

GLOBAL RAIL SPECIFICATION MATERIAL SELECTION GUIDE



Rogers...

leading the way with global flame, smoke and toxicity compliant solutions and technical expertise



Rogers' BISCO® material 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 adhesives.

A highly durable, long lasting and comfortable silicone seat cushion foam is supplied in bun stock form.

TECHNICAL EXPERTISE TO HELP DESIGN ROBUST SOLUTIONS

Design and application support:

- Cost of cushion ownership calculation
- 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.
- Seat cushion design
 - Cushion CAD mockup and prototyping
 - Molded to fabricated cushion conversion and design
- Seat construction guidance

Need help with an application? Rogers is here to support you.

Contact our product experts at the Solutions Center: solutions@rogerscorp.com



RAIL STANDARDS INCLUDE:

EN45545

The European standard for railway applications. This standard classifies all materials on board into different groups which must fulfill specific "requirement sets" that often include the use of several test methods.

49CFR238/ NFPA 130

The North American standard for railway applications. This standard is based upon a variety of test methods which cover flame, smoke, and toxicity. The specific area of application may limit or increase the required test methods.

BS 6853

The British standard for fire safety in the design and construction of railway vehicles. Although the standard has been withdrawn and replaced with EN 45545, Rogers still maintains the capabilities necessary to meet BS 6853 certification to allow for support of legacy projects.

EN45545 is the European standard for flame, smoke and toxicity in railway applications. The standard assigns a hazard level depending on the intended use of the railcar and further classifies applications and requirements.

EN45545 explained

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

HAZARD LEVEL CLASSIFICATION

HL1 HL2 HL3 →

Level pass / fail requirement stringency [Material compliant to HL3 fulfills HL1 & HL2 requirements]

HL classification dependent on operation and design category

PRODUCT CLASSIFICATION IN1A, EX2, F1...

Listed Products: EN 45545-2 Table 2 defines the requirement sets to be met for various listed product / applications. The listed products are categorized into numerous material applications sets for interior, exterior, furniture, electro technical and mechanical equipment.

Non-listed Products: Products not listed in EN45545-2 Table 2 are subject to the requirements of EN 45545-2 Section 4.3 and Table 3.

REQUIREMENT SET R1, R2, R3...

The material requirement set (R1, R2, R3..) defines the specific tests and pass/fail criteria of the associated products (IN1A, 1EX2, F1..) for each Hazard Level classification (HL1, HL2, HL3). The requirement sets are groupings of various product classifications and their applications (i.e. R22 defines requirements for interior seals).

Colors and Patterns: A test that qualifies a product will also qualify any other product which differs only in color and/or pattern.

Material Thickness: All intermediate thickness are also compliant when a product is compliant at two different thickness manufactured with identical formulations.

Requirement Set	Seals / Gaskets / Insulation / Gap-Filling						Acoustic Barrier	Seat Cushion Foam		
	Vibration Isolation Pads (Floating Floor)							MF1-35	MF1-55	MF1-75
	BF-2000	BF-1000	HT-870	HT-800	L3-XX40	HT-840				
Ultra Soft	Extra Soft	Soft	Medium	Medium Firm	Firm	Solid on Fiberglass	Soft Grade	Medium Grade	Firm Grade	
R1 - Interiors Primary				0.79mm [HL1]			0.7mm - 4mm [HL2]			
R2 - Interiors Limited Use		2.39mm - 25.4mm [HL3]		0.79mm - 12.7mm [HL2]	4mm [HL3] 25mm [HL2]	1.6mm - 6.35mm [HL3]	0.7mm - 4mm [HL2]			
R3 - Interiors Strips		2.39mm - 25.4mm [HL3]		0.79mm - 12.7mm [HL3]	4mm - 25mm [HL3]	1.6mm - 6.35mm [HL3]	0.7mm - 4mm [HL2]			
R7 - External Features							0.7mm - 4mm [HL2]			
R8 - External Roof Features				0.79mm - 12.7mm [HL3]						
R9 - Bogie Rubber Elements			2mm - 19mm [HL3]	0.79mm - 12.7mm [HL3]			0.7mm - 4mm [HL3]			
R10 - Flooring Components			2mm - 19mm [HL3]	0.79mm - 12.7mm [HL3]	4mm - 25mm [HL3]	1.6mm - 6.35mm [HL3]				
R18 - Full Seat								HL3	HL3	HL3
R19 - Staff Seats								HL3	HL3	HL3
R21 - Seat Components								HL3	HL3	HL3
R22 - Interior Seals	3.18mm - 12.7mm [HL3]	1.6mm - 25.4mm [HL2]	1.6mm - 12.7mm [HL3]	0.79mm - 12.7mm [HL3]	4mm - 25mm [HL3]	1.6mm - 6.35mm [HL3]				
R23 - Exterior Seals	3.18mm - 12.7mm [HL3]	1.6mm - 25.4mm [HL2]	1.6mm - 12.7mm [HL3]	0.79mm - 12.7mm [HL3]	4mm - 25mm [HL3]	1.6mm - 6.35mm [HL3]				

49CFR238 / NFPA 130 is the North American standard for flame, smoke and toxicity (FST). The standard specifies fire protection and life safety requirements for underground, surface, and elevated fixed guideway transit and passenger rail systems.

Rogers Corporation regularly tests our interior rail materials against global rail flame, smoke and toxicity standards. Doing so allows us to offer a high-quality solution no matter where your project is located.

ASTM E162 - Surface Flammability*

This test method measures and compares the surface flammability of materials when exposed to a prescribed level of radiant heat energy. It is intended for use in measurements of the surface flammability of materials exposed to fire.

ASTM E662 - Smoke Density*

This test method provides a means for determining the specific optical density of the smoke generated by specimens of materials and assemblies under the specified exposure conditions.

SMP 800-C - Toxic Gas Generation

The Bombardier SMP 800-C measures the toxic gas generation from the combustion of materials used in the vehicles construction.

ASTM C1166 - Flame Spread*

This test method is designed to differentiate the flame propagation characteristics of dense or cellular elastomeric compounds used in gaskets, setting blocks, shims, or spacers.

ASTM E1354 - Heat Release*

This test method is used primarily to determine the heat evolved in, or contributed to, a fire involving products of the test material. Also included is a determination of the effective heat of combustion, mass loss rate, the time to sustained flaming, and smoke production.

ASTM D3675 - Surface Flammability*

This test method is intended for use when measuring surface flammability of flexible cellular materials exposed to fire.

Seals / Gaskets / Insulation / Gap-Filling

Test Method	Description	Vibration Isolation (Floating Floor)						
		BF-1000	BF-2000	HT-870	HT-800	HT-820	HT-840	L3-XX40
		Ultra-Soft	Extra-Soft	Soft	Medium	Firm	Extra-Firm	Medium
ASTM E162	Surface Flammability	1.6mm - 25.4mm	3.18mm - 12.7mm	1.6mm - 12.7mm	0.79mm - 12.7mm	1.6mm - 6.35mm	1.6mm - 6.35mm	4mm - 25mm
ASTM E662	Smoke Density	1.6mm - 25.4mm	3.18mm - 12.7mm	1.6mm - 12.7mm	0.79mm - 12.7mm	1.6mm - 6.35mm	1.6mm - 6.35mm	4mm - 25mm
SMP 800C	Toxic Gas Generation	1.6mm - 25.4mm	3.18mm - 12.7mm	1.6mm - 12.7mm	0.79mm - 12.7mm	1.6mm - 6.35mm	1.6mm - 6.35mm	4mm - 25mm
ASTM C1166	Flame Spread	1.6mm - 12.7mm	3.18mm - 12.7mm	1.6mm - 12.7mm	0.79mm - 12.7mm			
ASTM E1354	Heat Release	1.6mm - 12.7mm	6.35mm	6.35mm	6.35mm		3.18mm	

Test Method	Description	Acoustic Barrier	Insulation / Fire Barrier	Reflective Thermal Barrier	Seat Cushion Foam			Backrest Cushion Foam
		HT-200	FPC	RF-120	MF1-35	MF1-55	MF1-75	MRF-400
		Solid	Foam (firm) on Fiberglass	Foam on Aluminized Fabric	Soft Grade	Medium Grade	Firm Grade	Medium Grade
ASTM E162	Surface Flammability	0.7mm - 4mm	1.6mm - 6.35mm	2.5mm	25mm	25mm	25mm	
ASTM D3675	Surface Flammability				25mm	25mm	25mm	25mm
ASTM E662	Smoke Density	0.7mm - 4mm	1.6mm - 6.35mm	2.5mm	25mm	25mm	25mm	25mm
SMP 800C	Toxic Gas Generation	0.7mm - 4mm	1.6mm - 6.35mm	2.5mm	25mm	25mm	25mm	25mm
ASTM C1166	Flame Spread							
ASTM E1354	Heat Release				25mm	25mm	25mm	25mm

* www.astm.org

APPLICATION AND MATERIAL GUIDE

The BISCO Silicones Advantage – Peace of Mind

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

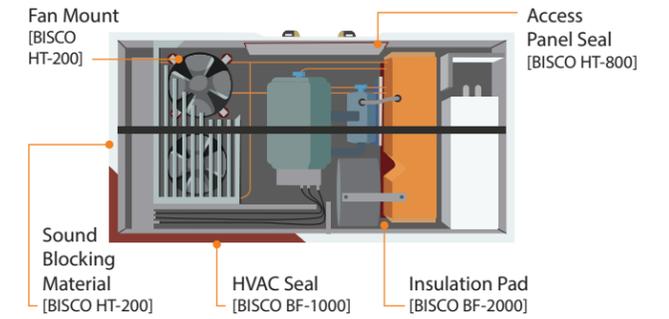
- Compliance to global FST standards without the use of restricted toxic substances.
- Fire-resistant properties are inherent to the homogenous formulation and cell structure, eliminating the need for fire-block layers and providing lasting fire resistance.

Reducing Maintenance Costs

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

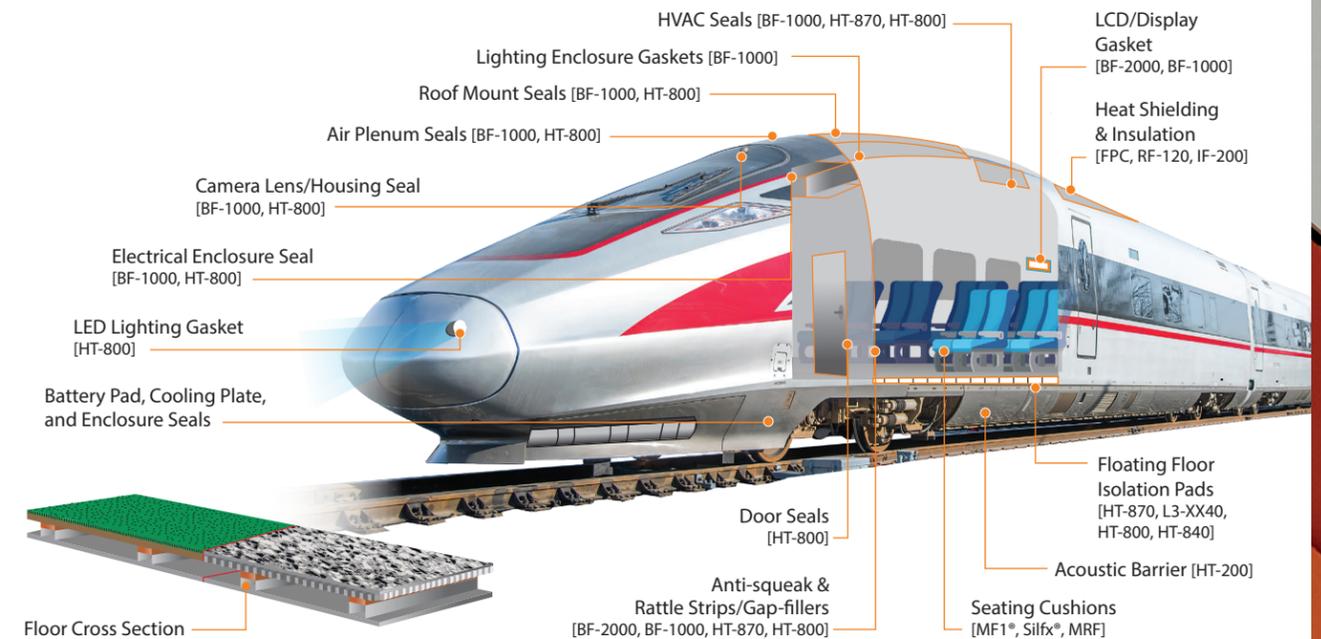
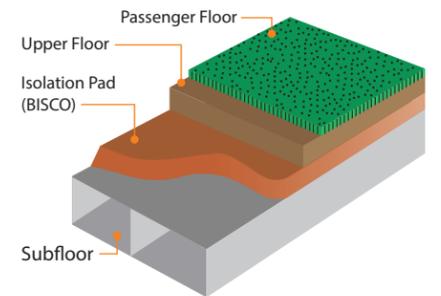
- Longer lasting cushion life and comfort compared to commonly used urethane cushions
- Significant savings in maintenance costs and revenue lost to downtime

HVAC SYSTEM



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.



PRODUCT DATA

Typical values shown unless otherwise noted.
Refer to datasheet for specification values.

		Cellular						Solid	Specialty		
		Continuous Roll				Bun	HT-6000 Series		w/substrate		
		Silicone Foam						Flame Resistant	Acoustic Barrier	Flame Barrier	
Product		BF-2000	BF-1000	HT-870	HT-800	HT-820	HT-840	MF1-55	HT-6360	HT-200	FPC
Standard Color		Black	White, Gray, Black	Red, Black	Black, Gray, Red	Gray	Gray	White	Black	Black	White
Physical Properties	Standard										
Thickness mm (in)		3.18-12.70 (0.125-0.500)	1.59-25.40 (0.063-1.000)	1.59-12.70 (0.063-0.500)	0.79-12.70 (0.031-0.500)	0.79-6.35 (0.031-0.250)	1.59-6.35 (0.063-0.250)	6.35-203.2 (0.250-8.00)	0.50-3.18 (0.020-0.125)	HT-200 defined by aerial density	1.59-6.35 (0.063-0.250)
Density											
Density, kg/m ³ (lb./ft ³)	typical values specification values	175 (11) Max 200 (12.5)	192 (12) 156-287 (9.8-17.9)	240 (15) 215-327 (13.4-20.4)	352 (22) 300-473 (18.7-29.5)	384 (24) 336-528 (21-33)	448 (28) 369-553 (23.7-34.5)	112 (7.0) 45-55 (6.5-8)			320 (20) min.
Areal Density, kg/m ² (lb./ft ²)									1.22-7.32 (0.25-1.5)		
Specific Gravity Internal Method (g/cc)								1.71	2.05 +/- .03		
Firmness											
Compression Force Deflection, kPa (psi)	typical values specification values	ASTM D1056 @ 25% Deflection	10 (1.5) 0-17 (0-2.5)	16.5 (2.4) 0-35 (0-5)	26 (3.8) 7-48 (1-7)	67 (9.7) 41-97 (6-14)	106 (15.3) 82-138 (12-20)	142 (20.6) 110-179 (16-26)	5.5 (0.8) 2.8-10.3 (0.4-1.5)		
Durometer, Shore A, except HT-6210 Shore OO		ASTM D2240							65 +/-5		
Compression Set (%)		ASTM D1056 @ 100°C (212°F)	6.9	1.7	1.6	2.4	2.6	1.8	1.5		
		ASTM D395 @ 150°C (302°F)							35		
		ASTM D395 @ 175°C (347°F)									
Tensile Strength, kPa (psi) HT-1500-Tensile Fill/ Tensile Warp (ppi)		ASTM D412 ASTM D751	140 (20)	140 (20)	240 (35)	240 (35)	240 (35)	240 (35)	69 (10)	1720 (250)	
Tensile Elongation (%)		ASTM D412	60	60	20	45	45	45	35	125	
Water Absorption (%)			1.4	0.5	0.5	0.5	0.5	0.5	5		
Tear Resistance (ppi)		ASTM D624									



For more information visit
rogerscorp.com/elastomeric-material-solutions/bisco-silicones

World Class Performance

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 Arizona (USA), Rogers operates manufacturing facilities in the United States, China, Germany, Belgium, Hungary, and South Korea, with joint ventures and sales offices worldwide.

www.rogerscorp.com

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Rogers is committed to producing quality products in a safe environment manufactured with robust management systems certified to industry standards.