# PART 1 GENERAL

* 1. SUMMARY

The installing Contractor shall be responsible for the design, engineering, fabrication (by a shade structure manufacturer), supply, shipping, unloading, shipping list verification and construction, and warranty of all materials and work specified herein.

* + 1. The intent of this Specification is to have one Contractor responsible for all work.

# RELATED DOCUMENTS

* + 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions of Division 00, Procurement and Contracting Requirements, apply to work in this section.

# REFERENCES

* + 1. ACI 315-48 - Manual of Standard Practice for Detailing Reinforced Concrete Structures
    2. ACI 318 - Building Code Requirements for Structural Concrete
    3. ASCE 7 - Minimum Design Loads for Buildings and Other Structures
    4. ASTM A 123 - Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products
    5. ASTM A 500/A 500 M - Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
    6. ASTM A603 - Standard Specification for Zinc-Coated Steel Structural Wire Rope
    7. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
    8. ASTM C109 / C109M Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
    9. ASTM C 150 - Standard Specification for Portland Cement
    10. ASTM D 1424 - Standard Test Method for Tearing Strength of Fabrics
    11. ASTM D 3451- 06 - Standard Guide for Testing Coating Powders and Powder Coatings
    12. ASTM D 3786 - Standard Test Method for Bursting Strength of Textile Fabrics
    13. ASTM D 4595 - Standard Test Method for Tensile Properties of Geotextiles
    14. ASTM E 8 - Standard Test Methods for Tension Testing of Metallic Materials
    15. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials
    16. ASTM F1554 - Standard Specification for Anchor Bolts
    17. AWS D1.1 - Structural Wedding Code – Steel
    18. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films (Test Method 2)
    19. FBC - Florida Building Code (FBC) including Chapter 16 and 3105
    20. FFPC Florida Fire Prevention Code (FFPC)

# SUBMITTALS

* + 1. The Bidding Entity shall provide documented evidence of experience on shade structure installation, including a list of ten (10) similar projects including customer, location, type, size, and total cost within the last five (5) years, and (1) one sample of plans and design calculations from a previous project. Projects provided as evidence with the Bidding Entity’s proposal shall be of comparable size and scope of work.
       1. Include in the reference a list of structure dimensions with installation dates, customer, and project locations/addresses.
    2. Qualifications of Shade Structure Manufacturer. Include the following:
       1. Brief Company History. Minimum 15 years’ experience.
       2. Business License
       3. Name, Phone Number, and email address of local Manufacturer’s Representative
       4. Name, Phone Number, email address and License Number of the Engineer of Record for the Shade Structure.
    3. Qualifications of Shade Structure Installing Contractor. Include the following:
       1. Copy of current/active State of Florida Contractor’s License
       2. Number of Years of experience in installation of Shade Structures. Minimum 5 years of experience is required.
       3. A minimum of 5 customer references of completed projects in Pinellas County Florida or other area having Basic Wind Speeds for Risk Category I and/or III per ASCE 7 Figure 26.5- 1A or 1B. Each project listed shall include the client’s name, the name and phone number of a knowledgeable person familiar with the Shade Structure project, and a complete description of the project including: project location/address, installation dates, shade type, structural details including

dimensions.

* + - 1. Business location including address, phone number, web site and principal contact with cell phone and email address.
      2. Letter from the Shade Structure Manufacturer certifying that the Installing Contractor has been trained, qualified and approved to install its products.
    1. Provide material samples and a list of colors available for fabric and powder-coatings.
    2. Site Plan showing location of the Shade Structure with respect to main educational facility and property lines. This does not have to be by land surveyor.
    3. Design Calculations for the structure and foundation signed and sealed by a State of Florida Registered Professional Engineer with extensive experience in design of shade structures demonstrating compliance with the Florida Building Code and ASCE-7. The wind design loads for any fabric or membrane-covered structure designed with a quick removal or breakaway membrane or fabric at wind velocities of 75 mph, shall be based on Section 2.1 (D) of this specification. Design calculations for the structure shall include the main frames, wind bracings (if applicable), roof framing, typical connections, etc. Design calculations shall show stresses at junction points and methods used to come up with the end reactions shown. Actual stresses versus allowable stresses shall be shown. Calculations supporting the design shall be submitted not only for the standard structure but also for modifications and for related components requiring structural design. Computer printouts shall be accompanied by sufficient design assumptions and identified input and output information to permit their proper evaluation. Engineer-of- Record shall certify the correctness of the results generated by any computer software and hardware that he/she uses in providing the engineering services.

Foundation plans and design calculations (with proper factor of safety) that are signed and sealed by a Florida Registered Professional Engineer shall be the Engineer-of- Record for the structure’s foundation.

* + 1. Drawings including details of fabrication and erection showing all structural heights, vertical clearances, connections, fabric type and grade, slope of shade roof, size and thickness of structural steel, cable size, and foundation details signed and sealed by a State of Florida Registered Professional Engineer. Note that the person who signed and sealed the above documents shall be the Engineer-of-Record for the structure. Sets of construction plans shall include as a minimum, column location plan, roof framing plan (where applicable), wind bracing plan (if applicable), elevation plans, connection details, framing member sections with dimensions, design criteria used, materials specifications, etc. Connection details and properly identified section members are needed to ease inspections. Column location plan shall show the magnitude and location of structure’s reaction on the foundation under all design conditions. It shall be the responsibility of the structure’s Engineer-of-Record to properly convey the foundation loads to the Foundation Engineer. Typical details not applicable to the project shall be crossed-out; otherwise it will be assumed to be included in the construction requirements. Therefore, the structure will be considered incomplete and unacceptable if said details are not incorporated.

Foundation plans shall designate the foundation capacity and shall include data indicating the nature of material anticipated. Site preparations requirements necessary

to provide the foundation capacity shall be specified in the foundation plans. Plans shall provide all necessary section and details including column base anchor size and embedment requirement. Anchors shall be hot-dipped galvanized. Foundation material specifications shall be provided for reinforcing steel, wire mesh, concrete, anchor bolts, etc. Indicate soil and concrete testing requirements. All concrete shall be consolidated in place using internal vibrators. Do not use vibrators to transport concrete within forms. If new slab is to be installed, check for drainage provision.

* + 1. Certification on Manufacturer’s company letterhead that the shade fabric meets or exceeds the flame propagation performance criteria of NFPA 701 or have a flame spread index not greater than 25 when tested in accordance with ASTM E 84 or UL 723. Provide also documentation of compliance with these standards.
    2. Certification on Manufacturer’s Company letterhead that the shade fabric pigment is lead-free.
    3. Copies of Shade Structure Manufacturer and Installing Contractor Warranties.
    4. Provide Manufacturer’s product information including any digital media presentation on the proposed Shade Structure(s).
    5. Once the shade structure design submittals as stated herein have been approved by the Owner, provide two 12 inch x 12 inch pieces of shade fabric in color selected for approval.
    6. Provide instructions on care of the shade fabric including any requirements for re-treating the fabric to maintain its fire-retardant classification.

# WARRANTY

* + 1. The Installing Contractor shall provide a one-year warranty on all labor and materials. The warranty shall include all labor, material, and equipment for repair or replacement of defective work and/or materials to the satisfaction of the Owner. The warranty shall include but not be limited to:
       1. Replacement of defective fabric and stitching showing signs of rot, embrittlement, cracking, tearing, mold, mildew, shrinkage, or significant color change.
       2. Repair/Replacement of foundations and steel structures showing signs of deterioration, excessive rusting, corrosion or deflection.
    2. Provide supplemental non-prorated Manufacturer’s warranties issued from date of substantial completion for the following minimums:
       1. 10-year on fabric materials including stitching.
       2. 20-year on the structural integrity of the steel frame work.
    3. The warranty shall not deprive the Owner of other rights under the provisions of the Contract Documents.

# PART 2 PRODUCTS

* 1. GENERAL
     1. The shade structure system shall be designed and certified by a Florida Registered Professional Engineer for structural soundness and manufactured to the specifications by skilled craftsmen.
     2. Shade products shall be shipped knocked-down, with complete assembly instructions ready for easy in-field installation.
     3. The Shade Structure System including but not limited to the footings, structural steel framing, fastening system, fabric, etc. shall be engineered to meet or exceed the requirements of the FBC and ASCE-7.
     4. Design the Structure to the following wind design criteria:
        1. Risk Category: III (if within 100 feet from permanent educational facilities, otherwise, design for risk category I). Any shade structure that is within 100 feet from permanent educational facilities, even if they are not student-occupied is considered a Risk Category III structure. Because they are close to an educational building, it is desired that they do not break apart and become wind-borne debris during a hurricane and damage a permanent educational building.
        2. Exposure: B or C, whichever is applicable depending on location, with the applicable coefficients and factors as outlined in Chapters 26 and 27 of ASCE 7.
        3. Frame w/ canopy: 105 M.P.H However, the wind design loads for any fabric or membrane covered structure designed with a permanent or non-removable fabric or membrane shall be for wind speed of 155 mph for Risk Category III or 135 mph for Risk Category I.
        4. Frame w/o canopy: 155 M.P.H. (for Risk Category III) or 135 M.P.H. (for Risk Category I).
        5. No reduction to applied wind pressures will be allowed due to membrane porosity or “sieve” factor. The fabric or membrane shall be considered 100% impermeable to air flow.
        6. Minimum design wind pressure applied perpendicular to all roof surfaces shall not be less than 16 psf (USD) or 9.6 psf (ASD).
     5. Design the Foundation for each of the following foundations types (Owner to verify by Soils Investigation):

Shallow Foundation: Soil Bearing Pressure: 2,000 psf

Deep Foundation: Lateral Bearing Pressure: 150 psf/ft.

* + - 1. Concrete: Minimum Strength @ 28 days: 3,000 psi; Slump: 3-5
      2. Grout: Non-Shrink, Non-Metallic: Minimum Strength @ 28 days: 4,000 psi
      3. Reinforcement Steel: ASTM A-615 Grade 60
      4. Anchor Bolts/Rods: ASTM F-1554 Grade 55 (galvanized)

# Material:

* + - 1. All materials shall be structurally sound and appropriate for safe use.
      2. Ensure product durability by the use of corrosion-resistant metals such as stainless steel, and coatings such as zinc plating, galvanizing, and powder coating on steel parts, subject to the product-specific requirements.
      3. Use fabrics with UV-stabilizers and fire retardants for longevity and safety.
    1. Packaging: Wrap all metal posts, rafters, and beams to protect the powder coat finish during shipping.
    2. Weldments: Factory/Shop weld all tubing members using Certified Welders meeting the latest edition of American Welding Society (AWS) specifications D 1.1 using E70XX Low Hydrogen and to the highest standards of quality workmanship. Finish the weldments with a zinc-rich galvanized coating. No field welding shall be permitted.

# Posts, Structural Frame Tubing, and Hardware:

* + - 1. Use cold-formed welded and seamless carbon steel structural tubing in round, square, and rectangular hollow structural sections (HSS) meeting ASTM A500/A500M, Grade B or C. Minimum Yield Strength of 42,000 psi; Minimum Tensile Strength of 58,000 psi on all posts, rafters, and beams.
      2. All fastening hardware shall be stainless steel.
      3. All steel components shall be hot-dipped galvanized per ASTM A-123 and powder- coated with a minimum 4 mils thickness. Powder-coating shall meet or exceed applicable ASTM standards for Adhesion, Color/Gloss, Hardness, Impact, Flexibility, Solvent Resistance, Overbake Resistance, and Salt Spray Resistance.
      4. All Steel Plates shall be ASTM A-572 Grade 50.

# Bolts, Nuts, and Washers:

* + - 1. Stainless Steel Bolts: ASTM F-593 Alloy Group 1 (304 SS, A-D) or Group 2 (316 SS, E-H).
      2. Nuts: ASTM F-594 Alloy Group 1 (304 SS, A-D) or Group 2 (316 SS, E-H).
      3. Washers: SS 304or SS316

# FASTENING SYSTEM

* + 1. Deliver the Shade Fabric complete with independent cables pre-inserted in fabric hems.
    2. Turnbuckles: Premium Closed Body and Open Body
    3. Wire Rope: Aircraft Grade 7 x 19
       1. (Stainless Steel) T-316 SS (Salt Air Environment – Marine Use) (Breaking Strength: varies with Material and Diameter. Specified by Design Engineer)
    4. Loop and clamp each cable at each end.
    5. Provide a Quick Release Fastening System without using special tools.
    6. Seal the rafters with no penetrations on the top side, thereby preventing water from entering.
    7. Provide instructional video DVD on handling the shade structure demonstrating the procedure for removing, and reinstalling the shade fabric.

# FABRIC

* + 1. Shade Fabric:
       1. Knitted of monofilament and tape construction high-density polyethylene (HDPE) with Ultra Violet (U.V.) stabilizers and flame retardant
       2. UV-Block Factor: 93% to 96% (color dependent)
       3. Shade Factor (visible light): 80-95% (color dependent)
       4. Normal Thickness: 0.057 inches
       5. Fabric Mass: Min 337 g/m²
       6. Light Fastness: 7-8 (Blue Wool Scale)
       7. Weather Fastness: 4-5 (Grey Scale Test)
       8. Tear Resistance: Warp 210N Weft 276 N
       9. Breaking Force: Warp 786N Weft 1544 N
       10. Bursting Pressure: Mean 3125 kPa
       11. Bursting Force: Mean 1775 N
       12. Stitching/Thread: All hems and seams are double rowlock stitched using exterior grade UV-stabilized polyethylene sewing thread. Thread shall be GORE™ TENARA® sewing thread (expanded PTFE).
       13. The fabric or membrane cover is designed to be removable, thus, it must contain a statement “The covering must be removed prior to a Hurricane or winds that exceed 40 m.p.h.” This statement must be stamped, printed or sewn on the shade fabric.
       14. Fabric connection points and cable exit points shall be reinforced, heat sealed and sewn. Fabric shall be pre-stressed prior to fabrication.

# Fire Rating/Flammability:

* + - 1. Fabric shall meet the flame propagation performance criteria of NFPA 701 or have a *flame spread index* not greater than 25 when tested in accordance with ASTM E 84 or UL 723. Furnish written documentation of compliance with these standards.

# PART 3 EXECUTION

* 1. INSTALLATION
     1. Installations of shade structure(s) by the Installing Contractor shall comply with the project permitted design documents and shall be installed in accordance with the manufacturer’s instructions for assembly, installation, and erection.
     2. The site shall be free of construction debris upon the completion of the project.

# TRAINING

* + 1. Upon substantial completion of the work, provide Video and hands-on training of Owner’s selected personnel, on maintenance and the proper removal and reinstallation of the shade fabric.

# END OF SECTION