

## Resistance to the passage of sound (Part E)

### Introduction

The Building Regulations 2000, Approved Document E (2003 Edition), Resistance to the Passage of Sound, Part E2b requires a minimum airborne sound insulation value of 40dB (R<sub>w</sub>) to be achieved for internal floors. This document provides guidance on how to achieve the required performance with a JJI-Joist floor.

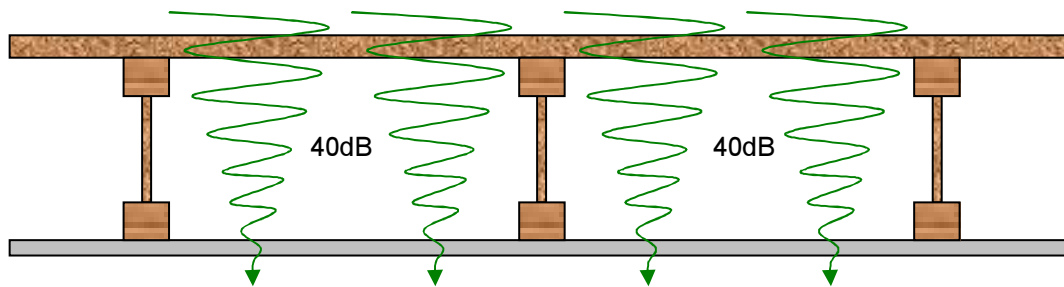


Figure 1. Sound Attenuation in Internal Floor

### Assessment

A series of Acoustic tests have been carried out over an 18-month period and assessed by both Sound Research Laboratories at Sudbury and RMP Acoustic Consultants in Edinburgh.

As a result of these tests we have been able to establish the minimum floor specification required to achieve the 40dB target value without the need for an insulation quilt.

This floor consisted of JJI220A Joists at 400mm centres overlaid with 18mm chipboard, screwed to the joists and a ceiling of 15mm standard plasterboard.

The graphic on the following page is based on this minimum specification and from the application of acoustic theory and assessments from the two research bodies we have extrapolated the effect of various parameters.

In addition, we have carried out testing on various different combinations which have confirmed the validity of the theory.

When 195mm deep joists are to be used, reference should be made to Approved Document E, Section 5.23, Internal floor type C. This section specifies the minimum surface densities for Decking, Ceiling and Mineral Wool Quilt necessary to meet the required laboratory sound insulation value.

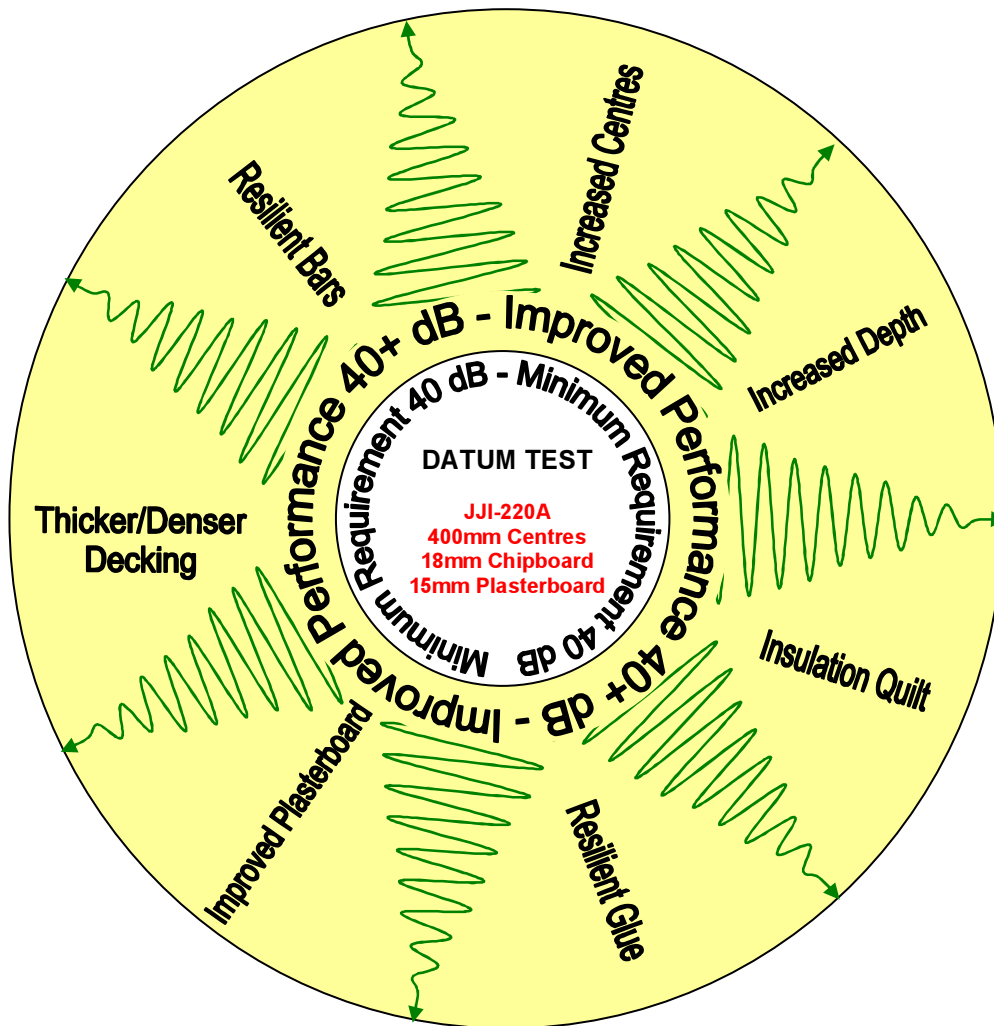


Figure 2. Factors to Improve Floor Performance

Datum Test (see graphic)	Result	40dB
Tested at the laboratories of Sound Research Laboratories Ltd. (SRL) on the 7th of September 2004	Joist Series	JJI220A
	Joist Centres	400mm
	Decking Type	18mm Chipboard (12.8kg/m <sup>2</sup> )
	Ceiling Lining	15mm Plasterboard (10kg/m <sup>2</sup> )
	Insulation Type	None
	Deck to Joist Fixing	Mechanical
	Additional Components	None

Table 1. Datum Test Results

## Theoretical Rational\*

Joist Depth – typically you can expect an increase in sound insulation of 1.5dB for a 25% increase in depth, 2.5dB for a 50% increase and 3.5dB for a 75% increase in joist depth.

Joist Centres - performance will improve with increased joist spacing. This is as a result of a reduced number of fixings / pathways per unit area.

Decking Type – performance will improve with thicker/denser decking over the same centres. The improvement is as a result of increased surface density.

Ceiling Lining - Thicker or Improved Sound Resistant Plasterboard (more dense) will improve performance over the same centres. The improvement is as a result of increased surface density.

Insulation Type – A Mineral Wool Quilt improves performance by absorbing airborne sound within the cavity and increases of between 2-3dB have been shown in our test results.

Deck to Joist Fixing – the base test result incorporated mechanical fixings with no glue between the joist and board. Conventional theory would suggest that there would be little or no benefit utilising glue. However, some of our test results have indicated a 1-2dB improvement when utilising a “No nails” type glue system. It is thought that the improvement may be due to the resilient nature of the glue and/or the restricted number of fixings penetrating the joist.

Additional Components – Resilient bars can typically give an improvement of 4 to 6 dB. Resilient Bars acoustically isolate the plasterboard from the underside of the joist.

\* This information has been extracted from the following references and has been corroborated by the results of the test program

- “The laboratory determination of the airborne sound transmission of a flooring system”, SRL Consultants in Noise &Vibration, Technical Report C/04/5L/3077/1, G. Thomson, 14/09/04
- “Airborne sound insulation provided by an internal floor system”, SRL Consultants in Noise &Vibration, Fax Transmission, N. Swainston, 20/05/05
- “Laboratory testing of internal floors”, Building Performance Centre, Technical Report S/3343/04, 30/01/04
- “Change of flooring joist centres and material thickness for part E2b performance”, RMP Acoustic Consultants, Fax Transmission S/3343C/04, Dr S. Smith, 7/04/2005