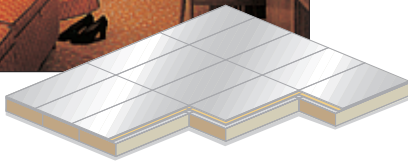


**STACO**



*Floating Floor System*  
*Floating Floor System*



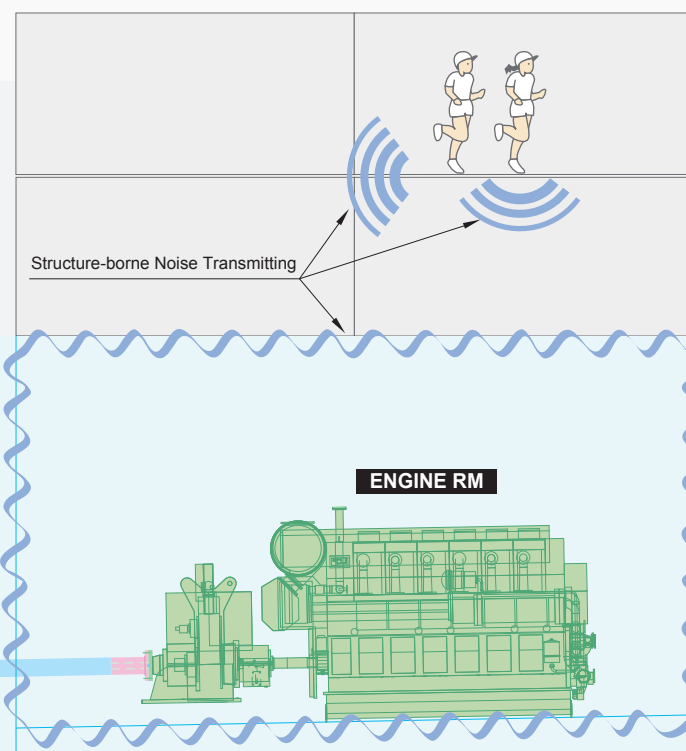
## FLOATING FLOOR SYSTEM

A major point of differences between Air-borne and Structure-borne sound is that while air-borne sound decreases markedly with distance, structure-borne sound (vibration) can travel through the structure with very little decrease along its path. For instance, we can hear an approaching train, although unable to see the train. This is because of the lack of damping in steel rails. The only way to attenuate structure-borne sound transmission along its path is to provide a discontinuity or break in the structure.

Impact and vibration are the two most common sources of structure-borne sounds. Walking, jogging and dancing are obvious examples of impact sound, which occurs for a short duration. Vibration, on the other hand, is periodic and continuous.

In order to deal with structure-borne noise, especially caused by foot-traffic and other human activities in ship, STACO Floating Floor system is the best solution. Impact sound insulation is primarily required of floor, because most impact-producing sources rest on floors.

STACO Floating Floor improves the structure-borne sound insulation of a deck floor. STACO Floating Floor system is applicable to the cabins located beneath areas where impact noise can be generated and the cabins located above where structure-borne noise is dominating.



The structure-borne sound insulation of a floor-ceiling assembly is measured in a two-cabin mock-up, one room above the other.

A standard tapping machine is placed on the test assembly to produce impact at a constant rate.

The tapping machine noise transmitted to the lower receiving room is measured in sixteen one-third-octave bands, from 100Hz to 3,150Hz per ISO 140-7.

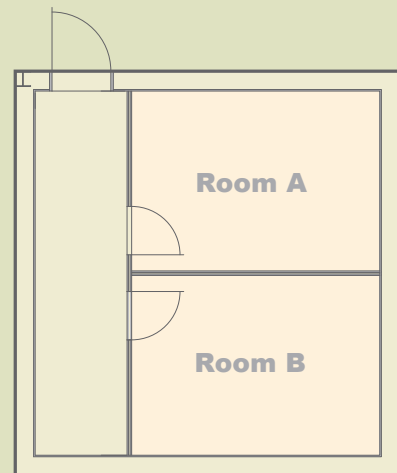
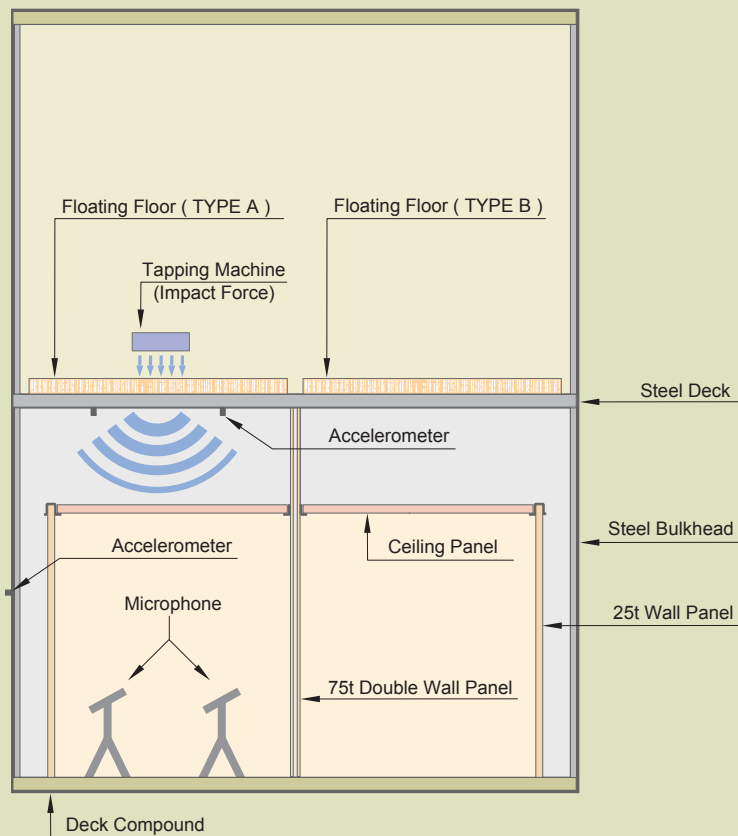
"Ln" shown in the graph describes the impact sound pressure level in the receiving room below the deck.

Using the measured sound level data, a single number rating of impact sound insulation is obtained by comparing it with a reference contour per ISO 717-2.

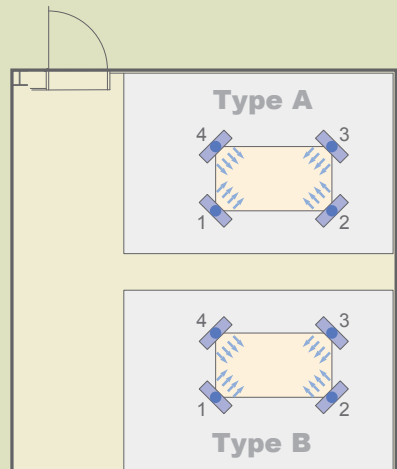
The rating so obtained is called "the weighted normalized impact sound pressure level, Ln,w".

In addition to the measure of Impact Sound, Structure-Borne Noise by vibration is also measured with accelerometers on the deck surface above ceiling and steel wall outside.

### Typical section



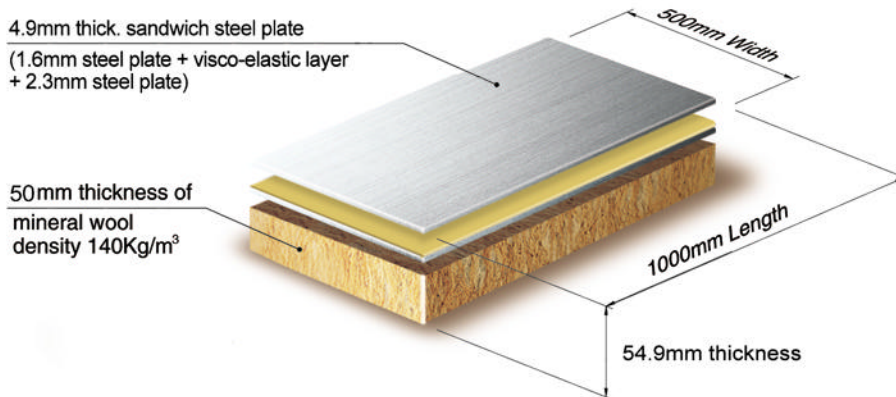
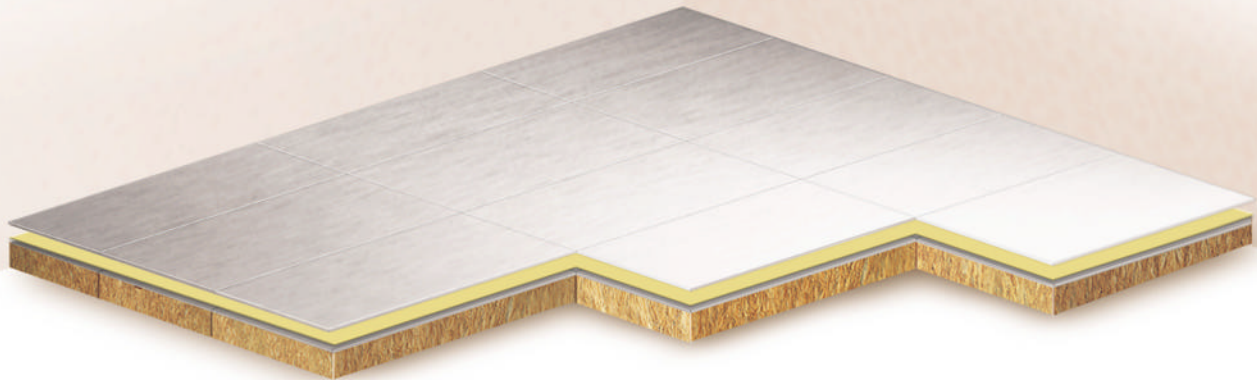
Floor impact deck plan



Receiving room plan

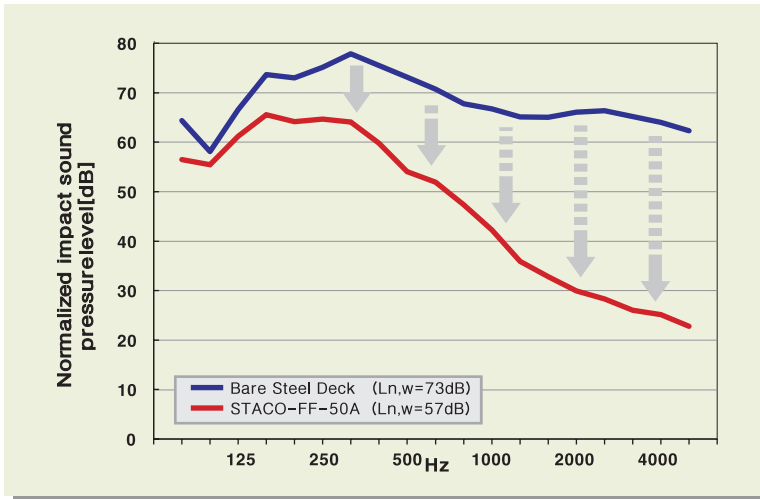
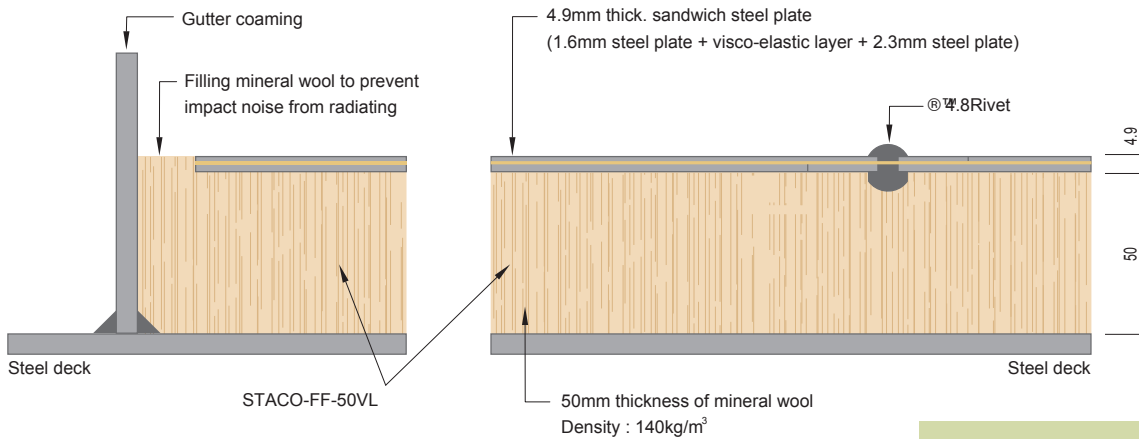
## STACO-FF-50VL

A-60 Fire Class Floating Floor

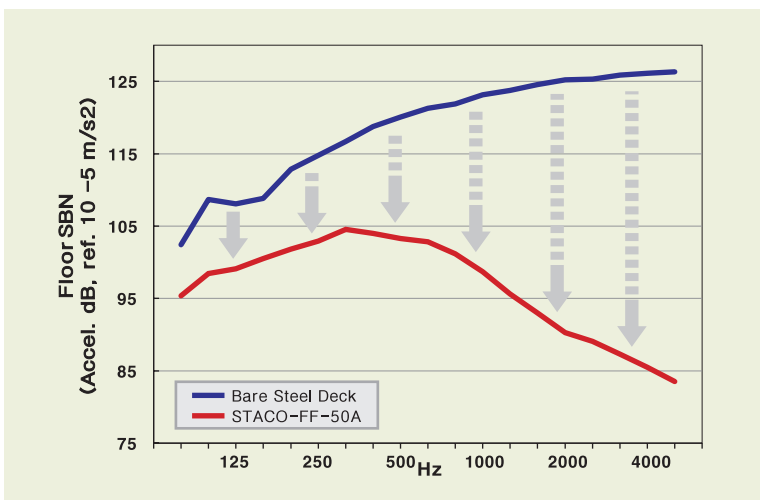


## Technical Specification

TECHNICAL DATA		CONSTRUCTION	
Fire Class	: A-60 Deck	Core Material	: Mineral Wool Density 140kg/m <sup>3</sup>
Weight	: 38.78 kg/m <sup>2</sup>	Surface Material	: 4.9mm thick. sandwich steel plate (1.6mm steel plate + viscoelastic layer + 2.3mm steel plate)
Normalized Impact Sound Level: L <sub>n,w</sub>	: 42dB	Finish Material	: Carpet or Vinyl Flooring
Thermal Transmittance	: 0.55 kcal/m <sup>2</sup> h <sub>0</sub> C		
DIMENSIONS			
Thickness	: 54.9 mm		+0, -1 mm
Width	: 500 mm (Standard)		+0, -1 mm
Length	: 1000 mm (Standard)		± 3 mm



Each curve above shows Ln, the impact noise level of 6mm steel deck and the deck with STACO-FF-50VL.



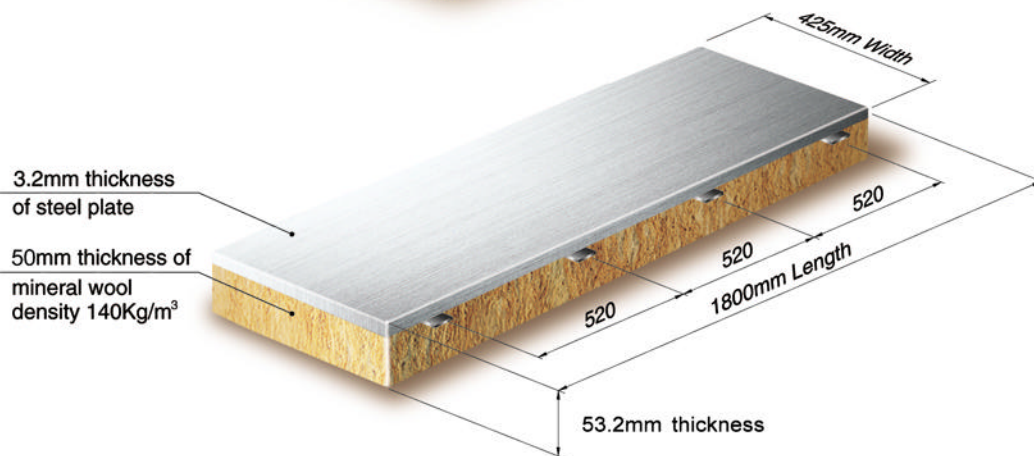
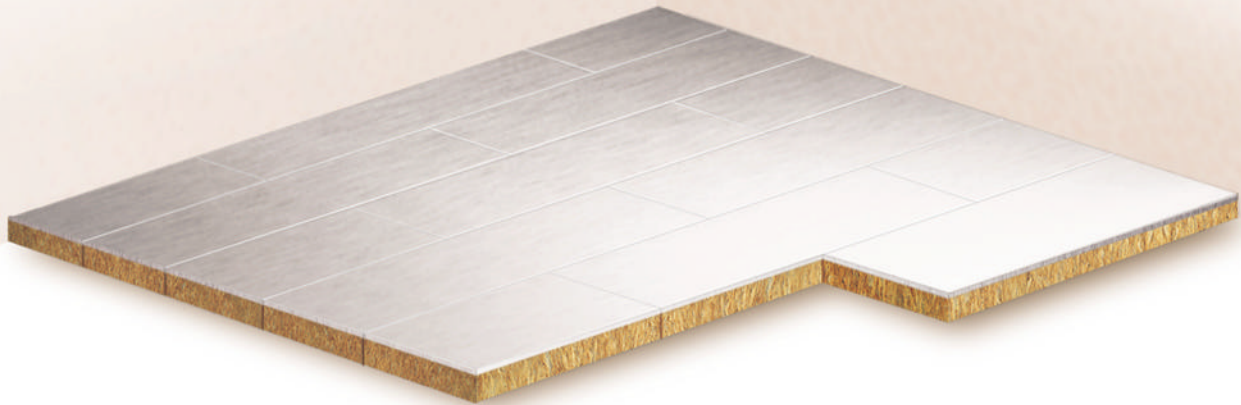
The above curves show reduction of Structure-Borne Noise when structural impact is applied on STACO-FF-50VL.

Hz	Type	Bare steel	FF-50VL
80		64.3	56.3
100		58.1	50.6
125		66.6	50.9
160		73.7	53.1
200		73.0	49.8
250		75.1	46.5
315		77.8	42.2
400		75.5	36.6
500		73.1	29.4
630		70.7	25.3
800		67.8	21.7
1000		66.7	18.3
1250		65.1	15.6
1600		65.1	14.1
2000		66.1	14.3
2500		66.4	13.3
3150		65.2	10.4
4000		64.0	8.7
5000		62.3	8.5
Ln,w		73 dB	42 dB

Hz	Type	Bare steel	FF-50VL
80		102.4	95.5
100		108.7	93.4
125		108.1	89.7
160		108.8	88.1
200		112.9	85.5
250		114.8	87.0
315		116.9	83.2
400		118.8	78.7
500		120.1	74.8
630		121.3	73.1
800		121.9	72.5
1000		123.1	67.7
1250		123.7	66.4
1600		124.6	63.7
2000		125.2	63.4
2500		125.3	62.9
3150		125.9	61.4
4000		126.1	62.7
5000		126.3	63.5

## STACO-FF-50A

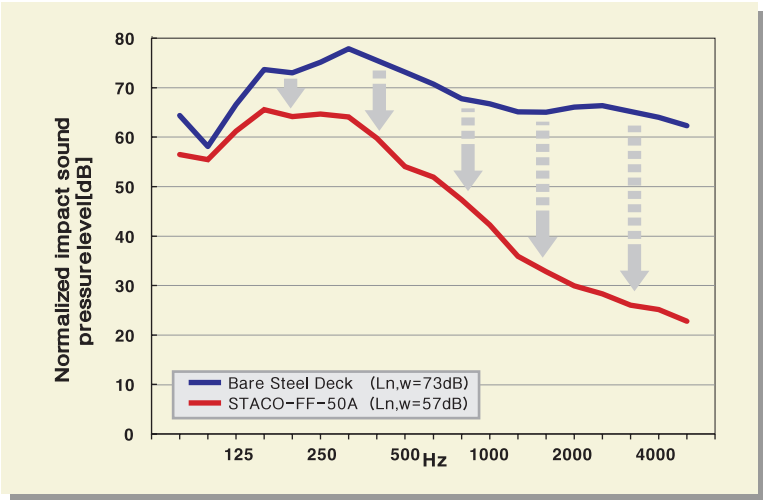
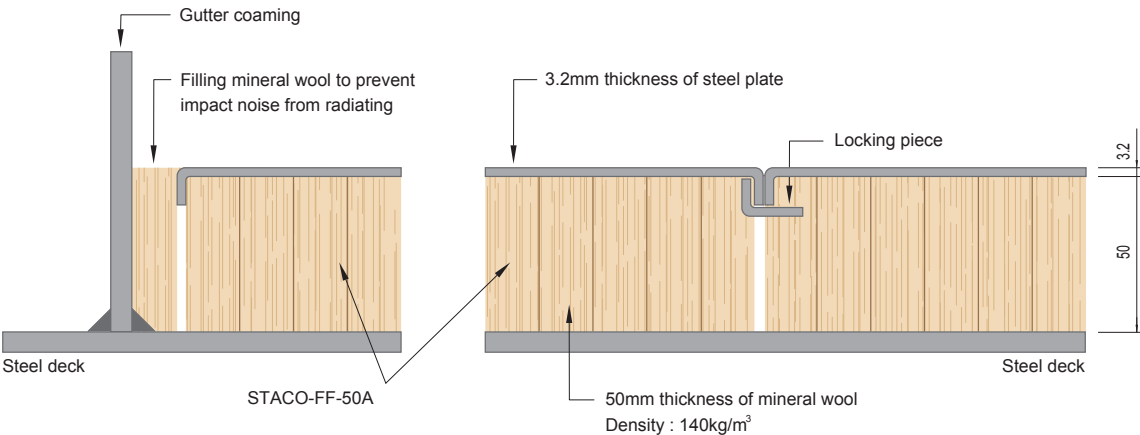
A-60 Fire Class Floating Floor



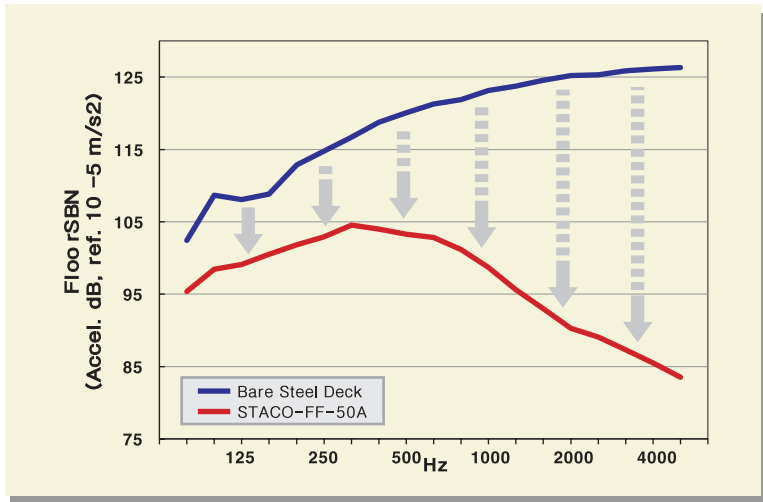
## Technical Specification

TECHNICAL DATA		CONSTRUCTION	
Fire Class	: A-60 Deck	Core Material	: Mineral Wool Density 140kg/m <sup>3</sup>
Weight	: 35.04 kg/m <sup>2</sup>	Surface Material	: 3.2mm Thickness Galv'd Steel Plate
Normalized Impact Sound Level: L <sub>n,w</sub>	57dB	Finish Material	: Carpet or Vinyl Flooring
Thermal Transmittance	: 0.40 kcal/m <sup>2</sup> h <sub>0</sub> C		
DIMENSIONS			
Thickness	: 53.2 mm		+0, -1 mm
Width	: 425 mm (Standard)		+0, -1 mm
Length	: 1800 mm (Standard)		± 3 mm





Each curve above shows Ln, the impact noise level of 6mm steel deck and the deck with STACO-FF-50A.



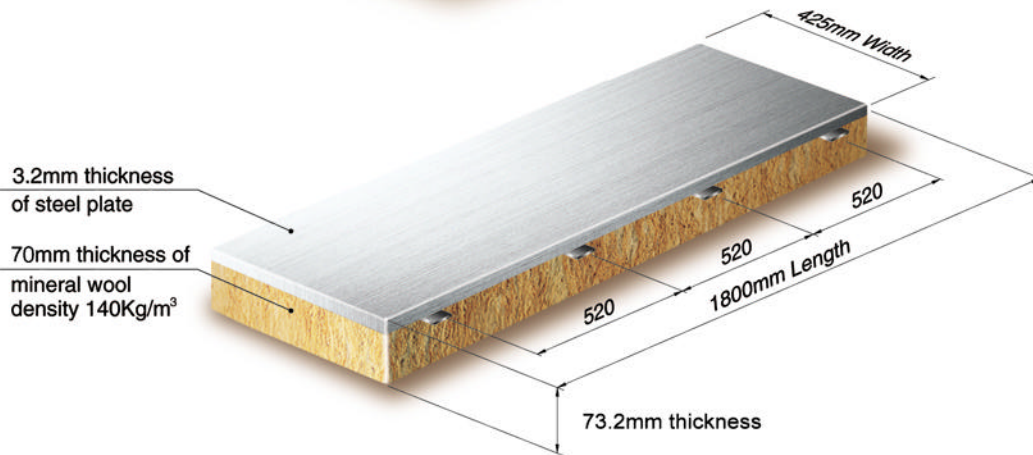
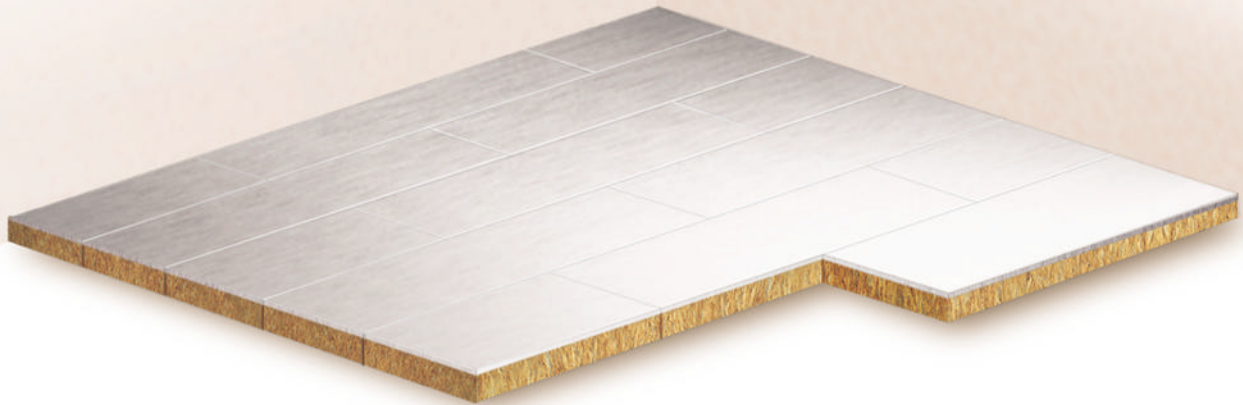
The above curves show reduction of Structure-Borne Noise when structural impact is applied on STACO-FF-50A.

Hz	Type	Bare steel	FF-50A
80		64.3	56.4
100		58.1	55.5
125		66.6	61.2
160		73.7	65.5
200		73.0	64.1
250		75.1	64.6
315		77.8	64.1
400		75.5	59.8
500		73.1	54.0
630		70.7	51.9
800		67.8	47.3
1000		66.7	42.2
1250		65.1	35.9
1600		65.1	32.8
2000		66.1	29.9
2500		66.4	28.3
3150		65.2	26.0
4000		64.0	25.2
5000		62.3	22.8
Ln,w		73 dB	57 dB

Hz	Type	Bare steel	FF-50A
80		102.4	95.4
100		108.7	98.5
125		108.1	99.1
160		108.8	100.5
200		112.9	101.8
250		114.8	102.9
315		116.9	104.6
400		118.8	104.0
500		120.1	103.3
630		121.3	102.8
800		121.9	101.2
1000		123.1	98.7
1250		123.7	95.6
1600		124.6	93.0
2000		125.2	90.3
2500		125.3	89.1
3150		125.9	87.3
4000		126.1	85.5
5000		126.3	83.5

# STACO-FF-70A

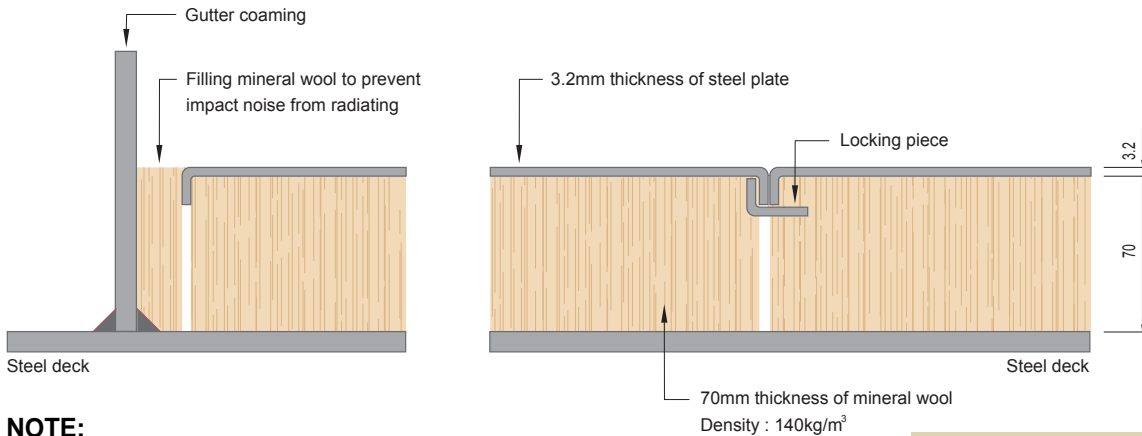
A-60 Fire Class Floating Floor



## Technical Specification

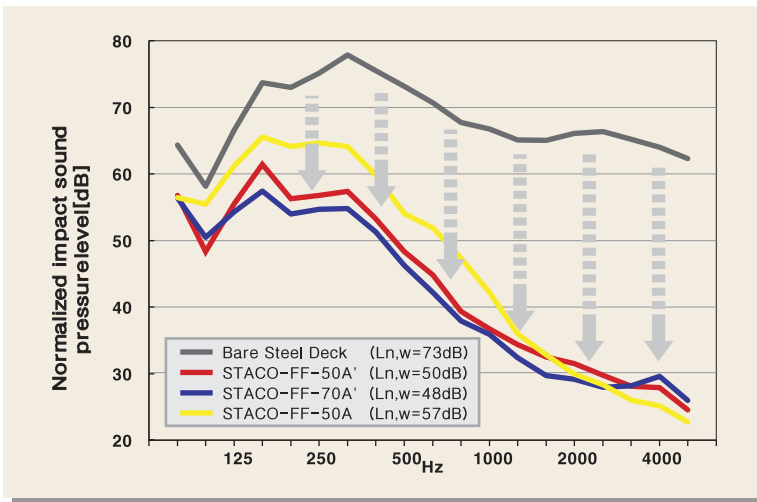
TECHNICAL DATA		CONSTRUCTION	
Fire Class	: A-60 Deck	Core Material	: Mineral Wool Density 140kg/m <sup>3</sup>
Weight	: 37.84 kg/m <sup>2</sup>	Surface Material	: 3.2mm Thkcknes Galv'd Steel Plate
Normalized Impact Sound Level: L <sub>n,w</sub>	55dB(Estimation)	Finish Material	: Carpet or Vinyl Flooring
Thermal Transmittance	: 0.40 kcal/m <sup>2</sup> h.C		
DIMENSIONS			
Thickness	: 73.2 mm		+0, -1 mm
Width	: 425 mm (Standard)		+0, -1 mm
Length	: 1800 mm (Standard)		± 3 mm



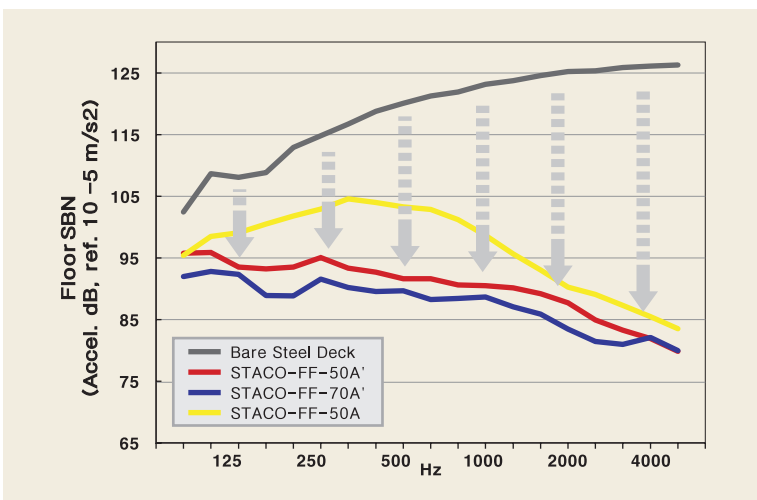


**NOTE:**

STACO-FF-70A' curve among the below curves results from floor panels which are not joint-welded each other. Therefore, an actual  $L_{n,w}$  value of STACO-FF-70A will be a little higher than test values of STACO-FF-70A'.



Each curve above shows  $L_{n,w}$ , the impact noise level of floors.  $L_{n,w}$  of FF-70A can be assumed by comparing FF-70A' curve with other curves.



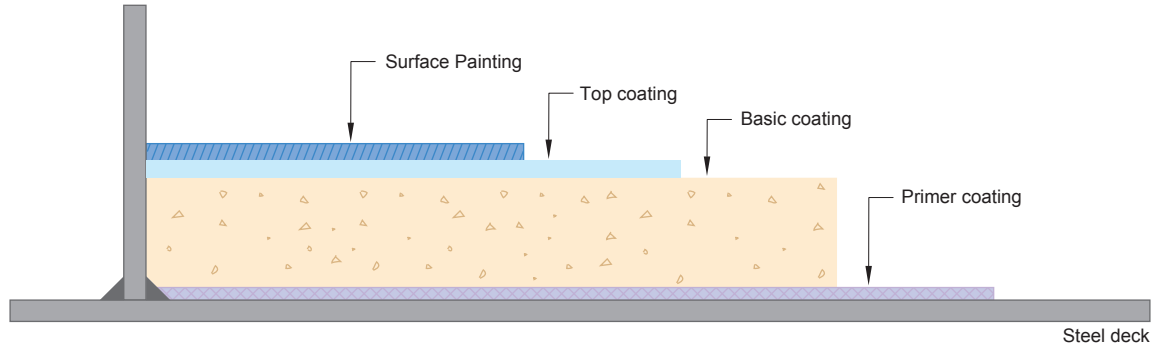
The above curves show the damping capacity against vibration by impact. It can be presumed a damping capacity of FF-70A better than of FF-50A.

Hz	Type	Bare steel	FF-50A'	FF-70A'
80		64.3	56.8	56.4
100		58.1	48.3	50.5
125		66.6	55.5	54.3
160		73.7	61.4	57.4
200		73.0	56.3	54.0
250		75.1	56.8	54.7
315		77.8	57.4	54.8
400		75.5	53.3	51.3
500		73.1	48.3	46.3
630		70.7	44.8	42.2
800		67.8	39.3	37.9
1000		66.7	36.7	35.9
1250		65.1	34.4	32.4
1600		65.1	32.5	29.7
2000		66.1	31.5	29.1
2500		66.4	29.8	27.9
3150		65.2	28.1	28.2
4000		64.0	27.9	29.6
5000		62.3	24.5	26.0
$L_{n,w}$		73 dB	50 dB	48 dB

Hz	Type	Bare steel	FF-50A'	FF-70A'
80		102.4	95.8	92.0
100		108.7	95.9	92.8
125		108.1	93.5	92.3
160		108.8	93.2	88.9
200		112.9	93.5	88.9
250		114.8	95.1	91.6
315		116.9	93.3	90.2
400		118.8	92.7	89.5
500		120.1	91.6	89.7
630		121.3	91.6	88.2
800		121.9	90.6	88.4
1000		123.1	90.5	88.7
1250		123.7	90.1	87.0
1600		124.6	89.2	85.9
2000		125.2	87.7	83.4
2500		125.3	84.9	81.5
3150		125.9	83.3	80.9
4000		126.1	81.9	82.1
5000		126.3	79.8	79.9

# DECK COVERING

## General Deck Composition

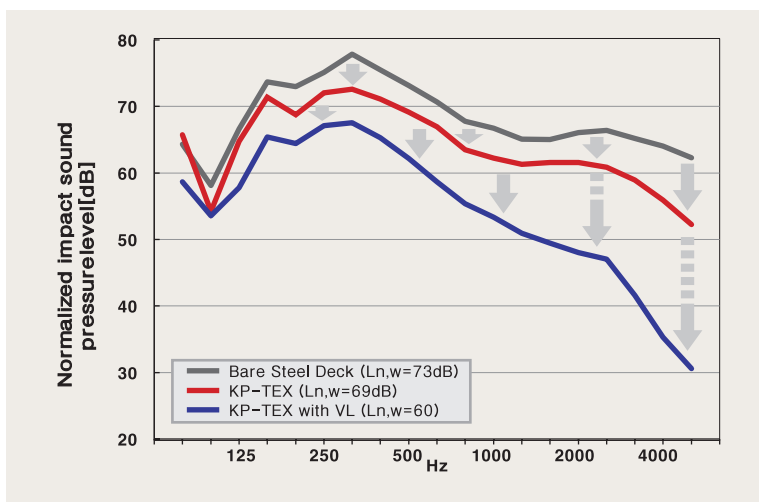


### Technical Specification

TECHNICAL DATA		CONSTRUCTION
Fire Class	: Noncombustible	1. Primer coating Thk. 0.5mm (liquid 0.5kg/m + solid 1.0kg/m )
Weight	: 18 kg/m <sup>2</sup>	2. Basic coating Thk. 6.6mm (liquid 1kg/m + solid 12kg/m )
Normalized Impact Sound Level: Ln,w	69dB	3. Top coating Thk. 0.6mm (liquid 0.5kg/m + solid 1.0kg/m )
Thermal Transmittance	: 0.40 kcal/m <sup>2</sup> h <sub>c</sub> C	4. Surface Painting Thk. 0.3mm (liquid 0.4kg/m )

### DIMENSIONS

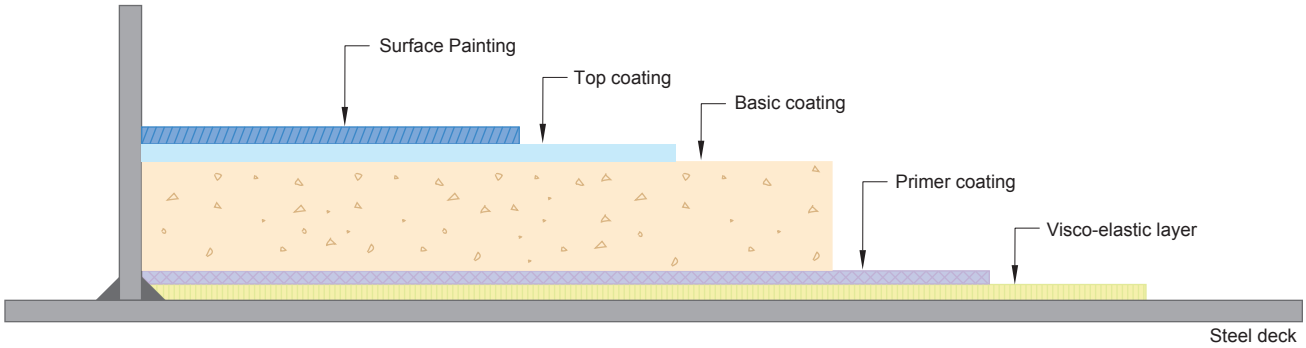
Thickness : Min. 8 mm +0, -1 mm



Each curve above shows Ln, the impact noise level of general deckcovering and deck covering with visco elastic layer.

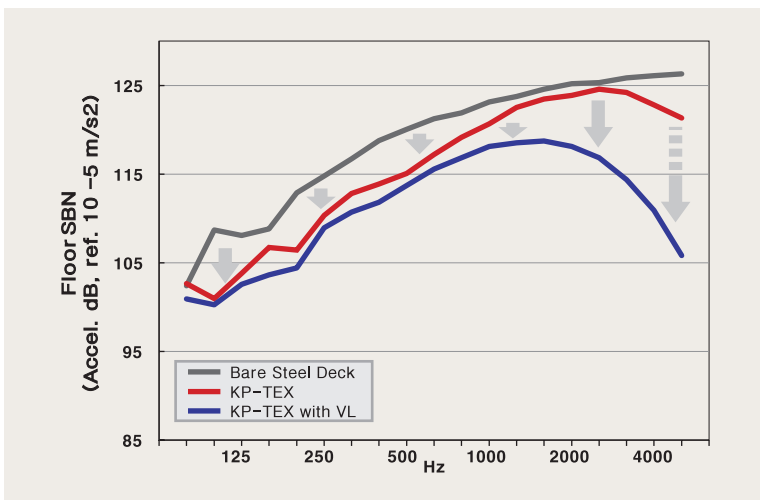
Hz	Type	KP-TEX	KP-TEX (with Viscoelastic)
80		65.8	58.7
100		54.2	53.6
125		64.8	57.8
160		71.4	65.4
200		68.7	64.4
250		72.1	67.1
315		72.6	67.6
400		71.1	65.3
500		69.2	62.2
630		67.0	58.7
800		63.5	55.4
1000		62.2	53.4
1250		61.3	50.9
1600		61.6	49.4
2000		61.6	48.0
2500		60.8	47.0
3150		59.0	41.6
4000		55.9	35.3
5000		52.3	30.6
Ln,w		69 dB	60 dB

High Impact sound Reduction Deck Composition



Technical Specification

TECHNICAL DATA		CONSTRUCTION
Fire Class	: Noncombustible	1. Viscoelastic Thk. 1.0mm
Weight	: 19.17 kg/m <sup>2</sup>	2. Primer coating Thk. 0.5mm (liquid 0.5kg/m + solid 1.0kg/m )
Normalized Impact Sound Level: L <sub>n,w</sub>	60dB	3. Basic coating Thk. 6.6mm (liquid 1kg/m + solid 12kg/m )
Thermal Transmittance	: 0.40 kcal/m <sup>2</sup> h <sub>o</sub> C	4. Top coating Thk. 0.6mm (liquid 0.5kg/m + solid 1.0kg/m )
		5. Surface Painting Thk. 0.3mm (liquid 0.4kg/m )
DIMENSIONS		
Thickness	: Min. 9 mm	+0, -1 mm

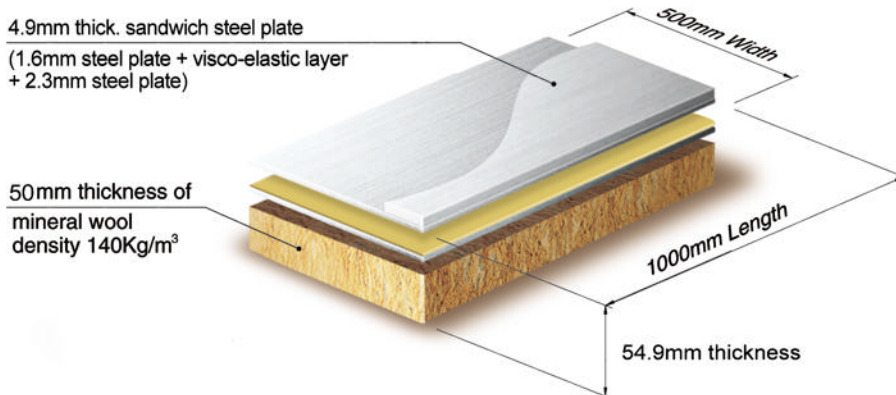
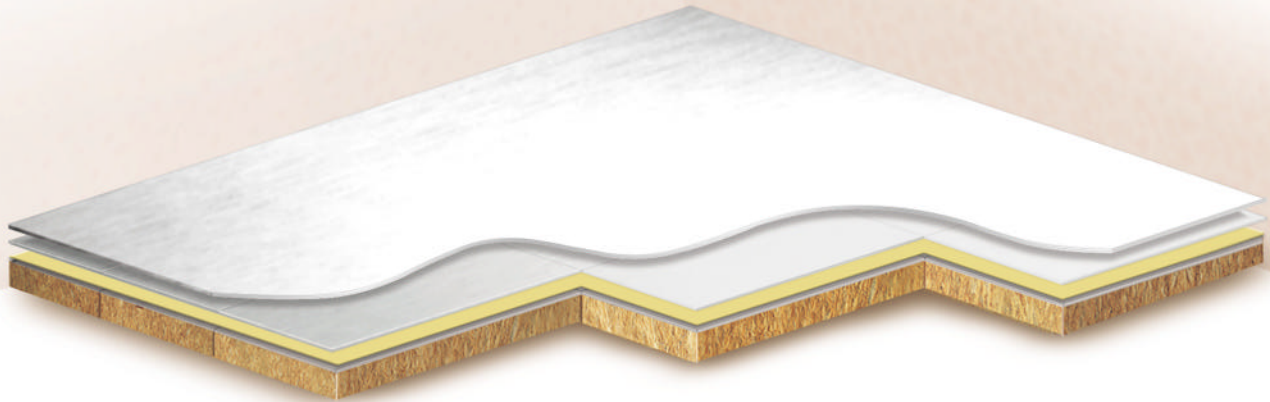


The above curves show reduction of Structure-Borne Noise when structural impact is applied on respectively.

Hz	Type	KP-TEX	KP-TEX (with Viscoelastic)
80		102.6	100.9
100		101.0	100.3
125		103.8	102.6
160		106.7	103.6
200		106.4	104.4
250		110.4	109.0
315		112.8	110.7
400		113.9	111.8
500		115.1	113.7
630		117.2	115.6
800		119.2	116.8
1000		120.6	118.2
1250		122.5	118.5
1600		123.4	118.7
2000		123.9	118.1
2500		124.6	116.8
3150		124.2	114.4
4000		122.8	110.9
5000		121.3	105.8

# FLOATING FLOOR with SCREED

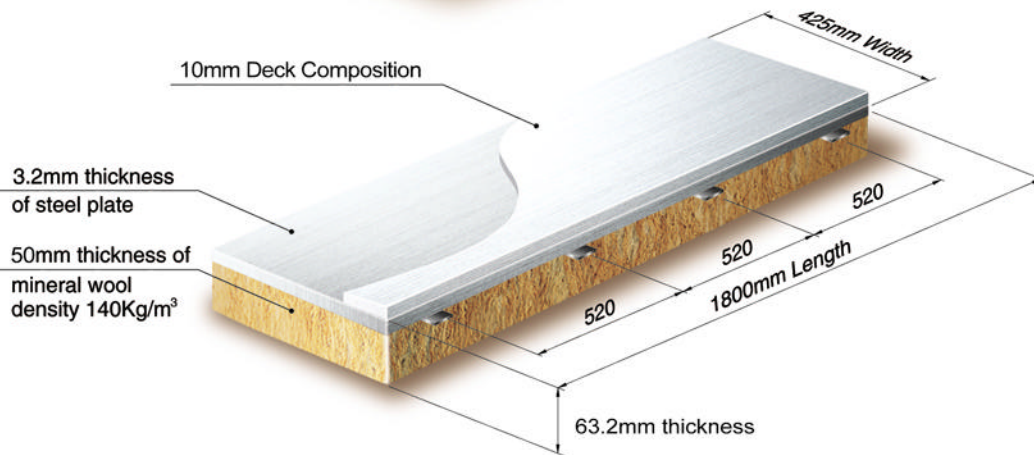
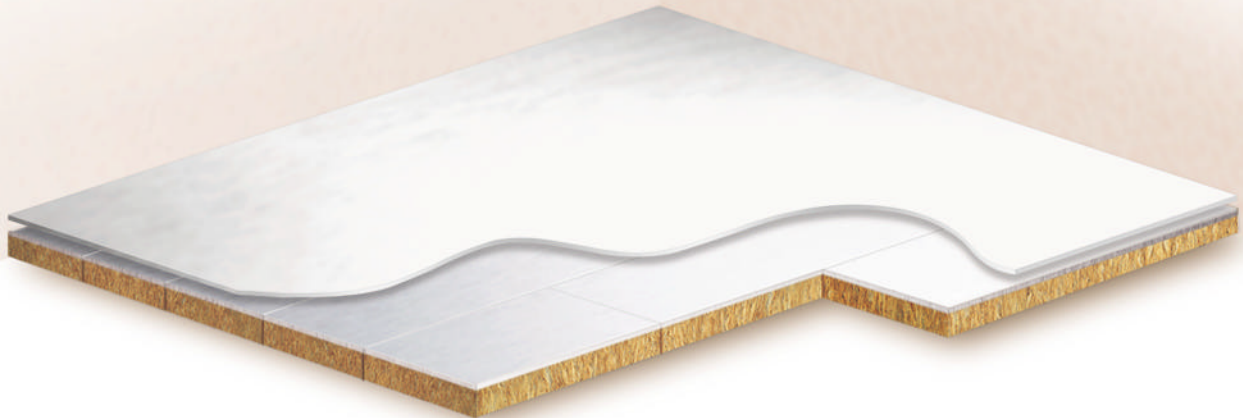
A-60 Fire Class Floating Floor



## Technical Specification

TECHNICAL DATA		CONSTRUCTION	
Fire Class	: A-60 Deck	Core Material	: Mineral Wool Density 140kg/m <sup>3</sup>
Weight	: 56.78 kg/m <sup>2</sup>	Surface Material	: 4.9mm thick. sandwich steel plate (1.6mm steel plate + viscoelastic layer + 2.3mm steel plate)
Normalized Impact Sound Level: L <sub>n,w</sub>	: 37dB	Finish Material	: Deck Composition
Thermal Transmittance	: 0.55 kcal/m <sup>2</sup> h <sub>0</sub> C		
DIMENSIONS			
Thickness	: 64.9 mm		+0, -1 mm
Width	: 500 mm (Standard)		+0, -1 mm
Length	: 1000 mm (Standard)		± 3 mm

A-60 Fire Class Floating Floor



Technical Specification

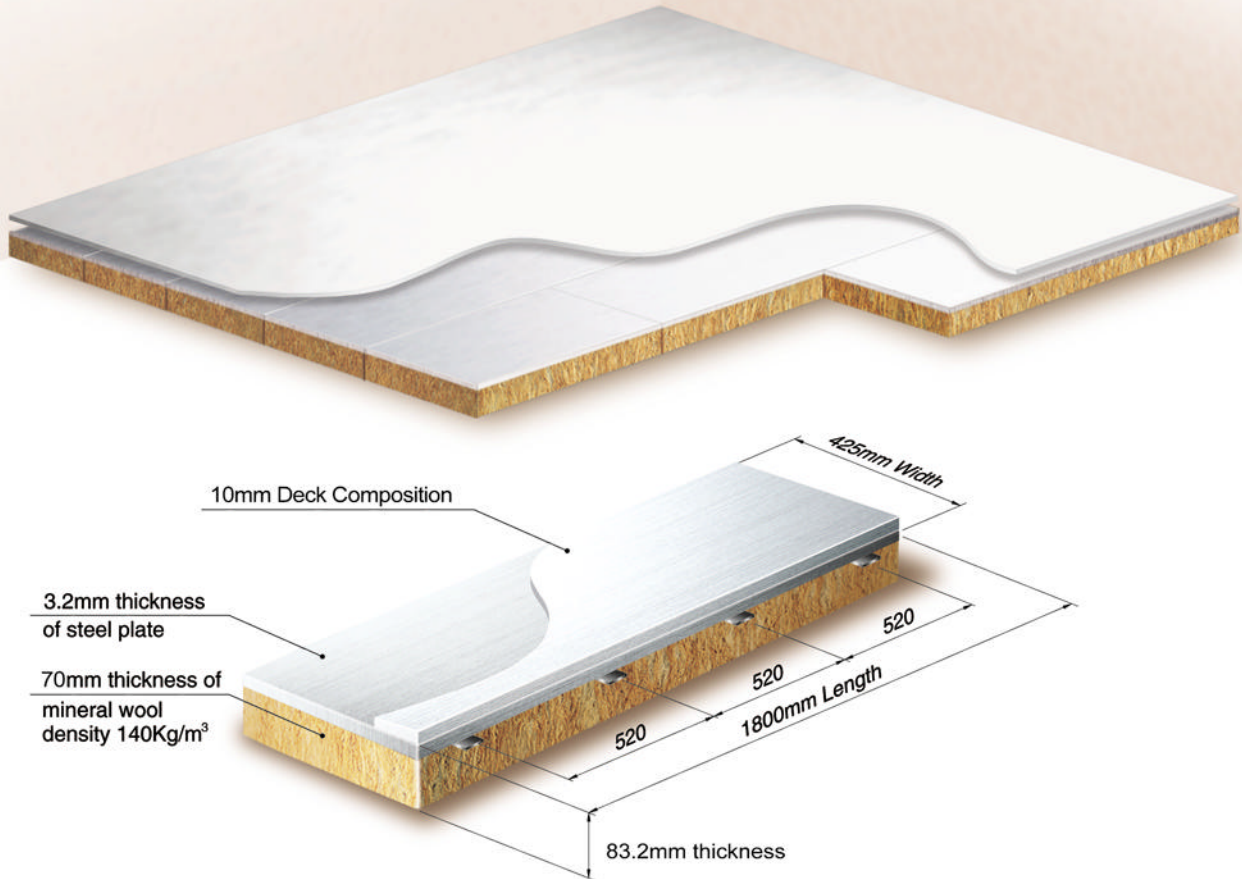
TECHNICAL DATA		CONSTRUCTION	
Fire Class	: A-60 Deck	Core Material	: Mineral Wool Density 140kg/m <sup>3</sup>
Weight	: 54.04 kg/m <sup>2</sup>	Surface Material	: 3.2mm Thkcknes Galv'd Steel Plate
Normalized Impact Sound Level: L <sub>n,w</sub>	52dB(Estimation)	Finish Material	: Carpet or Vinyl Flooring
Thermal Transmittance	: 0.40 kcal/m <sup>2</sup> h <sub>o</sub> C		

**DIMENSIONS**

Thickness	: 63.2 mm	+0, -1 mm
Width	: 425 mm (Standard)	+0, -1 mm
Length	: 1800 mm (Standard)	± 3 mm

# FLOATING FLOOR with SCREED

A-60 Fire Class Floating Floor

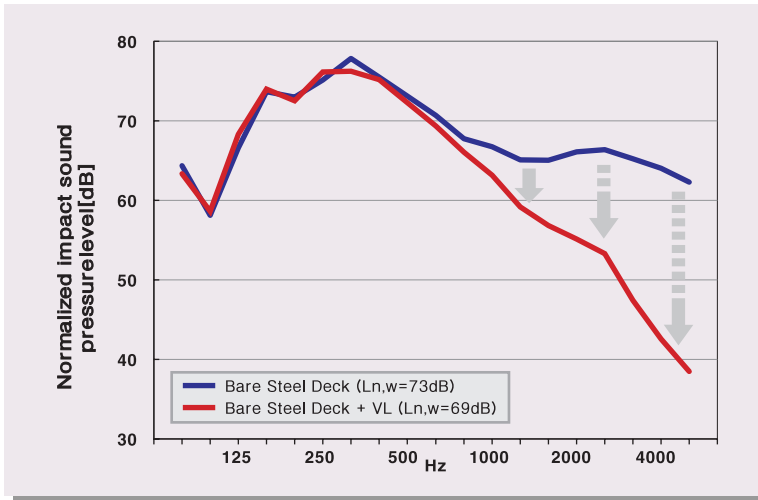


## Technical Specification

TECHNICAL DATA		CONSTRUCTION	
Fire Class	: A-60 Deck	Core Material	: Mineral Wool Density 140kg/m <sup>3</sup>
Weight	: 55.84 kg/m <sup>2</sup>	Surface Material	: 3.2mm Thkickness Galv'd Steel Plate
Normalized Impact Sound Level: L <sub>n,w</sub>	50dB	Finish Material	: Deck Composition
Thermal Transmittance	: 0.40 kcal/m <sup>2</sup> h <sub>o</sub> C		
DIMENSIONS			
Thickness	: 83.2 mm		+0, -1 mm
Width	: 425 mm (Standard)		+0, -1 mm
Length	: 1800 mm (Standard)		± 3 mm

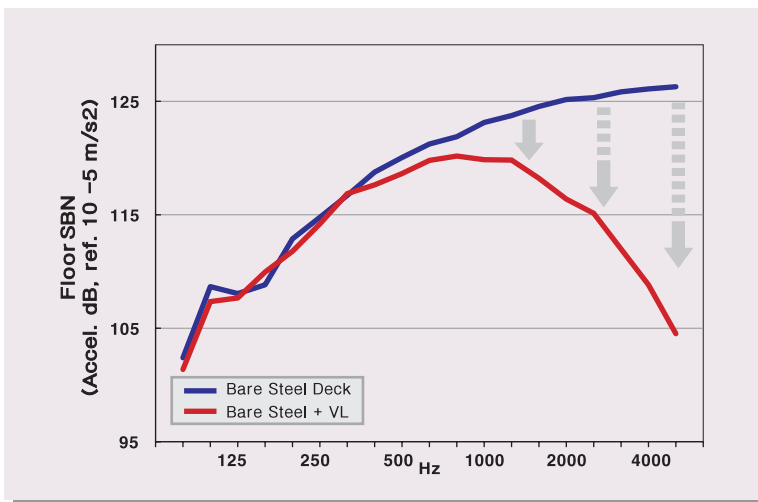


Bare Steel & Bare Steel with Visco elastic



Each curve above shows Ln, the impact sound insulation of a 6mm steel deck and the deck with visco-elastic layer.

Hz	Type	Bare steel	Bare steel (with Viscoelastic)
80		64.3	63.3
100		58.1	58.6
125		66.6	68.3
160		73.7	74.0
200		73.0	72.5
250		75.1	76.2
315		77.8	76.3
400		75.5	75.2
500		73.1	72.3
630		70.7	69.4
800		67.8	66.1
1000		66.7	63.2
1250		65.1	59.2
1600		65.1	56.8
2000		66.1	55.2
2500		66.4	53.3
3150		65.2	47.5
4000		64.0	42.6
5000		62.3	38.5
Ln,w		73 dB	69 dB



The above curves show reduction of Structure-Borne Noise visco-elastic layer when vibration occurs by impact.

Hz	Type	Bare steel	Bare steel (with Viscoelastic)
80		102.4	56.4
100		108.7	55.5
125		108.1	61.2
160		108.8	65.5
200		112.9	64.1
250		114.8	64.6
315		116.9	64.1
400		118.8	59.8
500		120.1	54.0
630		121.3	51.9
800		121.9	47.3
1000		123.1	42.2
1250		123.7	35.9
1600		124.6	32.8
2000		125.2	29.9
2500		125.3	28.3
3150		125.9	26.0
4000		126.1	25.2
5000		126.3	22.8