SECTION 084513 - STRUCTURED-POLYCARBONATE-PANEL ASSEMBLIES

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. SUMMARY
				1. Section includes aluminum-framed assemblies glazed with structured-polycarbonate panels as follows:

Wall assemblies.

Roof assemblies.

Skylight assemblies.

Canopy assemblies.

* + - 1. PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" paragraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - * 1. Preinstallation Conference: Conduct conference at Project site.
			1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Provide Qualification Data from Quality Control Submittals prior to submitting the remaining submittals in order specified below.

Submit Product Data, Shop Drawings, Samples, [**and**] [**Delegated Design**] submittals as one package.

Submit remaining Quality Controls Submittals.

Submit remaining submittals [**Fabrication Samples**], [**and**] [**Sustainable Design Submittals**].

Contract Closeout Submittals.

* + - * 1. Quality Control Submittals:

Qualification Data: For qualified [**Installer**] [**testing agency]**.

Product Test Reports: For each structured-polycarbonate-panel assembly, for tests performed by a qualified testing agency.

Retain "Product Test Report" paragraph below for standard panel assemblies.

Retain "Evaluation Reports" paragraph below if required; not all manufacturers have Evaluation Reports for all products. Verify availability with manufacturers and acceptability with code authorities.

Evaluation Reports: For structured-polycarbonate-panel assemblies from ICC-ES.

Field quality-control reports.

Sample Warranties: For special warranties.

Design Consultant to review code references and verify that the referenced sections/tables are current. Note that code references shall be based on the current version of the Uniform Code.

* + - * 1. Product Data: For each type of product.

Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum components of panel assemblies.

* + - * 1. Shop Drawings: For panel assemblies.

Include plans, elevations, sections, details, and attachments to other work.

Include details of provisions for assembly expansion and contraction and for draining moisture within the assembly to the exterior.

* + - * 1. Samples: In manufacturer's standard size.

For each type of structured-polycarbonate panel.

For each type of exposed finish for framing members.

Retain "Fabrication Samples" paragraph below to verify details of assembly if required.

* + - * 1. Fabrication Samples: Of each framing system intersection and adjacent panels, made from 12-inch lengths of full-size framing members and showing details of the following:

Joinery.

Anchorage.

Expansion provisions.

Structured-polycarbonate panels.

Flashing and drainage.

Retain "Delegated-Design Submittal" paragraph below if design services have been delegated to Contractor.

* + - * 1. Delegated-Design Submittal: For panel assemblies indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
				2. Sustainable Design Submittals:
				3. Contract Closeout Submittals:
				4. Maintenance Data: For panel assemblies to include in maintenance manuals.
			1. QUALITY ASSURANCE
				1. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
				2. Benchmarks: Build benchmarks to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

Retain first subparagraph below for large-scale benchmark. Indicate panel assemblies represented by benchmark on Drawings or draw benchmark as separate element.

Build benchmark of typical panel assemblies as shown on Drawings.

Approval of benchmarks does not constitute approval of deviations from the Contract Documents contained in benchmarks unless Director’s Representative specifically approves such deviations in writing.

* + - 1. WARRANTY

When warranties are required, verify with Director’s Representative that special warranties stated in this article are not less than remedies available to the Facility under prevailing local laws.

* + - * 1. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of panel assemblies that fail in materials or workmanship within specified warranty period.

Failures include, but are not limited to, the following:

Structural failures including, but not limited to, excessive deflection.

Delete option in first subparagraph below if retaining "Special Aluminum-Finish Warranty" paragraph below.

Deterioration of metals[**, metal finishes,**] and other materials beyond normal weathering.

Water leakage.

Verify available warranties and warranty periods for panel assemblies with manufacturers listed in Part 2 articles.

Warranty Period: [**Two**] [**Five**] <**Insert number**> years from date of Substantial Completion.

* + - * 1. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace structured-polycarbonate panels that exhibit defects in materials or workmanship within specified warranty period.

Defects include, but are not limited to, the following:

Delamination.

Color changes exceeding requirements.

Losses in light transmission beyond 6 percent from original when measured according to ASTM D1003.

Verify available warranties and warranty periods for panels with manufacturers listed in Part 2 articles.

Warranty Period: [**10**] <**Insert number**> years from date of Substantial Completion.

* + - * 1. Special Aluminum-Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.

Verify available warranties and warranty periods for finishes with manufacturers listed in Part 2 articles.

Warranty Period: [**Five**] [**10**] [**20**] <**Insert number**> years from date of Substantial Completion.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. PERFORMANCE REQUIREMENTS

Retain "Delegated Design" paragraph below if Contractor is required to assume responsibility for design.

* + - * 1. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design structured-polycarbonate-panel assemblies.
				2. Structural Loads: [**As indicated on Drawings**] <**Insert loads**>.
				3. Deflection Limits:

Based on Project conditions or requirements of authorities having jurisdiction, more stringent deflection criteria may be required than those specified in options in "Vertical Panel Assemblies" and "Overhead Panel Assemblies" subparagraphs below. Building codes include different deflection criteria depending on whether panel assemblies are classified as components and cladding or as part of the main wind-force-resisting system (e.g., where a panel assembly is the structural roof).

Vertical Panel Assemblies: Limited to [**1/60**] [**1/100**] [**1/120**] <**Insert deflection**> of clear span for each assembly component.

Overhead Panel Assemblies: Limited to [**1/60**] [**1/100**] [**1/120**] [**1/180**] <**Insert deflection**> of clear span for each assembly component.

* + - * 1. Structural-Test Performance: Panel assemblies tested according to ASTM E330, as follows:

When tested at positive and negative wind-load design pressures, assemblies do not show evidence of deflection exceeding specified deflection limits.

When tested at [**150**] <**Insert number**> percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not show evidence of material failures, structural distress, and permanent deformation of main framing members exceeding [**0.2**] <**Insert number**> percent of span.

Test Durations: As required by design wind velocity, but not less than [**10**] <**Insert number**> seconds.

Retain "Windborne-Debris Impact Resistance" paragraph below to suit Project. The BCNYS establishes criteria for buildings in hurricane-prone locations. In paragraph, "enhanced" option applies to essential facilities and has additional requirements. Verify requirements of authorities having jurisdiction. Verify which manufacturers have tested products and can demonstrate compliance.

* + - * 1. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone [**1**] [**2**] [**3**] [**4**] for [**basic**] [**enhanced**] protection.

Insert increased heights if different from those in "Large-Missile Test" and "Small-Missile Test" subparagraphs below. For enhanced protection, delete "Small-Missile Test" subparagraph.

Large-Missile Test: For glazing located within [**30 feet**] <**Insert dimension**> of grade.

Small-Missile Test: For glazing located between 30 feet and [**60 feet**] <**Insert dimension**> above grade.

Usually retain "Water Penetration under Static Pressure" paragraph below. For water penetration under static pressure tests, an air-pressure difference of 20 percent of wind-load design pressure provides satisfactory performance in most parts of the United States. Locations where high winds frequently occur simultaneously with heavy rains require higher test-pressure differences. Lower test-pressure differences are acceptable for some locations. Revise to suit Project.

* + - * 1. Water Penetration under Static Pressure: Provide panel assemblies that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than [**6.24 lbf/sq. ft.**] [**10 lbf/sq. ft.**] [**15 lbf/sq. ft.**] <**Insert value**>.

Retain "Water Penetration under Dynamic Pressure" paragraph below for dynamic-pressure test method. Both static-pressure and dynamic-pressure testing may be required; however, most manufacturers do not include test data in product literature for the more expensive dynamic-pressure testing.

* + - * 1. Water Penetration under Dynamic Pressure: Provide panel assemblies that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than [**6.24 lbf/sq. ft.**] <**Insert value**>.

AAMA 501.1's definition of "water leakage" allows up to 1/2 oz. of water to accumulate in a 15-minute period on an interior stop or stool integral to system.

Maximum Water Leakage: [**According to AAMA 501.1**] [**No uncontrolled water penetrating aluminum-framed systems or water appearing on systems' normally exposed interior surfaces from sources other than condensation**]. Water leakage does not include water that is controlled by flashing and gutters and drained to the exterior, or water that cannot damage adjacent materials or finishes.

* + - * 1. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

Differential values in "Temperature Change (Range)" subparagraph below (for aluminum in particular) are suitable for most of the United States. Revise to suit local conditions and metal color and finish.

Temperature Change (Range): [**120 deg F, ambient; 180 deg F**] <**Insert temperature range**>, material surfaces.

* + - * 1. Energy Performance: Provide panel assemblies with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below[**and certified and labeled according to NFRC**]:

Primary energy-performance requirements usually include thermal transmittance (U-factor), solar-heat-gain coefficient (SHGC), and air infiltration. If required, revise "Thermal Transmittance (U-Factor)" and "Solar Heat Gain Coefficient (SHGC)" subparagraphs below to include related and additional energy-performance considerations, such as condensation resistance and visible light transmittance. Revise values to suit climate zone of building envelope.

Lower U-factors may be achieved for some products with specially designed M-shaped internal structures or units filled with aerogel; verify with manufacturers and insert U-factor values as required.

Thermal Transmittance (U-Factor): Fixed glazing and framing areas shall have U-factor of not more than [**0.80 Btu/sq. ft. x h x deg F**] [**0.65 Btu/sq. ft. x h x deg F**] <**Insert value**> as determined according to NFRC 100.

Solar-Heat-Gain Coefficient (SHGC): Fixed glazing and framing areas shall have an SHGC of no greater than [**0.6**] [**0.7**] <**Insert value**> as determined according to NFRC 200.

ASTM E283 requires using a static-air-pressure differential of 1.57 lbf/sq. ft. unless otherwise indicated, which is equivalent to a 25-mph wind. A static-air-pressure differential of 6.24 lbf/sq. ft. is equivalent to a 50-mph wind. Insert other value as applicable.

Air Infiltration: Maximum air leakage through fixed glazing and framing areas of [**0.30 cfm/sq. ft.**] <**Insert value**> of fixed wall area as determined according to ASTM E283 at a minimum static-air-pressure differential of [**1.57 lbf/sq. ft.**] [**6.24 lbf/sq. ft.**] <**Insert value**>.

Consider inserting condensation-resistance and visible-light-transmittance criteria to suit Project.

* + - 1. STRUCTURED-POLYCARBONATE-PANEL ASSEMBLIES
				1. Structured-Polycarbonate-Panel Assemblies: Translucent assemblies that are supported by aluminum framing and glazed with structured-polycarbonate panels.
			2. STRUCTURED-POLYCARBONATE PANELS
				1. Structured-Polycarbonate Panels: Translucent, extruded-polycarbonate sheet with multiwall cellular cross section that provides isolated airspaces and that is coextruded with a UV-protective layer.

Not all manufacturers offer aerogel fill; verify availability if retaining "Cell Insulation" subparagraph below.

Cell Insulation: Fill cellular cross sections with aerogel.

Retain "Panel Thickness" paragraph below unless thickness is indicated on Drawings. Verify availability with manufacturer.

* + - * 1. Panel Thickness: Nominal [**5/16 inch**] [**3/8 inch**] [**1/2 inch**] [**5/8 inch**] [**1 inch**] <**Insert thickness**>.
				2. UV Resistance: [**Not required**] [**On outer surface**] [**On both surfaces**].
				3. Color: [**Transparent, colorless**] [**White**] [**Bronze**] [**Gray**] [**Green**] [**Blue**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color**>.
				4. Panel Performance:

Plastic Self-Ignition Temperature: 650 deg F or more according to ASTM D1929.

Smoke-Developed Index: 450 or less according to ASTM E84, or 75 or less according to ASTM D2843.

Class CC1 in "Combustibility Classification" subparagraph below has a burning extent of 1 inch or less; Class CC2 has a burning rate of 2.5 in./min. or less.

Combustibility Classification: [**Class CC1**] [**Class CC2**] based on testing according to ASTM D635.

Retain "Roof-Covering Classification" subparagraph below only if required. See "Code Considerations" Article in the Evaluations.

Roof-Covering Classification: [**Class A**] [**Class B**] [**Class C**] according to ASTM E108 or UL 790.

Retain "Interior Finish Classifications" subparagraph below only if required. See "Code Considerations" Article in the Evaluations.

Interior Finish Classification: [**Class A**] [**Class B**] [**Class C**] based on testing according to ASTM E84.

Revise color stability requirement in "Color Change" subparagraph below to suit Project. Not all manufacturers test products according to ASTM D2244, and testing conditions vary.

Color Change: Not more than 3.0 units Delta E, when measured according to ASTM D2244, after outdoor weathering compliant with procedures in ASTM D1435.

Revise testing environment to suit Project. Some manufacturers test for 120 months to more demanding Florida climate.

Outdoor Weathering Conditions: 60 months in Arizona or 120 months in a moderate North American climate.

Manufacturers' testing and reporting of impact resistance vary; revise "Impact Resistance" subparagraph below to suit Project. Coordinate with code requirements in hurricane-prone areas that are subject to windborne debris.

Impact Resistance: No failure at impact of [**200 ft. x lbf according to freefalling-ball impact test using a 3-1/2-inch-diameter, 6.3-lb ball**] <**Insert requirements**>.

Retain "Haze Factor" subparagraph below if required to diffuse direct sunlight.

Haze Factor: Greater than 90 percent when tested according to ASTM D1003.

* + - 1. ALUMINUM FRAMING SYSTEMS
				1. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.

Construction: [**One piece, extruded aluminum**] [**Thermally broken, extruded aluminum**] <**Insert description**>.

* + - * 1. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.

Sheet and Plate: ASTM B209.

Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

Extruded Structural Pipe and Tubes: ASTM B429.

Structural Profiles: ASTM B308.

* + - * 1. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning skylight components.
				2. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding fasteners and accessories; compatible with adjacent materials.

At closures, retaining caps, or battens, use ASTM A193, 300 series stainless-steel screws.

Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.

Retain "Concrete and Masonry Inserts" paragraph below if applicable or revise to suit Project.

* + - * 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123 or ASTM A153 requirements.

Retain "Anchor Bolts" paragraph below for fastening to wood curbs. If anchor bolts are required, coordinate locations.

* + - * 1. Anchor Bolts: ASTM A307, Grade A, galvanized steel.
				2. Concealed Flashing: Corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
				3. Exposed Flashing and Closures: Aluminum sheet not less than [**0.040 inch**] [**0.050 inch**] [**0.063 inch**] <**Insert dimension**> thick, finished to match framing.
				4. Framing Gaskets: Manufacturer's standard gasket system with low-friction surface treatment designed specifically for retaining structured-polycarbonate panels.
				5. Frame-System Sealants: As [**recommended in writing by manufacturer.**] [**specified in Section 079200 "Joint Sealants."**]
				6. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
			1. FABRICATION
				1. Fabricate aluminum components that, when assembled, have the following characteristics:

Profiles that are sharp, straight, and free of defects or deformations.

Accurately fitted joints with ends coped or mitered.

Internal guttering systems or other means to drain water passing through joints and moisture migrating within assembly to exterior.

* + - * 1. Fabricate aluminum sill closures with weep holes and for installation as continuous component.
				2. Reinforce aluminum components as required to receive fastener threads.
			1. ALUMINUM FINISHES

Retain finishes in four paragraphs below to suit Project. If retaining more than one, indicate location of each on Drawings or by inserts.

Retain one of two options in "Clear Anodic Finish" paragraph below. Class II finish is standard with many manufacturers; Class I finish is heavy anodized. Verify availability with manufacturers.

* + - * 1. Clear Anodic Finish: AAMA 611, [**AA-M12C22A41, Class I, 0.018 mm**] [**AA-M12C22A31, Class II, 0.010 mm**] or thicker.

Retain one of two options in "Color Anodic Finish" paragraph below. Verify availability with manufacturers.

* + - * 1. Color Anodic Finish: AAMA 611, [**AA-M12C22A42/A44, Class I, 0.018 mm**] [**AA-M12C22A32/A34, Class II, 0.010 mm**] or thicker.

Color: [**Light bronze**] [**Medium bronze**] [**Dark bronze**] [**Black**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from full range of industry colors and color densities**] <**Insert color**>.

* + - * 1. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

Retain one of two "High-Performance Organic Finish" paragraphs below; if both are required, indicate location of each system on Drawings, in schedules, or by inserts. Retain AAMA 2604 or AAMA 2605 for high- or superior-performance organic coatings, respectively, on extrusions and panels. If specific products are required, name coating manufacturers and products.

* + - * 1. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with [**AAMA 2604**] [**AAMA 2605**] and containing not less than [**50**] [**70**] percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

* + - * 1. High-Performance Organic Finish: [**Three**] [**Four**]-coat fluoropolymer finish complying with AAMA 2605 and containing not less than [**50**] [**70**] percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

1. EXECUTION
	* + 1. EXAMINATION
				1. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
				2. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. INSTALLATION
				1. General: Comply with manufacturer's written instructions.

Do not install damaged components.

Fit joints between aluminum components to produce hairline joints free of burrs and distortion.

Rigidly secure nonmovement joints.

Install anchors with separators and isolators to prevent metal corrosion, electrolytic deterioration, and immobilization of moving joints.

Seal joints watertight unless otherwise indicated.

* + - * 1. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with corrosion-resistant coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
				2. Install components plumb and true in alignment with established lines and elevations.
				3. Skylight Assemblies: Install continuous aluminum sill closures with weatherproof expansion joints and locked and sealed corners. Install components to drain water passing through joints and moisture migrating within assembly to exterior.
				4. Erection Tolerances: Install panel assemblies to comply with the following maximum tolerances:

Erection tolerances in "Alignment" and "Location and Plane" subparagraphs below are examples only that are based on manufacturers' literature. Coordinate with tolerances for support systems and revise to suit Project.

Alignment: Limit offset from true alignment to 1/32 inch where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches; otherwise, limit offset to 1/8 inch.

Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet, but no greater than 1/2 inch over total length.

* + - 1. FIELD QUALITY CONTROL

Retain "Testing Agency" paragraph below to identify who shall perform tests and inspections.

* + - * 1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

Generally, retain inexpensive test in "Water-Spray Test" subparagraph below to check panel assemblies' resistance to water penetration. Insert test-area requirements to suit Project.

Water-Spray Test: Before installation of interior finishes has begun, panel assemblies shall be tested according to AAMA 501.2 and shall not show evidence of water penetration.

If retaining "Water Penetration under Static Pressure" subparagraph below, verify, with qualified testing agencies, that Project conditions will allow satisfactory static-pressure field testing. A system's installed performance is generally less than its laboratory performance. Indicate test locations on Drawings.

Water Penetration under Static Pressure: Before installation of interior finishes has begun, areas shall be tested according to ASTM E1105.

Test Procedures: Test under [**uniform**] [**and**] [**cyclic**] static-air pressure.

Coordinate static-air-pressure, field-test performance requirements in "Static-Air-Pressure Difference" subparagraph below with static-air-pressure, laboratory-test performance requirements specified in "Performance Requirements" Article. Generally, 0.67 times the pressure specified for laboratory testing according to ASTM E331 is a realistic criterion.

Static-Air-Pressure Difference: <**Insert pressure**>.

Water Penetration: None.

* + - * 1. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
				2. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
				3. Prepare test and inspection reports.

END OF SECTION 084513