

FLOATING FLOORS



Wall Panels

Ceiling Panels

Unit Toilets

Marine Doors

Floating Floors

Furniture

Unit Cabins

Interior Furnishings

Modular Systems

Marine Engineering

Onshore Plants

FLOATING FLOORS

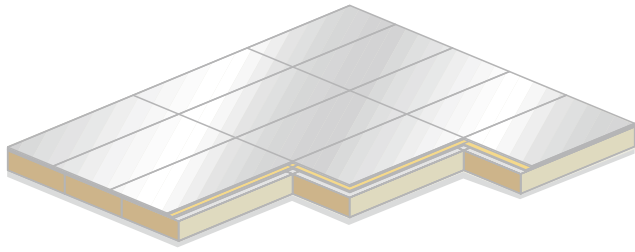
A high level of noise and vibration is generated in ship operation areas.

Hence sound-absorbing flooring is generally required in Ships.

STACO Floating Floor systems are the best solutions for noise & vibration absorption and are designed for universal applications on ships and offshore installations..

STACO provides A-60 floating floors having a high fire protection classification and excellent acoustic insulation. The different STACO standard A-60 fire class floating floors are classified as FF-50VL, FF-50A & FF-70A as per technical details shown in subsequent pages with different thicknesses of Core Materials, Surface Materials & Finish materials leading to different Sound reduction levels.

The Floors can also be provided with different types of Deck compositions of various thicknesses with various paint coatings without A-60 classification. The A-60 Fire Class Floating Floors with Screed (Sandwich steel plates with deck composition, mineral wool layer and with (or without) viscoelastic layer) can also be provided. The technical details of the Deck compositions & A-60 Fire Class Floating Floors with Screed are also shown in subsequent pages.



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.

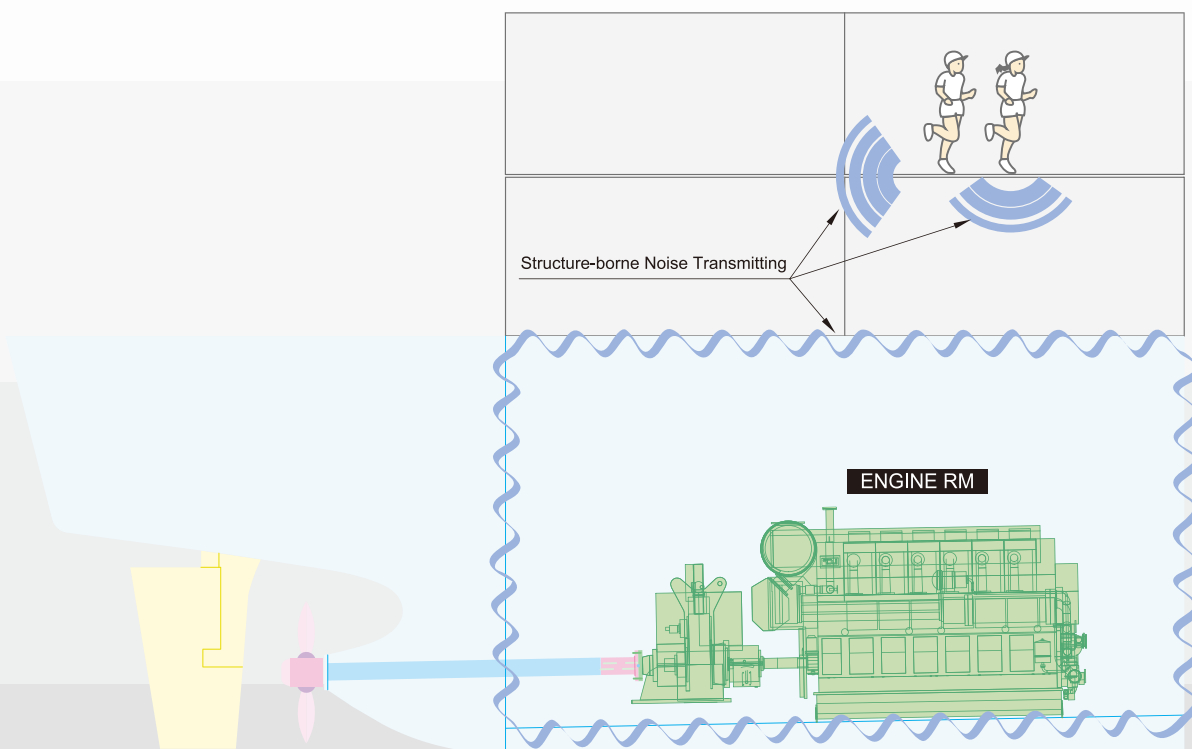
Walking, jogging and dancing are obvious examples of impact sound, which occurs for a short duration. Vibration, on the other hand, is periodic and continuous.

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.

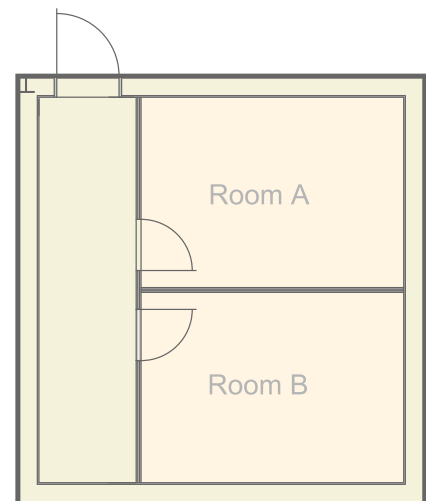
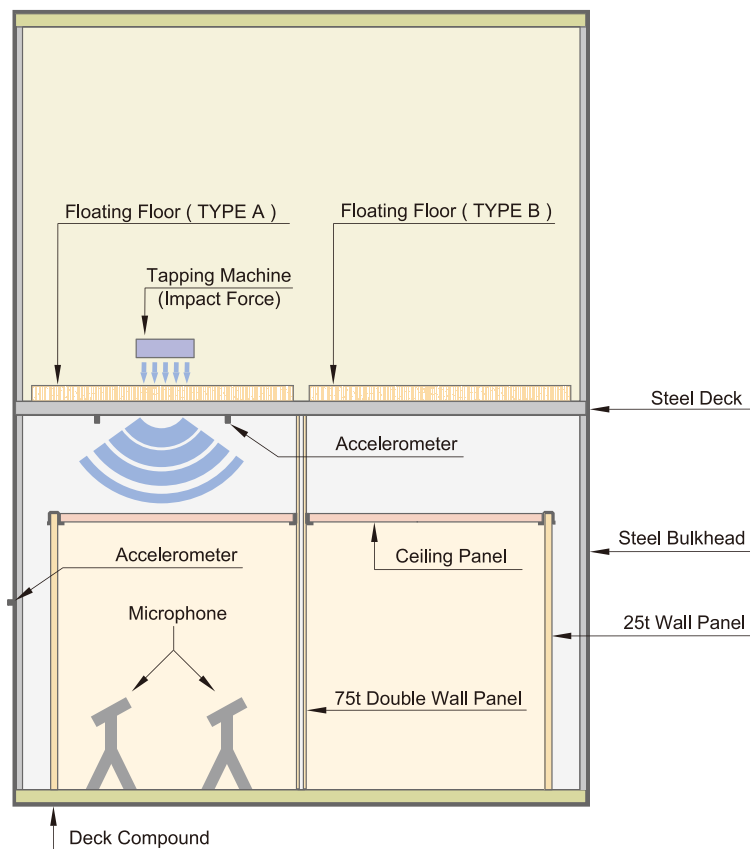
Using the measured sound level data, a single number rating of impact sound insulation is obtained by comparing it with a reference contour per ISO 717-2.

The rating so obtained is called "the weighted normalized impact sound pressure level, $L_{n,w}$ ".

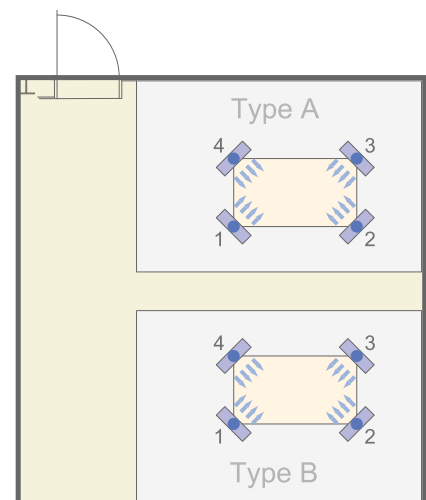
In addition to the measure of impact Sound. Structure-Borne Noise by vibration is also measured with accelerometers on the deck surface above ceiling and steel wall outside.

STACO A-60 Fire Class Floating Floor systems FF-50VL, FF-50A & FF-70A are designed for universal applications on ships and offshore installations. The STACO floating floor systems have the core material as Mineral Wool insulation material surfaced by a 4.9 or 3.2 mm thick galvanized steel plate and finished with Carpet or Vinyl Flooring.

Typical section



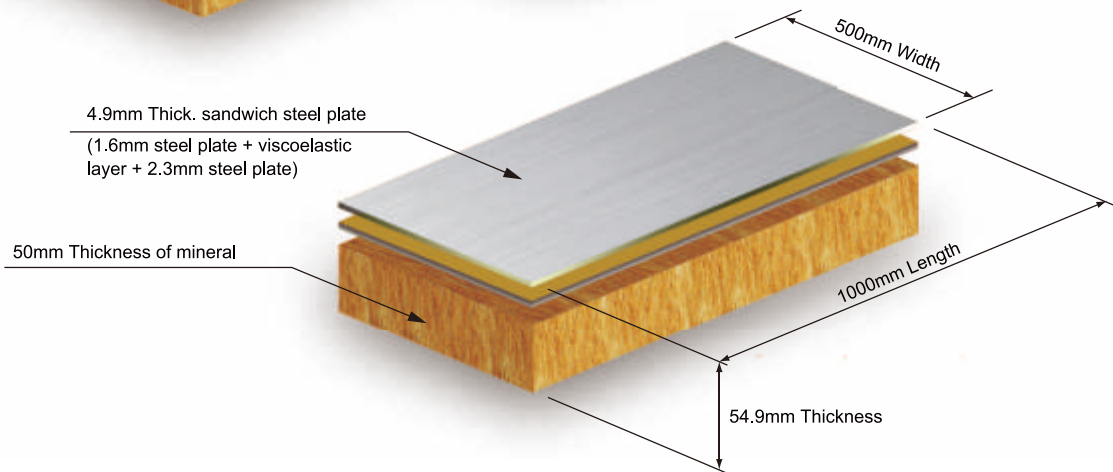
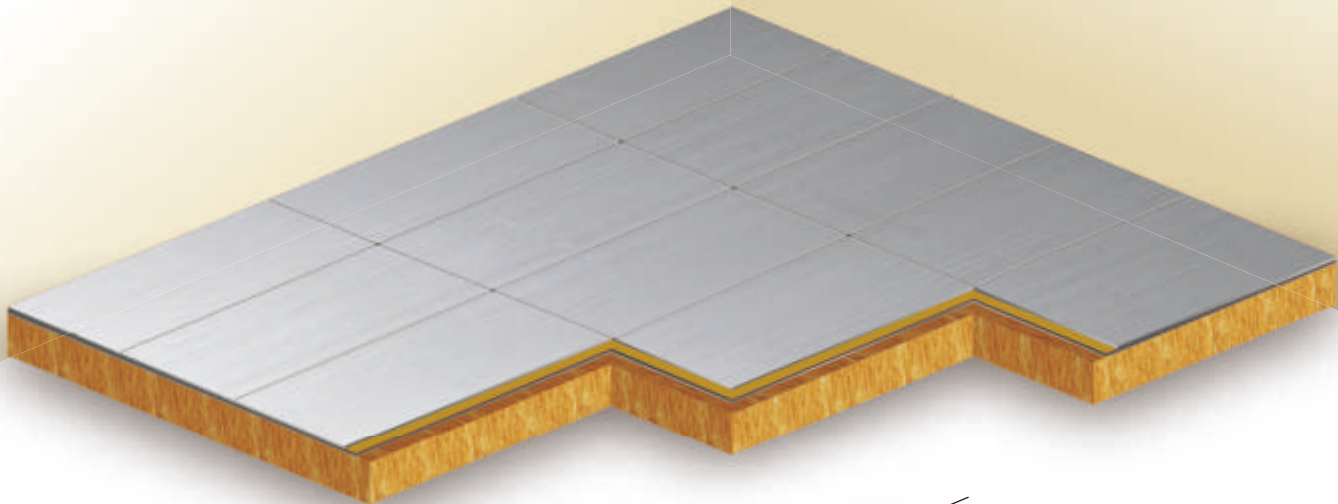
Floor impact deck plan



Receiving room plan

FF-50VL

A-60 Fire Class Floating Floor



Technical Data

Fire Class : A-60

Weight : 38.78kg/m²

Sound Reduction Index : L_{n,w} 42dB

Thermal Transmittance : 0.55kcal/m²h°C

Construction

Core Material : Mineral Wool

Surface Material : 4.9mm Thk. Sandwich Steel Plate

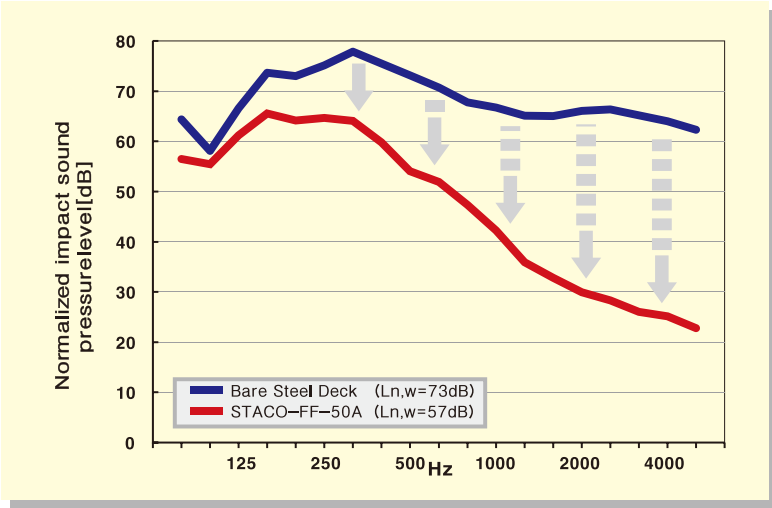
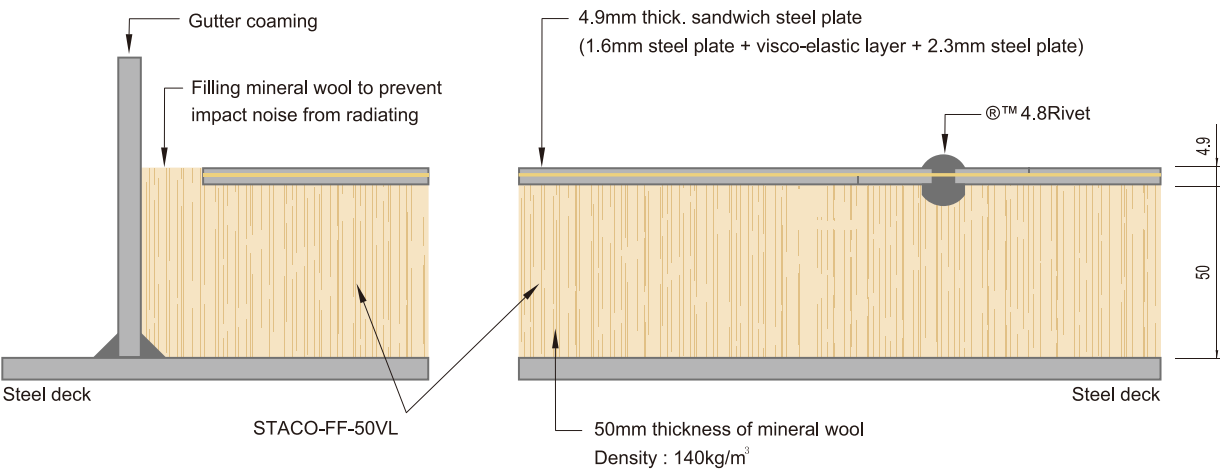
Finish Material : Carpet or Vinyl Flooring

Dimensions

Thickness	: 54.9mm	±1mm
Width	: 500mm(Standard)	±1mm
Length	: 1000mm(Standard)	±3mm

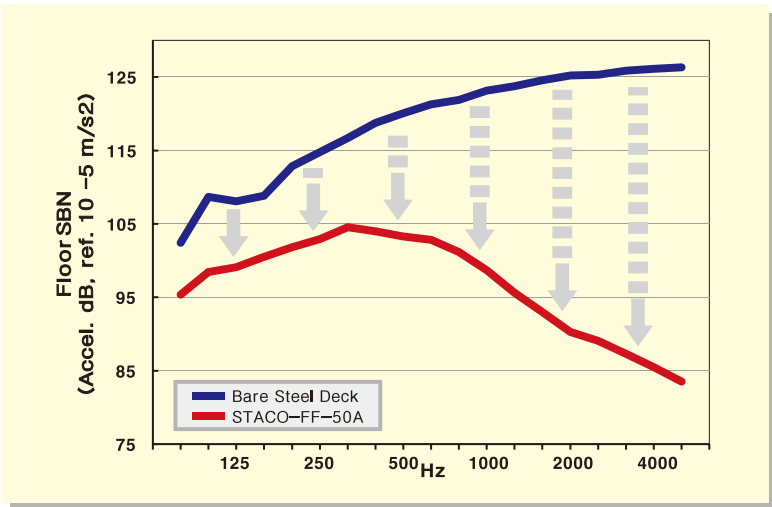
FF-50VL

A-60 Fire Class Floating Floor



Each curve above shows Ln, the impact noise level of 6mm steel deck and the deck with 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

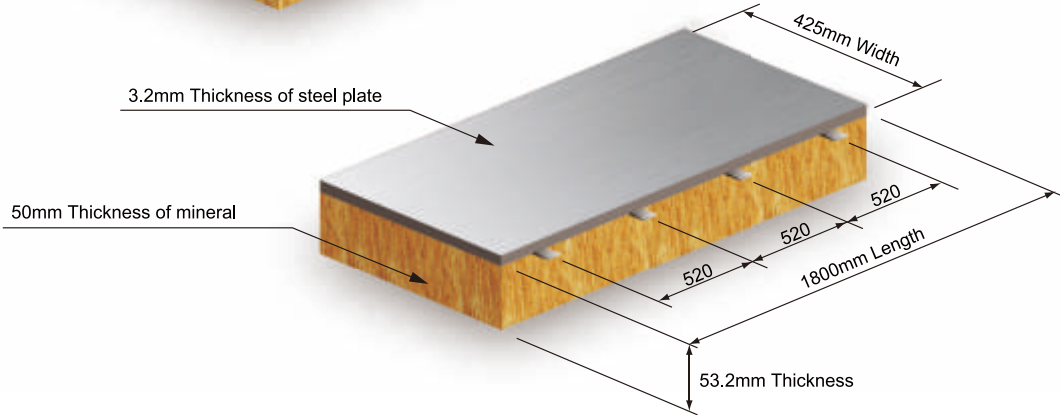
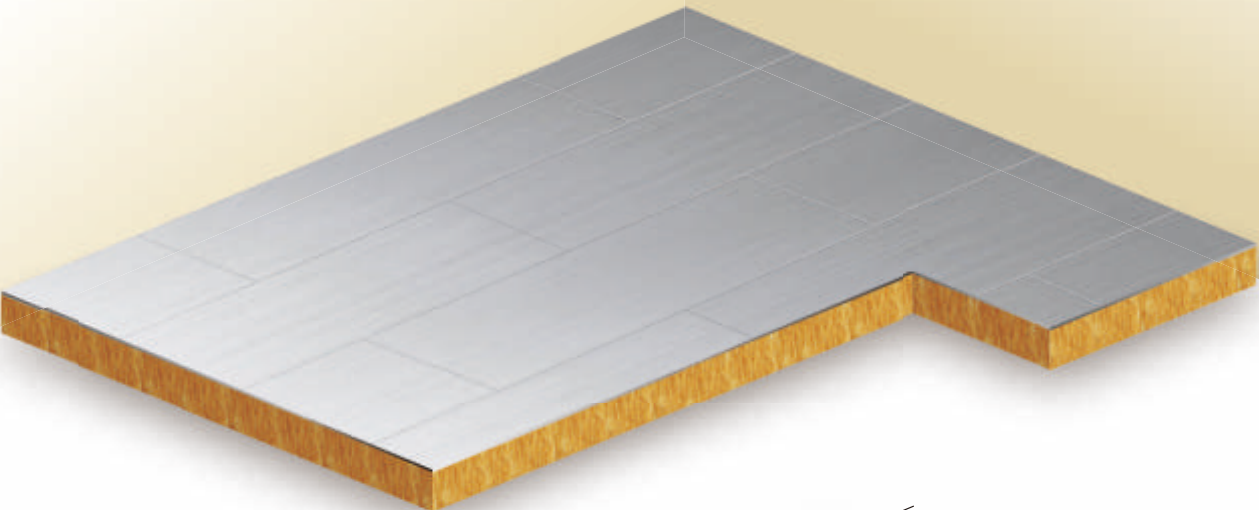


The above curves show reduction of Structure-Borne Noise when structural impact is applied on STACO-FF-50VL.

Hz	Type	Bare steel	FF-50VL
80		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

FF-50A

A-60 Fire Class Floating Floor

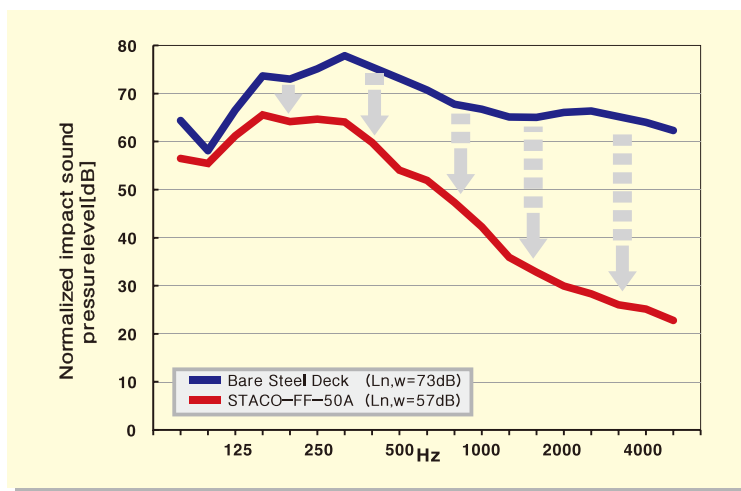
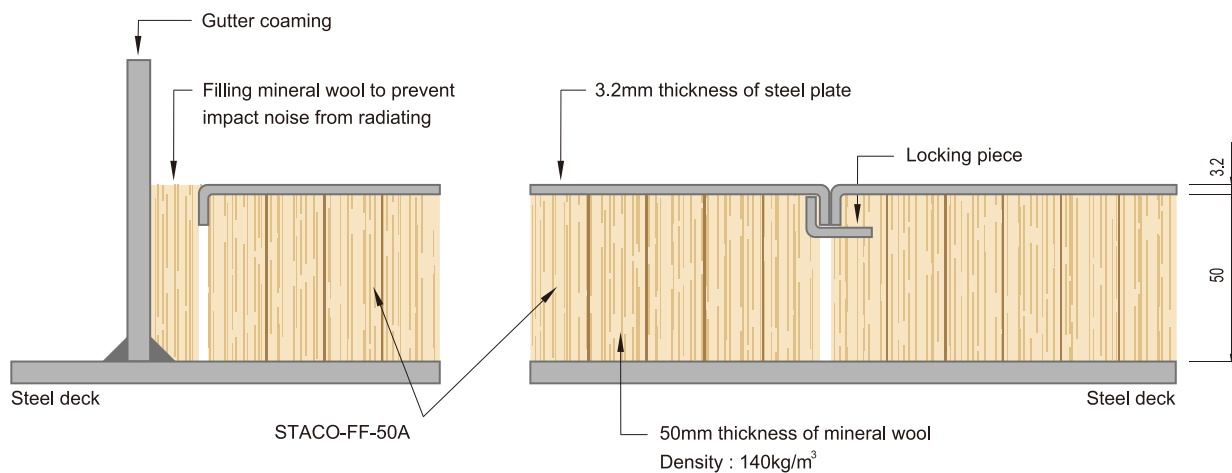


Technical Data
Fire Class : A-60
Weight : 35.04kg/m²
Sound Reduction Index : L _{n,w} 57dB
Thermal Transmittance : 0.55kcal/m²h°C

Construction
Core Material : Mineral Wool
Surface Material : 3.2mm Thickness Galv'd Steel Plate
Finish Material : Carpet or Vinyl Flooring

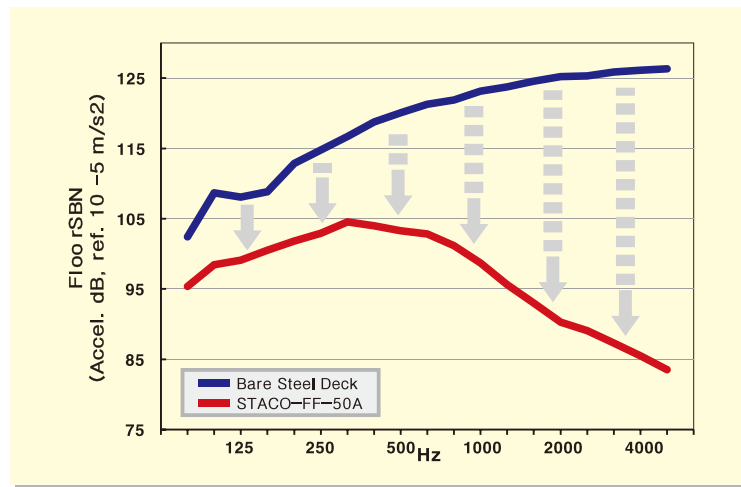
Dimensions		
Thickness	: 53mm	±1mm
Width	: 425mm(Standard)	±1mm
Length	: 1800mm(Standard)	±3mm

FF-50A A-60 Fire Class Floating Floor



Each curve above shows Ln, the impact noise level of 6mm steel deck and the deck with 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

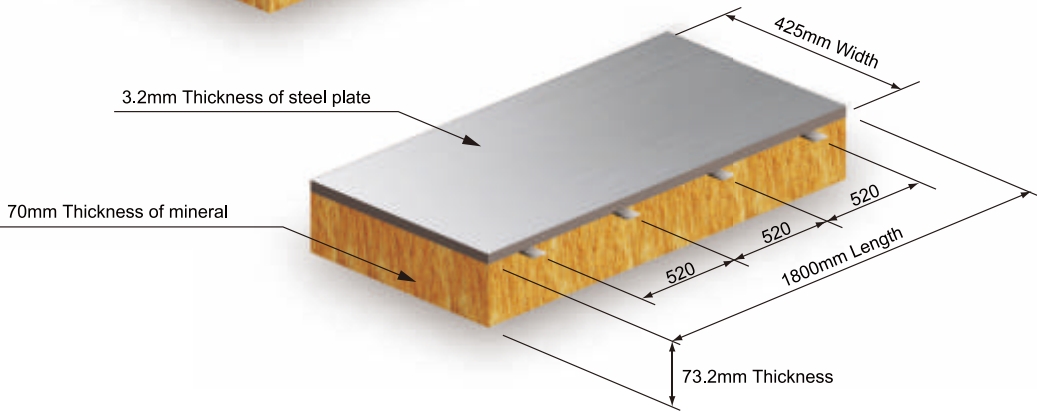
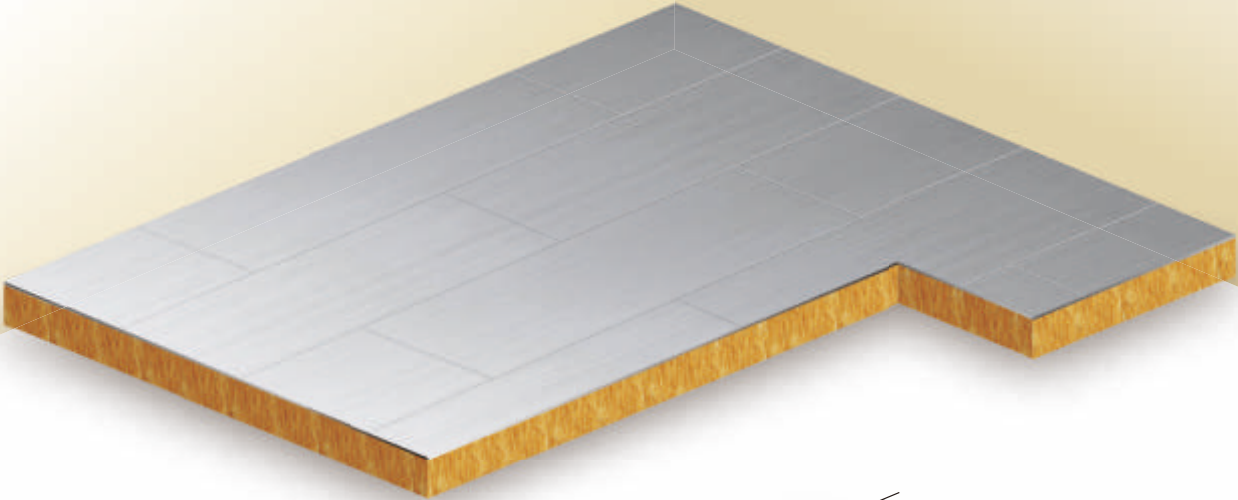


The above curves show reduction of Structure-Borne Noise when structural impact is applied on STACO-FF-50A.

Hz	Type	Bare steel	FF-50A
80		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

FF-70A

A-60 Fire Class Floating Floor

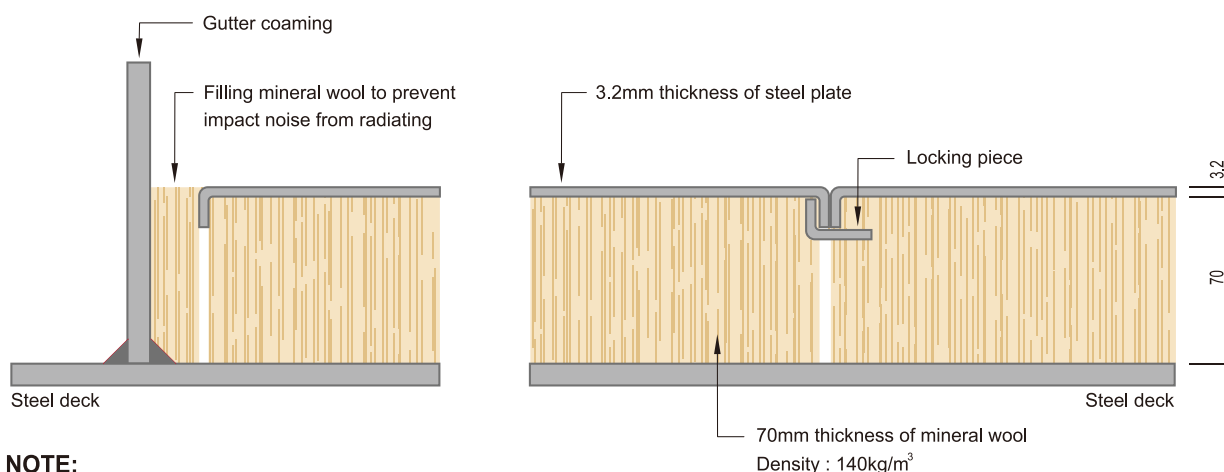


Technical Data
Fire Class : A-60
Weight : 37.84kg/m ²
Sound Reduction Index : L _{n,w} 55dB (Estimation)
Thermal Transmittance : 0.40kcal/m ² h°C

Construction
Core Material : Mineral Wool
Surface Material : 3.2mm Thickness Galv'd Steel Plate
Finish Material : Carpet or Vinyl Flooring

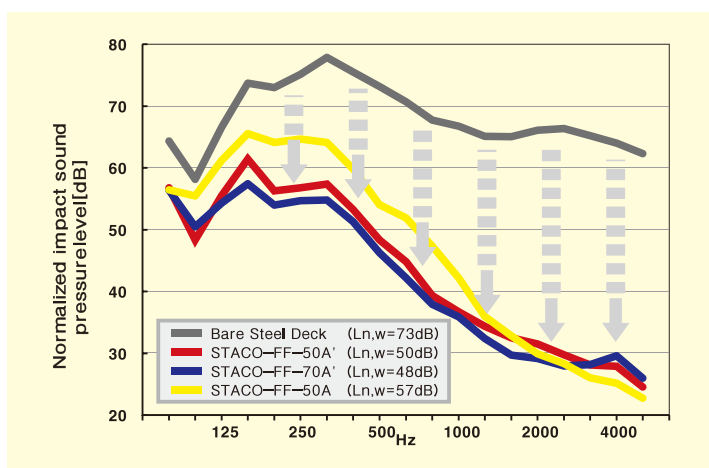
Dimensions		
Thickness	: 73mm	±1mm
Width	: 425mm(Standard)	±1mm
Length	: 1800mm(Standard)	±3mm

FF-70A A-60 Fire Class Floating Floor

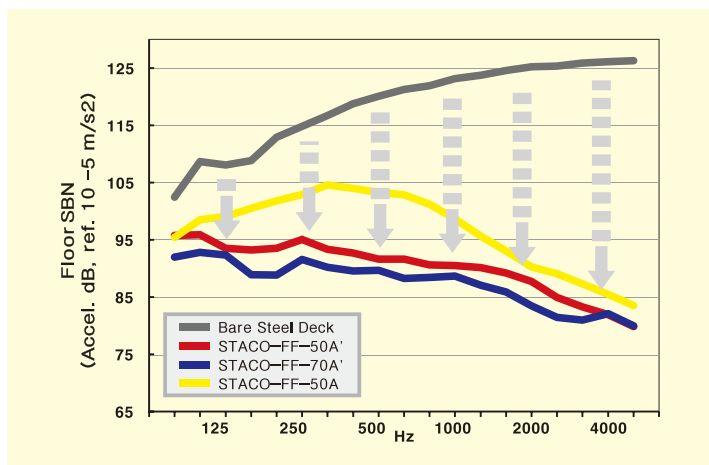


NOTE:

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



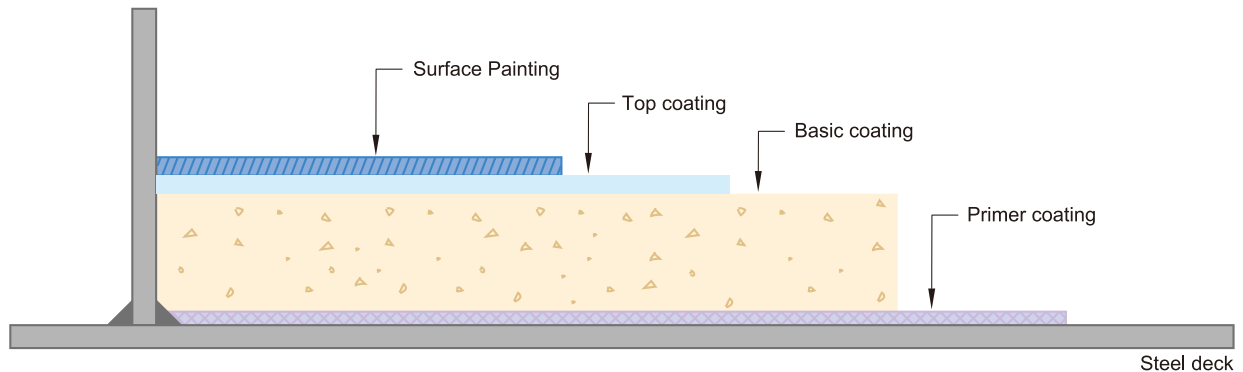
The above curves show the damping capacity against vibration by impact. It can be presumed a damping capacity of FF-70A better than of FF-50A.

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

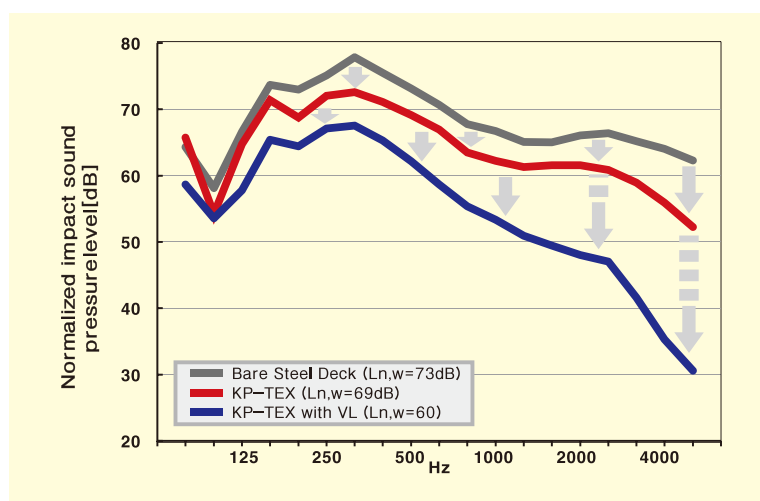
General Deck Composition



Technical Specification

Technical Data	Construction
Fire Class : Noncombustible	1. Primer coating Thk. 0.5mm (liquid 0.5kg/m + solid 1.0kg/m)
Weight : 18kg/m ²	2. Basic coating Thk. 6.6mm (liquid 1kg/m + solid 12kg/m)
Normalized Impact Sound Level : $L_{n,w}$ 69dB	3. Top coating Thk. 0.6mm (liquid 0.5kg/m + solid 1.0kg/m)
Thermal Transmittance : 0.40kcal/m ² h°C	4. Surface Painting Thk. 0.3mm (liquid 0.4kg/m)

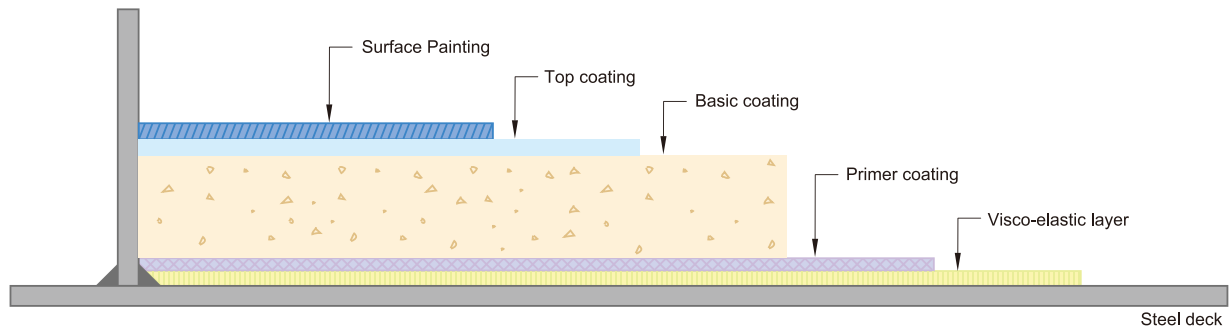
Dimensions	
Thickness	Min. 8mm
	+0, -1 mm



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

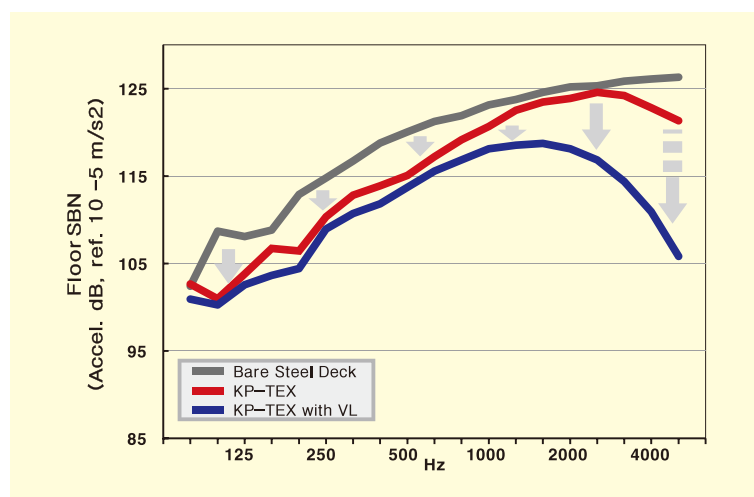
Hz	Type	KP-TEX	KP-TEX (with Viscoelastic)
80		65.8	58.7
100		54.2	53.6
125		64.8	57.8
160		71.4	65.4
200		68.7	64.4
250		72.1	67.1
315		72.6	67.6
400		71.1	65.3
500		69.2	62.2
630		67.0	58.7
800		63.5	55.4
1000		62.2	53.4
1250		61.3	50.9
1600		61.6	49.4
2000		61.6	48.0
2500		60.8	47.0
3150		59.0	41.6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

High Impact sound Reduction Deck Composition



Technical Specification

Technical Data	Construction
<p>Fire Class : Noncombustible</p> <p>Weight : 19.17kg/m²</p> <p>Normalized Impact Sound Level : L_{n,w} 60dB</p> <p>Thermal Transmittance : 0.40kcal/m²h°C</p>	<ol style="list-style-type: none"> 1. Viscoelastic Thk. 1.0mm 2. Primer coating Thk. 0.5mm (liquid 0.5kg/m + solid 1.0kg/m) 3. Basic coating Thk. 6.6mm (liquid 1kg/m + solid 12kg/m) 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. 9mm
	+0, -1 mm

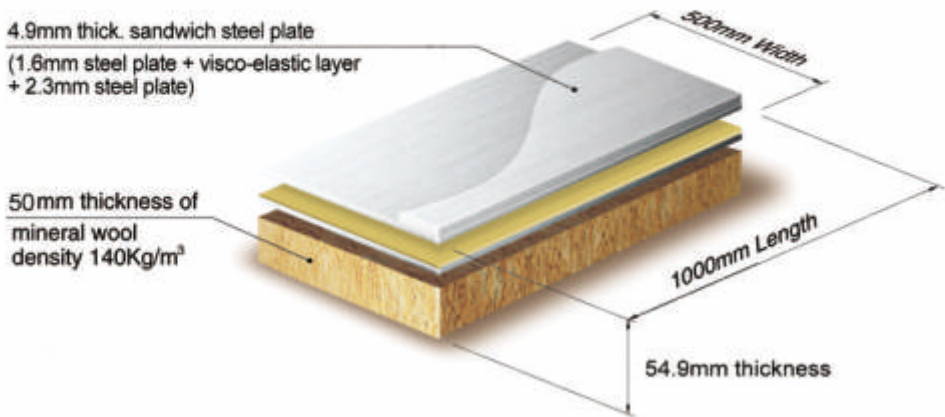
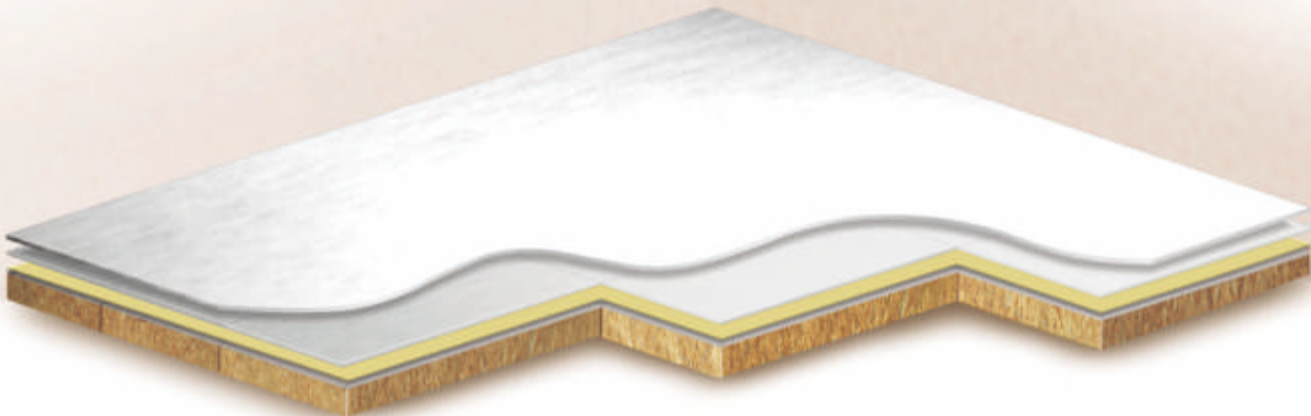


The above curves show reduction of Structure-Borne Noise when structural impact is applied on respectively.

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

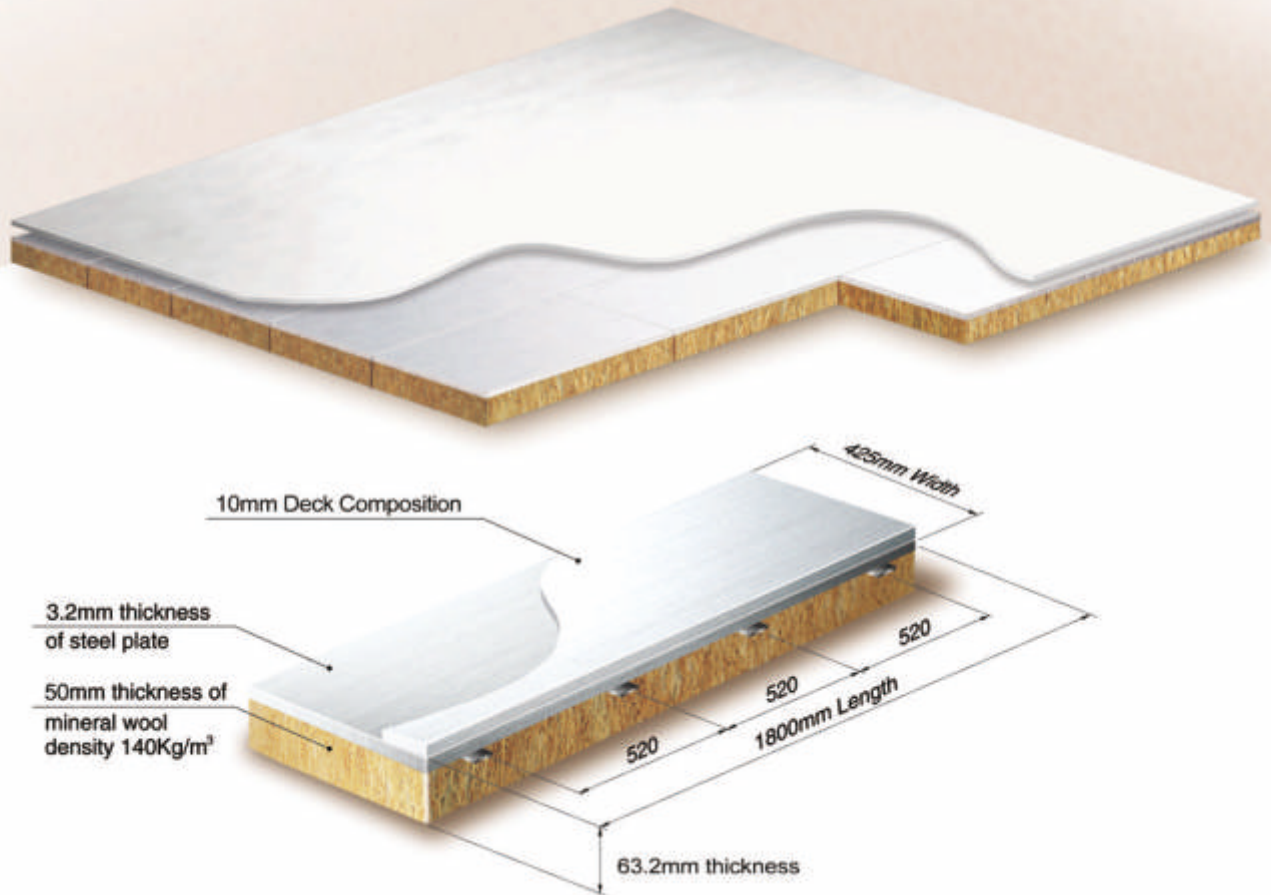


Technical Specification

Technical Data	Construction
Fire Class : A-60 Deck	Core Material : Mineral Wool Density 140kg/m³
Weight : 56.78kg/m²	Surface Material : 4.9mm Thick. sandwich steel plate (1.6mm steel plate + viscoelastic)
Normalized Impact Sound Level : $L_{n,w}$ 37dB	Finish Material : Deck Composition
Thermal Transmittance : 0.55kcal/m²h°C	

Dimensions		
Thickness	: 64.9mm	±0, -1mm
Width	: 500mm(Standard)	±0, -1mm
Length	: 1000mm(Standard)	±3mm

A-60 Fire Class Floating Floor



Technical Specification

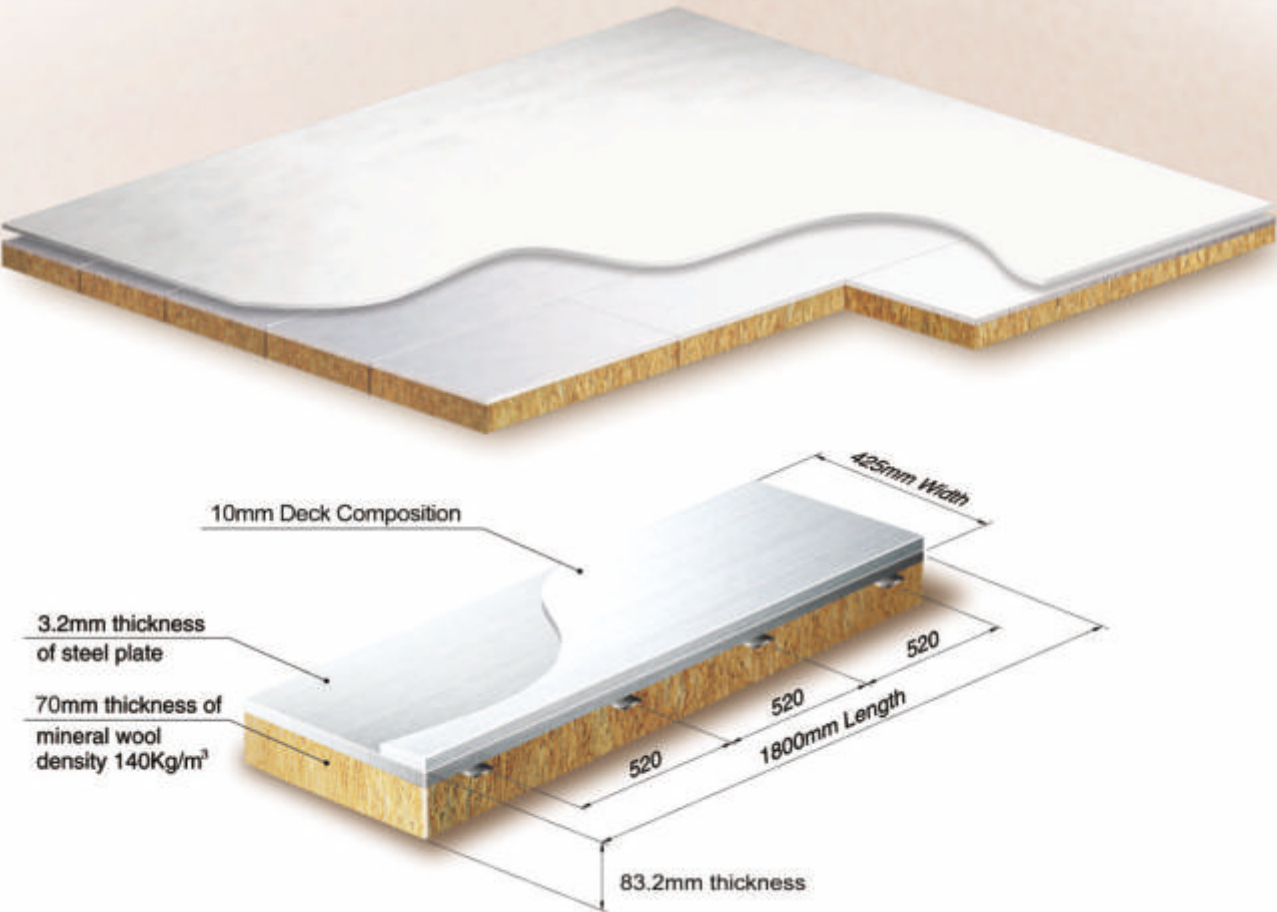
Technical Data	
Fire Class : A-60 Deck	
Weight : 54.04kg/m²	
Normalized Impact Sound Level : L _{n,w} 52dB (Estimation)	
Thermal Transmittance : 0.40kcal/m²h°C	

Construction	
Core Material : Mineral Wool Density 140kg/m³	
Surface Material : 3.2mm Thickness Galv'd Steel Plate	
Finish Material : Carpet or Vinyl Flooring	

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

Floating Floor with Screed

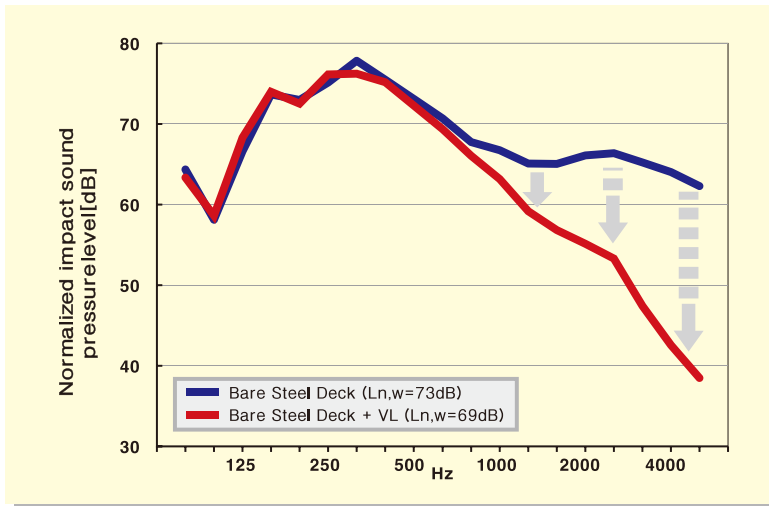
A-60 Fire Class Floating Floor



Technical Specification

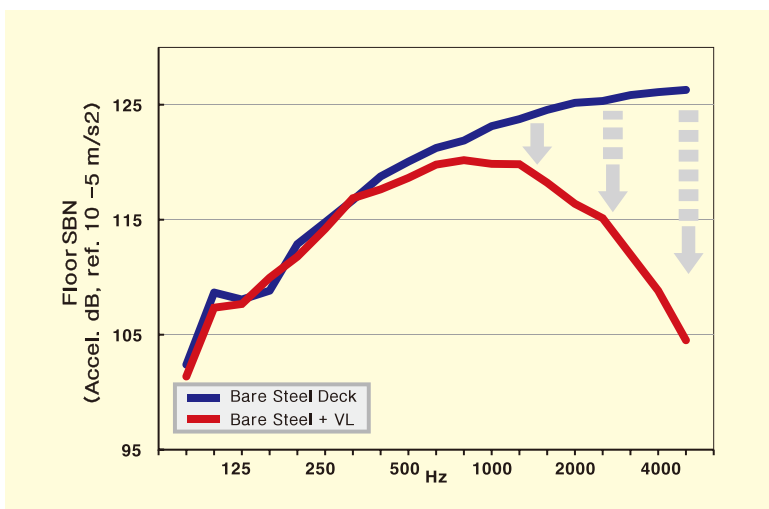
Technical Data	Construction
Fire Class : A-60 Deck	Core Material : Mineral Wool Density 140kg/m³
Weight : 55.84kg/m²	Surface Material : 3.2mm Thickness Galv'd Steel Plate
Normalized Impact Sound Level : L _{n,w} 50dB	Finish Material : Deck Composition
Thermal Transmittance : 0.40kcal/m²h°C	
Dimensions	
Thickness	: 83.2mm ±0, -1mm
Width	: 425mm(Standard) ±0, -1mm
Length	: 1800mm(Standard) ±3mm

Bare Steel & Bare Steel with Visco elastic



Each curve above shows L_n , 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
$L_{n,w}$		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