**SPECIFICATION FORM COVER SHEET**

**SECTION 133100**

**TENSILE MEMBRANE STRUCTURES – Architectural Umbrellas**

**Revision – December 2013**

**ALL TEXT IN RED WITHIN THE FOLLOWING PAGES TO BE REMOVED AFTER EDITING FOR A SPECIFIC PROJECT**

This specification section is written in conformance with the Construction Specifications Institute (CSI) MasterFormat™ guidelines. It must be carefully reviewed and edited by the Project Architect and/or Engineer to ensure compliance with project requirements and the applicable building code, including coordinating this section with other specification sections and the construction drawings.

SECTION 133100 - ARCHITECTURAL UMBRELLAS TENSILE MEMBRANE STRUCTURES

# PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 specification sections, apply to the Work of this Section.

1.2 SUMMARY

A. This Section includes the exterior architectural Birdair (Model, Model #)

B. The tensile structure contractor (hereafter referred to as “Subcontractor”) shall be responsible for the detailing, fabrication, supply, and installation or delivery of the Work specified herein, some or all of which may be subcontracted by Subcontractor to others meeting the qualification requirements of Section 1.5. The intent of this specification is to establish in the first instance an undivided, single-source responsibility of the Subcontractor for all of the foregoing functions.

C. Subcontractor’s Work shall include, but not necessarily be limited to, the supply, fabrication, shipment, and erection of the following principal items:

1. Quantity in word (number) Birdair (Model, Model #) Umbrella structure as indicated in this specification.

2. Cables and end fittings.

3. Perimeter, catenary, and sectionalized clamping system.

4. Structural steel, including masts, trusses, struts, beams, and/or weldments, as indicated on the drawings.

5. Fasteners and gasketing.

1. D. The architectural membrane used in these umbrellas shall be shall be PVC (i.e. polyvinylchloride) -coated polyester fabric. All references to "membrane" in this Section 13000, without exception, and whether singular, plural, or capitalized or not, are to such architectural membrane.

E. Related Sections: The following Construction Specification Institute (CSI) MasterFormat™ divisions contain requirements relating to this section:

1. Division 1: General Requirements.

2. Division 3: Concrete, for cast-in-place foundations.

3. Division 5: Metals, for structural metal framing, metal fabrications, expansion control systems, and shop-applied metal coatings.

5. Division 9: Finishes, for paints and coatings.

1.3 REFERENCES

A. General: Except as otherwise shown or noted, all Work shall comply with the requirements of the following codes and standards:

1. Building Code of xxxxx, current edition.

2.

1.4 SYSTEM REQUIREMENTS

1. General: Provide an umbrella system that complies with requirements specified herein.
	1. Powder Coated steel system
	2. PVC canopy
		1. Water proof, anti-fungal, easy to clean PVDF coating
	3. Stainless steel cables and fitting
	4. Reinforce webbing with Tenara sewing thread.

1.5 QUALITY ASSURANCE

A. Subcontractor Qualifications: Fabrication and erection of the tensile structure is limited to firms with proven experience in fabrication and construction of complex tensile structures. Such firms, through their own experience and/or that of their qualified subcontractors, shall meet the following minimum requirements:

1. The Subcontractor shall have at least twenty five (25) years’ experience in the successful fabrication and erection of permanent, custom tensile membrane structures.

2. The Subcontractor shall have fabricated and erected at least two hundred (200) architectural umbrellas.

3. The Subcontractor shall demonstrate it has a fabrication facility of adequate capacity and will maintain a staff experienced in the fabrication of umbrellas that will undertake the fabrication of this project.

4. The Subcontractor shall submit a Corporate Quality Control Manual describing the company’s complete quality assurance program.

5. The Subcontractor must be ISO 9001:2008 certified in the design, construction and installation of fabric and cables based structures.

B. Qualified Subcontractors

1. Birdair, Inc.

6461 Main Street, Amherst, New York 14221

Email: sales@birdair.com

Phone (716) 204-2152 Fax (716) 633-9850 Web Site [www.birdair.com](http://www.birdair.com)

1.6 SUBMITTALS

A. General: Notwithstanding any provisions of these specifications that may appear to be to the contrary, any and all submittals by the Subcontractor shall be subject to review, approval, and adoption by the Project Engineer as part of the overall project design and engineering, and shall not create a contractual or other professional design relationship between the Subcontractor and either the Project Engineer or the Owner.

B. Product Data: Include manufacturer’s specifications for materials, fabrication, installation, and recommendations for maintenance. Include test reports showing compliance with project requirements where test method is indicated.

1. Samples: Submit selection and verification samples.

C. Submittals With Bid: The General Contractor shall submit with its bid the following materials from the Subcontractor:

1. Schedule indicating key milestone dates during the project.

D. Fabric Samples

E. Quality Assurance Submittals.

F. Closeout Submittals.

1. Warranty: Project Warranty documents as described herein.

2. Maintenance Manual: Submit two (2) copies of a maintenance manual for the tensile membrane structure to the Owner. The manual shall include a schedule for routine inspection, an inspection checklist, and warranty. During the system erection period, the Owner shall provide maintenance personnel to be trained in the use of the repair materials.

1.7 PRODUCT DELIVERY, HANDLING, AND STORAGE

A. General: Refer to the Conditions of the Contract for product handling provisions.

B. Materials shall be packed, loaded, shipped, unloaded, stored, and protected in a manner that will avoid abuse, damage, and defacement.

1.8 WARRANTY

A. General: Refer to the Conditions of the Contract for project warranty provisions.

B. After final payment, the Subcontractor shall furnish the Owner with a written Warranty, which warrants that the tensile structure, its perimeter attachment system, and the structural support system as supplied by the Subcontractor have been installed in accordance with the project specifications and will be free from defects in materials and workmanship that will impair their normal use or service. The Warranty shall start from the date of Substantial Completion of the tensile membrane structure; which shall be the first date on which the entire tensile membrane structure is subject to design prestress conditions, and continue for a period of one (1) year thereafter.

## PART 2 - MATERIALS

2.1 ARCHITECTURAL MEMBRANE

1. A. General: The fabric used in these structures shall be comprised of PVC-coated polyester vinyl fabric as manufactured by:
2. Serge Ferrari, France
3. Mehler Texnologies, Germany
4. The fabric shall meet the following requirements:
5. General.
6. The primary materials shall be obtained from one manufacturer. Secondary materials shall be those recommended by the primary manufacturer.
7. The entire fabric shall be fabricated from one type of fabric.
8. Base fabric and coatings:
9. Yarns: The yarns used in the base fabric shall be high tenacity polyester of the highest commercial quality, essentially free of broken fibers after the weaving process, and fully suitable for coating. The fabric shall be woven with uniform tension and crimp in the warp and fill yarns and free of defects deleterious to the coating process. The base fabric shall be of sufficient width to allow for finished coated goods of at least 70 inches.
10. Weave: The weave shall be plain weave, panama weave, or Malimou weave. The weave shall be uniform, with the warp and fill at right angles to each other with a tolerance of 5 degrees. The bow in the fill direction shall not exceed 1 inch or 1 in 30 offset to width over length.
11. PVC Coating: After weaving, the base fabric shall be cleaned and primed to achieve optimum mechanical properties of the coated fabric. The PVC coating shall consist of new PVC resin, plasticizers, UV inhibitors, mold inhibitors, flame retarding agents, and extenders. These materials shall be applied to form a weatherized barrier between the polyester yarns and the environment. The formulation shall be demonstrated to have given satisfactory performance in the past with regard to flexibility in handling, adhesion, and durability in use. The coating shall be applied evenly to both sides of the fabric and shall be of sufficient thickness to permit proper high frequency (HF) welding of joints.
12. Unless selected by the Architect from the manufacturer’s standard colors, the fabric shall be white translucent fabric.
13. Product Substitutions: No substitutions will be permitted.

2.2 CABLES AND END FITTINGS

A. Materials.

1. All Cable to be Stainless steel.

2.3 Accessories.

1. Base Plates and Anchor Bolts.

a. Base plates supported on concrete, whether shop attached or shipped loose, shall be furnished and set on shims or leveling plates. Grouting shall be by the General Contractor.

b. Anchor bolt locations shall be furnished by the Subcontractor and used by the General Contractor to set the bolts. The General Contractor is to check carefully the setting of the bolts to their proper position prior to pouring of concrete. Anchor bolts, provided by the General Contractor, shall have two (2) nuts and washers. Damaged threads shall be repaired or be cut to permit full tightening of nuts.

H. Product Handling and Protection: Use all means necessary to protect structural steel before, during, and after installation and to protect the installed work and materials of all other trades.

I. Rejection and Replacement.

1. In the event of damage to the steel, immediately make all repairs and replacements necessary to the approval of and at no additional cost to the Subcontractor.

2. Any materials or welding rejected through inspection either in the shop, mill or field must be promptly replaced to the satisfaction of, and at no additional cost to, the Subcontractor.

J. Qualifications of Steel Fabricator: The steel fabricator shall have not less than five (5) years’ continuous experience in the fabrication of structural steel.

2.5 FASTENERS

A. General: Provide fasteners used to secure clamp systems to curbs and cables, assemblage of clamp systems, and other fasteners as required to complete the work specified herein.

B. Marine-grade 316 stainless steel cables and fittings.

C. Source Quality Control: The manufacturer shall certify that all fasteners comply with the above referenced specifications.

PART 3 - FABRICATION AND ERECTION

3.1 FABRICATION OF MEMBRANE PANELS

A. Fabric Membrane.

1. The Subcontractor shall take necessary care to plan and assemble the fabricated sections such that the assembly has no shop patches. Splices, if any, shall be patterned into a symmetrical and repetitive geometric arrangement within the assembly, shown on the shop drawings and, where feasible, hidden by structural members.

3.2 ERECTION OF MODULAR ASSEMBLIES

A. Prior to installation of the assemblies, the Subcontractor shall meet with the General Contractor to review the erection procedure and scheduling. The Subcontractor shall coordinate all work with other trades.

B. No trade shall have access to, or work from the modular structures, unless authorized by the Subcontractor in writing.

C. Erection of Structural Steel.

1. The Subcontractor shall employ a competent foreman to supervise all work of steel erection. This foreman shall be present at all times during the Subcontractor’s scope of work.

2. All precautions shall be taken to ensure an accurately located and completely safe and stable structure at all times. Adequate guy cables shall be used throughout the work and all erection bolts shall be drawn up tight.

3. All steel shall be accurately aligned before permanent connections are made.

4. Temporary bracing shall be left in place as long as may be required for safety. The bracing shall be located so it does not interfere with the erection of the tensile structure, and can be removed as required during construction.

a. The structure is to be self-supporting and stable after the building is fully completed. It is the Subcontractor’s sole responsibility to determine the erection procedure and sequence and to ensure the safety of the building and its component parts during erection. This includes the addition of whatever temporary bracing, guys or tie-downs that may be necessary. Such materials shall be removed by the Subcontractor and remain his property after completion of the project.

5. Erection tolerances shall be specified in the AISC “Code of Standard Practice for Steel Buildings and Bridges,” unless otherwise indicated.

3.3 PROTECTION AND CLEANING

A. Protect work from damage and deterioration during installation.

B. Upon completion of tensile membrane structure installation:

1. The Subcontractor shall clean all surfaces of the system’s components in conformance with the membrane manufacturer’s recommendations.

2. Inspect the system and repair membrane/mesh panels that have become damaged. Repairs shall be executed in such a way that they are visually acceptable.

C. Further protection of the work and final cleaning, if necessary, shall be the responsibility of the General Contractor.

END OF SECTION 133100