

SAFETY AND SECURITY FILM SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes film products applied to glass surfaces with a nano-technology fluid and edge anchor system to impart safety and security characteristics **to meet the National Institute of Justice (NIJ) Level I requirement.**
- B. Locations: As indicated on Drawings

1.2 DEFINITIONS

- A. Emissivity: The ability of a surface to absorb far-infrared heat and to reflect it. The lower the emissivity, the lower the far-infrared heat absorption and the greater the far-infrared heat reflectance.
- B. Far-Infrared Heat: Heat radiated from objects at temperatures below 1300 deg F such as heat radiated from: room objects, objects heated by the sun, or a home heating system. Far-infrared heat is different from near-infrared heat that is heat radiated from objects at highly elevated temperatures such as the sun.
- C. Low Emissivity (Low-E) Films: Films with improved far-infrared heat reflection, with the ability to reduce winter heat loss through windows. The reflection of far-infrared heat also reduces the need for summer cooling by reducing the transmission of far-infrared heat from outdoor objects through windows into the interior of a home or building.
- D. Low Reflectance Films: Films whose visible light reflectance values are very close to that of ordinary glass.
- E. Luminous Efficacy: Ratio of visible light transmission to shading coefficient for a glazing system.
- F. Neutral Solar Films: Films that allow visible light to pass without distortion of color and that have equal visible light transmission properties at all wavelengths in the visible range from 380 to 780 nanometers.
- G. Light to Solar Heat Gain Ratio: Ratio of visible light transmission to Solar Heat Gain Coefficient (SHGC) for a glazing system.
- H. Solar Heat Gain Coefficient (SHGC): The fraction of incident solar radiation that actually passes through that window, including solar energy that is both directly transmitted and that which is absorbed and subsequently released inwardly by re-radiation and conduction. SHGC is expressed as a number between 0 and 1. The lower a window's solar heat gain coefficient, the less solar heat it transmits. This number is the mathematical complement of the TSER value: The sum of the Total Solar Energy Rejection (TSER), in decimal form of a glazing system and its SHGC value is 1; therefore, $1 - \text{TSER} = \text{SHGC}$.

SAFETY AND SECURITY FILM SYSTEM (continued)

- I. Spectrally Selective Solar Films: Films that reduce solar heat gain mainly by reducing the transmission of near-infrared solar radiation with minimal reduction of visible light transmission. Films with a Light to Solar Heat Gain Ratio of above 1.00 are spectrally selective.

1.3 REFERENCES

- A. The following standards are referenced in this Section:
 1. ANSI Z97.1, "Safety Glazing Materials Used in Buildings—Safety Performance Specifications and Methods of Test."
 2. ASTM E-84, "Test Method for Surface Burning Characteristics of Building Materials".
 3. ASTM C-1499-09, Monotonic Equibiaxial Flexural Strength of Glass (Double Ring Test).
 4. ASTM D 882, "Standard Test Method for Tensile Properties of Thin Plastic Sheeting."
 5. ASTM E 903, "Test Method for Solar Absorbance, Reflectance, and Transmittance of Materials Using Integrating Spheres"
 6. ASTM D 1044, "Test Method for Resistance of Transparent Plastics to Surface Abrasion."
 7. ASTM D 3330, "Standard Test Methods for Peel-Adhesion at 180 Degree Angle".
 8. Consumer Product Safety Commission (CPSC) 16 CFR 1201, "Safety Standard for Architectural Glazing Materials."
 9. National Institute of Justice standard, NIJ-STD-0108.01.

1.4 ACTION SUBMITTALS

- A. Product Data (on 3/8" (10mm) annealed clear glass): For each film product indicated.

1.5 INFORMATION SUBMITTALS

- A. Qualification Data: For firms and persons specified under "Quality Assurance" Article 1.7, demonstrating their capabilities and experience by including a list of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

SAFETY AND SECURITY FILM SYSTEM (continued)

- A. Confirmation Data: Written confirmation from the curtain wall manufacturer that the warranty will not be affected by the security and safety film, the nano-technology fluid and the attachment system to the glazing members.

1.6 CLOSEOUT SUBMITTALS

- A. Closeout Submittals: Upon completion of the Work, submit the following;
 - 1. Executed warranty.
 - 2. Maintenance (cleaning) and replacement instructions.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Engage a firm experienced in manufacturing systems similar to those indicated for this Project and meeting the standards of the International Standards Organization (ISO), ISO 9001 Quality Assurance in Production and Installation.
- B. Installer Qualifications: Engage an experienced installer certified, licensed, or otherwise qualified by film manufacturer as having the necessary experience, staff, and training to install manufacturer's products according to specified requirements.
- C. Mockups: Apply glazing films in locations as directed to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Obtain approval of field samples before continuing with remainder of installation.
 - 2. Maintain field samples during remainder of installation in an undisturbed condition as a standard for judging the completed Work.
 - 3. Approved field samples may become part of the completed Work.
- D. Pre-installation Conference: Before installing glazing films, conduct conference at Project site. Conduct pre-installation conference in conjunction with installation of mockup.
 - 1. Meet with Owner, Architect, glazing film Installer and glazing film manufacturer's representative.
 - 2. Review methods and procedures related to installation, including manufacturer's written instructions.
 - 3. Examine substrate conditions for compliance with requirements.
 - 4. Review temporary protection measures required during and after installation.

SAFETY AND SECURITY FILM SYSTEM (continued)

5. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing films according to manufacturer's written instructions and as needed to prevent damage condensation, temperature changes, direct exposure to sun, or other causes.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with film installation when ambient and substrate temperature conditions are outside limits permitted by manufacturer and when glass substrates are wet from frost, condensation, or other causes.

1.10 WARRANTY

- A. Manufacturer's standard warranty agreeing to replace films that fail within 10 years from date of original installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS / PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include but are not limited to those indicated as Basis of Design.
- B. Basis of Design: Subject to compliance with requirements, provide the following safety and security films:
 1. **C-Bond Systems, LLC**; Safety and Security Films
6035 South Loop East
Houston, TX 77033
Phone: (832) 649-5658
Fax: (713) 513-5880
www.cbondsystems.com
info@cbondsystems.com
- C. Product Description – In accordance with National Institute of Justice (NIJ) Level I Ballistic Resistance (Security):(Per the attached report from H.P. White Laboratory, Inc). Minimum thickness of glass to be 3/8" inch (10 mm) annealed (non-tempered) monolithic or insulated units and C-Bond proprietary security film system applied with the C-Bond technology, a patented nanotechnology glass strengthening window film application solution.
- D. Color: Clear

SAFETY AND SECURITY FILM SYSTEM (continued)

2.2 PERFORMANCE REQUIREMENTS

- A. Thermal and Optical Performance Properties: Provide glazing films that will not affect the thermal and optical performance characteristics as established by the glass components scheduled for curtain wall, storefront and entrance glazing.
- B. Flexural Glass Strength: When tested in accordance with ASTM C-1499-09, Monotonic Equibiaxial Flexural Strength of Glass (Double Ring Test), the application of the mounting fluid/alone shall strengthen the glass to percentages up to and over 250 percent, and improve the flexure properties of the glass to percentages up to and over 130 percent.

2.3 GLAZING FILM ACCESSORIES

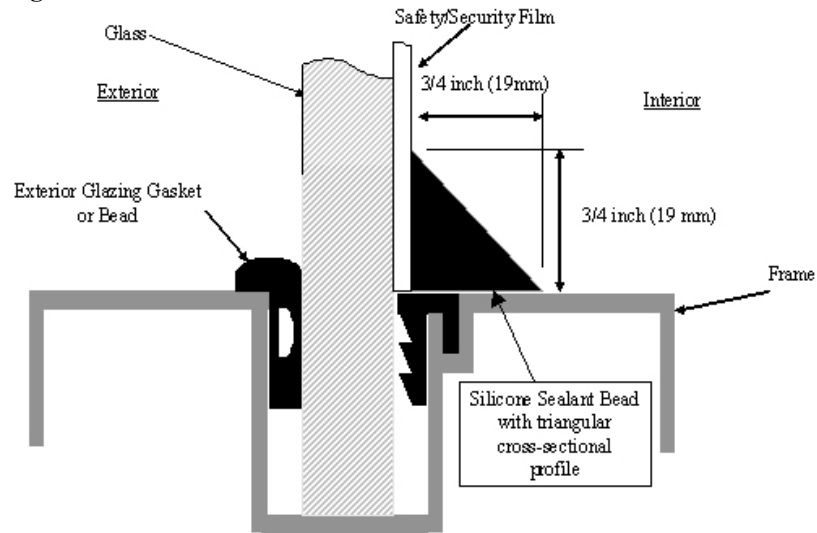
- A. General: Provide products complying with requirements of glazing film manufacturer for application indicated and with a proven record of compatibility with surfaces contacted in installation.
- C. Adhesive: Types recommended by glazing film manufacturer and nano-technology fluid manufacturer.
- D. Cleaners, Primers, and Sealers: Types recommended by glazing film manufacturer.

2.4 ANCHOR SYSTEM

- A. Provide transfer adhesive and mechanical anchor at edges of film to secure film, as recommended by the nano-technology fluid manufacturer.
 - 1. Dow 995 Structural Silicone adhesive (or approved alternative such as structural tape or mechanical anchor) to be used for all anchoring of film to window frame/glazing system.
 - a. Dow Corning® 995 Silicone Structural Glazing Sealant is a one-component neutral-curing silicone sealant designed specifically for structural bonding applications of glass and metal in factory or field situations.
 - b. See the attached Dow Corning® 995 Silicone Structural Glazing Sealant Product Information Sheet.
 - c. A minimum bead of 1/2" (.50") overlapping the exposed edge of the security film, and 1/2" (.50") overlapping the window frame/glazing system shall be used on all installations. Silicone bead installation may vary based on glazing system. **See Figure A below.**
 - d. Structural adhesive color to be black, white, or grey. As allowed by availability from structural sealant or tape manufacturer. Color matched is described as matching the color of the existing glazing bead/gasket wherever possible.

SAFETY AND SECURITY FILM SYSTEM (continued)

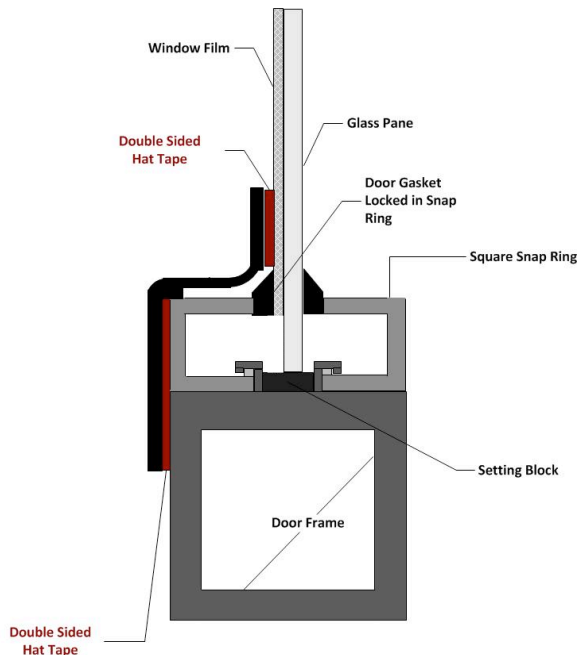
Figure A



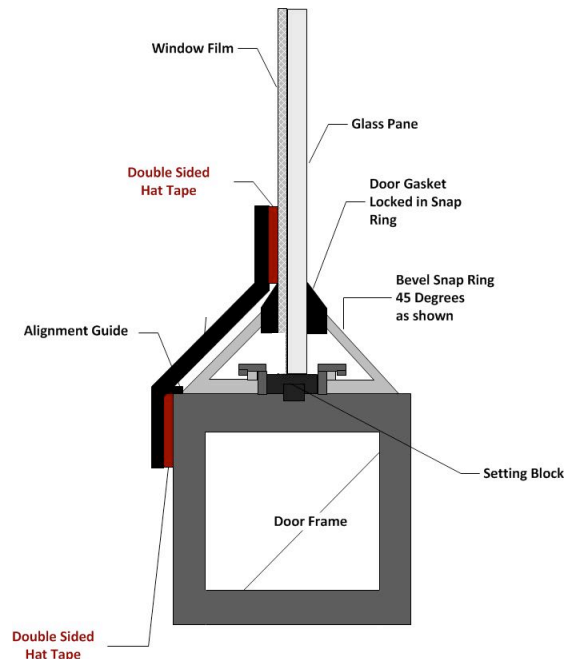
2. A Mechanical Anchor (such as structural tape) may be needed to secure doors or windows with unique glazing angles or with narrow exposed glazing ledges.

See examples A & B below.

Example A



Example B



PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine glass and surrounding adjacent surfaces for conditions affecting installation.
 - 1. Report conditions that may adversely effect installation. In report, include description of any glass that is broken, chipped, cracked, abraded, or damaged in any way.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Beginning of installation means acceptance of conditions.
- D. Ensure mechanical attachment to curtain wall system is acceptable.

3.2 PREPARATION

- A. Comply with manufacturers written instructions for surface preparation.
- B. Immediately before beginning installation of films, clean glass surfaces of substances that could impair glazing film's bond, including mold, mildew, oil, grease, dirt, and other foreign materials.
- C. Protect window frames and surrounding conditions from damage during installation.

3.3 INSTALLATION

- A. General: Comply with glazing film manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
 - 1. Clean glass surface with any typical household glass cleaner to remove debris such as; excess paint, sheetrock mud, dirt, lint, etc.... and dry with "Bounty" brand paper towels ONLY.
 - 2. Use **dedicated** spray bottle or pressurized tank to apply the nano-technology mounting fluid.
 - 3. If the nano-technology fluid sits idle more than 60 (sixty) minutes, slightly agitate it by rocking the spray bottle or pressurized tank from side to side for +/- 5 (five) seconds.
 - 4. Apply nano-technology mounting fluid as follows:
 - a. Hold spray bottle or pressurized tank nozzle approximately 8-10 inches from the glass surface.

Dow Corning® 995 Silicone Structural Adhesive

DOW CORNING

1. PRODUCT NAME

Dow Corning® 995 Silicone Structural Adhesive

2. MANUFACTURER

Dow Corning Corporation
Midland, MI 48686-0994
Phone: (517) 496-6000
FAX: (517) 496-4586

3. PRODUCT DESCRIPTION

Dow Corning 995 Silicone Structural Adhesive is a one-component, self-priming, shelf-stable, neutral-cure, elastomeric adhesive specifically formulated for silicone structural glazing, exhibiting the following unique features:

- Excellent unprimed adhesion to most common building substrates, including glass, reflective glass, anodized aluminum, granite and paints, including most fluoropolymer-based paints.
- Excellent shelf life and "Use By" dating
- Noncorrosive by-products
- 20-year performance warranty available
- Cures to extremely tough elastomeric rubber

Structural applications require prior testing and written print review by Dow Corning.

Basic Uses: Dow Corning 995 Silicone Structural Adhesive is designed for use in structural applications such as factory or field glazing of glass and metal.

Once cured, this adhesive forms a durable, flexible, watertight bond that can be warranted for 20 years.

The performance of sealant in a structural joint may be simulated using the ASTM C 1135 test procedure. The stress-strain relationship for Dow Corning 995 Silicone Structural Adhesive is illustrated in Figure 1.

Limitations: Dow Corning 995 Silicone Structural Adhesive should not be applied:

- To building materials that bleed oils, plasticizers or solvents – materials such as impregnated wood, oil-based caulks, green or partially vulcanized rubber gaskets or tapes
- In totally confined spaces (the sealant requires atmospheric moisture for cure)
- When surface temperatures exceed 60°C (140°F)
- Where painting of the sealant is required, as the paint film may crack and peel
- To surfaces in contact with food – this sealant does not comply with

Federal Food and Drug Administration food-additive regulations

- In below-grade applications
- For use as an interior penetration firestop sealing system
- In horizontal floor joints where abrasion and physical abuse are likely to be encountered
- To frost-laden or damp surfaces
- For continuous immersion in water

This product is neither tested nor represented as suitable for medical or pharmaceutical uses.

Composition and Materials: Dow Corning 995 Silicone Structural Adhesive is a one-part, ready-to-use material that has the consistency of toothpaste. This consistency remains

TYPICAL PROPERTIES

These values are not intended for use in preparing specifications.

As Supplied	
MIL-S-8802	Color Black
	Tack-Free Time, 50% RH, hours 1.5
	Curing Time, 50% RH, at 25°C (77°F), days 7-14
	Full Adhesion, days 14-21
	Flow, Sag or Slump, inches <0.1
	Working Time, minutes 10-20
As Cured – After 7 days at 25°C (77°F), 50% RH	
ASTM D 2240	Durometer Hardness, Shore A, points 40
ASTM D 412	Ultimate Tensile, psi 350
	Ultimate Elongation, % 525
ASTM D 624	Tear Strength, die B, ppi 49
ASTM C 794	Peel Strength, ppi 40
As Cured – After 21 days at 25°C (77°F), 50% RH	
ASTM C 1135	Tensile at 25%, psi 48
	Tensile at 50%, psi 75
ASTM C 719	Joint Movement Capability, % ±50
As Cured – After 21 days at 25°C (77°F), 50% RH and Subjected to 4,500 hours QUV ASTM G-53	
ASTM C 1135	Tensile at 25%, psi 50
	Tensile at 50%, psi 78
Specification Writers: Please obtain a copy of the Dow Corning Sales Specification for this product, and use it as a basis for your specifications. It may be obtained from any Dow Corning Sales Office, or from Dow Corning Customer Service in Midland, MI. Call 1-800-322-8723.	



Ballistic Resistance – Test Report

Client: C-Bond Systems, LLC.
Attention: Bruce Rich
410 Pierce Street
Houston, TX 77002

Date of report: 15 June 2015

Report prepared by: Ashley Gowland, Customer Operations Coordinator

Report reviewed by: Wesley Mason, Manager of Technical Operations - Hard Armor

Test method and supporting documentation: Per Customer Instructions
NIJ-STD-0108.01, Level 1

Job number: 000004449

Test item receipt date, shipping method, identification information, and inspection results: The sample(s) were received on **11 June 2015** via Federal Express. Test items were identified as 3/8" annealed glass. The sample(s) were inspected prior to testing and no anomalies were discovered.

Date of testing, test range, and testing performed: Testing commenced at the H.P. White Laboratory, Inc. facilities at 3114 Scarboro Road, Street, MD on **15 June 2015**.

Date testing completed, sample disposal, return shipping method: Testing concluded on **15 June 2015**; sample(s) will be discarded, unless otherwise instructed.

Test data transmittal method and storage location: This test report and test data were transmitted via email in a manner compliant with ISO 17025 requirements. Permanent electronic and hardcopy files are maintained in accordance with HPWLI data storage policy on data storage systems, filed by job number.

Revision number and date: NA

Disclaimer: Testing was performed on samples provided by the client. H.P. White Laboratory, Inc. holds no responsibility for sample selection methods. This report is based on data obtained from testing only the samples submitted, and should NOT be interpreted as an endorsement by H.P. White Laboratory, Inc. of the continuing quality or performance of any other items of the same, or similar, design. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government. This testing was performed by H.P. White Laboratory, Inc. to client specification, and the test results are the property of the client, who holds all rights of reproduction or publication of this report and related test data.

Test Procedures

Ballistic Resistance Testing: All testing was conducted on an indoor range at ambient conditions in accordance with your instructions and the general provisions of NIJ-STD-0108.01. Testing was conducted at threat level I, using caliber .38 Special, 158 grain, RN lead and 22, 40 grain, LRHV ammunitions. The test sample was positioned 16.5 feet from the muzzle of the barrel to produce zero degree obliquity impacts. Photoelectric infrared screens were located at 6.5 feet and 9.5 feet which, in conjunction with electronic chronographs, were used to compute bullet velocities at 8.0 feet forward of the muzzle. Penetrations was determined by visual examination of the 0.020 inch thick 2024-T3 aluminum witness plate, placed parallel to and at a distance of 6.0 inches behind the test sample. Table I provides a summary of information on the attached data record(s).

Report prepared by:



Ashley Gowland
 Customer Operations Coordinator

Report reviewed by:



Wesley Mason
 Manager of Technical Operations - Hard Armor

Table I: Ballistic Resistance, Summary of Results

Test Sample			Ballistic Threat			Results		
Sample Number	Thickness (in.) (a)	Weight (lbs.)	Caliber	Obliquity	Shots (b)	Velocity (fps)		Penetrations
						Max	Min	
150609LGPG-1	0.422	11.56	.38 Special	0°	5	867	851	0
150609LGPB-2	0.417	11.59	22 LRHV	0°	5	1043	1011	0

(a) Based on an average of four corner thicknesses
 (b) 4 shot(s) on 8" square – 1 in center



H.P. White Laboratory, Inc.

BALLISTIC RESISTANCE TEST

Client : 5805:C-Bond Systems, LLC

Job No. : 000004449 Test Date : 6/15/15

TEST PANEL

Manufacturer : C-Bond systems, LLC
 Size : 18 x 18 in.
 Thicknesses : 0.421, 0.421, 0.422, 0.422 in.
 Avg. Thick : 0.422 in.
 Description : 3/8" annealed glass

Sample No. : 150609LGPG-1
 Weight : 11.56 lbs.
 Hardness : NA
 Plies/Laminates : NA

Date Rec'd. : 6/11/15
 Via : Federal Express
 Returned : N/A

SET-UP

Shot Spacing : 4 ON 8" SQUARE - 1 IN CENTER
 Witness Panel : 0.020", 2024-T3 ALUMINUM
 Obliquity : 0 deg.
 Backing Material : NA
 Conditioning : AMBIENT

Primary Vel. Screens : 6.5 ft., 9.5 ft.
 Primary Vel. Location : 8.0 ft. From Muzzle
 Residual Vel. Screens : NA
 Residual Vel. Location : NA
 Range to Target : 16.5 ft.
 Target to Wit. : 6.0 in.

Range No. : 3
 Temp. : 72 F
 BP : 29.99 in. Hg
 RH : 60%
 Barrel No./Gun : R3/ .38 SPECIAL
 Gunner : Ches
 Recorder : Bonsall

AMMUNITION

(1) : .38 SPECIAL RN LEAD, 158 gr.
 (2) :
 (3) :
 (4) :

Lot No. : 0209025
 Lot No. :
 Lot No. :
 Lot No. :

APPLICABLE STANDARDS OR PROCEDURES

- (1) : NIJ-STD-0108.01
- (2) : LEVEL I
- (3) : REQUIRED VELOCITY: 800-900 FPS.

Shot No.	Ammo.	Time 1 (usec)	Velocity 1 (ft/s)	Time 2 (usec)	Velocity 2 (ft/s)	Avg. Vel. (ft/s)	Penetration	Footnotes
1	1	3459	867	3462	867	867	None	
2	1	3504	856	3509	855	856	None	
3	1	3509	855	3514	854	854	None	
4	1	3522	852	3529	850	851	None	
5	1	3468	865	3474	864	864	None	

<u>REMARKS :</u>	<u>FOOTNOTES :</u>



H.P. White Laboratory, Inc.

BALLISTIC RESISTANCE TEST

Client : 5805:C-Bond Systems, LLC

Job No. : 000004449 Test Date : 6/15/15

TEST PANEL

Manufacturer : C-Bond systems, LLC

Size : 18 x 18 in.

Thicknesses : 0.417, 0.417, 0.417, 0.417 in.

Avg. Thick. : 0.417 in.

Description : 3/8" annealed glass

Sample No. : 150609LGPB-2

Weight : 11.59 lbs.

Hardness : NA

Plies/Laminates : NA

Date Rec'd. : 6/11/15

Via : Federal Express

Returned : N/A

SET-UP

Shot Spacing : 4 ON 8" SQUARE - 1 IN CENTER

Witness Panel : 0.020", 2024-T3 ALUMINUM

Obliquity : 0 deg.

Backing Material : NA

Conditioning : AMBIENT

Primary Vel. Screens : 6.5 ft., 9.5 ft.

Primary Vel. Location : 8.0 ft. From Muzzle

Residual Vel. Screens : NA

Residual Vel. Location : NA

Range to Target : 16.5 ft.

Target to Wit. : 6.0 in.

Range No. : 3

Temp. : 72 F

BP : 29.99 in. Hg

RH : 60%

Barrel No./Gun : R3/ 22 LR

Gunner : Ches

Recorder : Bonsall

AMMUNITION

(1) : 22 LRHV, 40 gr.

(2) :

(3) :

(4) :

Lot No. : UNKNOWN

Lot No. :

Lot No. :

Lot No. :

APPLICABLE STANDARDS OR PROCEDURES

(1) : NIJ-STD-0108.01

(2) : LEVEL I

(3) : REQUIRED VELOCITY: 1010-1090 FPS.

Shot No.	Ammo.	Time 1 (usec)	Velocity 1 (ft/s)	Time 2 (usec)	Velocity 2 (ft/s)	Avg. Vel. (ft/s)	Penetration	Footnotes
1	1	2950	1017	2954	1016	1016	None	
2	1	2962	1013	2965	1012	1012	None	
3	1	2874	1044	2879	1042	1043	None	
4	1	2965	1012	2968	1011	1011	None	
5	1	2964	1012	2964	1012	1012	None	

<u>REMARKS :</u>	<u>FOOTNOTES :</u>



CLEANING AND GENERAL CARE INSTRUCTIONS FOR C-BOND SYSTEMS

C-Bond is a robust, durable product installed by trained professionals. You may observe some changes in the appearance of your window over the first 2 weeks; this is a normal part of the bonding process. Please note the following:

1. Do not clean the glass during the drying period.

The sun acts as a catalyst, ensuring that the adhesive thoroughly bonds the film to the glass. Window surfaces with a northern exposure or are internal glass may require longer drying times.

2. Any large moisture bubbles will disappear.

A few small particles or “points” may remain. These light reflections are inherent to film adhesives, and are usually visible only from the outside.

3. A slightly hazy or milky appearance.

This is caused by moisture between the film and the glass at the outset sometimes appears. Don't be concerned, it will disappear during the drying period.

4. Cleaning Instructions:

Do not use brushes, pure ammonia, industrial strength cleaners, or solutions that contain abrasive materials. Do not clean film for 10 days after installation. Never use cleaners that contain strong chemicals, especially ammonia. Harsh chemical can react to the window film, causing it to blotch, fade or peel from the glass. Regular dishwasher soap mixed with soft water is the best window cleaning solution that you can use. Only use soft window cleaning towels. Never use newspaper, white or brown paper towels, scrub pads or a window scraper.

***Windex is a registered trademark of SC Johnson**

Do not clean film for 5 days after installation.

If your C-Bond film product receives deep scratches or cuts, contact your dealer immediately for replacement. These scratches or cuts can render the system ineffective.

