ENTRY FORM

DVASE
2022 Excellence in Structural Engineering Awards Program

PROJECT CATEGORY (check one):

Buildings under $5M		Buildings Over $100M	
Buildings $5M - $15M		Other Structures Under $1M	✓
Buildings $15M - $40M		Other Structures Over $1M	
Buildings $40M - $100M		Single Family Home	

Approximate construction cost of facility submitted:	$25,000
Name of Project:	*Christina Suncatcher* (sculpture installation)
Location of Project:	DuPont Environmental Education Center 1400 Delmarva Lane, Wilmington, DE 19801
Date construction was completed (M/Y):	6/2021
Structural Design Firm:	Wiss, Janney, Elstner Associates, Inc.
Affiliation:	**All entries must be submitted by DVASE member firms or members.**
Architect:	Sarah Kavage Studio LLC
General Contractor:	Robert Zverina

Company Logo (insert .jpg in box below)

Important Notes:

- Please .pdf your completed entry form and email to bsagusti@barrhorstman.com.
- Please also email separately 2-3 of the best .jpg images of your project, for the slide presentation at the annual virtual presentation and for the DVASE website. Include a brief (approx. 4 sentences) summary of the project for the DVASE Awards Presentation with this separate email.

- Provide a concise project description in the following box (one page maximum). Include the significant aspects of the project and their relationship to the judging criteria.

Christina Suncatcher is among the largest of fifteen sculpture installations in the *Water Spirit* series created by Seattle-based visual artist Sarah Kavage. Along with performances and community events, the sculptures were part of an environmental art project entitled *Lenapehoking~Watershed: a place for water, art, and culture,* which ran from July through December 2021 at twenty-three sites connected by the Alliance for Watershed Education of the Delaware River. *Lenapehoking* means "the land of the Lenape" and honors the indigenous people whose ancestral lands once extended throughout the Delaware River watershed that DVASE members now call home.

The primary material of the sculptures, *Phragmites,* is an invasive reed species that spread rapidly throughout wetlands in the northeastern United States during the early twentieth century. *Phragmites* have crowded out native plants and altered habitats along the lower Delaware and its tributaries, including the freshwater tidal marsh at the DuPont Environmental Education Center, which was selected as the site for *Christina Suncatcher*. For this sculpture, the artist envisioned a parabolic arch extending over one of the elevated timber walkways, with its shape echoed in a second arch at the railing of a platform overlooking the Christina River.

In the native range of *Phragmites,* from the Middle East to Europe, they have been bundled, dried, and installed in layers as roof and wall coverings for thousands of years, a technique known as thatching. There are also instances of self-supporting thatch structures, such as the *mudhif* in southern Iraq, a traditional building form that inspired another sculpture in the *Water Spirit* series. Because *Christina Suncatcher* does not resemble any time-proven traditional form, and because extensive testing would have been required to establish an adequate factor of safety for a self-supporting thatched arch, the artist recognized a need for engineered armatures to be concealed within the sculpture.

Given its high strength-to-weight ratio, steel was the logical choice for the armatures to meet the following design constraints:

- Siting of the sculpture on a narrow timber walkway running through a marsh, where all equipment and material must be transported and assembled by hand;
- Support of the sculpture using "found" capacity in the existing walkway structure, which could not be practically reinforced given its proximity to the water surface;
- The three-dimensional curvature of armature components in the larger arch, which needed to fit closely around existing railing intersections; and
- A completely reversible installation, leaving only small fastener holes in existing walkway components.

The governing principle for design of the armatures was "many components, small forces," which mirrored the "many hands, light work" approach to assembling the sculpture. To resist overturning under wind pressure, the armature for the larger arch utilized inherently strong points in the structure—intersections between perpendicular railings—with multiple points of attachment keeping the forces acting on any individual fastener low. The armature for the smaller arch was designed to work as a vertical cantilever, again with multiple points of attachment to the railing.

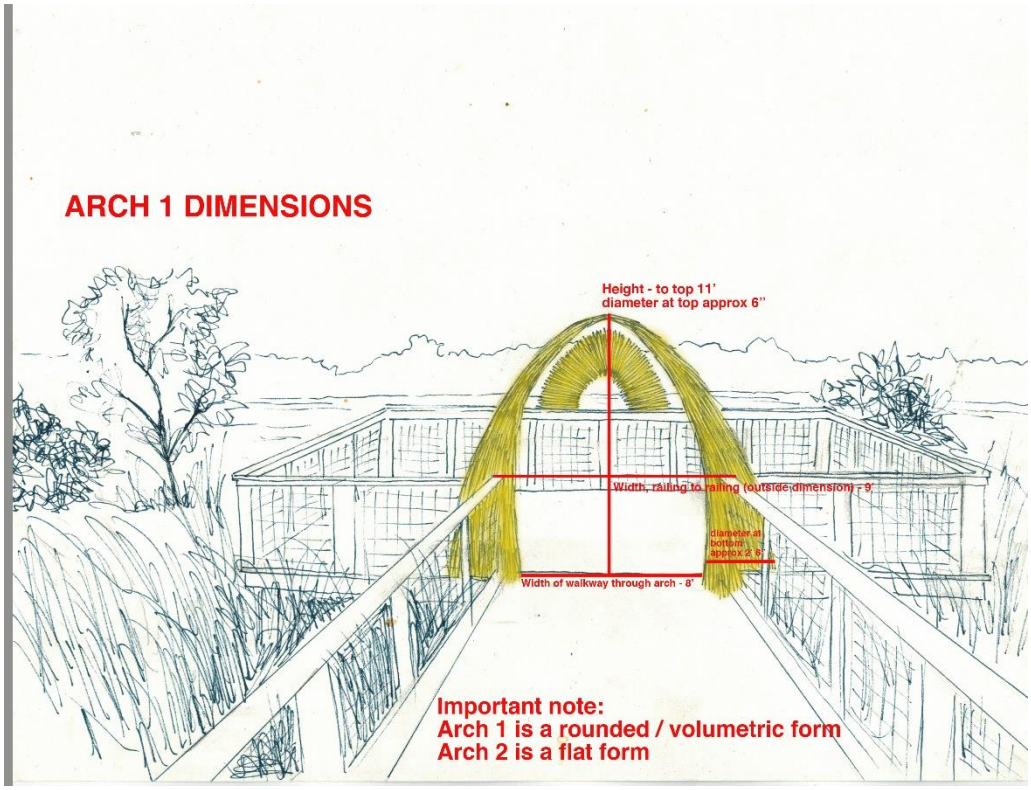
A triad of steel pipe ribs, braced to each other at frequent intervals by lacing bars, kept the primary members smaller and easier to bend into the complex shapes needed. Steel conduit was selected for the lacing bars so they could be cut to length, crimped, and drilled using hand tools. The spacing of the bars responds not only to structural considerations, but also to the need for closely spaced members onto which the bundles of reeds would be lashed. Even fastener selection was governed by thatching considerations, with each rib and lacing bar intersection joined by an eyebolt that provided loops through which lashing would be drawn.

The success of this design required close coordination between the structural engineer and the artist and a shared understanding of traditional thatching techniques. The engineer and his daughters also helped cut and gather reeds at the site during one of the artist's Phrag Fest events the preceding winter, forming a personal connection to the sculpture and the watershed it celebrates.

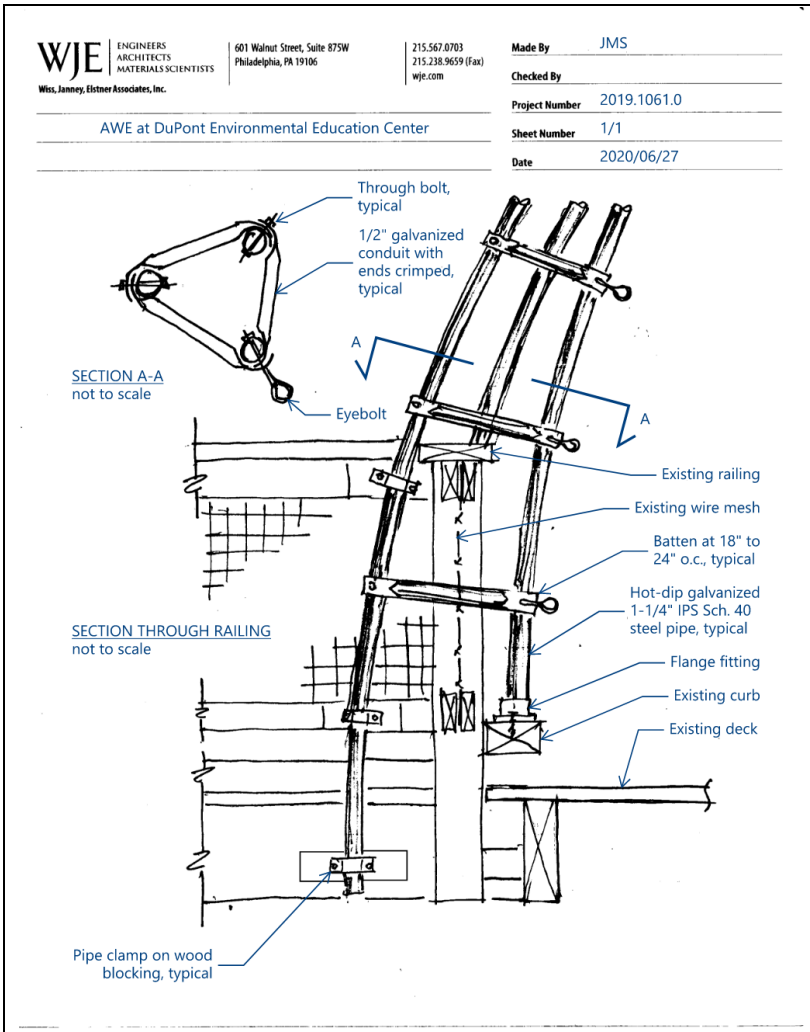
- The following 5 pages (maximum) can be used to portray your project to the awards committee through photos, renderings, sketches, plans, etc…

All photos by Robert Zverina unless otherwise noted.

Completed *Christina Suncatcher* installation



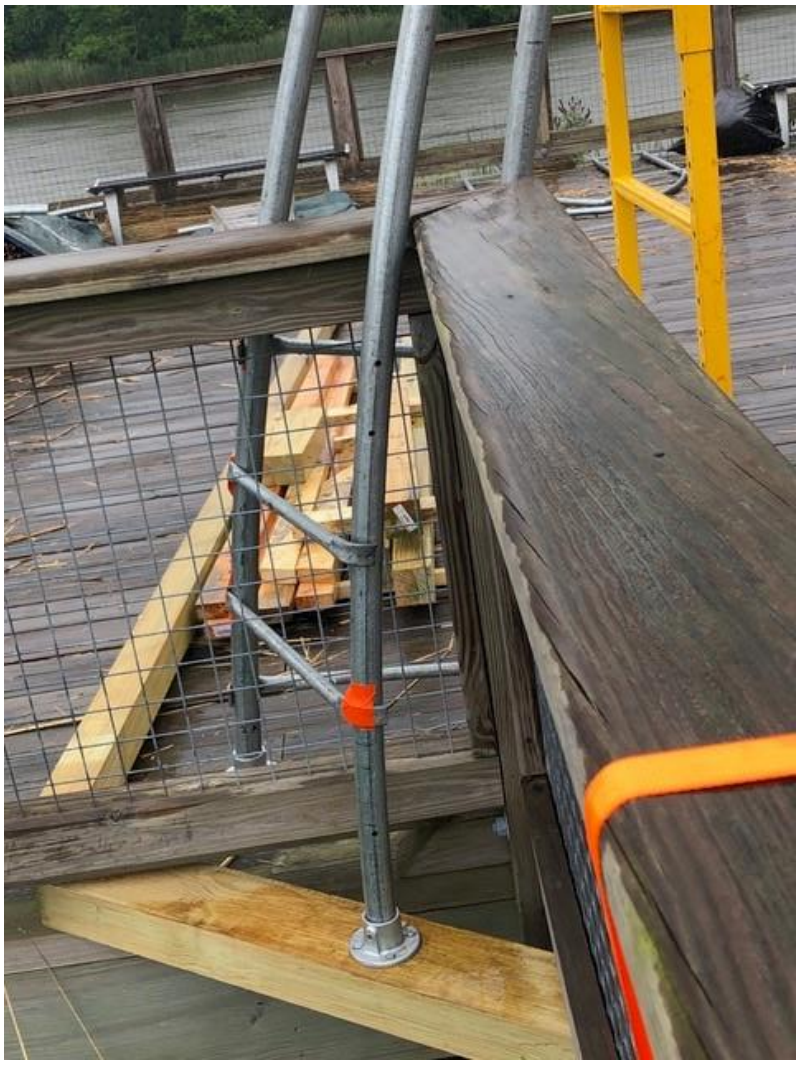
Artist's concept sketch



Structural engineer's concept sketch

Cutting and gathering reeds during Phrag Fest

Erection of armature for larger arch



Detail of armature connection to timber walkway structure

Preparing bundles of reeds for thatching

Layering bundles of reeds over armature

Lashing bundles of reeds to armature

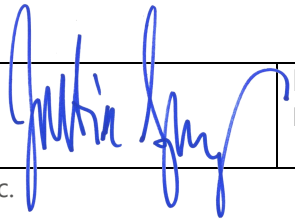
Completed *Christina Suncatcher* and installation crew

By signing, signatory agrees to the following and represents that he or she is authorized to sign for the structural design firm of record.

All entries become the property of DVASE and will not be returned. By entering, the entrant grants a royalty-free license to DVASE to use any copyrighted material submitted.

If selected as an award winner, you may be offered the opportunity to present your project at a DVASE breakfast seminar. Would you be willing to present to your colleagues? ☑ ***YES*** ☐ ***NO***

Submitted by:

Print name: Justin M. Spivey, PE, APT RP	**Signature:** 	**Date:** March 30, 2022
Submitting Firm:	Wiss, Janney, Elstner Associates, Inc.	
Mailing address:	601 Walnut Street, Suite 875W Philadelphia, PA 19106	
Telephone: (215) 567-0703	**Fax:**	**Email:** jspivey@wje.com