**PART 1 GENERAL**

* 1. **SUMMARY**
1. Section Includes Tubelite aluminum windows and all components and installation accessories supplied with the system.
	1. Tubelite Phantom 5000 Series zero sightline windows:
		1. Awning
		2. Casement
	2. **RELATED PRODUCTS**
2. Single Manufacture: All products in divisions listed below shall be supplied by a single manufacturer. To ensure consistency in quality, warranty, finish, and product compatibility, products supplied by different manufacturers are not acceptable.
	1. Division 08 42 13 - Aluminum Framed Entrances: *<insert Tubelite entrance products>.*
	2. Division 08 44 13 - Glazed Aluminum Curtainwalls: *<insert Tubelite curtainwall / window wall products>.*
	3. Division 08 13 16 – Aluminum Terrace Doors: *<insert Tubelite aluminum window products>.*
	4. Division 10 71 13 - Exterior Sun Control Devices: *<insert Tubelite sunshade products>.*
	5. Division 12 26 00 - Interior Daylighting Devices: *<insert Tubelite light shelf products>.*

*SPECIFIER NOTE: Review the following suggested Pre-installation Meeting and Agenda information and confirm that this Work is extensive enough to justify this meeting and edit for project specific meeting requirements.*

* 1. **ADMINISTRATIVE REQUIREMENTS**
1. Coordinate with installation of other components that comprise the exterior enclosure.
2. Pre-installation Meeting:
	* 1. Attendees: Owner’s Representative, Architect, General Contractor, Structural Engineer, Mechanical Engineer, Consultants, Window Installer. Window Manufacturer’s Representative, structural support installers, and installers whose work interfaces with windows, [\_\_\_\_\_\_\_].
	1. Agenda:
		1. Review and finalize construction schedule.
		2. Review code and project performance compliance documentation and testing requirements including product certification for energy (U-value, SHGC), condensation, ADA, acoustics, etc.
		3. Review product specific mockups and field testing requirements.
		4. Verify availability of materials, installer’s personnel, equipment, and facilities required to maintain schedule.
		5. Review means and methods related to installation, including manufacturer’s written instructions.
		6. Examine support conditions for compliance with requirements including alignment and attachment to structural members.
		7. Review flashings, membrane interface with windows, wall penetrations, openings, and conditions of other construction affecting this Work.
		8. Review temporary protection requirements for during and after installation of this Work.
	2. **PERFORMANCE REQUIREMENTS**
3. Design Wind Loads
	1. Provide aluminum window system with all structural components including but not limited to anchors and mullions based on the following wind load design pressures and the deflection and stress criteria of paragraph 1.04 B. Pressures based on Allowable Stress Design (ASD).
		1. [\_\_\_] psf positive and negative - typical zones
		[\_\_\_] psf negative - corner zones.
		2. Basic Wind Speed of [\_\_\_] mph
			1. Exposure Category [I],[II], [III]
			2. Importance factor [1], [1.15], [\_\_\_]
		3. Design criteria based on [\_\_\_] building code *or* wind pressure diagram.

 *NOTE: Tubelite is not responsible for determining design loads; this is the responsibility of the Engineer of Record for the building.*

* 1. **PERFORMANCE REQUIREMENTS (continued)**
1. Air, Water and Structural Performance:
	1. Windows shall meet or exceed the performance requirements of AAMA/WDMA/CSA 101/I.S.2/A440-11 (NAFS-11).
		1. Performance Class and Grade:
			1. Awning: AW-PG85
			2. Casement: AW-PG90
	2. Air Infiltration and Exfiltration Performance:
		1. Shall not exceed 0.1 cfm/ft2 at 6.24 psf static air pressure differential, when tested per ASTM 283.
	3. Water Infiltration Performance:
		1. Static: No uncontrolled water entry at a 15 psf static pressure differential with water applied at a minimum rate of 5 gal/ft2 hr when tested per ASTM E 331 and ASTM E 547.
	4. Structural Performance:
		1. Uniform Load Deflection Test
			1. No deflection of unsupported span L exceeding L/175 at +/- design loads when tested per ASTM E330: Awning 85 psf, Casement 90 psf.
		2. Uniform Load Structural Test
			1. System to withstand 1.5x design loads when tested per ASTM E330: Awning 127.5 psf, Casement 135 psf.
			2. There shall be no permanent deformation of main frame or sash members in excess of 0.2% of its clear span, no glass breakage, or permanent damage to fasteners, anchors, or hardware causing the window to be inoperable.
	5. Forced Entry Resistance:
		1. No entry shall be allowed when tested per ASTM F588 Grade 40.
	6. Life Cycle Testing:
		1. When tested per AAMA 910-10, there shall be no damage causing the windows to be inoperable. Testing shall include 4000 hardware cycles and thermal cycling followed by air and water infiltration.
2. Acoustic Performance:
	1. The system shall have a sound transmission class (STC) and an outdoor-indoor transmission class (OITC) rating when tested per ASTM E90 and ASTM E1332. Coordinate performance with 08 80 00 Glazing.
		1. 1” glazing: STC [33], OITC [26] *< 1/4” glass, 1/2” air space, 1/4” glass >*
		2. Test results using glass-only values are not acceptable.
3. Thermal Transmittance and Condensation Resistance Performance Requirements
	1. Thermal transmittance (U-factor) for window system shall not exceed [\_\_\_\_] BTU/hr-ft2- OF per NFRC 100.
	 *(Coordinate performance with 08 80 00 Glazing)*
		1. U-Factor performance reference data per NFRC 100 thermal simulations:

|  |  |
| --- | --- |
|  | **PHANTOM 5000 SYSTEM U-FACTOR**(BTU/hr-ft2-OF) |
| **CENTER OF GLASS U-FACTOR** (BTU/hr-ft2-OF) | **AWNING**4 side SSG andcaptured window wall | **AWNING**capturedcurtainwall | **CASEMENT**4 side SSG and captured window wall | **CASEMENT**capturedcurtainwall |
| ***aluminum spacer*** | ***warm edge spacer*** | ***aluminum spacer*** | ***warm edge spacer*** | ***aluminum spacer*** | ***warm edge spacer*** | ***aluminum spacer*** | ***warm edge spacer*** |
| 0.30 | **0.47** | **0.40** | **0.53** | **0.48** | **0.46** | **0.39** | **0.51** | **0.46** |
| 0.29 | **0.46** | **0.39** | **0.52** | **0.47** | **0.45** | **0.38** | **0.51** | **0.45** |
| 0.28 | **0.45** | **0.38** | **0.51** | **0.46** | **0.44** | **0.37** | **0.50** | **0.44** |
| 0.26 | **0.43** | **0.36** | **0.50** | **0.44** | **0.43** | **0.36** | **0.48** | **0.42** |
| 0.24 | **0.42** | **0.35** | **0.48** | **0.43** | **0.41** | **0.34** | **0.47** | **0.41** |
| 0.22 | **0.41** | **0.34** | **0.47** | **0.42** | **0.39** | **0.32** | **0.45** | **0.39** |
| 0.20 | **0.39** | **0.32** | **0.46** | **0.40** | **0.38** | **0.30** | **0.44** | **0.38** |
| 0.18 | **0.38** | **0.30** | **0.45** | **0.39** | **0.36** | **0.29** | **0.43** | **0.36** |

*NOTE: The above table for reference only. Please contact a Tubelite representative for system U-Factors using project specific glass and framing. Values determined in accordance with NFRC 100 for awning and casement configurations. Glass makeup: 1” IGU with ¼” lites, and ½”gap.*

* 1. Solar Heat Gain Coefficient (SHGC) for the window area shall not exceed [\_\_\_\_] as determined in accordance with NFRC 200. *(Coordinate performance with 08 80 00 Glazing)*
	2. **PERFORMANCE REQUIREMENTS (continued)**
	3. Condensation Resistance Factor (CRF) shall meet or exceed [\_\_\_\_]CRFframe and [\_\_\_\_]CRFglass as determined in accordance with AAMA 1503.
		1. CRF performance data:

|  |  |
| --- | --- |
|  | **CONDENSATION RESISTANCE FACTOR (CRF)** |
| **SYSTEM** | **FRAME**  | **GLASS** |
| **Awning - SSG** | **77** | **75** |
| **Awning - captured**  | **79** | **75** |
| **Casement - SSG** | **76** | **76** |
| **Casement - captured** | **78** | **76** |

 *NOTE: Table for reference only for product comparison. Values may change based on project specific glass. Please contact a Tubelite representative for more information.*

*The formation of condensation on interior surfaces is affected by many different variables outside of Tubelite’s control. Variables include but are not limited to: surrounding conditions, air flow / air circulation issues, extreme weather, HVAC settings, and unusual humidity levels. Tubelite cannot guarantee performance of system as stated above unless conditions are identical to those present in the testing procedure specified above.*

* 1. **SUBMITTALS**
1. Product Data:
	1. Manufacturer’s literature for each specified system.
	2. Components within assembly, including material descriptions, component profiles, finishes, anchorage and fasteners, glazing, and internal drainage.
2. Shop Drawings:
	1. Shop drawings must be prepared by a qualified engineering service under the employ of the [window manufacturer] [installer].
	2. Include system dimensions, framed opening requirements and tolerances, affected related Work, anchorage, expansion and contraction joint location and details, and field welding required.
	3. Include scaled shop drawings showing detailed relationships with glazing, flashing, internal drainage, joinery, and provisions for thermal expansion.
3. Design Data: Submit framing member structural and physical characteristics, [engineering calculations], and [dimensional limitations].
4. Samples:
	1. System components: Submit corner samples, anchors, fasteners, trim, and other materials as requested by the architect.
	2. Finish: Submit [two] aluminum sheet stock samples [2” x 3”] for each finish type.
5. Warranty: Submit manufacturer sample warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
6. Optional [Sustainable Design Submittals] or [LEED Reports]:
	1. *MR4.1 and MR4.2 Recycled Content*: Submit documentation from manufacturer for amounts of pre-consumer and post-consumer recycled content by weight for the products specified.
	2. *EA Credit 1 Optimize Energy Performance*: Submit documentation from manufacturer showing energy performance of system(s) beyond the prerequisite standard.
	3. *IEQ Credit 7.1 Thermal Comfort*: Submit documentation from manufacturer reflecting use of natural ventilation products.
	4. *IEQ Credit 8.1 Daylight and Views*: Submit documentation from manufacturer showing the introduction of daylight and views into regularly occupied areas as a function of percentage of these spaces exposed to such daylight and views.
	5. *MR5.1 and MR5.2 Regional Materials*: Submit documentation from manufacturer showing a minimum of 10% up to 20% (based on cost) of building materials or products extracted, harvested, recovered or manufactured within 500 miles of the project site.
	6. *MR3.1 and MR3.2 Resource Reuse*: Submit documentation from manufacturer reflecting use of a minimum of 5% up to 10% [based on weight] salvaged, refurbished or reused materials.
	7. **QUALITY ASSURANCE**
7. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least twenty years of documented experience.
8. 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.
9. Installer: Company approved by manufacturer and specializing in performing work of this section with at least [\_\_\_] years of [documented] installation experience.
10. Source Limitations: Obtain the windows and all products listed in Section 1.02 from a single manufacturer.
	1. **DELIVERY, STORAGE, AND HANDLING**
11. Materials to be packed, loaded, shipped, unloaded, stored and protected in accordance with AAMA CW-10.
12. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.
	1. **FIELD CONDITIONS**
13. 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.
14. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before fabrication of window framing and indicate measurements on Shop Drawings.
15. Install sealant according to sealant manufacturer guidelines.
16. Coordinate installation with other applicable trades.
	1. **WARRANTY**
17. Window Framing Warranty:
	1. Manufacturer agrees to repair or replace defective window components for a period of 2 [5] *<select>* years from the date of shipment. *< 5 years optional>.*
18. Finish Warranty:
	1. Warranty covers factory-applied organic and anodic finishes on exposed extruded aluminum surfaces without standing water accumulation, against peeling, checking, cracking, chalking and change of color, per applicable AAMA specifications.
		1. Paint Coatings
			1. AAMA 2605 70% PVDF:  10 [20] years *<20 years optional>*
			2. AAMA 2604 50% PVDF: 5 [10] years *<10 years optional>*
			3. AAMA 2603 Baked Enamel: 1 year (adhesion only)
		2. Anodized Coatings
			1. AAMA 611 Class I:   5 [10] years *<10 years optional>*
			2. AAMA 611 Class II:  2 years

*NOTE: Refer to Tubelite Limited Warranty and Finish Warranty for detailed exclusions, qualifications and limitations. When warranties are required, verify with Owner's counsel that warranties stated under this article are not less than remedies available to Owner under prevailing local laws. Verify the length of available warranties on the actual finish being specified.*

**PART 2 PRODUCTS**

* 1. **MANUFACTURER**
1. Basis of Design: Aluminum Windows
	1. Tubelite Inc. Phantom 5000 Series Zero Sightline: [Awning] [Casement] *<select>*
	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 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

* 1. **DESCRIPTION**
1. Zero sightline aluminum windows: Factory fabricated and finished, field glazed, corner key and crimped construction with related attachment components.
	1. Outswing [awning] [casement] *<select >.*
	2. Frame type: [flatback][captured][SSG] *<select >.*
	3. System dimensions:
		1. Depth: 4-1/4”
		2. Interior siteline: 1-3/4”
	4. Glazing Infill thickness: 1”
	5. Thermal Break for captured frame shall be pour and debridge polyurethane.
	6. **FINISHES**
2. Finish all exposed areas of aluminum window components in accordance with applicable AAMA Voluntary Finish Guide Specification: *<select from list below>.*

|  |  |  |  |
| --- | --- | --- | --- |
| **SPECIFICATION** | **DESCRIPTION** | **DESIGNATION** | **COLOR** |
| AAMA 2605 | 70% PVDF [2][3][4] coat *<select>* | Exterior Paint | [ ] *<specify color name/number>* |
| AAMA 2604 | 50% PVDF [2][3][4] coat *<select>* | Exterior Paint | [ ] *<specify color name/number>* |
| AAMA 2603 | Baked enamel | Interior Paint | [ ] *<specify color name/number>* |
| AAMA 611 | Class I - Color anodize coating,Eco-friendly etch (0.7 mils thick min) | AA-M10C21A44 |  [Black] *<contact Tubelite for other options>* |
| AAMA 611 | Class I - Clear anodize coating,Eco-friendly etch (0.7 mils thick min) | AA-M10C21A41 | Clear |
| AAMA 611 | Class II - Clear anodize coatingEco-friendly etch (0.4 mils thick min)  | AA-M10C21A31 | Clear |

1. Combination anodic oxide and transparent organic coatings as defined in AAMA 612 are not equivalent substitutions for the AAMA 611 anodized finishes shown above due to surface hardness disparities.
2. Applicator Qualifications: Certified by AAMA and listed on AAMA Verified Components List.
3. Verify accuracy of components, quantities, and sizes prior to application of finishes.
4. Applicator – PVDF Based Finishes:
	1. Use regenerative thermal oxidizer to destroy VOC’s.
	2. Utilize chrome-based five –stage pretreatment system applied in accordance with AAMA and ASTM standards. Use of a chrome-based five-stage system ensures long-term adhesion and an option for an extended warranty.
	3. Possess in-house blending capabilities, allow for only specific amount of paint needed for each project.
	4. Employ skilled professional field service division to repair warranty or application issues arising at Project site.
	5. Utilize documented quality control protocol in accordance with AAMA procedures.
5. Applicator – Anodize Finishes
	1. Utilize documented quality control protocol in accordance with AAMA 611 procedures.
		1. Online quality assurance inspection:
			1. Random sample check for color uniformity, maximum difference of 5AE.
			2. Random coating thickness testing:
				1. Class I clear and color anodize – 0.7 mils (18 microns)
				2. Class II clear anodize – 0.4 mils (10 microns)
	2. **MATERIALS**
6. Aluminum extrusions: Alloy 6063-T6 or 6063-T5 in accordance with ASTM B221, and extruded within commercial tolerances and free from defects that impair strength and/or durability.
7. Steel fasteners, screws, and bolts to be cadmium plated 300 or 400 series stainless.
8. Aluminum sheet alloy to meet requirements of ASTM B209.
9. Extruded or formed trim components will be a minimum 0.050" thick.
10. Exposed Flashings: [ “] thick aluminum sheet; finish matching framing members.
11. Concealed Flashings: [ “ ] thick [galvanized steel] [stainless steel] or [aluminum] sheet. *<select>*
12. Thermal Break for captured frames:
	1. Pour and debridge thermal barrier shall be a two part chemically curing polyurethane casting resin poured in place.
13. Glazing and Sealant material:
	1. Setting blocks: Provide in sizes and locations recommended by GANA Glazing Manual. Setting blocks used in conjunction with soft-coat low-e glass shall be EPDM [silicone].*<select>*
	2. Gaskets shall be weather-resistant, and compatible with all materials in contact.
	3. All sealants shall comply with applicable provisions of AAMA 800 and/or Federal Specifications FS-TT-001 and 002 Series.
	4. **FABRICATION**
14. Fabricate window frame and sash of extruded sections and mitered corners to sizes and profiles indicated on the approved shop drawings.
15. Ensure mitered aluminum corner joints are flush, hairline and weatherproof, accurately fitted and secured by one-piece extruded aluminum corner keys mechanically crimped into place. Seal corner joints during assembly with elastomeric sealer.
16. Expansion and Contraction: Fabricate to allow for thermal movement of materials when subjected to project temperature differential requirements.
	1. Allow for movement between adjacent construction, without damage to components or deterioration of seals.
	2. **COMPONENTS**
17. Hardware:
	1. Operator *<select>*
		1. Euro-style multi-point locking system, painted handle [grey][brown] *<select>* OR
		2. Roto-operator, painted handle and base [grey] [brown] *<select>* with multi lock linear operator, painted [grey][black][white] *<select>*
	2. Hinges *<select>*
		1. Awning: 4 bar stainless steel friction arm hinges with semi-concealed operating tension adjustment device.
		2. Casement: Extruded aluminum butt hinges, black anodized.
			1. Maximum opening 35O - stainless steel limited travel device
	3. 4” limited opening device (optional) *<specify>*
	4. Insect screens (optional) *<specify>*
		1. Insect screening mesh, count 18 x 16:
			1. aluminum - [black][bright] *<select>*
			2. fiberglass - black
		2. Screen frames: Extruded aluminum color to match interior window frame, mounted at interior with clear nylon clips.
		3. Provide wicket screen within insect screen for access to Euro-style multi-point locking handle.
18. Glass:
	1. Provide in accordance with Section 08 80 00.
19. Glazing:
	1. Glazing method shall be in accordance with manufacturer installation instruction and the GANA Glazing Manual for specified glass type, or as approved by the glass fabricator.
	2. Refer to Section 08 80 00 for requirements.

**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. **INSTALLATION**
5. Install windows in accordance with manufacturer's installation instructions, reviewed product data, approved shop drawings, and as indicated on Drawings (per Professional Engineer review when applicable).
6. Do not install damaged components.
7. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
8. Provide alignment attachments and shims to permanently fasten system to building structure.
9. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, [aligning with adjacent work].
10. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
11. Coordinate attachment and seal of membrane materials per architectural drawings. Refer to section 07 25 00.
12. Install accessories with positive anchorage to building, weather tight mounting, provisions for thermal expansion, and coordinate installation with flashings and other components.
13. Install glass in accordance with manufacturer’s installation instructions.
14. Install perimeter sealant in accordance with Section 07 92 00.
15. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.
16. Adjust and lubricate moving parts to operate smoothly and fit accurately.
17. Tolerances:
	1. Maximum variation from plumb: [1/16”] every 3’ non-cumulative, or [1/16”] per 10’, whichever is least.
	2. Maximum misalignment of two adjoining members abutting in plane: [1/32”].
	3. **CLEANING**
18. Comply with AAMA 609 and 610 for methods, equipment, and materials to clean finished aluminum after installation and for subsequent periodic maintenance.
19. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths.
20. Take care to remove dirt from corners, and wipe surfaces clean.
21. Remove excess sealant from glass and aluminum by method acceptable to sealant and finish manufacturer.

	1. **PROTECTION**
22. Protect installed products from damage during subsequent construction.
23. 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.*

*Tubelite takes no responsibility for product selection or application, including but limited to, compliance with laws, codes, merchantability or fitness for a particular purpose; and further disclaims all liability for the use in whole or in part, of these Guide Specifications in preparation of project specifications or other documents.*

**END OF SECTION 08 13 16**

This document supersedes all previous versions.