**PART 1 GENERAL**

* 1. **SUMMARY**
1. Section Includes Tubelite aluminum ribbon window and all components and installation accessories supplied with the system.
	1. Tubelite 900 Thermal and Ultra Thermal Ribbon Window systems:
		1. 900RW T Ribbon Window [4 1/2”] [6”]with single pour and debridged thermal barrier. *<select>*
		2. 900RW TU Ribbon Window [4 1/2”] [6”]with dual pour and debridged thermal barriers. *<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. Air Infiltration: Shall not exceed 0.060 cfm/ft2 at 6.24 psf static air pressure differential, when tested in accordance with ASTM 283.
	2. Water Performance:
		1. Static: No uncontrolled water entry at 15.0 psf static pressure differential when tested in accordance with ASTM E 331.
		2. Static Cyclic: No uncontrolled water entry at 15.0 psf static cyclic pressure differential when tested in accordance with ASTM E 547.
		3. Dynamic: No uncontrolled water entry at 15.0 psf dynamic pressure when tested in accordance with AAMA 501.1.
	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” or L/240 of clear spans plus ¼” for spans greater than 13’-6” or an amount that restricts edge deflection of individual glazing lites of glass to ¾” whichever is smaller.
	4. Live Loading Displacement: There shall be no life or safety type failures (glass breakage, anchor failures, structural damage, etc.) when tested in accordance with AAMA 501.7, live loading displacement (vertical movement): Testing to be conducted with three complete cycles of +/- ½” in the vertical direction parallel to the main elevation.
	5. 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 -20 °F to 180 °F.
	6. 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, ASTM E413 and ASTM E1332:
		1. 1” glazing = 31 STC, 25 OITC (1/4” annealed, 1/2” argon, 1/4” annealed)
	7. 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.
2. 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)*

|  |  |
| --- | --- |
|  | **900RW 4-1/2” SYSTEM U-FACTOR** (BTU/hr-ft²°F) |
| **CENTER OF GLASS U-FACTOR** (BTU/hr-ft2-OF) | **Single Thermal*****aluminum spacer*** | **Single Thermal*****warm edge*** | **Dual Thermal*****aluminum spacer*** | **Dual Thermal*****warm edge*** |
| 0.30 | **0.41** | **0.39** | **0.39** | **0.37** |
| 0.29 | **0.40** | **0.38** | **0.38** | **0.36** |
| 0.28 | **0.39** | **0.37** | **0.37** | **0.35** |
| 0.26 | **0.37** | **0.35** | **0.36** | **0.33** |
| 0.24 | **0.36** | **0.33** | **0.34** | **0.31** |
| 0.22 | **0.35** | **0.32** | **0.33** | **0.30** |
| 0.20 | **0.32** | **0.29** | **0.30** | **0.27** |
| 0.18 | **0.30** |  **0.28** | **0.28** | **0.26** |

*NOTE: Table for reference only. Please contact a Tubelite representative for system U-Factors using project specific glass and framing types and configurations. Values based on 4 ½” system depths and determined in accordance with NFRC 100 for a glazed wall configuration.*

|  |  |
| --- | --- |
|  | **900RW 6” SYSTEM U-FACTOR** (BTU/hr-ft²°F) |
| **CENTER OF GLASS U-FACTOR** (BTU/hr-ft2-OF) | **Single Thermal*****aluminum spacer*** | **Single Thermal*****warm edge*** | **Dual Thermal*****aluminum spacer*** | **Dual Thermal*****warm edge*** |
| 0.30 | **0.42** | **0.39** | **0.40** | **0.37** |
| 0.29 | **0.41** | **0.39** | **0.39** | **0.36** |
| 0.28 | **0.40** | **0.38** | **0.38** | **0.36** |
| 0.26 | **0.39** | **0.36** | **0.36** | **0.34** |
| 0.24 | **0.37** | **0.34** | **0.35** | **0.32** |
| 0.22 | **0.36** | **0.33** | **0.34** | **0.31** |
| 0.20 | **0.33** | **0.30** | **0.31** | **0.28** |
| 0.18 | **0.31** |  **0.29** | **0.29** | **0.26** |

*NOTE: Table for reference only. Please contact a Tubelite representative for system U-Factors using project specific glass and framing types and configurations. Values based on 6” system depths and determined in accordance with NFRC 100 for a glazed wall configuration.*

* 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.

|  |  |
| --- | --- |
|  | **900RW 6” SYSTEM****CONDENSATION RESISTANCE FACTOR (CRF)** |
|  | **Single Thermal** | **Dual Thermal** |
| **GLASS TYPE** | **FRAME** | **GLASS** | **FRAME** | **GLASS** |
| **1" (dual glazed)** | **68** | **70** | **72** | **72** |

 *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 Window Wall
	1. Tubelite Inc. 900RW Thermal [4 1/2”] [6”] with single pour and debridged thermal barrier *<specify one or more>.*
	2. Tubelite Inc. 900RW Ultra Thermal [4 1/2”] [6”] with dual pour and debridged thermal barriers *<specify one or more>.*
	3. 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
	4. **ALUMINUM WINDOW WALL**
2. Aluminum window wall: Shop or field fabricated, shop or field glazed, factory finished aluminum screw-spline framing members, and related flashing, anchorage and attachment devices.
	1. System dimensions:
		1. Exterior face dimension: 2-1/4”
		2. Back mullions depth: [4-1/2”] [6”] *<select>*
		3. Corner mullions
			1. 90o: [inside][outside][ *<select>*
	2. Glazing:
		1. Position: face of glass setback from exterior 1/2”
		2. Thickness: 1” [1-1/16”] [1-1/8”]*<select>*
		3. Method: System to be inside glazed, outside glazed, or a combination of both as indicated on drawings and details.
	3. Thermal barrier:
		1. Single or dual pour and debridge
	4. **FINISHES**
3. 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 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. 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: Alloy 6063-T6 in accordance with ASTM B221, and extruded within commercial tolerances and free from defects that impair strength and/or durability.
7. 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.
	1. Product: EcoLuminum™ by Tubelite Inc.
8. 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.
9. Structural Supporting Anchors: Refer to Section 05 12 00.
10. Glazing Gaskets: Glazing is held in place at the interior and exterior of the frame with a push-in EPDM gasket.
11. Fasteners: [Stainless] or [Galvanized] steel.
12. Inserts: Provide galvanized steel or cast iron inserts of suitable design and adequate strength for condition of use.
13. Exposed Flashings: [<\_\_\_> inch] thick aluminum sheet; finish matching framing members.
14. Concealed Flashings: [<\_\_\_> inch] thick [galvanized steel] [stainless steel] or [aluminum] sheet.
15. Perimeter Sealant: Refer to Section 07 90 05.
16. 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.
17. Bituminous Paint: Cold applied asphalt mastic, containing no asbestos fibers.
18. Thermal Break: Thermal barriers shall be a two part chemically curing, unfilled polyurethane casting resin poured in place for all members. Thermal barrier extrusion pour cavities shall be mechanically lanced or azobraded to secure the thermal break material.

	1. **FABRICATION**
19. 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.
20. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
21. 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.
22. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature from -20 to +180 degrees F over 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
23. Movement: Allow for movement between curtain wall and adjacent construction, without damage to components or deterioration of seals.
24. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
25. 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 25 00.
	2. **COMPONENTS**
26. Terrace Doors: Provide thermally broken terrace doors at location indicated on the architectural drawings.
	1. Basis of design: “TerraPorte 7600” terrace doors as manufactured by Tubelite, Inc. *<select>*
		1. Out-swing: single door
		2. Out-swing accessABLETM: single door
		3. In-swing: single door
		4. Refer to Section 08 13 16
	2. Operable Windows: Provide operable windows to allow natural ventilation into the building through the curtain wall system. Basis of design: “Phantom 5000” Zero Sightline Windows as manufactured by Tubelite, Inc.
		1. [Awning] [Casement] *<select>*
		2. Refer to Section 08 51 13
	3. Light Shelves: Provide light shelves at locations indicated on architectural drawings. Basis of design: “aLuminateTM Light Shelves” as manufactured by Tubelite, Inc.
		1. Refer to Section 12 26 00
27. Sun Shades: Provide sun shades at locations indicated on architectural drawings.
	1. Basis of design: “MaxblockTM Sun Shades” as manufactured by Tubelite, Inc.
	2. Blade: [round] [airfoil] [z-blade]. *<specify one or more>.*
	3. Outrigger projection: [20”] [25”] [30”] [35”] *<specify one or more>.*
		1. Refer to Section 10 71 13
28. Muntins:
	1. Provide muntin grids as shown on architectural drawings. Finish to match curtainwall frames.

**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, 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**
5. Install aluminum window wall framing assemblies 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 perimeter air and moisture vapor barrier materials.
	1. 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 hardware using templates provided.
	1. Refer to Section 08 71 00 for hardware installation requirements.
14. Install glass in accordance with Section 08 80 00, using glazing method required to achieve performance criteria.
15. Install perimeter sealant in accordance with Section 07 90 05.
16. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.
17. Adjust operating hardware for smooth operation.

	1. **TOLERANCES**
18. 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.
19. Maximum Misalignment of Two Adjoining Members Abutting in Plane: [1/32 inch] or [<\_\_\_> inch].

	1. **CLEANING**
20. Comply with AAMA 609 and 610 for methods, equipment, and materials to clean finished aluminum after installation and for subsequent periodic maintenance.
21. 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.
22. Remove excess sealant from glass and aluminum by method acceptable to sealant and finish manufacturer.

	1. **PROTECTION**
23. Protect installed products from damage during subsequent construction.
24. 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 44 13**

This document supersedes all previous versions.