TECHNICAL BULLETIN

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Acoustics: Rain Impact Noise

Kingspan®

Low Energy –
Low Carbon Buildings

Introduction

This Technical Bulletin is designed to demonstrate that the effect of rain impact noise in steel deck flat roofs can be successfully mitigated by the specification of Kingspan Insulation products. It also demonstrates that the introduction of a 24 mm mineral tile can significantly improve acoustic performance. As the specification of ceiling tiles does not normally form part of the roof build-up, the acoustic benefits may not be accounted for at the design stage.

This data is particularly useful in relation to the design of both school and healthcare buildings to help ensure acceptable indoor noise levels. The performance standards for school buildings are set out in Building Bulletin 93 and for healthcare buildings in Healthcare Technical Memorandum 08-01.

A series of Rain Impact Noise tests were conducted in accordance with International Standard ISO 140-18:2006 at SRL's laboratory at Holbrook House, Sudbury, Suffolk, to determine the rain generated impact sound transmission of various roofing systems, with and without the addition of ceiling tiles. The L_{IA} results from these tests can be used by acoustic consultants to calculate acoustic conditions to meet the L_{Aeq} performance standards and criteria set out in the performance standard documents referred to above. These calculations are complex and consider variables including room volumes, surfaces and finishes, roof / ceiling area, and reverberation data.

Definitions used in this Technical Bulletin

L_I - Sound Intensity Level in (dB) Sound intensity is the flow of sound power per unit area in a given direction, measured over an area perpendicular to the direction of flow, and is measured in Watts per metre squared (W/m^2).

L_{IA} - A-weighted Sound Intensity Level in (dB) This is the Sound Intensity Level 'A-weighted' to reflect how we actually hear noise.

L_{Aeq} – equivalent A-weighted Sound Pressure (indoor ambient noise) Level (dB) Sound pressure is the fluctuation in air pressure from steady atmospheric pressure due to sound. It is measured in Pascals (Pa).

Conclusions

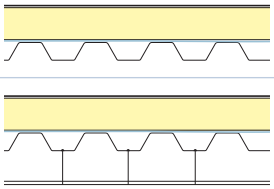
- Rain impact noise can be mitigated by simple roof build-ups insulated with Kingspan Thermaroof flat roof insulation products.
- The addition of a 24 mm mineral ceiling tile, (which is often not specified in a roof build-up as it is part of the internal fit-out), results in significantly improved performance.

Kingspan Insulation has many years experience in providing acoustics solutions. If you would like more information or to discuss anything you have read in this Technical Bulletin, please contact us by e-mailing: acoustics@kingspaninsulation.co.uk

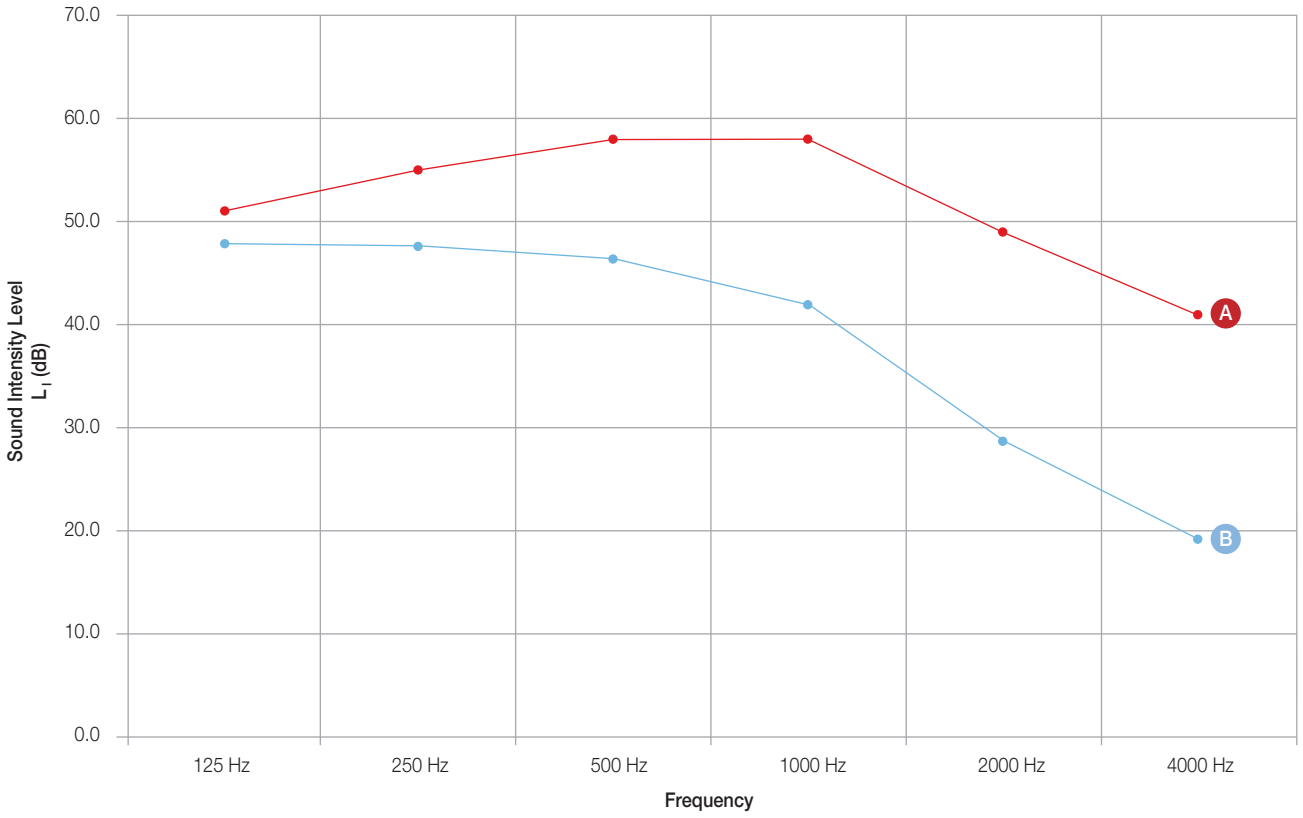
Appendix – Rain Impact Noise Data

Test 1

Construction Tested and Assessed	
A	100 mm *Kingspan* **Therma**roof® TR26 LPC/FM on galvanized metal deck, single ply waterproofing, polythene vapour control layer
B	Same as above with correction for 24 mm mineral fibre ceiling tile (8.23 Kg/m²) with a 300 mm ceiling void



Sound Intensity Data



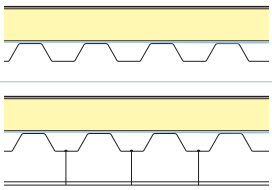
Sound Intensity Level (L_I) in dB over a Range of Frequencies							
	Frequency (Hz)						
Test	125	250	500	1000	2000	4000	Provenance
A	50.9	54.6	57.5	58.0	48.8	40.7	(Tested - SRL Report No. C/05/6W/40269/R03)
B	47.9	47.6	46.5	42.0	28.8	19.7	(Predicted - SRL Report No. C/40269)

A – weighted Sound Intensity Level (L_{IA})	
Test	L_{IA} (dB)
A	60.2
B	46.9

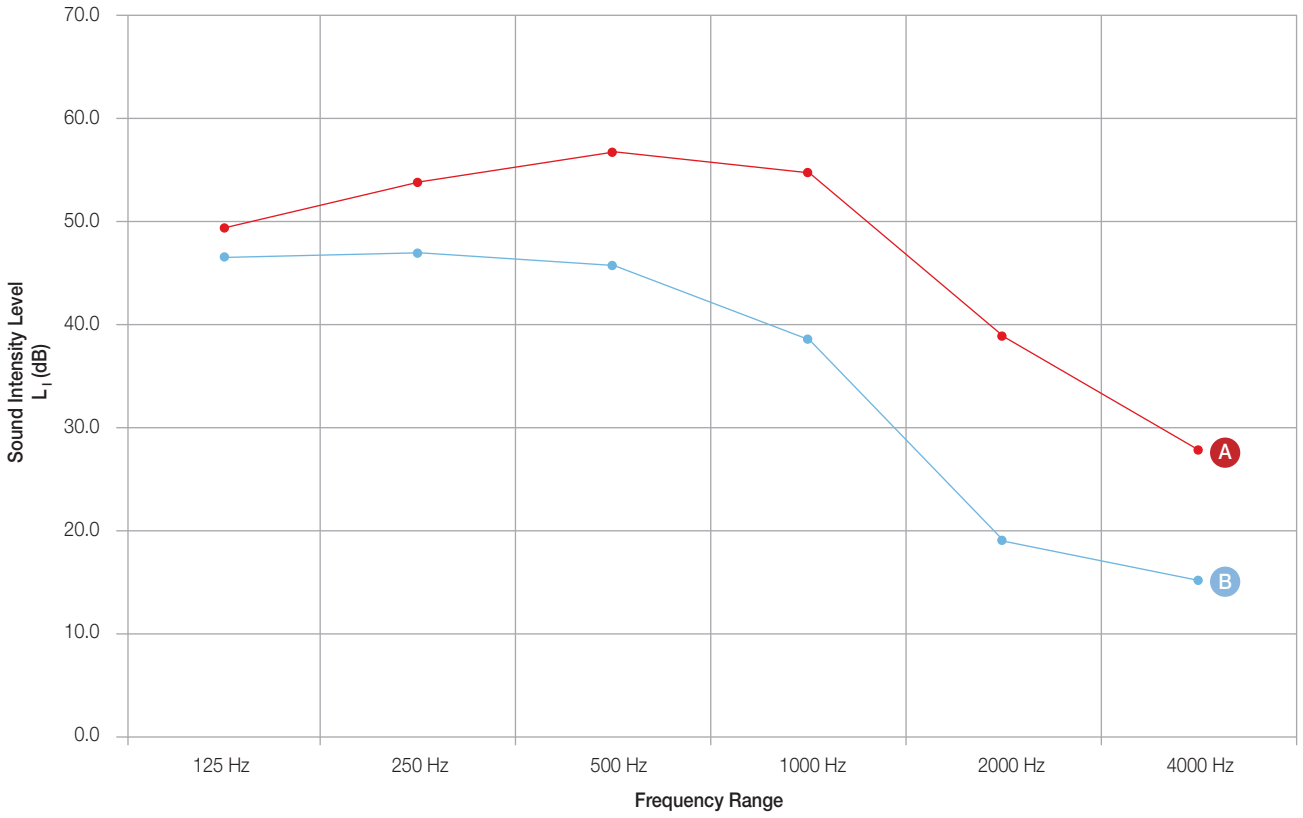
Appendix – Rain Impact Noise Data

Test 2

Construction Tested and Assessed	
A	100 mm *Kingspan* **Therma**roof® TR26 LPC/FM on galvanized metal deck, single ply fleece-backed waterproofing, polythene vapour control layer
B	Same as above with correction for 24 mm mineral fibre ceiling tile (8.23 Kg/m²) with a 300 mm ceiling void



Sound Intensity Data



Sound Intensity Level (L_I) in dB over a Range of Frequencies

	Frequency (Hz)						
Test	125	250	500	1000	2000	4000	Provenance
A	49.6	54.0	56.8	54.6	38.8	28.2	(SRL Test 4 Report No. C/05/6W/40269/R03)
B	46.6	47.0	45.8	38.6	18.8	15.0	(Predicted result)*

**Assessment carried out by Sound Research Laboratories.*

A – weighted Sound Intensity Level (L_{IA})

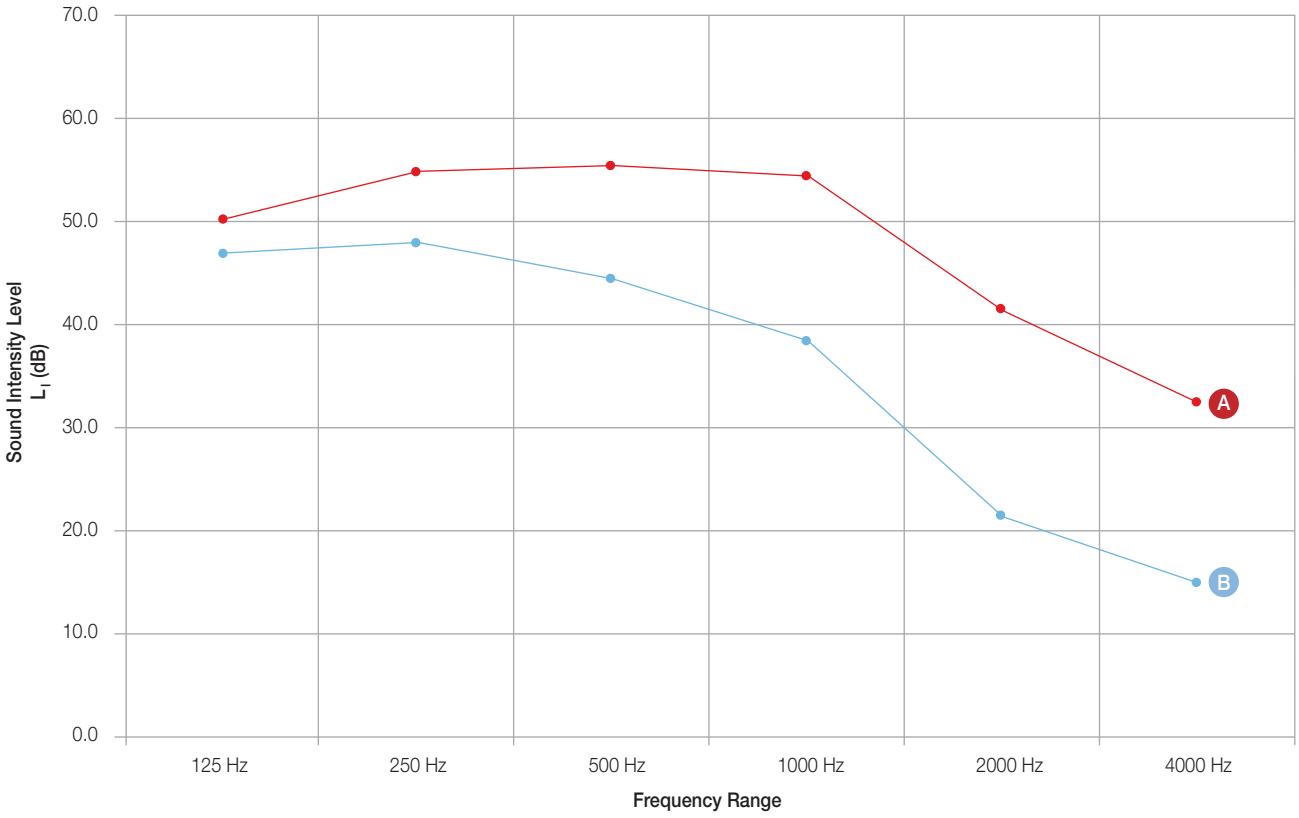
Test	L_{IA} (dB)
A	57.4
B	45.4

Appendix – Rain Impact Noise Data

Test 3

Construction Tested and Assessed	
A	110 mm *Kingspan* **Therma**roof® TR27 LPC/FM on galvanized metal deck, single ply fleece-backed waterproofing, polythene vapour control layer
B	Same as above with correction for 24 mm mineral fibre ceiling tile (8.23 Kg/m²) with a 300 mm ceiling void

Sound Intensity Data



Sound Intensity Level (L_I) in dB over a Range of Frequencies

	Frequency (Hz)						
Test	125	250	500	1000	2000	4000	Provenance
A	50.1	55.1	55.6	54.5	41.4	32.4	(SRL Test 5 Report No. C/05/6W/40269/R03)
B	47.1	48.1	44.6	38.5	21.4	15.0	(Predicted result)*

**Assessment carried out by Sound Research Laboratories.*

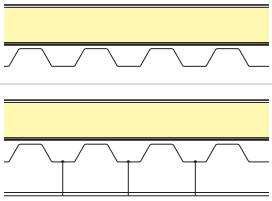
A – weighted Sound Intensity Level (L_{IA})

Test	L_{IA} (dB)
A	57.0
B	45.1

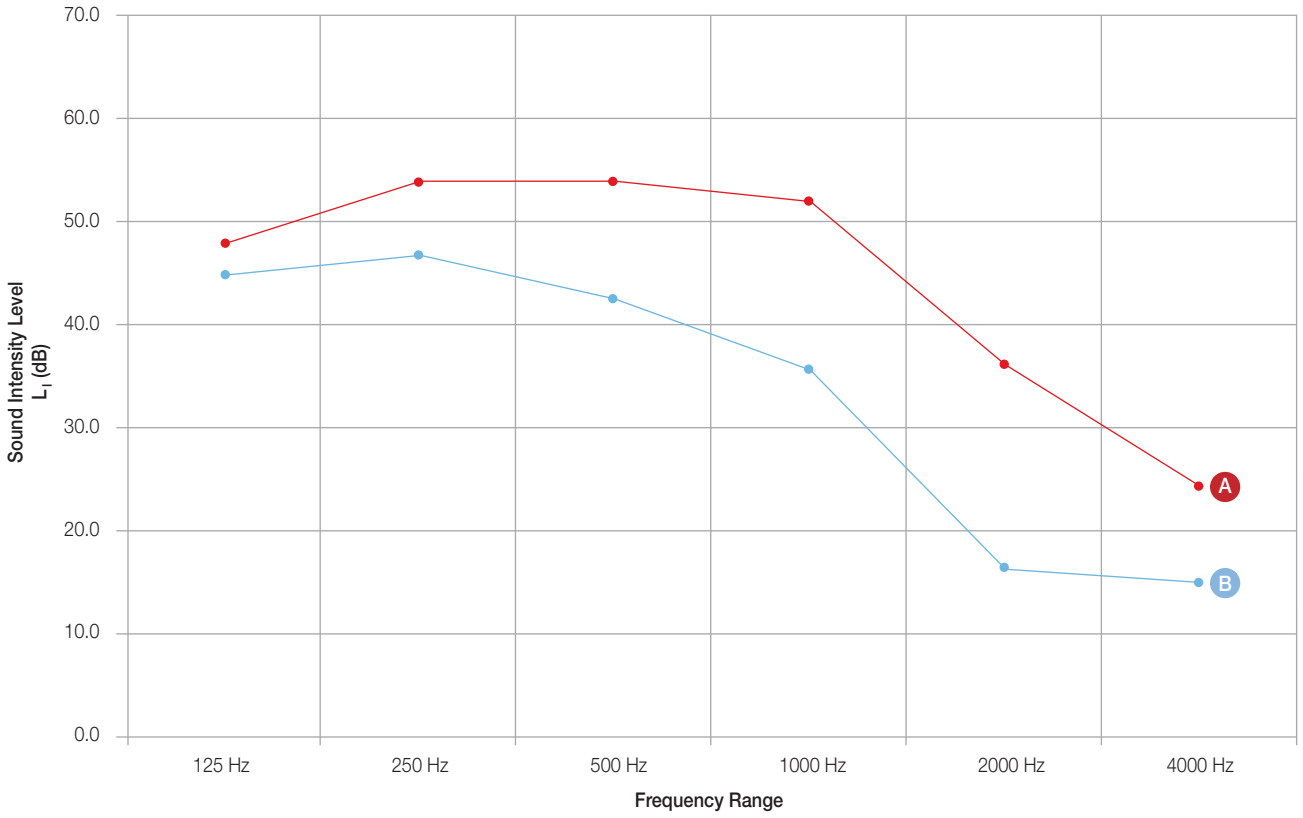
Appendix – Rain Impact Noise Data

Test 4

Construction Tested and Assessed	
A	110 mm *Kingspan* **Therma**roof® TR27 LPC/FM Rubbertech R10 10 mm on sealed galvanized metal deck, single ply fleece-backed waterproofing, no vapour control layer
B	Same as above with correction for 24 mm mineral fibre ceiling tile (8.23 Kg/m²) with a 300 mm ceiling void



Sound Intensity Data



Sound Intensity Level (L_I) in dB over a Range of Frequencies

	Frequency (Hz)						
Test	125	250	500	1000	2000	4000	Provenance
A	47.9	53.7	53.6	51.6	36.3	23.7	(Tested - SRL Test 1 Report No. C/09/8H/20777/R01)
B	44.9	46.7	42.6	35.6	16.3	15.0	(Predicted result)*

**Assessment carried out by Sound Research Laboratories.*

A – weighted Sound Intensity Level (L_{IA})

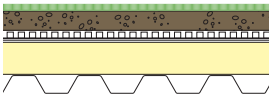
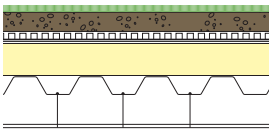
Test	L_{IA} (dB)
A	54.6
B	43.1

Appendix – Rain Impact Noise Data

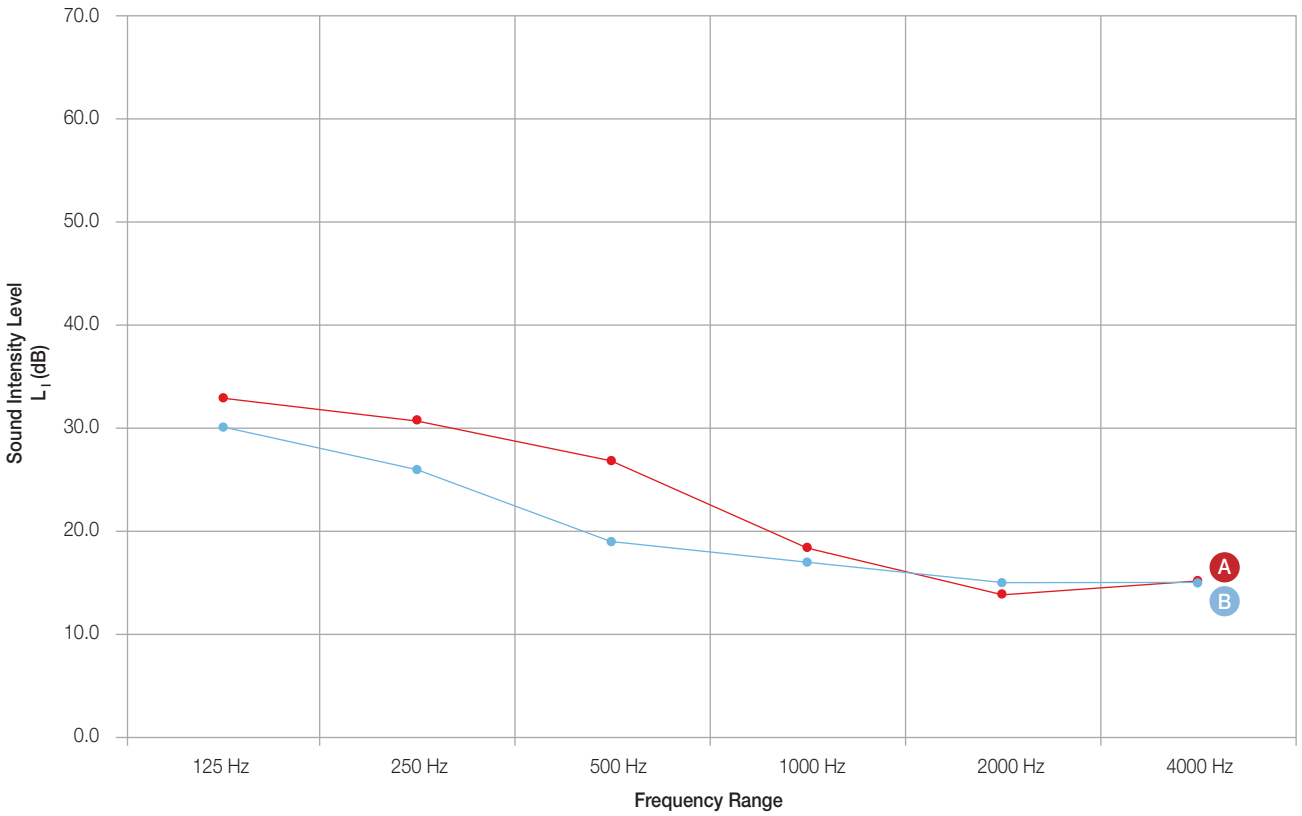
TECHNICAL BULLETIN

Test 6

Construction Tested and Assessed

A	100 mm *Kingspan* **Therma**roof® TR26/27 LPC/FM on galvanized metal deck, single ply waterproofing, 2.8 mm synthetic fibre protection mat, 25 mm corrugated HDPE drainage layer, 60 mm soil mix substrate, 20 mm sedum mat	
B	Same as above with correction for 24 mm mineral fibre ceiling tile (8.23 Kg/m²) with a 300 mm ceiling void	

Sound Intensity Data



Sound Intensity Level (L_I) in dB over a Range of Frequencies

	Frequency (Hz)						
Test	125	250	500	1000	2000	4000	Provenance
A	33.2	30.7	26.9	18.5	13.9	15.3	(SRL Test. 2 Report No. C/09/8H/20923)
B	30.2	26.0	19.0	17.0	15.0	15.0	(Predicted result)*

**Assessment carried out by Sound Research Laboratories.*

A – weighted Sound Intensity Level (L_{IA})

Test	L_{IA} (dB)
A	27.5
B	27.5

Contact Details

Customer Service

For quotations, order placement and details of despatches please contact the Kingspan Insulation Customer Service Department on the numbers below:

UK – Tel: +44 (0) 1544 388 601
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Literature & Samples

Kingspan Insulation produces a comprehensive range of technical literature for specifiers, contractors, stockists and end users. The literature contains clear 'user friendly' advice on typical design; design considerations; thermal properties; sitework and product data.

Available as a complete Design Manual or as individual product brochures, Kingspan Insulation technical literature is an essential specification tool. For copies please contact the Kingspan Insulation Marketing Department, or visit the Kingspan Insulation website, using the details below:

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– email: info@kingspaninsulation.ie
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Kingspan Insulation supports all of its products with a comprehensive Technical Advisory Service for specifiers, stockists and contractors.

This includes a computer–aided service designed to give fast, accurate technical advice. Simply phone the Kingspan Insulation Technical Service Department with your project specification. Calculations can be carried out to provide U–values, condensation / dew point risk, required insulation thicknesses etc… Thereafter any number of permutations can be provided to help you achieve your desired targets.

The Kingspan Insulation Technical Service Department can also give general application advice and advice on design detailing and fixing etc... Site surveys are also undertaken as appropriate.

The Kingspan Insulation British Technical Service Department operates under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U–value and Condensation Risk Calculations.

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