The ASTC ratings of high-rise constructions using CertainTeed SilentFX® QuickCut gypsum board

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https://doi.org/10.4224/23002223

NRC·CNRC CONSTRUCTION

The ASTC Ratings of High-rise Constructions Using CertainTeed SilentFX® QuickCut Gypsum Board

CertainTeed

Report A1-010179.1

30 May, 2018

National Research Council Canada | Conseil national de recherches Canada

Canada

The ASTC Ratings of High-rise Constructions Using CertainTeed SilentFX® QuickCut Gypsum Board

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Report No:	A1-010179.1
Report Date:	30 May 2018
Contract No:	A1-010179
Agreement date:	2 September 2016
Program:	Building Regulations for Market Access

63 pages

Copy no. 1 of 5

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Executive Summary

The 2015 edition of the National Building Code of Canada (NBCC) introduced significant changes to the acoustic requirements for residential constructions. The 2015 edition of the NBCC changes the acoustic requirements for residential constructions from requirements based on a Sound Transmission Class (STC) rating to requirements based on an Apparent Sound Transmission Class (ASTC) rating. The ASTC rating includes contributions from both the direct transmission through the common building element as well as flanking transmission through the attached junctions and elements. The ASTC rating is therefore a better metric than the STC rating for describing the sound insulation of a building construction.

The 2015 NBCC requires an ASTC rating ≥ 47 for constructions between dwelling units. The ASTC rating that a building constitution will achieve depends on the design of the building elements including the gypsum board, the framing and the thermal insulation as well as the design of the junctions between the building elements. Changes to the building elements or the junctions may change the ASTC rating.

This report includes twenty-two examples of the calculation of the ASTC rating for lightweight (25 gauge) steel stud walls typically used high-rise constructions in conjunction with concrete floors and ceilings. The gypsum board installed on the lightweight steel stud walls in the examples includes combinations of 15.9 mm (5/8") SilentFX® QuickCut gypsum board and 15.9 mm CertainTeed Type X gypsum board directly fixed to the steel studs. The examples include both lightweight and concrete masonry façade walls. All of the constructions shown in the examples achieved an ASTC rating of 47 or greater.

1. Objective

The 2015 edition of the National Building Code of Canada (NBCC) includes significant changes to the acoustic requirements for residential constructions. Earlier editions of the NBCC described the acoustic requirements in terms of the Sound Transmission Class (STC) rating of the walls or floors that separate different dwellings in a building. In the 2015 edition of the NBCC, the requirements based on a STC rating were replaced with new requirements based on the Apparent Sound Transmission Class (ASTC) rating. The 2015 NBCC requires that the ASTC rating is at least 47 for constructions between dwelling units. The requirements for constructions that separate dwelling units from elevator shafts or refuse chutes remained unchanged in the 2015 NBCC.

It is important to note that the ASTC rating is not interchangeable with the STC rating. The STC rating only considers the sound transmitted through the common wall or floor between rooms. The ASTC rating includes contributions from other transmission paths between the rooms (referred to as flanking paths as shown in Figure 1) and is therefore a better metric of the sound transmission that occupants in buildings will experience in practice. Since the ASTC rating includes transmission paths other than the direct transmission path, it is typically lower in numerical value than the STC rating of the common wall or floor.

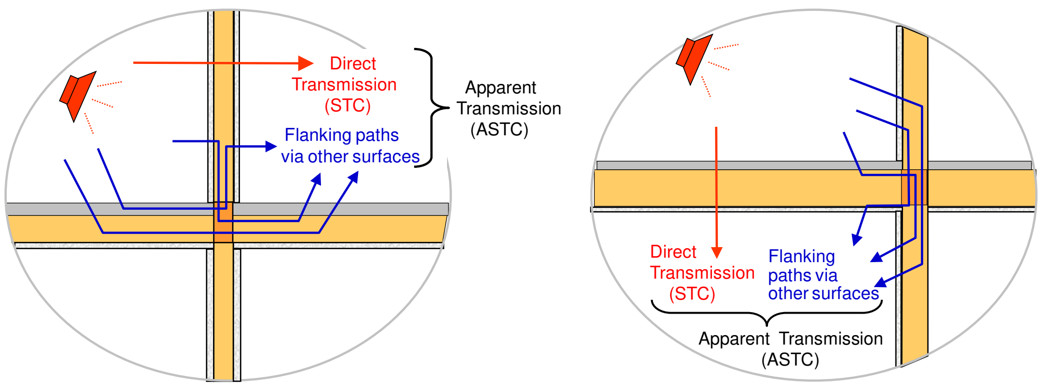


Figure 1: Comparison between STC and ASTC

The 2015 NBCC allows for three methods of demonstrating compliance with the acoustic requirements. The methods include post completion field testing, constructing buildings using the prescribed acceptable solutions found in Part 9 of the NBCC and the prediction of the ASTC rating using the prediction methods based on the standards, ISO 15712 [1] and ISO 10848 [2] and described in detail in the National Research Council Canada Research Report RR-331 *Guide to Calculating Airborne Sound Transmission in Buildings* [3]. Report RR-331 focuses on the method of showing compliance by the prediction of the ASTC rating.

Based on the methods of calculating the ASTC rating which are explained in Report RR-331, the calculations of the ASTC ratings of twenty-two examples of high-rise constructions of concrete floors and ceilings and lightweight metal stud demising walls with 15.9 mm SilentFX® QuickCut gypsum board directly fixed to the metal studs are presented. The examples include horizontal transmission for side-by-side rooms and vertical transmission for one-above-the-other rooms.

2. ASTC Examples Summary

A total of twenty-two examples of the calculation of the ASTC rating for typical high-rise constructions that use 15.9 mm SilentFX® QuickCut gypsum board directly fixed to lightweight metal stud demising walls are presented. The examples use the detailed method of the calculations as detailed in the National Research Council Report RR-331 to calculate the ASTC rating of side-by-side rooms and one-above-the-other rooms using rooms from the Extended Scenario of RR-331 as shown in Figure 2.

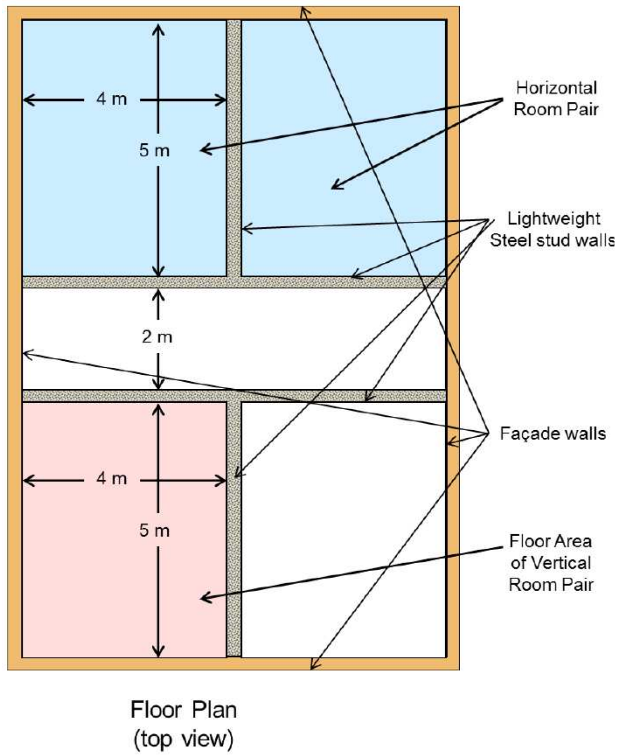


Figure 2: The floorplan used for the Extended Scenario.

The floors of the building above and below the floor shown in the figure are assumed to have identical floor plans. The floor and ceiling for the Extended Scenario are 150 mm thick concrete. Lightweight framed interior walls divide the interior spaces into room pairs with a corridor between the pairs. The pair of rooms used for the calculation of the ASTC rating of side-by-side rooms are shaded in blue. The floor area for the pair of rooms used for one-above-the-other ASTC calculations is shaded in pink. The room pairs have the same dimensions as the Standard Scenario used for the other examples in RR-331.

The pertinent dimensions and junction details of the Extended Scenario rooms are:

- For horizontal room pairs (rooms are side-by-side) the separating wall is 2.5 m high by 5 m wide. The flanking floors and ceilings are 4 m by 5 m. The flanking walls are 2.5 m by 4 m.
- For vertical room pairs (one room is above the other) the separating floor/ceiling is 4 m by 5 m and the flanking walls in both rooms are 2.5 m high.

Deviations from the dimensions shown in the Extended Scenarios can change the ASTC ratings shown in the examples.

The ASTC ratings for the constructions in the examples are summarized in the following tables.

Non-loadbearing Demising Walls - Lightweight Façade Infill Wall - Side-By-Side Rooms

Example Number	ASTC Rating	Construction Details				
		Demising Wall between Dwellings		Demising Wall between the Dwelling and the Hallway		Façade Wall with a Lightweight Infill Wall
		Gypsum Board Room Side	Gypsum Board Opposite Side	Gypsum Board Room Side	Gypsum Board Opposite Side	Gypsum Board Room Side
1	48	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm CertainTeed Type X gypsum board
2	47	"	One layer of 15.9 mm CertainTeed Type X gypsum board	“	One layer of 15.9 mm CertainTeed Type X gypsum board	“
3	47	“	“	One layer of 15.9 mm CertainTeed Type X gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	“
4	48	"	One layer of 15.9 mm SilentFX® QuickCut gypsum board	“	“	“
5	48	"	“	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm CertainTeed Type X gypsum board	“

Non-loadbearing Demising Walls - Lightweight Façade Infill Wall - One-above-the-Other Rooms

Example Number	ASTC Rating	Construction Details				
		Demising Wall between Dwellings		Demising Wall between the Dwelling and the Hallway		Façade Wall with a Lightweight Infill Wall
		Gypsum Board Room Side	Gypsum Board Opposite Side	Gypsum Board Room Side	Gypsum Board Opposite Side	Gypsum Board Room Side
6	57	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm CertainTeed Type X gypsum board
7	57	“	One layer of 15.9 mm CertainTeed Type X gypsum board	“	One layer of 15.9 mm CertainTeed Type X gypsum board	“
8	57	“	“	One layer of 15.9 mm CertainTeed Type X gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	“
9	57	One layer of 15.9 mm CertainTeed Type X gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	“	“	“
10	57	One layer of 15.9 mm SilentFX® QuickCut gypsum board	“	“	“	“
11	57	“	“	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm CertainTeed Type X gypsum board	“

Non-loadbearing Demising Walls - Concrete Masonry Façade Wall - Side-By-Side Rooms

Example Number	ASTC Rating	Construction Details				
		Demising Wall between Dwellings		Demising Wall between the Dwelling and the Hallway		Concrete Masonry Façade Wall
		Gypsum Board Room Side	Gypsum Board Opposite Side	Gypsum Board Room Side	Gypsum Board Opposite Side	
12	49	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	Bare
13	47	"	One layer of 15.9 mm CertainTeed Type X gypsum board	"	One layer of 15.9 mm CertainTeed Type X gypsum board	"
14	47	"	"	One layer of 15.9 mm CertainTeed Type X gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	"
15	48	"	One layer of 15.9 mm SilentFX® QuickCut gypsum board	"	"	"
16	48	"	"	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm CertainTeed Type X gypsum board	"

Non-loadbearing Demising Walls - Concrete Masonry Façade Wall - One-above-the-Other Rooms

Example Number	ASTC Rating	Construction Details				
		Demising Wall between Dwellings		Demising Wall between the Dwelling and the Hallway		Concrete Masonry Façade Wall
		Gypsum Board Room Side	Gypsum Board Opposite Side	Gypsum Board Room Side	Gypsum Board Opposite Side	
17	56	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	Bare
18	56	“	One layer of 15.9 mm CertainTeed Type X gypsum board	“	One layer of 15.9 mm CertainTeed Type X gypsum board	“
19	56	“	“	One layer of 15.9 mm CertainTeed Type X gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	“
20	56	One layer of 15.9 mm CertainTeed Type X gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	“	“	“
21	56	One layer of 15.9 mm SilentFX® QuickCut gypsum board	“	“	“	“
22	56	“	“	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm CertainTeed Type X gypsum board	“

3. ASTC Examples

Examples of the calculation of the ASTC ratings of high-rise constructions with concrete floors and ceilings and interior walls of lightweight steel studs are shown in the following sections. The examples use the detailed method of the calculations as detailed in the National Research Council Report RR-331.

3.1 Side-by-Side Rooms: Rooms with Light Steel Infill Walls

Example Number	ASTC Rating	Construction Details				
		Demising Wall between Dwellings		Demising Wall between the Dwelling and the Hallway		Lightweight Infill Wall Wallboard
		Gypsum Board Room Side	Gypsum Board Opposite Side	Gypsum Board Room Side	Gypsum Board Opposite Side	
1	48	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm CertainTeed Type X gypsum board
2	47	“	One layer of 15.9 mm CertainTeed Type X gypsum board	“	One layer of 15.9 mm CertainTeed Type X gypsum board	“
3	47	“	“	One layer of 15.9 mm CertainTeed Type X gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	“
4	48	“	One layer of 15.9 mm SilentFX® QuickCut gypsum board	“	“	“
5	48	“	“	One layer of 15.9 mm SilentFX® QuickCut gypsum board	“	“

Example 1: Rooms side-by-side - Non-loadbearing Separating Wall

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly fixed to the steel studs.**
- **The façade wall includes an infill wall with CertainTeed Type X gypsum board fixed to the non-loadbearing steel studs.**
- **One layer of 15.9 mm (5/8") CertainTeed SilentFX® QuickCut gypsum board fixed to the steel studs of all other walls.**

Separating wall assembly (non-loadbearing) with:

- One layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to each side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junction 1: Cross-junction of the separating wall with the floor:

- Concrete floor slab with a mass per unit area of 345 kg/m^2 (e.g. - normal weight concrete with thickness of 150 mm) with no topping or flooring.

Junction 2: T-junction of the separating wall with perimeter side wall with:

- An infill wall with one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the room side of the steel studs and one layer of 15.9 mm GlasRoc® Sheathing directly fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the infill wall cavity.

Junction 3: Cross-junction of the separating wall with the ceiling:

- Concrete ceiling slab with a mass per unit area of 345 kg/m^2 (e.g. - normal weight concrete with thickness of 150 mm) with no attached ceiling.

Junction 4: T-junction of the separating wall with the corridor wall:

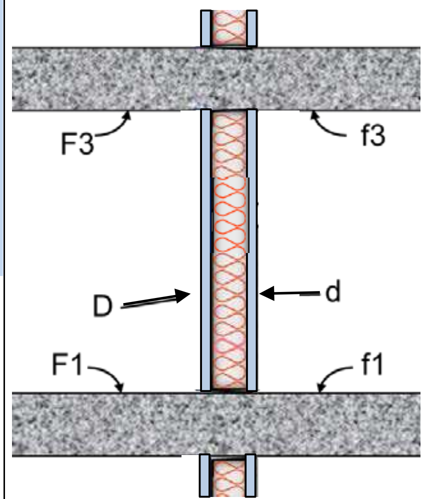
- Abutting corridor wall with non-loadbearing 25 gauge steel studs and all construction details the same as the separating wall.

Room Parameters

- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- The separating wall is 2.5 m high by 5 m wide.
- The flanking walls 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

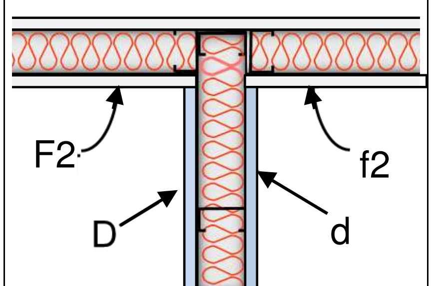
For the flanking elements F and f at Junctions 1 & 3 (Extended Concrete floor and ceiling)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_{Ff}	K_{Fd}	K_{dF}	$\Sigma l_k \cdot \alpha_k$
X-Junction 1 or 3	ISO 15712-1, Eq. 23 & E.7	-5.5	20.6	20.6	(ignore)
Total loss, n_{tot}	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	

Illustrations for this case

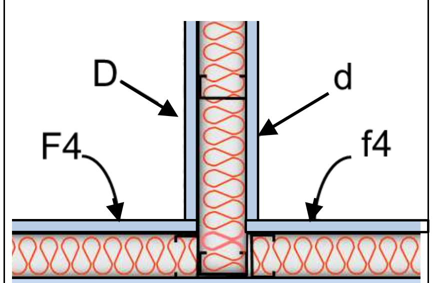


Junction of the steel stud separating wall with the 150 mm thick concrete floor and ceiling.
(Side view of Junctions 1 and 3)

External Cladding Not Shown



Junction of the separating wall with the external wall.
(Plan view of Junction 2)



Junction of the separating wall with the flanking corridor wall framed with steel studs.
(Plan view of Junction 4)

Example 1	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Wall of 1 Layer 15.9 mm SilentFX QC Directly Fixed to Each Side of 25 Gauge Metal Studs										
Sound Transmission Loss		TL_{Dd}	TLA-17-018	26	43	56	64	69	67	50
Junction 1 - Cross-Junction between the Common Wall and the 150 mm Concrete Floor										
Sound Transmission Loss	150 mm Concrete	TL_{F1}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,F1,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_{F1}	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_{f1}	No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time		$T_{s,F1,situ}$		0.215	0.154	0.107	0.073	0.048	0.031	
Equivalent Absorption Length		$a_{F1,situ}$	ISO 15712-1, Eq. 22	16.8	16.5	16.8	17.4	18.9	20.9	
In situ Sound Transmission Loss F1		$TL_{F1,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
In situ Sound Transmission Loss f1		$TL_{f1,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
Velocity Level Difference										
Path Ff		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	2.3	2.2	2.3	2.4	2.8	3.2	
Path Fd		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.2	24.2	25.2	26.3	27.5	28.7	
Path Df		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	23.2	24.2	25.2	26.3	27.5	28.7	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	43	46	54	62	72	80	57
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking STC for Junction 1				43	46	54	62	72	79	57
Junction 2 - T-Junction between the Common Wall and the Steel Stud Façade Wall with 1 Layer 15.9 mm Type X Directly Fixed to the Steel Studs										
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2,f2}$	ISO 15712-1, Eq. 25b	47	72	85	85	65	68	61
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	56	76	86	87	79	82	77
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	56	76	86	87	79	82	77
Flanking STC for Junction 2				46	69	81	81	65	68	61
Junction 3 - Cross-Junction between the Common Wall and the 150 mm Concrete Ceiling										
All values are the same as for Junction 1 with the exeption of the linings										
Change by a lining on F3	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f3	No Lining		No Lining	0	0	0	0	0	0	
Flanking Transmission Loss										
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	43	46	54	62	72	80	57
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking STC for Junction 3				43	46	54	62	72	79	57
Junction 4 - T-Junction between the Common Wall and the Steel Stud Corridor Wall of 1 Layer 15.9 mm SilentFX QC Directly Fixed on Each Side of the Studs										
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	56	77	90	90	84	82	80
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	61	77	90	90	86	84	83
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	61	77	90	90	86	84	83
Flanking STC for Junction 4				54	72	85	85	80	78	78
ASTC due to Direct plus Flanking Transmission				26	40	50	58	62	64	**48**

Example 2: Rooms side-by-side - Non-loadbearing Separating Wall

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly fixed to the steel studs.**
- **The façade wall includes an infill wall with CertainTeed Type X gypsum board fixed to the non-loadbearing steel studs.**
- **The separating wall has one layer of 15.9 mm SilentFX® QuickCut gypsum board fixed on one side and one layer of 15.9 mm CertainTeed Type X gypsum fixed on the other side.**
- **The corridor wall has one layer of 15.9 mm SilentFX® QuickCut gypsum board fixed on the room side and one layer 15.9 mm CertainTeed Type X gypsum board on the hall side.**

Separating wall assembly (non-loadbearing) with:

- One layer 15.9 mm SilentFX® QuickCut gypsum board fixed to the steel studs on one side (D) and one layer 15.9 mm CertainTeed Type X gypsum board fixed to the other side (d).
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junction 1: Cross-junction of the separating wall with the floor:

- Concrete floor slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no topping or flooring.

Junction 2: T-junction of the separating wall with perimeter side wall with:

- An infill wall with one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the room side of the steel studs and one layer of 15.9 mm GlasRoc® Sheathing directly fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the infill wall cavity.

Junction 3: Top Junction (separating wall / ceiling) with:

- Concrete ceiling slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no attached ceiling.

Junction 4: T-junction of the separating wall with the corridor wall:

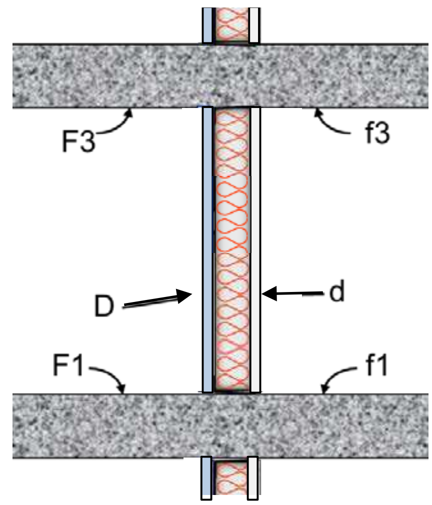
- One layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to the steel studs on the room side (F4 and f4) and one layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the corridor side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Room Parameters

- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- The separating wall is 2.5 m high by 5 m wide.
- The flanking walls 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

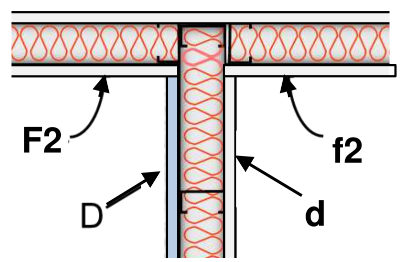
For the flanking elmeents F and f at Junctions 1 & 3 (Extended Concrete floor and ceiling)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m²) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	Σl_k*α_κ
X-Junction 1 or 3	ISO 15712-1, Eq. 23 & E.7	-5.6	21.0	21.0	(ignore)
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	

Illustrations for this case

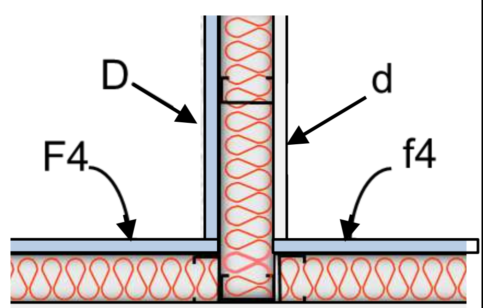


Junction of steel stud separating wall with 150 mm thick concrete floor and ceiling. (Side view of Junctions 1 and 3)

External Cladding Not Shown



Junction of separating wall with the infill wall of the external wall. (Plan view of Junction 2)



Junction of separating wall with flanking corridor wall framed with steel studs. (Plan view of Junction 4)

Example 2	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Common Wall of 1 Layer 15.9 mm SilentFX QC Directly Fixed to One Side of Steel Studs 1 Layer of 15.9 mm Type X Directly Fixed to the Other Side										
Sound Transmission Loss		TL_{Dd}	TLA-17-031	25	42	55	63	58	58	49
Junction 1 - Cross-Junction between the Common Wall and the 150 mm Concrete Floor										
Sound Transmission Loss	150 mm Concrete	TL_{F1}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,F1,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_{F1}	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_{f1}	No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time		$T_{s,F1,situ}$		0.218	0.155	0.108	0.074	0.049	0.032	
Equivalent Absorption Length		$a_{F1,situ}$	ISO 15712-1, Eq. 22	16.6	16.5	16.7	17.3	18.4	20.3	
In situ Sound Transmission Loss F1		$TL_{F1,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
In situ Sound Transmission Loss f1		$TL_{f1,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
Velocity Level Difference										
Path Ff		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	-0.4	-0.4	-0.4	-0.2	0.1	0.5	
Path Fd		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.6	24.6	25.6	26.7	27.8	29.0	
Path Df		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	23.6	24.6	25.6	26.7	27.8	29.0	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	41	44	52	60	69	77	55
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	61	73	86	90	90	90	83
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking STC for Junction 1				41	44	52	60	69	77	55
Junction 2 - T-Junction between the Common Wall and the Steel Stud Façade Wall with 190 mm Block										
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2,f2}$	ISO 15712-1, Eq. 25b	47	72	85	85	65	68	61
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	55	76	87	83	66	67	63
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	55	76	85	86	74	77	71
Flanking STC for Junction 2				46	69	81	80	62	64	59
Junction 3 - Cross-Junction between the Common Wall and the 150 mm Concrete Ceiling										
All values are the same as for Junction 1 with the exeption of the linings										
Change by a lining on F3	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f3	No Lining		No Lining	0	0	0	0	0	0	
Flanking Transmission Loss										
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	41	44	52	60	69	77	55
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	61	73	86	90	90	90	83
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking STC for Junction 3				41	44	52	60	69	77	55
Junction 4 - T-Junction between the Common Wall and the Steel Stud Corridor Wall										
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	58	75	90	90	85	84	81
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	58	78	90	90	78	76	75
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	60	77	90	90	87	85	83
Flanking STC for Junction 4				54	72	85	85	77	75	74
ASTC due to Direct plus Flanking Transmission				25	39	48	56	56	57	**47**

Example 3: Rooms side-by-side - Non-loadbearing Separating Wall

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly fixed to the steel studs.**
- **The façade wall includes an infill wall with CertainTeed Type X gypsum board fixed to the non-loadbearing steel studs.**
- **The separating wall has one layer of 15.9 mm SilentFX® QuickCut gypsum board fixed on one side and one layer of 15.9 mm CertainTeed Type X gypsum fixed on the other side.**
- **The corridor wall has one layer of 15.9 mm CertainTeed Type X gypsum board fixed on the room side and one layer 15.9 mm SilentFX® QuickCut gypsum board on the corridor side.**

Separating wall assembly (non-loadbearing) with:
- One layer 15.9 mm SilentFX® QuickCut gypsum board fixed to the steel studs on one side (D) and one layer 15.9 mm CertainTeed Type X gypsum board fixed to the other side (d).
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junction 1: Cross-junction of the separating wall with the floor:
- Concrete floor slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no topping or flooring.

Junction 2: T-junction of the separating wall with perimeter side wall with:
- An infill wall with one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the room side of the steel studs and one layer of 15.9 mm GlasRoc® Sheathing directly fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the infill wall cavity.

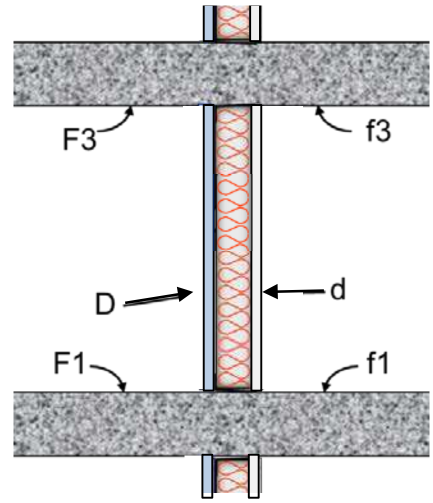
Junction 3: Cross-junction of the separating wall with the ceiling:
- Concrete ceiling slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no attached ceiling.

Junction 4: T-junction of the separating wall with the corridor wall:
- One layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the steel studs on the room side (F4 and f4) and one layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to the corridor side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Room Parameters
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- The separating wall is 2.5 m high by 5 m wide.
- The flanking walls 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

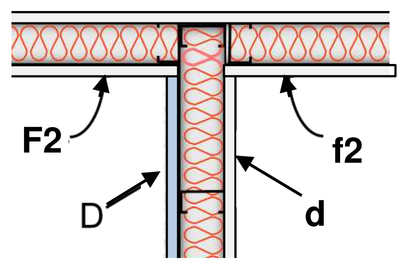
For the flanking elmeents F and f at Junctions 1 & 3 (Extended Concrete floor and ceiling)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	$\Sigma l\_k{*}\alpha\_k$
X-Junction 1 or 3	ISO 15712-1, Eq. 23 & E.7	-5.6	21.0	21.0	(ignore)
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	

Illustrations for this case

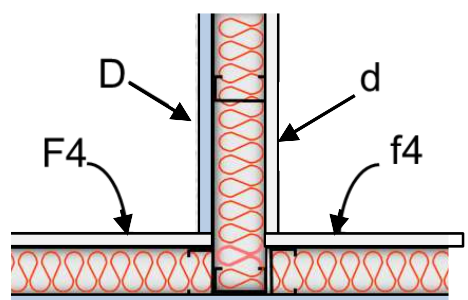


Junction of steel stud separating wall with 150 mm thick concrete floor and ceiling. (Side view of Junctions 1 and 3)

External Cladding Not Shown



Junction of separating wall with the infill wall of the external wall. (Plan view of Junction 2)



Junction of separating wall with flanking corridor wall framed with steel studs. (Plan view of Junction 4)

Example 3	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Common Wall of 1 Layer 15.9 mm SilentFX QC Directly Fixed to One Side of Steel Studs 1 Layer of 15.9 mm Type X Directly Fixed to the Other Side										
Sound Transmission Loss		TL_{Dd}	TLA-17-031	25	42	55	63	58	58	49
Junction 1 - Cross-Junction between the Common Wall and the 150 mm Concrete Floor										
Sound Transmission Loss	150 mm Concrete	TL_{F1}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,F1,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_{F1}	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_{f1}	No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time		$T_{s,F1,situ}$		0.218	0.155	0.108	0.074	0.049	0.032	
Equivalent Absorption Length		$a_{F1,situ}$	ISO 15712-1, Eq. 22	16.6	16.5	16.7	17.3	18.4	20.3	
In situ Sound Transmission Loss F1		$TL_{F1,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
In situ Sound Transmission Loss f1		$TL_{f1,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
Velocity Level Difference										
Path Ff		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	-0.4	-0.4	-0.4	-0.2	0.1	0.5	
Path Fd		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.6	24.6	25.6	26.7	27.8	29.0	
Path Df		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	23.6	24.6	25.6	26.7	27.8	29.0	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	41	44	52	60	69	77	55
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	61	73	86	90	90	90	83
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking STC for Junction 1				41	44	52	60	69	77	55
Junction 2 - T-Junction between the Common Wall and the Steel Stud Façade Wall with 1 Layer 15.9 mm Type X Directly Fixed to the Steel Studs										
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2,f2}$	ISO 15712-1, Eq. 25b	47	72	85	85	65	68	61
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	55	76	87	83	66	67	63
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	55	76	85	86	74	77	71
Flanking STC for Junction 2				46	69	81	80	62	64	59
Junction 3 - Cross-Junction between the Common Wall and the 150 mm Concrete Ceiling										
All values are the same as for Junction 1 with the exeption of the linings										
Change by a lining on F3	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f3	No Lining		No Lining	0	0	0	0	0	0	
Flanking Transmission Loss										
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	41	44	52	60	69	77	55
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	61	73	86	90	90	90	83
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking STC for Junction 3				41	44	52	60	69	77	55
Junction 4 - T-Junction between the Common Wall and the Steel Stud Corridor Wall										
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	50	75	84	85	67	67	67
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	55	75	86	82	67	65	66
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	55	74	83	85	74	75	72
Flanking STC for Junction 4				48	70	79	79	64	63	63
ASTC due to Direct plus Flanking Transmission				25	39	48	56	55	56	**47**

Example 4: Rooms side-by-side - Non-loadbearing Separating Wall

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly fixed to the steel studs.**
- **The façade wall includes an infill wall with CertainTeed Type X gypsum board fixed to the non-loadbearing steel studs.**
- **The separating wall has one layer of 15.9 mm SilentFX® QuickCut gypsum board fixed on each side.**
- **The corridor wall has one layer of 15.9 mm CertainTeed Type X gypsum board on the room side and one layer of 15.9mm SilentFX® QuickCut gypsum board on the corridor side.**

Separating wall assembly (non-loadbearing) with:

- One layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to each side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junction 1: Cross-junction of the separating wall with the floor:

- Concrete floor slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no topping or flooring.

Junction 2: T-junction of the separating wall with perimeter side wall with:

- An infill wall with one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the room side of the steel studs and one layer of 15.9 mm GlasRoc® Sheathing directly fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the infill wall cavity.

Junction 3: Cross-junction of the separating wall with the ceiling:

- Concrete ceiling slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no attached ceiling.

Junction 4: T-junction of the separating wall with the corridor wall:

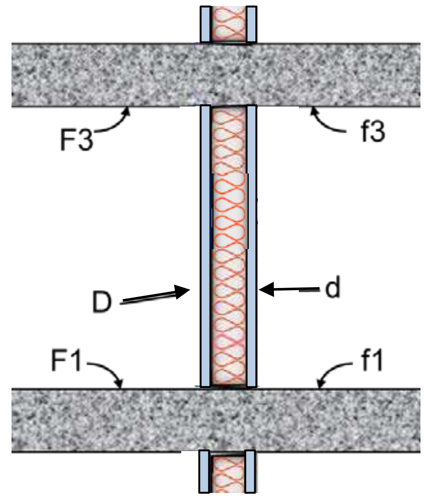
- One layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the steel studs on the room side (F4 and f4) and one layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to the corridor side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Room Parameters

- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- The separating wall is 2.5 m high by 5 m wide.
- The flanking walls 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

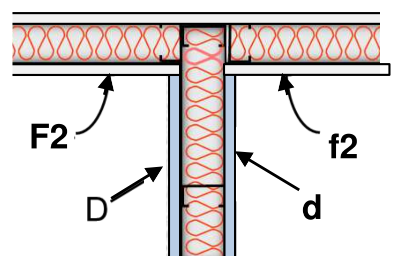
For the flanking elmeents F and f at Junctions 1 & 3 (Extended Concrete floor and ceiling)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_{Ff}	K_{Fd}	K_{dF}	$\Sigma l_k \cdot \alpha_k$
X-Junction 1 or 3	ISO 15712-1, Eq. 23 & E.7	-5.5	20.6	20.6	(ignore)
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	

Illustrations for this case

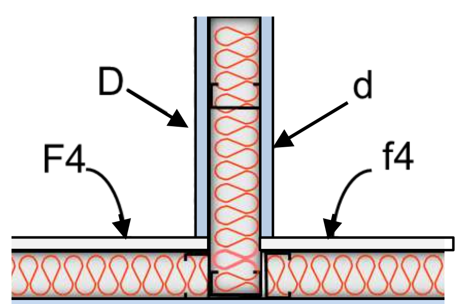


Junction of steel stud separating wall with 150 mm thick concrete floor and ceiling. (Side view of Junctions 1 and 3)

External Cladding Not Shown



Junction of separating wall with the infill wall of the external wall. (Plan view of Junction 2)



Junction of separating wall with flanking corridor wall framed with steel studs. (Plan view of Junction 4)

Example 4	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Common Wall of 1 Layer 15.9 mm SilentFX QC Directly Fixed to One Side of Steel Studs 1 Layer of 15.9 mm Type X Directly Fixed to the Other Side										
Sound Transmission Loss		TL_{Dd}	TLA-17-018	26	43	56	64	69	67	50
Junction 1 - Cross-Junction between the Common Wall and the 150 mm Concrete Floor										
Sound Transmission Loss	150 mm Concrete	TL_{F1}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,F1,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_{F1}	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_{f1}	No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time		$T_{s,F1,situ}$		0.216	0.154	0.108	0.073	0.049	0.031	
Equivalent Absorption Length		$a_{F1,situ}$	ISO 15712-1, Eq. 22	16.7	16.6	16.8	17.4	18.5	20.3	
In situ Sound Transmission Loss F1		$TL_{F1,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
In situ Sound Transmission Loss f1		$TL_{f1,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
Velocity Level Difference										
Path Ff		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	-0.3	-0.3	-0.3	-0.1	0.2	0.6	
Path Fd		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.2	24.1	25.2	26.2	27.4	28.6	
Path Df		$D_{v,D,f1,situ}$	ISO 15712-1, Eq. 21	23.2	24.1	25.2	26.2	27.4	28.6	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	41	44	52	60	69	78	55
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking STC for Junction 1				41	44	52	60	69	77	55
Junction 2 - T-Junction between the Common Wall and the Steel Stud Façade Wall with 1 Layer 15.9 mm Type X Directly Fixed to the Steel Studs										
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2,f2}$	ISO 15712-1, Eq. 25b	47	72	85	85	65	68	61
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	56	77	86	87	79	82	77
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	56	77	86	87	79	82	77
Flanking STC for Junction 2				46	70	81	81	65	68	61
Junction 3 - Cross-Junction between the Common Wall and the 150 mm Concrete Ceiling										
All values are the same as for Junction 1 with the exeption of the linings										
Change by a lining on F3	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f3	No Lining		No Lining	0	0	0	0	0	0	
Flanking Transmission Loss										
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	41	44	52	60	69	78	55
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking STC for Junction 3				41	44	52	60	69	77	55
Junction 4 - T-Junction between the Common Wall and the Steel Stud Corridor Wall										
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	50	75	84	85	67	67	67
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	55	75	84	85	80	79	78
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	55	75	84	85	80	79	78
Flanking STC for Junction 4				48	70	79	80	67	66	66
ASTC due to Direct plus Flanking Transmission				25	39	48	56	60	62	**48**

Example 5: Rooms side-by-side - Non-loadbearing Separating Wall

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly fixed to the steel studs.**
- **The façade wall includes an infill wall with CertainTeed Type X gypsum board fixed to the non-loadbearing steel studs.**
- **The separating wall has one layer of 15.9 mm SilentFX® QuickCut gypsum board fixed on each side.**
- **The corridor wall has one layer of 15.9 mm SilentFX® QuickCut gypsum board fixed on the room side and one layer 15.9 mm CertainTeed Type X gypsum board on the hall side.**

Separating wall assembly (non-loadbearing) with:
- One layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to each side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junction 1: Cross-junction of the separating wall with the floor:
- Concrete floor slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no topping or flooring.

Junction 2: T-junction of the separating wall with perimeter side wall with:
- An infill wall with one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the room side of the steel studs and one layer of 15.9 mm GlasRoc® Sheathing directly fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the infill wall cavity.

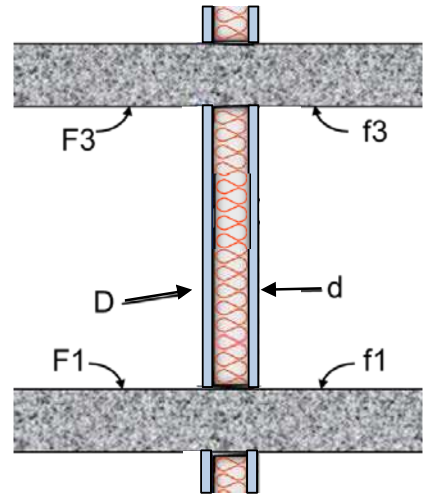
Junction 3: Cross-junction of the separating wall with the ceiling:
- Concrete ceiling slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no attached ceiling.

Junction 4: T-junction of the separating wall with the corridor wall:
- One layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to the steel studs on the room side (F4 and f4) and one layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the corridor side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Room Parameters
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- The separating wall is 2.5 m high by 5 m wide.
- The flanking walls 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

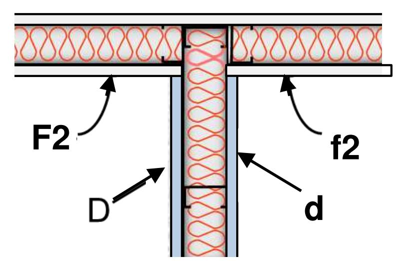
For the flanking elmeents F and f at Junctions 1 & 3 (Extended Concrete floor and ceiling)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	$\Sigma l_k \alpha_k$
X-Junction 1 or 3	ISO 15712-1, Eq. 23 & E.7	-5.5	20.6	20.6	(ignore)
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	

Illustrations for this case

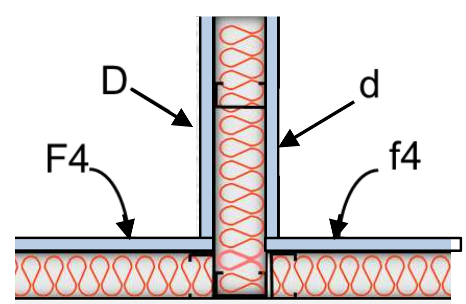


Junction of steel stud separating wall with 150 mm thick concrete floor and ceiling. (Side view of Junctions 1 and 3)

External Cladding Not Shown



Junction of separating wall with the infill wall of the external wall. (Plan view of Junction 2)



Junction of separating wall with flanking corridor wall framed with steel studs. (Plan view of Junction 4)

Example 5	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Common Wall of 1 Layer 15.9 mm SilentFX QC Directly Fixed to One Side of Steel Studs 1 Layer of 15.9 mm Type X Directly Fixed to the Other Side										
Sound Transmission Loss		TL_{Dd}	TLA-17-018	26	43	56	64	69	67	50
Junction 1 - Cross-Junction between the Common Wall and the 150 mm Concrete Floor										
Sound Transmission Loss	150 mm Concrete	TL_{F1}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,F1,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_{F1}	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_{f1}	No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time		$T_{s,F1,situ}$		0.216	0.154	0.108	0.073	0.049	0.031	
Equivalent Absorption Length		$a_{F1,situ}$	ISO 15712-1, Eq. 22	16.7	16.6	16.8	17.4	18.5	20.3	
In situ Sound Transmission Loss F1		$TL_{F1,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
In situ Sound Transmission Loss f1		$TL_{f1,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
Velocity Level Difference										
Path Ff		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	-0.3	-0.3	-0.3	-0.1	0.2	0.6	
Path Fd		$\underline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.2	24.1	25.2	26.2	27.4	28.6	
Path Df		$D_{v,D,f1,situ}$	ISO 15712-1, Eq. 21	23.2	24.1	25.2	26.2	27.4	28.6	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	41	44	52	60	69	78	55
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking STC for Junction 1				41	44	52	60	69	77	55
Junction 2 - T-Junction between the Common Wall and the Steel Stud Façade Wall with 1 Layer 15.9 mm Type X Directly Fixed to the Steel Studs										
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2,f2}$	ISO 15712-1, Eq. 25b	47	72	85	85	65	68	61
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	56	77	86	87	79	82	77
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	56	77	86	87	79	82	77
Flanking STC for Junction 2				46	70	81	81	65	68	61
Junction 3 - Cross-Junction between the Common Wall and the 150 mm Concrete Ceiling										
All values are the same as for Junction 1 with the exeption of the linings										
Change by a lining on F3	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f3	No Lining		No Lining	0	0	0	0	0	0	
Flanking Transmission Loss										
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	41	44	52	60	69	78	55
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	63	74	85	90	90	90	85
Flanking STC for Junction 3				41	44	52	60	69	77	55
Junction 4 - T-Junction between the Common Wall and the Steel Stud Corridor Wall										
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	58	75	90	90	85	84	81
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	60	77	90	90	90	89	84
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	60	77	90	90	90	89	84
Flanking STC for Junction 4				54	71	85	85	83	82	78
ASTC due to Direct plus Flanking Transmission				25	39	48	56	61	64	**48**

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3.2 One-above-the-Other Rooms: Rooms with Light Steel Infill Walls

Example Number	ASTC Rating	Construction Details				
		Demising Wall between Dwellings		Demising Wall between the Dwelling and the Hallway		Lightweight Infill Wall Wallboard
		Gypsum Board Room Side	Gypsum Board Opposite Side	Gypsum Board Room Side	Gypsum Board Opposite Side	
6	57	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm CertainTeed Type X gypsum board
7	57	"	One layer of 15.9 mm CertainTeed Type X gypsum board	"	One layer of 15.9 mm CertainTeed Type X gypsum board	"
8	57	"	"	One layer of 15.9 mm CertainTeed Type X gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	"
9	57	One layer of 15.9 mm CertainTeed Type X gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	"	One layer of 15.9 mm CertainTeed Type X gypsum board	"
10	57	One layer of 15.9 mm SilentFX® QuickCut gypsum board	"	"	"	"
11	57	"	"	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm CertainTeed Type X gypsum board	"

Example 6: Rooms one-above-the-other

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **The internal walls are lightweight (25 gauge) steel stud walls.**
- **Gypsum board directly attached to the steel studs.**
- **The façade wall includes an infill wall with CertainTeed Type X gypsum board directly attached to the light steel studs.**
- **One layer of 15.9 mm (5/8") SilentFX® QuickCut gypsum board directly fixed to the steel studs of all other walls.**

Separating floor assembly with:

- Concrete floor with mass per unit area of 345 kg/m^2 (e.g. – normal weight concrete with thickness of 150 mm) with no topping / flooring on top or ceiling lining below.

Junctions 1 and 4: Cross-junction of separating floor / flanking wall with:

- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8") SilentFX® QuickCut gypsum board fixed to each side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junctions 2 and 3: T-junctions of separating floor / flanking wall with:

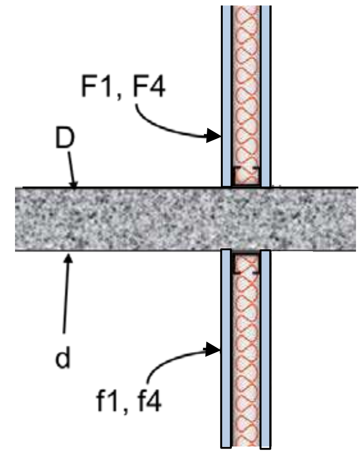
- An infill wall with one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm CertainTeed Type X gypsum board directly attached to the steel studs. 15.9 mm GlasRoc® Sheathing directly attached to the other side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the infill wall cavity.

Room Parameters

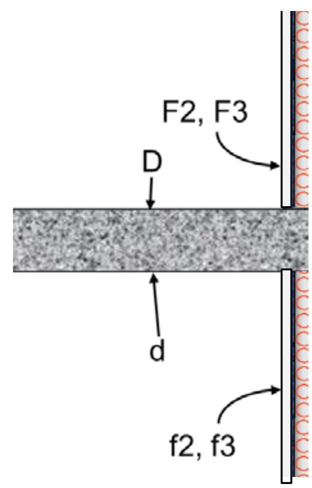
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- Walls F1, f1, F3 and f3 are 2.5 m high by 5 m wide.
- Walls F2, f2, F4 and f4 are 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the separating assembly					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	Σl_k*α_κ
X-Junction 1 & 4	ISO 15712-1, Eq. 23 & E.7	31.2	20.6	20.6	(ignore)
T-Junction 2 & 3	ISO 15712-1, Eq. 23 & E.7	32.8	21.4	21.4	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	

Illustrations for this case



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junctions 1 and 4)



T-Junction of the separating floor of 150 mm thick concrete floor with the steel stud infill wall. Note the external cladding is not shown in the figure
(Side view of Junction 2 and 3)

Example 6	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Floor of 150 mm Concrete										
Sound Transmission Loss	150 mm Concrete	TL_{Dd}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,Dd,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_D	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_d	No Lining	0	0	0	0	0	0	
Structural Reverberation Time		$T_{s,Dd,situ}$		0.215	0.154	0.107	0.073	0.048	0.031	
Equivalent Absorption Length		$a_{Dd,situ}$	ISO 15712-1, Eq. 22	16.8	16.5	16.8	17.4	18.9	20.9	
In situ Sound Transmission Loss F1		$TL_{Dd,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
Junction 1 - Cross-Junction between the 150 mm Concrete Floor and the Steel Stud Flanking Wall										
Velocity Level Difference										
Path Ff_1		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	37.2	36.2	35.2	34.2	33.2	32.2	
Path Fd_1		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.2	24.2	25.2	26.3	27.5	28.7	
Path Df_1		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	23.2	24.2	25.2	26.3	27.5	28.7	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	78	90	90	90	90	90	90
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	65	76	87	90	90	90	86
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	65	76	87	90	90	90	86
Flanking STC for Junction 1				62	73	83	85	85	85	82
Junction 2 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Façade Wall with 1 Layer 15.9 mm Type X Directly Fixed to the Steel Studs										
Velocity Level Difference										
Path Ff_2		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	25.2	24.2	23.2	22.2	21.2	20.2	
Path Fd_2		$\overline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	17.7	18.7	19.7	20.8	22.0	23.2	
Path Df_2		$\overline{D_{v,D,f2,situ}}$	ISO 15712-1, Eq. 21	17.7	18.7	19.7	20.8	22.0	23.2	
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2.f2}$	ISO 15712-1, Eq. 25b	60	79	90	90	75	72	69
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	57	69	81	87	85	89	79
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	57	69	81	87	85	89	79
Flanking STC for Junction 2				53	66	78	83	74	72	69
Junction 3 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Façade Wall										
Velocity Level Difference										
Path Ff_3		$\overline{D_{v,F3,f3,situ}}$	ISO 15712-1, Eq. 21	25.2	24.2	23.2	22.2	21.2	20.2	
Path Fd_3		$\overline{D_{v,F3,d,situ}}$	ISO 15712-1, Eq. 21	22.3	23.3	24.3	25.5	26.9	28.3	
Path Df_3		$\overline{D_{v,D,f3,situ}}$	ISO 15712-1, Eq. 21	22.3	23.3	24.3	25.5	26.9	28.3	
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	59	78	90	90	74	71	68
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	61	73	85	90	89	90	83
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	61	73	85	90	89	90	83
Flanking STC for Junction 3				55	69	81	85	74	71	68
Junction 4 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Corridor Wall										
Velocity Level Difference										
Path Ff_4		$\overline{D_{v,F4,f4,situ}}$	ISO 15712-1, Eq. 21	37.2	36.2	35.2	34.2	33.2	32.2	
Path Fd_4		$\overline{D_{v,F4,d,situ}}$	ISO 15712-1, Eq. 21	23.7	24.7	25.7	26.8	28.0	29.2	
Path Df_4		$\overline{D_{v,D,f4,situ}}$	ISO 15712-1, Eq. 21	23.7	24.7	25.7	26.8	28.0	29.2	
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	79	90	90	90	90	90	90
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	66	77	88	90	90	90	87
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	66	77	88	90	90	90	87
Flanking STC for Junction 4				63	74	84	85	85	85	83
ASTC due to Direct plus Flanking Transmission				42	46	54	62	68	68	**57**

Example 7: Rooms one-above-the-other

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **The internal walls are lightweight (25 gauge) steel stud walls.**
- **Gypsum board directly attached to the steel studs.**
- **The façade wall includes an infill wall with CertainTeed Type X gypsum board directly attached to the light steel studs.**
- **Walls F1 and f1 have one layer of 15.9mm SilentFX® QuickCut gypsum board fixed on the room side and one layer of 15.9 mm CertainTeed Type X gypsum board on the other side.**
- **Hallway walls have one layer of 15.9mm SilentFX® QuickCut gypsum board fixed on the room side and one layer of 15.9 mm CertainTeed Type X gypsum board on the hall side.**

Separating floor assembly with:
- Concrete floor with mass per unit area of 345 kg/m^2 (e.g. – normal weight concrete with thickness of 150 mm) with no topping / flooring on top or ceiling lining below.

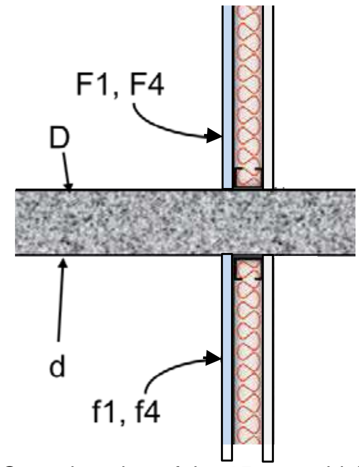
Junctions 1 and 4: Cross-junction of separating floor / flanking wall with:
- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8") SilentFX® QuickCut gypsum board fixed to the room side and one layer of 15.9 mm (5/8") CertainTeed Type X gypsum board fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junctions 2 and 3: T-junctions of separating floor / flanking wall with:
- An infill wall with one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm CertainTeed Type X gypsum board directly attached to the steel studs. 15.9 mm GlasRoc® Sheathing directly attached to the other side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the infill wall cavity.

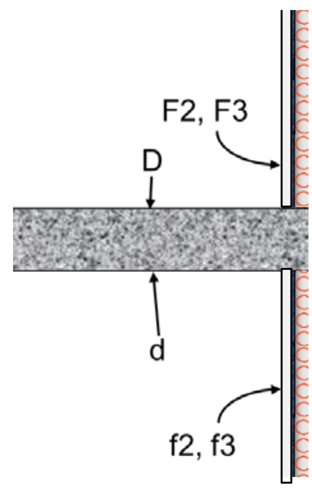
Room Parameters
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- Walls F1, f1, F3 and f3 are 2.5 m high by 5 m wide.
- Walls F2, f2, F4 and f4 are 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the separating assembly					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	Σl_k*α_κ
X-Junction 1 & 4	ISO 15712-1, Eq. 23 & E.7	32.0	21.0	21.0	(ignore)
T-Junction 2 & 3	ISO 15712-1, Eq. 23 & E.7	32.7	21.3	21.3	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	

Illustrations for this case



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junctions 1 and 4)



T-Junction of the separating floor of 150 mm thick concrete floor with the steel stud infill wall. Note the external cladding is not shown in the figure
(Side view of Junction 2 and 3)

Example 7	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Floor of 150 mm Concrete										
Sound Transmission Loss	150 mm Concrete	TL_{Dd}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,Dd,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_D	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_d	No Lining	0	0	0	0	0	0	
Structural Reverberation Time		$T_{s,Dd,situ}$		0.218	0.155	0.108	0.074	0.049	0.032	
Equivalent Absorption Length		$a_{Dd,situ}$	ISO 15712-1, Eq. 22	16.6	16.5	16.7	17.3	18.4	20.3	
In situ Sound Transmission Loss F1		$TL_{Dd,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
Junction 1 - Cross-Junction between the 150 mm Concrete Floor and the Steel Stud Flanking Wall										
Velocity Level Difference										
Path Ff_1		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_1		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.6	24.6	25.6	26.7	27.8	29.0	
Path Df_1		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	23.6	24.6	25.6	26.7	27.8	29.0	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	77	90	90	90	90	90	90
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	65	76	87	90	90	90	86
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	65	76	87	90	90	90	86
Flanking STC for Junction 1				62	73	83	85	85	85	82
Junction 2 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Façade Wall										
Velocity Level Difference										
Path Ff_2		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	25.2	24.2	23.2	22.2	21.2	20.2	
Path Fd_2		$\overline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	17.7	18.7	19.7	20.8	21.9	23.1	
Path Df_2		$\overline{D_{v,D,f2,situ}}$	ISO 15712-1, Eq. 21	17.7	18.7	19.7	20.8	21.9	23.1	
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2,f2}$	ISO 15712-1, Eq. 25b	60	79	90	90	75	72	69
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	57	69	81	87	84	89	79
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	57	69	81	87	84	89	79
Flanking STC for Junction 2				53	66	78	83	74	72	69
Junction 3 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Façade Wall										
Velocity Level Difference										
Path Ff_3		$\overline{D_{v,F3,f3,situ}}$	ISO 15712-1, Eq. 21	25.2	24.2	23.2	22.2	21.2	20.2	
Path Fd_3		$\overline{D_{v,F3,d,situ}}$	ISO 15712-1, Eq. 21	22.3	23.3	24.3	25.5	26.7	28.1	
Path Df_3		$\overline{D_{v,D,f3,situ}}$	ISO 15712-1, Eq. 21	22.3	23.3	24.3	25.5	26.7	28.1	
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	59	78	90	90	74	71	68
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	61	73	85	90	89	90	83
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	61	73	85	90	89	90	83
Flanking STC for Junction 3				55	69	81	85	74	71	68
Junction 4 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Corridor Wall										
Velocity Level Difference										
Path Ff_4		$\overline{D_{v,F4,f4,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_4		$\overline{D_{v,F4,d,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.1	27.2	28.3	29.5	
Path Df_4		$\overline{D_{v,D,f4,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.1	27.2	28.3	29.5	
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	78	90	90	90	90	90	90
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	66	77	88	90	90	90	87
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	66	77	88	90	90	90	87
Flanking STC for Junction 4				63	74	84	85	85	85	83
ASTC due to Direct plus Flanking Transmission				42	46	54	62	68	68	**57**

Example 8: Rooms one-above-the-other

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **The internal walls are lightweight (25 gauge) steel stud walls.**
- **Gypsum board directly attached to the steel studs.**
- **The façade wall includes an infill wall with CertainTeed Type X gypsum board directly attached to the light steel studs.**
- **Walls F1 and f1 have one layer of 15.9 mm SilentFX® QuickCut gypsum board fixed on the room side and one layer of 15.9 mm CertainTeed Type X gypsum board on the other side.**
- **Hallway walls have one layer of 15.9 mm CertainTeed Type X gypsum board fixed on the room side and one layer of 15.9 mm SilentFX® QuickCut gypsum board on the hall side.**

Separating floor assembly with:

- Concrete floor with mass per unit area of 345 kg/m^2 (e.g. – normal weight concrete with thickness of 150 mm) with no topping / flooring on top or ceiling lining below.

Junction 1: Cross-junction of separating floor / flanking wall with:

- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8") SilentFX® QuickCut gypsum board fixed to the room side (F1 and f1) and one layer of 15.9 mm (5/8") CertainTeed Type X gypsum board fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junctions 2 and 3: T-junctions of separating floor / flanking wall with:

- An infill wall with one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm CertainTeed Type X gypsum board directly attached to the steel studs. 15.9 mm GlasRoc® Sheathing directly attached to the other side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the infill wall cavity.

Junction 4: Cross-junction of separating floor / flanking wall with:

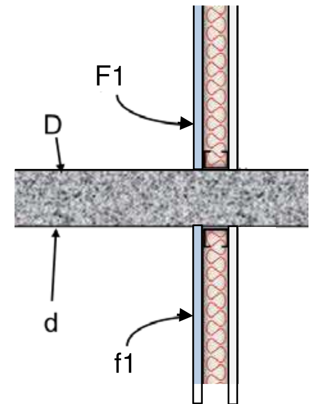
- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8”) CertainTeed Type X gypsum board fixed to the room side (F4 and f4) and 15.9 mm (5/8”) SilentFX® QuickCut gypsum board fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Room Parameters

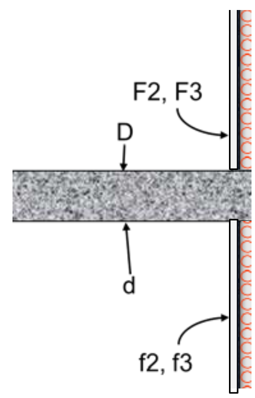
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- Walls F1, f1, F3 and f3 are 2.5 m high by 5 m wide.
- Walls F2, f2, F4 and f4 are 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the separating assembly					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	Σl_k*α_κ
X-Junction 1 & 4	ISO 15712-1, Eq. 23 & E.7	32.0	21.0	21.0	(ignore)
T-Junction 2 & 3	ISO 15712-1, Eq. 23 & E.7	32.7	21.3	21.3	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	

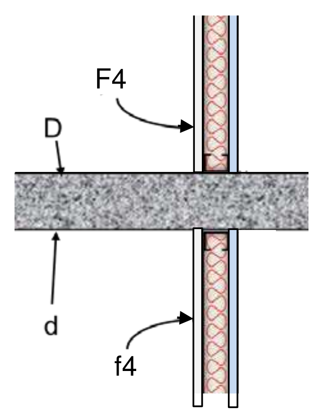
Illustrations for this case



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junction 1)



T-Junction of the separating floor of 150 mm thick concrete floor with the steel stud infill wall. Note the external cladding is not shown in the figure
(Side view of Junction 2 and 3)



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junction 4)

Example 8	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Floor of 150 mm Concrete										
Sound Transmission Loss	150 mm Concrete	TL_{Dd}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,Dd,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_D	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_d	No Lining	0	0	0	0	0	0	
Structural Reverberation Time		$T_{s,Dd,situ}$		0.218	0.155	0.108	0.074	0.049	0.032	
Equivalent Absorption Length		$a_{Dd,situ}$	ISO 15712-1, Eq. 22	16.6	16.5	16.7	17.3	18.4	20.3	
In situ Sound Transmission Loss F1		$TL_{Dd,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
Junction 1 - Cross-Junction between the 150 mm Concrete Floor and the Steel Stud Flanking Wall										
Velocity Level Difference										
Path Ff_1		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_1		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.6	24.6	25.6	26.7	27.8	29.0	
Path Df_1		$D_{v,D,f1,situ}$	ISO 15712-1, Eq. 21	23.6	24.6	25.6	26.7	27.8	29.0	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	77	90	90	90	90	90	90
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	65	76	87	90	90	90	86
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	65	76	87	90	90	90	86
Flanking STC for Junction 1				62	73	83	85	85	85	82
Junction 2 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Façade Wall										
Velocity Level Difference										
Path Ff_2		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	25.2	24.2	23.2	22.2	21.2	20.2	
Path Fd_2		$\overline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	17.7	18.7	19.7	20.8	21.9	23.1	
Path Df_2		$D_{v,D,f2,situ}$	ISO 15712-1, Eq. 21	17.7	18.7	19.7	20.8	21.9	23.1	
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2.f2}$	ISO 15712-1, Eq. 25b	60	79	90	90	75	72	69
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	57	69	81	87	84	89	79
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	57	69	81	87	84	89	79
Flanking STC for Junction 2				53	66	78	83	74	72	69
Junction 3 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Façade Wall										
Velocity Level Difference										
Path Ff_3		$\overline{D_{v,F3,f3,situ}}$	ISO 15712-1, Eq. 21	25.2	24.2	23.2	22.2	21.2	20.2	
Path Fd_3		$\overline{D_{v,F3,d,situ}}$	ISO 15712-1, Eq. 21	22.3	23.3	24.3	25.5	26.7	28.1	
Path Df_3		$D_{v,D,f3,situ}$	ISO 15712-1, Eq. 21	22.3	23.3	24.3	25.5	26.7	28.1	
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	59	78	90	90	74	71	68
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	61	73	85	90	89	90	83
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	61	73	85	90	89	90	83
Flanking STC for Junction 3				55	69	81	85	74	71	68
Junction 4 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Corridor Wall										
Velocity Level Difference										
Path Ff_4		$\overline{D_{v,F4,f4,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_4		$\overline{D_{v,F4,d,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.1	27.2	28.3	29.5	
Path Df_4		$D_{v,D,f4,situ}$	ISO 15712-1, Eq. 21	24.1	25.1	26.1	27.2	28.3	29.5	
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	74	90	90	90	90	90	90
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	64	76	89	90	90	90	86
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	64	76	89	90	90	90	86
Flanking STC for Junction 4				60	73	85	85	85	85	82
ASTC due to Direct plus Flanking Transmission				42	46	54	62	68	68	**57**

Example 9: Rooms one-above-the-other

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **The internal walls are lightweight (25 gauge) steel stud walls.**
- **Gypsum board directly attached to the steel studs.**
- **The façade wall includes an infill wall with CertainTeed Type X gypsum board directly attached to the light steel studs.**
- **Walls F1 and f1 have one layer of 15.9 mm CertainTeed Type X gypsum board fixed on the room side and one layer of 15.9 mm SilentFX® QuickCut gypsum board on the other side.**
- **Hallway walls have one layer of 15.9 mm CertainTeed Type X gypsum board fixed on the room side and one layer of 15.9 mm SilentFX® QuickCut gypsum board on the hall side.**

Separating floor assembly with:

- Concrete floor with mass per unit area of 345 kg/m^2 (e.g. – normal weight concrete with thickness of 150 mm) with no topping / flooring on top or ceiling lining below.

Junctions 1 and 4: Cross-junction of separating floor / flanking wall with:

- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8") CertainTeed Type X gypsum board fixed to the room side and 15.9 mm (5/8") SilentFX® QuickCut gypsum board fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junctions 2 and 3: T-junctions of separating floor / flanking wall with:

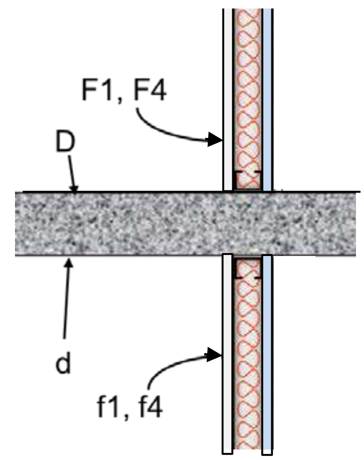
- An infill wall with one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm CertainTeed Type X gypsum board directly attached to the steel studs. 15.9 mm GlasRoc® Sheathing directly attached to the other side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the infill wall cavity.

Room Parameters

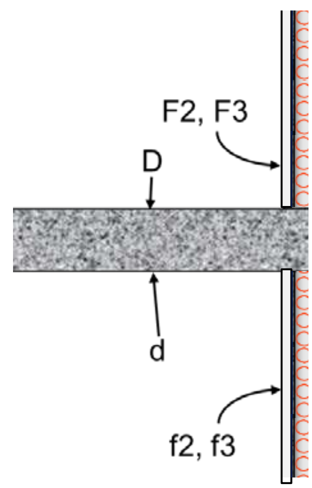
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- Walls F1, f1, F3 and f3 are 2.5 m high by 5 m wide.
- Walls F2, f2, F4 and f4 are 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the separating assembly					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	$\Sigma l_k \cdot \alpha_k$
X-Junction 1 & 4	ISO 15712-1, Eq. 23 & E.7	32.0	21.0	21.0	(ignore)
T-Junction 2 & 3	ISO 15712-1, Eq. 23 & E.7	32.7	21.3	21.3	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	

Illustrations for this case



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junctions 1 and 4)



T-Junction of the separating floor of 150 mm thick concrete floor with the steel stud infill wall. Note the external cladding is not shown in the figure
(Side view of Junction 2 and 3)

Example 9	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Floor of 150 mm Concrete										
Sound Transmission Loss	150 mm Concrete	TL_{Dd}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,Dd,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_D	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_d	No Lining	0	0	0	0	0	0	
Structural Reverberation Time		$T_{s,Dd,situ}$		0.218	0.155	0.108	0.074	0.049	0.032	
Equivalent Absorption Length		$a_{Dd,situ}$	ISO 15712-1, Eq. 22	16.6	16.5	16.7	17.3	18.4	20.3	
In situ Sound Transmission Loss F1		$TL_{Dd,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
Junction 1 - Cross-Junction between the 150 mm Concrete Floor and the Steel Stud Flanking Wall										
Velocity Level Difference										
Path Ff_1		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_1		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.6	24.6	25.6	26.7	27.8	29.0	
Path Df_1		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	23.6	24.6	25.6	26.7	27.8	29.0	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	73	90	90	90	90	90	90
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	63	75	88	90	90	90	86
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	63	75	88	90	90	90	86
Flanking STC for Junction 1				60	72	84	85	85	85	82
Junction 2 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Façade Wall										
Velocity Level Difference										
Path Ff_2		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	25.2	24.2	23.2	22.2	21.2	20.2	
Path Fd_2		$\overline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	17.7	18.7	19.7	20.8	21.9	23.1	
Path Df_2		$\overline{D_{v,D,f2,situ}}$	ISO 15712-1, Eq. 21	17.7	18.7	19.7	20.8	21.9	23.1	
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2,f2}$	ISO 15712-1, Eq. 25b	60	79	90	90	75	72	69
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	57	69	81	87	84	89	79
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	57	69	81	87	84	89	79
Flanking STC for Junction 2				53	66	78	83	74	72	69
Junction 3 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Façade Wall										
Velocity Level Difference										
Path Ff_3		$\overline{D_{v,F3,f3,situ}}$	ISO 15712-1, Eq. 21	25.2	24.2	23.2	22.2	21.2	20.2	
Path Fd_3		$\overline{D_{v,F3,d,situ}}$	ISO 15712-1, Eq. 21	22.3	23.3	24.3	25.5	26.7	28.1	
Path Df_3		$\overline{D_{v,D,f3,situ}}$	ISO 15712-1, Eq. 21	22.3	23.3	24.3	25.5	26.7	28.1	
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	59	78	90	90	74	71	68
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	61	73	85	90	89	90	83
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	61	73	85	90	89	90	83
Flanking STC for Junction 3				55	69	81	85	74	71	68
Junction 4 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Corridor Wall										
Velocity Level Difference										
Path Ff_4		$\overline{D_{v,F4,f4,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_4		$\overline{D_{v,F4,d,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.1	27.2	28.3	29.5	
Path Df_4		$\overline{D_{v,D,f4,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.1	27.2	28.3	29.5	
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	74	90	90	90	90	90	90
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	64	76	89	90	90	90	86
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	64	76	89	90	90	90	86
Flanking STC for Junction 4				60	73	85	85	85	85	82
ASTC due to Direct plus Flanking Transmission				42	46	54	62	68	68	**57**

Example 10: Rooms one-above-the-other

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **The internal walls are lightweight (25 gauge) steel stud walls.**
- **Gypsum board directly attached to the steel studs.**
- **The façade wall includes an infill wall with CertainTeed Type X gypsum board directly attached to the light steel studs.**
- **Walls F1 and f1 have one layer of 15.9 mm (5/8") SilentFX® QuickCut gypsum board directly fixed to the steel studs on both sides.**
- **Hallway walls have one layer of 15.9 mm CertainTeed Type X gypsum board fixed on the room side and one layer of 15.9 mm SilentFX® QuickCut gypsum board on the hall side.**

Separating floor assembly with:

- Concrete floor with mass per unit area of 345 kg/m^2 (e.g. – normal weight concrete with thickness of 150 mm) with no topping / flooring on top or ceiling lining below.

Junction 1: Cross-junction of separating floor / flanking wall with:

- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8") SilentFX® QuickCut gypsum board fixed to each side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junctions 2 and 3: T-junctions of separating floor / flanking wall with:

- An infill wall with one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm CertainTeed Type X gypsum board directly attached to the steel studs. 15.9 mm GlasRoc® Sheathing directly attached to the other side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the infill wall cavity.

Junction 4: Cross-junction of separating floor / flanking wall with:

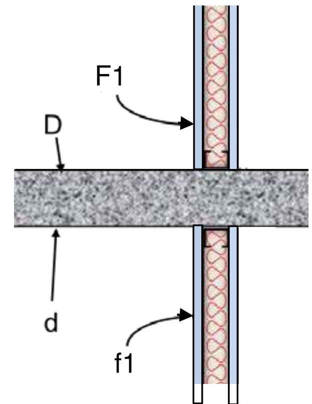
- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8") CertainTeed Type X gypsum board fixed to the room side (F4 and f4) and 15.9 mm (5/8") SilentFX® QuickCut gypsum board fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Room Parameters

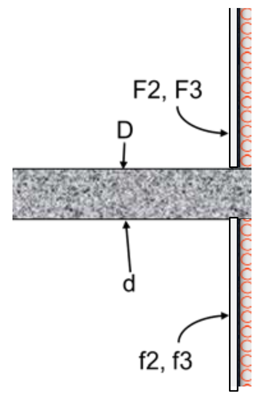
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- Walls F1, f1, F3 and f3 are 2.5 m high by 5 m wide.
- Walls F2, f2, F4 and f4 are 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the separating assembly					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	$\Sigma l_k * \alpha_k$
X-Junction 1	ISO 15712-1, Eq. 23 & E.7	31.1	20.6	20.6	(ignore)
T-Junction 2 & 3	ISO 15712-1, Eq. 23 & E.7	29.4	24.6	24.6	6.497
X-Junction 4	ISO 15712-1, Eq. 23 & E.7	32.7	24.3	24.3	(ignore)
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	

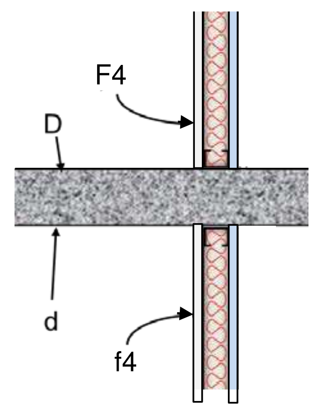
Illustrations for this case



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junction 1)



T-Junction of the separating floor of 150 mm thick concrete floor with the steel stud infill wall. Note the external cladding is not shown in the figure
(Side view of Junction 2 and 3)



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junction 4)

Example 10	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Floor of 150 mm Concrete										
Sound Transmission Loss	150 mm Concrete	TL_{Dd}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,Dd,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_D	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_d	No Lining	0	0	0	0	0	0	
Structural Reverberation Time		$T_{s,Dd,situ}$		0.216	0.154	0.108	0.073	0.049	0.031	
Equivalent Absorption Length		$a_{Dd,situ}$	ISO 15712-1, Eq. 22	16.7	16.6	16.8	17.4	18.5	20.3	
In situ Sound Transmission Loss F1		$TL_{Dd,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
Junction 1 - Cross-Junction between the 150 mm Concrete Floor and the Steel Stud Flanking Wall										
Velocity Level Difference										
Path Ff_1		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	37.1	36.1	35.1	34.1	33.1	32.1	
Path Fd_1		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.2	24.1	25.2	26.2	27.4	28.6	
Path Df_1		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	23.2	24.1	25.2	26.2	27.4	28.6	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	77	90	90	90	90	90	90
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	65	76	87	90	90	90	86
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	65	76	87	90	90	90	86
Flanking STC for Junction 1				62	73	83	85	85	85	82
Junction 2 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Façade Wall										
Velocity Level Difference										
Path Ff_2		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	25.2	24.2	23.2	22.2	21.2	20.2	
Path Fd_2		$\overline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	17.7	18.7	19.7	20.8	21.9	23.1	
Path Df_2		$\overline{D_{v,D,f2,situ}}$	ISO 15712-1, Eq. 21	17.7	18.7	19.7	20.8	21.9	23.1	
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2,f2}$	ISO 15712-1, Eq. 25b	60	79	90	90	75	72	69
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	57	69	81	87	84	89	79
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	57	69	81	87	84	89	79
Flanking STC for Junction 2				53	66	78	83	74	72	69
Junction 3 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Façade Wall										
Velocity Level Difference										
Path Ff_3		$\overline{D_{v,F3,f3,situ}}$	ISO 15712-1, Eq. 21	25.2	24.2	23.2	22.2	21.2	20.2	
Path Fd_3		$\overline{D_{v,F3,d,situ}}$	ISO 15712-1, Eq. 21	22.3	23.3	24.3	25.5	26.7	28.1	
Path Df_3		$\overline{D_{v,D,f3,situ}}$	ISO 15712-1, Eq. 21	22.3	23.3	24.3	25.5	26.7	28.1	
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	59	78	90	90	74	71	68
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	61	73	85	90	89	90	83
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	61	73	85	90	89	90	83
Flanking STC for Junction 3				55	69	81	85	74	71	68
Junction 4 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Corridor Wall										
Velocity Level Difference										
Path Ff_4		$\overline{D_{v,F4,f4,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_4		$\overline{D_{v,F4,d,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.1	27.2	28.3	29.5	
Path Df_4		$\overline{D_{v,D,f4,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.1	27.2	28.3	29.5	
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	74	90	90	90	90	90	90
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	64	76	89	90	90	90	86
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	64	76	89	90	90	90	86
Flanking STC for Junction 4				60	73	85	85	85	85	82
ASTC due to Direct plus Flanking Transmission				42	46	54	62	68	68	**57**

Example 11: Rooms one-above-the-other

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **The internal walls are lightweight (25 gauge) steel stud walls.**
- **Gypsum board directly attached to the steel studs.**
- **The façade wall includes an infill wall with CertainTeed Type X gypsum board directly attached to the light steel studs.**
- **Walls F1 and f1 have one layer of 15.9 mm (5/8”) SilentFX® QuickCut gypsum board directly fixed to the steel studs on both sides.**
- **Hallway walls have one layer of 15.9 mm SilentFX® QuickCut gypsum board fixed on the room side and one layer of 15.9 mm CertainTeed Type X gypsum board on the hall side.**

Separating floor assembly with:

- Concrete floor with mass per unit area of 345 kg/m^2 (e.g. – normal weight concrete with thickness of 150 mm) with no topping / flooring on top or ceiling lining below.

Junction 1: Cross-junction of separating floor / flanking wall with:

- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8”) SilentFX® QuickCut gypsum board fixed to each side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junctions 2 and 3: T-junctions of separating floor / flanking wall with:

- An infill wall with one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm CertainTeed Type X gypsum board directly attached to the steel studs. 15.9 mm GlasRoc® Sheathing directly attached to the other side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the infill wall cavity.

Junction 4: Cross-junction of separating floor / flanking wall with:

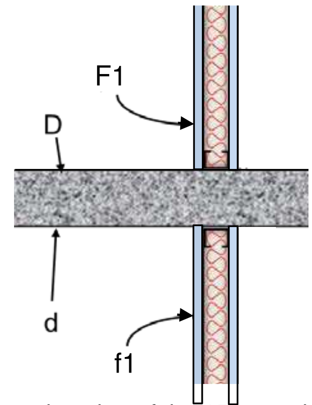
- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8") SilentFX® QuickCut gypsum board fixed to the room side (F4 and f4) and one layer of 15.9 mm (5/8") CertainTeed Type X gypsum board fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Room Parameters

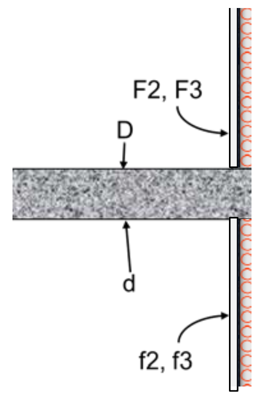
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- Walls F1, f1, F3 and f3 are 2.5 m high by 5 m wide.
- Walls F2, f2, F4 and f4 are 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the separating assembly					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	Σl_k*α_k
X-Junction 1	ISO 15712-1, Eq. 23 & E.7	31.1	20.6	20.6	(ignore)
T-Junction 2 & 3	ISO 15712-1, Eq. 23 & E.7	29.4	24.6	24.6	6.497
X-Junction 4	ISO 15712-1, Eq. 23 & E.7	32.7	24.3	24.3	(ignore)
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	

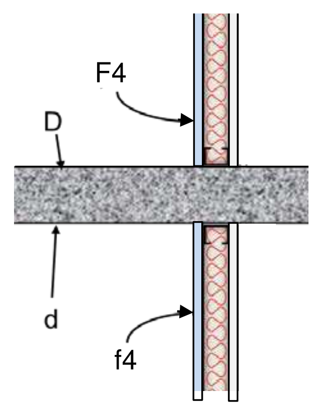
Illustrations for this case



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junction 1)



T-Junction of the separating floor of 150 mm thick concrete floor with the steel stud infill wall. Note the external cladding is not shown in the figure
(Side view of Junction 2 and 3)



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junction 4)

Example 11	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Floor of 150 mm Concrete										
Sound Transmission Loss	150 mm Concrete	TL_{Dd}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,Dd,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_D	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_d	No Lining	0	0	0	0	0	0	
Structural Reverberation Time		$T_{s,Dd,situ}$		0.216	0.154	0.108	0.073	0.049	0.031	
Equivalent Absorption Length		$a_{Dd,situ}$	ISO 15712-1, Eq. 22	16.7	16.6	16.8	17.4	18.5	20.3	
In situ Sound Transmission Loss F1		$TL_{Dd,situ}$	ISO 15712-1, Eq. 19	43	46	54	62	71	79	57
Junction 1 - Cross-Junction between the 150 mm Concrete Floor and the Steel Stud Flanking Wall										
Velocity Level Difference										
Path Ff_1		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	37.1	36.1	35.1	34.1	33.1	32.1	
Path Fd_1		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.2	24.1	25.2	26.2	27.4	28.6	
Path Df_1		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	23.2	24.1	25.2	26.2	27.4	28.6	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	77	90	90	90	90	90	90
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	65	76	87	90	90	90	86
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	65	76	87	90	90	90	86
Flanking STC for Junction 1				62	73	83	85	85	85	82
Junction 2 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Façade Wall										
Velocity Level Difference										
Path Ff_2		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	25.2	24.2	23.2	22.2	21.2	20.2	
Path Fd_2		$\overline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	17.7	18.7	19.7	20.8	21.9	23.1	
Path Df_2		$\overline{D_{v,D,f2,situ}}$	ISO 15712-1, Eq. 21	17.7	18.7	19.7	20.8	21.9	23.1	
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2,f2}$	ISO 15712-1, Eq. 25b	60	79	90	90	75	72	69
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	57	69	81	87	84	89	79
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	57	69	81	87	84	89	79
Flanking STC for Junction 2				53	66	78	83	74	72	69
Junction 3 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Façade Wall										
Velocity Level Difference										
Path Ff_3		$\overline{D_{v,F3,f3,situ}}$	ISO 15712-1, Eq. 21	25.2	24.2	23.2	22.2	21.2	20.2	
Path Fd_3		$\overline{D_{v,F3,d,situ}}$	ISO 15712-1, Eq. 21	22.3	23.3	24.3	25.5	26.7	28.1	
Path Df_3		$\overline{D_{v,D,f3,situ}}$	ISO 15712-1, Eq. 21	22.3	23.3	24.3	25.5	26.7	28.1	
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	59	78	90	90	74	71	68
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	61	73	85	90	89	90	83
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	61	73	85	90	89	90	83
Flanking STC for Junction 3				55	69	81	85	74	71	68
Junction 4 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Corridor Wall										
Velocity Level Difference										
Path Ff_4		$\overline{D_{v,F4,f4,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_4		$\overline{D_{v,F4,d,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.1	27.2	28.3	29.5	
Path Df_4		$\overline{D_{v,D,f4,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.1	27.2	28.3	29.5	
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	78	90	90	90	90	90	90
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	66	77	88	90	90	90	87
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	66	77	88	90	90	90	87
Flanking STC for Junction 4				63	74	84	85	85	85	83
ASTC due to Direct plus Flanking Transmission				42	46	54	62	68	68	**57**

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3.3 Side-by-Side Rooms: Rooms with Heavy Concrete / Masonry Façades

Example Number	ASTC Rating	Construction				
		Demising Wall between Dwellings		Demising Wall between the Dwelling and the Hallway		Heavy Facade
		Room 1	Room 2	Room Side	Hall Side	
12	49	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	No Lining
13	47	"	One layer of 15.9 mm CertainTeed Type X gypsum board	"	One layer of 15.9 mm CertainTeed Type X gypsum board	"
14	47	"	"	One layer of 15.9 mm CertainTeed Type X gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	"
15	48	"	One layer of 15.9 mm SilentFX® QuickCut gypsum board	"	"	"
16	48	"	"	One layer of 15.9 mm SilentFX® QuickCut gypsum board	"	"

Example 12: Rooms side-by-side - Non-loadbearing Separating Wall

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **Heavy concrete or masonry façade.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly attached to the steel studs.**
- **One layer of 15.9 mm (5/8”) CertainTeed SilentFX® QuickCut gypsum board directly fixed to each side of the steel stud walls.**

Separating wall assembly (non-loadbearing) with:

- One layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to each side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junction 1: Cross-junction of the separating wall with the floor:

- Concrete floor slab with a mass per unit area of 345 kg/m^2 (e.g. - normal weight concrete with thickness of 150 mm) with no topping or flooring.

Junction 2: T-junction of the separating wall with perimeter side wall with:

- Abutting wall of concrete blocks with a mass per unit area of 238 kg/m^2 (e.g. 190 mm hollow blocks with normal weight aggregate[1]).
- No lining on the façade walls.

Junction 3: Cross-junction of the separating wall with the ceiling:

- Concrete ceiling slab with a mass per unit area of 345 kg/m^2 (e.g. - normal weight concrete with thickness of 150 mm) with no attached ceiling.

Junction 4: T-junction of the separating wall with the corridor wall with:

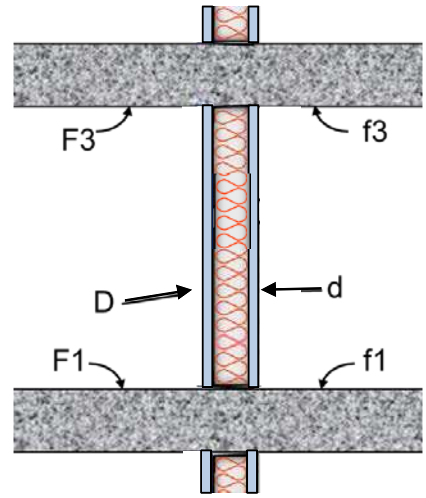
- Abutting corridor wall with non-loadbearing 25 gauge steel studs and all construction details the same as the separating wall.

Room Parameters

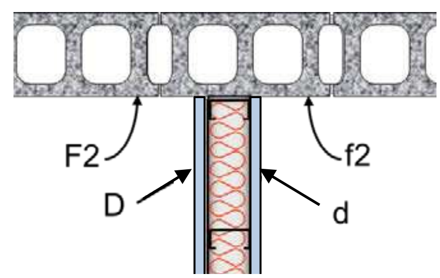
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- The separating wall is 2.5 m high by 5 m wide.
- The flanking walls 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the flanking elements F and f at Junctions 1 & 3 (Extended Concrete floor and ceiling)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	Σl_k*α_κ
X-Junction 1 or 3	ISO 15712-1, Eq. 23 & E.7	-5.5	20.6	20.6	(ignore)
T-Junction 2	ISO 15712-1, Eq. 23 & E.7	-5.0	18.9	18.9	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	
For flanking elements F2 and f2 (Masonry Façade)					
internal loss η_i = 0.015		c_L = 3500			
mass per unit area (kg/m^2) = 238		f_c = 98			
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.089	(at 500 Hz)	

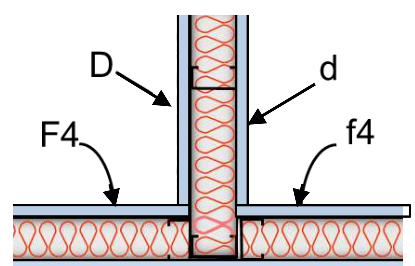
Illustrations for this case



Junction of steel stud separating wall with 150 mm thick concrete floor and ceiling. (Side view of Junctions 1 and 3)



Junction of separating wall with the heavy weight façade wall. (Plan view of Junction 2)



Junction of separating wall with flanking corridor wall framed with steel studs. (Plan view of Junction 4)

Example 12	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Wall										
Sound Transmission Loss		TL_{Dd}	TLA-17-018	26	43	56	64	69	67	50
Junction 1 - Cross-Junction between the Common Wall and the 150 mm Concrete Floor										
Sound Transmission Loss	150 mm Concrete	TL_{F1}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,F1,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_{F1}	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_{f1}	No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time		$T_{s,F1,situ}$		0.176	0.122	0.085	0.056	0.038	0.025	
Equivalent Absorption Length		$a_{F1,situ}$	ISO 15712-1, Eq. 22	20.5	20.9	21.3	22.6	23.8	25.5	
In situ Sound Transmission Loss F1		$TL_{F1,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
In situ Sound Transmission Loss f1		$TL_{f1,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
Velocity Level Difference										
Path Ff		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	3.1	3.2	3.3	3.6	3.8	4.1	
Path Fd		$\underline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.7	24.7	25.6	26.8	27.9	29.0	
Path Df		$D_{v,D,f1,situ}$	ISO 15712-1, Eq. 21	23.7	24.7	25.6	26.8	27.9	29.0	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	45	48	56	66	74	82	59
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking STC for Junction 1				45	48	56	66	74	81	59
Junction 2 - T-Junction between the Common Wall and the Concrete Masonry Flanking Wall										
Sound Transmission Loss	190 mm Block	TL_{F2}	RR-334, NRC Mean BLK190(NW)	35	38	44	50	58	62	49
Structural Reverberation Time		$T_{s,F2,lab}$	Laboratory Measured	0.299	0.191	0.119	0.072	0.042	0.024	
Change by a lining on F2	No Lining	ΔTL_{F2}	No Lining	0	0	0	0	0	0	
Change by a lining on f2	No Lining	ΔTL_{f2}	No Lining	0	0	0	0	0	0	
Flanking Elements F2 and f2: In-situ Data										
Structural Reverberation Time		$T_{s,F2,situ}$	ISO 15712-1, Eq. C.1-C.3	0.105	0.072	0.049	0.032	0.021	0.013	
Equivalent Absorption Length		$a_{F2,situ}$	ISO 15712-1, Eq. 22	17.3	17.8	18.6	19.8	21.5	24.1	
In situ Sound Transmission Loss F2		$TL_{F2.situ}$	ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
In situ Sound Transmission Loss f2		$TL_{f2,situ}$	ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
Velocity Level Difference										
Path Ff		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	5.4	5.5	5.7	6.0	6.4	6.8	
Path Fd		$\underline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	24.7	25.7	26.7	27.9	29.1	30.3	
Path Df		$D_{v,D,f2,situ}$	ISO 15712-1, Eq. 21	24.7	25.7	26.7	27.9	29.1	30.3	
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2.f2}$	ISO 15712-1, Eq. 25b	46	48	55	60	68	73	59
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	64	75	85	90	90	90	86
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	64	75	85	90	90	90	86
Flanking STC for Junction 2				46	48	55	60	68	73	59
Junction 3 - Cross-Junction between the Common Wall and the 150 mm Concrete Ceiling										
All values are the same as for Junction 1 with the exeption of the linings										
Change by a lining on F3	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f3	No Lining		No Lining	0	0	0	0	0	0	
Flanking Transmission Loss										
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	45	48	56	66	74	82	59
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking STC for Junction 3				45	48	56	66	74	81	59
Junction 4 - T-Junction between the Common Wall and the Steel Stud Corridor Wall										
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	56	77	90	90	84	82	80
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	61	77	90	90	86	84	83
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	61	77	90	90	86	84	83
Flanking STC for Junction 4				54	72	85	85	80	78	78
ASTC due to Direct plus Flanking Transmission				26	40	50	57	64	65	**49**

Example 13: Rooms side-by-side - Non-loadbearing Separating Wall

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **Heavy concrete or masonry façade.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly attached to the steel studs.**
- **The non-load bearing walls include either one layer of 15.9 mm SilentFX® QuickCut gypsum board or one layer of 15.9 mm CertainTeed Type X gypsum board.**

Separating wall assembly (non-loadbearing) with:

- One layer 15.9 mm SilentFX® QuickCut gypsum board fixed to the steel studs on one side (D) and one layer 15.9 mm CertainTeed Type X gypsum board fixed to the other side (d).
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junction 1: Cross-junction of the separating wall with the floor:

- Concrete floor slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no topping or flooring.

Junction 2: T-junction of the separating wall with perimeter side wall with:

- Abutting wall of concrete blocks with a mass per unit area of 238 kg/m^2 (e.g. 190 mm hollow blocks with normal weight aggregate[1]).
- No lining on the façade walls.

Junction 3: Top Junction (separating wall / ceiling) with:

- Concrete ceiling slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no attached ceiling.

Junction 4: T-junction of the separating wall with the corridor wall with:

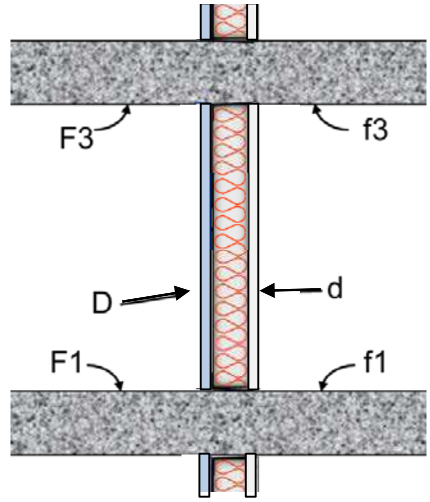
- One layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to the steel studs on the room side (F4 and f4) and one layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the corridor side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Room Parameters

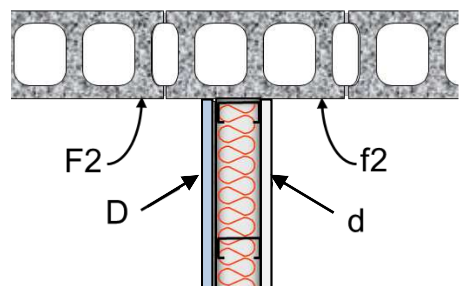
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- The separating wall is 2.5 m high by 5 m wide.
- The flanking walls 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the flanking elements F and f at Junctions 1 & 3 (Extended Concrete floor and ceiling)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	Σl_k*α_κ
X-Junction 1 or 3	ISO 15712-1, Eq. 23 & E.7	-5.6	21.0	21.0	(ignore)
T-Junction 2	ISO 15712-1, Eq. 23 & E.7	-5.2	19.4	19.4	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	
For flanking elements F2 and f2 (Masonry Façade)					
internal loss η_i = 0.015		c_L = 3500			
mass per unit area (kg/m^2) = 238		f_c = 98			
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.089	(at 500 Hz)	

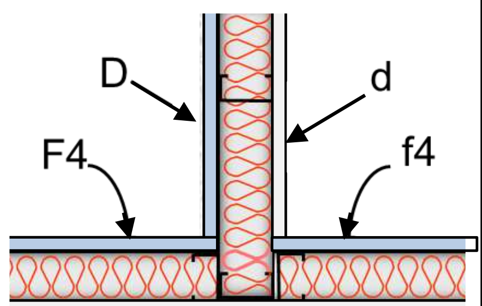
Illustrations for this case



Junction of steel stud separating wall with 150 mm thick concrete floor and ceiling. (Side view of Junctions 1 and 3)



Junction of separating wall with the heavy weight façade wall. (Plan view of Junction 2)



Junction of separating wall with flanking corridor wall framed with steel studs. (Plan view of Junction 4)

Example 13	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Wall										
Sound Transmission Loss		TL_{Dd}	TLA-17-031	25	42	55	63	58	58	49
Junction 1 - Cross-Junction between the Common Wall and the 150 mm Concrete Floor										
Sound Transmission Loss	150 mm Concrete	TL_{F1}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,F1,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_{F1}	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_{f1}	No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time		$T_{s,F1,situ}$		0.176	0.122	0.084	0.057	0.038	0.025	
Equivalent Absorption Length		$a_{F1,situ}$	ISO 15712-1, Eq. 22	20.6	20.9	21.5	22.4	23.8	25.8	
In situ Sound Transmission Loss F1		$TL_{F1,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
In situ Sound Transmission Loss f1		$TL_{f1,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
Velocity Level Difference										
Path Ff		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	0.5	0.6	0.7	0.9	1.2	1.5	
Path Fd		$D_{v,F1,d,situ}$	ISO 15712-1, Eq. 21	24.1	25.1	26.2	27.2	28.4	29.5	
Path Df		$D_{v,D,f1,situ}$	ISO 15712-1, Eq. 21	24.1	25.1	26.2	27.2	28.4	29.5	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	42	46	54	63	71	79	57
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	62	74	87	90	90	90	84
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking STC for Junction 1				42	46	54	63	71	78	57
Junction 2 - T-Junction between the Common Wall and the Concrete Masonry Flanking Wall										
Sound Transmission Loss	190 mm Block	TL_{F2}	RR-334, NRC Mean BLK190(NW)	35	38	44	50	58	62	49
Structural Reverberation Time		$T_{s,F2,lab}$	Laboratory Measured	0.299	0.191	0.119	0.072	0.042	0.024	
Change by a lining on F2	No Lining	ΔTL_{F2}	No Lining	0	0	0	0	0	0	
Change by a lining on f2	No Lining	ΔTL_{f2}	No Lining	0	0	0	0	0	0	
Flanking Elements F2 and f2: In-situ Data										
Structural Reverberation Time		$T_{s,F2,situ}$	ISO 15712-1, Eq. C.1-C.3	0.105	0.072	0.049	0.032	0.021	0.013	
Equivalent Absorption Length		$a_{F2,situ}$	ISO 15712-1, Eq. 22	17.3	17.8	18.6	19.8	21.5	24.1	
In situ Sound Transmission Loss F2		$TL_{F2,situ}$	ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
In situ Sound Transmission Loss f2		$TL_{f2,situ}$	ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
Velocity Level Difference										
Path Ff		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	3.2	3.3	3.5	3.8	4.1	4.6	
Path Fd		$D_{v,F2,d,situ}$	ISO 15712-1, Eq. 21	25.1	26.1	27.2	28.4	29.5	30.8	
Path Df		$D_{v,D,f2,situ}$	ISO 15712-1, Eq. 21	25.1	26.1	27.2	28.4	29.5	30.8	
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2.f2}$	ISO 15712-1, Eq. 25b	44	46	52	58	66	71	57
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	62	74	86	90	90	90	85
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	64	75	85	90	90	90	86
Flanking STC for Junction 2				44	46	52	58	66	71	57
Junction 3 - Cross-Junction between the Common Wall and the 150 mm Concrete Ceiling										
All values are the same as for Junction 1 with the exeption of the linings										
Change by a lining on F3	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f3	No Lining		No Lining	0	0	0	0	0	0	
Flanking Transmission Loss										
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	42	46	54	63	71	79	57
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	62	74	87	90	90	90	84
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking STC for Junction 3				42	46	54	63	71	78	57
Junction 4 - T-Junction between the Common Wall and the Steel Stud Corridor Wall										
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	55	77	90	90	73	73	70
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	58	76	90	90	76	75	71
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	60	77	90	90	75	75	72
Flanking STC for Junction 4				52	72	85	85	70	69	66
ASTC due to Direct plus Flanking Transmission				25	39	47	55	57	57	**47**

Example 14: Rooms side-by-side - Non-loadbearing Separating Wall

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **Heavy concrete or masonry façade.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly attached to the steel studs.**
- **The non-load bearing walls include either one layer of 15.9 mm SilentFX® QuickCut gypsum board or one layer of 15.9 mm CertainTeed Type X gypsum board.**

Separating wall assembly (non-loadbearing) with:

- One layer 15.9 mm SilentFX® QuickCut gypsum board fixed to the steel studs on one side (D) and one layer 15.9 mm CertainTeed Type X gypsum board fixed to the other side (d).
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junction 1: Cross-junction of the separating wall with the floor:

- Concrete floor slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no topping or flooring.

Junction 2: T-junction of the separating wall with perimeter side wall with:

- Abutting wall of concrete blocks with a mass per unit area of 238 kg/m^2 (e.g. 190 mm hollow blocks with normal weight aggregate[1]).
- No lining on the façade walls.

Junction 3: Cross-junction of the separating wall with the ceiling:

- Concrete ceiling slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no attached ceiling.

Junction 4: T-junction of the separating wall with the corridor wall:

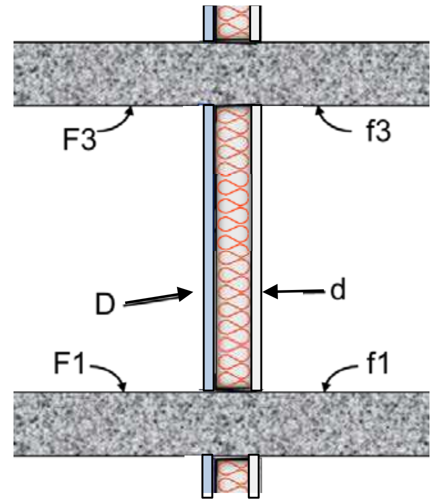
- One layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the steel studs on the room side (F4 and f4) and one layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to the corridor side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Room Parameters

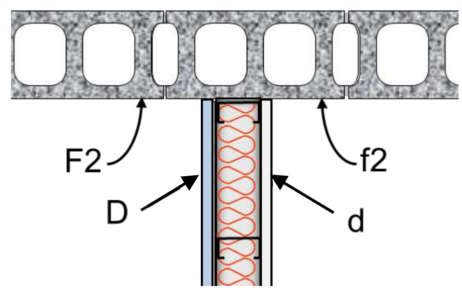
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- The separating wall is 2.5 m high by 5 m wide.
- The flanking walls 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the flanking elements F and f at Junctions 1 & 3 (Extended Concrete floor and ceiling)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	$\Sigma l_k{*}\alpha_k$
X-Junction 1 or 3	ISO 15712-1, Eq. 23 & E.7	-5.6	21.0	21.0	(ignore)
T-Junction 2	ISO 15712-1, Eq. 23 & E.7	-5.2	19.4	19.4	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	
For flanking elements F2 and f2 (Masonry Façade)					
internal loss η_i = 0.015		c_L = 3500			
mass per unit area (kg/m^2) = 238		f_c = 98			
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.089	(at 500 Hz)	

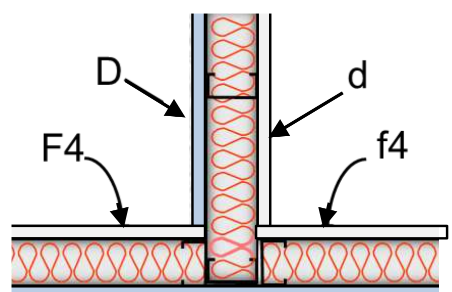
Illustrations for this case



Junction of steel stud separating wall with 150 mm thick concrete floor and ceiling. (Side view of Junctions 1 and 3)



Junction of separating wall with the heavy weight façade wall. (Plan view of Junction 2)



Junction of separating wall with flanking corridor wall framed with steel studs. (Plan view of Junction 4)

Example 14	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Wall										
Sound Transmission Loss		TL_{Dd}	TLA-17-031	25	42	55	63	58	58	49
Junction 1 - Cross-Junction between the Common Wall and the 150 mm Concrete Floor										
Sound Transmission Loss	150 mm Concrete	TL_{F1}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,F1,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_{F1}	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_{f1}	No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time		$T_{s,F1,situ}$		0.176	0.122	0.084	0.057	0.038	0.025	
Equivalent Absorption Length		$a_{F1,situ}$	ISO 15712-1, Eq. 22	20.6	20.9	21.5	22.4	23.8	25.8	
In situ Sound Transmission Loss F1		$TL_{F1,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
In situ Sound Transmission Loss f1		$TL_{f1,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
Velocity Level Difference										
Path Ff		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	0.5	0.6	0.7	0.9	1.2	1.5	
Path Fd		$\underline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.2	27.2	28.4	29.5	
Path Df		$D_{v,D,f1,situ}$	ISO 15712-1, Eq. 21	24.1	25.1	26.2	27.2	28.4	29.5	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	42	46	54	63	71	79	57
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	62	74	87	90	90	90	84
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking STC for Junction 1				42	46	54	63	71	78	57
Junction 2 - T-Junction between the Common Wall and the Concrete Masonry Flanking Wall										
Sound Transmission Loss	190 mm Block	TL_{F2}	RR-334, NRC Mean BLK190(NW)	35	38	44	50	58	62	49
Structural Reverberation Time		$T_{s,F2,lab}$	Laboratory Measured	0.299	0.191	0.119	0.072	0.042	0.024	
Change by a lining on F2	No Lining	ΔTL_{F2}	No Lining	0	0	0	0	0	0	
Change by a lining on f2	No Lining	ΔTL_{f2}	No Lining	0	0	0	0	0	0	
Flanking Elements F2 and f2: In-situ Data										
Structural Reverberation Time		$T_{s,F2,situ}$	ISO 15712-1, Eq. C.1-C.3	0.105	0.072	0.049	0.032	0.021	0.013	
Equivalent Absorption Length		$a_{F2,situ}$	ISO 15712-1, Eq. 22	17.3	17.8	18.6	19.8	21.5	24.1	
In situ Sound Transmission Loss F2		$TL_{F2.situ}$	ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
In situ Sound Transmission Loss f2		$TL_{f2,situ}$	ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
Velocity Level Difference										
Path Ff		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	3.2	3.3	3.5	3.8	4.1	4.6	
Path Fd		$\underline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	25.1	26.1	27.2	28.4	29.5	30.8	
Path Df		$D_{v,D,f2,situ}$	ISO 15712-1, Eq. 21	25.1	26.1	27.2	28.4	29.5	30.8	
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2.f2}$	ISO 15712-1, Eq. 25b	44	46	52	58	66	71	57
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	62	74	86	90	90	90	85
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	64	75	85	90	90	90	86
Flanking STC for Junction 2				44	46	52	58	66	71	57
Junction 3 - Cross-Junction between the Common Wall and the 150 mm Concrete Ceiling										
All values are the same as for Junction 1 with the exeption of the linings										
Change by a lining on F3	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f3	No Lining		No Lining	0	0	0	0	0	0	
Flanking Transmission Loss										
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	42	46	54	63	71	79	57
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	62	74	87	90	90	90	84
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking STC for Junction 3				42	46	54	63	71	78	57
Junction 4 - T-Junction between the Common Wall and the Steel Stud Corridor Wall										
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	51	74	90	90	74	73	70
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	56	74	90	90	76	75	71
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	58	76	90	90	76	75	71
Flanking STC for Junction 4				49	70	85	85	70	69	66
ASTC due to Direct plus Flanking Transmission				25	39	47	55	57	57	**47**

Example 15: Rooms side-by-side - Non-loadbearing Separating Wall

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **Heavy concrete or masonry façade.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly attached to the steel studs.**
- **The non-load bearing walls include either one layer of 15.9 mm SilentFX® QuickCut gypsum board or one layer of 15.9 mm CertainTeed Type X gypsum board.**

Separating wall assembly (non-loadbearing) with:
- One layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to each side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junction 1: Cross-junction of the separating wall with the floor:
- Concrete floor slab with a mass per unit area of 345 kg/m2 (e.g. -normal weight concrete with thickness of 150 mm) with no topping or flooring.

Junction 2: T-junction of the separating wall with perimeter side wall with:
- Abutting wall of concrete blocks with a mass per unit area of 238 kg/m^2 (e.g. 190 mm hollow blocks with normal weight aggregate[1]).
- No lining on the façade walls..

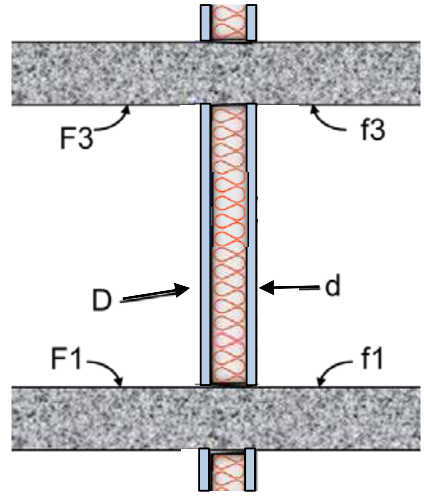
Junction 3: Cross-junction of the separating wall with the ceiling:
- Concrete ceiling slab with a mass per unit area of 345 kg/m2 (e.g. -normal weight concrete with thickness of 150 mm) with no attached ceiling.

Junction 4: T-junction of the separating wall with the corridor wall:
- One layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the steel studs on the room side (F4 and f4) and one layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to the corridor side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

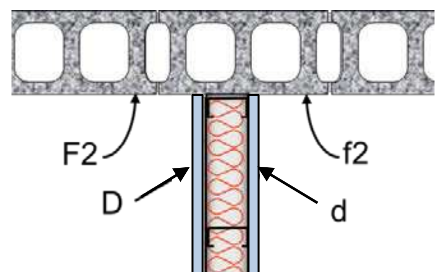
Room Parameters
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- The separating wall is 2.5 m high by 5 m wide.
- The flanking walls 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the flanking elements F and f at Junctions 1 & 3 (Extended Concrete floor and ceiling)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	$\Sigma l\_k*\alpha\_k$
X-Junction 1 or 3	ISO 15712-1, Eq. 23 & E.7	-5.5	20.6	20.6	(ignore)
T-Junction 2	ISO 15712-1, Eq. 23 & E.7	-5.0	18.9	18.9	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	
For flanking elements F2 and f2 (Masonry Façade)					
internal loss η_i = 0.015		c_L = 3500			
mass per unit area (kg/m^2) = 238		f_c = 98			
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.089	(at 500 Hz)	

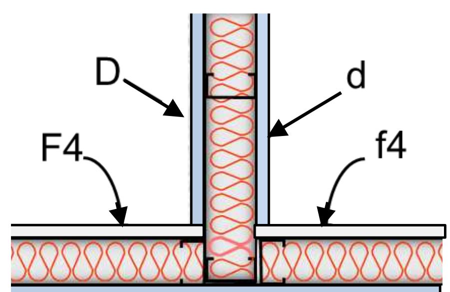
Illustrations for this case



Junction of steel stud separating wall with 150 mm thick concrete floor and ceiling. (Side view of Junctions 1 and 3)



Junction of separating wall with the heavy weight façade wall. (Plan view of Junction 2)



Junction of separating wall with flanking corridor wall framed with steel studs. (Plan view of Junction 4)

Example 15	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Wall										
Sound Transmission Loss		TL_{Dd}	TLA-17-018	26	43	56	64	69	67	50
Junction 1 - Cross-Junction between the Common Wall and the 150 mm Concrete Floor										
Sound Transmission Loss	150 mm Concrete	TL_{F1}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,F1,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_{F1}	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_{f1}	No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time		$T_{s,F1,situ}$		0.176	0.122	0.084	0.057	0.038	0.025	
Equivalent Absorption Length		$a_{F1,situ}$	ISO 15712-1, Eq. 22	20.6	20.9	21.5	22.4	23.8	25.8	
In situ Sound Transmission Loss F1		$TL_{F1,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
In situ Sound Transmission Loss f1		$TL_{f1,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
Velocity Level Difference										
Path Ff		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	0.6	0.7	0.8	1.0	1.2	1.6	
Path Fd		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.6	24.7	25.7	26.8	27.9	29.1	
Path Df		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	23.6	24.7	25.7	26.8	27.9	29.1	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	43	46	54	63	71	80	57
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking STC for Junction 1				43	46	54	63	71	79	57
Junction 2 - T-Junction between the Common Wall and the Concrete Masonry Flanking Wall										
Sound Transmission Loss	190 mm Block	TL_{F2}	RR-334, NRC Mean BLK190(NW)	35	38	44	50	58	62	49
Structural Reverberation Time		$T_{s,F2,lab}$	Laboratory Measured	0.299	0.191	0.119	0.072	0.042	0.024	
Change by a lining on F2	No Lining	ΔTL_{F2}	No Lining	0	0	0	0	0	0	
Change by a lining on f2	No Lining	ΔTL_{f2}	No Lining	0	0	0	0	0	0	
Flanking Elements F2 and f2: In-situ Data										
Structural Reverberation Time		$T_{s,F2,situ}$	ISO 15712-1, Eq. C.1-C.3	0.105	0.072	0.049	0.032	0.021	0.013	
Equivalent Absorption Length		$a_{F2,situ}$	ISO 15712-1, Eq. 22	17.3	17.8	18.6	19.8	21.5	24.1	
In situ Sound Transmission Loss F2		$TL_{F2.situ}$	ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
In situ Sound Transmission Loss f2		$TL_{f2,situ}$	ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
Velocity Level Difference										
Path Ff		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	3.3	3.5	3.7	3.9	4.3	4.8	
Path Fd		$\overline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	24.6	25.7	26.8	27.9	29.1	30.3	
Path Df		$\overline{D_{v,D,f2,situ}}$	ISO 15712-1, Eq. 21	24.6	25.7	26.8	27.9	29.1	30.3	
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2.f2}$	ISO 15712-1, Eq. 25b	44	46	53	58	66	71	57
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	64	75	85	90	90	90	86
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	64	75	85	90	90	90	86
Flanking STC for Junction 2				44	46	53	58	66	71	57
Junction 3 - Cross-Junction between the Common Wall and the 150 mm Concrete Ceiling										
All values are the same as for Junction 1 with the exeption of the linings										
Change by a lining on F3	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f3	No Lining		No Lining	0	0	0	0	0	0	
Flanking Transmission Loss										
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	43	46	54	63	71	80	57
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking STC for Junction 3				43	46	54	63	71	79	57
Junction 4 - T-Junction between the Common Wall and the Steel Stud Corridor Wall										
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	51	74	90	90	74	73	70
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	58	76	90	90	81	79	78
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	58	76	90	90	81	79	78
Flanking STC for Junction 4				50	70	85	85	73	71	69
ASTC due to Direct plus Flanking Transmission				25	39	48	55	62	64	**48**

Example 16: Rooms side-by-side - Non-loadbearing Separating Wall

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **Heavy concrete or masonry façade.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly attached to the steel studs.**
- **The non-load bearing walls include either one layer of 15.9 mm SilentFX® QuickCut gypsum board or one layer of 15.9 mm CertainTeed Type X gypsum board.**

Separating wall assembly (non-loadbearing) with:

- One layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to each side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junction 1: Cross-junction of the separating wall with the floor:

- Concrete floor slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no topping or flooring.

Junction 2: T-junction of the separating wall with perimeter side wall with:

- Abutting wall of concrete blocks with a mass per unit area of 238 kg/m^2 (e.g. 190 mm hollow blocks with normal weight aggregate[1]).
- No lining on the façade walls.

Junction 3: Cross-junction of the separating wall with the ceiling:

- Concrete ceiling slab with a mass per unit area of 345 kg/m2 (e.g. - normal weight concrete with thickness of 150 mm) with no attached ceiling.

Junction 4: T-junction of the separating wall with the corridor wall:

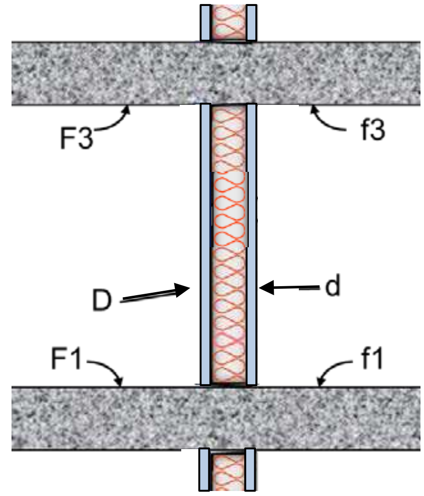
- One layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to the steel studs on the room side (F4 and f4) and one layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the corridor side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Room Parameters

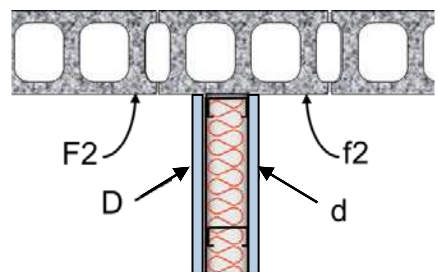
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- The separating wall is 2.5 m high by 5 m wide.
- The flanking walls 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the flanking elements F and f at Junctions 1 & 3 (Extended Concrete floor and ceiling)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	$\Sigma l_k \cdot \alpha_k$
X-Junction 1 or 3	ISO 15712-1, Eq. 23 & E.7	-5.5	20.6	20.6	(ignore)
T-Junction 2	ISO 15712-1, Eq. 23 & E.7	-5.0	18.9	18.9	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	
For flanking elements F2 and f2 (Masonry Façade)					
internal loss η_i = 0.015		c_L = 3500			
mass per unit area (kg/m^2) = 238		f_c = 98			
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.089	(at 500 Hz)	

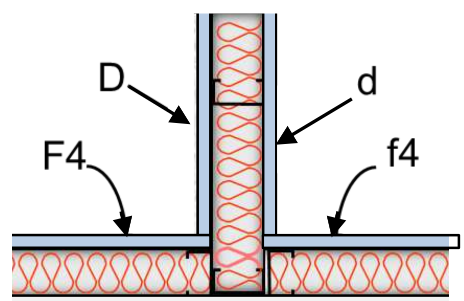
Illustrations for this case



Junction of steel stud separating wall with 150 mm thick concrete floor and ceiling. (Side view of Junctions 1 and 3)



Junction of separating wall with the heavy weight façade wall. (Plan view of Junction 2)



Junction of separating wall with flanking corridor wall framed with steel studs. (Plan view of Junction 4)

Example 16	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Wall										
Sound Transmission Loss		TL_{Dd}	TLA-17-018	26	43	56	64	69	67	50
Junction 1 - Cross-Junction between the Common Wall and the 150 mm Concrete Floor										
Sound Transmission Loss	150 mm Concrete	TL_{F1}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,F1,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_{F1}	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_{f1}	No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time		$T_{s,F1,situ}$		0.176	0.122	0.084	0.057	0.038	0.025	
Equivalent Absorption Length		$a_{F1,situ}$	ISO 15712-1, Eq. 22	20.6	20.9	21.5	22.4	23.8	25.8	
In situ Sound Transmission Loss F1		$TL_{F1,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
In situ Sound Transmission Loss f1		$TL_{f1,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
Velocity Level Difference										
Path Ff		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	0.6	0.7	0.8	1.0	1.2	1.6	
Path Fd		$D_{v,F1,d,situ}$	ISO 15712-1, Eq. 21	23.6	24.7	25.7	26.8	27.9	29.1	
Path Df		$D_{v,D,f1,situ}$	ISO 15712-1, Eq. 21	23.6	24.7	25.7	26.8	27.9	29.1	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	43	46	54	63	71	80	57
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking STC for Junction 1				43	46	54	63	71	79	57
Junction 2 - T-Junction between the Common Wall and the Concrete Masonry Flanking Wall										
Sound Transmission Loss	190 mm Block	TL_{F2}	RR-334, NRC Mean BLK190(NW)	35	38	44	50	58	62	49
Structural Reverberation Time		$T_{s,F2,lab}$	Laboratory Measured	0.299	0.191	0.119	0.072	0.042	0.024	
Change by a lining on F2	No Lining	ΔTL_{F2}	No Lining	0	0	0	0	0	0	
Change by a lining on f2	No Lining	ΔTL_{f2}	No Lining	0	0	0	0	0	0	
Flanking Elements F2 and f2: In-situ Data										
Structural Reverberation Time		$T_{s,F2,situ}$	ISO 15712-1, Eq. C.1-C.3	0.105	0.072	0.049	0.032	0.021	0.013	
Equivalent Absorption Length		$a_{F2,situ}$	ISO 15712-1, Eq. 22	17.3	17.8	18.6	19.8	21.5	24.1	
In situ Sound Transmission Loss F2		$TL_{F2,situ}$	ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
In situ Sound Transmission Loss f2		$TL_{f2,situ}$	ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
Velocity Level Difference										
Path Ff		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	3.3	3.5	3.7	3.9	4.3	4.8	
Path Fd		$D_{v,F2,d,situ}$	ISO 15712-1, Eq. 21	24.6	25.7	26.8	27.9	29.1	30.3	
Path Df		$D_{v,D,f2,situ}$	ISO 15712-1, Eq. 21	24.6	25.7	26.8	27.9	29.1	30.3	
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2.f2}$	ISO 15712-1, Eq. 25b	44	46	53	58	66	71	57
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	64	75	85	90	90	90	86
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	64	75	85	90	90	90	86
Flanking STC for Junction 2				44	46	53	58	66	71	57
Junction 3 - Cross-Junction between the Common Wall and the 150 mm Concrete Ceiling										
All values are the same as for Junction 1 with the exeption of the linings										
Change by a lining on F3	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f3	No Lining		No Lining	0	0	0	0	0	0	
Flanking Transmission Loss										
Flanking TL for Path Ff_3		$TL_{F3,f3}$	ISO 15712-1, Eq. 25a	43	46	54	63	71	80	57
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	64	75	86	90	90	90	86
Flanking STC for Junction 3				43	46	54	63	71	79	57
Junction 4 - T-Junction between the Common Wall and the Steel Stud Corridor Wall										
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	55	77	90	90	73	73	70
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	60	77	90	90	81	79	78
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	60	77	90	90	81	79	78
Flanking STC for Junction 4				53	72	85	85	72	71	69
ASTC due to Direct plus Flanking Transmission				25	39	48	55	62	64	**48**

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3.4 One-above-the-Other Rooms: Rooms with Heavy Concrete / Masonry Façades

Example Number	ASTC Rating	Construction				
		Demising Wall between Dwellings		Demising Wall between the Dwelling and the Hallway		Heavy Facade
		Room Side	Opposite Side	Room Side	Opposite Side	
17	56	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	No Lining
18	56	"	One layer of 15.9 mm CertainTeed Type X gypsum board	"	One layer of 15.9 mm CertainTeed Type X gypsum board	"
19	56	"	"	One layer of 15.9 mm CertainTeed Type X gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	"
20	56	One layer of 15.9 mm CertainTeed Type X gypsum board	One layer of 15.9 mm SilentFX® QuickCut gypsum board	"	One layer of 15.9 mm CertainTeed Type X gypsum board	"
21	56	One layer of 15.9 mm SilentFX® QuickCut gypsum board	"	"	"	"
22	56	"	"	One layer of 15.9 mm SilentFX® QuickCut gypsum board	One layer of 15.9 mm CertainTeed Type X gypsum board	"

Example 17: Rooms one-above-the-other

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **Heavy concrete or masonry façade.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly attached to the steel studs.**
- **One layer of 15.9 mm (5/8") CertainTeed SilentFX® QuickCut gypsum board directly fixed to each side of the steel stud walls.**

Separating floor assembly with:

- Concrete floor with mass per unit area of 345 kg/m^2 (e.g. – normal weight concrete with thickness of 150 mm) with no topping / flooring on top or ceiling lining below.

Junctions 1 and 4: Cross-junction of separating floor / flanking wall with:

- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8") SilentFX® QuickCut gypsum board fixed to each side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junctions 2 and 3: T-junctions of separating floor / flanking wall with:

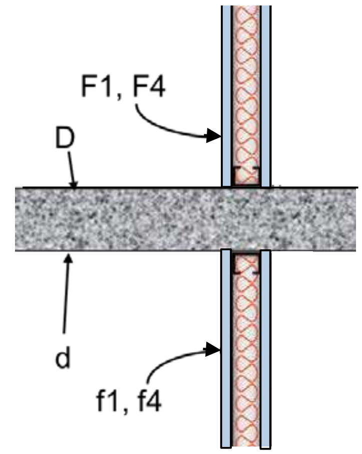
- Rigid mortared T-junctions with perimeter concrete block façade wall assemblies.
- The walls above and below the floor are one wythe of concrete blocks with a mass per unit area of 238 kg/m^2 (e.g. 190 mm hollow blocks with normal weight aggregate)[1].
- No lining on the façade walls.

Room Parameters

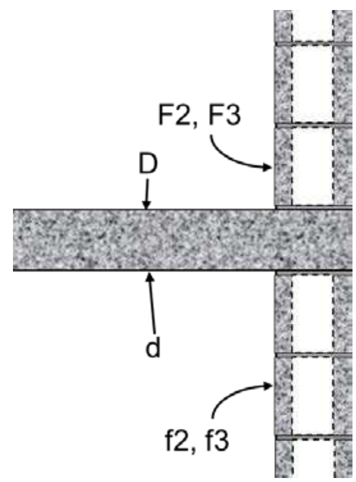
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- Walls F1, f1, F3 and f3 are 2.5 m high by 5 m wide.
- Walls F2, f2, F4 and f4 are 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the separating assembly (Extended concrte floor surface)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	$\Sigma l_k \cdot \alpha_k$
X-Junction 1 & 4	ISO 15712-1, Eq. 23 & E.7	31.1	20.6	20.6	(ignore)
T-Junction 2 & 3	ISO 15712-1, Eq. 23 & E.7	8.1	5.8	5.8	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	
For flanking elements F2, f2, F3 and f3 (Masonry Façade)					
internal loss η_i = 0.015		c_L = 3500			
mass per unit area (kg/m^2) = 238		f_c = 98			
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.089	(at 500 Hz)	

Illustrations for this case



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls. (Side view of Junctions 1 and 4)



T-Junction of a 150 mm thick concrete floor with a 190 mm concrete block wall. (Side view of Junction 2 and 3)

Example 17	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Floor of 150 mm Concrete										
Sound Transmission Loss	150 mm Concrete	TL_{Dd}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,Dd,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_D	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_d	No Lining	0	0	0	0	0	0	
Structural Reverberation Time		$T_{s,Dd,situ}$		0.176	0.122	0.085	0.056	0.038	0.025	
Equivalent Absorption Length		$a_{Dd,situ}$	ISO 15712-1, Eq. 22	20.5	20.9	21.3	22.6	23.8	25.5	
In situ Sound Transmission Loss F1		$TL_{Dd,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
Junction 1 - Cross-Junction between the 150 mm Concrete Floor and a Steel Stud Flanking Wall										
Velocity Level Difference										
Path Ff_1		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	37.1	36.1	35.1	34.1	33.1	32.1	
Path Fd_1		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.6	24.7	25.7	26.8	27.9	29.1	
Path Df_1		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	23.6	24.7	25.7	26.8	27.9	29.1	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	77	90	90	90	90	90	90
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	66	77	88	90	90	90	87
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	66	77	88	90	90	90	87
Flanking STC for Junction 1				63	74	84	85	85	85	83
Junction 2 - T-Junction between the 150 mm Concrete Floor and the Concrete Masonry Façade Wall										
Sound Transmission Loss	190 mm Block		RR-334, NRC Mean BLK190(NW)	40	42	48	53	61	65	49
Structural Reverberation Time			Laboratory Measured	0.299	0.191	0.119	0.072	0.042	0.024	
Change by a lining on F2	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f2	No Lining		No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time			ISO 15712-1, Eq. C.1-C.3	0.105	0.072	0.049	0.032	0.021	0.013	
Equivalent Absorption Length			ISO 15712-1, Eq. 22	17.3	17.8	18.6	19.8	21.5	24.1	
In situ Sound Transmission Loss F2			ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
In situ Sound Transmission Loss f2			ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
Velocity Level Difference										
Path Ff_2		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	14.5	14.6	14.8	15.1	15.4	15.9	
Path Fd_2		$\overline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	12.6	12.7	12.8	13.1	13.4	13.8	
Path Df_2		$\overline{D_{v,D,f2,situ}}$	ISO 15712-1, Eq. 21	12.6	12.7	12.8	13.1	13.4	13.8	
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2.f2}$	ISO 15712-1, Eq. 25b	58	60	66	71	79	84	71
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	56	59	66	73	81	88	70
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	56	59	66	73	81	88	70
Flanking STC for Junction 2				52	54	61	68	76	81	65
Junction 3 - T-Junction between the 150 mm Concrete Floor and the Concrete Masonry Façade Wall										
The input data for Junction 3 is the same as that for Junction 2. But, the different junction length changes the flanking TL.										
Flanking TL for Path Ff_3		$L_{F3.f3}$	ISO 15712-1, Eq. 25a	57	59	65	70	78	83	70
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	56	58	65	73	81	87	69
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	56	58	65	73	81	87	69
Flanking STC for Junction 3				51	54	60	67	75	81	65
Junction 4 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Corridor Wall										
Velocity Level Difference										
Path Ff_4		$\overline{D_{v,F4,f4,situ}}$	ISO 15712-1, Eq. 21	37.2	36.2	35.2	34.2	33.2	32.2	
Path Fd_4		$\overline{D_{v,F4,d,situ}}$	ISO 15712-1, Eq. 21	24.2	25.2	26.2	27.4	28.5	29.6	
Path Df_4		$\overline{D_{v,D,f4,situ}}$	ISO 15712-1, Eq. 21	24.2	25.2	26.2	27.4	28.5	29.6	
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	79	90	90	90	90	90	90
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	67	78	89	90	90	90	87
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	67	78	89	90	90	90	87
Flanking STC for Junction 4				64	75	85	85	85	85	83
ASTC due to Direct plus Flanking Transmission				43	45	53	61	69	75	**56**

Example 18: Rooms one-above-the-other

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **Heavy concrete or masonry façade.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly attached to the steel studs.**
- **The non-load bearing walls include either one layer of 15.9 mm SilentFX® QuickCut gypsum board or one layer of 15.9 mm CertainTeed Type X gypsum board.**

Separating floor assembly with:

- Concrete floor with mass per unit area of 345 kg/m^2 (e.g. – normal weight concrete with thickness of 150 mm) with no topping / flooring on top or ceiling lining below.

Junctions 1 and 4: Cross-junction of separating floor / flanking wall with:

- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8") SilentFX® QuickCut gypsum board fixed to the room side and one layer of 15.9 mm (5/8") CertainTeed Type X gypsum board fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junctions 2 and 3: T-junctions of separating floor / flanking wall with:

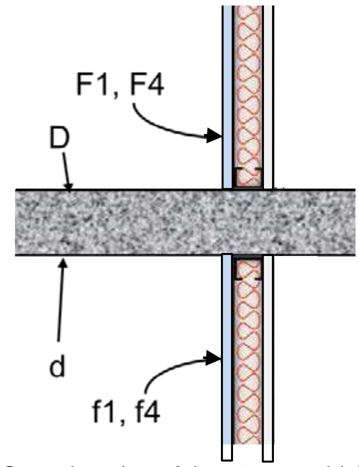
- Rigid mortared T-junctions with perimeter concrete block façade wall assemblies.
- The walls above and below the floor are one wythe of concrete blocks with a mass per unit area of 238 kg/m^2 (e.g. 190 mm hollow blocks with normal weight aggregate)[1].
- No lining on the façade walls.

Room Parameters

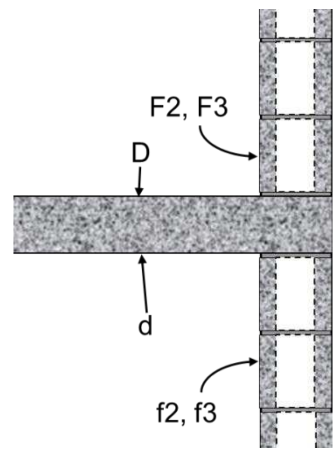
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- Walls F1, f1, F3 and f3 are 2.5 m high by 5 m wide.
- Walls F2, f2, F4 and f4 are 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the separating assembly (Extended concrte floor surface)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	Σl_k*α_κ
X-Junction 1 & 4	ISO 15712-1, Eq. 23 & E.7	32.0	21.0	21.0	(ignore)
T-Junction 2 & 3	ISO 15712-1, Eq. 23 & E.7	8.1	5.8	5.8	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	
For flanking elements F2, f2, F3 and f3 (Masonry Façade)					
internal loss η_i = 0.015		c_L = 3500			
mass per unit area (kg/m^2) = 238		f_c = 98			
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.089	(at 500 Hz)	

Illustrations for this case



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junctions 1 and 4)



T-Junction of a 150 mm thick concrete floor with a 190 mm concrete block wall.
(Side view of Junction 2 and 3)

Example 18	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Floor of 150 mm Concrete										
Sound Transmission Loss	150 mm Concrete	TL_{Dd}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,Dd,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_D	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_d	No Lining	0	0	0	0	0	0	
Structural Reverberation Time		$T_{s,Dd,situ}$		0.176	0.122	0.084	0.057	0.038	0.025	
Equivalent Absorption Length		$a_{Dd,situ}$	ISO 15712-1, Eq. 22	20.6	20.9	21.5	22.4	23.8	25.8	
In situ Sound Transmission Loss F1		$TL_{Dd,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
Junction 1 - Cross-Junction between the 150 mm Concrete Floor and a Steel Stud Flanking Wall										
Velocity Level Difference										
Path Ff_1		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_1		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.2	27.2	28.4	29.5	
Path Df_1		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.2	27.2	28.4	29.5	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	77	90	90	90	90	90	90
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	66	77	88	90	90	90	87
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	66	77	88	90	90	90	87
Flanking STC for Junction 1				63	74	84	85	85	85	83
Junction 2 - T-Junction between the 150 mm Concrete Floor and the Concrete Masonry Façade Wall										
Sound Transmission Loss	190 mm Block		RR-334, NRC Mean BLK190(NW)	40	42	48	53	61	65	49
Structural Reverberation Time			Laboratory Measured	0.299	0.191	0.119	0.072	0.042	0.024	
Change by a lining on F2	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f2	No Lining		No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time			ISO 15712-1, Eq. C.1-C.3	0.105	0.072	0.049	0.032	0.021	0.013	
Equivalent Absorption Length			ISO 15712-1, Eq. 22	17.3	17.8	18.6	19.8	21.5	24.1	
In situ Sound Transmission Loss F2			ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
In situ Sound Transmission Loss f2			ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
Velocity Level Difference										
Path Ff_2		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	14.5	14.6	14.8	15.1	15.4	15.9	
Path Fd_2		$\overline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	12.6	12.7	12.8	13.1	13.4	13.8	
Path Df_2		$\overline{D_{v,D,f2,situ}}$	ISO 15712-1, Eq. 21	12.6	12.7	12.8	13.1	13.4	13.8	
Other Side										
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2.f2}$	ISO 15712-1, Eq. 25b	58	60	66	71	79	84	71
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	56	59	66	73	81	88	70
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	56	59	66	73	81	88	70
Flanking STC for Junction 2				52	54	61	68	76	81	65
Other Side										
Junction 3 - T-Junction between the 150 mm Concrete Floor and the Concrete Masonry Façade Wall										
The input data for Junction 3 is the same as that for Junction 2. But, the different junction length changes the flanking TL.										
Flanking TL for Path Ff_3		$L_{F3.f3}$	ISO 15712-1, Eq. 25a	57	59	65	70	78	83	70
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	56	58	65	73	81	87	69
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	56	58	65	73	81	87	69
Flanking STC for Junction 3				51	54	60	67	75	81	65
Junction 4 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Corridor Wall										
Velocity Level Difference										
Path Ff_4		$\overline{D_{v,F4,f4,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_4		$\overline{D_{v,F4,d,situ}}$	ISO 15712-1, Eq. 21	24.6	25.6	26.6	27.7	28.8	30.0	
Path Df_4		$\overline{D_{v,D,f4,situ}}$	ISO 15712-1, Eq. 21	24.6	25.6	26.6	27.7	28.8	30.0	
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	78	90	90	90	90	90	90
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	67	78	89	90	90	90	87
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	67	78	89	90	90	90	87
Flanking STC for Junction 4				64	75	85	85	85	85	83
ASTC due to Direct plus Flanking Transmission				43	45	53	61	69	75	**56**

Example 19: Rooms one-above-the-other

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **Heavy concrete or masonry façade.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly attached to the steel studs.**
- **The non-load bearing walls include either one layer of 15.9 mm SilentFX® QuickCut gypsum board or one layer of 15.9 mm CertainTeed Type X gypsum board.**

Separating floor assembly with:
- Concrete floor with mass per unit area of 345 kg/m^2 (e.g. – normal weight concrete with thickness of 150 mm) with no topping / flooring on top or ceiling lining below.

Junction 1: Cross-junction of separating floor / flanking wall with:
- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8") SilentFX® QuickCut gypsum board fixed to the room side (F1 and f1) and one layer of 15.9 mm (5/8") CertainTeed Type X gypsum board fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

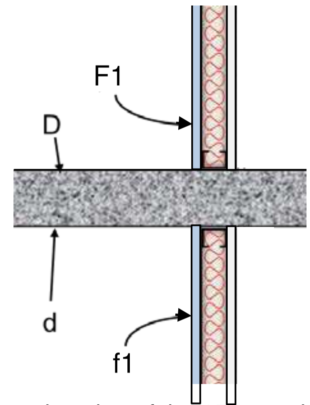
Junctions 2 and 3: T-junctions of separating floor / flanking wall with:
- Rigid mortared T-junctions with perimeter concrete block façade wall assemblies.
- The walls above and below the floor are one wythe of concrete blocks with a mass per unit area of 238 kg/m^2 (e.g. 190 mm hollow blocks with normal weight aggregate)[1].
- No lining on the façade walls.

Junction 4: Cross-junction of separating floor / flanking wall with:
- One layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the steel studs on the room side (F4 and f4) and one layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to the corridor side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

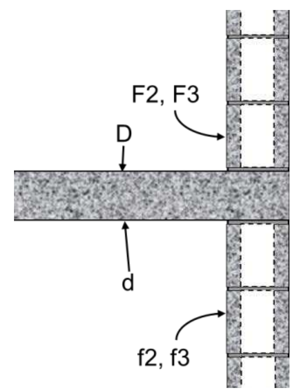
Room Parameters
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- Walls F1, f1, F3 and f3 are 2.5 m high by 5 m wide.
- Walls F2, f2, F4 and f4 are 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the separating assembly (Extended concrte floor surface)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	$\Sigma l_k \cdot \alpha_k$
X-Junction 1 & 4	ISO 15712-1, Eq. 23 & E.7	32.0	21.0	21.0	(ignore)
T-Junction 2 & 3	ISO 15712-1, Eq. 23 & E.7	8.1	5.8	5.8	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	
For flanking elements F2, f2, F3 and f3 (Masonry Façade)					
internal loss η_i = 0.015		c_L = 3500			
mass per unit area (kg/m^2) = 238		f_c = 98			
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.089	(at 500 Hz)	

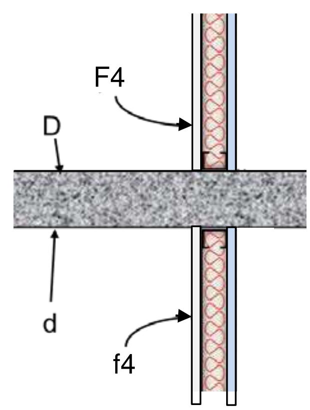
Illustrations for this case



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junction 1)



T-Junction of a 150 mm thick concrete floor with a 190 mm concrete block wall.
(Side view of Junction 2 and 3)



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junction 4)

Example 19	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Floor of 150 mm Concrete										
Sound Transmission Loss	150 mm Concrete	TL_{Dd}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,Dd,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_D	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_d	No Lining	0	0	0	0	0	0	
Structural Reverberation Time		$T_{s,Dd,situ}$		0.176	0.122	0.084	0.057	0.038	0.025	
Equivalent Absorption Length		$a_{Dd,situ}$	ISO 15712-1, Eq. 22	20.6	20.9	21.5	22.4	23.8	25.8	
In situ Sound Transmission Loss F1		$TL_{Dd,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
Junction 1 - Cross-Junction between the 150 mm Concrete Floor and a Steel Stud Flanking Wall										
Velocity Level Difference										
Path Ff_1		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_1		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.2	27.2	28.4	29.5	
Path Df_1		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.2	27.2	28.4	29.5	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	77	90	90	90	90	90	90
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	66	77	88	90	90	90	87
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	66	77	88	90	90	90	87
Flanking STC for Junction 1				63	74	84	85	85	85	83
Junction 2 - T-Junction between the 150 mm Concrete Floor and the Concrete Masonry Façade Wall										
Sound Transmission Loss	190 mm Block		RR-334, NRC Mean BLK190(NW)	40	42	48	53	61	65	49
Structural Reverberation Time			Laboratory Measured	0.299	0.191	0.119	0.072	0.042	0.024	
Change by a lining on F2	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f2	No Lining		No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time			ISO 15712-1, Eq. C.1-C.3	0.105	0.072	0.049	0.032	0.021	0.013	
Equivalent Absorption Length			ISO 15712-1, Eq. 22	17.3	17.8	18.6	19.8	21.5	24.1	
In situ Sound Transmission Loss F2			ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
In situ Sound Transmission Loss f2			ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
Velocity Level Difference										
Path Ff_2		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	14.5	14.6	14.8	15.1	15.4	15.9	
Path Fd_2		$\overline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	12.6	12.7	12.8	13.1	13.4	13.8	
Path Df_2		$\overline{D_{v,D,f2,situ}}$	ISO 15712-1, Eq. 21	12.6	12.7	12.8	13.1	13.4	13.8	
Other Side										
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2.f2}$	ISO 15712-1, Eq. 25b	58	60	66	71	79	84	71
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	56	59	66	73	81	88	70
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	56	59	66	73	81	88	70
Flanking STC for Junction 2				52	54	61	68	76	81	65
Other Side										
Junction 3 - T-Junction between the 150 mm Concrete Floor and the Concrete Masonry Façade Wall										
The input data for Junction 3 is the same as that for Junction 2. But, the different junction length changes the flanking TL.										
Flanking TL for Path Ff_3		$L_{F3.f3}$	ISO 15712-1, Eq. 25a	57	59	65	70	78	83	70
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	56	58	65	73	81	87	69
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	56	58	65	73	81	87	69
Flanking STC for Junction 3				51	54	60	67	75	81	65
Junction 4 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Corridor Wall										
Velocity Level Difference										
Path Ff_4		$\overline{D_{v,F4,f4,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_4		$\overline{D_{v,F4,d,situ}}$	ISO 15712-1, Eq. 21	24.6	25.6	26.6	27.7	28.8	30.0	
Path Df_4		$\overline{D_{v,D,f4,situ}}$	ISO 15712-1, Eq. 21	24.6	25.6	26.6	27.7	28.8	30.0	
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	74	90	90	90	90	90	90
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	65	77	90	90	90	90	87
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	65	77	90	90	90	90	87
Flanking STC for Junction 4				61	74	85	85	85	85	82
ASTC due to Direct plus Flanking Transmission				43	45	53	61	69	75	**56**

Example 20: Rooms one-above-the-other

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **Heavy concrete or masonry façade.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly attached to the steel studs.**
- **The non-load bearing walls include either one layer of 15.9 mm SilentFX® QuickCut gypsum board or one layer of 15.9 mm CertainTeed Type X gypsum board.**

Separating floor assembly with:

- Concrete floor with mass per unit area of 345 kg/m^2 (e.g. – normal weight concrete with thickness of 150 mm) with no topping / flooring on top or ceiling lining below.

Junctions 1 and 4: Cross-junction of separating floor / flanking wall with:

- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8") CertainTeed Type X gypsum board fixed to the room side and 15.9 mm (5/8") SilentFX® QuickCut gypsum board fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junctions 2 and 3: T-junctions of separating floor / flanking wall with:

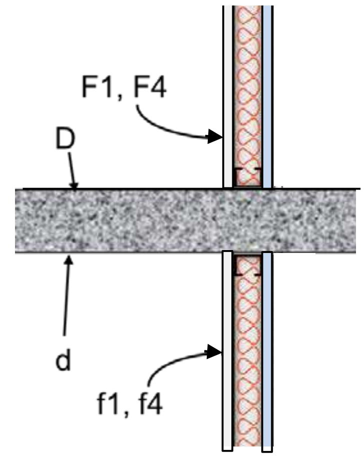
- Rigid mortared T-junctions with perimeter concrete block façade wall assemblies.
- The walls above and below the floor are one wythe of concrete blocks with a mass per unit area of 238 kg/m^2 (e.g. 190 mm hollow blocks with normal weight aggregate)[1].
- No lining on the façade walls.

Room Parameters

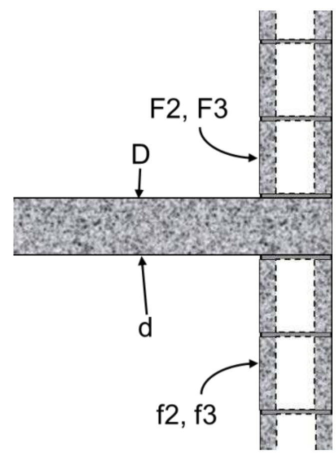
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- Walls F1, f1, F3 and f3 are 2.5 m high by 5 m wide.
- Walls F2, f2, F4 and f4 are 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the separating assembly (Extended concrte floor surface)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	Σl_k*α_κ
X-Junction 1 & 4	ISO 15712-1, Eq. 23 & E.7	32.0	21.0	21.0	(ignore)
T-Junction 2 & 3	ISO 15712-1, Eq. 23 & E.7	8.1	5.8	5.8	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	
For flanking elements F2, f2, F3 and f3 (Masonry Façade)					
internal loss η_i = 0.015		c_L = 3500			
mass per unit area (kg/m^2) = 238		f_c = 98			
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.089	(at 500 Hz)	

Illustrations for this case



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junctions 1 and 4)



T-Junction of a 150 mm thick concrete floor with a 190 mm concrete block wall.
(Side view of Junction 2 and 3)

Example 20	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Floor of 150 mm Concrete										
Sound Transmission Loss	150 mm Concrete	TL_{Dd}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,Dd,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_D	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_d	No Lining	0	0	0	0	0	0	
Structural Reverberation Time		$T_{s,Dd,situ}$		0.176	0.122	0.084	0.057	0.038	0.025	
Equivalent Absorption Length		$a_{Dd,situ}$	ISO 15712-1, Eq. 22	20.6	20.9	21.5	22.4	23.8	25.8	
In situ Sound Transmission Loss F1		$TL_{Dd,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
Junction 1 - Cross-Junction between the 150 mm Concrete Floor and a Steel Stud Flanking Wall										
Velocity Level Difference										
Path Ff_1		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_1		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.2	27.2	28.4	29.5	
Path Df_1		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	24.1	25.1	26.2	27.2	28.4	29.5	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	73	90	90	90	90	90	90
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	64	76	89	90	90	90	86
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	64	76	89	90	90	90	86
Flanking STC for Junction 1				60	73	85	85	85	85	82
Junction 2 - T-Junction between the 150 mm Concrete Floor and the Concrete Masonry Façade Wall										
Sound Transmission Loss	190 mm Block		RR-334, NRC Mean BLK190(NW)	40	42	48	53	61	65	49
Structural Reverberation Time			Laboratory Measured	0.299	0.191	0.119	0.072	0.042	0.024	
Change by a lining on F2	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f2	No Lining		No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time			ISO 15712-1, Eq. C.1-C.3	0.105	0.072	0.049	0.032	0.021	0.013	
Equivalent Absorption Length			ISO 15712-1, Eq. 22	17.3	17.8	18.6	19.8	21.5	24.1	
In situ Sound Transmission Loss F2			ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
In situ Sound Transmission Loss f2			ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
Velocity Level Difference										
Path Ff_2		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	14.5	14.6	14.8	15.1	15.4	15.9	
Path Fd_2		$\overline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	12.6	12.7	12.8	13.1	13.4	13.8	
Path Df_2		$\overline{D_{v,D,f2,situ}}$	ISO 15712-1, Eq. 21	12.6	12.7	12.8	13.1	13.4	13.8	
Other Side										
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2.f2}$	ISO 15712-1, Eq. 25b	58	60	66	71	79	84	71
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	56	59	66	73	81	88	70
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	56	59	66	73	81	88	70
Flanking STC for Junction 2				52	54	61	68	76	81	65
Other Side										
Junction 3 - T-Junction between the 150 mm Concrete Floor and the Concrete Masonry Façade Wall										
The input data for Junction 3 is the same as that for Junction 2. But, the different junction length changes the flanking TL.										
Flanking TL for Path Ff_3		$L_{F3.f3}$	ISO 15712-1, Eq. 25a	57	59	65	70	78	83	70
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	56	58	65	73	81	87	69
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	56	58	65	73	81	87	69
Flanking STC for Junction 3				51	54	60	67	75	81	65
Junction 4 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Corridor Wall										
Velocity Level Difference										
Path Ff_4		$\overline{D_{v,F4,f4,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_4		$\overline{D_{v,F4,d,situ}}$	ISO 15712-1, Eq. 21	24.6	25.6	26.6	27.7	28.8	30.0	
Path Df_4		$\overline{D_{v,D,f4,situ}}$	ISO 15712-1, Eq. 21	24.6	25.6	26.6	27.7	28.8	30.0	
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	74	90	90	90	90	90	90
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	65	77	90	90	90	90	87
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	65	77	90	90	90	90	87
Flanking STC for Junction 4				61	74	85	85	85	85	82
ASTC due to Direct plus Flanking Transmission				43	45	53	61	69	75	**56**

Example 21: Rooms one-above-the-other	Illustration for this case

Example 21: Rooms one-above-the-other

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **Heavy concrete or masonry façade.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly attached to the steel studs.**
- **The non-load bearing walls include either one layer of 15.9 mm SilentFX® QuickCut gypsum board or one layer of 15.9 mm CertainTeed Type X gypsum board.**

Separating floor assembly with:

- Concrete floor with mass per unit area of 345 kg/m^2 (e.g. – normal weight concrete with thickness of 150 mm) with no topping / flooring on top or ceiling lining below.

Junction 1: Cross-junction of separating floor / flanking wall with:

- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8") SilentFX® QuickCut gypsum board fixed to each side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junctions 2 and 3: T-junctions of separating floor / flanking wall with:

- Rigid mortared T-junctions with perimeter concrete block façade wall assemblies.
- The walls above and below the floor are one wythe of concrete blocks with a mass per unit area of 238 kg/m^2 (e.g. 190 mm hollow blocks with normal weight aggregate)[1].
- No lining on the façade walls.

Junction 4: Cross-junction of separating floor / flanking wall with:

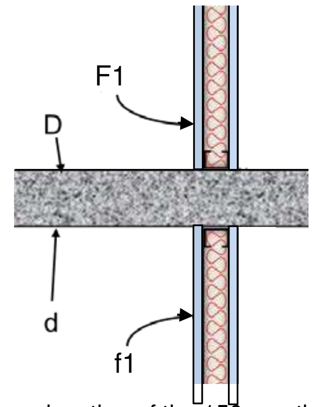
- One layer of 15.9 mm CertainTeed Type X gypsum board directly fixed to the steel studs on the room side (F4 and f4) and one layer of 15.9 mm SilentFX® QuickCut gypsum board directly fixed to the corridor side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Room Parameters

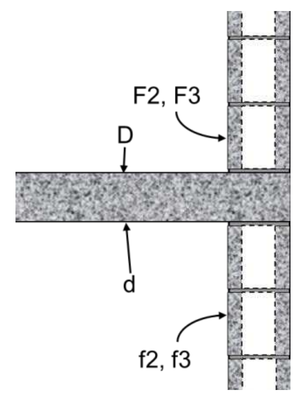
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- Walls F1, f1, F3 and f3 are 2.5 m high by 5 m wide.
- Walls F2, f2, F4 and f4 are 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the separating assembly (Extended concrte floor surface)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	$\Sigma l_k \cdot \alpha_k$
X-Junction 1 & 4	ISO 15712-1, Eq. 23 & E.7	31.1	20.6	20.6	(ignore)
T-Junction 2 & 3	ISO 15712-1, Eq. 23 & E.7	8.1	5.8	5.8	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	
For flanking elements F2, f2, F3 and f3 (Masonry Façade)					
internal loss η_i = 0.015		c_L = 3500			
mass per unit area (kg/m^2) = 238		f_c = 98			
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.089	(at 500 Hz)	

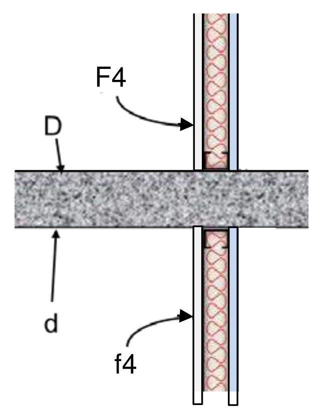
Illustration for this case



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls. (Side view of Junction 1)



T-Junction of a 150 mm thick concrete floor with a 190 mm concrete block wall. (Side view of Junction 2 and 3)



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls. (Side view of Junction 4)

Example 21	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Floor of 150 mm Concrete										
Sound Transmission Loss	150 mm Concrete	TL_{Dd}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,Dd,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_D	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_d	No Lining	0	0	0	0	0	0	
Structural Reverberation Time		$T_{s,Dd,situ}$		0.176	0.122	0.084	0.057	0.038	0.025	
Equivalent Absorption Length		$a_{Dd,situ}$	ISO 15712-1, Eq. 22	20.6	20.9	21.5	22.4	23.8	25.8	
In situ Sound Transmission Loss F1		$TL_{Dd,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
Junction 1 - Cross-Junction between the 150 mm Concrete Floor and a Steel Stud Flanking Wall										
Velocity Level Difference										
Path Ff_1		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	37.1	36.1	35.1	34.1	33.1	32.1	
Path Fd_1		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.6	24.7	25.7	26.8	27.9	29.1	
Path Df_1		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	23.6	24.7	25.7	26.8	27.9	29.1	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	77	90	90	90	90	90	90
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	66	77	88	90	90	90	87
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	66	77	88	90	90	90	87
Flanking STC for Junction 1				63	74	84	85	85	85	83
Junction 2 - T-Junction between the 150 mm Concrete Floor and the Concrete Masonry Façade Wall										
Sound Transmission Loss	190 mm Block		RR-334, NRC Mean BLK190(NW)	40	42	48	53	61	65	49
Structural Reverberation Time			Laboratory Measured	0.299	0.191	0.119	0.072	0.042	0.024	
Change by a lining on F2	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f2	No Lining		No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time			ISO 15712-1, Eq. C.1-C.3	0.105	0.072	0.049	0.032	0.021	0.013	
Equivalent Absorption Length			ISO 15712-1, Eq. 22	17.3	17.8	18.6	19.8	21.5	24.1	
In situ Sound Transmission Loss F2			ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
In situ Sound Transmission Loss f2			ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
Velocity Level Difference										
Path Ff_2		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	14.5	14.6	14.8	15.1	15.4	15.9	
Path Fd_2		$\overline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	12.6	12.7	12.8	13.1	13.4	13.8	
Path Df_2		$\overline{D_{v,D,f2,situ}}$	ISO 15712-1, Eq. 21	12.6	12.7	12.8	13.1	13.4	13.8	
Other Side										
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2.f2}$	ISO 15712-1, Eq. 25b	58	60	66	71	79	84	71
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	56	59	66	73	81	88	70
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	56	59	66	73	81	88	70
Flanking STC for Junction 2				52	54	61	68	76	81	65
Other Side										
Junction 3 - T-Junction between the 150 mm Concrete Floor and the Concrete Masonry Façade Wall										
The input data for Junction 3 is the same as that for Junction 2. But, the different junction length changes the flanking TL.										
Flanking TL for Path Ff_3		$L_{F3,f3}$	ISO 15712-1, Eq. 25a	57	59	65	70	78	83	70
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	56	58	65	73	81	87	69
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	56	58	65	73	81	87	69
Flanking STC for Junction 3				51	54	60	67	75	81	65
Junction 4 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Corridor Wall										
Velocity Level Difference										
Path Ff_4		$\overline{D_{v,F4,f4,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_4		$\overline{D_{v,F4,d,situ}}$	ISO 15712-1, Eq. 21	24.6	25.6	26.6	27.7	28.8	30.0	
Path Df_4		$\overline{D_{v,D,f4,situ}}$	ISO 15712-1, Eq. 21	24.6	25.6	26.6	27.7	28.8	30.0	
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	74	90	90	90	90	90	90
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	65	77	90	90	90	90	87
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	65	77	90	90	90	90	87
Flanking STC for Junction 4				61	74	85	85	85	85	82
ASTC due to Direct plus Flanking Transmission				43	45	53	61	69	75	**56**

Example 22: Rooms one-above-the-other

- **Detailed Method using the Extended Scenario.**
- **Concrete floors and ceilings.**
- **Heavy concrete or masonry façade.**
- **The framing of the internal walls is one row of non-loadbearing (25 gauge) steel studs spaced 406 mm on center.**
- **The gypsum board is directly attached to the steel studs.**
- **The non-load bearing walls include either one layer of 15.9 mm SilentFX® QuickCut gypsum board or one layer of 15.9 mm CertainTeed Type X gypsum board.**

Separating floor assembly with:

- Concrete floor with mass per unit area of 345 kg/m^2 (e.g. – normal weight concrete with thickness of 150 mm) with no topping / flooring on top or ceiling lining below.

Junction 1: Cross-junction of separating floor / flanking wall with:

- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8”) SilentFX® QuickCut gypsum board fixed to each side of the steel studs.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Junctions 2 and 3: T-junctions of separating floor / flanking wall with:

- Rigid mortared T-junctions with perimeter concrete block façade wall assemblies.
- The walls above and below the floor are one wythe of concrete blocks with a mass per unit area of 238 kg/m^2 (e.g. 190 mm hollow blocks with normal weight aggregate)[1].
- No lining on the façade walls.

Junction 4: Cross-junction of separating floor / flanking wall with:

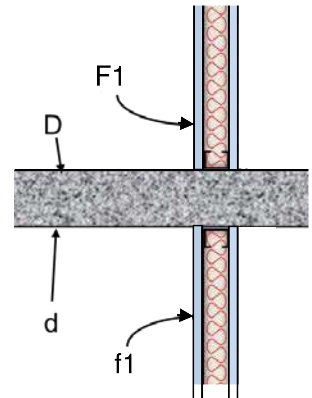
- Walls above and below the floor have one row of non-loadbearing 25 gauge steel studs spaced 406 mm on center.
- One layer of 15.9 mm (5/8") SilentFX® QuickCut gypsum board fixed to the room side (F4 and f4) and one layer of 15.9 mm (5/8") CertainTeed Type X gypsum board fixed to the other side.
- One layer of 89 mm thick CertainTeed R12 Sustainable Insulation® in the wall cavity.

Room Parameters

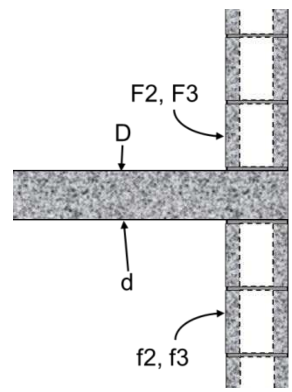
- See Figure 2 of this report or Figure 5.1 of the National Research Council Report RR-331.
- Walls F1, f1, F3 and f3 are 2.5 m high by 5 m wide.
- Walls F2, f2, F4 and f4 are 2.5 m high by 4 m wide.
- The floor / ceilings are 4 m by 5 m.

For the separating assembly (Extended concrte floor surface)					
internal loss η_i = 0.006		c_L = 3500			
mass per unit area (kg/m^2) = 345		f_c = 124			
	Reference	K_Ff	K_Fd	K_dF	$\Sigma l_k \cdot \alpha_k$
X-Junction 1 & 4	ISO 15712-1, Eq. 23 & E.7	31.1	20.6	20.6	(ignore)
T-Junction 2 & 3	ISO 15712-1, Eq. 23 & E.7	8.1	5.8	5.8	6.497
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.052	(at 500 Hz)	
For flanking elements F2, f2, F3 and f3 (Masonry Façade)					
internal loss η_i = 0.015		c_L = 3500			
mass per unit area (kg/m^2) = 238		f_c = 98			
Total loss, n_tot	ISO 15712-1, Eq. C.1		0.089	(at 500 Hz)	

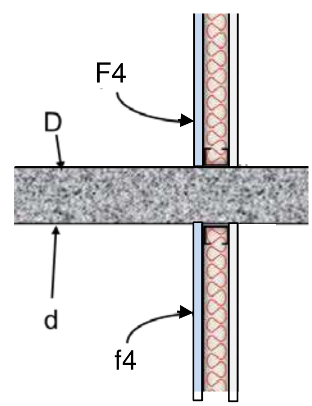
Illustration for this case



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junction 1)



T-Junction of a 150 mm thick concrete floor with a 190 mm concrete block wall.
(Side view of Junction 2 and 3)



Cross junction of the 150 mm thick concrete separating floor with the non-loadbearing steel stud walls.
(Side view of Junction 4)

Example 22	Description	Symbol	Reference	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	STC, ASTC
Direct Sound Transmission Loss of the Common Floor of 150 mm Concrete										
Sound Transmission Loss	150 mm Concrete	TL_{Dd}	RR-333, CON150, TLF-15-045	40	42	50	58	66	75	53
Structural Reverberation Time		$T_{s,Dd,lab}$	Laboratory Measured	0.439	0.369	0.250	0.205	0.146	0.077	
Change by a lining on F1	No Lining	ΔTL_D	No Lining	0	0	0	0	0	0	
Change by a lining on f1	No Lining	ΔTL_d	No Lining	0	0	0	0	0	0	
Structural Reverberation Time		$T_{s,Dd,situ}$		0.176	0.122	0.084	0.057	0.038	0.025	
Equivalent Absorption Length		$a_{Dd,situ}$	ISO 15712-1, Eq. 22	20.6	20.9	21.5	22.4	23.8	25.8	
In situ Sound Transmission Loss F1		$TL_{Dd,situ}$	ISO 15712-1, Eq. 19	44	47	55	64	72	80	58
Junction 1 - Cross-Junction between the 150 mm Concrete Floor and a Steel Stud Flanking Wall										
Velocity Level Difference										
Path Ff_1		$\overline{D_{v,F1,f1,situ}}$	ISO 15712-1, Eq. 21	37.1	36.1	35.1	34.1	33.1	32.1	
Path Fd_1		$\overline{D_{v,F1,d,situ}}$	ISO 15712-1, Eq. 21	23.6	24.7	25.7	26.8	27.9	29.1	
Path Df_1		$\overline{D_{v,D,f1,situ}}$	ISO 15712-1, Eq. 21	23.6	24.7	25.7	26.8	27.9	29.1	
Flanking Transmission Loss										
Flanking TL for Path Ff_1		$TL_{F1,f1}$	ISO 15712-1, Eq. 25a	77	90	90	90	90	90	90
Flanking TL for Path Fd_1		$TL_{F1,d}$	ISO 15712-1, Eq. 25a	66	77	88	90	90	90	87
Flanking TL for Path Df_1		$TL_{D,f1}$	ISO 15712-1, Eq. 25a	66	77	88	90	90	90	87
Flanking STC for Junction 1				63	74	84	85	85	85	83
Junction 2 - T-Junction between the 150 mm Concrete Floor and the Concrete Masonry Façade Wall										
Sound Transmission Loss	190 mm Block		RR-334, NRC Mean BLK190(NW)	40	42	48	53	61	65	49
Structural Reverberation Time			Laboratory Measured	0.299	0.191	0.119	0.072	0.042	0.024	
Change by a lining on F2	No Lining		No Lining	0	0	0	0	0	0	
Change by a lining on f2	No Lining		No Lining	0	0	0	0	0	0	
Flanking Elements F1 and f1: In-situ Data										
Structural Reverberation Time			ISO 15712-1, Eq. C.1-C.3	0.105	0.072	0.049	0.032	0.021	0.013	
Equivalent Absorption Length			ISO 15712-1, Eq. 22	17.3	17.8	18.6	19.8	21.5	24.1	
In situ Sound Transmission Loss F2			ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
In situ Sound Transmission Loss f2			ISO 15712-1, Eq. 19	40	42	48	53	61	65	53
Velocity Level Difference										
Path Ff_2		$\overline{D_{v,F2,f2,situ}}$	ISO 15712-1, Eq. 21	14.5	14.6	14.8	15.1	15.4	15.9	
Path Fd_2		$\overline{D_{v,F2,d,situ}}$	ISO 15712-1, Eq. 21	12.6	12.7	12.8	13.1	13.4	13.8	
Path Df_2		$\overline{D_{v,D,f2,situ}}$	ISO 15712-1, Eq. 21	12.6	12.7	12.8	13.1	13.4	13.8	
Other Side										
Flanking Transmission Loss										
Flanking TL for Path Ff_2		$TL_{F2.f2}$	ISO 15712-1, Eq. 25b	58	60	66	71	79	84	71
Flanking TL for Path Fd_2		$TL_{F2,d}$	ISO 15712-1, Eq. 25b	56	59	66	73	81	88	70
Flanking TL for Path Df_2		$TL_{D,f2}$	ISO 15712-1, Eq. 25b	56	59	66	73	81	88	70
Flanking STC for Junction 2				52	54	61	68	76	81	65
Other Side										
Junction 3 - T-Junction between the 150 mm Concrete Floor and the Concrete Masonry Façade Wall										
The input data for Junction 3 is the same as that for Junction 2. But, the different junction length changes the flanking TL.										
Flanking TL for Path Ff_3		$L_{F3.f3}$	ISO 15712-1, Eq. 25a	57	59	65	70	78	83	70
Flanking TL for Path Fd_3		$TL_{F3,d}$	ISO 15712-1, Eq. 25a	56	58	65	73	81	87	69
Flanking TL for Path Df_3		$TL_{D,f3}$	ISO 15712-1, Eq. 25a	56	58	65	73	81	87	69
Flanking STC for Junction 3				51	54	60	67	75	81	65
Junction 4 - T-Junction between the 150 mm Concrete Floor and the Steel Stud Corridor Wall										
Velocity Level Difference										
Path Ff_4		$\overline{D_{v,F4,f4,situ}}$	ISO 15712-1, Eq. 21	38.0	37.0	36.0	35.0	34.0	33.0	
Path Fd_4		$\overline{D_{v,F4,d,situ}}$	ISO 15712-1, Eq. 21	24.6	25.6	26.6	27.7	28.8	30.0	
Path Df_4		$\overline{D_{v,D,f4,situ}}$	ISO 15712-1, Eq. 21	24.6	25.6	26.6	27.7	28.8	30.0	
Flanking Transmission Loss										
Flanking TL for Path Ff_4		$TL_{F4,f4}$	ISO 15712-1, Eq. 25b	78	90	90	90	90	90	90
Flanking TL for Path Fd_4		$TL_{F4,d}$	ISO 15712-1, Eq. 25b	67	78	89	90	90	90	87
Flanking TL for Path Df_4		$TL_{D,f4}$	ISO 15712-1, Eq. 25b	67	78	89	90	90	90	87
Flanking STC for Junction 4				64	75	85	85	85	85	83
ASTC due to Direct plus Flanking Transmission				43	45	53	61	69	75	**56**

4. Conclusions

The report presented twenty-two examples of the calculation of ASTC ratings for typical high-rise constructions using 15.9 mm SilentFX® QuickCut gypsum board attached to lightweight steel stud walls. All of the constructions in the examples meet or exceed the acoustic requirements of the 2015 National Building Code Canada.

Footnotes

1. For the concrete block walls in these examples, the value of 238 kg/m^2 is the measured mass per unit area for the tested wall specimen including mortar. Normal weight concrete block masonry units conform to CSA A165.1 and have a concrete mass density of not less than 2000 kg/m^3. 190 mm hollow core units are not less than 53% solid, and 140 mm hollow core units are not less than 73% solid, each giving a minimum wall mass per area over 200 kg/m^2. Additional information on material properties and sound transmission for other concrete block wall assemblies are given in the National Research Council Canada Research Report RR-334: *Apparent Sound Insulation in Concrete Block Buildings* [4].

References

[1] ISO 15712-1:2005 -- Building acoustics -- Estimation of acoustic performance of buildings from the performance of elements -- Part 1: Airborne sound insulation between rooms. Geneva, Switzerland: International Standards Organization; 2005.

[2] ISO 10848-1:2006 -- Acoustics -- Laboratory measurement of the flanking transmission of airborne and impact sound between adjoining rooms -- Part 1: Frame document. Geneva, Switzerland: International Standards Organization; 2006.

[3] Hoeller C, Quirt D, Mahn J, RR-331: Guide to Calculating Airborne Sound Transmission in Buildings: 3rd Edition. Ottawa, Canada: National Research Council Canada; 2017.

[4] Zeitler B, Quirt D, Schoenwald S, Mahn J. RR-334: Apparent Sound Insulation in Concrete Block Buildings. Ottawa, Canada: National Research Council Canada; 2015.