**PART 1 GENERAL**

* 1. **SUMMARY**

1. Section Includes Tubelite aluminum windows and all components and installation accessories supplied with the system.
   1. Tubelite 4000CW Series Window system:
      1. 4000CW PO FB Awning *<select>*
      2. 4000CW PO CW Awning *<select>*
      3. 4000CW PO SF Awning *<select>*
      4. 4000CW PO FB Casement *<select>*
      5. 4000CW PO CW Casement  *<select>*
      6. 4000CW PO SF Casement *<select>*
   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 43 13 – Aluminum Framed Storefronts: *<insert Tubelite storefront products>.*
   3. Division 08 44 13 - Glazed Aluminum Curtainwalls: *<insert Tubelite curtainwall*
   4. Division 08 51 13 - Aluminum Windows: *<insert Tubelite aluminum window products>.*
   5. Division 08 13 16 – Aluminum Terrace Doors: *<insert Tubelite terrace door products>.*
   6. Division 10 71 13 - Exterior Sun Control Devices: *<insert Tubelite sun control products>.*
   7. Division 12 26 00 - Interior Daylighting Devices: *<insert Tubelite daylighting products>.*

* 1. **ADMINISTRATIVE REQUIREMENTS**

1. Coordinate with installation of other components that comprise the exterior enclosure.
2. Pre-installation Meeting:
   1. Attendees:
      1. Owner
      2. Architect
      3. General Contractor
      4. Installer
   2. **PERFORMANCE REQUIREMENTS**
3. Design Wind Loads
   1. Provide aluminum window wall system, including but not limited to anchorage capable of withstanding wind load design pressures based on the following:
      1. [\_\_\_] psf positive / negative pressures in typical zones and [\_\_\_] negative pressures at corner zones.
      2. Basic Wind Speed of [\_\_\_] mph
         1. Exposure Category (I,II,III) [\_\_\_]
         2. Importance factor (1, 1.15) [\_\_\_]
      3. Local building codes

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

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 and A440S1-17 supplement.
2. Performance Class and Grade:
   1. 4000CW PO FB Awning: Class CW-PG70 *<select>*
   2. 4000CW PO CW Awning: Class CW-PG70 *<select>*
   3. 4000CW PO SF Awning: Class CW-PG70 *<select>*
   4. 4000CW PO FB Casement: Class CW-PG70 *<select>*
   5. 4000CW PO CW Casement: Class CW-PG70 *<select>*
   6. 4000CW PO SF Casement: Class CW-PG70 *<select>*
3. Air Infiltration Performance:
   1. Air Infiltration shall not exceed 0.1 cfm/ft2 at 1.57 psf static air pressure differential, when tested in accordance with ASTM 283.
   2. Air Exfiltration shall not exceed 0.1 cfm/ft2 at 1.57 psf static air pressure differential, when tested in accordance with ASTM 283.
   3. Air Infiltration (opt. @ 6.27psf) shall not exceed 0.2 cfm/ft2 at 6.27psf static air pressure differential, when tested in accordance with ASTM 283.
   4. Air Exfiltration (opt. @ 6.27psfshall not exceed 0.2 cfm/ft2 at 6.27psf static air pressure differential, when tested in accordance with ASTM 283.

*NOTE: Air testing for CW Class unites requires unites to be tested at 1.57psf test pressure, results for testing @ optional 6.26psf for CW units have been included for informational purposes only.*

1. Water Performance:
   1. Cyclic Static Air Pressure: No uncontrolled water entry at 15.0 psf Cyclic Static Air Pressure Differential when tested in accordance with ASTM E 547.
2. Structural Performance:
   1. Uniform Load Deflection Test:
      1. No deflection of any unsupported span L of test specimen in excess of L/175 at both positive and negative load when tested in accordance with ASTM E330.
         1. 4000CW PO FB Awning: 70 psf *<select>*
         2. 4000CW PO CW Awning: 70 psf *<select>*
         3. 4000CW PO SF Awning: 70 psf *<select>*
         4. 4000CW PO FB Casement: 70 psf *<select>*
         5. 4000CW PO CW Casement: 70 psf *<select>*
         6. 4000CW PO SF Casement: 70 psf *<select>*
   2. Uniform Load Structural Test:
      1. 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 when tested in accordance with ASTM E330.
         1. 4000CW PO FB Awning: 105 psf *<select>*
         2. 4000CW PO CW Awning: 105 psf *<select>*
         3. 4000CW PO SF Awning: 105 psf *<select>*
         4. 4000CW PO FB Casement: 105 psf *<select>*
         5. 4000CW PO CW Casement: 105 psf *<select>*
         6. 4000CW PO SF Casement: 105 psf *<select>*
3. Forced Entry Resistance and Insect Screen Serviceability:
   1. No entry shall be allowed when tested per ASTM F588 Grade 10.
   2. There shall be no disengagement or deformation of screen members after 13.5 lbf. test load
4. Sound Rating: The system shall have a sound transmission class (STC) and an outdoor-indoor transmission class (OITC) rating when tested in accordance with ASTM E90:
   1. 1” glazing: 34 STC, 26 OITC (1/4” tempered, 1/2” air space, 1/4” tempered)

Thermal Transmittance and Condensation Resistance Performance Requirements

* 1. Thermal transmittance (U-factor) for window system shall not exceed [\_\_\_\_] BTU/hr-ft2-OF as determined in accordance with NFRC 100. *(Coordinate with 08 80 00 Glazing)*

|  |  |  |
| --- | --- | --- |
|  | **UniVent 4000CW SYSTEM U-FACTOR** | |
|  | |
| **CENTER OF GLASS** | **4000CW PO Awning** | **4000CW PO Casement** |  |
| **U-FACTOR** | **1” Glass** | **1" Glass** |  |
| (BTU/hr-ft2-OF) | ***warm edge spacer*** | ***aluminum spacer*** |  |
| 0.24 | **0.44** | **0.42** |  |

*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 configurations using FB frame. 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 with 08 80 00 Glazing)*
  2. Condensation Resistance Factor (CRF) shall meet or exceed [\_\_\_\_] CRFframe and [\_\_\_\_] CRFglass as determined in accordance with AAMA 1503.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **4000CW PO Awning** | | **4000 PO Casement** | |
| **GLASS TYPE** | | **FRAME** | **GLASS** | **FRAME** | **GLASS** |
| **1" (dual glazed)** | | **66** | **69** | **67** | **68** |

*NOTE: The formation of condensation on interior surfaces is affected by many different variables outside of Tubelite’s control. Variables can 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. See Section 01 30 00 – Administrative Requirements, for submittal procedures.
2. Product Data: Submit for each component within assembly, including material descriptions, component profiles, finishes, anchorage and fasteners, glazing, and internal drainage.
3. Shop Drawings: Submit system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.
4. Include scaled shop drawings showing detailed relationships with glazing, flashing, internal drainage, joinery, and provisions for thermal expansion.
5. Design Data: Submit framing member structural and physical characteristics, [engineering calculations], and [dimensional limitations].
6. Samples: Submit [two] or [\_\_\_] aluminum sheet stock samples [2 inch x 3 inch long] illustrating aluminum surface finish as indicated.
7. Warranty: Submit manufacturer sample warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
8. 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 for products specified, and include statement indicating costs of materials having recycled content.
   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 cost) salvaged, refurbished or reused materials.
   7. **QUALITY ASSURANCE**
9. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least [twenty] or [\_\_\_] years of [documented] experience.
10. 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.
11. Installer: Company specializing in performing work of this section and approved by manufacturer with at least [\_\_\_] years of [documented] experience.
12. Source Limitations: Obtain each component of curtain wall and entrance systems from single source and from single manufacturer.
    1. **DELIVERY, STORAGE, AND HANDLING**
13. Handle aluminum products of this section in accordance with AAMA CW-10.
14. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.
    1. **FIELD CONDITIONS**
15. 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.
16. 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.
17. Install sealant according to sealant manufacturer guidelines.
    1. **WARRANTY**
18. Aluminum Curtainwall Framing Warranty:
    1. Manufacturer agrees to repair or replace defective ribbon window components for a period of 2 [3][5][10] years from the date of shipment. *<3, 5, and 10 years optional>.*
19. 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. UniVent 4000CW Series Window
   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. **ALUMINUM WINDOW WALL**
2. Aluminum window: Factory finished, fabricated, and assembled. Glass and glazing by installer.
   1. System dimensions (sightline x depth):
      1. 4000CW PO FB Awning: Zero” X 3-1/2” *<select>*
      2. 4000CW PO CW Awning: Zero” X 3-1/2” *<select>*
      3. 4000CW PO SF Awning: Zero” X 3-1/2” *<select>*
      4. 4000CW PO FB Casement: Zero” X 3-1/2” *<select>*
      5. 4000CW PO CW Casement: Zero” X 3-1/2” *<select>*
      6. 4000CW PO SF Casement: Zero” X 3-1/2” *<select>*

*NOTE:* System dimensions do not account for the insect screen

* 1. Glazing:
     1. Thickness: 1”
  2. Thermal Break:

1. Frame and Sash: Continuous EPDM “bulb” gasket isolators
   1. **FINISHES**
2. Finish all exposed areas of aluminum ribbon 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 | [Light Bronze],[Medium Bronze],[Dark Bronze] [Extra Dark Bronze] [Black],[Champagne], [Light Champagne], [Copper] [other] *<select >* |
| AAMA 611 | Class I - Clear anodize coating,  Eco-friendly etch (0.7 mils thick min) | AA-M10C21A41 | Clear |
| AAMA 611 | Class II - Clear anodize coating Eco-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. Utilize automated rotary atomization spray bell application providing uniform coverage with manual spray reinforcement for coverage in areas unreachable by automation.
   5. Employ skilled professional field service division to repair warranty or application issues arising at Project site.
   6. Utilize documented quality control protocol in accordance with AAMA procedures.
5. Applicator – Anodize Finishes
   1. Offer both standard eco-friendly (acid) and optional caustic (traditional) etching technologies.
   2. Utilize fully automated, computer-controlled process lines for consistency through Project.
   3. 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)
   4. **MATERIALS**
6. Extruded Aluminum: 6063-T5 or T6 alloy for primary non-radius components: 6063-T5 or T6, 6005-T5, 6105-T5 or 6061-T6 for anchor components; all in accordance with ASTM B221.
7. Optional recycled aluminum: *<specify as required>*
   1. Provide EcoLuminum™ by Tubelite containing 70% recycled aluminum comprised of 55% pre-consumer and 15% post-consumer material.
8. Principal extruded framing members will be a minimum 0.070" in thickness.
9. Extruded sash members will be a minimum 0.060" in thickness.
10. Optional 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.
11. Structural Steel Sections: ASTM A36/A36M; [galvanized in accordance with requirements of ASTM A123/A123M] or [shop primed]. Refer to Section 05 1200.
12. Sealants
    1. All sealants shall comply with applicable provisions of AAMA 800 and/or Federal Specifications FS-TT-001 and 002 Series.
    2. Frame joinery sealants shall be suitable for application specified and as tested and approved by window wall manufacturer.
13. Glass:
    1. Provide in accordance with Section 08 80 00.
14. Glazing
    1. Provide in general accordance with Section 08 80 00.
    2. Glazing method shall be in general accordance with the GANA Glazing Manual for specified glass type, or as tested and approved by the manufacturer.
15. Glazing Materials
    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 silicone.
    2. Back-bedding tapes, expanded cellular glazing tapes shall meet the requirements of applicable specifications cited in AAMA 800.
    3. Glazing gaskets shall be weather-resistant and compatible with all materials in contact.
    4. Structural silicone sealant where used shall meet the requirements of ASTM C1184.
    5. All materials and finishes in contact with structural silicone shall be tested for compatibility and approved by the sealant manufacturer for the intended application.
    6. Gaskets in continuous contact with structural silicone shall be extruded silicone or compatible material.
16. Thermal Break in starter and Receptors:
    1. Continuous extruded 6/6 polyamide nylon with 25% glass fiber reinforcing, mechanically crimped into cross-knurled cavities.
17. Weather-Stripping
    1. Dual durometer PVC, polypropylene, TPE, EPDM, neoprene, silicone, or other suitable material as tested and approved by the window wall manufacturer.
    2. **FABRICATION**
18. Fabricate window frame and sash of extruded sections.
19. Frames and sash to be mitered and crimped.
20. 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.
21. 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. Glass Drainage: Provide weep holes at sill sash and frame to drain any condensation or accumulating water to exterior.
    3. **COMPONENTS**
22. Hardware:
    1. Operator / Locks: *<specify>*
       1. Multi Point Lock Handle, PO: [silver] [white] [ black] *<select>*
       2. ROTO-operator, PO: [silver] [white] [ black] *<select>*
       3. Claw Handle, PO (used w/ ROTO): [silver] [white] [ black] *<select>*
    2. Hinges *<specify>*
       1. Awning: 4-bar stainless steel friction arm hinges
       2. Limited opening: [4”] *<select >*
    3. Insect screens (optional)
       1. Mesh, count 18 x 16:
          1. Aluminum: [bright [charcoal] *<select>*
          2. Fiberglass: [grey] [charcoal] *<select>*
       2. Extruded aluminum color to match interior window frame.
          1. 4000CW PO (with ROTO), 5/16” screen turn clips *<select>*
          2. 4000CW PO (with Wickets), 1” screen turn clips *<select>*
23. Glass:
    1. Provide in accordance with Section 08 80 00.
24. 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.

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.
   1. **PREPARATION**
4. Coordinate and furnish anchors fasteners, pocket filler inserts, shims, and other accessories.
   1. Coordinate delivery of these items to Project site.
   2. **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.

* 1. **TOLERANCES**

1. Maximum variation from plumb: [1/16”] every 3’ non-cumulative, or [1/16”] per 10’, whichever is least.

* 1. **CLEANING**

1. Comply with AAMA 609 and 610 for methods, equipment, and materials to clean finished aluminum after installation and for subsequent periodic maintenance.
2. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners, and wipe surfaces clean.
3. Remove excess sealant from glass and aluminum by method acceptable to sealant and finish manufacturer.  
   1. **PROTECTION**
4. Protect installed products from damage during subsequent construction.
5. 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 51 13**

This document supersedes all previous versions.