Detailed report for consortium on fire resistance and sound insulation of floors: sound transmission and impact insulation data in 1/3 octave bands

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Detailed Report for Consortium on Fire Resistance and Sound Insulation of Floors: Sound Transmission and Impact Insulation Data in 1/3 Octave Bands

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The IRC Acoustics Laboratory recently completed the measurement phase of a study of airborne and impact sound transmission through typical floor constructions used in Canadian housing. A companion to an earlier summary report,[1] this report provides the one-third octave band data measured in the project for airborne sound transmission loss and impact sound pressure level and some discussion of the major effects seen during the project. The report is intended for use by consultants, research workers and anyone who needs the detailed sound insulation spectra.

For convenience, much of the information from the summary report is reproduced in this report, however, readers may find the summary report useful.

In addition to the Institute for Research in Construction of the National Research Council Canada (IRC/NRCC), the work was supported by a consortium including

- Boise Cascade
- Canada Mortgage and Housing Corporation (CMHC),
- Canadian Home Builder Association (CHBA)
- Canadian Portland Cement Association (CPCA)
- Canadian Sheet Steel Building Institute (CSSBI),
- Canadian Wood Council (CWC)
- Cellulose Insulation Manufacturers Association of Canada (CIMAC),
- Forintek Canada Corporation (FORINTEK),
- Gypsum Association
- Gypsum Manufacturers of Canada (GMC),
- Louisiana-Pacific Incorporated
- Nascor Inc.
- Ontario Home Warranty Program
- Ontario Ministry of Housing
- Owens Corning Fibreglas Canada Inc. (OCFCI),
- Roxul Inc. (ROXUL).
- Trus Joist MacMillan
- Willamette Industries

Some of the floor specimens were chosen by IRC for technical reasons but the majority of the specimens were approved as part of a structured series established collectively by the consortium.

The acoustical measurements included impact sound measurements using experimental, non-standard devices. These measurements were made to provide extra information that might be used to improve the existing standardized tapping machine test or to develop new test procedures. A third IRC report will deal with these experimental impact measurements in detail.

The combined set of over 190 specimens provides

- data for systematic evaluation of sound transmission through joist floor systems,
- data for development of prediction methods,
- data for development of improved constructions, and
- a consistent assembly of STC and IIC data needed by builders and regulators to select constructions suitable for party floors in multi-family dwellings.

Areas requiring Additional Work

To a large extent the project has successfully established the major parameters affecting the sound insulation of floors. Areas that need further work for building code purposes were listed in the summary report. Some are repeated here with problem areas of a more scientific nature.

- Few acoustical tests were done in the project using the 12.7 mm board. In some cases there seemed little, if any, difference between a floor with a 15.9 mm Type X gypsum board ceiling and the same floor with a 12.7 mm Type X gypsum board ceiling. More tests are needed to more clearly define the differences between these board types.
- More tests are needed with wood trusses to be sure that all variants of trusses are examined and to try to find a reason for the anomalously low impact insulation class ratings with these floors.
- More tests are needed with wood I-joist floors to try to determine why there is so much variability with these floors. The consistency obtained with solid wood joist construction suggests that there is a real physical reason for the variability but only experiment will establish what this reason is.
- More tests are needed with rock fibre batts and blown-in cellulose to more clearly define what advantage these materials have over glass fibre batts.

- The impact insulation provided by a floor is, for the ISO tapping machine, extremely dependent on the compliance of the surface layer of the floor. Some work is being done in a separate project to study the influence of floor toppings on impact sound insulation but the topic is complicated and very extensive; more work would definitely be useful.

MEASUREMENT PROCEDURES

M59 test facility.

The M59 floor test facility (Figure 1) comprises two rooms[2] with volumes of about 175 m^3 (Room volumes change when specimens of different thicknesses are installed). The bottom room is constructed of 30 cm thick poured concrete and is supported on steel springs and neoprene placed under the floor. The upper room is constructed from steel studs and layers of particleboard. It is supported on steel columns that in turn rest on steel springs and neoprene supports.

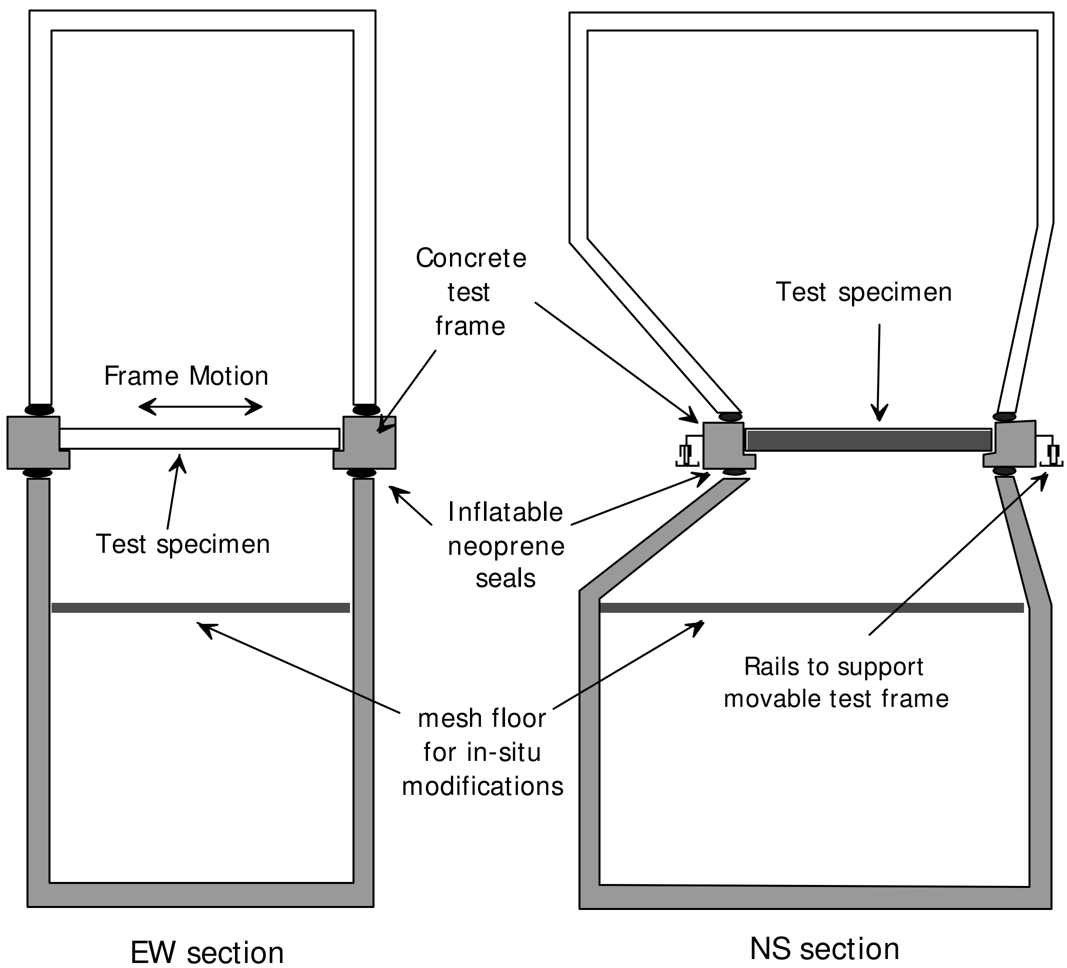


Figure 1: Sections through the M59 floor testing facility. (Not to scale)

Floor specimens are constructed in one of two concrete test frames that can be removed from between the reverberation rooms and lifted by a crane to a storage area or to the floor of the main laboratory. Figure 2 shows the frame partly inserted between the rooms. The dimensions of the test frames are shown in Figure 3. The floor specimen opening measures 3.8 x 4.7 m. Gaps between the upper and lower chambers and the edges of the movable frame are sealed with inflatable gaskets. To reduce transmission around or through the frame, shields are placed over the exposed parts of the frame in the upper room after the frame and specimen are installed between the rooms. In addition to the inflatable gaskets, backer rod[?] and tape are used to further seal the gap between the lower room lip and the test frame.

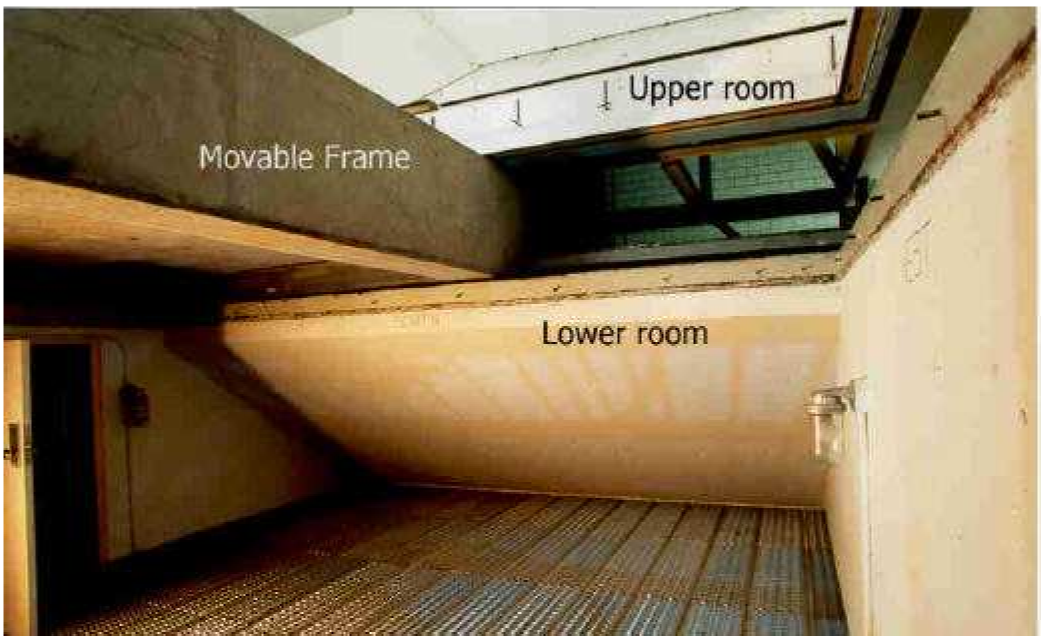


Figure 2: Insertion of floor frame between the upper and lower chambers.

[?] Backer rod is closed-cell, polyurethane foam formed into long cylinders. It is used for sealing gaps in construction so caulking may be applied on top of it in economical quantities.

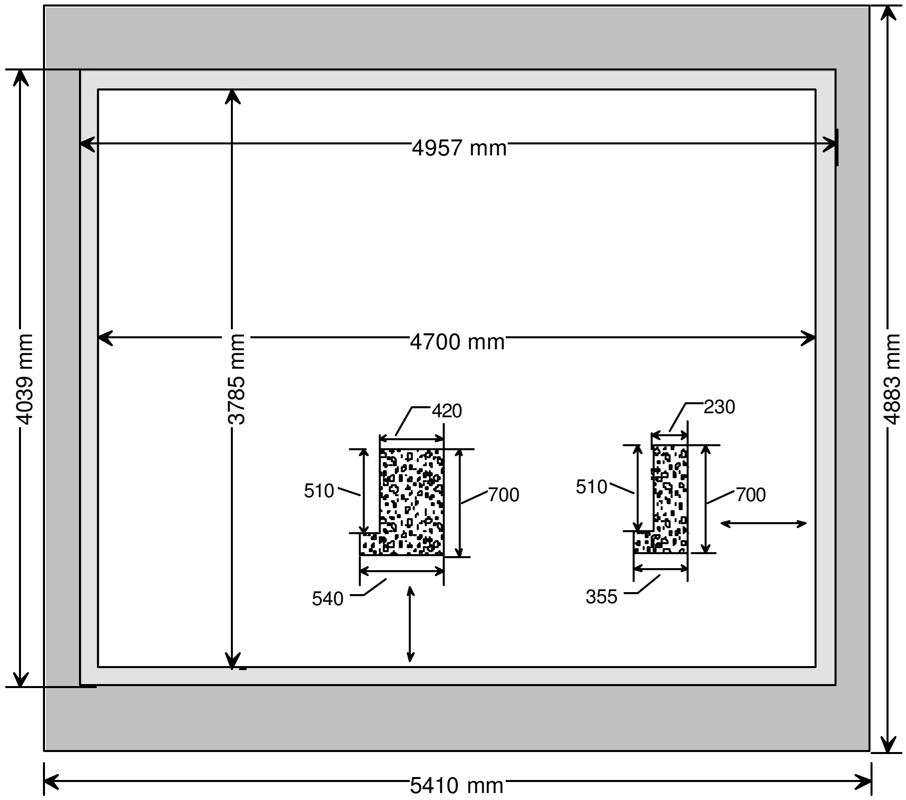


Figure 3: Plan and section of test frame for supporting specimens.

In each room a microphone is mounted at the end of a scissors-jack arrangement that is attached to a boom that turns about an axis near the middle of the ceiling. The scissors-jack moves along the boom and lowers and raises the microphone. Stepping motors set the microphone position and nine microphone positions are used in each room. (See Figure 4)

Airborne Sound — ASTM E90

Measurements of airborne sound transmission are made in accordance with ASTM E90[3]. In the M59 floor test facility sound is generated in one room using four loudspeaker systems, each with its own noise generator and amplifier. The movable microphone in each room measures the sound pressure levels and sound decay rates at frequencies from 50 to 6300 Hz. The information collected is used to calculate sound transmission loss (TL) and sound transmission class (STC) according to ASTM E413[4]. Measurements are made with each room in turn serving as the source room and the two sets of results are averaged.

Figure 4: Automated system for moving the microphone in each room. Two of the four loudspeakers used in each room are visible in the picture.

Impact Sound — ASTM E492

Transmission of impact sound through floors is measured in accordance with ASTM E492[5]. A standardised tapping machine incorporating 5 steel-faced hammers is placed on the floor under test in four specified positions. A motor drives the hammers so they each strike the floor surface twice per second for a total rate of 10 impacts per second. Sound pressure levels and decay rates are measured in the room below. In this report, measurements are presented from 50 to 6300 Hz. The information collected is used to calculate the normalised impact sound pressure level and the impact insulation class (IIC) according to ASTM E989[6]. In the report normalised impact sound pressure level is referred to using the acronym ISPL. All impact sound pressure levels presented in the report are normalised.

CODING SYSTEM FOR SPECIMEN DESCRIPTION

To avoid the tedium of reading long descriptions of floor constructions a coding system is used throughout the report. Each layer in a floor is coded as follows:

- an integer representing the number of sheets of material
- a sequence of letters to indicate the material in the layer
- a number representing the thickness in mm of each sheet in the layer.

If the number of sheets in a layer is one, the leading 1 is omitted. Underbars separate layers. The coding system is applied to beam-like floor elements, such as joists and resilient metal channels, that do not constitute layers. For such elements, the number following the letters is the depth of each element—the dimension along the axis perpendicular to the plane of the floor—and the number in parentheses following the depth code is the separation between each beam-like element.

Thus the code OSB15_WJ235(406)_GFB150_RC13(610)_2G15.9 describes the following floor:

- A 15 mm thick OSB subfloor.
- 38 x 235 mm wood joists, 406 mm on centres (o.c.)
- 150 mm thick glass fibre batts in the joist cavities.
- 13 mm deep resilient metal channels screwed 610 mm o.c. perpendicular[?] to the joists
- Two layers of gypsum board[?], 15.9 mm thick, applied to the resilient metal channels.

This coding system is used in the detailed tables at the end of this report and in the computer files on the accompanying disk. The coding system simplifies computer searches for particular constructions.

In some instances in figures comparing specimens, n or xxx is used to indicate that a parameter is being varied. Thus nOSB15 indicates that the number of layers of oriented

[?] In the project, all resilient metal channels were applied at right angles to the joists.

[?] With a few exceptions, all the gypsum board in the project was fire-rated, Type X.

strandboard varies and RC13(xxx) indicates that the spacing between resilient metal channels varies.

The codes used to identify materials are given in the table below.

CAR	Carpet
UND	Underpad
VIN	Vinyl flooring
PLY	Plywood
OSB	Oriented strandboard
WFB	Wood fibre board
WPB	Wood particle board
WJ	Wood joists (solid)
SJ	Steel joists
WT	Wood truss-joists
WI	Wood I-joists
GFB	Glass fibre batts
MFB	Mineral fibre batts
CFL	Blown-in cellulose fibre
CFS	Sprayed-on cellulose fibre (to underside of subfloor and sides of joists)
RC	Resilient metal channels
UC	U-channels
CC	C-channels
WFUR	Wood furring
G	Gypsum board
CON	Concrete

REPEATABILITY AND REPRODUCIBILITY

For comparing test results within a series of measurements or among laboratories two concepts are important: *reproducibility* and *repeatability*.

Reproducibility is defined as the closeness of agreement between results obtained on nominally identical test specimens with the same test method in different laboratories. This includes deviations due to systematic differences between facilities and equipment, variations in implementation of the test procedures, and uncontrolled differences in the specimen and its installation. The *reproducibility* is a characteristic of the test method that must be determined by an inter-laboratory comparison study. Reproducibility values are likely to depend on the kind of specimen being measured. In ISO 140, reproducibility values for measurements of airborne sound transmission loss range from 3 dB at mid-frequencies to 7 dB at low frequencies (See Figure 9). Values should agree within this range 19 times out of 20. It is because of this large uncertainty that systematic studies in one laboratory (like that reported here) are needed for clear comparisons. The only reproducibility values available for ASTM E90 are for a reference steel panel and are given in ASTM E1289[7].

Repeatability may be defined as the closeness of agreement between independent results obtained with the identical test specimen in the same laboratory with the same equipment and test method by the same operator within a short time period. Estimates of this repeatability can be made by running the same test several times in succession without disturbing the specimen in any way. Computer-controlled tests repeated in this manner usually show negligible variation. The repeatability so determined represents the limit associated with the measurement conditions specified by the computer program, for example, the integration time used to measure the sound pressure levels and the number of microphones used in each room. Changes in room temperature or humidity might also be a factor. This repeatability is of limited interest.

In this project, besides airborne sound transmission loss measurements, several different impact tests were routinely conducted on each floor specimen. Some of these used quite severe impacts that might have caused significant changes to the test specimen. So a more useful estimate of repeatability was obtained by running over a period of several days complete sets of all tests normally conducted. Thus any environmental effects and possible changes due to violent impacts are included in the estimate of repeatability which is here termed the *re-test repeatability*. Tests were made in this way on the same specimen nine times over a period of 13 days. Eight of the STC ratings obtained were 50 and one was 51. Only 8 tapping machine tests were run; 4 gave IIC ratings of 45 and 4 gave ratings of 46. The airborne and impact data are plotted in Figure 5 and Figure 6.

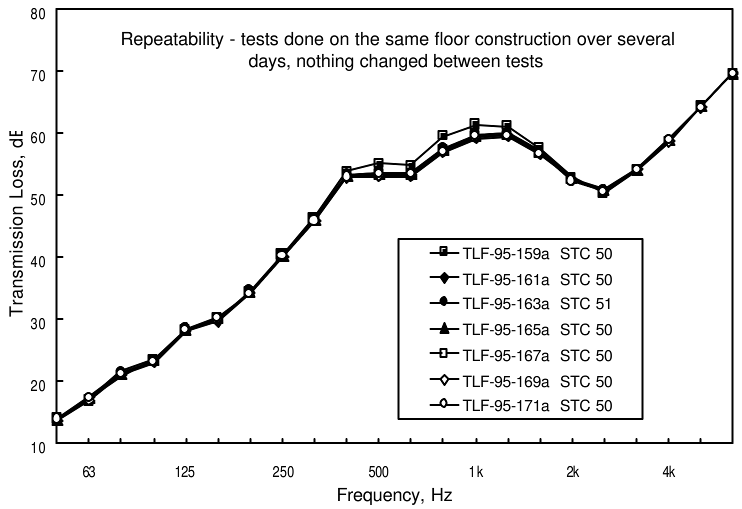


Figure 5: Repeat transmission loss tests on the same floor construction (OSB15_GFB152_WJ184(406)_RC13(610)_G16).

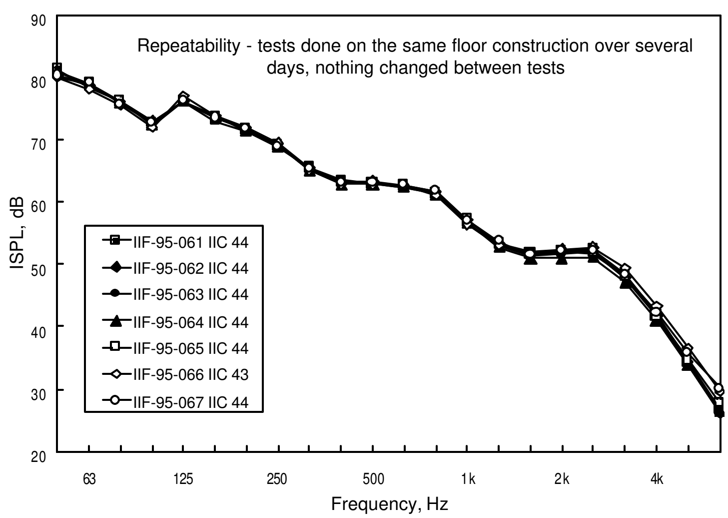


Figure 6: Repeat tapping machine tests on the same floor construction (OSB15_GFB152_WJ184(406)_RC13(610)_G16).

The airborne sound data contain one anomalous result, the first test TLF-95-195a, where transmission loss values are a few decibels higher than all other tests in a limited frequency range. Because the differences are confined to a small frequency range, one can say that they are not due to some program or calibration error. Instead, they must be associated with some physical change in the floor. Note that there are no such differences for the impact tests in Figure 6. It is possible that there were physical changes as a result of the pounding from the ISO tapping machine and the other impactors used in the project, but one can only speculate. The re-test repeatability values obtained from these data are plotted in Figure 9 and Figure 10. Two values of re-test r are presented for airborne measurements: one that includes the anomalous test and one that does not.

Reference floor

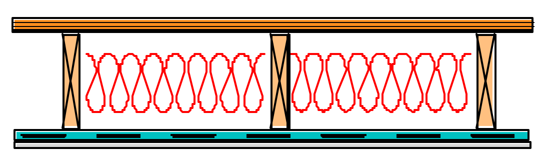
Rebuild repeatability may be defined as the closeness of agreement between results obtained with the same test method in the same laboratory on nominally identical test specimens constructed with nominally identical materials. Since the laboratory, measurement methods and equipment remain constant, any variance found reflects variations in materials and installation techniques and possible unknown effects.

To investigate *rebuild repeatability*, the same floor was constructed and tested eight times in the laboratory over a period of about 1 year using new materials each time. The floor construction consisted of

- a 15 mm thick OSB subfloor.
- 38 x 235 mm wood joists, 406 mm o.c.
- a layer of 152 mm thick glass fibre batts in the joist cavities.
- 13 mm deep resilient metal channels screwed 610 mm o.c. perpendicular to the joists
- one layer of Type X gypsum board, 15.9 mm thick, applied to the resilient metal channels.

The reference floor

OSB15_WJ235(406)_GFB152_RC13(610)_G15.9



This floor is referred to as the *reference floor* in the report and the average of the eight tests as *Mean ref* in the tables.

For the reference floor, Figure 7 shows the mean transmission losses and the computed rebuild repeatability values as error bars. Figure 8 gives the corresponding information for the impact sound pressure levels. The retest and rebuild repeatability values are themselves displayed in Figure 9 and Figure 10.

As expected, the rebuild repeatability is greater than the re-test repeatability. It is surprising, however, to note that the reproducibility given for the ISO tapping machine test in ISO140-2 is smaller at some frequencies than the rebuild r. The reason for this becomes clear on reading the footnote in ISO 140-2 that says the reproducibility values are based on tests made by different measurement teams on the *same* 140 mm slab in a *single* laboratory. While this may be the best information available, it is not a valid measure of reproducibility.

The repeatability that is relevant when comparisons are being made among floors depends on whether the floors were completely rebuilt or only had minor changes made to one of them before re-testing. For minor changes, for example adding an additional layer of gypsum board, the re-test repeatability would give more appropriate estimates of the uncertainty associated with the measurement.

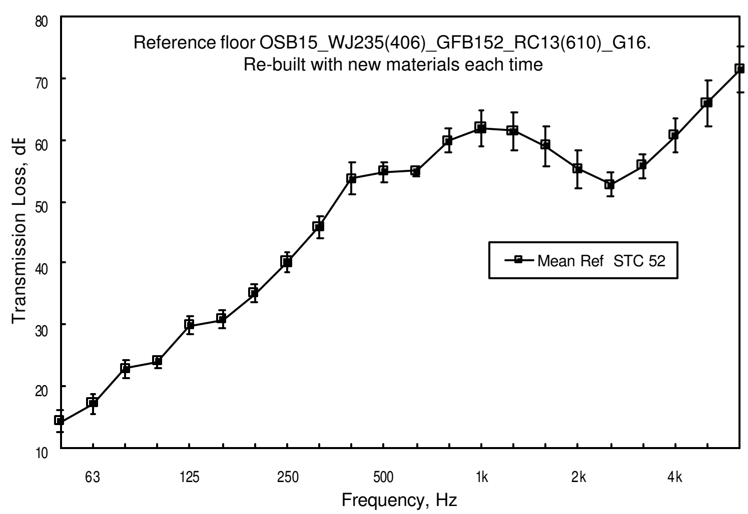


Figure 7: Airborne sound transmission loss for the reference floor. The graph shows the mean of 8 measurements. The error bars are the computed rebuild repeatability values.

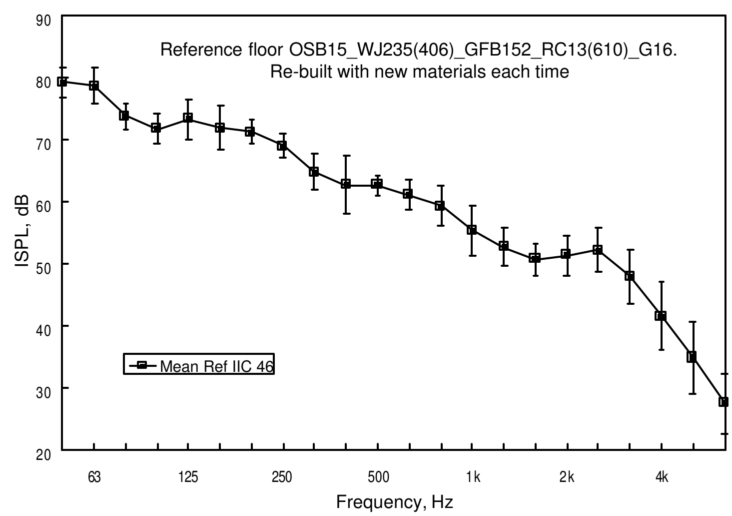


Figure 8: Normalised impact sound pressure levels for the reference floor. The graph shows the mean of 8 measurements. The error bars are the computed rebuild repeatability values.

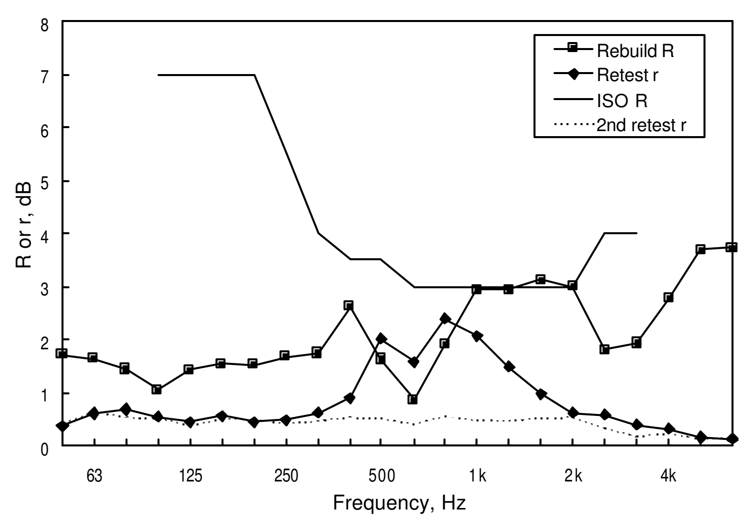


Figure 9: Rebuild and retest repeatability values for TL measurements for the reference floor. The dotted line excludes the anomalous result shown in Figure 5.

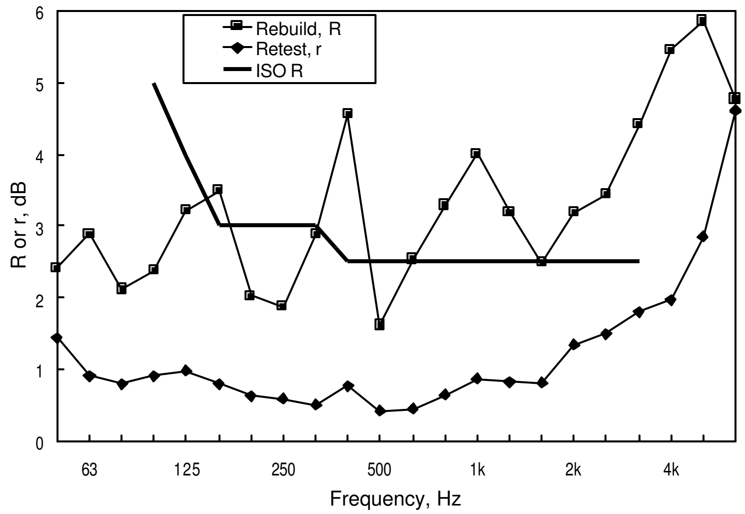


Figure 10: Rebuild and retest repeatability values for ISPL measurements for the reference floor.

Four of the STC ratings obtained for the re-builds of the reference floor were 51 and four were 52. Four of the IIC ratings were 45 and four were 46. The data from these measurements were used to estimate rebuild repeatability for the STC and IIC ratings. For the purposes of this report, a change of more than 1 point in the STC or IIC rating may be taken as significant and can be attributed to a change in the specimen. A change of only 1 should be regarded as not significant unless an examination of the 1/3 octave band data shows significant changes.

During the project a steel joist floor, nominally identical to the reference floor except for the joists used, was constructed three times. Only airborne transmission loss tests were conducted on the three specimens. There are too few tests to allow any estimate of rebuild repeatability but the data in Figure 11 suggest that one might expect more variability with this type of joist, at least around 1 kHz.

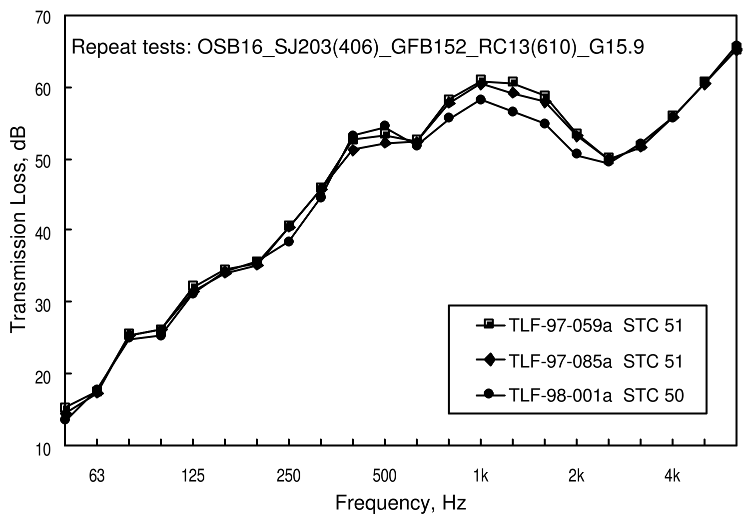


Figure 11: TL for repeat tests on completely rebuilt steel-joist floors.

The IRC Acoustics laboratory has a 150-mm thick concrete slab that is used as a reference specimen and is installed and re-tested repeatedly. Six measurements of the standard installation are available. Although the data were not collected as part of this project, they are included here because of their relevance to this section. Yet another kind of repeatability, the *re-install repeatability* can be calculated and the values are shown in Figure 12: . Comparisons among these measured repeatabilities and the ISO values are interesting but will not be presented here.

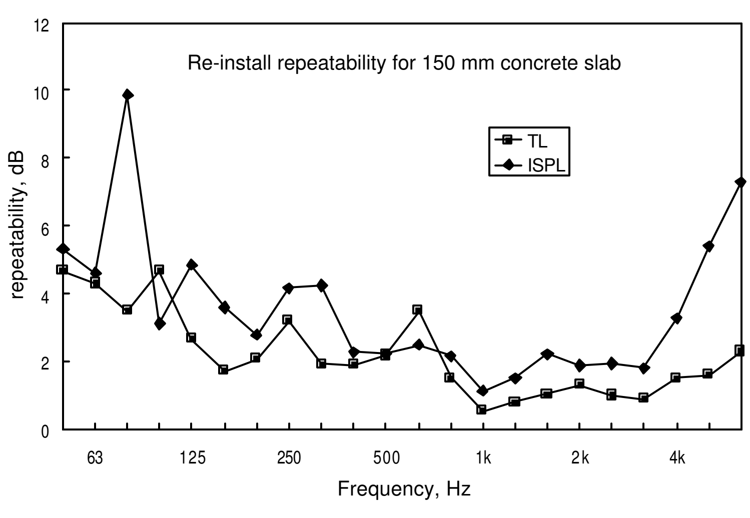


Figure 12: Re-install repeatability for the IRC 150-mm concrete slab (6 tests).

PRELIMINARY INVESTIGATIONS

Before embarking on a long series of measurements, several construction variables were investigated to determine whether they had a significant effect on sound transmission. The reference floor construction described in the previous section was used to investigate them.

Effects of Joist Length

Some theoretical considerations and published experimental data suggested that the length of the joists in a floor would have a significant effect on sound transmission. To test this hypothesis a movable concrete support was constructed that allowed the test frame to support wood-joist floors with different joist lengths. This device is sketched in Figure 13 and Figure 14. A dimensioned drawing of the test frame is shown in Figure 3. The filler section shown in Figure 14 held pieces of a 150 mm thick concrete slab, sound absorbing material and gypsum board so sound transmission through this section was negligible relative to that through the test floor.

The reference floor was first constructed to completely fill the test frame with 4.85-m long joists parallel to the long axis of the frame. Two sets of 19 x 64 mm cross-bridging were installed between the joists 1617 mm from each edge of the floor. After testing, part of the OSB layer and the gypsum board were removed at one end and the joists cut to the new length. The movable support was inserted, the floor repaired and the filler section constructed and sealed. This process was repeated for joist lengths of 4.34, 3.45 and 2.92 m. The floor was also re-constructed as a full-size floor with the joists perpendicular to the long axis of the specimen frame (joist length 3.92 m). The one-third octave band plots of data for these tests (Figure 15 and Figure 16) show no significant variations at low frequencies that might be attributed to joist length. It was surprising that there was so little change in the results when the joist length ranged from 2.92 to 4.85 m, but the data are clear. On the basis of this result, it was decided that joist length was not an important factor and that for convenience, all floors would be constructed with joists or trusses parallel to the short axis of the specimen frame.

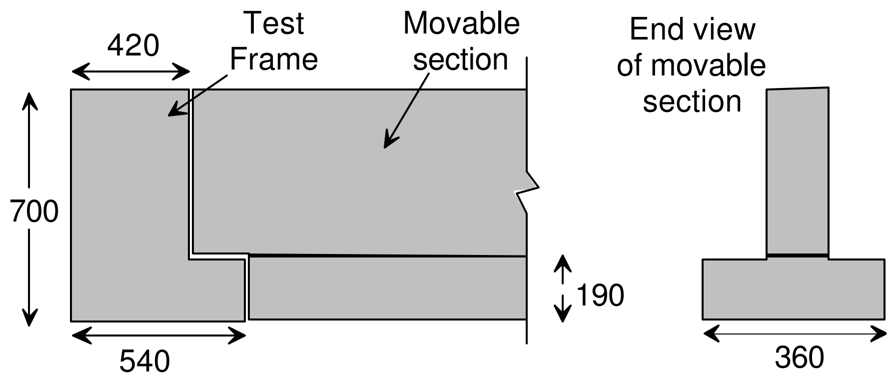


Figure 13: The movable concrete support used to change the floor size by supporting different joist lengths.

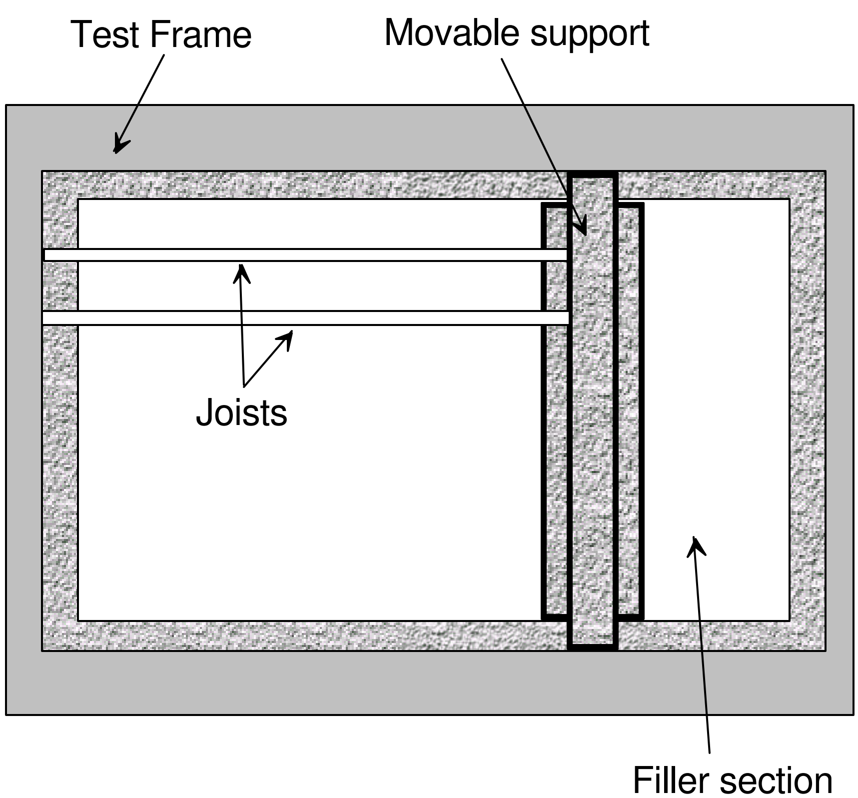


Figure 14: Illustration of the use of the movable concrete support when testing floors with different joist lengths.

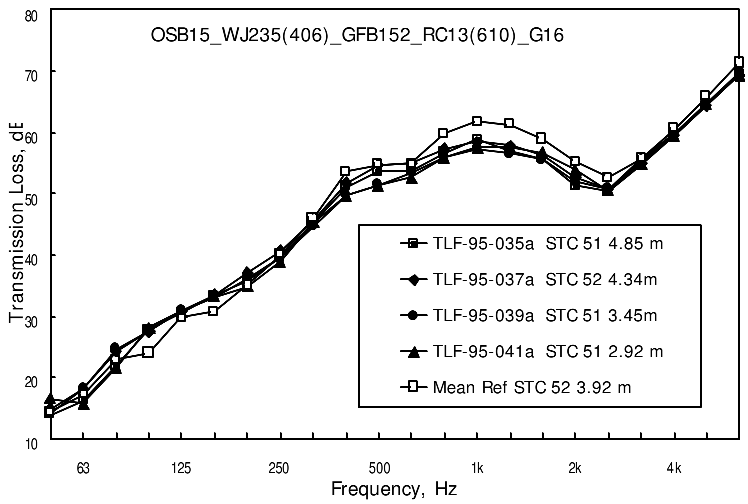


Figure 15: Transmission loss for wood joist floors differing only in joist length.

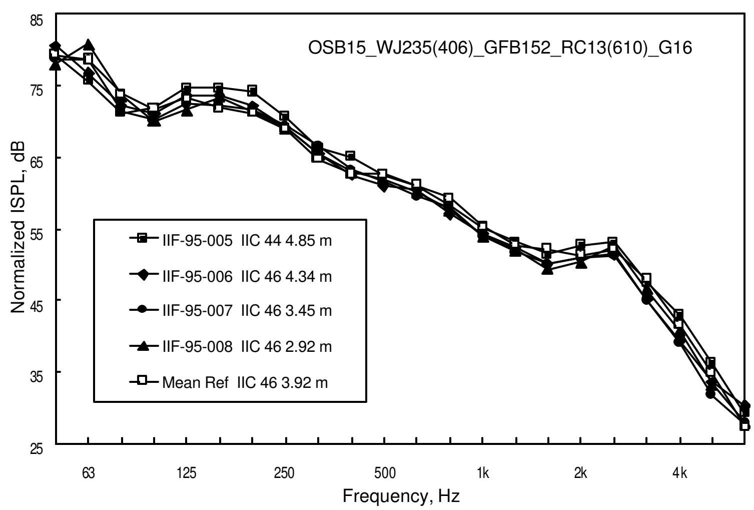
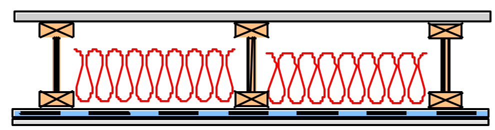


Figure 16: Impact sound pressure levels for wood joist floors differing only in joist length.

Number of I-joists in floor

When measuring sound transmission, it is important to avoid having sections of the floor or wall with joist or stud separation much different from the nominal value. This situation arises when the width of the test opening is not an integer multiple of the joist or stud spacing. Research has shown[8] that such atypical cavities can significantly reduce the transmission loss for wall systems and introduce variability in a test series.

There are two possible methods of constructing a floor with joists spaced 406 mm o.c. in the floor test frame: one using thirteen equally spaced joists with no joist on the midline of the floor and one using fourteen joists with one placed on the midline of the floor. The second arrangement results in two smaller cavities at each end of the floor and was expected to give lower sound insulation. The arrangement with 13 joists was used throughout the project. However, to verify the hypothesis that there would be an effect due to the joist layout, two floors were constructed using 13 and then 14 wood I-joists with the construction being

1 layer of 15 mm OSB subfloor 241 mm deep wood I-joists, 406 mm o.c. 152 mm glass fibre batts resilient metal channels, 406 mm o.c. one layer of 15.9 mm gypsum board	

The effect on the sound insulation can be seen in Figure 17 and Figure 18. The differences around 125 Hz are the primary cause of changes in the STC and IIC. There are also significant differences from 500 to 1000 Hz but these do not affect the STC and IIC. As expected, using fewer joists gives better sound insulation although the effects are small in this case.

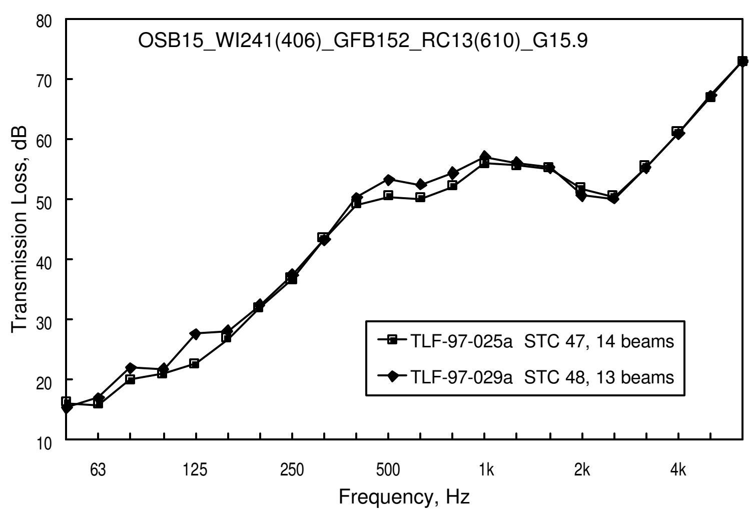


Figure 17: Transmission loss for I-joist floors differing only in the number of I-joists used.

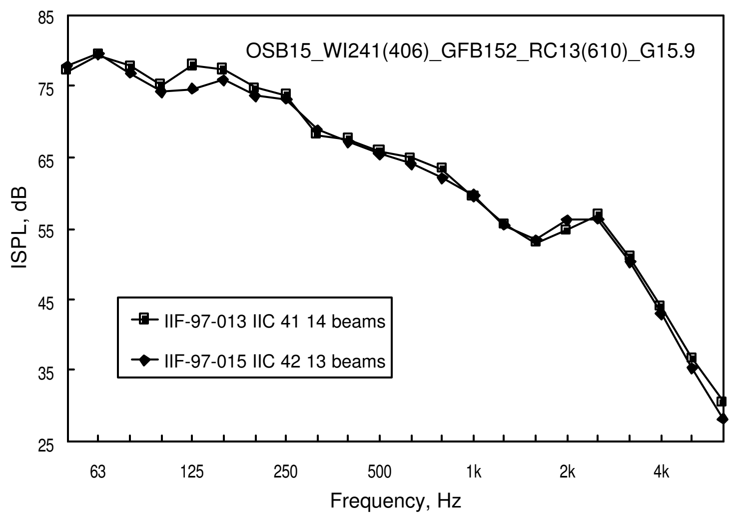


Figure 18: Impact sound pressure levels for I-joist floors differing only in the number of I-joists used.

Sub-Floor attachment

Screw Tightness

One issue that was addressed was the possibility of changes in sound reduction caused by changes in the tightness of the screws attaching the sub-floor to the joists. In practice, changes in tightness could be caused by changes in the moisture content of the wood after installation, or by variations in workmanship during installation. To test the significance of screw tightness, the reference floor was constructed with floor screws tightened normally and then loosened in 1/4 turn increments until they had been loosened by 1 full turn. Measurements were made at each stage. There were no significant differences in the STC or the IIC ratings, but there were differences in the transmitted sound energy at the frequencies above 500 Hz; as the screws were loosened, less sound was transmitted (Figure 19 and Figure 20).

When this experiment was repeated with a 15 mm thick plywood subfloor instead of the OSB subfloor, similar results were obtained; all the STC values were 50, two IIC values were 43 and three were 44.

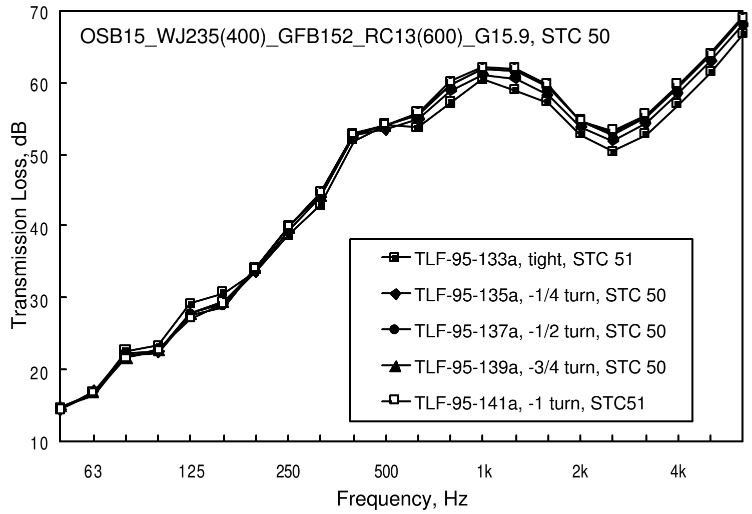


Figure 19: Effect on transmission loss of loosening screws in an OSB sub-floor.

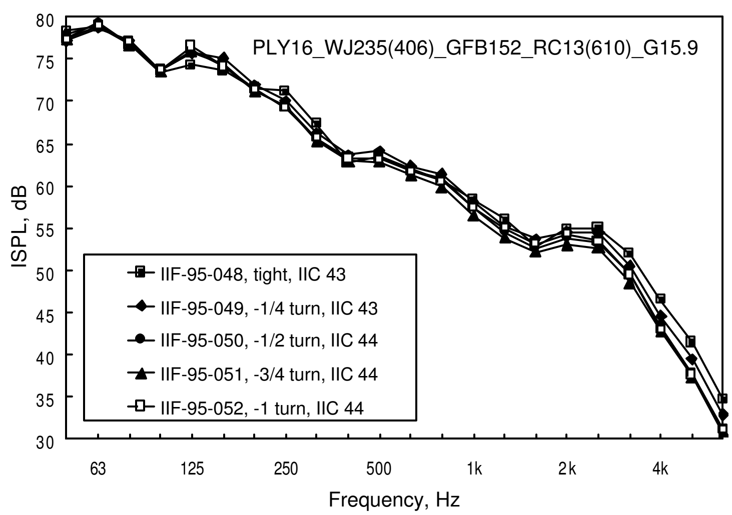


Figure 20: Effect on impact sound pressure level of loosening screws in an OSB sub-floor.

Screws vs. Construction adhesive and Nails

The possibility that there might be a difference between screwing the OSB subfloor to the joists and attaching it with construction adhesive and nails was also examined. During the project, using only screws to attach the subfloor was obviously preferable as it allowed changes to be made easily to the subfloor or the sound absorbing material in the cavity. If using construction adhesive had given different results, then more tests with construction adhesive would have been necessary.

It was also possible that using extra screws to attach the subfloor would have given the same result as using construction adhesive. To investigate these possibilities, the normal screw spacing used to attach the OSB subfloor to the joists (300 mm o.c.) was halved and then halved again. The OSB subfloor was then removed and re-attached using construction adhesive and nails.

Fortunately, the results (Figure 21 and Figure 22) showed that the attachment methods gave no significant differences in either the one-third-octave band plots, or the STC and IIC values. Being able to use screws to attach the floor sheathing greatly simplifies changes to constructions. Consequently, during the project all floors were screwed to the joists.

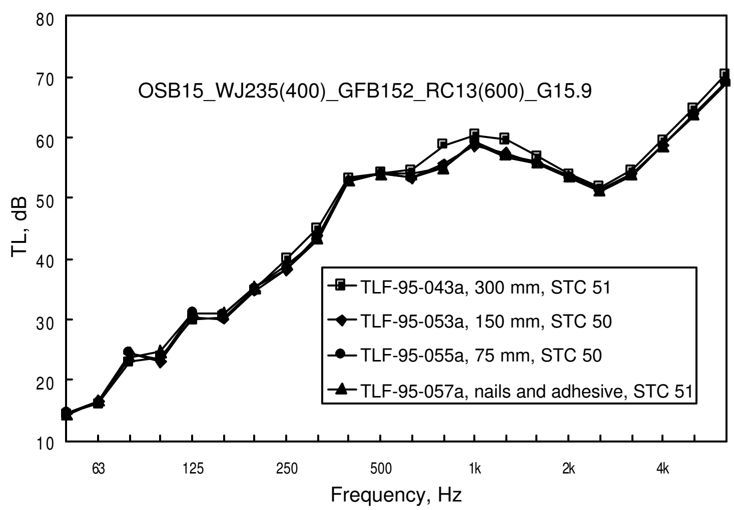


Figure 21: Effect of different screw spacing and adhesive attachment on transmission loss. The dimension following the test ID is the spacing between screws in the field of the floor. Edge spacing was half this value in each case.

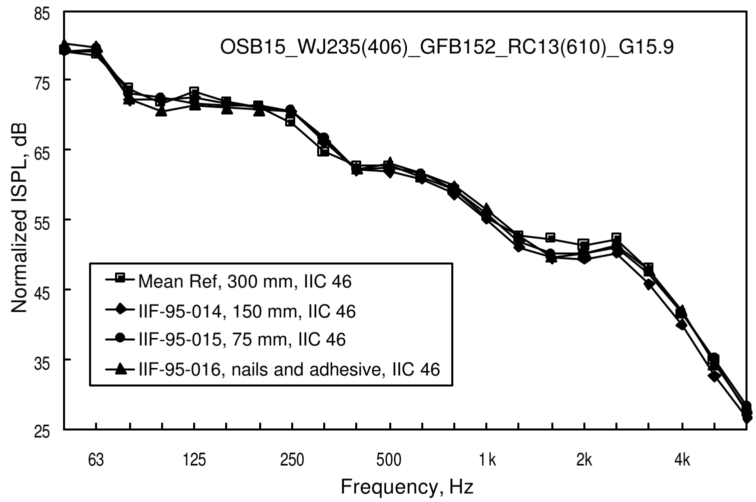


Figure 22: Effect of different screw spacing and adhesive attachment on impact sound pressure level. The dimension following the test ID is the spacing between screws in the field of the floor. Edge spacing was half this value in each case.

Drying of concrete slab

According to ASTM acoustical testing standards, concrete constructions should be allowed to cure for 28 days before testing unless data are available to show that a shorter period of curing will suffice. When a 35 mm concrete slab was poured on top of a wood joist floor, we had the opportunity to measure the sound transmission through the floor as it was drying. Such data are useful within the laboratory, the project, and to other laboratories that might wish to use a shorter curing time for similar specimens. The construction of the floor was

- 35 mm concrete
- 1 layer of 15 mm OSB subfloor
- 38 x 235 mm wood joists, 406 mm o.c.
- 152 mm glass fibre batts in the joist cavities
- 1 layer of 15.9 mm gypsum board.

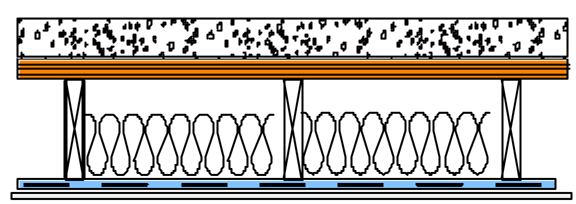


Figure 23 shows that the TL spectrum did not change significantly after the 5th day.

To avoid potential damage to the concrete, the first impact test using the ISO tapping machine was not conducted until the 14th day. The IIC rating varied from 27 to 28 due to variations of around 0.5 dB at 2500 Hz that caused the 8 dB rule in ASTM E989 to be activated.

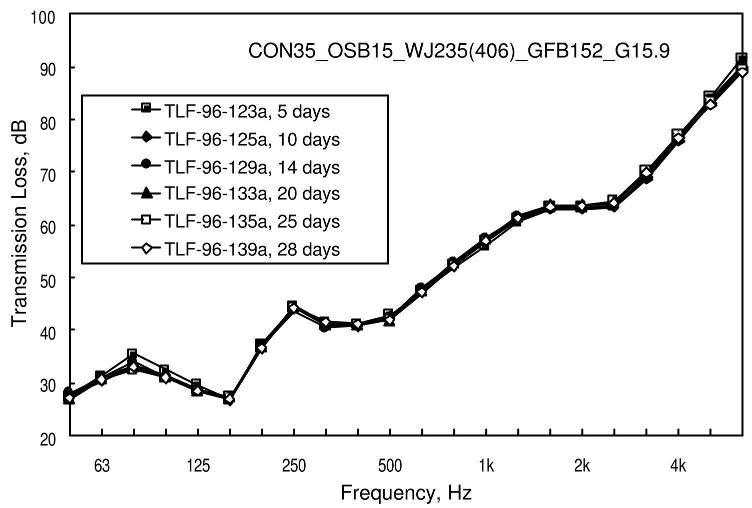


Figure 23: Transmission loss data for a wood joist floor with a concrete topping at several intervals after the initial concrete pour. The STC was 48 in each case.

Presence of cross-bracing in floors

To determine whether the presence of cross-bracing in the floors had any significant effect on the sound insulation, two floor specimens were constructed. Each floor was constructed with a single row of cross-bracing on the mid-line and tested. The cross-bracing was then removed, the floor re-assembled and tested again. The cross-bracing had no significant effect on the sound insulation in either case.

EFFECT OF STRUCTURAL AND MATERIAL CHANGES

During the project, many variables were investigated to determine their effect on sound insulation. Where possible the reference floor was used as a starting point for variations and only one floor element was varied within a series. For example, where the joist type was varied, the subfloor, sound absorbing material, resilient metal channel arrangement and ceiling layer were kept the same. The floor description is not always given in words but can usually be found in coded form in the relevant figures.

Single layer results

Data for single layers comprising one or more sheets of material aid in developing prediction models. Also, simple situations sometimes give insight that may be relevant to more complicated cases. So, at convenient times in the project sound insulation was measured for some single layer constructions.

Ceiling layers

Figure 24 shows sound transmission loss for the three thicknesses of gypsum board used during the project. A few points are worth noting about these spectra. As the mass of the board increases, so does the transmission loss until the coincidence dip begins to have an effect. It is odd that all three specimens gave the same transmission loss at 50 Hz. This may be due to chance. The dip in the curves around 100 Hz also needs an explanation but none is available. It may be related to the response of the reverberation rooms, the spacing between the resilient metal channels or the size of the gypsum board panels.

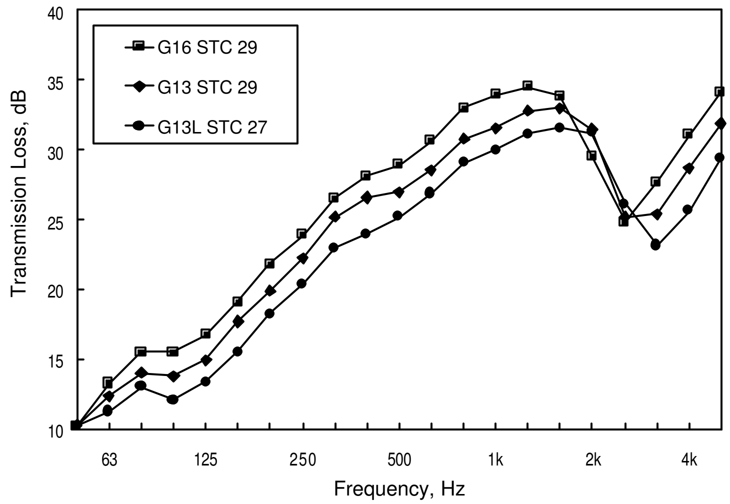


Figure 24: Sound transmission loss for single sheets of gypsum board suspended from wood joists on resilient metal channels spaced 610 mm o.c. The letter L denotes the lightweight, type 1500 board.

Figure 25 shows transmission losses for single and double layers of 15.9 mm gypsum board. Note that the dip around 100 Hz is still evident. The increase in transmission loss due to the second layer of gypsum board is fairly constant up to about 400 Hz at which point there is a reduction. From about 400 Hz to 1600 the additional weight is less effective. Corresponding plots for the other two types of gypsum board show similar behaviour.

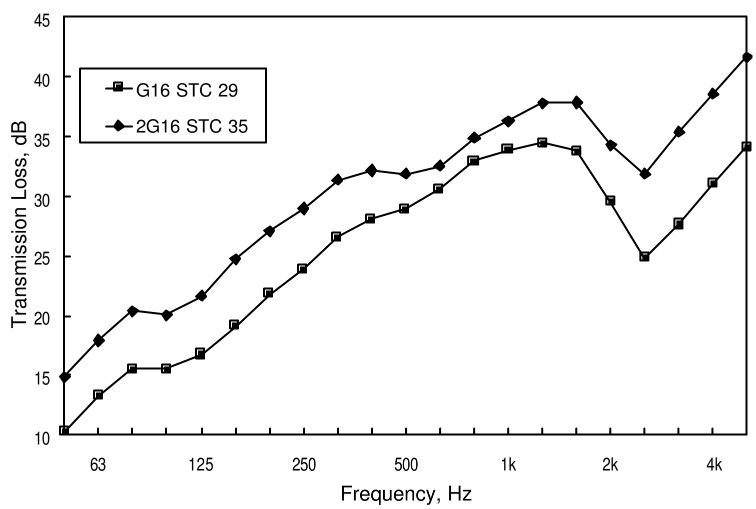


Figure 25: sound transmission loss for single and double sheets of 15.9 mm type X gypsum board.

The probable explanation for this behaviour becomes more evident when *differences* between the single sheet and the double sheet results are plotted in Figure 26. Some resonance phenomenon is causing a reduction in the transmission loss for the double sheet layer. Other work in this laboratory[9] has shown that although two sheets of material may be nominally in contact, the contact is not perfect and there is usually some air confined between the sheets. The trapped air enables a mass-air-mass resonance to occur and reduce the TL. The calculated thickness of the trapped air is about 1 mm in each case. This is not an unreasonable number.

In cavity walls or floors where each layer may comprise more than one sheet of material, the effects of this resonance will still be seen in the transmission loss plots for the composite specimen.

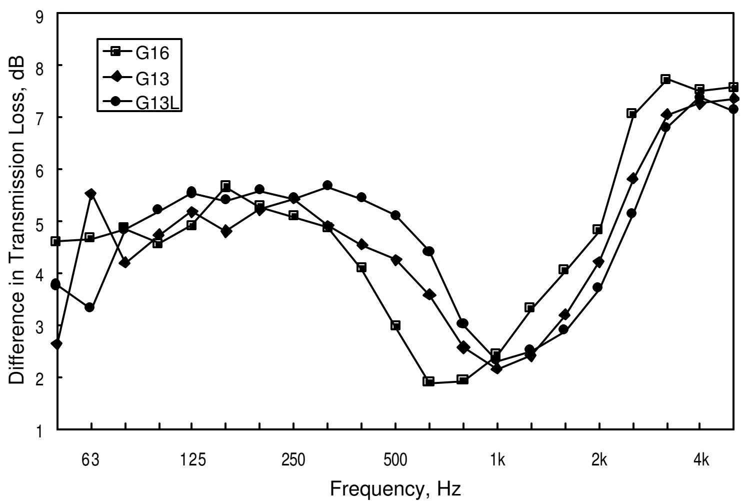


Figure 26: Differences between single sheet and the double sheet transmission losses for the three types of gypsum board used in the project.

Floor layers on joists

Only two thicknesses of oriented strand board (OSB) were used in the project: 15 and 19 mm. The single layer TL data obtained for them were not very different and are not plotted here.

Three thicknesses of plywood were used. The transmission losses are plotted in Figure 27 and the normalised ISPLs in Figure 28. The TL plot is much more complicated than that for the gypsum board partly because plywood is strongly orthotropic, having quite different stiffnesses along and across the panel. This leads to a much broader coincidence dip and sensitivity to damping over more of the frequency range of interest. Furthermore, the attachment of the subfloor to the supporting joists produces more complicated systems than gypsum board supported on resilient channels. The joist depth, joist spacing and type of joist may all affect the sound transmission. Note that in both figures the sound insulation for two sheets of 13 mm plywood is significantly greater than that for a single sheet of 25 mm plywood.

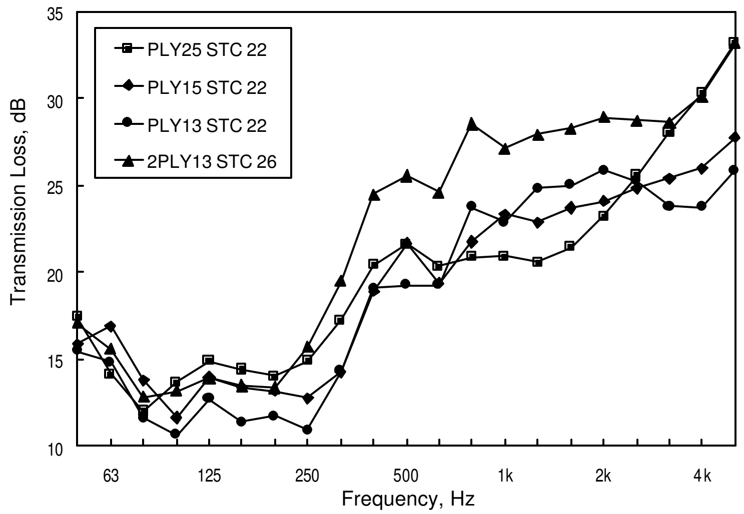


Figure 27: Sound transmission loss for three thicknesses of plywood and a double sheet of 13 mm plywood.

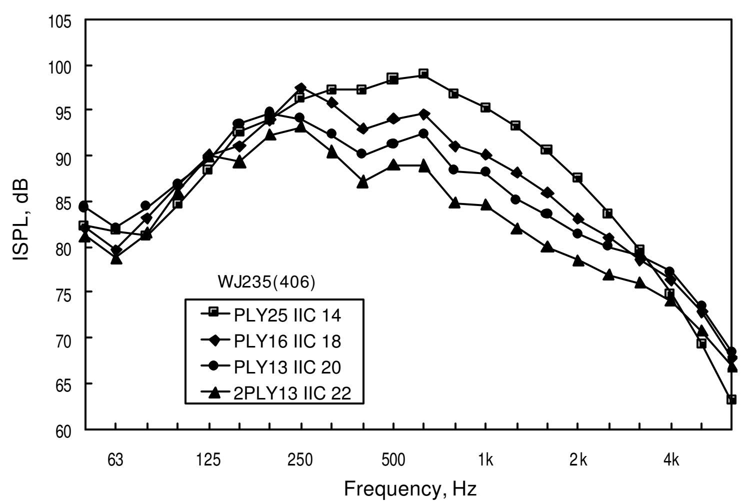


Figure 28: Normalized impact sound pressure levels for three thicknesses of plywood and a double sheet of 13 mm plywood.

Figure 29 shows measured variations in sound transmission loss for 15 mm OSB on four joist types. The corresponding ISPL plots are shown in Figure 30. There are large variations in the sound insulation associated with joist spacing and depth. From this limited set of data, one cannot say what dependence there is on joist type. The I-joists and the solid wood joists give results that are quite similar when spacing and depth are the same.

Variations of this magnitude increase the difficulty of predicting sound insulation for single layer floors. Parameters such as joist depth and spacing have to be included in calculation models. While this may be a difficulty for modelling single-layer floors, for complete, double-layer floors other factors may be more important.

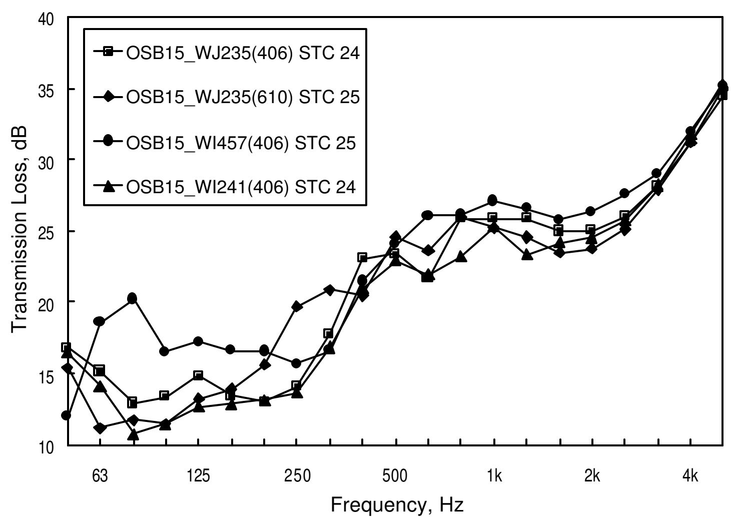


Figure 29: Airborne sound transmission loss for 15 mm OSB on four joist types.

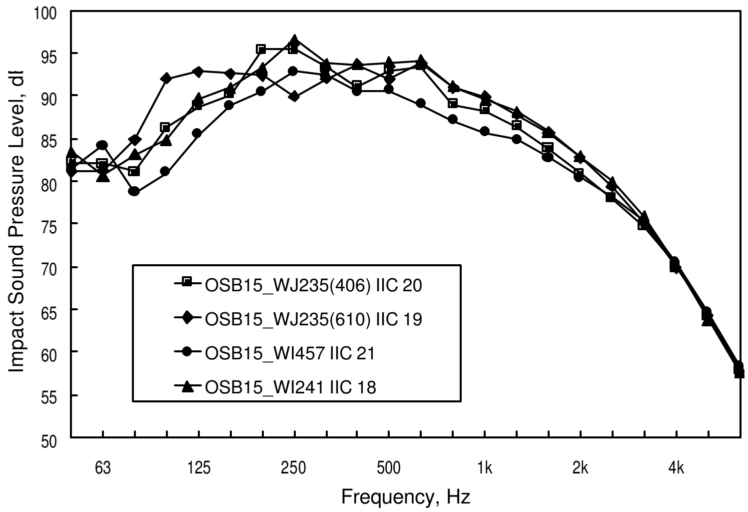


Figure 30: Normalized impact sound pressure level for 15 mm OSB on four joist types.

Figure 26 showed evidence of a mass-air-mass resonance for double layers of gypsum board. Figure 31 shows a similar difference plot for single and double layers of 13 and 15 mm plywood. The dip in the curve around 1600 Hz may be attributed to the same resonance mechanism. The frequency where the dip occurs is higher due to the lower mass of the plywood relative to the gypsum board and possibly also to a smaller residual air-gap. The layers of plywood are likely to be in closer contact because they are screwed firmly to the supporting joists, which are closer together than the resilient metal channels supporting the gypsum board. The depth of the resonance is less presumably because of greater contact between the plywood layers, which leads to greater damping due to friction.

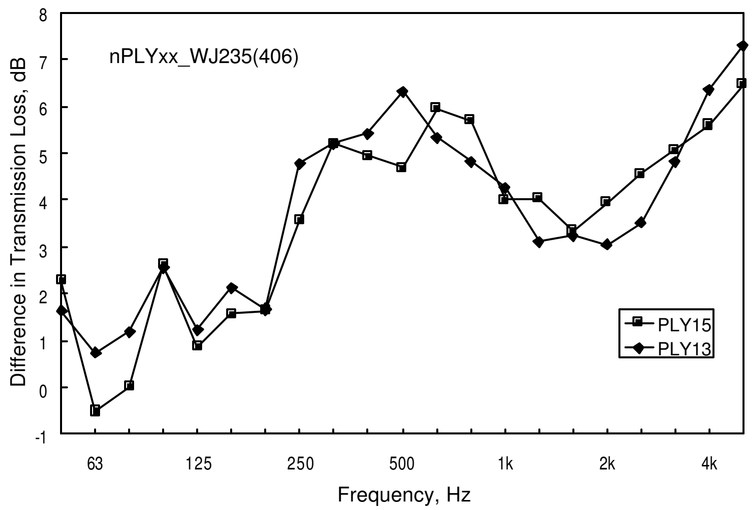


Figure 31: Increase in TL due to changing from a single layer of plywood to a double layer.

Concrete slabs

Only three concrete slabs were constructed and tested during the project; two had uniform cross-sections and one was ribbed. The TL plots and the ISPL plots are shown in Figure 32 and Figure 33. These plots include results for a 40 mm slab supported on 15 mm OSB on joists.

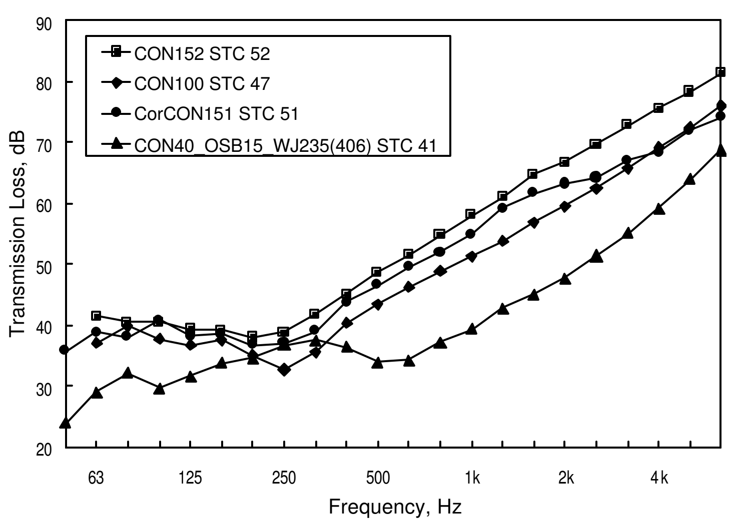


Figure 32: TL plots for the concrete slabs used in the project.

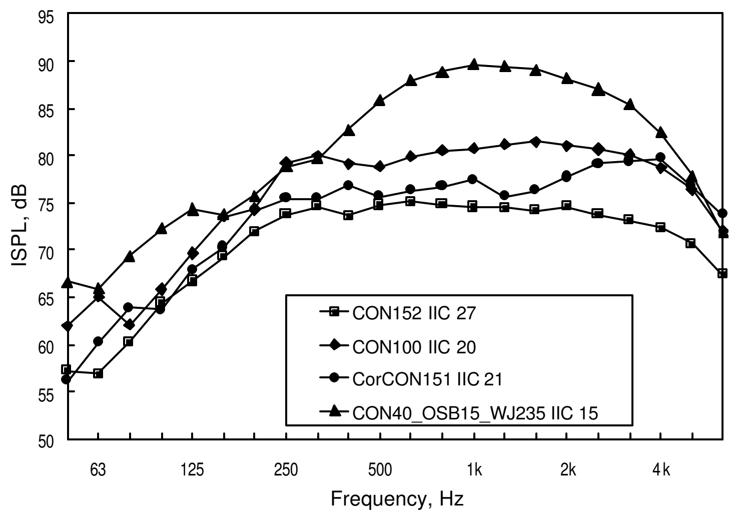


Figure 33: NISPL for the concrete slabs used in the project.

Changes to the sub-floor

In this section the changes that are discussed are changes that were made using the basic structure of the reference floor. So, in each case the joists were 235 mm deep (406 mm o.c.), resilient metal channels were 610 mm o.c and there was 152 mm of glass fibre in the cavity.

Changing material

Changes in sub-floor thickness, such as changing from 15 to 19 mm OSB or from 16 to 25 mm plywood, had only a small effect on TL or ISPL. The changes were consistent with the changes in weight of the sub-floor so no comparison plots are shown here.

Number of layers

Adding a second layer to the sub-floor also gave results that were consistent with what might be expected from doubling the weight. It was shown in Figure 26 that the TL spectra for double layers of gypsum board showed evidence of a mass-air-mass resonance. The corresponding plot for double layers of OSB (Figure 31) did too. The difference plots for complete floor systems with single and double sub-floor layers do not show any obvious resonances (Figure 34).

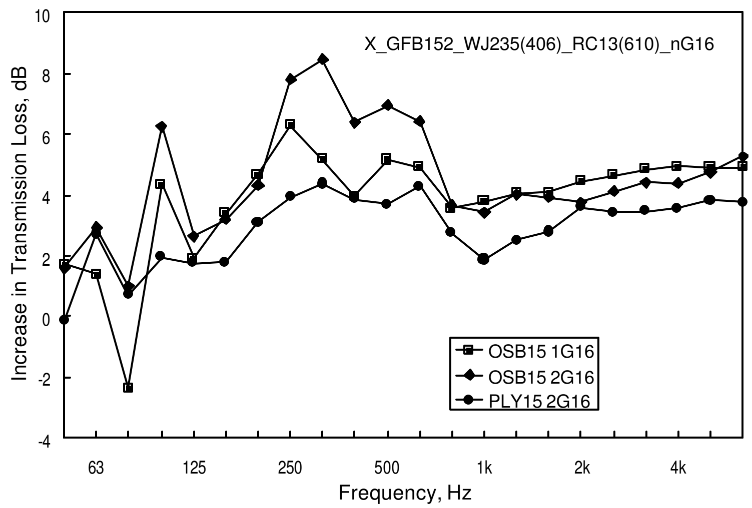


Figure 34: Increase in TL due to doubling of number of layers in the sub-floor. The first code in the legend denotes the subfloor material, the second code is the number of layers of gypsum board in the ceiling.

Changing the number of layers in the sub-floor while maintaining the same mass per unit area produced more interesting results. Figure 35 and Figure 36 show changes due to substitution of two layers of 13 mm plywood for a single 25 mm layer. There are significant improvements in TL from 250 to 2500 Hz and over a slightly wider frequency range for ISPL. The same effect was seen for the plywood sub-floors tested without ceilings (Figure 27 and Figure 28).

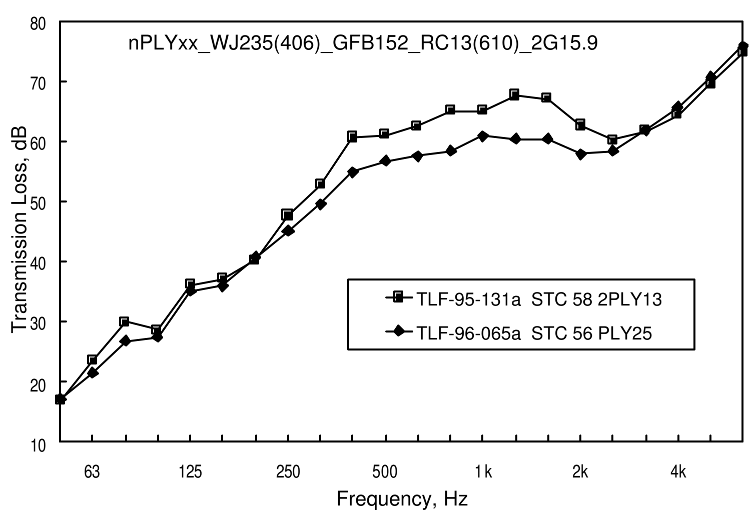


Figure 35: TL plots showing effect of changing sub-floor from one layer of 25 mm thick plywood to two layers of 13 mm plywood.

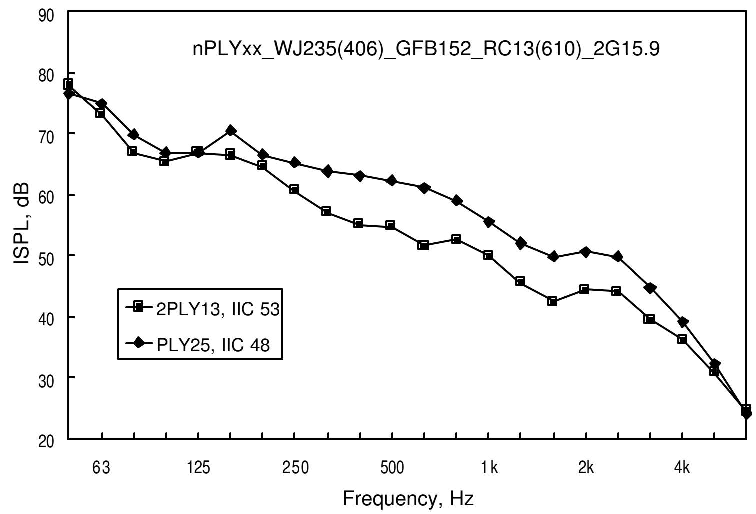


Figure 36: ISPL plots showing effect of changing sub-floor from one layer of 25 mm thick plywood to two layers of 13 mm plywood.

Changes to the ceiling

Type of gypsum board

Changing the type of the gypsum board used in the floors caused changes in transmission loss and impact sound pressure level that were in accord with the changes in weight. No comparison plots are shown here.

Number of layers

Adding a second layer of gypsum board increased sound insulation in accord with the additional weight. Earlier, the mass-air-mass resonance that occurs between two layers of gypsum board tested as a ceiling only was shown to cause a dip in the transmission loss curves around 1000 Hz. The resonance still occurs in complete floors. Figure 37 and Figure 38 show the changes that result from adding a second layer of gypsum board. The resonance dip is obvious and quite narrow in two cases, but rather broad for the double layer of 15.9 mm gypsum board.

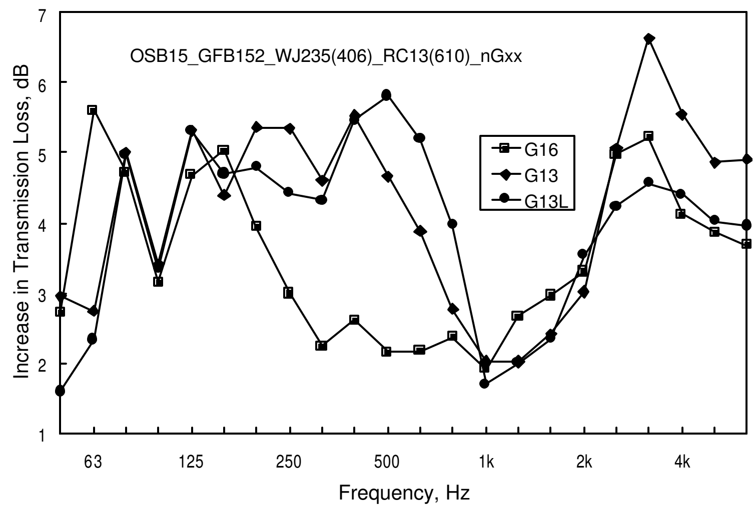


Figure 37: Increase in TL caused by adding a second layer of gypsum board.

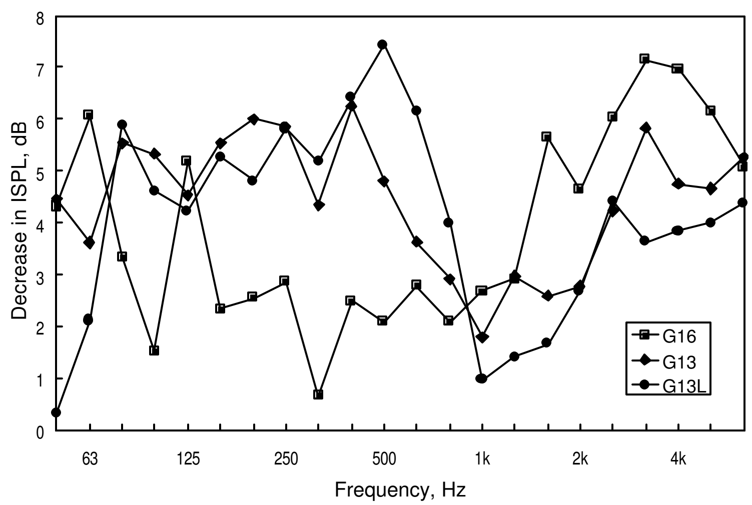


Figure 38: Decrease in ISPL caused by adding a second layer of gypsum board.

Resilient channel effects

The positioning of resilient metal channels is an important issue for fire resistance ratings and for sound insulation. Measurements on the reference floor with resilient metal channels spaced uniformly at different separations showed a dependence of STC and IIC on channel separation or, the total length of channels in the floor[1]; as the spacing between channels decreased, so did the sound insulation. TL and ISPL results for the cases with uniformly spaced channels are shown in Figure 39 and Figure 40. The STC ranges from 47 to 52 and the IIC from 40 to 46 with the greatest changes occurring around 125 Hz.

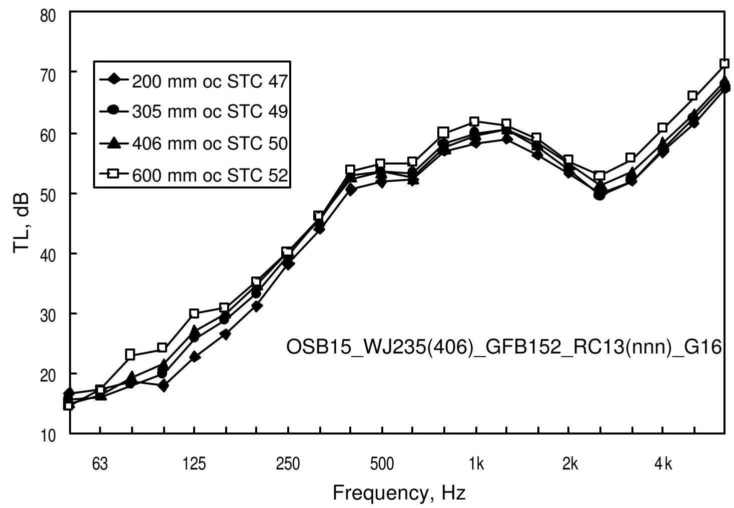


Figure 39: Sound transmission loss for wood joist floors with four uniformly spaced resilient metal channel arrangements.

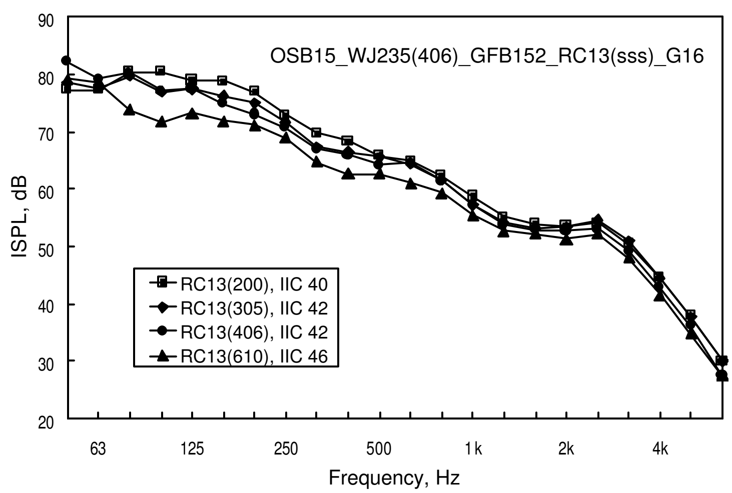


Figure 40: Impact sound pressure levels for wood joist floors with four uniformly spaced resilient metal channel arrangements.

Figure 41 shows how transmission loss decreases as the total length of resilient metal channels supporting the ceiling layer increases. The frequencies shown are those where the effect is most prominent. At other frequencies there is still an effect due to increasing the length of the channels, but it is about 1/3 of that shown in the figure.

It was established during the fire resistance part of the project that to ensure good fire resistance, some means of attaching the butt[?] ends of the gypsum board more firmly was needed. So, starting with a uniform array of resilient metal channels spaced 406 mm o.c., additional pieces of channel were added to support the butt ends. The various layouts of channels to support single and double layers of gypsum board are shown in reference [1]. Here, it is enough to note that additional pieces of channels reduced sound insulation. The data points for these cases are for total channel lengths around 57 m. The trend for uniformly spaced channels is quite regular but when the additional channels are added, there is considerable scatter in the data.

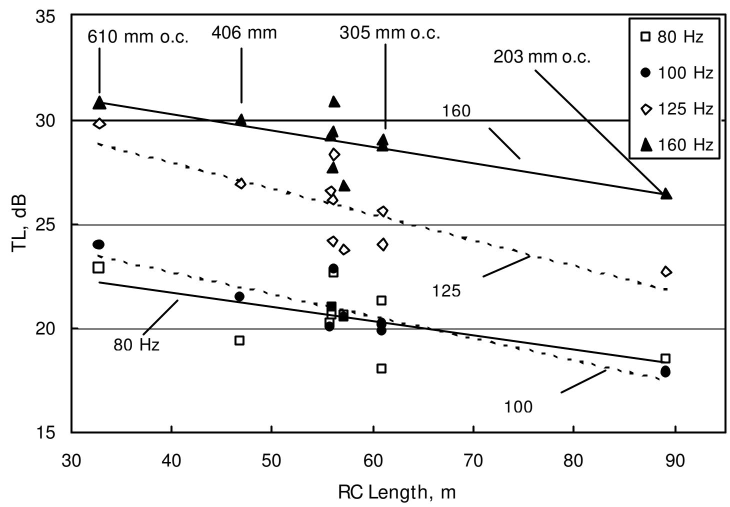


Figure 41: TL versus the total length of resilient metal channels supporting the 15.9 mm gypsum board ceiling. The lines are best fits to the data.

Similar data for the ISPL are shown in Figure 42. The dependence on the length of the resilient metal channels is again greatest around 125 Hz.

[?] The “butt end” of a sheet of gypsum board is the edge with the shorter length, usually 1.2 m, that is untapered.

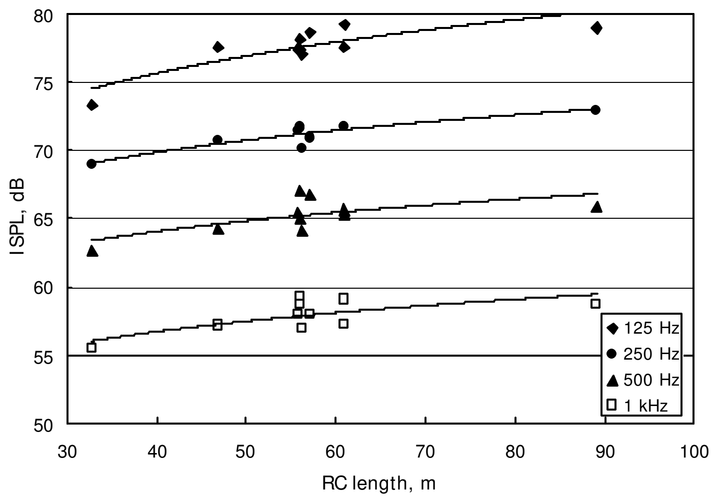


Figure 42: ISPL versus the total length of resilient metal channels supporting the 15.9 mm gypsum board ceiling.

Resilient metal channels versus other ceiling support methods.

The dependence of sound insulation on resilient metal channel spacing demonstrates that energy transmission through the ceiling support is an important limiting mechanism for floor sound insulation. Figure 43 and Figure 44 show data for different furring systems that might be used to support gypsum board. In addition to the simple systems that were attached directly to the joists, a more complicated system was built where the gypsum board was suspended from the joists using 12-gauge wire, C- and U-channels. The C-channels were 610 mm o.c with tops held 6 mm below bottom of the joists by the wire. U-channels were wired at right angles to the C-channels and spaced 610 mm o.c. The overall cavity depth was 298 mm. This floor is compared in the figures with floors having cavity depths of about 250 mm. Other comparisons show that the difference in cavity depth has a negligible effect in this case.

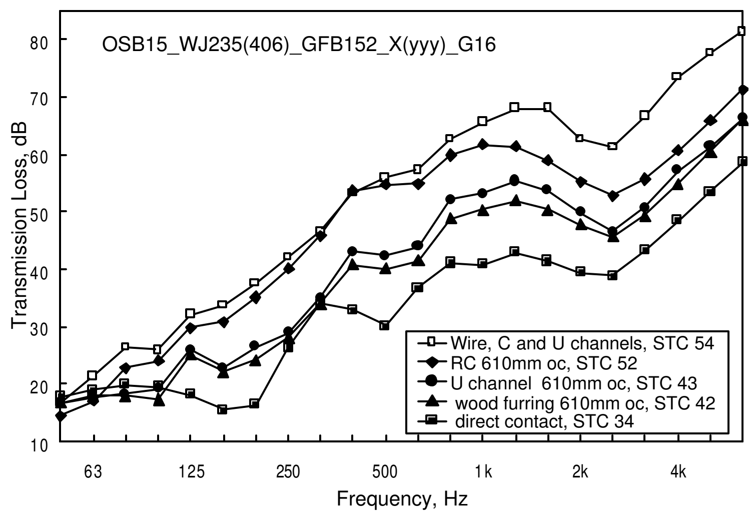


Figure 43: TL for different methods of supporting a single sheet of 15.9 mm gypsum board.

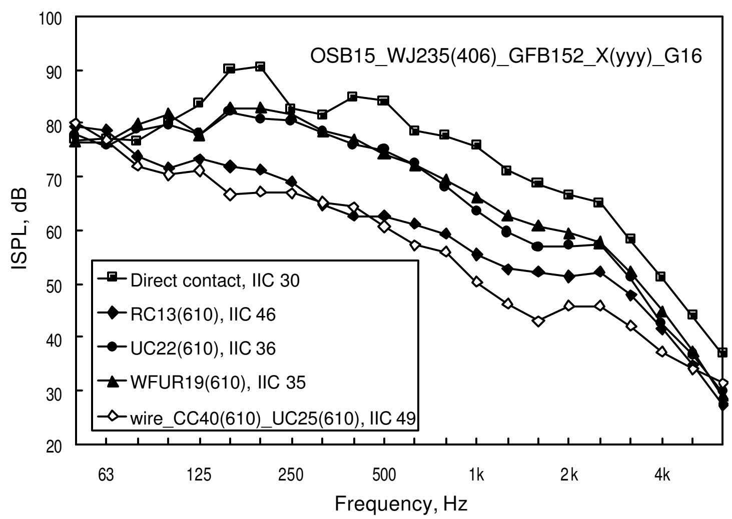


Figure 44: ISPL for different methods of supporting a single sheet of 15.9 mm gypsum board.

These results suggest that ceiling suspension systems might be developed that would increase sound insulation. However, fire resistance and installation costs must also be considered for potential new systems. There may be greater benefits from simply adding a second sheet of gypsum board to the ceiling.

Thickness and type of sound absorbing material

The effects of different thicknesses and types of sound absorbing material were examined in a 235 mm deep wood joist floor, a 457 mm deep wood I-joist floor, and a 203 mm steel joist floor. In each case joists were 406 mm o.c. Apart from the different joist types, the construction elements were the same as used in the reference floor. The dependence of STC and IIC on percentage thickness is shown in Figure 45 and Figure 46.

These figures show that sound transmission class and impact insulation class increase fairly linearly with the amount of sound absorbing material in the cavity. In the 250 mm deep cavity there is an apparent maximum reached in the STC when the cavity is about 80% full. This is not the case, however, in the 470 mm deep cavity. The trends for IIC are less clear. The second point to note from these graphs is that the more dense rock fibre batts give small but definite improvements in sound insulation relative to the glass fibre batts.

Cellulose fibre was installed in two ways: as a layer wet-sprayed on to the underside of the floor and blown in from the top of the steel joist cavity. From the limited data available, it is not possible to say whether the wet-sprayed cellulose fibre gives sound insulation much different from the glass and rock fibre. Only two thicknesses were tested with the larger thickness being about 70 mm.

Tests in the steel joist floor with blown-in cellulose, glass fibre and rock fibre batts of the same thickness gave unsatisfactory data. The rock and cellulose fibre results were significantly better than the results for the glass fibre obtained at the same time. However, the construction with glass fibre was built and tested three times at different times in the project. Two of the results were not significantly different from the results for the rock and cellulose fibre, while one was. The reason for the difference is not known.

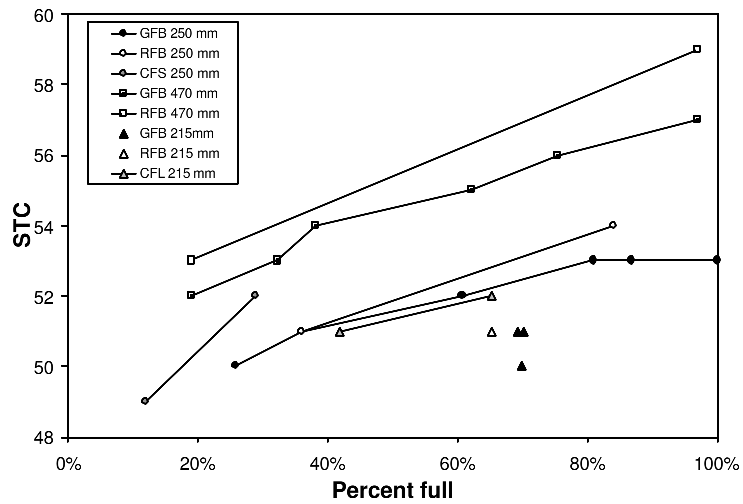


Figure 45: Dependence of STC on thickness of layer of sound absorbing material in a 235 mm wood joist floor (filled and unfilled circles), a 457 mm deep wood I-joist floor (filled and unfilled squares), and a 205 mm deep steel joist floor (filled and unfilled triangles). GFB = glass fibre batts, RFB = rock fibre batts, CFS = sprayed on cellulose fibre, CFL = blown-in cellulose fibre. The dimensions following these codes give the cavity depth.

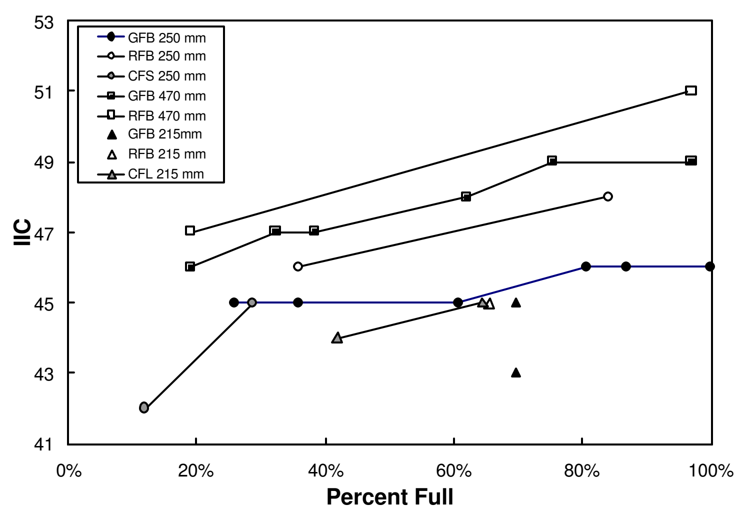


Figure 46: Dependence of IIC on thickness of layer of sound absorbing material in a 235 mm wood joist floor (filled and unfilled circles), a 457 mm deep wood I-joist floor (filled and unfilled squares), and a 205 mm deep steel joist floor(filled and unfilled triangles). GFB = glass fibre batts, RFB = rock fibre batts, CFS = sprayed on cellulose fibre, CFL = blown-in cellulose fibre. The dimensions following these codes give the cavity depth.

Figure 47 and Figure 48 show improvements in sound insulation due to increasing thickness of glass fibre in the 470 mm deep wood I-joist floor. The improvements are relative to the 90 mm thickness in each case. There is no very clear trend except for the frequencies around 250 Hz for the TL plot. Similar plots for the 250 mm deep solid wood joist case show even less pattern.

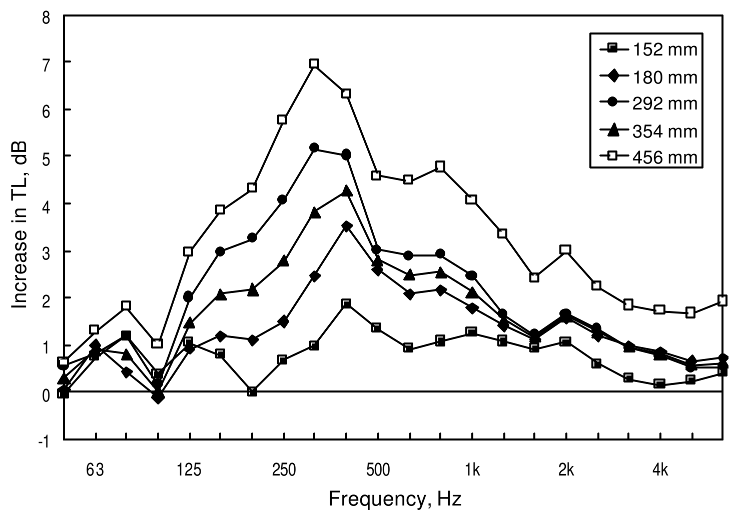


Figure 47: Increase in TL due to different thicknesses of glass fibre in a 470 mm deep wood I-joist floor. The increases are relative to the 90 mm thickness.

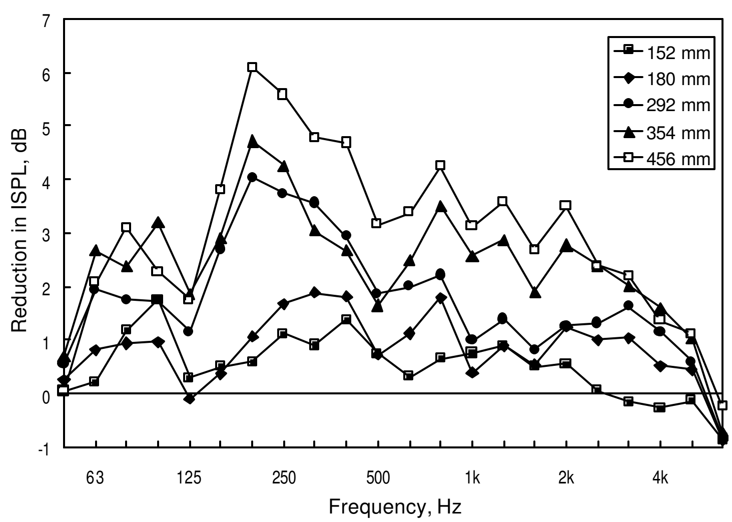


Figure 48: Reduction in ISPL due to different thicknesses of glass fibre in a 470 mm deep wood I-joist floor. The reductions are relative to the 90 mm thickness.

In one of the tests in the wood joist floor, the 250 mm deep cavity was overfilled with three 90 mm thick glass fibre batts (100% full results). Comparison of the results for this construction with the case where the same floor was 87% full, shows that the additional thickness and the compression of the glass fibre does not significantly change the sound transmission loss nor the impact sound levels from the ISO tapping machine.

The apparent anomalies in these results are due to the combined effects of the pounding during impact testing, minor variations in construction and materials, and the inherent uncertainty in measurement. To obtain more reliable information on the effect of different sound absorbing materials on transmission loss requires a test series designed to extract that information only. The project was not designed for such detailed investigations.

Effect of joist depth

Solid Wood Joists

Increasing the depth of the joists and so the floor cavity should, according to simple theory, increase the transmission loss. In Figure 49 transmission losses for three solid wood joist depths are shown. The elements of the floor were the same as for the reference floor except for the changing joist depth. The corresponding plots for impact sound pressure level are in Figure 50. Improvements in sound insulation are primarily confined to the frequency range from 80 to160 Hz in both figures. This suggests that transmission by some other path, probably through the resilient metal channels, is more important than transmission through the air and sound absorbing material in the cavity.

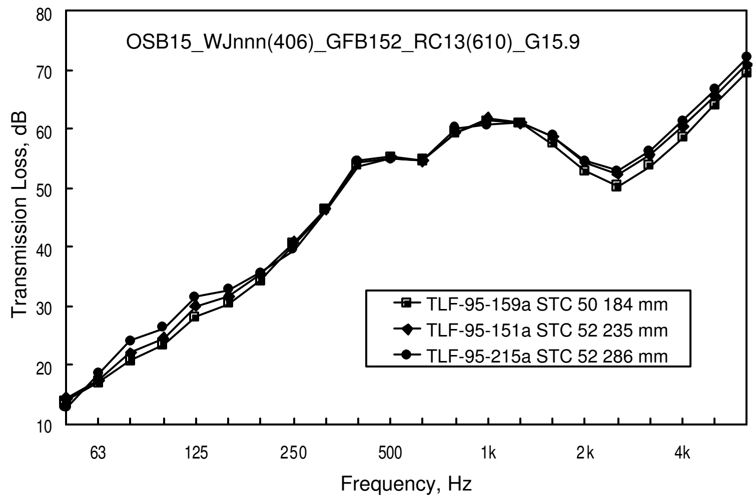


Figure 49: TL for 38 mm solid wood joists with different depths.

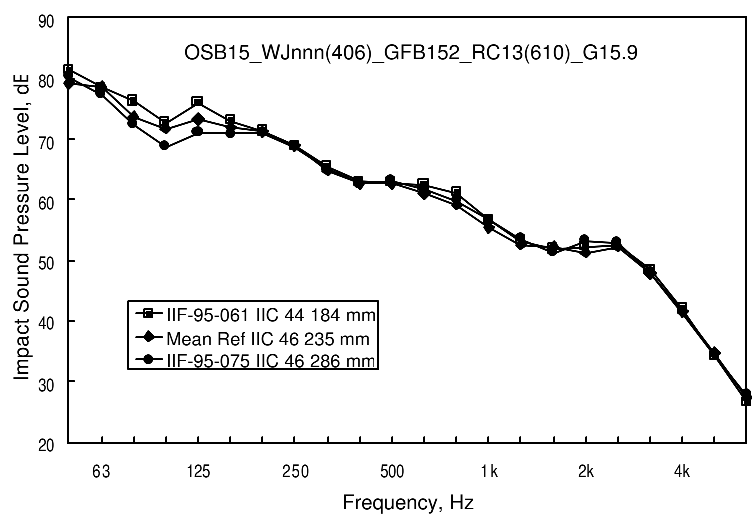


Figure 50: ISPL for 38 mm solid wood joists with different depths.

Steel Joist Depth

Three steel joist floors with differing joist depths were constructed. The other elements were the same as for the reference floor. Transmission loss and impact sound pressure level plots are shown in Figure 51 and Figure 52. These plots show more variation at mid and high frequencies than those just shown for solid wood joists, but similar trends effects are evident at low frequencies. Again changes in STC and IIC are negligible.

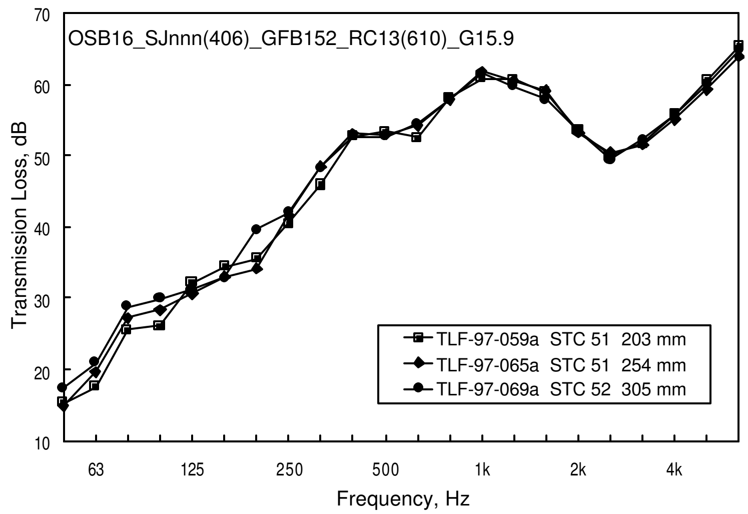


Figure 51: TL for steel joist floors with different joist depths.

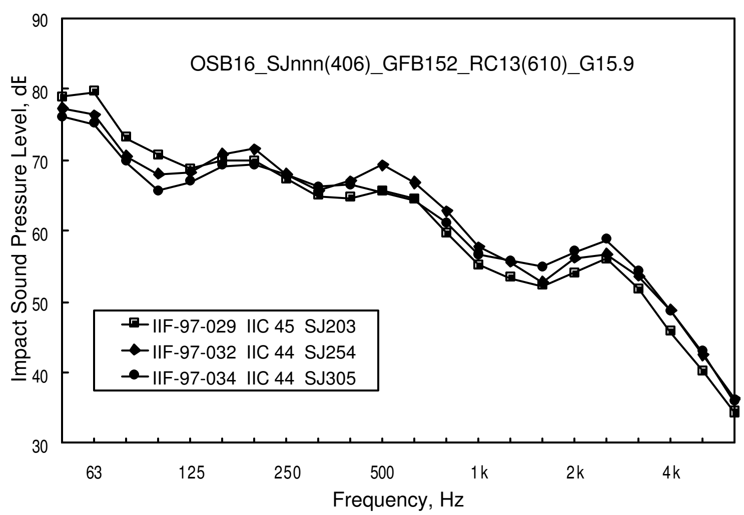


Figure 52: ISPL for steel joist floors with different joist depths.

I-joist Depth

The effect of depth was evaluated in the same way for manufactured wood I-joists. For these measurements (Figure 53 and Figure 54) the range in depth was much greater. Again the transmission loss at low frequencies increases as joist depth increases but the impact sound pressure level plot does not show such a clear trend.

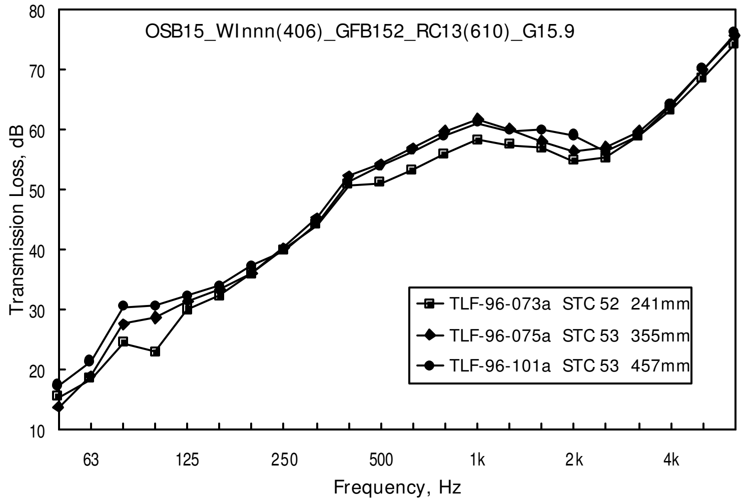


Figure 53: TL for wood I-joists with different depths.

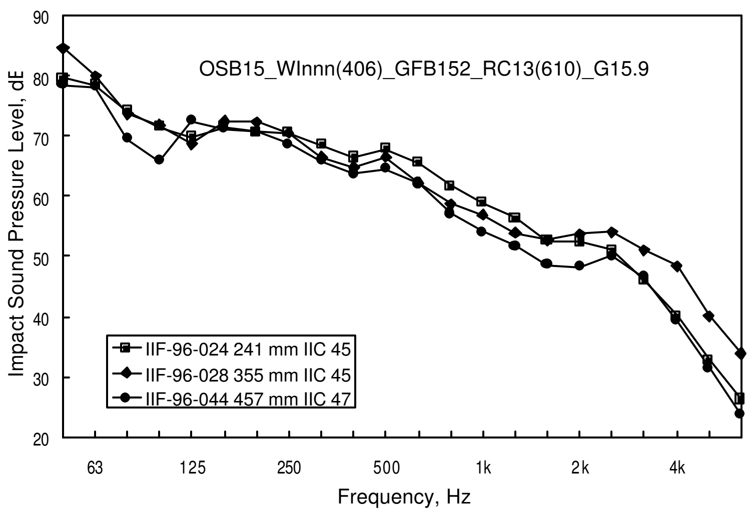


Figure 54: ISPL for wood I-joists with different depths.

Wood Truss Depth

Wood truss-joists with different depths were tested with the joists spaced 488 and 610 mm apart. Only two floors were constructed in each category. With the truss-joists 488 mm o.c., increasing the joist depth gave significant improvements. With a spacing of 610 mm, there were no significant changes (See Figure 55 to Figure 58). Further investigation is needed to properly understand truss-joist floors.

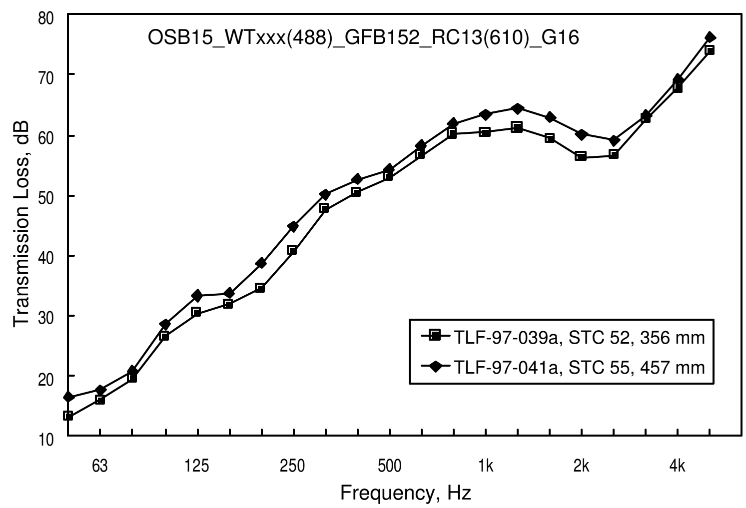


Figure 55: TL for wood truss floors with different truss depths and trusses spaced 488 mm o.c.

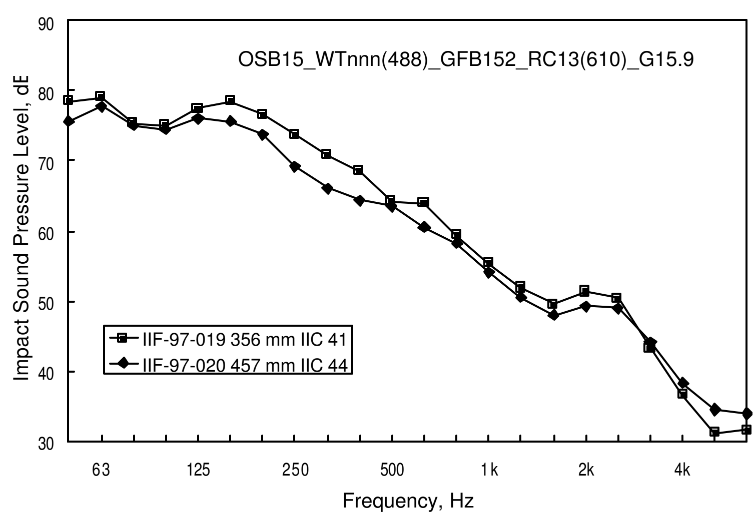


Figure 56: ISPL for wood truss floors with different truss depths and trusses spaced 488 mm o.c.

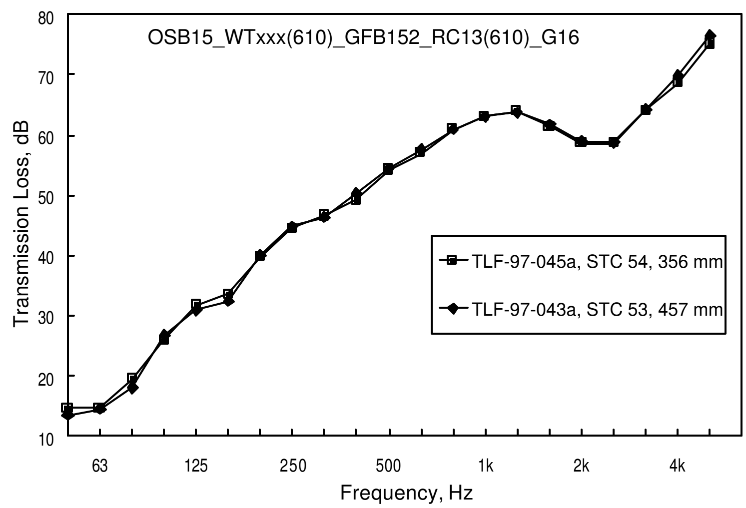


Figure 57: TL for wood truss floors with different truss depths and trusses spaced 610 mm o.c.

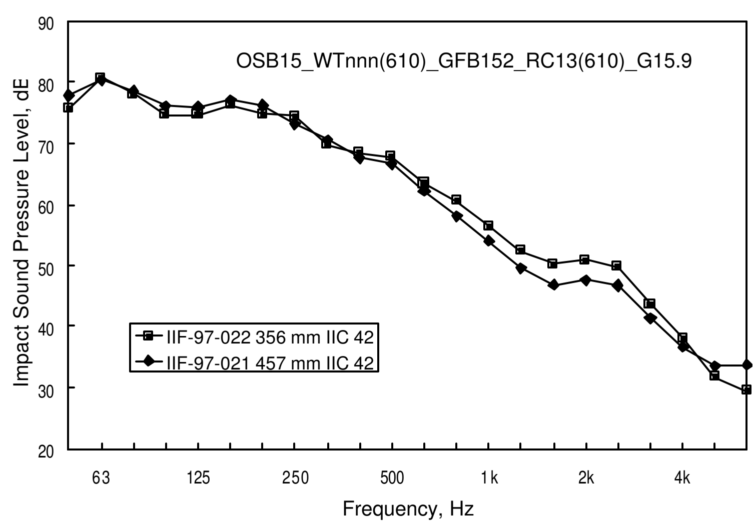


Figure 58: ISPL for wood truss floors with different truss depths and trusses spaced 610 mm o.c.

Effect of Joist Spacing

Solid wood joists

Floors with solid wood joists at four different joist spacings were tested. The TL spectra are in Figure 59 and the ISPL spectra are in Figure 60. Changes in TL are evident above

125 Hz, but below that joist spacing has no effect. Changes in impact sound pressure level are smaller than changes in transmission loss.

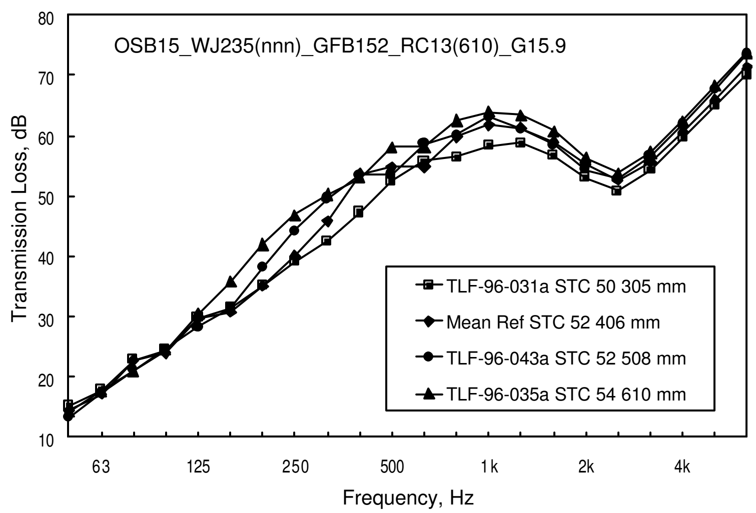


Figure 59: TL for solid wood joists (38 x 235 mm) with different joist spacing.

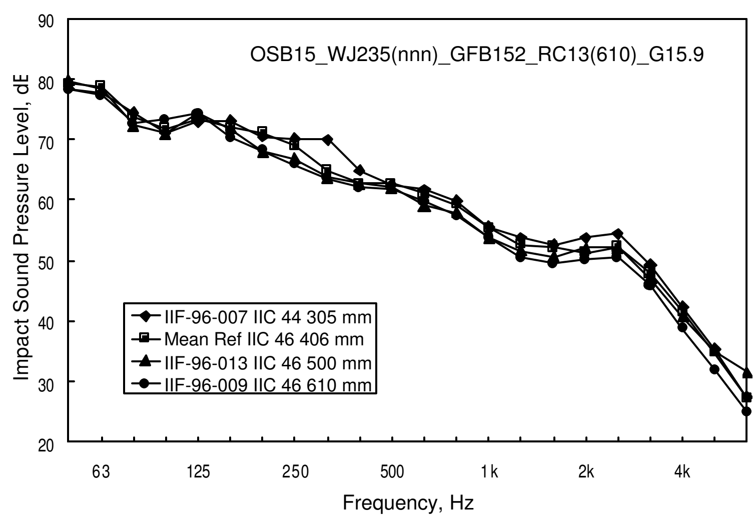


Figure 60: ISPL for solid wood joists (38 x 235 mm) with different joist spacing.

Steel Joists

Only two steel joist floors with different joist spacing were constructed. The data are presented in Figure 61 and Figure 62. The transmission loss plot shows greater changes than does the impact sound pressure level plot, but it is not possible to draw conclusions with so few data.

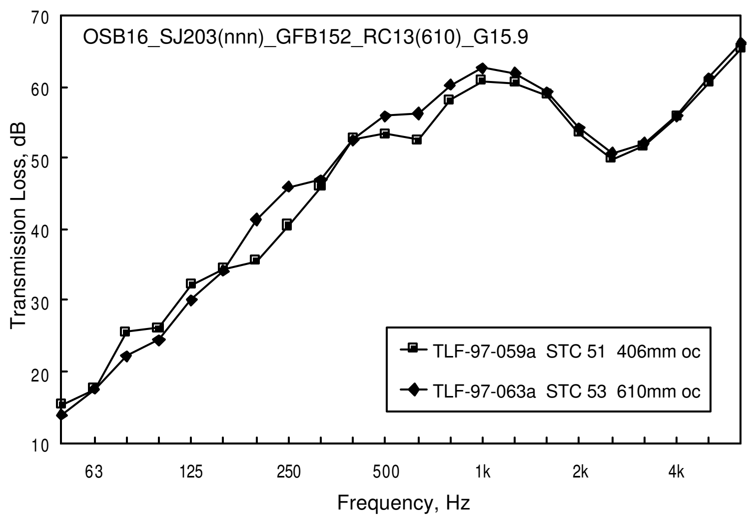


Figure 61: TL for steel joist floors with two different joist spacings.

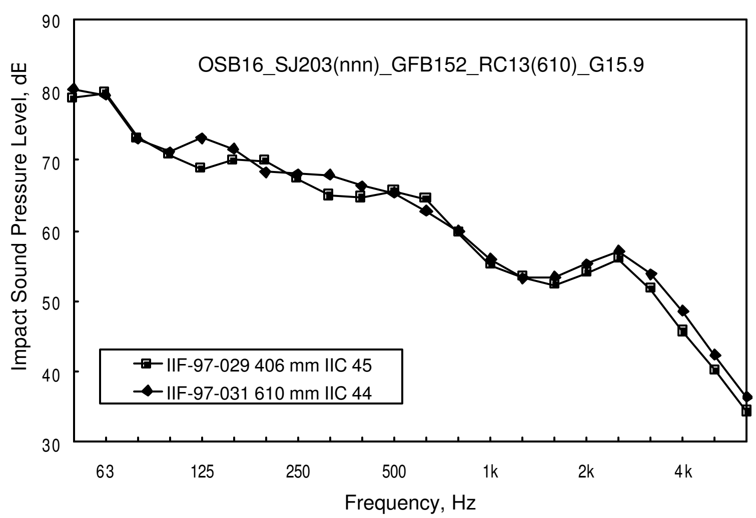


Figure 62: ISPL for steel joist floors with two different joist spacings.

Wood Trusses

Three wood truss floors may be compared to see effects of joist spacing. The data in Figure 63 and Figure 64 show no clear trends.

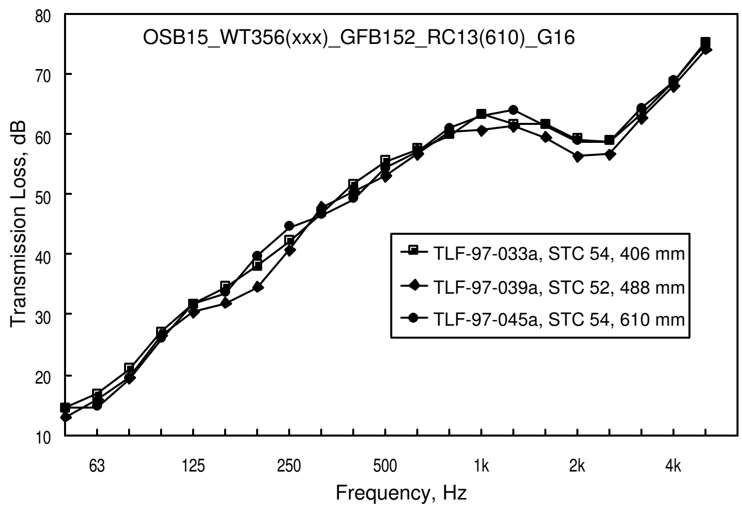


Figure 63: TL for wood truss floors with different spacing.

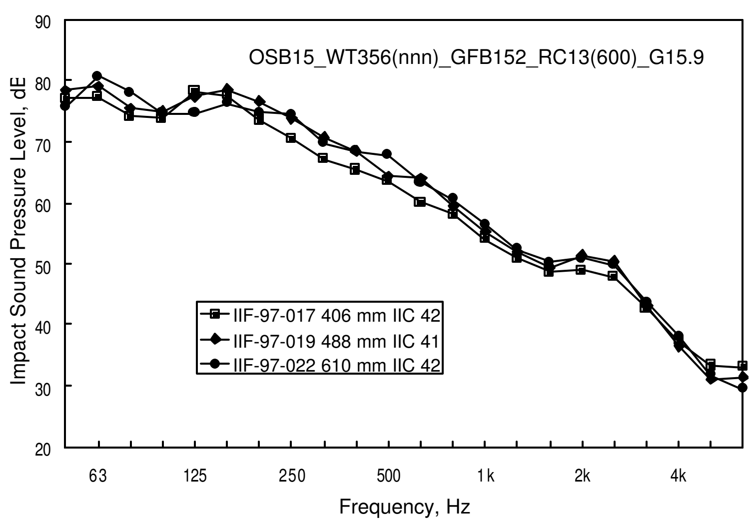


Figure 64: ISPL for wood truss floors with different spacing.

Steel Joist floors

Effect of gauge of steel

Three floors were constructed using 203 mm deep steel joists formed from 14, 16, and 18 gauge metal. In all other respects the floors were nominally identical to the reference floor. The transmission loss and impact sound pressure level plots for the three constructions are shown in Figure 65 and Figure 66. The IIC ratings are not significantly different. Although the STC ratings range from 50 to 52 with the *lighter* gauge joists getting the *lowest* STC rating, this STC difference should not be considered significant. In the earlier discussion of rebuild repeatability data were presented that suggested that steel joist floors might show greater variability than wood joist floors. Until more data are available, it is best to assume that there is no significant effect on the sound insulation due to steel gauge for the range of gauges considered.

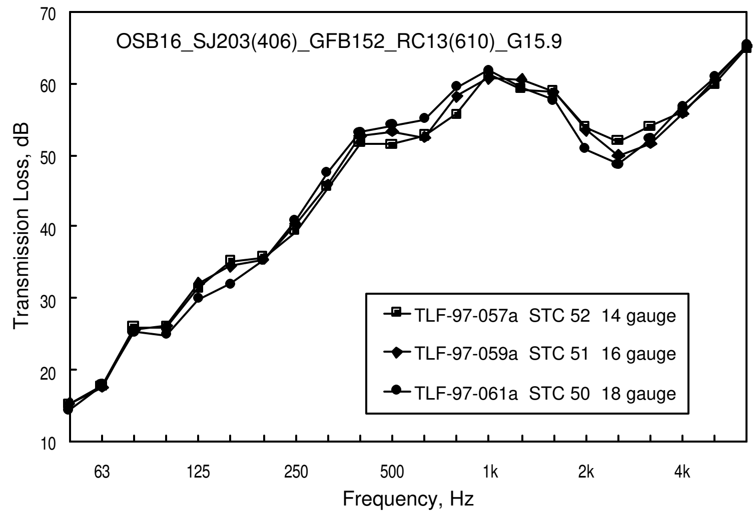


Figure 65: TL for three floors differing only in the metal gauge used to form the steel joists.

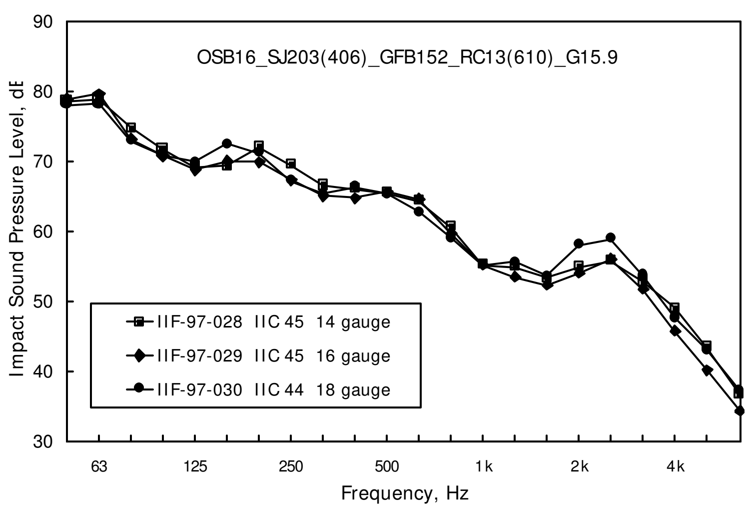


Figure 66: ISPL for three floors differing only in the metal gauge used to form the steel joists.

Type of Joist

To determine the differences in sound insulation that can be attributed to the type of joist or truss used requires comparisons among floors that are practically identical in all details of their construction except for the type of joist or truss. Practical considerations required that during the project not all joist depths, spacings and types were tested with the same subfloor, ceiling, sound absorbing material and resilient metal channel arrangements. However, some data are available for comparison for a joist spacing of 406 mm.

The data are presented in Figure 67 and Figure 68. These plots show that the steel joist specimen gave significantly better sound insulation than the other two around 100 Hz but joist type had no effect on the STC. The impact sound pressure level plot for the steel joist floor shows large differences with respect to the other two types of joist floors but the range in IIC ratings is small.

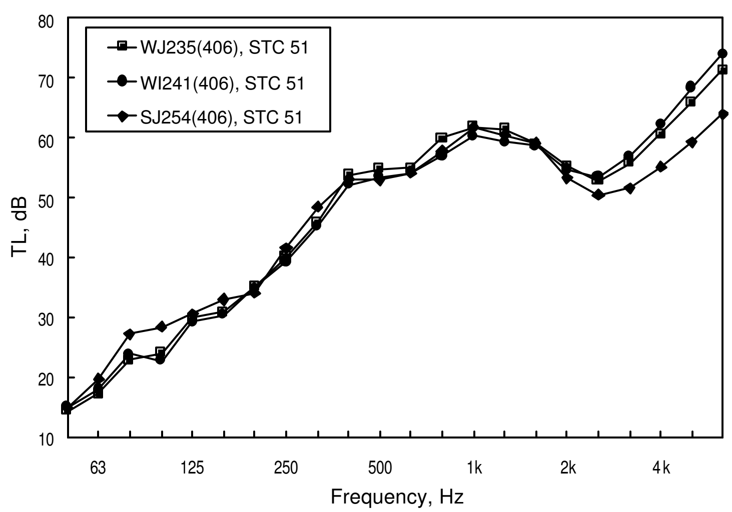


Figure 67: Transmission Loss for three floors with different joist types with 15 mm OSB subfloors, 150 mm of glass fibre batts, resilient metal channels 610 mm o.c. and a single layer of 15.9 mm gypsum board.

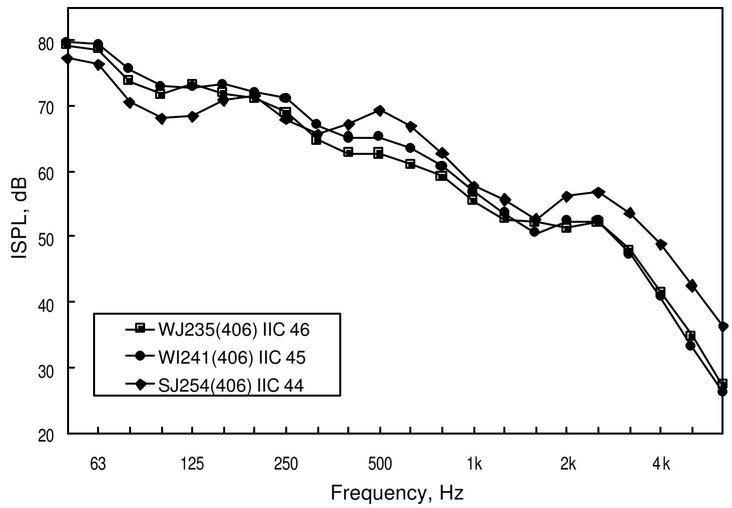


Figure 68: Normalised impact sound pressure levels for three floors with different joist types with 15 mm OSB subfloors, 150 mm of glass fibre batts, resilient metal channels 610 mm o.c. and a single layer of 15.9 mm gypsum board.

Wood I-joist type

Eight floors, nominally identical except for the type of I-joist, were tested to determine whether I-joist type had an effect on the sound insulation. All floors in this sub-set had the same construction as the reference floor except for the use of the I-joists.

Differences among the floors were only in the I-joist construction; these differences are detailed in Table 1. The data are plotted in Figure 69 and Figure 70. The range in STC and IIC values obtained is significant and perplexing. No reason has been found for these disparate ratings. None of the physical parameters in the table correlate with the STC or with the IIC ratings, which are also quite dissimilar. The first and eighth I-joists in the table, for example, appear to be identical yet the STC ratings for floors constructed with them differ by 3 points. The differences in IIC and STC in the table can not be explained on the basis of the small variations in weight of the floor constituents.

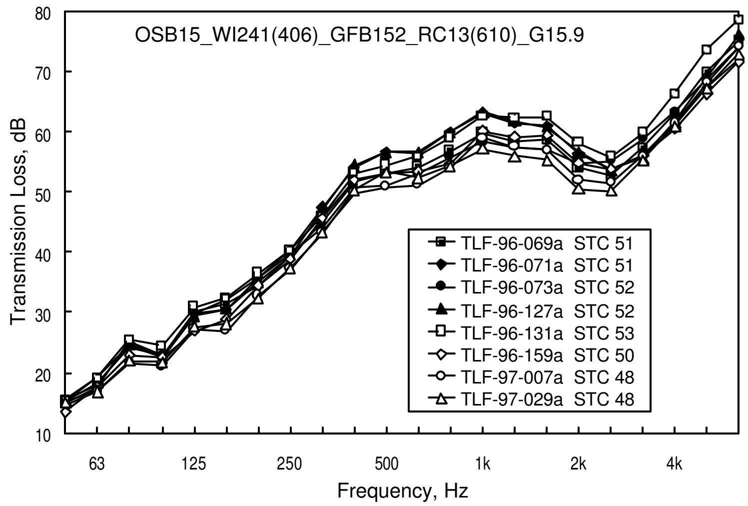


Figure 69: Transmission loss values for floors differing only in the type of I-joist used.

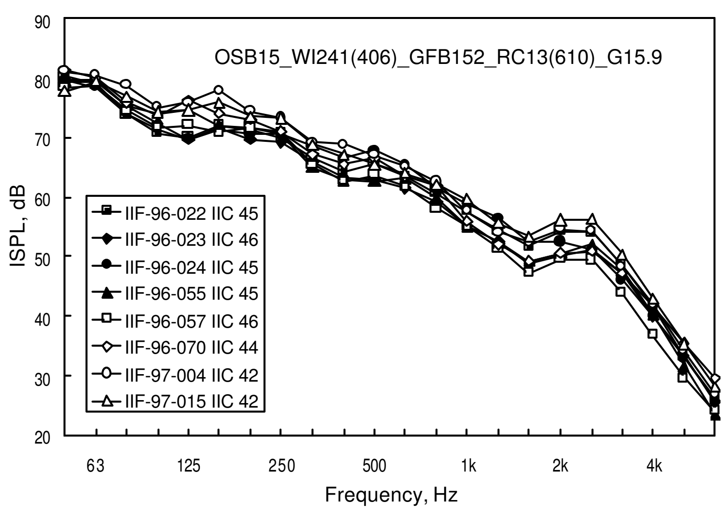


Figure 70: Normalized impact sound pressure levels for floors differing only in the type of I-joist used.

Table 1: I-joist properties, STC and IIC ratings for nominally identical floors

Manu-facturer	Flange			Web		Rimboard		avg. mass per unit length of beam kg/m	TestID and STC	TestID and IIC	OSB mass, kg	Frame mass, kg	Ceiling mass, kg
	Material	dimensions											
		Horiz-ontal	Verti-cal	material	Thick-ness, mm	Material	Thick-ness, mm						
A	solid wood	64	38	OSB	10	OSB	22	3.4	TLF-96-069a **51**	IIF-96-022 **45**	179.9	202.9	196.8
A	solid wood	38	64	OSB	10	OSB	22	3.1	TLF-96-071a **51**	IIF-96-023 **46**	181.8	189.8	198.8
A	solid wood	89	38	OSB	11	OSB	22	4.3	TLF-96-073a **52**	IIF-96-023 **45**	188.6	251.9	198.2
B	LVL	38	38	OSB	9.5	OSB	32	3	TLF-96-127a **52**	IIF-96-055 **45**	179.1	200.6	181.1
B	LVL	57	38	OSB	9.5	OSB	32	4.1	TLF-96-131a **53**	IIF-96-057 **46**	179.3	252.3	204.3
C	LVL	38	38	plywood	9.5	plywood	25	2.5	TLF-96-159a **50**	IIF-96-070 **44**	181.2	163.2	200.7
D	LVL	38	38	OSB	9.5	OSB	25	3.1	TLF-97-007a **48**	IIF-97-004 **42**	173.3	158.6	199.3
E	solid wood	64	38	OSB	9.5	OSB	28	3.4	TLF-97-029a **48**	IIF-97-015 **42**	173.4	213.9	196.7

Rimboard attachment

A: 3"x.14" diameter common nails, two in top flange of I-joist and two in bottom flange
B: 10d (3") common nails, one in top flange of I-joist and one in bottom flange
C: 8d (2-1/2") common nails, one in top flange of I-joist and one in bottom flange
D: 8d (2-1/2") common nails, one in top flange of I-joist and one in bottom flange
E: 8d (2-1/2") common nails, one in top flange of I-joist and one in bottom flange

Wood Truss-Joist Type

Two floors were constructed, differing only in the type of truss used. In each case the trusses were 356 mm deep and 610 mm o.c. In one case the trusses were constructed from 38 x 89 mm lumber with a 38 mm wide bearing surface. In the other case, the trusses were constructed from 38 x 64 mm lumber with a 64 mm wide bearing surface. The other elements of the floors were the same as the reference floor.

The one-third octave band plots in Figure 71 and Figure 72 suggest there may be some effect associated with the flange width, more measurements are needed to determine whether this is so. If there is an effect, it appears to be rather small in this case.

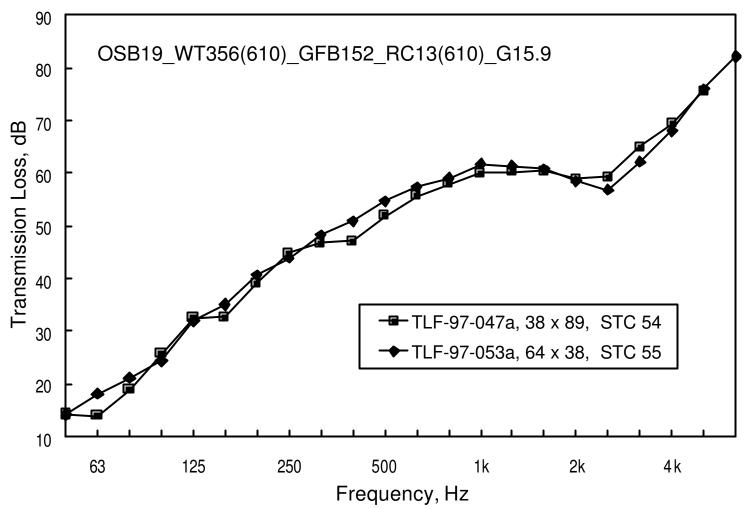


Figure 71: Transmission loss spectra for two floors differing only in the orientation and type of lumber used to build the trusses. The first dimension is the width of the flange in contact with the OSB. The second is the depth of the flange.

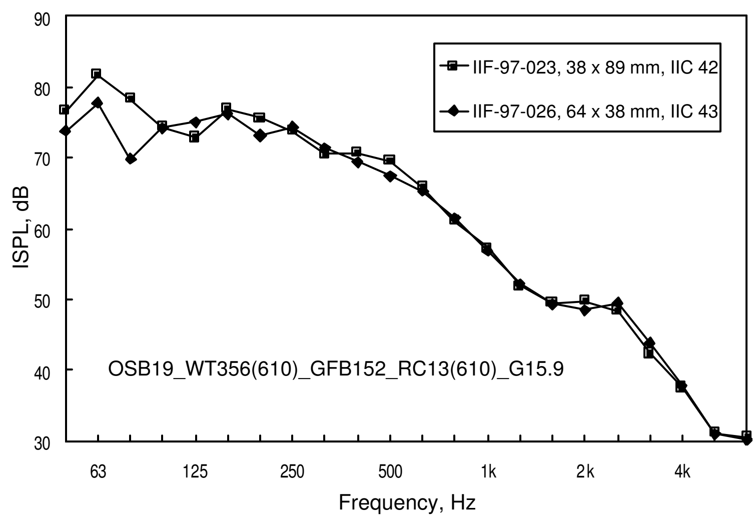
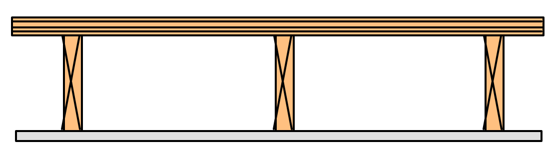


Figure 72: Impact sound pressure level spectra for two floors differing only in the orientation and type of lumber used to build the trusses. The first dimension is the width of the flange in contact with the OSB. The second is the depth of the flange.

In all of the above comparisons, comparisons are made uncertain or impossible by the sparsity of the data. Despite the relatively small values of re-build repeatability obtained for the solid wood joist reference floor, it is still not possible to be precise about the effect of joist type, depth and spacing on sound insulation. In reference 1, the effects on these variables on STC and IIC were found to be small for floors incorporating resilient metal channels.

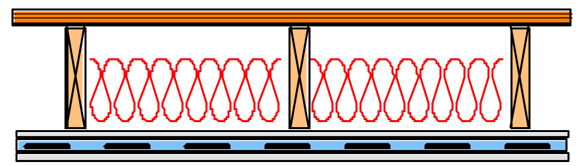
Improving floors

Occupants of older homes often want to increase the sound insulation of a floor. Four methods for doing so were examined. The base floor consisted of

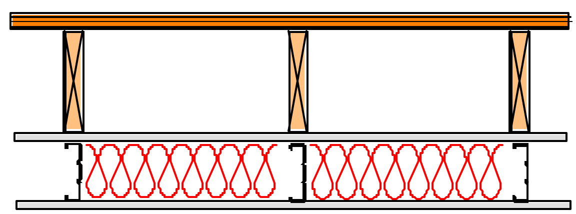
one layer of 15 mm OSB subfloor 38 x 235 mm wood joists, 406 mm o.c. one layer of 15.9 mm gypsum board screwed directly to the joists **STC 33, IIC 28**	

Method 1: It is commonly believed that adding resilient metal channels and a layer of gypsum board to the existing gypsum board is an effective way to increase the sound insulation of a wall or floor. It is also thought that the addition of sound absorbing material

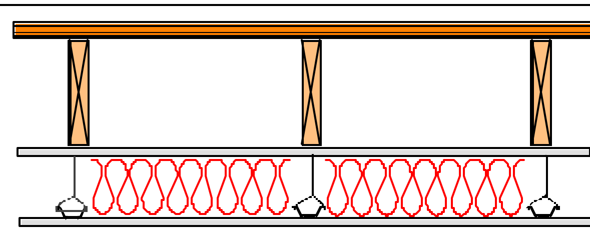
in the cavity of a wall or floor will significantly increase the sound insulation even when the gypsum board is directly attached to the joists or studs. Previous experience has shown that neither technique is effective. In the first method used to improve the base floor, both of these techniques were evaluated together. 152 mm glass fibre batts were added to the cavity of the base floor. Resilient metal channels were attached to the existing gypsum board and a second layer of 15.9 mm gypsum board was added to the ceiling. These alterations resulted in STC and IIC values of 38 and 31.

Method 1 Adding sound absorbing material, resilient metal channels and gypsum board. **STC 38, IIC 31**	

Method 2: In the second method 38 x 89 mm resilient steel studs were screwed to the joists through the existing gypsum board, 89 mm thick glass fibre batts were placed in the cavities between the steel studs, and one layer of 15.9 mm gypsum board was screwed to the steel studs. The STC and IIC obtained were 53 and 46.

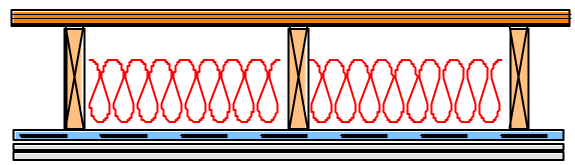
Method 2 Adding resilient steel studs sound absorbing material, and gypsum board. **STC 53, IIC 46**	

Method 3: Method 3 used wire and U-channels to support an additional layer of gypsum board at a distance of 90 mm from the existing ceiling. 89 mm thick glass fibre batts were placed in the cavity between the layers of gypsum board. The STC and IIC obtained were 52 and 46.

Method 3 Adding wire and U-channels to support additional gypsum board **STC 52, IIC 46**	

Method 4: In the 4th case the existing ceiling was removed completely, 152 mm thick glass fibre batts were placed in the cavity and a new ceiling consisting of 2 layers of gypsum board on resilient metal channels was installed. The STC and IIC for this assembly are 55 and 49 respectively, demonstrating that it is best to follow good acoustical practice from the beginning or, when this has not been done, to correct the construction so it becomes properly designed. The transmission loss and impact sound pressure level values are plotted for each case in Figure 73 and Figure 74.

Method 4
Floor rebuilt to conform to good acoustical practice.
STC 55, IIC 49



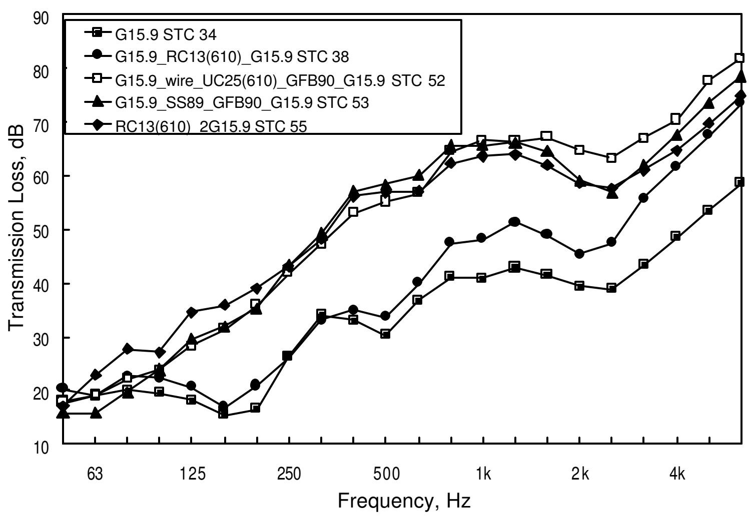


Figure 73: Transmission losses for base floor and upgraded versions. The coded descriptions in the legend identify the construction materials attached to the underside of the joists.

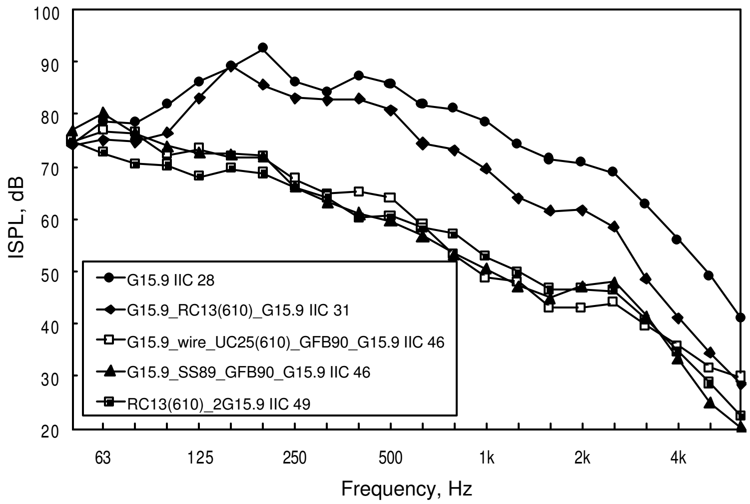


Figure 74: Impact sound pressure levels for base floor and upgraded versions. The coded descriptions in the legend identify the construction materials attached to the underside of the joists.

CONSTRUCTION DETAILS

Joist and beam layouts

For some of the constructions, the ratio of the length of the test frame and the joist spacing was not an integer. This results in there being small cavities at each end of the floor. Cavities such as these can increase sound transmission to a degree that depends on the details in each case. This effect was not extensively investigated during the project. Detailed information on joist layout is provided in the earlier report[1].

Gypsum board installation

All gypsum board joints were caulked and covered with metal tape. Tests in this laboratory have shown that this method of finishing gives identical results to those obtained when the gypsum board is finished with paper tape and gypsum compound.

Gypsum board was applied with the long axis perpendicular to the resilient metal channels, furring or joists as appropriate and screwed 610 mm o.c. in the base layer and 305 mm o.c. in the face layer.

MATERIAL PROPERTIES

Dimensions, Weights and Densities

A certain amount of variation in the physical properties of building materials is inevitable. The values given below for generic materials, such as joists, are typical. In other cases, measured values are given. The reader can deduce what is being presented from the context.

Solid Wood Joists

Dimensions	Density, kg/m^3	kg/m
38 x 184	390	2.8
38 x 235	401	3.7
38 x 286	404	4.4

Wood I-joists

Manufacturer ID	Flange Horizontal x vertical	Flange material	Web	Joist Depth, mm	Weight, kg/m
A	64 x 38	solid wood	10 mm OSB	241	3.4
A	38 x 64	solid wood	10 mm OSB	241	3.1
A	89 x 38	solid wood	11mm OSB	241	4.3
A	89 x 38	solid wood	11mm OSB	356	5.2
A	89 x 38	solid wood	12mm OSB	457	5.8
B	38 x 38	LVL*	9.5 mm OSB	241	3.0
B	57 x 38	LVL	9.5 mm OSB	241	4.1
C	38 x 38	LVL	9.5 mm plywood	241	2.5
D	38 x 38	LVL	9.5 mm OSB	241	3.1
E	64 x 38	solid wood	9.5 mm OSB	241	3.4

* Laminated veneer lumber

Wood Trusses

All trusses were formed from 38 x 89 mm lumber with the exception of the case marked with an asterisk which used 38 x 64 mm lumber. In the latter case, the bearing surface was 64 mm wide. In all other cases, the bearing surface was 38 mm wide. The following table and figures give relevant construction details.

Depth, mm	Width, mm	mass/unit length (kg/m)
356	38	4.8
356	38	4.8
356	38	5.4
457	38	5.1
457	38	5.2
610	38	5.4
356	64	4.5

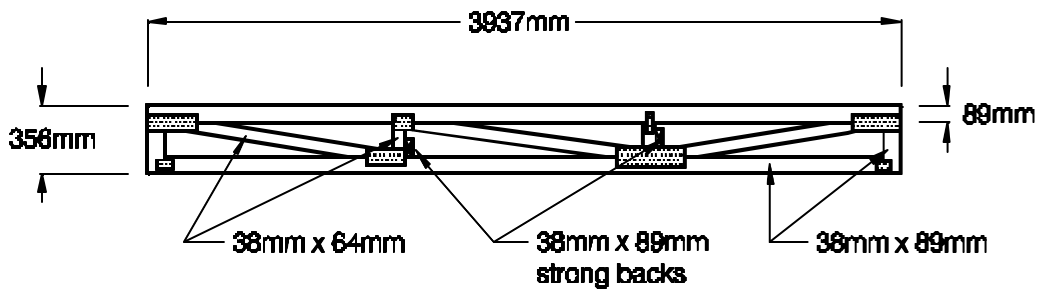


Figure 75: Construction of 356 mm deep wood trusses using 38 x 89 mm lumber.

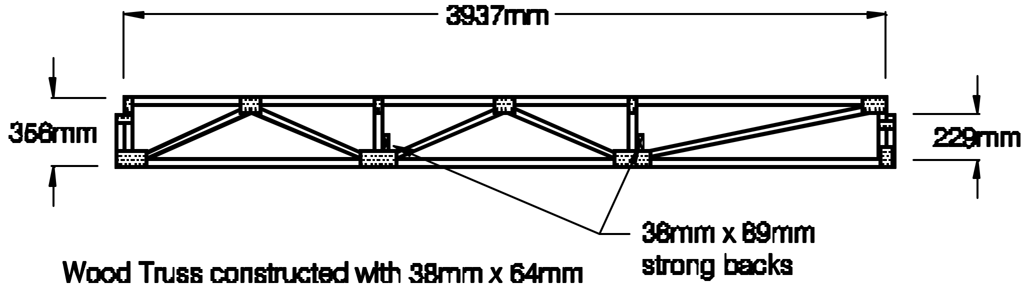


Figure 76: Construction of 356 mm deep wood trusses using 38 x 64 mm lumber

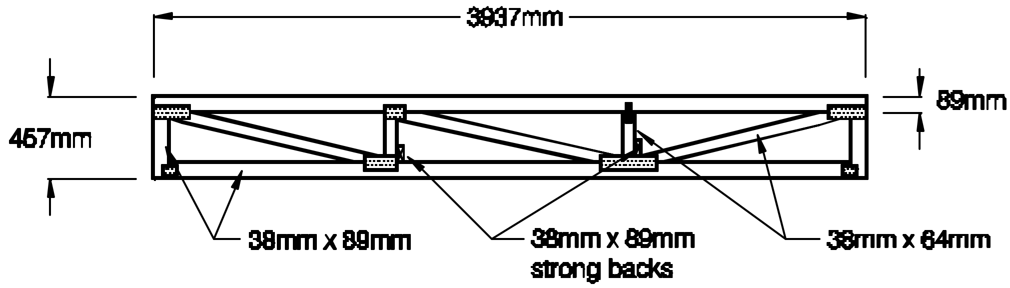


Figure 77: Construction of 457 mm deep wood trusses using 38 x 89 mm lumber.

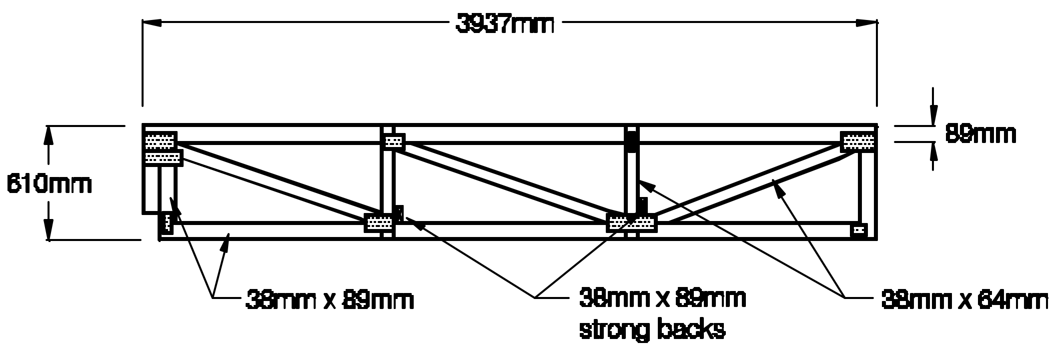


Figure 78: Construction of 610 mm deep wood trusses using 38 x 89 mm lumber.

Steel Joists, C section

Depth, mm	Gauge of steel	mass/unit length (kg/m)
203	14	4.3
203	16	3.5
203	18	2.8
203	16	3.5
254	16	4.4
305	16	5.0

Floor Layers

OSB 15.1 mm thick = 8.8 kg/m^2
OSB 19 mm thick =10.3 kg/m^2

Wood particle board, 9.5 kg/m^2

Plywood 13 mm thick = 5.7 kg/m^2
Plywood 15.1 mm thick = 7.1 kg/m^2
Plywood 25 mm thick = 12.1 kg/m^2

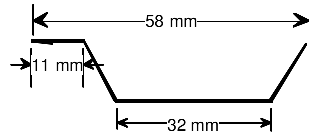
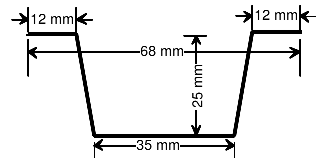
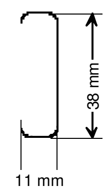
Sound Absorbing Material

65 mm thick glass fibre, 10.8 kg/m^3
89 mm thick R12 glass fibre. 10.6 kg/m^3
152 mm thick R20 glass fibre, 11.1 kg/m^3
202 mm thick R28 glass fibre. 13 kg/m^3

89 mm thick R13 rock fibre, 28.3 kg/m^3
210 mm thick R32 rock fibre, 36 kg/m^3

30 mm sprayed-on cellulose fibre, 52 kg/m^3
72 mm sprayed-on cellulose fibre, 48 kg/m^3
blown-in cellulose fibre, 23 kg/m^3

Metal Furring

resilient metal channels 13 mm deep 25 Ga., 0.26 kg/m	
U-channels, cold-rolled, 25 mm deep, 25 Ga. 0.37 kg/m	
C-channels, cold-rolled, 11 x 38 mm, 0.42 kg/m	

Wood furring strips and cross-bracing

Nominally 1" x 3" actually 19 x 64 mm, 0.47 kg/m

Gypsum Board

15.9 mm thick, fire-rated Type X gypsum board, surface weight = 11.3 kg/m^2

12.7 mm thick fire-rated Type C gypsum board, surface weight = 9.1 kg/m^2

12.7 mm thick Type 1500 gypsum board, surface weight = 7.4 kg/m^2

Concrete

Gypsum concrete, 1862 kg/m^3

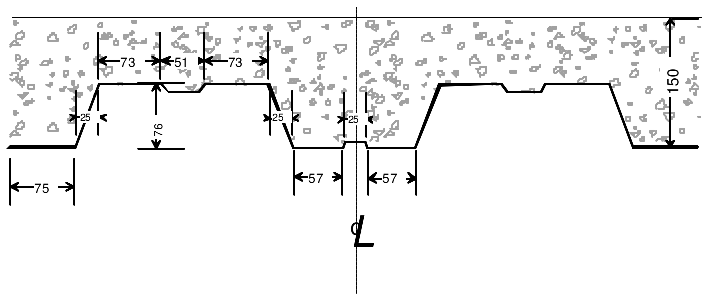
100 mm IRC reference concrete slab, 2330 kg/m^3, 233 kg/m^2

150 mm IRC reference concrete slab, 2375 kg/m^3, 356 kg/m^2.

35 mm thick IRC reference concrete slab, 2101 kg/m^3.

35 mm thick concrete slab poured on top of floor, 2448 kg/m^3.

The metal pan for the ribbed concrete floor was 0.9 mm thick with the dimensions shown here. The concrete density was 2401 kg/m^3, for a surface density of 272 kg/m^2.



Young's modulus

Some measurements of Young's modulus have been made on the major materials used in the project. These measurements will be supplemented as needed in further work to develop analytical models for predicting sound insulation. The measurements were made in two ways: by measuring the resonance of a bar of the material and by measuring the longitudinal wave speed across a sample of the material. The values are given in Table 2.

Table 2: Values of Young's modulus for some materials in project

		Young's modulus, N/m^2	
Material	Cut	Mean	Standard deviation
15.9 mm Gypsum board	Across long axis	2.0×10^9	1.5×10^8
	Along long axis	3.2×10^9	1.3×10^8
OSB	Across long axis	2.1×10^9	1.3×10^8
	Along long axis	6.8×10^9	1.5×10^8
Plywood	Across long axis	2.4×10^9	3.1×10^8
	Along long axis	7.6×10^9	2.7×10^8
Concrete		3.3×10^{10}	
Steel		2.2×10^{11}	

REFERENCES

REFERENCES

[1] Summary Report For Consortium On Fire Resistance And Sound Insulation Of Floors: Sound Transmission Class And Impact Insulation Class Results. A.C.C. Warnock and J.A. Birta. Internal report IRC-IR-766. April 1998.

[2] R.E. Halliwell, J.D. Quirt, and A.C.C. Warnock, “Design and Commissioning of a New Floor Sound Transmission Facility”, Proc INCE 93, p995.

[3] ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

[4] ASTM E413 Classification for Rating Sound Insulation.

[5] ASTM E492 Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-ceiling Assemblies using the Tapping Machine.

[6] ASTM E989 Standard Classification for Determination of Impact Insulation Class.

[7] ASTM E1289 Standard Specification for reference specimen for sound transmission loss.

[8] J.H. Rindel and D. Hoffmeyer, Proceedings of INCE 91, p279-282, 1991.

[9] Quirt, J.D. "Sound transmission through windows. I. Single and double glazing" *Journal of the Acoustical Society of America* 72(3), 1982 pp. 834-844.

Appendix

This appendix presents the transmission losses and normalized impact sound pressure levels for the floors tested during the project.

The identifiers for the airborne and impact tests are at the top right of each page, followed by the coded description of the construction. The coding system is explained in the main part of this report but, for convenience, the coded description is converted into a table on the upper right of each page giving for each layer, the material name, the number of layers (N), the thickness in mm (Thick.) and, where appropriate, the spacing between elements in mm (Spac.). Thickness, as applied to elements such as joists, means the dimension of the element measured along the axis perpendicular to the plane of the subfloor and ceiling.

A second material table on the upper right provides weights for the frame, subfloor and ceiling layers. Below these tables, explanatory notes provide additional information needed to comprehend the construction details. All dimensions are in mm, all masses are in kg.

The table on the left side of each page gives the airborne sound transmission loss and the normalized impact sound pressure level at each frequency, both in decibels. The last two rows of this table give the ASTM single ratings STC and IIC and the ISO ratings R_w and $L_{n,w}$.

The charts at the bottom of each page display the measured transmission losses and the normalized impact sound pressure level. The reference contours plotted as three connected straight lines are the ASTM STC and IIC contours as appropriate.

All of the information presented in the following pages is also in the spreadsheet files on the disk accompanying this report.

The tests have been grouped to keep results for similar constructions close together. For detailed investigations, computer comparisons will obviously be preferable. An index at the end of the appendix facilitates finding specific test results.

Unless otherwise noted, screw patterns used complied with those specified in the National Building Code of Canada. Gypsum board layers were attached with screws 305 mm o.c. in face layers, subfloor layers were screwed 150 mm o.c. around the edges of the floor, 305 mm o.c. in the field in face layers. In base layers, the separations were doubled.

Table of Contents

Group 1: Solid Wood Joists, Single Layer Subfloors, single ceiling layers

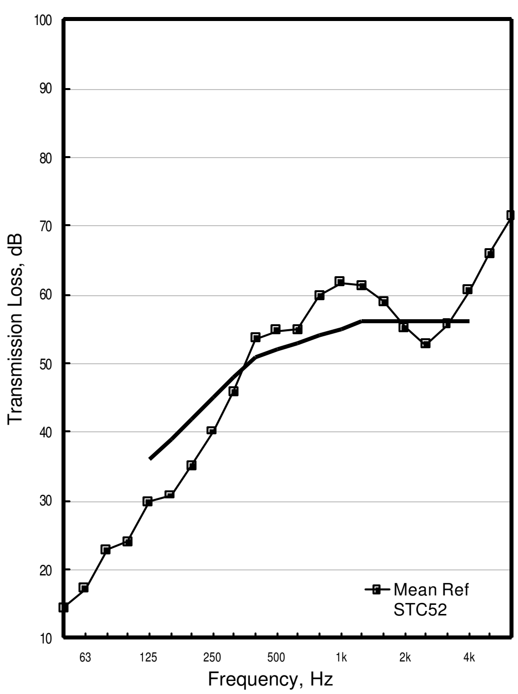
Mean Ref
Mean Ref
OSB15_WJ235(406)_GFB152_RC13(610)_G16

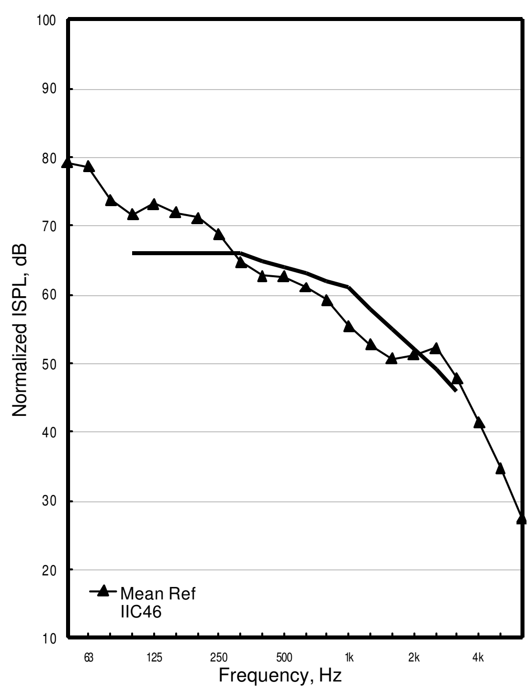
Freq. Hz	Mean Ref, TL	Mean Ref, ISPL
50	14	79
63	17	79
80	23	74
100	24	72
125	30	73
160	31	72
200	35	71
250	40	69
315	46	65
400	54	63
500	55	63
630	55	61
800	60	59
1000	62	55
1250	61	53
1600	59	51
2000	55	51
2500	53	52
3150	56	48
4000	61	42
5000	66	35
6300	71	27
STC/IIC	52	46
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	224.0 ± 11.5	
Floor layers	182.4 ± 6.7	9.1 kg/m^2
Ceiling layers	202.0 ± 4.3	11.3 kg/m^2

This is the arithmetic average of several re-builds of the same floor construction.TLF-95-043a, TLF-95-059a, TLF-95-093a, TLF-95-121a, TLF-95-151a, TLF-96-047a, TLF-96-079a, TLF-96-095a. 38 x 235 x 3924 mm joists. Gypsum board layers screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





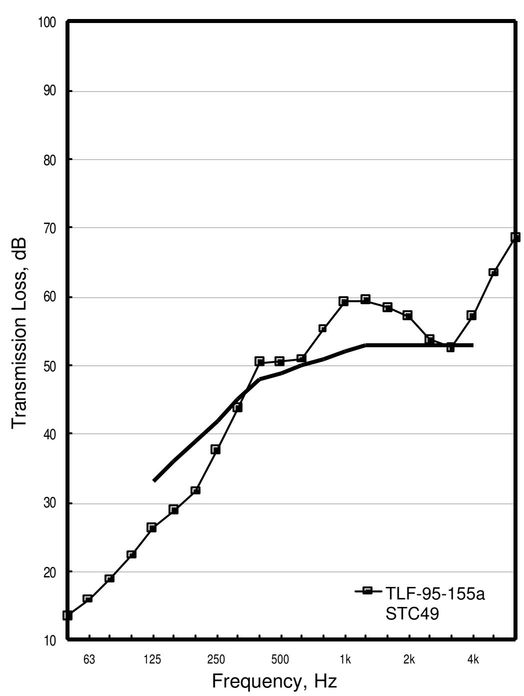
TLF-95-155a
IIF-95-059
OSB15_WJ235(406)_GFB152_RC13(610)_G13

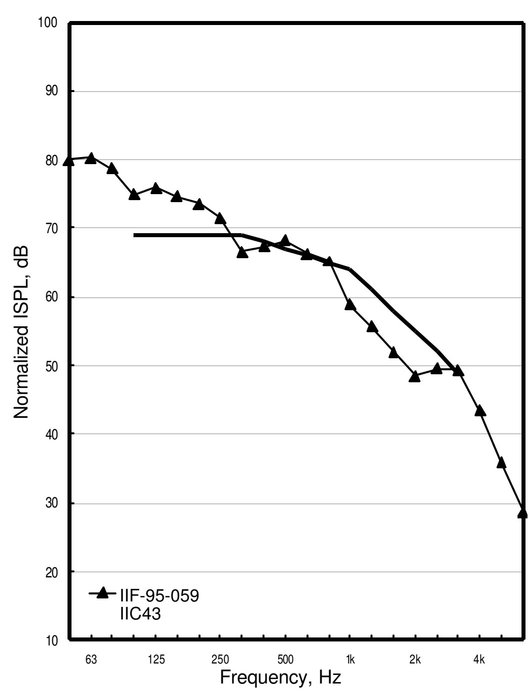
Freq. Hz	TLF-95-155a	IIF-95-059
50	14	80
63	16	80
80	19	79
100	22	75
125	26	76
160	29	75
200	32	74
250	38	72
315	44	67
400	50	67
500	51	68
630	51	66
800	55	65
1000	59	59
1250	59	56
1600	58	52
2000	57	48
2500	54	50
3150	52	49
4000	57	43
5000	63	36
6300	69	29
STC/IIC	49	43
$R_w/L_{n,w}$	48	67

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	13	

	Mass, kg	
Frame	238.8	
Floor layers	181.2	9.0 kg/m^2
Ceiling layers	129.8	7.3 kg/m^2

1500 lb/MSF board perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





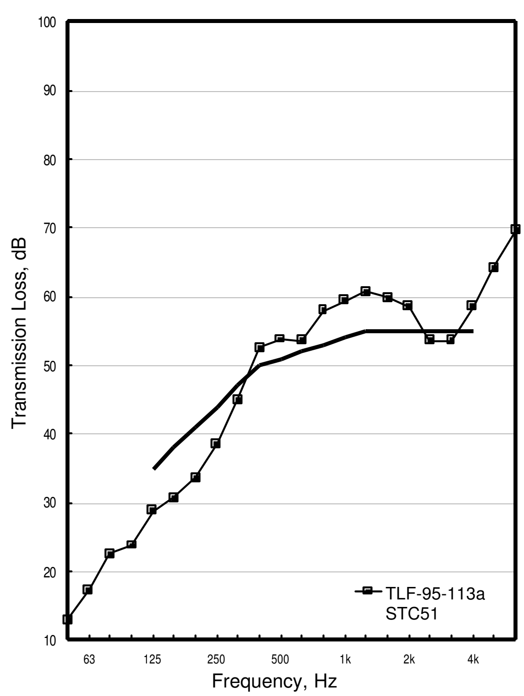
TLF-95-113a
IIF-95-040
OSB15_WJ235(406)_GFB152_RC13(610)_G13

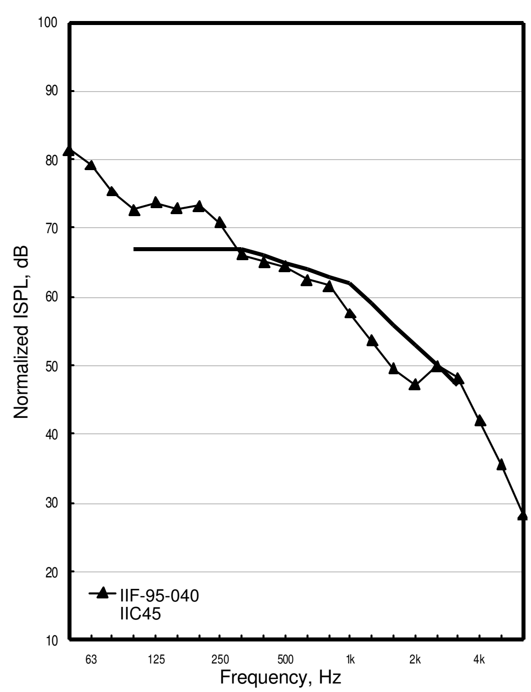
Freq. Hz	TLF-95-113a	IIF-95-040
50	13	81
63	17	79
80	23	75
100	24	73
125	29	74
160	31	73
200	34	73
250	39	71
315	45	66
400	52	65
500	54	64
630	54	63
800	58	62
1000	59	58
1250	61	54
1600	60	49
2000	59	47
2500	54	50
3150	54	48
4000	58	42
5000	64	36
6300	70	28
STC/IIC	51	45
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	13	

	Mass, kg	
Frame	237.6	
Floor layers	192.8	9.6 kg/m^2
Ceiling layers	171.4	9.6 kg/m^2

Type C gypsum board attached perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





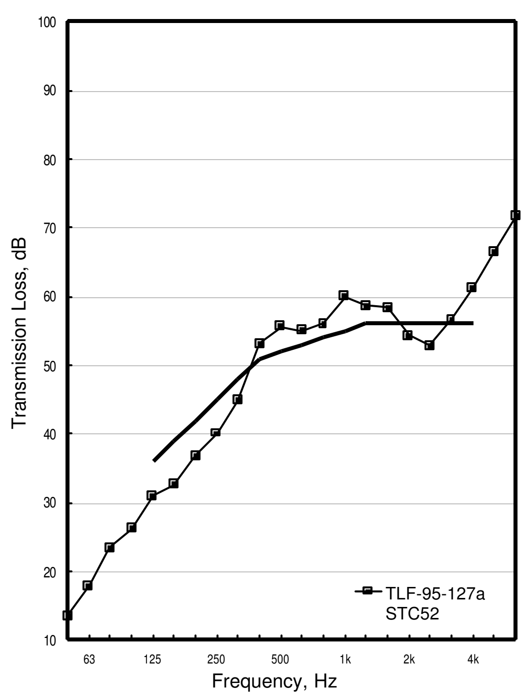
TLF-95-127a
IIF-95-045
OSB19_WJ235(406)_GFB152_RC13(610)_G16

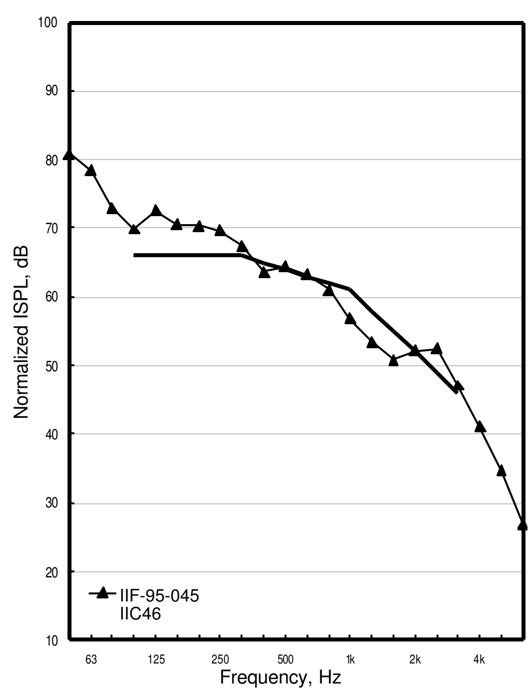
Freq. Hz	TLF-95-127a	IIF-95-045
50	14	81
63	18	78
80	23	73
100	26	70
125	31	73
160	33	71
200	37	70
250	40	70
315	45	67
400	53	64
500	56	64
630	55	63
800	56	61
1000	60	57
1250	59	53
1600	58	51
2000	54	52
2500	53	52
3150	57	47
4000	61	41
5000	66	35
6300	72	27
STC/IIC	52	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	19	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	237.6	
Floor layers	209.0	10.4 kg/m^2
Ceiling layers	207.0	11.6 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





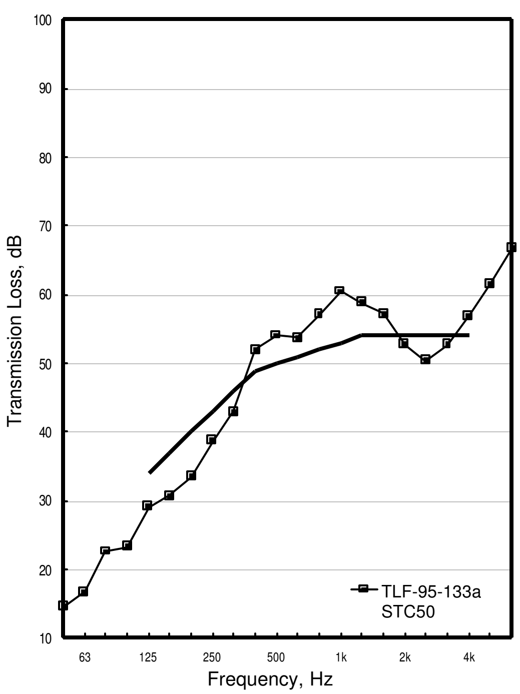
TLF-95-133a
IIF-95-048
PLY15_WJ235(406)_GFB152_RC13(610)_G16

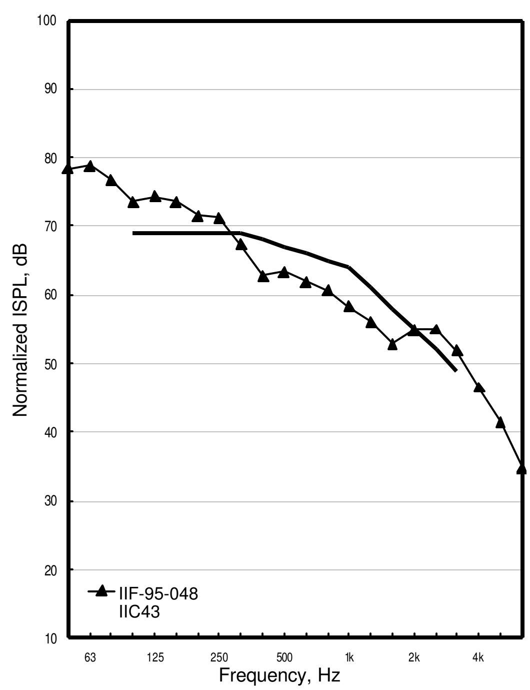
Freq. Hz	TLF-95-133a	IIF-95-048
50	15	78
63	17	79
80	23	77
100	23	74
125	29	74
160	31	74
200	34	72
250	39	71
315	43	67
400	52	63
500	54	63
630	54	62
800	57	61
1000	60	58
1250	59	56
1600	57	53
2000	53	55
2500	50	55
3150	53	52
4000	57	47
5000	61	41
6300	67	35
STC/IIC	50	43
$R_w/L_{n,w}$	49	67

Material	N	Thick.	Spac.
Plywood	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	238.8	
Floor layers	140.0	7 kg/m^2
Ceiling layers	206.8	11.6 kg/m^2

Gypsum board screwed 305 o.c. Plywood screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





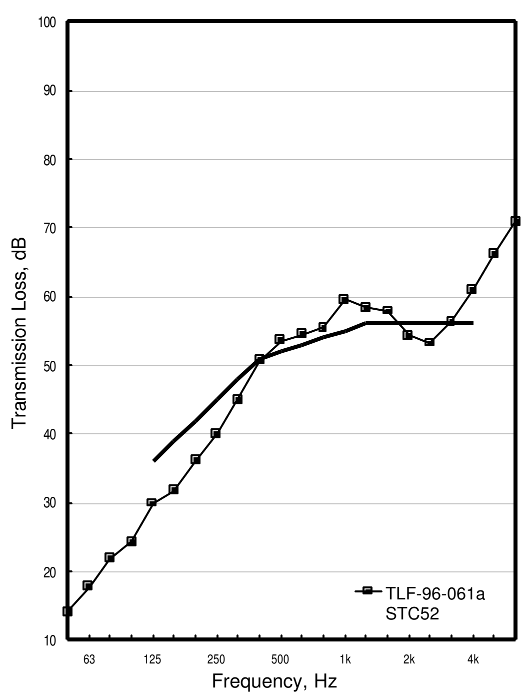
TLF-96-061a
IIF-96-018
PLY25_WJ235(406)_GFB152_RC13(610)_G16

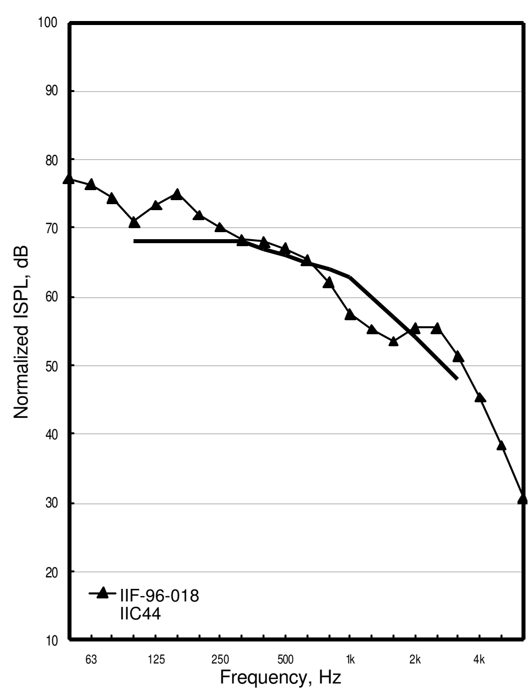
Freq. Hz	TLF-96-061a	IIF-96-018
50	14	77
63	18	76
80	22	74
100	24	71
125	30	73
160	32	75
200	36	72
250	40	70
315	45	68
400	51	68
500	54	67
630	54	65
800	56	62
1000	60	58
1250	58	55
1600	58	54
2000	54	55
2500	53	56
3150	56	51
4000	61	45
5000	66	38
6300	71	31
STC/IIC	52	44
$R_w/L_{n,w}$	50	67

Material	N	Thick.	Spac.
Plywood	1	25	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	203.9	
Floor layers	241.7	12 kg/m^2
Ceiling layers	203.0	11.4 kg/m^2

Type X gypsum, perpendicular to RC. Gypsum board screwed 305 o.c. Plywood screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





Group 2: Solid Wood Joists: Single Layer Subfloor, Double Layer Ceiling

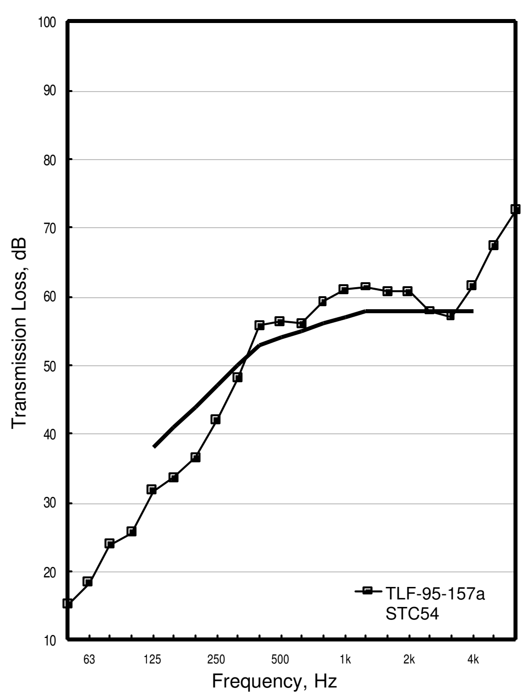
TLF-95-157a
IIF-95-060
OSB15_WJ235(406)_GFB152_RC13(610)_2G13

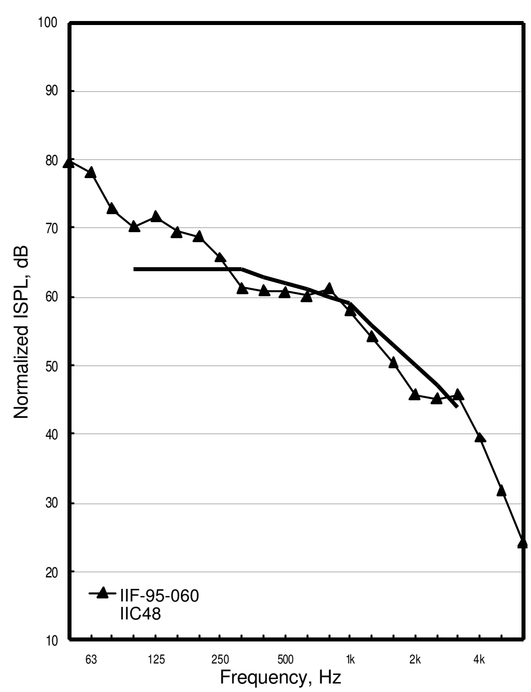
Freq. Hz	TLF-95-157a	IIF-95-060
50	15	80
63	18	78
80	24	73
100	26	70
125	32	72
160	34	69
200	36	69
250	42	66
315	48	61
400	56	61
500	56	61
630	56	60
800	59	61
1000	61	58
1250	61	54
1600	61	50
2000	61	46
2500	58	45
3150	57	46
4000	62	40
5000	67	32
6300	73	24
STC/IIC	54	48
$R_w/L_{n,w}$	53	62

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	2	13	

	Mass, kg	
Frame	238.8	
Floor layers	181.2	9.0 kg/m^2
Ceiling layers	259.6	14.6 kg/m^2

1500 lb/MSF board, both layers perpendicular to RC, joints staggered. Base layer gypsum board screwed 610 o.c., face layer gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





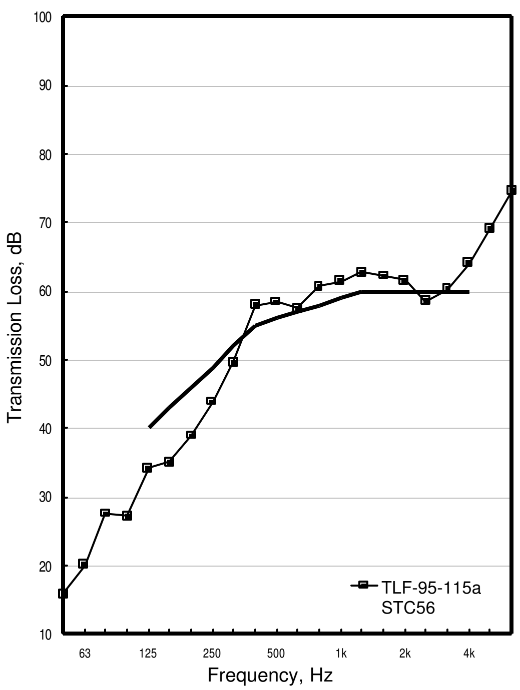
TLF-95-115a
IIF-95-041
OSB15_WJ235(406)_GFB152_RC13(610)_2G13

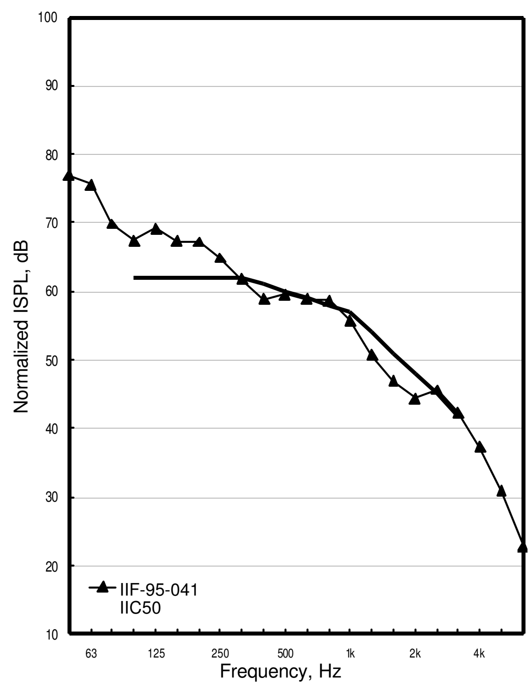
Freq. Hz	TLF-95-115a	IIF-95-041
50	16	77
63	20	76
80	28	70
100	27	67
125	34	69
160	35	67
200	39	67
250	44	65
315	50	62
400	58	59
500	58	60
630	57	59
800	61	59
1000	61	56
1250	63	51
1600	62	47
2000	62	44
2500	59	46
3150	60	42
4000	64	37
5000	69	31
6300	75	23
STC/IIC	56	50
$R_w/L_{n,w}$	55	60

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	2	13	

	Mass, kg	
Frame	237.6	
Floor layers	192.8	9.6 kg/m^2
Ceiling layers	343.8	19.3 kg/m^2

Type C gypsum board, both layers perpendicular to RC, joints staggered. Base layer screwed 610 o.c., face layer 305 o.c. OSB screwed to joists 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





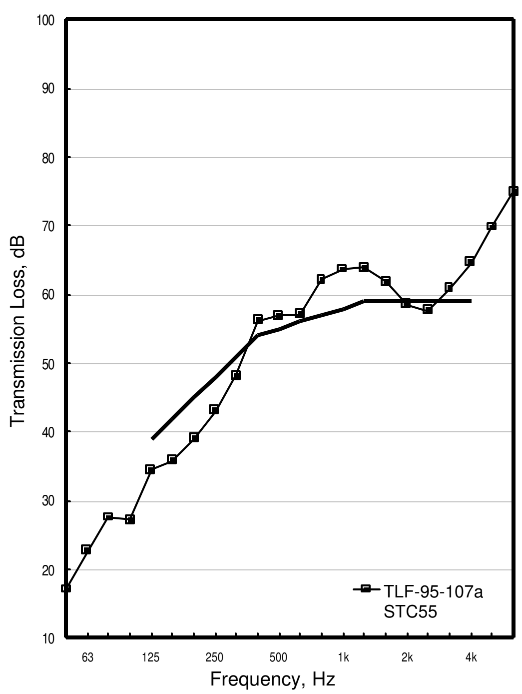
TLF-95-107a
IIF-95-039
OSB15_WJ235(406)_GFB152_RC13(610)_2G16

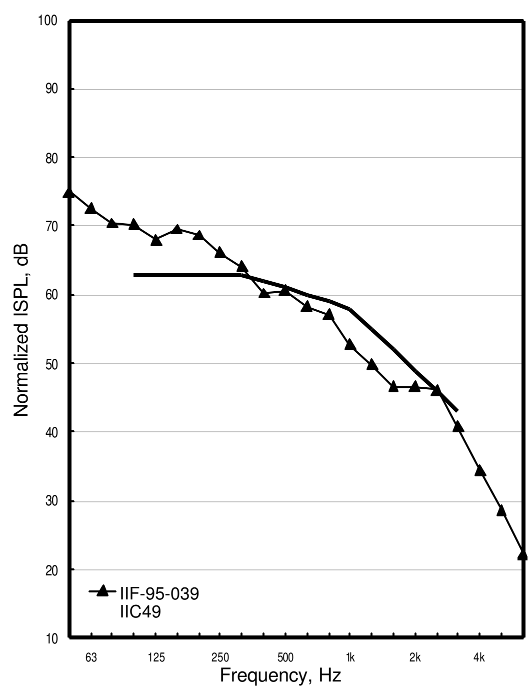
Freq. Hz	TLF-95-107a	IIF-95-039
50	17	75
63	23	73
80	28	70
100	27	70
125	34	68
160	36	70
200	39	69
250	43	66
315	48	64
400	56	60
500	57	61
630	57	58
800	62	57
1000	64	53
1250	64	50
1600	62	47
2000	58	47
2500	58	46
3150	61	41
4000	65	35
5000	70	29
6300	75	22
STC/IIC	55	49
$R_w/L_{n,w}$	54	61

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	2	16	

	Mass, kg	
Frame	222.2	
Floor layers	191.6	9.5 kg/m^2
Ceiling layers	384.4	21.6 kg/m^2

RC 610 o.c., perpendicular to joists. 2 layers of Type X gypsum board. Both layers of gypsum board perpendicular to RC, joints staggered. Base layer gypsum board screwed 610 o.c., face layer 305 o.c. OSB screwed to joists 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





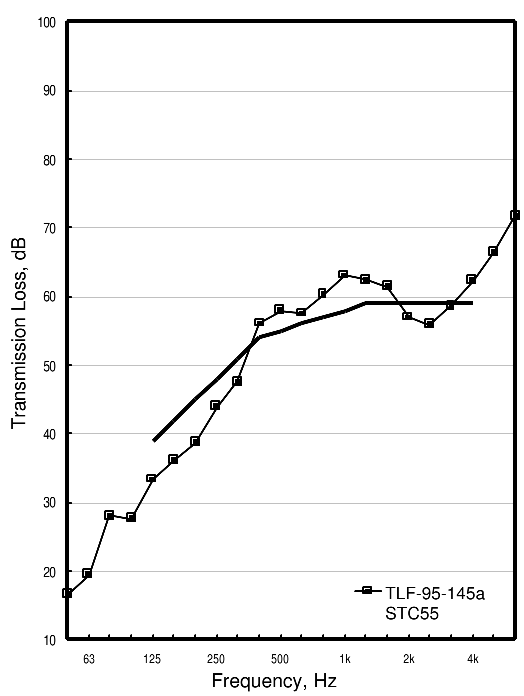
TLF-95-145a
IIF-95-054
PLY15_WJ235(406)_GFB152_RC13(610)_2G16

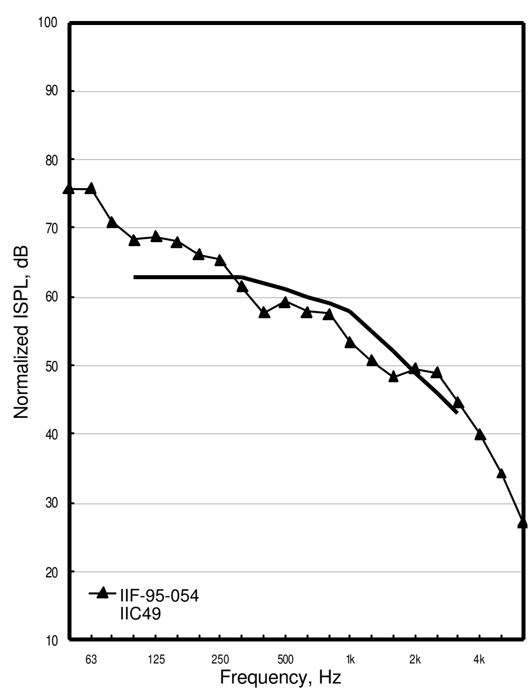
Freq. Hz	TLF-95-145a	IIF-95-054
50	17	76
63	20	76
80	28	71
100	28	68
125	33	69
160	36	68
200	39	66
250	44	65
315	48	61
400	56	58
500	58	59
630	58	58
800	60	58
1000	63	53
1250	62	51
1600	61	48
2000	57	50
2500	56	49
3150	59	45
4000	62	40
5000	66	34
6300	72	27
STC/IIC	55	49
$R_w/L_{n,w}$	54	61

Material	N	Thick.	Spac.
Plywood	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	2	16	

	Mass, kg	
Frame	238.8	
Floor layers	140.0	7 kg/m^2
Ceiling layers	415.0	23.3 kg/m^2

Both layers of gypsum board perpendicular to RC, joints staggered. Base layer gypsum screwed 610 o.c., face layer screwed 305 o.c. Plywood screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





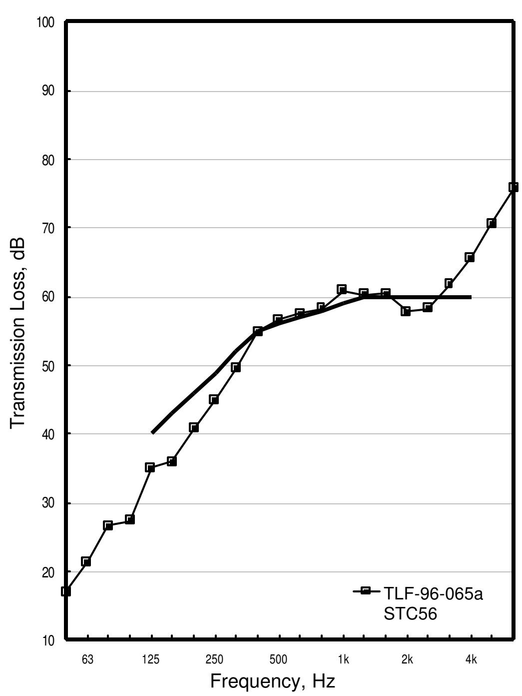
TLF-96-065a
IIF-96-020
PLY25_WJ235(406)_GFB152_RC13(610)_2G16

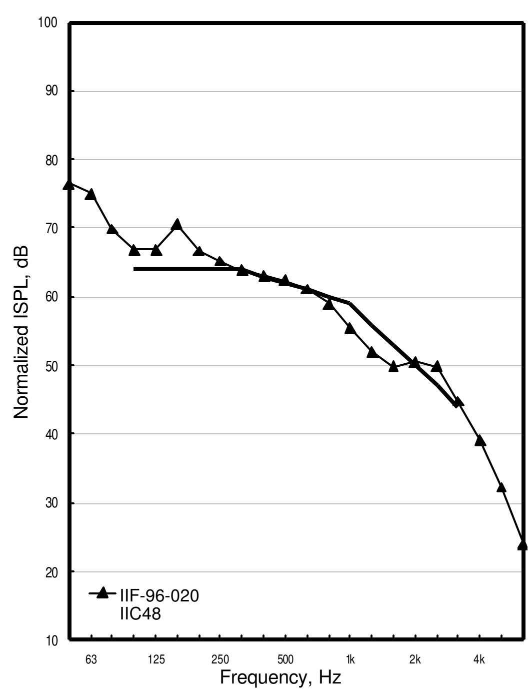
Freq. Hz	TLF-96-065a	IIF-96-020
50	17	77
63	21	75
80	27	70
100	27	67
125	35	67
160	36	70
200	41	67
250	45	65
315	50	64
400	55	63
500	57	62
630	57	61
800	58	59
1000	61	55
1250	60	52
1600	60	50
2000	58	51
2500	58	50
3150	62	45
4000	66	39
5000	71	32
6300	76	24
STC/IIC	56	48
$R_w/L_{n,w}$	55	62

Material	N	Thick.	Spac.
Plywood	1	25	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	2	16	

	Mass, kg	
Frame	203.9	
Floor layers	241.7	12 kg/m^2
Ceiling layers	404.4	22.7 kg/m^2

Both layers of Type X gypsum, perpendicular to RC. Base layer gypsum board screwed 610 o.c., face layer gypsum board screwed 305 o.c. Plywood screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





Group 3: Solid Wood Joists: Double Layer Subfloor, Single Layer Ceiling

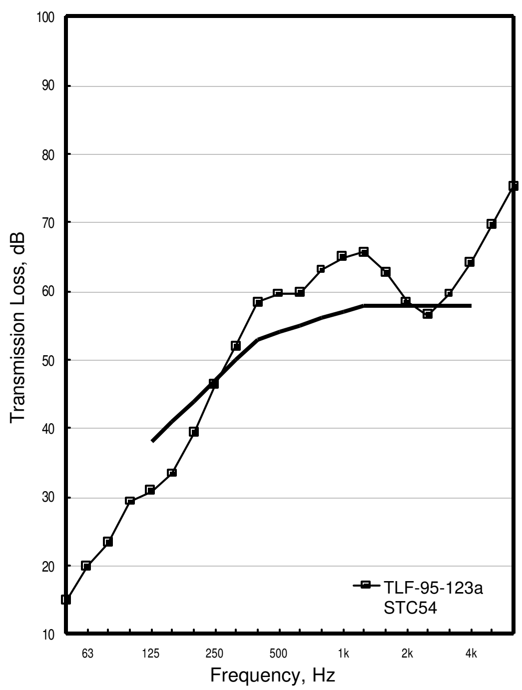
TLF-95-123a
IIF-95-043
2OSB15_WJ235(406)_GFB152_RC13(610)_G16

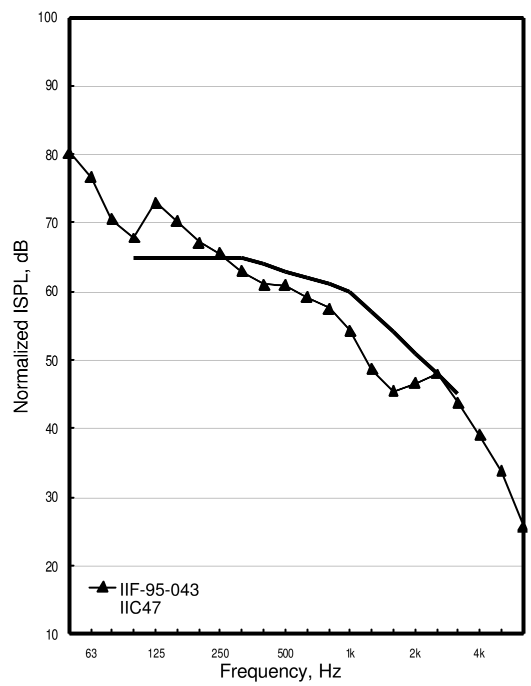
Freq. Hz	TLF-95-123a	IIF-95-043
50	15	80
63	20	77
80	23	71
100	29	68
125	31	73
160	33	70
200	39	67
250	46	66
315	52	63
400	58	61
500	60	61
630	60	59
800	63	58
1000	65	54
1250	66	49
1600	63	45
2000	58	47
2500	56	48
3150	60	44
4000	64	39
5000	70	34
6300	75	26
STC/IIC	54	47
$R_w/L_{n,w}$	54	61

Material	N	Thick.	Spac.
Oriented strandboard	2	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	237.6	
Floor layers	384.4	19.1 kg/m^2
Ceiling layers	207.0	11.6 kg/m^2

Gypsum board screwed 305 o.c. Both layers of base layer OSB screwed 305 o.c. around edges, 610 o.c. in the field, face layer OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





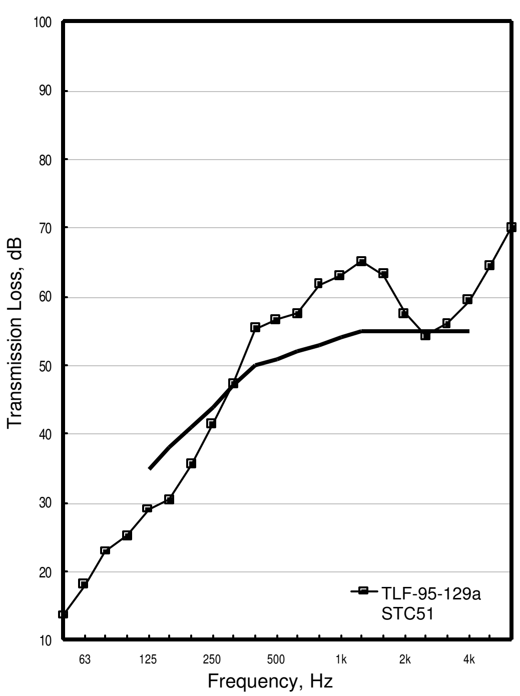
TLF-95-129a
IIF-95-046
2PLY13_WJ235(406)_GFB152_RC13(610)_G16

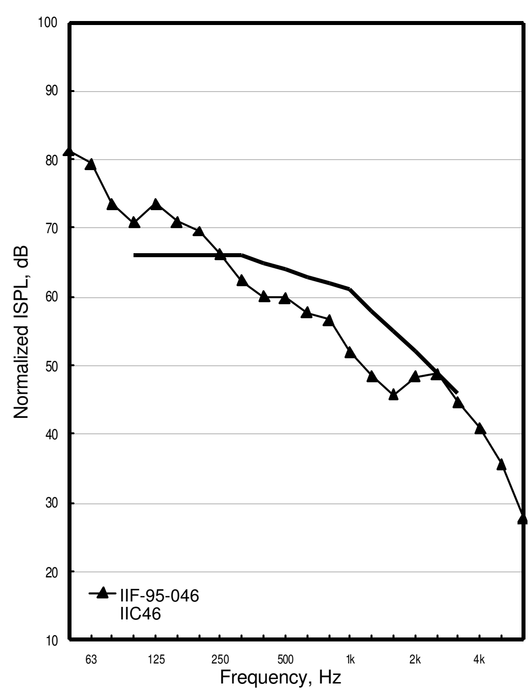
Freq. Hz	TLF-95-129a	IIF-95-046
50	14	81
63	18	79
80	23	74
100	25	71
125	29	74
160	30	71
200	35	70
250	42	66
315	47	62
400	55	60
500	57	60
630	58	58
800	62	57
1000	63	52
1250	65	48
1600	63	46
2000	58	48
2500	54	49
3150	56	45
4000	59	41
5000	64	36
6300	70	28
STC/IIC	51	46
$R_w/L_{n,w}$	51	63

Material	N	Thick.	Spac.
Plywood	2	13	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	237.6	
Floor layers	226.2	11.3 kg/m^2
Ceiling layers	207.0	11.6 kg/m^2

Gypsum board screwed 305 o.c. Base layer plywood screwed 305 o.c. around edges, 610 o.c. in the field. Face layer plywood screwed 150 o.c. around edges, 305 o.c. in the field. Both layers of plywood perpendicular to joists, joints staggered. One set of 19 x 64 mm cross-bridging.





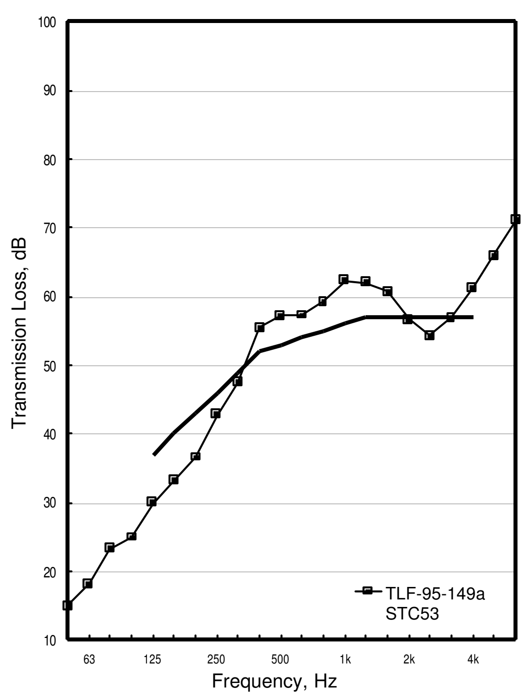
TLF-95-149a
IIF-95-056
2PLY15_WJ235(406)_GFB152_RC13(610)_G16

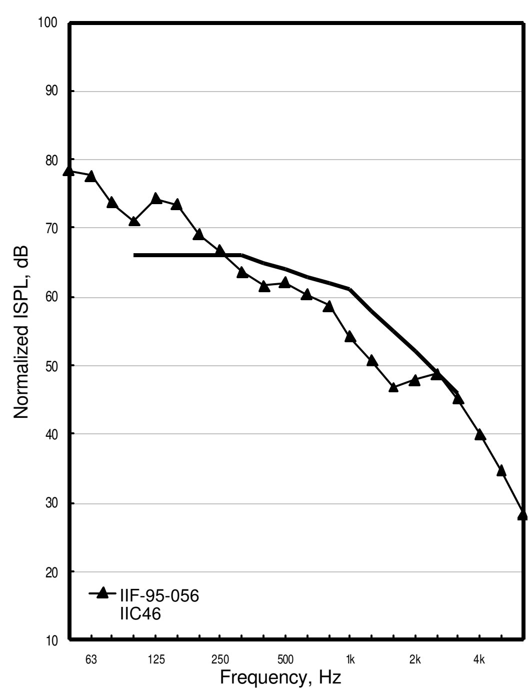
Freq. Hz	TLF-95-149a	IIF-95-056
50	15	78
63	18	78
80	23	74
100	25	71
125	30	74
160	33	73
200	37	69
250	43	67
315	47	64
400	55	62
500	57	62
630	57	60
800	59	59
1000	62	54
1250	62	51
1600	61	47
2000	57	48
2500	54	49
3150	57	45
4000	61	40
5000	66	35
6300	71	28
STC/IIC	53	46
$R_w/L_{n,w}$	52	63

Material	N	Thick.	Spac.
Plywood	2	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	238.8	
Floor layers	273.6	13.6 kg/m^2
Ceiling layers	206.8	11.6 kg/m^2

Gypsum board layer screwed 305 o.c. Base layer plywood screwed 305 o.c. around edges, 610 o.c. in the field, face layer of plywood screwed 150 o.c. around edges, 305 o.c. in the field. Both layers of plywood perpendicular to joists, joints staggered. One set of 19 x 64 mm cross bridging.





Group 4: Solid Wood Joists: Double Layer Subfloor, Double layer ceiling

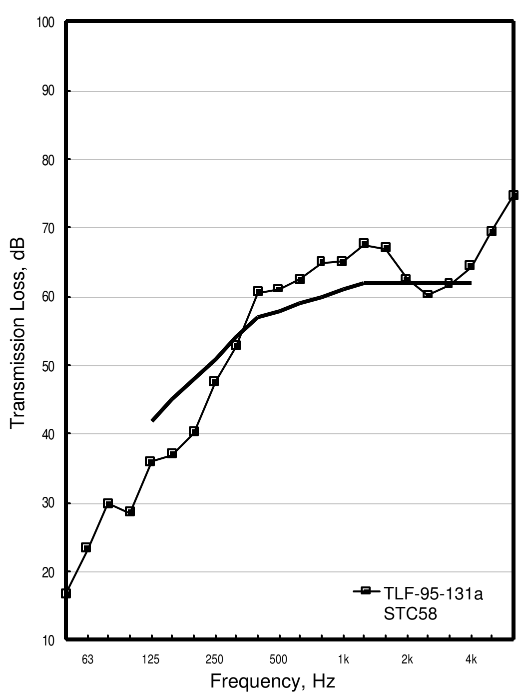
TLF-95-131a
IIF-95-047
2PLY13_WJ235(406)_GFB152_RC13(610)_2G16

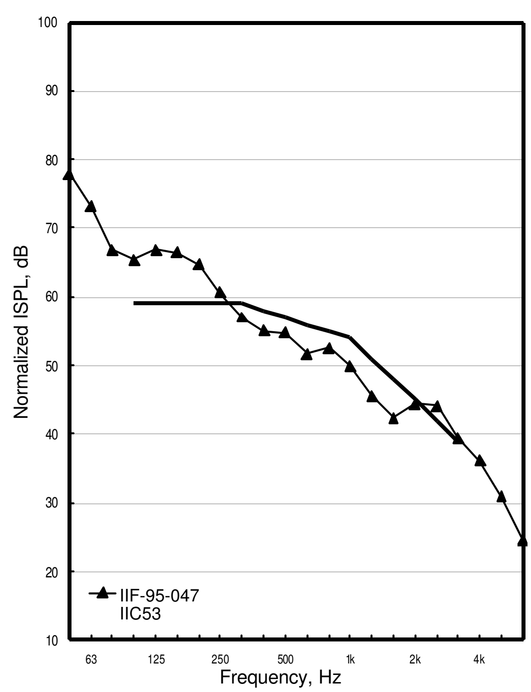
Freq. Hz	TLF-95-131a	IIF-95-047
50	17	78
63	23	73
80	30	67
100	29	65
125	36	67
160	37	66
200	40	65
250	48	61
315	53	57
400	61	55
500	61	55
630	62	52
800	65	53
1000	65	50
1250	68	46
1600	67	42
2000	63	44
2500	60	44
3150	62	40
4000	64	36
5000	69	31
6300	75	24
STC/IIC	58	53
$R_w/L_{n,w}$	57	57

Material	N	Thick.	Spac.
Plywood	2	13	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	2	16	

	Mass, kg	
Frame	237.6	
Floor layers	411.8	20.5 kg/m^2
Ceiling layers	226.2	12.7 kg/m^2

Both layers Base layer gypsum board 610 o.c., face layer gypsum board screwed 305 o.c. Base layer plywood screwed 305 o.c. around edges, 610 o.c. in the field. Face layer plywood screwed 150 o.c. around edges, 305 o.c. in the field. Both layers of plywood perpendicular to joists, joints staggered. One set of 19 x 64 mm cross-bridging.





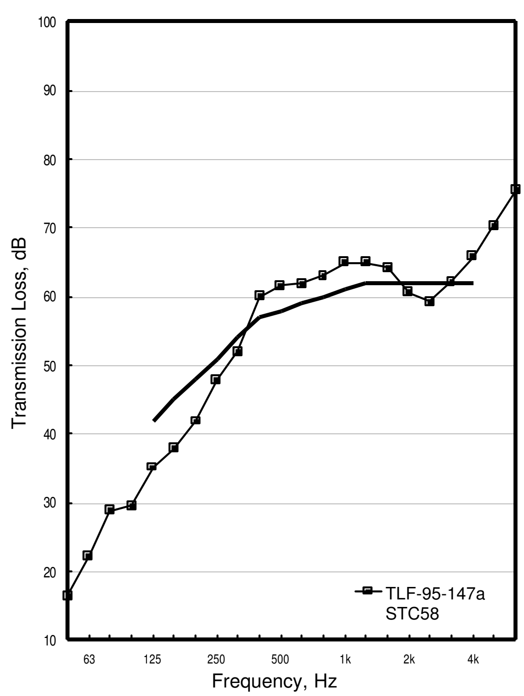
TLF-95-147a
IIF-95-055
2PLY15_WJ235(406)_GFB152_RC13(610)_2G16

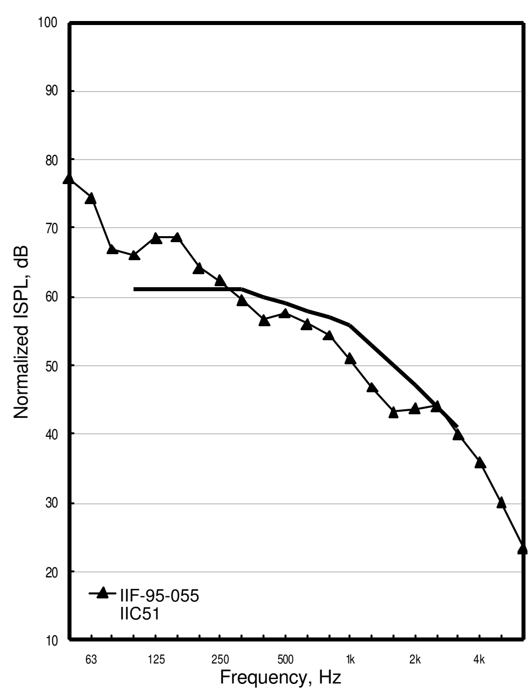
Freq. Hz	TLF-95-147a	IIF-95-055
50	16	77
63	22	74
80	29	67
100	30	66
125	35	69
160	38	69
200	42	64
250	48	62
315	52	60
400	60	57
500	62	58
630	62	56
800	63	54
1000	65	51
1250	65	47
1600	64	43
2000	61	44
2500	59	44
3150	62	40
4000	66	36
5000	70	30
6300	75	23
STC/IIC	58	51
$R_w/L_{n,w}$	57	58

Material	N	Thick.	Spac.
Plywood	2	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	2	16	

	Mass, kg	
Frame	238.8	
Floor layers	273.6	13.6 kg/m^2
Ceiling layers	415.0	23.3 kg/m^2

Both layers of gypsum board perpendicular to RC, joints staggered. Base layer gypsum screwed 610 o.c., face layer screwed 305 o.c. Base layer plywood screwed 305 o.c. around edges, 610 o.c. in the field, face layer of plywood screwed 150 o.c. around edges, 305 o.c. in the field. Both layers of plywood perpendicular to joists, joints staggered. One set of 19 x 64 mm cross bridging.





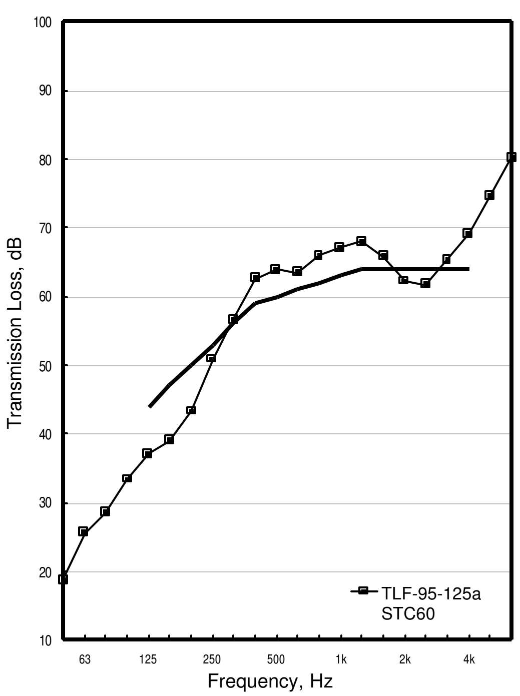
TLF-95-125a
IIF-95-044
2OSB15_WJ235(406)_GFB152_RC13(610)_2G16

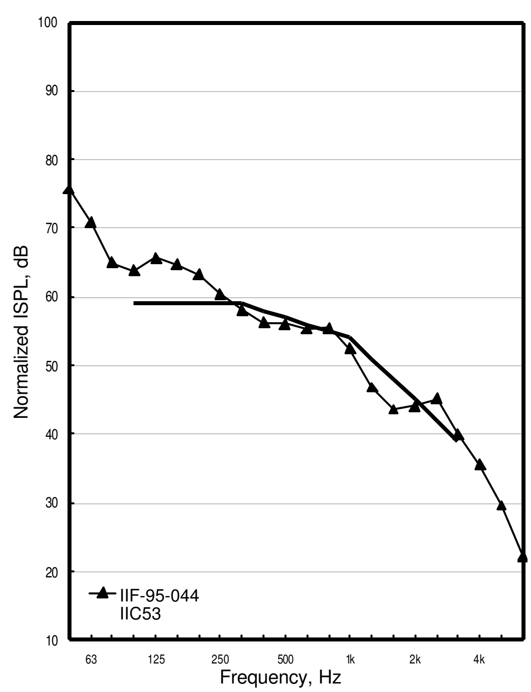
Freq. Hz	TLF-95-125a	IIF-95-044
50	19	76
63	26	71
80	29	65
100	33	64
125	37	66
160	39	65
200	43	63
250	51	60
315	57	58
400	63	56
500	64	56
630	63	55
800	66	55
1000	67	52
1250	68	47
1600	66	44
2000	62	44
2500	62	45
3150	65	40
4000	69	35
5000	75	30
6300	80	22
STC/IIC	60	53
$R_w/L_{n,w}$	59	57

Material	N	Thick.	Spac.
Oriented strandboard	2	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	2	16	

	Mass, kg	
Frame	237.6	
Floor layers	384.4	19.1 kg/m^2
Ceiling layers	415.0	23.3 kg/m^2

Both layers of base layer of gypsum board screwed 610 o.c., face layer 305 o.c. Both layers of base layer OSB screwed 305 o.c. around edges, 610 in the field, face layer OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





Group 5: Solid Wood Joists: Varying depth and spacing of joists

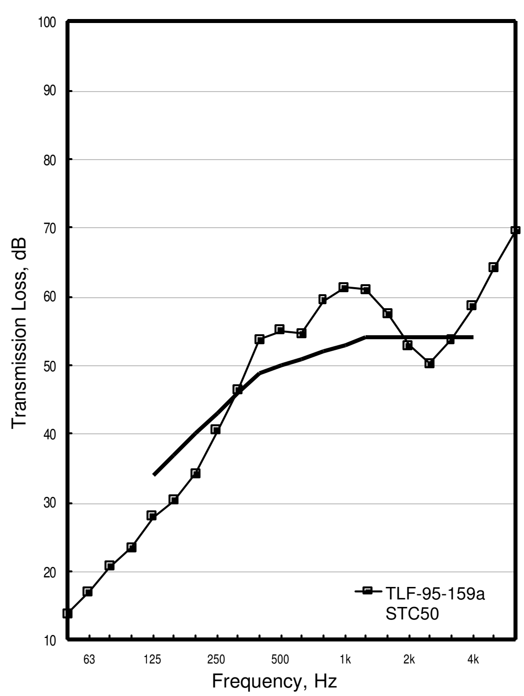
TLF-95-159a
IIF-95-061
OSB15_WJ184(406)_GFB152_RC13(610)_G16

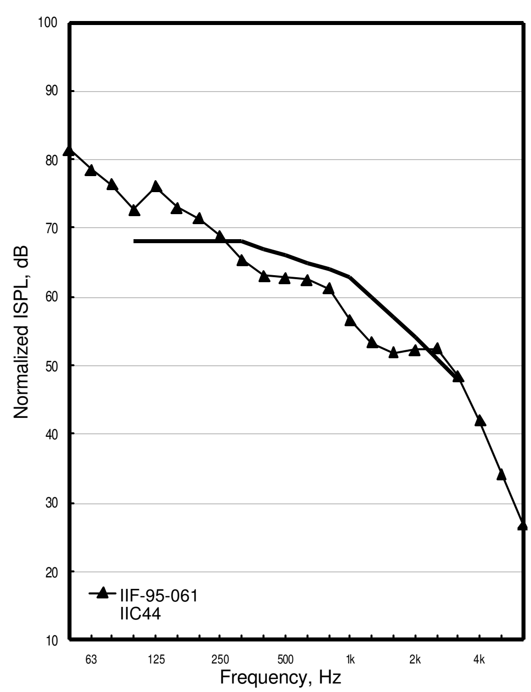
Freq. Hz	TLF-95-159a	IIF-95-061
50	14	81
63	17	79
80	21	76
100	23	73
125	28	76
160	30	73
200	34	71
250	40	69
315	46	65
400	54	63
500	55	63
630	55	62
800	59	61
1000	61	57
1250	61	53
1600	58	52
2000	53	52
2500	50	52
3150	54	49
4000	58	42
5000	64	34
6300	70	27
STC/IIC	50	44
$R_w/L_{n,w}$	49	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		184	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	174.2	
Floor layers	181.6	9.0 kg/m^2
Ceiling layers	203.0	11.4 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





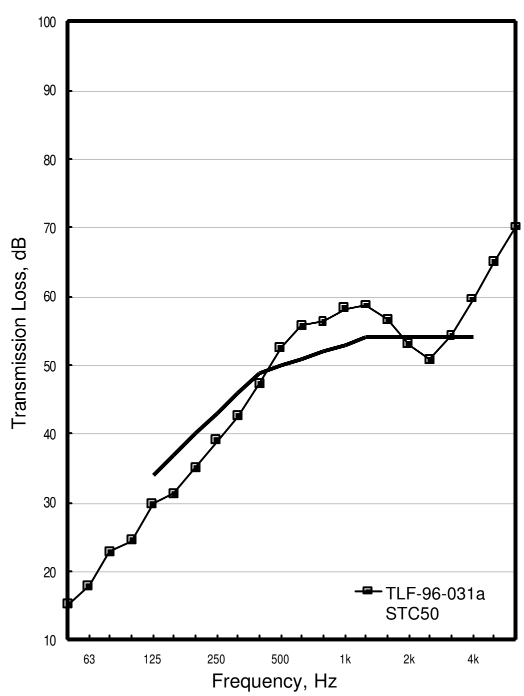
TLF-96-031a
IIF-96-007
OSB15_GFB152_WJ235(305)_RC13(610)_G16

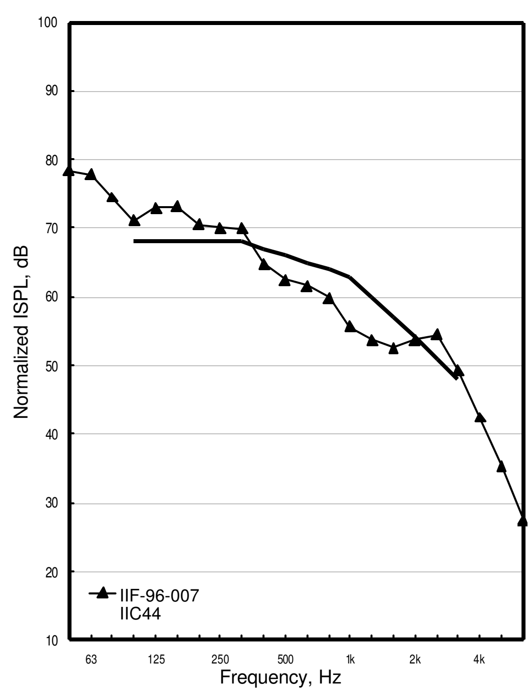
Freq. Hz	TLF-96-031a	IIF-96-007
50	15	78
63	18	78
80	23	75
100	24	71
125	30	73
160	31	73
200	35	71
250	39	70
315	42	70
400	47	65
500	52	62
630	56	62
800	56	60
1000	58	56
1250	59	54
1600	57	53
2000	53	54
2500	51	54
3150	54	49
4000	60	42
5000	65	35
6300	70	27
STC/IIC	50	44
$R_w/L_{n,w}$	49	66

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Glass fibre batts		152	
Wood joists (solid)		235	305
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	217.8	
Floor layers	185.5	9.2 kg/m^2
Ceiling layers	200.0	11.2 kg/m^2

One set of 19 x 64 cross bridging. Type X gypsum perpendicular to RC. Gypsum screwed 305 o.c. OSB screwed 150 o.c. around edges 305 o.c. in the field.





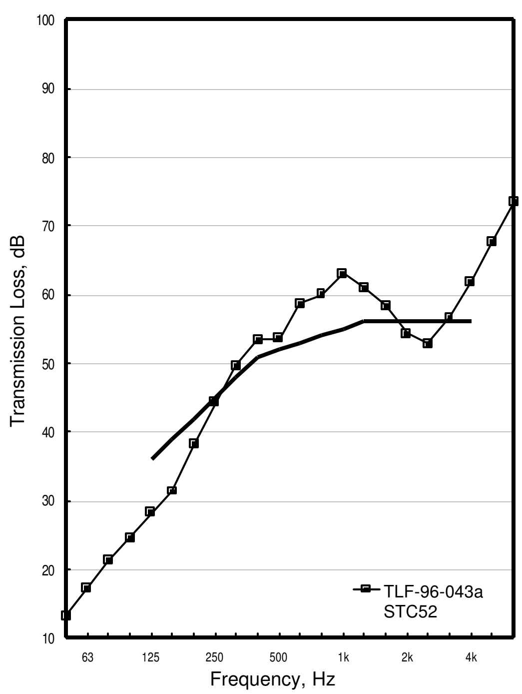
TLF-96-043a
IIF-96-013
OSB15_GFB152_WJ235(500)_RC13(610)_G16

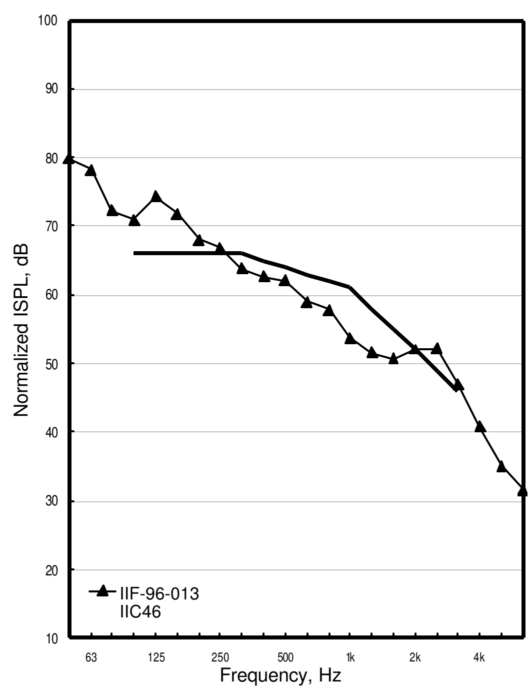
Freq. Hz	TLF-96-043a	IIF-96-013
50	13	80
63	17	78
80	21	72
100	25	71
125	28	74
160	31	72
200	38	68
250	44	67
315	50	64
400	53	63
500	54	62
630	59	59
800	60	58
1000	63	54
1250	61	52
1600	58	51
2000	54	52
2500	53	52
3150	57	47
4000	62	41
5000	68	35
6300	73	32
STC/IIC	52	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Glass fibre batts		152	
Wood joists (solid)		235	500
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	185.9	
Floor layers	182.0	9.1 kg/m^2
Ceiling layers	201.4	11.3 kg/m^2

Type X gypsum perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





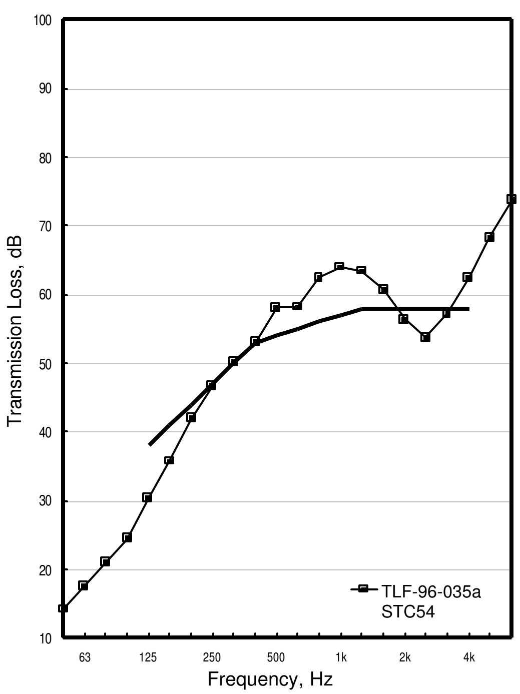
TLF-96-035a
IIF-96-009
OSB15_GFB152_WJ235(610)_RC13(610)_G16

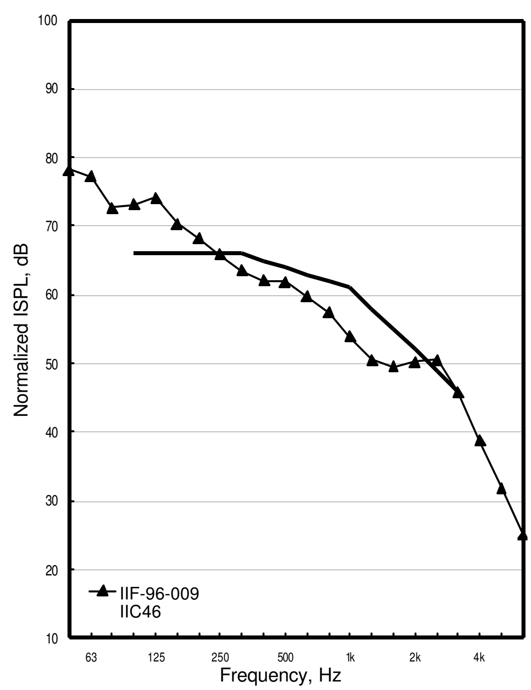
Freq. Hz	TLF-96-035a	IIF-96-009
50	14	78
63	18	77
80	21	73
100	24	73
125	30	74
160	36	70
200	42	68
250	47	66
315	50	63
400	53	62
500	58	62
630	58	60
800	62	57
1000	64	54
1250	63	51
1600	61	49
2000	56	50
2500	54	51
3150	57	46
4000	62	39
5000	68	32
6300	74	25
STC/IIC	54	46
$R_w/L_{n,w}$	54	63

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Glass fibre batts		152	
Wood joists (solid)		235	610
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	165.5	
Floor layers	181.7	9.0 kg/m^2
Ceiling layers	199.8	11.2 kg/m^2

Type X gypsum perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges 305 o.c. in the field. One set of 19 x 64 cross bridging.





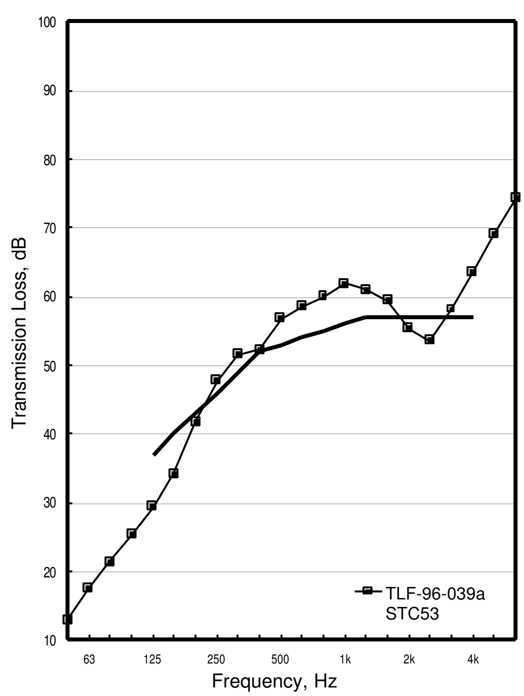
TLF-96-039a
IIF-96-011
OSB19_GFB152_WJ235(610)_RC13(610)_G16

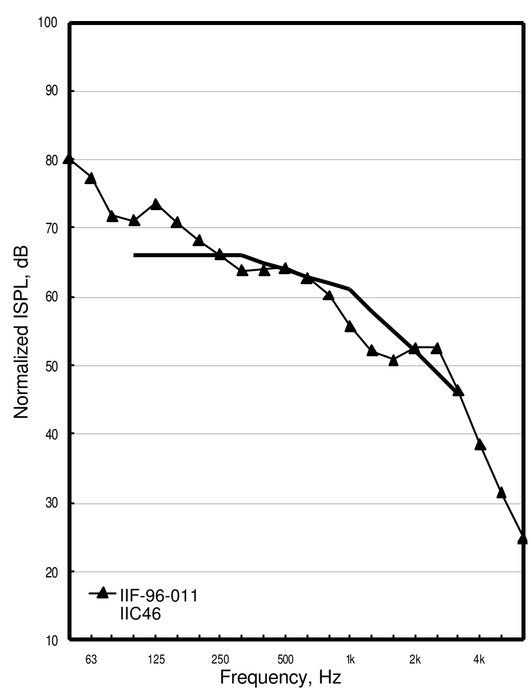
Freq. Hz	TLF-96-039a	IIF-96-011
50	13	80
63	18	77
80	21	72
100	25	71
125	29	74
160	34	71
200	42	68
250	48	66
315	52	64
400	52	64
500	57	64
630	58	63
800	60	60
1000	62	56
1250	61	52
1600	59	51
2000	55	53
2500	54	53
3150	58	46
4000	64	39
5000	69	31
6300	74	25
STC/IIC	53	46
$R_w/L_{n,w}$	53	64

Material	N	Thick.	Spac.
Oriented strandboard	1	19	
Glass fibre batts		152	
Wood joists (solid)		235	610
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	165.5	
Floor layers	208.9	10.4 kg/m^2
Ceiling layers	199.8	11.2 kg/m^2

Type X gypsum board, perpendicular to RC. Gypsum screwed 305 o.c. OSB screwed to joists 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





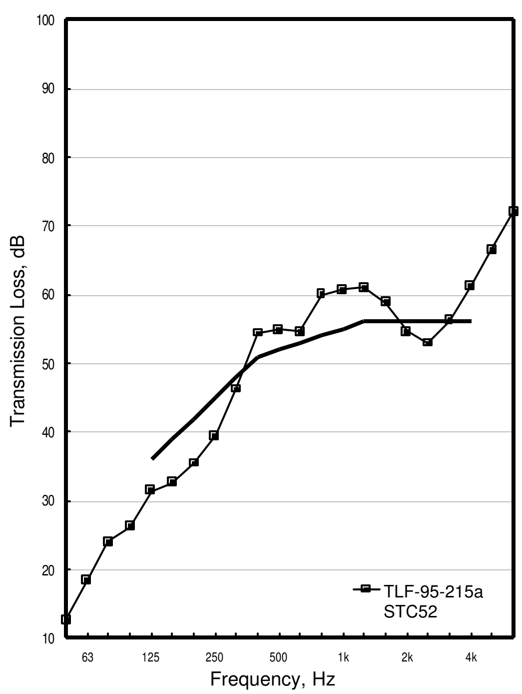
TLF-95-215a
IIF-95-075
OSB15_WJ286(406)_GFB152_RC13(610)_G16

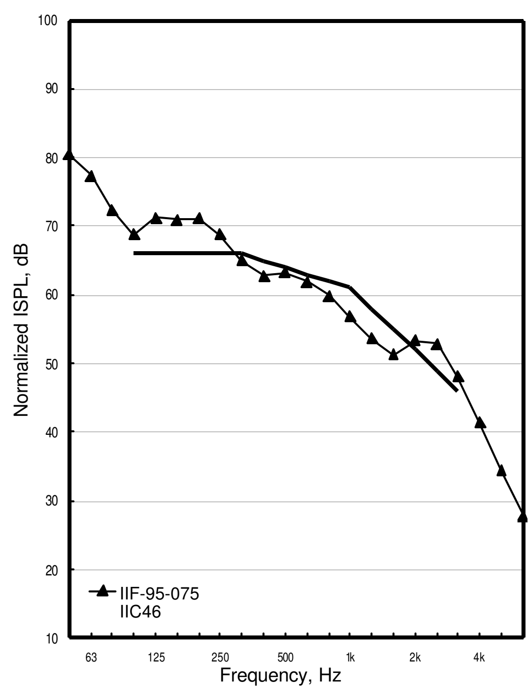
Freq. Hz	TLF-95-215a	IIF-95-075
50	13	80
63	18	77
80	24	72
100	26	69
125	31	71
160	33	71
200	35	71
250	39	69
315	46	65
400	54	63
500	55	63
630	55	62
800	60	60
1000	61	57
1250	61	54
1600	59	51
2000	55	53
2500	53	53
3150	56	48
4000	61	41
5000	67	34
6300	72	28
STC/IIC	52	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		286	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	271.0	
Floor layers	171.1	8.5 kg/m^2
Ceiling layers	201.5	11.3 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





Group 6: Solid Wood Joists: Varying cavity fillings

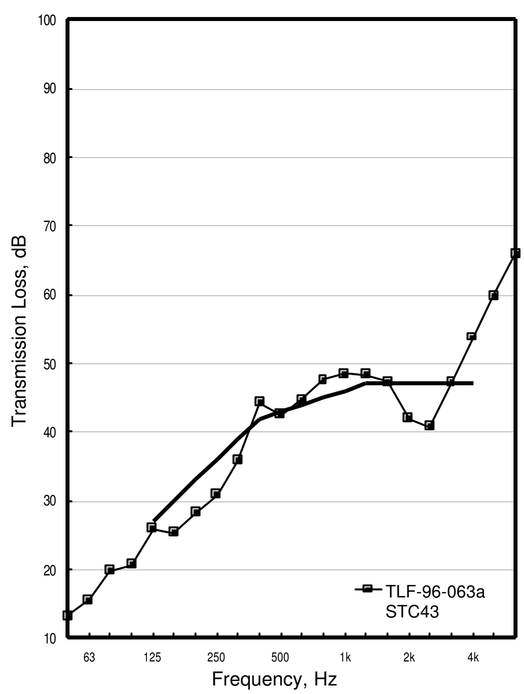
TLF-96-063a
IIF-96-019
OSB15_WJ235(406)_RC13(610)_G16

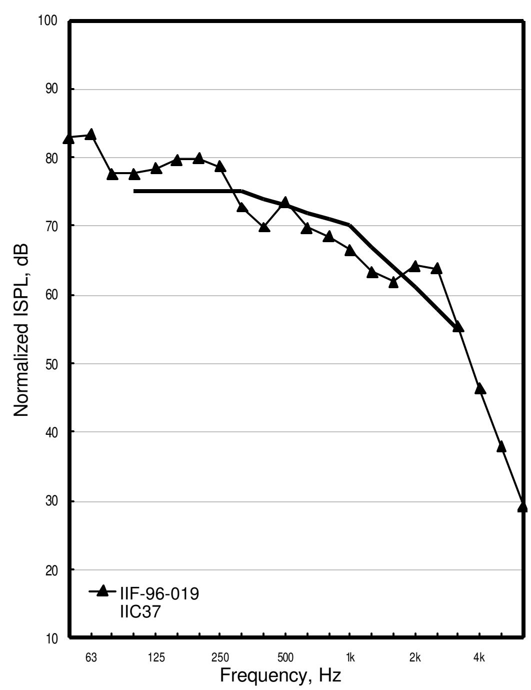
Freq. Hz	TLF-96-063a	IIF-96-019
50	13	83
63	16	83
80	20	78
100	21	78
125	26	78
160	25	80
200	28	80
250	31	79
315	36	73
400	44	70
500	43	74
630	45	70
800	48	68
1000	48	66
1250	48	63
1600	47	62
2000	42	64
2500	41	64
3150	47	56
4000	54	46
5000	60	38
6300	66	29
STC/IIC	43	37
$R_w/L_{n,w}$	42	73

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	217.8	
Floor layers	182.8	9.1 kg/m^2
Ceiling layers	200.0	11.2 kg/m^2

Type X gypsum, perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





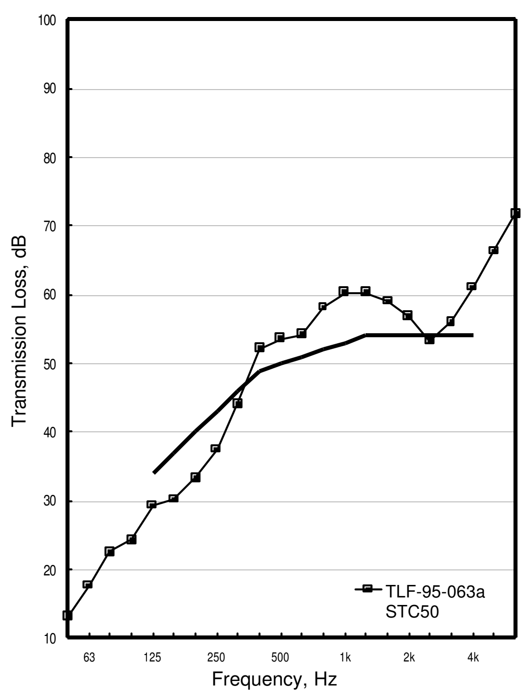
TLF-95-063a
IIF-95-019
OSB15_WJ235(406)_GFB65_RC13(610)_G16

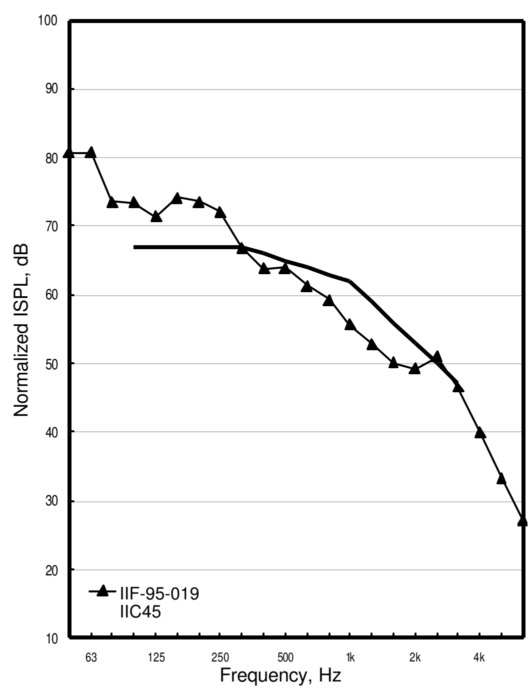
Freq. Hz	TLF-95-063a	IIF-95-019
50	13	81
63	18	81
80	23	74
100	24	73
125	29	71
160	30	74
200	33	73
250	37	72
315	44	67
400	52	64
500	54	64
630	54	61
800	58	59
1000	60	56
1250	60	53
1600	59	50
2000	57	49
2500	53	51
3150	56	47
4000	61	40
5000	66	33
6300	72	27
STC/IIC	50	45
$R_w/L_{n,w}$	49	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		65	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	223.3	
Floor layers	178.2	8.9 kg/m^2
Ceiling layers	195.3	11 kg/m^2

Type X gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





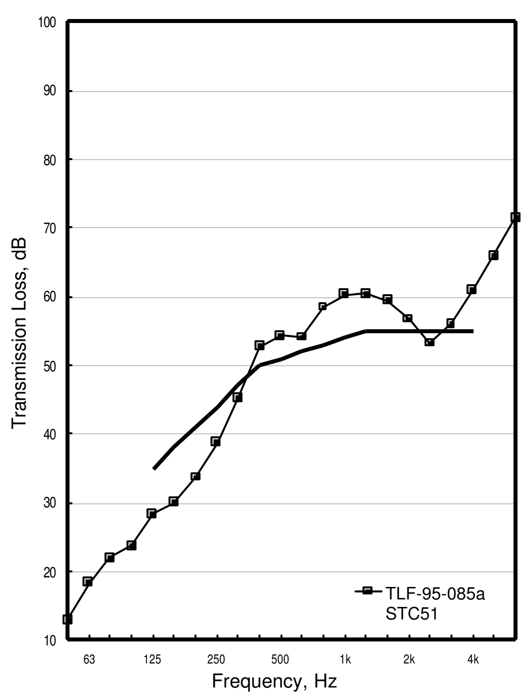
TLF-95-085a
IIF-95-030
OSB15_GFB90_WJ235(406)_RC13(610)_G16

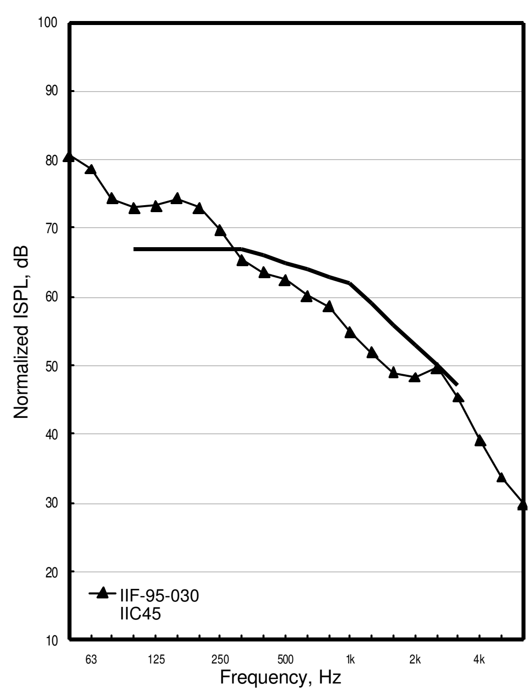
Freq. Hz	TLF-95-085a	IIF-95-030
50	13	80
63	18	79
80	22	74
100	24	73
125	28	73
160	30	74
200	34	73
250	39	70
315	45	65
400	53	64
500	54	63
630	54	60
800	58	59
1000	60	55
1250	60	52
1600	59	49
2000	57	48
2500	53	50
3150	56	45
4000	61	39
5000	66	34
6300	71	30
STC/IIC	51	45
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Glass fibre batts		90	
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	223.3	
Floor layers	178.2	8.9 kg/m^2
Ceiling layers	195.3	11 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





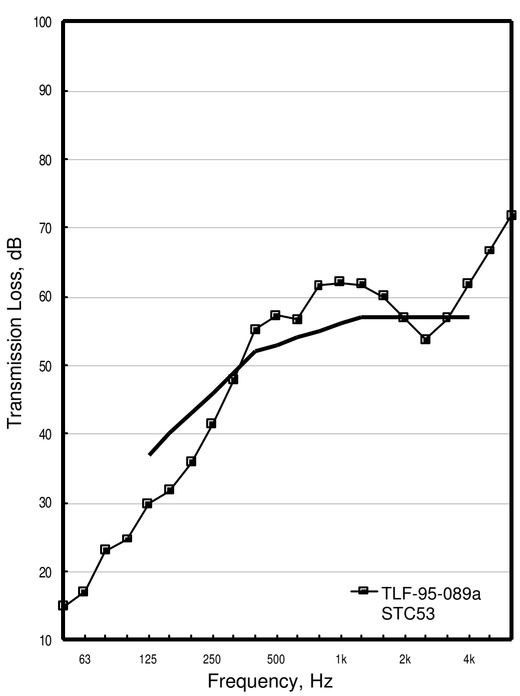
TLF-95-089a
IIF-95-032
OSB15_GFB202_WJ235(406)_RC13(610)_G16

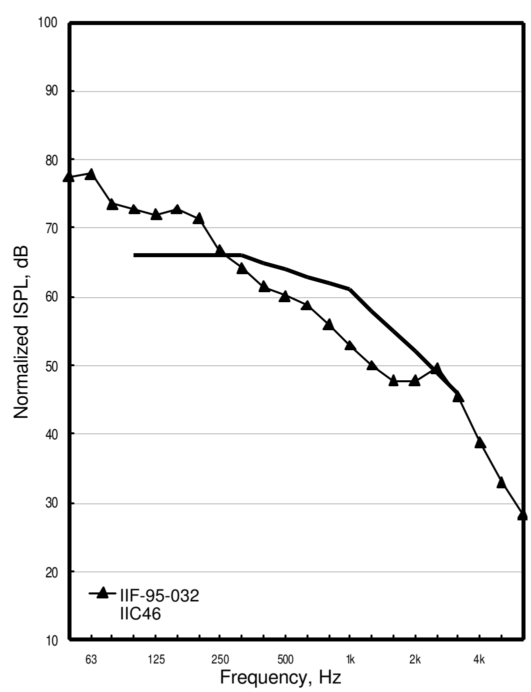
Freq. Hz	TLF-95-089a	IIF-95-032
50	15	77
63	17	78
80	23	74
100	25	73
125	30	72
160	32	73
200	36	71
250	42	67
315	48	64
400	55	62
500	57	60
630	57	59
800	62	56
1000	62	53
1250	62	50
1600	60	48
2000	57	48
2500	54	50
3150	57	46
4000	62	39
5000	67	33
6300	72	28
STC/IIC	53	46
$R_w/L_{n,w}$	52	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Glass fibre batts		202	
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	223.3	
Floor layers	178.2	8.9 kg/m^2
Ceiling layers	195.3	11 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





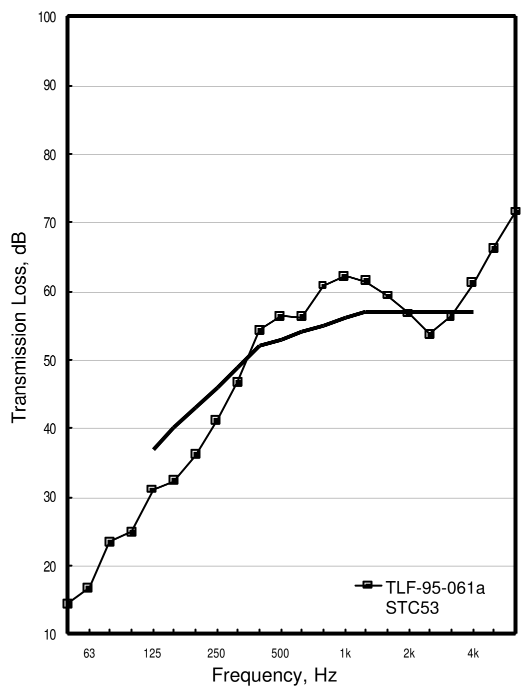
TLF-95-061a
IIF-95-018
OSB15_WJ235(406)_GFB65_GFB152_RC13(610)_G16

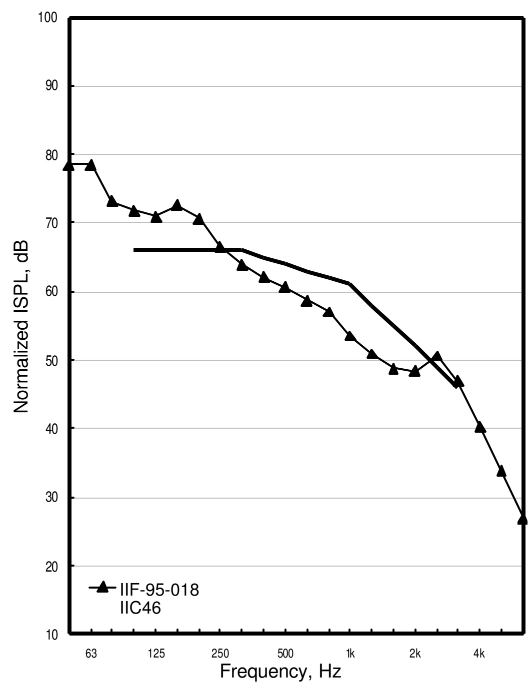
Freq. Hz	TLF-95-061a	IIF-95-018
50	14	78
63	17	79
80	23	73
100	25	72
125	31	71
160	32	73
200	36	71
250	41	67
315	47	64
400	54	62
500	56	61
630	56	59
800	61	57
1000	62	54
1250	61	51
1600	59	49
2000	57	48
2500	54	51
3150	56	47
4000	61	40
5000	66	34
6300	72	27
STC/IIC	53	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		65	
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	223.3	
Floor layers	178.2	8.9 kg/m^2
Ceiling layers	195.3	11 kg/m^2

Type X gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





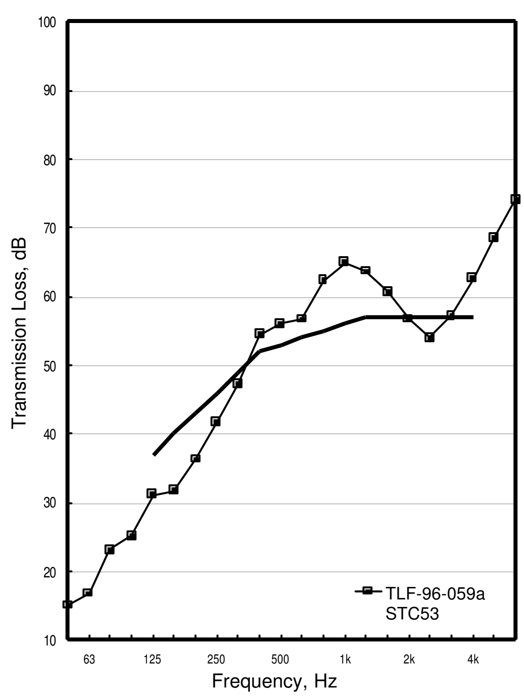
TLF-96-059a
IIF-96-017
OSB15_WJ235(406)_GFB270_RC13(610)_G16

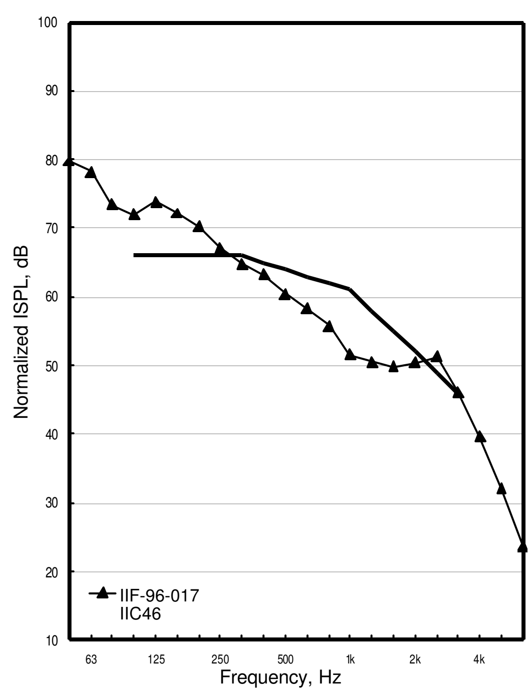
Freq. Hz	TLF-96-059a	IIF-96-017
50	15	80
63	17	78
80	23	73
100	25	72
125	31	74
160	32	72
200	36	70
250	42	67
315	47	65
400	54	63
500	56	60
630	57	58
800	62	56
1000	65	52
1250	64	51
1600	61	50
2000	57	50
2500	54	51
3150	57	46
4000	63	40
5000	69	32
6300	74	24
STC/IIC	53	46
$R_w/L_{n,w}$	52	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		270	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	217.8	
Floor layers	182.8	9.1 kg/m^2
Ceiling layers	200.0	11.2 kg/m^2

Three layers of R12 to make a 270 mm thick batt - overfilled cavity. Type X gypsum, perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





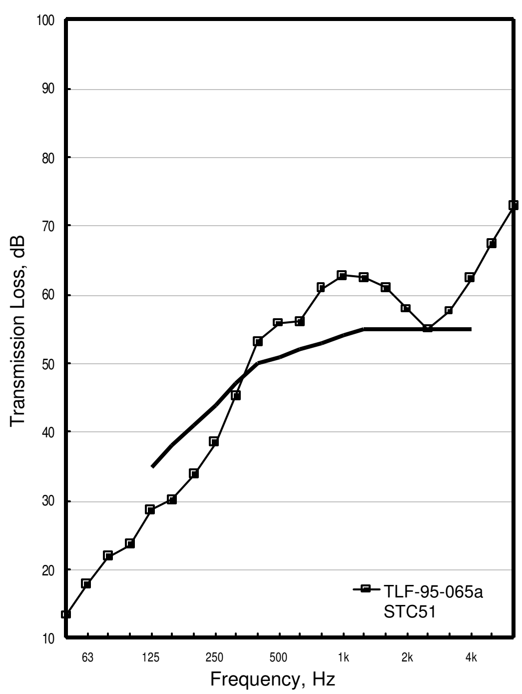
TLF-95-065a
IIF-95-020
OSB15_MFB90_WJ235(406)_RC13(610)_G16

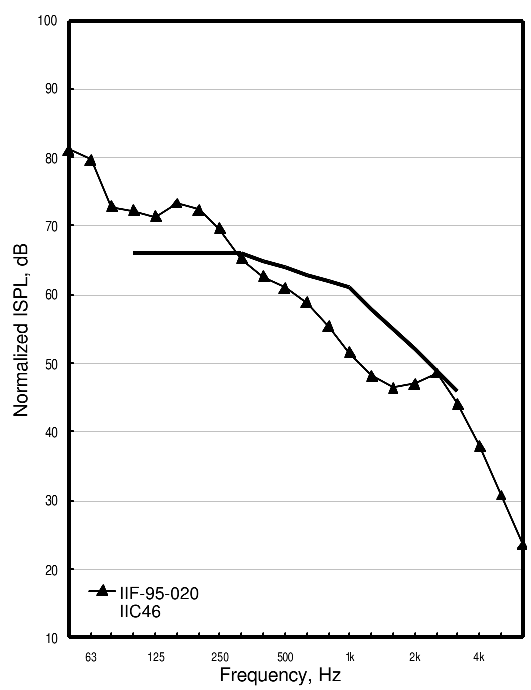
Freq. Hz	TLF-95-065a	IIF-95-020
50	13	81
63	18	80
80	22	73
100	24	72
125	29	71
160	30	73
200	34	72
250	38	70
315	45	65
400	53	63
500	56	61
630	56	59
800	61	55
1000	63	52
1250	62	48
1600	61	46
2000	58	47
2500	55	49
3150	58	44
4000	62	38
5000	67	31
6300	73	24
STC/IIC	51	46
$R_w/L_{n,w}$	50	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Mineral fibre batts		90	
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	223.3	
Floor layers	178.2	8.9 kg/m^2
Ceiling layers	195.3	11 kg/m^2

Type X gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





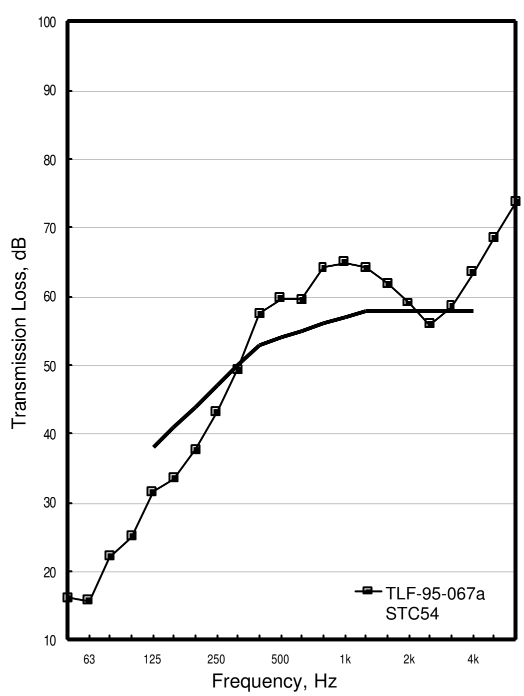
TLF-95-067a
IIF-95-021
OSB15_MFB210_WJ235(406)_RC13(610)_G16

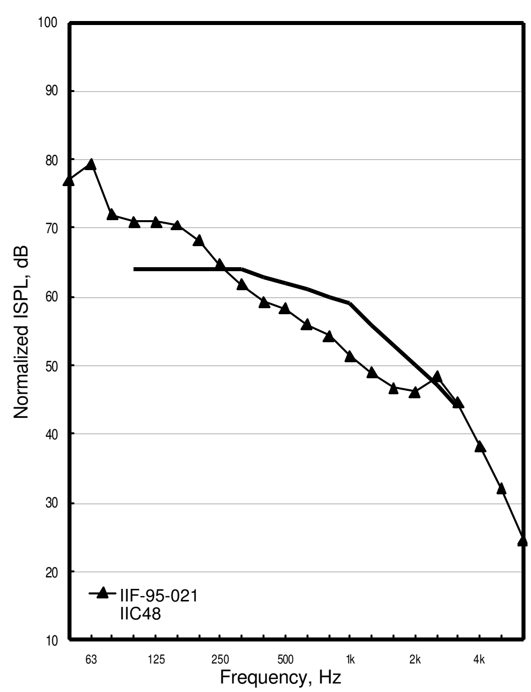
Freq. Hz	TLF-95-067a	IIF-95-021
50	16	77
63	16	79
80	22	72
100	25	71
125	32	71
160	34	70
200	38	68
250	43	65
315	49	62
400	57	59
500	60	58
630	60	56
800	64	54
1000	65	51
1250	64	49
1600	62	47
2000	59	46
2500	56	48
3150	58	45
4000	64	38
5000	68	32
6300	74	25
STC/IIC	54	48
$R_w/L_{n,w}$	53	62

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Mineral fibre batts		210	
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	223.3	
Floor layers	178.2	8.9 kg/m^2
Ceiling layers	195.3	11 kg/m^2

Type X gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





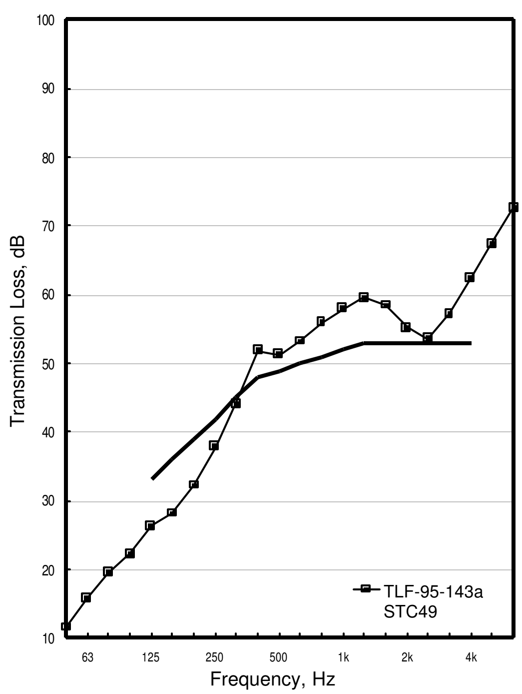
TLF-95-143a
IIF-95-053
OSB15_WJ235(406)_CFS59_RC13(610)_G16

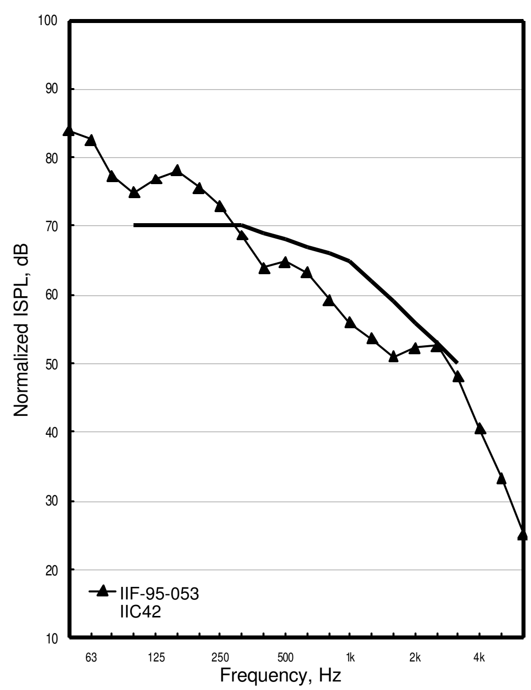
Freq. Hz	TLF-95-143a	IIF-95-053
50	12	84
63	16	83
80	20	77
100	22	75
125	26	77
160	28	78
200	32	76
250	38	73
315	44	69
400	52	64
500	51	65
630	53	63
800	56	59
1000	58	56
1250	60	54
1600	58	51
2000	55	52
2500	54	53
3150	57	48
4000	62	41
5000	67	33
6300	73	25
STC/IIC	49	42
$R_w/L_{n,w}$	48	68

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Sprayed-on cellulose fibre		59	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	223.3	
Floor layers	193.8	9.6 kg/m^2
Ceiling layers	195.3	11 kg/m^2

Gypsum board screwed 305 o.c. Gypsum board screwed 305 o.c. Cellulose measured average thickness 30 mm. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





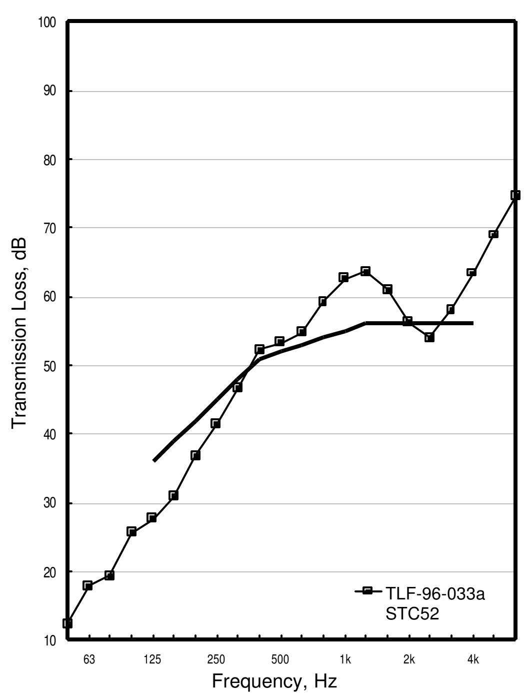
TLF-96-033a
IIF-96-008
OSB15_CFS90_WJ235(406)_RC13(610)_G16

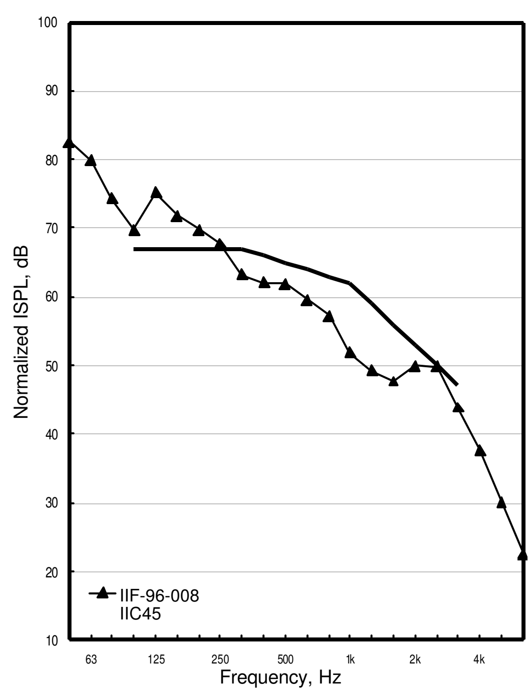
Freq. Hz	TLF-96-033a	IIF-96-008
50	12	83
63	18	80
80	19	74
100	26	70
125	28	75
160	31	72
200	37	70
250	42	68
315	47	63
400	52	62
500	53	62
630	55	60
800	59	57
1000	63	52
1250	64	49
1600	61	48
2000	56	50
2500	54	50
3150	58	44
4000	63	38
5000	69	30
6300	75	23
STC/IIC	52	45
$R_w/L_{n,w}$	51	63

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Sprayed-on cellulose fibre		90	
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	223.3	
Floor layers	193.8	9.6 kg/m^2
Ceiling layers	200.3	11.3 kg/m^2

Type X gypsum perpendicular to RC. Gypsum board screwed 305 o.c. Nominal 90 mm wet spray cellulose. OSB screwed 150 o.c. around edges 305 o.c. in the field. One set of 19x64 mm cross bridging.





Group 7: Solid Wood Joists: Varying ceiling supports, empty cavity

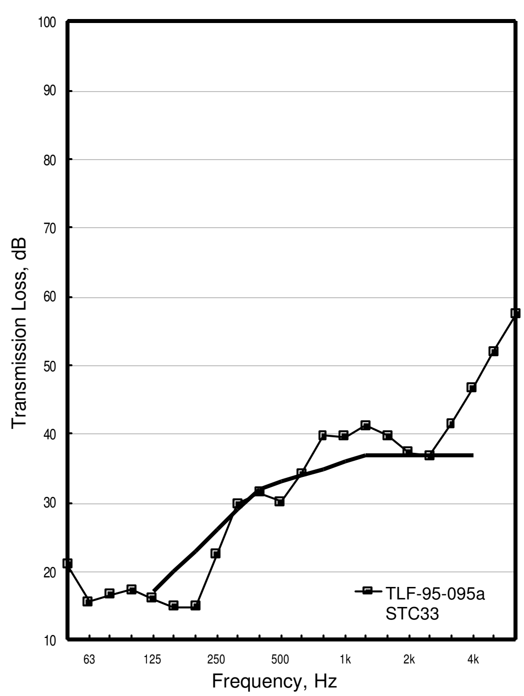
TLF-95-095a
IIF-95-035
OSB15_WJ235(406)_G16

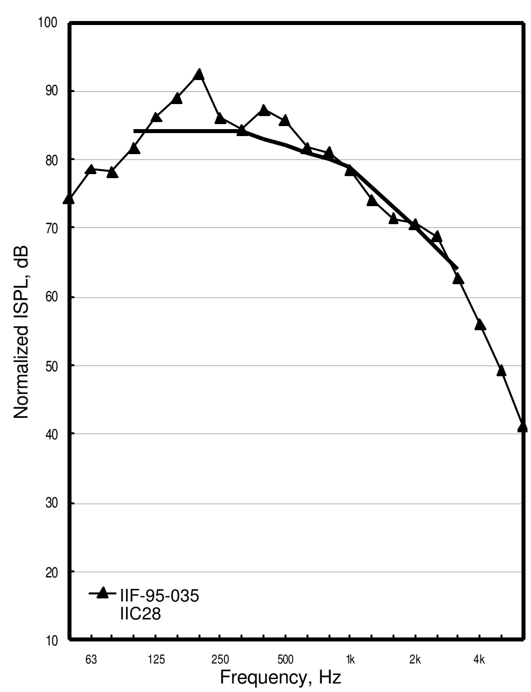
Freq. Hz	TLF-95-095a	IIF-95-035
50	21	74
63	16	79
80	17	78
100	17	82
125	16	86
160	15	89
200	15	92
250	23	86
315	30	84
400	31	87
500	30	86
630	34	82
800	40	81
1000	40	78
1250	41	74
1600	40	71
2000	37	71
2500	37	69
3150	42	63
4000	47	56
5000	52	49
6300	57	41
STC/IIC	33	28
$R_w/L_{n,w}$	34	82

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Gypsum board	1	16	

	Mass, kg	
Frame	222.2	
Floor layers	191.6	9.5 kg/m^2
Ceiling layers	205.6	11.6 kg/m^2

Type X gypsum board perpendicular to joists. Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





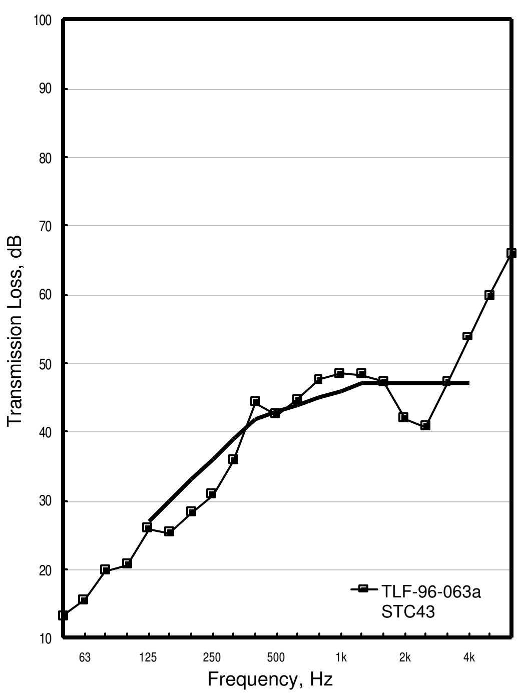
TLF-96-063a
IIF-96-019
OSB15_WJ235(406)_RC13(610)_G16

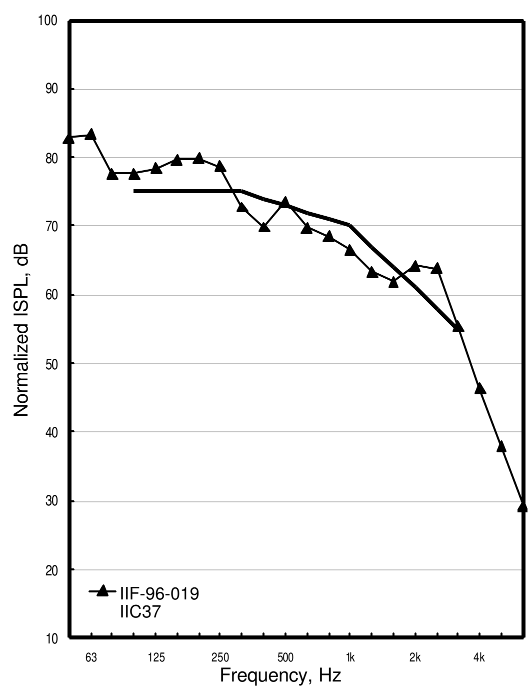
Freq. Hz	TLF-96-063a	IIF-96-019
50	13	83
63	16	83
80	20	78
100	21	78
125	26	78
160	25	80
200	28	80
250	31	79
315	36	73
400	44	70
500	43	74
630	45	70
800	48	68
1000	48	66
1250	48	63
1600	47	62
2000	42	64
2500	41	64
3150	47	56
4000	54	46
5000	60	38
6300	66	29
STC/IIC	43	37
$R_w/L_{n,w}$	42	73

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	217.8	
Floor layers	182.8	9.1 kg/m^2
Ceiling layers	200.0	11.2 kg/m^2

Type X gypsum, perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





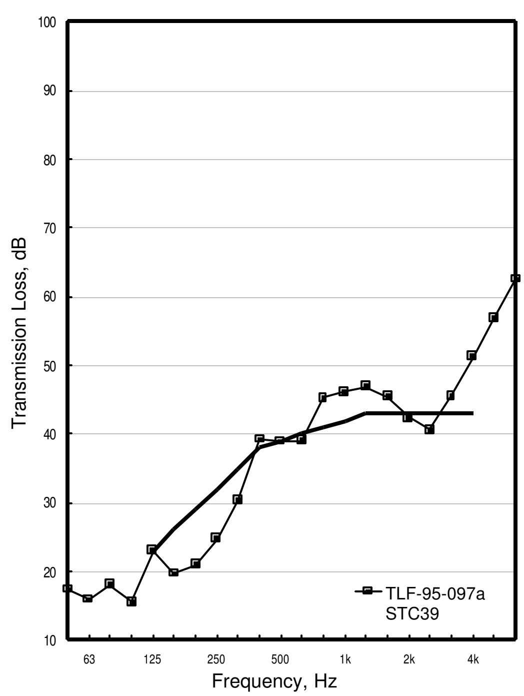
TLF-95-097a
IIF-95-036
OSB15_WJ235(406)_WFUR19(610)_G16

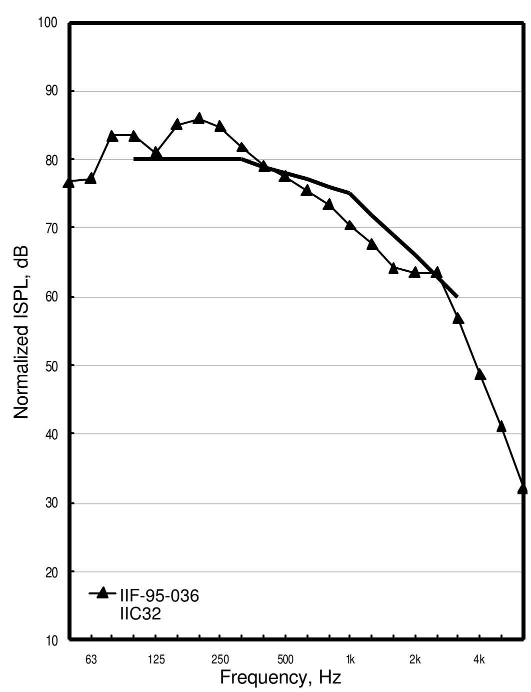
Freq. Hz	TLF-95-097a	IIF-95-036
50	17	77
63	16	77
80	18	83
100	16	84
125	23	81
160	20	85
200	21	86
250	25	85
315	30	82
400	39	79
500	39	78
630	39	75
800	45	73
1000	46	70
1250	47	68
1600	45	64
2000	42	63
2500	41	64
3150	46	57
4000	51	49
5000	57	41
6300	63	32
STC/IIC	39	32
$R_w/L_{n,w}$	38	77

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
wood furring strips		19	610
Gypsum board	1	16	

	Mass, kg	
Frame	232.2	
Floor layers	191.6	9.5 kg/m^2
Ceiling layers	205.2	11.5 kg/m^2

No cross-bridging, no RC. 19 x 64 mm wood furring strips, 610 o.c. Type X gypsum board perpendicular to furring strips. Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field.





Group 8: Solid Wood Joists: Varying ceiling supports, absorption in cavity

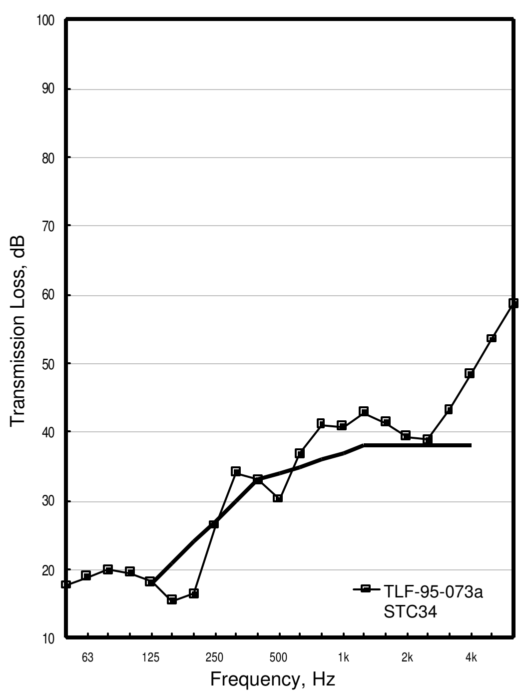
TLF-95-073a
IIF-95-024
OSB15_WJ235(406)_GFB152_G16

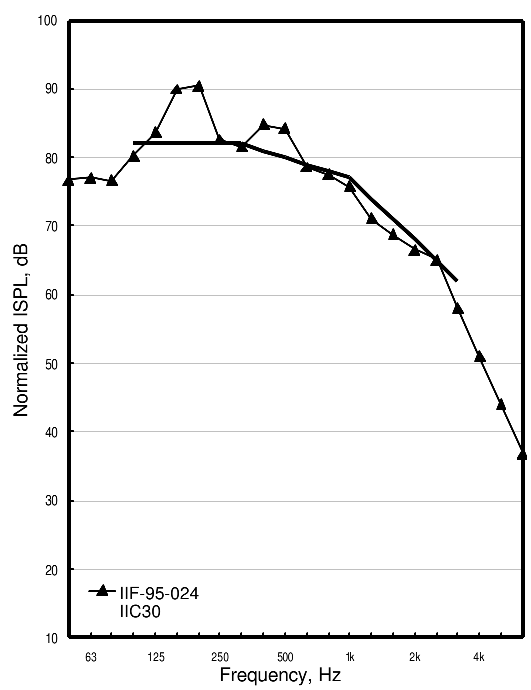
Freq. Hz	TLF-95-073a	IIF-95-024
50	18	77
63	19	77
80	20	77
100	20	80
125	18	84
160	15	90
200	16	90
250	26	83
315	34	82
400	33	85
500	30	84
630	37	79
800	41	78
1000	41	76
1250	43	71
1600	41	69
2000	39	67
2500	39	65
3150	43	58
4000	48	51
5000	53	44
6300	59	37
STC/IIC	34	30
$R_w/L_{n,w}$	35	80

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Gypsum board	1	16	

	Mass, kg	
Frame	235.3	
Floor layers	194.9	9.7 kg/m^2
Ceiling layers	203.0	11.4 kg/m^2

Type X gypsum board perpendicular to joists, screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





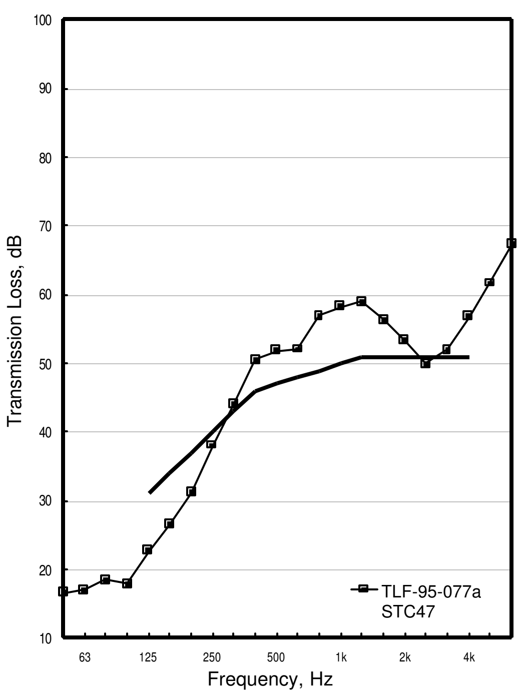
TLF-95-077a
IIF-95-026
OSB15_WJ235(406)_GFB152_RC13(200)_G16

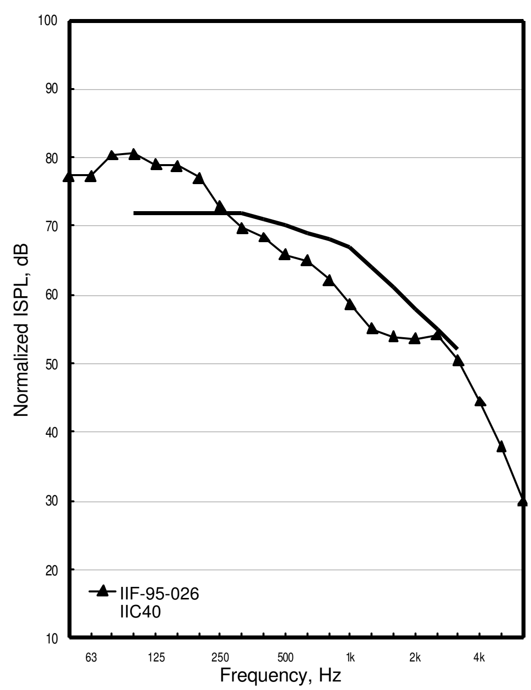
Freq. Hz	TLF-95-077a	IIF-95-026
50	17	77
63	17	77
80	18	80
100	18	80
125	23	79
160	26	79
200	31	77
250	38	73
315	44	70
400	51	68
500	52	66
630	52	65
800	57	62
1000	58	59
1250	59	55
1600	56	54
2000	53	54
2500	50	54
3150	52	50
4000	57	44
5000	62	38
6300	67	30
STC/IIC	47	40
$R_w/L_{n,w}$	46	70

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	200
Gypsum board	1	16	

	Mass, kg	
Frame	235.3	
Floor layers	194.9	9.7 kg/m^2
Ceiling layers	200.1	11.2 kg/m^2

Type X gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





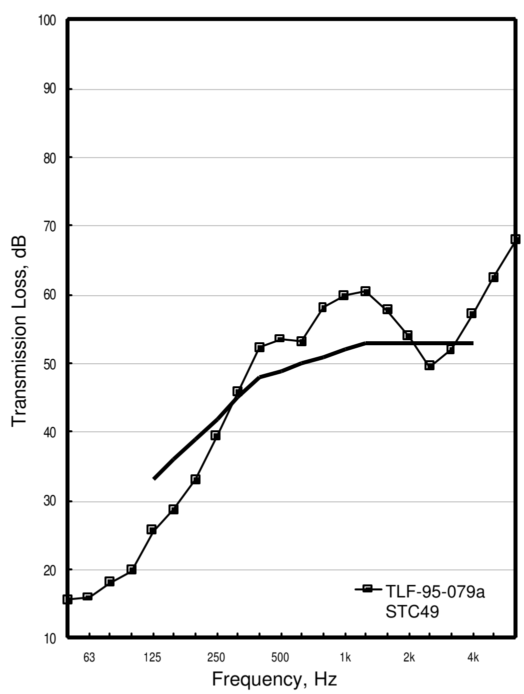
TLF-95-079a
IIF-95-027
OSB15_WJ235(406)_GFB152_RC13(305)_G16

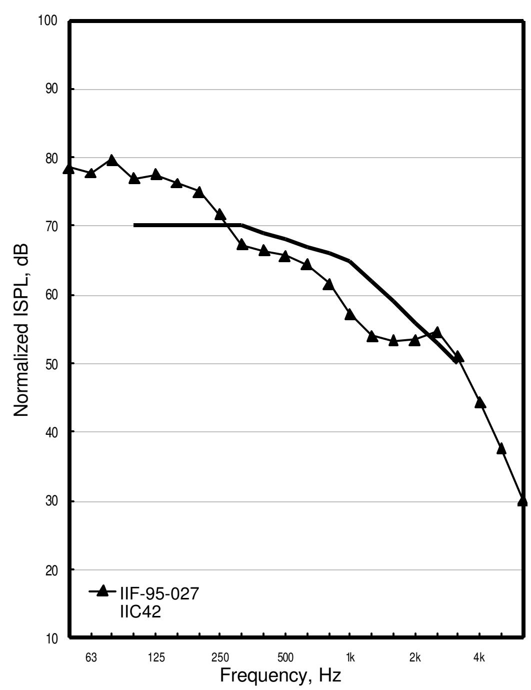
Freq. Hz	TLF-95-079a	IIF-95-027
50	16	79
63	16	78
80	18	80
100	20	77
125	26	78
160	29	76
200	33	75
250	39	72
315	46	67
400	52	66
500	53	66
630	53	64
800	58	62
1000	60	57
1250	60	54
1600	58	53
2000	54	53
2500	49	55
3150	52	51
4000	57	44
5000	62	38
6300	68	30
STC/IIC	49	42
$R_w/L_{n,w}$	48	68

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	305
Gypsum board	1	16	

	Mass, kg	
Frame	235.3	
Floor layers	194.9	9.7 kg/m^2
Ceiling layers	201.9	11.3 kg/m^2

RC 305 o.c. Type X gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





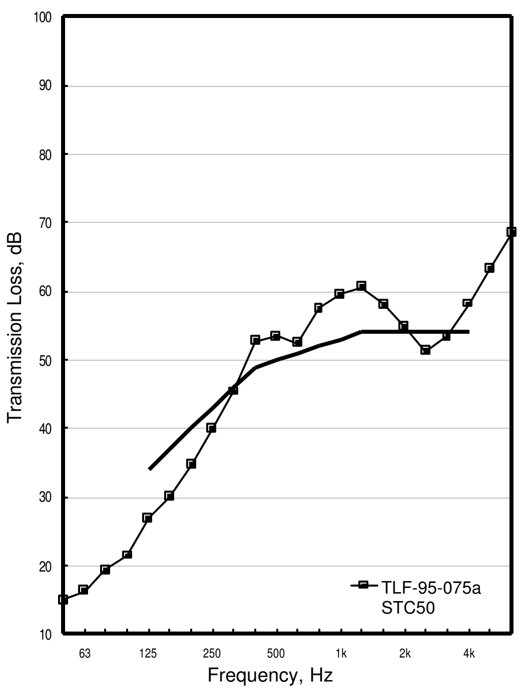
TLF-95-075a
IIF-95-025
OSB15_WJ235(406)_GFB152_RC13(406)_G16

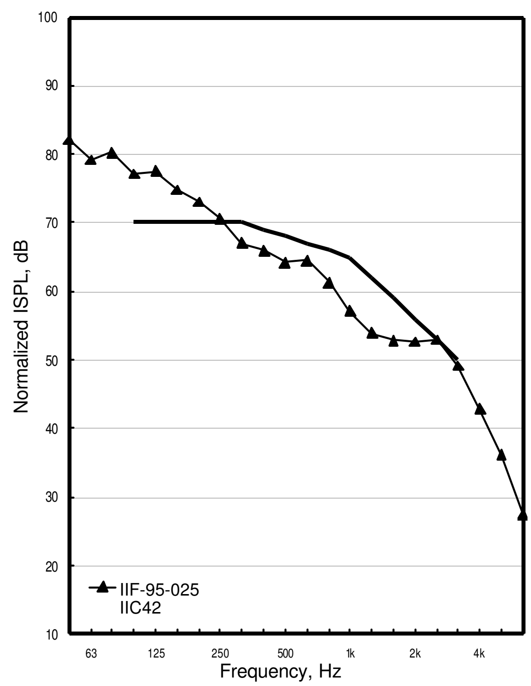
Freq. Hz	TLF-95-075a	IIF-95-025
50	15	82
63	16	79
80	19	80
100	21	77
125	27	78
160	30	75
200	35	73
250	40	71
315	45	67
400	53	66
500	53	64
630	52	65
800	57	61
1000	60	57
1250	61	54
1600	58	53
2000	55	53
2500	51	53
3150	53	49
4000	58	43
5000	63	36
6300	68	27
STC/IIC	50	42
$R_w/L_{n,w}$	49	67

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	406
Gypsum board	1	16	

	Mass, kg	
Frame	235.3	
Floor layers	194.9	9.7 kg/m^2
Ceiling layers	200.1	11.2 kg/m^2

Type X gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





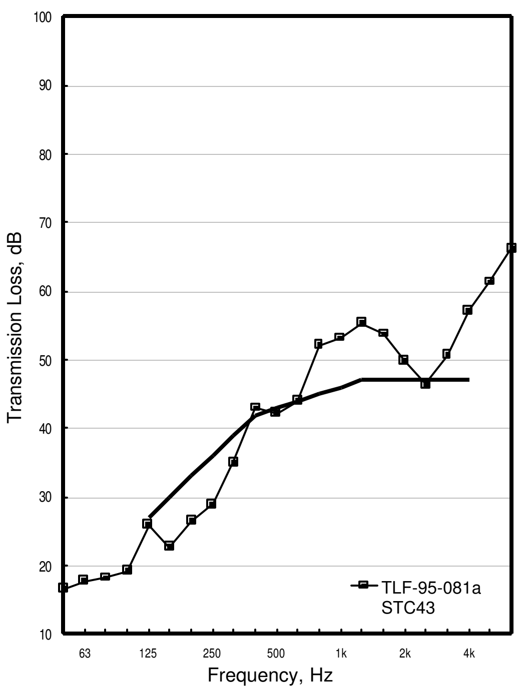
TLF-95-081a
IIF-95-028
OSB15_WJ235(406)_GFB152_UC22(610)_G16

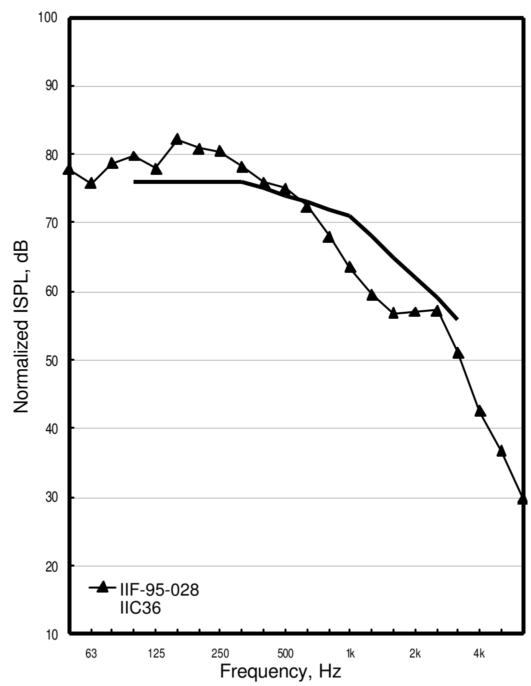
Freq. Hz	TLF-95-081a	IIF-95-028
50	17	78
63	18	76
80	18	79
100	19	80
125	26	78
160	23	82
200	27	81
250	29	80
315	35	78
400	43	76
500	42	75
630	44	72
800	52	68
1000	53	63
1250	55	60
1600	54	57
2000	50	57
2500	46	57
3150	51	51
4000	57	43
5000	61	37
6300	66	30
STC/IIC	43	36
$R_w/L_{n,w}$	42	74

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
U-channels		22	610
Gypsum board	1	16	

	Mass, kg	
Frame	235.3	
Floor layers	194.9	9.7 kg/m^2
Ceiling layers	201.9	11.3 kg/m^2

Metal U-channel 610 o.c. Type X gypsum board perpendicular to "U" channels, screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





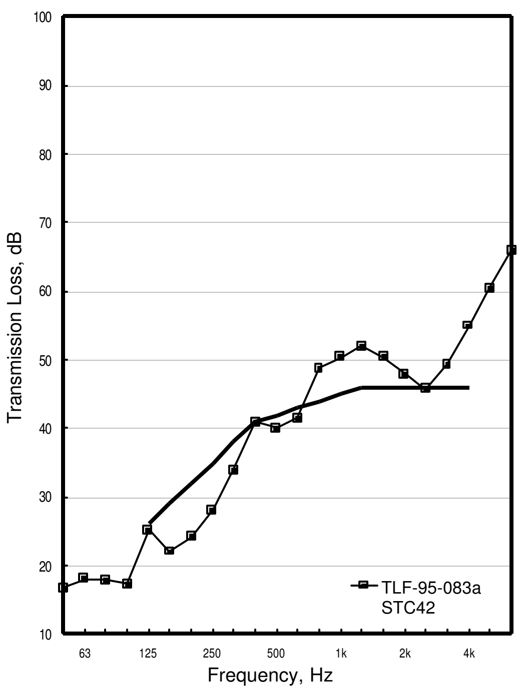
TLF-95-083a
IIF-95-029
OSB15_WJ235(406)_GFB152_WFUR19(610)_G16

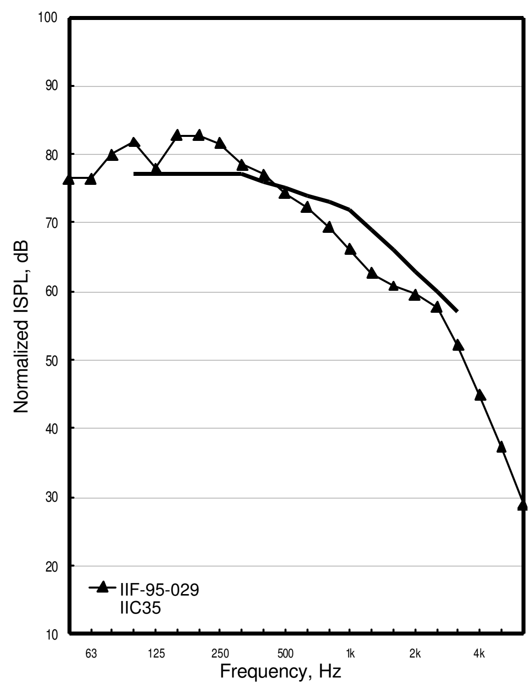
Freq. Hz	TLF-95-083a	IIF-95-029
50	17	76
63	18	76
80	18	80
100	17	82
125	25	78
160	22	83
200	24	83
250	28	82
315	34	79
400	41	77
500	40	74
630	42	72
800	49	69
1000	50	66
1250	52	63
1600	50	61
2000	48	59
2500	46	58
3150	49	52
4000	55	45
5000	60	37
6300	66	29
STC/IIC	42	35
$R_w/L_{n,w}$	41	74

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
wood furring strips		19	610
Gypsum board	1	16	

	Mass, kg	
Frame	235.3	
Floor layers	194.9	9.7 kg/m^2
Ceiling layers	201.9	11.3 kg/m^2

25 x 76 mm wood furring strips 610 o.c. Type X gypsum board perpendicular to wood furring strips. Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





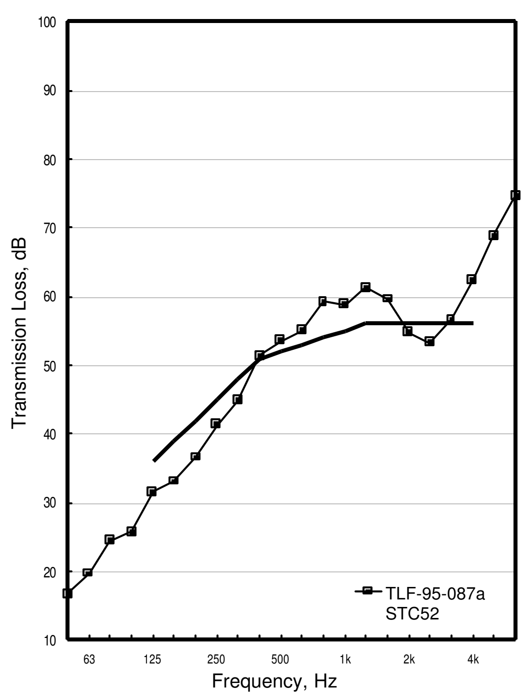
TLF-95-087a
IIF-95-031
OSB15_WJ235(406)_GFB152_WFUR19(610)_RC13(610)_G16

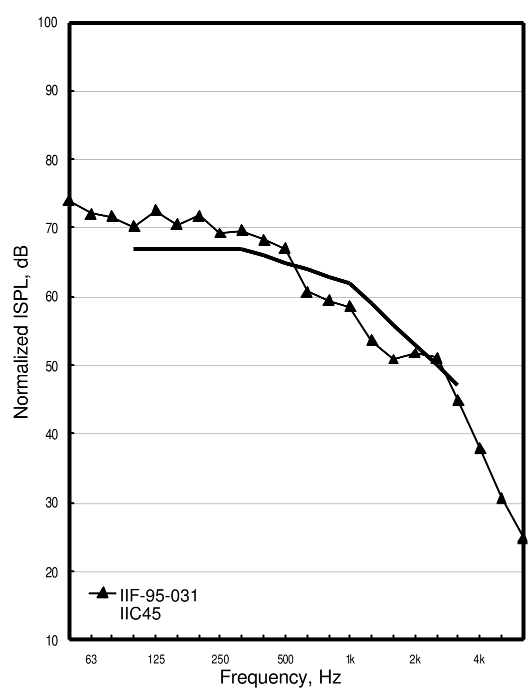
Freq. Hz	TLF-95-087a	IIF-95-031
50	17	74
63	20	72
80	25	72
100	26	70
125	32	73
160	33	70
200	37	72
250	41	69
315	45	70
400	51	68
500	54	67
630	55	61
800	59	59
1000	59	59
1250	61	54
1600	60	51
2000	55	52
2500	53	51
3150	57	45
4000	62	38
5000	69	31
6300	75	25
STC/IIC	52	45
$R_w/L_{n,w}$	51	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Wood furring strips		19	610
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	235.3	
Floor layers	194.9	9.7 kg/m^2
Ceiling layers	205.4	11.5 kg/m^2

25 x 76 mm wood furring strips, 610 o.c., perpendicular to joists. RC 610 o.c., perpendicular to wood furring. Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





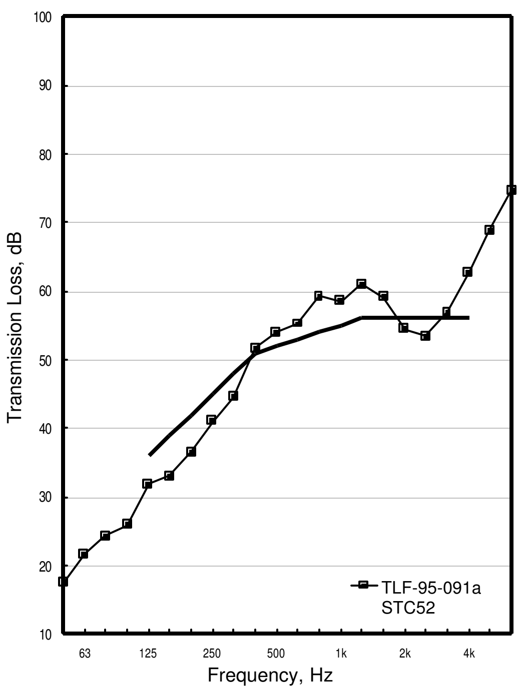
TLF-95-091a
IIF-95-033
OSB15_WJ235(406)_GFB152_WFUR19(610)_RC13(610)_G16

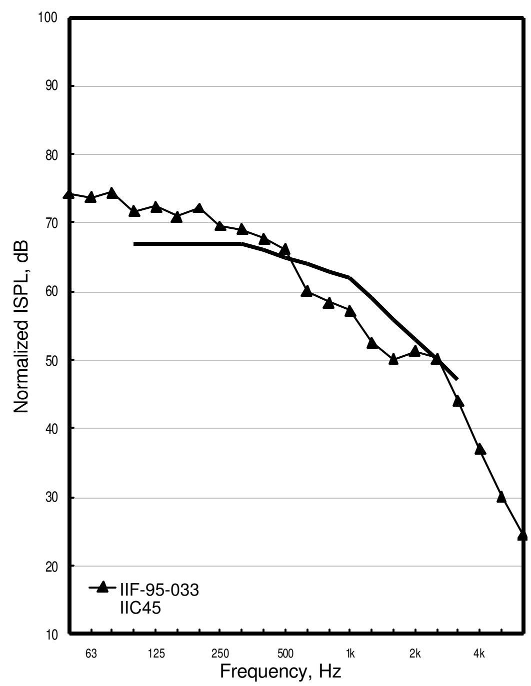
Freq. Hz	TLF-95-091a	IIF-95-033
50	17	74
63	22	74
80	24	74
100	26	72
125	32	72
160	33	71
200	37	72
250	41	70
315	45	69
400	52	68
500	54	66
630	55	60
800	59	58
1000	59	57
1250	61	53
1600	59	50
2000	54	51
2500	53	50
3150	57	44
4000	63	37
5000	69	30
6300	75	24
STC/IIC	52	45
$R_w/L_{n,w}$	52	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Wood furring strips		19	610
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	235.3	
Floor layers	194.9	9.7 kg/m^2
Ceiling layers	205.4	11.5 kg/m^2

No cross-bridging. 25 x 76 mm wood furring strips 610 o.c. perpendicular to joists. RC 610 o.c., perpendicular to wood furring strips. Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field.





Group 9: Solid Wood Joists: Alternative ceiling supports, absorption in cavity

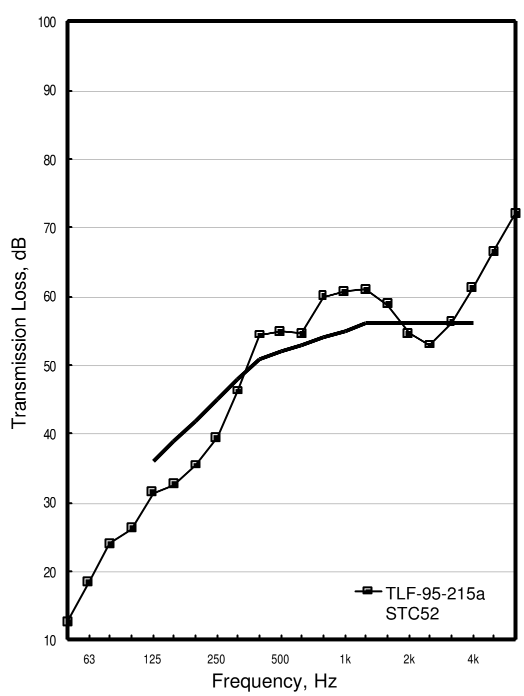
TLF-95-215a
IIF-95-075
OSB15_WJ286(406)_GFB152_RC13(610)_G16

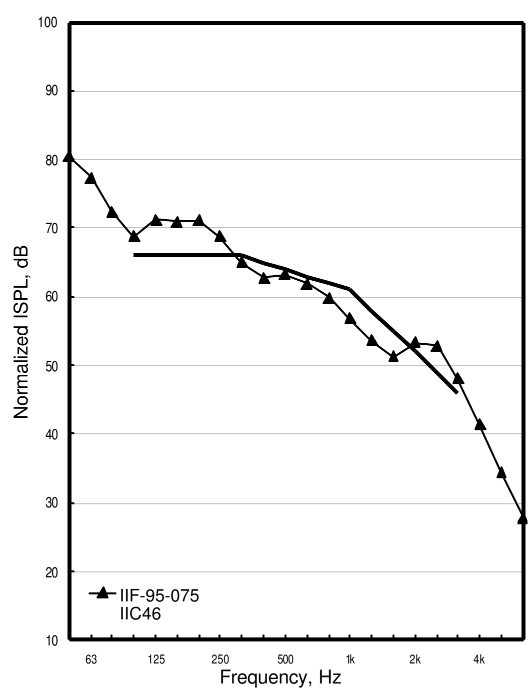
Freq. Hz	TLF-95-215a	IIF-95-075
50	13	80
63	18	77
80	24	72
100	26	69
125	31	71
160	33	71
200	35	71
250	39	69
315	46	65
400	54	63
500	55	63
630	55	62
800	60	60
1000	61	57
1250	61	54
1600	59	51
2000	55	53
2500	53	53
3150	56	48
4000	61	41
5000	67	34
6300	72	28
STC/IIC	52	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		286	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	271.0	
Floor layers	171.1	8.5 kg/m^2
Ceiling layers	201.5	11.3 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





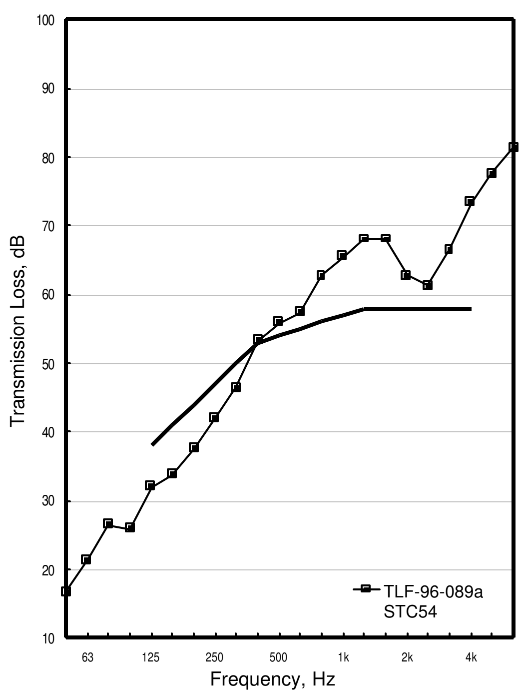
TLF-96-089a
IIF-96-038
OSB15_WJ235(406)_GFB152_wire_CC40(610)_UC25(610)_G16

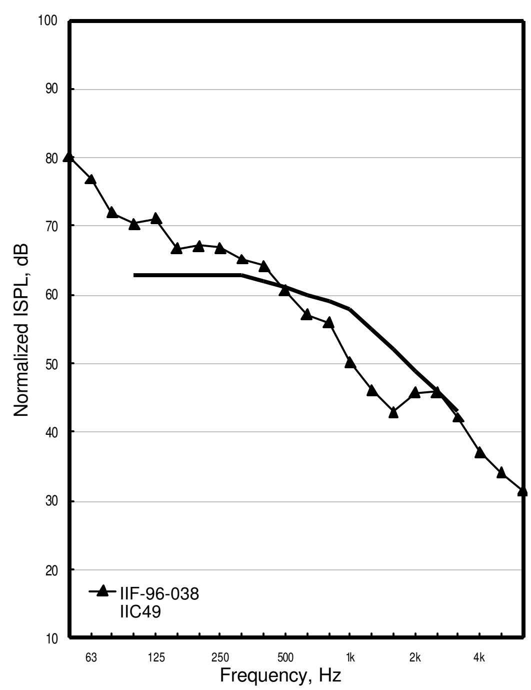
Freq. Hz	TLF-96-089a	IIF-96-038
50	17	80
63	21	77
80	26	72
100	26	70
125	32	71
160	34	67
200	38	67
250	42	67
315	46	65
400	53	64
500	56	61
630	57	57
800	63	56
1000	66	50
1250	68	46
1600	68	43
2000	63	46
2500	61	46
3150	67	42
4000	73	37
5000	78	34
6300	81	31
STC/IIC	54	49
$R_w/L_{n,w}$	53	61

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
wire			
C-channels		40	610
U-channels		25	610
Gypsum board	1	16	

	Mass, kg	
Frame	242.1	
Floor layers	181.8	9.0 kg/m^2
Ceiling layers	197.7	11.1 kg/m^2

12 gauge wire used to suspend C-channel from joists. Space between bottom of joists and top of C-channel is 6 mm. C-channel 610 o.c., perpendicular to joists. 25 mm U-channel attached to C-channel 610 o.c., perpendicular to C-channel. Type X gypsum board, perpendicular to U-channel. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





Group 10: Solid Wood Joists: Different floor coverings

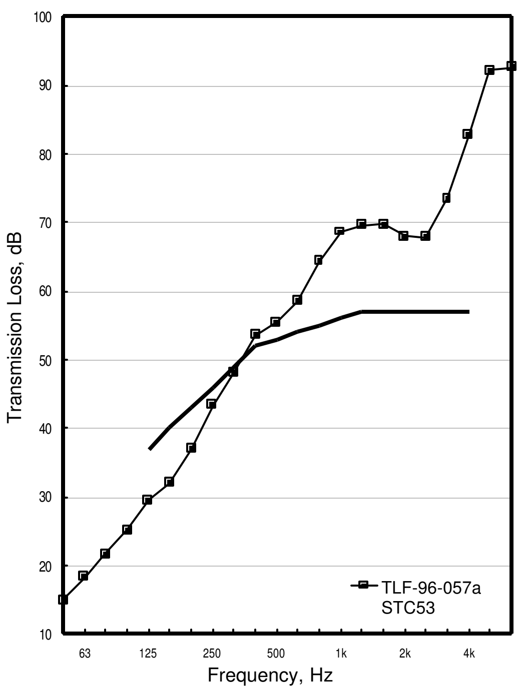
TLF-96-057a
IIF-96-016
CAR_FOMRUB9_OSB15_WJ235(406)_GFB152_RC13(610)_G16

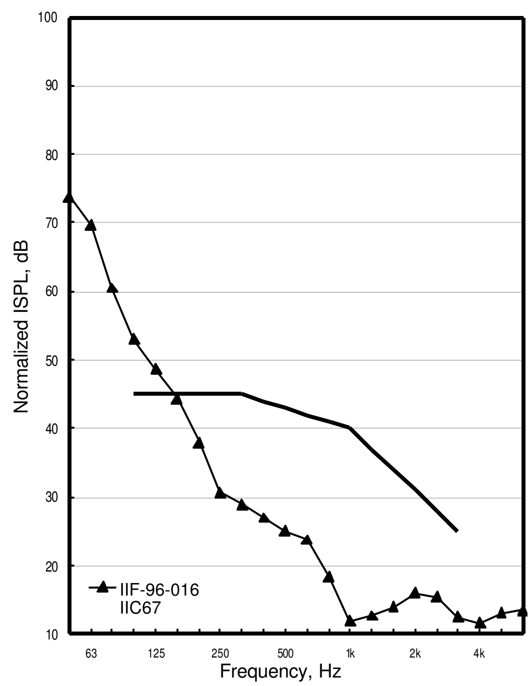
Freq. Hz	TLF-96-057a	IIF-96-016
50	15	74
63	18	70
80	22	60
100	25	53
125	30	49
160	32	44
200	37	38
250	43	31
315	48	29
400	54	27
500	55	25
630	59	24
800	64	18
1000	69	12
1250	70	13
1600	70	14
2000	68	16
2500	68	16
3150	73	13
4000	83	12
5000	92	13
6300	93	14
STC/IIC	53	67
$R_w/L_{n,w}$	52	37

Material	N	Thick.	Spac.
Carpet			
Underpad		9	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	217.8	
Floor layers	269.9	13.4 kg/m^2
Ceiling layers	200.0	11.2 kg/m^2

Type X gypsum board, perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. Carpet 6 mm , underlay 9 mm. One set of 19 x 64 cross bridging.





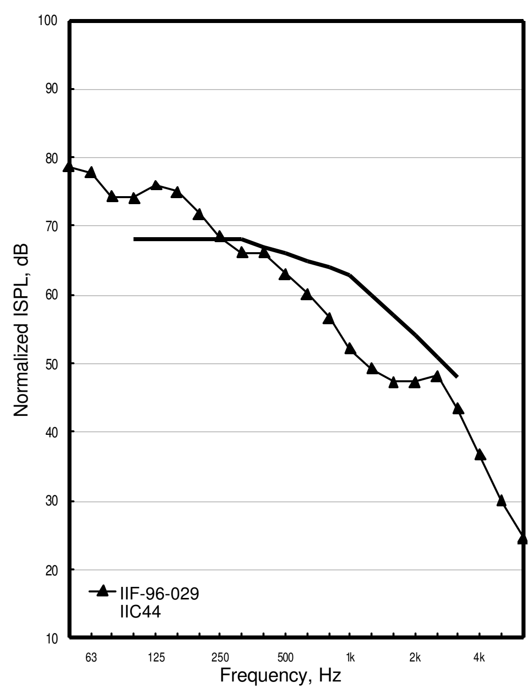
No Test
IIF-96-029
VIN1.2_OSB15_WJ235(406)_GFB152_RC13(610)_G16

Freq. Hz	No Test	IIF-96-029
50		79
63		78
80		74
100		74
125		76
160		75
200		72
250		69
315		66
400		66
500		63
630		60
800		57
1000		52
1250		49
1600		47
2000		47
2500		48
3150		43
4000		37
5000		30
6300		25
STC/IIC		44
$R_w/L_{n,w}$		65

Material	N	Thick.	Spac.
1.2 mm vinyl			
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	217.8	
Floor layers	269.9	13.4 kg/m^2
Ceiling layers	200.0	11.2 kg/m^2

Inexpensive vinyl glued to center part of floor.



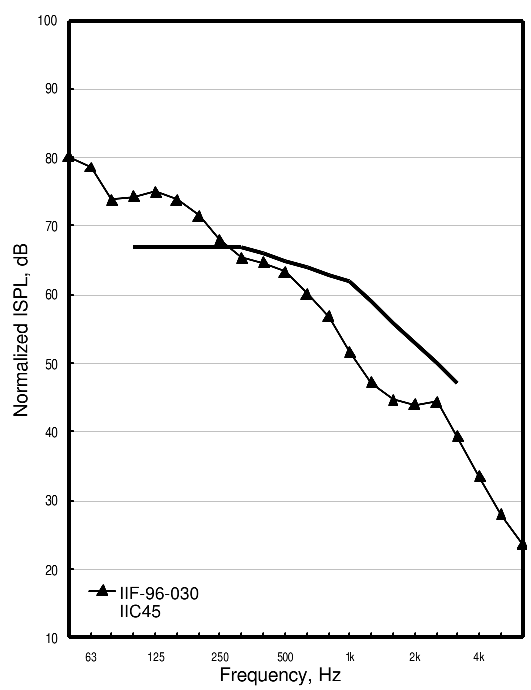
No Test
IIF-96-030
VIN1.9_OSB15_WJ235(406)_GFB152_RC13(610)_G16

Freq. Hz	No Test	IIF-96-030
50		80
63		79
80		74
100		74
125		75
160		74
200		72
250		68
315		65
400		65
500		63
630		60
800		57
1000		52
1250		47
1600		45
2000		44
2500		44
3150		39
4000		34
5000		28
6300		24
STC/IIC		45
$R_w/L_{n,w}$		65

Material	N	Thick.	Spac.
1.9 mm vinyl			
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	217.8	
Floor layers	269.9	13.4 kg/m^2
Ceiling layers	200.0	11.2 kg/m^2

Expensive vinyl glued to center part of floor.



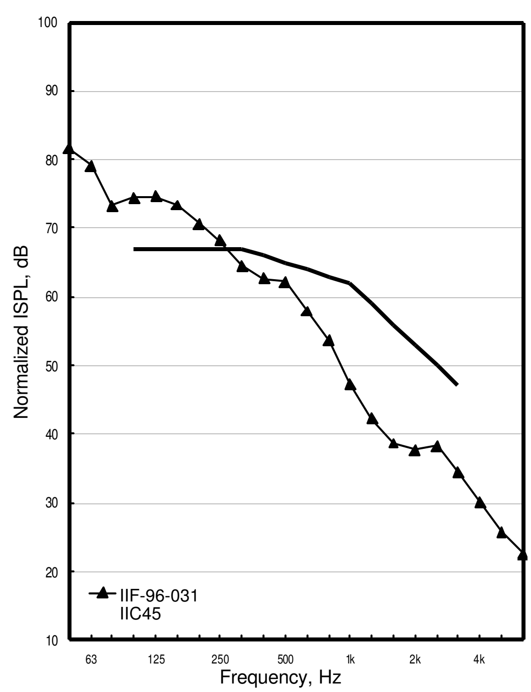
No Test
IIF-96-031
VIN1.2_OSB15_WJ235(406)_GFB152_RC13(610)_G16

Freq. Hz	No Test	IIF-96-031
50		82
63		79
80		73
100		74
125		75
160		73
200		71
250		68
315		65
400		63
500		62
630		58
800		54
1000		47
1250		42
1600		39
2000		38
2500		38
3150		35
4000		30
5000		26
6300		23
STC/IIC		45
$R_w/L_{n,w}$		64

Material	N	Thick.	Spac.
1.2 mm vinyl			
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	217.8	
Floor layers	269.9	13.4 kg/m^2
Ceiling layers	200.0	11.2 kg/m^2

Medium-priced vinyl glued to center part of floor.



Group 11: Solid Wood Joists: 35 mm concrete topping with varying ceilings and cavity fillings

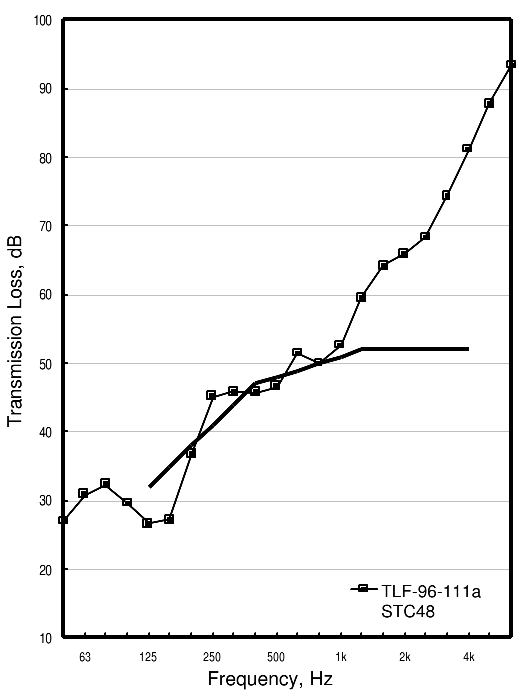
TLF-96-111a
IIF-96-049
CON35_OSB15_WJ235(406)_GFB152_G16

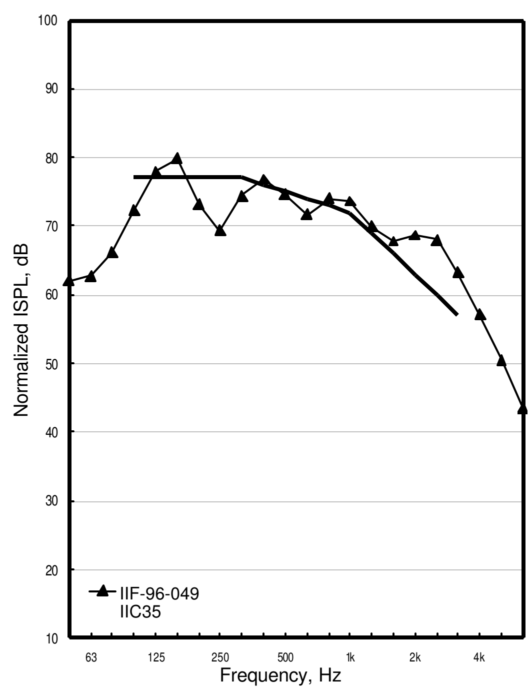
Freq. Hz	TLF-96-111a	IIF-96-049
50	27	62
63	31	63
80	32	66
100	30	72
125	27	78
160	27	80
200	37	73
250	45	69
315	46	74
400	46	77
500	47	75
630	51	72
800	50	74
1000	53	74
1250	60	70
1600	64	68
2000	66	69
2500	68	68
3150	74	63
4000	81	57
5000	88	50
6300	93	43
STC/IIC	48	35
$R_w/L_{n,w}$	50	75

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Gypsum board	1	16	

	Mass, kg	
Frame	203.9	
Floor layers	1567.5	78 kg/m^2
Ceiling layers	205.2	11.5 kg/m^2

40 mm reference concrete slab placed on top of OSB subfloor. One set of 19 x 64 cross bridging. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





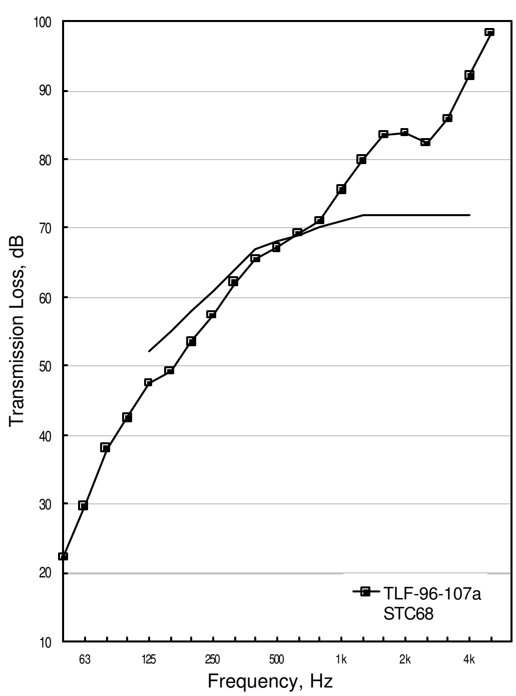
TLF-96-107a
IIF-96-047
CON35_OSB15_WJ235(406)_GFB152_RC13(610)_G16

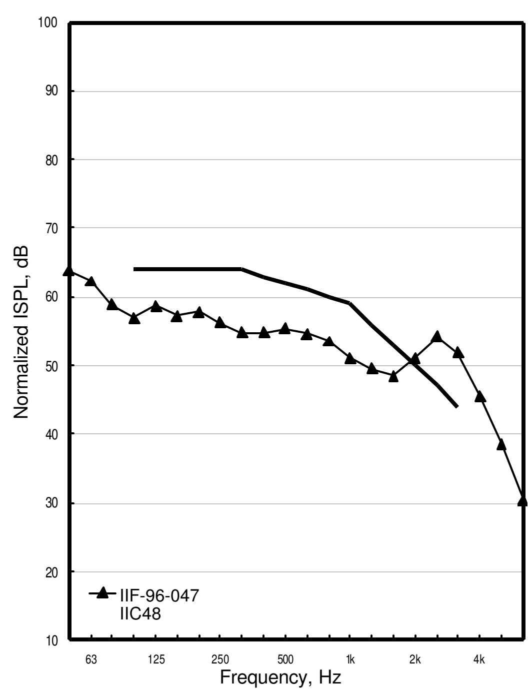
Freq. Hz	TLF-96-107a	IIF-96-047
50	22	64
63	30	62
80	38	59
100	42	57
125	47	59
160	49	57
200	53	58
250	57	56
315	62	55
400	65	55
500	67	55
630	69	55
800	71	54
1000	76	51
1250	80	50
1600	84	48
2000	84	51
2500	82	54
3150	86	52
4000	92	46
5000	98	39
6300		30
STC/IIC	68	48
$R_w/L_{n,w}$	68	57

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	203.9	
Floor layers	1567.5	78 kg/m^2
Ceiling layers	198.2	11.1 kg/m^2

40 mm reference concrete slab placed on top of OSB subfloor. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





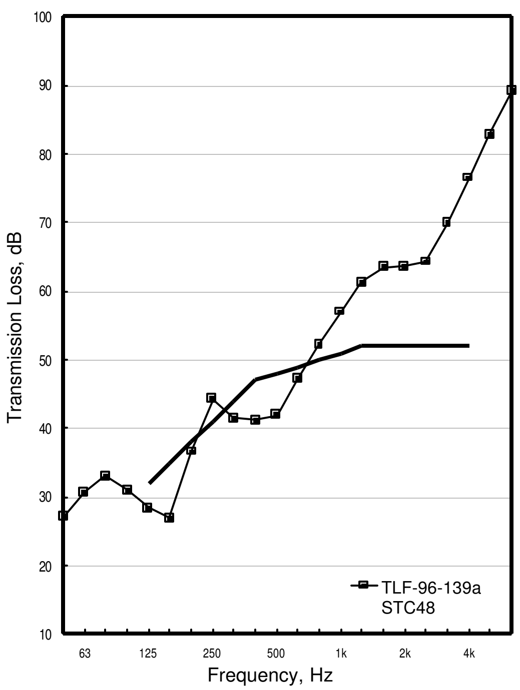
TLF-96-139a
IIF-96-061
CON35_OSB15_WJ235(406)_GFB152_G16

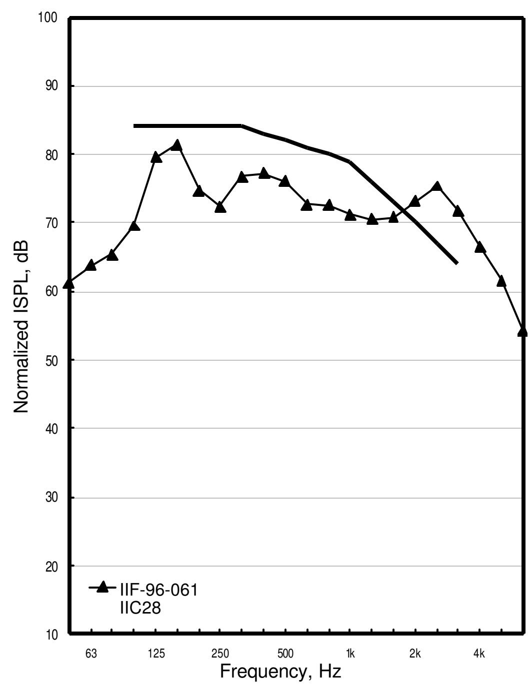
Freq. Hz	TLF-96-139a	IIF-96-061
50	27	61
63	31	64
80	33	65
100	31	70
125	28	80
160	27	81
200	37	75
250	44	72
315	42	77
400	41	77
500	42	76
630	47	73
800	52	73
1000	57	71
1250	61	70
1600	64	71
2000	64	73
2500	64	75
3150	70	72
4000	76	67
5000	83	62
6300	89	54
STC/IIC	48	28
$R_w/L_{n,w}$	48	79

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Gypsum board	1	16	

	Mass, kg	
Frame	203.9	
Floor layers	1863.9	92.7 kg/m^2
Ceiling layers	205.2	11.5 kg/m^2

Concrete curing time: 28 days. 40 mm regular concrete poured directly on top of OSB subfloor. Gypsum board screwed 305 o.c. OSB 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





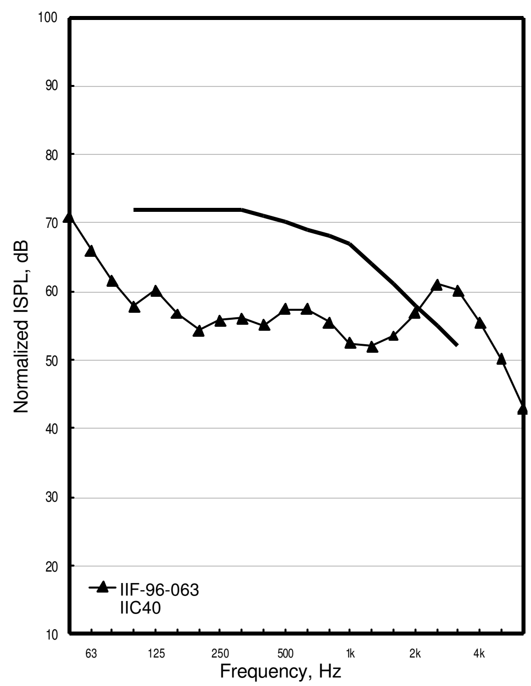
TLF-96-143a
IIF-96-063
CON35_OSB15_WJ235(406)_GFB152_RC13(610)_G16

Freq. Hz	TLF-96-143a	IIF-96-063
50	22	71
63	29	66
80	38	62
100	42	58
125	48	60
160	50	57
200	56	54
250	59	56
315	62	56
400	63	55
500	61	57
630	63	57
800	69	56
1000	75	52
1250	79	52
1600	80	54
2000	80	57
2500	78	61
3150	82	60
4000	87	56
5000	93	50
6300		43
STC/IIC	67	40
$R_w/L_{n,w}$	67	64

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	203.9	
Floor layers	1863.9	92.7 kg/m^2
Ceiling layers	198.5	11.2 kg/m^2

Concrete curing time: 33 days. 40 mm regular concrete poured directly on top of OSB subfloor. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.



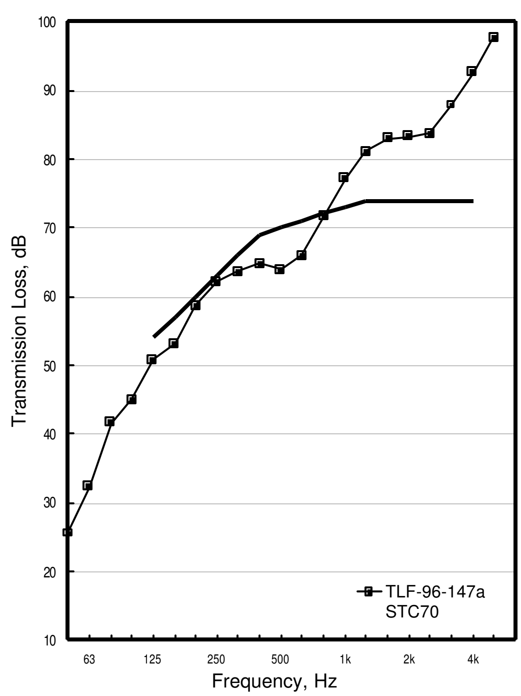
TLF-96-147a
IIF-96-065
CON35_OSB15_WJ235(406)_GFB152_RC13(610)_2G16

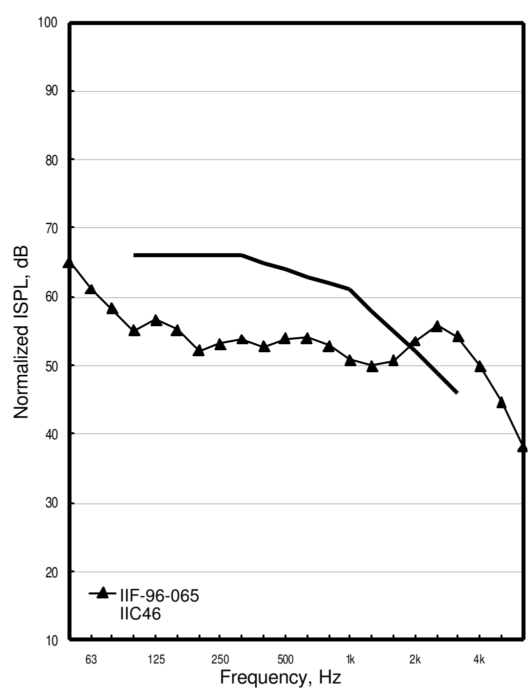
Freq. Hz	TLF-96-147a	IIF-96-065
50	26	65
63	32	61
80	42	58
100	45	55
125	51	57
160	53	55
200	59	52
250	62	53
315	64	54
400	65	53
500	64	54
630	66	54
800	72	53
1000	77	51
1250	81	50
1600	83	51
2000	83	54
2500	84	56
3150	88	54
4000	93	50
5000	98	45
6300		38
STC/IIC	70	46
$R_w/L_{n,w}$	70	60

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	2	16	

	Mass, kg	
Frame	203.9	
Floor layers	1863.9	92.7 kg/m^2
Ceiling layers	398.6	22.4 kg/m^2

Concrete curing time: 35 days. 40 mm regular concrete poured directly on top of OSB subfloor. Both layers of base and face layer joints staggered. Base layer gypsum board screwed 610 o.c., face layer screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





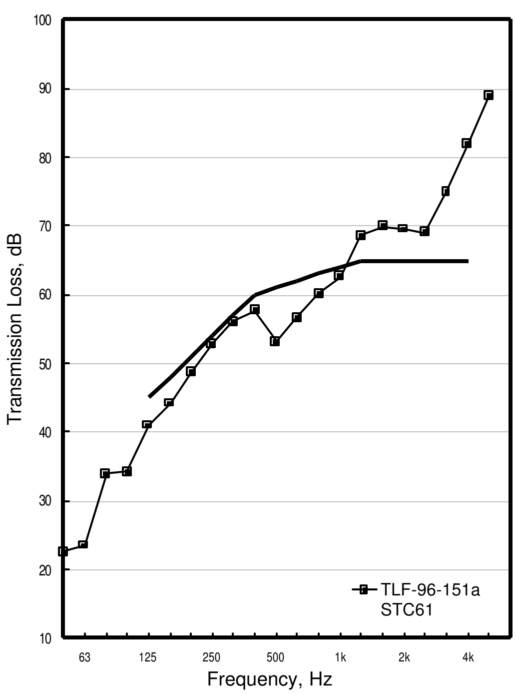
TLF-96-151a
IIF-96-067
CON35_OSB15_WJ235(406)_RC13(610)_G16

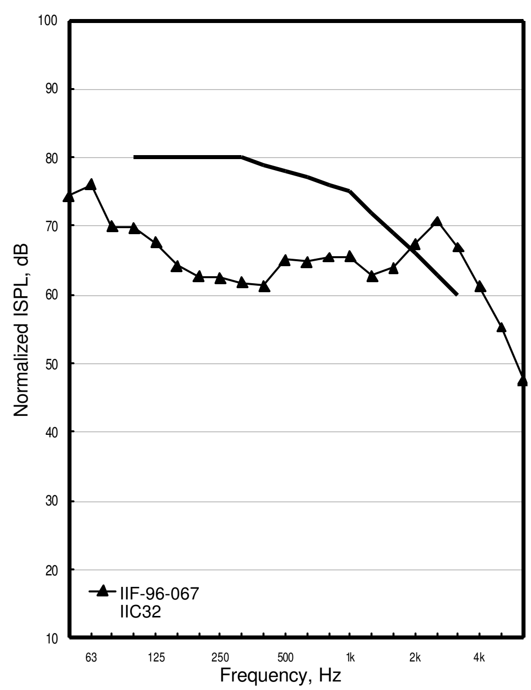
Freq. Hz	TLF-96-151a	IIF-96-067
50	23	74
63	24	76
80	34	70
100	34	70
125	41	68
160	44	64
200	49	63
250	53	62
315	56	62
400	58	61
500	53	65
630	57	65
800	60	65
1000	63	66
1250	69	63
1600	70	64
2000	70	67
2500	69	71
3150	75	67
4000	82	61
5000	89	55
6300		48
STC/IIC	61	32
$R_w/L_{n,w}$	60	73

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	203.9	
Floor layers	1863.9	92.7 kg/m^2
Ceiling layers	198.5	11.2 kg/m^2

Concrete curing time: 40 days. 40 mm regular concrete poured directly on top of OSB subfloor. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





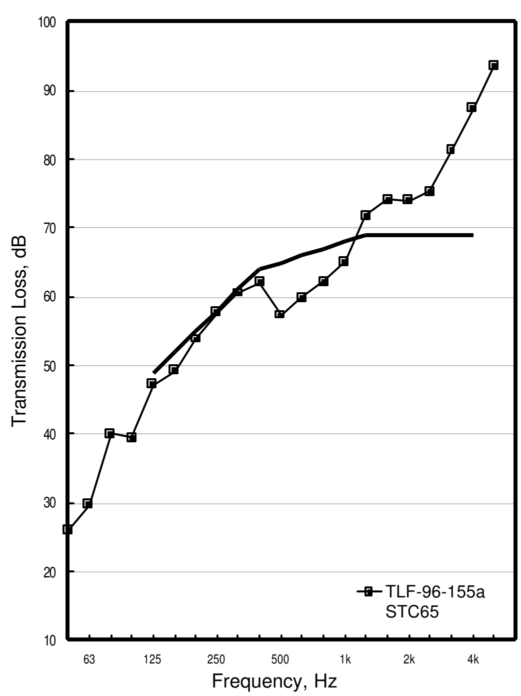
TLF-96-155a
IIF-96-068
CON35_OSB15_WJ235(406)_RC13(610)_2G16

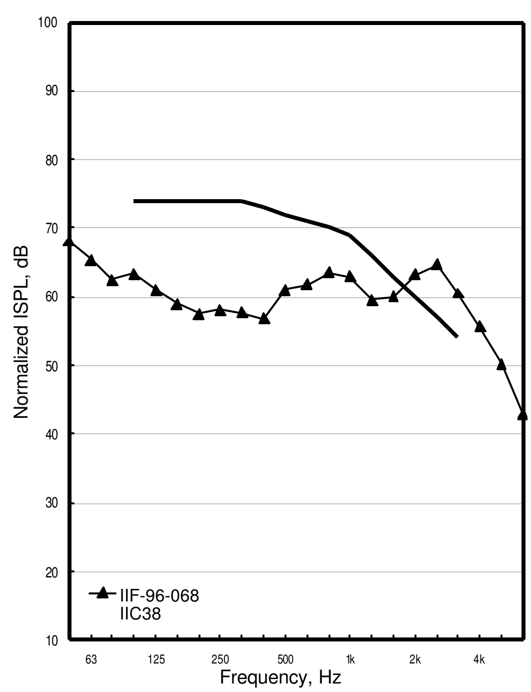
Freq. Hz	TLF-96-155a	IIF-96-068
50	26	68
63	30	65
80	40	63
100	39	63
125	47	61
160	49	59
200	54	57
250	58	58
315	60	58
400	62	57
500	57	61
630	60	62
800	62	63
1000	65	63
1250	72	60
1600	74	60
2000	74	63
2500	75	65
3150	81	61
4000	87	56
5000	94	50
6300		43
STC/IIC	65	38
$R_w/L_{n,w}$	64	68

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	2	16	

	Mass, kg	
Frame	203.9	
Floor layers	1863.9	92.7 kg/m^2
Ceiling layers	400.5	22.5 kg/m^2

Concrete curing time: 42 days. 40 mm regular concrete poured directly on top of OSB subfloor. 38 x 235 x 3924 mm joists. RCs 610 o.c. perpendicular to joists. Both layers of base & face layer joints staggered. Base layer gypsum board screwed 610 o.c., face layer screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





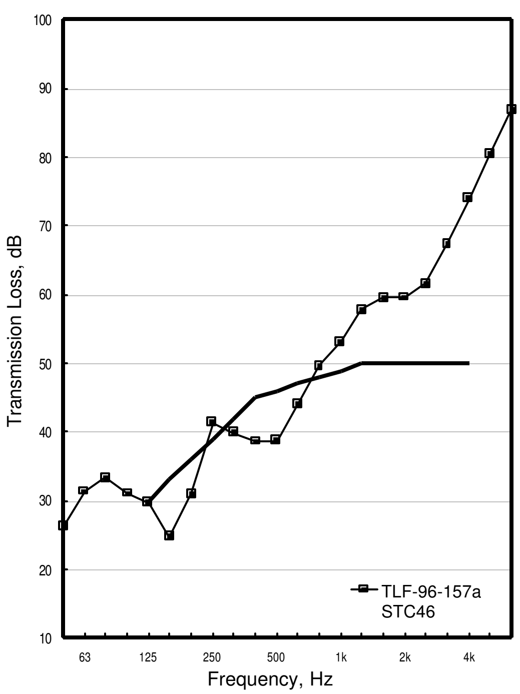
TLF-96-157a
IIF-96-069
CON35_OSB15_WJ235(406)_G16

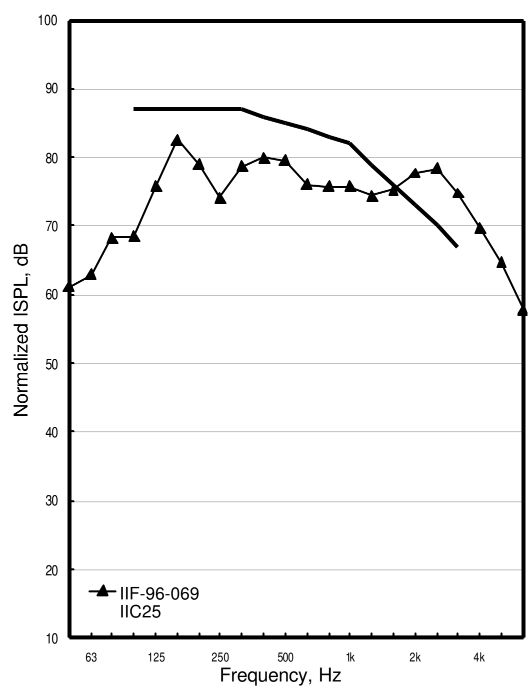
Freq. Hz	TLF-96-157a	IIF-96-069
50	26	61
63	31	63
80	33	68
100	31	69
125	30	76
160	25	83
200	31	79
250	41	74
315	40	79
400	39	80
500	39	80
630	44	76
800	50	76
1000	53	76
1250	58	74
1600	60	75
2000	60	78
2500	62	78
3150	67	75
4000	74	70
5000	80	65
6300	87	58
STC/IIC	46	25
$R_w/L_{n,w}$	46	83

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Gypsum board	1	16	

	Mass, kg	
Frame	203.9	
Floor layers	1863.9	92.7 kg/m^2
Ceiling layers	201.5	11.3 kg/m^2

Concrete curing time: 47 days. 40 mm regular concrete poured directly on top of OSB subfloor. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





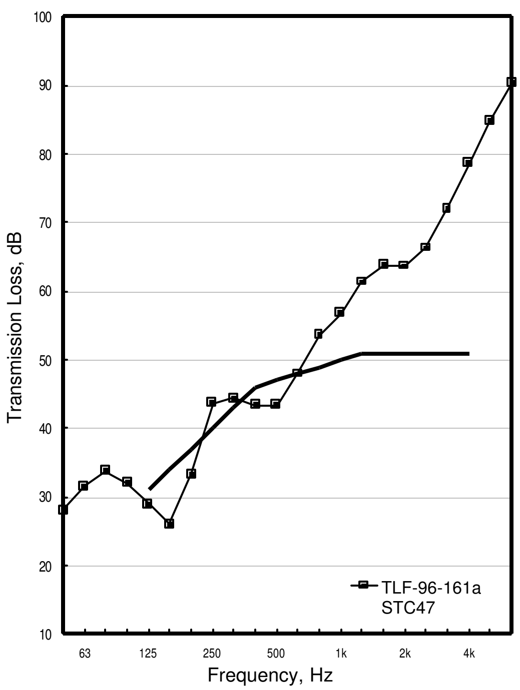
TLF-96-161a
IIF-96-071
CON35_OSB15_WJ235(406)_2G16

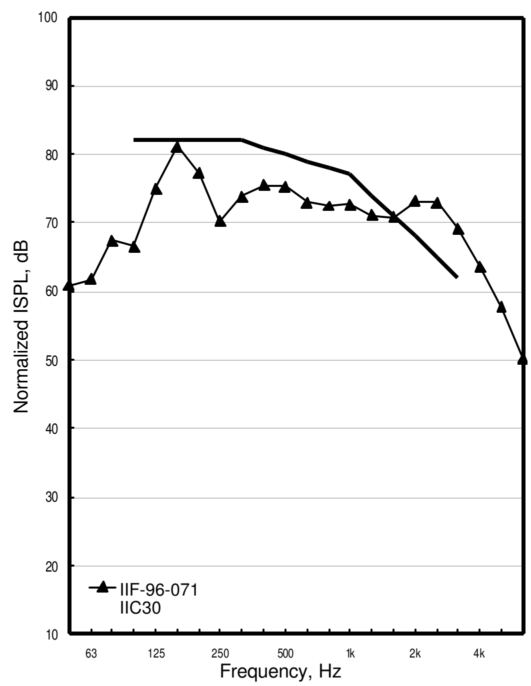
Freq. Hz	TLF-96-161a	IIF-96-071
50	28	61
63	32	62
80	34	67
100	32	67
125	29	75
160	26	81
200	33	77
250	44	70
315	44	74
400	43	76
500	43	75
630	48	73
800	54	72
1000	57	73
1250	61	71
1600	64	71
2000	64	73
2500	66	73
3150	72	69
4000	79	64
5000	85	58
6300	90	50
STC/IIC	47	30
$R_w/L_{n,w}$	48	78

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Gypsum board	2	16	

	Mass, kg	
Frame	203.9	
Floor layers	1863.9	92.7 kg/m^2
Ceiling layers	404.0	22.7 kg/m^2

Concrete curing time 54 days, 40 mm regular concrete poured directly on top of OSB subfloor. Both layers of base & face layer joints staggered. Base layer gypsum board screwed 610 o.c., face layer screwed 305 o.c. OSB screwed 150 o.c. around the edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





Group 12: Wood I-Joists: Different manufacturers, 240 mm depth

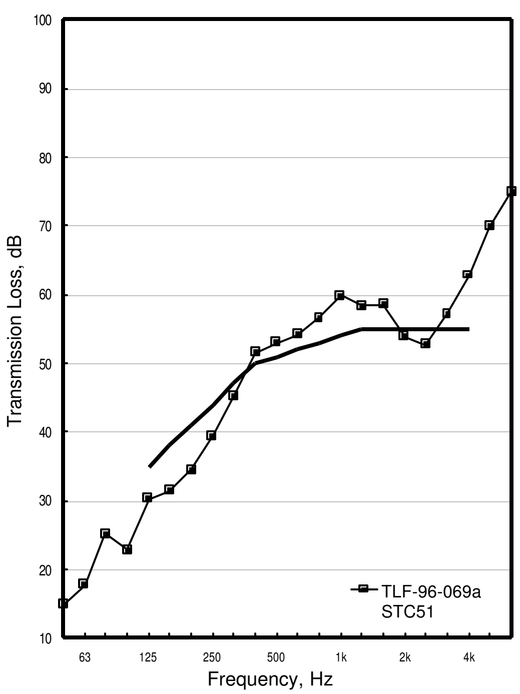
TLF-96-069a
IIF-96-022
OSB15_WI241(406)_GFB152_RC13(610)_G16

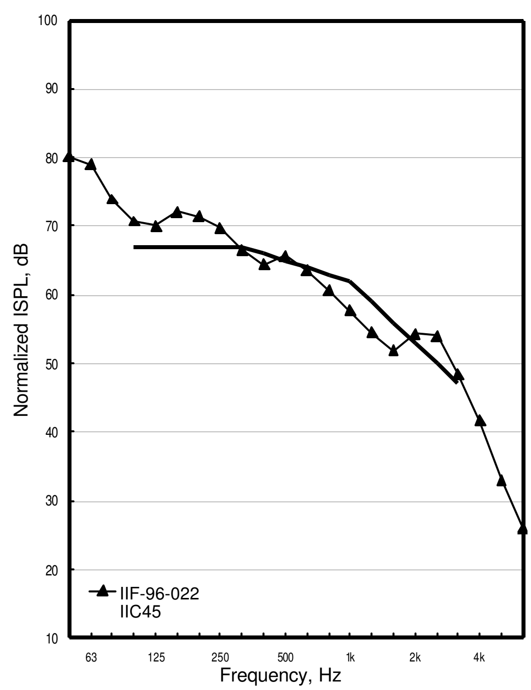
Freq. Hz	TLF-96-069a	IIF-96-022
50	15	80
63	18	79
80	25	74
100	23	71
125	30	70
160	31	72
200	35	71
250	39	70
315	45	67
400	52	64
500	53	66
630	54	63
800	57	61
1000	60	58
1250	58	54
1600	59	52
2000	54	54
2500	53	54
3150	57	48
4000	63	42
5000	70	33
6300	75	26
STC/IIC	51	45
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	202.9	
Floor layers	179.9	9.0 kg/m^2
Ceiling layers	196.8	11.1 kg/m^2

63.5 x 38 flange, 241 mm deep wood I-joists. 22 mm OSB rimboard used. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. Manufacturer A.





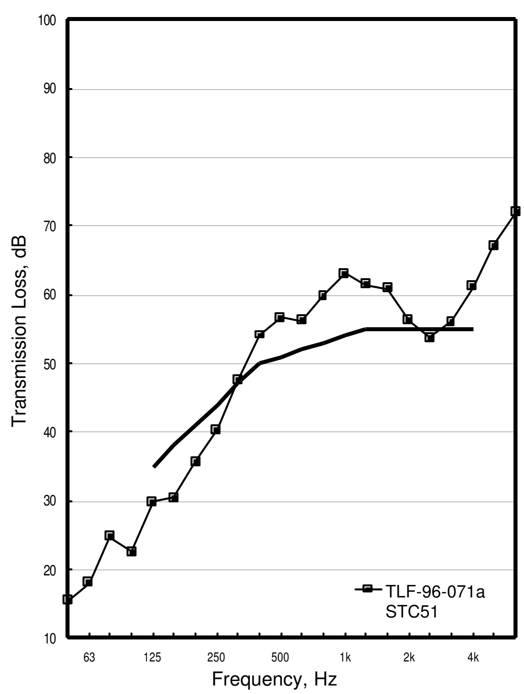
TLF-96-071a
IIF-96-023
OSB15_WI241(406)_GFB152_RC13(610)_G16

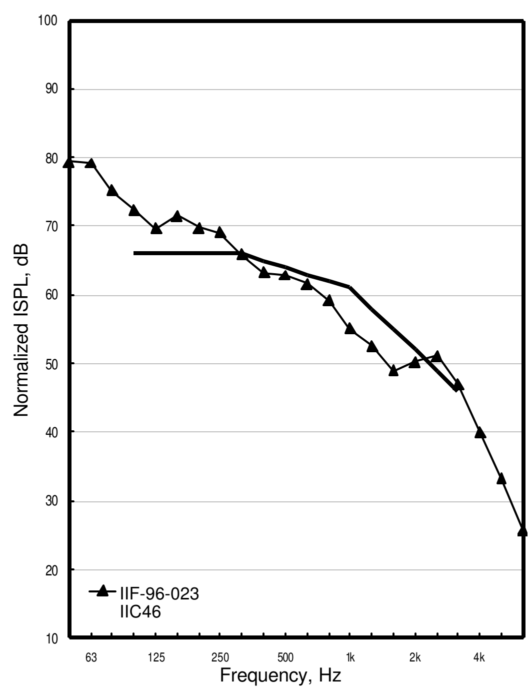
Freq. Hz	TLF-96-071a	IIF-96-023
50	15	79
63	18	79
80	25	75
100	23	72
125	30	70
160	30	71
200	36	70
250	40	69
315	47	66
400	54	63
500	57	63
630	56	62
800	60	59
1000	63	55
1250	61	53
1600	61	49
2000	56	50
2500	54	51
3150	56	47
4000	61	40
5000	67	33
6300	72	26
STC/IIC	51	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	189.8	
Floor layers	181.8	9.0 kg/m^2
Ceiling layers	198.8	11.2 kg/m^2

38 x 63.5 flange, 241 mm deep wood I-joists. 22 mm OSB rimboard used. Type X gypsum board, perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. Manufacturer A.





Group 13: Wood I-Joists: different joist depths

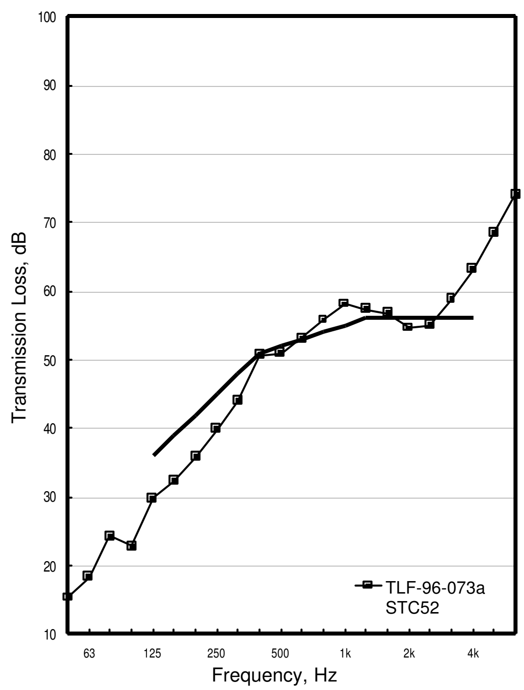
TLF-96-073a
IIF-96-024
OSB15_WI241(406)_GFB152_RC13(610)_G16

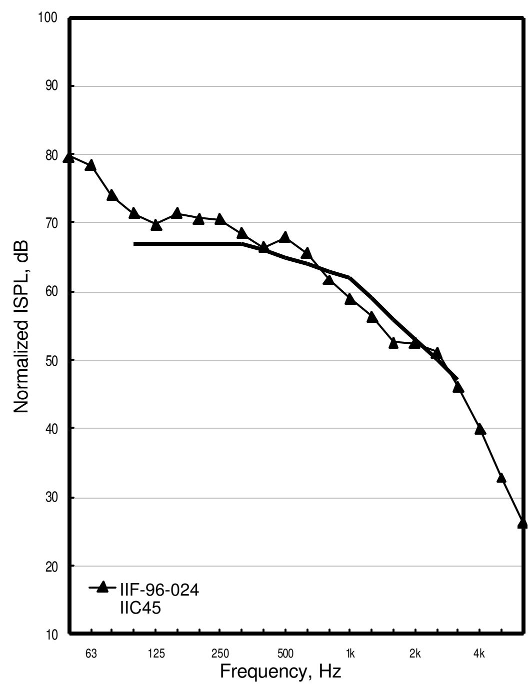
Freq. Hz	TLF-96-073a	IIF-96-024
50	15	80
63	18	78
80	24	74
100	23	71
125	30	70
160	32	71
200	36	71
250	40	71
315	44	69
400	51	66
500	51	68
630	53	66
800	56	62
1000	58	59
1250	57	56
1600	57	53
2000	55	52
2500	55	51
3150	59	46
4000	63	40
5000	68	33
6300	74	26
STC/IIC	52	45
$R_w/L_{n,w}$	51	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	251.9	
Floor layers	188.6	9.4 kg/m^2
Ceiling layers	198.2	11.1 kg/m^2

89 x 38 flange, 241 mm deep wood I-joists. 22 mm OSB rimboard used. Type X gypsum board, perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. Manufacturer A.





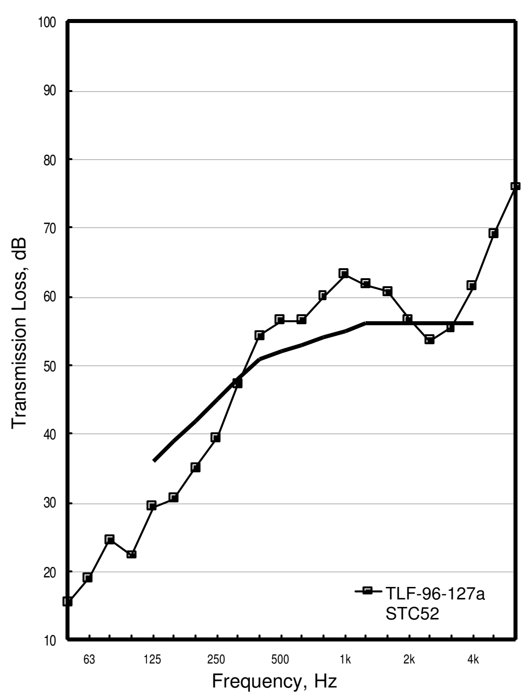
TLF-96-127a
IIF-96-055
OSB15_WI241(406)_GFB152_RC13(610)_G16

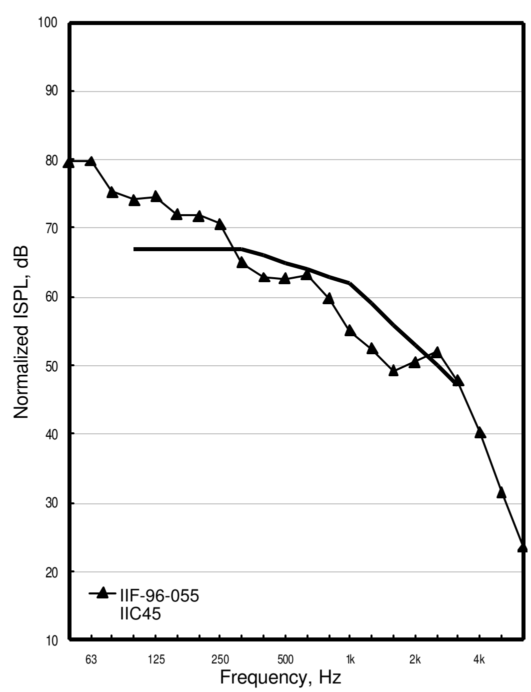
Freq. Hz	TLF-96-127a	IIF-96-055
50	15	80
63	19	80
80	25	75
100	22	74
125	29	75
160	31	72
200	35	72
250	40	71
315	47	65
400	54	63
500	57	63
630	57	63
800	60	60
1000	63	55
1250	62	52
1600	61	49
2000	57	51
2500	54	52
3150	56	48
4000	61	40
5000	69	32
6300	76	24
STC/IIC	52	45
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	200.6	
Floor layers	179.1	8.9 kg/m^2
Ceiling layers	181.1	10.2 kg/m^2

38 x 38 flange, 241 mm deep wood I-joists. 32 mm timberstrand rimboard used. Gypsum board screwed 305 o.c. 152 mm R20 glass fibre. OSB screwed 150 o.c. around edges, 305 o.c. in the field. Manufacturer B.





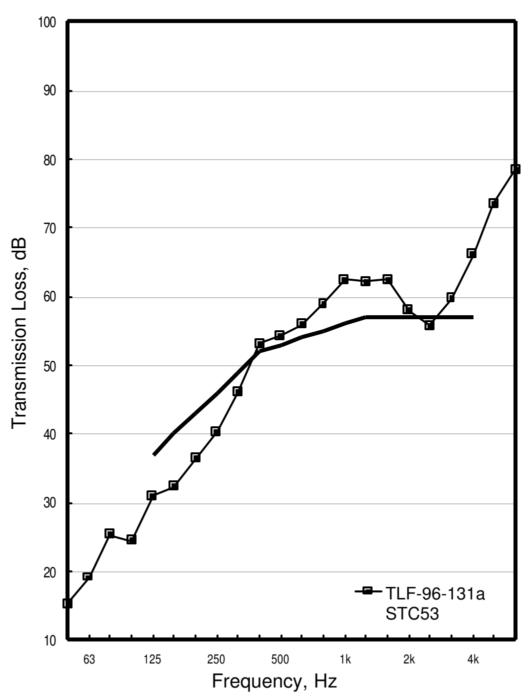
TLF-96-131a
IIF-96-057
OSB15_WI241(406)_GFB152_RC13(610)_G16

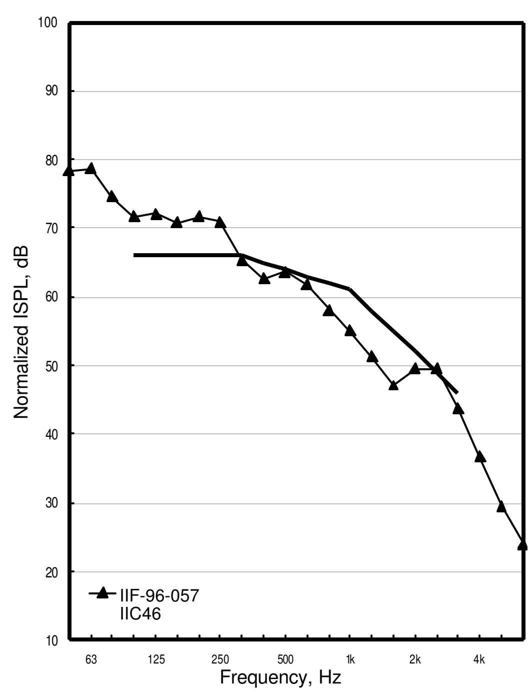
Freq. Hz	TLF-96-131a	IIF-96-057
50	15	78
63	19	79
80	25	75
100	24	72
125	31	72
160	32	71
200	36	72
250	40	71
315	46	65
400	53	63
500	54	64
630	56	62
800	59	58
1000	62	55
1250	62	51
1600	62	47
2000	58	50
2500	56	49
3150	60	44
4000	66	37
5000	74	30
6300	78	24
STC/IIC	53	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	252.3	
Floor layers	179.3	8.9 kg/m^2
Ceiling layers	204.3	11.5 kg/m^2

57 x 38 flange, 241 mm deep wood I-joists. 32 mm timberstrand rimboard used. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field.
Manufacturer B.





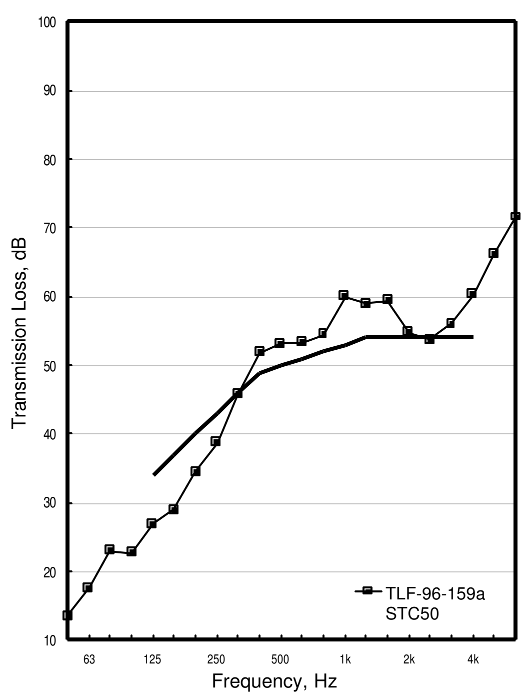
TLF-96-159a
IIF-96-070
OSB15_WI241(406)_GFB152_RC13(610)_G16

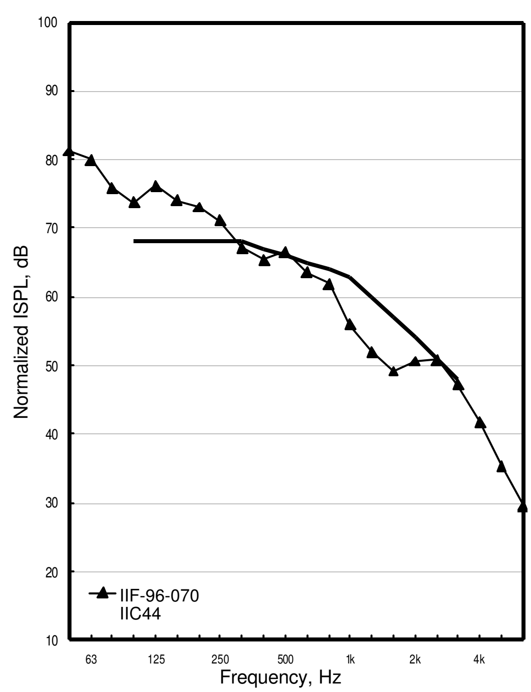
Freq. Hz	TLF-96-159a	IIF-96-070
50	14	81
63	18	80
80	23	76
100	23	74
125	27	76
160	29	74
200	34	73
250	39	71
315	46	67
400	52	65
500	53	67
630	53	64
800	55	62
1000	60	56
1250	59	52
1600	59	49
2000	55	51
2500	54	51
3150	56	47
4000	60	42
5000	66	35
6300	72	30
STC/IIC	50	44
$R_w/L_{n,w}$	50	66

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	163.2	
Floor layers	181.2	9.0 kg/m^2
Ceiling layers	200.7	11.3 kg/m^2

38 x 38 flange, 241 mm deep wood I-joists. 25 mm timberstrand rimboard used. RC 610 o.c. perpendicular to I-joists. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. Manufacturer C.





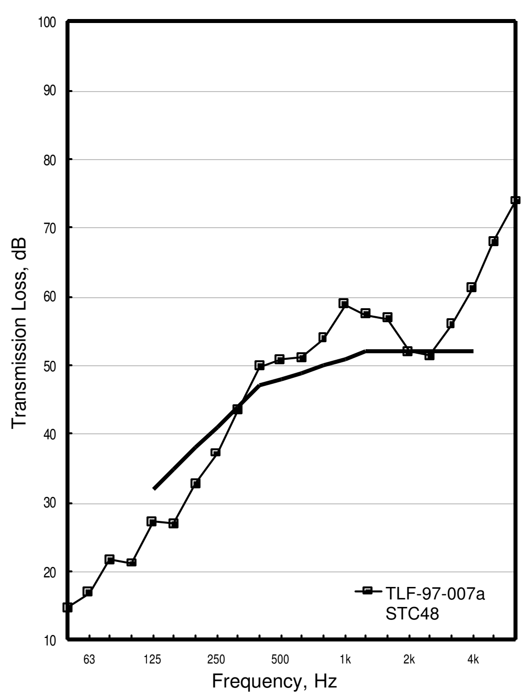
TLF-97-007a
IIF-97-004
OSB15_WI241(406)_GFB152_RC13(610)_G16

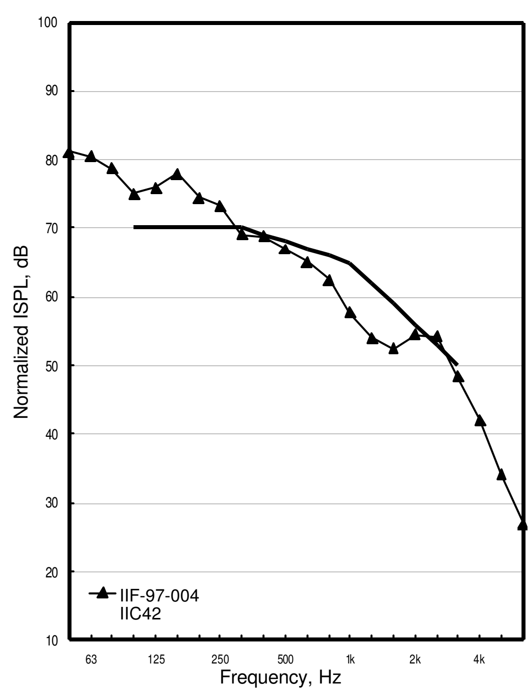
Freq. Hz	TLF-97-007a	IIF-97-004
50	15	81
63	17	80
80	22	79
100	21	75
125	27	76
160	27	78
200	33	74
250	37	73
315	43	69
400	50	69
500	51	67
630	51	65
800	54	63
1000	59	58
1250	57	54
1600	57	52
2000	52	55
2500	51	54
3150	56	48
4000	61	42
5000	68	34
6300	74	27
STC/IIC	48	42
$R_w/L_{n,w}$	48	68

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	158.6	
Floor layers	173.3	8.6 kg/m^2
Ceiling layers	199.3	11.2 kg/m^2

38 x 38 mm LVL flange, 10 mm OSB web, 241 deep wood I-joists. 25 mm OSB rimboard used. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. OSB perpendicular to I-joists. Manufacturer D.





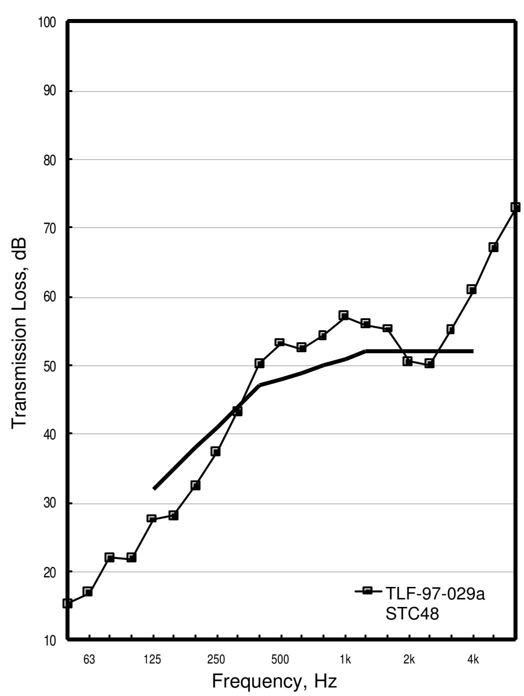
TLF-97-029a
IIF-97-015
OSB15_WI241(406)_GFB152_RC13(610)_G16

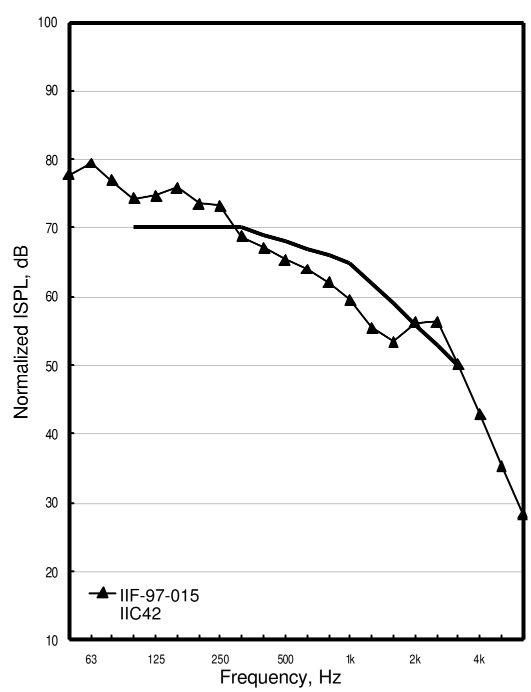
Freq. Hz	TLF-97-029a	IIF-97-015
50	15	78
63	17	79
80	22	77
100	22	74
125	28	75
160	28	76
200	32	74
250	37	73
315	43	69
400	50	67
500	53	65
630	52	64
800	54	62
1000	57	60
1250	56	56
1600	55	53
2000	50	56
2500	50	56
3150	55	50
4000	61	43
5000	67	35
6300	73	28
STC/IIC	48	42
$R_w/L_{n,w}$	48	68

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	213.9	
Floor layers	173.4	8.6 kg/m^2
Ceiling layers	196.7	11.1 kg/m^2

38 x 64 mm solid wood flange, 10 mm OSB web, 241 mm deep wood I-joists. Thirteen I-joists used. 28 mm OSB rimboard used. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.
Manufacturer E.





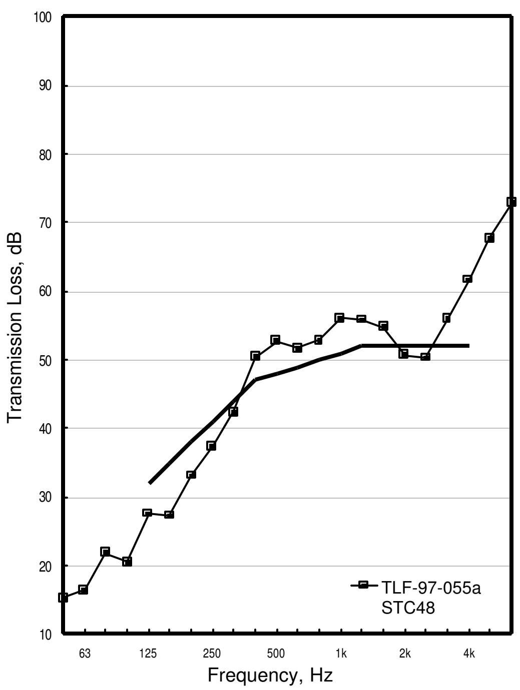
TLF-97-055a
IIF-97-027
OSB15_WI241(406)_GFB152_RC13(610)_G16

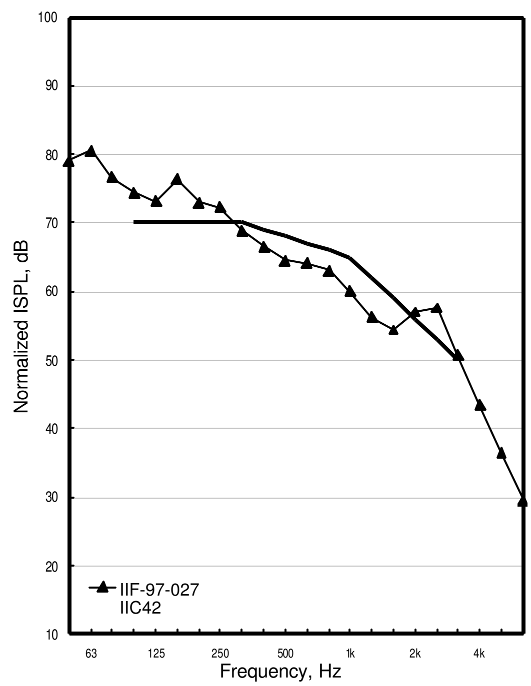
Freq. Hz	TLF-97-055a	IIF-97-027
50	15	79
63	16	80
80	22	77
100	21	74
125	28	73
160	27	76
200	33	73
250	37	72
315	42	69
400	50	67
500	53	65
630	52	64
800	53	63
1000	56	60
1250	56	56
1600	55	54
2000	51	57
2500	50	58
3150	56	51
4000	62	43
5000	68	36
6300	73	30
STC/IIC	48	42
$R_w/L_{n,w}$	47	68

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	213.9	
Floor layers	173.4	8.6 kg/m^2
Ceiling layers	205.7	11.6 kg/m^2

REPEAT of TLF97029 (Original OSB & I-joist construction saved and re-used) 38 x 64 mm solid wood flange, 10 mm OSB web, 241 deep wood I-joists. 28 mm OSB rimboard used. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field. OSB perpendicular to I-joists.





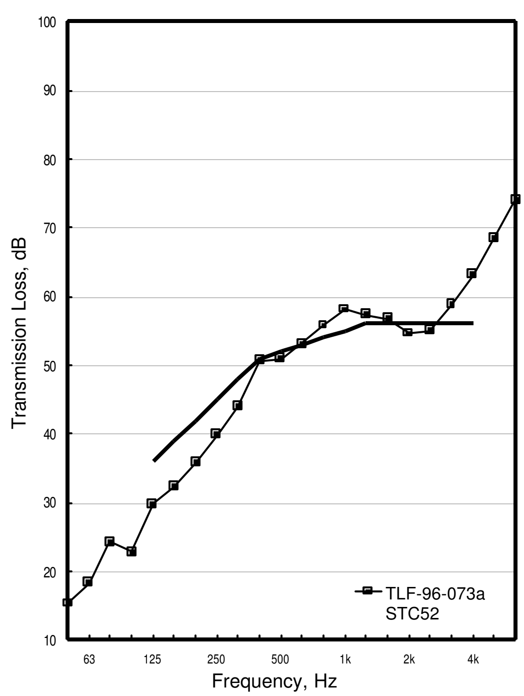
TLF-96-073a
IIF-96-024
OSB15_WI241(406)_GFB152_RC13(610)_G16

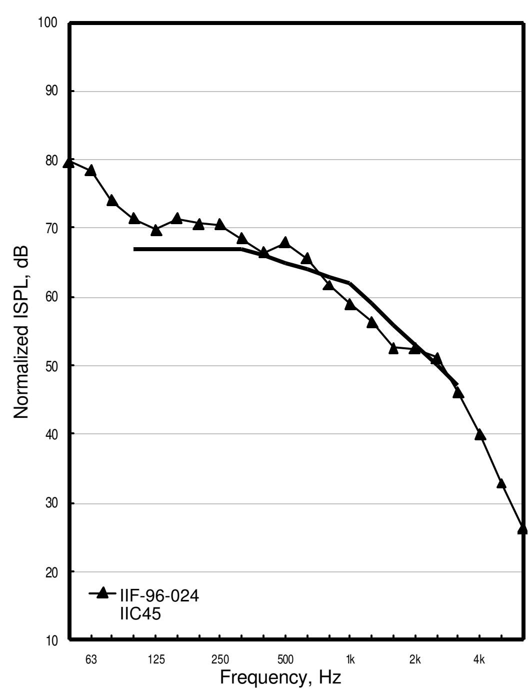
Freq. Hz	TLF-96-073a	IIF-96-024
50	15	80
63	18	78
80	24	74
100	23	71
125	30	70
160	32	71
200	36	71
250	40	71
315	44	69
400	51	66
500	51	68
630	53	66
800	56	62
1000	58	59
1250	57	56
1600	57	53
2000	55	52
2500	55	51
3150	59	46
4000	63	40
5000	68	33
6300	74	26
STC/IIC	52	45
$R_w/L_{n,w}$	51	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	251.9	
Floor layers	188.6	9.4 kg/m^2
Ceiling layers	198.2	11.1 kg/m^2

89 x 38 flange, 241 mm deep wood I-joists. 22 mm OSB rimboard used. Type X gypsum board, perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. Manufacturer A.





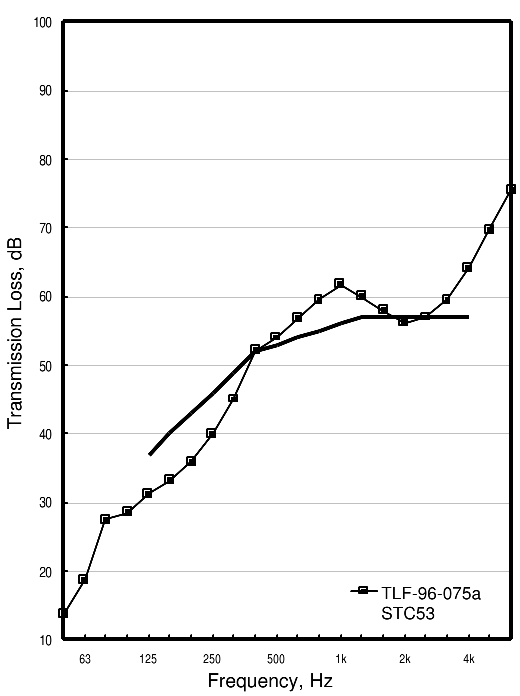
TLF-96-075a
IIF-96-028
OSB15_WI355(406)_GFB152_RC13(610)_G16

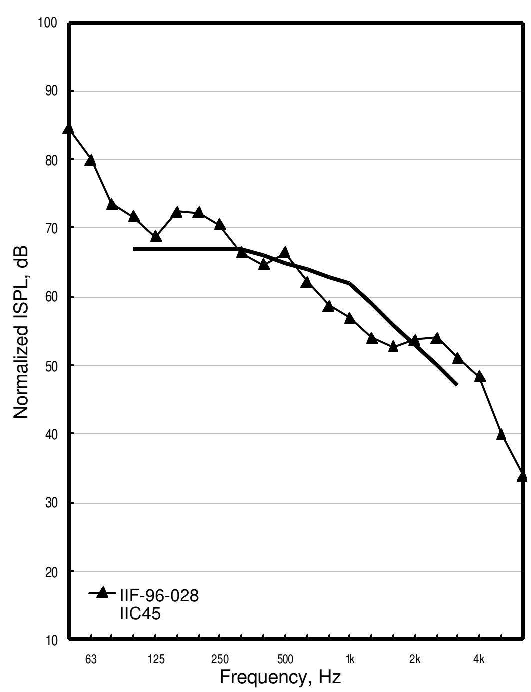
Freq. Hz	TLF-96-075a	IIF-96-028
50	14	85
63	19	80
80	27	74
100	29	72
125	31	69
160	33	72
200	36	72
250	40	70
315	45	66
400	52	65
500	54	66
630	57	62
800	60	59
1000	62	57
1250	60	54
1600	58	53
2000	56	54
2500	57	54
3150	60	51
4000	64	48
5000	70	40
6300	75	34
STC/IIC	53	45
$R_w/L_{n,w}$	52	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		355	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	328.6	
Floor layers	188.6	9.4 kg/m^2
Ceiling layers	198.4	11.1 kg/m^2

89 x 38 flange, 355 mm deep wood I-joists. 19 mm OSB rimboard used. 38 x 140 mm web stiffeners on both sides of web and at each end of each I-joist. Type X gypsum board, perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. OSB perpendicular to I-joists. Manufacturer A.





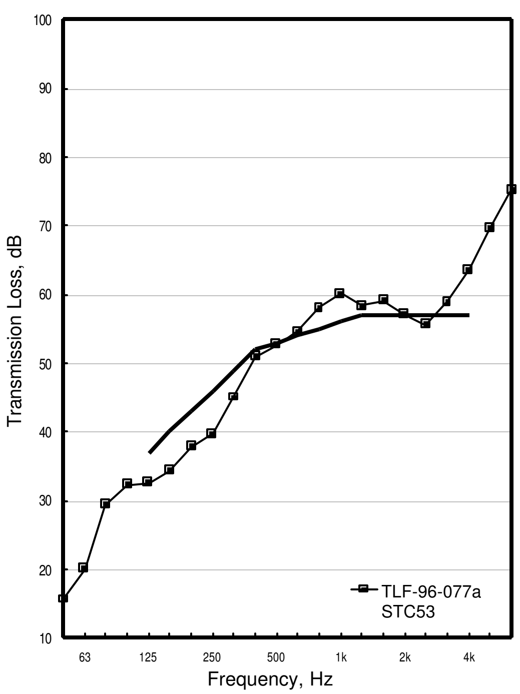
TLF-96-077a
IIF-96-032
WFB15_WI457(406)_GFB152_RC13(610)_G16

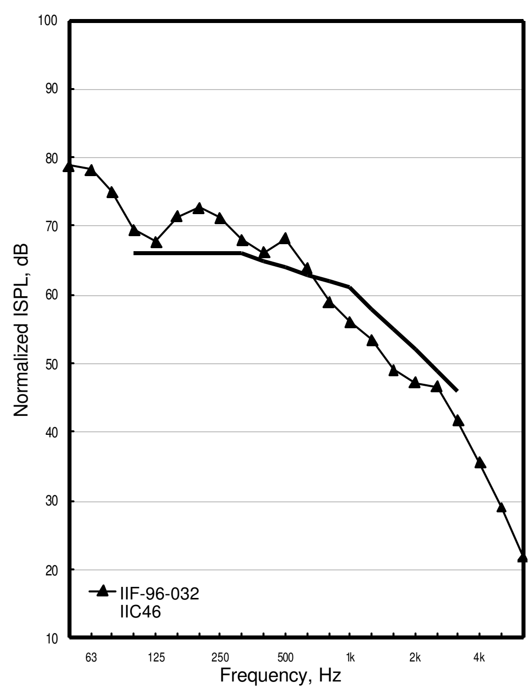
Freq. Hz	TLF-96-077a	IIF-96-032
50	16	79
63	20	78
80	29	75
100	32	69
125	33	68
160	34	71
200	38	73
250	40	71
315	45	68
400	51	66
500	53	68
630	55	64
800	58	59
1000	60	56
1250	58	53
1600	59	49
2000	57	47
2500	56	47
3150	59	42
4000	64	36
5000	70	29
6300	75	22
STC/IIC	53	46
$R_w/L_{n,w}$	53	64

Material	N	Thick.	Spac.
Waferboard	1	15	
Wood I-joists		457	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	386.6	
Floor layers	191.1	9.5 kg/m^2
Ceiling layers	196.8	11.1 kg/m^2

89 x 38 flange, 475 mm deep wood I-joists. 19 mm plywood rimboard used. 38 x 140 mm web stiffeners on both sides of web and at each end of each I-joist. Type X gypsum board, perpendicular to RC. Gypsum board screwed 305 o.c. Waferboard screwed 150 o.c. around edges, 305 o.c. in the field. Waferboard perpendicular to I-joists. Manufacturer A.





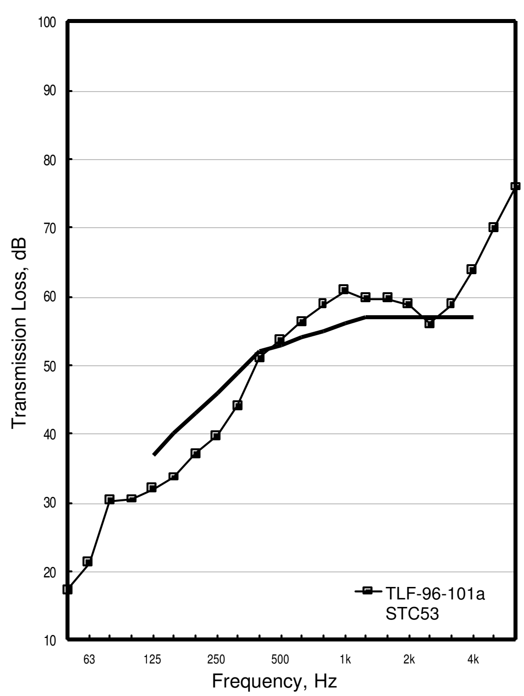
TLF-96-101a
IIF-96-044
OSB15_WI457(406)_GFB152_RC13(610)_G16

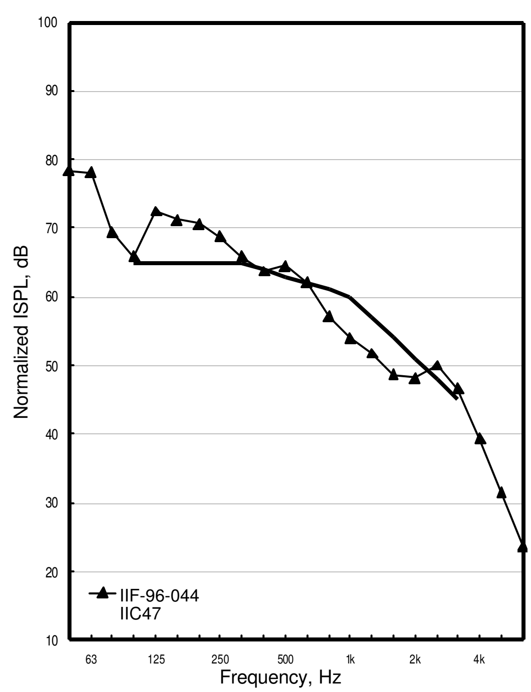
Freq. Hz	TLF-96-101a	IIF-96-044
50	17	78
63	21	78
80	30	69
100	31	66
125	32	72
160	34	71
200	37	71
250	40	69
315	44	66
400	51	64
500	54	64
630	56	62
800	59	57
1000	61	54
1250	60	52
1600	60	49
2000	59	48
2500	56	50
3150	59	47
4000	64	39
5000	70	31
6300	76	24
STC/IIC	53	47
$R_w/L_{n,w}$	52	63

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		457	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	386.6	
Floor layers	175.4	8.7 kg/m^2
Ceiling layers	201.9	11.3 kg/m^2

89 x 38 flange, 457 mm deep wood I-joist. 19 mm plywood rimboard used. 38 x 140 mm web stiffeners on both sides of web and at each end of each I-joist. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. Manufacturer A.





Group 14: Wood I-Joists: Variable cavity fillings

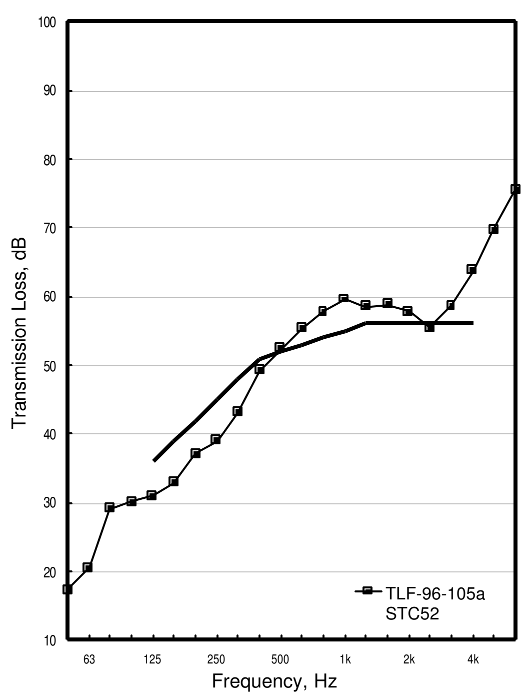
TLF-96-105a
IIF-96-046
OSB15_WI457(406)_GFB90_RC13(610)_G16

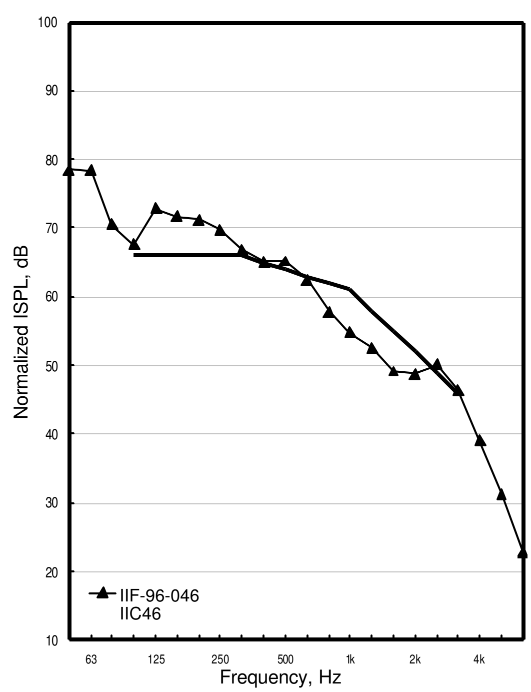
Freq. Hz	TLF-96-105a	IIF-96-046
50	17	78
63	20	78
80	29	71
100	30	68
125	31	73
160	33	72
200	37	71
250	39	70
315	43	67
400	49	65
500	52	65
630	55	62
800	58	58
1000	60	55
1250	59	53
1600	59	49
2000	58	49
2500	56	50
3150	59	46
4000	64	39
5000	70	31
6300	76	23
STC/IIC	52	46
$R_w/L_{n,w}$	52	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		457	406
Glass fibre batts		90	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	386.6	
Floor layers	175.4	8.7 kg/m^2
Ceiling layers	201.9	11.3 kg/m^2

89 x 38 mm, 457 mm deep I-joists. 19 mm plywood rimboard used. 38 x 140 mm web stiffeners on both sides of web and at each end of each I-joist. Gypsum board screwed 305 o.c. R12. OSB screwed 150 o.c. around edges, 305 o.c. in the field.
Manufacturer A.





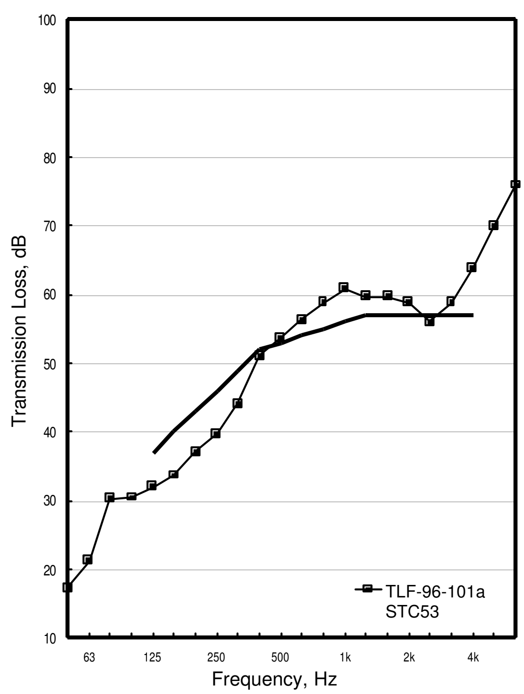
TLF-96-101a
IIF-96-044
OSB15_WI457(406)_GFB152_RC13(610)_G16

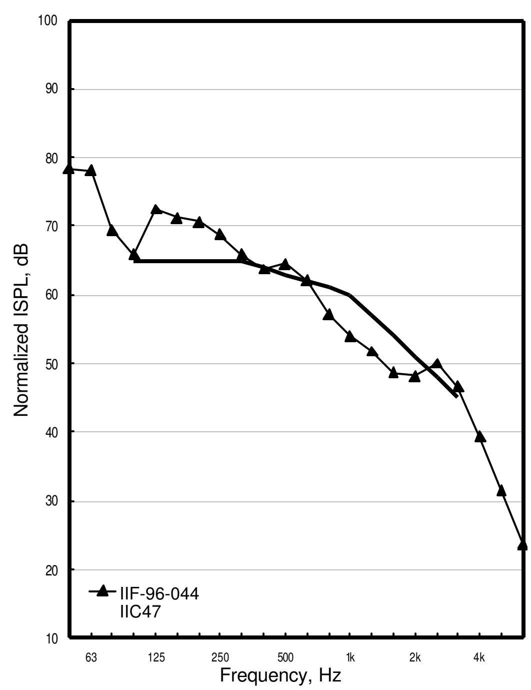
Freq. Hz	TLF-96-101a	IIF-96-044
50	17	78
63	21	78
80	30	69
100	31	66
125	32	72
160	34	71
200	37	71
250	40	69
315	44	66
400	51	64
500	54	64
630	56	62
800	59	57
1000	61	54
1250	60	52
1600	60	49
2000	59	48
2500	56	50
3150	59	47
4000	64	39
5000	70	31
6300	76	24
STC/IIC	53	47
$R_w/L_{n,w}$	52	63

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		457	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	386.6	
Floor layers	175.4	8.7 kg/m^2
Ceiling layers	201.9	11.3 kg/m^2

89 x 38 flange, 457 mm deep wood I-joist. 19 mm plywood rimboard used. 38 x 140 mm web stiffeners on both sides of web and at each end of each I-joist. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





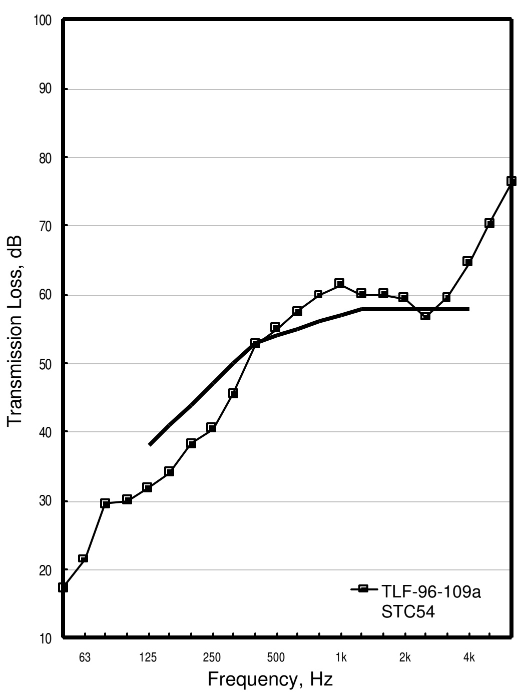
TLF-96-109a
IIF-96-048
OSB15_WI457(406)_2GFB90_RC13(610)_G16

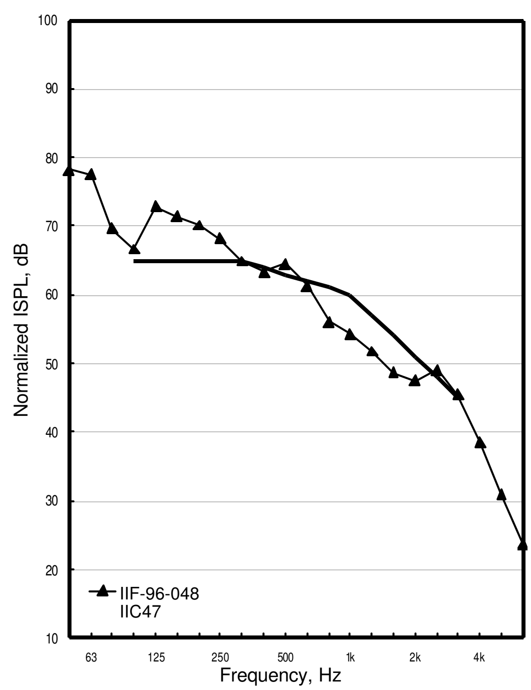
Freq. Hz	TLF-96-109a	IIF-96-048
50	17	78
63	21	78
80	29	70
100	30	67
125	32	73
160	34	71
200	38	70
250	40	68
315	46	65
400	53	63
500	55	64
630	57	61
800	60	56
1000	61	54
1250	60	52
1600	60	49
2000	59	48
2500	57	49
3150	60	45
4000	65	39
5000	70	31
6300	76	24
STC/IIC	54	47
$R_w/L_{n,w}$	53	63

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		457	406
Glass fibre batts	2	90	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	386.6	
Floor layers	175.4	8.7 kg/m^2
Ceiling layers	201.9	11.3 kg/m^2

89 x 38 mm, 457 mm deep wood I-joists. 19 mm plywood rimboard used. 38 x 140 mm web stiffeners on both sides of web and at each end of each I-joist. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





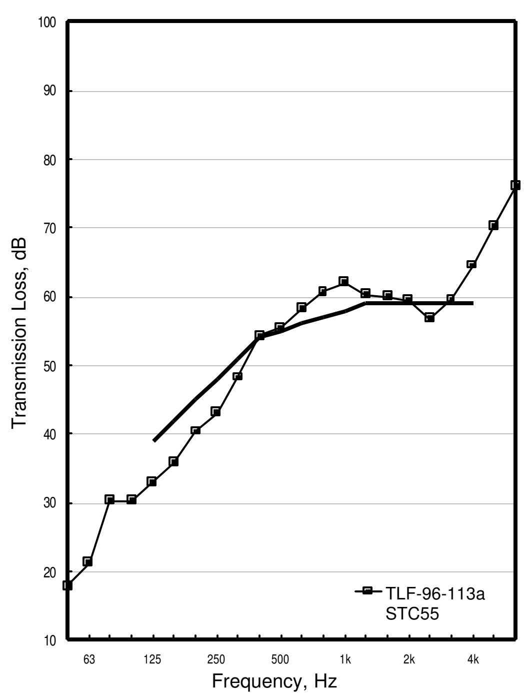
TLF-96-113a
IIF-96-050
OSB15_WI457(406)_GFB292_RC13(610)_G16

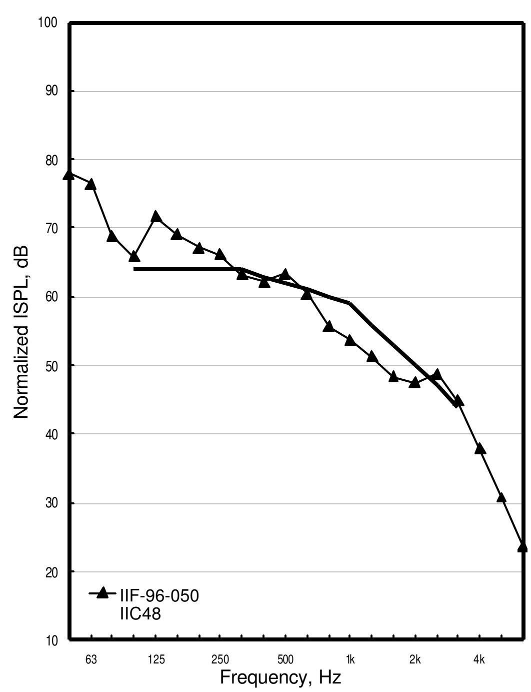
Freq. Hz	TLF-96-113a	IIF-96-050
50	18	78
63	21	76
80	30	69
100	30	66
125	33	72
160	36	69
200	40	67
250	43	66
315	48	63
400	54	62
500	55	63
630	58	60
800	61	56
1000	62	54
1250	60	51
1600	60	48
2000	59	48
2500	57	49
3150	60	45
4000	65	38
5000	70	31
6300	76	24
STC/IIC	55	48
$R_w/L_{n,w}$	54	62

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		457	406
Glass fibre batts		292	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	386.6	
Floor layers	175.4	8.7 kg/m^2
Ceiling layers	201.9	11.3 kg/m^2

89 x 38 flange, 457 mm deep wood I-joists. 19 mm plywood rimboard used. 38 x 140 mm web stiffeners on both sides of web and at each end of each I-joist. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





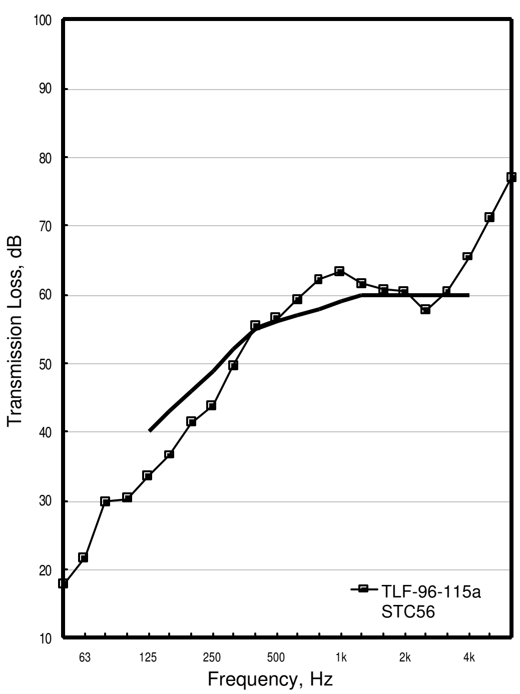
TLF-96-115a
IIF-96-051
OSB15_WI457(406)_GFB354_RC13(610)_G16

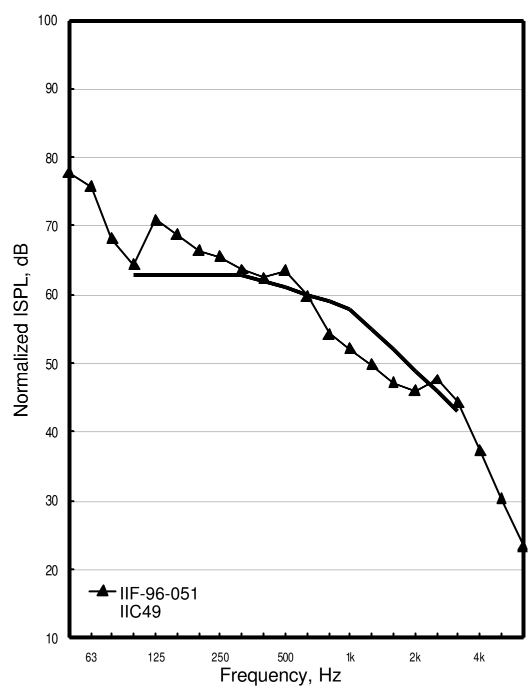
Freq. Hz	TLF-96-115a	IIF-96-051
50	18	78
63	22	76
80	30	68
100	30	64
125	34	71
160	37	69
200	41	66
250	44	66
315	50	64
400	55	62
500	56	64
630	59	60
800	62	54
1000	63	52
1250	62	50
1600	61	47
2000	60	46
2500	58	48
3150	61	44
4000	65	37
5000	71	30
6300	77	23
STC/IIC	56	49
$R_w/L_{n,w}$	55	61

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		457	406
Glass fibre batts		354	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	386.6	
Floor layers	175.4	8.7 kg/m^2
Ceiling layers	201.9	11.3 kg/m^2

152 mm R20 and 202 mm R28 glass fibre on top of one another. 89 x 38 flange, 457 mm deep wood I-joists. 19 mm plywood rimboard used. 38 x 140 mm web stiffeners on both sides of web and at each end of each I-joist. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





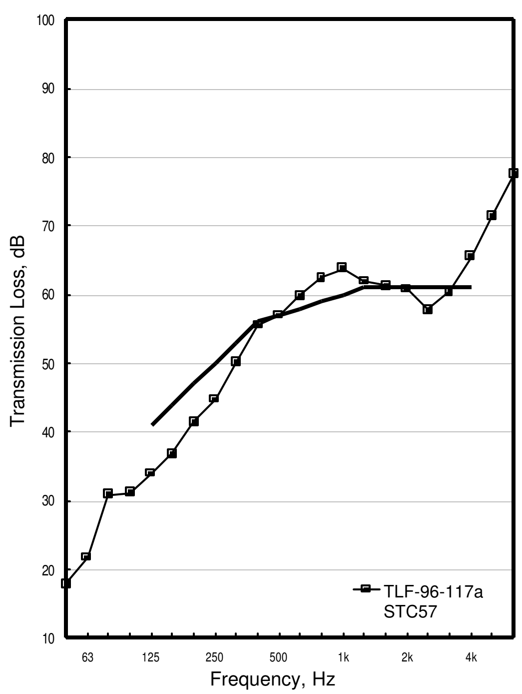
TLF-96-117a
IIF-96-052
OSB15_WI457(406)_GFB456_RC13(610)_G16

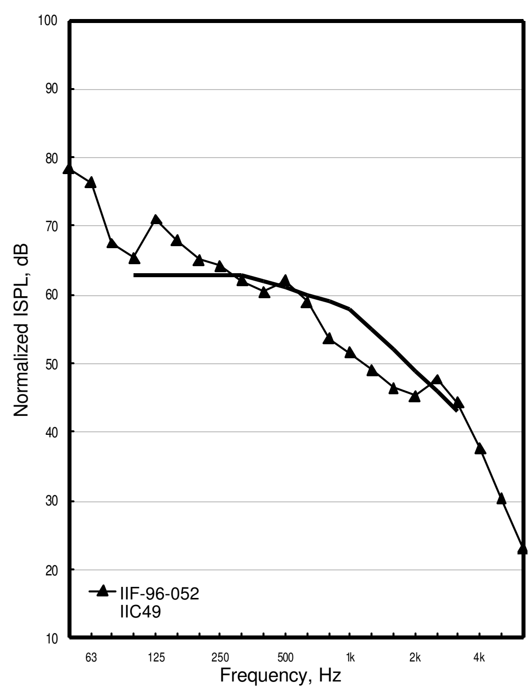
Freq. Hz	TLF-96-117a	IIF-96-052
50	18	78
63	22	76
80	31	67
100	31	65
125	34	71
160	37	68
200	41	65
250	45	64
315	50	62
400	56	60
500	57	62
630	60	59
800	63	54
1000	64	52
1250	62	49
1600	61	46
2000	61	45
2500	58	48
3150	60	44
4000	66	38
5000	71	30
6300	77	23
STC/IIC	57	49
$R_w/L_{n,w}$	56	60

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		457	406
Glass fibre batts		456	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	386.6	
Floor layers	175.4	8.7 kg/m^2
Ceiling layers	201.9	11.3 kg/m^2

Three 152 mm R20 glass fibre on top of one another. 89 x 38 flange, 457 mm deep wood I-joists. 19 mm plywood rimboard used. 38 x 140 mm web stiffeners on both sides of web and at each end of each I-joist. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. Gypsum board





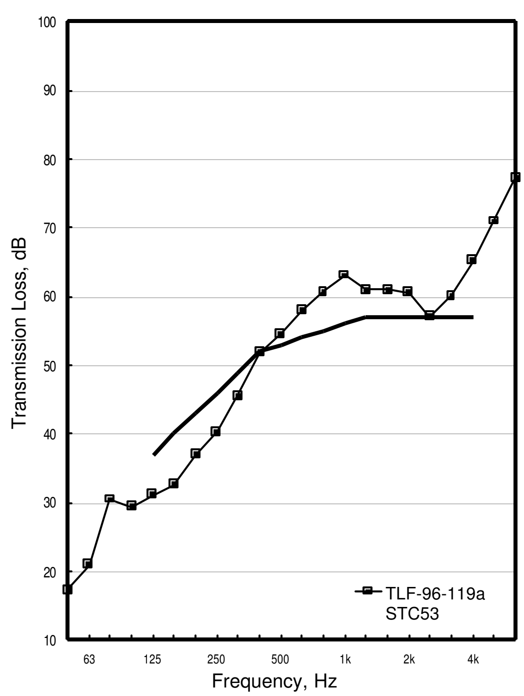
TLF-96-119a
IIF-96-053
OSB15_WI457(406)_MFB90_RC13(610)_G16

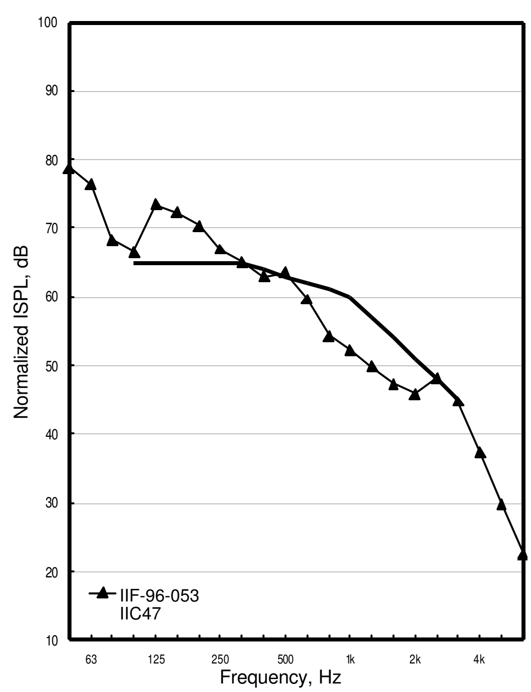
Freq. Hz	TLF-96-119a	IIF-96-053
50	17	79
63	21	76
80	30	68
100	29	67
125	31	73
160	33	72
200	37	70
250	40	67
315	46	65
400	52	63
500	55	64
630	58	60
800	61	54
1000	63	52
1250	61	50
1600	61	47
2000	61	46
2500	57	48
3150	60	45
4000	65	37
5000	71	30
6300	77	23
STC/IIC	53	47
$R_w/L_{n,w}$	52	63

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		457	406
Mineral fibre batts		90	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	386.6	
Floor layers	175.4	8.7 kg/m^2
Ceiling layers	201.9	11.3 kg/m^2

90 mm R13 mineral fibre. 89 x 38 flange, 457 mm deep wood I-joists. 19 mm plywood rimboard used. 38 x 140 mm web stiffeners on both sides of web and at each end of each I-joist. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





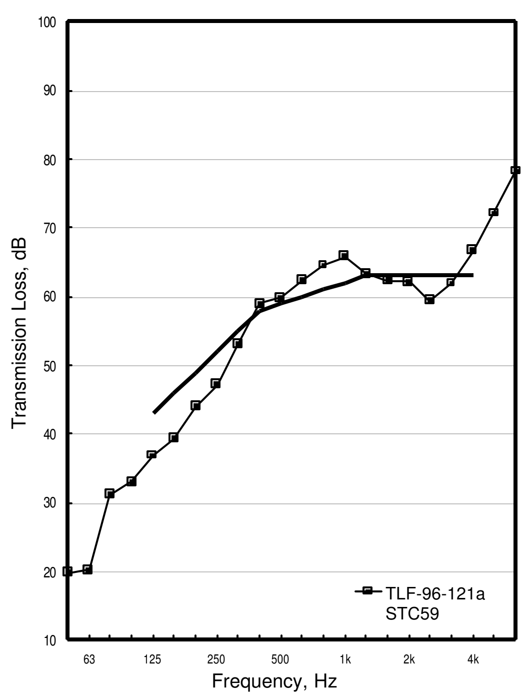
TLF-96-121a
IIF-96-054
OSB15_WI457(406)_MFB456_RC13(610)_G16

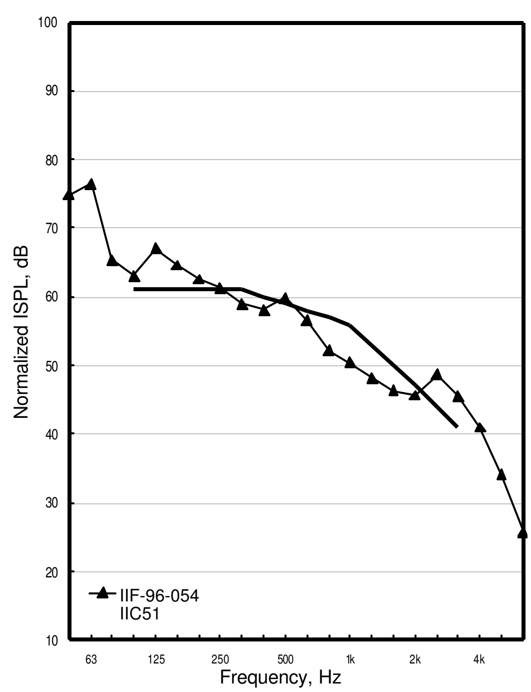
Freq. Hz	TLF-96-121a	IIF-96-054
50	20	75
63	20	77
80	31	65
100	33	63
125	37	67
160	39	65
200	44	63
250	47	61
315	53	59
400	59	58
500	60	60
630	62	57
800	65	52
1000	66	50
1250	63	48
1600	62	46
2000	62	46
2500	59	49
3150	62	46
4000	67	41
5000	72	34
6300	78	26
STC/IIC	59	51
$R_w/L_{n,w}$	58	58

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		457	406
Mineral fibre batts		456	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	386.6	
Floor layers	175.4	8.7 kg/m^2
Ceiling layers	201.9	11.3 kg/m^2

Three 152 mm R22.5 mineral fibre on top of one another. 89 x 38 flange, 457 mm deep wood I-joists. 19 mm plywood rimboard used. 38 x 140 mm web stiffeners on both sides of web and at each end of each I-joist. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





Group 15: Wood I-Joists: 240 mm deep, 38 x 38 mm flanges, empty cavity, variable joists, subfloors, ceilings and resilient metal channel spacings

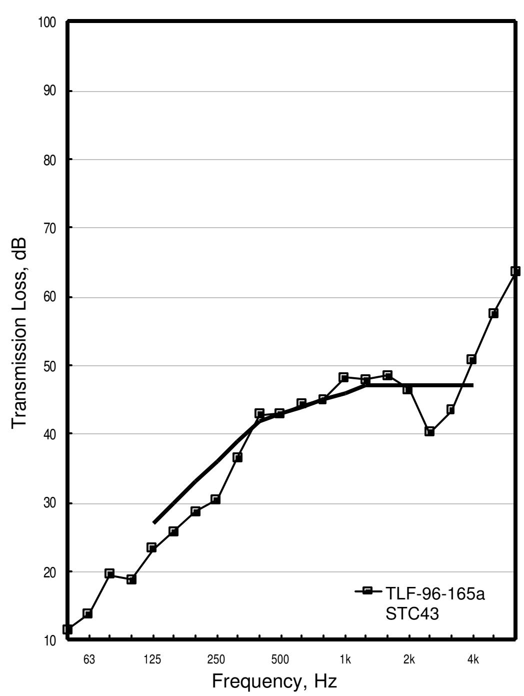
TLF-96-165a
IIF-96-073
OSB15_WI241(406)_RC13(610)_G13

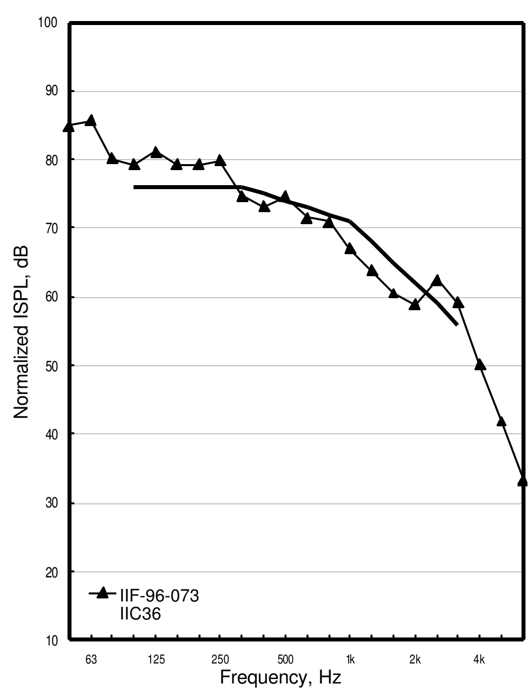
Freq. Hz	TLF-96-165a	IIF-96-073
50	11	85
63	14	86
80	20	80
100	19	79
125	23	81
160	26	79
200	29	79
250	30	80
315	37	75
400	43	73
500	43	75
630	44	72
800	45	71
1000	48	67
1250	48	64
1600	48	61
2000	46	59
2500	40	62
3150	43	59
4000	51	50
5000	57	42
6300	64	33
STC/IIC	43	36
$R_w/L_{n,w}$	42	74

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Resilient metal channels		13	610
Gypsum board	1	13	

	Mass, kg	
Frame	163.2	
Floor layers	181.2	9.0 kg/m^2
Ceiling layers	175.3	9.8 kg/m^2

38x38 flange, 241 mm deep wood I-joists. 25 mm timberstrand rimboard used. RC 610 o.c. perpendicular to I-joists. Type C gypsum board. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around the edges, 305 o.c. in the field.





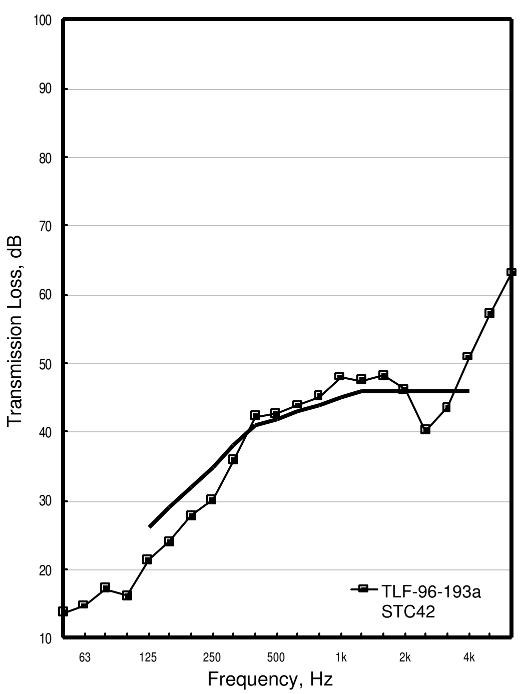
TLF-96-193a
IIF-96-085
OSB15_WI241(406)_RC13(406)_G13

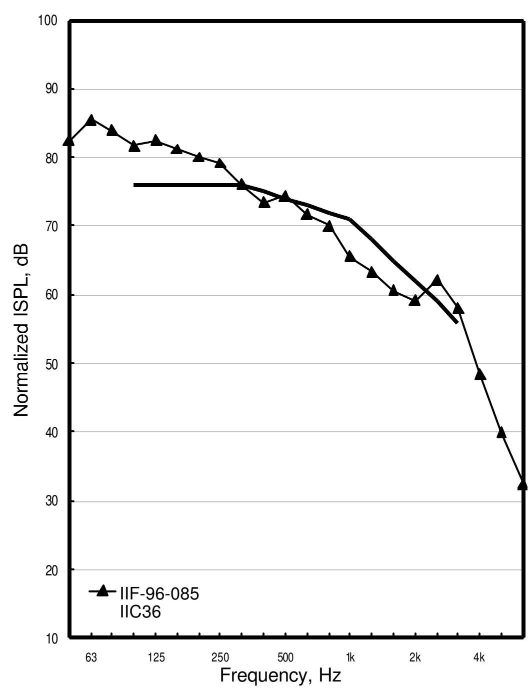
Freq. Hz	TLF-96-193a	IIF-96-085
50	14	82
63	15	85
80	17	84
100	16	82
125	21	82
160	24	81
200	28	80
250	30	79
315	36	76
400	42	73
500	43	74
630	44	72
800	45	70
1000	48	66
1250	48	63
1600	48	61
2000	46	59
2500	40	62
3150	44	58
4000	51	48
5000	57	40
6300	63	32
STC/IIC	42	36
$R_w/L_{n,w}$	41	74

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Resilient metal channels		13	406
Gypsum board	1	13	

	Mass, kg	
Frame	163.2	
Floor layers	181.2	9.0 kg/m^2
Ceiling layers	175.5	9.9 kg/m^2

38 x 38 mm flange, 241 mm deep wood I-joists. 25 mm timberstrand rimboard used. RC 406 o.c. perpendicular to I-joists. Type C gypsum board perpendicular to RCs. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





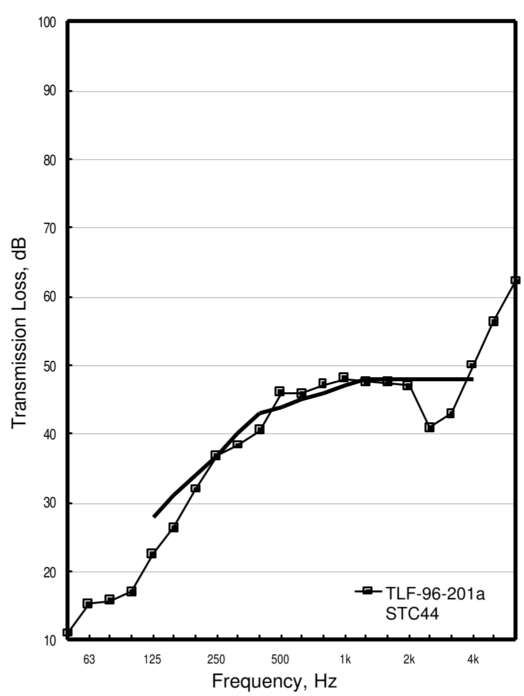
TLF-96-201a
IIF-96-089
OSB15_WI241(610)_RC13(406)_G13

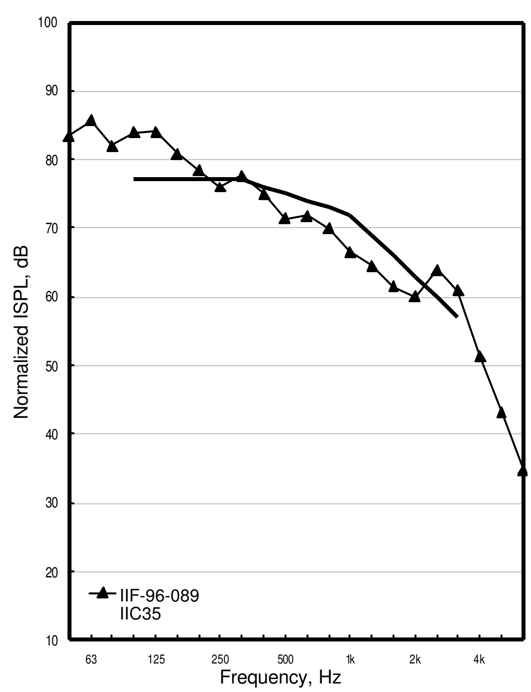
Freq. Hz	TLF-96-201a	IIF-96-089
50	11	83
63	15	86
80	16	82
100	17	84
125	23	84
160	26	81
200	32	78
250	37	76
315	38	78
400	40	75
500	46	71
630	46	72
800	47	70
1000	48	67
1250	48	65
1600	48	61
2000	47	60
2500	41	64
3150	43	61
4000	50	51
5000	56	43
6300	62	35
STC/IIC	44	35
$R_w/L_{n,w}$	43	75

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	610
Resilient metal channels		13	406
Gypsum board	1	13	

	Mass, kg	
Frame	97.8	
Floor layers	178.2	8.9 kg/m^2
Ceiling layers	174.7	9.8 kg/m^2

38 x 38 mm LVL flange, 9.5 mm plywood web. Ten 241 mm deep wood I-joists, 610 o.c. with two small cavities at ends. 25 mm timberstrand rimboard used. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. OSB perpendicular to I-joists.





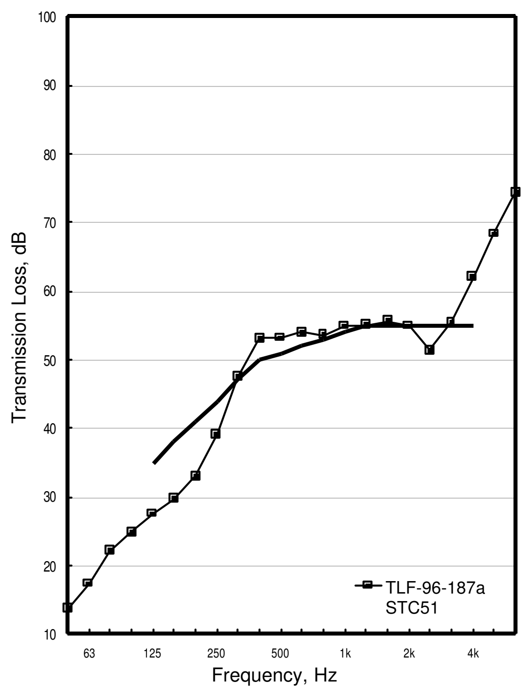
TLF-96-187a
IIF-96-082
2OSB15_WI241(406)_RC13(406)_2G13

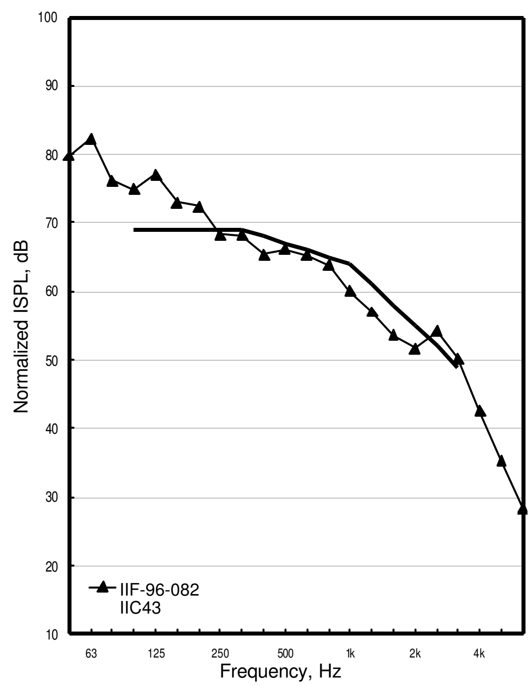
Freq. Hz	TLF-96-187a	IIF-96-082
50	14	80
63	17	82
80	22	76
100	25	75
125	28	77
160	30	73
200	33	72
250	39	68
315	47	68
400	53	65
500	53	66
630	54	65
800	54	64
1000	55	60
1250	55	57
1600	56	54
2000	55	52
2500	51	54
3150	56	50
4000	62	43
5000	68	35
6300	74	28
STC/IIC	51	43
$R_w/L_{n,w}$	49	66

Material	N	Thick.	Spac.
Oriented strandboard	2	15	
Wood I-joists		241	406
Resilient metal channels		13	406
Gypsum board	2	13	

	Mass, kg	
Frame	163.2	
Floor layers	353.2	17.6 kg/m^2
Ceiling layers	351.6	19.8 kg/m^2

38 x 38 flange, 241 mm deep wood I-joists. 25 mm timberstrand rimboard used. RC 406 o.c. perpendicular to I-joists. Both layers of Type C perpendicular to RCs. Base layer gypsum board screwed 610 o.c., face layer screwed 305 o.c. Base layer OSB screwed 305 o.c. around edges, 610 o.c. in the field. Face layer of OSB screwed 150 o.c. around edges, 305 o.c. in the field. Both layers of OSB perpendicular to I-joists.





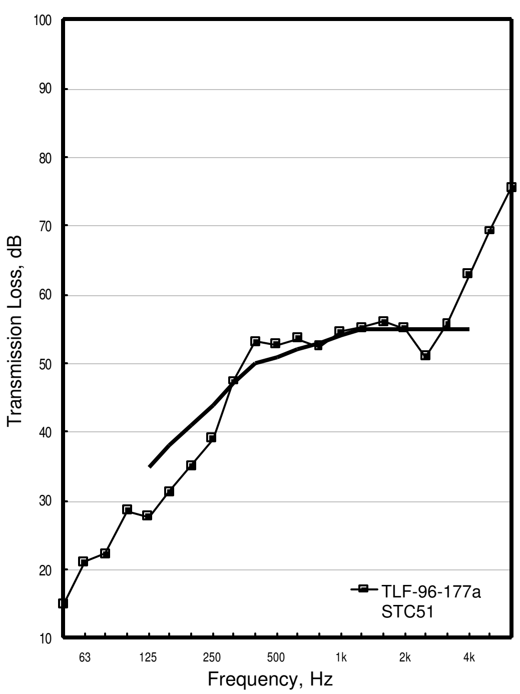
TLF-96-177a
IIF-96-079
2OSB15_WI241(406)_RC13(610)_2G13

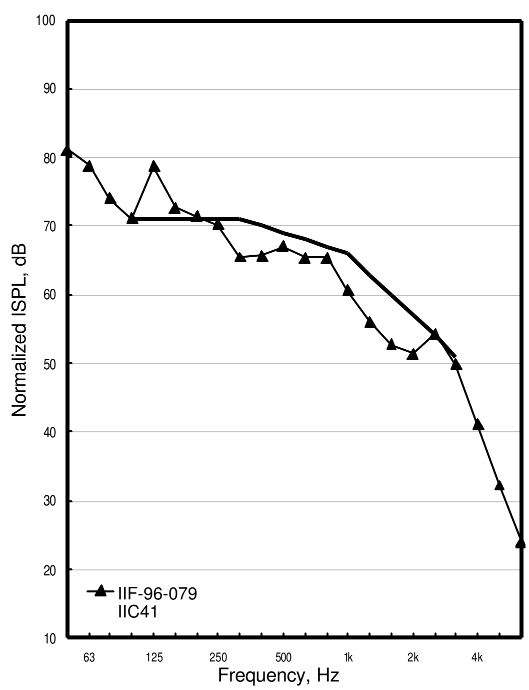
Freq. Hz	TLF-96-177a	IIF-96-079
50	15	81
63	21	79
80	22	74
100	29	71
125	28	79
160	31	73
200	35	71
250	39	70
315	47	65
400	53	66
500	53	67
630	54	65
800	52	65
1000	55	61
1250	55	56
1600	56	53
2000	55	51
2500	51	54
3150	56	50
4000	63	41
5000	69	32
6300	76	24
STC/IIC	51	41
$R_w/L_{n,w}$	50	67

Material	N	Thick.	Spac.
Oriented strandboard	2	15	
Wood I-joists		241	406
Resilient metal channels		13	610
Gypsum board	2	13	

	Mass, kg	
Frame	163.2	
Floor layers	353.2	17.6 kg/m^2
Ceiling layers	351.9	19.8 kg/m^2

38 x 38 flange, 241 mm deep wood I-joists. 25 mm timberstrand rimboard used. RC 610 o.c. perpendicular to I-joists. Base layer of gypsum board screwed 610 o.c., face layer screwed 305. Base layer OSB screwed 305 o.c. around edges, 610 o.c. in the field. Face layer of OSB screwed 150 o.c. around edges, 305 o.c. in the field. Both layers of OSB perpendicular to I-joists.





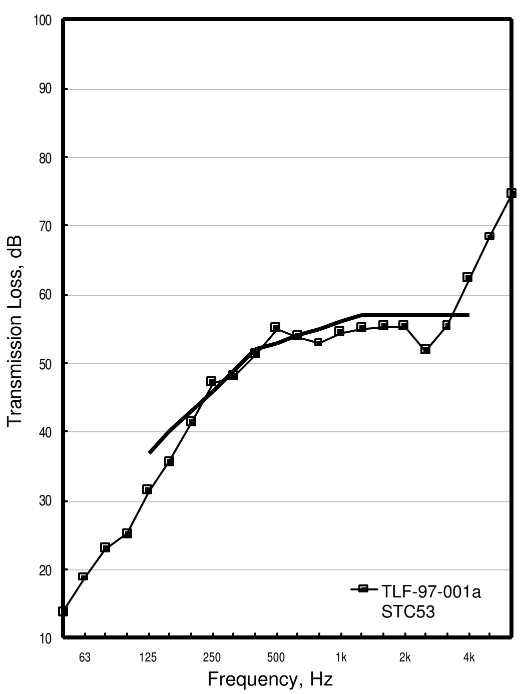
TLF-97-001a
IIF-97-001
2OSB15_WI241(610)_RC13(406)_2G13

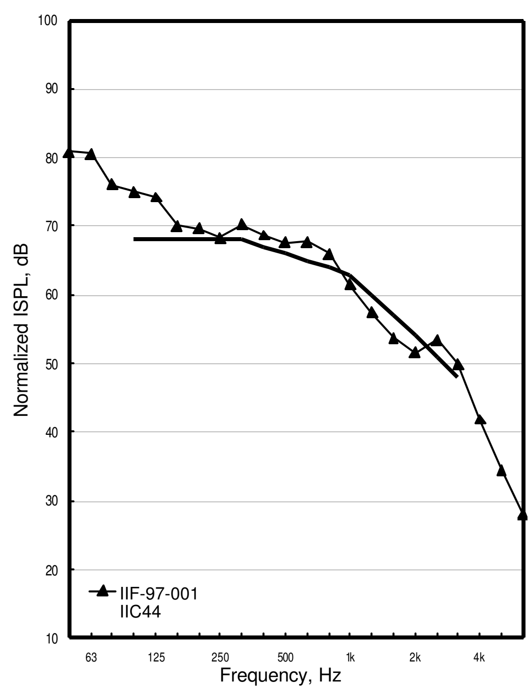
Freq. Hz	TLF-97-001a	IIF-97-001
50	14	81
63	19	81
80	23	76
100	25	75
125	31	74
160	36	70
200	41	70
250	47	68
315	48	70
400	51	69
500	55	68
630	54	68
800	53	66
1000	54	62
1250	55	57
1600	55	54
2000	55	52
2500	52	53
3150	55	50
4000	62	42
5000	68	35
6300	75	28
STC/IIC	53	44
$R_w/L_{n,w}$	52	66

Material	N	Thick.	Spac.
Oriented strandboard	2	15	
Wood I-joists		241	610
Resilient metal channels		13	406
Gypsum board	2	13	

	Mass, kg	
Frame	97.8	
Floor layers	349.1	17.4 kg/m^2
Ceiling layers	345.6	19.4 kg/m^2

38 x 38 mm LVL flange, 9.5 mm plywood web, 10 241 mm deep wood I-joists, 610 o.c. with two small cavities at ends. 25 mm timberstrand rimboard used. RC 406 o.c. perpendicular to I-joists. Type C perpendicular to RCs. Base layer gypsum board screwed 610 o.c., face layer screwed 305 o.c. Base layer OSB screwed 305 o.c. around edges, 610 o.c. in the field. Face layer of OSB screwed 150 o.c. around edges, 305 o.c. in the field. Both layers of OSB perpendicular to I-joists.





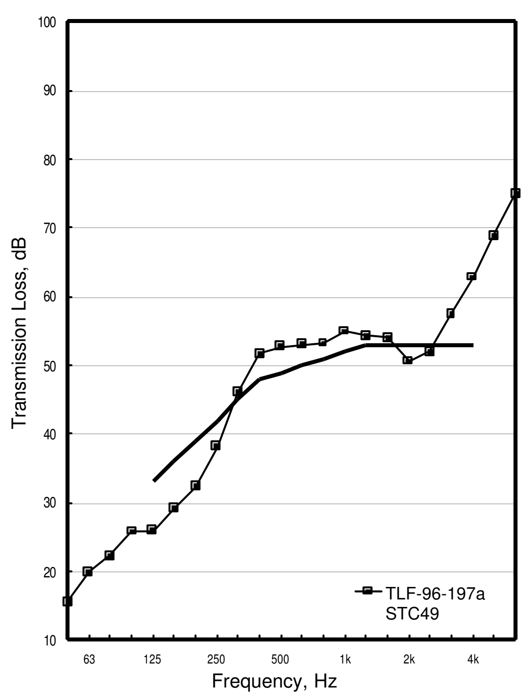
TLF-96-197a
IIF-96-087
2OSB15_WI241(406)_RC13(406)_2G16

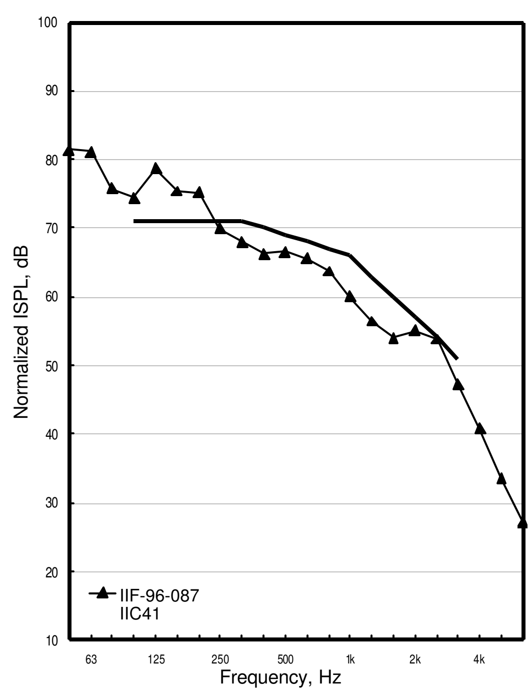
Freq. Hz	TLF-96-197a	IIF-96-087
50	16	81
63	20	81
80	22	76
100	26	74
125	26	79
160	29	75
200	32	75
250	38	70
315	46	68
400	52	66
500	53	67
630	53	66
800	53	64
1000	55	60
1250	54	56
1600	54	54
2000	51	55
2500	52	54
3150	57	47
4000	63	41
5000	69	33
6300	75	27
STC/IIC	49	41
$R_w/L_{n,w}$	49	67

Material	N	Thick.	Spac.
Oriented strandboard	2	15	
Wood I-joists		241	406
Resilient metal channels		13	406
Gypsum board	2	16	

	Mass, kg	
Frame	163.2	
Floor layers	353.2	17.6 kg/m^2
Ceiling layers	403.6	22.7 kg/m^2

38 x 38 mm flange, 241 mm deep wood I-joists. 25 mm timberstrand rimboard used. RC 406 o.c. perpendicular to I-joists. Both layers of base layer gypsum board screwed 610 o.c., face layer screwed 305 o.c. Base layer OSB screwed 305 o.c. around edges, 610 o.c. in the field. Face layer of OSB screwed 150 o.c. around edges, 305 o.c. in the field. Both layers of OSB perpendicular to I-joists.





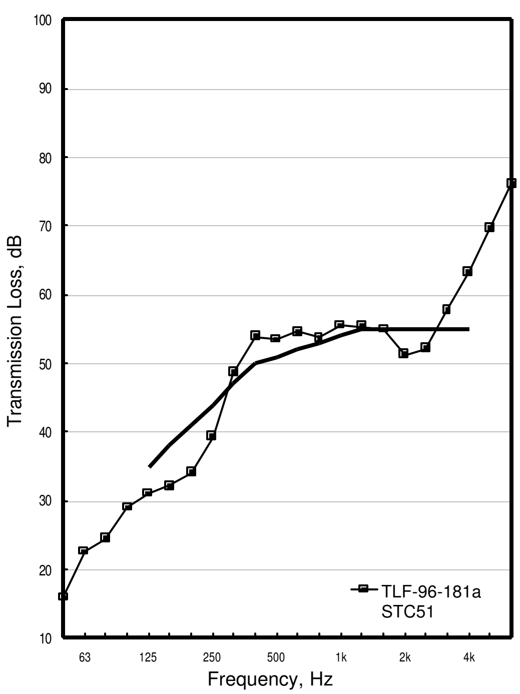
TLF-96-181a
IIF-96-081
2OSB15_WI241(406)_RC13(610)_2G16

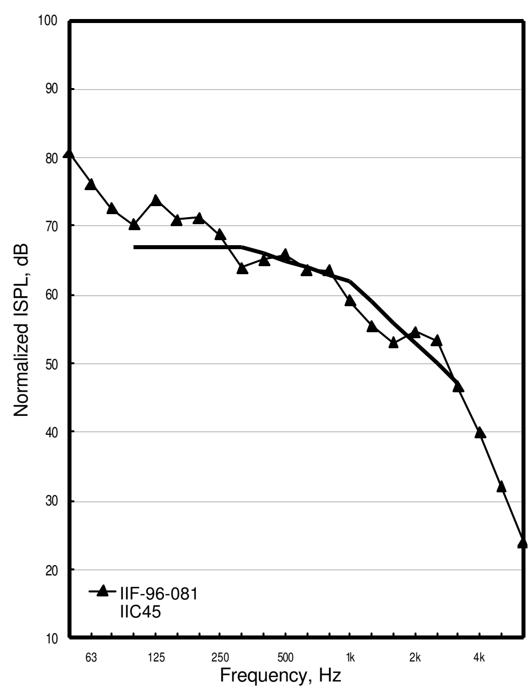
Freq. Hz	TLF-96-181a	IIF-96-081
50	16	81
63	23	76
80	24	73
100	29	70
125	31	74
160	32	71
200	34	71
250	39	69
315	49	64
400	54	65
500	53	66
630	55	64
800	54	63
1000	56	59
1250	55	56
1600	55	53
2000	51	55
2500	52	53
3150	58	47
4000	63	40
5000	70	32
6300	76	24
STC/IIC	51	45
$R_w/L_{n,w}$	51	65

Material	N	Thick.	Spac.
Oriented strandboard	2	15	
Wood I-joists		241	406
Resilient metal channels		13	610
Gypsum board	2	16	

	Mass, kg	
Frame	163.2	
Floor layers	353.2	17.6 kg/m^2
Ceiling layers	406.1	22.8 kg/m^2

38 x 38 flange, 241 mm deep wood I-joists. 25 mm timberstrand rimboard used. RC 610 o.c. perpendicular to I-joists. Both layers of base layer gypsum board screwed 610 o.c.; face layer screwed 305 o.c. Base layer OSB screwed 305 o.c. around edges, 610 o.c. in the field. Face layer of OSB screwed 150 o.c. around edges, 305 o.c. in the field. Both layers of OSB perpendicular to I-joists.





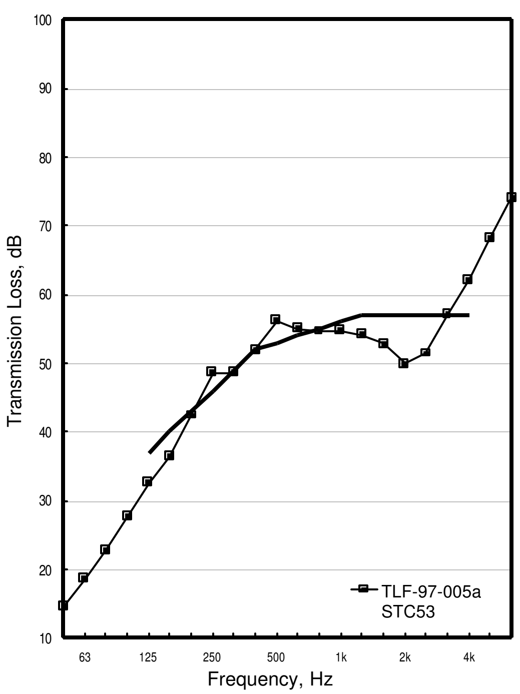
TLF-97-005a
IIF-97-003
2OSB15_WI241(610)_RC13(406)_2G16

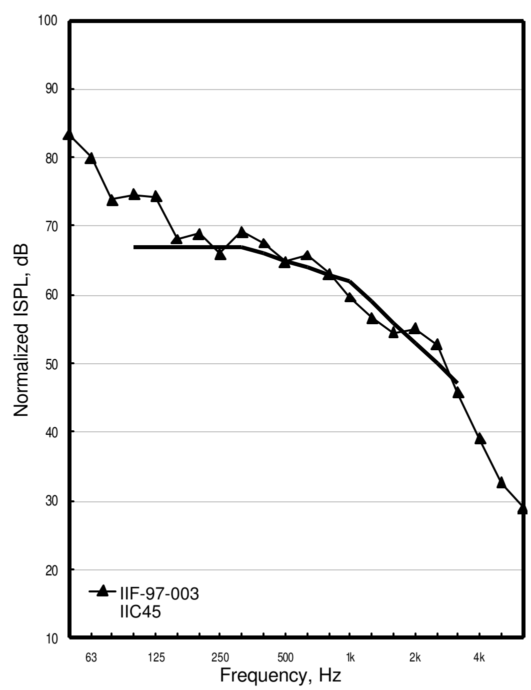
Freq. Hz	TLF-97-005a	IIF-97-003
50	15	83
63	19	80
80	23	74
100	28	75
125	33	74
160	36	68
200	42	69
250	49	66
315	49	69
400	52	67
500	56	65
630	55	66
800	55	63
1000	55	60
1250	54	57
1600	53	55
2000	50	55
2500	51	53
3150	57	46
4000	62	39
5000	68	33
6300	74	29
STC/IIC	53	45
$R_w/L_{n,w}$	52	65

Material	N	Thick.	Spac.
Oriented strandboard	2	15	
Wood I-joists		241	610
Resilient metal channels		13	406
Gypsum board	2	16	

	Mass, kg	
Frame	97.8	
Floor layers	349.1	17.4 kg/m^2
Ceiling layers	396.3	22.3 kg/m^2

38 x 38 mm LVL flange, 9.5 mm plywood web, Ten 241 mm deep wood I-joists, 610 o.c. with two small cavities at ends. 25 mm timberstrand rimboard used. Base layer gypsum board screwed 610 o.c., face layer screwed 305 o.c. Base layer OSB screwed 305 o.c. around edges, 610 o.c. in the field. Face layer of OSB screwed 150 o.c. around edges, 305 o.c. in the field. Both layers of OSB perpendicular to I-joists.





Group 16: Wood I-Joists: 240 mm deep, 38 x 38 mm flanges, different resilient metal channel spacing, filled cavity

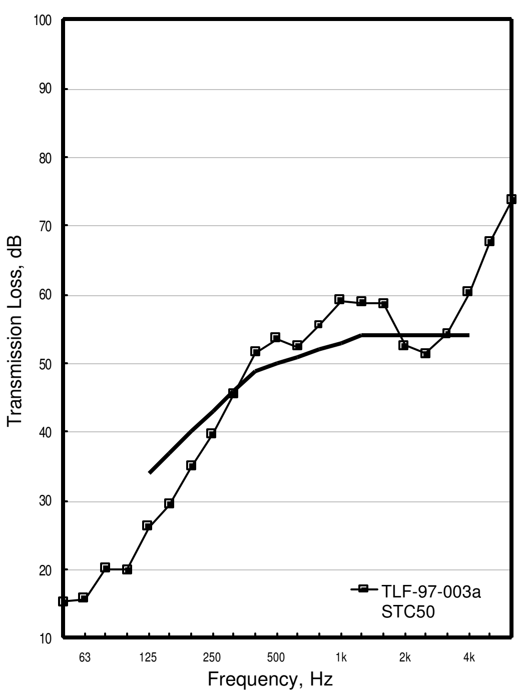
TLF-97-003a
IIF-97-002
OSB15_WI241(406)_GFB152_RC13(406)_G16

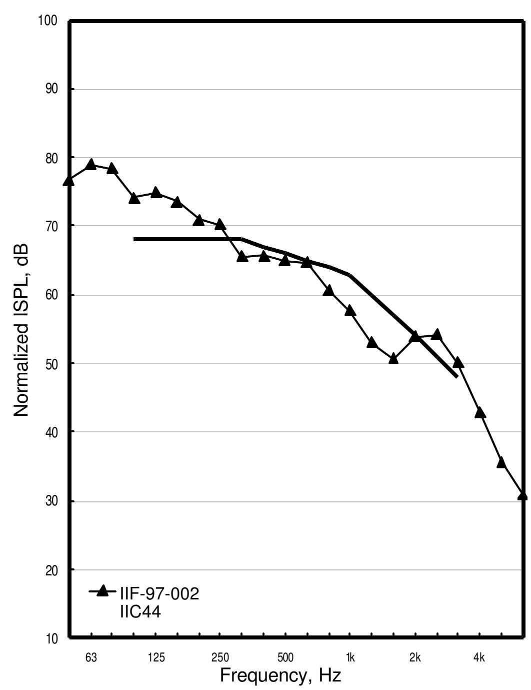
Freq. Hz	TLF-97-003a	IIF-97-002
50	15	77
63	16	79
80	20	78
100	20	74
125	26	75
160	29	74
200	35	71
250	40	70
315	45	66
400	52	66
500	54	65
630	52	65
800	56	61
1000	59	58
1250	59	53
1600	59	51
2000	53	54
2500	51	54
3150	54	50
4000	60	43
5000	68	36
6300	74	31
STC/IIC	50	44
$R_w/L_{n,w}$	49	66

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	406
Gypsum board	1	16	

	Mass, kg	
Frame	158.6	
Floor layers	173.3	8.6 kg/m^2
Ceiling layers	200.2	11.2 kg/m^2

38 x 38 mm LVL flange, 10 mm OSB web, 241 mm deep wood I-joists. 25 mm OSB rimboard used. RC 406 o.c. (no extra channels added). Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





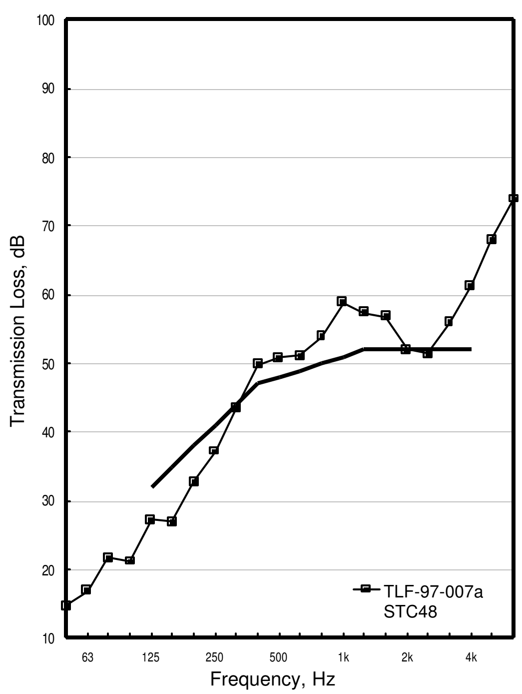
TLF-97-007a
IIF-97-004
OSB15_WI241(406)_GFB152_RC13(610)_G16

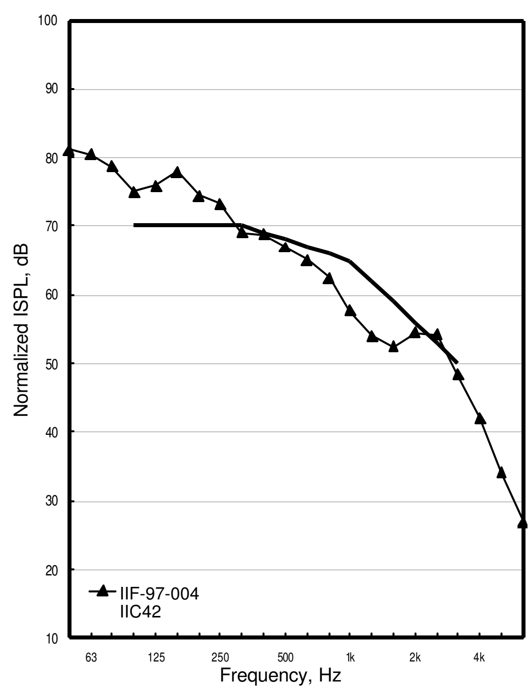
Freq. Hz	TLF-97-007a	IIF-97-004
50	15	81
63	17	80
80	22	79
100	21	75
125	27	76
160	27	78
200	33	74
250	37	73
315	43	69
400	50	69
500	51	67
630	51	65
800	54	63
1000	59	58
1250	57	54
1600	57	52
2000	52	55
2500	51	54
3150	56	48
4000	61	42
5000	68	34
6300	74	27
STC/IIC	48	42
$R_w/L_{n,w}$	48	68

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	158.6	
Floor layers	173.3	8.6 kg/m^2
Ceiling layers	199.3	11.2 kg/m^2

38 x 38 mm LVL flange, 10 mm OSB web, 241 deep wood I-joists. 25 mm OSB rimboard used. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. OSB perpendicular to I-joists.





Group 17: Wood Truss Floors: Varying joist depth and spacing and varying subfloor

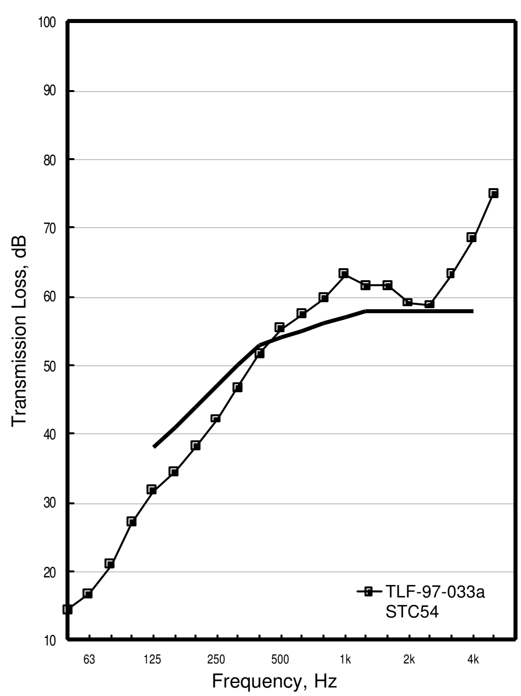
TLF-97-033a
IIF-97-017
OSB15_WT356(406)_GFB152_RC13(610)_G16

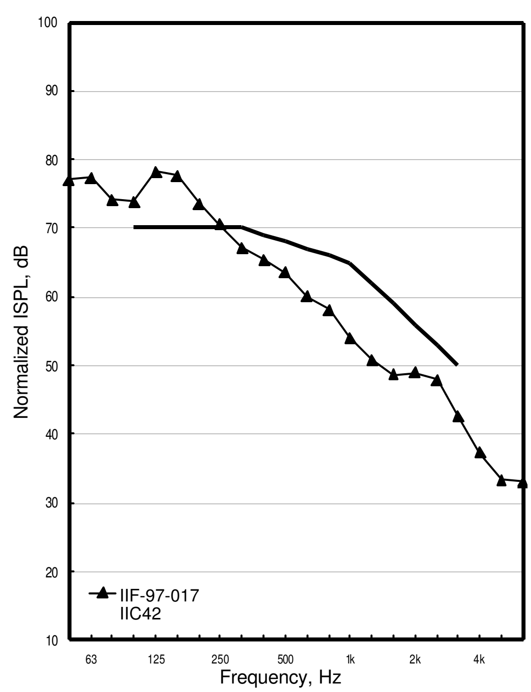
Freq. Hz	TLF-97-033a	IIF-97-017
50	14	77
63	17	77
80	21	74
100	27	74
125	32	78
160	35	78
200	38	74
250	42	71
315	47	67
400	52	65
500	55	64
630	57	60
800	60	58
1000	63	54
1250	62	51
1600	62	49
2000	59	49
2500	59	48
3150	63	43
4000	68	37
5000	75	33
6300		33
STC/IIC	54	42
$R_w/L_{n,w}$	53	67

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood truss joists		356	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	324.5	
Floor layers	188.7	9.4 kg/m^2
Ceiling layers	198.0	11.1 kg/m^2

Metal plate connected wood trusses. Two 2"X4" strong backs nailed perpendicular to wood trusses. 32 mm OSB rimboard used. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





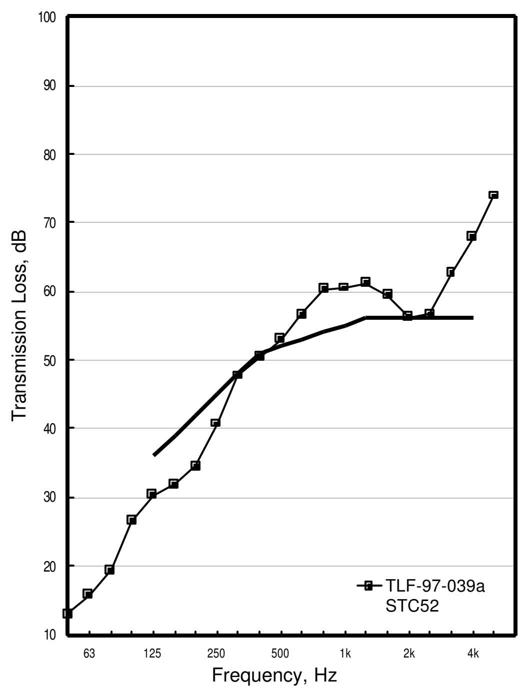
TLF-97-039a
IIF-97-019
OSB15_WT356(488)_GFB152_RC13(610)_G16

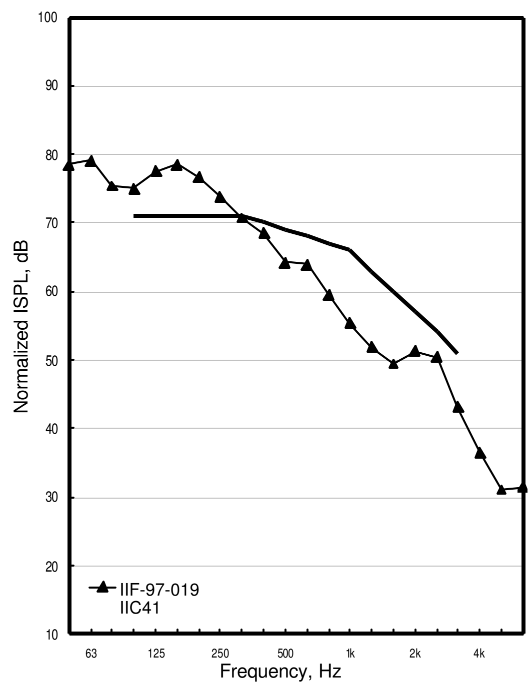
Freq. Hz	TLF-97-039a	IIF-97-019
50	13	78
63	16	79
80	19	75
100	27	75
125	30	78
160	32	79
200	34	77
250	41	74
315	48	71
400	50	68
500	53	64
630	57	64
800	60	59
1000	60	55
1250	61	52
1600	59	49
2000	56	51
2500	57	50
3150	63	43
4000	68	37
5000	74	31
6300	*	31
STC/IIC	52	41
$R_w/L_{n,w}$	52	69

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood truss joists		356	488
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	302.4	
Floor layers	188.6	9.4 kg/m^2
Ceiling layers	198.7	11.2 kg/m^2

Metal plate connected wood trusses. Two 2"x4" strong backs nailed perpendicular to wood trusses. 32 mm OSB rimboard used. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





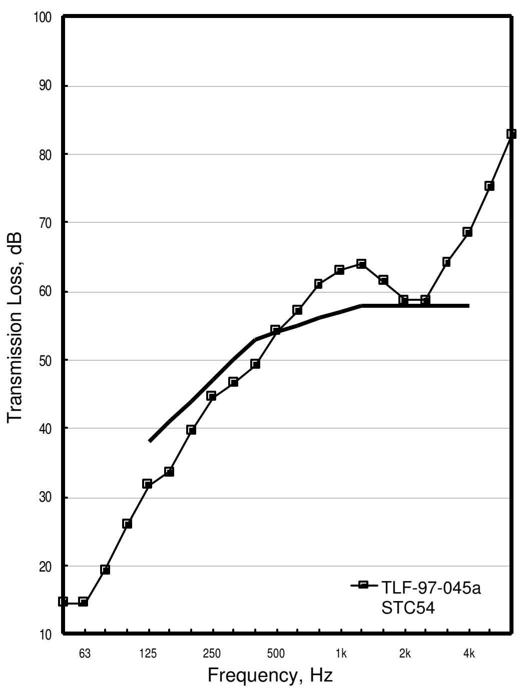
TLF-97-045a
IIF-97-022
OSB15_WT356(610)_GFB152_RC13(610)_G16

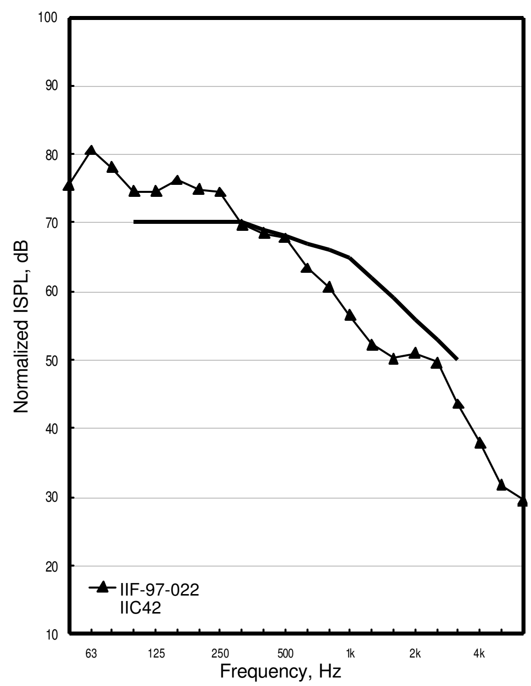
Freq. Hz	TLF-97-045a	IIF-97-022
50	14	76
63	15	81
80	19	78
100	26	75
125	32	75
160	34	76
200	40	75
250	45	74
315	47	70
400	49	69
500	54	68
630	57	63
800	61	61
1000	63	57
1250	64	52
1600	61	50
2000	59	51
2500	59	50
3150	64	44
4000	69	38
5000	75	32
6300	83	30
STC/IIC	54	42
$R_w/L_{n,w}$	53	67

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood truss joists		356	610
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	283.9	
Floor layers	191.8	9.5 kg/m^2
Ceiling layers	199.6	11.2 kg/m^2

Metal plate connected wood trusses. Two 2"x4" strong backs nailed perpendicular to wood trusses. 32 mm thick OSB rimboard used. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





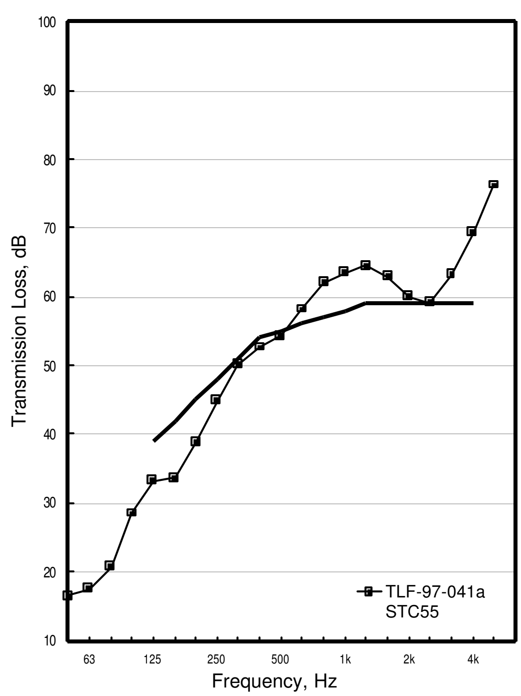
TLF-97-041a
IIF-97-020
OSB15_WT457(488)_GFB152_RC13(610)_G16

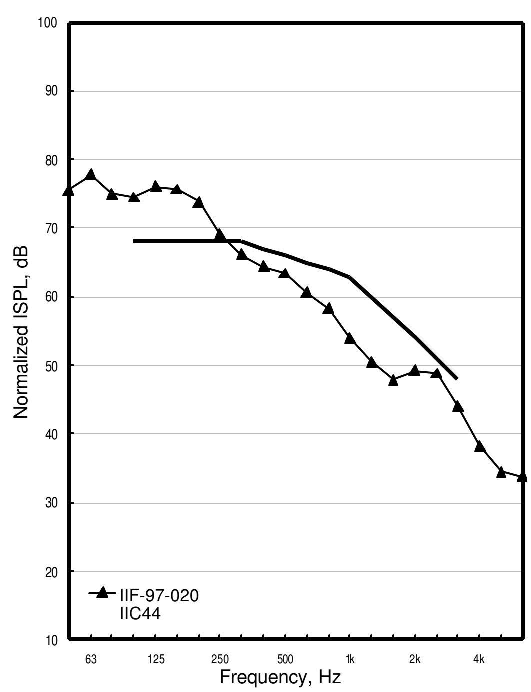
Freq. Hz	TLF-97-041a	IIF-97-020
50	16	76
63	17	78
80	21	75
100	28	75
125	33	76
160	34	76
200	39	74
250	45	69
315	50	66
400	53	64
500	54	63
630	58	61
800	62	58
1000	63	54
1250	64	51
1600	63	48
2000	60	49
2500	59	49
3150	63	44
4000	69	38
5000	76	34
6300	*	34
STC/IIC	55	44
$R_w/L_{n,w}$	54	66

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood truss joists		457	488
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	334.3	
Floor layers	188.7	9.4 kg/m^2
Ceiling layers	197.1	11.1 kg/m^2

Metal plate connected wood trusses. Two 2"x4" strong backs nailed perpendicular to wood trusses. Two pieces of 229 mm deep x 32 mm thick of OSB rimboard used. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





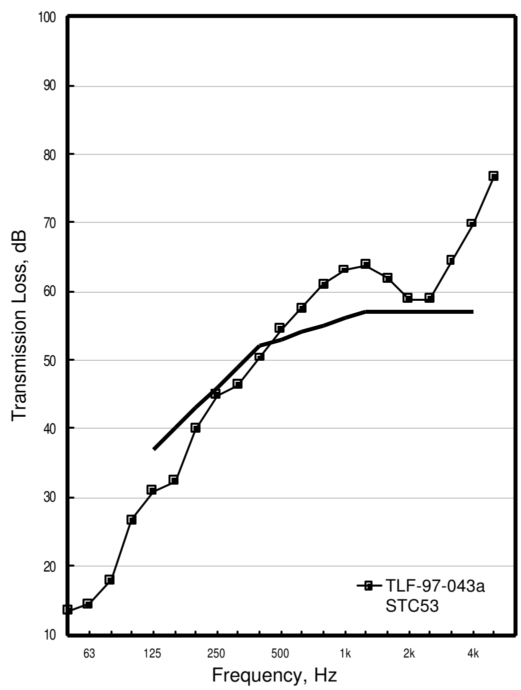
TLF-97-043a
IIF-97-021
OSB15_WT457(610)_GFB152_RC13(610)_G16

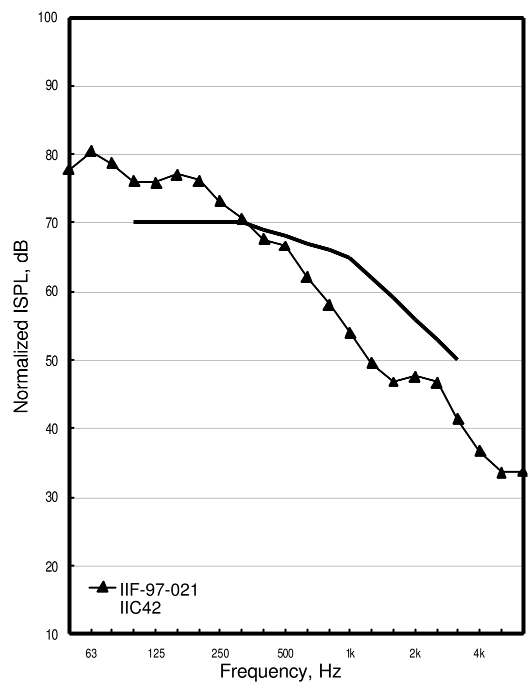
Freq. Hz	TLF-97-043a	IIF-97-021
50	13	78
63	14	80
80	18	79
100	27	76
125	31	76
160	32	77
200	40	76
250	45	73
315	46	71
400	50	68
500	54	67
630	58	62
800	61	58
1000	63	54
1250	64	50
1600	62	47
2000	59	48
2500	59	47
3150	64	41
4000	70	37
5000	77	34
6300	*	34
STC/IIC	53	42
$R_w/L_{n,w}$	53	68

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood truss joists		457	610
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	296.1	
Floor layers	191.3	9.5 kg/m^2
Ceiling layers	199.2	11.2 kg/m^2

Metal plate connected wood trusses. Two 2"x4" strong backs nailed perpendicular to wood trusses. Two pieces of 229 mm deep x 32 mm thick of OSB rimboard used. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





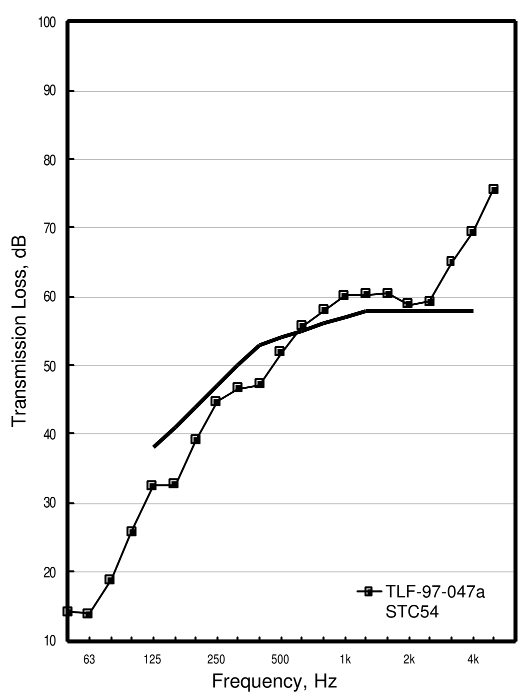
TLF-97-047a
IIF-97-023
OSB19_WT356(610)_GFB152_RC13(610)_G16

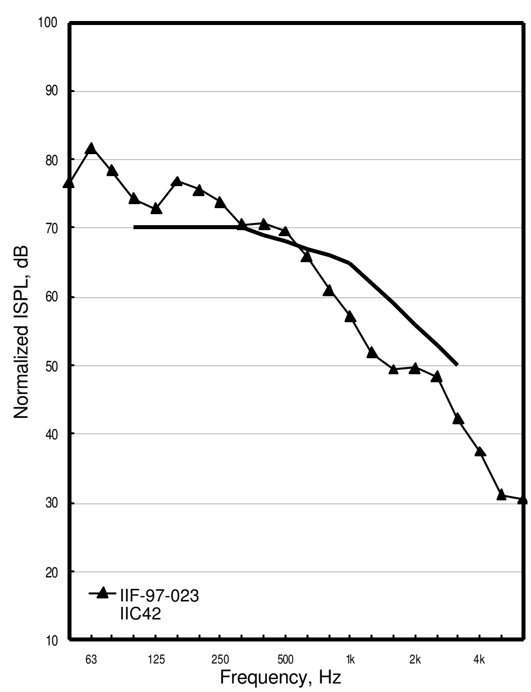
Freq. Hz	TLF-97-047a	IIF-97-023
50	14	77
63	14	82
80	19	78
100	26	74
125	33	73
160	33	77
200	39	76
250	45	74
315	47	71
400	47	71
500	52	70
630	56	66
800	58	61
1000	60	57
1250	60	52
1600	60	49
2000	59	50
2500	59	48
3150	65	42
4000	69	38
5000	76	31
6300	*	31
STC/IIC	54	42
$R_w/L_{n,w}$	53	68

Material	N	Thick.	Spac.
Oriented strandboard	1	19	
Wood truss joists		356	610
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	283.9	
Floor layers	201.8	10 kg/m^2
Ceiling layers	199.6	11.2 kg/m^2

Metal plate connected wood trusses. Two 2"x4" strong backs nailed perpendicular to wood trusses. 32 mm thick OSB rimboard used. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





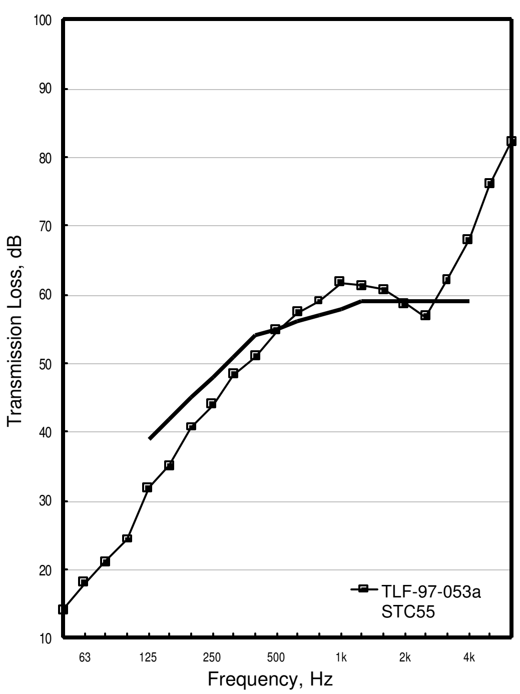
TLF-97-053a
IIF-97-026
OSB19_WT356(610)_GFB152_RC13(610)_G16

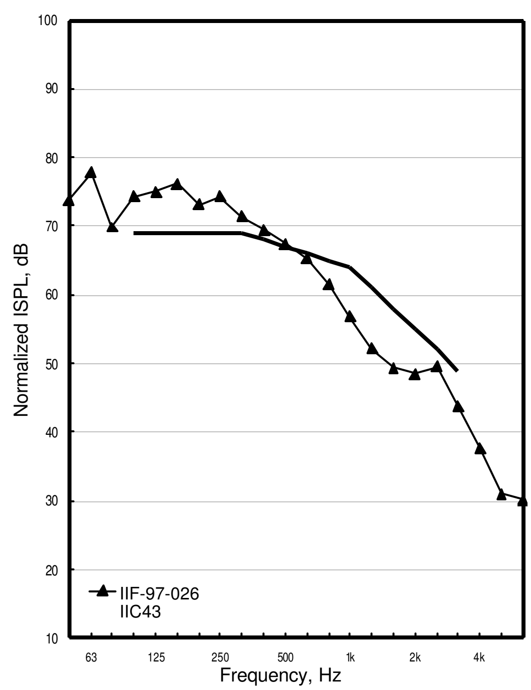
Freq. Hz	TLF-97-053a	IIF-97-026
50	14	74
63	18	78
80	21	70
100	24	74
125	32	75
160	35	76
200	41	73
250	44	74
315	48	71
400	51	69
500	55	67
630	57	65
800	59	62
1000	62	57
1250	61	52
1600	61	49
2000	59	49
2500	57	49
3150	62	44
4000	68	38
5000	76	31
6300	82	30
STC/IIC	55	43
$R_w/L_{n,w}$	53	67

Material	N	Thick.	Spac.
Oriented strandboard	1	19	
Wood truss joists		356	610
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	277.3	
Floor layers	208.0	10.3 kg/m^2
Ceiling layers	205.2	11.5 kg/m^2

Metal plate connected wood trusses, flanges made from 2x3 lumber. Flange is 65 mm horizontally by 40 mm vertically. Two 2"x4" strong backs nailed perpendicular to wood trusses. 32 mm thick OSB rimboard used. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints they are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





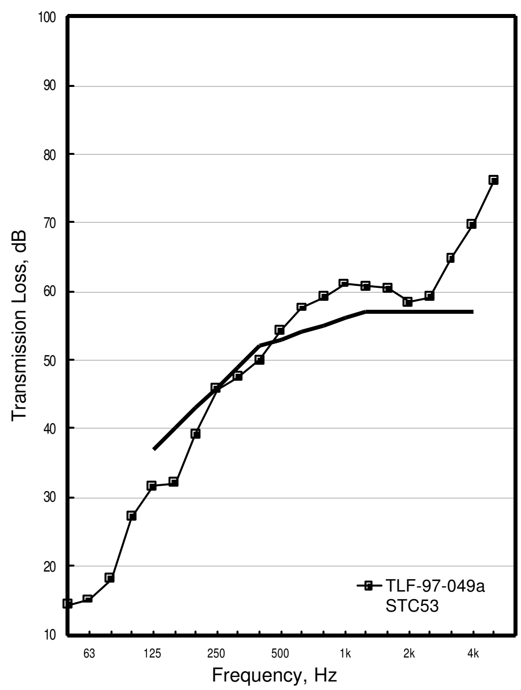
TLF-97-049a
IIF-97-024
OSB19_WT457(610)_GFB152_RC13(610)_G16

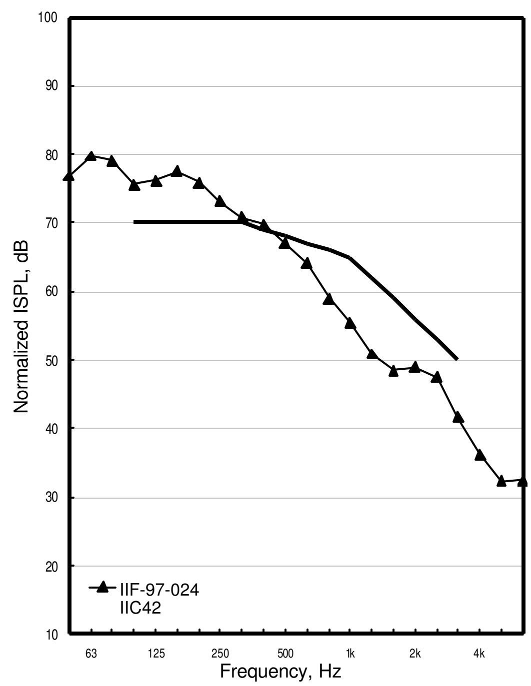
Freq. Hz	TLF-97-049a	IIF-97-024
50	14	77
63	15	80
80	18	79
100	27	76
125	32	76
160	32	78
200	39	76
250	46	73
315	47	71
400	50	70
500	54	67
630	58	64
800	59	59
1000	61	56
1250	61	51
1600	60	49
2000	58	49
2500	59	47
3150	65	42
4000	70	36
5000	76	32
6300	*	33
STC/IIC	53	42
$R_w/L_{n,w}$	53	68

Material	N	Thick.	Spac.
Oriented strandboard	1	19	
Wood truss joists		457	610
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	296.1	
Floor layers	201.4	10 kg/m^2
Ceiling layers	199.2	11.2 kg/m^2

Metal plate connected wood trusses. Two 2"x4" strong backs nailed perpendicular to wood trusses. 32 mm thick OSB rimboard used. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





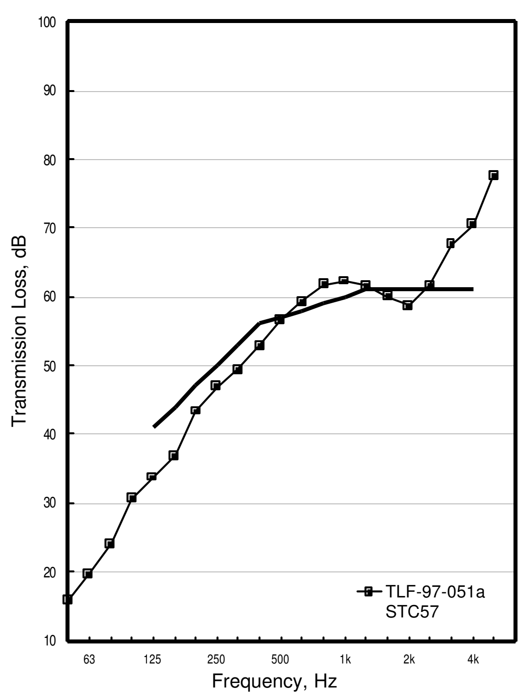
TLF-97-051a
IIF-97-025
OSB19_WT610(610)_GFB152_RC13(610)_G16

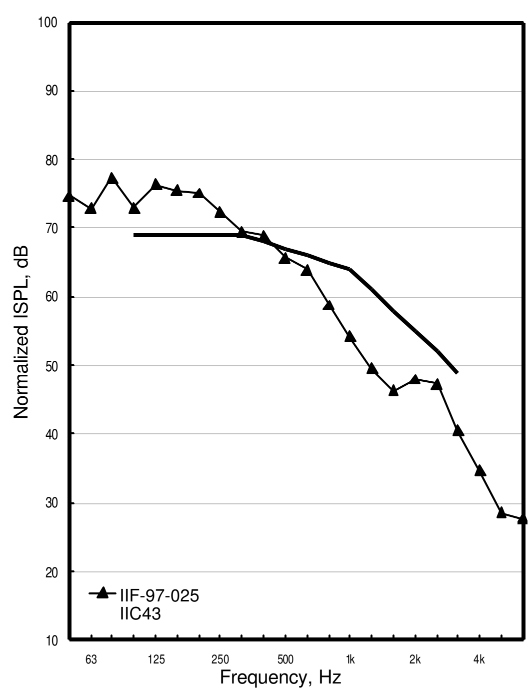
Freq. Hz	TLF-97-051a	IIF-97-025
50	14	75
63	20	73
80	20	77
100	26	73
125	33	76
160	34	75
200	41	75
250	46	72
315	48	69
400	50	69
500	56	66
630	58	64
800	61	59
1000	63	54
1250	62	49
1600	62	46
2000	59	48
2500	58	47
3150	65	41
4000	71	35
5000	78	28
6300	*	28
STC/IIC	55	43
$R_w/L_{n,w}$	54	67

Material	N	Thick.	Spac.
Oriented strandboard	1	19	
Wood truss joists		610	610
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	310.1	
Floor layers	205.4	10.2 kg/m^2
Ceiling layers	205.8	11.6 kg/m^2

Metal plate connected wood trusses. Two 2"x4" strong backs nailed perpendicular to wood trusses. 32 mm thick OSB rimboard used. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





Group 18: Steel Joist Floors: Varying joist depth, spacing and metal gauge, varying subfloor

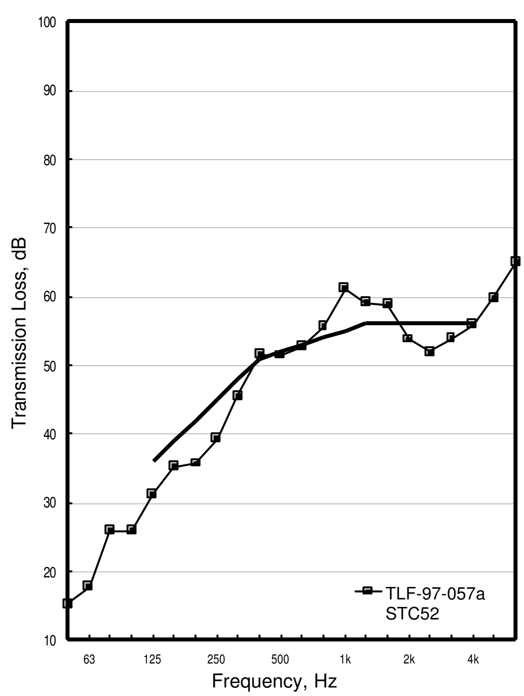
TLF-97-057a
IIF-97-028
OSB16_SJ203(406)_GFB152_RC13(610)_G16

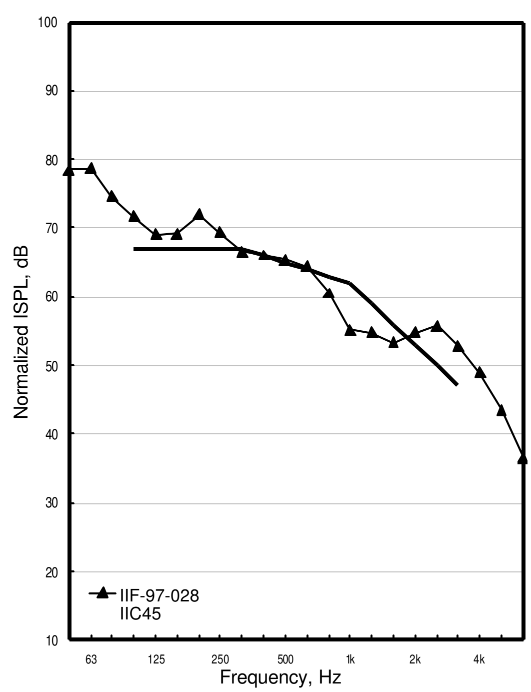
Freq. Hz	TLF-97-057a	IIF-97-028
50	15	78
63	18	79
80	26	75
100	26	72
125	31	69
160	35	69
200	36	72
250	39	69
315	46	67
400	52	66
500	51	65
630	53	64
800	56	61
1000	61	55
1250	59	55
1600	59	53
2000	54	55
2500	52	56
3150	54	53
4000	56	49
5000	60	43
6300	65	37
STC/IIC	52	45
$R_w/L_{n,w}$	51	65

Material	N	Thick.	Spac.
Oriented strandboard	1	16	
Steel joists		203	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	279.9	
Floor layers	167.2	8.3 kg/m^2
Ceiling layers	204.4	11.5 kg/m^2

14 gauge steel joists. Four joist cavities between blocking pieces. 18 gauge flat strap bridging strip installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





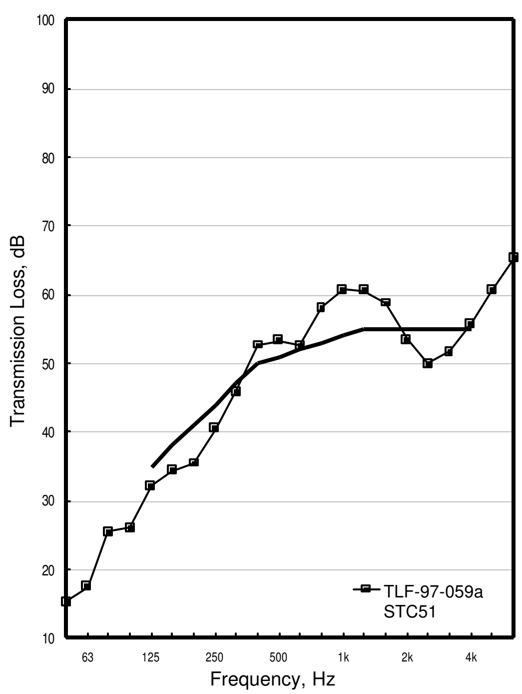
TLF-97-059a
IIF-97-029
OSB16_SJ203(406)_GFB152_RC13(610)_G16

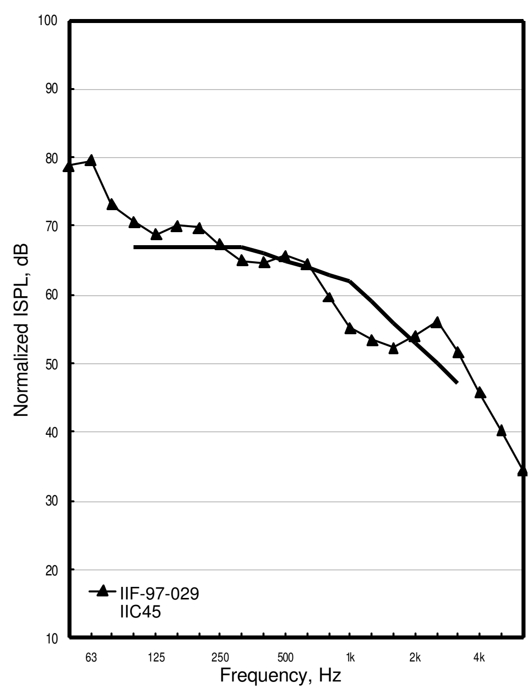
Freq. Hz	TLF-97-059a	IIF-97-029
50	15	79
63	18	80
80	26	73
100	26	71
125	32	69
160	34	70
200	35	70
250	40	67
315	46	65
400	53	65
500	53	66
630	53	65
800	58	60
1000	61	55
1250	61	53
1600	59	52
2000	53	54
2500	50	56
3150	52	52
4000	56	46
5000	61	40
6300	65	34
STC/IIC	51	45
$R_w/L_{n,w}$	51	65

Material	N	Thick.	Spac.
Oriented strandboard	1	16	
Steel joists		203	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	231.2	
Floor layers	166.8	8.3 kg/m^2
Ceiling layers	203.8	11.4 kg/m^2

16 gauge steel joists. Four joist cavities between blocking pieces. 18 gauge flat strap bridging strip installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





TLF-97-085a

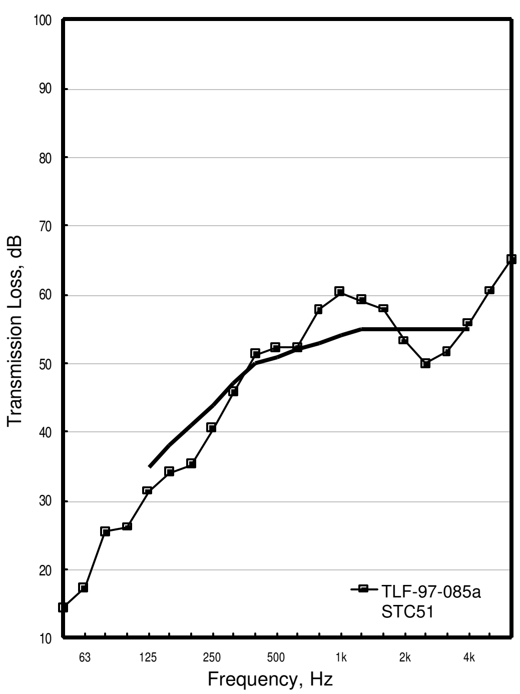
OSB16_SJ203(406)_GFB152_RC13(610)_G16

Freq. Hz	TLF-97-085a	
50	14	
63	17	
80	25	
100	26	
125	31	
160	34	
200	35	
250	40	
315	46	
400	51	
500	52	
630	52	
800	58	
1000	60	
1250	59	
1600	58	
2000	53	
2500	50	
3150	52	
4000	56	
5000	60	
6300	65	
STC/IIC	51	
$R_w/L_{n,w}$	50	

Material	N	Thick.	Spac.
Oriented strandboard	1	16	
Steel joists		203	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	231.2	
Floor layers	166.8	8.3 kg/m^2
Ceiling layers	203.8	11.4 kg/m^2

16 gauge steel joists. Four joist cavities between blocking pieces. 18 gauge flat strap bridging strip installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field. Rebuild of TLF-97-059a .



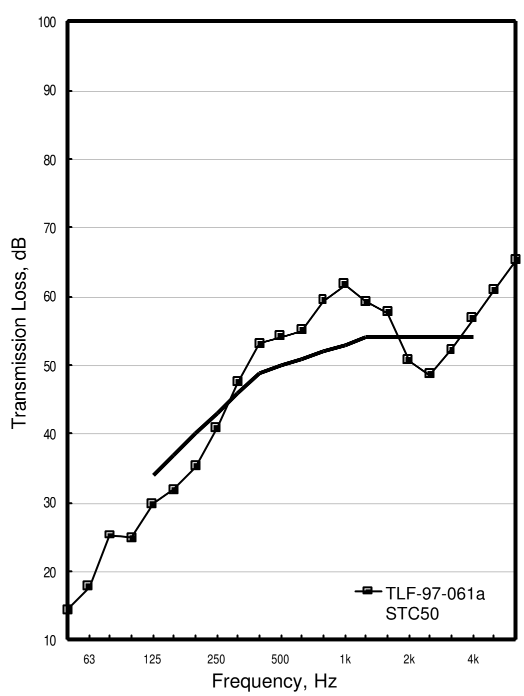
TLF-97-061a
IIF-97-030
OSB16_SJ203(406)_GFB152_RC13(610)_G16

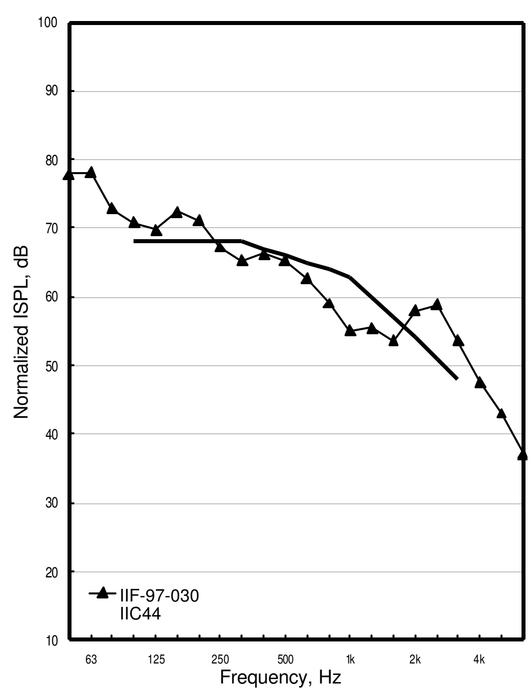
Freq. Hz	TLF-97-061a	IIF-97-030
50	14	78
63	18	78
80	25	73
100	25	71
125	30	70
160	32	72
200	35	71
250	41	67
315	48	65
400	53	66
500	54	65
630	55	63
800	59	59
1000	62	55
1250	59	56
1600	58	54
2000	51	58
2500	49	59
3150	52	54
4000	57	48
5000	61	43
6300	65	37
STC/IIC	50	44
$R_w/L_{n,w}$	50	66

Material	N	Thick.	Spac.
Oriented strandboard	1	16	
Steel joists		203	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	189.2	
Floor layers	166.5	8.3 kg/m^2
Ceiling layers	204.5	11.5 kg/m^2

18 gauge steel joists. Four joist cavities between blocking pieces. 18 gauge flat strap bridging strip installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





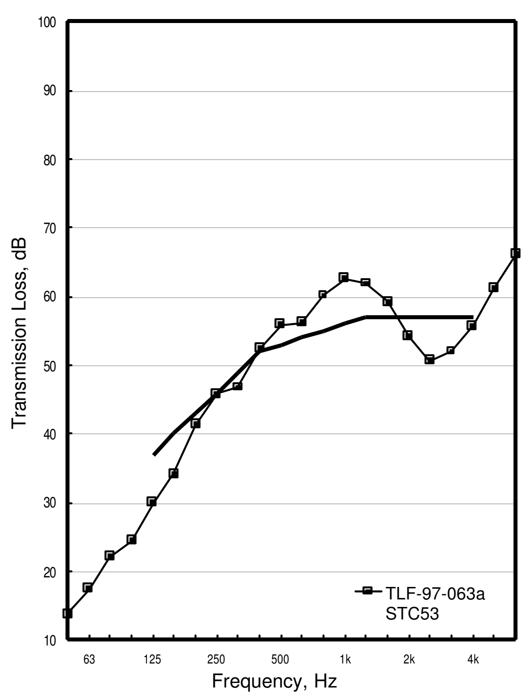
TLF-97-063a
IIF-97-031
OSB16_SJ203(610)_GFB152_RC13(610)_G16

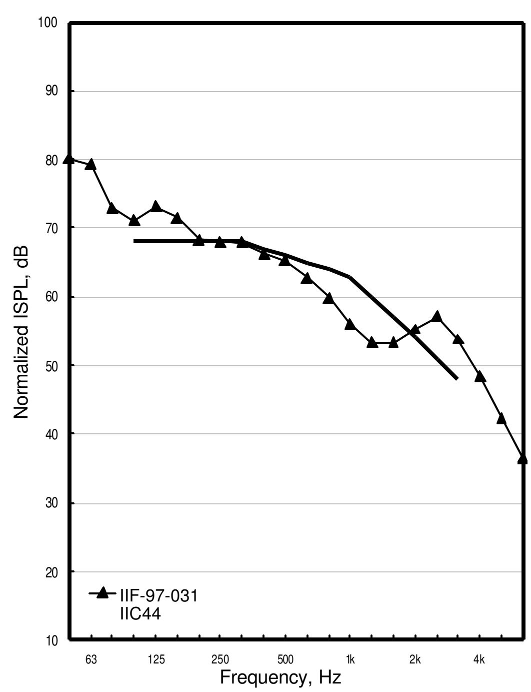
Freq. Hz	TLF-97-063a	IIF-97-031
50	14	80
63	17	79
80	22	73
100	24	71
125	30	73
160	34	72
200	41	68
250	46	68
315	47	68
400	52	66
500	56	65
630	56	63
800	60	60
1000	63	56
1250	62	53
1600	59	53
2000	54	55
2500	51	57
3150	52	54
4000	56	49
5000	61	42
6300	66	36
STC/IIC	53	44
$R_w/L_{n,w}$	51	66

Material	N	Thick.	Spac.
Oriented strandboard	1	16	
Steel joists		203	610
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	173.0	
Floor layers	169.7	8.4 kg/m^2
Ceiling layers	205.0	11.5 kg/m^2

16 gauge steel joists. Four joist cavities between blocking pieces. 18 gauge flat strap bridging strip installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 mm o.c. in the field.





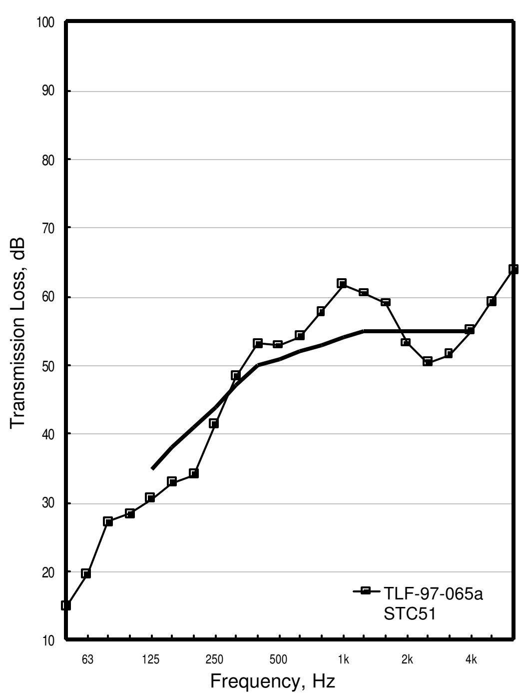
TLF-97-065a
IIF-97-032
OSB16_SJ254(406)_GFB152_RC13(610)_G16

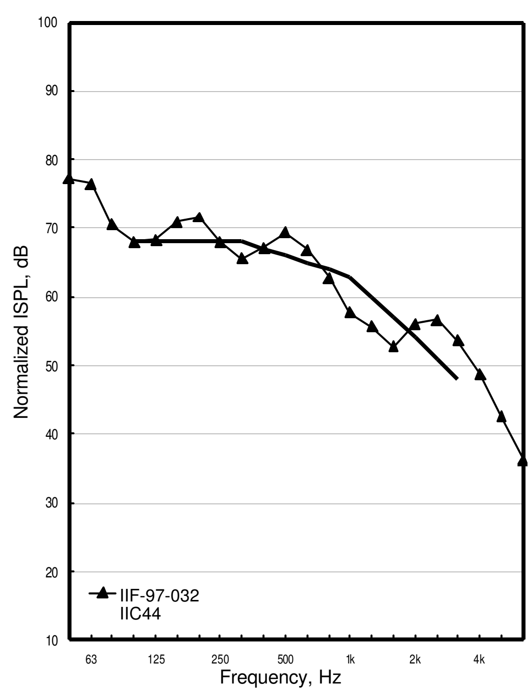
Freq. Hz	TLF-97-065a	IIF-97-032
50	15	77
63	20	76
80	27	71
100	28	68
125	31	68
160	33	71
200	34	72
250	42	68
315	48	66
400	53	67
500	53	69
630	54	67
800	58	63
1000	62	58
1250	60	56
1600	59	53
2000	53	56
2500	50	57
3150	52	54
4000	55	49
5000	59	42
6300	64	36
STC/IIC	51	44
$R_w/L_{n,w}$	51	66

Material	N	Thick.	Spac.
Oriented strandboard	1	16	
Steel joists		254	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	286.8	
Floor layers	168.6	8.4 kg/m^2
Ceiling layers	205.2	11.5 kg/m^2

16 gauge steel joists, 406 mm o.c. Four joist cavities between blocking pieces. 18 gauge flat strap bridging strip installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





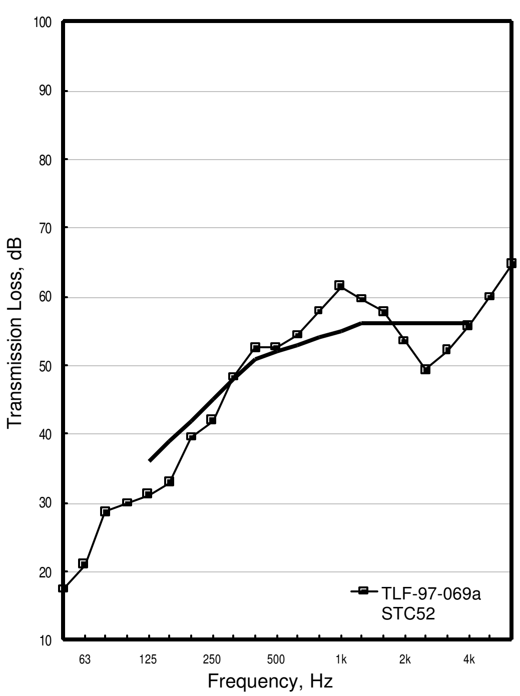
TLF-97-069a
IIF-97-034
OSB16_SJ305(406)_GFB152_RC13(610)_G16

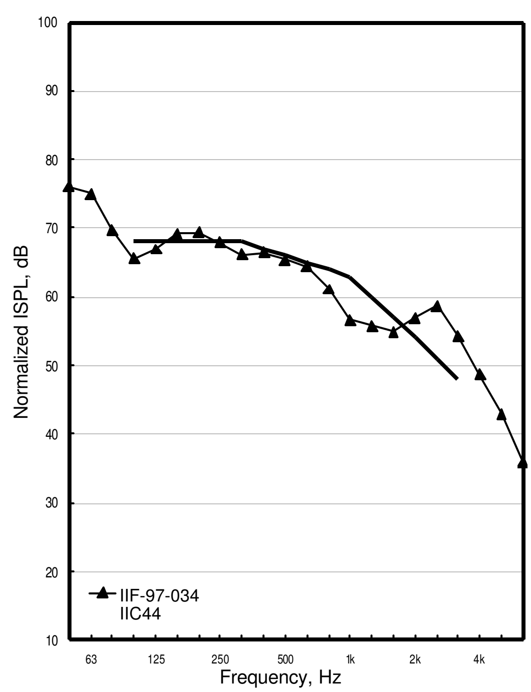
Freq. Hz	TLF-97-069a	IIF-97-034
50	17	76
63	21	75
80	29	70
100	30	66
125	31	67
160	33	69
200	40	69
250	42	68
315	48	66
400	53	66
500	53	65
630	54	64
800	58	61
1000	61	57
1250	60	56
1600	58	55
2000	53	57
2500	49	59
3150	52	54
4000	56	49
5000	60	43
6300	65	36
STC/IIC	52	44
$R_w/L_{n,w}$	51	65

Material	N	Thick.	Spac.
Oriented strandboard	1	16	
Steel joists		305	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	340.0	
Floor layers	171.0	8.5 kg/m^2
Ceiling layers	204.4	11.5 kg/m^2

16 gauge steel joists. Four joist cavities between blocking pieces. 18 gauge flat strap bridging strip installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 152 mm o.c. around edges, 305 mm o.c. in the field.





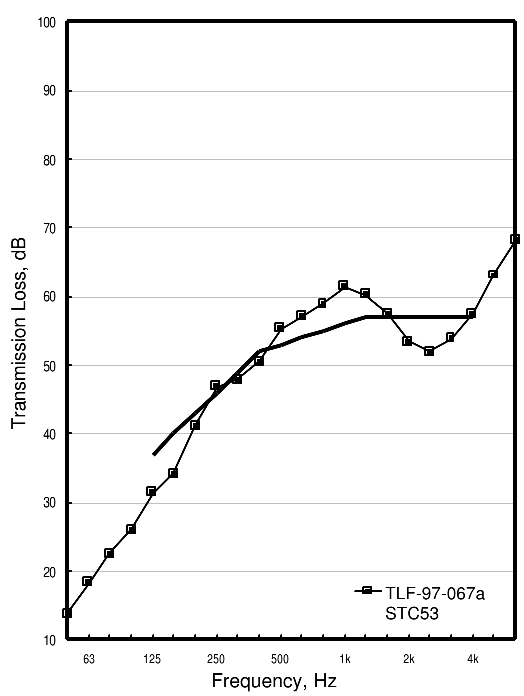
TLF-97-067a
IIF-97-033
OSB19_SJ203(610)_GFB152_RC13(610)_G16

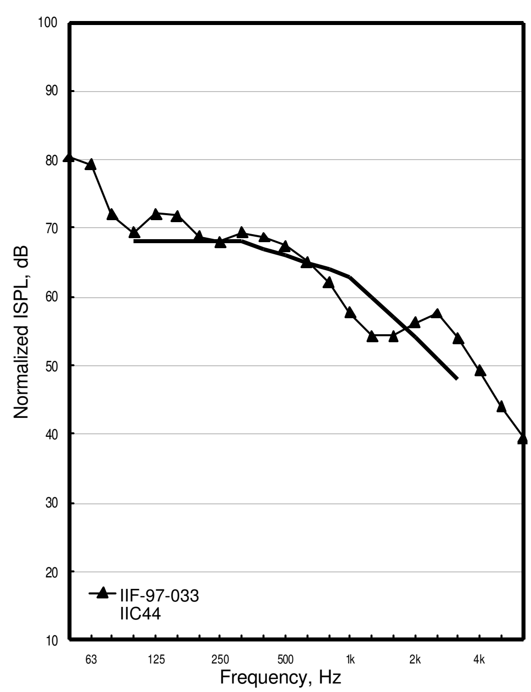
Freq. Hz	TLF-97-067a	IIF-97-033
50	14	80
63	18	79
80	23	72
100	26	69
125	31	72
160	34	72
200	41	69
250	47	68
315	48	69
400	50	69
500	55	67
630	57	65
800	59	62
1000	61	58
1250	60	54
1600	57	54
2000	53	56
2500	52	58
3150	54	54
4000	57	49
5000	63	44
6300	68	40
STC/IIC	53	44
$R_w/L_{n,w}$	52	66

Material	N	Thick.	Spac.
Oriented strandboard	1	19	
Steel joists		203	610
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	173.0	
Floor layers	212.0	10.5 kg/m^2
Ceiling layers	205.0	11.5 kg/m^2

16 gauge steel joists. Four joist cavities between blocking pieces. 18 gauge flat strap bridging strip installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 mm o.c. in the field.





Group 19: Steel Joists, 16 gauge: Varying cavity absorption

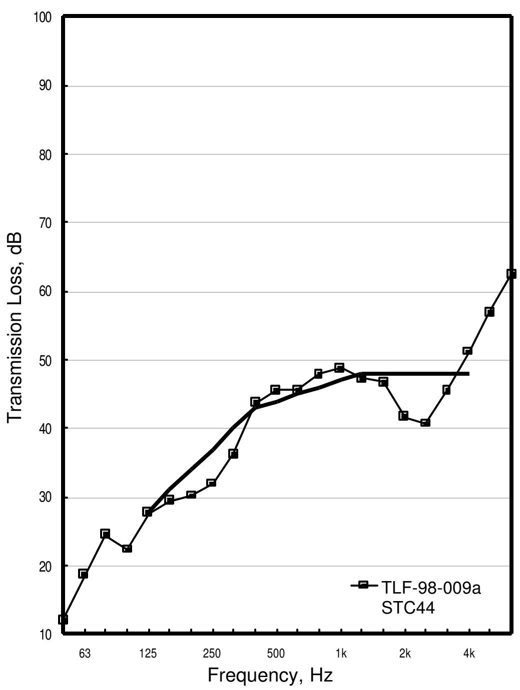
TLF-98-009a
IIF-98-004
OSB16_SJ203(406)_RC13(610)_G16

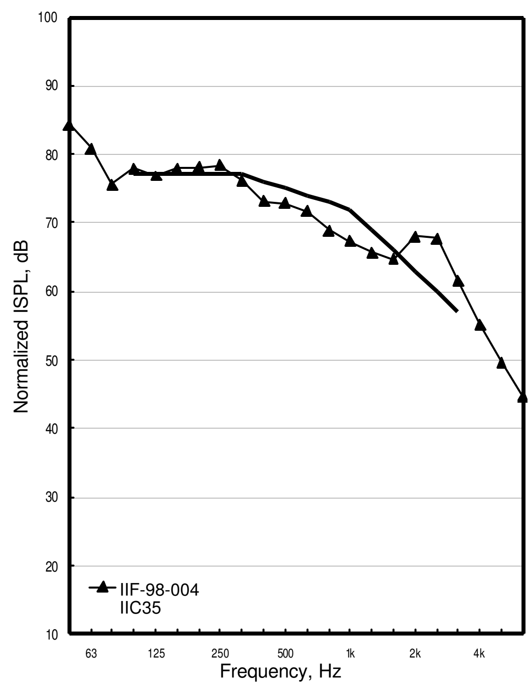
Freq. Hz	TLF-98-009a	IIF-98-004
50	12	84
63	19	81
80	24	76
100	22	78
125	28	77
160	29	78
200	30	78
250	32	78
315	36	76
400	44	73
500	46	73
630	46	72
800	48	69
1000	49	67
1250	47	66
1600	47	65
2000	42	68
2500	41	68
3150	46	62
4000	51	55
5000	57	50
6300	62	45
STC/IIC	44	35
$R_w/L_{n,w}$	43	74

Material	N	Thick.	Spac.
Oriented strandboard	1	16	
Steel joists		203	406
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	231.2	
Floor layers	175.3	8.7 kg/m^2
Ceiling layers	198.7	11.2 kg/m^2

16 gauge steel joists. Four joist cavities between blocking pieces. 18 gauge flat strap bridging installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





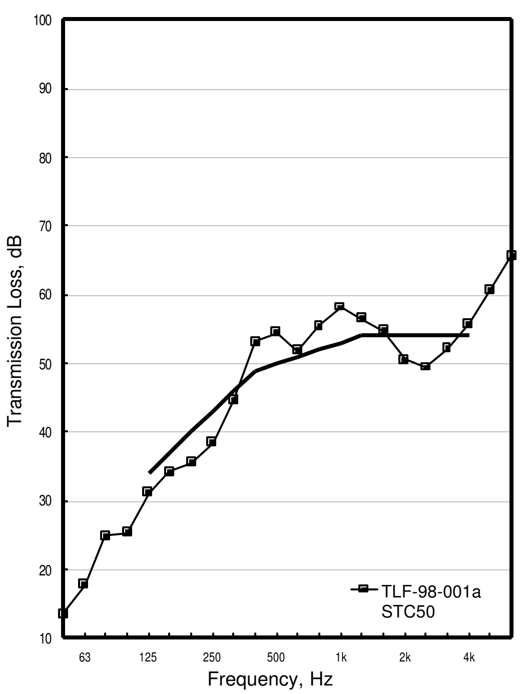
TLF-98-001a
IIF-98-001
OSB16_SJ203(406)_GFB152_RC13(610)_G16

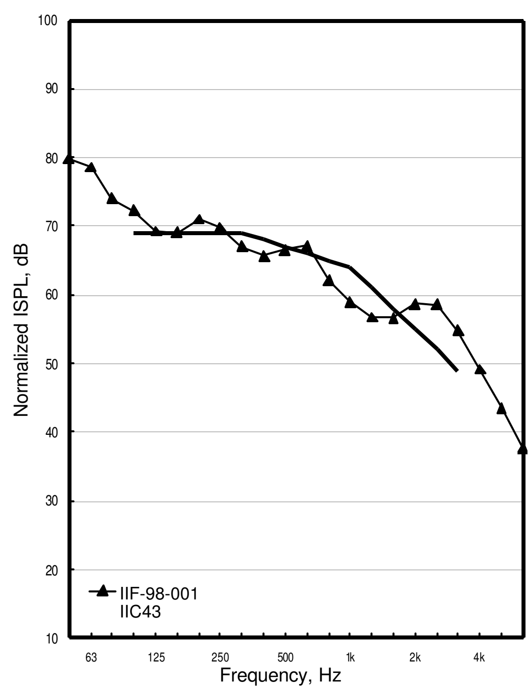
Freq. Hz	TLF-98-001a	IIF-98-001
50	13	80
63	18	79
80	25	74
100	25	72
125	31	69
160	34	69
200	36	71
250	38	70
315	45	67
400	53	66
500	54	66
630	52	67
800	55	62
1000	58	59
1250	57	57
1600	55	57
2000	50	59
2500	49	59
3150	52	55
4000	56	49
5000	61	44
6300	66	38
STC/IIC	50	43
$R_w/L_{n,w}$	49	67

Material	N	Thick.	Spac.
Oriented strandboard	1	16	
Steel joists		203	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	231.2	
Floor layers	175.3	8.7 kg/m^2
Ceiling layers	198.7	11.2 kg/m^2

Repeat of TLF-97-059a and TLF-97-085a. Same joists, all other materials new. Joists disassembled then re-assembled for this test. 16 gauge steel joists, 406 mm o.c. Four joist cavities between blocking pieces. 18 gauge flat strap bridging strip installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





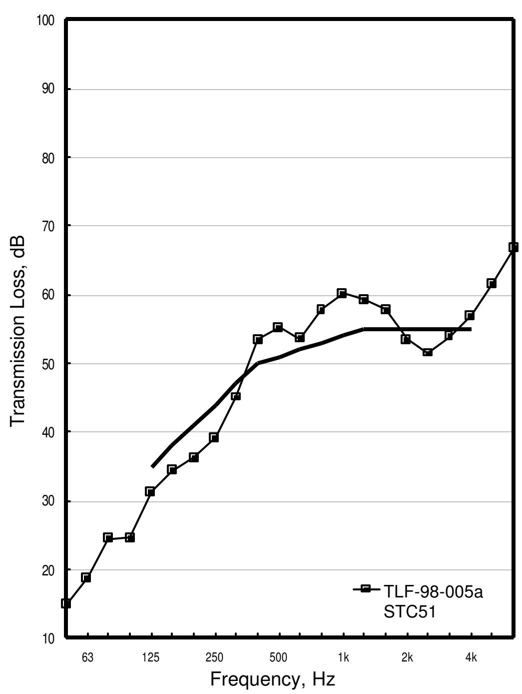
TLF-98-005a
IIF-98-002
OSB16_SJ203(406)_MFB140_RC13(610)_G16

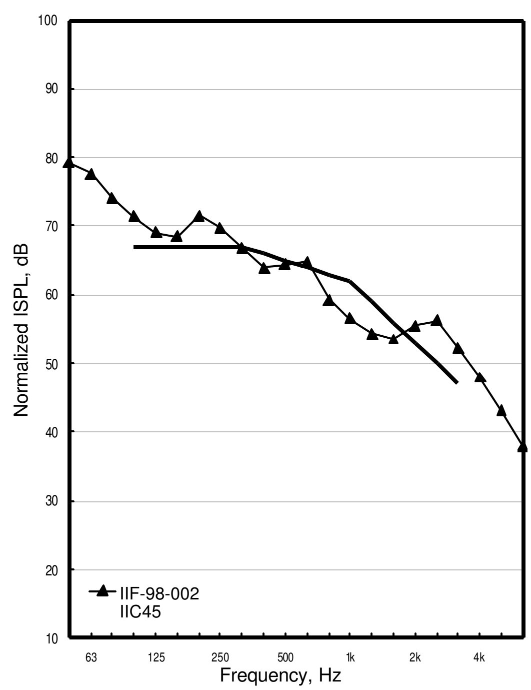
Freq. Hz	TLF-98-005a	IIF-98-002
50	15	79
63	19	78
80	25	74
100	25	71
125	31	69
160	34	68
200	36	71
250	39	70
315	45	67
400	53	64
500	55	64
630	54	65
800	58	59
1000	60	56
1250	59	54
1600	58	54
2000	53	55
2500	51	56
3150	54	52
4000	57	48
5000	62	43
6300	67	38
STC/IIC	51	45
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	16	
Steel joists		203	406
Mineral fibre batts		140	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	231.2	
Floor layers	175.3	8.7 kg/m^2
Ceiling layers	198.7	11.2 kg/m^2

16 gauge steel joists. Four joist cavities between blocking pieces. 18 gauge flat strap bridging strip installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





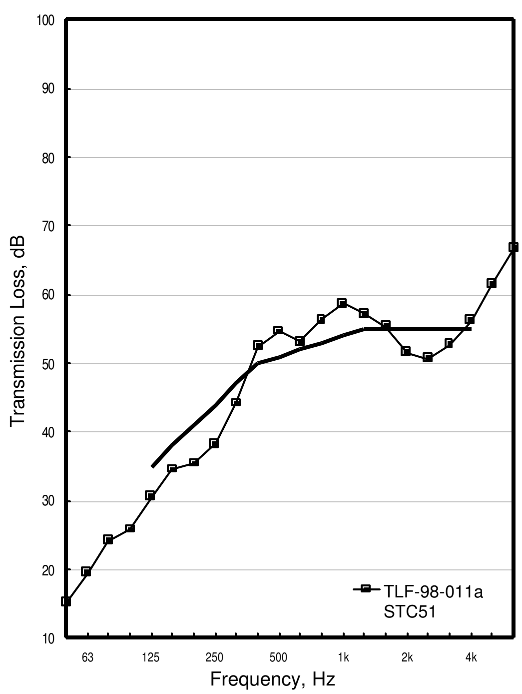
TLF-98-011a
IIF-98-005
OSB16_SJ203(406)_CFL90_RC13(610)_G16

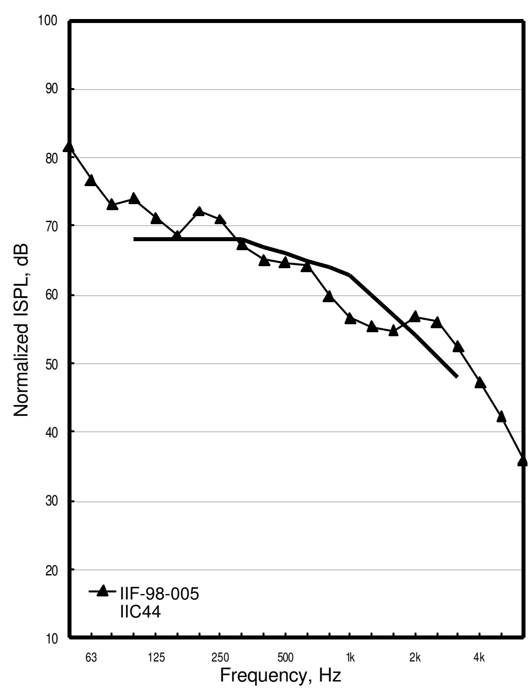
Freq. Hz	TLF-98-011a	IIF-98-005
50	15	82
63	20	77
80	24	73
100	26	74
125	31	71
160	35	69
200	35	72
250	38	71
315	44	67
400	52	65
500	55	65
630	53	64
800	56	60
1000	59	57
1250	57	55
1600	55	55
2000	52	57
2500	51	56
3150	53	52
4000	56	47
5000	61	42
6300	67	36
STC/IIC	51	44
$R_w/L_{n,w}$	50	66

Material	N	Thick.	Spac.
Oriented strandboard	1	16	
Steel joists		203	406
Blown-in cellulose fibre		90	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	231.2	
Floor layers	175.4	8.7 kg/m^2
Ceiling layers	199.8	11.2 kg/m^2

16 gauge steel joists. Four joist cavities between blocking pieces. 18 gauge flat strap bridging installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. Dry blown in cellulose, nominal thickness 85 mm. Mesh installed between RCs and bottom of joists. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





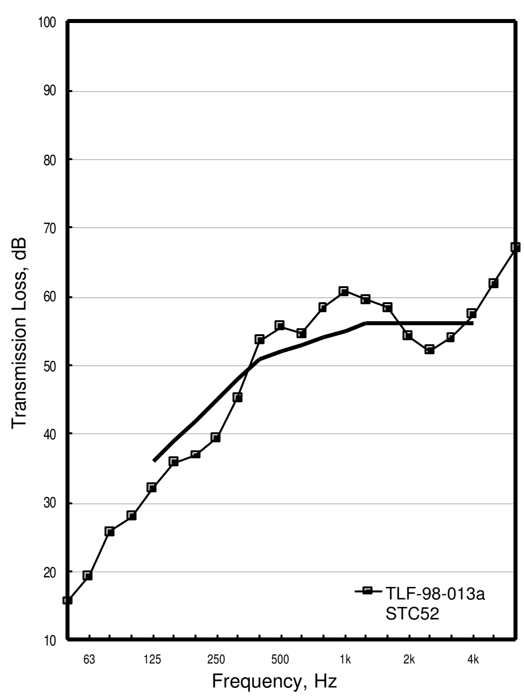
TLF-98-013a
IIF-98-006
OSB16_SJ203(406)_CFL140_RC13(610)_G16

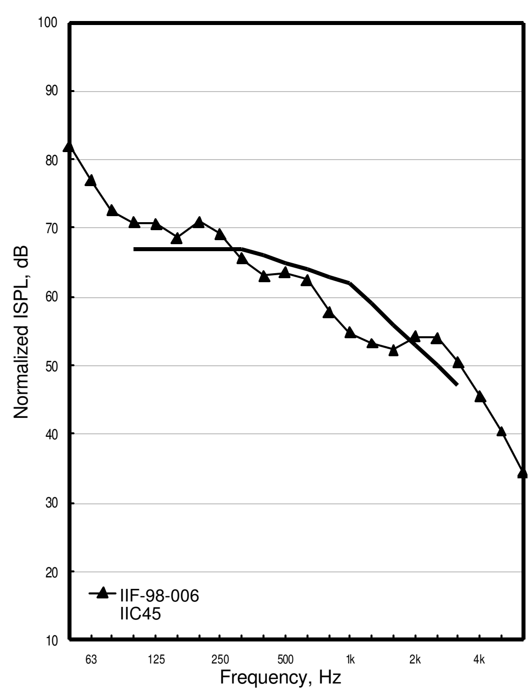
Freq. Hz	TLF-98-013a	IIF-98-006
50	16	82
63	19	77
80	26	73
100	28	71
125	32	71
160	36	69
200	37	71
250	39	69
315	45	66
400	54	63
500	56	64
630	55	62
800	58	58
1000	61	55
1250	60	53
1600	58	52
2000	54	54
2500	52	54
3150	54	51
4000	57	46
5000	62	40
6300	67	34
STC/IIC	52	45
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	16	
Steel joists		203	406
Blown-in cellulose fibre		140	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	231.2	
Floor layers	175.4	8.7 kg/m^2
Ceiling layers	199.8	11.2 kg/m^2

16 gauge steel joists, 406 mm o.c. Four joist cavities between blocking pieces. 18 gauge flat strap bridging installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. Dry blown in cellulose, nominal thickness 140 mm. Mesh installed between RCs and bottom of joists. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





Group 20: Steel Joists, 16 gauge: Gypsum concrete topping

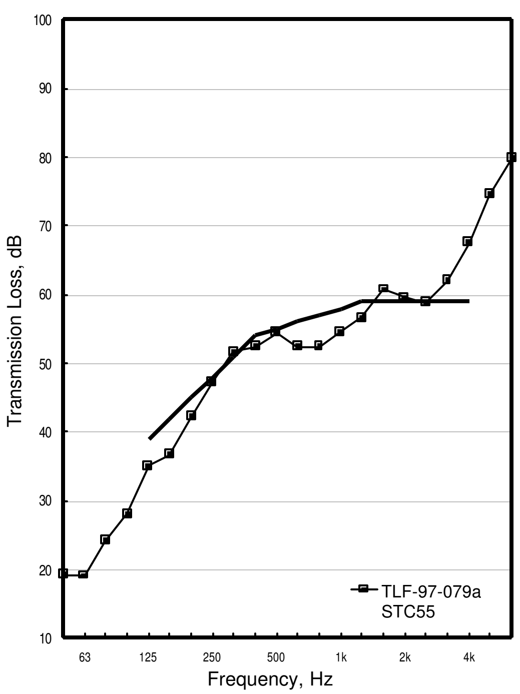
TLF-97-079a
IIF-97-039
GCON25_OSB16_SJ203(406)_RC13(610)_G16

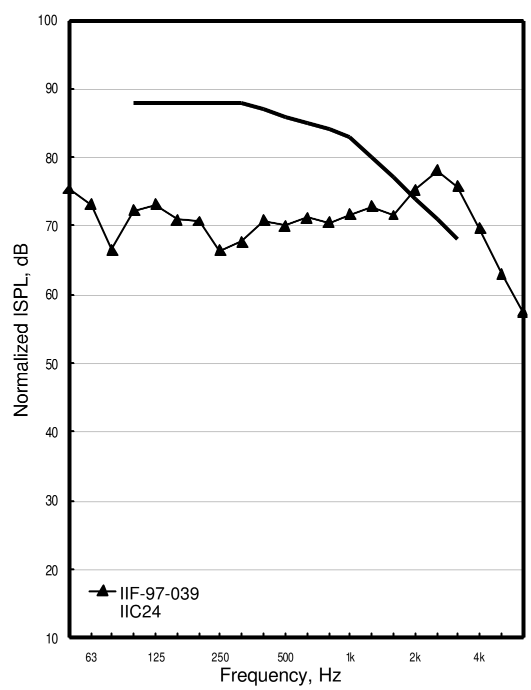
Freq. Hz	TLF-97-079a	IIF-97-039
50	19	75
63	19	73
80	24	66
100	28	72
125	35	73
160	37	71
200	42	71
250	47	66
315	52	68
400	52	71
500	55	70
630	52	71
800	52	71
1000	55	72
1250	57	73
1600	61	72
2000	60	75
2500	59	78
3150	62	76
4000	68	70
5000	74	63
6300	80	57
STC/IIC	55	24
$R_w/L_{n,w}$	54	81

Material	N	Thick.	Spac.
Gypsum concrete		25	
Oriented strandboard	1	16	
Steel joists		203	406
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	173.0	
Floor layers	1131.0	56.3 kg/m^2
Ceiling layers	205.0	11.5 kg/m^2

Gypsum concrete topping. 16 gauge steel joists. Four joist cavities between blocking pieces. 18 gauge flat strap bridging strip installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





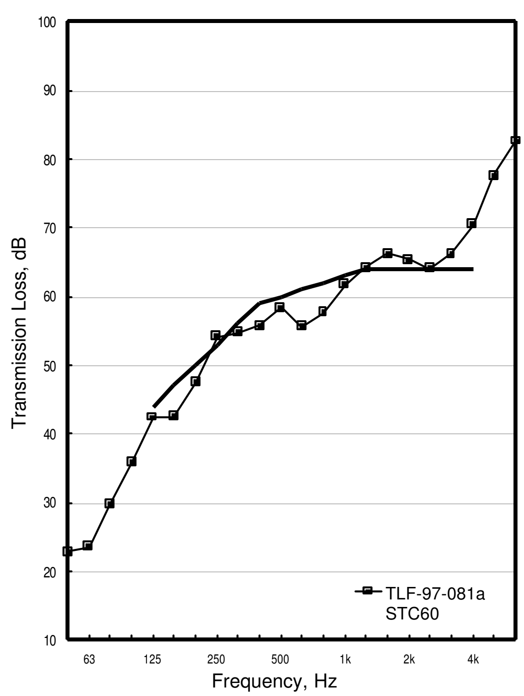
TLF-97-081a
IIF-97-040
GCON25_OSB16_SJ203(406)_GFB152_RC13(610)_G16

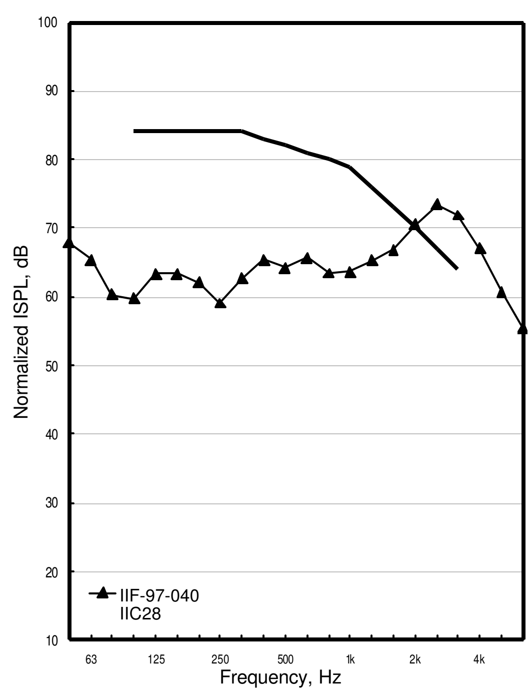
Freq. Hz	TLF-97-081a	IIF-97-040
50	23	68
63	24	65
80	30	60
100	36	60
125	42	63
160	43	63
200	48	62
250	54	59
315	55	63
400	56	65
500	58	64
630	56	66
800	58	63
1000	62	64
1250	64	65
1600	66	67
2000	65	71
2500	64	73
3150	66	72
4000	70	67
5000	78	61
6300	83	55
STC/IIC	60	28
$R_w/L_{n,w}$	60	77

Material	N	Thick.	Spac.
Gypsum concrete		25	
Oriented strandboard	1	16	
Steel joists		203	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	173.0	
Floor layers	1131.0	56.3 kg/m^2
Ceiling layers	205.0	11.5 kg/m^2

Gypsum concrete topping. 16 gauge steel joists. Four joist cavities between blocking pieces. 18 gauge flat strap bridging strip installed at center of floor, perpendicular to joists. Gypsum board screwed 305 mm o.c. All gypsum board screws are 38 mm in from gypsum board edge except along butt joints where the screws are 10 mm from the edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





Group 21: Concrete Floors: Uniform and ribbed slabs

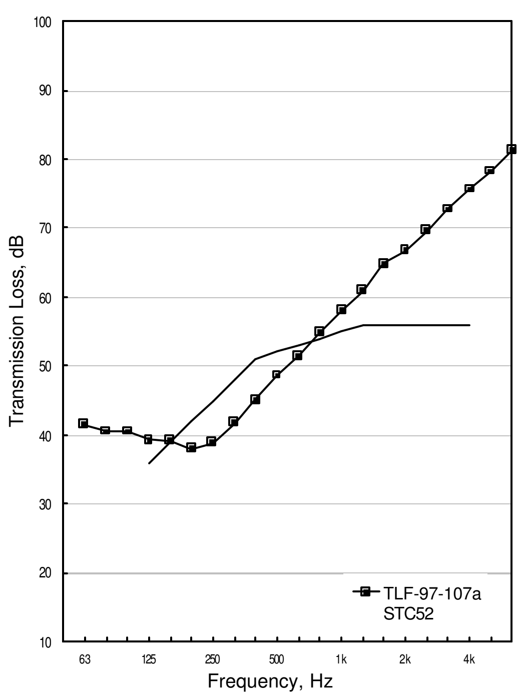
TLF-97-107a
IIF-97-048
CON150

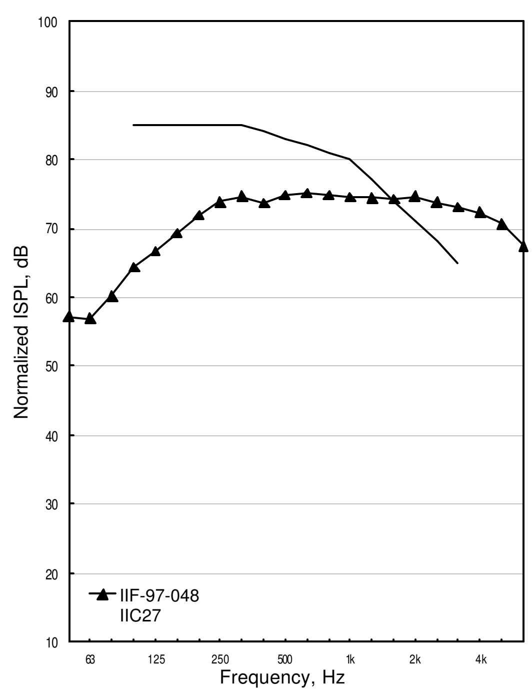
Freq. Hz	TLF-97-107a	IIF-97-048
50		57
63	41	57
80	40	60
100	40	64
125	39	67
160	39	69
200	38	72
250	39	74
315	42	75
400	45	74
500	49	75
630	51	75
800	55	75
1000	58	75
1250	61	74
1600	65	74
2000	67	75
2500	70	74
3150	73	73
4000	76	72
5000	78	71
6300	81	67
STC/IIC	52	27
$R_w/L_{n,w}$	52	80

Material	Thick.
Concrete	150

	Mass, kg	
Floor layers	7030.0	350 kg/m^2

Concrete reference slab.





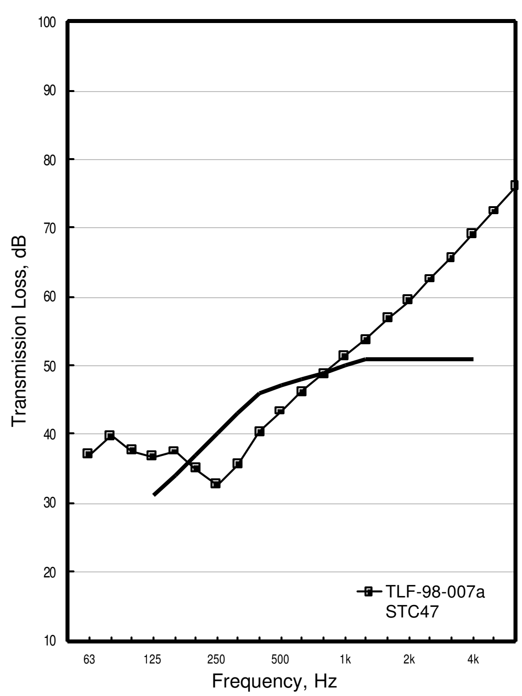
TLF-98-007a
IIF-98-003
CON100

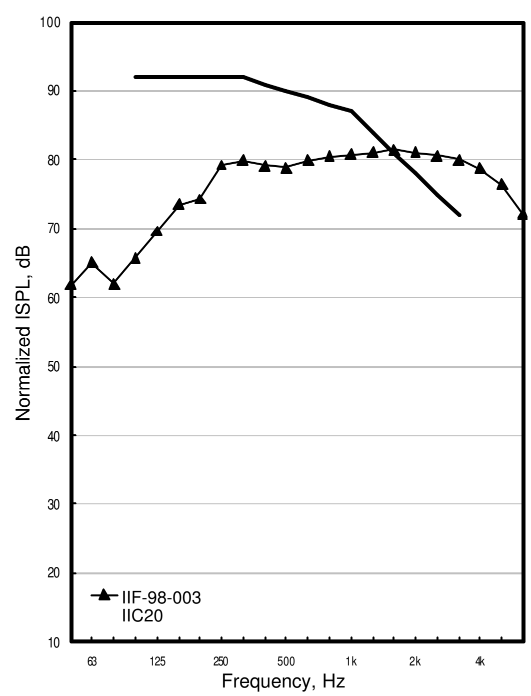
Freq. Hz	TLF-98-007a	IIF-98-003
50	*	62
63	37	65
80	40	62
100	38	66
125	37	70
160	38	74
200	35	74
250	33	79
315	36	80
400	40	79
500	43	79
630	46	80
800	49	80
1000	51	81
1250	54	81
1600	57	81
2000	59	81
2500	63	81
3150	66	80
4000	69	79
5000	72	76
6300	76	72
STC/IIC	47	20
$R_w/L_{n,w}$	47	87

Material	Thick.
Concrete	100

	Mass, kg	
Floor layers	4457	226 kg/m^2

Concrete reference slab





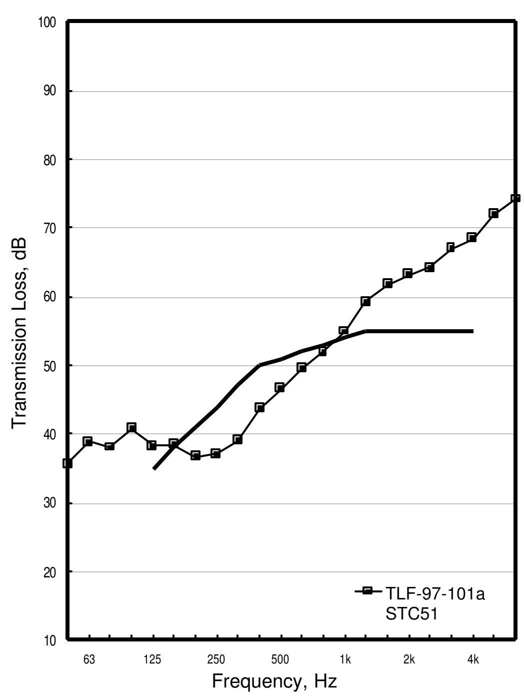
TLF-97-101a
IIF-97-045
CON150_Steel

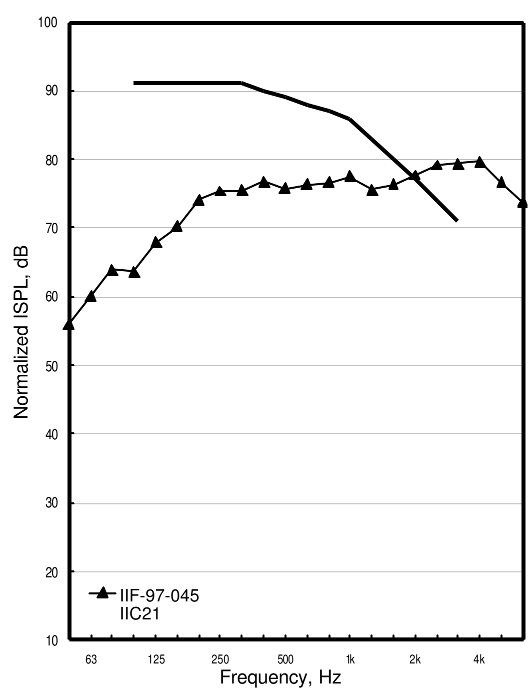
Freq. Hz	TLF-97-101a	IIF-97-045
50	36	56
63	39	60
80	38	64
100	41	64
125	38	68
160	38	70
200	37	74
250	37	75
315	39	75
400	44	77
500	47	76
630	50	76
800	52	77
1000	55	77
1250	59	76
1600	62	76
2000	63	78
2500	64	79
3150	67	79
4000	68	80
5000	72	77
6300	74	74
STC/IIC	51	21
$R_w/L_{n,w}$	50	84

Material	Thick.
Concrete	75 -150

	Mass, kg	
Floor layers	5352	272 kg/m ^{2}

Regular weight concrete poured on top of corrugated steel panels. Steel panels are 0.94 mm thick. Concrete has a varying thickness from 75 to 150 mm.





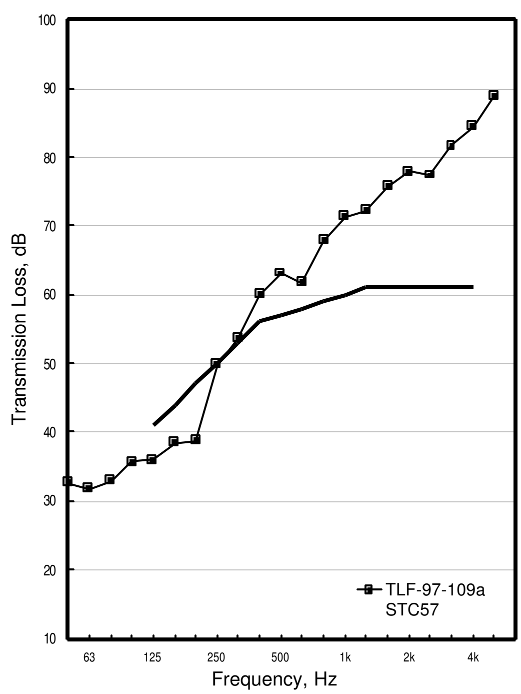
TLF-97-109a
IIF-97-049
CON152_Steel_RC13(406)_2G13

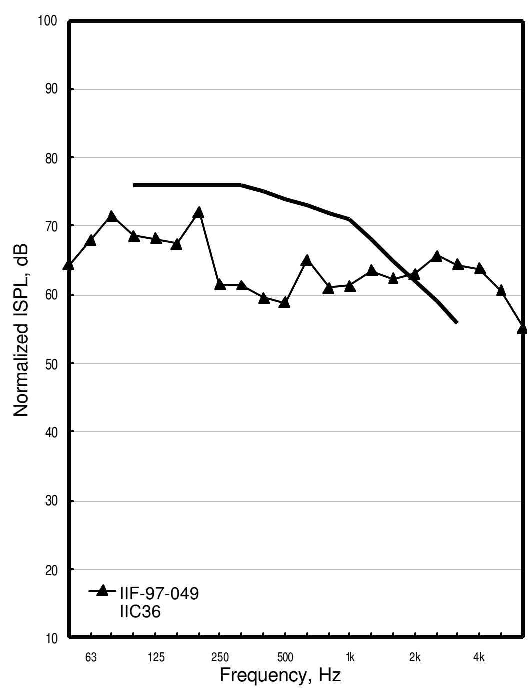
Freq. Hz	TLF-97-109a	IIF-97-049
50	33	64
63	32	68
80	33	71
100	36	69
125	36	68
160	39	67
200	39	72
250	50	61
315	54	61
400	60	60
500	63	59
630	62	65
800	68	61
1000	71	61
1250	72	63
1600	76	62
2000	78	63
2500	77	66
3150	82	64
4000	84	64
5000	89	61
6300	*	55
STC/IIC	57	36
$R_w/L_{n,w}$	59	70

Material	N	Thick.	Spac.
Concrete		75-150	
Resilient metal channels		13	406
Gypsum board	2	13	

	Mass, kg	
Floor layers	5352	272 kg/m^2
Ceiling layers	205.2	11.5 kg/m^2

Regular weight concrete poured on top of corrugated steel panels. Steel panels are 0.94 mm thick. Concrete has a varying thickness from 75 to 150 mm. Type C gypsum board.





Group 22: Ceiling Layers Only

TLF-95-103a

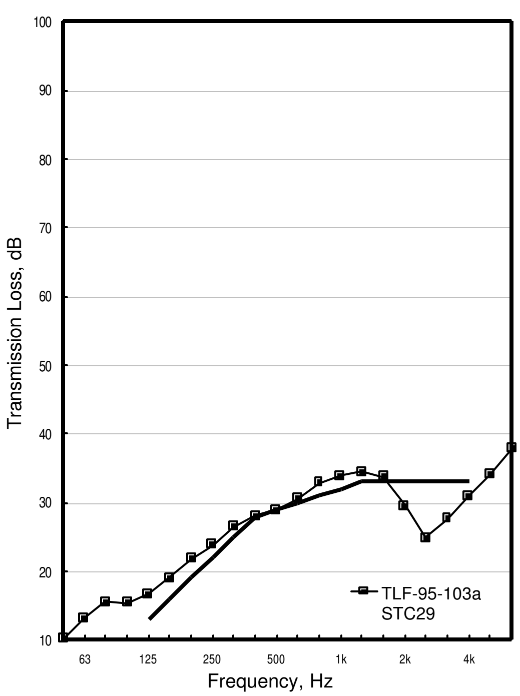
WJ235(406)_RC13(610)_G16

Freq. Hz	TLF-95-103a	
50	10	
63	13	
80	16	
100	15	
125	17	
160	19	
200	22	
250	24	
315	27	
400	28	
500	29	
630	31	
800	33	
1000	34	
1250	34	
1600	34	
2000	29	
2500	25	
3150	28	
4000	31	
5000	34	
6300	38	
STC/IIC	29	
$R_w/L_{n,w}$	31	

Material	N	Thick.	Spac.
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	222.2	
Floor layers	None	
Ceiling layers	205.4	11.5 kg/m^2

No OSB, no insulation. Gypsum board screwed 305 o.c. One set of 19 x 64 mm cross-bridging.



TLF-95-105a

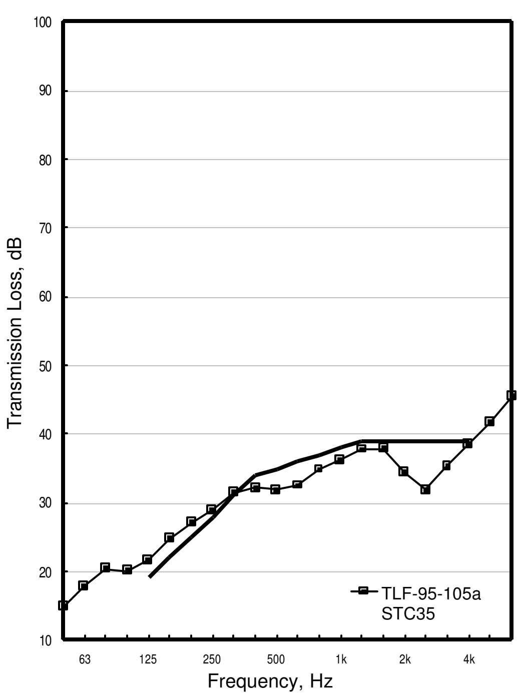
WJ235(406)_RC13(610)_2G16

Freq. Hz	TLF-95-105a	
50	15	
63	18	
80	20	
100	20	
125	22	
160	25	
200	27	
250	29	
315	31	
400	32	
500	32	
630	33	
800	35	
1000	36	
1250	38	
1600	38	
2000	34	
2500	32	
3150	35	
4000	39	
5000	42	
6300	45	
STC/IIC	35	
$R_w/L_{n,w}$	35	

Material	N	Thick.	Spac.
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	2	16	

	Mass, kg	
Frame	222.2	
Floor layers	None	
Ceiling layers	384.4	21.6 kg/m^2

No OSB, no insulation. 2 layers of Type X gypsum board. Both layers of gypsum board perpendicular to RC, joints staggered. Base layer gypsum board screwed 610 o.c., face layer 305 o.c. One set of 19 x 64 mm cross-bridging.



TLF-95-119a

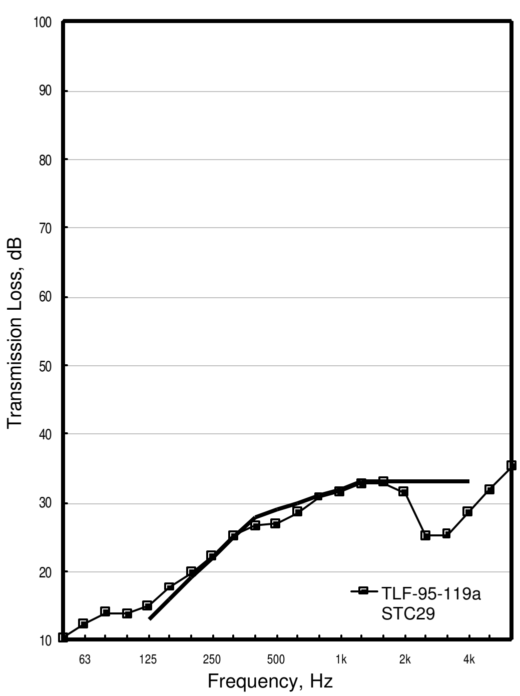
WJ235(406)_RC13(610)_G13

Freq. Hz	TLF-95-119a	
50	10	
63	12	
80	14	
100	14	
125	15	
160	18	
200	20	
250	22	
315	25	
400	27	
500	27	
630	29	
800	31	
1000	32	
1250	33	
1600	33	
2000	31	
2500	25	
3150	25	
4000	29	
5000	32	
6300	35	
STC/IIC	29	
$R_w/L_{n,w}$	29	

Material	N	Thick.	Spac.
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	1	13	

	Mass, kg	
Frame	237.6	
Floor layers	None	
Ceiling layers	171.4	9.6 kg/m^2

Type C gypsum board gypsum board screwed 305 o.c., no OSB. One set of 19 x 64 mm cross-bridging.



TLF-95-117a

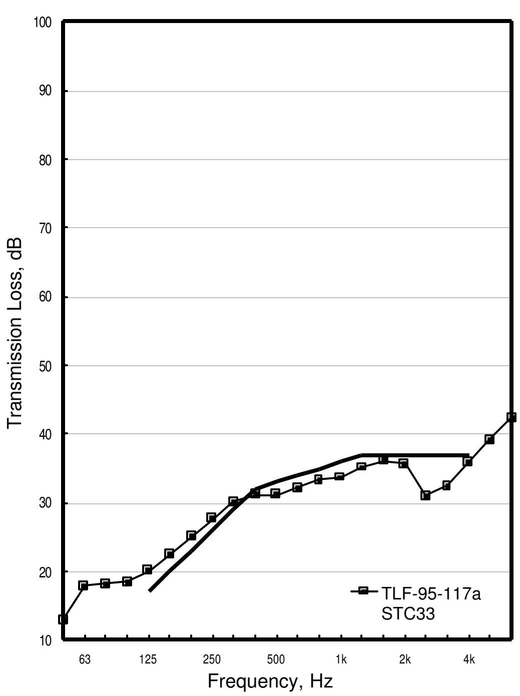
WJ235(406)_RC13(610)_2G13

Freq. Hz	TLF-95-117a	
50	13	
63	18	
80	18	
100	19	
125	20	
160	22	
200	25	
250	28	
315	30	
400	31	
500	31	
630	32	
800	33	
1000	34	
1250	35	
1600	36	
2000	36	
2500	31	
3150	32	
4000	36	
5000	39	
6300	42	
STC/IIC	33	
$R_w/L_{n,w}$	33	

Material	N	Thick.	Spac.
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	2	13	

	Mass, kg	
Frame	237.6	
Floor layers	None	
Ceiling layers	343.8	19.3 kg/m^2

Type C gypsum board, both layers perpendicular to RC, joints staggered. Base layer screwed 610 o.c., face layer 305 o.c. No insulation, no OSB. One set of 19 x 64 mm cross-bridging.



TLF-96-183a

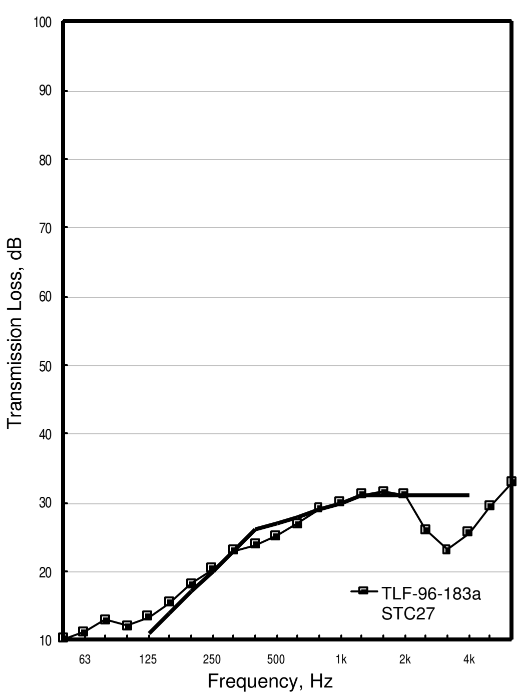
WJ235(406)_RC13(610)_G13

Freq. Hz	TLF-96-183a	
50	10	
63	11	
80	13	
100	12	
125	13	
160	15	
200	18	
250	20	
315	23	
400	24	
500	25	
630	27	
800	29	
1000	30	
1250	31	
1600	32	
2000	31	
2500	26	
3150	23	
4000	26	
5000	29	
6300	33	
STC/IIC	27	
$R_w/L_{n,w}$	28	

Material	N	Thick.	Spac.
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	1	13	

	Mass, kg	
Frame	243.2	
Floor layers	172.1	8.6 kg/m^2
Ceiling layers	131.4	7.4 kg/m^2

1500 lb/MSF gypsum board screwed 305 o.c. No insulation & no subfloor. One set of 19 x 64 cross bridging.



TLF-96-185a

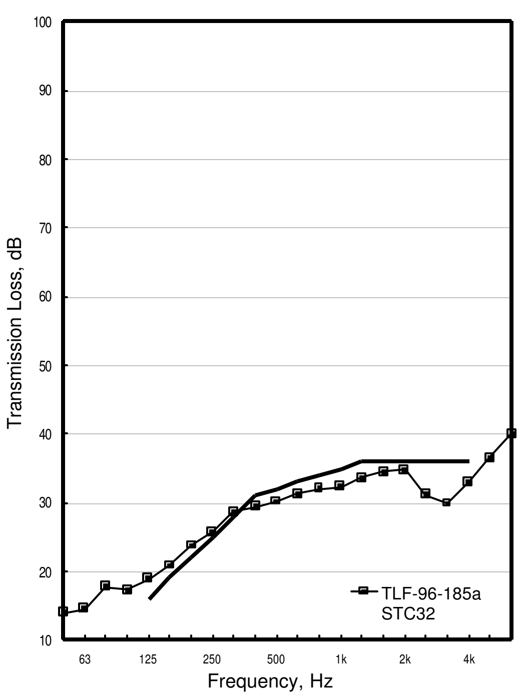
WJ235(406)_RC13(610)_2G13

Freq. Hz	TLF-96-185a	
50	14	
63	15	
80	18	
100	17	
125	19	
160	21	
200	24	
250	26	
315	29	
400	29	
500	30	
630	31	
800	32	
1000	32	
1250	34	
1600	34	
2000	35	
2500	31	
3150	30	
4000	33	
5000	37	
6300	40	
STC/IIC	32	
$R_w/L_{n,w}$	32	

Material	N	Thick.	Spac.
Wood joists (solid)		235	406
Resilient metal channels		13	610
Gypsum board	2	13	

	Mass, kg	
Frame	243.2	
Floor layers	172.1	8.6 kg/m^2
Ceiling layers	262.2	14.7 kg/m^2

Both layers of 1500 lb/MSF gypsum board perpendicular to joists. Base layer screwed 610 o.c., face layer 305 o.c. No insulation & no subfloor. One set of 19 x 64 cross bridging.



Group 23: Floor Layers Only

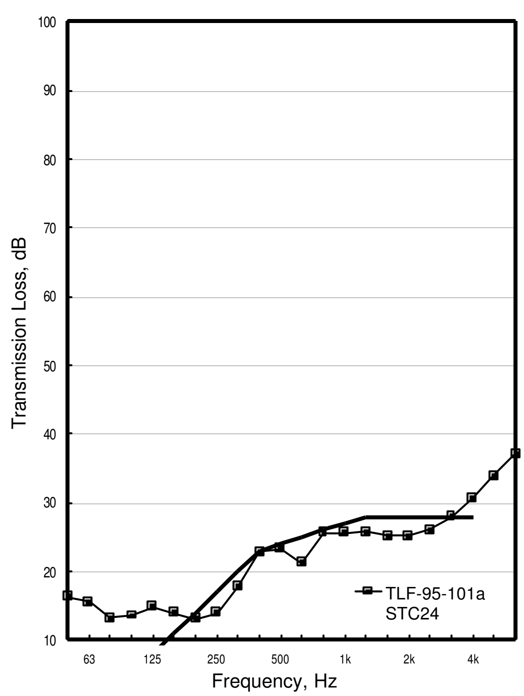
TLF-95-101a
IIF-95-038
OSB15_WJ235(406)

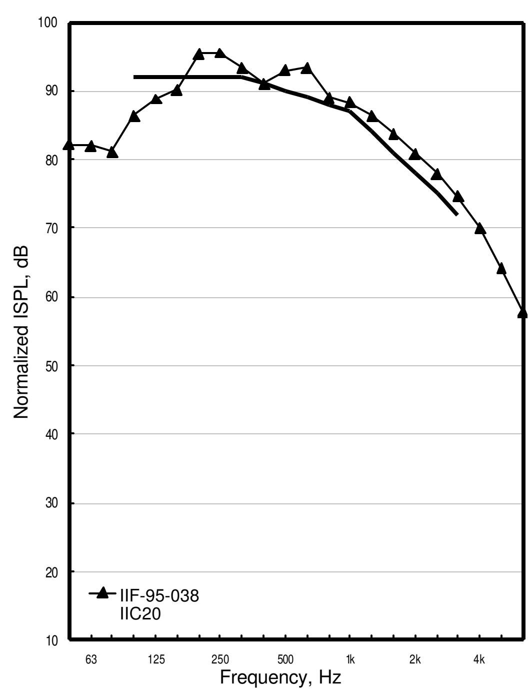
Freq. Hz	TLF-95-101a	IIF-95-038
50	16	82
63	16	82
80	13	81
100	14	86
125	15	89
160	14	90
200	13	95
250	14	95
315	18	93
400	23	91
500	23	93
630	21	93
800	26	89
1000	26	88
1250	26	86
1600	25	84
2000	25	81
2500	26	78
3150	28	75
4000	31	70
5000	34	64
6300	37	58
STC/IIC	24	20
$R_w/L_{n,w}$	24	90

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406

	Mass, kg	
Frame	222.2	
Floor layers	191.6	9.5 kg/m^2
Ceiling layers	None	

No RC, no gypsum board. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





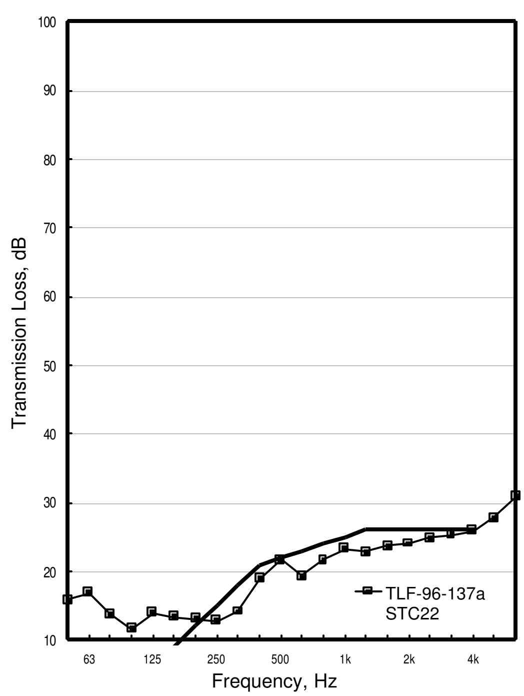
TLF-96-137a
IIF-96-060
PLY15_WJ235(406)

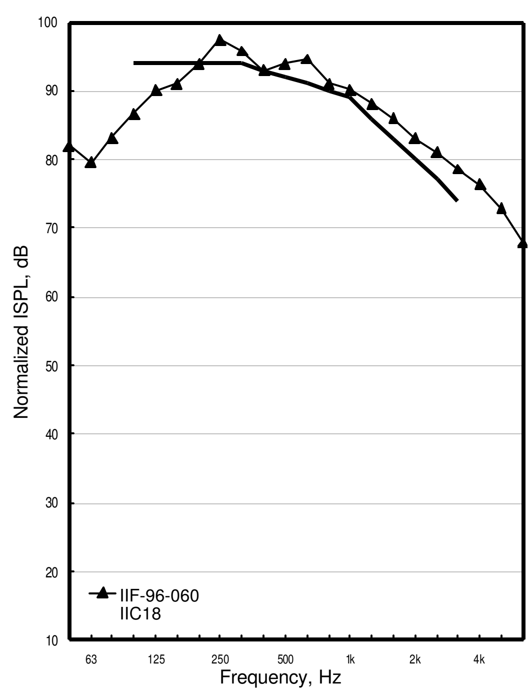
Freq. Hz	TLF-96-137a	IIF-96-060
50	16	82
63	17	80
80	14	83
100	12	87
125	14	90
160	13	91
200	13	94
250	13	97
315	14	96
400	19	93
500	22	94
630	19	95
800	22	91
1000	23	90
1250	23	88
1600	24	86
2000	24	83
2500	25	81
3150	25	79
4000	26	76
5000	28	73
6300	31	68
STC/IIC	22	18
$R_w/L_{n,w}$	22	92

Material	N	Thick.	Spac.
Plywood	1	15	
Wood joists (solid)		235	406

	Mass, kg	
Frame	243.2	
Floor layers	136.9	6.8 kg/m^2
Ceiling layers	None	

One set of 19 x 64 cross bridging. Plywood screwed 150 o.c. around edges, 305 o.c. in the field.





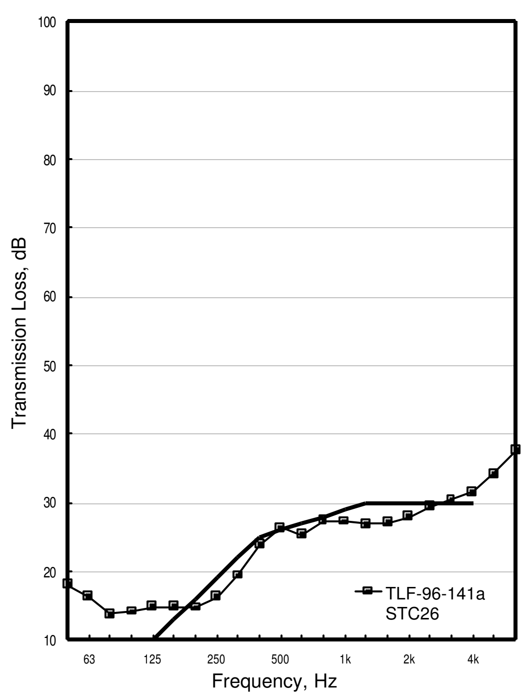
TLF-96-141a
IIF-96-062
2PLY15_WJ235(406)

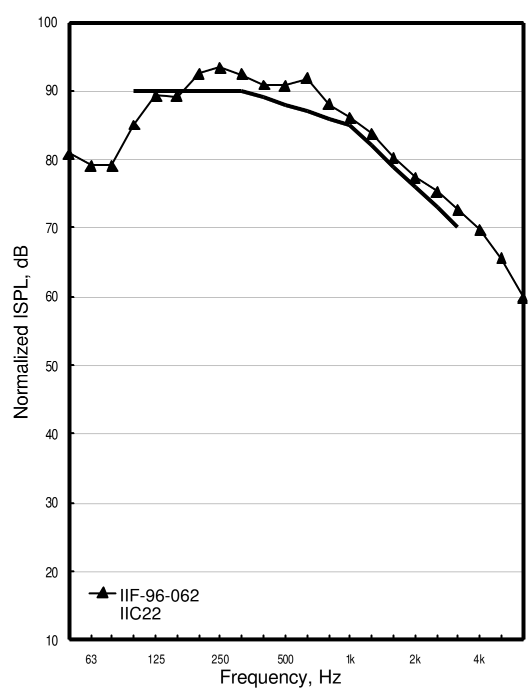
Freq. Hz	TLF-96-141a	IIF-96-062
50	18	81
63	16	79
80	14	79
100	14	85
125	15	89
160	15	89
200	15	92
250	16	93
315	19	92
400	24	91
500	26	91
630	25	92
800	27	88
1000	27	86
1250	27	84
1600	27	80
2000	28	77
2500	29	75
3150	30	73
4000	32	70
5000	34	66
6300	38	60
STC/IIC	26	22
$R_w/L_{n,w}$	26	88

Material	N	Thick.	Spac.
Plywood	2	15	
Wood joists (solid)		235	406

	Mass, kg	
Frame	243.2	
Floor layers	275.6	13.7 kg/m^2
Ceiling layers	None	

Base layer of plywood screwed 305 o.c. around the edges, 610 o.c. in the field. Face layer of plywood screwed 150 o.c. around the edges, 305 o.c. in the field. Plywood perpendicular to joists, base and face layer joints staggered. One set of 19 x 64 cross bridging.





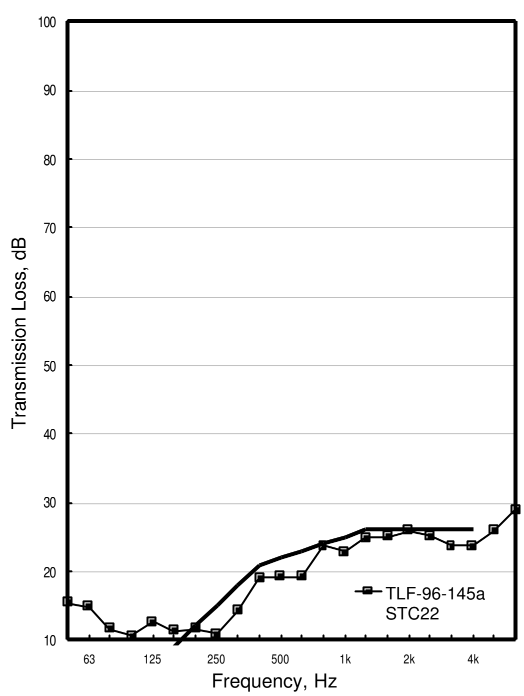
TLF-96-145a
IIF-96-064
PLY13_WJ235(406)

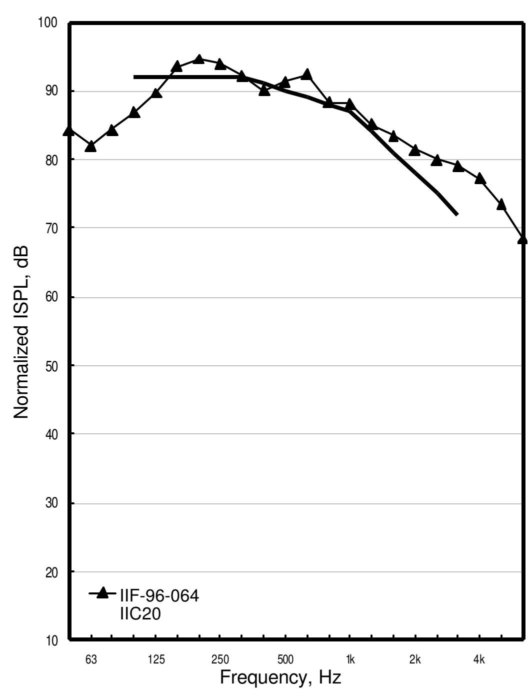
Freq. Hz	TLF-96-145a	IIF-96-064
50	15	84
63	15	82
80	12	84
100	11	87
125	13	90
160	11	93
200	12	95
250	11	94
315	14	92
400	19	90
500	19	91
630	19	92
800	24	88
1000	23	88
1250	25	85
1600	25	83
2000	26	81
2500	25	80
3150	24	79
4000	24	77
5000	26	73
6300	29	68
STC/IIC	22	20
$R_w/L_{n,w}$	22	90

Material	N	Thick.	Spac.
Plywood	1	13	
Wood joists (solid)		235	406

	Mass, kg	
Frame	243.2	
Floor layers	111.8	5.6 kg/m^2
Ceiling layers	None	

Plywood screwed 150 o.c. around edges, 305 o.c. in the field.
One set of 19 x 64 cross bridging.





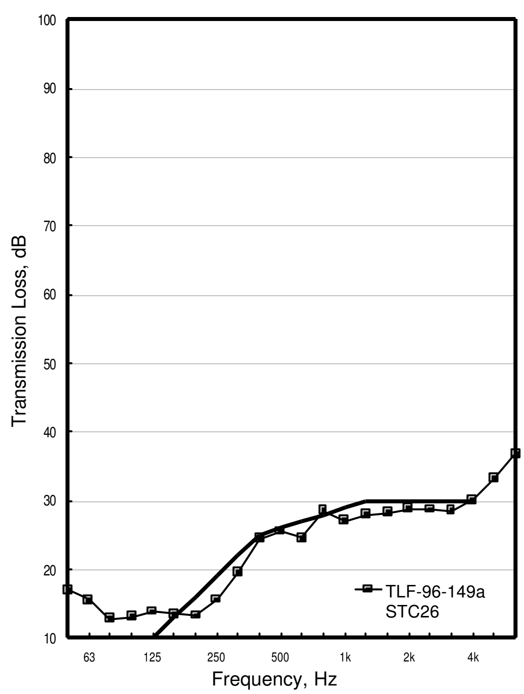
TLF-96-149a
IIF-96-066
2PLY13_WJ235(406)

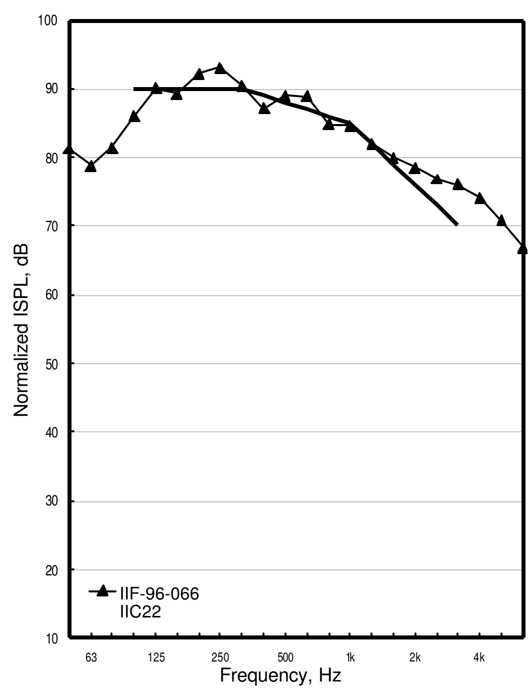
Freq. Hz	TLF-96-149a	IIF-96-066
50	17	81
63	16	79
80	13	81
100	13	86
125	14	90
160	13	89
200	13	92
250	16	93
315	19	90
400	24	87
500	26	89
630	25	89
800	29	85
1000	27	85
1250	28	82
1600	28	80
2000	29	79
2500	29	77
3150	29	76
4000	30	74
5000	33	71
6300	37	67
STC/IIC	26	22
$R_w/L_{n,w}$	26	88

Material	N	Thick.	Spac.
Plywood	2	13	
Wood joists (solid)		235	406

	Mass, kg	
Frame	243.2	
Floor layers	224.4	11.2 kg/m^2
Ceiling layers	None	

Base layer of plywood screwed 305 o.c. around the edges, 610 o.c. in the field. Face layer of plywood screwed 150 o.c. around edges, 305 o.c. in the field. Plywood perpendicular to joists, base and face layer joints staggered. One set of 19 x 64 cross bridging.





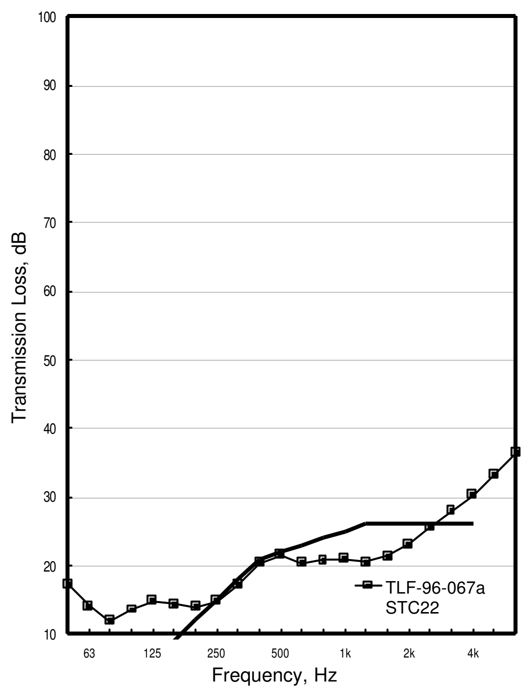
TLF-96-067a
IIF-96-021
PLY25_WJ235(406)

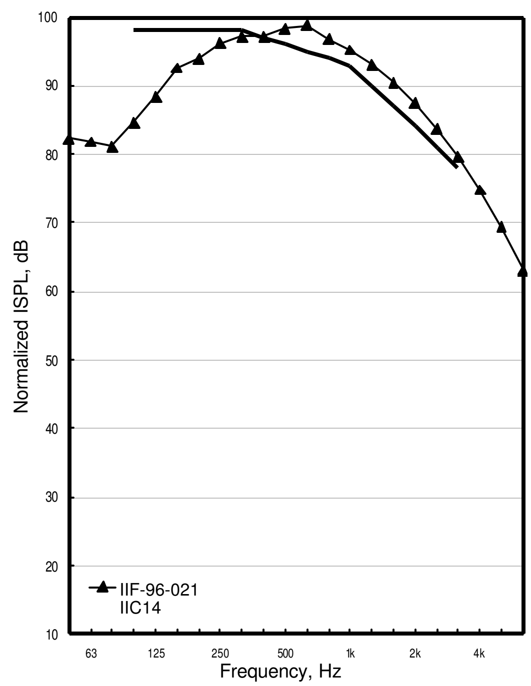
Freq. Hz	TLF-96-067a	IIF-96-021
50	17	82
63	14	82
80	12	81
100	14	85
125	15	88
160	14	93
200	14	94
250	15	96
315	17	97
400	20	97
500	22	98
630	20	99
800	21	97
1000	21	95
1250	21	93
1600	21	90
2000	23	87
2500	26	84
3150	28	80
4000	30	75
5000	33	69
6300	36	63
STC/IIC	22	14
$R_w/L_{n,w}$	22	96

Material	N	Thick.	Spac.
Plywood	1	25	
Wood joists (solid)		235	406

	Mass, kg	
Frame	203.9	
Floor layers	241.7	12 kg/m^2
Ceiling layers	None	

Plywood screwed 150 o.c. around edges, 305 o.c. in the field.
One set of 19 x 64 cross bridging.





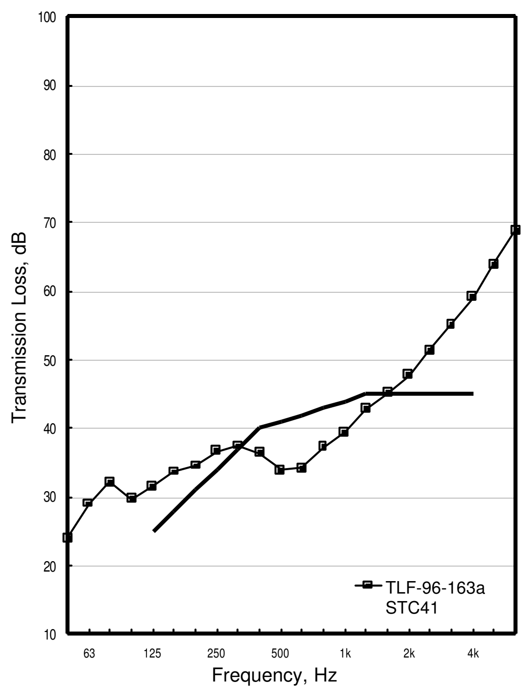
TLF-96-163a
IIF-96-072
CON35_OSB15_WJ235(406)

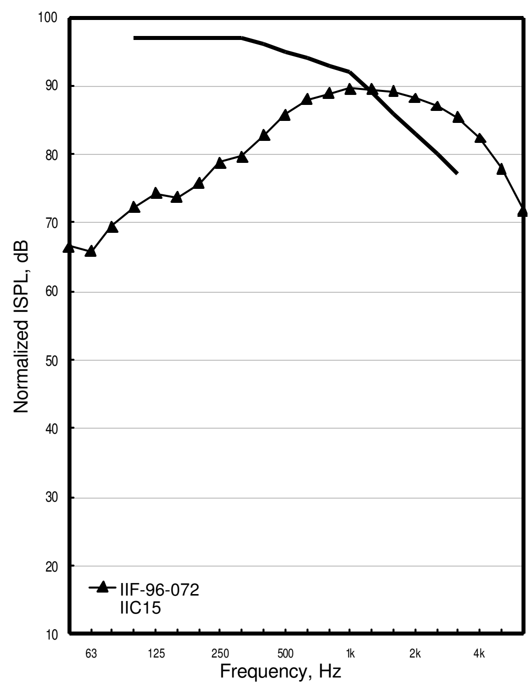
Freq. Hz	TLF-96-163a	IIF-96-072
50	24	67
63	29	66
80	32	69
100	30	72
125	32	74
160	34	74
200	35	76
250	37	79
315	37	80
400	36	83
500	34	86
630	34	88
800	37	89
1000	39	90
1250	43	89
1600	45	89
2000	48	88
2500	51	87
3150	55	85
4000	59	82
5000	64	78
6300	69	72
STC/IIC	41	15
$R_w/L_{n,w}$	41	94

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406

	Mass, kg	
Frame	203.9	
Floor layers	1863.9	92.7 kg/m^2
Ceiling layers	None	

Concrete curing time 68 days, 40 mm regular concrete poured directly on top of OSB subfloor. No gypsum board. OSB screwed 150 o.c. around the edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





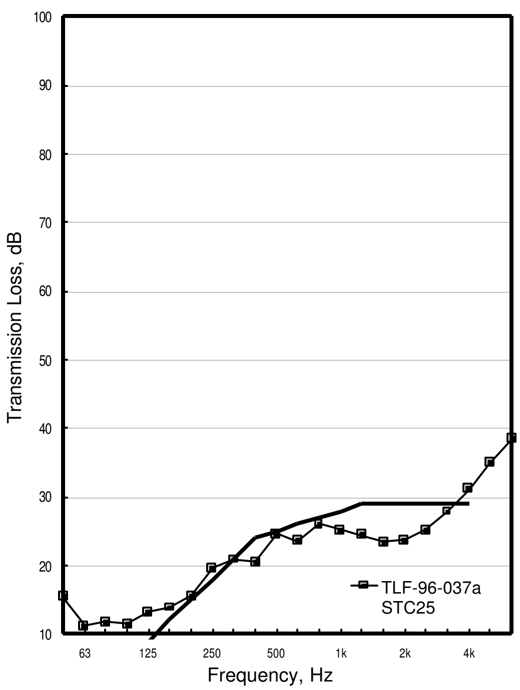
TLF-96-037a
IIF-96-010
OSB15_WJ235(610)

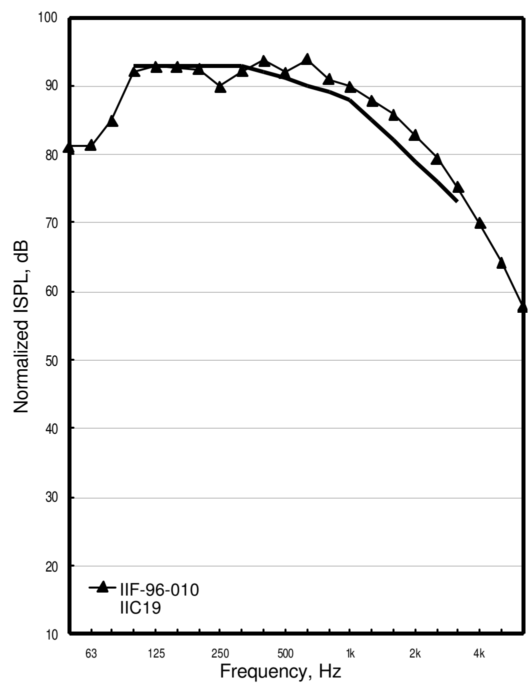
Freq. Hz	TLF-96-037a	IIF-96-010
50	15	81
63	11	81
80	12	85
100	11	92
125	13	93
160	14	93
200	16	92
250	20	90
315	21	92
400	20	94
500	25	92
630	24	94
800	26	91
1000	25	90
1250	25	88
1600	23	86
2000	24	83
2500	25	79
3150	28	75
4000	31	70
5000	35	64
6300	38	58
STC/IIC	25	19
$R_w/L_{n,w}$	25	91

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	610

	Mass, kg	
Frame	165.5	
Floor layers	181.7	9.0 kg/m^2
Ceiling layers	None	

OSB screwed to joists 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





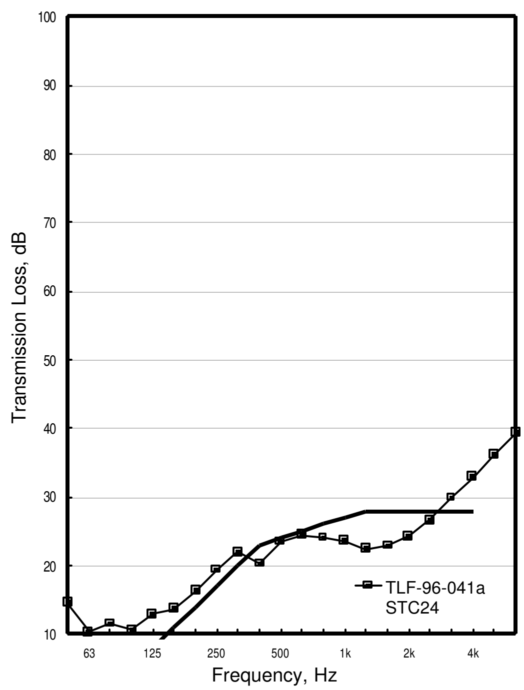
TLF-96-041a
IIF-96-012
OSB19_WJ235(610)

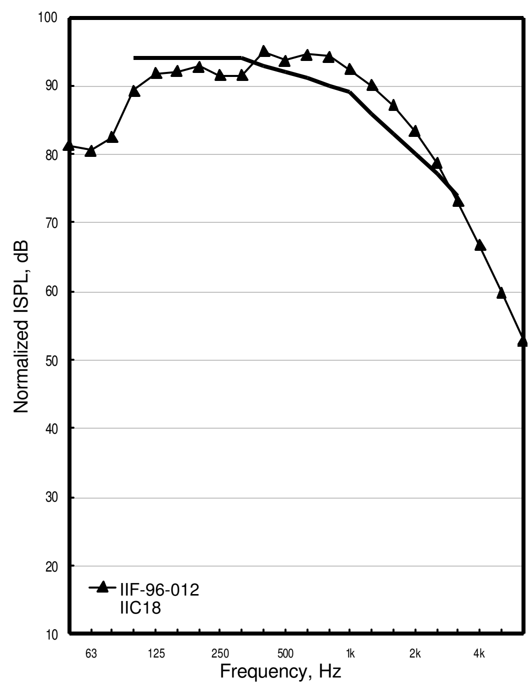
Freq. Hz	TLF-96-041a	IIF-96-012
50	14	81
63	10	80
80	12	83
100	11	89
125	13	92
160	14	92
200	16	93
250	19	91
315	22	91
400	20	95
500	24	94
630	24	95
800	24	94
1000	24	92
1250	22	90
1600	23	87
2000	24	83
2500	27	79
3150	30	73
4000	33	67
5000	36	60
6300	39	53
STC/IIC	24	18
$R_w/L_{n,w}$	24	92

Material	N	Thick.	Spac.
Oriented strandboard	1	19	
Wood joists (solid)		235	610

	Mass, kg	
Frame	165.5	
Floor layers	208.9	10.4 kg/m^2
Ceiling layers	None	

OSB screwed to joists 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





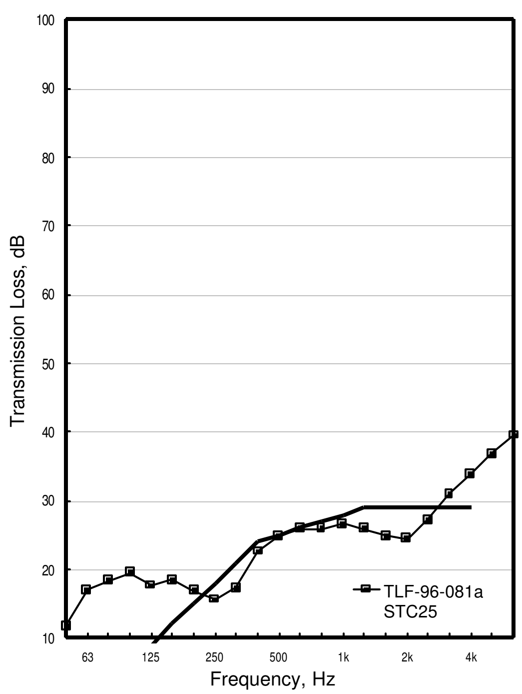
TLF-96-081a
IIF-96-034
OSB15_WI457(406)

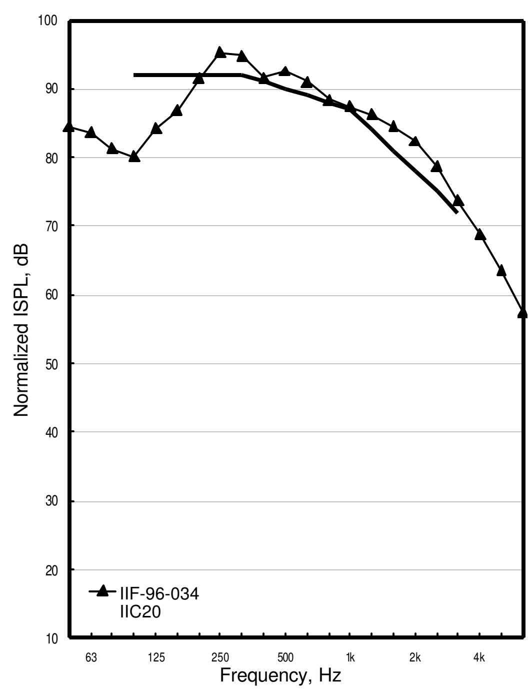
Freq. Hz	TLF-96-081a	IIF-96-034
50	12	84
63	17	84
80	18	81
100	19	80
125	18	84
160	18	87
200	17	92
250	16	95
315	17	95
400	23	92
500	25	93
630	26	91
800	26	88
1000	27	87
1250	26	86
1600	25	84
2000	24	82
2500	27	79
3150	31	74
4000	34	69
5000	37	64
6300	40	57
STC/IIC	25	20
$R_w/L_{n,w}$	25	90

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		457	406

	Mass, kg	
Frame	386.6	
Floor layers	191.1	9.5 kg/m^2
Ceiling layers	None	

89 x 38 flange, 475 mm deep wood I-joist, 406 o.c. 19 mm plywood rimboard used. 38 x 140 mm web stiffeners on both sides of web and at each end of each I-joist. Single layer of 16 mm waferboard applied perpendicular to I-joists. Waferboard screwed 150 o.c. around edges, 305 o.c. in the field.





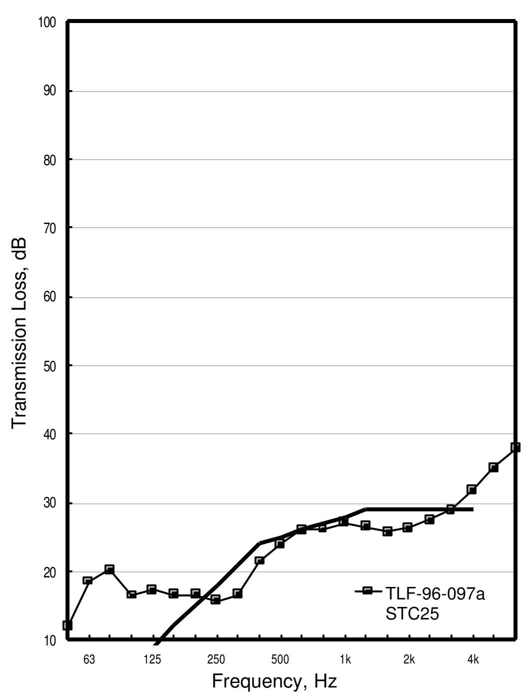
TLF-96-097a
IIF-96-042
OSB15_WI457(406)

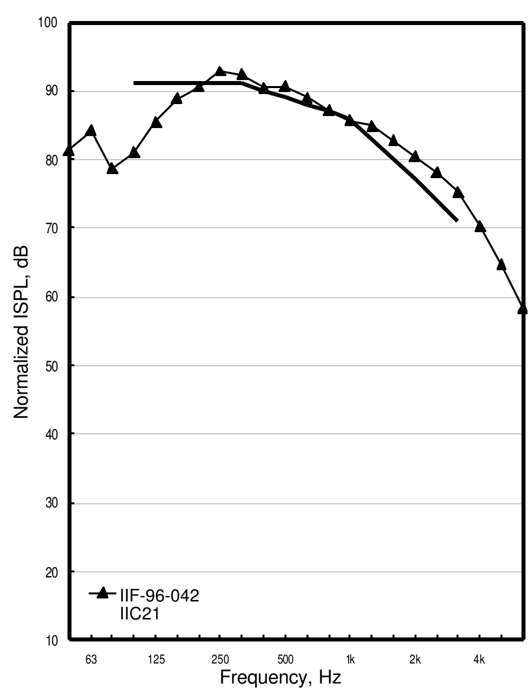
Freq. Hz	TLF-96-097a	IIF-96-042
50	12	81
63	19	84
80	20	79
100	17	81
125	17	85
160	17	89
200	17	91
250	16	93
315	17	92
400	21	90
500	24	91
630	26	89
800	26	87
1000	27	86
1250	27	85
1600	26	83
2000	26	80
2500	28	78
3150	29	75
4000	32	70
5000	35	65
6300	38	58
STC/IIC	25	21
$R_w/L_{n,w}$	25	89

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		457	406

	Mass, kg	
Frame	386.6	
Floor layers	175.4	8.7 kg/m^2
Ceiling layers	None	

89 x 38 flange, 457 deep wood I-joists 406 o.c. 19 mm plywood rimboard used. 38 x 140 mm web stiffeners on both sides of web and at each end of each I-joist. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





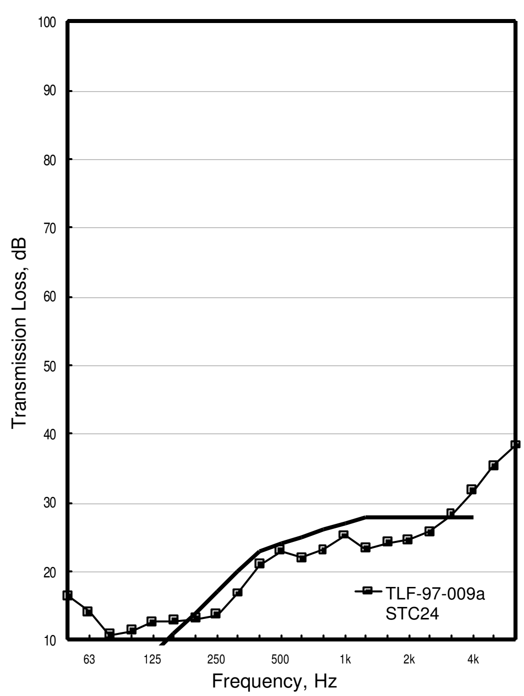
TLF-97-009a
IIF-97-005
OSB15_WI241(406)

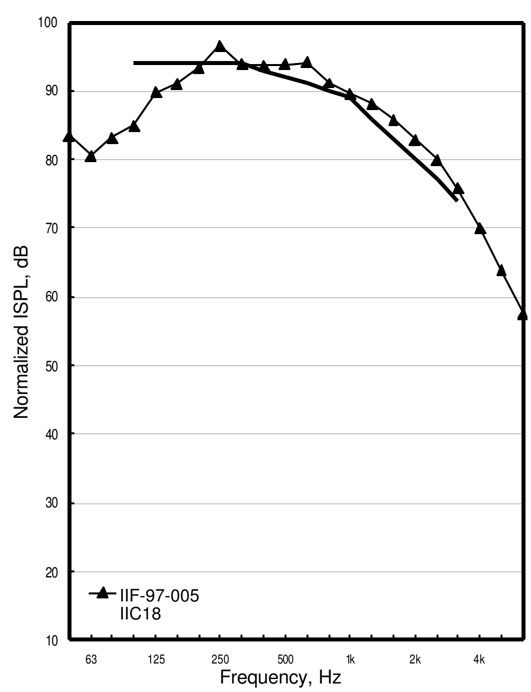
Freq. Hz	TLF-97-009a	IIF-97-005
50	16	83
63	14	81
80	11	83
100	11	85
125	13	90
160	13	91
200	13	93
250	14	97
315	17	94
400	21	94
500	23	94
630	22	94
800	23	91
1000	25	90
1250	23	88
1600	24	86
2000	25	83
2500	26	80
3150	28	76
4000	32	70
5000	35	64
6300	38	58
STC/IIC	24	18
$R_w/L_{n,w}$	24	92

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406

	Mass, kg	
Frame	158.6	
Floor layers	173.3	8.6 kg/m^2
Ceiling layers	None	

38 x 38 mm LVL flange, 10 mm OSB web, 241 deep wood I-joists. 25 mm OSB rimboard used. OSB screwed 150 o.c. around edges, 305 o.c. in the field. OSB perpendicular to I-joists.





Group 24 : Different joist lengths

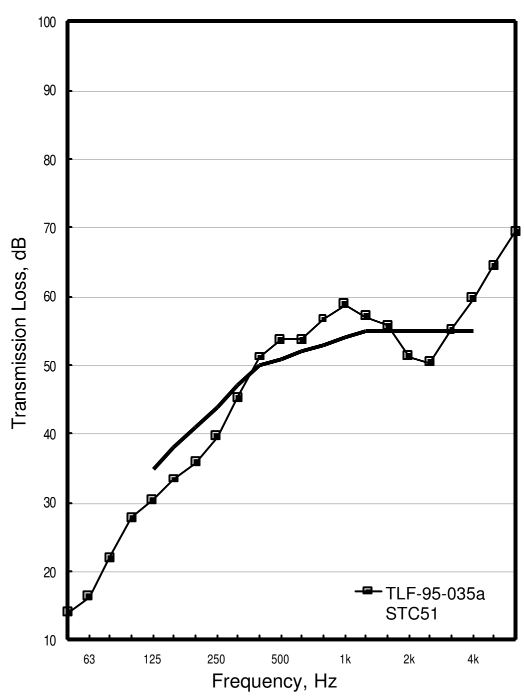
TLF-95-035a
IIF-95-005
OSB15_WJ235(406)_GFB152_RC13(610)_G16

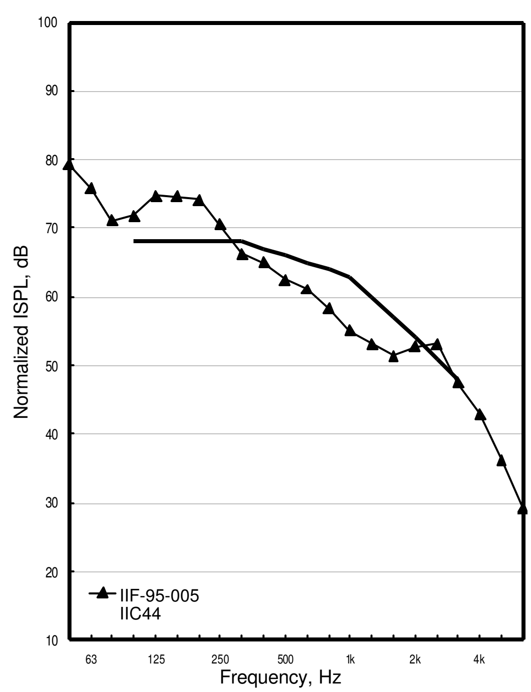
Freq. Hz	TLF-95-035a	IIF-95-005
50	14	79
63	16	76
80	22	71
100	28	72
125	30	75
160	33	75
200	36	74
250	40	71
315	45	66
400	51	65
500	54	62
630	54	61
800	57	58
1000	59	55
1250	57	53
1600	56	51
2000	51	53
2500	50	53
3150	55	48
4000	60	43
5000	64	36
6300	69	29
STC/IIC	51	44
$R_w/L_{n,w}$	50	66

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	236.2	
Floor layers	179.9	8.9 kg/m^2
Ceiling layers	203.8	11.4 kg/m^2

38 x 235 x 4851 mm joists. Two sets of 19 x 64 mm cross-bridging every 1617 mm. OSB screwed 150 o.c. around the edges & 305 o.c. in the field.





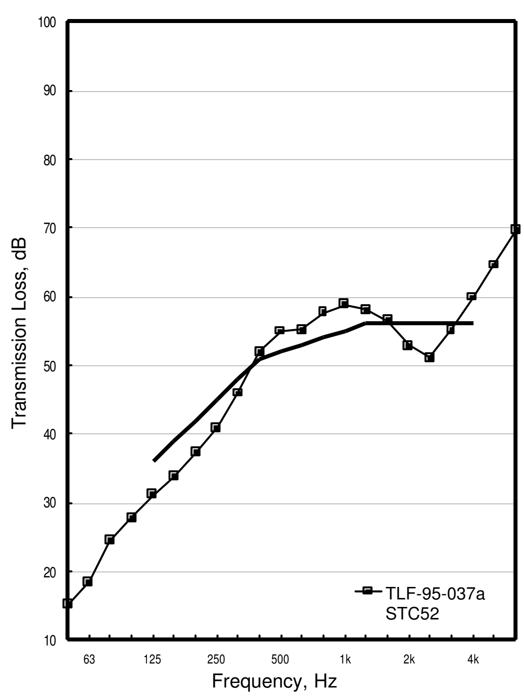
TLF-95-037a
IIF-95-006
OSB15_WJ235(406)_GFB152_RC13(610)_G16

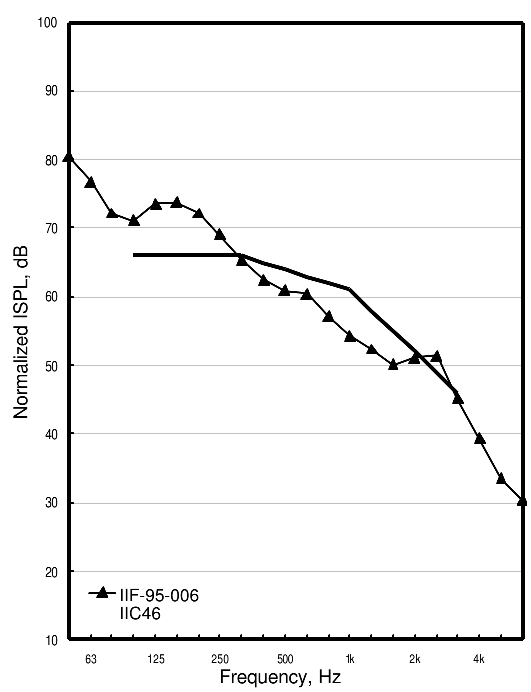
Freq. Hz	TLF-95-037a	IIF-95-006
50	15	80
63	18	77
80	25	72
100	28	71
125	31	74
160	34	74
200	37	72
250	41	69
315	46	65
400	52	63
500	55	61
630	55	60
800	58	57
1000	59	54
1250	58	52
1600	57	50
2000	53	51
2500	51	51
3150	55	45
4000	60	39
5000	65	34
6300	70	30
STC/IIC	52	46
$R_w/L_{n,w}$	51	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	215.6	
Floor layers	161.8	8 kg/m^2
Ceiling layers	181.6	10.2 kg/m^2

38 x 235 x 4343 mm joists. Two sets of 19 x 64 mm cross-bridging. Type X gypsum board screwed 305 o.c. OSB screwed 150 o.c. around the edges & 305 o.c. in the field. Dividing barrier installed.





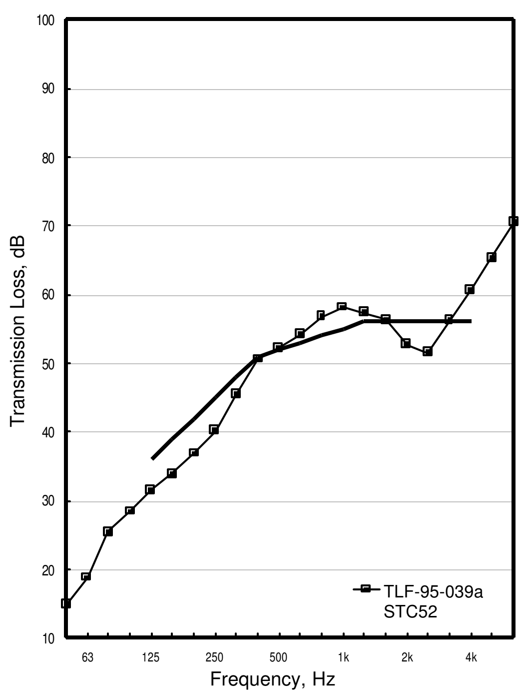
TLF-95-039a
IIF-95-007
OSB15_WJ235(406)_GFB152_RC13(610)_G16

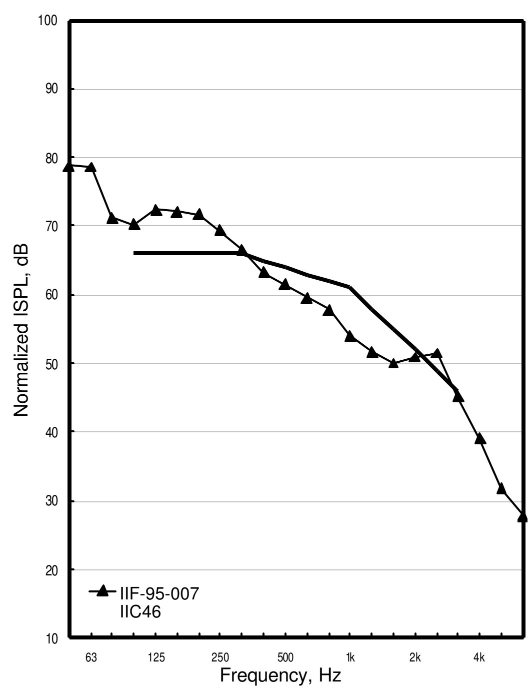
Freq. Hz	TLF-95-039a	IIF-95-007
50	15	79
63	19	79
80	25	71
100	28	70
125	32	72
160	34	72
200	37	72
250	40	69
315	45	67
400	51	63
500	52	61
630	54	60
800	57	58
1000	58	54
1250	57	52
1600	56	50
2000	53	51
2500	52	52
3150	56	45
4000	61	39
5000	65	32
6300	70	28
STC/IIC	52	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	177.6	
Floor layers	129.6	6.4 kg/m^2
Ceiling layers	143.3	8 kg/m^2

38 x 235 x 3454 mm joists. One set of 19 x 64 mm cross-bridging. Type X gypsum board screwed 305 o.c. OSB screwed 150 o.c. around the edges & 305 o.c. in the field. Dividing barrier installed.





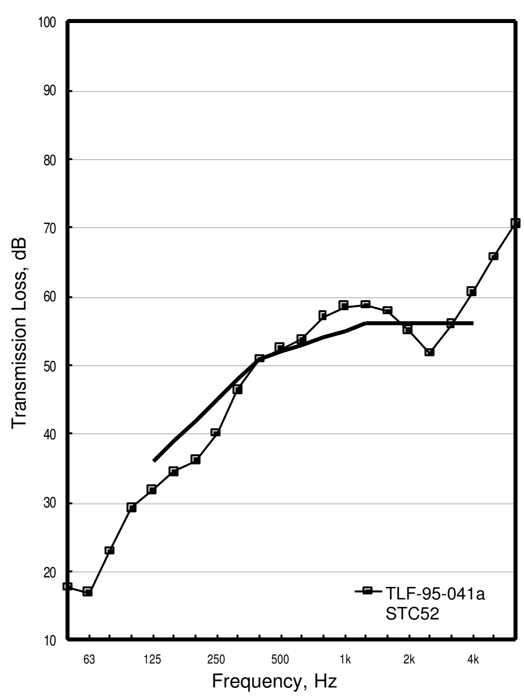
TLF-95-041a
IIF-95-008
OSB15_WJ235(406)_GFB152_RC13(610)_G16

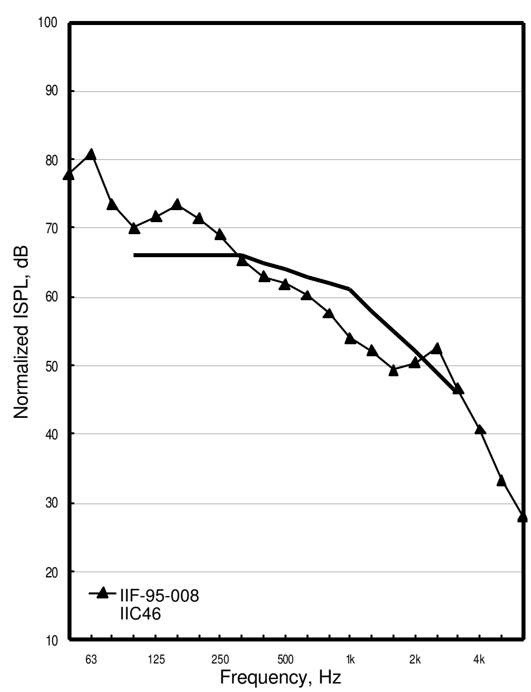
Freq. Hz	TLF-95-041a	IIF-95-008
50	18	78
63	17	81
80	23	74
100	29	70
125	32	72
160	34	73
200	36	71
250	40	69
315	46	65
400	51	63
500	52	62
630	54	60
800	57	58
1000	59	54
1250	59	52
1600	58	49
2000	55	50
2500	52	53
3150	56	47
4000	61	41
5000	66	33
6300	71	28
STC/IIC	52	46
$R_w/L_{n,w}$	52	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	153.2	
Floor layers	108.8	5.4 kg/m^2
Ceiling layers	120.0	6.7 kg/m^2

38 x 235 x 2921 mm joists. One set of 19 x 64 mm cross-bridging. Type X gypsum board screwed 305 o.c. OSB screwed 150 o.c. around the edges & 305 o.c. in the field. Dividing barrier installed.





Group 25 : Screw tightness in OSB

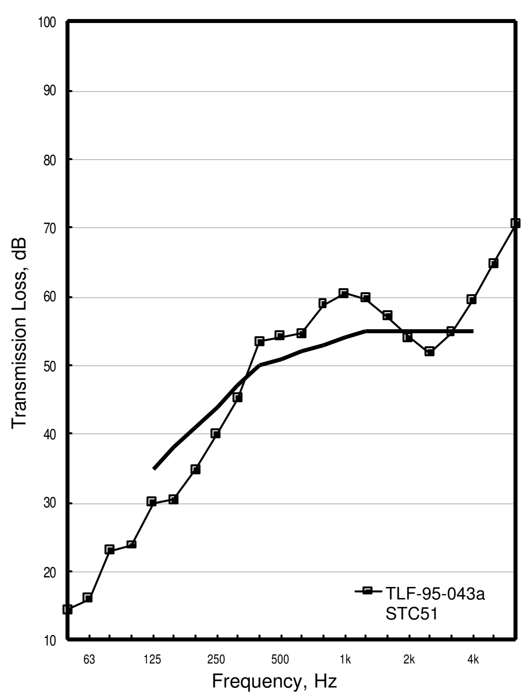
TLF-95-043a
IIF-95-009
OSB15_WJ235(406)_GFB152_RC13(610)_G16

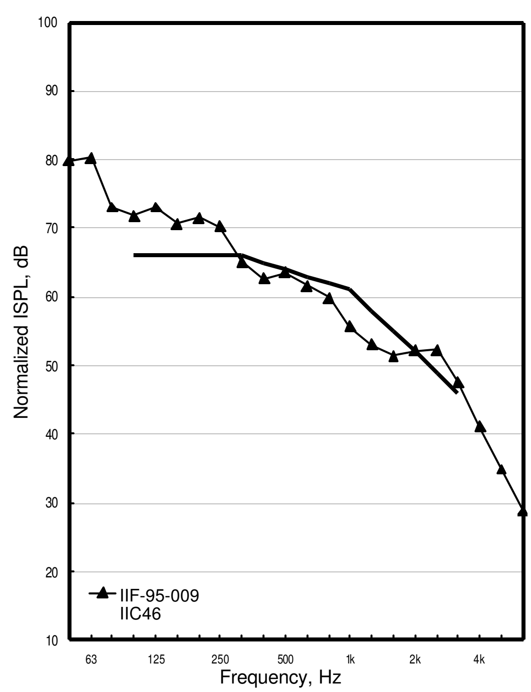
Freq. Hz	TLF-95-043a	IIF-95-009
50	14	80
63	16	80
80	23	73
100	24	72
125	30	73
160	30	71
200	35	71
250	40	70
315	45	65
400	53	63
500	54	64
630	55	62
800	59	60
1000	60	56
1250	60	53
1600	57	51
2000	54	52
2500	52	52
3150	55	48
4000	60	41
5000	65	35
6300	71	29
STC/IIC	51	46
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	230.4	
Floor layers	174.5	8.7 kg/m^2
Ceiling layers	201.2	11.3 kg/m^2

One set of 19 x 64 mm cross-bridging. Type X gypsum board screwed 305 o.c. OSB screwed 150 o.c. around the edges & 305 o.c. in the field. Reference floor assembly.





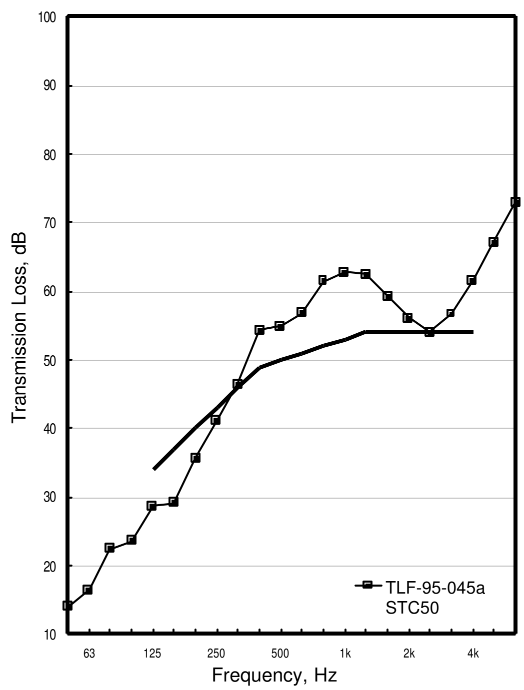
TLF-95-045a
IIF-95-010
OSB15_WJ235(406)_GFB152_RC13(610)_G16

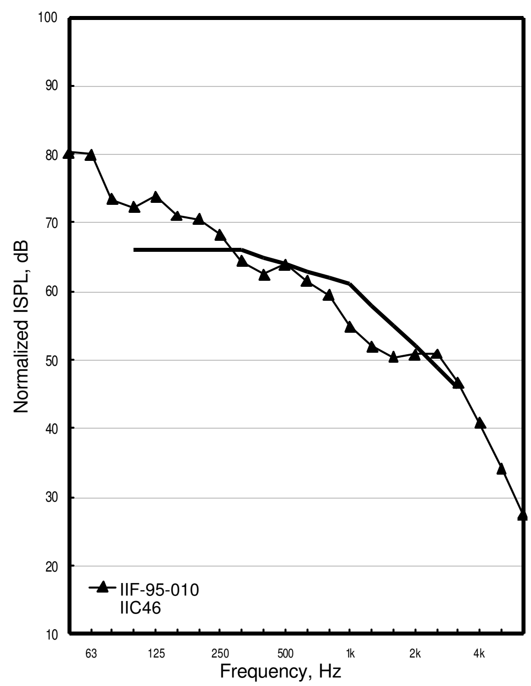
Freq. Hz	TLF-95-045a	IIF-95-010
50	14	80
63	16	80
80	22	73
100	24	72
125	29	74
160	29	71
200	36	70
250	41	68
315	46	64
400	54	62
500	55	64
630	57	62
800	61	59
1000	63	55
1250	62	52
1600	59	50
2000	56	51
2500	54	51
3150	57	47
4000	62	41
5000	67	34
6300	73	27
STC/IIC	50	46
$R_w/L_{n,w}$	50	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	230.4	
Floor layers	174.5	8.7 kg/m^2
Ceiling layers	201.2	11.3 kg/m^2

OSB screws released 1/4 turn, screws 150 o.c. around the edges & 305 o.c. in the field. Type X gypsum board screwed 305 o.c. One set of 19 x 64 mm cross-bridging.





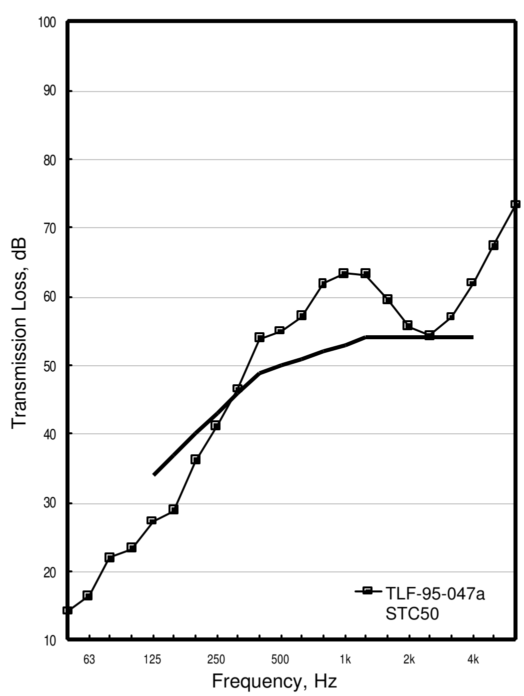
TLF-95-047a
IIF-95-011
OSB15_WJ235(406)_GFB152_RC13(610)_G16

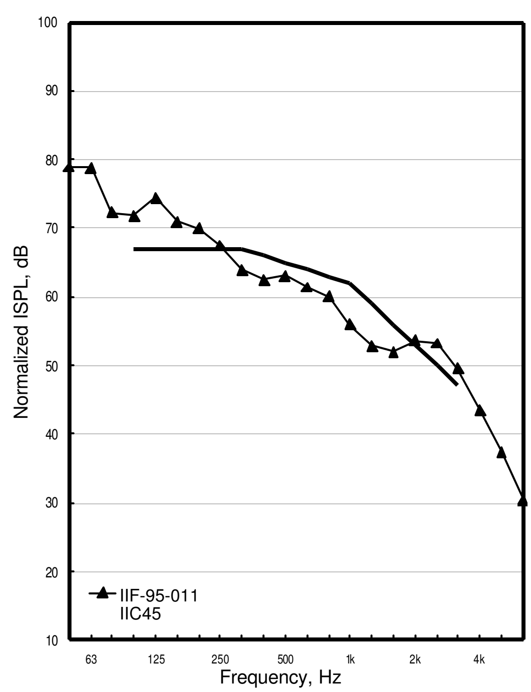
Freq. Hz	TLF-95-047a	IIF-95-011
50	14	79
63	16	79
80	22	72
100	23	72
125	27	74
160	29	71
200	36	70
250	41	68
315	47	64
400	54	62
500	55	63
630	57	61
800	62	60
1000	63	56
1250	63	53
1600	60	52
2000	56	54
2500	54	53
3150	57	50
4000	62	44
5000	67	37
6300	73	30
STC/IIC	50	45
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	230.4	
Floor layers	174.5	8.7 kg/m^2
Ceiling layers	201.2	11.3 kg/m^2

OSB screws released 1/2 turn, screws 150 o.c. around the edges & 305 o.c. in the field. Type X gypsum board screwed 305 o.c. One set of 19 x 64 mm cross-bridging.





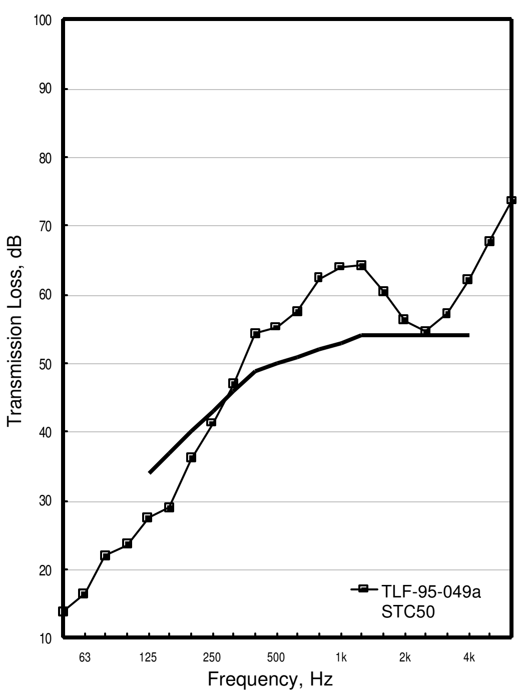
TLF-95-049a
IIF-95-012
OSB15_WJ235(406)_GFB152_RC13(610)_G16

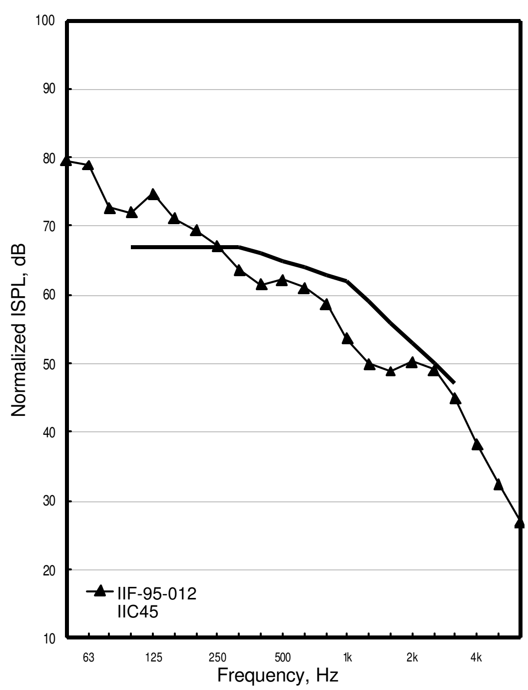
Freq. Hz	TLF-95-049a	IIF-95-012
50	14	80
63	16	79
80	22	73
100	24	72
125	27	75
160	29	71
200	36	69
250	41	67
315	47	64
400	54	61
500	55	62
630	57	61
800	62	59
1000	64	54
1250	64	50
1600	60	49
2000	56	50
2500	55	49
3150	57	45
4000	62	38
5000	68	32
6300	74	27
STC/IIC	50	45
$R_w/L_{n,w}$	50	63

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	230.4	
Floor layers	174.5	8.7 kg/m^2
Ceiling layers	201.2	11.3 kg/m^2

OSB screws released 3/4 turn, screws 150 o.c. around the edges & 305 o.c. in the field. Type X gypsum board screwed 305 o.c. One set of 19 x 64 mm cross-bridging.





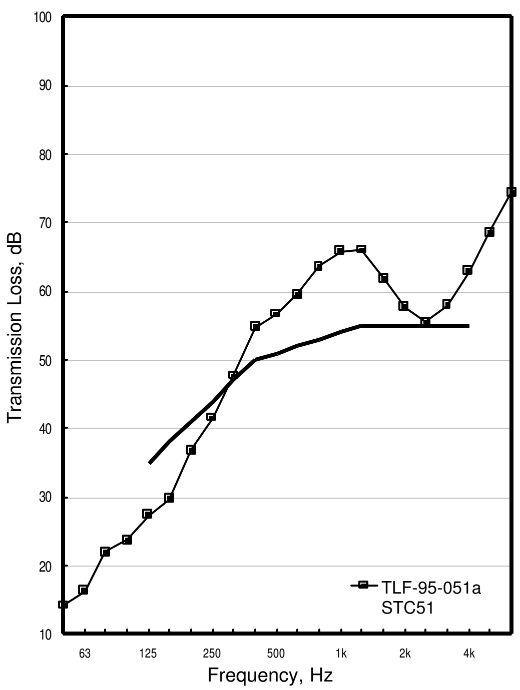
TLF-95-051a
IIF-95-013
OSB15_WJ235(406)_GFB152_RC13(610)_G16

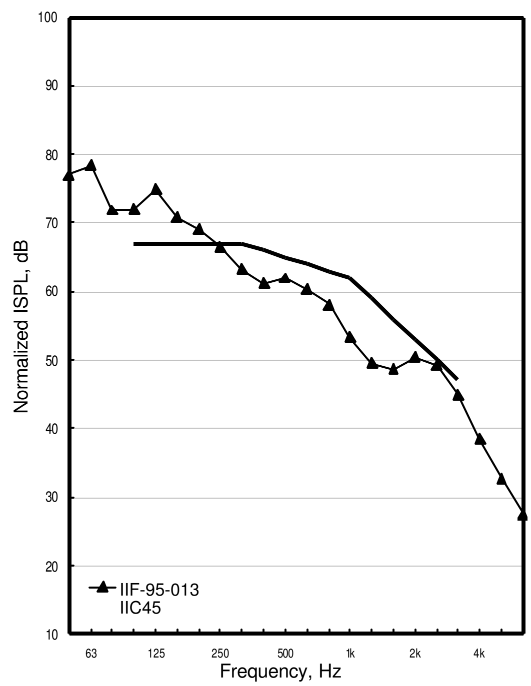
Freq. Hz	TLF-95-051a	IIF-95-013
50	14	77
63	16	78
80	22	72
100	24	72
125	27	75
160	30	71
200	37	69
250	42	67
315	48	63
400	55	61
500	57	62
630	60	60
800	64	58
1000	66	53
1250	66	50
1600	62	49
2000	58	50
2500	55	49
3150	58	45
4000	63	38
5000	69	33
6300	74	28
STC/IIC	51	45
$R_w/L_{n,w}$	51	63

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	230.4	
Floor layers	174.5	8.7 kg/m^2
Ceiling layers	201.2	11.3 kg/m^2

OSB screws released 1 full turn, screws 150 o.c. around the edges & 305 o.c. in the field. Type X gypsum board screwed 305 o.c. One set of 19 x 64 mm cross-bridging.





Group 26 : Number of screws, nails and glue in OSB

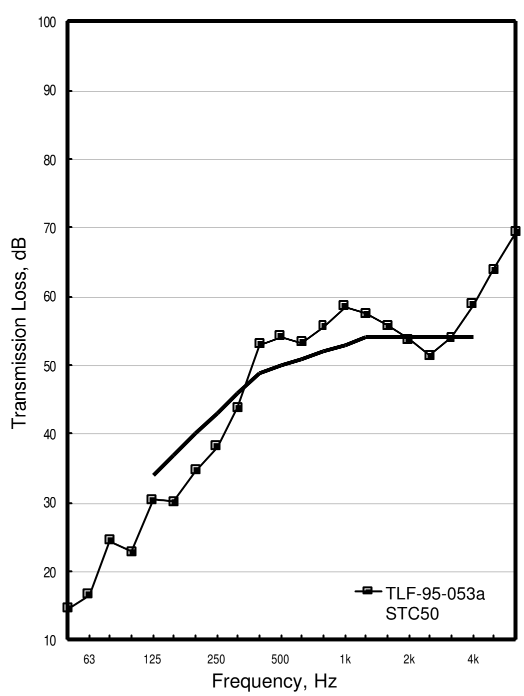
TLF-95-053a
IIF-95-014
OSB15_WJ235(406)_GFB152_RC13(610)_G16

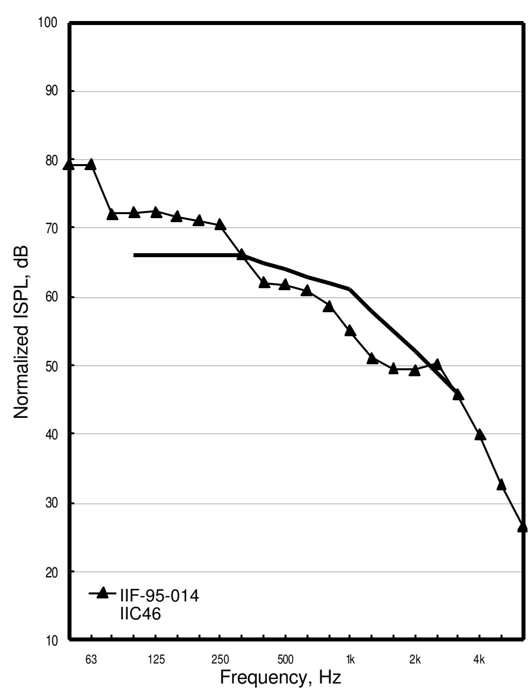
Freq. Hz	TLF-95-053a	IIF-95-014
50	15	79
63	17	79
80	24	72
100	23	72
125	30	72
160	30	72
200	35	71
250	38	70
315	44	66
400	53	62
500	54	62
630	53	61
800	56	59
1000	59	55
1250	57	51
1600	56	50
2000	54	49
2500	51	50
3150	54	46
4000	59	40
5000	64	33
6300	69	27
STC/IIC	50	46
$R_w/L_{n,w}$	49	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	230.4	
Floor layers	174.5	8.7 kg/m^2
Ceiling layers	201.2	11.3 kg/m^2

OSB screws fully tightened, screws 75oc around the edges & 150 o.c. in the field. Type X gypsum board screwed 305 o.c. One set of 19 x 64 mm cross-bridging.





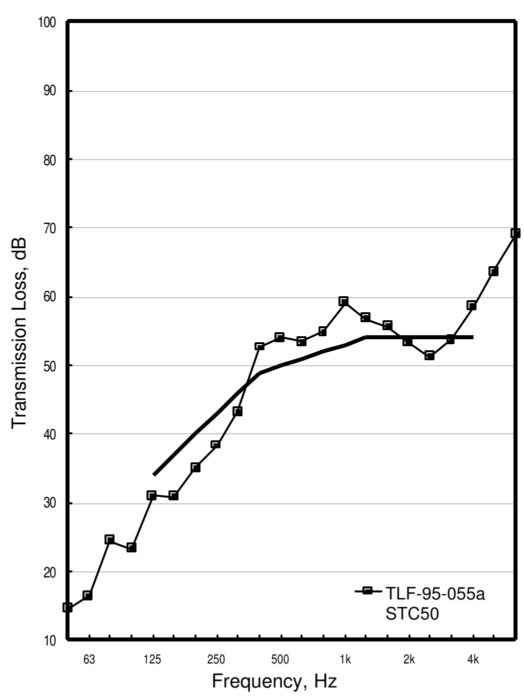
TLF-95-055a
IIF-95-015
OSB15_WJ235(406)_GFB152_RC13(610)_G16

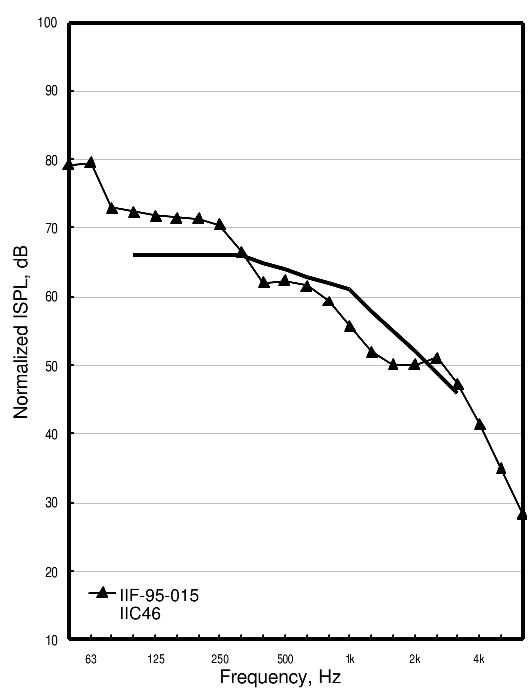
Freq. Hz	TLF-95-055a	IIF-95-015
50	15	79
63	16	80
80	24	73
100	23	72
125	31	72
160	31	71
200	35	71
250	38	71
315	43	67
400	53	62
500	54	62
630	53	62
800	55	59
1000	59	56
1250	57	52
1600	56	50
2000	53	50
2500	51	51
3150	54	47
4000	59	42
5000	64	35
6300	69	28
STC/IIC	50	46
$R_w/L_{n,w}$	49	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	230.4	
Floor layers	174.5	8.7 kg/m^2
Ceiling layers	201.2	11.3 kg/m^2

OSB screws fully tightened, screws 38oc around the edges & 75oc in the field. Type X gypsum board screwed 305 o.c. One set of 19 x 64 mm cross-bridging.





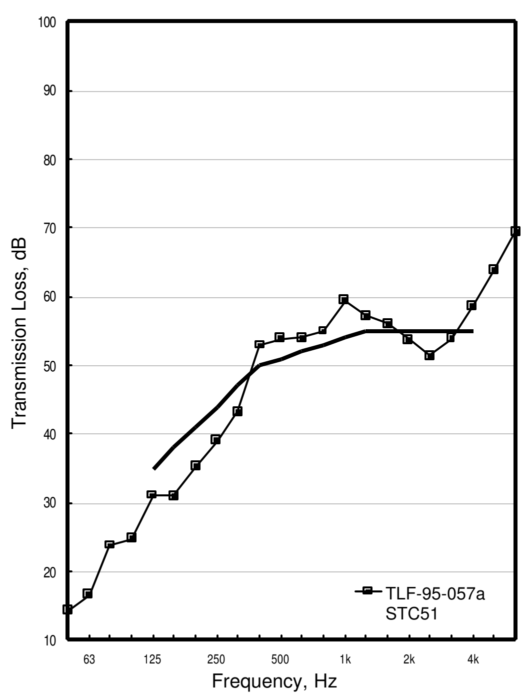
TLF-95-057a
IIF-95-016
OSB15_WJ235(406)_GFB152_RC13(610)_G16

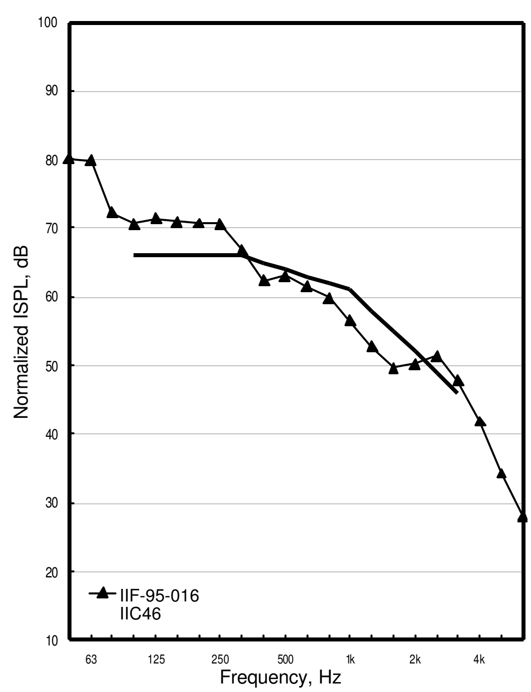
Freq. Hz	TLF-95-057a	IIF-95-016
50	14	80
63	17	80
80	24	72
100	25	71
125	31	71
160	31	71
200	35	71
250	39	71
315	43	67
400	53	62
500	54	63
630	54	62
800	55	60
1000	59	57
1250	57	53
1600	56	50
2000	54	50
2500	51	51
3150	54	48
4000	59	42
5000	64	34
6300	69	28
STC/IIC	51	46
$R_w/L_{n,w}$	50	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	230.4	
Floor layers	174.5	8.7 kg/m^2
Ceiling layers	201.2	11.3 kg/m^2

OSB glued to joists, nailed 150 o.c. around the edges & 305 o.c. in the field. Type X gypsum board screwed 305 o.c. One set of 19 x 64 mm cross-bridging.





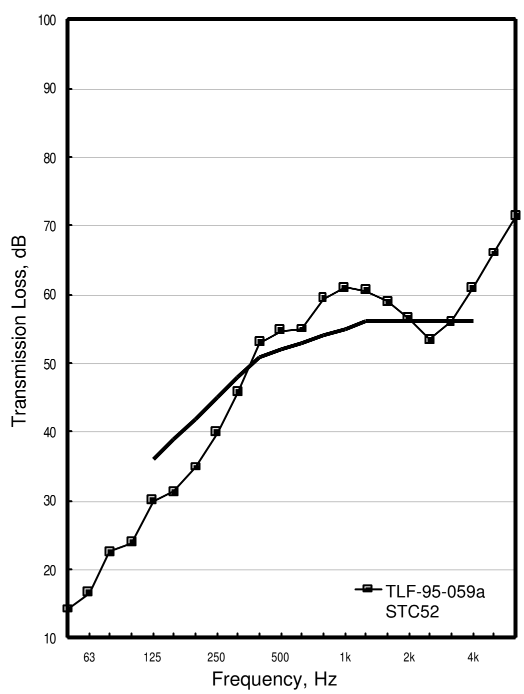
TLF-95-059a
IIF-95-017
OSB15_WJ235(406)_GFB152_RC13(610)_G16

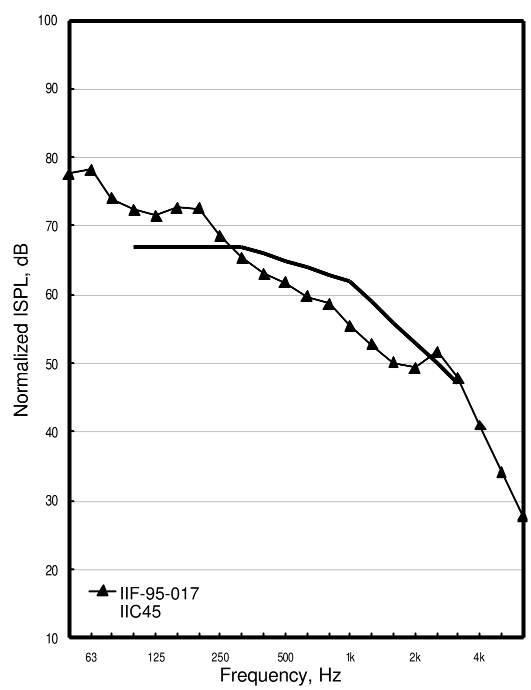
Freq. Hz	TLF-95-059a	IIF-95-017
50	14	78
63	17	78
80	23	74
100	24	72
125	30	72
160	31	73
200	35	73
250	40	69
315	46	65
400	53	63
500	55	62
630	55	60
800	59	59
1000	61	56
1250	61	53
1600	59	50
2000	56	49
2500	53	52
3150	56	48
4000	61	41
5000	66	34
6300	71	28
STC/IIC	52	45
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	223.3	
Floor layers	178.2	8.9 kg/m^2
Ceiling layers	195.3	11 kg/m^2

OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. Type X gypsum board screwed 305 o.c. One set of 19 x 64 mm cross-bridging. Reference floor assembly.





Group 27 : Screw tightness in plywood subfloor

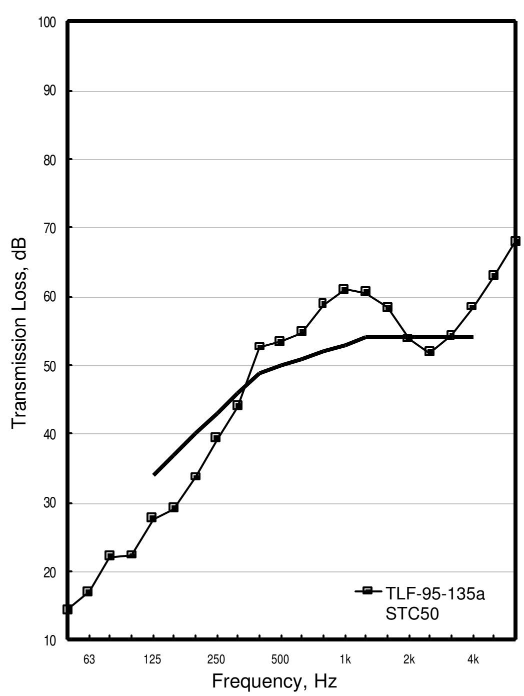
TLF-95-135a
IIF-95-049
PLY15_WJ235(406)_GFB152_RC13(610)_G16

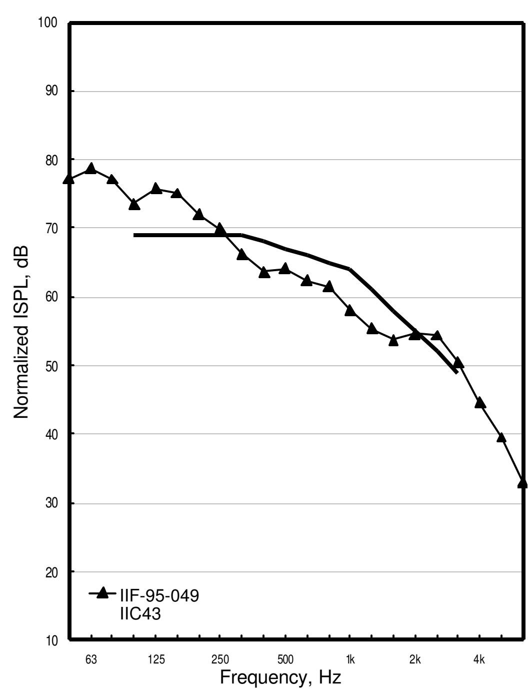
Freq. Hz	TLF-95-135a	IIF-95-049
50	14	77
63	17	79
80	22	77
100	22	74
125	28	76
160	29	75
200	34	72
250	39	70
315	44	66
400	53	64
500	53	64
630	55	62
800	59	61
1000	61	58
1250	61	55
1600	58	54
2000	54	55
2500	52	54
3150	54	51
4000	58	45
5000	63	40
6300	68	33
STC/IIC	50	43
$R_w/L_{n,w}$	49	67

Material	N	Thick.	Spac.
Plywood	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	238.8	
Floor layers	140.0	7.0 kg/m^2
Ceiling layers	206.8	11.6 kg/m^2

Plywood screws loosened 1/4 turn. Gypsum board screwed 305 o.c. Plywood screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging. Compare with TLF-95-133a.





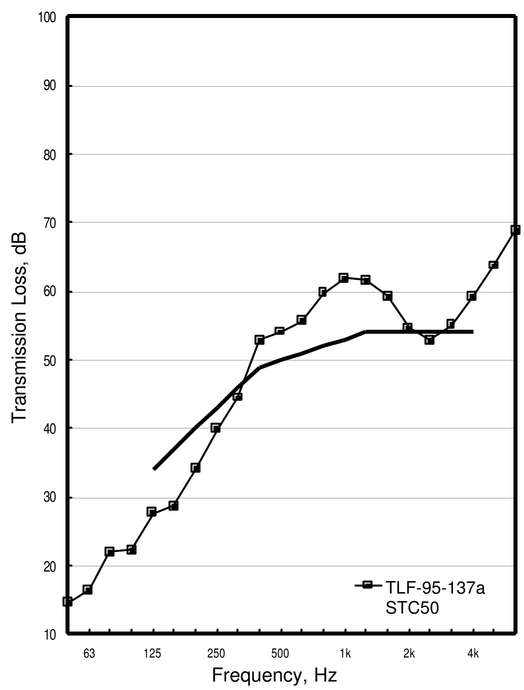
TLF-95-137a
IIF-95-050
PLY15_WJ235(406)_GFB152_RC13(610)_G16

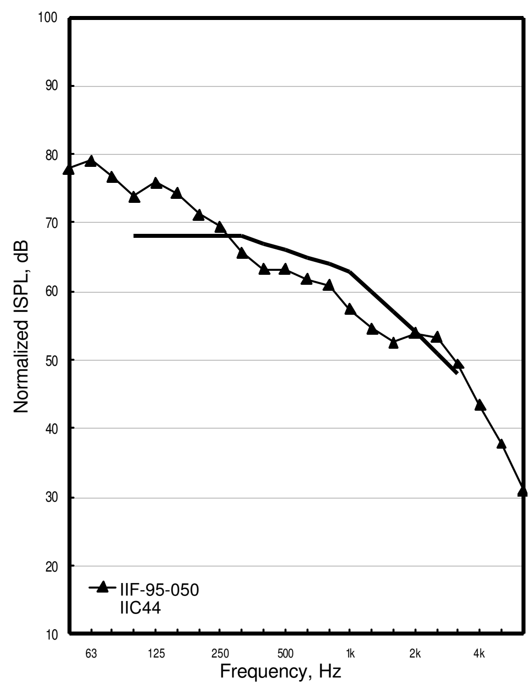
Freq. Hz	TLF-95-137a	IIF-95-050
50	15	78
63	16	79
80	22	77
100	22	74
125	28	76
160	29	74
200	34	71
250	40	69
315	44	66
400	53	63
500	54	63
630	56	62
800	60	61
1000	62	57
1250	62	55
1600	59	53
2000	55	54
2500	53	53
3150	55	49
4000	59	43
5000	64	38
6300	69	31
STC/IIC	50	44
$R_w/L_{n,w}$	49	66

Material	N	Thick.	Spac.
Plywood	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	238.8	
Floor layers	140.0	7.0 kg/m^2
Ceiling layers	206.8	11.6 kg/m^2

Plywood screws loosened 1/2 turn. Gypsum board screwed 305 o.c. Plywood screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging. Compare with TLF-95-133a.





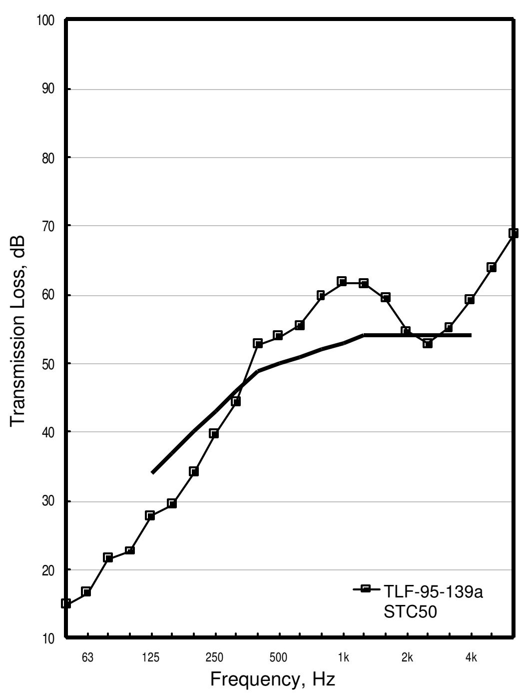
TLF-95-139a
IIF-95-051
PLY15_WJ235(406)_GFB152_RC13(610)_G16

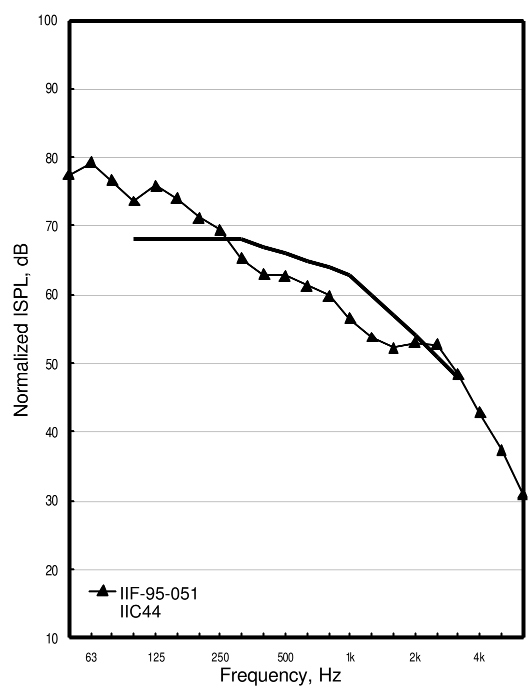
Freq. Hz	TLF-95-139a	IIF-95-051
50	15	77
63	17	79
80	22	77
100	23	74
125	28	76
160	29	74
200	34	71
250	40	69
315	44	65
400	53	63
500	54	63
630	55	61
800	60	60
1000	62	56
1250	62	54
1600	59	52
2000	55	53
2500	53	53
3150	55	49
4000	59	43
5000	64	37
6300	69	31
STC/IIC	50	44
$R_w/L_{n,w}$	49	66

Material	N	Thick.	Spac.
Plywood	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	238.8	
Floor layers	140.0	7.0 kg/m^2
Ceiling layers	206.8	11.6 kg/m^2

Plywood screws loosened 3/4 turn. Gypsum board screwed 305 o.c. Plywood screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging. Compare with TLF-95-133a.





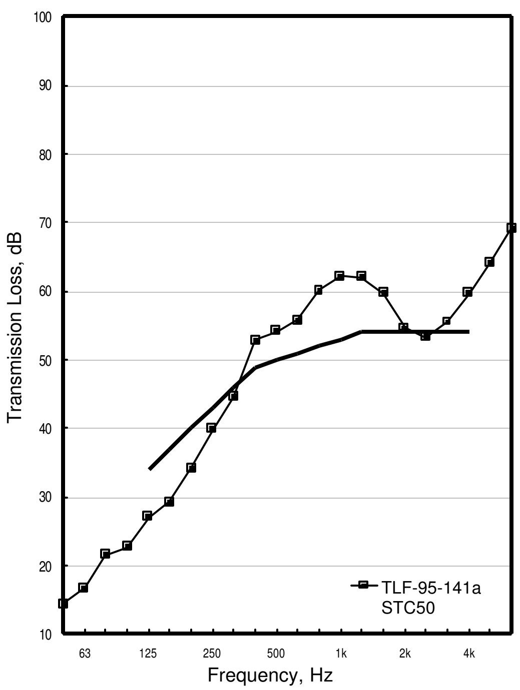
TLF-95-141a
IIF-95-052
PLY15_WJ235(406)_GFB152_RC13(610)_G16

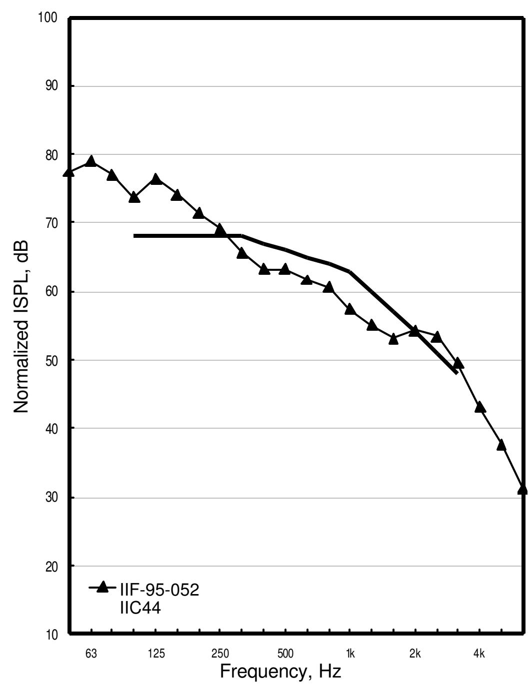
Freq. Hz	TLF-95-141a	IIF-95-052
50	14	77
63	17	79
80	22	77
100	23	74
125	27	76
160	29	74
200	34	71
250	40	69
315	45	66
400	53	63
500	54	63
630	56	62
800	60	61
1000	62	57
1250	62	55
1600	60	53
2000	55	54
2500	53	53
3150	56	50
4000	60	43
5000	64	38
6300	69	31
STC/IIC	50	44
$R_w/L_{n,w}$	49	66

Material	N	Thick.	Spac.
Plywood	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	238.8	
Floor layers	140.0	7.0 kg/m^2
Ceiling layers	206.8	11.6 kg/m^2

Plywood screws loosened 1 turn. Gypsum board screwed 305 o.c. Plywood screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging. Compare with TLF-95-133a.





Group 28 : Position of glass fibre batts

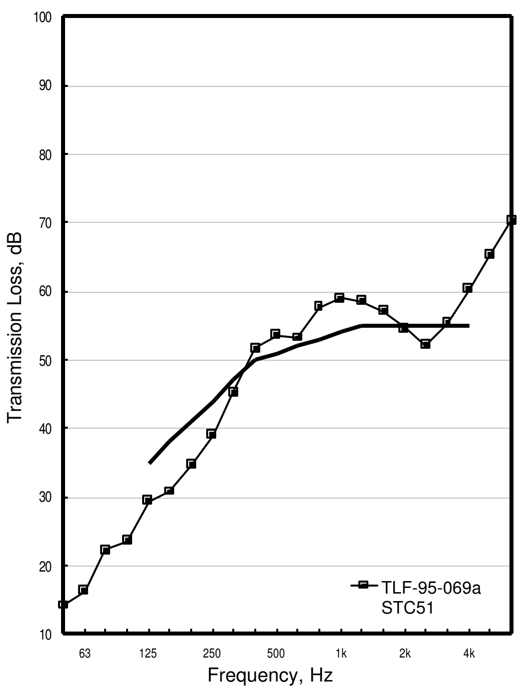
TLF-95-069a
IIF-95-022
OSB15_WJ235(406)_GFB152_RC13(610)_G16

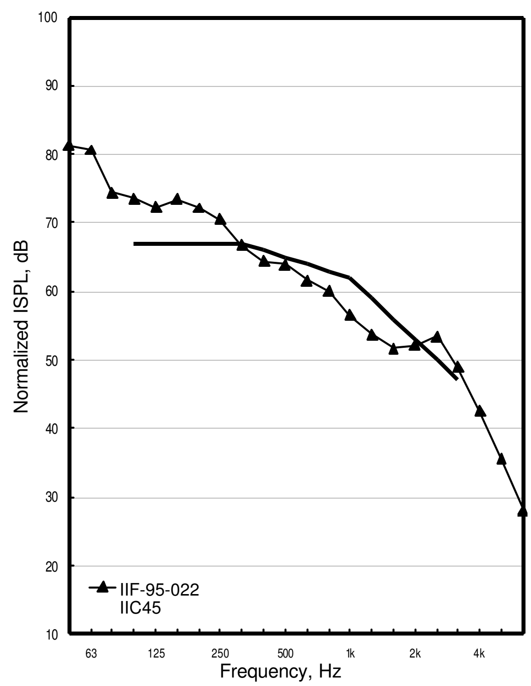
Freq. Hz	TLF-95-069a	IIF-95-022
50	14	81
63	16	81
80	22	74
100	24	74
125	29	72
160	31	73
200	35	72
250	39	71
315	45	67
400	52	64
500	54	64
630	53	62
800	58	60
1000	59	57
1250	59	54
1600	57	52
2000	55	52
2500	52	53
3150	55	49
4000	60	42
5000	65	36
6300	70	28
STC/IIC	51	45
$R_w/L_{n,w}$	50	66

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	223.3	
Floor layers	178.2	8.9 kg/m^2
Ceiling layers	195.3	11 kg/m^2

R20 suspended in center of joist cavity (top of batt approx. 41 mm from top of joist). Type X gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





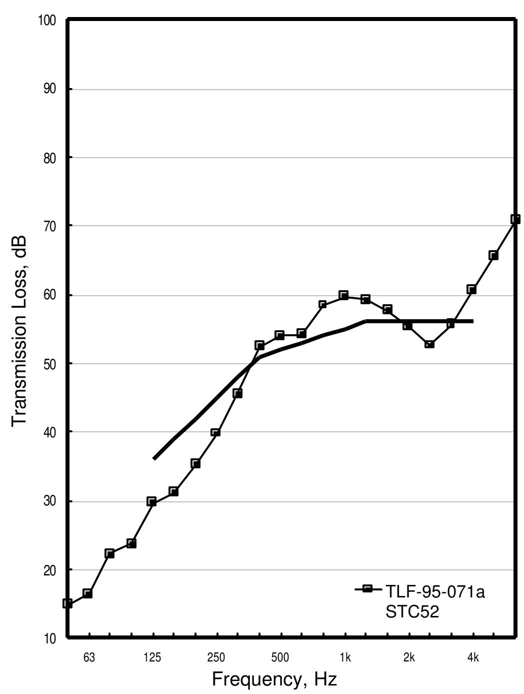
TLF-95-071a
IIF-95-023
OSB15_WJ235(406)_GFB152_RC13(610)_G16

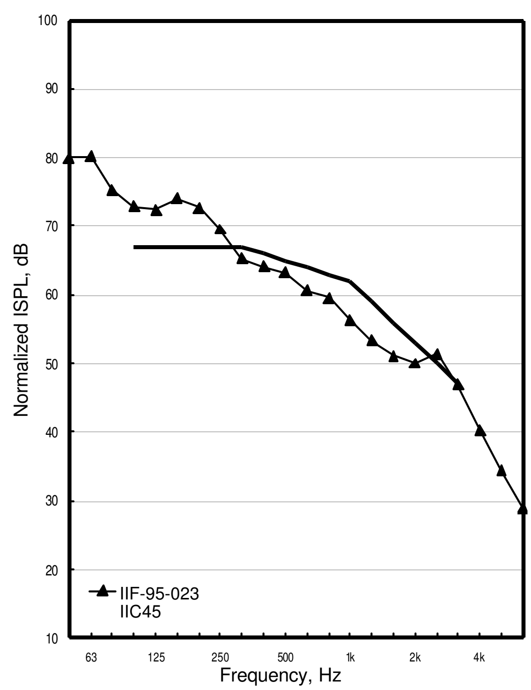
Freq. Hz	TLF-95-071a	IIF-95-023
50	15	80
63	16	80
80	22	75
100	24	73
125	30	72
160	31	74
200	35	73
250	40	70
315	46	65
400	52	64
500	54	63
630	54	61
800	58	60
1000	60	56
1250	59	53
1600	58	51
2000	55	50
2500	53	51
3150	56	47
4000	61	40
5000	66	34
6300	71	29
STC/IIC	52	45
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	223.3	
Floor layers	178.2	8.9 kg/m^2
Ceiling layers	195.3	11 kg/m^2

R20 positioned at top of joist cavity (top of batt right under OSB). Type X gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





Group 29 : Effect of cross-bridging

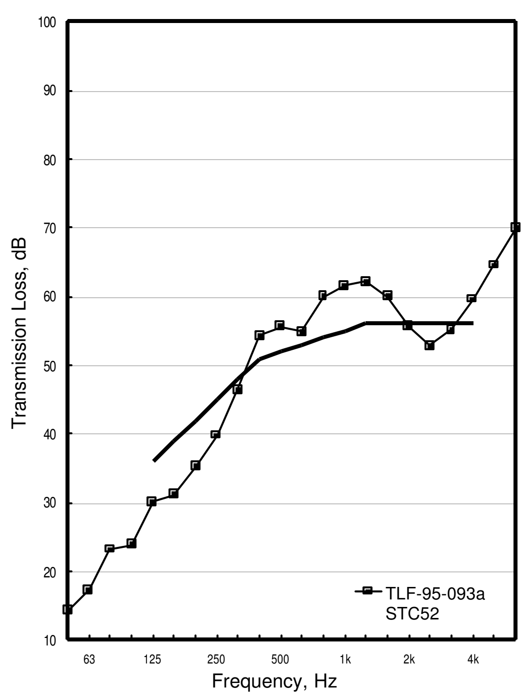
TLF-95-093a
IIF-95-034
OSB15_WJ235(406)_GFB152_RC13(610)_G16

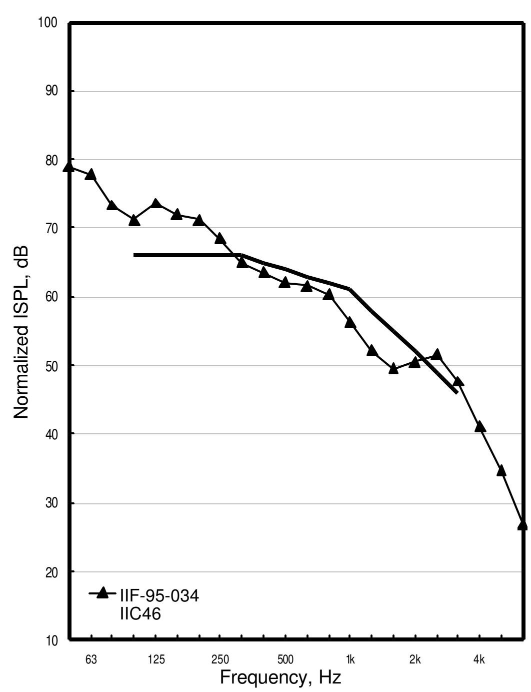
Freq. Hz	TLF-95-093a	IIF-95-034
50	14	79
63	17	78
80	23	73
100	24	71
125	30	74
160	31	72
200	35	71
250	40	69
315	46	65
400	54	64
500	56	62
630	55	62
800	60	60
1000	62	56
1250	62	52
1600	60	50
2000	56	51
2500	53	52
3150	55	48
4000	60	41
5000	65	35
6300	70	27
STC/IIC	52	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	222.2	
Floor layers	191.6	9.5 kg/m^2
Ceiling layers	205.4	11.5 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging. Reference floor assembly.





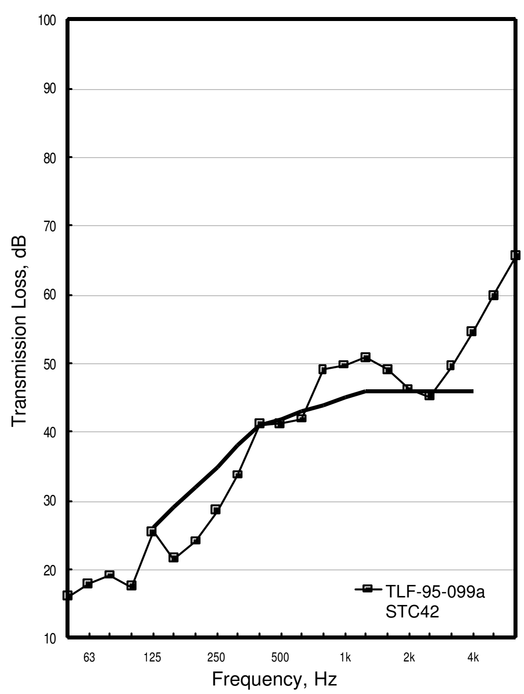
TLF-95-099a
IIF-95-037
OSB15_WJ235(406)_GFB152_WFUR19(610)_G16

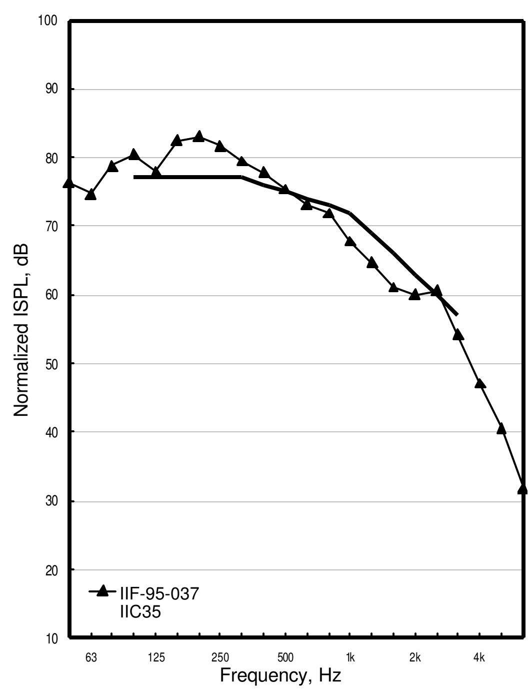
Freq. Hz	TLF-95-099a	IIF-95-037
50	16	76
63	18	75
80	19	79
100	18	80
125	25	78
160	22	82
200	24	83
250	29	82
315	34	79
400	41	78
500	41	75
630	42	73
800	49	72
1000	50	68
1250	51	65
1600	49	61
2000	46	60
2500	45	61
3150	50	54
4000	55	47
5000	60	41
6300	66	32
STC/IIC	42	35
$R_w/L_{n,w}$	41	75

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Wood furring strips		19	610
Gypsum board	1	16	

	Mass, kg	
Frame	236.6	
Floor layers	191.6	9.5 kg/m^2
Ceiling layers	205.2	11.5 kg/m^2

No cross-bridging, no RC. 19 x 64 mm wood furring strips, 610 o.c. Type X gypsum board perpendicular to furring strips. Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field.





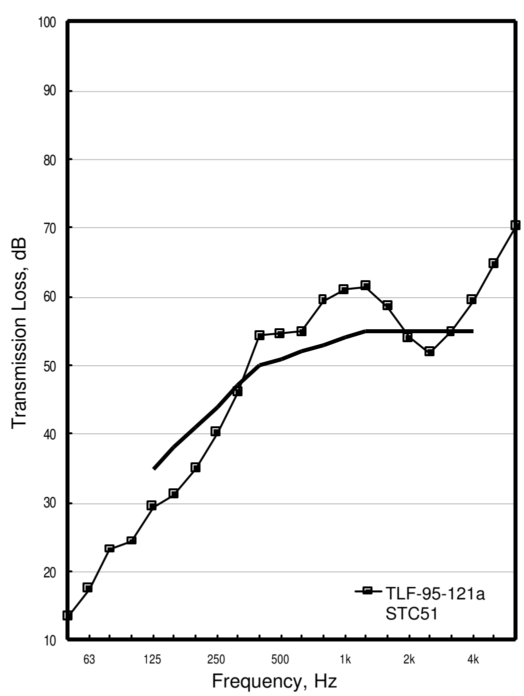
TLF-95-121a
IIF-95-042
OSB15_WJ235(406)_GFB152_RC13(610)_G16

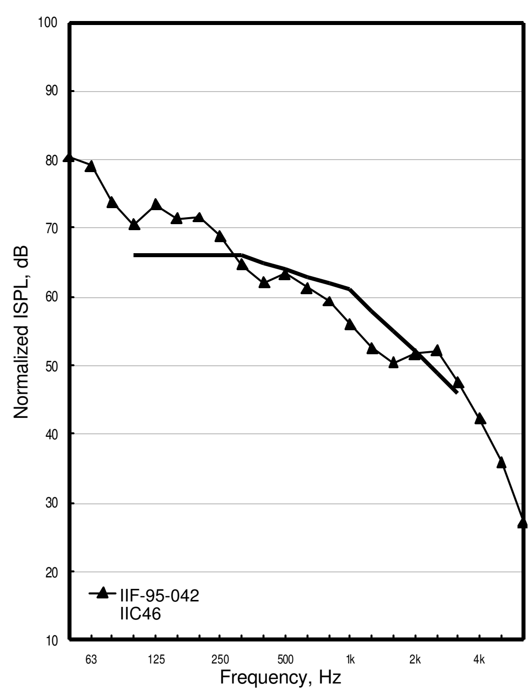
Freq. Hz	TLF-95-121a	IIF-95-042
50	13	80
63	17	79
80	23	74
100	24	71
125	29	73
160	31	71
200	35	72
250	40	69
315	46	65
400	54	62
500	55	63
630	55	61
800	59	59
1000	61	56
1250	61	53
1600	59	50
2000	54	52
2500	52	52
3150	55	48
4000	59	42
5000	65	36
6300	70	27
STC/IIC	51	46
$R_w/L_{n,w}$	50	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	237.6	
Floor layers	192.8	9.6 kg/m^2
Ceiling layers	207.0	11.6 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross-bridging. Reference floor assembly.





Group 30 : Systems for Improving Floors

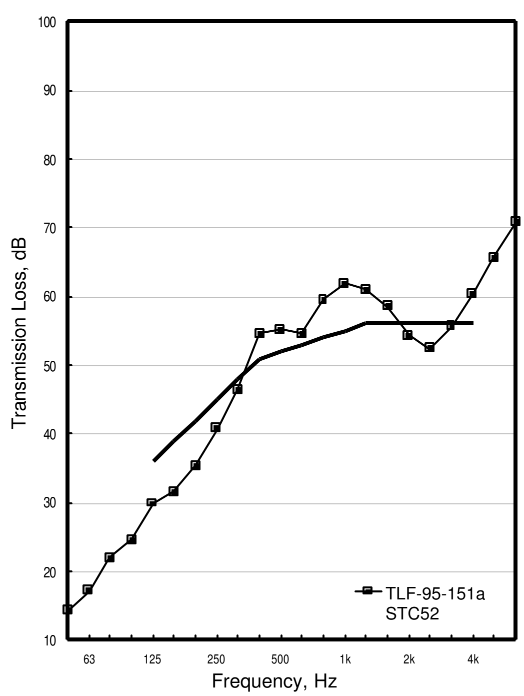
TLF-95-151a
IIF-95-057
OSB15_WJ235(406)_GFB152_RC13(610)_G16

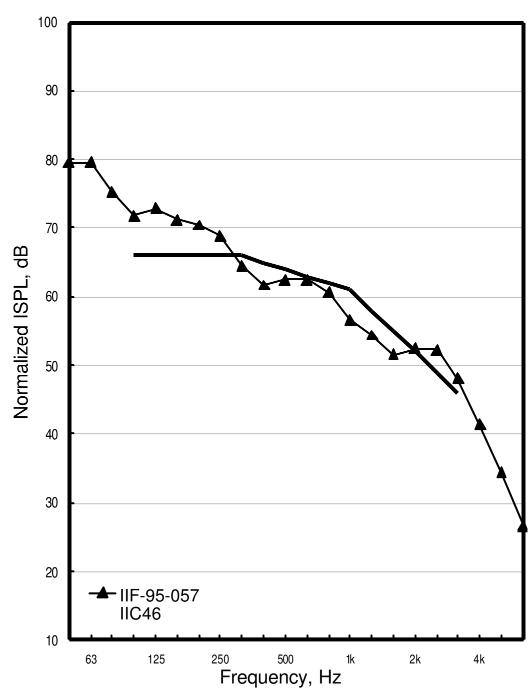
Freq. Hz	TLF-95-151a	IIF-95-057
50	14	80
63	17	80
80	22	75
100	25	72
125	30	73
160	32	71
200	35	70
250	41	69
315	46	64
400	55	62
500	55	63
630	55	63
800	60	61
1000	62	57
1250	61	54
1600	59	52
2000	54	52
2500	52	52
3150	56	48
4000	60	41
5000	66	34
6300	71	27
STC/IIC	52	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	238.8	
Floor layers	181.2	9.0 kg/m^2
Ceiling layers	206.8	11.6 kg/m^2

Gypsum board layer screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging. Reference floor assembly.





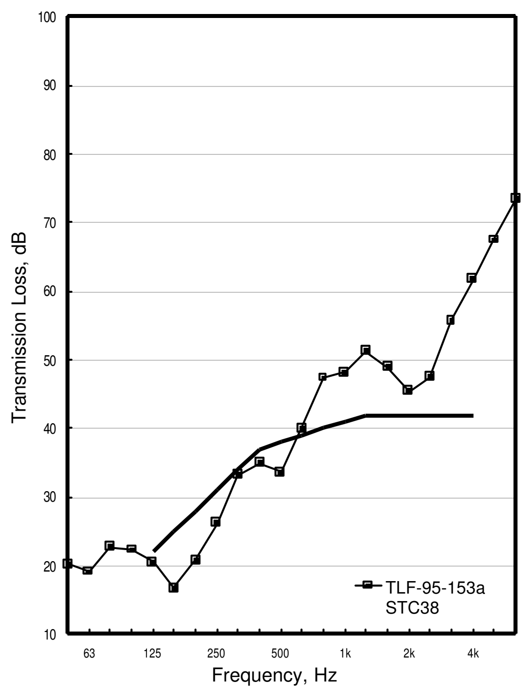
TLF-95-153a
IIF-95-058
OSB15_WJ235(406)_GFB152_G16_RC13(610)_G16

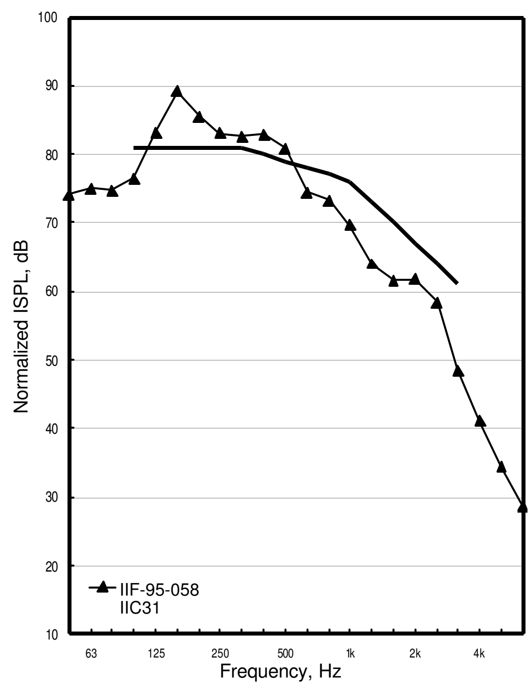
Freq. Hz	TLF-95-153a	IIF-95-058
50	20	74
63	19	75
80	23	75
100	22	76
125	21	83
160	17	89
200	21	86
250	26	83
315	33	83
400	35	83
500	34	81
630	40	74
800	47	73
1000	48	70
1250	51	64
1600	49	62
2000	45	62
2500	47	58
3150	56	49
4000	62	41
5000	67	34
6300	73	29
STC/IIC	38	31
$R_w/L_{n,w}$	38	78

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Gypsum board	1	16	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	238.8	
Floor layers	181.2	9.0 kg/m^2
Ceiling layers	417.4	23.4 kg/m^2

Gypsum board is Type X. First layer screwed directly to joists 305 o.c., perpendicular to joists. Second layer gypsum board screwed to RC 305 o.c., perpendicular to RC. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





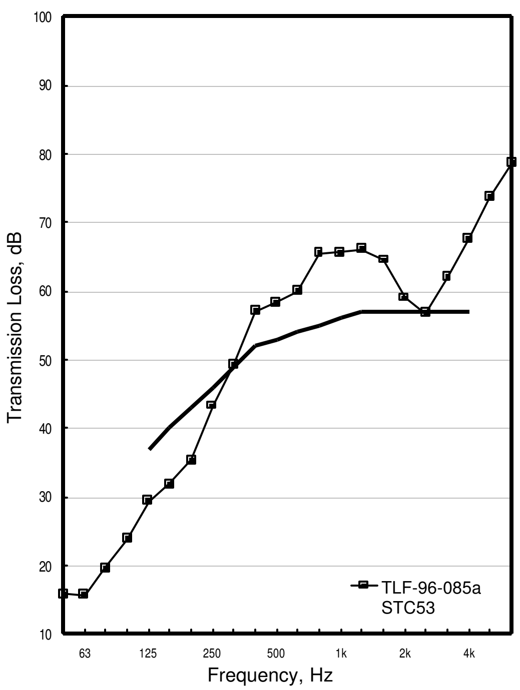
TLF-96-085a
IIF-96-036
OSB15_WJ235(406)_G16_SS89_GFB90_G16

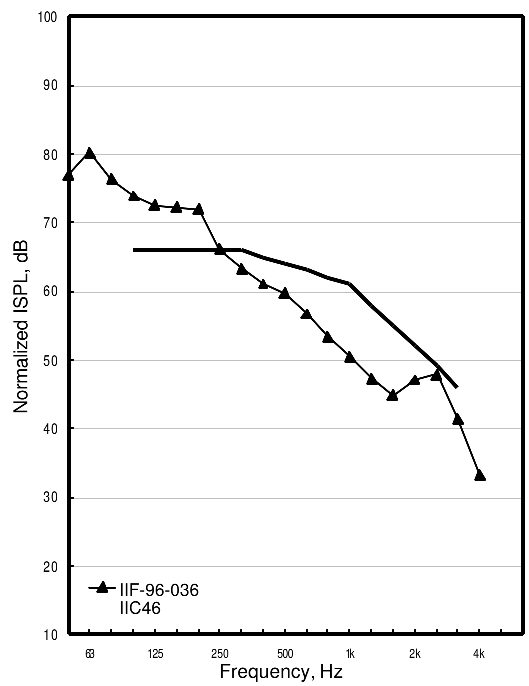
Freq. Hz	TLF-96-085a	IIF-96-036
50	16	77
63	16	80
80	20	76
100	24	74
125	29	73
160	32	72
200	35	72
250	43	66
315	49	63
400	57	61
500	58	60
630	60	57
800	66	53
1000	66	51
1250	66	47
1600	65	45
2000	59	47
2500	57	48
3150	62	42
4000	68	33
5000	74	0
6300	79	0
STC/IIC	53	46
$R_w/L_{n,w}$	52	63

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Gypsum board	1	16	
Steel studs		89	
Glass fibre batts		90	
Gypsum board	1	16	

	Mass, kg	
Frame	249.8	
Floor layers	181.8	9.0 kg/m^2
Ceiling layers	394.7	22.2 kg/m^2

Type X gypsum board attached directly to joists, perpendicular to joists. 89 mm non-loadbearing steel studs attached to gypsum board, perpendicular to joists. R12 in steel stud cavities. Type X attached to steel studs, perpendicular to steel studs. Base & face layers of gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





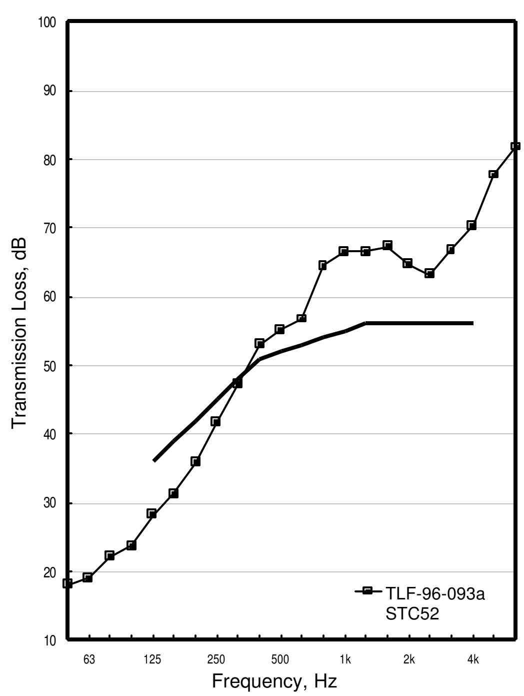
TLF-96-093a
IIF-96-040
OSB15_WJ235(406)_G16_wire_UC25(610)_GFB90_G16

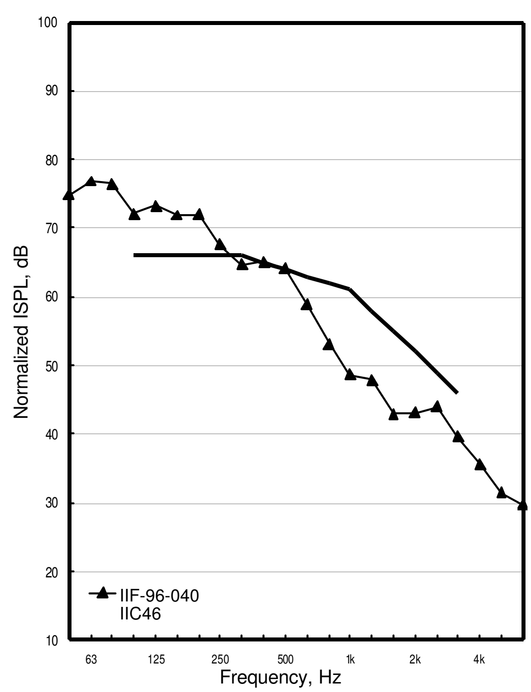
Freq. Hz	TLF-96-093a	IIF-96-040
50	18	75
63	19	77
80	22	76
100	24	72
125	28	73
160	31	72
200	36	72
250	42	68
315	47	65
400	53	65
500	55	64
630	57	59
800	64	53
1000	67	49
1250	66	48
1600	67	43
2000	65	43
2500	63	44
3150	67	40
4000	70	36
5000	78	32
6300	82	30
STC/IIC	52	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Gypsum board	1	16	
wire			
U-channels		25	610
Glass fibre batts		90	
Gypsum board	1	16	

	Mass, kg	
Frame	256.6	
Floor layers	181.8	9.0 kg/m^2
Ceiling layers	401.6	22.6 kg/m^2

38 x 235 x 3924 mm wood joists. Type X gypsum board perpendicular to joists screwed 305 o.c. 12 gauge wire used to suspend C-channel from joists. Space between bottom of gypsum board and top of C-channel is 70 mm. C-channel 610 o.c. perpendicular to joists. U-channel attached to C-channel 610 o.c. perpendicular to C-channel. R12 between gypsum board. Type X gypsum board, perpendicular to joists & screwed 305 o.c. to U-channel. OSB screwed 150 o.c. around edges, 300m o.c. in the field. One set of 19 x 64 cross bridging.





Group 31 : Re-test Repeatability

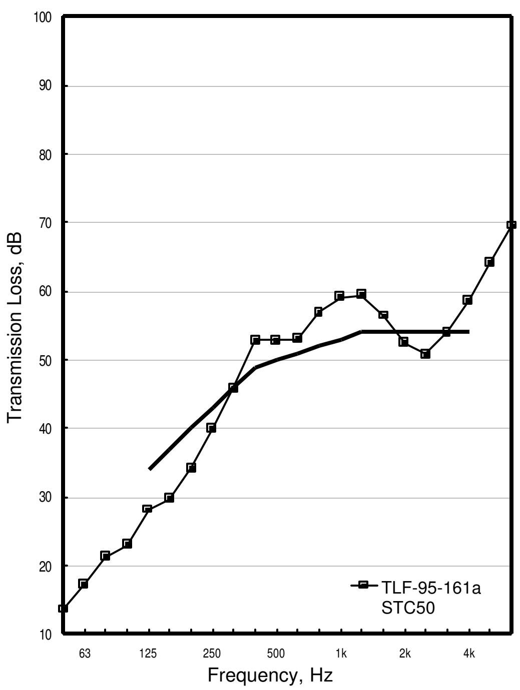
TLF-95-161a
IIF-95-062
OSB15_WJ184(406)_GFB152_RC13(610)_G16

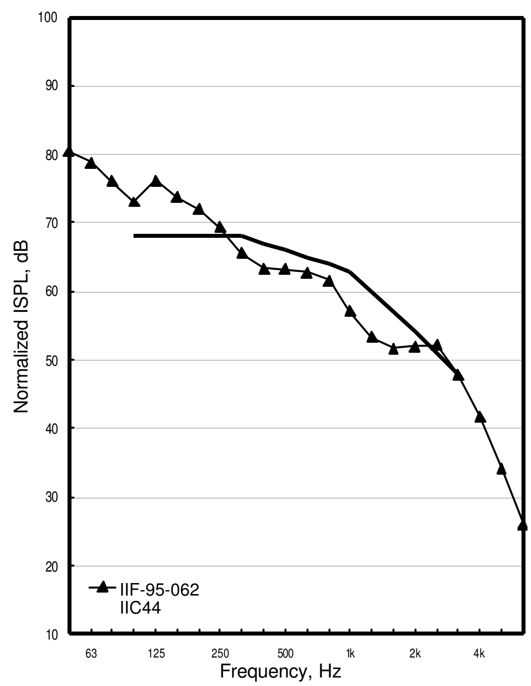
Freq. Hz	TLF-95-161a	IIF-95-062
50	14	80
63	17	79
80	21	76
100	23	73
125	28	76
160	30	74
200	34	72
250	40	69
315	46	66
400	53	63
500	53	63
630	53	63
800	57	62
1000	59	57
1250	59	53
1600	56	52
2000	52	52
2500	51	52
3150	54	48
4000	59	42
5000	64	34
6300	70	26
STC/IIC	50	44
$R_w/L_{n,w}$	49	66

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		184	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	174.2	
Floor layers	181.6	9.0 kg/m^2
Ceiling layers	203.0	11.4 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





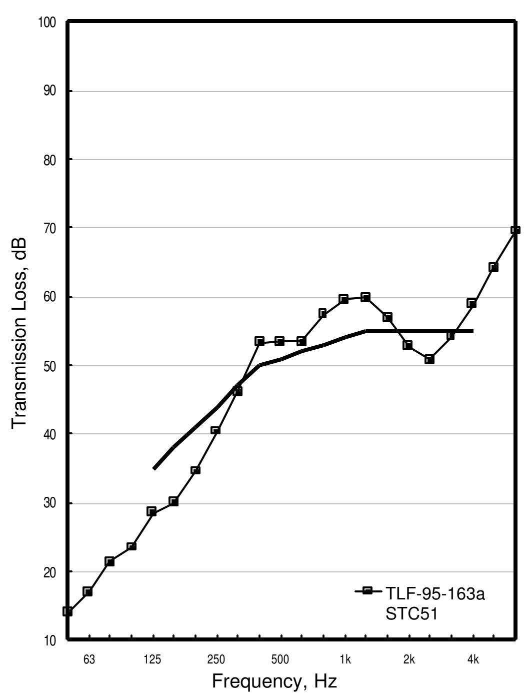
TLF-95-163a
IIF-95-063
OSB15_WJ184(406)_GFB152_RC13(610)_G16

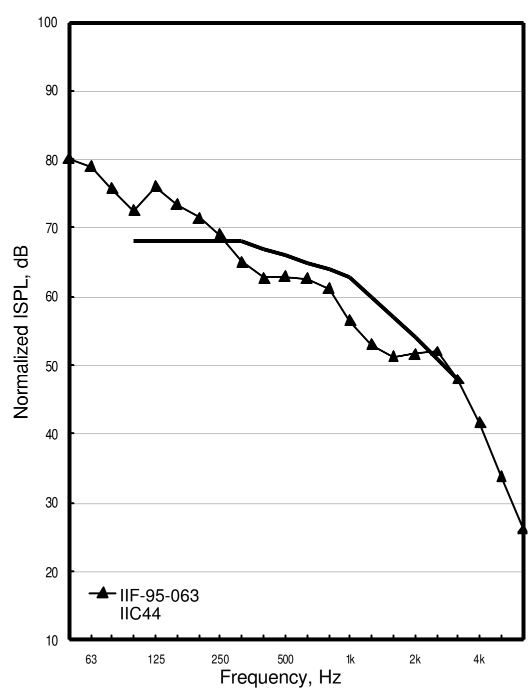
Freq. Hz	TLF-95-163a	IIF-95-063
50	14	80
63	17	79
80	21	76
100	23	73
125	29	76
160	30	73
200	35	72
250	40	69
315	46	65
400	53	63
500	53	63
630	53	63
800	57	61
1000	60	57
1250	60	53
1600	57	51
2000	53	52
2500	51	52
3150	54	48
4000	59	42
5000	64	34
6300	70	26
STC/IIC	51	44
$R_w/L_{n,w}$	49	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		184	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	174.2	
Floor layers	181.6	9.0 kg/m^2
Ceiling layers	203.0	11.4 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





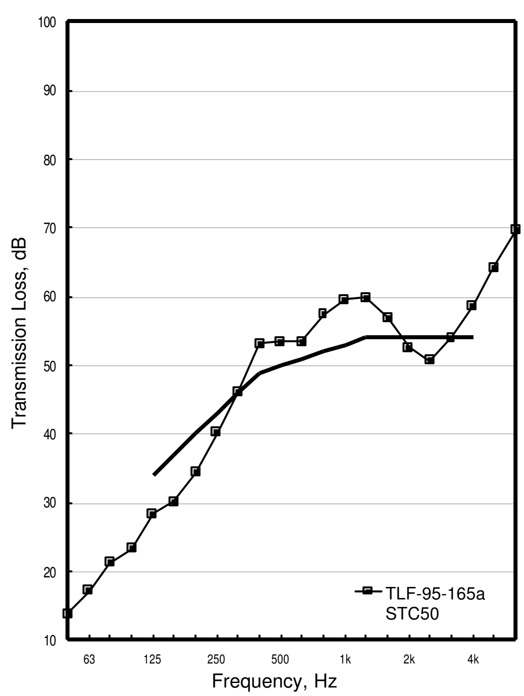
TLF-95-165a
IIF-95-064
OSB15_WJ184(406)_GFB152_RC13(610)_G16

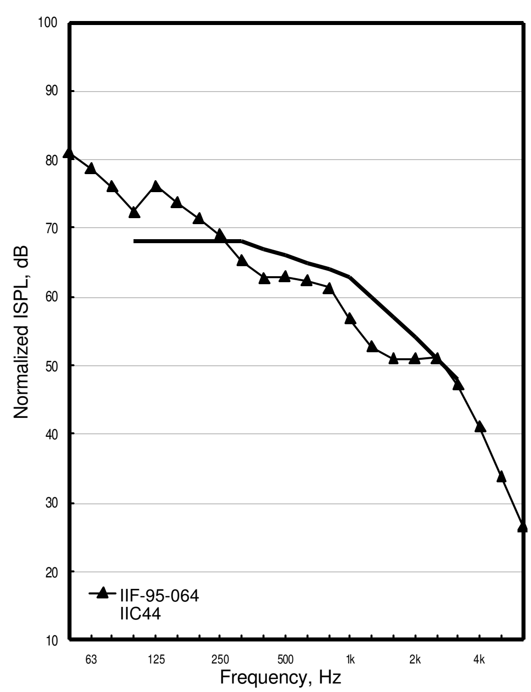
Freq. Hz	TLF-95-165a	IIF-95-064
50	14	81
63	17	79
80	21	76
100	23	72
125	28	76
160	30	74
200	34	71
250	40	69
315	46	65
400	53	63
500	53	63
630	53	62
800	57	61
1000	60	57
1250	60	53
1600	57	51
2000	53	51
2500	51	51
3150	54	47
4000	59	41
5000	64	34
6300	70	26
STC/IIC	50	44
$R_w/L_{n,w}$	49	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		184	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	174.2	
Floor layers	181.6	9.0 kg/m^2
Ceiling layers	203.0	11.4 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





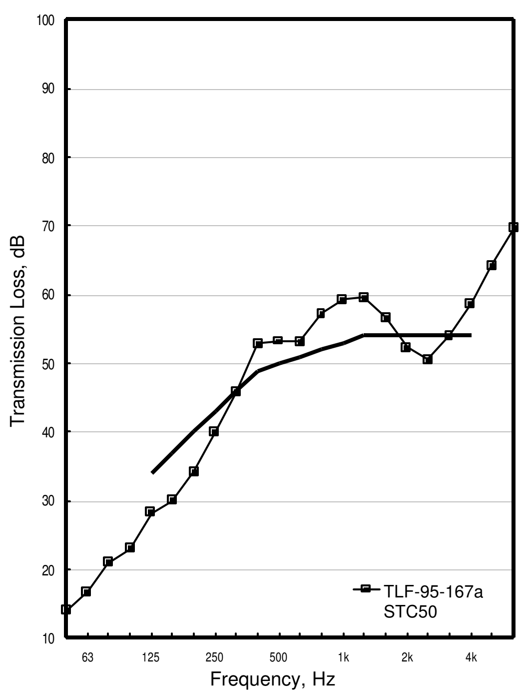
TLF-95-167a
IIF-95-065
OSB15_WJ184(406)_GFB152_RC13(610)_G16

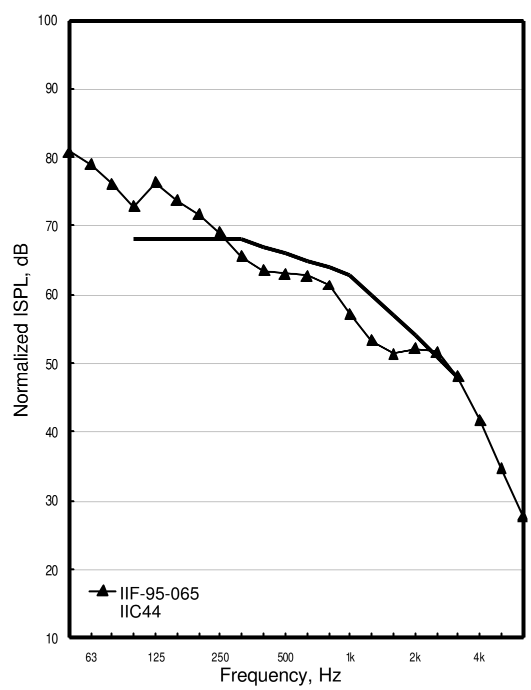
Freq. Hz	TLF-95-167a	IIF-95-065
50	14	81
63	17	79
80	21	76
100	23	73
125	28	76
160	30	74
200	34	72
250	40	69
315	46	66
400	53	64
500	53	63
630	53	63
800	57	61
1000	59	57
1250	60	53
1600	57	51
2000	52	52
2500	51	52
3150	54	48
4000	59	42
5000	64	35
6300	70	28
STC/IIC	50	44
$R_w/L_{n,w}$	49	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		184	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	174.2	
Floor layers	181.6	9.0 kg/m^2
Ceiling layers	203.0	11.4 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





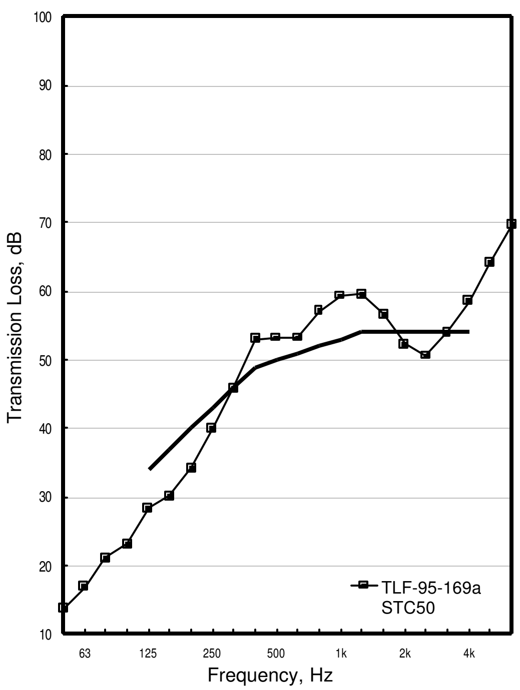
TLF-95-169a
IIF-95-066
OSB15_WJ184(406)_GFB152_RC13(610)_G16

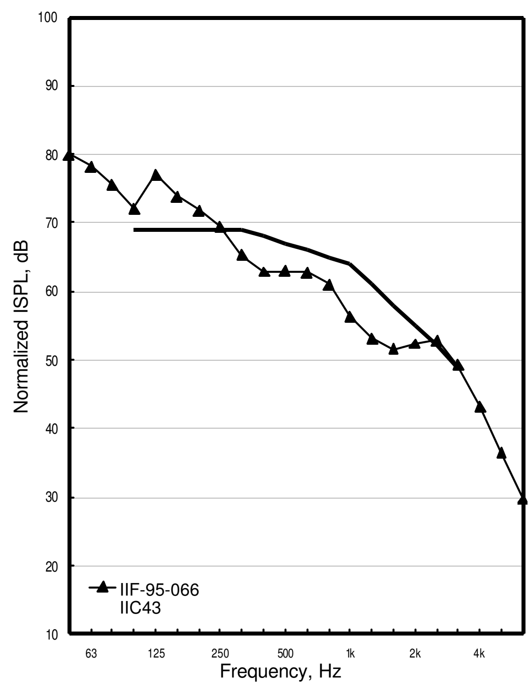
Freq. Hz	TLF-95-169a	IIF-95-066
50	14	80
63	17	78
80	21	76
100	23	72
125	28	77
160	30	74
200	34	72
250	40	69
315	46	65
400	53	63
500	53	63
630	53	63
800	57	61
1000	59	56
1250	60	53
1600	57	52
2000	52	52
2500	51	53
3150	54	49
4000	59	43
5000	64	36
6300	70	30
STC/IIC	50	43
$R_w/L_{n,w}$	49	66

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		184	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	174.2	
Floor layers	181.6	9.0 kg/m^2
Ceiling layers	203.0	11.4 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





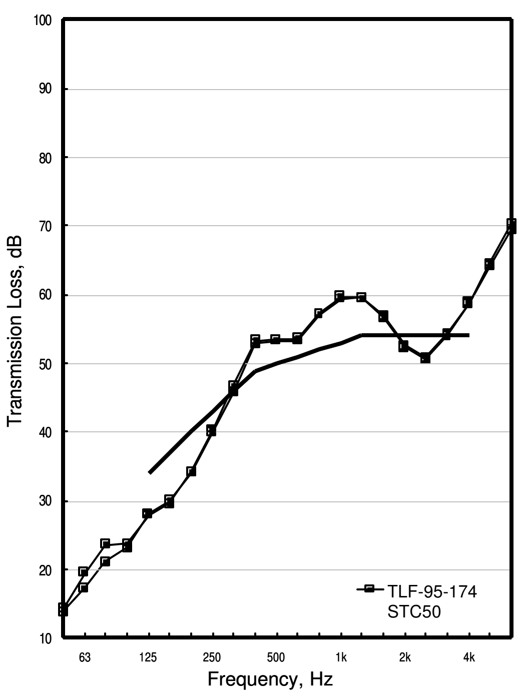
TLF-95-171a
IIF-95-067
OSB15_WJ184(406)_GFB152_RC13(610)_G16

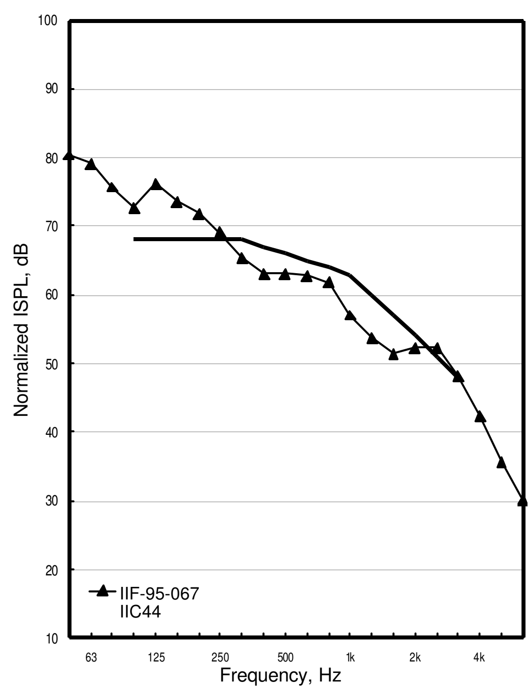
Freq. Hz	TLF-95-171a	IIF-95-067
50	14	80
63	17	79
80	21	76
100	23	73
125	28	76
160	30	74
200	34	72
250	40	69
315	46	65
400	53	63
500	53	63
630	53	63
800	57	62
1000	59	57
1250	60	54
1600	57	51
2000	52	52
2500	51	52
3150	54	48
4000	59	42
5000	64	36
6300	69	30
STC/IIC	50	44
$R_w/L_{n,w}$	49	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		184	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	174.2	
Floor layers	181.6	9.0 kg/m^2
Ceiling layers	203.0	11.4 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging.





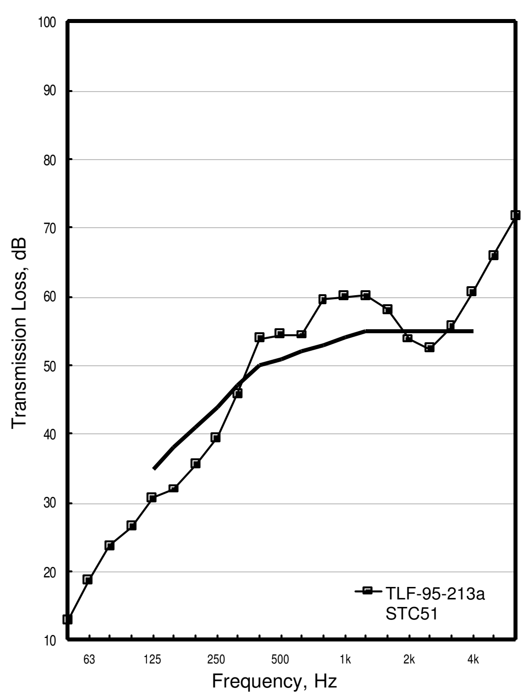
TLF-95-213a
IIF-95-074
OSB15_WJ286(406)_GFB152_RC13(610)_G16

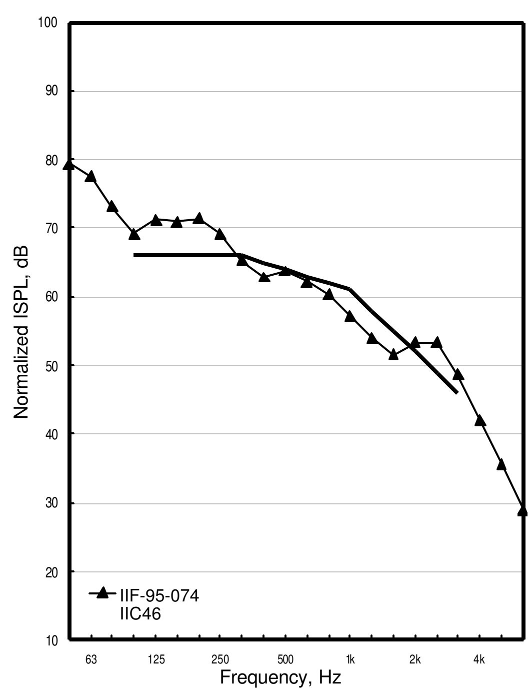
Freq. Hz	TLF-95-213a	IIF-95-074
50	13	79
63	19	78
80	24	73
100	27	69
125	31	71
160	32	71
200	35	71
250	39	69
315	46	65
400	54	63
500	54	64
630	54	62
800	60	60
1000	60	57
1250	60	54
1600	58	52
2000	54	53
2500	52	53
3150	56	49
4000	61	42
5000	66	36
6300	72	29
STC/IIC	51	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		286	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	271.0	
Floor layers	171.1	8.5 kg/m^2
Ceiling layers	201.5	11.3 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross-bridging.





Group 32 : Re-build Repeatability

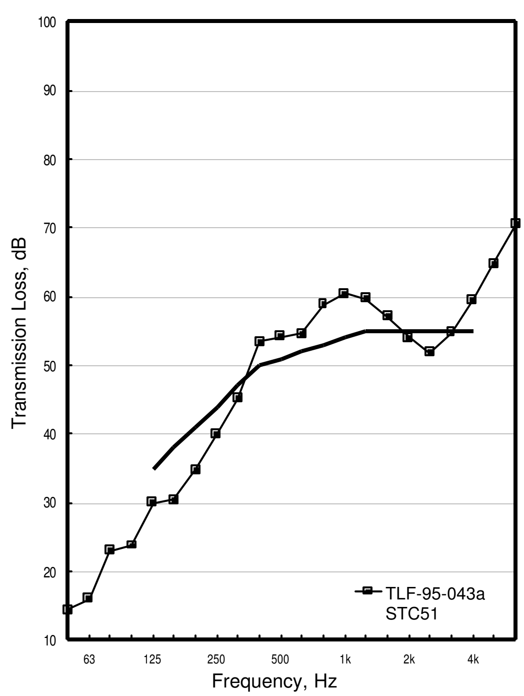
TLF-95-043a
IIF-95-009
OSB15_WJ235(406)_GFB152_RC13(610)_G16

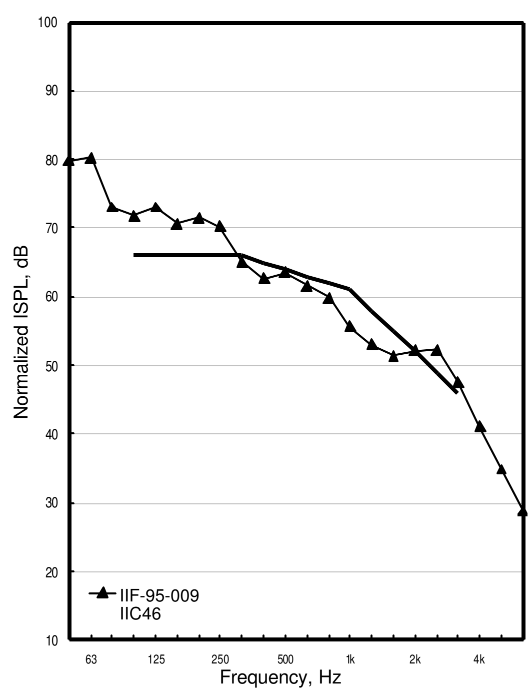
Freq. Hz	TLF-95-043a	IIF-95-009
50	14	80
63	16	80
80	23	73
100	24	72
125	30	73
160	30	71
200	35	71
250	40	70
315	45	65
400	53	63
500	54	64
630	55	62
800	59	60
1000	60	56
1250	60	53
1600	57	51
2000	54	52
2500	52	52
3150	55	48
4000	60	41
5000	65	35
6300	71	29
STC/IIC	51	46
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	230.4	
Floor layers	174.5	8.7 kg/m^2
Ceiling layers	201.2	11.3 kg/m^2

One set of 19 x 64 mm cross-bridging. Type X gypsum board screwed 305 o.c. OSB screwed 150 o.c. around the edges & 305 o.c. in the field. Reference floor assembly.





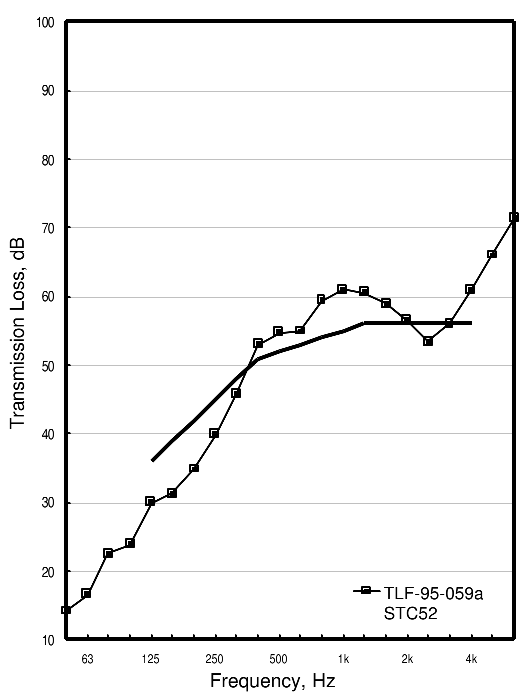
TLF-95-059a
IIF-95-017
OSB15_WJ235(406)_GFB152_RC13(610)_G16

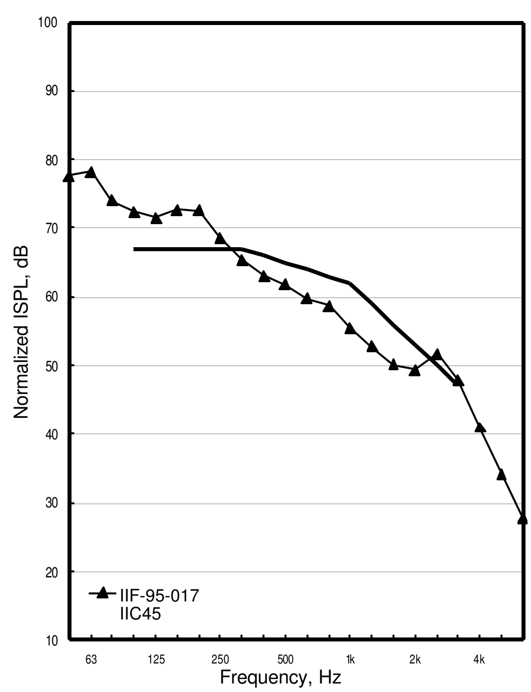
Freq. Hz	TLF-95-059a	IIF-95-017
50	14	78
63	17	78
80	23	74
100	24	72
125	30	72
160	31	73
200	35	73
250	40	69
315	46	65
400	53	63
500	55	62
630	55	60
800	59	59
1000	61	56
1250	61	53
1600	59	50
2000	56	49
2500	53	52
3150	56	48
4000	61	41
5000	66	34
6300	71	28
STC/IIC	52	45
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	223.3	
Floor layers	178.2	8.9 kg/m^2
Ceiling layers	195.3	11 kg/m^2

OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. Type X gypsum board screwed 305 o.c. One set of 19 x 64 mm cross-bridging. Reference floor assembly.





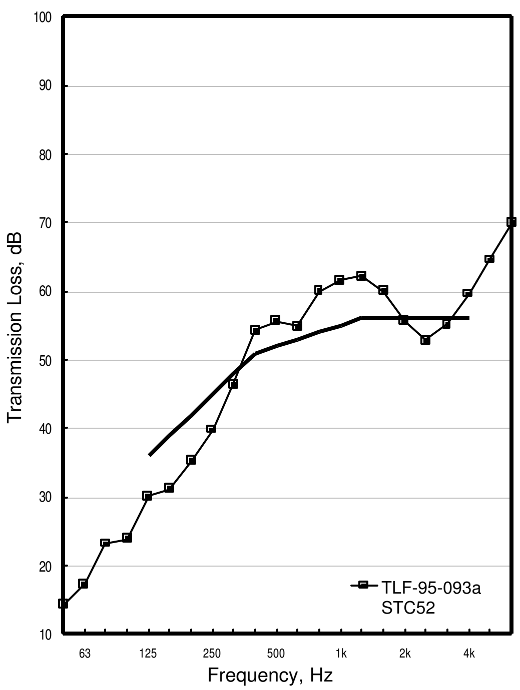
TLF-95-093a
IIF-95-034
OSB15_WJ235(406)_GFB152_RC13(610)_G16

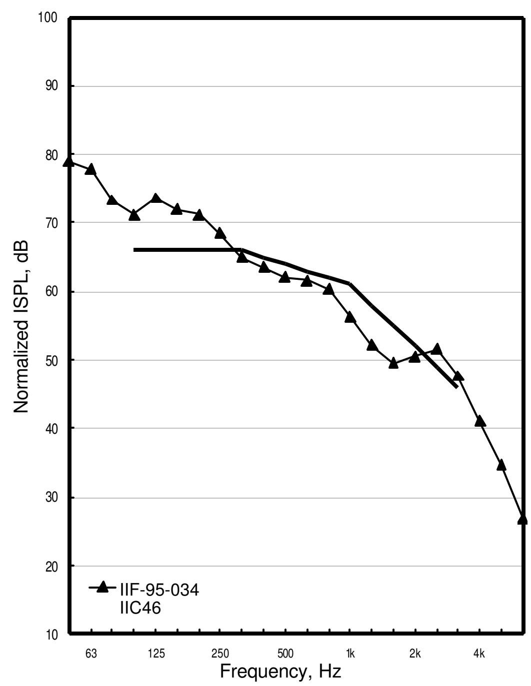
Freq. Hz	TLF-95-093a	IIF-95-034
50	14	79
63	17	78
80	23	73
100	24	71
125	30	74
160	31	72
200	35	71
250	40	69
315	46	65
400	54	64
500	56	62
630	55	62
800	60	60
1000	62	56
1250	62	52
1600	60	50
2000	56	51
2500	53	52
3150	55	48
4000	60	41
5000	65	35
6300	70	27
STC/IIC	52	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	222.2	
Floor layers	191.6	9.5 kg/m^2
Ceiling layers	205.4	11.5 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around the edges & 305 o.c. in the field. One set of 19 x 64 mm cross-bridging. Reference floor assembly.





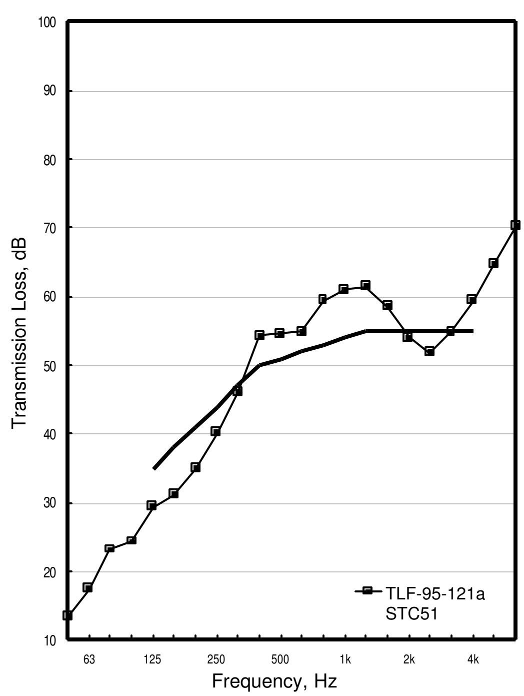
TLF-95-121a
IIF-95-042
OSB15_WJ235(406)_GFB152_RC13(610)_G16

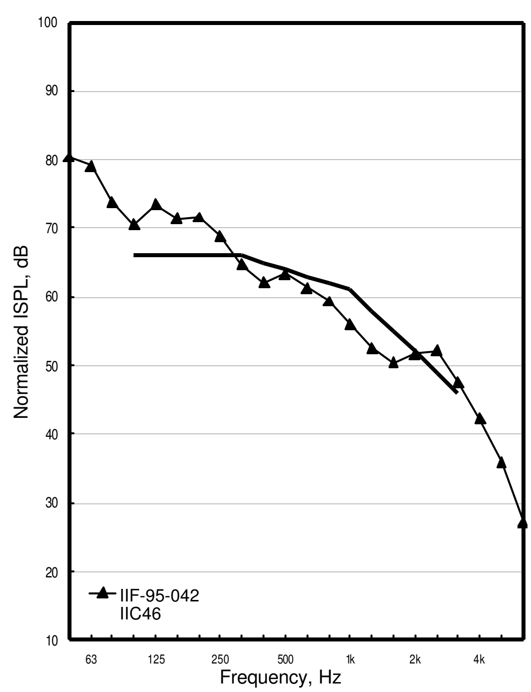
Freq. Hz	TLF-95-121a	IIF-95-042
50	13	80
63	17	79
80	23	74
100	24	71
125	29	73
160	31	71
200	35	72
250	40	69
315	46	65
400	54	62
500	55	63
630	55	61
800	59	59
1000	61	56
1250	61	53
1600	59	50
2000	54	52
2500	52	52
3150	55	48
4000	59	42
5000	65	36
6300	70	27
STC/IIC	51	46
$R_w/L_{n,w}$	50	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	237.6	
Floor layers	192.8	9.6 kg/m^2
Ceiling layers	207.0	11.6 kg/m^2

Gypsum board screwed 305 o.c. OSB screwed to joists 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross-bridging. Reference floor assembly.





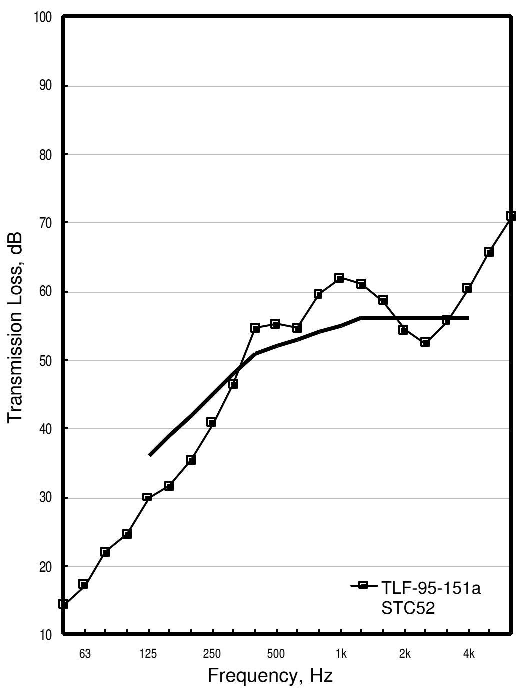
TLF-95-151a
IIF-95-057
OSB15_WJ235(406)_GFB152_RC13(610)_G16

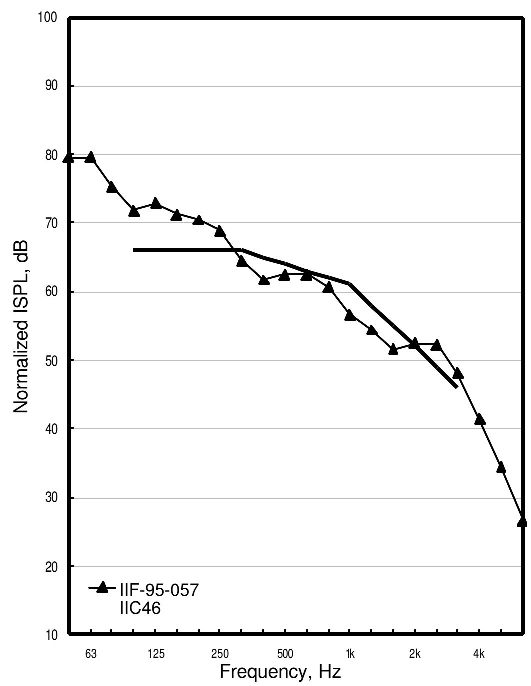
Freq. Hz	TLF-95-151a	IIF-95-057
50	14	80
63	17	80
80	22	75
100	25	72
125	30	73
160	32	71
200	35	70
250	41	69
315	46	64
400	55	62
500	55	63
630	55	63
800	60	61
1000	62	57
1250	61	54
1600	59	52
2000	54	52
2500	52	52
3150	56	48
4000	60	41
5000	66	34
6300	71	27
STC/IIC	52	46
$R_w/L_{n,w}$	51	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	238.8	
Floor layers	181.2	9.0 kg/m^2
Ceiling layers	206.8	11.6 kg/m^2

Gypsum board layer screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 mm cross bridging. Reference floor assembly.





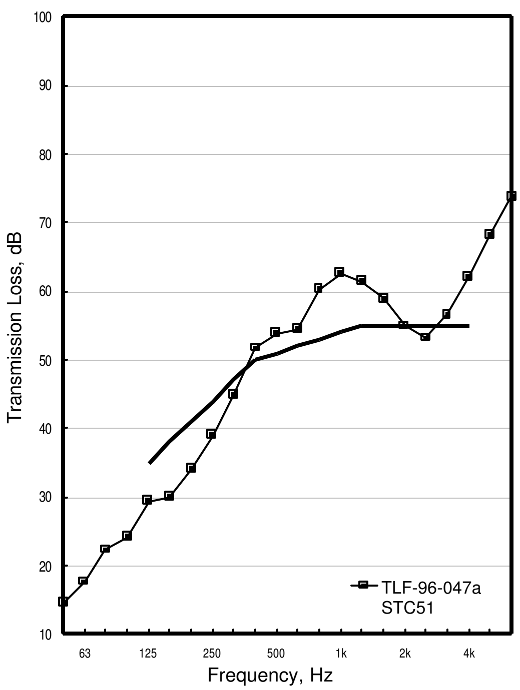
TLF-96-047a
IIF-96-015
OSB15_WJ235(406)_GFB152_RC13(610)_G16

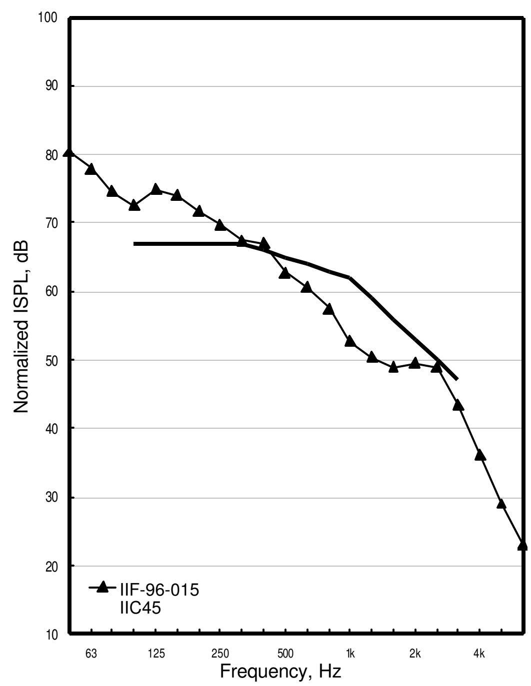
Freq. Hz	TLF-96-047a	IIF-96-015
50	15	80
63	18	78
80	22	75
100	24	73
125	29	75
160	30	74
200	34	72
250	39	70
315	45	67
400	52	67
500	54	63
630	55	61
800	60	58
1000	63	53
1250	61	50
1600	59	49
2000	55	50
2500	53	49
3150	57	44
4000	62	36
5000	68	29
6300	74	23
STC/IIC	51	45
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	217.8	
Floor layers	182.8	9.1 kg/m^2
Ceiling layers	200.0	11.2 kg/m^2

Type X gypsum perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging. Reference floor assembly.





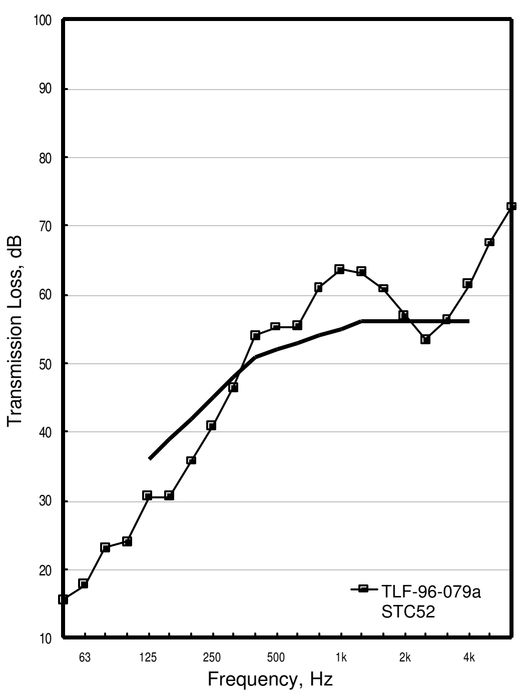
TLF-96-079a
IIF-96-033
OSB15_WJ235(406)_GFB152_RC13(610)_G16

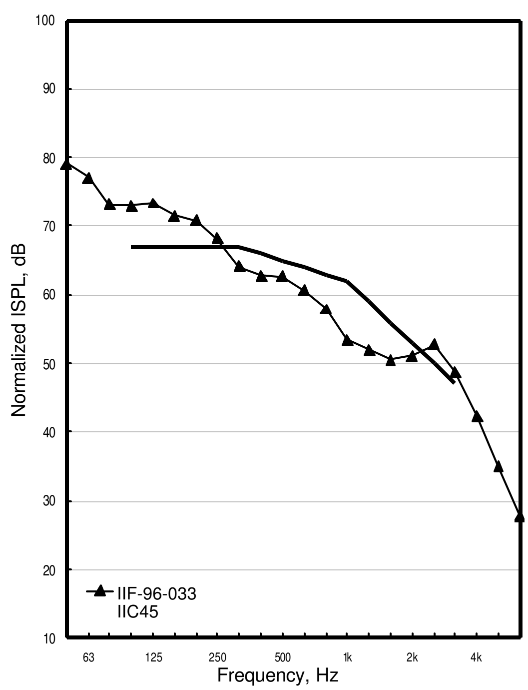
Freq. Hz	TLF-96-079a	IIF-96-033
50	16	79
63	18	77
80	23	73
100	24	73
125	31	73
160	31	71
200	36	71
250	41	68
315	46	64
400	54	63
500	55	63
630	55	61
800	61	58
1000	64	53
1250	63	52
1600	61	51
2000	57	51
2500	53	53
3150	56	49
4000	61	42
5000	67	35
6300	73	28
STC/IIC	52	45
$R_w/L_{n,w}$	51	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	217.8	
Floor layers	181.8	9.0 kg/m^2
Ceiling layers	197.7	11.1 kg/m^2

Type X gypsum board, perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.
Reference floor assembly.





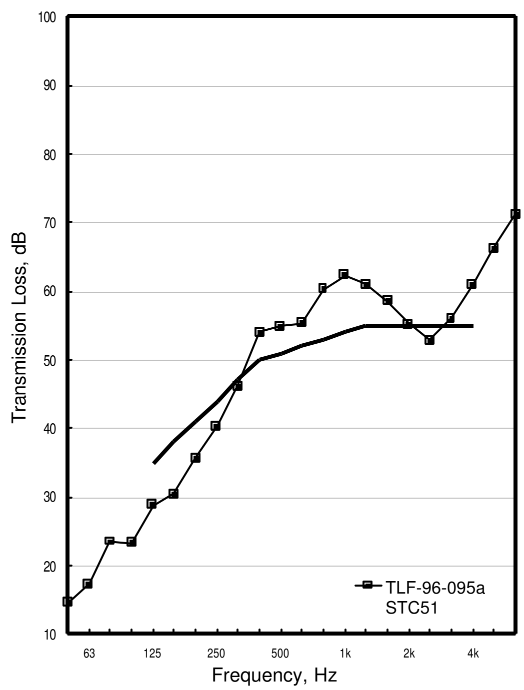
TLF-96-095a
IIF-96-041
OSB15_WJ235(406)_GFB152_RC13(610)_G16

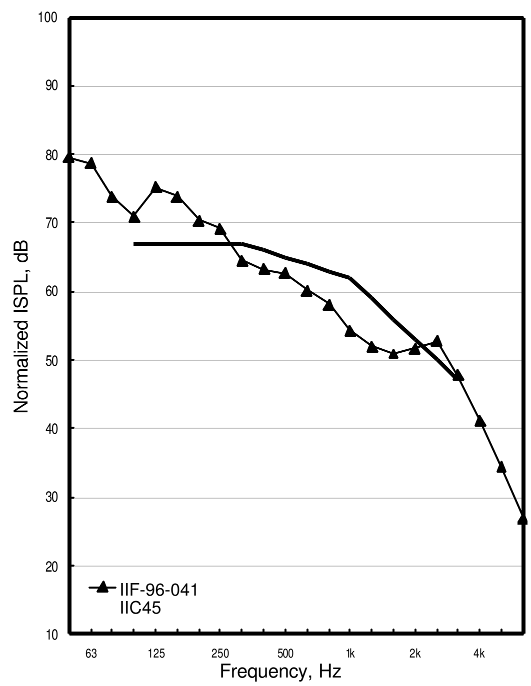
Freq. Hz	TLF-96-095a	IIF-96-041
50	15	80
63	17	79
80	24	74
100	23	71
125	29	75
160	30	74
200	36	70
250	40	69
315	46	65
400	54	63
500	55	63
630	55	60
800	60	58
1000	62	54
1250	61	52
1600	58	51
2000	55	52
2500	53	53
3150	56	48
4000	61	41
5000	66	34
6300	71	27
STC/IIC	51	45
$R_w/L_{n,w}$	50	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	203.9	
Floor layers	176.5	8.8 kg/m^2
Ceiling layers	202.5	11.4 kg/m^2

Type X gypsum board, perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.
Reference floor assembly.





Group 33 : Curing of Concrete Topping

TLF-96-125a

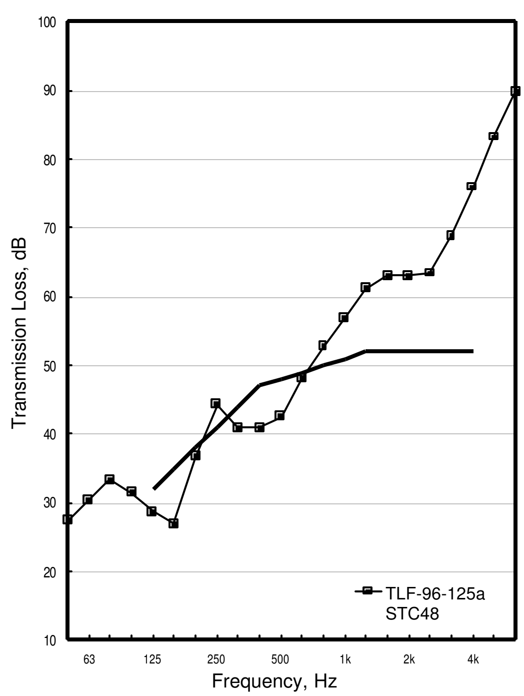
CON35_OSB15_WJ235(406)_GFB152_G16

Freq. Hz	TLF-96-125a	
50	27	
63	30	
80	33	
100	31	
125	29	
160	27	
200	37	
250	44	
315	41	
400	41	
500	43	
630	48	
800	53	
1000	57	
1250	61	
1600	63	
2000	63	
2500	63	
3150	69	
4000	76	
5000	83	
6300	90	
STC/IIC	48	
$R_w/L_{n,w}$	48	

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Gypsum board	1	16	

	Mass, kg	
Frame	203.9	
Floor layers	1863.9	92.7 kg/m^2
Ceiling layers	205.2	11.5 kg/m^2

Concrete curing time: 10 days. 40 mm regular concrete poured directly onto OSB subfloor. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.



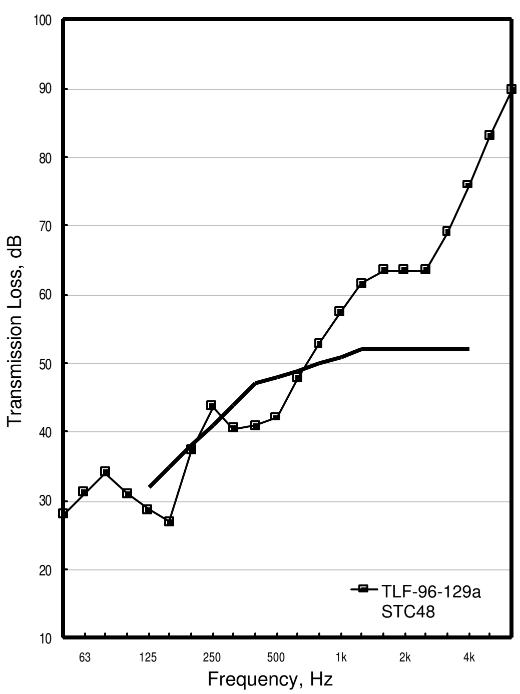
TLF-96-129a
IIF-96-056
CON35_OSB15_WJ235(406)_GFB152_G16

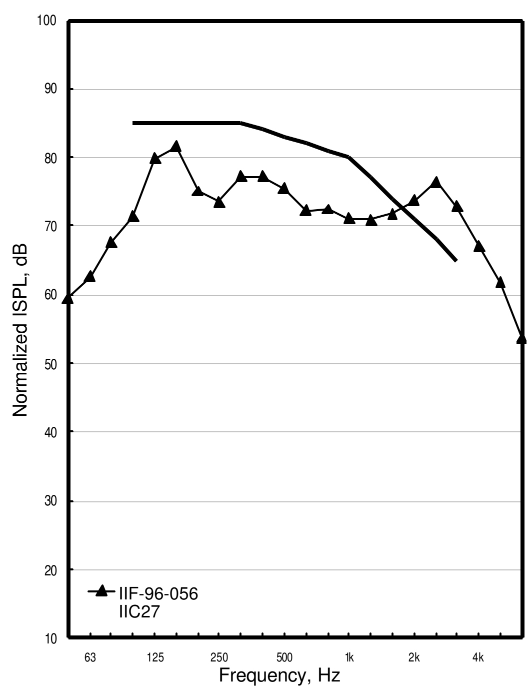
Freq. Hz	TLF-96-129a	IIF-96-056
50	28	60
63	31	63
80	34	68
100	31	71
125	29	80
160	27	82
200	37	75
250	44	74
315	41	77
400	41	77
500	42	75
630	48	72
800	53	72
1000	57	71
1250	62	71
1600	63	72
2000	63	74
2500	64	76
3150	69	73
4000	76	67
5000	83	62
6300	90	54
STC/IIC	48	27
$R_w/L_{n,w}$	48	80

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Gypsum board	1	16	

	Mass, kg	
Frame	203.9	
Floor layers	1863.9	92.7 kg/m^2
Ceiling layers	205.2	11.5 kg/m^2

Concrete curing time: 14 days. 40 mm regular concrete poured directly onto OSB subfloor. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set 19 x 64 cross bridging.





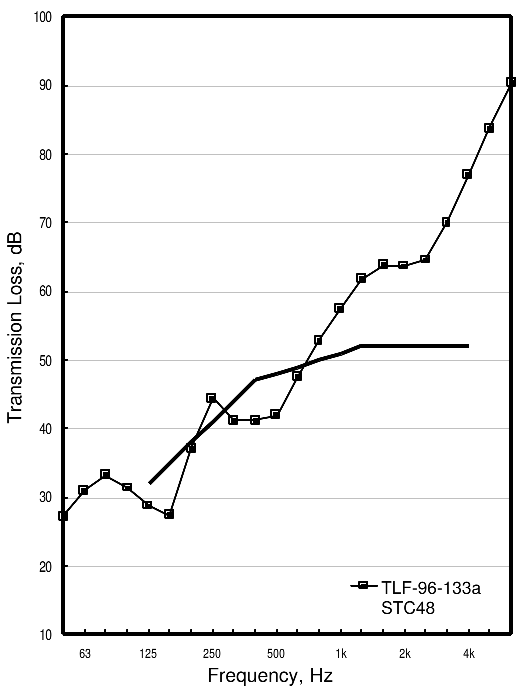
TLF-96-133a
IIF-96-058
CON35_OSB15_WJ235(406)_GFB152_G16

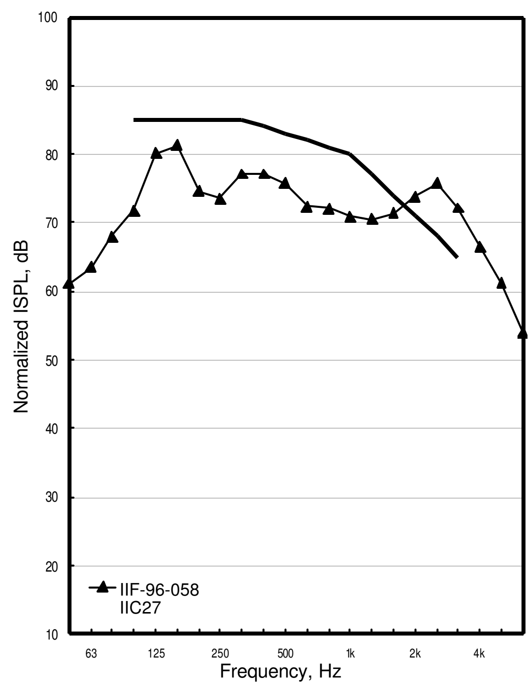
Freq. Hz	TLF-96-133a	IIF-96-058
50	27	61
63	31	63
80	33	68
100	31	72
125	29	80
160	27	81
200	37	75
250	44	74
315	41	77
400	41	77
500	42	76
630	47	72
800	53	72
1000	57	71
1250	62	71
1600	64	71
2000	64	74
2500	65	76
3150	70	72
4000	77	67
5000	84	61
6300	90	54
STC/IIC	48	27
$R_w/L_{n,w}$	48	79

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Gypsum board	1	16	

	Mass, kg	
Frame	203.9	
Floor layers	1863.9	92.7 kg/m^2
Ceiling layers	205.2	11.5 kg/m^2

Concrete curing time: 20 days. 40 mm regular concrete poured directly onto OSB subfloor. Gypsum board screwed 305 o.c. OSB applied perpendicular to joists. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





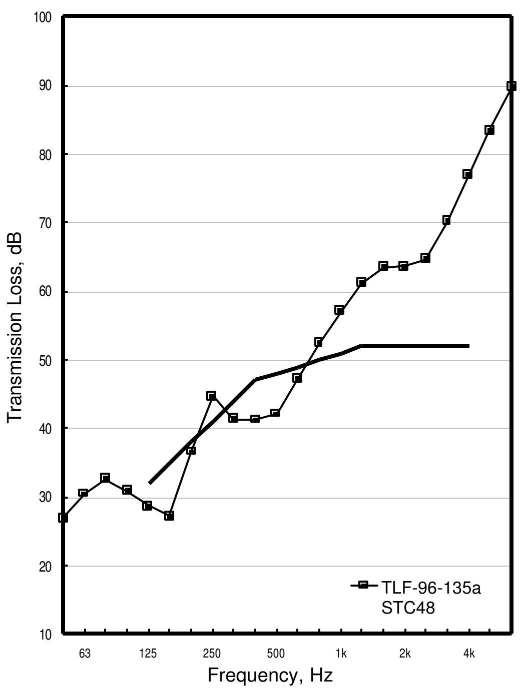
TLF-96-135a
IIF-96-059
CON35_OSB15_WJ235(406)_GFB152_G16

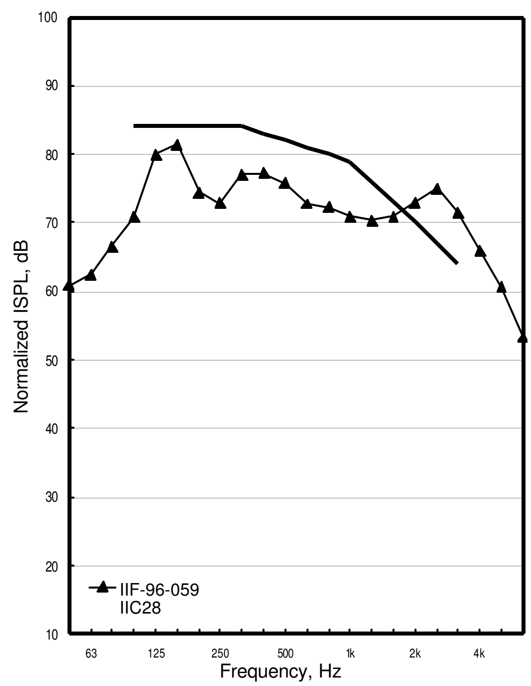
Freq. Hz	TLF-96-135a	IIF-96-059
50	27	61
63	31	62
80	33	66
100	31	71
125	29	80
160	27	81
200	37	74
250	45	73
315	41	77
400	41	77
500	42	76
630	47	73
800	52	72
1000	57	71
1250	61	70
1600	64	71
2000	64	73
2500	65	75
3150	70	71
4000	77	66
5000	83	61
6300	90	53
STC/IIC	48	28
$R_w/L_{n,w}$	48	79

Material	N	Thick.	Spac.
Concrete		35	
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Gypsum board	1	16	

	Mass, kg	
Frame	203.9	
Floor layers	1863.9	92.7 kg/m^2
Ceiling layers	205.2	11.5 kg/m^2

Concrete curing time: 25 days. 40 mm regular concrete poured directly onto OSB subfloor. Gypsum board screwed 305 o.c. OSB applied perpendicular to joists. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





Group 34 : Additional Resilient Metal Channels

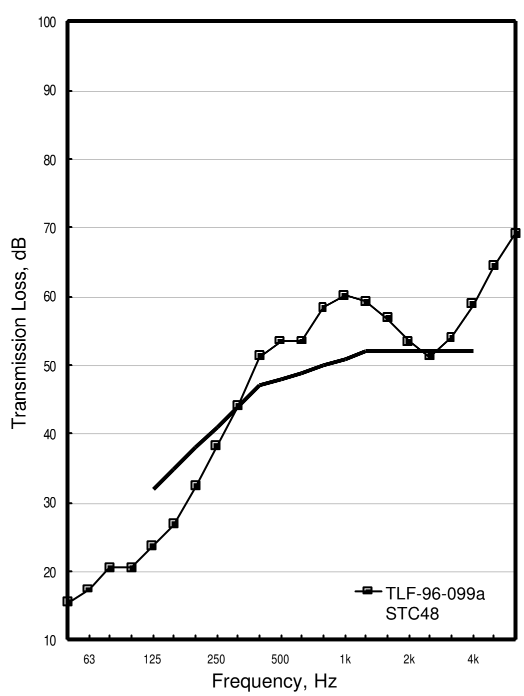
TLF-96-099a
IIF-96-043
OSB15_WJ235(406)_GFB152_RC13(406+short)_G16

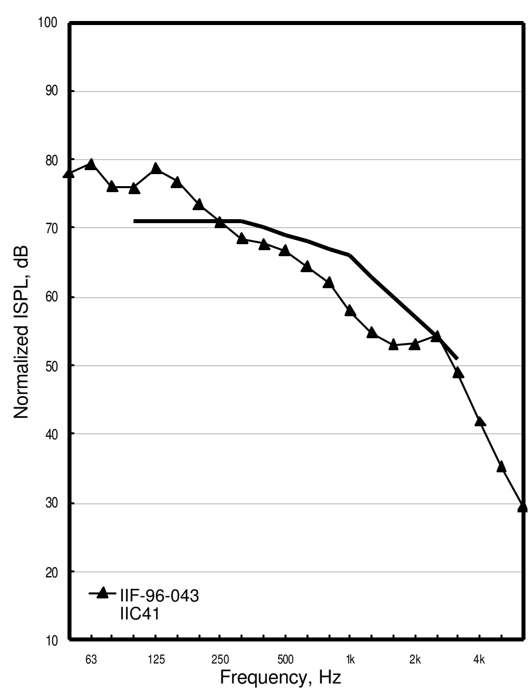
Freq. Hz	TLF-96-099a	IIF-96-043
50	15	78
63	17	79
80	21	76
100	21	76
125	24	79
160	27	77
200	32	73
250	38	71
315	44	68
400	51	68
500	54	67
630	53	64
800	58	62
1000	60	58
1250	59	55
1600	57	53
2000	53	53
2500	51	54
3150	54	49
4000	59	42
5000	64	35
6300	69	29
STC/IIC	48	41
$R_w/L_{n,w}$	47	68

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	406+ short
Gypsum board	1	16	

	Mass, kg	
Frame	203.9	
Floor layers	176.5	8.8 kg/m^2
Ceiling layers	198.3	11.1 kg/m^2

RC 406 o.c. with a double set of RCs at gypsum board butt joints. Type X gypsum board, perpendicular to RC. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





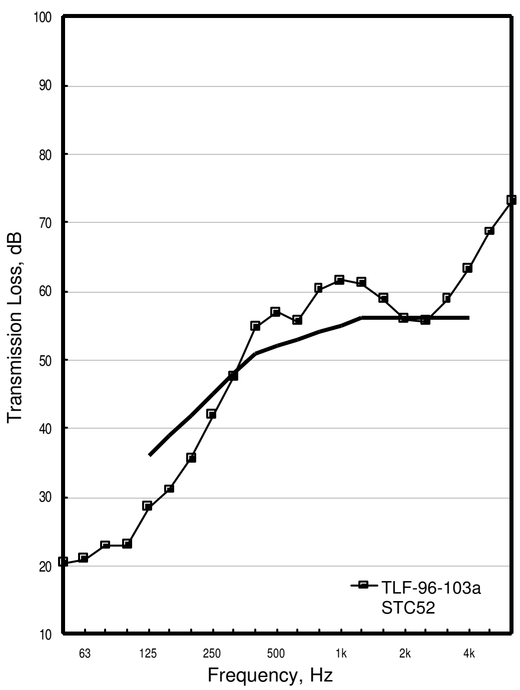
TLF-96-103a
IIF-96-045
OSB15_WJ235(406)_GFB152_RC13(406+ short)_2G16

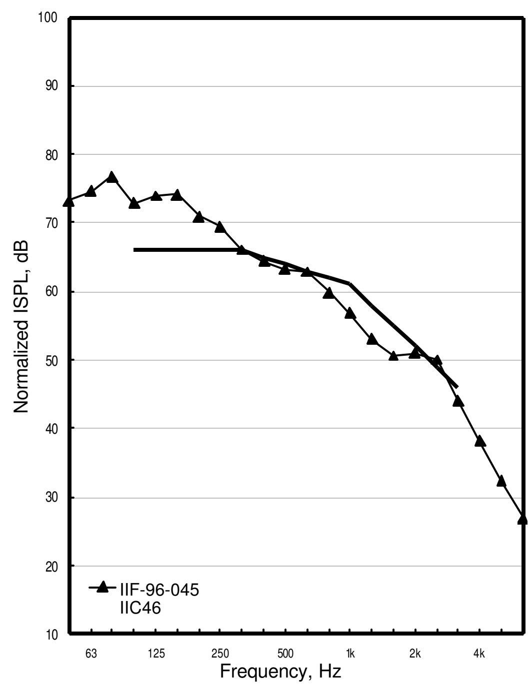
Freq. Hz	TLF-96-103a	IIF-96-045
50	20	73
63	21	75
80	23	77
100	23	73
125	29	74
160	31	74
200	36	71
250	42	69
315	47	66
400	55	64
500	57	63
630	56	63
800	60	60
1000	62	57
1250	61	53
1600	59	51
2000	56	51
2500	56	50
3150	59	44
4000	63	38
5000	69	32
6300	73	27
STC/IIC	52	46
$R_w/L_{n,w}$	51	65

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	406+ short
Gypsum board	2	16	

	Mass, kg	
Frame	203.9	
Floor layers	176.5	8.8 kg/m^2
Ceiling layers	400.1	22.5 kg/m^2

RC 406 o.c. with a double set of RCs at gypsum board butt joints for both layers. Type X gypsum board, both layers of gypsum board perpendicular to RC. Both layers of gypsum screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





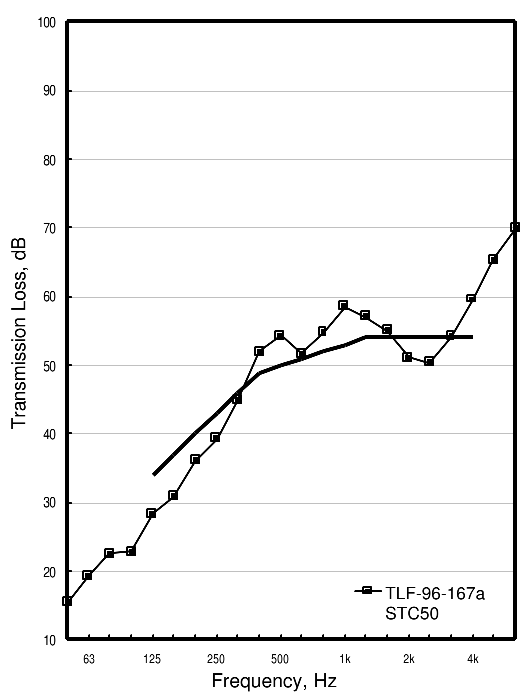
TLF-96-167a
IIF-96-074
OSB15_WJ235(406)_GFB152_RC13(406+2)_G16

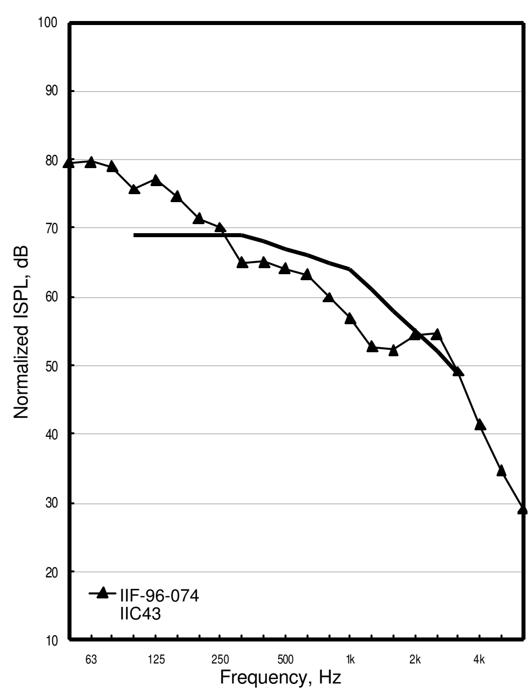
Freq. Hz	TLF-96-167a	IIF-96-074
50	15	80
63	19	80
80	23	79
100	23	76
125	28	77
160	31	75
200	36	71
250	39	70
315	45	65
400	52	65
500	54	64
630	52	63
800	55	60
1000	58	57
1250	57	53
1600	55	52
2000	51	55
2500	50	55
3150	54	49
4000	60	41
5000	65	35
6300	70	29
STC/IIC	50	43
$R_w/L_{n,w}$	49	67

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	406+2
Gypsum board	1	16	

	Mass, kg	
Frame	243.2	
Floor layers	172.1	8.6 kg/m^2
Ceiling layers	202.5	11.4 kg/m^2

RCs 406 o.c. with two extra full-length RCs added at butt joints. Gypsum board screwed on the special spacing of 610 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





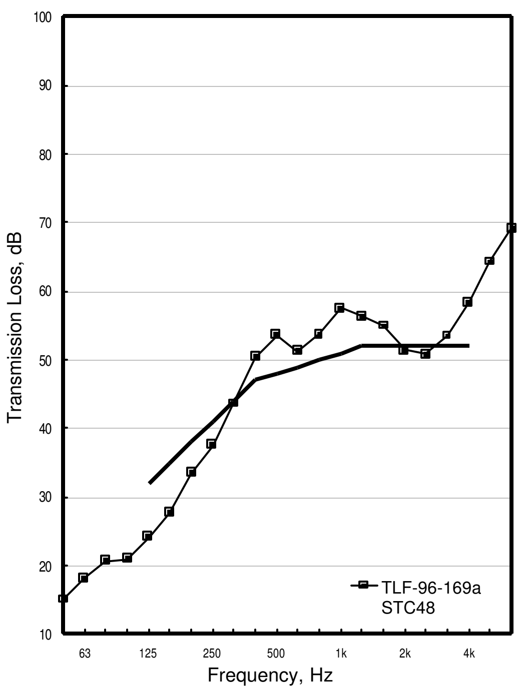
TLF-96-169a
IIF-96-075
OSB15_WJ235(406)_GFB152_RC13(406+2)_G16

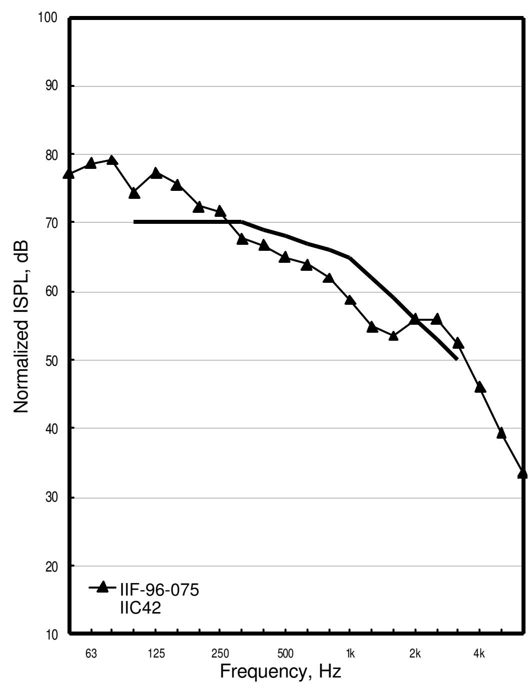
Freq. Hz	TLF-96-169a	IIF-96-075
50	15	77
63	18	79
80	21	79
100	21	74
125	24	77
160	28	76
200	34	72
250	38	72
315	44	68
400	50	67
500	54	65
630	51	64
800	54	62
1000	57	59
1250	56	55
1600	55	54
2000	51	56
2500	51	56
3150	53	52
4000	58	46
5000	64	39
6300	69	33
STC/IIC	48	42
$R_w/L_{n,w}$	47	68

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	406+2
Gypsum board	1	16	

	Mass, kg	
Frame	243.2	
Floor layers	172.1	8.6 kg/m^2
Ceiling layers	202.5	11.4 kg/m^2

RCs 406 o.c. with two extra full-length RCs added at butt joints. Gypsum board screwed on 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





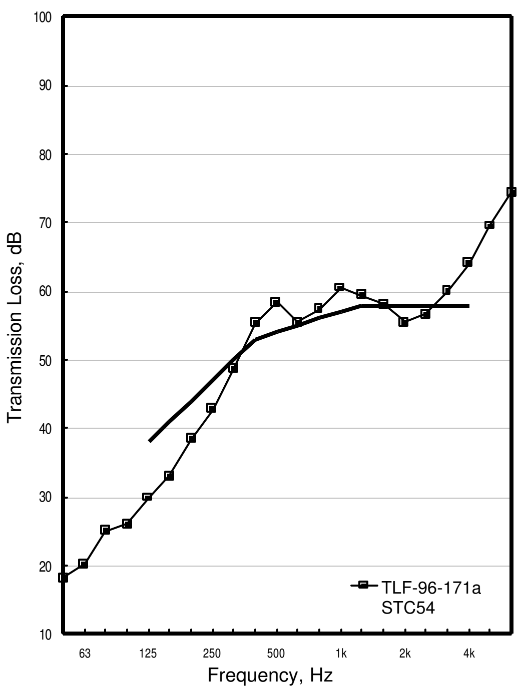
TLF-96-171a
IIF-96-076
OSB15_WJ235(406)_GFB152_RC13(406+2)_2G16

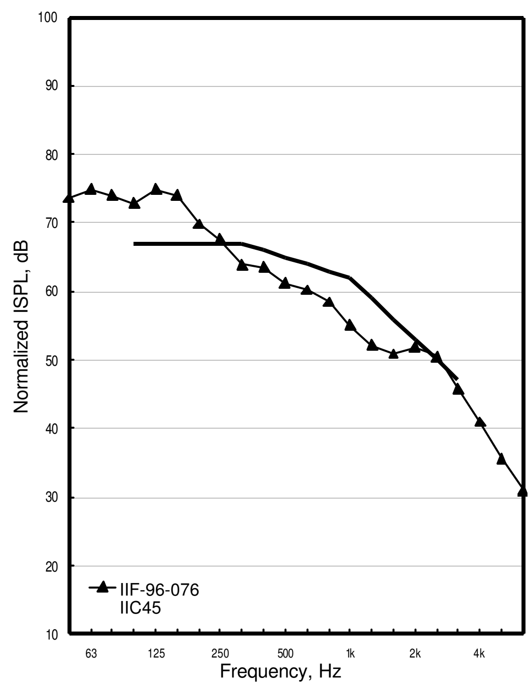
Freq. Hz	TLF-96-171a	IIF-96-076
50	18	74
63	20	75
80	25	74
100	26	73
125	30	75
160	33	74
200	38	70
250	43	68
315	49	64
400	55	64
500	58	61
630	55	60
800	57	58
1000	60	55
1250	59	52
1600	58	51
2000	55	52
2500	57	50
3150	60	46
4000	64	41
5000	70	36
6300	74	31
STC/IIC	54	45
$R_w/L_{n,w}$	53	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	406+2
Gypsum board	2	16	

	Mass, kg	
Frame	243.2	
Floor layers	172.1	8.6 kg/m^2
Ceiling layers	401.7	22.6 kg/m^2

RCs 406 o.c. with two extra full-length RCs added at base layer butt joints. Both layers of base and face layer joints staggered. Base layer of gypsum board screwed on the special spacing of 305 o.c. as per NFL. Face layer gypsum screwed 305 o.c. Butt joints of face layer screwed with Type G gypsum board screws 305 o.c. into the base layer of gypsum board only. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





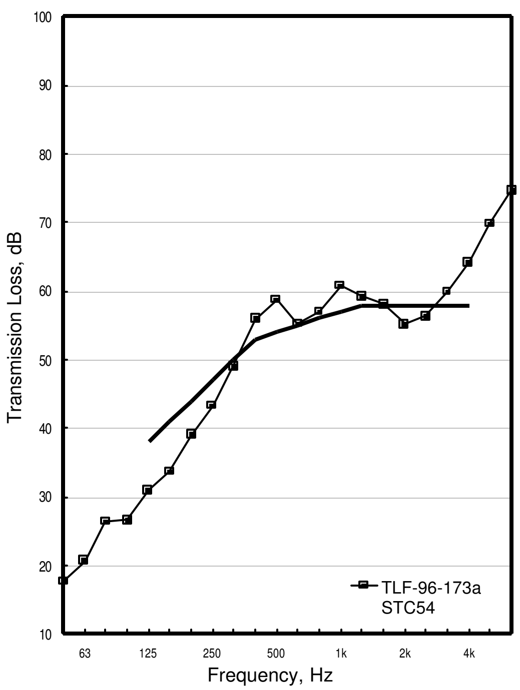
TLF-96-173a
IIF-96-077
OSB15_WJ235(406)_GFB152_RC13(406+2)_2G16

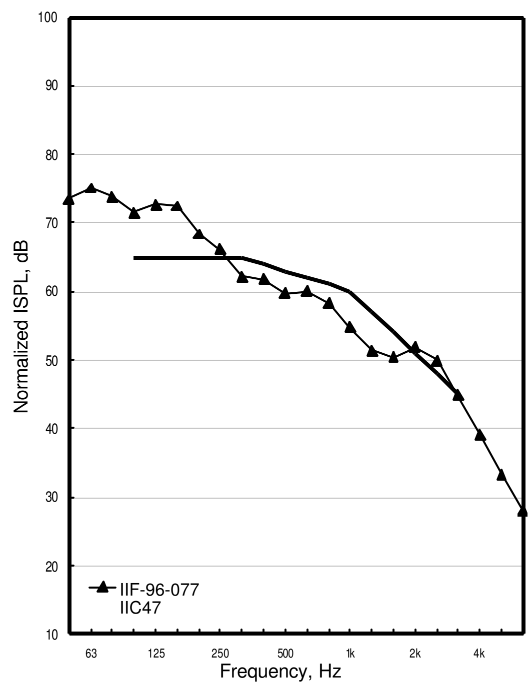
Freq. Hz	TLF-96-173a	IIF-96-077
50	18	74
63	21	75
80	26	74
100	27	71
125	31	73
160	34	72
200	39	68
250	43	66
315	49	62
400	56	62
500	59	60
630	55	60
800	57	58
1000	61	55
1250	59	51
1600	58	50
2000	55	52
2500	56	50
3150	60	45
4000	64	39
5000	70	33
6300	75	28
STC/IIC	54	47
$R_w/L_{n,w}$	53	63

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	406+2
Gypsum board	2	16	

	Mass, kg	
Frame	243.2	
Floor layers	172.1	8.6 kg/m^2
Ceiling layers	401.7	22.6 kg/m^2

RCs 406 o.c. with two extra full-length RCs added at base layer butt joints. Both layers of base and face layer joints staggered. Base layer of gypsum board screwed 610 o.c. Face layer gypsum screwed 305 o.c. Butt joints of face layer screwed with Type G gypsum board screws 305 o.c. into the base layer of gypsum board only. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





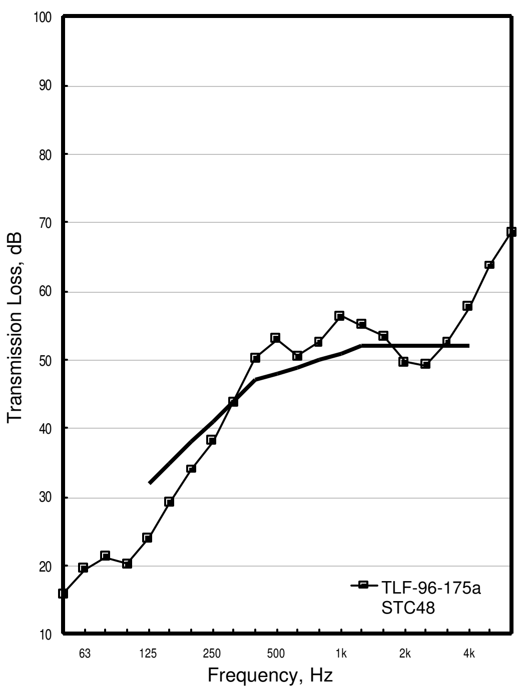
TLF-96-175a
IIF-96-078
OSB15_WJ235(406)_GFB152_RC13(406+ short)_G16

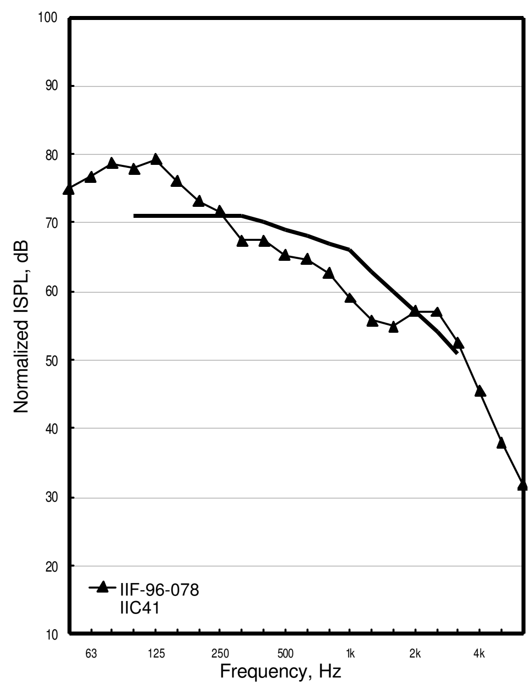
Freq. Hz	TLF-96-175a	IIF-96-078
50	16	75
63	20	77
80	21	79
100	20	78
125	24	79
160	29	76
200	34	73
250	38	72
315	44	67
400	50	67
500	53	65
630	50	65
800	53	63
1000	56	59
1250	55	56
1600	53	55
2000	50	57
2500	49	57
3150	53	53
4000	58	45
5000	64	38
6300	69	32
STC/IIC	48	41
$R_w/L_{n,w}$	47	69

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	406 + short
Gypsum board	1	16	

	Mass, kg	
Frame	243.2	
Floor layers	172.1	8.6 kg/m^2
Ceiling layers	200.0	11.2 kg/m^2

RCs 406 o.c. with three 1.82 m RCs and two 0.813 m long RCs added at butt joints. Gypsum board screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





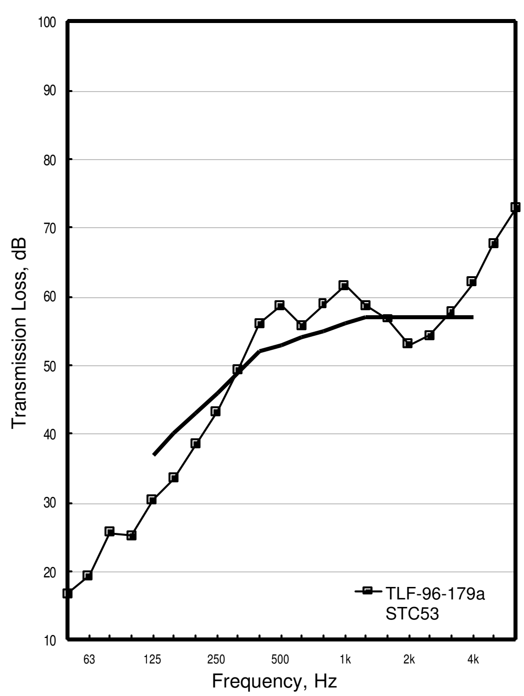
TLF-96-179a
IIF-96-080
OSB15_WJ235(406)_GFB152_RC13(406)_2G16

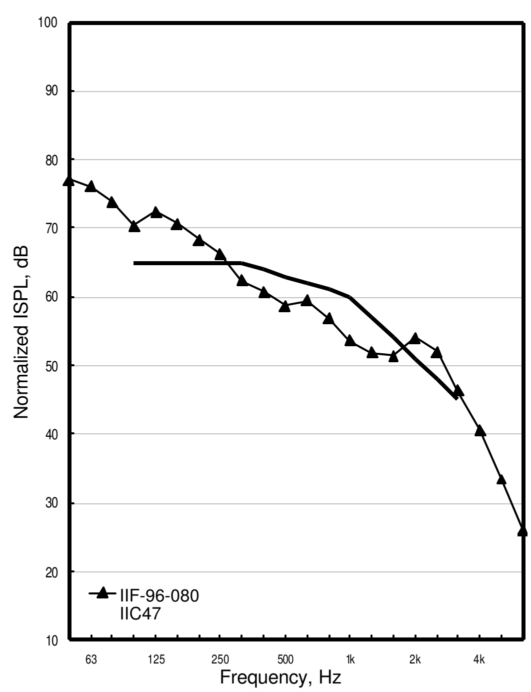
Freq. Hz	TLF-96-179a	IIF-96-080
50	17	77
63	19	76
80	26	74
100	25	70
125	30	72
160	33	71
200	38	68
250	43	66
315	49	62
400	56	61
500	59	59
630	56	59
800	59	57
1000	62	54
1250	59	52
1600	57	51
2000	53	54
2500	54	52
3150	58	46
4000	62	41
5000	68	33
6300	73	26
STC/IIC	53	47
$R_w/L_{n,w}$	52	63

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood joists (solid)		235	406
Glass fibre batts		152	
Resilient metal channels		13	406
Gypsum board	2	16	

	Mass, kg	
Frame	243.2	
Floor layers	172.1	8.6 kg/m^2
Ceiling layers	402.6	22.6 kg/m^2

RCs 400 o.c. Both layers of base layer gypsum board screwed 610 o.c., face layer screwed 305 o.c. OSB screwed 150 o.c. around edges, 305 o.c. in the field. One set of 19 x 64 cross bridging.





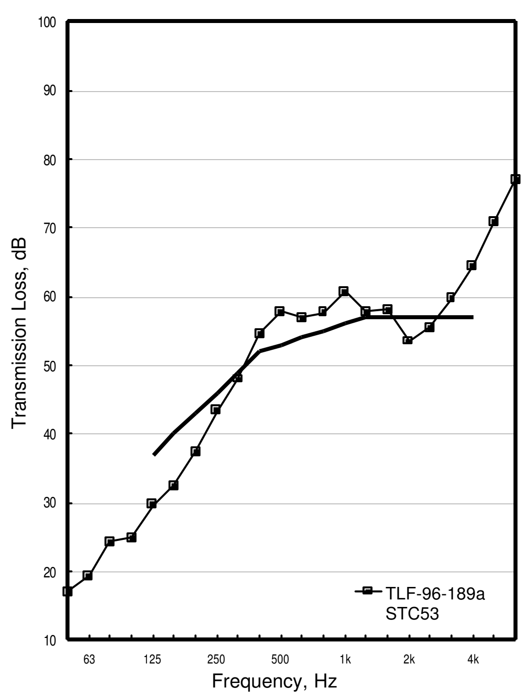
TLF-96-189a
IIF-96-083
OSB15_WI241(406)_GFB152_RC13(406+2)_2G16

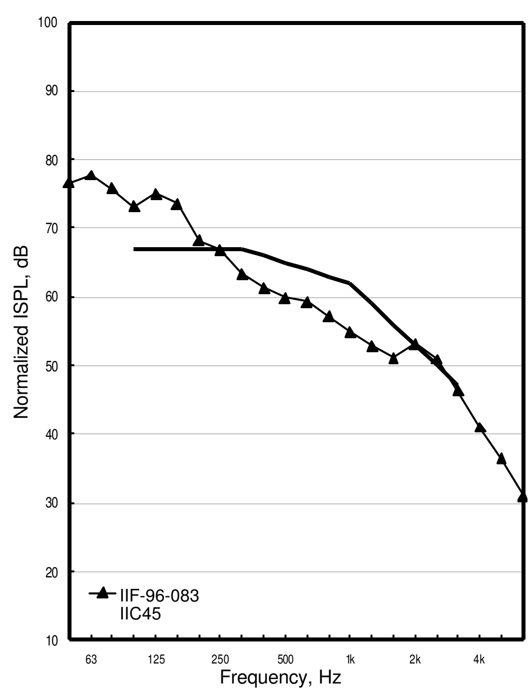
Freq. Hz	TLF-96-189a	IIF-96-083
50	17	77
63	19	78
80	24	76
100	25	73
125	30	75
160	33	74
200	37	68
250	43	67
315	48	63
400	55	61
500	58	60
630	57	59
800	58	57
1000	61	55
1250	58	53
1600	58	51
2000	53	53
2500	55	51
3150	60	46
4000	64	41
5000	71	36
6300	77	31
STC/IIC	53	45
$R_w/L_{n,w}$	52	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	406+2
Gypsum board	2	16	

	Mass, kg	
Frame	158.6	
Floor layers	173.3	8.6 kg/m^2
Ceiling layers	404.5	22.7 kg/m^2

38 x 38 mm LVL flange, 10 mm OSB web, 241 mm deep wood I-joists. 25 mm OSB rimboard used. RC 406 o.c. with two extra full-length RCs added at base layer butt joints. Both layers of base and face layer joints staggered. Base layer gypsum board screwed 610 o.c., face layer screwed 305 o.c. Face layer butt joints screwed into base layer only with Type G gypsum board screws. All gypsum board screws are 38 mm in from gypsum board edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





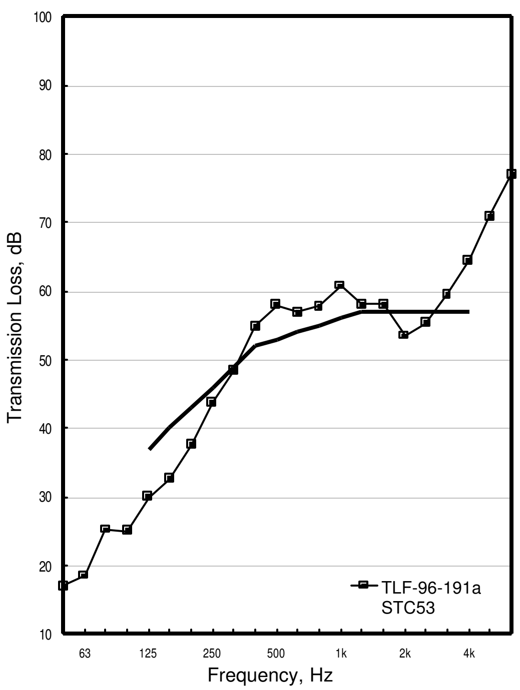
TLF-96-191a
IIF-96-084
OSB15_WI241(406)_GFB152_RC13(406+2)_2G16

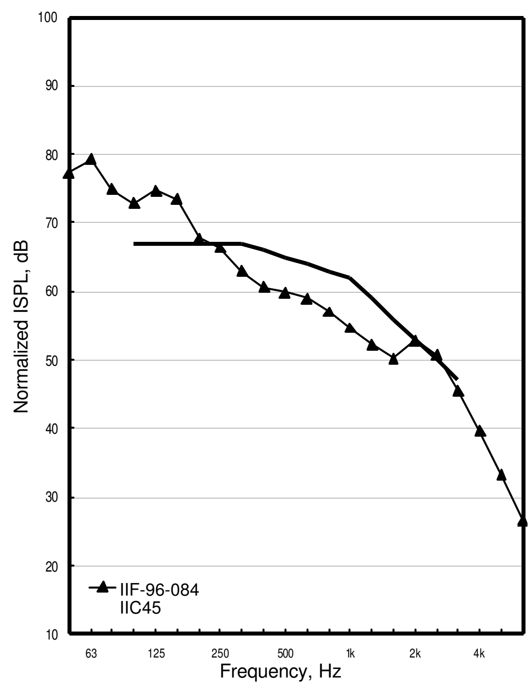
Freq. Hz	TLF-96-191a	IIF-96-084
50	17	77
63	19	79
80	25	75
100	25	73
125	30	75
160	33	73
200	38	68
250	44	66
315	48	63
400	55	61
500	58	60
630	57	59
800	58	57
1000	61	55
1250	58	52
1600	58	50
2000	53	53
2500	55	51
3150	60	46
4000	64	40
5000	71	33
6300	77	27
STC/IIC	53	45
$R_w/L_{n,w}$	52	64

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
resilient metal channels		13	406+2
Gypsum board	2	16	

	Mass, kg	
Frame	158.6	
Floor layers	173.3	8.6 kg/m^2
Ceiling layers	404.5	22.7 kg/m^2

38 x 38 mm LVL flange, 10 mm OSB web, 241 mm deep wood I-joists. 25 mm OSB rimboard used. RC 406 o.c. with two extra full-length RCs added at base layer butt joints. Both layers of base and face layer joints staggered. Base layer gypsum board screwed 610 o.c., face layer screwed 305 o.c. Face layer butt joints screwed into base layer only with Type G gypsum board screws on 150 o.c. All gypsum board screws are 38 mm in from gypsum board edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





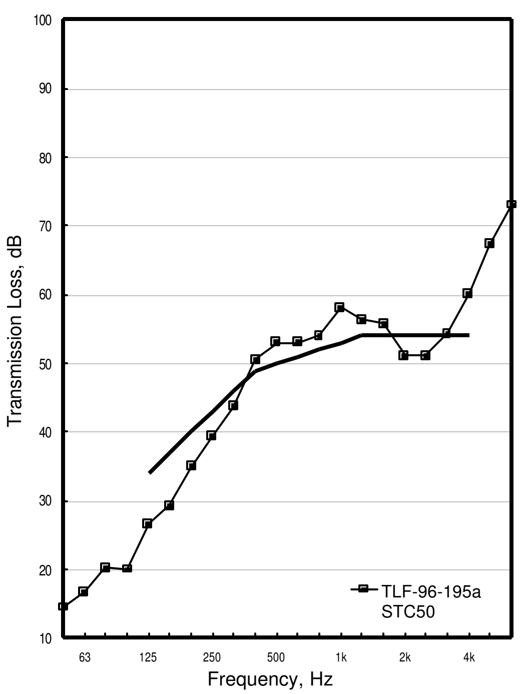
TLF-96-195a
IIF-96-086
OSB15_WI241(406)_GFB152_RC13(406+2)_G16

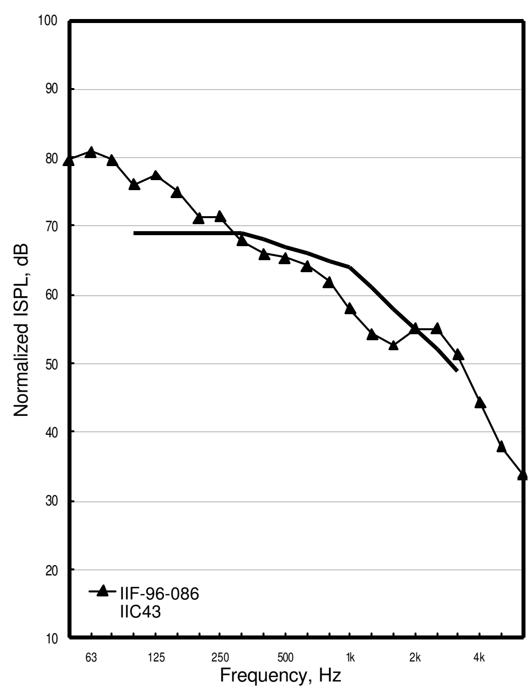
Freq. Hz	TLF-96-195a	IIF-96-086
50	14	80
63	17	81
80	20	80
100	20	76
125	27	77
160	29	75
200	35	71
250	39	71
315	44	68
400	50	66
500	53	65
630	53	64
800	54	62
1000	58	58
1250	56	54
1600	56	53
2000	51	55
2500	51	55
3150	54	51
4000	60	44
5000	67	38
6300	73	34
STC/IIC	50	43
$R_w/L_{n,w}$	48	67

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	406+2
Gypsum board	1	16	

	Mass, kg	
Frame	158.6	
Floor layers	173.3	8.6 kg/m^2
Ceiling layers	404.5	22.7 kg/m^2

38 x 38 mm LVL flange, 10 mm OSB web, 241 deep wood I-joists. 25 mm OSB rimboard used. RC 406 o.c. with two extra full-length RCs added at butt joints. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





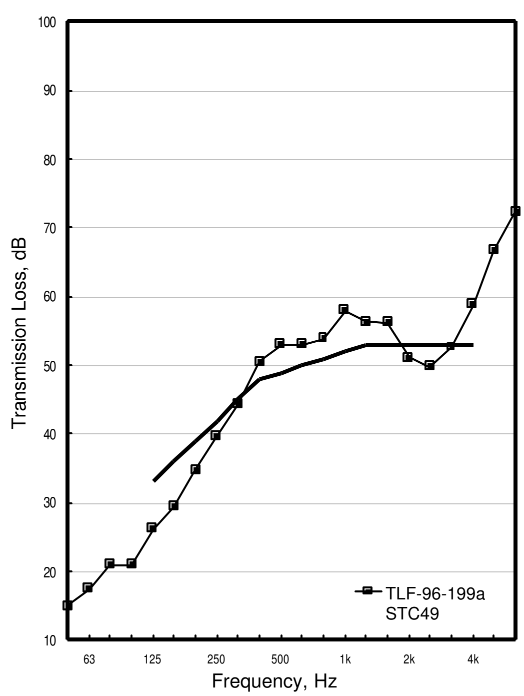
TLF-96-199a
IIF-96-088
OSB15_WI241(406)_GFB152_RC13(406+2)_G16

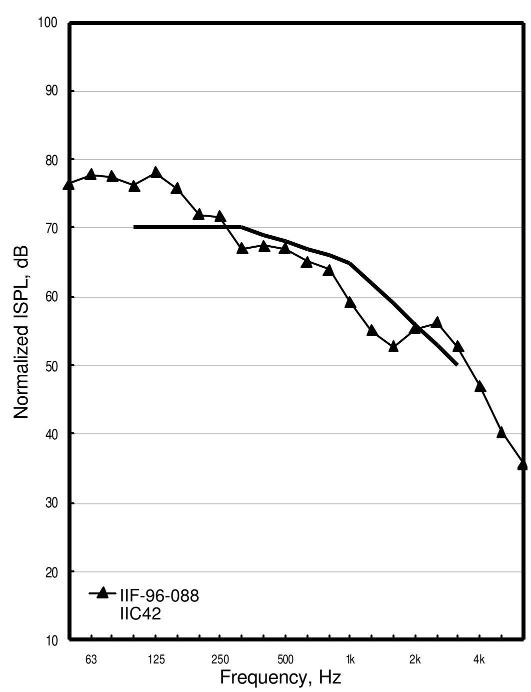
Freq. Hz	TLF-96-199a	IIF-96-088
50	15	76
63	17	78
80	21	78
100	21	76
125	26	78
160	29	76
200	35	72
250	40	72
315	44	67
400	51	67
500	53	67
630	53	65
800	54	64
1000	58	59
1250	56	55
1600	56	53
2000	51	55
2500	50	56
3150	53	53
4000	59	47
5000	67	40
6300	72	36
STC/IIC	49	42
$R_w/L_{n,w}$	48	68

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	406+2
Gypsum board	1	16	

	Mass, kg	
Frame	158.6	
Floor layers	173.3	8.6 kg/m^2
Ceiling layers	201.8	11.3 kg/m^2

38 x 38 mm LVL flange, 10 mm OSB web, 241 deep wood I-joists. OSB rimboard used. RCs installed 406 o.c., then two extra full-length RCs added. Gypsum board screwed 305 o.c. Gypsum board screws are 38 mm in from gypsum board edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.





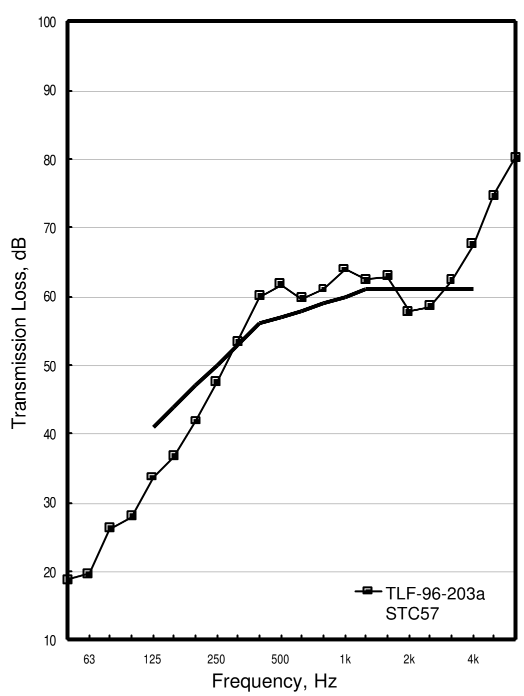
TLF-96-203a
IIF-96-090
OSB15_WI241(406)_MFB241_RC13(406+2)_2G16

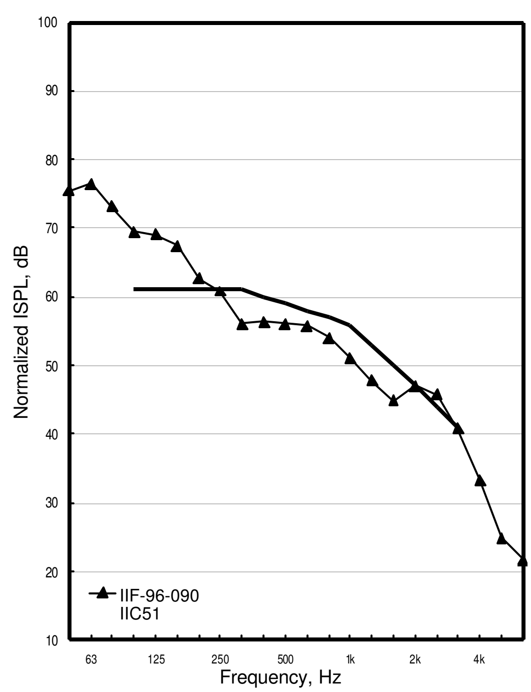
Freq. Hz	TLF-96-203a	IIF-96-090
50	19	75
63	20	76
80	26	73
100	28	69
125	34	69
160	37	67
200	42	63
250	48	61
315	53	56
400	60	56
500	62	56
630	60	56
800	61	54
1000	64	51
1250	62	48
1600	63	45
2000	58	47
2500	59	46
3150	62	41
4000	68	33
5000	75	25
6300	80	22
STC/IIC	57	51
$R_w/L_{n,w}$	56	59

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Mineral fibre batts		241	
Resilient metal channels		13	406+2
Gypsum board	2	16	

	Mass, kg	
Frame	158.6	
Floor layers	173.3	8.6 kg/m^2
Ceiling layers	403.6	22.7 kg/m^2

38 x 38 mm LVL flange, 10 mm OSB web, 241 deep wood I-joists. 25 mm OSB rimboard used. RC 400 mm o.c., then two extra full-length RCs added. Both layers of base and face layer joints staggered. Base layer gypsum board screwed 610 o.c., face layer screwed 305 o.c. Face layer butt joints screwed into base layer only with Type G gypsum board screws on 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge. 152 mm R22.5 and 89 mm R13 rock fibre batts. OSB screwed 150 o.c. around edges, 305 o.c. in the field. OSB perpendicular to I-joists.





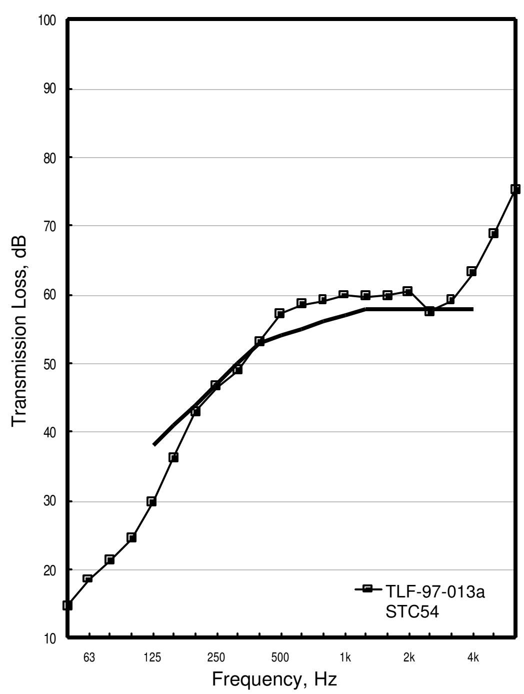
TLF-97-013a
IIF-97-007
OSB19_WI241(610)_RC13(406)_GFB90_2G13

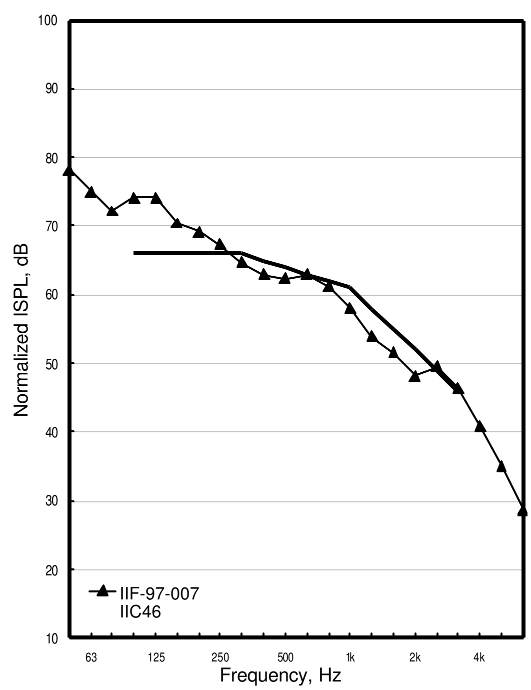
Freq. Hz	TLF-97-013a	IIF-97-007
50	15	78
63	19	75
80	21	72
100	25	74
125	30	74
160	36	70
200	43	69
250	47	67
315	49	65
400	53	63
500	57	62
630	59	63
800	59	61
1000	60	58
1250	60	54
1600	60	52
2000	60	48
2500	57	49
3150	59	46
4000	63	41
5000	69	35
6300	75	29
STC/IIC	54	46
$R_w/L_{n,w}$	54	64

Material	N	Thick.	Spac.
Oriented strandboard	1	19	
Wood I-joists		241	610
Resilient metal channels		13	406
Glass fibre batts		90	
Gypsum board	2	13	

	Mass, kg	
Frame	97.8	
Floor layers	208.8	10.4 kg/m^2
Ceiling layers	341.1	19.2 kg/m^2

38 x 38 mm LVL flange, 9.5 mm plywood web, Ten 241 mm deep wood I-joists, 610 o.c. with two small cavities at ends. 25 mm plywood timberstrand rimboard used. RC 406 o.c. then two extra full-length channels added. Base layer gypsum board screwed 610 mm o.c., face layer screwed 305 mm o.c. Face layer butt joints screwed into base layer only with Type G gypsum board screws on 305 mm o.c. OSB screwed 152 mm o.c. around edges, 305 mm o.c. in the field.





Group 35: Number of Joists

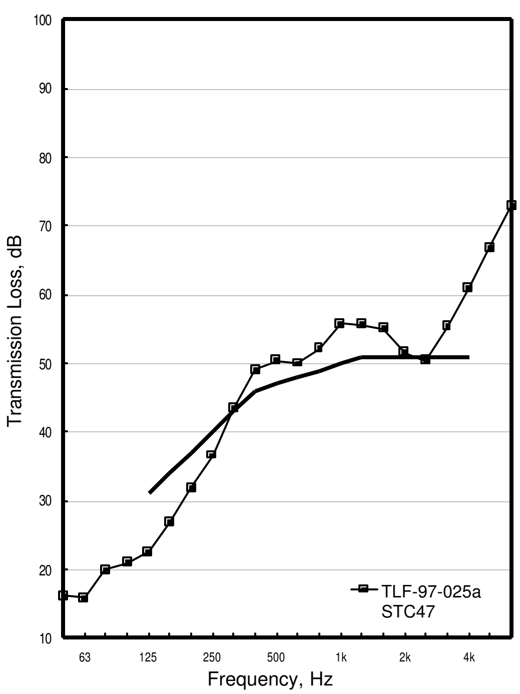
TLF-97-025a
IIF-97-013
OSB15_WI241(406)_GFB152_RC13(610)_G16

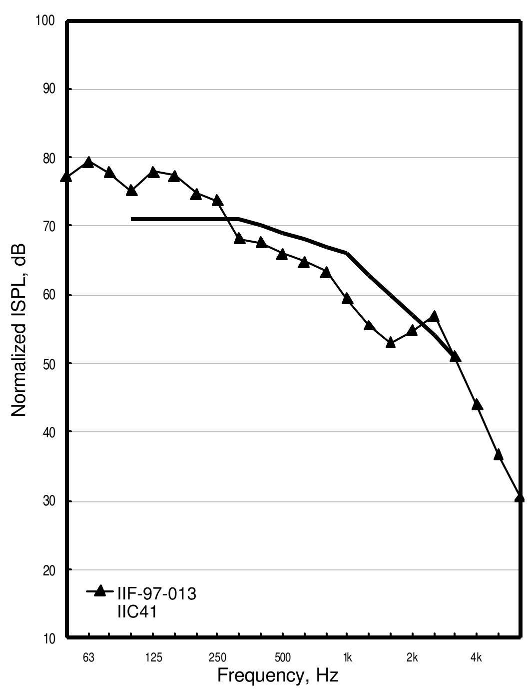
Freq. Hz	TLF-97-025a	IIF-97-013
50	16	77
63	16	79
80	20	78
100	21	75
125	23	78
160	27	77
200	32	75
250	37	74
315	43	68
400	49	68
500	50	66
630	50	65
800	52	63
1000	56	59
1250	56	56
1600	55	53
2000	52	55
2500	50	57
3150	55	51
4000	61	44
5000	67	37
6300	73	31
STC/IIC	47	41
$R_w/L_{n,w}$	47	69

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	227.3	
Floor layers	172.4	8.6 kg/m^2
Ceiling layers	198.0	11.1 kg/m^2

38 x 64 mm solid wood flange, 10 mm OSB web, 241 mm depth wood I-joists. 28 mm OSB rimboard used. RC 406 o.c. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field. Manufacturer E. 14 I-joists used with a 203 mm wide cavity at each end.





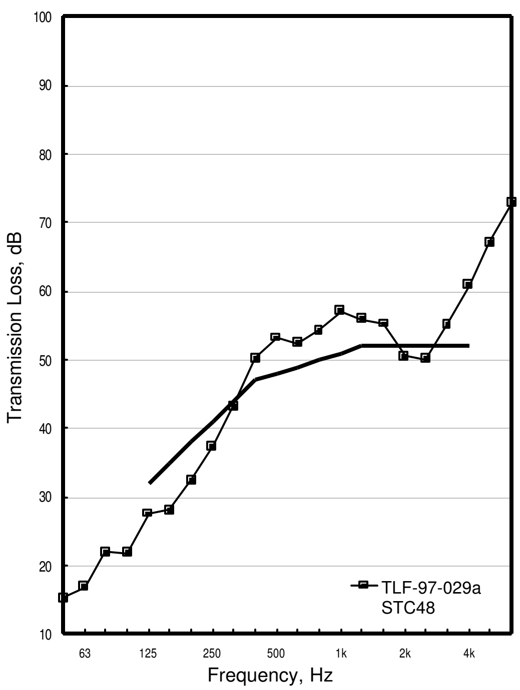
TLF-97-029a
IIF-97-015
OSB15_WI241(406)_GFB152_RC13(610)_G16

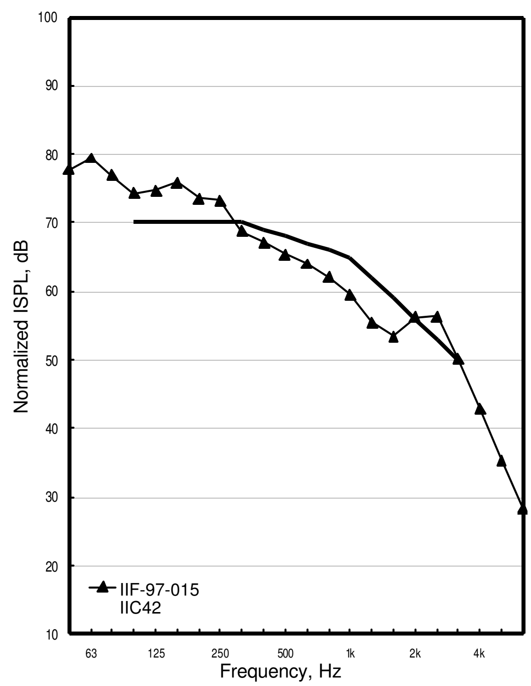
Freq. Hz	TLF-97-029a	IIF-97-015
50	15	78
63	17	79
80	22	77
100	22	74
125	28	75
160	28	76
200	32	74
250	37	73
315	43	69
400	50	67
500	53	65
630	52	64
800	54	62
1000	57	60
1250	56	56
1600	55	53
2000	50	56
2500	50	56
3150	55	50
4000	61	43
5000	67	35
6300	73	28
STC/IIC	48	42
$R_w/L_{n,w}$	48	68

Material	N	Thick.	Spac.
Oriented strandboard	1	15	
Wood I-joists		241	406
Glass fibre batts		152	
Resilient metal channels		13	610
Gypsum board	1	16	

	Mass, kg	
Frame	213.9	
Floor layers	173.4	8.6 kg/m^2
Ceiling layers	196.7	11.1 kg/m^2

38 x 64 mm solid wood flange, 10 mm OSB web, 241 mm deep wood I-joists. Thirteen I-joists used. 28 mm OSB rimboard used. Gypsum board screwed 305 o.c. All gypsum board screws are 38 mm in from gypsum board edge. OSB screwed 150 o.c. around edges, 305 o.c. in the field.
Manufacturer E. 13 I-joists used.





Index of Test identifiers