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 **SECTION 08 45 13**

 **Structured Polycarbonate Panel Assemblies**

# Series 3500 – 40mm Polycarbonate Glazing System

**PART 1 - GENERAL**

* 1. **SUMMARY**
1. This section includes the following:
	1. Vertical wall system glazed with 40mm interlocking translucent multi-walled polycarbonate panels.
2. Related Sections: The following sections contain requirements that relate to this section.
	1. Division 5 Section “Structural Steel”
	2. Division 6 Section “Rough Carpentry”
	3. Division 7 Section “Flashing and sheet metal”
	4. Division 7 Section “Joint Sealants”
	5. Division 8 Section “Aluminum entrances and storefronts”

**1.2 PERFORMANCE REQUIREMENTS**

A. General: Provide a complete system consisting of aluminum frame and polycarbonate glazing capable of withstanding loads as defined by the local governing codes having jurisdiction where the system is to be installed without failure. Failure to include the following:

1. Deflection exceeding specified limits.
2. Thermal stresses transferred to the building structure.
3. Framing members transferring stresses, including those caused by thermal and structural movement to glazing.
4. Weakening of fasteners, attachments and other components.
5. Deflection Limits: Maximum calculated deflection of any framing member in a direction normal to the glazing plane when subjected to specified design pressures shall be limited to ***[L/xxx (DGI to provide)]*** of its clear span.
6. Structural Loads: Provide structural polycarbonate panel assemblies, including anchorage, capable of withstanding the effects of the following design loads:
	1. Wall Loads:
		1. Positive Wind Load: ***[Enter positive wind load].***
		2. Negative Wind Load: ***[Enter negative wind load].***
7. Water Infiltration: No uncontrolled leakage in accordance with ASTM E 331, at a test pressure of 7.5 psf.
8. Air Infiltration: Will not exceed 0.05 cfm per square foot of glazing at a differential pressure of 1.57 psf and not to exceed 0.07 cfm per square foot at 6.24 psf in accordance with ASTM E 283.
9. Uniform Static Air pressure Difference: No damage at [75] psf in accordance to ASTM E 331.
10. Impact Testing:
	1. Small Missile in accordance with ASTM E 1886
11. Appearance:
	1. Panel thickness: 40mm (1.5 inch) nominal
	2. Panel profile: 7-wall ***(Other panel profiles available, please contact DGI for information and availability)***.
		1. Other glazing panels including standing seam and corrugated profiles are not acceptable.
		2. Fiberglass, FRP and built up panels with internal structure not acceptable.
	3. Panel width: 19-11/16” (inches) nominal.
	4. Panel color: ***[Enter panel color]*** ***(Clear and Opal)***.
		1. Panels shall be uniform in color according to manufacturer standard allowable

 variation.

1. Thermal Performance: according to NFRC performance standards as follows: ***[choose from panels below]***
2. ***Clear 7-wall panel: U-factor = [0.28], SHGC = [0.58]***
3. ***Clear IR 7-wall panel: U-factor = [0.26], SHGC = [0.35]***
4. ***Clear UV2 Matte 7-wall: U-factor = [0.24], SHGC = [0.48]***
5. ***Opal 7-wall panel: U-factor = [0.28], SHGC = [0.39]***
6. ***Opal IR 7-wall panel: U-factor = [0.26], SHGC = [0.30]***
7. ***For optional panel values, please contact DGI.***
8. Solar Performance:
9. Visible light transmission
	* 1. ***[Enter panel color same as section 1.2/F.4]***
		2. ***[Enter Visible Light Transmission from choices below]***
			1. ***Clear 3-wall = 72% VLT***
			2. ***Opal 3-wall = 35% VLT***
			3. ***Bronze 3-wall = 35% VLT***
			4. ***Clear “X”-wall = 57% VLT***
			5. ***Opal “X”-wall = 27% VLT***
			6. ***Optional panel Visible Light Transmission values available, please contact DGI.***
10. Flammability:
	* 1. Panel shall have a CC1 fire rating classification when tested in accordance with ASTM D 635 or equivalent.
		2. The panel shall have a Class A flame Spread and smoke developed rating when tested in accordance with ASTM E 84.
		3. Panel shall have an ignition temperature of 896 degrees F when tested in accordance with ASTM D 1929.

**1.3 SUBMITTALS**

1. Product Data Sheets: Submit manufacturer's product data, including details of construction and installation, materials and finish and installation instructions applicable to the configuration.
2. Shop Drawings:
	1. Shall include Plans and / or elevations and details of the system and its installation. Flashing sealants and anchorage shall be clearly indicated.
	2. Shall note gauges of brake metal, the finish on the framing and any other information required to properly describe and install the system.
3. Samples for Selection: Submit manufacturer’s samples for each glazing type (4” x 6”), framing system (4”), finish, and color specified.
4. Manufacturer’s Certification: Submit manufacturer’s certification that materials comply with specified requirements and are suitable for intended application.
5. Manufacturer’s Project References: Submit list of completed projects including project name and location, name of architect, and type of daylighting manufactured.
6. Warranty: Submit manufacturer's standard warranty.
7. Test Reports:
8. *ASTM D 635 - Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.*
9. *ASTM D 1929 – Ignition Temperature of Plastics.*
10. *ASTM E 1996 – Small Missile impact*
11. *ASTM E 1886 – Air Pressure Cycling*
12. *ASTM E 84 - Surface Burning Characteristics of Building Materials.*
13. *ASTM E 283 – Air Infiltration.*
14. *ASTM E 308 – Color Change*
15. *ASTM E 313 - Yellowness*
16. *ASTM E 330 – Structural Performance.*
17. *ASTM E 331 – Water Penetration.*
18. *NFRC 102 – Thermal Performance.*
19. *NFRC 201 - Solar Heat Gain Coefficient.*
20. *NFRC 202 – Visible Transmittance at Normal Incidence*.

**1.4 WARRANTY**

1. Warranty: Written warranty, executed by the manufacturer agreeing to repair components of Series 3500 40mm Polycarbonate Glazing system that fail in materials or workmanship within the specified warranty period. Failure includes, but are not limited to the following:
	1. Structural failures.
	2. Failure of systems to meet performance requirements.
	3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
	4. Water leakage; defined as uncontrolled water appearing on normally exposed interior surfaces of the glazing system from sources other than condensation, resulting from defects in the Series 3500 system materials or workmanship. [Water controlled by flashing and gutters and drained back to the exterior and that cannot damage adjacent materials or finishes is not water leakage]. Water leakage resulting from improper installations not part of the warranty.
2. System Warranty: Provide written warranty from manufacturer agreeing to replace materials that exhibit defects from manufacturing or fabrication that contribute to water leakage (as defined above) or Structural failure. The manufacturer will, in a timely fashion, furnish (only) new components to replace those found to be defective.
	1. ***Warranty Period: [2]*** year from date of shipment from manufacturer.
3. Polycarbonate Warranty: Provide written warranty from manufacturer agreeing to repair or replace work that has or develops defects in the polycarbonate panels. “Defects” is defined as abnormal aging or deterioration.
	1. ***Warranty period for polycarbonate: [10]*** years from date of shipment from manufacturer against the following.
		1. Yellowing – The changes of yellowing index established in accordance with ASTM D 1925 standard should be less than 10 delta after 10 years, in relation to the original value.
		2. Change in light transmission of no more than 6% per ASTM D 1003, in relation to the original value.
		3. No delamination of panel affecting appearance, performance or structural integrity of the 40mm cellular polycarbonate glazing panel.
		4. No breakage due to direct effect from weather conditions and hail impact as defined by manufacturers written warranty submitted as part of section ***[1.3/F]*** in this specification.
4. Finish Warranty: Provide written warranty from manufacturer agreeing to repair or replace work with finish defects. “Defects” is defined as peeling, chipping, chalking, fading, abnormal aging or deterioration and failure to perform as required.
	1. **Warranty Period for “Anodized” finish:**
		1. [10] Years from date of shipment from manufacturer.
		2. Longer warranty periods available upon request if specified.
	2. **Warranty Period for Fluoropolymer PVDF (“Kynar”) finish:**
		1. AAMA 2605 (70% Fluoropolymer PVDF) – [10] years from date of shipment from manufacturer.
		2. AAMA 2604 (50% Fluoropolymer PVDF) – [5] years from date of shipment from manufacturer.
	3. **Warranty for Baked Enamel finish:**
		1. AAMA 2603 – [1] year from date of shipment.
	4. **Warranty Period for “Tnemec” finish:**
		1. [10] Years from date of shipment from manufacturer.
		2. Longer warranty periods available upon request if specified.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURER**

A. Basis-of-Design Product: ***Series 3500 40mm Polycarbonate Glazing System*** by Duo-Gard Industries Inc., 40442 Koppernick Road, Canton, Michigan 48187. Phone (734) 207-9700. Fax (734) 207-7995. Web Site: www.duo-gard.com.

1. Substitutions: Manufacturers shall not be considered without prior approval in writing no later than ten (10) calendar days prior to bid. Substitute manufacturers must have been in the vertical glazing manufacturing for not less than a period of 15 years and must submit to the Architect the following:
	1. List of similar projects successfully completed within the last 5 years.
	2. Proof of financial capability.
	3. Complete details of proposed glazing system.
	4. Complete specifications for Architect’s review.
	5. Include proof of conformance and test reports per section 1.3/G.
		1. Any exceptions taken from this specification must be noted on the approval request. A list of all approved manufacturers and products will be issued by addendum. No other manufacturers will be acceptable. No verbal approvals will be given. Listing manufacturer’s names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements.

**2.2 MATERIALS**

1. Framing System:
	1. Shall be extruded aluminum alloy of 6063-T5, 6005-T5 or 6061-T6 ASTM B 221. All sections shall be formed true to detail and free from defects impairing appearance, strength and durability. Provide integral weep holes in factory supplied sill extrusions and welded corner assemblies to provide end dams.
	2. Thermally improved perimeter aluminum framing members, exclusive of cover caps, shall incorporate minimal thermal bridge location only at fastener locations typically 18” on center unless otherwise noted. Thermal isolation is created through the practice of isolating the components through non-thermally conductive materials.
2. Glazing Gaskets:
	1. Shall be elastomeric, having low friction where in contact with the glazing panel.
	2. Shall be compatible with the polycarbonate glazing panel.
3. Fasteners:
	1. In general, concealed fasteners are to be used for all aluminum framing unless noted in submittal drawings.
	2. In system construction, the use of adhesives and sealants are not allowed.
	3. Where exposed, fasteners shall be stainless steel with stainless steel backed neoprene washers
	4. Concealed fasteners may be stainless steel or zinc-plated steel in accordance with ASTM specifications A165-55 or A164-55.
	5. Bolts, anchors and other fastening devices shall be as required for the strength of the connections and shall be suitable for conditions encountered. Washers shall be of the same material as the fasteners.
4. Sealants: Single component, non-sag, high performance, non-priming, gun grade sealant furnished by glazing manufacturer.
	1. Factory-Applied Sealant: Gunnable, non-hardening, elastomeric sealant. ASTM C 920, Type S, Class 12, Grade NS. Fed Spec TT-S-1657, Type 1.n.
	2. Field-Applied Sealant: Approved by translucent insulated daylighting manufacturer.
	3. Sealant conforms to USDA approval standards.
5. Flashing:
	1. Minimum of .040” thick Aluminum.
	2. Factory formed to project profile(s) in 10-ft. lengths, whenever practical, to allow for field trimming and fitment to suit as-built conditions.
	3. The finish on this flashing metal shall match as closely as possible the finish on the aluminum framing members.
	4. Concealed flashing: Manufacturer’s standard corrosion resistant, non-staining, non-bleeding flashing compatible with adjacent materials
	5. Exposed flashing: Aluminum sheet alloy of 5005-H34, thickness as required for proper performance per application.
6. Polycarbonate Glazing Panels:
	* 1. The extruded panels shall be uniform in color with an integral extruded multi-cell core. The panel’s exterior and interior face shall be interconnected and spaced apart by continuous ribs, perpendicular and/or be diagonal “cross” pattern between the exterior and interior face. The space between the faces, in cross section, shall be divided into multiple adjacent intermediate walls parallel to each other. Dual panel and dual wall system with an interstitial space shall not be permitted.
		2. Panels shall consist of a polycarbonate resin with a permanent, co-extruded, ultraviolet protective layer on both faces of the panel. This protective layer shall be co-extruded by the manufacturer during the original manufacturing process of the panel and shall be a permanent, non-removable, part of the panel. Post applied coating or films of dissimilar materials are unacceptable and not allowed.
		3. Provide Modular, Tongue and Groove interconnecting, multi-walled polycarbonate panel as follows:
			1. Thickness: 40mm (1.57 or 1-9/16 inch) nominal.
			2. Manufactured in The United States.
			3. Color selected from manufacturer’s standard available colors by Architect.
			4. Extruded one single length for each glazing area. Transverse connections are not acceptable.
			5. Provide panel with the following Visible Light Transmission: ***[Enter panel VLT from Section line 1.2/J.1.b]***

**2.3 FABRICATION**

A. Fabricate framing components as follows:

* 1. Factory prepare, fit and assemble components where practical prior to delivery.
	2. Fabricate components that, when assembled, will fit precisely and accurately with mitered or coped ends producing hairline joints free of burrs and distortion.
	3. Fabricate components to accommodate thermal expansion and contraction, field adjustment and provide minimum clearance and shimming for proper glazing system installation and performance.
	4. Fabricate components to properly drain water passing through joints; drain condensation and moisture occurring and mitigating within glazing system to the exterior through internal guttering and a weep system.
	5. Fabricate components to ensure that glazing is properly isolated for low friction thermal and physical movement within the glazing system.
	6. Fabricate components with straight, sharp profiles and edges free from defects or deformations before finishing.
	7. Fabricate, fit and assemble components to the greatest extent practical before finishing.
	8. Reinforce components and member as required to retain fastener thread and engagement.
	9. Fabricate glazing retainer bars for fastener placement at 12” on center.
	10. Weld components before finishing and in concealed location to greatest extent practical to minimize distortion and/or discoloration.
1. Provide aluminum framing to the longest lengths possible to minimize splice joints. Splice joints will be sealed and locked with at least a six inch offset between frame components.
2. Provide welded corner assemblies were practical.
3. Prepare aluminum framing components for anchors and connection devices, fasteners and hardware.
4. Glazing Panels:
	1. Polycarbonate panels will be extruded and fabricated in one single length for each glazing area. Transverse panel connections are not acceptable. One glazing area is defined as the area between 2 adjacent tongue and groove joints, from head to sill framing.
	2. Glazing panels will be shop fabricated to a “rough” size allowing easy field cutting/fitting to accommodate proper thermal movement within aluminum framing based on seasonal conditions at time of installation.
	3. The internal cellular structure of the glazing panel will be properly blown clean of any manufacturing debris prior to shipment and installation.

**2.4 ALUMINUM FINISHES**

1. General: Comply with NAAMM “Metal Finish Manual” recommendations for application and designations of finishes.
2. Finish designations prefixed by AA conform to the system for designations of aluminum finished established by the Aluminum Association.
	1. “Clear” Anodized Finish: Class 1 AA-M10 C22 A41 in accordance with AAMA 611-12 Architectural Class 1 Clear anodized finish.
	2. “Color” Anodized Finish Class 1 AA-M10 C22 A42/A44 in accordance with AAMA 611-12 Architectural Class 1 anodized finish.
		1. Color: **[Insert Color choice from below].**
			1. (“Bronze” / “Champagne” / “Black”)
	3. 70% Fluoropolymer PVDF “Kynar” Finish: complying with AAMA 2605.
		1. Standard Color: **[insert color from standard color chart]**
		2. Custom Color upon request: **[provide required custom color code and manufacturer information for custom color match]**
	4. 50% Fluoropolymer PVDF “Kynar” Finish: complying with AAMA 2604.
		1. Color: **[insert color from standard color chart]**
		2. Custom Color upon request: **[provide required custom color code and manufacturer information for custom color match]**
	5. Baked Enamel Finish: complying with AAMA 2603.
		1. Color:**[insert color from standard color chart]**
		2. Custom Color upon request:**[provide required custom color code and manufacturer information for custom color match]**

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

1. Examine areas to receive translucent glazing. Notify Contractor / Architect of conditions that would adversely affect installation or subsequent utilization of daylighting. Do not proceed with installation until unsatisfactory conditions are corrected.
2. Ensure supports to receive translucent insulated daylighting are clean, flat, level, plumb, square, accurately aligned, and correctly located.
3. All submitted opening sizes, dimensions and tolerances are to be field verified by the installer unless otherwise stipulated.
4. Installer to examine site conditions to verify readiness. Notify general contractor or owner about any defects requiring corrections, including but not limited to improperly sloping sill substrates and uneven planar substrates. Do not work until conditions are satisfactory

**3.2 INSTALLATION**

1. Install components in strict accordance with manufacturer’s instructions and approved shop drawings. Use proper fasteners and hardware for material attachments as specified.
2. Use methods of attachment to structure which include provisions for thermal movement.

C. Glazing shall be installed in accordance with panel and system manufacturer’s guidelines.

D. Install daylighting including flashing, fasteners, hardware, gaskets, joint sealants, and glazing materials required for a complete, weathertight installation.

E. Remove all protective coverings on polycarbonate panels during or immediately after installation.

F. Apply joint sealants in accordance to sealant and system manufacturer’s guidelines. Use sealant approved by system manufacturer as specified previously in specification.

G. Repair any minor installation marks or damage to metal finish in accordance with manufacturer's instructions and as approved by Architect. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

**3.4 CLEANING**

1. During installation, protect exposed surfaces against accumulation of paint, caulking, disfiguration and damage.
2. Interior glazing surfaces shall be cleaned as the panels are being installed. The exterior shall be cleaned as each phase of the work is completed.
3. Remove excess joint sealant in accordance with sealant manufacturer's instructions.
4. Clean inside and outside of glazing panels immediately after installation and after joint sealants have cured.
5. Follow panel manufacturer’s instructions when cleaning exposed panel surfaces. Clean polycarbonate and frame at time of installation.
6. Clean glazing panels in accordance with panel and system manufacturer’s instructions and guidelines.
7. Do not use harsh cleaning materials or methods that would damage metal finish or glazing.

**3.5 PROTECTION**

A. Protect installed translucent insulated daylighting from damage during construction.

B. Remove and replace damaged daylighting components as determined by Architect.

**END OF SECTION**