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	x	Other Structures Over $1M	
Buildings $40M - $100M		Single Family Home	

Approximate construction cost of facility submitted:	$21 Million
Name of Project:	University of Pennsylvania Museum (of Archaeology & Anthropology) Coxe and Harrison Wings Renovations
Location of Project:	Philadelphia, PA
Date construction was completed (M/Y):	11/2019
Structural Design Firm:	Keast & Hood Structural Engineers
Affiliation:	**All entries must be submitted by DVASE member firms or members.**
Architect:	Gluckman Tang Architects
General Contractor:	HSC Construction

Company Logo (insert .jpg in box below)

KEAST & HOOD
STRUCTURAL ENGINEERS

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.

In 2017, the University of Pennsylvania Museum of Archaeology and Anthropology began a three-phase project to renovate two of its six wings in what is the largest renovation in the Museum's 120-year history. "Phase One" saw the restoration of over 82,000 GSF of the historic Harrison Auditorium and Rotunda (c. 1915) and the Coxe Memorial Wing (c. 1926), originally built to display the museum's Egyptian Collection.

The Coxe and Harrison Wings - unchanged for a century - had become antiquities of their own. Keast & Hood has been involved with the master-planning, feasibility studies, and enabling projects leading to this renovation for almost 20 years (including a 20,000 sqft underground mechanical addition in 2005).

The ambitious project scope included major changes to the circulation, including the addition of two elevators and a monumental stair. Three sets of restrooms were added and new HVAC systems were incorporated into galleries which exhibit ancient artifacts from around the world. These changes transform the visitor experience and all of the work was performed while the museum remained open.

The structural challenges of the project were of epic proportions: removal of three floors of the Coxe Wing for a new stair and elevator, investigation and modifications to sensitive Guastavino floor construction, creation of openings through 8 ft thick brick walls for duct mains, and floor overbuilds for ADA compliance. This work required engineers to understand materials and methods of construction from 1896 – 1926: from Roebling arches to Guastavino vaults, from plate girders to flat tile arches.

Existing terra-cotta ventilation flues and rainwater conductors in the brick walls made creation of new openings difficult and thermal scanning of the walls was required to locate and avoid these systems. Bricks were salvaged from demo and reused to rebuild jambs and match the existing building fabric.

A small corridor between the Coxe and Harrison Wings– a major bottleneck in the museum's circulation – was significantly widened. The existing brick arches here were replaced with steel beam lintels in a complex construction sequence that transferred loads from thick load-bearing masonry walls above.

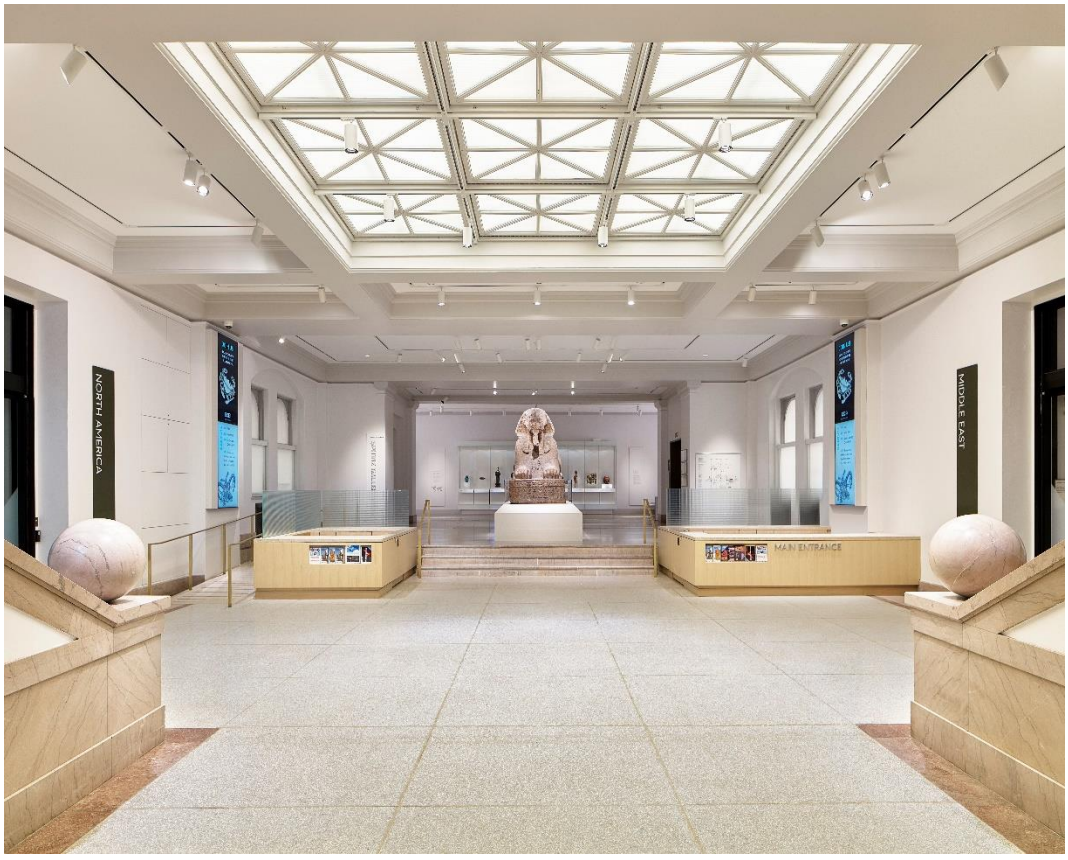
All of this work needed to be performed surgically by the CM, HSC, and their masonry subcontractor Lepore, as the building remained open to the public during construction and construction vibration was a dangerous threat to the artifacts the museum displays and conserves. Keast & Hood developed detailed suggested sequences of construction, including full sheets in the construction documents, to aid the contractors in pricing and planning this difficult work.

During construction, the museum decided to move their iconic 3000 year old, 12.5 ton Sphinx (the largest in the Western Hemisphere) from the lowest gallery of the Coxe Wing to the newly renovated Kamin Entrance a full story and a half above. Keast & Hood designed the floor infill and overbuild for the weight of the Sphinx and assisted the museum and their moving team in planning for this historical move. After resting for 90 years, the Sphinx moved "300 ft in 3 days" and will stay put for a long time.

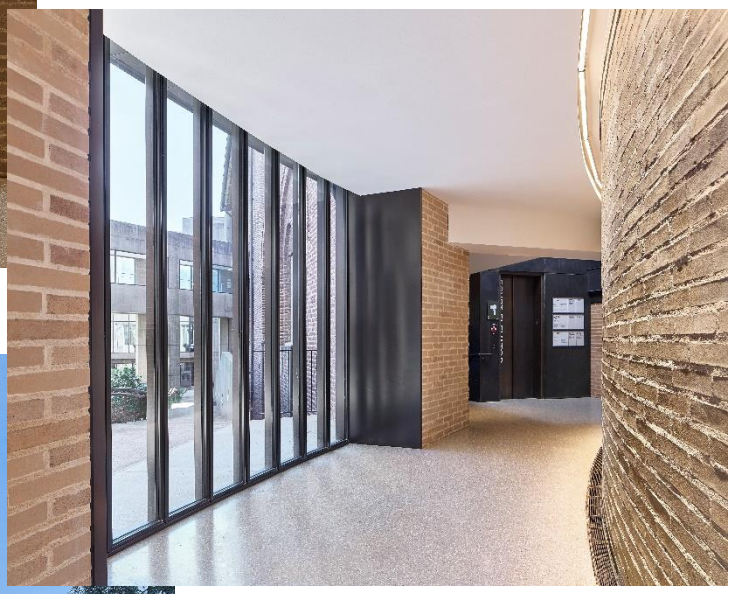
The renovation dramatically improves the visitor experience and positions the museum for future renovations. We were proud to continue our work at this important Philadelphia institution.

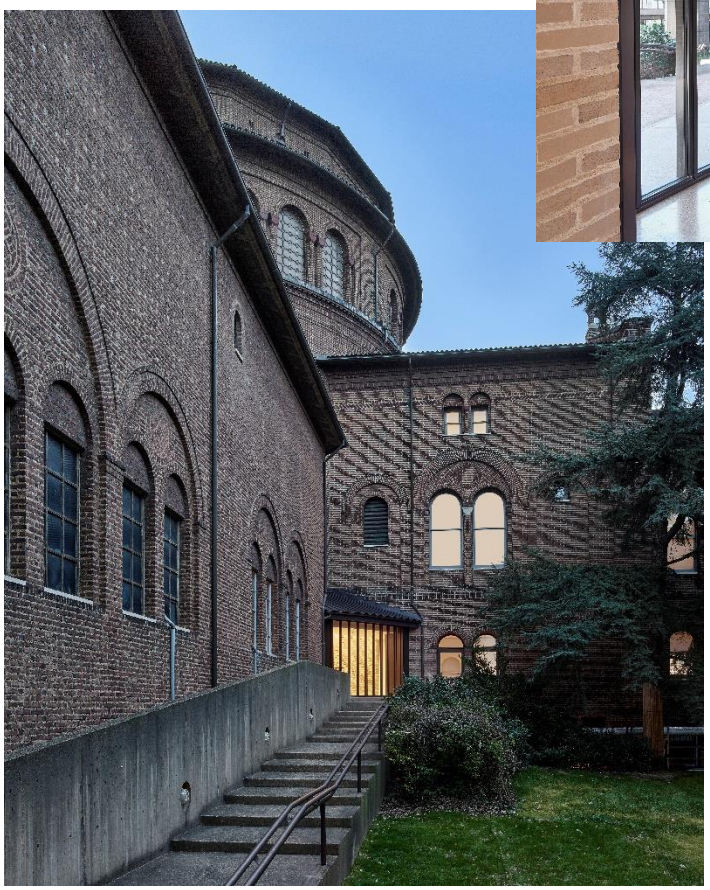
- The following 5 pages (maximum) can be used to portray your project to the awards committee through photos, renderings, sketches, plans, etc...

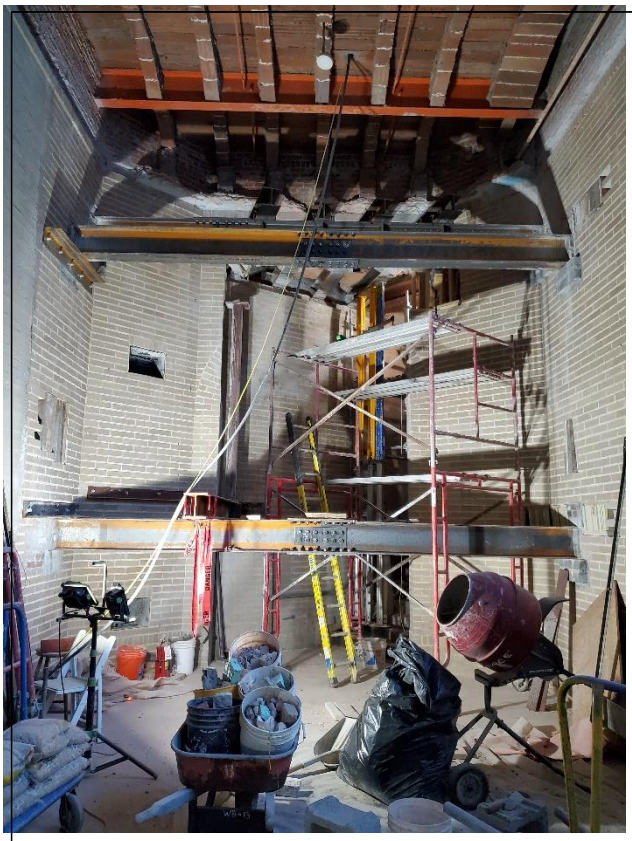
Above: Before images of the museum gift shop and entry sequence to the Harrison Auditorium. Below: The new main entrance with the relocated Sphinx featured prominently on the structurally reinforced floor and removed auditorium stair.



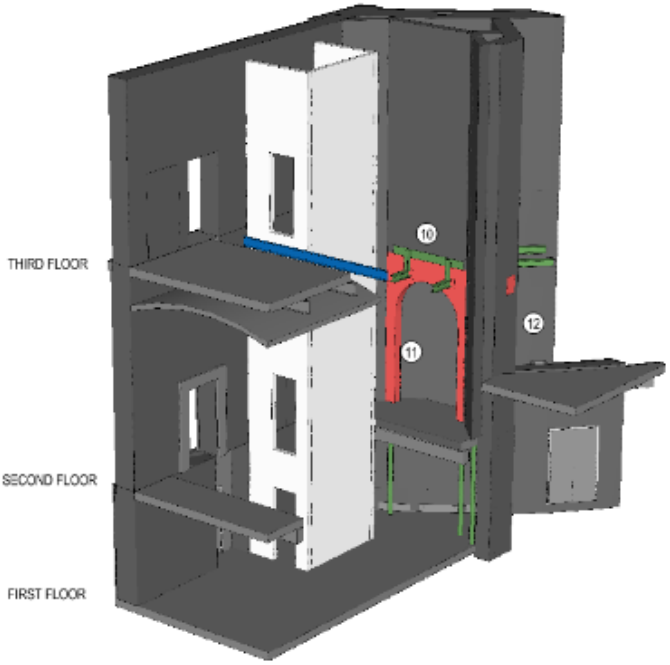
Widened corridors and new circulation patterns allow better connection between galleries and the new main entrance while leading to a new elevator and public stair. The new window wall was added bringing in more natural light to the space.



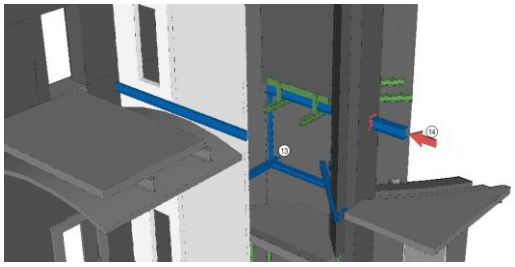




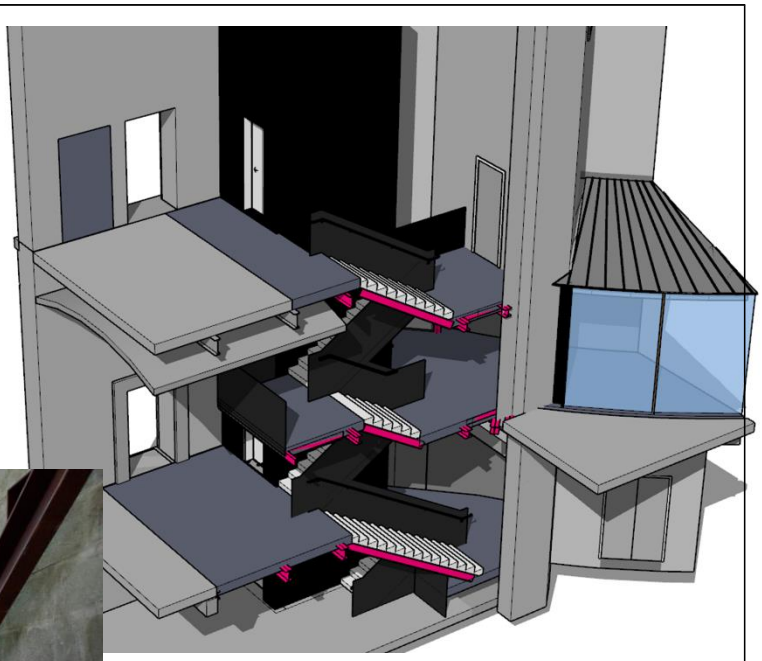
To allow for the insertion of the new elevator and stair, three floors of the Coxe Wing were removed and required a complex construction sequence. In this area, original windows and skylights were also reopened to bring in daylight.



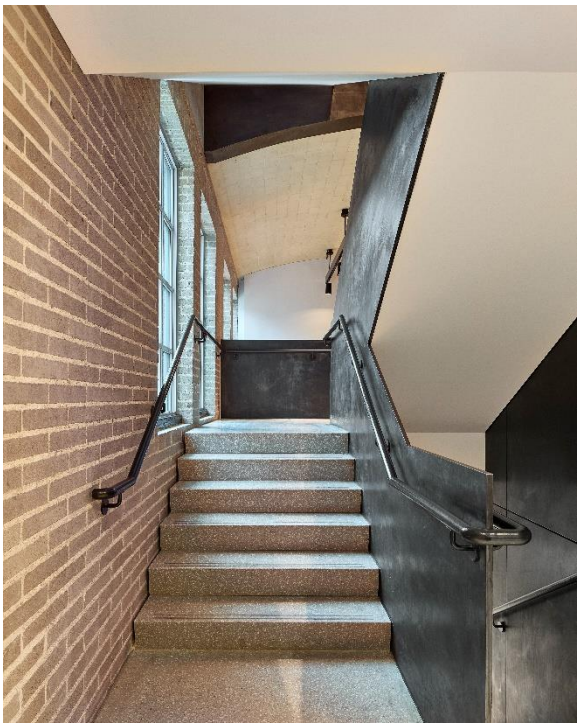
Keast & Hood developed detailed suggested sequences of construction, including full sheets in the construction documents, to aid the contractors in pricing and planning this difficult work.

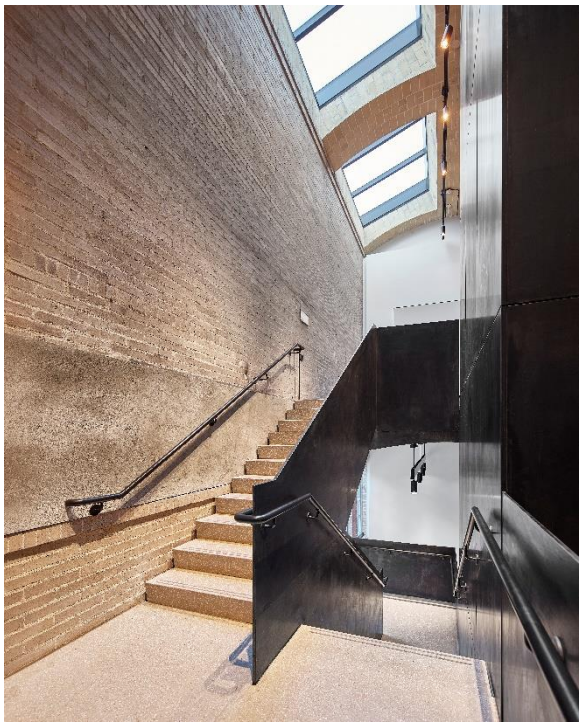


Complexity of inserting the new stair into the historic space: A very tight work area at a central portion of the building made it hard to access, including difficulty bringing a heavy ¾" steel plate "spine" into the building. The plate is architectural and features a blackened steel finish that required coordination with the architect and fabricator for tight tolerances and a specific installation sequence.

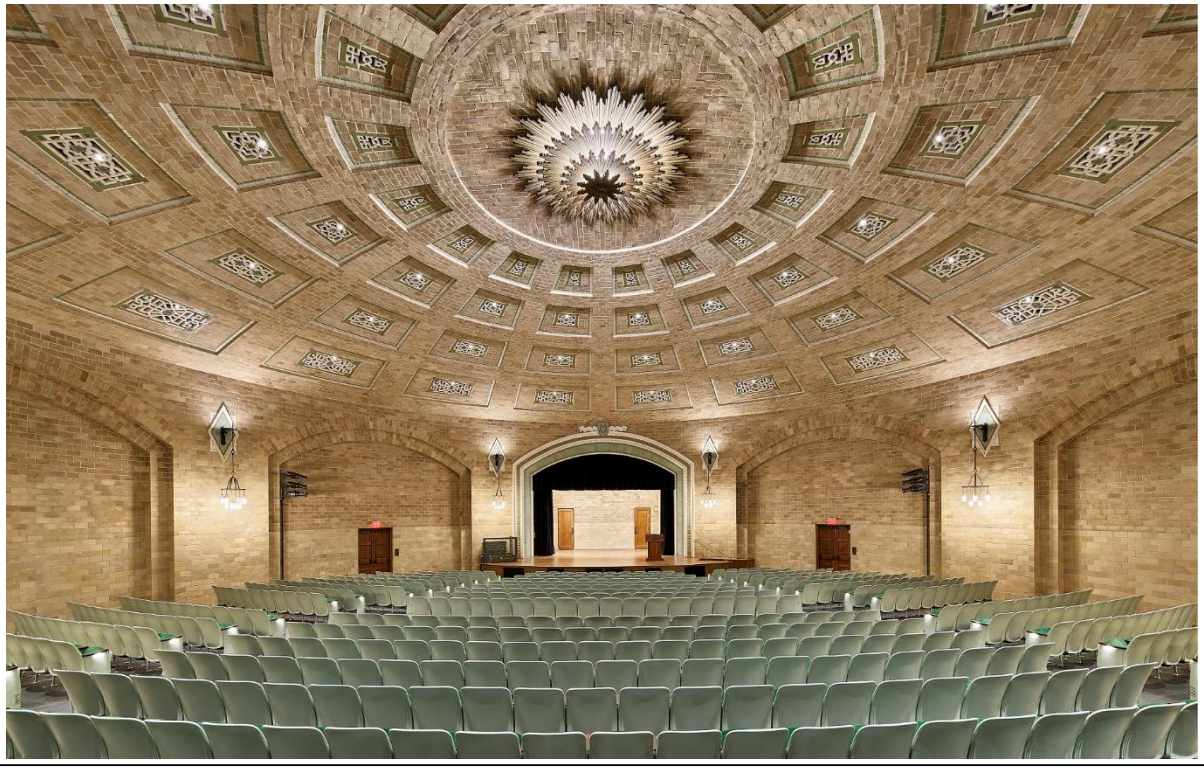


Shown below: Finished new stair and elevator with reopened windows and new skylights.





Above: The auditorium before the renovation. Below: The Harrison Auditorium with improved accessibility and the addition of air conditioning to the space to allow for patron comfort while retaining the historic character of the space. State-of-the-art stage lighting, and audio-visual systems were installed allowing the 620-seat space to serve as a multi-purpose venue.

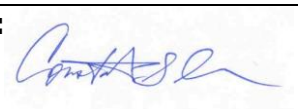


By signing, signatory agrees to the following and represents that he or she is authorized to sign for the structural design firm of record.

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: Constantine G. Doukakis, PE	**Signature:** 	**Date: 4/2/2021**
Submitting Firm:	Keast & Hood Structural Engineers	
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Telephone: 215-625-0099	**Fax: 215-625-9408**	**Email: ddoukakis@keasthood.com**