### Soling Materials Guide

The adjacent table presents for the shoe technologist the basic properties of most of the solings he or she is likely to encounter. It will be of value in the selection of new or alternative materials.

It must be emphasised that the range of solings covered by each polymer type is very wide. This is especially so in the case of solid vulcanised rubber, where types included in the general summary range from inexpensive highly filled soling to premium quality carbon or silica reinforced rubbers. Special purpose, eg oil resistant, compounds are also included.

Section 5 explains each property in detail. Section 6 gives notes on adhesion in a separate table. The inside back cover gives guidance on identification of the most common types.

#### The Notes

1. Wear resistance. The figures are ‘specific durability’ results based on practical wear trials carried out by SATRA. Specific durability is derived from volume loss relative to the SATRA standard reference soling.

2. Hardness. The following arbitrary ranges have been used:
   - Vey soft <45 IRE-ID
   - Soft 45 - 54 IRE-ID
   - Medium 55 - 74 IRE-ID
   - Moderately hard 75 - 84 IRE-ID
   - Hard 85-95 IRE-ID
   - Very hard >95 IRE-ID

3. Crack resistance. The purely mechanical forms of tracking are considered here, not cracking due to chemical attack, extreme dryness in the case of leather, etc.

### Table: Soling Materials Guide

<table>
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<tr>
<th>Soling</th>
<th>Form</th>
<th>Normal Specific Gravity (density) range</th>
<th>Wear resistance (Note 1)</th>
<th>Hardness (Note 2)</th>
<th>Crack Resistance (Note 3)</th>
<th>Slip resistance</th>
<th>Other properties</th>
<th>Other comments</th>
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</thead>
<tbody>
<tr>
<td>Leather</td>
<td>Solid - bends, cut soles, built units &amp; insert moulded</td>
<td>0.95-1.05</td>
<td>0.3 - 0.8</td>
<td>Fair - Moderate</td>
<td>Hard</td>
<td>Good</td>
<td>Can be low initially on dry surfaces and, where heavily saturated, on wet surfaces</td>
<td>Not waterproof but can be impregnated to alter properties</td>
</tr>
<tr>
<td>Leatherbond</td>
<td>Solid sheet, cut soles, built units</td>
<td>1.05 - 1.15</td>
<td>0.9 - 1.0</td>
<td>Fair - Moderate</td>
<td>Hard</td>
<td>Good</td>
<td>Semi-permanent</td>
<td>Semi-permanent</td>
</tr>
<tr>
<td>Resin rubber</td>
<td>Solid sheet, cut soles, built units &amp; insert moulded</td>
<td>1.25 - 1.40</td>
<td>0.7 - 1.3</td>
<td>Hard</td>
<td>Good</td>
<td>Good though some finishes affect performance when new</td>
<td>Good</td>
<td>Properties are a compromise between those of leather and resin rubber</td>
</tr>
</tbody>
</table>

### PVC

- **Form**: Solid - moulded on and some sheet
- **Normal Specific Gravity (density)**: 1.15 - 1.35
- **Wear resistance (Note 1)**: Medium
- **Hardness (Note 2)**: 1.3 - 1.9
- **Crack Resistance (Note 3)**: Good
- **Slip resistance**: Satisfactory
- **Other properties**: Relatively stiff material. Adhesion should be checked
- **Other comments**: Good general purpose soling. PVC 0.7 - 0.9

### PVC Blends

- **Form**: Cellulose - units and moulded on
- **Normal Specific Gravity (density)**: 1.15 - 1.20
- **Wear resistance (Note 1)**: Medium
- **Hardness (Note 2)**: 2.2 - 2.6
- **Crack Resistance (Note 3)**: Good
- **Slip resistance**: Satisfactory
- **Other properties**: Low temperature cracking
- **Other comments**: Good soft grades. Can be low initially on wet surfaces

### PU Reaction Resin rubber (TR)

- **Form**: Solid - and units moulded on
- **Normal Specific Gravity (density)**: 1.25 - 1.30
- **Wear resistance (Note 1)**: Medium
- **Hardness (Note 2)**: 1.3 - 1.9
- **Crack Resistance (Note 3)**: Good
- **Slip resistance**: Satisfactory
- **Other properties**: Relatively low cost. Can be low initially on wet surfaces
- **Other comments**: High shrinkage should be checked

### Thermoplastic PU

- **Form**: Solid - and moulded on
- **Normal Specific Gravity (density)**: 1.15 - 1.25
- **Wear resistance (Note 1)**: Medium
- **Hardness (Note 2)**: 3.0 - 6.0
- **Crack Resistance (Note 3)**: Excellent
- **Slip resistance**: Satisfactory
- **Other properties**: Relatively stiff material. Adhesion should be checked
- **Other comments**: Good high load, low high temperature. Wears very smooth.

### Thermoplastic Polyurethane (TPU)

- **Form**: Solid - and moulded on
- **Normal Specific Gravity (density)**: 1.25 - 1.30
- **Wear resistance (Note 1)**: Medium
- **Hardness (Note 2)**: 4.0 - 5.0
- **Crack Resistance (Note 3)**: Excellent
- **Slip resistance**: Satisfactory
- **Other properties**: Very good
- **Other comments**: Relatively stiff material. Adhesion should be checked

### Polyurethane Crosslinked

- **Form**: Solid - and moulded on
- **Normal Specific Gravity (density)**: 0.9 - 1.0
- **Wear resistance (Note 1)**: Medium
- **Hardness (Note 2)**: 9.0 - 12.0
- **Crack Resistance (Note 3)**: Excellent
- **Slip resistance**: Satisfactory
- **Other properties**: Relatively stiff material. Relatively low cost
- **Other comments**: Good

### Specialty Solings

- **Form**: Solid - and moulded on
- **Normal Specific Gravity (density)**: 0.6 - 0.8
- **Wear resistance (Note 1)**: Medium
- **Hardness (Note 2)**: 0.6 - 1.0
- **Crack Resistance (Note 3)**: Good
- **Slip resistance**: Satisfactory
- **Other properties**: Relatively low cost
- **Other comments**: Good

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