 64

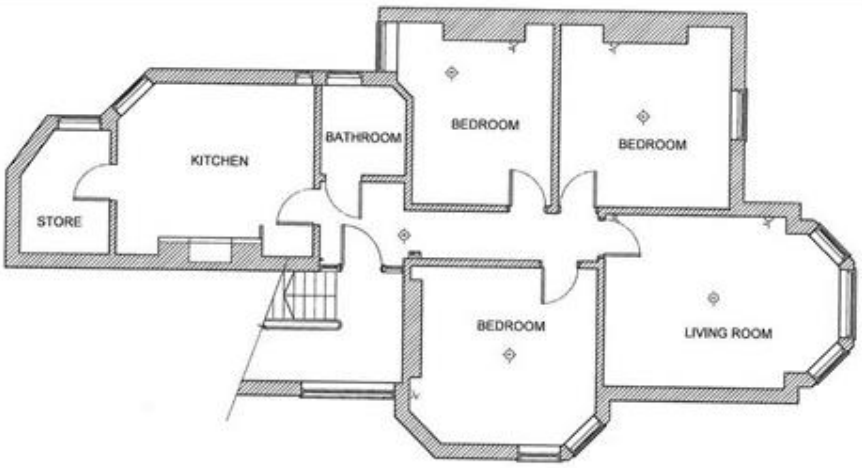
ROOMS FOR RESIDENTIAL PURPOSES		**Airborne standard $D_{nT,w} + C_{tr}$ dB**	**Impact standard $L'_{nT,w}$ dB**
Purpose-built rooms	Walls	At least 43	N/A
	Floors and stairs	At least 45	Up to 62
Rooms formed by material change of use	Walls	At least 43	N/A
	Floors and stairs	At least 43	Up to 64

APPENDIX 2

LAYOUT PLANS & PHOTOGRAPHS – PRIOR TO WORKS

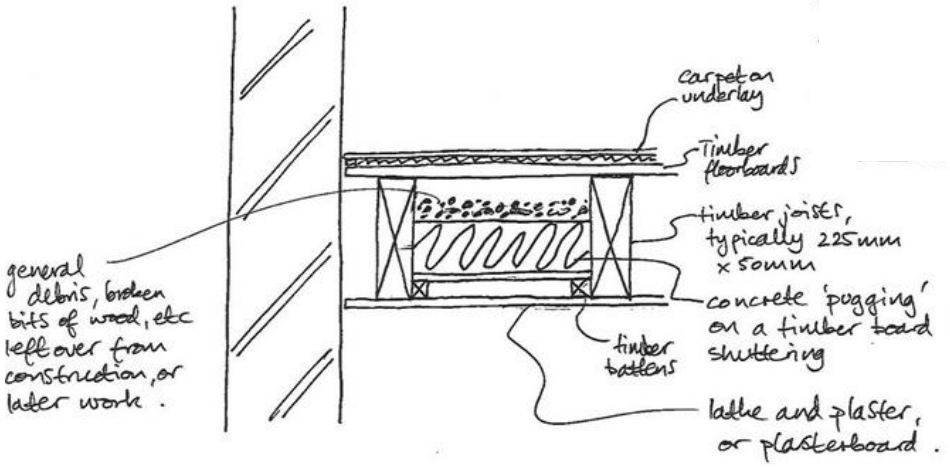
LAYOUT AND CONSTRUCTION — QUEEN'S CLUB GARDENS, W14

(a) Typical Floor Plan. Provided by the Estate Office, 20 May 2011

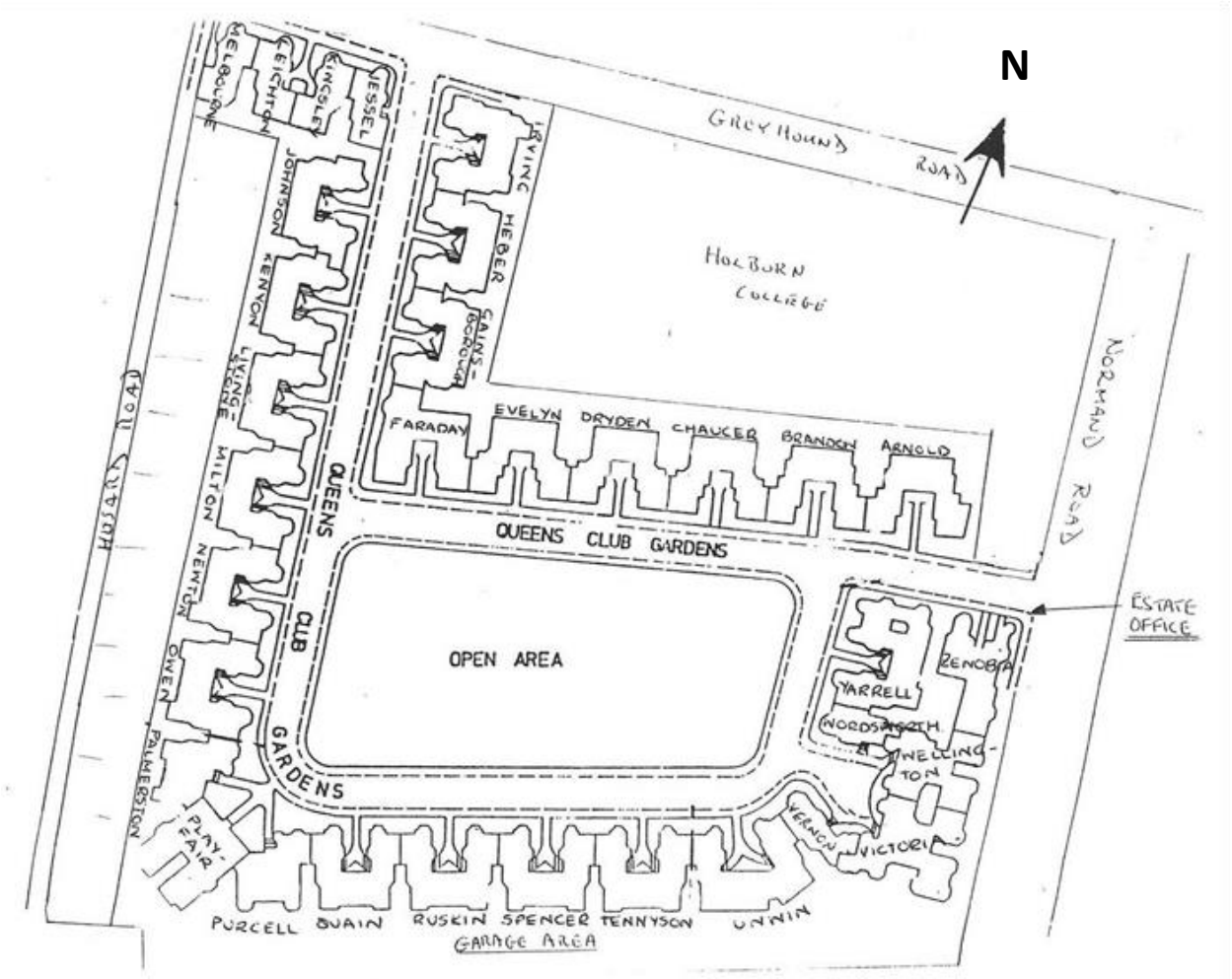


(b) Typical Timber-joist Floor Construction. Provided by Graeme Elkington, Faraday Property Management Ltd, 12 May 2011.

N.B. We are advised some floors have no concrete pugging in place, some lath and plaster ceilings have been replaced by plasterboard, and some floors have no carpet and underlay.



(c) Layout Plan of Queen's Club Gardens Estate. Plan provided by Estate Office, 20 May 2011


N
GREY HOUND ROAD
HOLBORN COLLEGE
NORMAN ROAD
HOLLAND ROAD
MELBOURNE
EGHTON
KINGSLEY
JESSEL
JOHNSON
KENNON
LEVINGE
MILTON
NEWTON
OWEN
PALMERSTON
IRVING
HEBER
SCOTIA
FARADAY
EVELYN
DRYDEN
CHAUCER
BRANDON
ARNOLD
QUEENS CLUB GARDENS
QUEENS CLUB GARDENS
OPEN AREA
ESTATE OFFICE
RENOIR
YARRELL
WORDSWORTH
WELLING-TON
VERNON
VICTORIA
PLAY-FAIR
PURCELL
QUAIN
RUSKIN
SPENCER
TENNYSON
UNWIN
GARAGE AREA

(d) Illustrative Photographs of Floors – Test Location (1). Taken by BAP, 20 May 2011.

Living Room - Loose floorboards removed for BAP's inspection; typical timber joist floor construction with pugging between joists.

Side Bedroom (west) – carpet and underlay being pulled back to expose floorboards for BAP's impact sound insulation testing.

(e) Illustrative Photographs of Floors – Test Location (2). Taken by BAP, 20 May 2011

Front Bedroom (north) – carpet and underlay being pulled back to expose floorboards for BAP's impact sound insulation testing

Side Bedroom (east) – carpet and underlay being pulled back to expose floorboards for BAP's impact sound insulation testing