



# ENTRY FORM

## DVASE 2019 Excellence in Structural Engineering Awards Program

### PROJECT CATEGORY (check one):

Buildings under \$2M		Buildings Over \$100M	
Buildings \$2M-\$10M		Other Structures Under \$5M	
Buildings \$10M - \$30M		Other Structures Over \$5M	
Buildings \$30M - \$100M		Single Family Home	X

Approximate construction cost of facility submitted:	Undisclosed
Entry Fee:	<b>FREE</b>
Name of Project:	Private Residence
Location of Project:	<u>Avalon, New Jersey</u>
Date construction was completed (M/Y):	03/2019
Structural Design Firm:	Mulhern and Kulp Residential Structural Engineering
Affiliation:	<b>All entries must be submitted by DVASE member firms or members.</b>
Architect:	Blaine Steinman Architects
General Contractor:	<u>Stonewood Builders, LLC</u>

Company Logo (insert .jpg in box below)



### Important Notes:

- Please .pdf your completed entry form and email to [bkoroncai@barrpino.com](mailto:bkoroncai@barrpino.com).
- Please also email separately 2-3 of the best .jpg images of your project, for the slide presentation at the May dinner 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.

The architectural features of this 7,200 sq. ft., 3-story modern beach home provided breathtaking bay views, copious amount of natural light and a multitude of structural challenges. Mulhern + Kulp worked all phases of structural engineering from initial design development through construction administration including site visits to confirm compliance with the structural construction documents. The length of the project was nearly 6 years from original design concept to the end of construction and included years of homeowner revisions concurrent with construction. These revisions ranged from retrofitting as-built roof framing for a new double-barrel vaulted ceiling to removing the main steel column in the kitchen that was an integral part of the gravity and lateral load paths, to a unique steel frame for a kitchen island to extend out from counter tops that had already been installed.

Certain architectural features of this unique home required challenging structural solutions to provide support within the overall building constraints. Three stories of living space was proposed to be built between the elevated Design Flood Elevation (DFE) and the township restricted overall allowable building height. These parameters resulted in having to re-design the roof after construction had started to lower the maximum roof height. The re-design included large areas of the roof becoming flat with several mitered steel beams to support the rafters. In addition, a separate structure was built on property to house a 100 kW generator for the house. The generator was housed in a 200 square foot accessory building and placed on steel beams supporting the generator skid.

This home was constructed with a variety of materials including wood, steel, masonry, and concrete. The home owner specifically requested all deflection requirements to be “doubled” for his floor framing to ensure a very rigid floor with minimal “bounce”. Thus, the code-allowable total load floor deflection requirement of  $L/360$  was increased to  $L/720$ . This drove the design of the main level floor framing to be a reinforced concrete slab on steel beams and reinforced CMU piers. The home owner also wanted maximum head height underneath the main level for storage purposes, which lead to W6x steel beams to be spaced at 24” o.c. to support the reinforced concrete slab. The upper level interior spaces were framed with a mix of i-joists and LVL floor joists, while exterior decks were framed with solid sawn joists. The “drive-under” foundation was built with reinforced CMU piers and CMU foundation walls located on reinforced concrete grade beams supported by driven timber piles. Large steel girders spanned long lengths at the 2<sup>nd</sup> floor framing plan to accommodate the roll-down screens and nanawalls which serve to open the entire rear of the house up to the views of the bay.

One of the biggest challenges of the project came after most of the structure had been built. For architectural purposes, (2) LVL columns and an adjacent HSS steel column in the kitchen that was part of a moment frame needed to be removed and relocated, along with some adjacent LVL columns. Thus, a 30’-long W14x109 was designed to be lifted by crane from the rear of the house underneath the existing framing to span back to an existing wall in order for the other columns to be removed. New steel moment frames also needed to be designed and installed to resolve the lateral capacity that was being removed. This also required some major foundation retrofitting to support the new columns and steel moment frames.

At all levels, many of the shear transfer details needed to be customized around the unique layout and architectural features. A combination of wood-framed shear walls and steel moment frames were used in resisting the design lateral forces of this home. The majority of the shear walls needed to be located on the interior of the home accommodated by unique shear transfer details and hold-downs. Large glass openings and wide-open floor plans required the use of multiple steel moment frames to resist the lateral forces.

Another notable architectural feature is an infinity pool that abuts the covered veranda at the rear of the property. The foundation for this pool presented another structural challenge. The pool was to be designed by the pool manufacturer; however, it became apparent that the pool foundation wall needed to directly abut the covered veranda foundation wall and share the grade beam for support. The grade beam had to be analyzed for that offset loading, and a mechanical connection was designed from the pool foundation wall to the existing grade beam. The existing grade beam also had to be retrofitted at spots with new helical piles for support.

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



*Picture of the rear of the house from the bay*



*Large steel beams & moment frames in the family room/Veranda to allow for the back of the house to open up to the bay*



*Curved wooden stair stringers at rear deck*



*Mitered steel beams at the roof framing*



*Double barrel vaulted Ceiling in the Family Room with steel plates bolted to the ridge beam to support a chandelier*

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. DVASE / NCSEA is hereby granted the right to use or publish entries and accompanying materials in **STRUCTURE** magazine or other publications. In addition, a royalty-free license is granted to DVASE / NCSEA to use any copyrighted material submitted.*

Submitted by:

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