

MANU-SPEC® 2001
SHEFFIELD PLASTICS INC.
A Bayer Polymers Company

PLASTIC GLAZING 08840
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This MANU-SPEC® utilizes the Construction Specifications Institute (CSI) *Manual of Practice*, including *MasterFormat*™, *SectionFormat*™ and *PageFormat*™. A MANU-SPEC is a manufacturer-specific proprietary product specification using the proprietary method of specifying applicable to project specifications and master guide specifications. Optional text is indicated by brackets (); delete optional text in final copy of specification. Specifier Notes typically precede specification text; delete notes in final copy of specification. Trade/brand names with appropriate symbols typically are used in Specifier Notes; symbols are not used in specification text. Metric conversion, where used, is soft metric conversion.

This MANU-SPEC specifies plastic glazing, marketed under the “MAKROLON HYGARD®” trademarks manufactured by Sheffield Plastics Inc. Revise MANU-SPEC section number and title below to suit project requirements, specification practices and section content. Refer to CSI *MasterFormat* for other section numbers and titles.

Section 08840
Plastic Glazing

Part 1 General

1.01 SUMMARY

A. Section includes: Plastic glazing.

1. Types: Types of plastic glazing include:

- a. Polycarbonate plastic glazing
- b. Abrasion-resistant polycarbonate, plastic glazing
- c. Enhanced UV-resistant polycarbonate plastic glazing
- d. Laminated polycarbonate plastic glazing for security applications

e. Laminated polycarbonate plastic glazing for bullet resisting security glazing

Specifier Note: Revise paragraph below to suit project requirements. Add section numbers and titles per CSI *MasterFormat* and specifier's practice

B. Related Sections: Section(s) related to this section include:

1. Skylights: Division 7 Metal Framed Skylights Section
2. Sealants: Division 7 Joint Sealers Section
3. Aluminum Windows: Division 8 Aluminum Windows Section
4. Glazing: Division 8 Glazing Section
5. Curtain Walls: Division 8 Aluminum Curtain Wall Systems Section
6. Equipment: Division 11 Detention Equipment

Specifier Note: Article below may be omitted when specifying manufacturer's proprietary products and recommended installation. Retain Reference Article when specifying products and installation by an industry reference standard. If retained, list standard(s) referenced in this section indicate issuing authority name, acronym, standard designation and title. Establish policy for indicating edition date of standard referenced. Conditions of the Contract or Division 1 References Section may establish the edition date of standards. This article does not require compliance with standard, but is merely a listing of references used. Article below should list only those industry standards referenced in this section.

1.02 REFERENCES

- A. General Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title, or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- B. American Society for Testing and Materials (ASTM):
1. ASTM D256 Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
 2. ASTM D638 Standard Test Method for Tensile Properties of Plastics
 3. ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 4. ASTM D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

5. ASTM D1929 Standard Test Method for Determining the Ignition Temperature of Plastics
6. ASTM F1915 Standard Test Methods for Glazing for Detention Facilities

C. American National Standards Institute (ANSI)

1. ANSI Z97.1 Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings

D. Underwriters Laboratories, Inc. (UL):

1. UL 752 Bullet Resistance Standard

E. H.P. White

1. ASTM F1233 Standard Test Method for Security Glazing Materials and Systems
2. H.P. White TP-0500.02 Test Procedures for Transparent Materials for use in Forced Entry or Containment Barriers.

1.03 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide plastic glazing which has been manufactured, fabricated and installed to maintain (specify performance criteria) performance criteria stated by manufacturer without defects, damage or failure.

Specifier Note: Article below includes submittal of relevant data to be furnished by Contractor either before, during or after construction. Coordinate this article with Architect's and Contractor's duties and responsibilities in Conditions of the Contract and Division 1 Submittal Procedures Section.

1.04 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
- B. Product Data: Submit product data, including manufacturer's SPEC-DATA® product sheet, for specified products. Submit manufacturer's printed product information that includes physical properties and recommended installation and glazing procedures including edge engagement guidelines. Include data on material weight, wind load capacity, light transmission, shading coefficient, and thermal expansion.
- C. Samples: Submit selection and verification samples for finishes, colors, and textures. Submit samples for each glazing type specified, not less than 12" square and framed on two adjacent

sides to show glazing system.

D. Quality Assurance Submittals: Submit the following:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
3. Manufacturer's Instructions: Manufacturer's installation instructions

Specifier Note: Coordinate paragraph below with Part 3 Field Quality Requirements Article herein. Retain or delete as applicable.

4. Manufacturer's Field Reports: Manufacturer's field reports specified herein.

E. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
2. Warranty: Warranty documents specified herein.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

Specifier Note: Retain paragraph below to suit project requirements; otherwise, delete paragraph below.

- a. Certificate: When requested, submit certificate indicating qualification

2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction approving acceptable installer and approving application method.

Specifier Note: Paragraph below should list obligations for compliance with specific code requirements particular to this section. General statements to comply with a particular code are typically addressed in Conditions of the Contract and Division 1 Regulatory Requirements Section. Repetitive statements should be avoided.

B. Regulatory Requirements: (Specify applicable requirements of regulatory agencies).

Building Codes: MAKROLON HYGARD products meet building code requirements (BOCA, SBCCI, ICBO) CC-1 for rated plastic glazing material, and does not support combustion. MAKROLON HYGARD BR750 is rated CC-2. Current data on building code requirements and product compliance may be obtained from Sheffield technical support specialists. Installation must comply with the requirements of applicable authorities having jurisdiction.

1. Building Codes: (specify applicable requirements of building codes).
Approvals: Contact manufacturer for current information on approvals by industry entities.
2. Approval: (specify applicable requirements of approvals).

Specifier Note: Retain paragraph below for erected assemblies (either on-site or off site) required for review of construction, coordination of work of several sections, testing, or observation of operation. Mockups, when accepted or approved, establish standards by which work will be judged. Coordinate below with Division 1 Quality Control (Mockup Requirements) section.

C. Mockups: install at project site a job mockup using acceptable products and manufacturer approved installation methods. Obtain Owner's and Architect's acceptance of finish color, texture and pattern and workmanship standard. Comply with Division 1 Quality Control (Mockup Requirements) section.

Specifier Note: Edit paragraph below to specifying mockup size.

1. Mockup size: (specify mockup size).
2. Maintenance: Maintain mockup during construction for workmanship comparison; removed and legally dispose of mockup when no longer required.

3. Incorporation: Mockup may be incorporated into final construction upon Owner's approval.

D. Preinstallation Meetings: Conduct preinstallation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with Division 1 Product Requirements Sections.
- B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Deliver polycarbonate sheets on enclosed pallets.
- D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer. Store in dry, well-ventilated and covered areas at temperatures below 80°F (27°C). Handle polycarbonate sheets carefully to prevent damage; do not drop, slide or drag.

1.07. PROJECT CONDITIONS

- A. Environmental Requirements/Conditions: Substrate and ambient air temperature shall be in accordance with manufacturer's requirements.

Specifier Note: Coordinate article below with conditions of the contract and with Division 1 Closeout Submittals (Warranty) section.

1.08. WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

Specifier Note: Products are warranted against delamination, coating failure, excessive yellowing, and loss of light transmission. Sheffield Plastics Inc. will not be responsible for the use of its product information relative to an actual application. Users must make their own determination of project suitability for their specific use. No warranty is made for the fitness of any product and nothing in the product literature waives any of the seller's conditions of sale.

Full warranty details including warranty conditions, duration, and remedies are available from the manufacturer upon request.

- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents
1. Provide manufacturer's written warranty.
 2. Provide manufacturer's written warranty covering loss of light transmission and yellowing.
 3. Provide manufacturer's written warranty covering coating failure, loss of light transmission, and yellowing.

Specifier Note: Coordinate paragraph below with manufacturer's warranty requirements.

4. Warranty Period: (specify term) years commencing on date of substantial completion.

PART 2 PRODUCTS

Specifier Note: Retain article below for proprietary method specification. Add product attributes, performance characteristics, material standards, and descriptions as applicable. Use of such phrases as "or equal" or "or approved equal" or similar phrases may cause ambiguity in specifications. Such phrases require verification (procedural, legal, and regulatory) and assignment of responsibility for determining "or equal" products.

2.01 PLASTIC PRODUCTS

Specifier Note: Sheffield Plastics Inc. is a market leader in the production of high performance thermoplastic sheet materials and has been at the leading-edge of product innovation and manufacturing technology for 50 years. As an ISO 9002 certified company, Sheffield Plastics is dedicated to a corporate policy of operational excellence, offering engineering and technical assistance coupled with a customer-oriented approach to the marketplace.

- A. Manufacturer: Sheffield Plastics Inc.

Specifier Note: Paragraph below is an addition to CSI *SectionFormat* and a supplement to MANU-SPEC. Retain or delete paragraph below per project requirements and specifier's practice.

1. Contact: 119 Salisbury Road, Sheffield, MA 01257; Telephone: (877) 413-7957,

Fax: (413) 229-8717, web site: www.sheffieldplastics.com

Specifier Note: MAKROLON polycarbonate glazing products are manufactured from MAKROLON resin. This material is as clear as glass and 250 times stronger. The product can be cut or cold-formed on-site during installation. It is lightweight (approximately two-thirds the weight of glass of equal thickness) and requires less structural support than all-glass systems. It offers high levels of durability and energy efficiency in use. By allowing the transmittance of up to 90% of solar energy and 88% of visible light, clear MAKROLON sheet is an excellent glazing material where clarity is essential. MAKROLON HYGARD laminates consist of multiple layers of polycarbonate or polycarbonate/acrylic with bonding interlayers. They offer high resistance to physical and ballistic attack.

B. Proprietary Product(s)/System(s):

Specifier Note: MAKROLON Polycarbonate Glazing: Sheffield's extruded MAKROLON polycarbonate sheets are lightweight, self-supporting, energy efficient products that are 30 times stronger than acrylic sheet. It can be used in a wide range of architectural, industrial, commercial, and aerospace applications, including: transportation glazing, institutional glazing, barrel vaults, skylights, covered walkways, storefronts, privacy glazing, factory over-glazing.

1. MAKROLON Polycarbonate Sheet

Sheffield Plastics Inc. offers the following **MAKROLON** products: **MAKROLON SG** – multi-wall sheets; **MAKROLON GP** – general purpose sheets; **MAKROLON GP Matte** – matte finish sheets; **MAKROLON GP Pebble** – pebble texture sheets; **MAKROLON FD** – FDA compliant sheets; **MAKROLON SN** – sign grade sheets; **MAKROLON Sign Matte** – matte finish sign grade sheets; **MAKROLON AR** – abrasion resistant sheets; **MAKROLON SL** - enhanced UV resistant sheets; **MAKROLON FI** – flame inhibiting sheets.

- a. Polycarbonate Sheet: comply with ANSI Z97.1 and with properties as follows:
 - 1) Specific Gravity: 1.2 per ASTM D792
 - 2) Tensile Strength, yield: 9000 psi (62 MPa) per ASTM D638
 - 3) Tensile Strength, Ultimate: 9500 psi (65 MPa) per ASTM D638
 - 4) Tensile Modulus: 345,000 psi (2378 MPa) per ASTM D638
 - 5) Flexural Strength at 5% strain: 13,500 psi (93 MPa) per ASTM D790
 - 6) Flexural Modulus: 345,000 psi (2378 MPa) per ASTM D256
 - 7) Izod Impact Strength (0.125" [3.2 mm] notched): 12 – 16 ft lb./in. per ASTM D256
 - 8) Self Ignition Temperature: 1070°F (577°C) per ASTM D1929
 - 9) Flash Ignition Temperature: 870°F (466°C) per ASTM D1929

Specifier Note: MAKROLON available sizes range from .020" (0.51 mm) to 1.250" (31.8 mm) thick, 60" (1524 mm) to 120" (3048 mm) length, and 36" (914 mm) to 96" (2438 mm) width. Size availability varies by product, contact manufacturer. Finishes include: matte, polished or textured: colors: available product colors include clear, bronze, and gray. Some other colors are available on certain products, contact manufacturer.

- b. General Purpose Type: Provide MAKROLON GP, UV inhibiting plastic glazing sheet:
 - 1) Thickness: (specify 0.118" [3 mm] nominal; 0.177" [4.5 mm] nominal; 0.236" nominal [6 mm]; 0.375" [9.6 mm] nominal; 0.500" [12.7 mm] nominal)
 - 2) Color: (specify clear A00; gray I30; dark gray I35; bronze K09; custom color to match architect's sample)

- c. Enhanced UV Resistant Type: Provide MAKROLON SL UV enhanced plastic glazing sheet
 - 1) Thickness: (specify 0.118" [3 mm] nominal; 0.177" [4.5 mm] nominal; 0.236" nominal [6 mm])
 - 2) Color: (specify clear A00; gray I30; dark gray I35; bronze K09; custom color to match architect's sample)

- d. UV and Abrasion Resistant Type: Provide MAKROLON AR (one-side coated) (two-side coated) hard-coated plastic glazing sheet:
 - 1) Thickness: (specify 0.118" [3 mm] nominal; 0.177" [4.5 mm] nominal; 0.236" nominal [6 mm]; 0.375" [9.6mm] nominal; 0.500" [12.7mm] nominal)
 - 2) Color: (specify clear A00; gray I30; dark gray I35; bronze K09; custom color to match architect's sample)

- e. Multi-wall Type: Provide MAKROLON SG multi-wall plastic glazing sheet
 - 1) Thickness: (specify 4 mm nominal; 6 mm nominal; 8 mm nominal; 10 mm nominal; 16 mm nominal)
 - 2) Color: (specify clear A00; bronze K09; opal B35; custom color to match architect's sample)

Specifier Note: MAKROLON HYGARD polycarbonate laminates: Sheffield's, MAKROLON HYGARD polycarbonate laminates are used in security glazing applications requiring high protection levels from both ballistic attack and physical assault, up to UL Level 3 standards. MAKROLON HYGARD Security Glazing is UL 752 Listed for multiple shot, no-spall protection ranging from 9 mm to 0.44 magnum caliber ammunition. Test reports are available upon request. MAKROLON HYGARD Security Glazing is virtually unbreakable and will not yield dangerous glass shards or "spider web" under attack, allowing full vision for appropriate tactical decisions. MAKROLON HYGARD features a tough hard coated surface and requires almost no maintenance. The nonstick, abrasion-resistant coating resists marring and spray point graffiti, and cleans easily. These products are suitable for: jails and prisons, detention centers, correctional facilities, psychiatric hospitals, schools and institutions, 24-hour convenience stores, drive-up windows, train and bus blazing, bus shelters and ticket counters, banks, and currency exchanges.

2. MAKROLON HYGARD Polycarbonate Security Laminate

a. Polycarbonate Sheet; comply with ANSI Z97.1 and with properties as follows:

- 1) Specific gravity: 1.2 per ASTM D792
- 2) Tensile Strength, Yield: 9000 psi (62 MPa) per ASTM D638
- 3) Tensile Strength, Ultimate: 9500 psi (65 MPa) per ASTM D638
- 4) Tensile Modulus: 340,000 psi (2343 MPa) per ASTM D638
- 5) Flexural Strength at 5% Strain: 13,500 psi (93 MPa) per ASTM D790
- 6) Flexural Modulus: 345,000 psi (2378 MPa) per ASTM D256
- 7) Izod Impact Strength (0.125" [3.2 mm] notched): 12 – 16 ft lb./in. per ASTM D256
- 8) Self-ignition Temperature: 1077°F (581°C) per ASTM D1929
- 9) Flash Ignition Temperature: 872°F (467°C) per ASTM D1929

Specifier Note: Sheffield MAKROLON HYGARD products include the following: MAKROLON HYGARD CG375/500/750 – containment grade laminates; MAKROLON HYGARD BR750/1000/1250 – bullet resistant laminates. Sizes: Available sizes range from .375" (9.5 mm) to 1.250" (32 mm) thick, 78" (1981 mm) to 96" (2438 mm) length, and 36" (914 mm) to 60" (1524 mm) width. Size availability varies by product, contact manufacturer. Available product colors include clear, bronze, and gray. Some other colors are available on certain products, contact manufacturer.

- b. Containment Type: Provide MAKROLON HYGARD CG375/500/750 plastic glazing sheet:

- 1) Thickness: (specify 0.375" [9.6 mm] nominal; 0.500" [12.7 mm] nominal; 0.750" [19.1 mm] nominal)
 - 2) Color: (specify clear A00; gray I30; bronze K09; custom color to match architect's sample)
- c. Bullet Resistant Type: Provide MAKROLON HYGARD BR750/1000/1250 plastic glazing sheet:
- 1) Thickness: (specify 0.750" [19.1 mm] nominal; 1.00" [27 mm] nominal; 1.25" nominal [32 mm])
 - 2) Color: (specify clear A00; gray I30; bronze K09; custom color to match architect's sample)

2.02 POLYCARBONATE LAMINATED SECURITY GLAZING

A. Provide MAKROLON HYGARD CG375 2-ply polycarbonate laminate with the following properties:

1. Forced Entry Rating: ASTM F1233 Class III Sequence 12; H.P. White TP-0500.02 Level II Step 11
2. Ballistic Rating: H.P. White TP-0500.02 Level A (.38 Special)
3. Gauge: 0.390" (9.9 mm) +/- 5% Tolerance
4. Weight: 2.5 lb./sq. ft.
5. Shading Coefficient: 0.92
6. Light Transmission: 86%

B. Provide MAKROLON HYGARD CG500 3-ply polycarbonate laminate with the following properties:

1. Forced Entry Rating: ASTM F1233 Class III Sequence 15; H.P. White TP-0500.02 Level II Step 12
2. Ballistic Rating: H.P. White TP-0500.02 Level A (.38 Special)
3. Gauge: 0.530" (13.5 mm) +/- 5% Tolerance
4. Weight: 3.3 lb./sq. ft.
5. Shading Coefficient: 0.90
6. Light Transmission: 84%

- C. Provide MAKROLON HYGARD CG750 3-ply polycarbonate laminate with the following properties:
1. Forced Entry Rating: ASTM F1233 Class IV Sequence 26; H.P. White TP-0500.02 Level IV Step 31
 2. Ballistic Rating: H.P. White TP-0500.02 Level B (9 mm)
 3. Gauge: 0.780" (19.8 mm) +/- 5% Tolerance
 4. Weight: 4.9 lb./sq. ft. (24 kg/m²)
 5. Shading Coefficient: 0.87
 6. Light Transmission: 77%
- D. Provide MAKROLON HYGARD BR750 3-ply polycarbonate laminate with acrylic interlayer with the following properties:
1. Ballistic Rating: H.P. White TP-0500.02 Level B (9 mm); UL 752 Level 1 MPSA (9 mm)
 2. Gauge: 0.780" (19.8 mm) +/- 8% Tolerance
 3. Weight: 5.1 lb./sq. ft. (26.4 kg/m²)
 4. Shading Coefficient: 0.89
 5. Light Transmission: 88%
- E. Provide MAKROLON HYGARD BR 1000 4-ply polycarbonate laminate with the following properties:
1. Forced Entry Rating: ASTM F1233 Class V; H.P. White TP-0500.02 Level V Sequence 42
 2. Ballistic Rating: H.P. White TP-0500.02 (Level B 9 mm); UL 752 Level 2 SPSA .357 Magnum
 3. Gauge: 1.06" (27 mm) +/- 5% Tolerance
 4. Weight: 6.5 lb./sq. ft. (31.7 kg/m²)
 5. Shading Coefficient: 0.78
 6. Light transmission: 72%
- F. Provide MAKROLON HYGARD BR1250 4-ply polycarbonate laminate with the following properties:
1. Forced Entry Rating: ASTM F1233 Class V; H.P. White TP-0500.02 Level V
 2. Ballistic Rating: ASTM F1233 .44 Magnum; H.P. White TP-0500.02 Level C (.44 Magnum) UL 752 Level 3 SPSA .44 Magnum
 3. Gauge: 1.30" (33 mm) +/- 5% Tolerance

4. Weight: 8.1 lb./sq. ft. (39.5 kg/m²)
5. Shading Coefficient: 0.81
6. Light Transmission: 67%

Specifier Note: Edit article below to suit project requirements. If substitutions are permitted, edit text below. Add text to refer to Division 1 Project Requirements (Product Substitutions Procedures) Section.

2.03 PRODUCT SUBSTITUTIONS

- A. Substitutions: No substitutions permitted

2.04 ACCESSORIES

- A. Glazing Accessories: As recommended by manufacturer of plastic glazing sheet for wet or dry glazing installations.

2.05 RELATED MATERIALS

- A. Related Materials: Refer to other sections listed in Related Sections paragraph herein for related materials.

2.06 SOURCE QUALITY

- A. Source Quality: Obtain plastic glazing materials from a single manufacturer.

PART 3 EXECUTION

Specifier Note: Article below is an addition to the CSI *SectionFormat* and a supplement to MANU-SPEC. Revise article below to suit project requirements and specifier's practice.

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.
 1. Install plastic glazing in accordance with manufacturer's recommendations for edge engagement and expansion allowance.
 2. Employ only sealants and glazing accessories that have been approved by manufacturer of plastic glazing sheet.
 3. Remove protective masking immediately after glazing operations are completed.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
1. Examine pallets upon delivery for evidence of damage.
 2. Examine and verify that frame openings are correct size and conform to recommendations of the plastic glazing sheet manufacturer.

3.03 PREPARATION

- A. Surface Preparation: Clean frame contact surfaces with compatible solvent and wipe dry. Do not allow solvent to pool in glazing channels. Immediately prior to installation, expose glazing edges of plastic sheet by peeling back factory applied protective masking to a dimension sufficient for edge engagement.

Specifier Note: Coordinate article below with manufacturer's recommended installation details and requirements.

3.04 INSTALLATION

- A. Plastic Glazing Installation:
1. Sawing: Use triple chip design saw blades and a steady feed rate when cutting to prevent heat buildup and excessive stress. Do not force material through saw. For maximum strength, sand or scrape cut edges smooth removing saw marks.
 2. Framing: Retain MAKROLON HYGARD laminates in metal channels or hollow metal frames whenever possible. Utilize structural security framing systems with forced entry and/or ballistics ratings equal to laminate selected. Edge engagement shall be sufficient to maintain glazing in frame when impacted. Provide 1" (25.4 mm) edge engagement minimum.
 3. Attachment: When using mechanical attachment methods for joining MAKROLON HYGARD, drill holes slightly oversize to prevent binding in case of material expansion. Use nuts and bolts with washers. Use backer strips of like material to maintain the bullet-resisting characteristics of MAKROLON HYGARD laminate selected. Do not over tighten bolts.
 4. Installation: use wet or dry gaskets that are compatible with polycarbonate such as low modulus silicone sealants or EPDM gasketing. Avoid metal to laminate contact by using an

appropriate glazing tape or gaskets on both sides of MAKROLON HYGARD laminate. Remove protective masking after glazing operations are completed and before prolonged exposure to direct sunlight, moisture or high temperature. Comply with installation recommendations from manufacturer.

- B. Related Products Installation: Refer to other sections listed in Related Sections paragraph herein for related products installation.

3.05 FIELD QUALITY REQUIREMENTS

- A. Site Tests (installation and post-installation testing): (specify applicable test requirements to be performed during and/or after product installation).

Specifier Note: Edit paragraph below. Establish number and duration of periodic site visits with owner and manufacturer, and specify below. Consult with manufacturer for services required. Coordinate paragraph below with Division 1 Quality Assurance Section and Part 1 Quality Assurance Submittals herein. Delete if manufacturer's field service not required.

- B. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

- 1. Site Visits: (specify number and duration of periodic site visits).

3.06 CLEANING

Specifier Note: If installed properly, plastic glazing should not require cleaning. If cleaning becomes necessary, comply with manufacturer's instructions and use only cleaning agents and techniques that have been approved by manufacturer. These products are designed to require little maintenance. Depending on local environmental conditions, regular washing with a mild soap and warm water solution using a soft cloth or sponge is recommended. To prevent water spots, dry with a chamois or sponge. Do not use abrasive cleaners or sharp instruments that may gouge the surface. Organic solvents such as butyl cellosolve, kerosene, naphtha and petroleum spirits as well as methanol, ethanol (denatured) and isopropyl alcohol work well on many common forms of graffiti. All of these compounds should be thoroughly rinsed off after cleaning.

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's

instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.07 PROTECTION

- A. Protection: protect installed product and finish surfaces from damage during construction.
 - 1. Comply with provisions of Division 1 for protecting installed work. Affix polyethylene film or other covering approved by plastic glazing sheet manufacturer to framing members, as required to protect plastic glazing from other construction operations.

END OF SECTION