**GENERAL INFORMATION**

**Product Description:**
A two component paste grade system for repairing and rebuilding machinery and equipment. Based on a silicon steel alloy blended with high molecular weight reactive polymers and oligomers. When cured, the material is durable yet fully machinable. Also used as a high strength structural adhesive for bonding or for creation of irregular load bearing shims with good electrical insulation characteristics. For use in Original Equipment Manufacturer repair situations.

**Application Areas:**
When mixed and applied as detailed in the Belzona Instructions for Use (IFU), the system is ideally suited for application to the following:
- Shafts
- Hydraulic rams
- Bearing housings
- Keyways
- Engine blocks
- Casings
- Pipes
- Tanks
- Flange faces

**APPLICATION INFORMATION**

**Working Life**
Will vary according to temperature. At 77°F (25°C) the usable life of mixed material is 15 minutes.

**Cure Time**
Cure times will vary depending on the ambient conditions and will be reduced for thicker sections and extended for thinner applications. Consult the Belzona IFU for specific details.

**Volume Capacity**
24.3 in³ (398 cm³)/kg.

<table>
<thead>
<tr>
<th><strong>Base Component</strong></th>
<th><strong>Paste Component</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appearance</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Dark gray</td>
</tr>
<tr>
<td><strong>Gel strength at 77°F (25°C)</strong></td>
<td>&gt;150 g/cm³ HF</td>
</tr>
<tr>
<td><strong>Density</strong></td>
<td>2.70 - 2.90 g/cm³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Solidifier Component</strong></th>
<th><strong>Paste Component</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appearance</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>Light gray</td>
</tr>
<tr>
<td><strong>Gel strength at 77°F (25°C)</strong></td>
<td>40 - 150 g/cm³ GQ</td>
</tr>
<tr>
<td><strong>Density</strong></td>
<td>1.64 - 1.70 g/cm³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mixed Properties</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixing Ratio by Weight (Base : Solidifier)</td>
</tr>
<tr>
<td>Mixing Ratio by Volume (Base : Solidifier)</td>
</tr>
<tr>
<td>Mixed Form</td>
</tr>
<tr>
<td>Peak Exotherm Temperature</td>
</tr>
<tr>
<td>Time to Peak Exotherm</td>
</tr>
<tr>
<td>Slump Resistance</td>
</tr>
<tr>
<td>Mixed Density</td>
</tr>
</tbody>
</table>

The above application information serves as introductory guide only. For full application details including the recommended application procedure/technique, refer to the Belzona IFU which is enclosed with each packaged product.
ABRASION

<table>
<thead>
<tr>
<th>Taper</th>
<th>The Taper abrasion resistance determined in accordance with ASTM D4060 with 1 kg load is typically:</th>
</tr>
</thead>
<tbody>
<tr>
<td>H10 Wheels (Wet)</td>
<td>852 mm³ loss per 1000 cycles</td>
</tr>
<tr>
<td>CS17 Wheels (Dry)</td>
<td>24 mm³ loss per 1000 cycles</td>
</tr>
</tbody>
</table>

ADHESION

<table>
<thead>
<tr>
<th>Tensile Shear</th>
<th>When tested in accordance with ASTM D1002, using degreased strips, grit blasted to a 3-4 mil profile, typical values will be:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild steel</td>
<td>2,790 psi (19.2 MPa)</td>
</tr>
<tr>
<td>Brass</td>
<td>1,650 psi (11.4 MPa)</td>
</tr>
<tr>
<td>Copper</td>
<td>2,060 psi (14.2 MPa)</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>2,960 psi (20.4 MPa)</td>
</tr>
<tr>
<td>Aluminium</td>
<td>1,950 psi (13.4 MPa)</td>
</tr>
</tbody>
</table>

| Tensile fatigue | The Tensile fatigue in accordance with ASTM D3366 at ambient temperature and 653 psi (4.5MPa) applied static tensile stress is >1,000,000 cycles. |

<table>
<thead>
<tr>
<th>Pull Off Adhesion</th>
<th>When tested in accordance with ASTM D 4541/ ISO 4624, the pull off strength from grit blasted steel will be typically:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3240 psi (22.3 MPa)</td>
<td>68°F (20°C) cure</td>
</tr>
<tr>
<td>2980 psi (20.5 MPa)</td>
<td>212°F (100°C) cure</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cleavage strength</th>
<th>When tested in accordance with ASTM D 1062, the cleavage strength to grit blasted steel will be typically:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1199 psi</td>
<td>68°F (20°C) cure</td>
</tr>
</tbody>
</table>

CHEMICAL RESISTANCE

Once fully cured, the material will demonstrate excellent resistance to most commonly found inorganic acids and alkalis at concentrations up to 20%. The material is also resistant to hydro-carbons, mineral oils, lubricating oils and many other commonly found chemicals.

* For a more detailed description of chemical resistance properties, refer to relevant Chemical Resistance chart.

COMPRESSION PROPERTIES

When determined in accordance with ASTM D695 (1.0in/25.4mm thick test pieces), typical values will be:

<table>
<thead>
<tr>
<th>Compressive Strength (Maximum)</th>
<th>Cure temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>12525 psi (86.4 MPa)</td>
<td>68°F (20°C)</td>
</tr>
<tr>
<td>16645 psi (114.8 MPa)</td>
<td>212°F (100°C)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compressive Strength (Yield)</th>
<th>Cure temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>9620 psi (66.3 MPa)</td>
<td>68°F (20°C)</td>
</tr>
<tr>
<td>10955 psi (75.6 MPa)</td>
<td>212°F (100°C)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compressive Modulus</th>
<th>Cure temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.77 x 10³ psi (1217 MPa)</td>
<td>68°F (20°C)</td>
</tr>
<tr>
<td>1.75 x 10³ psi (1205 MPa)</td>
<td>212°F (100°C)</td>
</tr>
</tbody>
</table>

When determined using a modified version of ASTM D695, at thickness more representative of in service application, typical values will be:

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Compressive Strength (Yield)</th>
<th>Cure Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.24 in (6.0 mm)</td>
<td>13095 psi (90.3 MPa)</td>
<td>68°F (20°C)</td>
</tr>
<tr>
<td></td>
<td>16450 psi (114.4 MPa)</td>
<td>212°F (100°C)</td>
</tr>
<tr>
<td>0.12 in (3.0 mm)</td>
<td>14855 psi (102.5 MPa)</td>
<td>68°F (20°C)</td>
</tr>
<tr>
<td></td>
<td>18980 psi (130.9 MPa)</td>
<td>212°F (100°C)</td>
</tr>
</tbody>
</table>

Bonded to grit blasted mild steel (single side)

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Compressive Strength (Yield)</th>
<th>Cure Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.12 in (3.0 mm)</td>
<td>19910 psi (137.3 MPa)</td>
<td>68°F (20°C)</td>
</tr>
<tr>
<td></td>
<td>23840 psi (164.4 MPa)</td>
<td>212°F (100°C)</td>
</tr>
</tbody>
</table>

CHEMICAL ANALYSIS

The mixed Belzona 1111 has been independently analyzed for halogens, heavy metals, and other corrosion-causing impurities in accordance with ASTM E165, ASTM D4327 and ASTM E1479. Typical results are displayed as follows:

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Total Concentration (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoride</td>
<td>224</td>
</tr>
<tr>
<td>Chloride</td>
<td>398</td>
</tr>
<tr>
<td>Bromide</td>
<td>ND (&lt;12)</td>
</tr>
<tr>
<td>Sulfur</td>
<td>1019</td>
</tr>
<tr>
<td>Nitrite</td>
<td>ND (&lt;6)</td>
</tr>
<tr>
<td>Nitrate</td>
<td>4</td>
</tr>
<tr>
<td>Zinc</td>
<td>3.4</td>
</tr>
<tr>
<td>Antimony</td>
<td>ND (&lt;3.0)</td>
</tr>
<tr>
<td>Arsenic</td>
<td></td>
</tr>
<tr>
<td>Bismuth</td>
<td></td>
</tr>
<tr>
<td>Cadmium</td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td></td>
</tr>
<tr>
<td>Tin</td>
<td></td>
</tr>
<tr>
<td>Silver</td>
<td></td>
</tr>
<tr>
<td>Mercury</td>
<td></td>
</tr>
<tr>
<td>Gallium</td>
<td></td>
</tr>
<tr>
<td>Indium</td>
<td></td>
</tr>
</tbody>
</table>

ND: Not Detected

CORROSION PROTECTION

Corrosion Resistance
Will show no visible signs of corrosion after 5,000 hours exposure in the ASTM B117 salt spray cabinet.
**ELECTRICAL PROPERTIES**

Dielectric Constant (Relative Permittivity)
Tested to ASTM D150 is typically 8.0 when tested at 1V & 10 kHz.

Dielectric Strength
Tested to ASTM D149 is typically 2.2 kV/mm when tested at 2000V/s.

Dissipation Factor (Tan Delta/Dielectric Loss)
Tested to ASTM D150 is typically 0.09 when tested at 1V & 10 kHz.

Surface Resistivity
Tested to ASTM D257 is typically $2.28 \times 10^9$ Mohm when tested at 500V for 1 minute.

Volume Resistivity
Tested to ASTM D257 is typically $2.6 \times 10^9$ Mohm when tested at 500V for 1 minute.

**ELONGATION & TENSILE PROPERTIES**

When determined in accordance with ASTM D638, typical values will be:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength</td>
<td>4975 psi / 34.3 MPa</td>
<td>6686 psi / 46.1 MPa</td>
</tr>
<tr>
<td>Cure temperature</td>
<td>68°F (20°C)</td>
<td>212°F (100°C)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Property</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elongation</td>
<td>0.49 %</td>
<td>0.58 %</td>
</tr>
<tr>
<td>Cure temperature</td>
<td>68°F (20°C)</td>
<td>212°F (100°C)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Property</th>
<th>Unit 1</th>
<th>Unit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young's Modulus</td>
<td>12.6 x 10^9 psi / 8681 MPa</td>
<td>12.3 x 10^6 psi / 8468 MPa</td>
</tr>
<tr>
<td>Cure temperature</td>
<td>68°F (20°C)</td>
<td>212°F (100°C)</td>
</tr>
</tbody>
</table>

**FLEXURAL PROPERTIES**

When determined in accordance with ASTM D790, typical values will be:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexural Strength</td>
<td>9140 psi (63.0 MPa)</td>
<td>11820 psi (81.5 MPa)</td>
</tr>
<tr>
<td>Cure temperature</td>
<td>68°F (20°C)</td>
<td>212°F (100°C)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Property</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexural Modulus</td>
<td>10.44 x 10^9 psi (7199 MPa)</td>
<td>10.15 x 10^6 psi (6995 MPa)</td>
</tr>
<tr>
<td>Cure temperature</td>
<td>68°F (20°C)</td>
<td>212°F (100°C)</td>
</tr>
</tbody>
</table>

**FOOD CONTACT**

Incidental Food Contact (USDA)
USDA compliant as an incidental food contact surface.

Direct Food Contact (FDA)
Meets extraction requirements as set out in 21 CFR 175.300 (paragraph c) for a broad range of food types in Conditions of Use D, E and F (paragraph d).
Please contact Belzona for more comprehensive data.

**HARDNESS**

Shore D
When determined in accordance with ASTM D2240, typical value will be 84

Barcol
When determined in accordance with ASTM D2583, using Model No.935, typical values will be:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cure temperature</td>
<td>68°F (20°C)</td>
<td>212°F (100°C)</td>
</tr>
</tbody>
</table>

**HEAT RESISTANCE**

Heat Distortion Temperature (HDT)
Tested to ASTM D648 (264 psi fiber stress), typical values obtained will be:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cure temperature</td>
<td>127°F (53°C)</td>
<td>195°F (91°C)</td>
</tr>
</tbody>
</table>

Dry Heat Resistance
The indicated degradation temperature in air based on Differential Scanning Calorimetry (DSC) operated in accordance with ISO11357 is typically 392°F (200°C). For many applications the product is suitable down to -40°F (-40°C).

**IMPACT RESISTANCE**

Impact Strength
The impact strength (reverse notched) when tested to ASTM D256 is typically:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cure temperature</td>
<td>68°F (20°C)</td>
<td>212°F (100°C)</td>
</tr>
</tbody>
</table>

Belzona 1111 - Product Specification Sheet

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Publication No. 07-10-19
Page 3 of 4
Belzona products are manufactured under an ISO 9001 Registered Quality Management System

Belzona 1111 is available from a network of Belzona Distributors throughout the world for prompt delivery to the application site. For information, consult the Belzona Distributor in your area.

Prior to using this material, please consult the relevant Safety Data Sheets.

This product will meet the performance claims stated herein when material is stored and used as instructed in the Belzona Information For Use leaflet. Belzona ensures that all its products are carefully manufactured to ensure the highest quality possible and are tested strictly in accordance with universally recognized standards (ASTM, ANSI, BS, DIN, ISO, etc.). Since Belzona has no control over the use of the product described herein, no warranty for any application can be given.

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Publication No. 07-10-19 Page 4 of 4