Research & Development Highlights

Technical Series
90-246

Soundproofing Floors
Phase 1: The Underside of the Floor

Introduction

Sound transmission between floors is a common problem in multiple-unit dwellings. To find effective and economical ways of resolving this problem, CMHC initiated a research project on the sound isolation provided by floor/ceiling assemblies in wood construction. The first phase of this study, described here, investigated the acoustical performance of different materials incorporated in the underside of floor/ceiling assemblies. These included sound absorptive materials in the floor cavity, as well as ceiling finishes and installation methods. The results of these tests are presented in the following table, which contains diagrams of the assemblies tested and their detailed composition, Sound Transmission Class (STC) ratings and Impact Insulation Class (JIC) ratings. The higher the STC and JIC rating, the better.

Findings

Spacing the joists at 406 mm (16 in.) centres seemed to generate a sub-panel resonance at 160 Hz in the plywood subfloor. In many floors tested, this effect reduced the STC rating.

The four different types of resilient furrings tested (floor 7) provided almost identical sound isolation performance.

Resilient furrings are highly recommended in the construction of floor/ceiling assemblies separating dwellings. The use of wood furrings is not advisable since the mechanical coupling they provided between the floor and the ceiling greatly reduced the performance of the assemblies tested.

Doubling the mass of a drywall ceiling attached to resilient furrings (floor 9) led to an improvement of roughly 5 dB in the STC rating and in the transmission loss at all frequencies. With wood furrings, doubling the mass of the drywall ceiling (floor 8) led to no improvement in either the STC rating or the transmission loss at low frequencies for which the mechanical coupling was important. It also led to a degradation in the IIC rating.

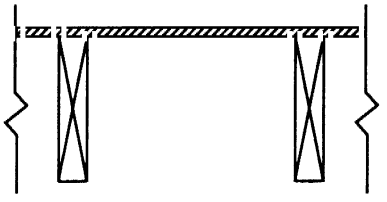
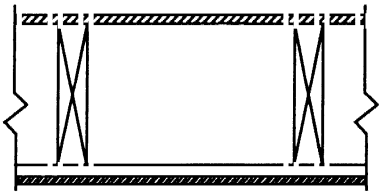
Filling the joist cavity provided approximately the same STC performance, regardless of the material used (floor 3, floor 11).

Wood fibreboard is often inserted between the joists and resilient fumngs (floor 10). This practice did not provide any STC improvements.

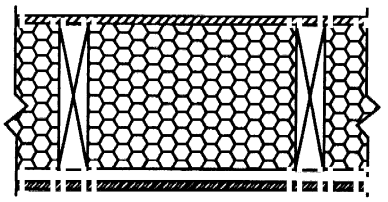
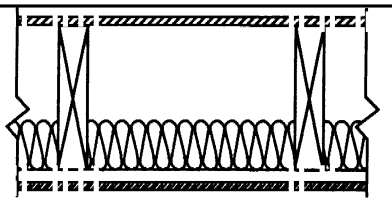
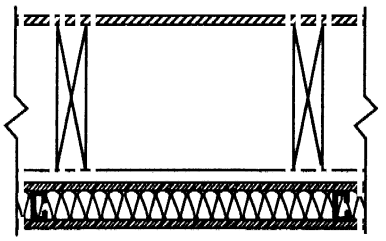
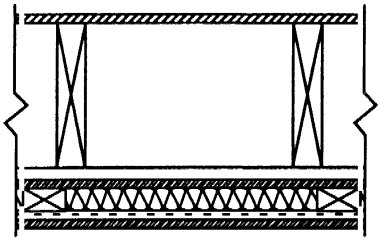
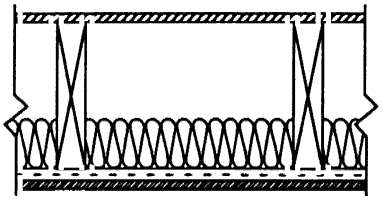
The most efficient way of improving the performance of an existing floor/ceiling assembly is to build an additional ceiling under it. A ceiling consisting of 12.7 mm (1/2 in.) drywall, fastened to 63.5 mm (2 1/2 in.) standard metal studs, with batt insulation between the studs (floor 5), provided the best results. It also improved the STC rating by 15 points.

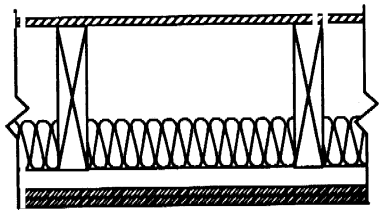
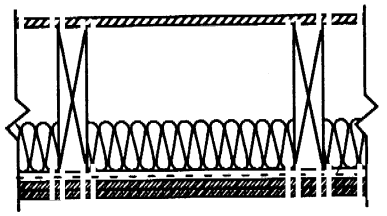
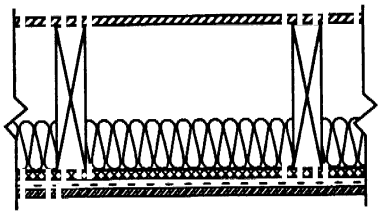
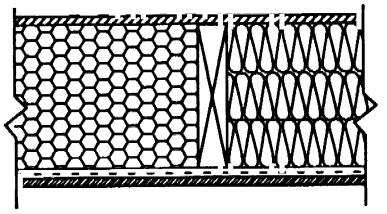
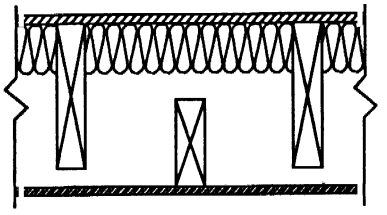
The independently joisted floor/ceiling measured in this study (floor 12) tested STC 40, while more conventional floor/ceiling assemblies built with resilient furring tested around STC 45. The use of independently joisted ceilings is therefore not recommended.

See also: Soundproofing Floors – Phase II: The Surface of the Floor (90-247).

	Composition	Sound Transmission Class (STC) Rating	Impact Insulation Class (IIC) Rating
1	 BASIC FLOOR ASSEMBLY • 16mm plywood • 38 mm x 230 mm joists at 406 mm centres	24	20
2	 • 16mm plywood • 38 mm x 230 mm joists at 406 mm centres • **25** mm x **38** mm wood furring strips at 610mm centres • 12.7 mm gypsum board	38	37

CMHC SCHL
Helping to house Canadians

		Composition	Sound Transmission Class (STC) Rating	Impact Insulation Class (IIC) Rating
3		• 38 mm x 230 mm joists at 406 mm centres • Space between joists filled with blown-in insulation materials: 3A - Cellulose blown-in attic insulation: Weathershield by Thermo-Cell Insulation Ltd. 3B - Mineral blown-in attic insulation: Red Top manufactured by CCC • 25 mm x 38 mm wood furring strips at 610 mm centres • 12.7 mm gypsum board	49 48	44 45
7W		• 16mm plywood • 38 mm x 230 mm joists at 406 mm centres • 89 mm glass fibre ball insulation between floor joists • 25 mm x 38 mm wood furring strips: 4A - Wood furrings at 610 mm centres 4B -Wood furrings at 406 mm centres • 12.7 mm gypsum board	44 37	41 32
5		•l6mmplywood • 38 mm x 230 mm joists at 406 mm centres • 25 mm x 38 mm wood furring strips at 610 mm centres • 12.7 mm gypsum board • 63.5 mm standard metal studs (25 GA.) spaced at 610 mm centres and screwed to furring strips • 63.5 mm pink glass fibre insulation between studs • 12.7 mm gypsum board	53	45
6		•l6mmplywood • 38 mm x 230 mm joists at 406 mm centres • 25 mm x 38 mm wood furring strips at 610 mm centres • 12.7 mm gypsum board • 38 mm x 75 mm wood blocking installed on flat side at 610 mm centres, and screwed to furring strips • 38 mm glass fibre ball insulation between the wood blocking at 610 mm centres • 12.7 mm resilient metal channel screwed to blocking • 12.7 mm gypsum board screwed to resilient furrings	46	42
7		• 16mm plywood • 38 mm x 230 mm joists at 406 mm centres • 89 mm glass fibre batt insulation between floor joists • 12.7 mm resilient metal channel screwed to joists: 7A - Resilient furrings by Pichette Metal, at 610mm centres 7B - Resilient furrings by RL Metal, at 610 mm centres 7C - Resilient furrings by Trebord, at 610 mm centres 7D - Resilient furrings RC-1 by CCC, at 610 mm centres 7E - Resilient furrings RC-1 by CCC, at 406 mm centres 7F - Resilient furrings RC-1 by CCC, at 406 mm centres installed parallel to the joists • 12.7 mm gypsum board	44 44 44 45 44 45	43 43 43 44 42 42

		Composition	Sound Transmission Class (STO) Rating	Impact Insulation Class (IIC) Rating
8		•lGmm plywood • 38 mm x 230 mm joists at 406 mm centres • 25 mm x 38 mm wood furring strips at 610 mm centres • Two layers of 12.7 mm gypsum board	37	35
9		• 16 mm plywood • 38 mm x 230 mm joists at 406 mm centres • 89 mm glass fibre ball insulation between joists • Resilient furrings RC-1 by CCC, screwed to joists at 610 mm centres • Two layers of 12.7 mm gypsum board	50	49
10		•l6mm plywood • 38 mm x 230 mm joists at 406 mm centres • 89 mm glass fibre ball insulation between floor joists • 12.7 mm wood fibre board screwed directly to underside of joists • Resilient furrings RC-1 by CGC, screwed to joists at 610 mm centres • 12.7 mm gypsum board	45	42
11		• 16 mm plywood • 38 mm x 230 mm joists at 406 mm centressound absorptive materials in cavity between joists: hA -3 layers of 89 mm pink glass fibre batt insulation IIB - Cellulose blown-in attic insulation: Weathershield by Thermo-Cell Insulation Ltd. liC - Acoustical blown-in insulation: Benocoustics by Benolec • Resilient furrings RC-1 by CGC, screwed to joists at 610 mm centres • 12.7 mm gypsum board	51 49 51	46 47 47
12		• 16 mm plywood • 38 mm x 230 mm joists at 406 mm centres • 89 mm glass fibre ball insulation between floor joists • 38 mm x 140 mm ceiling joists supported by common 38 mm x 230 mm plate at perimeter of test opening • 12.7 mm gypsum board screwed to 38 mm x 140 mm ceiling joists	40	38

Project Manager: Jacques Rousseau

Research Report: Research Project on the Noise Isolation Provided by Floor/Ceiling Assemblies in Wood Construction (Phase I)

Research Consultant: MIMAcoustical Consultants Inc.

A full report on this research project is available from the Canadian Housing Information Centre at the address below.

Housing Research at CMHC

Under Part JX of the National Housing Act, the Government of Canada provides funds to CMHC to conduct research into the social, economic and technical aspects of housing and related flelds, and to undertake the publishing and distribution of the results of this research.

This factsheet is one of a series intended to inform you of the nature and scope of CMHC's technical research program.

This **Research and Development Highlights** factsheet is one of a wide variety of housing-related publications produced by CMHC.

For a complete list of Research and Development Highlights, or for more information on CMHC housing research and information, please contact:

The Canadian Housing Information Centre
Canada Mortgage and Housing Corporation
700 Montreal Road
Ottawa (Ontario)
K1A 0P7

Telephone: (613) 748-2367
Fax: (613) 748-2098

Cette publication est aussi disponible en français.