ENTRY FORM

DVASE
2021 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:	$15 MILLION
Name of Project:	Warner Hall Renovation - University of Delaware
Location of Project:	Newark, Delaware
Date construction was completed (M/Y):	Under Construction
Structural Design Firm:	Thornton Tomasetti
Affiliation:	**All entries must be submitted by DVASE member firms or members.**
Architect:	ABHA Architects in collaboration with Robert A.M. Stern Architects
General Contractor:	Whiting-Turner

Company Logo (insert .jpg in box below)

Thornton Tomasetti

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.

Thornton Tomasetti provided structural engineering services for the renovation of Warner Hall, a three-story building composed of wood, steel, and brick masonry wall structures. Warner Hall was originally constructed in 1914, and has served as a women's residence hall for the University of Delaware prior to this renovation which will convert the building into the central hub for Wellness and Counseling. The floors of the hall are a mix of wood and steel elements, and the roof contains heavy timber and 2x wood. The intent of the project is to preserve as much of the original facade and structure as possible while converting the building's interior spaces.

The project team was tasked with an initial condition assessment of the structural and exterior elements. As an operating dormitory, efforts continued through construction when access became more available. Major repairs included the rehabilitation of the west patio with an entire replacement of the slab and cover-plating of the corroded steel beams, as well as damaged joist repairs found during demolition.

Due to limited existing drawings, existing posts and beams were uncovered during demolition that interrupted the new space planning. It was determined that these elements were added as a means to stiffen long span joists by supporting them at midspan. In order to maintain the original design intent of the renovation, the decision was made to remove the post and beams and reinforce the floor joists. In lieu of conventional wood sistered joists, cold-formed steel joists were used to reduce the overall weight of reinforcement and aid in constructability.

Additional challenges included installing MEP upgrades that worked within the existing building profile. To limit the impact to floor plans, risers were placed in an out-of-service chimney of the original fireplace. Issues arose when it was determined that the brick chimney corbeled in the attic space before eventually exiting through the roof line—ultimately impacting the installation of the risers. Shoring the upper portion of the chimney to allow the corbel to be deconstructed and rebuilt was deemed prohibitive. Alternatively, removing the chimney altogether would have adversely affected the exterior appearance of the historic building. A third option was utilized where a steel frame was installed to permanently transfer the upper part of the chimney to the lower portion of the chimney and the exterior bearing wall. This removed the corbeled masonry entirely which allowed the MEP contractors to work freely while preserving a major architectural feature.

The most substantial impact structurally consisted of retrofits to accommodate a new elevator. The elevator, which was located to optimize office space and minimize the overrun sightline impacts, required the shaft to run directly through a primary wood roof truss that supports additional hip trusses framing the end of the attic. To maintain support of the truss, steel columns were added at either side of the elevator shaft that traveled the height of the building to sit on a concrete mat that also formed the bottom of the elevator pit. A beam at the top of the shaft, near the top of the truss, facilitated a moment frame to maintain the lateral continuity of the roof truss.

Multiple analyses were performed on the truss, with different combinations of boundary conditions at the supports to quantify the change in behavior under both gravity and lateral loads. Where other members of the truss were overstressed, reinforcing was provided. For smaller overstresses, steel plates were fastened with screws to existing wood members to increase axial capacity. Some members and connections experienced larger overstresses that required web members to be replaced with HSS 4x4 tubes and steel-to-wood connections. Close attention was paid to avoid disturbing the hip truss connections, where possible. Since the attic is tightly spaced wood framing that is over a hundred years old, field welds on new steel were avoided for safety reasons.

The project is currently wrapping up construction and has had minimal field issues, due in large part to the numerous site visits to document existing conditions during design phases, as well as the 360 degree photos that have been provided by the contractor throughout construction to allow for virtual coordination.

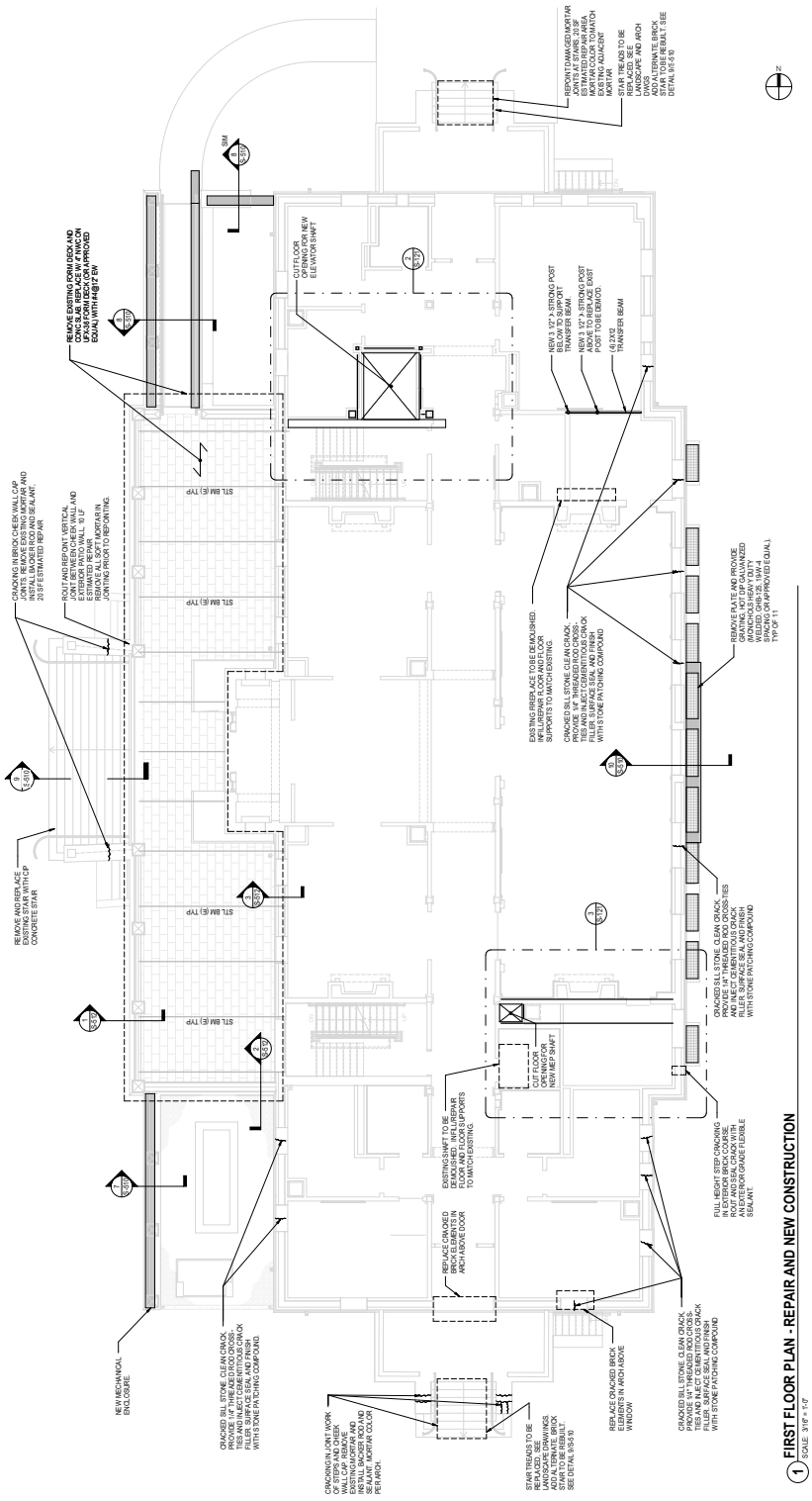
- The following 5 pages (maximum) can be used to portray your project to the awards committee through photos, renderings, sketches, plans, etc…

Warner Hall - University of Delaware shortly after construction in 1914.

Warner Hall - University of Delaware during initial condition assessment.

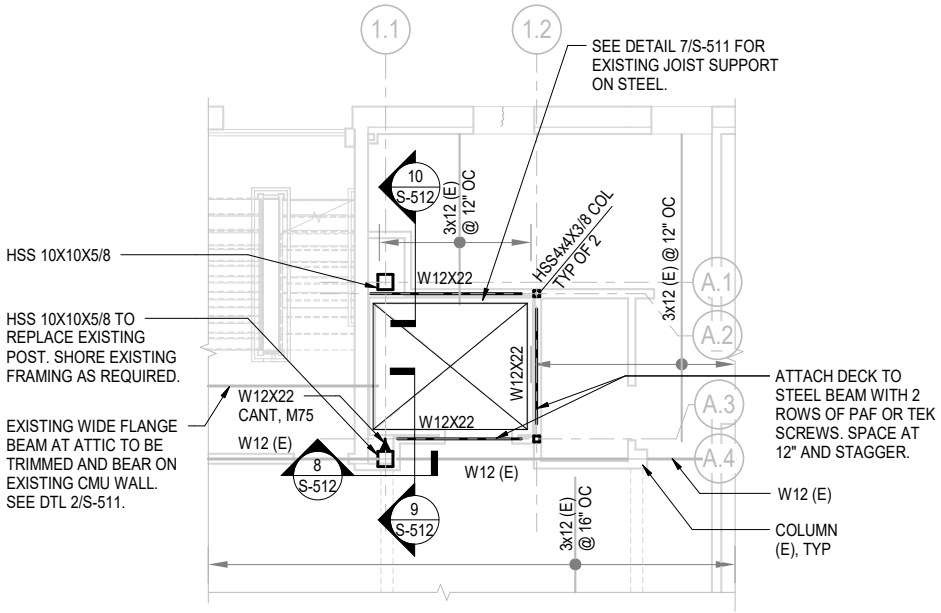
Interior framing at Level 3 after demolition

Corbeled chimney in the attic



1 FIRST FLOOR PLAN - REPAIR AND NEW CONSTRUCTION
SCALE: 3/16" = 1'-0"

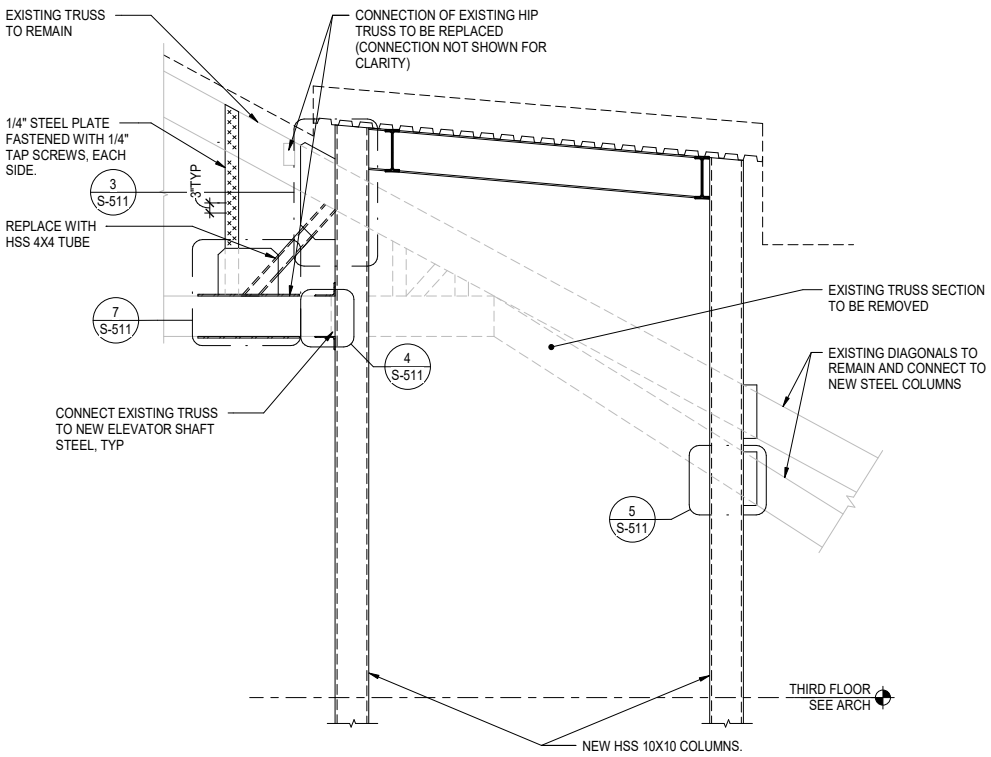
First floor plan showing extents of repair and construction both interior and exterior



2 PARTIAL FIRST-ATTIC LEVEL FRAMING PLAN

SCALE: 3/16" = 1'-0"

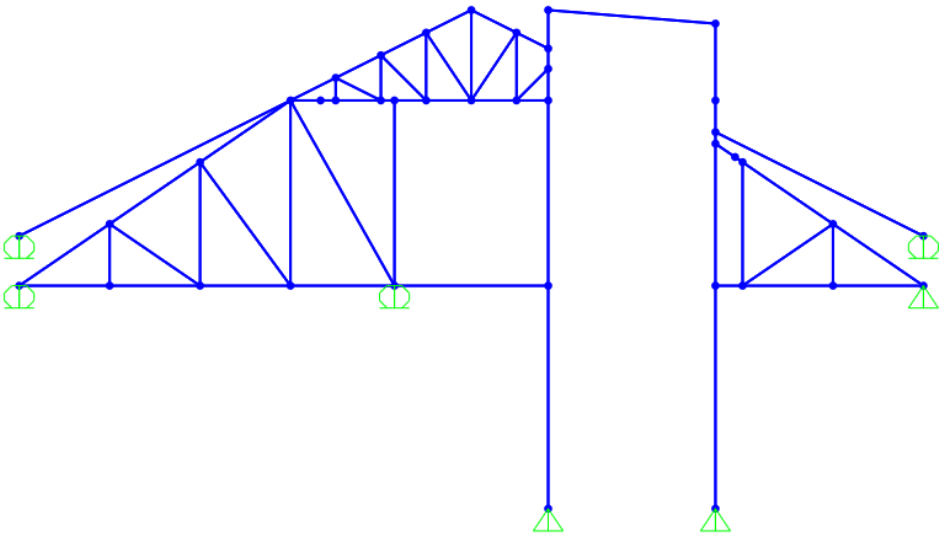
Partial plan of new elevator shaft at typical floors



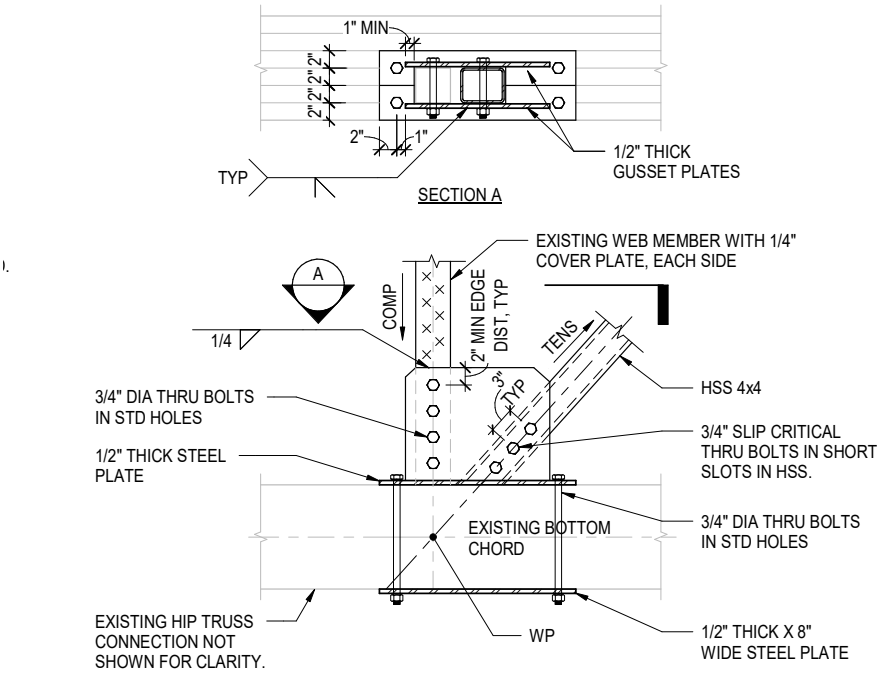
1 EXISTING TRUSS SUPPORT AT ELEVATOR SHAFT

SCALE: 1/2" = 1'-0"

Elevation of roof truss modifications at elevator shaft



Roof truss modifications at elevator shaft - SAP analysis model



7 LOWER WEB CONNECTION

SCALE: 1" = 1'-0"

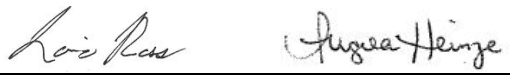
Roof truss modifications at elevator shaft - sample connection repair detail

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:	**Signature:**	**Date:**
LOUIS ROSS ANGELA HEINZE		3/26/2021

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