SECTION 084413 – GLAZED ALUMINUM CURTAIN WALLS

SECTION 084423 – STRUCTURAL SEALANT GLAZED CURTAIN WALLS

TUBELITE 400 SERIES FORCEFRONT STORM CURTAINWALL

**PART 1 – GENERAL**

* 1. **SUMMARY**
1. Section Includes
	1. Glazed aluminum curtain walls and structural sealant glazed curtain walls.
	2. Embedded items and connections for attaching systems to building structure as indicated on drawings.
	3. Available Tubelite 400 Series ForceFront Storm systems:
		1. 400 Series ForceFront Storm 7 13/16”overall depth with 1 5/16” glazing *<specify one: SECTION 084413 outside glazed with pressure plate (Captured), SECTION 084423 outside structural sealant glazed (SSG), or combination of Captured and SSG >.*
	4. **REFERENCE STANDARDS**
2. AAMA - American Architectural Manufacturers Association ([www.aamanet.org](http://www.aamanet.org))
	1. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2012
	2. AAMA 501.2 – Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; American Architectural Manufacturers Association; 2009 (part of AAMA 501)
	3. AAMA 609 and 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2009
	4. AAMA 611 - Voluntary Standards for Anodized Architectural Aluminum; 2012
	5. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013
3. ASTM International (American Society for Testing and Materials; [www.astm.org](http://www.astm.org))
	1. ASTM A36/A36M – Standard Specification for Carbon Structural Steel; 2008
	2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012
	3. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2011
	4. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012
	5. ASTM D523 - Standard Test Method for Specular Gloss; 2008
	6. ASTM D2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2011
	7. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity; 2011
	8. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2007
	9. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004
	10. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2010
	11. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2009
4. The Society for Protective Coatings ([www.sspc.org](http://www.sspc.org))
	1. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002
5. LEED – Leadership in Energy and Environmental Design
6. NAAMM – National Association of Architectural Metal Manufacturers

	1. **ADMINISTRATIVE REQUIREMENTS**
7. Coordinate with installation of other components that comprise the exterior enclosure.
8. Pre-installation Meeting:
	1. Attendees:
		1. Owner
		2. Architect
		3. General Contractor
		4. Installer
	2. **PERFORMANCE REQUIREMENTS**
9. Design Wind Loads
	1. Provide curtain wall system, including but not limited to anchorage capable of withstanding wind load design pressures per hurricane testing TAS 202 A/W/S, TAS 201 large (LMI)/small missile impact (SMI), TAS 203 cyclic load test:
		1. Captured twin span with wet glazed SG/PVB glazing
			1. SMI +78/-71 psf
			2. LMI +/-70 psf
		2. Captured single span for LMI
			1. +/-70 psf dry glazed
			2. +/-90 psf wet glazed SG glazing
			3. +/-65 psf wet glazed PVB glazing
		3. SSG twin span with wet glazed SG/VS02/PVB glazing for SMI/LMI
			1. +/-63.3 psf
		4. SSG single span with wet glazed SG/VS02 glazing for LMI
			1. +/-90 psf

*NOTE: Tubelite is not responsible for determination of wind loads. This information is the responsibility of the building’s design engineer.*

1. Air, Water, Structural Performance
	1. Air Infiltration: Air infiltration shall not exceed 0.060 cfm (0.00003 m^3/s) per square foot (0.09 m^2) at 6.24 psf (299 Pa) static air pressure differential, when tested in accordance with ASTM 283.
	2. Water Leakage: There shall be no uncontrolled water entry at 15.6 psf (746 Pa) static test pressure as defined in AAMA 501.
	3. Structural Performance: Structural performance shall be based on a maximum allowable deflection of L/175 of the clear span for spans up to 13’-6” (4115 mm) or L/240 of clear spans plus ¼” (6mm) for spans greater than 13’-6” (4115 mm), or an amount that restricts edge deflection of individual glazing lites of glass to ¾” (19 mm), whichever is smaller.
	4. Thermal Cycling: There shall be no buckling, stress on glass, edge seal failure, excess stress on structure, anchors and fasteners, or reduction in performance when tested in accordance with AAMA 501.5 at a temperature range of 0 degrees F (-18 C) to 180 degrees F (82 C).
	5. Seismic Cycling: There shall be no life or safety type failures (glass breakage, anchor failures, structural damage, etc.) when tested in accordance with AAMA 501.4, seismic test (lateral cycling).
	6. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
	7. **SUBMITTALS**
2. See Section 01 3000 – Administrative Requirements, for submittal procedures.
3. Product Data: Submit for each component within assembly, including material descriptions, component profiles, finishes, anchorage and fasteners, glazing, and internal drainage.
4. Shop Drawings: Submit system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.
5. Include scaled shop drawings showing detailed relationships with glazing, flashing, internal drainage, joinery, and provisions for thermal expansion.
6. Design Data: Submit framing member structural and physical characteristics, [engineering calculations], and [dimensional limitations].
7. Samples: Submit [two] or [\_\_\_] framing member samples [3 inch long] illustrating aluminum surface finish as indicated.
8. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
9. [Sustainable Design Submittals] or [LEED Reports]:
	1. Submit documentation from manufacturer for amounts of pre-consumer and post-consumer recycled content for products specified, and include statement indicating costs of materials having recycled content.
	2. **QUALITY ASSURANCE**
10. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least [twenty] or [\_\_\_] years of [documented] experience.
11. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State that the Project is located.
12. Installer: Company specializing in performing work of this section and approved by manufacturer with at least ~~[twenty]~~ [\_\_\_] years of [documented] experience.
13. Source Limitations: Obtain each component of curtain wall and entrance systems from single source and from single manufacturer.

	1. **DELIVERY, STORAGE, AND HANDLING**
14. Handle aluminum products of this section in accordance with AAMA CW-10.
15. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.
16. Remove protective covering from aluminum framing prior to installation.

	1. **FIELD CONDITIONS**
17. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of this Work to be performed according to manufacturer's installation instructions and warranty requirements.
18. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before fabrication of curtain wall framing and indicate measurements on Shop Drawings.
	1. Coordinate with construction schedule.
19. Install sealant according to sealant manufacturer guidelines.
	1. **WARRANTY**
20. Refer to Section 01 7800 - Closeout Submittals, for additional warranty requirements.
21. System Warranty: Manufacturer agrees to repair or replace supplied components of glazed curtain walls that do not comply with requirements or that fail in materials or workmanship within two years from date of Substantial Completion.
	1. Failures include, but are not limited to, the following:
		1. Structural failures including, but not limited to, excessive deflection of framing members.
		2. Noise or vibration created by wind and thermal and structural movements.
		3. Water penetration through fixed glazing and framing areas beyond amount allowed by performance criteria test standards as indicated.
		4. Failure of operating components.
22. Finish Warranty: Manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period. *<specify desired finish>*
	1. Superior Organic Coating: In accordance with AAMA 2605 test procedures for 70 percent PVDF resin on aluminum curtain wall framing.
		1. Fading, Loss of Color Retention: Minimum loss of 5 Delta E units (Hunter) in accordance with ASTM D2244.
		2. Chalking, Chalky White Powder on Aluminum Surfaces: Chalking minimum of No. 8 for colors or minimum of No. 6 for white in accordance with ASTM D4214.
		3. Loss of Adhesion: Loss of 10 percent due to cracking, checking or peeling, or failure to adhere to bare metal.
		4. Gloss Retention: Minimum of 50 percent in accordance with ASTM D523.
		5. Salt Spray, Accelerated: At least 4,000 hours in accordance with ASTM B117.
		6. Humidity Testing, Accelerated: At least 4,000 hours in accordance with ASTM D2247.
		7. Warranty - maximum 20 years.
	2. Anodized Coating: In accordance with AAMA 611 standards for [Class 1] or [Class II-Clear] on aluminum curtain wall framing.
		1. Loss of Adhesion: Resists cracking, crazing, flaking, and blistering when forming and welding completed prior to finishing; post forming or welding voids warranty.
		2. Fading, Loss of Color Retention: Minimum loss of 5 Delta E units (Hunter) in accordance with ASTM D2244.
		3. Chalking, Chalky White Powder on Aluminum Surface: Chalking minimum of No. 8 in accordance with ASTM D4214.
		4. Salt Spray, Accelerated: At least 3,000 hours (Class I) and 1,000 hours (Class II) in accordance with ASTM B117.
		5. Warranty - maximum 10 years.

**PART 2 – PRODUCTS**

* 1. **MANUFACTURER**
1. Basis of Design – Glazed Aluminum Curtain Wall
	1. 400 Series ForceFront Storm 7 13/16”overall depth with 1 5/16” glazing *<specify one: SECTION 084413 outside glazed with pressure plate (Captured), SECTION 084423 outside structural sealant glazed (SSG), or combination of Captured and SSG >.*
	2. Substitutions
		1. Manufacturer’s products that meet specified design requirements may be considered as a substitution. Substitution requests / submittals must include the following, and be submitted at least ten (10) working days prior to the bid date.
			1. Submittal information must include test reports as specified in performance sections.
			2. Copy of manufactures warranty
			3. Any additional information as requested
			4. System details / samples
	3. **GLAZED CURTAIN WALL**
2. Aluminum glazed curtain wall: factory finished aluminum shear clip or screw-spline framing members with infill, and related flashing, anchorage and attachment devices.
	1. Construction: Thermally broken.
	2. Shop or field assembly.
	3. Overall captured system dimensions with standard 3/4” deep face cover. Additional face cover depths are available.
		1. 7 13/16”overall depth with 1 5/16” infill
		2. Exterior sightline of 2-1/2” for standard vertical and horizontal mullions.
	4. System to be captured on all four sides, structurally silicone glazed, or a combination of both as indicated on drawings and details.
	5. Utilize aluminum pressure plates.
3. Finish: [High performance clear anodized finish] [High performance color anodized finish] or [Superior performance organic coating] *<specify desired coating>*.
	1. Factory finish surfaces exposed in completed assemblies.
	2. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
4. Anodized Color: [Clear] [Medium Bronze] [Light Bronze] [Dark Bronze] [Extra dark Bronze] [Black] [Copper] [Champagne] [As scheduled] or [As selected by Architect from manufacturer’s standard line of colors] *<specify desired color>*.
5. Painted Color: [<\_\_\_>] [As scheduled] or [As selected by Architect from manufacturer’s standard line of colors].

	1. **COMPONENTS**
6. Glass: Refer to Section 08 8000.

	1. **MATERIALS**
7. Extruded Aluminum: Alloy 6063-T6 in accordance with ASTM B221, and extruded within commercial tolerances and free from defects that impair strength and/or durability.
8. Recycled Content: For aluminum extrusions, except those required for doors and door frames, provide manufacturer’s product fabricated from aluminum with 70 percent or greater recycled content.
	1. Product: EcoLuminum™ by Tubelite Inc.
9. Structural Steel Sections: ASTM A36/A36M; [galvanized in accordance with requirements of ASTM A123/A123M] or [shop primed]. Refer to Section 05 1200.
	1. Where galvanizing is not compatible with alloy of component parts, apply heavy coating of epoxy paint where necessary to prevent galvanic action with dissimilar materials.
10. Structural Supporting Anchors: Refer to Section 05 1200.
11. Glazing Gaskets: Glazing is held in place at the interior and exterior of the frame with a push-in EPDM gasket.
12. Fasteners: [Stainless] or [Galvanized] steel.
13. Inserts: Provide galvanized steel or cast iron inserts of suitable design and adequate strength for condition of use.
14. Exposed Flashings: [0.032 inch] or [<\_\_\_> inch] thick aluminum sheet; finish matching framing members.
15. Concealed Flashings: [0.018 inch] or [<\_\_\_> inch] thick [galvanized steel] [stainless steel] or [aluminum] sheet.
16. Perimeter Sealant: Refer to Section 07 9005.
17. Galvanizing Repair Paint: High zinc content paint for over welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight and in compliance with SSPC Paint 20.
18. Bituminous Paint: Cold applied asphalt mastic, containing no asbestos fibers.
19. Thermal Break: Mullion construction shall consist of continuous polyamide thermal struts which completely separates the interior portion of the back member from the exterior.

	1. **ACCESSORIES**
20. Light shelves: Provide light shelves to allow more natural daylight and less artificial lighting needs. Light shelves shall effectively increase the amount of natural daylight reaching deeper into occupied areas which shall reduce the need for artificial light.
	1. Basis of design: “aLuminate Light Shelves” as manufactured by Tubelite, Inc.
	2. **FABRICATION**
21. Ensure joints and corners are flush, hairline and weatherproof, accurately fitted and secured.
	1. Prepare framework to receive anchors and hardware.
	2. Conceal fasteners and attachments from view.
	3. Reinforce framework as required for imposed loads.
22. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
23. System Internal Drainage: Drain to exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
	1. Fabricate drainage system so weeps and flashings are integral to system and others are not required.
24. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
25. Movement: Allow for movement between curtainwall and adjacent construction, without damage to components or deterioration of seals.
26. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
27. Air and Vapor Seal: Maintain continuous air barrier and moisture vapor retarder throughout assembly, primarily in line with inside pane of glazing [and inner sheet of infill panel] and heel bead of glazing compound.
	1. Refer to Section 07 2500.
	2. **FINISHES**
28. Comply with NAAMM's - Metal Finishes Manual for Architectural and Metal Products, for recommendations of designating finishes.
29. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride (PVDF) resin system.
	1. Two-Coat Fluoropolymer: AAMA 2605, fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' installation instructions.
	2. Three-Coat Fluoropolymer: AAMA 2605, fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' installation instructions.
	3. Two-Coat Mica Fluoropolymer: AAMA 2605, fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' installation instructions.
	4. Four-Coat Fluoropolymer: AAMA 2605, fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat and clear coats. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' installation instructions.
30. Color Anodized Finish: AAMA 611, Class I, AA-M10C21A44 electrolytically deposited colored anodic coating not less than 0.7 mils thick.
31. Clear Anodized Finish: AAMA 611, Class I, AA-M10C21A41 clear anodic coating not less than 0.7 mils thick.
32. Clear Anodized Finish: AAMA 611, Class II, AA-M10C21A31 clear anodic coating not less than 0.4 mils thick.
33. Field Touch-Up Materials: As recommended by coating manufacturer for field application.

**PART 3 – EXECUTION**

* 1. **VERIFICATION OF CONDITIONS**
1. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of this Work.
2. Notify Contractor in writing, with a copy sent to Owner and Architect, of any conditions detrimental to proper and timely completion of this Work.
3. Proceed with installation only after unsatisfactory conditions have been corrected.
4. Start of this Work shall indicate acceptance of areas and conditions as satisfactory by the Installer.

	1. **PREPARATION**
5. Coordinate and furnish anchors, concrete inserts, sleeves, anchor bolts, and other accessories to be embedded in concrete or masonry construction.
	1. Coordinate delivery of these items to Project site.
	2. **INSTALLATION**
6. Install curtain wall framing assemblies in accordance with manufacturer's installation instructions, reviewed product data, approved shop drawings, and as indicated on Drawings.
7. Do not install damaged components.
8. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
9. Provide alignment attachments and shims to permanently fasten system to building structure.
10. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, [aligning with adjacent work].
11. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
12. Install sill flashings with end dams; turn up ends and edges; seal to adjacent work to form water tight dam.
13. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
14. Coordinate attachment and seal of perimeter air and moisture vapor barrier materials.
	1. Refer to section 07 2500.
15. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
16. Install accessories with positive anchorage to building, weather tight mounting, provisions for thermal expansion, and coordinate installation with flashings and other components.
17. Install hardware using templates provided.
	1. Refer to Section 08 7100 for hardware installation requirements.
18. Install glass in accordance with Section 08 8000, using glazing method required to achieve performance criteria.
19. Install perimeter sealant in accordance with Section 07 9005.
20. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

	1. **TOLERANCES**
21. Maximum Variation from Plumb: [0.06 inches] or [<\_\_\_> inches] every 3 ft non-cumulative, or [1/16 inches] or [<\_\_\_> inches] per 10 ft, whichever is least.
22. Maximum Misalignment of Two Adjoining Members Abutting in Plane: [1/32 inch] or [<\_\_\_> inch].

	1. **ADJUSTING**
23. Adjust operating hardware for smooth operation.

	1. **CLEANING**
24. Comply with AAMA 609 and 610 for methods, equipment, and materials to clean finished aluminum after installation and for subsequent periodic maintenance.
25. Remove protective material such as non-adhesive papers, adhesive papers and strippable plastic films from pre-finished aluminum surfaces as soon as there is no longer a need for protection.
26. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths.
27. Take care to remove dirt from corners, and wipe surfaces clean.
28. Remove excess sealant from glass and aluminum by method acceptable to sealant manufacturer.

	1. **PROTECTION**
29. Protect installed products from damage during subsequent construction.
30. Protect anodized finishes from prolonged exposure to alkaline, such as lime in masonry mortar, or acidic and other corrosive materials.

DISCLAIMER STATEMENT

This guide specification is intended to be used by a qualified construction specifier. The guide specification is not intended to be verbatim as a project specification without appropriate modifications for the specific use intended. The guide specification must be used and coordinated with the procedures of each design firm, and the particular requirements of a specific construction project.

Tubelite reserves the right to change configuration without prior notice when deemed necessary for product improvement.

Laws and building and safety codes governing the design and use of glazed entrance, window, and curtain wall products vary widely. Tubelite does not control the selection of product configurations, operating hardware, or glazing materials, and assumes no responsibility thereof.

**END OF SECTION 084413, 084423**

This document supersedes all previous versions.