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:	Undisclosed
Name of Project:	Undisclosed Industrial Process Building
Location of Project:	NJ
Date construction was completed (M/Y):	2021
Structural Design Firm:	Orndorf & Associates, Inc.
Affiliation:	All entries must be submitted by DVASE member firms or members.
Architect:	None
General Contractor:	Undisclosed

Company Logo (insert .jpg in box below)



Important Notes:

- Please .pdf your completed entry form and email to <u>bsagusti@barrhorstman.com</u>.
- 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.

Orndorf & Associates was retained as the engineer of record (full A to Z design, including connection design) and construction administration services for a new industrial process building located in southern New jersey.

This is a 75 foot tall, 4-story structure that features 2,300 square feet of ground floor and 5,000 square feet of two-way diamond plated elevated floors, including seven (7) mezzanine levels. The structure also features a two-story skybridge to an existing processing building, and a specialty designed structurally exposed exterior stair tower.

The entire super-structure was designed utilizing European steel shapes and the project was documented in metric and imperial units, both of which was a strict requirement of the project specifications as defined by the owner. Additionally, the entire structure was to be bolted together, not all different than an erector set. All welded connections and joints were done in the shop, in Europe, and the entire steel package was shipped to New Jersey, for it to be erected by American steel workers. The process equipment engineering, which required detailed coordination with our team, was done by Italian engineers, and all meetings were conducted virtually during a time appropriate for both time-zones.

The process building houses three (3) 230 Kips process tanks, up to 42 feet tall, numerous vessels and other equipment at each level of the structure, as well as an extensive process / utility piping throughout the super-structure and below grade.

The lateral system utilizes multi-story braced frames. Due to a lack of published diaphragm capacity values (for diamond plates), and a need for a redundant yet flexible (future change in equipment / use) structure, horizontal bracing was utilized for diaphragm and sub-diaphragm action, and the contribution from the diamond plates were ignored. Additionally, floor vibrations were a concern due to a lack of mass at the floors, which had to be compensated in the design of the structure.

The building is nestled between existing process structures and equipment which minimized the available footprint for the structure. Due to large utilities and overhead doors, the lateral bracing was limited to a single 16 foot wide bay, in each orthogonal direction of the building, placed at the four exterior walls of the building. The braced frames bays had an aspect ratio of 4.7 (H to W), as they measured 75 feet tall.

The already massive uplift demands (due to the slender braced frame bays) were further exacerbated, thanks to the light weight of the structure as well as the presence of very large and heavy equipment's and vessels at the top floors, creating larger than usual seismic demands. Still, an R = 3 system was utilized.

A mat foundation system was utilized to support the super-structure. The adjacent existing structures, existing equipment and underground utilities limited the footprint of the proposed building's foundations to less than 16 inches off the building's exterior column grids. Additionally, large ground supported process tanks were also located in a limited distance from the building columns which caused complex loading and demand on the foundations. In order to resolve the large uplift & gravity loads within a tight layout of process equipment and tight limits of the building footprint, as well as to satisfy the geotechnical limitations, per the geotech's recommendation, a mat slab was utilized. Our office worked closely with the geotechnical engineer to determine the most accurate modulus of subgrade reaction (Ks), which required several iterations of providing accurate building forces to the geotechnical engineer. The mat slab's elevation had to be low enough to allow for a special drainage system, a manhole and sloping utilities between the slab on grade and the top of the mat foundation. A thick, doubly reinforced, concrete slab on grade was designed to support a live loads of 800 PSF, and potential large point loads required to accommodate rigging and installation of large process equipment using cranes and other methods.

Special attention was also taken to resolve the lateral loads in each of the floor's diaphragms which utilized horizontal angle bracing between steel floor members and the large lateral loads at the base of the lateral steel columns. The base plates and anchor bolts at the base of the steel columns required special detailing. The baseplate demands required the use of stiffener plates from the sides of the steel column to the base plate.

This project had a little bit of everything. Including a language barrier. Which we think is both awesome and fun.

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











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 XNO**

Submitted by:						
Print name:		Signature;	X	Date:		
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