



ROGERS
CORPORATION

PSI Silicones

Rail Interiors Solutions

EN 45545 Material Selection Guide

Rogers' BISCO® product family offers a wide range of multi-functional silicone based elastomeric foams and solids for use in many rail interior applications such as seals, gaskets, floor isolation pads, thermal insulation, sound barriers and anti-squeak / rattle pads. These materials are offered in continuous sheet form, enabling ease of fabrication whether slitting, die-cutting or laminating with adhesive.

In addition, Rogers offers a highly durable silicone seat cushion foam supplied in bun stock form or as a fabricated cushion shaped to the customer's design requirements.

Rogers ... leading the way with EN 45545 compliant solutions and technical expertise

The EN 45545 Explained

Standards:

EN 45545-1: Fire Protection of Railway Vehicles : General Guidelines

EN 45545-2: Fire Protection of Railway Vehicles : Requirements for Fire Behavior of materials and components

The material requirement set (R1, R2..) is dependent on the train car type (HL rating) and product classification (IN1A, EX2..) :



OPERATION CATEGORY	DESIGN CATEGORY			
	N: Standard Vehicles	A: Automatic train vehicles. No on board emergency staff	D: Double Decked vehicle	S: Sleeping and couchette vehicles
1	HL1	HL1	HL1	HL2
2	HL2	HL2	HL2	HL2
3	HL2	HL2	HL2	HL3
4	HL3	HL3	HL3	HL3

EN 45545-2 Table 1 - Hazard Level Classification

OPERATION CATEGORY	SERVICE TYPE	INFRASTRUCTURE	EVACUATION PLAN
1	Mainline, regional, urban and suburban	No underground sections, tunnels and/or elevated structures.	Vehicle shall stop with minimum delay at a suitable safe location.
2	Urban and suburban	Includes underground sections, tunnels and/or elevated structures with walkways/safe side evacuation.	Vehicle shall stop at next station or suitable safe location. May stop at walkway/safe side evacuation.
3	Mainline and regional	Includes underground sections, tunnels and/or elevated structures with walkways/safe side evacuation.	Vehicle shall stop at suitable ground level location or rescue station. May stop at walkway/safe side evacuation.
4	Mainline, regional, urban and suburban	Includes underground sections, tunnels and/or elevated structures without walkways/safe side evacuation.	Vehicle shall continue to the next station, suitable ground level location or rescue station.

EN 45545-1 Table 1 - Operation Categories

Application and Material Guide

The BISCO Silicones Advantage – Peace of Mind

HVAC System

Multi-functional Solutions

- » Numerous benefits in one material choice.
- » Unique chemistries deliver exceptional performance to long-term physical, thermal and environmental abuse.

Long-Term Durability

- » Excellent dimensional stability
- » Resilient to mechanical fatigue
- » High & low temperature resistance
- » Low compression set, creep and stress relaxation

Design Reliability

BISCO Silicones ensure components and systems perform as expected for the life of the railcar through:

- » Long term material durability and performance
- » Resistance to environmental factors (UV, ozone, chemical, temperature resistance)

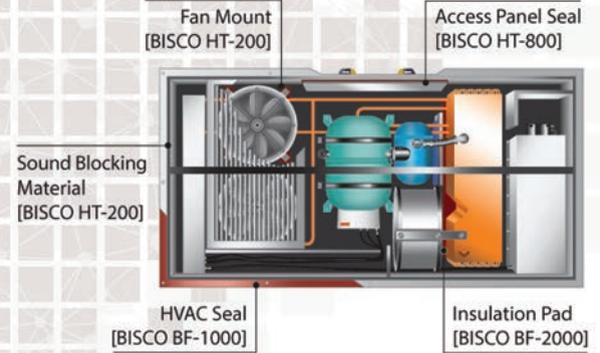
Passenger Safety

- » Compliance to EN 45545 requirements without the use of restricted toxic substances.
- » Fire-resistant properties are inherent to the homogenous formulation and cell structure, eliminating the need for fire-block layers and providing lasting fire resistance.

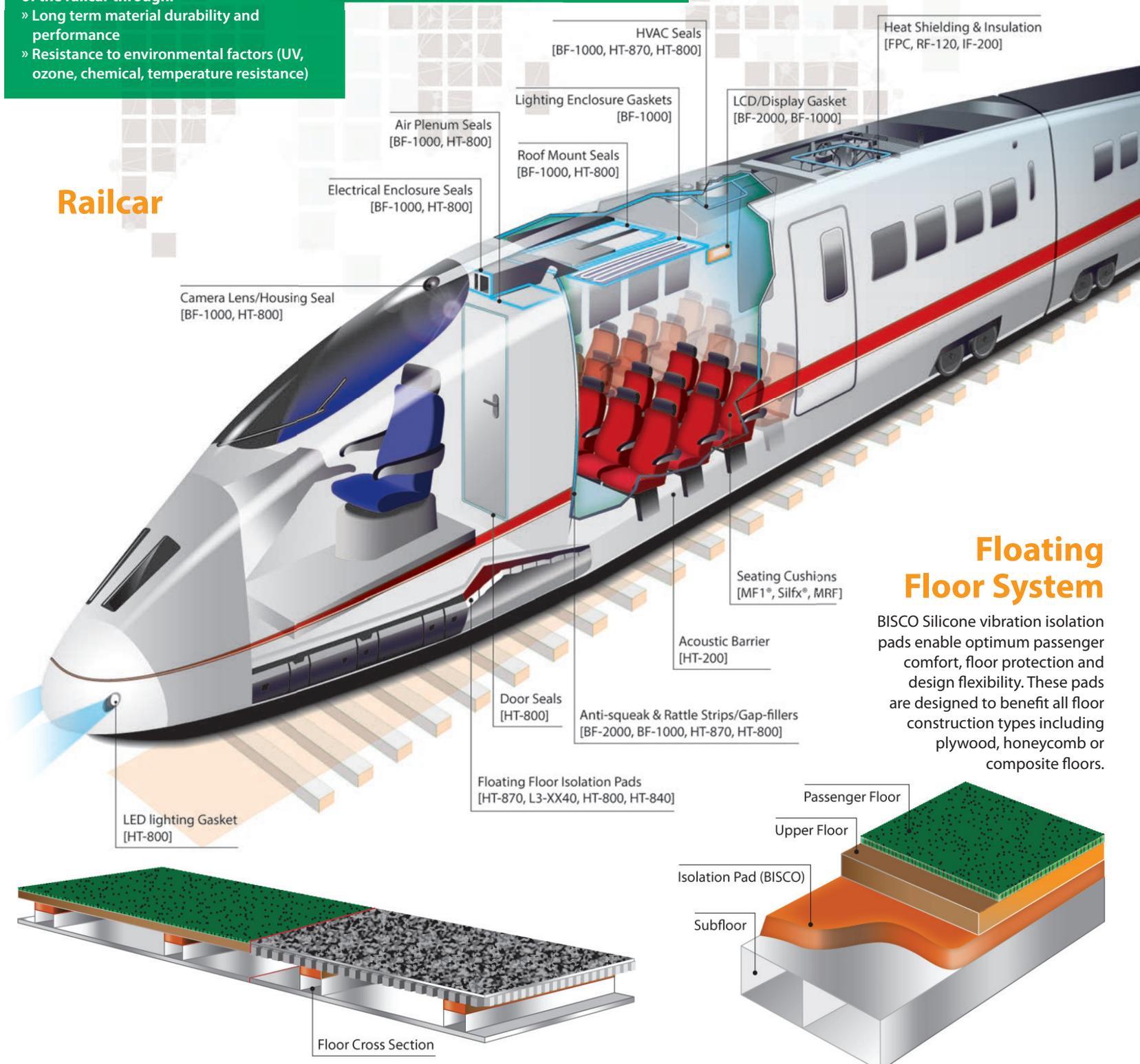
Reducing Maintenance Costs

By utilizing the MF1® silicone seat foam, transit authorities benefit from:

- » Longer lasting cushion life and comfort compared to commonly used urethane cushions
- » Significant savings in maintenance costs and revenue lost to downtime

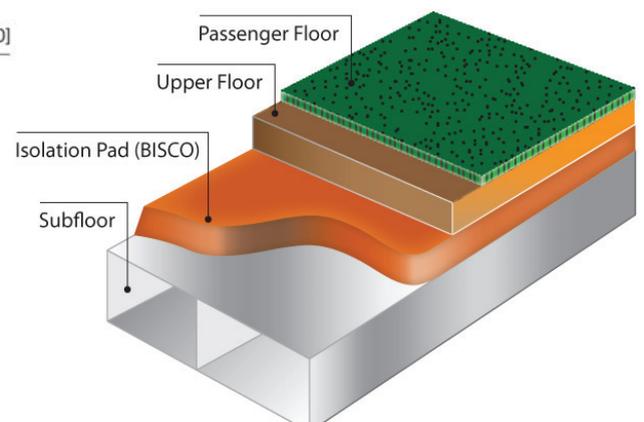


Railcar



Floating Floor System

BISCO Silicone vibration isolation pads enable optimum passenger comfort, floor protection and design flexibility. These pads are designed to benefit all floor construction types including plywood, honeycomb or composite floors.



Floor Cross Section

Helping **power, protect, connect** our world™

Material Selection Guide

EN 45545 REQUIREMENT SET	LISTED PRODUCT NO.	MULTI-FUNCTIONAL (SEAL / GASKET / ANTI-SQUEAK & RATTLE / INSULATION / GAP-FILLER)						ACOUSTIC BARRIER	SEAT CUSHION FOAM
		VIBRATION ISOLATION PADS (FLOORING)							
		BF-2000	BF-1000	HT-870	HT-800	L3-XX40	HT-840	HT-200	MF1
		ULTRA SOFT	EXTRA SOFT	SOFT	MEDIUM	MEDIUM FIRM	FIRM	FLEXIBLE SOLID	SOFT-MEDIUM -FIRM
R1 - Interiors Primary	IN1A, IN1B, IN1D, IN1E, IN15, IN4, IN7, IN12A, IN12B, IN14				0.79MM [HL1]	4MM [HL2]		0.7MM - 4MM [HL2]	
R2 - Interiors Limited Use	IN2, IN9A, IN10		2.39MM - 25.4MM [HL3]		1.6MM - 12.7MM [HL3]	4MM [HL3] 25MM [HL2]	1.6MM - 6.35MM [HL3]	0.7MM - 4MM [HL3]	
R3 - Interiors Strips	IN3A		2.39MM - 25.4MM [HL3]		0.79MM - 12.7MM [HL3]	4MM - 25MM [HL3]	1.6MM - 6.35MM [HL3]	0.7MM - 4MM [HL3]	
R7 - External Features	IN12C, EX1A, EX1C, EX3, EX4, EX5, EX6A, EX8, EL3C				0.79MM [HL1]	4MM [HL2]		0.7MM - 4MM [HL3]	
R8 - External Roof Features	EX2, EX6B				12.7MM [HL3]				
R9 - Bogie Rubber Elements	M1			2MM - 19MM [HL3]	2MM - 12.7MM [HL3]				
R10 - Flooring Components	IN1C, IN15			2MM - 19MM [HL3]	2MM - 12.7MM [HL3]	4MM - 25MM [HL3]	1.6MM - 6.35MM [HL3]		
R18 - Full Seat	F1								HL3
R19 - Staff Seats	F2								HL3
R21 - Seat Components	F1A, F1B, F1E, F3								HL3
R22 - Interior Seals	IN16	3.18MM - 12.7MM [HL3]	1.6MM - 25.4MM [HL2]		0.79MM - 12.7MM [HL3]	4MM - 25MM [HL3]	1.6MM - 6.35MM [HL3]		
R23 - Exterior Seals	EX12	3.18MM - 12.7MM [HL3]	1.6MM - 25.4MM [HL2]		0.79MM - 12.7MM [HL3]	4MM - 25MM [HL3]	1.6MM - 6.35M [HL3]		
PHYSICAL PROPERTIES	TEST STANDARD	TYPICAL VALUES ONLY							
Density, kg/m3 (lb/ft3)	ASTM D1056 derived	160 (10)	192 (12)	240 (15)	352 (22)	352 (22)	449 (27)	See Datasheet	112 (7)
Compression Force Deflection, kPa (psi)	ASTM D1056 (25% compression)	10.3 (1.5)	20.7 (3)	27.6 (4)	62.0 (9)	89.6 (13)	151.7 (22)		6.2 (0.9)
Tensile Strength, kPa (psi)	ASTM D412	172 (25)	241 (35)	207 (30)	310 (45)	172 (25)	414 (60)		86 (12.5)
Elongation, %	ASTM D412	85	90	90	80	40	60		45
Thermal Conductivity, Wm/k	ASTM C518	0.05	0.06	0.07	0.07		0.1		0.05
Water Absorption, %	Submersion (24 hrs @ 23C)	5							-
Compression Set, %	ASTM D1056 (100C at 50% compression)	5							
Temperature Range, C	Rogers Internal / ASTM D1056	-55 to 200							

See material datasheets or visit www.rogerscorp.com/emrail for more information on all product offerings

BISCO Silicone Specialty Services

Value Added

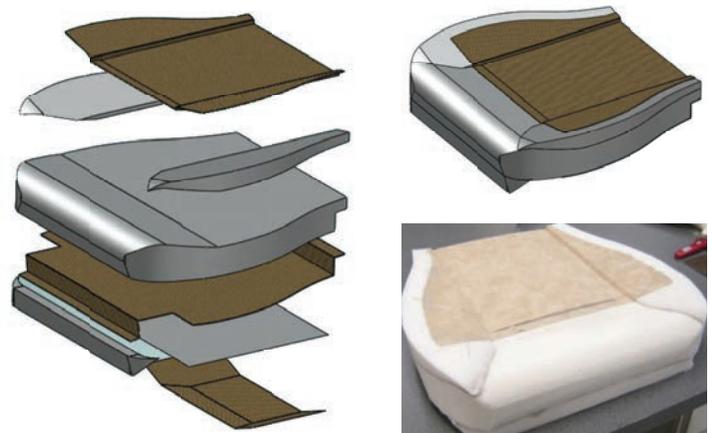
(ROLLED MATERIALS – ELASTOMERS & SOLIDS):

- » Pressure sensitive adhesive options
 - Acrylic adhesive (one or two sides of material)
 - Silicone adhesive (one side of material)
- » Slitting
 - Slitting rolls to desired width
 - Material with or without adhesive
- » Specialty substrates applied to material

Seat Cushion Fabrication

(MF1® BUN STOCK ONLY):

- Slit and cut to desired sheet dimensions
- Complex contour cutting using CNC
- Cut and assemble process to meet desired cushion shape
- Cotton duck cloth reinforcement



Rogers — Technical expertise to help design robust solutions

Design and application support:

- » Seat cushion design
 - Cushion CAD mockup and prototyping
 - Molded to fabricated cushion conversion and design
 - Cost of cushion ownership calculation
- » Seat construction guidance
- » Floating floor isolation material design
- » Vibrations and acoustic
- » Gasket and seal design
- » In-house R&D and product development

Converter Network:

- » Rogers partners with and sells its materials through a select group of Preferred Converters.
- » These converters specialize in various fabrication processes including laminating adhesives, slitting, die-cutting, contour shape cutting, CNC and assembly of components.

Talk to a Rogers' technical sales or application engineer today.
Visit: www.rogerscorp.com/ems/bisco/contactus.aspx

About Rogers Corporation

Rogers Corporation (NYSE:ROG) is a global leader in engineered materials to power, protect, and connect our world. With more than 180 years of materials science experience, Rogers delivers high-performance solutions that enable clean energy, internet connectivity, and safety and protection applications, as well as other technologies where reliability is critical. Rogers delivers Power Electronics Solutions for energy-efficient motor drives, vehicle electrification and alternative energy; Elastomeric Material Solutions for sealing, vibration management and impact protection in mobile devices, transportation interiors, industrial equipment and performance apparel; and Advanced Connectivity Solutions for wireless infrastructure, automotive safety and radar systems. Headquartered in Connecticut (USA), Rogers operates manufacturing facilities in the United States, China, Germany, Belgium, Hungary, and South Korea, with joint ventures and sales offices worldwide.

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