REPORT

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Testing

Innovation Skåne AB
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Determination of impact sound insulation of floors in the laboratory according to EN ISO 10140-3

(6 appendices)

The meaning of this test is to investigate the impact of a special screw on a floor construction. The screws were used to fasten gypsum boards on furring on the underside. The ceilings with the special screws were compared with acoustical steel studs with ordinary screwing.

Client

Innovation Skåne AB

Test object

A joists floor of wooden studs 45x220 at c/c 600 with 95 mm mineral wool and furring 28x70 at c/c 300 or Knauf AP Acoustical studs 25x85 at c/c 300.

On top of the wooden studs 22 mm chipboard were applied.

One or two layers of 12,5 mm gypsum boards (Gyproc GNE) were attached by either ordinary screws against the acoustical studs or by special screws against the furring.

Pictures on the floors and the special screws are given in the report.

Arrival of test object

Just before the test

Date of test

2019-02-20 up to 2019-02-26

Results

Weighted normalized impact sound pressure level ($L_{n,w}$) are given in table 1. Complete results can be seen in the enclosures. Lower values are better sound insulation.

A direct comparison between the special screws and ordinary screws in acoustical studs is given in table 2 and in the enclosures 5 and 6.

The test results are valid for the tested specimens only.

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Table 1 - Results

Floor structure below:	Weighted impact sound insulation, $L_{n,w}$ (dB)	$C_{I,50-2500}$ (dB)	Enclosure
One layer of gypsum boards with The special screws in the furring	70	2	1
One layer of gypsum boards with ordinary screws in the acoustical studs	66	3	2
Two layers of gypsum boards with the special screws in the furring	64	4	3
Two layers of gypsum boards with ordinary screws in the acoustical studs	63	2	4

Table 2 – Results of the special screws compared with ordinary screws in acoustical studs. Negative numbers means less impact sound insulation with the special screws.

	$L_{n,w}$ (dB)	$C_{I,50-2500}$ (dB)	$L_{n,w} + C_{I,50-2500}$ (dB)
One layer of gypsum boards	-4	1	-3
Two layers of gypsum boards	-1	-2	-3

Measurement method

The impact sound insulation measurements have been performed according to EN ISO 10140-3.

The adaptation terms of the impact sound insulation (C_I and $C_{I,50-2500}$) are defined in EN ISO 717-2:96.

Measurement uncertainty

Measurement U, according to ISO 12999-1:2014, with respect to the reproducibility and with the coverage factor k=2 (corresponding to 95% confidence level) are estimated to 1,5 dB.

Regarding the 1/3-octave bands we have rely on the former standard ISO 140/2:91(E) as given in table 3.

Table 3 - Reproducibility

1/3 octave-band centre frequency (Hz)	Reproducibility (dB)
100	5
125	4
160	3
200	3
250	3
315	3
400	3
500	2,5
630	2,5
800	2,5
1000	2,5
1250	2,5
1600	2,5
2000	2,5
2500	2,5
3150	2,5

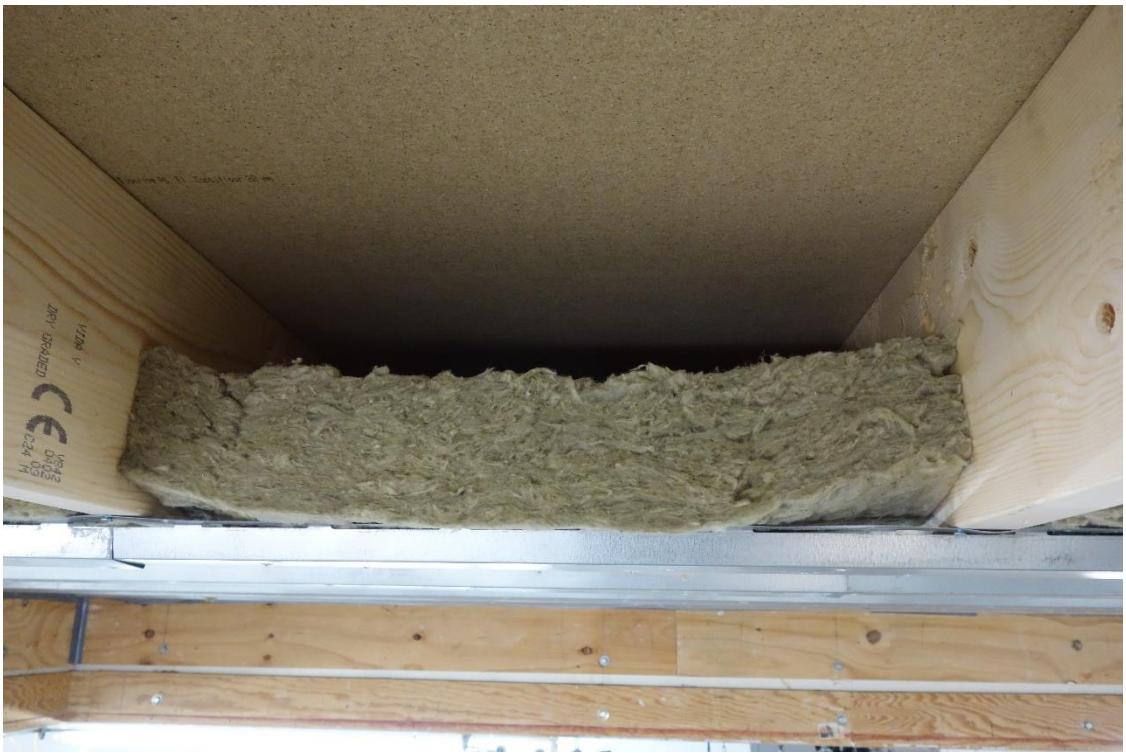
Pictures of the test objects and their mounting

Picture 1 – The special screw used in the test with the furring in enclosure 1 and 3.

Picture 2 – The floor from below. The furring 28x70 can be seen.

Picture 3 - The Knauf AP Acoustical stud.

Picture 4 – The floor from below with the Knauf AP Acoustical stud.



Picture 5 – The mineral wool between the wooden studs 45x220.

Picture 6 – The floor from above, 22 mm chipboard.

Picture 7 - The wooden studs 45x220 where attached by screws into studs 45x145 placed directly on the edges of the test opening on all sides.

Picture 8 – The wooden studs on the short side, 45x145 screwed into 45x220.

Picture 9 – The gypsum boards from below, an example.

Mounting

The floors where built in SP:s sound insulation laboratory for floors (vertical measurements). The wooden studs 45x220 where attached by screws into studs 45x145 placed directly on the edges of the test opening on all sides (see the picture 7 and 8). The edges of the test object in the upper laboratory were covered by several strips of gypsum boards and sealed by tape and model clay.

Equipment

Instrument	*Manufacturer*	*Type.*	*Serial no.*
Real time analyzer	Norsonic	830	500338
Calibrator	Brüel & Kjaer	4230	500932
Tapping machine	Norsonic	211	503028
Microphone receiving room	Brüel & Kjær	4166	1072010
Microphone preamplifier receiving room	Brüel & Kjær	2619	726782
Microphone boom receiving room	Brüel & Kjær	3923	912304
Microphone power supply receiving room	Brüel & Kjær	2804	1445249

RISE Research Institutes of Sweden AB
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Appendices

Appendix 1

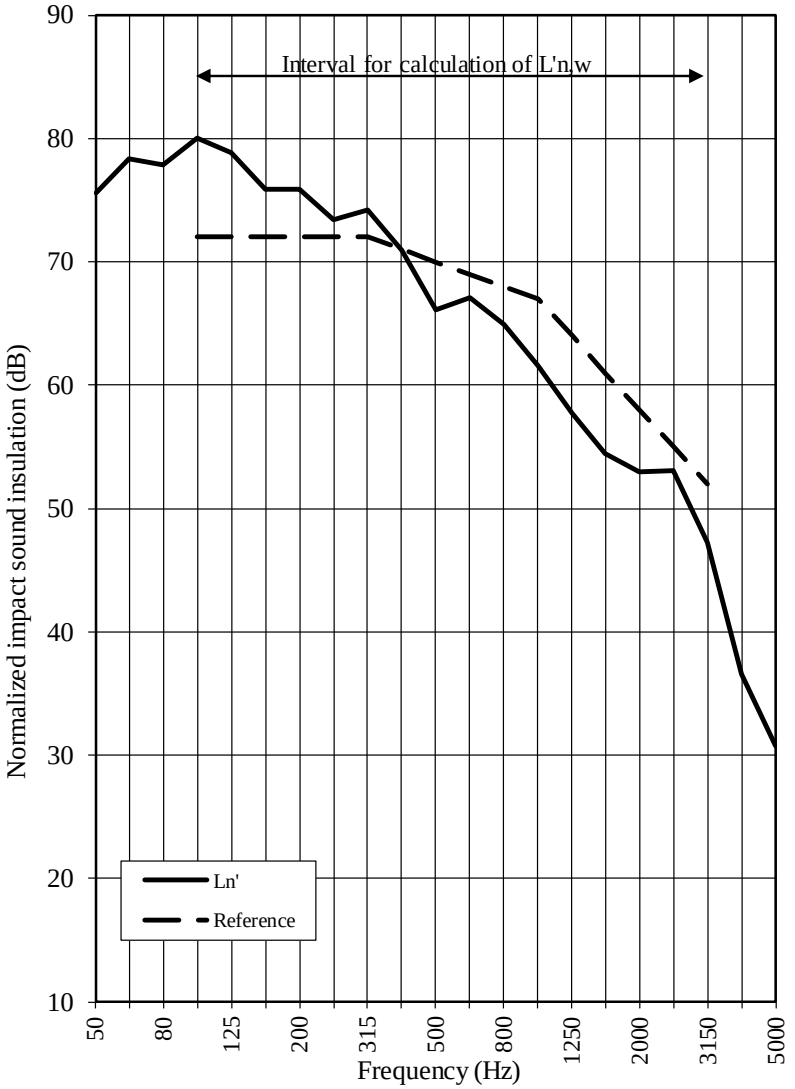
Determination of impact sound insulation according to EN ISO 10140-3

Client: Innovation Skåne

Test object: A joists wood floor of studs: 45x220 at c/c 600 and 95 mm mineral wool and furring 28x70 at c/c 300.
On top: 22 mm floor chipboard
Under: **One layer of gypsum boards** fastened by **the special screws** at c/c 450 along each furring.

Test date: 2019-02-20
Receiving room volume: 138 m3

Results: Weighted impact sound level, $L_{n,w}$ and spectrum adaption terms, C_I & $C_{I,50-2500}$



Frequency (Hz)	Ln (dB)
50	75,6
63	78,4
80	77,8
100	80,1
125	78,8
160	75,9
200	75,9
250	73,4
315	74,2
400	70,9
500	66,1
630	67,1
800	64,9
1000	61,6
1250	57,7
1600	54,5
2000	52,9
2500	53,1
3150	47,2
4000	36,5
5000	30,7

$L_{n,w}$	**70**
C_I	0
$C_{I,50-2500}$	2
Sum. dev.	26,3
Max. dev.	8,1
Frequency	100

Appendix 2

Determination of impact sound insulation according to EN ISO 10140-3

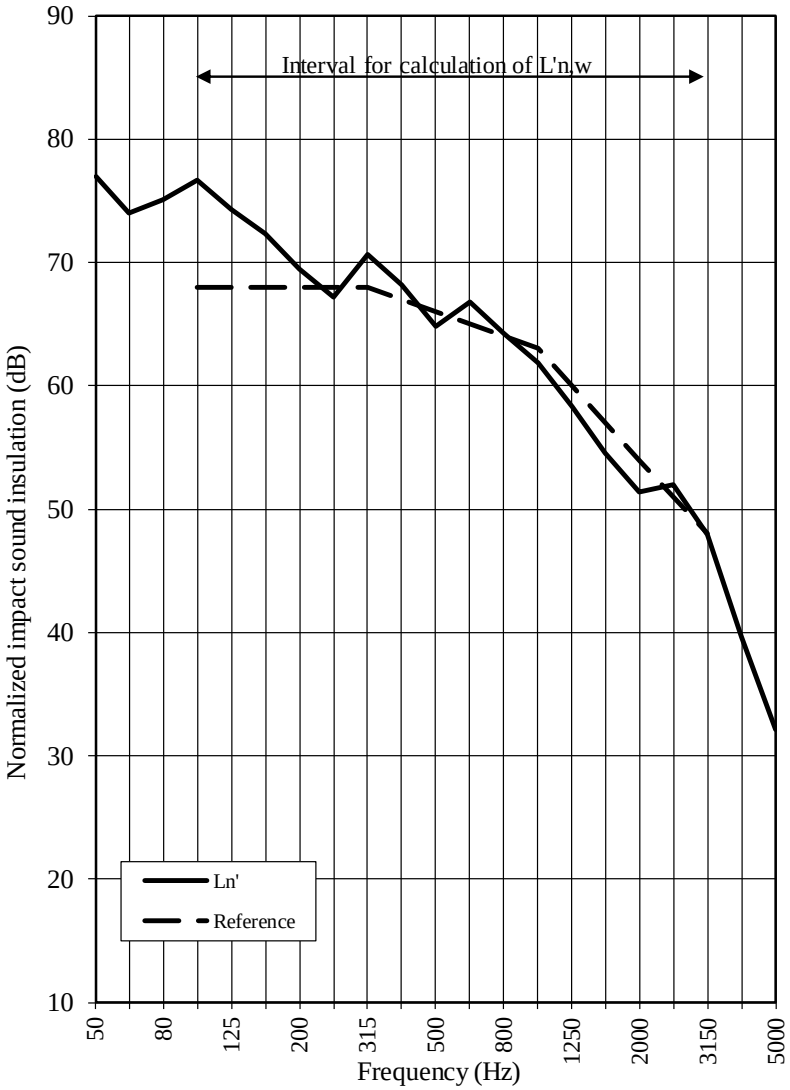
Client: Innovation Skåne AB

Test object: A joists wood floor of studs: 45x220 at c/c 600 and 95 mm mineral wool and **Knauf AP acoustical steel studs** 25x85 at c/c 300.
On top: 22 mm floor chipboard
Under: **One layer of gypsum boards** fastened by screws at c/c 200 along edges and c/c 300 in the middle of boards.

Test date: 2019-02-24

Receiving room volume: 138 m3

Results: Weighted impact sound level, $L_{n,w}$ and spectrum adaption terms, C_I & $C_{I,50\text{-}2500}$



Frequency (Hz)	Ln (dB)
50	77,0
63	74,0
80	75,1
100	76,7
125	74,3
160	72,3
200	69,5
250	67,2
315	70,7
400	68,2
500	64,8
630	66,8
800	64,2
1000	61,9
1250	58,3
1600	54,6
2000	51,4
2500	52,0
3150	47,9
4000	39,6
5000	32,1

$L_{n,w}$	**66**
C_I	0
$C_{I,50\text{-}2500}$	3
Sum. dev.	27,6
Max. dev.	8,7
Frequency	100

Appendix 3

Determination of impact sound insulation according to EN ISO 10140-3

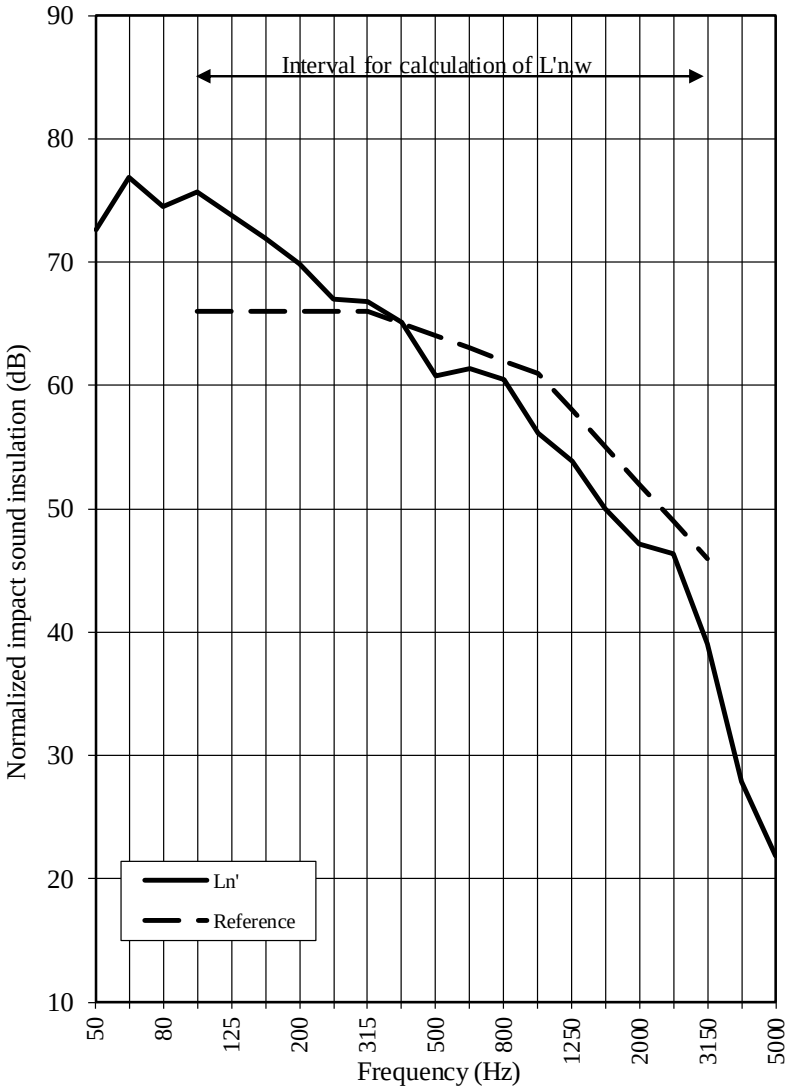
Client: Innovation Skåne AB

Test object: A joists wood floor of studs: 45x220 at c/c 600 and 95 mm mineral wool and furring 28x70 at c/c 300.
On top: 22 mm floor chipboard
Under: **Two layers of gypsum boards** with the first fastened by special screws.
First layer: **The special screws** at c/c 450 along each furring.
Second layer: Ordinary screws towards first layer at c/c 500 along boards boards and c/c 300 across boards. The second layer was not screwed into the furring.

Test date: 2019-02-21

Receiving room volume: 138 m3

Results: Weighted impact sound level, $L_{n,w}$ and spectrum adaption terms, C_I & $C_{I,50-2500}$



Frequency (Hz)	Ln (dB)
50	72,7
63	76,9
80	74,5
100	75,7
125	73,8
160	71,9
200	69,9
250	67,0
315	66,8
400	65,1
500	60,8
630	61,3
800	60,5
1000	56,1
1250	53,8
1600	50,0
2000	47,1
2500	46,4
3150	39,0
4000	27,9
5000	21,9

$L_{n,w}$	**64**
C_I	1
$C_{I,50-2500}$	4
Sum. dev.	29,2
Max. dev.	9,7
Frequency	100

Appendix 4

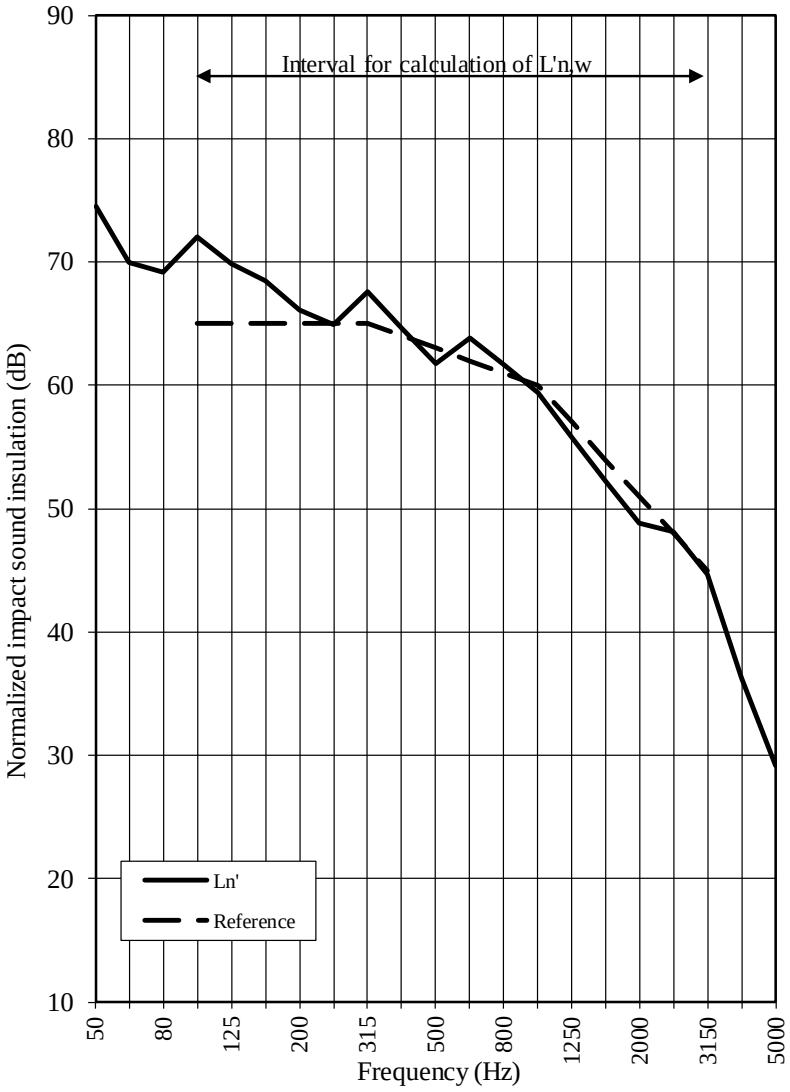
Determination of impact sound insulation according to EN ISO 10140-3

Client: Innovation Skåne AB

Test object: A joists wood floor of studs: 45x220 at c/c 600 and 95 mm mineral wool and **Knauf AP acoustical steel studs** 25x85 at c/c 300.
On top: 22 mm floor chipboard
Under: **Two layers of gypsum boards**.
First layer: screwed at c/c 600 towards acoustical steel studs.
Second layer: screwed at c/c 200 along edges and c/c 300 in the middle of boards towards the acoustical steel studs.

Test date: 2019-02-26
Receiving room volume: 138 m3

Results: Weighted impact sound level, $L_{n,w}$ and spectrum adaption terms, C_I & $C_{I,50-2500}$



Frequency (Hz)	Ln (dB)
50	74,5
63	69,9
80	69,2
100	72,0
125	69,9
160	68,5
200	66,1
250	65,0
315	67,6
400	64,6
500	61,7
630	63,8
800	61,6
1000	59,4
1250	55,8
1600	52,2
2000	48,8
2500	48,1
3150	44,6
4000	36,3
5000	29,1

$L_{n,w}$	**63**
C_I	-1
$C_{I,50-2500}$	2
Sum. dev.	22,2
Max. dev.	7,0
Frequency	100

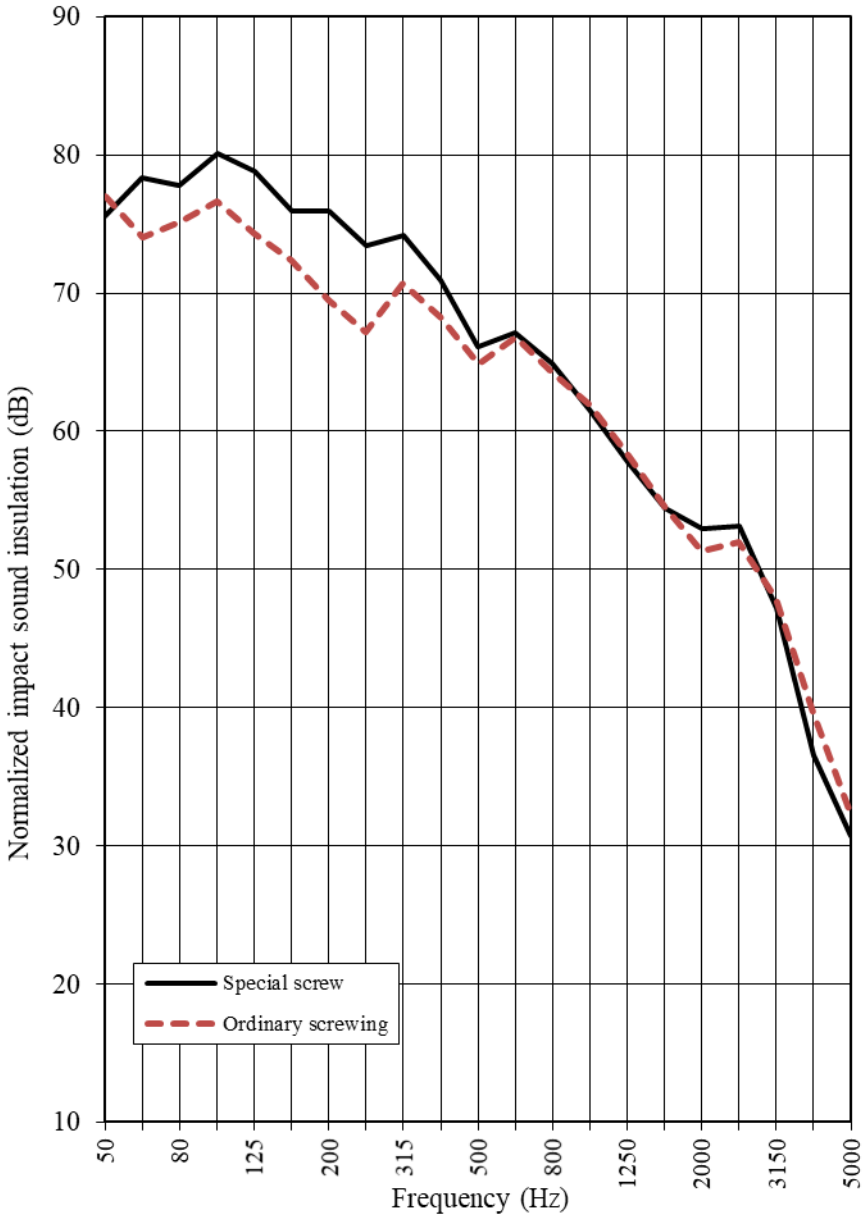
Appendix 5

One layer of gypsum boards on the underside of the floor - The special screws compared with ordinary screwing on acoustical steel studs.

Lower values are better impact sound insulation.

Black line: The special screws.

Dashed red line: Ordinary screwing on acoustical studs.



Appendix 6

Two layers of gypsum boards on the underside of the floor - The special screws compared with ordinary screwing on acoustical steel studs.

Lower values are better impact sound insulation.

Black line: The special screws

Dashed red line: Ordinary screwing on acoustical studs.