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## Product Guide Specification

Specifier Notes: This product guide specification is written according to the Construction Specifications Institute (CSI) 3-Part Format, including *MasterFormat*, *SectionFormat*, and *PageFormat*, as described in *The CSI Construction Specifications Practice Guide*.

This section must be carefully reviewed and edited by the Architect to meet the requirements of the project and local building code. Coordinate this section with other specification sections and the Drawings. Delete all "Specifier Notes" after editing this section.

Section numbers and titles are from *MasterFormat 2012 Update*.

## SECTION 08 01 81.92

### ON-SITE GLASS RESTORATION AND PROTECTION

Specifier Notes: This section covers Diamon-Fusion International, Inc. on-site restoration and protection of the outside surface of exterior glass to restore damaged glass to "like-new" condition and protect it from future degradation with a long-lasting protective coating. Consult Diamon-Fusion International, Inc. for assistance in editing this section for the specific application.

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. On-site restoration and protection of outside surface of exterior glass.

## 1.2 RELATED REQUIREMENTS

Specifier Notes: Edit the following list of related sections as necessary. Limit the list to sections with specific information that the reader might expect to find in this section, but is specified elsewhere.

- A. Section 08 40 00 – Entrances, Storefronts, and Curtain Walls.
- B. Section 08 50 00 – Windows.
- C. Section 08 81 00 – Glass Glazing.

## 1.3 DEFINITIONS

- A. Stage 2 Corrosion of Glass: When the surface of the glass has been gouged, scratched, or eaten away by corrosion. Glass with stage 2 corrosion cannot be repaired cost effectively and must be replaced.

## 1.4 REFERENCE STANDARDS

Specifier Notes: List reference standards used elsewhere in this section, complete with designations and titles.

- A. ASTM B 117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
- B. ASTM C 813 – Standard Test Method for Hydrophobic Contamination on Glass by Contact Angle Measurement.
- C. ASTM C 1549 – Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
- D. ASTM D 1003 – Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.
- E. ASTM D 1894 – Standard Test Method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheeting.
- F. ASTM D 6578 – Standard Practice for Determination of Graffiti Resistance.
- G. ASTM G 53 – Practice for Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials.
- H. EN 1279-4 – Glass in Building - Insulating Glass Units: Methods of Test for the Physical Attributes of Edge Seals.
- I. TAPPI T815 – Coefficient of Static Friction (Slide Angle) of Packaging and Packaging Materials (Including Shipping Sack Papers, Corrugated and Solid Fiberboard) (Inclined Plane Method).

## 1.5 PRERESTORATION MEETINGS

Specifier Notes: Edit prerestoration meetings as necessary. Delete if not required.

- A. Convene prerestoration meeting [1 week] [2 weeks] before start of on-site glass restoration and protection.
- B. Require attendance of parties directly affecting work of this section, including Contractor, Architect, applicator, and manufacturer's representative.
- C. Review materials, protection of in-place conditions, surface preparation, restoration and protection procedures, and coordination with other work.

## 1.6 SUBMITTALS

Specifier Notes: Edit submittal requirements as necessary. Delete submittals not required.

- A. Comply with Section 01 33 00 – Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, including surface preparation and application instructions.
- C. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- D. Test Reports: Submit manufacturer's test reports from testing performed by independent laboratory of protective surface treatment.
- E. Manufacturer's Project References: Submit manufacturer's list of successfully completed on-site glass restoration and protection projects, including project name and location, name of architect, and type and quantity of on-site glass restoration and protection furnished.
- F. Applicator's Project References: Submit applicator's list of successfully completed on-site glass restoration and protection projects, including project name and location, name of architect, and type and quantity of on-site glass restoration and protection applied.
- G. Cleaning and Maintenance Instructions:
  - 1. Submit manufacturer's glass cleaning and maintenance instructions.
  - 2. Submit name of source for maintenance products.
- H. Warranty Documentation: Submit manufacturer's standard warranty.

## 1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
  - 1. Manufacturer regularly engaged, for a minimum of 15 years, in the manufacturing of on-site glass restoration and protection materials of similar type to that specified.

- B. Applicator's Qualifications:
1. Applicator regularly engaged in application of on-site glass restoration and protection materials of similar type to that specified.
  2. Employ persons trained for application of on-site glass restoration and protection materials.
  3. Approved and/or licensed by manufacturer.

Specifier Notes: Edit mock-ups as necessary. Delete if not required.

- C. Mock-ups: Perform test of on-site glass restoration and protection for evaluation of materials, performance, workmanship, and results.
1. Perform test using same materials for use in the Work.
  2. Perform test at locations determined by Architect.
  3. Do not proceed until materials, performance, workmanship, and results of test are approved by Architect.
  4. Approved Test Area: Standard for materials, performance, workmanship, and results of on-site glass restoration and protection.

## **1.8 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
1. Store and handle materials in accordance with manufacturer's instructions.
  2. Keep materials in manufacturer's original, unopened containers and packaging until application.
  3. Store materials in clean, dry area indoors.
  4. Store materials out of direct sunlight.
  5. Keep materials from freezing.
  6. Protect materials during storage, handling, and application to prevent contamination or damage.

## **1.9 AMBIENT CONDITIONS**

- A. Do not apply on-site glass restoration and protection surface treatment materials:
1. When air temperatures are below 45 degrees F (7 degrees C) or above 90 degrees F (32 degrees C) during application.
  2. Where surface temperatures are too hot to touch.
  3. In direct sunlight.
  4. When rain, snow, or excessive moisture is expected during application.

## **1.10 WARRANTY**

- A. Warranty Period, Diamon-Fusion Protective Coating:
1. Cracking, Peeling, Hazing, and Yellowing: Lifetime.

Specifier Notes: Water repellency warranty period for the Diamon-Fusion protective coating can be extended from 15 to 30 years, if manufacturer-approved revitalization of outside surface of exterior glass is performed every five years, after the first 15 years. Consult Diamon-Fusion International, Inc. for more information.

2. Water Repellency: 15 years, with minimum 70-degree contact angle and less than 30-degree sliding angle.

B. Warranty Period, Clear-Fusion Pro Protective Coating:

1. Cracking, Peeling, Hazing, and Yellowing: Lifetime.
2. Water Repellency: 12 years, with minimum 70-degree contact angle and less than 30-degree sliding angle.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURER**

A. Manufacturer: Diamon-Fusion International, Inc., 9361 Irvine Boulevard, Irvine, California 92618 USA. Toll Free (US) 888-344-4334. Phone +1 949-388-8000. Fax + 1 949-388-3299. Website [www.DFIolutions.com](http://www.DFIolutions.com). E-mail [info@DiamonFusion.com](mailto:info@DiamonFusion.com)

B. Substitutions: Not permitted.

### **2.2 PERFORMANCE REQUIREMENTS**

A. On-Site Restoration and Protection of Outside Surface of Exterior Glass:

1. Restore damaged glass.
2. Protect glass from corrosion.
3. Protect glass from future degradation.
4. Make glass hydrophobic (water repellent).
5. Make glass scratch and impact resistant.
6. Make glass stain and graffiti resistant.
7. Make glass oleophobic (oil repellent).
8. Make glass resistant to etching caused by hard water.
9. Improve visual aspect of glass.
10. Prevent deterioration of performance of energy coatings on glass and loss of energy efficiency.
11. Reduce glass cleaning time.
12. Reduce glass maintenance.

B. Protective Coating:

1. Nanotechnology thin-film coatings fill in the microscopic pores in glass.
2. Prevents minerals and contaminants from embedding themselves deep into the surface, making the glass easier to clean.
3. Bonds created by the protective coating and the glass surface are covalent, sharing electrons with the glass and becoming part of those surfaces.

- C. Not Acceptable Performance Characteristics:
  - 1. Initial Contact Angle: Less than 90 degrees.
  - 2. Initial Sliding Angle: More than 30 degrees.
  - 3. Cure time.

### 2.3 TESTING OF PROTECTIVE SURFACE TREATMENT

Specifier Notes: Include testing for the protective coatings specified in the Materials article. Delete testing for protective coatings not specified.

- A. Testing of "Diamon-Fusion 1":
  - 1. UV Radiation Test, ASTM G 53 Modified, 672 Exposure Hours: Treated glass surface did not show evidence of coating degradation such as yellowing, crazing, haze, loss of adhesion, or loss of abrasion resistance.
  - 2. Contact Angle, Centrifugal Adhesion Balance Goniometer Test:
    - a. Treated Glass: 118 degrees.
    - b. Untreated Clean Glass: 11 degrees.
  - 3. Contact Angle, ASTM C 813, Treated Glass, Initial: 110 degrees.
  - 4. Coefficient of Friction with Glass Indenter Wet, ASTM D 1894: 0.13.
  - 5. Load Required to Damage Glass, Static-Sliding Wet-Dry Method: Weight of a debris particle required to damage a piece of glass treated with protective surface treatment shall be a minimum of 10 times heavier than weight required to damage an untreated piece of glass.
  - 6. Brilliance of Treated Surface, Refractive Index: Increase at least 20 percent from untreated state.
  - 7. Xenon Test: Sample exposed to radiation of 75 W/m<sup>2</sup> during 1,600 hours with wavelength between 300 nm and 400 nm. After exposure, surface contact angle shall be at least 3 times greater than untreated surface.
  - 8. Salt Spray Test, ASTM B 117, 504 Exposure Hours: Treated glass surface did not fade, peel, haze, or chip, and remained more water repellent than untreated glass surface.
  - 9. Compatibility with Glass Sealant, prEN 1279-4: Compatibility of coated glass surface with Fenzi North America "Hotver 2000" thermoplastic hot-melt sealant used for sealing insulating glass units: No adverse reaction.
- B. Testing of "Diamon-Fusion Hand Applied Version B (HAB)":
  - 1. Mechanical Abrasion/Contact Angle Test, ASTM D 6578 and C 813:
    - a. Initial Contact Angle: 101 degrees.
    - b. Contact Angle After 400 Cycles: 78 degrees.
    - c. Contact Angle After 800 Cycles: 71 degrees.
  - 2. Sliding Angle Test, TAPPI T815: 13.1 degrees.
  - 3. Haze Resistance Test, ASTM D 1003: 0.84 percent.
  - 4. Solar Reflectance, ASTM C 1549, No change in solar reflectance of treated substrates.
- C. Testing of "Diamon-Fusion CVA":
  - 1. Mechanical Abrasion/Contact Angle Test, ASTM D 6578 and C 813:
    - a. Initial Contact Angle: 97 degrees.
    - b. Contact Angle After 400 Cycles: 70 degrees.
    - c. Contact Angle After 800 Cycles: 56 degrees.

2. Sliding Angle Test, TAPPI T815: 21.5 degrees.
3. Haze Resistance Test, ASTM D 1003: 1.23 percent.
4. Silicone Adhesion Test, Tensile Strength: 233 lbs.
5. Solar Reflectance, ASTM C 1549, No change in solar reflectance of treated substrates.

## 2.4 MATERIALS

Specifier Notes: Specify materials required for on-site restoration and protection of the outside surface of exterior glass. Delete materials not required. Consult Diamon-Fusion International, Inc. for assistance in determining the appropriate materials for the specific application.

- A. Protective Coating: "Diamon-Fusion 1 and 2 System".
  1. Protective nano-coating for glass.
  2. Water, dirt, and stain repellent.
  3. Optically clear coating.
  4. Liquid.
  
- B. Protective Coating: "Diamon-Fusion Ultra and 2 System".
  1. Protective nano-coating for glass.
  2. Water, dirt, and stain repellent.
  3. Optically clear coating.
  4. Liquid.
  
- C. Protective Coating: "Clear-Fusion Pro".
  1. Protective nano-coating for glass.
  2. Water, dirt, and stain repellent.
  3. Optically clear coating.
  4. Liquid.
  5. Single-step coating process.
  
- D. Protective Coating: "Clear-Fusion V".
  1. Protective nano-coating for glass.
  2. Water, dirt, and stain repellent.
  3. Optically clear coating.
  4. Liquid.
  5. Single-step coating process.
  
- E. Revitalizer and Protector: "Revitalizer".
  1. Maintenance product after application of protective coating.
  2. Revitalizer and surface protector.
  3. Water, dirt, and stain repellent.
  4. Liquid.
  5. Single-step application.
  
- F. Cleaner and Restorer: "Glass Rescue".
  1. Prepares glass for treatment with protective coating.
  2. Cleans and restores heavily stained surfaces to "like-new" condition.
  3. Removes hard-water stains and mineral deposits.

4. Removes existing surface coatings.
  5. Do not use when existing factory-applied surface coatings are to remain.
  6. Paste.
- G. Stain Remover: "Restoration Powder".
1. Prepares glass for treatment with protective coating.
  2. Cleans and restores stained surfaces to "like-new" condition.
  3. Removes normal to moderate hard-water stains and mineral deposits.
  4. Removes existing surface coatings.
  5. Do not use when existing factory-applied surface coatings are to remain.
  6. Powder.
- H. Etched Glass Cleaner: "S-25".
1. Cleans etched and sandblasted glass.
  2. Prepares etched and sandblasted glass for treatment with protective coating.
  3. Removes fingerprints.
  4. Liquid.
- I. Towels: Supplied by manufacturer of on-site glass restoration and protection materials.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas to receive on-site glass restoration and protection.
- B. Verify outside surface of exterior glass is capable of receiving on-site glass restoration and protection.
- C. Do not apply on-site glass restoration and protection to:
1. Glass that is cracked, chipped, or broken.
  2. Glass with metallic coatings on outside surface.
  3. Glass with stage 2 corrosion on outside surface.
- D. Notify Architect of conditions that would adversely affect on-site glass restoration and protection.
- E. Do not begin on-site glass restoration and protection until unacceptable conditions are corrected.

### **3.2 PREPARATION**

- A. Protection of In-Place Conditions: Protect adjacent surfaces and landscaping from contact with on-site glass restoration and protection materials.
- B. Surface Preparation:
1. Clean outside glass surfaces in accordance with manufacturer's instructions.



2. Remove dirt, dust, ambient pollutants, hard-water stains, other stains, residue, cleaners, and other surface contaminants which could adversely affect application of on-site glass restoration and protection materials.

### **3.3 RESTORATION**

- A. Perform on-site glass restoration and protection in accordance with manufacturer's instructions at exterior locations indicated on the Drawings.
- B. Apply on-site glass restoration and protection materials to properly prepare, clean, restore, revitalize, coat, and protect outside surface of exterior glass.
- C. Ensure glass is clean and dry before applying protective coating.
- D. Do not add thinners to materials.

### **3.4 PROTECTION**

- A. Protect glass surfaces that received on-site glass restoration and protection to ensure that, except for normal weathering, surfaces will be without damage or deterioration at time of Substantial Completion.

**END OF SECTION**