### Column A
Current AGRSS Standard sections and language that requires instruction from the retention system provider to help ensure AGR technician compliance. Note that only those sections of the Standard pertaining to the required support of the retention system provider are listed.

### Column B
Retention System Provider instruction response to Column A
(List the response that an AGR Technician should provide in order to match the instructions your company provides pertaining to the subject identified in Column A)

### Column C
Identify the location within your current, written, comprehensive training instructions where your instruction response from Column B can be identified.
(Document name, page and paragraph)

#### 4.0 Vehicle Assessment before Replacement

4.1 Those engaged in automotive glass replacement shall not undertake or complete such installation when any related condition would compromise the retention system and the owner/operator shall be so notified.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
<th>Column C</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0 Vehicle Assessment before Replacement</td>
<td>If conditions that would prevent a safe installation are observed prior to glass installation, the job shall not be completed until the condition is corrected. The customer/owner/operator must also be notified.</td>
<td>Refer to: Page 3, Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) Optional: Dow Fixed Glass Replacement Record – Appendix FGTP Version 5.4 may be used to document conditions observed prior to completing the glass installation</td>
</tr>
</tbody>
</table>

#### 5.0 Selection of Glass and Retention Systems

5.1 Those engaged in automotive glass replacement shall use retention systems that are produced under the ISO 9001 standard or any standard that contains the entire text of ISO 9001.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
<th>Column C</th>
</tr>
</thead>
</table>

5.3 Those engaged in automotive glass replacement shall use either an OEM approved retention system or equivalent retention system as certified in writing by the equivalent retention system manufacturer directly or through a private labeler.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
<th>Column C</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3 Selection of Glass and Retention Systems</td>
<td>Refer to: Page 1, Sidebar &amp; Page 8, Section 2 in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018)</td>
<td>Refer to: Page 1, Sidebar &amp; Page 8, Section 2 in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018)</td>
</tr>
</tbody>
</table>
5.4 Those engaged in automotive glass replacement shall obtain and follow written comprehensive and current application instructions from the retention systems manufacturer or private labeler. These instructions shall include at least the proper use of the retention system storage specifications, minimum drive-away time charts containing temperature and humidity variables if applicable, and any special procedures required for adverse weather conditions.

### 1. GLASS CLEANING:

- References to the use of safety glasses and the use of chemical resistant gloves is for the protection of the installer and has no effect on the safety of the installation.
- Dow Instructions reference GC-800 as an example, other commercial grade glass cleaners are acceptable as long the ingredient list does not include anti-streak compounds.
- Dow Automotive GC-800 & BETABRADE should be stored according the same as adhesives or primers.
- Dow Automotive GC-800 & BETABRADE is NOT subject to the same expiration date limits or lot number recordkeeping requirements as adhesives or primers.
- Dow Automotive or any other glass cleaner containing water should not be used at below freezing temperatures or below without following special cold weather steps.
- Dow Automotive Instructions recommend the use of "lint-free" paper towels. This is a goal, not a specific requirement. Many paper towels that might be considered "lint-free" are not labeled as such and some labeled as "lint-free" are not.
- BETABRADE F1 MAY be used instead of "wet-scrubbing" glass & fritted bonding surfaces when contamination is visibly detected.

---

### Dow Automotive provides eight different adhesive systems to the AGR Industry.

- Two may use BETAPRIME CLEAR Glass/Frit Primer.
- Two must use BETAPRIME™ 5504G Glass primer.
- Four do not require any primer on fritted glass and all eight can be used with BETAPRIME 5504G(sa) Primers.

To avoid confusion, refer to the instruction sheet attached to the product information sheet/brochure for the specific adhesive system being audited. Also refer to the product information pages of the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) Pages 29-34  
Exceptions and explanations to statements in the instruction sheets are minimal and will be listed in column B.

**1. GLASS CLEANING:**

Refer to: Pages 11 & 12 for glass cleaning in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) or installation instructions on Page 3 of appropriate brochure

All EZ Kit Packaged adhesives include current instructions for use in box

**BETABRADE (Optional Use) Video**

Additional links to instructions to be updated at later date.
### 2. GLASS PREP/PRIMING:

- **Product requirements**
- **Application requirements**
- **Storage requirements**
- **Shelf-life (opened & unopened)**
- **Adverse weather conditions**
- **Additional requirements**
  - Used Glass
  - Pre-primed glass
  - PAAS
  - Non-traditional contamination
  - Other

---

### 2. GLASS PREP/PRIMING:

- BETASEAL 0°ne and Express can be used with BETAPRIME CLEAR or 5504G(sa) glass primers
- BETASEAL U-400HMNC and BETASEAL Xpress30 must be used with BETAPRIME 5504G(sa) glass primer
- BETASEAL U-418, U-418HV, 428plus & 838 do not require glass primer, but can be used with BETAPRIME 5504G(sa) for additional cosmetic appearance and/or extra UV protection.
- Shelf life of primers is up to the expiration date marked on the package when stored according to the requirements on the specific product brochure. All Dow packaging is being updated to match current literature. Storage temperatures on current literature supersedes all previous requirements.
- Open life on BETAPRIME 5504G in cans is 14 days when properly sealed after use and stored according to the requirements on the specific product brochure.
- When bonding to previously installed glass, as long as the new adhesive is being applied to freshly cut, well bonded, uncontaminated cure urethane on both the body and glass, Dow will allow the use of “used” glass.
- Glass pre-primed by an OEM manufacturer should be re-primed with BETAPRIME 5504G(sa)
- “Double-dipping” of daubers in BETAPRIME 5504G All-in-One Primer is not encouraged as it could slightly reduce open life of the primer. It is NOT a compliance problem if the technician does “double-dip” when priming glass or encapsulation and will not compromise the bond.

---

### 2. GLASS PREP/PRIMING:

*Refer to:* Pages 13 & 14 for glass priming in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018)

*All EZ Kit Packaged adhesives include current instructions for use in box*

*Also refer to the product information pages of the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018)*

*Pages 29-34*
3. PINCHWELD PREP/PRIMING:

- Product requirements
- Application requirements
- Storage requirements
- Shelf-life (opened & unopened)
- Adverse weather conditions
- Additional requirements
  - Corrosion treatment
  - Gasket Sets

3. PINCHWELD PREP/PRIMING:

- References to “protect customer vehicle” is not a requirement for a safe installation, it is an industry “best practice”.
- Shelf life of primers is up to the expiration date marked on the package when stored according to the requirements on the specific product brochure.
- Open life on BETAPRIME 5504G in cans is 14 days when properly sealed after use and stored according to the requirements on the specific product brochure.
- Follow instructions in product brochure for each specific adhesive for proper cleaning and priming of bare metal and/or preparation of glass or painted surfaces when using adhesive with gasket set glass.
- All references in adhesive instructions to “dry fitting” and the use of “tape guides” in the installation of glass is for convenience and is NOT necessary for a safe installation.
- Reference to trimming existing adhesive to a height of 1-2 mm is a recommendation but a layer of uncontaminated, well bonded, freshly cut urethane as thin as 1/64” is acceptable.
- Recommendation to “avoid” priming existing urethane is not mandatory as BP 5504G is acceptable as a PAAS Primer.
- Priming moldings with BP 5504G is a recommendation only and has no effect on a safe installation.
- “Double-dipping” of daubers after it touches the body of the vehicle is not encouraged or recommended with BETAPRIME 5504G All-in-One Primer as it could introduce contamination that could be transferred when priming glass or frit.

3. PINCHWELD PREP/PRIMING:

Refer to: Pages 15 thru 20 for body preparation and priming in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018)

All EZ Kit Packaged adhesives include current instructions for use in box

Also refer to the product information pages of the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) Pages 29-34
4. URETHANE APPLICATION:

- Product requirements
- Application requirements
- Storage requirements
- Shelf-life
- Adverse weather conditions
- Additional requirements
  - SDAT identification
  - Non-conductive considerations
  - High modulus considerations
  - Other

4. URETHANE APPLICATION:

- References to use BETACLEAN 424 is a recommendation and as long as it is not used on a bonding surface, the solvent used to clean the exterior of the vehicle is up to the specific user

- References to application of adhesive at a 90° angle is a recommendation and a means of giving perspective to the term “vertical” with regards to the applicator. Application of adhesive at lower angles is not considered a safety issue.

- Recommendation to “back paddle” urethane after setting the glass is to minimize leaks and is not required for a safe installation.

- All Dow packaging is being updated to match current literature.

4. URETHANE APPLICATION:

Refer to: Pages 21 thru 25 for adhesive application the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018)

All EZ Kit Packaged adhesives include current instructions for use in box

Also refer to the product information pages of the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) Pages 29-34

5. Those engaged in automotive glass replacement shall only use retention systems that have lot numbers and expiration dates printed on appropriate products.

Refer to Dow Automotive product brochure for instructions for specific product used. ALL Dow Automotive Product sticks, bottles, cartridges and sausages have lot numbers and expiration dates printed on the individual package as well as the box it is packed in.

ALL Dow Automotive Product sticks, bottles, cartridges and sausages have lot numbers and expiration dates printed on the individual package as well as the box it is packed in. G-EZ Kit packaging includes Master Lot Code Stickers that record all primer lot codes and adhesive lot code from the EZ Kit and have a place to record DOT number from glass

Also refer to the product information pages of the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) Pages 29-34
### 6.0 Installation Standards-Adhesive Bonded

<table>
<thead>
<tr>
<th>6.1 Those engaged in automotive glass replacement shall follow the adhesive manufacturer's application instructions as provided by the manufacturer directly, or through the private labeler. All in-shop or mobile installations shall be performed under environmental and other conditions that are compatible with the application instructions required in Section 5.</th>
<th>Refer to the product information pages of the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) Pages 29-34 for instructions for specific product used OR use instructions included in EZ Kit box, individual adhesive box or access on <a href="http://www.DowARG.com">www.DowARG.com</a> Website.</th>
<th>Refer to the product information pages of the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) Pages 29-34 for instructions for specific product used OR use instructions included in EZ Kit box, individual adhesive box or access on <a href="http://www.DowARG.com">www.DowARG.com</a> Website.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2 Products must be stored and controlled according to manufacturers' requirements as provided directly or through a private labeler.</td>
<td>Refer to product storage temperature referenced on each brochure for specific adhesive or primer being used.</td>
<td>Referenced in product brochure for specific adhesive in use on last page under &quot;shelf life&quot;.</td>
</tr>
<tr>
<td>6.3 No automotive glass replacement shall be undertaken using an adhesive glass retention bonding system that would not achieve minimum drive-away strength by the time the vehicle may be reasonably expected to be operated.</td>
<td>Refer to drive-away time chart on brochure for specific product being used.</td>
<td>Drive-away chart in product brochure for specific adhesive in use. Refer to Appendix Pages in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018)</td>
</tr>
<tr>
<td>6.4 The vehicle owner / operator shall be notified prior to and after the installation process of the minimum drive-away time under the circumstances of the replacement.</td>
<td>Notify the customer/owner/operator of the appropriate safe minimum drive away time referenced in the last section of the adhesive specific instructions in each adhesive brochure or in the appendix of the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018)</td>
<td>Refer to: Dow Fixed Glass Replacement Record Form in the Appendix Pages in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) MAY be used.</td>
</tr>
<tr>
<td>6.5 Adhesive shall be applied so that the finished bead cross section profile and dimensions meet or exceed original equipment configuration or recommendation of adhesive system manufacturer.</td>
<td>Product use instructions are included in each adhesive brochure for the specific adhesive being applied.</td>
<td>Refer to: Pages 21 thru 25 for adhesive application the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) or installation instructions on Page 3 of each appropriate brochure</td>
</tr>
</tbody>
</table>
6.6 If the OEM installation was polyurethane, then the glass shall be replaced with polyurethane or an equivalent adhesive bonding system. If the OEM installation was butyl, polysulfide, or other non-polyurethane, and the vehicle is licensed for highway use, adhesive bonded stationary glass installations shall be performed using polyurethane or an equivalent retention system unless in conflict with current OEM specifications.

Always use urethane to match existing bonding adhesive and use urethane to upgrade installations of other adhesives to urethane bond

Refer to Dow Automotive product brochure for instructions for specific product used.

Product use instructions are included in each adhesive brochure for the specific adhesive being applied

Refer to: Pages 15 & 17 for body preparation in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018)

<table>
<thead>
<tr>
<th>6.7 All adhesive system component lot numbers shall be traceable to each job.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record the lot number from the glass primer if required, pinchweld primer and adhesives used in the installation.</td>
</tr>
<tr>
<td>Optional: Use Master Lot Code Stickers in GEZ Kit packaging that records all primer lot codes and adhesive lot code from the GEZ Kit and have a place to record DOT number from glass</td>
</tr>
<tr>
<td>Referenced in product brochure for specific adhesive in use on page 3 under “record keeping”</td>
</tr>
<tr>
<td>Refer to: Dow Fixed Glass Replacement Record Form in the Appendix Pages in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) MAY be used.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6.9 No product that has exceeded the manufacturer or private labeler’s stated expiration date, open shelf life, or active shelf life shall be used.</th>
</tr>
</thead>
<tbody>
<tr>
<td>All products can be used up to and including the date printed on the product if unopened. Bottled BP 5504G may be for up to 14 days after opening if within shelf life printed on product container.</td>
</tr>
<tr>
<td>Refer to Dow Automotive product brochure for instructions for specific product used. ALL Dow Automotive Product sticks, bottles, cartridges and sausages have lot numbers and expiration dates printed on the individual package as well as the box it is packed in.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6.11 When inappropriate replacement materials or methods are detected, those engaged in automotive glass replacement shall report their findings to the vehicle owner/operator.</th>
</tr>
</thead>
<tbody>
<tr>
<td>If inappropriate replacement materials or methods are detected prior to glass installation, the job shall not be completed until the condition is corrected. The customer/owner/operator must also be notified.</td>
</tr>
<tr>
<td>Refer to: Dow Fixed Glass Installation Guide page 3 or Dow Fixed Glass Replacement Record Form in the Appendix Pages in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) MAY be used.</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>6.12 When those engaged in automotive glass replacement correct inappropriate glass installations, they shall remove any inappropriate materials that would compromise the retention system. They shall fully correct any adverse glass installation related condition(s) caused by the use of inappropriate materials or methods, and they shall use appropriate methods described elsewhere within Section 5 of this document.</th>
<th>If inappropriate replacement materials or methods are detected prior to glass installation, the job shall not be completed until the condition is corrected. Adverse glass installation related condition(s) caused by the use of inappropriate materials or methods shall be fully corrected and appropriate methods described elsewhere within Section 6 of this document shall be adhered to. The customer/owner/operator must also be notified.</th>
<th>Refer to: Dow Fixed Glass Installation Guide page 3 or Dow Fixed Glass Replacement Record Form in the Appendix Pages in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) MAY be used.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.13 When sealing air or water leaks within a polyurethane retention system, only compatible polyurethane adhesive shall be used. (No silicone or butyl may be used).</td>
<td>To avoid future contamination problems encountered with non-urethane adhesives and sealants, use urethane according to preparation and application instructions specific to that adhesive.</td>
<td>NOTE: may be in conflict with existing OEM service bulletins Use instructions specific to adhesive in adhesive brochure</td>
</tr>
</tbody>
</table>
| 6.14 Only the full cut method should be used for polyurethane retention systems. | Follow adhesive system installation instructions in product brochure specific to adhesive being used. “Full-cut” method is trimming existing adhesive to within 1-2 mm in height.  
Note: 1-2 mm is a recommendation. Trimmed original adhesive height as thin as 1/64” is acceptable | Refer to: Dow Fixed Glass Installation Guide Pages 15 thru 20 for body preparation and priming in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) or installation instructions on Page 3 of each appropriate brochure  
All EZ Kit Packaged adhesives include current instructions for use in box |

### 7.0 Installation Standards- Rubber Gasket

| 7.1 If the OEM utilizes the combination of a rubber gasket and polyurethane as a retention system, an equivalent adhesive bonding system must be used in the installation. In cases when the OEM didn't include polyurethane or an equivalent adhesive system, such systems shall be used if later production models included the addition of adhesive systems without body style modification. | When sealing and bonding gaskets with urethane, follow glass preparation procedures in appropriate adhesive instructions in adhesive brochure | Use ANSI/AGSC/AGRSS Standard directive on Pg. 6, Section 7  
Use glass preparation instructions specific to adhesive in adhesive brochure |
<table>
<thead>
<tr>
<th>7.2 If the OEM gasket installation did not include adhesive and the vehicle is licensed for highway use and is less than 10,000 lbs. Gross Vehicle Weight (GVW), the installation shall include polyurethane or an equivalent adhesive bonding system. The following are permissible exceptions: egress applications, antique or classic vehicle restorations, or in cases in which this practice conflicts with current vehicle manufacturer specifications.</th>
<th>When sealing and bonding gaskets with urethane, follow glass preparation procedures in appropriate adhesive instructions in adhesive brochure</th>
<th>Use ANSI/AGSC/AGRSS Standard directive on Pg. 6, Section 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.3 When sealing air or water leaks within a rubber gasket/polyurethane ADHESIVE SYSTEM only compatible polyurethane shall be used. (No silicone or butyl may be used).</td>
<td>When sealing and bonding gaskets with urethane, follow glass preparation procedures in appropriate adhesive instructions in adhesive brochure</td>
<td>Use ANSI/AGSC/AGRSS Standard directive on Pg. 6, Section 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use glass preparation instructions specific to adhesive in adhesive brochure</td>
</tr>
</tbody>
</table>
### 8.0 Additional Requirements

| **8.4** Whenever OEM retention systems are modified on later production models without body style modification, the most current retention system shall be used in the replacement unless otherwise specified by the OEM. | When sealing and bonding with urethane, follow glass preparation procedures in appropriate adhesive instructions in adhesive brochure | Use ANSI/AGSC/AGRSS Standard directive on Pg. 6, Section 8.4

Refer to Dow Automotive product brochure for instructions for specific product used OR use instructions included in EZ Kit box, individual adhesive box or access on www.DowARG.com Website.

*Also refer to the product information pages of the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) Pages 29-34*

| **8.5** Notification of defective product:
- A failure or defect in any product used or intended for use in the automotive glass replacement process that could jeopardize customer safety shall be reported promptly to the manufacturer or supplier of the product.
- Any product installed by those engaged in automotive glass replacements that is discovered to be defective or which is determined could jeopardize customer safety shall be immediately reported to the customer with an offer to remedy the situation. | Report any product that does not appear to perform properly to the manufacturer of the product and company supervisor or management

Using required records like: glass part number, DOT number, primer lot number and adhesive lot number, work with vehicle owner/operator to remedy the problem or recall. | Follow ANSI/AGSC/AGRSS Standard directive in section 6.12 and 8.5

| **8.6** Those engaged in automotive glass replacement shall not introduce any chemical agents, such as cleaners, solvents, lubricants, release agents, or utilize any installation practice, which will adversely affect the glass retention system. | When sealing and bonding with urethane, follow glass preparation procedures in appropriate adhesive instructions in adhesive brochure | Refer to: Dow Fixed Glass Installation Guide page 3 side bar

|
| 8.7 Those engaged in automotive glass replacement shall create and retain records of each auto glass replacement for a period of at least three years from the date the work was completed sufficient to demonstrate compliance with this standard. Records, either electronic or hard-copy, shall be legible, easily identifiable and readily available. Such three year period may be temporarily shortened for specific, clear and substantial reasons but shall be adhered to when such reasons no longer exist. | Those engaged in automotive glass replacement shall maintain documentation to demonstrate compliance with this standard. **Refer to:** Dow Fixed Glass Installation Guide page 3 or Dow Fixed Glass Replacement Record Form in the Appendix Pages in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) **MAY be used.** |
### Retention System Provider Deliverables:

<table>
<thead>
<tr>
<th>Deliverable:</th>
<th>Retention System Provider Response:</th>
<th>Is Documentation Included: (Yes, No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1 Those engaged in automotive glass replacement shall use retention systems</td>
<td><strong>Dow Automotive response:</strong> All Dow Automotive materials are manufactured according to internal American Standard Testing Method (ASTM) and International Standardization Organization (ISO) procedures. Furthermore, our adhesives meet or exceed all OEM and Federal Motor Vehicle Safety Standards (FMVSS) and are crash proven, having passed the FMVSS 212 windshield retention test.</td>
<td>Refer to: Page 3, Sidebar in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018)</td>
</tr>
<tr>
<td>that are produced under the ISO 9001 standard or any standard that contains</td>
<td></td>
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<tr>
<td>the entire text of ISO 9001.</td>
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<td></td>
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<tr>
<td>**Identify your organizations current quality assurance standard and how this</td>
<td></td>
<td></td>
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<tr>
<td>should be identified by your glass shop customers.</td>
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<td></td>
</tr>
<tr>
<td>5.3 Those engaged in automotive glass replacement shall use either an OEM</td>
<td><strong>Dow Automotive response:</strong> Dow Automotive supplies the urethane adhesives used to originally install windshields in nearly all domestic autos and two thirds of all vehicles manufactured worldwide. Adhesive systems from Dow Automotive have passed all Ford, GM, DaimlerChrysler and transnational manufacturer durability, vibration, cold impact and fogging resistance performance tests, including the two-year outdoor exposure tests required by many OEMs. When used as directed, Dow Automotive adhesives meet or exceed all of the OEM strength requirements outlined in glass bonding specifications.</td>
<td>Refer to: Pages 3, 7 &amp; 8 in the Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018)</td>
</tr>
<tr>
<td>approved retention system or equivalent retention system as certified in writing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>by the equivalent retention system manufacturer directly or through a private</td>
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<tr>
<td>labeler.</td>
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<tr>
<td>**Provide validation to this requirement and how your glass shop customers’</td>
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<td></td>
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<tr>
<td>would demonstrate your compliance to this section of the Standard.</td>
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<td></td>
</tr>
</tbody>
</table>
| 5.4 | Those engaged in automotive glass replacement shall obtain and follow written comprehensive and current application instructions from the retention systems manufacturer or private labeler. These instructions shall include at least the proper use of the retention system storage specifications, minimum dive-away time charts containing temperature and humidity variables if applicable, and any special procedures required for adverse weather conditions. | Dow Automotive response: We update and distribute product brochures like the following regularly. These contain:  
• Application details and requirements  
• Drive-away time charts with temperature and humidity variables  
• Step-by-step installation instructions  
• Safety precautions  
• Storage and shelf life information | Refer to: The Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) or installation instructions on Page 3 of each appropriate brochure  
All EZ Kit Packaged adhesives include current instructions for use in box |
| 6.3 | No automotive glass replacement shall be undertaken using an adhesive glass retention bonding system that would not achieve minimum drive-away strength by the time the vehicle may be reasonably expected to be operated. | Dow Automotive response: Drive-away time data like the following charts are included in all Dow Automotive product literature and technical data.  
Other Drive-away charts are available on the Dow Automotive Website at: www.DowARG.com | Refer to: The Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018) or installation instructions on Page 3 of each appropriate brochure  
All EZ Kit Packaged adhesives include current instructions for use in box |
9.1 Technicians installing replacement automotive glass shall be fully qualified for the tasks they are required to perform. Such qualifications shall include, at a minimum, completion of a comprehensive training program with a final exam and an ongoing education component. The program shall include, among other things: AGR safety issues, an understanding of OEM installation standards and procedures, relevant technical specifications, Adhesive System Manufacturer specific comprehensive retention system training and the opportunity to apply and demonstrate the skills technicians learn.

**IF YOUR COMPANY DOES PROVIDE TRAINING**, identify the name of your training course, the testing provided, the certificates provided and the frequency of such training and/or continuing education.

---

Dow Automotive response: Dow Automotive has offered its industry-leading Fixed Glass Installation Training Program, and customized training programs for almost 30 years. More than 30,000 technicians have received certificates of program completion like the sample on page 5 of our Fixed Glass Installation Guide, which we update and distribute regularly.

The Dow Fixed glass Training Program was registered with AGSC in 2008 thru current

- Code of Practice
- Product safety
- Use the proper amount of adhesive
- Vehicle preparation
- Corrosion prevention and treatment

---

9.2 Training with respect to the content and requirements of the current version of this standard shall be required for all personnel directly involved in the automotive glass replacement process (examples: scheduling, purchasing, installing, customer service, quality control, management). Records of this training detailing content, date, participants and acknowledgement of the participant’s successful completion of the training and receipt of a printed copy of the current standard shall be maintained.

**IF YOUR COMPANY DOES PROVIDE TRAINING**, identify the document provided to record the required items mentioned above relating to this training.

---

Dow Fixed Glass Training Program, started in 1999 is in its fifth generation. It was the first AGSC/AGRSS Registered Training Program and is still currently in all forms. It is recommended but not required that customers be retrained approximately every two years or when products and procedures change. A certificate is provided upon completion of the course.

---

Refer to: Page 3, Dow Automotive Fixed Glass Installation Guide Ver. 5.4 (2018)

Request Dow Fixed Glass Training

Contact Local Dow Automotive Representative/Trainer
### Contact Information:

<table>
<thead>
<tr>
<th>Your Company’s Name:</th>
<th>Dow Automotive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your Company’s Address:</td>
<td>1250 Harmon Rd Auburn Hills, MI 48326</td>
</tr>
<tr>
<td>Your Name:</td>
<td>Steve Allison</td>
</tr>
<tr>
<td>Your Title:</td>
<td>Technical Service and Development Engineer</td>
</tr>
<tr>
<td>Your Phone Number:</td>
<td>248-391-6569</td>
</tr>
<tr>
<td>Your Email Address:</td>
<td><a href="mailto:sallison@dow.com">sallison@dow.com</a></td>
</tr>
<tr>
<td>Your Mailing Address:</td>
<td>1250 Harmon Rd Auburn Hills, MI 48326</td>
</tr>
<tr>
<td>Part</td>
<td>Pre-Treatment Process</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------------------------------------------</td>
</tr>
<tr>
<td>Ceramic Coat Frit/Inner Frit</td>
<td>BETABRADE F1, BETACLEAN GC-800, BETAPRIME 5504G</td>
</tr>
<tr>
<td>Clear Glass No Frit</td>
<td>BETABRADE F1, BETACLEAN GC-800, BETAPRIME 5504G - 2 coats</td>
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<tr>
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<tr>
<td>OEM Pre-Primed Parts (Black)</td>
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<tr>
<td>Any Bare Metal (Nicks and Scratches)</td>
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</tr>
<tr>
<td>Corroded Bare Metal</td>
<td>Remove Surface Corrosion (See FGIG for More Details), Clean Bare Metal with 100% Acetone or Heptane, BETAPRIME 5504G - 2 coats</td>
</tr>
<tr>
<td>Body Side Paint</td>
<td>BETACLEAN GC-800, BETAPRIME 5504G</td>
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</table>
DOW AUTOMOTIVE – WORLD CLASS PRODUCTS AND SUPPORT

More than 1 billion vehicles worldwide have been assembled using Dow Automotive windshield adhesives. These trusted products are also available to the automotive aftermarket.

Safety

Safety is always the bottom line at Dow Automotive. All our aftermarket products are crash proven to rigorous OEM standards and also stand up to robust durability testing.

Innovation

Dow Automotive leads the field in technology and innovation. Our R&D team is dedicated to finding ways to improve polyurethane technology for all automotive aftermarket glass replacements. For example, Dow Automotive’s newest adhesive, BETASEAL™ Xpress30, features a 30-minute drive-away time powered by Dow’s new RPM adhesive technology. The faster drive-away time helps get customers back on the road safely with less waiting for the adhesive to cure. Our BETAPRIME™ 5504G All-in-One Primer eliminates the need for multiple primers to reduce cost and inventory. BETAPRIME™ 5504G features a no shake formulation and shorter dry times, speeding up installations and helping to eliminate possible errors. All of Dow Automotive’s adhesives are cold applied – no heating required. BETASEAL™ G-EZKits contain everything technicians need for a good day’s work.

Support

When you choose aftermarket products from Dow Automotive, you not only get the best products available, you partner with an industry leader. Dow Automotive Field Sales and Technical Service team members are 100% dedicated to support our aftermarket customers. Dow Automotive offers top-class in person and on-line training for technicians and promptly responds to your needs and concerns to give you world-class support. Dow Automotive also offers a comprehensive mobile Web site that puts critical installation information in the palm of your hand. Visit www.DowARG.com from your mobile device for more information.

Quality

You can trust the quality of all our products. We pride ourselves on products that are free of defects and retain batch-to-batch consistency. All cleaners, primers and adhesives are optimized for value – they ensure peace of mind for customers, while keeping your material costs low and making your workdays go easier and faster.

If found, please return to:
Dow Automotive
1250 Harmon Road
Auburn Hills, MI 48326 USA
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INTRODUCTION

Direct glazing is the primary bonding method used on virtually all vehicles manufactured worldwide. It is where glass is bonded directly to the vehicle body using a high-strength adhesive. Direct glazing restores the structural integrity of the passenger compartment to ensure the safety of vehicle occupants. This method places greater structural design demands on the windshield, which, in turn, puts greater demands on the knowledge and skills of the installer.

Dow Automotive is concerned about the safety of passengers and the need to establish standards for the Automotive Replacement Glass (ARG) industry. In response to these concerns, Dow Automotive developed a Code of Practice and seeks your endorsement.

CODE OF PRACTICE

Code introduction

The Code of Practice establishes a framework and set of guidelines to ensure the ARG industry provides consumers with high-quality service and products.

Compliance with the Code of Practice helps ensure:

1. Customers are treated fairly and all products and services meet OEM standards and specifications.
2. The products and services offered by participants are provided in a safe and efficient manner, in accordance with fair business practices and relevant health and safety regulations.

Many of the principles and provisions in the Code of Practice are a restatement of time-tested methods and practices observed by reputable participants in the industry.

The Code of Practice demonstrates the high standard of business practices and services adopted by participants. It is a tool by which services may be measured and judged.

This results in advantages for and protection of customers who elect to use the products and services offered by participants.

The principles set out in the Code of Practice are not intended to qualify, supplement or interpret any existing laws or regulations applicable to the industry. They should be used as practical, reasonable guides.

The ANSI/AGSC/AGRSS current standard is the first and only North American standard detailing the steps and procedures installers should take to provide safer automotive glass replacement. It is one of the most significant safety developments in the automotive glass industry in the past 50 years.

The standard explains what steps should be followed for safer replacements and also sets up procedures for handling difficult or problem installations. It was developed by a dedicated group of automotive glass industry professionals under the auspices of ANSI/AGSC/AGRSS. The entire development process followed the procedure of the American National Standards Institute (ANSI) to ensure that it was open and complete. As a result, the auto glass industry has a standard that is compiled by the industry, not just one group or company.

It is important that every single person and company involved in the ARG industry be familiar with the ANSI/AGSC/AGRSS Standard. Visit agsc.org for more information.
Objectives

The objectives of the Code of Practice are to help you:

- Comply with ANSI/AGSC/AGRSS current standards in all installations
- Ensure vehicles are restored to the OEM design specifications for structural integrity and aesthetics
- Assure compliance with the Motor Vehicle Act that mandates all vehicles be repaired and restored to original strength and safety. The Motor Vehicle Act, Section 1397 (a2a) states: No ... dealer ... or repair business shall knowingly render inoperative, in whole or in part, any device or element of design installed on or in a motor vehicle
- Satisfy Federal Motor Vehicle Safety Standards (FMVSS) 208, 212, 216a, 219 and 111
- Promote the use of the most current, technologically advanced products, materials, methods and processes
- Promote the use of glass replacement parts that meet ANSI Z26.1 (as specified by FMVSS 205) and are so marked
- Encourage and develop high standards of workmanship and business ethics within the industry
- Create awareness of safety issues
- Establish and maintain a good reputation and standing in the ARG industry

SCOPE

The Code of Practice includes the following:

Principles: product origin, quality and standards

All products and processes used conform to ANSI/AGSC/AGRSS standards, include the following.

Glass components will:
- Conform to ANSI/AGSC/AGRSS standards
- Be of a quality or standard to restore the structural integrity of consumers’ vehicles

Adhesives will:
- Conform to Original Equipment Manufacturer (OEM) specifications for automotive glass bonding or be endorsed by OEM

Other products (rubber, clips, cleaners, etc.) will:
- Be fit for their purpose or approved by the OEM

Methods and techniques

Participants will use methods and techniques consistent with the Code of Practice in order to ensure:
- Structural integrity of the customer’s vehicle is restored to OEM specifications following the replacement of any automotive glass component
- Aesthetics of the customer’s vehicle is equivalent to OEM-specified appearance (allowing for reasonable deterioration due to vehicle age)
Installation standards and procedure

Installation standards and procedures must be adequately documented and accessible by users at all times through an information system. Information must be kept up-to-date as new vehicles are released.

Follow the recommended installation procedures:

1. Prior to commencement of work, inspect vehicle for pre-existing damage or conditions that would prevent a safe installation. Report any unsafe conditions or damage to the vehicle’s owner and record on the Dow Automotive Fixed Glass Replacement Record or other work documents. Notify customer of MDAT under the circumstances of the installation.

2. Properly protect the customer’s vehicle by utilizing hood, seat and door covers and other protective shields.

3. Assess if the vehicle deploys any advanced driver assist systems (ADAS). If the vehicle has ADAS that require recalibration, make sure to communicate to the customer your company’s policy/plan to recalibrate or not.

4. Inspect replacement parts thoroughly for defects before starting work. (Optional step: dry fit glass to ensure a proper fit in pinchweld prior to applying adhesive).

5. Verify that all primers and adhesives are within current shelf life and have been stored according to the adhesive manufacturers specified recommendations on product brochure.

6. Use adhesives equivalent to those used during manufacture (e.g., urethane adhesive for urethane adhesive).

7. Make sure that all mechanically fastened parts are replaced according OEM specifications.

8. Only use external mirror replacements that meet FMVSS 111.

9. Notify adhesive, vehicle or glass manufacturer if a product failure is observed when working on a vehicle. Also notify the owner/operator of the vehicle.

10. Test for water leaks and wind noise after installation.

11. Inspect the vehicle to ensure:
   a. All trim fits neatly and there are no gaps or exposed edges.
   b. All accessories (i.e., wiper arms, rear glass defroster and radio/telephone antennas) are properly reconnected.
   c. The installed glass has been properly cleaned and is streak free.
   d. All broken glass, dirt, debris and adhesives or sealants are cleaned from interior and/or exterior of vehicle.

12. Record all lot numbers of primers and adhesives used, as well as the U.S. Department of Transportation (DOT) number and part number of all glass parts installed.

13. If any product problems are found, contact Dow Automotive at +1-800-453-3779 or email fxddarg@dow.com.

14. Make sure consumers understand their responsibility and precautions for minimum drive-away time. Place an information card in a visible, noticeable location in the vehicle. Installation procedures for direct-glazed, urethane-set windshields are detailed later in this guide.

Direct-glazed automotive glass

All products and processes used should conform to OEM specifications, including:

- Urethane adhesives that meet all applicable OEM standards
- Glass preparation products and/or primers (as determined by adhesive system) to chemically prepare the glass bonding surface and reduce bond degradation, which may be partially caused by ultra-violet (UV) light penetration through the ceramic frit over time
- Body preparation – for example, small bare metal areas. The primer must be applied to the clean metal surfaces of the car body to both promote adhesion and provide corrosion resistance of the glass to the body. This ensures the structural integrity of the vehicle (which conforms to OEM specifications).
- Perform all direct-glazed installations using the “OEM method”
COMMONLY USED TERMS

*Code of Practice* refers to guidelines that establish the minimum requirements for the industry.

*Participants* refers to all groups or individuals committed and prepared to comply with all aspects of the Code of Practice.

*Industry* refers to any organization, company, group, individual or partnership supplying, replacing or repairing any glass component in the ARG industry in accordance with local, state and federal statutory requirements.

PRODUCT SAFETY

Symbols in this guide

Throughout this manual, paragraphs containing particularly important information are marked with the symbols NOTE, CAUTION and WARNING.

Safety precautions

This safety information is provided in good faith, but does not replace the worker’s obligation to be familiar with all products, Safety Data Sheets (SDS) in the United States, Workplace Hazardous Materials Information Systems (WHMIS) in Canada and to exercise due care and caution in auto glass installation, materials handling and equipment operation.

Safety can never be overemphasized. Good safety practices are the best means of preventing personal injury or damage to property.

The safe use of chemicals

It is a common misconception that chemicals can only enter the body through the mouth. Some chemicals can enter the body via other means and present a greater hazard. For example, the skin’s resistance to chemicals is reduced if it is bruised or cut; the eye offers little resistance to chemicals because of its composition.

The following safety tips are recommended when handling chemical products:

- Always read the SDS (WHMIS) for more instructions
- Always wear protective gear such as chemically resistant gloves and safety glasses
- Avoid prolonged or repeated skin contact
- Never smoke, eat or drink when using chemicals, even if they are not flammable
- Always read the instructions on containers and observe precautions given
- Always store chemicals in their approved and labeled containers
- Always keep the container sealed when not in use
- Never sniff or inhale vapors. It can impair judgment and may cause adverse medical effects.
- Keep flammable chemicals away from flame and ignition sources

The safe use of electrical equipment, including applicators and battery chargers

Respect electrical equipment for your protection.

- Make sure the power cord is properly connected to outlet and that outlet is grounded
- Use a Ground Fault Interrupter (GFI) when working mobile or in a wet or damp area
- Do not use worn or frayed electrical wiring or a faulty electrical plug

NOTE

The NOTE paragraph alerts the reader to a situation that requires more attention than the regular technical text in this manual.

CAUTION

The CAUTION paragraph alerts the reader to a situation where improper procedures may cause damage to equipment or property.

WARNING

The WARNING paragraph alerts the reader to a situation where serious and permanent injury to personnel, as well as damage to equipment and property, could result from improper procedures.
General first aid recommendations

**Skin contact:** promptly wipe off excess material, then wash skin thoroughly with soap and water.

**Eye contact:** immediately flush with water for at least 15 minutes. Contact a physician if any symptoms persist.

**Inhalation:** move to fresh air and contact a physician.

**Ingestion:** contact a physician or poison control center immediately.

**Clothing:** remove contaminated clothing and launder before reuse.

Occupational safety and health

All participants and employers will provide a safe workplace and environment for the community in accordance with government requirements. All participants, employers and employees will adhere to government laws and regulations applying to the supply, installation and/or repair of automotive glass in motor vehicles. Additionally, the participants will need to ensure the proper disposal of unused materials or containers.

Training and skill qualification

All participants will provide structured training for their employees or access to a structured training program. This will help ensure installers are adequately skilled to perform automotive glass replacement and/or repairs in accordance with the Code of Practice.

- All skills obtained by technicians will be documented and recorded by their employers, trainers or assessors using an easily accessible records retrieval system
- Where applicable, all training will conform to industry standards
- Employers and employees will take advantage of continuing education available at trade shows, seminars and electronically via the Internet

Minimum equipment/facility specification

Workshop facilities will be equipped to meet local, state and/or federal legal requirements and will include the following equipment:

- First aid kit
- Fire extinguishers
- Vacuum cleaners for all work sites
- Workbench
- Electric- or pneumatic-driven cut-out tool and accessories
- Electric drill and selection of drill bits
- Bench grinder
- Individual tool kit and personal protective equipment for employees.

See next two subsections.
Personal protective equipment
For each employee, provide the following minimum required protective equipment:

- Eye protection (glasses/goggles)
- Foot protection (safety shoes/boots)
- Ear protection (ear muffs/plugs)
- Respiratory protection (respirator/face mask)
- Body protection (apron)
- Hand and wrist protection
- Cut-resistant gloves
- Disposable chemical-resistant gloves
- Anti-vibration gloves
- Cut-resistant forearm protectors

Dow Automotive recommends the following tools:
Individual tool kit per employee for mobile and in-shop installations:

- Windshield stand
- Vacuum cleaner (industrial strength)
- Molding release tools
- Wire cutout tool
- Channel scraper
- Headliner tool
- Locking strip tool (truck)
- Long-nose pliers
- Adhesive applicator
- Masking tape
- Vacuum cups
- Ball peen hammer
- Wiper arm remover tool
- Hood covers
- Seat covers
- Mirror bracket adhesive
- Single-edged razor blades and holder
- Torx bit set
- Nozzle notching tool
- Utility knife with heavy-duty blades
- Replacement blades (as required)
- Phillips screwdriver set
- Small rubber mallet
- Riveter and rivets
- Combination pliers
- Nut drivers
- Door handle tool
- Door trim pad remover
- Channel chisel
- Allen key sets (Metric and English)
- Power cutout tools
- Assorted drill bits
- Drill (electric/battery)
- Socket sets (Metric and English)
- Standard screwdriver set
- Digital camera

Safe material disposal
Participants shall be responsible for compliance with all applicable federal, state/provincial and local statutes regarding the management, use, handling, treatment, storage, disposal and transportation of hazardous wastes and materials. Participants with compliance questions shall contact their local, state/provincial or federal environmental regulatory agency.

Participants shall read the appropriate SDS (WHMIS) for all adhesive, primer, preparation and cleaning products.

Participants shall contact the appropriate emergency response team in the event of a chemical accident involving a spill, leak, fire or explosion.
URETHANE CHEMISTRY

Introduction

Urethane is the only adhesive technology used in high-performance auto glass bonding. This is because urethane is capable of withstanding high levels of deformation with little loss of adhesive strength and performance. Urethanes are tough and abrasion resistant. BETASEAL™ urethane adhesives are formulated to be durable enough to withstand long-term weather exposure.

Why not butyl?

For many years, butyl provided adequate sealing, but little strength. When automobile designs changed, adhesive technology improved to provide high structural strength, as well as a moisture seal. Butyl is now considered a contaminant and should be completely removed to ensure 100% bond strength for glass originally installed with urethane adhesive.

Windshield retention and roof crush requirements

The most common cause of death during an accident is being thrown from a vehicle. In 1970, federal legislation was enacted requiring the windshield to remain intact during a 30 mph frontal impact (FMVSS 212). In 1973, similar legislation was enacted requiring the passenger car roof to withstand roof collapse during a rollover accident (FMVSS 216a). Due to fuel economy and other concerns, automotive manufacturers chose not to reinforce the roof pillars to meet this standard, instead using the windshield as an integral part of the car body.

Today, most cars manufactured in North America use urethane adhesive to bond the windshield and car body into a single unit. Manufacturers are required to verify strength and performance by crash and crush testing each make and model before it can go to market. Urethane adhesive is also applied in backlite and many fixed sidelite installations.

Adhesive strength

Safety is the bottom line – auto manufacturers, insurance companies and aftermarket professionals are all concerned about passenger safety. BETASEAL™ urethane adhesives have been developed to protect occupants in crashes and rollover accidents. They are formulated to:

- Become a structural part of the vehicle body
- Provide replacement glass bond strength equal to that of the original vehicle
- Meet original auto manufacturer FMVSS certification standards

Who determines what is safe?

The DOT mandates all new vehicles pass the FMVSS performance tests. These actual destructive tests ensure that vehicles maintain a minimum safety standard. The standard does not allow substitution of laboratory tests for the destructive crash tests.
FMVSS performance standards

**FMVSS 212** measures windshield retention in a barrier crash. Automobiles equipped with passive restraints must retain 50%. Vehicles not equipped with passive restraints must have at least 75% retention. Some vehicle manufacturers require 100% retention in this severe crash test.

**FMVSS 208** occupant crash protection specifies equipment requirements for active and passive restraints, including air bags. There can be no separation of load-bearing safety assemblies in a 30 mph barrier crash. This pertains to the windshield because the passenger side air bag deploys off the windshield in order to perform its safety function.

**FMVSS 216a** is the roof crush performance test. It measures the structural strength required to protect occupants in the event the vehicle rolls over. Three times unloaded vehicle weight under 6,000 lbs. and one and one-half times the unloaded vehicle weight between 6,000 and 10,000 lbs. of force is applied at an angle to the roof. Five inches of deflection or less is required to pass.

**FMVSS 219** windshield intrusion test measures the windshield’s ability to keep a 15 lb. object traveling at 30 mph from entering the vehicle cabin. The glass and adhesive bond protects occupants from intrusion of external objects. The windshield can displace no more than one-quarter inch to pass.

The urethane solution

**BETASEAL™** polyurethane adhesives are subjected to lab, impact and crash tests prior to full production to verify adhesion to new and old paint and ceramic frits. Dow Automotive collaborates with OEMs, universities and suppliers worldwide in order to formulate and manufacture adhesives that exceed OEM specifications and applicable safety standards. Adhesive systems from Dow Automotive have passed specification testing for Ford, GM, Fiat Chrysler and all manufacturers globally. Test specifications include, but are not limited to, physical properties and adhesion durability testing (accelerated weathering and outdoor exposure).

**BETASEAL™** adhesives are developed exclusively for automotive glass bonding. Tensile and lap shear strengths measure a material’s resistance to being pulled or torn apart. Cohesive failure occurs when the adhesive sticks to the glass and aperture, but the body of the adhesive is torn apart. Adhesive failure is a measurement of the urethane’s effectiveness to adhere to the substrate (e.g., ceramic frit band and pinchweld). An adhesive failure of 100% means the polyurethane pulled loose from the substrate without leaving material, failing OEM standards. **BETASEAL™** polyurethane adhesives are approved for use by all automotive vehicle manufacturers.

Dow Automotive certified to comply

Dow Automotive has supplied urethane adhesive to automakers since 1973. More than 600 million vehicles in North America are glazed with BETASEAL™ urethane adhesives (more than 1 billion worldwide). Dow Automotive offers the same approved products to the aftermarket.

**NOTE**

Not all brands of urethane adhesives meet the OEM minimum durability requirement. Auto manufacturers continuously evaluate multi-year fleet test data and environmental tests to verify durability.

**Over 1 Billion**

Vehicles glazed with BETASEAL™ polyurethane adhesives.
Urethane adhesive chemistry
There are a variety of urethane products with diverse characteristics. Common to all urethanes is the use of compounds that contain nitrogen-carbon-oxygen groups. These compounds react readily with a wide variety of other chemical groups.

Molecular crosslink
For proper molecular bonding to occur between the glass, urethane adhesive and auto body, all surfaces must be properly cleaned and prepared. The glass must be cleaned with an effective glass and surface cleaner.

The glass and frit must be prepared for bonding to create active molecular sites for urethane bonding. The primer is designed to react with the surface molecules on the glass (fritted and clear). After appropriate flash time, the primer develops a strong bond to the glass and creates a surface that is ready for adhesive bonding.

When brought together, the adhesive creates short connections or bridges, commonly known as crosslinks, with neighboring chains of atoms in the chemical layers. This “sandwich” fuses by molecular crosslinking into a strong cohesive unit to retain the windshield in the event of a crash. The interlocking geometries along surface areas and substrates represent active sites for molecular bonding. The metal pinchweld must be checked for corrosion and large areas of bare metal. If found, they must be cleaned with an approved cleaner and primed with an appropriate metal priming system.

 Primer use and compatibility

BETAPRIME™ 5504G All-in-One Primer is the only primer needed for all auto glass installations. It can be used to prime glass, ceramic frit, encapsulations, pinchweld, bare metal areas and all other common automotive substrates. BETAPRIME™ 5504G means the correct primer is used every time, avoiding costly and time-consuming mistakes.

Dow Automotive also sells BETAPRIME™ CLEAR glass primer in our G-EZKit with BETASEAL™ O’ne™ and BETASEAL™ Express. BETAPRIME™ CLEAR is only compatible with BETASEAL™ O’ne™ and BETASEAL™ Express and should not be used with other adhesives.

100% bond strength
Both chemical and mechanical compatibility are essential. All chemicals are part of a unit. The chemical layers fuse into strong cohesive units when properly applied. The result is 100% bond strength.

The effect of relative humidity on cure
Relative humidity (RH) is the amount of moisture the air holds compared with the maximum amount it could hold at a given temperature. This means at a RH of 50% and temperature of 95°F (35°C), the amount of moisture in the air is 3 grams. At 60°F (15.5°C) and a RH of 50%, it is 1 gram. This means the cure rate of any conventional-cure urethane adhesive is significantly affected by a small change in temperature even though the RH has remained constant.

The effect of temperature on cure
Temperature also plays a role in the cure of the adhesive. At higher temperatures, the chemical reactions that cure the adhesive occur at a faster rate. At lower temperatures, these chemical reactions slow down. Because of this, it is critical for installers to document temperature and humidity at the time of the installation and consult minimum drive-away times charts (included in the Appendix of this guide) before releasing vehicles to customers.
Adhesive types
There are three basic types of urethane adhesives used for automotive glass bonding: conventional-cure, advanced-cure and chemical-cure systems. Dow Automotive offers all three types of urethane adhesives.

Conventional-cure urethane adhesives
Conventional-cure, one-component systems are simple to use. The urethane adhesive is applied with a caulking gun and then allowed to cure. Conventional-cure systems rely on atmospheric moisture for the chemical reaction cure to occur. The lower the moisture content in the air, the slower the adhesive cure rate. Colder air cannot physically hold as much moisture as warmer air.

Primerless auto glass urethane technology
Dow Automotive offers conventional-cure adhesives like BETASEAL™ U-418 and BETASEAL™ U-418HV. These adhesives are primerless-to-glass. They differ from traditional adhesive systems because the functionality of auto glass primer is built into the adhesive. Dow Automotive’s primerless-to-glass adhesives are designed to form the same chemical bonds to glass frit as the primer does. Once applied to clean glass, BETASEAL™ U-418 and BETASEAL™ U-418HV urethane adhesives form strong cross-linked bonds to the glass, without the primer. When using any of these products, it is important to make note of temperature and humidity during the installation and consult minimum drive-away charts referenced in the appendix of this guide.

Advanced-cure urethane adhesives
Advanced-cure urethane adhesives are one-component materials that contain enhanced chemical crosslinking to speed bonding. Advanced-cure adhesives need less moisture to cure and create uniform, reinforced properties throughout the adhesive. The chemical structure is the same in every direction. They absorb and dissipate crash stresses better than conventional-cure adhesives and develop high initial green strength to enable faster drive-away times.

RINA technology
Traditionally, Dow Automotive has used its patented Reinforced Isotropic Network Adhesive (RINA) technology in adhesives to achieve short MDAT times that customers demand. RINA creates uniform chemical, physical and performance properties throughout the adhesive bead. Its reinforced structure allows it to absorb and dissipate crash stresses more effectively and enable faster drive away than conventional, one-component adhesives.

RPM technology
Recently, Dow developed the next step in advanced-cure adhesive technology, Reinforced Polysotropic Micronetworked adhesive (RPM). RPM is an evolution of RINA technology. RPM offers the same highly crosslinked adhesive that RINA provides but, by shortening the distance between chemical bonds, the adhesive develops strength even faster, allowing for even further MDAT reduction. RPM technology is used exclusively in BETASEAL™ Xpress30, our newest adhesive, featuring an accelerated 30 minute MDAT down to 0°F.

Chemical-cure urethane adhesives
Chemical-cure urethane adhesive solves special time, temperature and humidity problems. For more information on chemical-cure adhesives, consult your local Dow representative for more details.
GLASS PREPARATION: CLEANING

BETABRADE™ F1 Surface Contamination Remover

Not all surface contaminants are visible. Dow Automotive developed a practical solution to identify and remove both visible and “invisible” contamination. The presence of oil, wax and manufacturing or packaging residue are good indicators that contamination is present.

- Simple, easy, time-saving application
- Visible – so you can make sure you’ve applied it thoroughly
- Safe for the installer – no spraying or atomization
- Part of a simple clean, prime, bond windshield replacement solution
- Will not damage or blemish glass

Removing silicone

Silicone residue, deposited in the manufacturing process, interferes with adhesive bonding and it isn’t always easy to identify. When present, it can prevent adhesives from bonding properly, often leading to windshield replacements that leak. Use of BETABRADE™ F1 is recommended for every installation when contamination is present.

Cleaning preparation for most replacement glass:

1. Inspect the replacement glass for defects, damage or signs of contamination.
2. Contaminants can be difficult to detect and remove. Use of BETABRADE™ F1 to remove contamination is recommended.
3. Shake BETABRADE™ F1 bottle for 10 seconds (Figure 1).
4. Apply 2 mm thin line of BETABRADE™ F1 around entire glass bonding area (Figure 2). On encapsulated bonding surfaces, do not use BETABRADE™ F1, instead use BETACLEAN™ GC-800 and scrub pad.
5. Scrub the bonding area with a lint-free paper towel until dry (Figure 3).
6. Spray entire windshield with BETACLEAN™ GC-800 and wipe clean with a lint-free paper towel to ensure it is clean and free of any traces of BETABRADE™ F1 in the bondline (Figure 4).

BETABRADE™ F1 cold weather application procedure:

7. For mobile jobs, once the windshield has been removed from the van, and exposed to cold temperatures, it must be cleaned in less than four (4) minutes. If the cleaning process takes longer than four (4) minutes, or the BETABRADE™ F1 freezes on the glass surface, the glass should be returned to a warmer environment and existing BETABRADE™ F1 must be removed using a lint-free towel. REPEAT STEPS 4 through 6.

BETACLEAN™ GC-800 Glass Cleaner

- BETACLEAN™ GC-800 Glass Cleaner has an aggressive formulation that cuts through glass contaminants
- Evaporates quickly to save time and ensure a dry, residue-free bonding surface
- Sprays on and wipes off
- Foams for best dirt, road film and grease cleanup
- Does not run
- Available individually or as part of a BETASEAL™ G-EZKit
- May be used as a cutout lubricant

NOTE

Traces of BETABRADE™ F1 outside of bonding areas will not affect the adhesive bond.

CAUTION

Always carefully clean glass to remove contaminants from glass surface.
GLASS PREPARATION: PRIMING

Primerless auto glass urethane technology

Primerless auto glass urethane systems, such as BETASEAL™ U-418 and BETASEAL™ U-418HV, differ from traditional adhesive systems because the functionality of auto glass primer is built into the adhesive. Dow Automotive’s primerless-to-glass adhesives are designed to form the same chemical bonds to glass and ceramic frit as the primer does. Once applied to clean glass, BETASEAL™ U-418 and BETASEAL™ U-418HV quick cure primerless to auto glass urethane adhesives form strong cross-linked bonds to the glass, without the primer.

WARNING

Quickly close primer bottle with inner seal and cap when finished with use.

WARNING

Always check the expiration date to ensure the product still has shelf life. If using bottles, secure all caps immediately.

NOTE

Primerless-to-glass urethane adhesives require the use of BETAPRIME™ 5504G Primer on non-glass surfaces.

WARNING

BETASEAL™ adhesive systems (except BETASEAL™ U-418 and BETASEAL™ U-418HV) require glass primers. Any part left out of the system can lead to adhesive failure. Never use any other manufacturers’ primers, cleaners or other chemicals in conjunction with any BETASEAL™ adhesive system.

Removing key links is dangerous

Removing a key link in any adhesive system is dangerous. It can greatly reduce the overall ability of the system to perform its safety functions. Any part left out or incorrectly applied could cause adhesive bond failure. Skipping an element produces inadequate crosslinking and risks possible bond failure.

WARNING

Never use butyl primers with urethane adhesives. They are not compatible and will cause bond failure. Use the same brand of glass cleaner, urethane prep, primer and adhesive to ensure compatibility.

NOTE

Primerless-to-glass urethane adhesives require the use of BETAPRIME™ 5504G Primer on non-glass surfaces.

Evaporation working time

Primers are very moisture sensitive. Close the containers, using both the inner and outer caps, immediately after every use to preserve contents. Primers can have an open life of up to fourteen (14) days. Unopened product is considered within shelf life up to and including the expiration date marked on the product. BETAPRIME™ 5504G All-in-One Primer has an open life of fourteen (14) days. When in doubt, throw it out. Always mark the opening date or end of open life date on the can when opening it for the first time. If using single-application primer sticks, check the expiration date printed on the stick, use, then discard.
BETAPRIME™ 5504G All-in-One Primer

BETAPRIME™ 5504G All-in-One Primer is easy to use and can be used to prime glass, ceramic frit, encapsulations and PAAS. The system chemically alters the glass surface to ensure adhesive compatibility and proper bonding. Use with all BETASEAL™ adhesive bonding systems requiring primers.

Once glass is clean, follow these priming steps:

1. Check the expiration date on the container.
2. If using BETAPRIME™ 5504G All-in-One Primer in bottle, open cap and use the loose cap to pry up the inner seal in a circular motion containing the inner seal in the cap or by pulling gently on the grab ring in the inner seal.
   If using BETAPRIME™ 5504G SA stick, open by pinching or bending (on corner of bench) the tube near the foam head to break the internal glass ampule releasing the black primer. While breaking, be careful to orientate the stick so that the foam applicator is up to prevent possible primer from dripping. Point the foam head down toward surface to be primed.
   Allow the primer to saturate the foam head. Gently squeezing the tube will allow the foam head to saturate faster. Apply light pressure to the foam head (too much will damage the foam during application).

For any fritted glass (internal or external):

3. Apply BETAPRIME™ 5504G All-in-One Primer with a clean wool dauber or primer stick in one, even, wet coat, moving the dauber in the same direction.
4. Allow primer to dry for 2 minutes at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes.

For glass without any frit:

3. Apply BETAPRIME™ 5504G All-in-One Primer with a clean wool dauber or primer stick in one, even, wet coat, moving the dauber in the same direction.
4. Allow primer to dry for 2 minutes at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes.
5. Apply a second coat of BETAPRIME™ 5504G and allow to dry for 2 minutes at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes. When using BETAPRIME™ 5504G SA primer stick on clear glass, two sticks may be required for proper application.

Pre-primed glass

When OEM pre-primed glass is to be installed, the glass should be cleaned and BETAPRIME™ 5504G All-in-One Primer should be applied according to standard installation instructions. Black primer should be re-primed only with black primer. When glass has been pre-primed with any unknown aftermarket primer, it should not be used.

* Scratches WELL outside of the bonding area do not have to be completely dry at the time of installation.
Encapsulation and PAAS windshields
Some bonded glass parts require special preparation due to the use of encapsulating materials such as PVC or reaction injection molding (RIM).

All encapsulations require special preparation.

Cleaning RiM, PVC or PAAS encapsulated bonding surfaces:
1. Spray encapsulation with BETACLEAN™ GC-800.
2. Scrub area vigorously with abrasive pad, then wipe clean with a lint-free paper towel (scrub lightly on PAAS).

Once replacement glass part is clean, follow these priming steps:
1. Check the expiration date on the container.
2. The primer bottle and SA applicator no longer require shaking.
3. Apply BETAPRIME™ 5504G All-in-One Primer with a clean wool dauber in one, even, wet coat, moving the dauber in the same direction on fritted glass or encapsulation.
4. Allow primer to dry for 2 minutes at 20°F (-7°C) and above.
   From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes.
5. Apply a fresh bead of urethane adhesive to prepared site and install glass as normal.

Cold weather glass preparation:
- Keep glass at 60°F (15.6°C) or warmer during transportation
- Clean glass within 4 minutes of removing glass from van
- If cleaning takes longer, or BETABRADE™ F1 or BETACLEAN™ GC-800 freeze on the glass surface, return glass to warmer environment and remove BETABRADE™ F1 or BETACLEAN™ GC-800 from the glass

Cold weather vehicle preparation:
- Do not spray BETACLEAN™ GC-800 directly onto bonding surface at temperatures below 40°F (-4.4°C)
- Apply BETACLEAN™ GC-800 directly to a lint-free paper towel and wipe along bonding surface until the surface is clean and dry
- Limit the cleaning area to 24 inches or less at a time to further reduce chance of ice formation
- BETACLEAN™ GC-800 freezing on bond surfaces can prevent the adhesive from bonding properly

Advanced formulation BETAPRIME™ 5504G no longer requires shaking. However, shaking will not have a negative effect on the performance.

Step 1: Clean encapsulation or PAAS area with BETACLEAN™ GC-800 Glass Cleaner and wipe with a lint-free paper tower.

Step 3: Apply BETAPRIME™ 5504G to the encapsulation or PAAS surface with a dauber.

Step 5: Apply a fresh bead of urethane adhesive to prepared site and install glass as normal.

NOTE
If the PAAS bead requires the bonding surface to be trimmed to allow for application of the new urethane, trim PAAS bead. Apply adhesive directly to freshly trimmed PAAS just like application to a cut bead on the body of the car.

WARNING
Do not use BETABRADE™ F1 on encapsulated surfaces.
Bonding to the vehicle body
Always try to apply urethane adhesive directly to the freshly cut OEM urethane bead. OEM and aftermarket paint and clear coats create difficult surfaces for aftermarket bonding. Each layer of the OEM paint process builds and connects with the next to form a strong chain of materials. It helps to understand the original painting process so technicians are aware of the complex surface to which the original adhesive bonds.

The first step in the OEM painting process is the hot-water wash. The hot water washes away oils and then a zinc phosphate wash preps the metal. The metal is immersed in an electro-chromic dip of e-coat by applying a charge to the metal part that is opposite to the charge of the bath of paint particles. These paint particles are drawn to the metal and the paint is evenly deposited on all areas of the part.

The part is then baked in an e-coat oven at 300°F to 400°F (150°C to 200°C) for approximately 30 minutes. This forms a thin, strong base surface for the next material. Some manufacturers apply urethane body primer directly to this layer and then extrude polyurethane adhesive on top of it. Other manufacturers apply color and clear coats, then bake to form a strong bond. Urethane primer is then applied to the cured color and clear coats.

The most recent OEM trend is primerless-to-paint adhesives. Primerless-to-paint technology eliminates the need for a pinchweld primer and enables the specially formulated adhesive to bond directly to the paint. This technology does not affect the aftermarket when bonding directly to the OEM urethane. Do not attempt to bond directly to paint without body primer, as most aftermarket urethanes are not formulated to bond primerless to the paint.

New urethane adhesive bonds best to freshly cut, uncontaminated and well-bonded original urethane. When working on a vehicle that is having body work done, do not trim the existing bead of original urethane until it is time to apply the new urethane. Once the adhesive is trimmed, it will remain fresh for 2 hours. After 2 hours, it will need to be retrimmed or refreshed with BETAPRIME™ 5504G All-in-One Primer. Trimmed urethane left exposed to any environment will become contaminated. Contaminated urethane should be removed to expose fresh, uncontaminated material for bonding.

Chemical contamination on body
Chemicals or sealants such as butyl or silicone are not compatible with the polyurethane system and will cause chemical contamination. Chemical contamination is difficult to remove with other chemicals – it must be removed by mechanical scraping or abrading. Removing all the contamination is required to ensure a top-quality installation.

If all paint is removed, but e-coat is left intact, BETAPRIME™ 5504G All-in-One Primer is required. If all the paint and e-coat is removed down to bare metal, follow the instructions for priming bare metal with BETAPRIME™ 5504G (page 20). This process also applies to any installation that requires the installer to correct previous substandard work or contamination.

Fiberglass/polycarbonate/ acrylic bonding
Dow Automotive has done very limited testing on fiberglass, Lexan® (polycarbonate) and Plexiglas® (acrylic) materials. Based on the limited testing that has been performed, BETAPRIME™ 5504G All-in-One Primer works best. Prior to application, take an abrasive pad and lightly scrub (rough up) the application area before applying the BETAPRIME™ 5504G. Once the BETAPRIME™ 5504G has been applied and allowed to flash off (dry), then apply the urethane adhesive.

**Note**

Plastic glazing will expand far greater than glass or metal. A broad, thin bead will be extremely rigid. It is best to make the bead no wider than it is tall.
**Painting precautions**

Many new paint finishes use a clear-coat finish over the color coat to resist chemicals and maintain a glossy finish. This may cause a bonding problem if fresh color and clear coat are in the bonding area. The pinchweld should be masked off with tape prior to any color coat and/or clear coats being applied. The original urethane should be left intact during painting and body repair. Trim the urethane adhesive down to the recommended 1 to 2 mm final thickness just prior to installing the new glass. The new bead of urethane can then be applied directly to the freshly trimmed bead of original urethane.

**Vehicle care and tools**

Take every precaution to protect the customer’s vehicle from accidental damage while work is in progress. The following steps are recommended:

1. Inspect vehicle. List any dents, scratches, missing parts or other pre-existing conditions that could prevent a safe installation on the pre-inspection section of the Dow Automotive Fixed Glass Replacement Record or company document. Also notify the vehicle owner/operator.

2. Cover the hood, roof, trunk area, instrument panel, defroster vents, floor area, seats, sills or whatever is necessary with an appropriate padded cover material or paint-safe protective tape.

3. Make sure the proper tools are available and ready for use before starting the job.

**Used Glass**

- In these guidelines, all previously installed glass parts are considered “Used Glass”. The current ANSI/AGSC/AGRSS Standard states that “All adhesive system component lot numbers must be traceable to each job”. This is the basis for the following best practices for reinstalling adhesive bonded used glass.

- The part to be reinstalled must be removed by the installing company or known to be removed according to industry practices as to avoid chemical contamination and degradation of the original bond between the existing adhesive/primer system and the glass part.

- The original adhesive/primer on the glass part must be left intact until the time when the part is to be installed. The part will then be prepared in a fashion similar to body preparation and the new adhesive will be applied to freshly cut, uncontaminated, well bonded adhesive.

- OEM installed glass parts may use the vehicle identification number as a traceable path to the original installation along with the lot numbers of the new products used. Aftermarket parts lacking a traceable path (lot numbers and known application practices) to the original installation do not appear to meet the previously mentioned ANSI/AGSC/AGRSS Standard requirements.

- The new adhesives and primers applied in accordance with normal Dow Automotive Fixed Glass Installation Practices will bond to OE or equivalent aftermarket adhesive, but the aftermarket adhesive system may not stay bonded to the glass part. Any recall of product for the previously used aftermarket adhesive system cannot be traced without the appropriate lot numbers.

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**CAUTION**

Primers, cleaning solvents and urethane adhesives may permanently adhere to and stain an interior or exterior surface if spilled or dripped on the customer’s vehicle. You may be unable to remove these materials without damaging a surface.
BODY PREPARATION: CLEANING AND PRIMING

Cleaning the vehicle body:
1. Remove all trim and moldings.
2. Remove glass using the preferred method.
3. Clean any dirty areas on the bonding surface with a clean towel sprayed with BETACLEAN™ GC-800 or water to remove as much dirt and debris as possible.
4. Trim existing urethane bead down to 1-2 mm.
5. Thoroughly inspect the pinchweld for any scratches or bare metal areas, both inside and outside the bonding area.

See pages 19-20 for preparation of bare metal areas.

Once body surface is clean and dry, follow these priming steps.
1. Check the expiration date on the container.
2. The primer bottle no longer requires shaking.

For priming scratches and large areas of bare metal to prevent corrosion:
3. Apply one coat of BETAPRIME™ 5504G All-in-One Primer with a clean wool dauber to any scratches in the paint or large areas of bare metal. **When priming large areas of bare metal, only apply a maximum of 8 to 12 linear inches per dauber. This ensures the dauber has enough primer to apply a thick enough coat to protect the bare metal.**
4. Allow primer to dry for 2 minutes at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes.
5. Apply a second coat of BETAPRIME™ 5504G and allow primer to dry for 2 minutes at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes.

For priming painted bonding surfaces (no bare metal):
3. Apply one coat of BETAPRIME™ 5504G All-in-One Primer with a clean wool dauber to the painted area where original adhesive may have peeled off or to extend the bonding area when applying adhesive to the glass part.
4. Allow primer to dry for 2 minutes at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes.

Cold weather vehicle preparation:
- Do not spray BETACLEAN™ GC-800 directly onto bonding surface at temperatures below 40°F (4.4°C)
- Apply BETACLEAN™ GC-800 directly to a lint-free paper towel and wipe along bonding surface until the surface is clean and dry
- Limit the cleaning area to 24 inches or less at a time to further reduce chance of ice formation
- BETACLEAN™ GC-800 freezing on bond surfaces can prevent adhesive from bonding properly
- In cold temperatures, BETAPRIME™ 5504G All-in-One Primer may have a wet appearance – this is normal as long as proper dry times are followed.

A triangle or V-shaped bead of adhesive applied to glass will wet out into the trimmed adhesive but may not line up exactly with the full width of the trimmed adhesive bead, reducing surface contact. Make sure to carefully prime any painted or metal areas that could come in contact with adhesive.
BODY PREPARATION: PREVENTING CORROSION

Preventing corrosion

Manufacturers protect a vehicle’s pinchweld from corrosion by covering bare metal with e-coat and/or paint. Auto glass technicians can inadvertently expose bare metal on the pinchweld during glass removal. Exposing bare metal to oxidants (air and water) causes corrosion.

Cut-out and utility knives can damage painted metal in areas that may be difficult to treat or impossible to see. Knowing how and where damage is likely to occur helps you find scratched metal and treat it before corrosion can develop.

Automotive pinchweld
- Deep penetration with knife blade can damage pinchweld bottom
- Adjust blade to ensure it cannot reach metal

Glass removal
-Scratches in paint are often hidden by urethane
-Untreated scratches can develop corrosion
-Trimming back old urethane with knife can nick sidewalls of pinchweld
-Adjust blade to ensure it cannot reach metal
-Once the trimming cut is complete, inspect bottom and sides of pinchweld to ensure paint/e-coat is not scratched
-Treat scratches with BETAPRIME™ 5504G All-in-One Primer

Release of bond
- Corrosion travels beneath paint/e-coat to weaken bond strength
- During a crash, corrosion can cause paint/e-coat and adhesive to separate from the pinchweld
- The windshield could dislodge, compromising air bag safety system and passengers

WARNING

Deep scratches made in the paint during the relief or plunge cut are inaccessible to primers used in touch up. The scratched area will corrode over time. Not scratching the area is the only sure way to avoid corrosion.

Deep penetration of a knife can damage the aperture and lead to corrosion.

Small scratches can be hidden by polyurethane.

Deep penetration of a knife can damage the aperture and lead to corrosion.

A small scratch can lead to heavy corrosion and bond failure.
**BODY PREPARATION: TREATING CORROSION**

**Corrosion treatment**

Corrosion (rust) must be removed before replacing a windshield. If it isn’t removed, it can compromise the safety of the vehicle. Where present on the pinchweld, surface rust (exhibiting no loss of metal thickness) can be removed with an abrasive wheel, grinding stone or by media blasting. When rust destroys or reduces the metal’s strength and thickness, take the vehicle to an auto body repair facility to have the rusted area restored to its original condition.

**Customer service and documentation**

Inspect the area around the glass for existing damage or signs of corrosion. Discuss corrosion treatment with the vehicle owner before starting the job. If you detect any problem areas, photograph and document the visible extent of corrosion damage. Notify the vehicle owner and discuss corrosion treatment options. Inform the vehicle owner of the importance and value of proper corrosion treatment for safety and vehicle durability. Once the owner agrees to the corrosion treatment, determine who is responsible for payment and begin the job.

**BODY PREPARATION: LEVELS OF CORROSION**

**Levels of corrosion and treatment**

The four levels of corrosion are:

1. **Light oxidation** – light metal discoloration, orange in color. Remove with an abrasive wheel or grinding stone.

2. **Moderate** – some red spots. Remove with an abrasive wheel, grinding stone or by media blasting.

3. **Severe** – deep pitting. Dark red spots with raised edges. Remove with an abrasive wheel, grinding stone or by media blasting.

4. **Perforation** – varies from holes in metal to loss of metal. Replace panel.

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**NOTE**

Images are from scratched, OEM e-coated metal samples.

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**WARNING**

Coarse abrasive wheels or grinding stones may remove too much metal and weaken the part. They can also cause warping due to intense heat on the thin sheet metal. Wire brushes should not be used on any corrosion more severe than light oxidation. Take care to avoid possible paint damage. Only repair areas with good adhesion.
Removing Surface Corrosion
Mechanically remove surface corrosion, taking care to remove as little uncorroded metal as possible. Clean bare metal with 100% acetone or heptane and wipe adjacent trimmed adhesive with clean towel dampened with BETACLEAN™ GC-800 Glass Cleaner or water. It’s best to avoid priming trimmed adhesive and be sure to adhere to proper dry times and temperatures.

Priming bare aluminum or steel with BETAPRIME™ 5504G All-in-One Primer
For priming scratches and large areas of bare metal to prevent corrosion:

1. Apply one coat of BETAPRIME™ 5504G All-in-One Primer with a clean wool dauber to any scratches in the paint or large areas of bare metal (Figure 1). When priming large areas of bare metal, only apply a maximum of 8 to 12 linear inches per dauber. This ensures the dauber has enough primer to apply a thick coat to protect the bare metal.

2. Allow primer to dry for 2 minutes at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes.

3. Apply a second coat of BETAPRIME™ 5504G and allow primer to dry for 2 minutes at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes.

<table>
<thead>
<tr>
<th>Tool Description</th>
<th>Pro</th>
<th>Con</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandpaper or abrasive pad</td>
<td>Light - medium abrasive. Good on wide but light damage. Manual or use of power tool.</td>
<td>May not follow “high and low” contour of pinchweld. May take too much metal on “high” areas, while attempting to abrade “low” areas. May not fit well into the “V” at the base of the pinchweld on all vehicles.</td>
</tr>
<tr>
<td>Wire wheel</td>
<td>Light abrasive. Good on wide but light damage. Electric powered; air powered with regulator to govern maximum RPM.</td>
<td>Does not always get to the “bottom” of corrosion. Stray wires may damage headliner or roof paint. Can be more difficult to control. Ineffective on corrosion beyond level 1.</td>
</tr>
<tr>
<td>Abrasive wheels</td>
<td>Medium abrasive. Good on wider areas as well as level 2 and level 3 damage. Air or electric powered.</td>
<td>Does not follow “high and low” contour of pinchweld. May take too much metal on high areas while attempting to abrade low areas. Can be more difficult to control. May not fit well into the “V” at the bottom of the pinchweld.</td>
</tr>
<tr>
<td>Media blasting</td>
<td>Medium abrasive. Good on wider areas as well as level 2 and level 3 damage. Air or electric powered.</td>
<td>Requires substantial air supply. Requires extra protection of vehicle. May require extra clean up.</td>
</tr>
<tr>
<td>Grinding stones or mounted points</td>
<td>Medium abrasive. Good on narrow cut-lines and wider areas. Good control. Near-precision abrasion to damaged areas only. Air or electric powered.</td>
<td>Softer stones are sacrificial and will not last as long. May not fit well into the “V” at the base of the pinchweld on all vehicles.</td>
</tr>
<tr>
<td>1/8˝ Carbide burrs</td>
<td>Excellent for cut-lines and smaller areas. Fits well into “V” at the base of the pinchweld. Good control. Air or electric powered.</td>
<td>Can be aggressive. Must use care to not remove excessive metal thickness. Good for smaller areas and cut-lines only.</td>
</tr>
</tbody>
</table>

Figure 1: Using a clean, unused dauber, apply an even coat of BETAPRIME™ 5504G.

**Note**
BETAPRIME™ 5504G is moisture sensitive. Replace the inner plug and close cap immediately after every use to preserve contents.

**Warning**
Avoid inhalation of solvent vapors and eye contact. Always use BETAPRIME™ 5504G in ventilated areas. Observe health and safety procedures. BETAPRIME™ 5504G has an open life of fourteen (14) days.

**Caution**
Do not reinsert (double dip) the dauber into the primer bottle if it has touched the body of the vehicle. This could contaminate the remaining primer in the bottle.

**Caution**
All appropriate safeguards for the protection of the technician and the vehicle should be taken prior to any corrosion procedures that are performed. These safety precautions would include, but are not limited to, safety glasses, dust masks, gloves and clothing for the technician and protective coverings for the vehicle.

Abrading corrosion requires skill and care and should not be attempted without education and training of all tools, abrasives and materials which will be used.
ADHESIVE APPLICATION

BETASEAL™ urethane adhesives do not need additional heating to apply. They are all easy to use with professional dispensers. All BETASEAL™ adhesive systems may be warmed to ease dispensing in cold weather.

After cleaning and priming the pinchweld, encapsulation, glass and other necessary areas, apply adhesive using the following instructions.

First choose whether you apply adhesive to the glass or the pinchweld.

For glass application:
1. For best application results, hold the applicator in a vertical position (at 90° to the surface) and dispense the adhesive with a continuous motion in a uniform V-shaped bead.
2. Apply adhesive to the glass on top of the bond line.
3. Make sure the bead is uniform and has no gaps; add material or tool joints if necessary.

For pinchweld application:
1. For best application results, hold the applicator in a vertical position (at 90° to the surface) and dispense the adhesive with a continuous motion in a uniform V-shaped bead. This is to ensure that the nozzle tip sits flush to the cut urethane so the V-shaped bead dispensed makes good contact. For applications on the body where maintaining the applicator 90° to the surface is difficult due to the need for an extended reach, it might be useful to cut a bit of an angle to the tip (not more than 30°). This will allow the tip to remain flush with the cut urethane and the V-shaped bead will make good contact.
2. Apply adhesive to the pinchweld perimeter directly on top of the freshly cut original equipment urethane.
3. Make sure the bead is uniform and has no gaps; add material or tool joints if necessary.

Install the glass:
1. Place the glass in the body opening.
2. Adjust glass to precise alignment.
3. Lightly press into position.
4. Avoid slapping or smacking the glass.

Clean up:
1. Clean any excess uncured urethane with BETACLEAN™ U-424 Urethane Adhesive Cleaner.
2. Clean the newly installed glass with BETACLEAN™ GC-800 Glass Cleaner.

NOTE
Ensure all surfaces the urethane will contact are properly primed, including the glass, vehicle body, bare metal, and any nicks and scratches in the paint. Improper priming could lead to bond failure.
ADHESION: BEAD SHAPE

Round bead
A round bead lays on top of the trimmed adhesive (Figure 1). This exposes the bead of new adhesive to curing of the surface, preventing penetration and wet out to the bonding surfaces.

A round bead after application of glass has minimal penetration into rough surface, as well as having a high potential for trapping air pockets between the glass and new adhesive (Figure 2).

Triangle or V-shaped bead
A triangle or V-shaped bead applied to trimmed adhesive has superior penetration into the rough surface (Figure 3).

A triangle or V-shaped bead wets out as glass is pressed or decked into the new adhesive, while avoiding creation of air pockets (Figure 4). This bead most closely duplicates the original OEM adhesive application.

A triangle or V-shaped bead on glass
A triangle or V-shaped bead applied to glass will penetrate and wet out into the trimmed adhesive when decked (Figure 5).

A triangle or V-shaped bead applied to glass will penetrate and wet out into the trimmed adhesive when decked and squeeze out potential air pockets (Figure 6).

A triangle or V-shaped bead applied to glass will wet out into the trimmed adhesive but may not line up exactly with the full width of the trimmed adhesive bead, reducing surface contact.

A triangle or V-shaped bead applied to glass may require application of appropriate primer to area outside of trimmed adhesive area to promote full adhesion of new adhesive (Figure 7).

NOTE
Reuse of nozzles may trap a small amount of air between the adhesive in the nozzle and the new adhesive in the cartridge or sausage leading to a bubble in the adhesive bead.
Use the right amount of urethane — more is not always better — and save time, materials and improve installations.

The average domestic windshield requires about one and one-half cartridges of urethane for a “full cut” installation. Many installers report using two, or even three, cartridges to install a windshield. Dow Automotive recommends using only enough adhesive to do the job correctly. Using too much adhesive creates extra cleanup, wastes material and time and can affect drive-away times.

The best surface to bond BETASEAL™ urethane adhesive is freshly trimmed, uncontaminated and well-bonded, original equipment urethane. If too much adhesive is applied, it may flow past the original bead and into the contaminated, unprimed pinchweld sidewall. This can reduce bond strength and create areas that trap water next to the glass and pinchweld.

Minimize Waste and Maximize Effectiveness

Vehicle designers put a lot of thought into the placement and size of the adhesive bead.

When removing the molding and glass from a vehicle, note the size and location of the adhesive bead used by the vehicle manufacturer. There is usually a small channel between the bead of urethane and the sidewall of the pinchweld.

This channel allows air and moisture to circulate around the bead to assist curing. In addition, the channel allows excess water to drain from the perimeter of the glass, reducing corrosion and leaks.

Cleaning

Dow Automotive does not recommend the use of unapproved solvents or other chemical treatments to remove contamination on smooth glass, fritted glass or trimmed adhesive bonding surfaces. Solvents and chemical treatments may react with the contamination you are trying to remove and/or create contamination where none is present.

Dow Automotive drive-away times for all moisture-cure adhesives (adhesives that cure from the outside in) depend on cured urethane bonding to the pinchweld and glass. While a full cure may not be required for minimum drive away, a sufficient amount of the urethane bead needs to be cured to provide adequate bond strength. If too much adhesive is used, the bead may flow out from under the glass to the edge of the windshield. This slows the building of strength because the cured portion of the bead is not supporting the windshield.

When using “push in” type moldings, apply a small amount of additional urethane at the space between the glass and the body. Allow the fins on the molding to push through the additional adhesive to leave an air/water channel around the perimeter of the glass.
HIGH-MODULUS AND NON-CONDUCTIVE ADHESIVES

Sensitive electronic encapsulated glass demands a specialized adhesive, known as a high-modulus, non-conductive (HMNC) adhesive. High-modulus and non-conductivity are distinctly different and unrelated properties. However, the two properties may be combined to solve two engineering criteria at once.

When to use a high-modulus, non-conductive urethane adhesive

Glass installers may compromise the electronic systems encapsulated in windshields and backlites of luxury automobiles when replacing the glass with regular, current-conducting urethane adhesives. Sensitive electronic signals require specialized non-conductive adhesive to maintain optimal operating levels.

Many European luxury vehicles (such as Mercedes-Benz, BMW and Jaguar) currently use the technology to encapsulate radio antennas into their windshields or backlites. Cell phone, global positioning system and other electronic antenna encapsulations are the next generation. Automakers mandate use of non-conductive, high-performance adhesives in replacements to maintain the integrity of the systems. Traditional urethane adhesives, including most BETASEAL™ products, are conductive. They contribute to electrical interference and may impede radio and navigational signals.

What is high-modulus?

High-modulus adhesives have a much higher tolerance to stress. This characteristic enables them to stiffen the vehicle body to improve handling and overall stability in vehicles designed to use this advanced technology. High performance and luxury vehicle manufacturers specify and use high-modulus adhesives because they can be used as structural elements to stabilize the vehicle to improve the ride and reduce rattles, vibrations and other vehicle noises.

Vehicle designers place greater demands on high-modulus adhesives. The adhesives bear much more of the pushes, pulls and twists associated with everyday driving. High-modulus adhesives must have a higher elastic limit than normal adhesives or they deform or rupture under the increased stress.

**NOTE**

Always use high-modulus adhesive to replace a windshield originally installed with a high-modulus adhesive to restore the proper handling and the quiet, comfortable ride associated with luxury and high-performance vehicles.

Many more vehicles use HM or HMNC than NC only. Consult the NAGS list for vehicles that require HMNC adhesives.

**Types of stress**

- Tension stretches a body.
- Compression shrinks a body.
- Shear laterally twists a body.
- Torsion wrings a body.
What is non-conductive?

Conductive refers to the electrical insulating properties of urethane adhesives. All materials conduct electricity. Materials that are least conductive are used to insulate electrical wires from unwanted leakage of electrical current. In antennas, the voltages are so low that any loss may severely degrade incoming or outgoing signals.

Urethane adhesives used to bond antenna-encapsulated glass must prevent the flow of electricity between the glass and metal. AM-FM radio antennas operate in the frequency ranges of 1 to 150 MHz. The antenna busbars mounted to the stationary glass often contact the adhesive during the assembly or replacement process. This causes impedance and power loss, which leads to a reduction in the signal strength.

Don’t all rubber-like adhesives insulate?

Contrary to popular belief, flexible, rubber-like plastic materials do conduct electricity. Glass manufacturers, automakers and replacement shops try to keep the antenna and the adhesive separated. But due to manufacturing and installation variations, contact is inevitable.

The urethane adhesive must resist the leakage in or out of electric current. Engineers measure the resistance, capacitance and conductance of the urethane adhesive with an impedance measurement where the current that passes through a sample of cured urethane adhesive is measured.

Non-conductive urethane adhesive contains a special grade of carbon. Ordinarily carbon is conductive, but this special grade of carbon inhibits the flow of electricity. When combined with a high-grade polymer, it produces a strong, HMNC urethane adhesive.
BETASEAL™ G-EZKits
A good day’s work in one box
• Everything you need in a single box — urethane, primer, glass cleaner, nozzles, daubers and more
• Easy-to-use — master lot number for all kit components
• Choose from BETASEAL™ Xpress30, BETASEAL™ 0°ne™ or BETASEAL™ Express in cartridge or sausage
• Gun-n-Go — easy application, no heating required
See BETASEAL™ Xpress30, BETASEAL™ 0°ne™ and BETASEAL™ Express product brochures for more information.

Everything you need for a good day’s work
Each BETASEAL™ G-EZKit contains adhesive (BETASEAL™ Xpress30, BETASEAL™ Express or BETASEAL™ 0°ne™), primer, glass cleaner, nozzles, daubers, AGRSS compliant lot number tracking stickers and mirror hang tags. Everything has one master lot number to make your days easier and more efficient.

BETAPRIME™ 5504G All-in-One Primer
One primer for nearly all your windshield replacement needs
• Primer bottle and SA applicator no longer require shaking
• Fast flash off time in temperatures as low as 0°F
• Use on glass, bare metal, nicks and scratches in paint and encapsulations (RIM, PVC and PAAS)
• Save time and money — shaking not required
• Compatible with all BETASEAL™ adhesives

BETAPRIME™ CLEAR
BETAPRIME™ CLEAR is available exclusively as part of a BETASEAL™ G-EZKit. Use it to prime windshields with ceramic frit (either internal or external frit).
• Glass and ceramic frit primer
• The primer stick does not need to be shaken
• To open, point BETAPRIME™ CLEAR stick pad down toward the surface to be primed and pinch tube once between thumb and forefinger where it is marked on the stick to break internal vial and release the primer
• Allow the pad to saturate — it is not necessary to squeeze the tube
• Slowly draw the applicator around the glass/frit surface to be primed to get an even glossy primer film in one direction
• Apply twice around the bonding surface
• One stick for each application — discard after use
• Allow to dry for six (6) minutes at 0°F (-18°C) and above
• Available only as part of a BETASEAL™ G-EZKit
• BETAPRIME™ CLEAR is only compatible with BETASEAL™ Express and BETASEAL™ 0°ne™. Do not use with BETASEAL™ Xpress30 or BETASEAL™ U-400HMNC.

CAUTION
BETAPRIME™ CLEAR is for use with BETASEAL™ Express or BETASEAL™ 0°ne™ only. Do not use with other adhesives.

NOTE
When working with glass with no frit band, you will need to prime the bonding area of the glass with BETAPRIME™ 5504G Primer. BETAPRIME™ CLEAR does not provide enough UV protection alone.
Primming scratches, large areas of bare metal and painted bonding surfaces

Clean
1. Remove all trim and moldings.
2. Remove glass using the preferred method.
3. Clean any dirty areas on the bonding surface with BETACLEAN™ GC-800 or water and a lint-free paper towel to remove all dust, dirt and debris.
4. Trim existing urethane bead down to 1-2 mm.

Once clean and dry, the pinchweld can be primed
1. Check the expiration date on the container. BETAPRIME™ 5504G All-in-One Primer has an open life of 14 days.
2. The primer bottle no longer requires shaking.

For priming scratches and large areas of bare metal to prevent corrosion:
3. Apply one coat of BETAPRIME™ 5504G All-in-One Primer with a clean wool dauber to any scratches in the paint or large areas of bare metal (Figure 1). When priming large areas of bare metal, only apply a maximum of 8 to 12 linear inches per dauber. This ensures the dauber has enough primer to apply a thick coat to protect the bare metal.
4. Allow primer to dry for 2 minutes at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes.
5. Apply a second coat of BETAPRIME™ 5504G and allow primer to dry for 2 minutes at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes.

For priming painted bonding surfaces (no bare metal):
3. Apply one coat of BETAPRIME™ 5504G All-in-One Primer with a clean wool dauber to the painted area where original adhesive may have peeled off or to extend the bonding area when applying adhesive to the glass part.
4. Allow primer to dry for 2 minutes at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes.

Bond
5. Apply fresh bead of polyurethane adhesive to prepared site and install glass as normal.

Advanced formulation BETAPRIME™ 5504G no longer requires shaking. However, shaking will not have a negative effect on the performance.

**CAUTION**
Take care to avoid touching the clean and/or primed glass bonding surface while applying any trim or moldings.

**CAUTION**
Do not reinsert (double dip) the dauber into the primer bottle if it has touched the body of the vehicle. This could contaminate the remaining primer in the bottle.

**NOTE**
Scratches well outside of the bonding area do not have to be completely dry at the time of installation.

**NOTE**
In cold temperatures, BETAPRIME™ 5504G may have a wet appearance—this is normal as long as proper dry times are followed.
Adhesive system requirements

BETASEAL™ Adhesives are part of a complete adhesive system. When applied according to the installation instructions, BETASEAL™ Adhesives help restore windshield structures to their original strength.

The complete system includes the following products:

- BETABRADE™ F1 Surface Contamination Remover
- BETACLEAN™ GC-800 Glass Cleaner
- BETAPRIME™ 5504G All-in-One Primer

Shelf life

Maximum shelf life, as stated on product packaging, is achieved when the product is stored at an ambient temperature that does not continuously exceed 110°F (43.3°C).

Using BETASEAL™ Adhesives

Clean

1. Remove glass from pinchweld and clean pinchweld with BETACLEAN™ GC-800 Glass Cleaner or water and dry with a clean paper towel.
2. Inspect the glass part.
3. Clean the replacement windshield using BETABRADE™ F1 and BETACLEAN™ GC-800 and wipe with a lint-free paper towel.
4. Trim original adhesive to within 1-2 mm in thickness.

Prime

5. Check the expiration date on the container.
6. The primer bottle and SA applicator no longer require shaking.
7. Apply BETAPRIME™ 5504G All-in-One Primer to the ceramic frit or encapsulation with a clean wool dauber in one, even, wet coat, moving the dauber in the same direction.
8. Allow primer to dry for 2 minutes at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes.
9. Apply one coat of BETAPRIME™ 5504G with a clean wool dauber to the painted area where original adhesive may have peeled off or to extend the bonding area when applying adhesive to the glass part.
10. Apply two coats of BETAPRIME™ 5504G to any bare metal.
11. Allow primer to dry for 2 minutes per coat at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes per coat.

Bond

12. Apply fresh bead of polyurethane adhesive to prepared site and install glass as normal.

CAUTION

Do not reinsert (double dip) the dauber into the primer bottle if it has touched the body of the vehicle. This could contaminate the remaining primer in the bottle.
BETASEAL™ XPRESS30
ALL-APPLICATION AUTO GLASS URETHANE ADHESIVE

30-minute minimum drive away
- Exclusive RPM adhesive technology
- High modulus, non-conductive
- Excellent pumpability, no heating required
- Short tails and outstanding decking
- Easy-to-tool
- Single component – 600 ml sausage or 310 ml cartridge
- Requires the use of glass primer (BETAPRIME™ 5504G ONLY)

Application details
- See vehicle manufacturer’s recommendations for additional details. Do not use any other manufacturers’ primers, cleaners or other chemicals in conjunction with any BETASEAL™ adhesive system.
- Apply at air temperatures of 0°F (-17.8°C) and warmer
- Working time – 8-10 minutes. In extreme heat and humidity, working time may be reduced to 6 minutes.
- Available in cartridge or sausage and in G-EZKits

BETASEAL™ Xpress30 adhesive is especially formulated to help retain the performance of vehicles, including those requiring a HMNC adhesive. Dow Automotive conducted extensive laboratory, crash and long-term testing to promote a safe bond and lasting performance for all applications. BETASEAL™ Xpress30 adhesive enables technicians to simplify replacements by using one adhesive all the time.

30-minute minimum drive away
BETASEAL™ Xpress30 is a cold-applied adhesive with a 30-minute minimum drive-away time in temperatures as low as 0°F (-17.8°C). That makes BETASEAL™ Xpress30 very versatile and easy to use all year round.

Exclusive RPM technology
BETASEAL™ Xpress30 is an advanced cure, one-component adhesive with enhanced chemical crosslinking to speed bonding for faster minimum drive-away times than conventional-cure adhesives.

BETASEAL™ Xpress30 is the only adhesive that features Dow’s newly developed RPM technology. RPM is the next step in advanced cure adhesive technology. RPM offers the same highly crosslinked adhesive as the RINA technology used in BETASEAL™ 0°ne and BETASEAL™ Express. But, by shortening the distance between chemical bonds, the adhesive develops strength even faster, allowing for even further MDAT reduction.

High-modulus, non-conductive formula
The high-modulus formula enhances a vehicle’s structural integrity and improves passenger comfort by reducing road noise and stiffening the vehicle’s ride. It is also non-conductive for reduced interference with radio, GPS and phone reception in OEM antenna-encapsulated windshields and backlites.

CAUTION
High performance and luxury vehicles require HMNC urethane to maintain their enhanced handling and integrated electronics. Use of any other adhesive can degrade vehicle performance.

WARNING
BETASEAL™ adhesive systems (except BETASEAL™ U-418 and BETASEAL™ U-418HV) require glass primers. Any part left out of the system can lead to adhesive failure. Never use any other manufacturers’ primers, cleaners or other chemicals in conjunction with any BETASEAL™ adhesive system.

WARNING
BETASEAL™ Xpress30 is compatible only with BETAPRIME™ 5504G All-in-One Primer.
BETASEAL™ 0’NE™
ALL-APPLICATION AUTO GLASS URETHANE ADHESIVE

**Simply the best**

- One adhesive for all auto glass replacements
- One-hour minimum drive away in temperatures as low as 0°F (-17.8°C)
- One urethane for standard and high modulus, non-conductive HMNC applications
- Crash proven
- Gun-n-Go – easy application, no heating required
- Requires the use of glass primer
- No heating required for safe use

**Application details**

- See vehicle manufacturer’s recommendations for additional details. Do not use any other manufacturers’ primers, cleaners or other chemicals in conjunction with any BETASEAL™ adhesive system.
- Apply at air temperatures of 0°F (-17.8°C) and warmer
- Working time – 8-10 minutes. In extreme heat and humidity, working time may be reduced to 6 minutes.
- Available in cartridge or sausage and in G-EZKits

BETASEAL™ 0’ne™ adhesive is especially formulated to help retain the performance of vehicles, including those requiring a HMNC adhesive. Dow Automotive conducted extensive laboratory, crash and long-term testing to promote a safe bond and lasting performance for all applications. BETASEAL™ 0’ne™ adhesive enables technicians to simplify replacements by using one adhesive all the time.

**One-hour minimum drive away**

BETASEAL™ 0’ne™ is a cold-applied adhesive with a one-hour minimum drive-away time in temperatures as low as 0°F (-17.8°C). That makes BETASEAL™ 0’ne™ very versatile and easy to use all year round.

**Exclusive RINA (Reinforced Isotropic Network Adhesive) technology**

BETASEAL™ 0’ne™ is an advanced cure, one-component adhesive with enhanced chemical crosslinking to speed bonding for faster minimum drive-away times than conventional-cure adhesives.

Advanced-cure RINA technology reduces dependence on moisture and creates uniform and reinforced properties throughout the bead for high initial green strength, resulting in faster minimum drive-away times.

**High-modulus, non-conductive formula**

The high-modulus formula enhances a vehicle’s structural integrity and improves passenger comfort by reducing road noise and stiffening the vehicle’s ride. It is also non conductive for reduced interference with radio, GPS and phone reception in OEM antenna-encapsulated windshields and backlites.

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**CAUTION**

High performance and luxury vehicles require HMNC urethane to maintain their enhanced handling and integrated electronics. Use of any other adhesive can degrade vehicle performance.

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**WARNING**

BETASEAL™ adhesive systems (except BETASEAL™ U-418 and BETASEAL™ U-418HV) require glass primers. Any part left out of the system can lead to adhesive failure. Never use any other manufacturers’ primers, cleaners or other chemicals in conjunction with any BETASEAL™ adhesive system.
**BETASEAL™ EXPRESS**

*Fast, easy, trusted*

- One-hour minimum drive away in temperatures as low as 0°F (-17.8°C)
- Gun-n-Go – easy application, no heating required
- Crash proven
- Improved formula is easy to use with superior decking and short cut-off string
- Apply at air temperatures of 0°F (-17.8°C) and warmer
- Choose from cartridges, foil pack or as part of an G-EZKit
- Working time – 8-10 minutes. In extreme heat and humidity, working time may be reduced to 6 minutes.
- Requires the use of glass primer
- No heating required for safe use

For improved productivity and profitability, choose BETASEAL™ Express. Its Gun-n-Go formula is easy to use and helps get customers back on the road faster. BETASEAL™ Express is specially formulated for all standard glass replacements and enables technicians to provide high-quality work, especially in cold weather – as low as 0°F (-17.8°C).

**One-hour minimum drive away at 0°F (-17.8°C)**

A one-hour minimum drive away helps customers get back on the road faster, even on cold days. Yet at these low temperatures, BETASEAL™ Express remains easy to gun and doesn’t require heating to use. It is an excellent choice for all standard windshield replacements.

**Exclusive RINA (Reinforced Isotropic Network Adhesive) technology**

BETASEAL™ Express is an advanced cure, one-component adhesive with enhanced chemical crosslinking to speed bonding for faster minimum drive-away times than conventional-cure adhesives.

Advanced-cure RINA technology reduces dependence on moisture and creates uniform and reinforced properties throughout the bead for high initial green strength, resulting in faster minimum drive-away times.

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**WARNING**

BETASEAL™ adhesive systems (except BETASEAL™ U-418 and BETASEAL™ U-418HV) require glass primers. Any part left out of the system can lead to adhesive failure. Never use any other manufacturers’ primers, cleaners or other chemicals in conjunction with any BETASEAL™ adhesive system.
**BETASEAL™ U-400HMNC**

*The New Modern Standard*

- High modulus for torsional stiffness to quiet and stabilize the vehicle’s ride
- Non-conductive preserves radio, cellular phone and global positioning system reception in OEM antenna-encapsulated windshields and backlites
- Shorter minimum drive-away time – 2 hours in temperatures as low as 20°F (-7°C)
- Gun-n-Go – easy application, no heating required
- Use with BETAPRIME™ 5504G All-in-One Primer
- Crash proven and value priced OEM adhesive
- Available in cartridge or sausage

- Requires the use of glass primer (BETAPRIME™ 5504G ONLY)

BETASEAL™ U-400HMNC is a reliable and easy-to-use aftermarket adhesive. Its roots are entrenched in more than 30 years of proven OEM use.

**No heat, quick installation**

This urethane adhesive is easy to apply – simply Gun-n-Go, no heating required. It has excellent decking and sag resistance.

**Advanced-cure adhesive**

BETASEAL™ U-400HMNC is an advanced-cure adhesive. An advanced-cure polyurethane adhesive is a one-component system that can be applied in below freezing conditions. Advanced-cure adhesives absorb and dissipate crash stresses sooner than conventional-cure adhesives and develop a high initial green strength for faster drive-away times. BETASEAL™ U-400HMNC has a minimum drive-away time of two hours in temperatures as low 20°F (-7°C).

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**WARNING**

BETASEAL™ adhesive systems (except BETASEAL™ U-418 and BETASEAL™ U-418HV) require glass primers. Any part left out of the system can lead to adhesive failure. Never use any other manufacturers’ primers, cleaners or other chemicals in conjunction with any BETASEAL™ adhesive system.

**CAUTION**

High performance and luxury vehicles require HMNC urethane to maintain their enhanced handling and integrated electronics. Use of any other adhesive can degrade vehicle performance.

**WARNING**

BETASEAL™ U-400HMNC is compatible only with BETAPRIME™ 5504G All-in-One Primer.
Adhesive system requirements
BETASEAL™ U-418 and BETASEAL™ U-418HV are primerless-to-glass adhesive systems. When applied according to the installation instructions, both adhesives restore windshield structures to their original strength.

The complete system includes the following products:
- BETABRADE™ F1 Surface Contamination Remover
- BETACLEAN™ GC-800 Glass Cleaner
- BETAPRIME™ 5504G All-in-One Primer

Shelf life
Maximum shelf life, as stated on product packaging, is achieved when the product is stored at an ambient temperature that does not continuously exceed 110°F (43.3°C).

Using BETASEAL™ U-418 and BETASEAL™ U-418HV

Clean
1. Remove glass from pinchweld and clean pinchweld with BETACLEAN™ GC-800 Glass Cleaner or water and dry with a clean paper towel.
2. Clean the replacement windshield using BETABRADE™ F1 and BETACLEAN™ GC-800 and wipe with a lint-free paper towel.
3. Trim original adhesive to within 1-2 mm in thickness.

Prime
4. Check the expiration date on the container.
5. The primer bottle no longer requires shaking.
6. Apply one coat of BETAPRIME™ 5504G All-in-One Primer with a clean wool dauber to the painted area where original adhesive may have peeled off or to extend the bonding area when applying adhesive to the glass part.
7. Apply two coats of BETAPRIME™ 5504G to any bare metal.
8. Allow primer to dry for 2 minutes per coat at 20°F (-7°C) and above. From 20°F (-7°C) down to 0°F (-18°C), allow primer to dry for 6 minutes per coat.

Bond
9. Apply fresh bead of polyurethane adhesive to prepared site and install glass as normal.

NOTE
Primerless auto glass urethane adhesives require the use of BETAPRIME™ 5504G Primer on the pinchweld and encapsulation.

CAUTION
Use of two coats of BETAPRIME™ 5504G Primer is recommended for clear glass (no frit on or in the glass) for additional UV protection and better cosmetic appearance.

Advanced formulation BETAPRIME™ 5504G no longer requires shaking. However, shaking will not have a negative effect on the performance.
BETASEAL™ U-418 AND BETASEAL™ U-418HV

*Easy, convenient, primerless*

- Primerless-to-glass for faster applications
- Simple, three-step glass replacement solution – clean, prime and bond
- Gun-n-Go – easy application, no heating required
- Crash proven
- Excellent for day-to-day installations
- Apply at temperatures of 40°F (4.4°C) and warmer
- Working time – 15 minutes at 72°F (22°C) and 50% RH

Keep costs down and efficiency high with BETASEAL™ U-418 and BETASEAL™ U-418HV. These popular adhesives are specially formulated to help technicians save time and money by speeding up installations with a primerless-to-glass formula.

**Easy to use**

These urethane adhesives are easy to apply – simply Gun-n-Go, no heating required. Also, they have good decking and sag resistance. BETASEAL™ U-418 and BETASEAL™ U-418HV can also be used for backlites, quarter glass and other stationary glass.

**Conventional-cure adhesive**

BETASEAL™ U-418 and BETASEAL™ U-418HV are conventional-cure adhesives, meaning that they rely on the moisture in the air to cure. If the relative humidity is low, the curing time will be longer. They are recommended for use at temperatures of 40°F (4.4°C) and above.

**NOTE**

*Utility Sealant*

BETASEAL™ U-418 is a medium viscosity sealant that can be used as a utility adhesive for structurally bonded or direct-glazed automotive glass. This includes:

- Windshields
- Backlites
- Quarter glass
- Stationary glass
- Attaching hardware to glass
- Back-filling to install reveal moldings or other trim
- Bonding gaskets
- Sealing leaks and gaps
APPENDIX:

Glossary of Technical Terms
Minimum Drive-away Times
Fixed Glass Replacement Record

GLOSSARY OF TECHNICAL TERMS
The following is a list of terms frequently used in this guide with definitions.

A
Accelerated aging – a set of laboratory conditions designed to produce results of normal aging in a short time frame. Factors included are: temperature, light, oxygen and water.
Active life – the time frame in which an applied primer can be bonded to (starts after primer is cured/dry).
Adhesion – when two surfaces cling or stick together, held by forces at their interface.
Adhesive failure – characterized by the ability to pull the adhesive or sealant loose from a surface, similar to peeling tape off a plastic substrate.
Advanced cure – one-component urethane adhesive that contains enhanced chemical crosslinking to speed bonding. Recommended for use below 40°F (4.4°C).
Aging – the progressive change in the chemical and physical properties of a sealant or adhesive.
All-in-one-primer – a primer that can be used on all common aftermarket substrates.

B
Backlite – rear window.
Bead – a sealant or compound applied in a joint irrespective of the application method, e.g., a urethane bead applied to the aperture.
Bite – amount of adhesive overlap between the aperture and windshield.
Block (setting) – small piece of neoprene or other suitable material used to position the glass in the frame or opening.
Bond – the attachment at an interface between substrate and adhesive or sealant.
Bond strength – the force per unit area necessary to rupture a bond.
Busbar – insulated metallic conductor used to carry a current, e.g., to or from an antenna encapsulated in a backlite.
Butyl rubber – a copolymer of isobutene and isoprene. As a sealant, it has good elongation and low recovery but is slow to cure.

C
Capacitance – the ability of a conductor or dielectric to store electric charge and a measure of the ratio of stored charge to electric potential.
Catalyst – a substance added in small quantities to promote a reaction, while remaining unchanged itself.
Caulk (noun) – sealant with a relatively low movement capability.
Caulk (verb) – to fill joint with a sealant.
Ceramic frit – a black, ceramic composite applied to the perimeter of the windshield glass for cosmetic and protective purposes. This ceramic composition protects the urethane adhesive against harmful UV rays responsible for urethane degradation.
Channels – the three-sided, U-shaped openings for car windows.
Chemical cure – curing by chemical reaction, which usually involves the crosslinking of a polymer.
Cohesion – the molecular attraction which holds the body of a sealant or adhesive together. The internal strength of an adhesive or sealant.
Cohesive failure – characterized by the ability to pull the body of the sealant or adhesive apart.
Combustible – any liquid that will ignite at or above 100°F (37.7°C), but below 200°F (93.2°C).
Compression – pressure exerted on a sealant in a joint.
Conductance – the measure of the ability of the circuit to conduct electricity.
Conventional cure (moisture cure) – adhesives that rely on water vapor molecules and time to cure. The water in the air causes a chemical reaction in the adhesive. The adhesive bead cures from the outside to the center as the moisture diffuses into the adhesive. Not recommended for use below 40°F (4.4°C).
Creep – the deformation of a body with time under constant load.
Crosslinked – molecules that are joined side-by-side, as well as end-to-end.
Cure – to set up or harden by means of a chemical reaction.
Cure time – the time required for adhesive to cure at a given temperature and relative humidity.
Curing agent – a chemical added to aid curing in a polymer.
**D**

Decking – the ability of a urethane adhesive to support (deck) a windshield in the aperture opening.

Dielectric – matter that serves as an electrical insulator or sustains an electric field with minimum dissipation in power.

Dielectric constant – the measure of a given capacitor filled with a given dielectric compared to the same capacitor with only a vacuum.

**E**

E-coat (electro coating) – method of painting which uses electrical current to deposit the paint. An e-coat system applies a direct-current (DC) charge to a metal part immersed in a bath of oppositely charged paint particles. The paint particles are drawn to the metal and paint is deposited on the part, forming an even, continuous film over the entire surface until the coating reaches the desired thickness.

Elastomer – a rubbery material which returns to approximately its original dimensions in a short time after a relatively large amount of deformation.

Exothermic – chemical reaction in which energy is released, such as heat.

Extendibility – the ability of a sealant to stretch under tensile load.

**F**

Fatigue failure – failure of a material due to rapid cyclic deformation.

Filler – finely ground material added to a sealant or adhesive to change or improve certain properties.

Flash point – minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when heated.

Frit – see ceramic frit.

**G**

Galvanic corrosion – electrochemical corrosion caused by dissimilar metals in an electrolyte.

Gasket – pre-formed shapes, such as strips, grommets, etc., of rubber or rubber-like composition, used to fill and seal a joint or opening either alone or in conjunction with a supplemental application or a sealant.

Green strength – initial strength of material when first applied.

**I**

Impedance – measure of the total opposition to current flow in an alternating-current circuit.

**J**

Joint – the opening between component parts.

**L**

Lap joint – joint in which the component parts overlap so the sealant or adhesive is placed into shear action.

Lap shear – a test sample that measures the force required to pull apart a lap joint fastened with cured adhesive. The pull direction is along the longitudinal axis of the joint test coupon.

Lead-free frit – the ceramic band around the perimeter of the windshield used for UV protection – now typically made from zinc or bismuth-based paint rather than lead-based paint.

Lite – another term for a pane of glass or windshield.

**M**

Modulus – the ratio of stress to strain.

Microsiemens (μS) – a unit of conductance.

Moisture cure (conventional cure) – adhesives that rely on water vapor molecules and time to cure. The water in the air causes a chemical reaction in the adhesive. The adhesive bead cures from the outside to the center as the moisture diffuses into the adhesive.

Monomer – a material composed of single molecules. A building block in the manufacture of polymers.

**O**

Open life – the allowable time a product can be used after the container/package has been opened for the first time (does not extend past expiration date).

Open time – the time interval between when an adhesive is applied and when it becomes no longer workable.

Oxidation – formation of an oxide. Also the deterioration of rubbery materials due to the action of oxygen or ozone.

**P**

PAS (PAAS) – see pre-applied adhesive system.

Peel test – a test of an adhesive or sealant using one rigid and one flexible substrate. The flexible material is folded back (usually 180°) and the substrates are peeled apart. Strength is measured in pounds per inch of width.
Pico farad (pF) – a unit of capacitance.

Polymer – a compound consisting of long chain-like molecules. The building units in the chain are monomers.

Polysulfide rubber – a synthetic polymer usually obtained from sodium polysulfide. Polysulfide rubbers make very good sealants.

Pre-applied adhesive system – polyurethane adhesive applied in a specific shape by the glass manufacturer to the edge of the glass. Used as a molding and decorative trim for flush-mounted auto glass. Abbreviated as PAS or PAAS.

Prep – glass etching material that removes contaminants and prepares glass for bonding.

Pressure-sensitive adhesive – adhesive that retains tack after release of the solvent, so it can be bonded by simple hand pressure.

Primer – a preparatory material applied to substrates in order to improve adhesion.

PSI – Pounds per Square Inch – a unit of measure of pressure.

R

Resilience – measure of energy stored and recovered during a loading cycle, expressed in percent.

Resins – solid organic materials, generally not soluble in water, which have little or no tendency to crystallize, e.g., epoxy and polyester resins.

Resistance – the opposition that a device or material offers to the flow of direct current.

RINA – acronym for Reinforced Isotropic Network Adhesive. Its high-strength copolymer speeds bonding and increases strength in urethane adhesives. The modified internal structure needs less moisture to cure. RINA technology creates uniform and reinforced properties throughout the adhesive that absorb and dissipate crash stresses faster than conventional adhesives.

RPM – acronym for Reinforced Polyisotropic Micro-networked adhesive. RPM offers the same highly crosslinked adhesive as the RINA technology used in BETASEAL™ O°ne and BETASEAL™ Express. But, by shortening the distance between chemical bonds, the adhesive develops strength even faster, allowing for even further MDAT reduction. Featured only in BETASEAL™ Xpress30.

S

Sealant – any material used to seal joints or openings against the intrusion or passage of any foreign substance such as water, gasses, air or dirt.

Shear test – a method of deforming a sealed or bonded joint by forcing the substrates to slide over each other. Shear strength is reported in units of force per unit area (PSI).

Shelf life – the length of time a sealant or adhesive can be stored and still retain its properties.

Shore hardness – the measure of firmness of a compound by means of a Durometer Hardness Gauge. Range of 20 to 25 is about the firmness of an art gum eraser. Range around 90 is about the firmness of a rubber shoe heel.

Shrinkage – the percentage of volume or weight loss under specified conditions.

Sidelite – car side window.

Solvent – a liquid in which another substance can be dissolved.

Substrate – an adherent surface, or surface of a sealant or adhesive.

T

Tackiness – the stickiness of the surface of a sealant or adhesive.

Tear strength – the load required to tear apart a sealant specimen.

Tensile strength – resistance of a material to a tensile force (a stretch). The cohesive strength of a material, expressed in PSI.

Toxic – a material poisonous or dangerous to humans by swallowing, inhalation or contact resulting in eye or skin irritation.

U

Ultimate elongation – elongation at failure.

Ultraviolet light – part of the light spectrum. UV rays can cause chemical changes in rubbery materials.

Urethane – a family of polymers ranging from rubbery to brittle. Usually formed by the reaction of a disocyanate with a hydroxyl; also called polyurethane.

V

Viscosity – a measure of the flow properties of a liquid or paste. For example, honey is more viscous than water. Water (the standard of comparison) has a viscosity of 1/100 of a poise.

Vulcanization – improving the elastic properties of a rubber by a chemical change.

W

Weather-O-Meter – an environmental chamber in which specimens are subjected to water spray and UV light.

Working time – defined as the period of time from when urethane is first extruded to the final placement of glass into the aperture.
**MINIMUM DRIVE-AWAY TIMES** — Cure times (in hours)

**BETASEAL™ Xpress30**
30-minute minimum drive-away time in all temperatures and humidities down to 0° F.

**BETASEAL™ 0’ne™**
1 hour minimum drive-away time in all temperatures and humidities down to 0° F.

**BETASEAL™ Express**
1 hour minimum drive-away time in all temperatures and humidities down to 0° F.

**BETASEAL™ U-400HMNC**
2 hour minimum drive-away times in all temperatures and humidities down to 20°F.

**BETASEAL™ U-418HV**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Relative humidity</th>
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<tbody>
<tr>
<td>40°-50°F</td>
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</tr>
<tr>
<td>50°-60°F</td>
<td>10°-15.5°C</td>
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<tr>
<td>80°-90°F</td>
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<tr>
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<td>&gt; 32.2°C</td>
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<td>&gt; 70%</td>
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<td>10-30%</td>
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**BETASEAL™ U-418**

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<td>7</td>
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</tbody>
</table>
FIXED GLASS REPLACEMENT RECORD

Inspected by: [ ]

Invoice number: [ ]

VIN: [ ] License plate number and state: [ ] Mileage: [ ]

Inspection sticker number: [ ] Customer signature: [ ]

☐ Passenger Side Air Bag ☐ Side-Impact Air Bag

Pre-Inspection
S = Scratched
D = Dented
C = Chipped
M = Missing
R = Rust

Post-Inspection
☐ Vacuum
☐ Trim secure
☐ Glass clean
☐ Wipers OK
☐ Stickers/tags
☐ Check radio

Vehicle Type
☐ 2-door
☐ 4-door
☐ Hatchback
☐ Station wagon
☐ Sport utility
☐ Mini-van
☐ Van/truck
☐ Mini-pickup
☐ Full-size pickup

Installation Information

Date and time glass was set: [ ]
Vehicle release date and time: [ ]

Customer informed of adhesive MDAT: ☐ Before installation ☐ After installation [ ]

Temperature at start of curing (degrees F): [ ] (degrees C): [ ] Relative humidity at start of curing (percent): [ ]

Does vehicle have ADAS? ☐

Moldings or parts used: [ ]

D.O.T. number (on glass – identifies manufacturer): [ ]

<table>
<thead>
<tr>
<th>Product</th>
<th>Material Used</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>Glass/Frit Primer</td>
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<tr>
<td>Pinchweld Primer</td>
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</tbody>
</table>

Place Lot Code
Sticker here

Product information available at www.DowARG.com

*Verify material is not expired; lot number contains expiration-date information