RISA TECHNOLOGIES

CASE STUDY

Hulls Sculpture
Mesiti-Miller Engineering, Inc.

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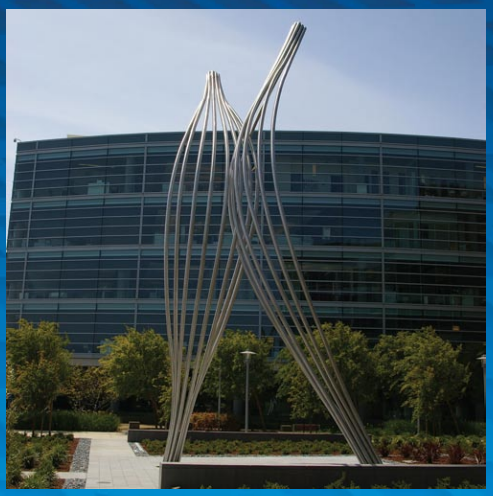


Project

Rigorous 3D computer analyses were performed in order to properly model the organic shape of the 42-foot tall steel sculpture and ensure that all loads were accurately accounted for.

Challenges

- Necessity of "thinking outside-of-the-box" to create a plan to analyze and design the unusual structure and maintain the artist's original design concept
- Starting the analysis and design from an art model instead of architectural plans
- Analyze and design structure for wind and seismic loads while minimizing diameter of steel tubes

Solutions

The imagination of an artist, the intuition of a structural engineer and the power of RISA-3D came together to help a Northern Californian sculptor bring his vision to life.

Sculptor Richard Deutsch approached the engineers at Mesiti-Miller Engineering, Inc. (Santa Cruz, Calif.) with a challenge: take his form and make it possible.

The project, a 42-foot high stainless steel sculpture entitled *Hulls*, was made possible with the help of RISA-3D.

The design of the sculpture was inspired by the shipbuilding history of the Mission Bay area of San Francisco. Like the ships once moored nearby, the sculpture is of a massive scale, creating challenges for both the artist and the staff at Mesiti-Miller Engineering, Inc.

The first hurdle to overcome was bridging the gap between the art and engineering.

"He's a sculptor," said Nick Stuart, Mesiti-Miller Engineering's lead engineer on the project. "He's not an architect and not used to

QUICK FACTS

Location
San Francisco

Design Team
Richard Deutsch, Sculptor

Mark Mesiti-Miller (EOR)
Nick Stuart
Mesiti-Miller Engineering,
Santa Cruz, Calif.

Completion
April 2008

Cost
$200,000 (approx.)

Size
45 ft (h) x 20 (w) w/ 16 ft. base

Software
RISA-3D

For more information on RISA-3D or to download a free demo version, go to www.risa.com

"When I show this to people, they look at the sculpture and (say), 'It's got the wow factor'. It…(was) great to demonstrate the variety of what we could do as a firm."

Nick Stuart, P.E., Mesiti-Miller Engineering, Inc.

working with engineers and was not familiar with the construction process."

Initially, Deutsch supplied only a wire-frame study model to scale to demonstrate his vision and provide a guide for the engineering team to determine the best approach for the design. From there, he created a computer-generated surface model that went through several iterations before it was ready to be imported into RISA-3D.

"RISA-3D was integral in this analysis, enabling us to quickly analyze different (design) concepts and determine if changes were needed," Stuart said.

The primary objective was to analyze and design the sculpture for the inherent wind and seismic loads, while minimizing the diameter of the stainless steel pipe members to retain the sculptures slenderness and translucency.

As it turned out, the sculpture needed several modifications before it could be built. Deutsch originally wanted to use 2-inch steel pipes but the initial analysis called for 6-inch pipes.

Eventually, 4.5-inch double strong pipes were used.

Particularly useful was RISA's seamless compatibility with .dxf files. Stuart was able to quickly import .dxf files of the sculptor's surface model created in Rhino 3D and get started on his analysis.

"This facilitated quick back-and-forth iterations of the form and structural demand capacity, based on the orientation of the pipes," Stuart said. "The steel code check feature enabled us to verify the strength of the pipe sections."

Stuart modeled eight different wind directions to apply to the model, each having to be re-applied when the pipe size changed. RISA enabled him to save the loads and quickly apply each to the new member sizes using RISA-3D's graphic modeling tools.

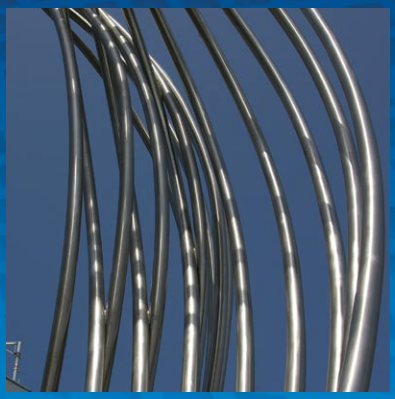
"RISA-3D is an excellent program for structural analysis because it enables a greater sense of control over the inherent matrix-driven analysis than other programs, while providing a user-friendly interface," Stuart says. "Renderings and deflected shape diagrams were also useful for this project."

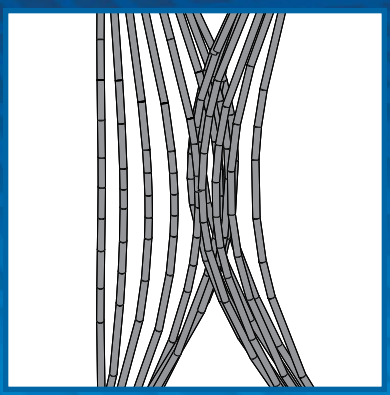
The loads also needed to be carefully directed into the earth through specialized connection and foundation design, all while remaining invisible on the finished product.

The result was a stunning piece of artwork and a memorable experience for all involved.

"When I show this to people, they look at the sculpture and (say), 'It's got the wow factor'," Stuart says. "It is cool to look at and great to be able to demonstrate the variety of what we can do as a firm.

"It was challenging to bridge the gap between the design process and construction phase. I think the finished work turned out great."





RISA Technologies has developed cutting-edge structural design and optimization software since 1987. With a well-trained team of engineers and software developers, we are working to meet the needs of our growing client base by implementing new design features and expanding the suite of software tools that we offer.

Our products are used by 24 of the top 25 U.S. design firms and in more than 70 countries for towers, skyscrapers, airports, stadiums, petrochemical facilities, bridges, roller coasters and everything in between.

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