The information contained in this Material Selection Guide is intended to assist you in designing with Rogers’ BISCO Silicone Foams. It is not intended to and does not create any warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose or that the results shown on the Material Selection Guide will be achieved by a user for a particular purpose. The user should determine the suitability of Rogers’ BISCO Silicone Foams for each application. The Rogers logo, Helping, power, protect, connect our world, BISCO, MF1 and Silfx are trademarks of Rogers Corporation or one of its subsidiaries. ©2015 Rogers Corporation. All rights reserved. Printed in U.S.A. 0915-1.0AG, Publication #180-307

Rogers Corporation — Elastomeric Material Solutions
US 607.786.8112 | Europe +32.9.235.36.11 | Asia +86.512.6258.2700

For additional information or product availability contact your Rogers Customer Service Representative.

Elastomeric Material Solutions

Belgium
Rogers BBA
Tel: +32 9 235 3611
Fax: +32 9 235 3612

Taiwan
Rogers Taiwan Inc.
Tel: +886.2.8660.9056
Fax: +886.2.8660.9057

Japan
Rogers Japan Inc.
Tel: +81.3.5200.2700
Fax: +81.3.5200.0571

Korea
Rogers Korea Inc.
Tel: +82.31.291.3660
Fax: +82.31.291.3610

Shanghai
Rogers (Shanghai) International Trading Co., Ltd.
Tel: +86.21.62176000
Fax: +86.21.62176010

Beijing
Rogers (Shanghai) International Trading Co., Ltd.
Tel: +86.10.5820.7667
Fax: +86.10.5820.7997

Shenzhen
Rogers (Shanghai) International Trading Co., Ltd.
Tel: +86.755.8236.6060
Fax: +86.755.8236.6123

Elastomeric Material Solutions

Rail Interiors Solutions

Application and Material Guide

The BISCO Silicones Advantage – Peace of Mind

Multi-functional Solutions


Long-Term Durability

Excellent dimensional stability and long-term performance:
- Long-term dimensional stability
- Superior compressive set and creep resistance

Design Reliability

BISCO Silicone materials are reliable and system performance is expected to be the life of the railcar:
- Excellent dimensional stability
- Resilient to mechanical fatigue
- High & low temperature resistance
- Low compression set, creep and stress relaxation

Passenger Safety

Compliant with EN 45545 requirements without the use of mineral-based solutions:
- A material property patented and controlled by Rogers for the rail industry
- Excellent performance in all use cases
- Confidently meeting the new UIC 551 and EN 45545 standards

Reducing Maintenance Costs

- By reducing the amount of foam that requires replacement to reduce maintenance costs
- Moisture and ozone resistance to extend service life
- Excellent dimensional stability for maintenance and installation

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.

Passenger Safety

- Compliance to EN 45545 requirements without the use of mineral-based solutions
- A material property patented and controlled by Rogers for the rail industry
- Excellent performance in all use cases
- Confidently meeting the new UIC 551 and EN 45545 standards

Reducing Maintenance Costs

- By reducing the amount of foam that requires replacement to reduce maintenance costs
- Moisture and ozone resistance to extend service life
- Excellent dimensional stability for maintenance and installation

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 innovations and success, 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 systems, 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, Korea, Japan, Taiwan, Singapore, and South America, with joint ventures and sales offices worldwide.

Contact Information

Belgium
Rogers BBA
Tel: +32 9 235 3611
Fax: +32 9 235 3612

Taiwan
Rogers Taiwan Inc.
Tel: +886.2.8660.9055
Fax: +886.2.8660.9057

Japan
Rogers Japan Inc.
Tel: +81.3.231.3730
Fax: +81.3.236.0751

Korea
Rogers Korea Inc.
Tel: +82.1.291.2940
Fax: +82.1.291.2941

Shanghai
Rogers (Shanghai)
International Trading Co., Ltd.
Tel: +86.21.62175094
Fax: +86.21.62677913

Beijing
Rogers (Shanghai)
International Trading Co., Ltd.
Tel: +86.10.5820.7667
Fax: +86.10.5820.7997

Shenzhen
Rogers (Shanghai)
International Trading Co., Ltd.
Tel: +86.755.8236.6060
Fax: +86.755.8236.6123

Elastomeric Material Solutions

Carol Steen, L. RGA / Tel: 302.794.6200 / Fax: 302.794.6201
Cost: Orders Toll Free: 800.227.2068
Samples, Literature, Tech Support 607.786.8112 or TollFree: 800.935.2940

For press releases and current product availability, please visit Rogers Customer Service Representatives.
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

Material level classification (IN1A, EX2..) is dependent on the train car type (HL rating) and technical and mechanical equipment. The listed products are categorized into numerous material applications (ie R22 defines requirements associated products (IN1A, EX2, F1..) for each Hazard classification dependent on operation and design category.

Material Selection Guide

BISCO Silicone Specialty Services

Value Added
- 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

Rogers — Technical expertise to help design robust solutions

Design and application support:
- Cushion design
- Molds to fabricated cushion conversion and design
- Cost of cushion ownership calculation
- Seat construction guidance
- Floating floor isolation material design
- Vibration 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
Multi-functional Solutions
Multiple benefits in a single material choice.
Unique chemistries offer improved performance to last longer.

Long-Term Durability
Advanced dimensional stability.
Highly performant under long-term applications.
Longer life, lower bulk, and increased structural integrity.

Design Reliability
BISCO transmits energy and systems perform as expected for the life of the railcar.

Passenger Safety
Compliant to EN 45545 requirements without the use of restricted toxic substances.
No smoke or toxic gases are released in a fire.
Highly performant under long-term applications.

Reducing Maintenance Costs
By delivering the best total cost of ownership through warranty-based services.
BISCO offers low compression set, creep and stress relaxation.

Safety
BISCO Silicones ensure components and systems perform as expected for the life of the railcar:
- Long term material durability and performance
- Resistance to environmental factors (UV, ozone, chemical, temperature resistance)

Contact Information
Belgium
Rogers BEKA
Tel: +32 9 235 36 11
Fax: +32 9 235 36 58
Taiwan
Rogers Taiwan Inc.
Tel: +886.2.8660.9056
Fax: +886.2.8660.9057
Singapore
Rogers Technologies Singapore Inc.
Tel: +65.6747.3521
Fax: +65.6747.7422
Korea
Rogers Korea Inc.
Tel: +82.31.291.3660
Fax: +82.31.291.3610
Shanghai
Rogers (Shanghai) International Trading Co., Ltd.
Tel: +86.21.6217.5599
Fax: +86.21.6267.7913
Beijing
Rogers (Shanghai) International Trading Co., Ltd.
Tel: +86.10.5820.7667
Fax: +86.10.5820.7997
Shenzhen
Rogers (Shanghai) International Trading Co., Ltd.
Tel: +86.755.8236.6060
Fax: +86.755.8236.6123

Elastomeric Material Solutions
Carol Steen, Inc., USA / Tel: 630.796.6206 Fax: 630.796.6201
Cost: Order Toll Free: 800.237.2068 Samples, Literature, Tech Support: 630.796.8112 or Toll Free: 800.935.2940

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 innovations and experience, Rogers delivers high-performance solutions that enable clean energy, internet and connectivity, automotive safety, and 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 systems, 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.
Rogers…leading the way with EN 45545 compliant solutions and technical expertise

**Material Selection Guide**

<table>
<thead>
<tr>
<th>LISTED PRODUCT NO.</th>
<th>VALUE ADDED FUNCTIONALITY</th>
<th>MATERIAL THICKNESS</th>
<th>HL CLASSIFICATION</th>
<th>MATERIAL PROPERTIES</th>
<th>TEST STANDARD</th>
<th>TYPICAL VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>R21 - Seat Components</td>
<td>F1A, F1B, F1E, F3</td>
<td>12.7MM</td>
<td>HL3</td>
<td>Compression Force Deflection, kPa (psi)</td>
<td>ASTM D1056</td>
<td>5 (75) 6 (90) 7 (100) 8 (125)</td>
</tr>
<tr>
<td>R8 - External Roof Features</td>
<td>EX2, EX6B</td>
<td>12.7MM</td>
<td>HL3</td>
<td>Tensile Strength, kPa (psi)</td>
<td>ASTM D412</td>
<td>172 (25) 241 (35) 207 (30) 310 (45)</td>
</tr>
<tr>
<td>R9 - Bogie Rubber Elements</td>
<td>M1</td>
<td>2MM - 19MM</td>
<td>HL3</td>
<td>Thermal Conductivity, Wm/k</td>
<td>ASTM C518</td>
<td>0.05 0.06 0.07 0.07 0.1 0.05</td>
</tr>
<tr>
<td>R18 - Full Seat</td>
<td>F1</td>
<td>HL3</td>
<td></td>
<td>Elongation, %</td>
<td>ASTM D412</td>
<td>85 90 90 80 40 60 45</td>
</tr>
<tr>
<td>R17 - Comfortable Seating</td>
<td>F1</td>
<td>HL3</td>
<td></td>
<td>Water Absorption, %</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>R6 - Bulkhead</td>
<td></td>
<td></td>
<td></td>
<td>Temperature Range, °C</td>
<td></td>
<td>Rogers Internal / ASTM D1056 -55 to 200</td>
</tr>
<tr>
<td>R16 - Exterior Roof</td>
<td></td>
<td></td>
<td></td>
<td>Compression Set, %</td>
<td>ASTM D1056</td>
<td>5</td>
</tr>
<tr>
<td>R15 - Interiors Secondary</td>
<td></td>
<td></td>
<td></td>
<td>PHYSICAL PROPERTIES TEST STANDARD TYPICAL VALUES ONLY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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 seats, 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 bulk stock form or as a fabricated cushion shaped to the customer’s design requirements.**

**Hazard Level Classification**

<table>
<thead>
<tr>
<th>HAZARD LEVEL CLASSIFICATION</th>
<th>PRODUCT CLASSIFICATION</th>
<th>REQUIREMENT SET</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL1</td>
<td>IN1A, EX2, F1...</td>
<td>For the technical expertise of EN 45545-2 Table 2 defines the requirement set (R1, R2,...) and product classification. This table provides additional and complementary information to the technical specification with respect to fire severity, duration, etc.</td>
</tr>
<tr>
<td>HL2</td>
<td>IN1B, EX2</td>
<td>For the technical expertise of EN 45545-2 Table 2 defines the requirement set (R1, R2,...) and product classification. This table provides additional and complementary information to the technical specification with respect to fire severity, duration, etc.</td>
</tr>
<tr>
<td>HL3</td>
<td>IN1D, EX2</td>
<td>For the technical expertise of EN 45545-2 Table 2 defines the requirement set (R1, R2,...) and product classification. This table provides additional and complementary information to the technical specification with respect to fire severity, duration, etc.</td>
</tr>
</tbody>
</table>

**Innovative Solutions**

- Silicon-based sealants and adhesives
- BISCO® BUN® silicone elastomers
- BISCO® C606® silicone foam
- BISCO® TRAD® silicone adhesive
- BISCO® FLEX® silicone foam

**Value Added**

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

**Service**

- In-house R&D and product development
- Technical expertise to help design robust solutions
- 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.

**Converter Network**

- Rogers — Technical expertise to help design robust solutions
- Design and application support:
  - Seat cushion design
  - Cushion CAD modeling and prototyping
  - Molds 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

**Visit**

Visit: www.rogerscorp.com/ems/bisco/contactus.aspx
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 seats, 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, E2X, ...)

### Material Selection Guide

<table>
<thead>
<tr>
<th>Requirement Set</th>
<th>R1, R2, R3 ...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In-house R&amp;D and product development</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Converter Network</strong></td>
<td></td>
</tr>
<tr>
<td><strong>BARRIER</strong></td>
<td></td>
</tr>
<tr>
<td><strong>SOLID</strong></td>
<td></td>
</tr>
<tr>
<td><strong>ULTRA SOFT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>EXTRA SOFT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>SOFT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>MEDIUM</strong></td>
<td></td>
</tr>
<tr>
<td><strong>FIRM</strong></td>
<td></td>
</tr>
<tr>
<td><strong>FLEXIBLE</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Value Added**

- 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

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

**BISCO Silicone Specialty Services**

**Seat Cushion Fabrication**

- (MF1® BUN STOCK ONLY):
  - 515 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 CAO modeling and prototyping
- Molded to fabricated cushion conversion and design
- Cost of cushion ownership calculation
- Seat construction guidance
- Floating floor isolation material design
- Vibrations and acoustics
- Gasket and seal design

**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.

**Visit:** www.rogerscorp.com/ems/bisco/contactus.aspx
**Application and Material Guide**

The BISCO Silicones Advantage – Peace of Mind

**Multi-functional Solutions**
- **Railcar**: Numerous benefits in one material choice.
- **HVAC System**: Unique chemistries deliver exceptional performance to long-term physical, thermal and environmental abuse.

**Long-Term Durability**
- Excellent dimensional stability
- 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**
- Longer lasting cushion life and comfort compared to commonly used urethane cushions
- Significant savings in maintenance costs and revenue lost to downtime

**Contact Information**

**Belgium**
- Rogers BBA
  - Tel: +32 9 235 3611
  - Fax: +32 9 235 3658

**Taiwan**
- Rogers Taiwan Inc.
  - Tel: +886.2.8660.9056
  - Fax: +886.2.8660.9057

**Japan**
- Rogers Japan Inc.
  - Tel: +81.3.5200.2700
  - Fax: +81.3.5200.0571

**Korea**
- Rogers Korea Inc.
  - Tel: +82.31.291.3660
  - Fax: +82.31.291.3610

**Shanghai**
- Rogers (Shanghai) International Trading Co., Ltd.
  - Tel: +86.21.62175599
  - Fax: +86.21.62677913

**Beijing**
- Rogers (Shanghai) International Trading Co., Ltd.
  - Tel: +86.10.5820.7667
  - Fax: +86.10.5820.7997

**Shenzhen**
- Rogers (Shanghai) International Trading Co., Ltd.
  - Tel: +86.755.8236.6060
  - Fax: +86.755.8236.6123

**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 systems, 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.