cross sections

Magazine for the Structural Engineers Association of New York

2023 VOLUME 28 NO. 3

cross sections

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ON THE COVER
The Sphere at The Venetian
by The Madison Square Garden Company

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MESSAGES

PRESIDENT'S MESSAGE

YUNLU (LULU) SHEN, PE

What are the opportunities and challenges facing our organization and our profession? How can we navigate the changing environment and leverage our strengths? These were the questions the board deliberated when we undertook the Strategic Planning exercise this July.

At the beginning of the process, a survey was sent to a representative selection of industry leaders and active volunteers to understand member perspectives. The responses described a myriad of challenges, including:

- Design for climate change with rational and commercially viable carbon reduction strategies
- Impact of emerging technologies like AI and machine learning
- Generational shift in approach to work-life balance and involvement in the industry
- Workforce challenges like shrinking employee pool and high turnover rates
- Diversity, equity and inclusion in the industry
- Lack of recognition and appreciation for the value of structural engineers.

With these challenges in mind, we crafted our new vision and mission statements. We envisioned a future where structural engineers not only perform meaningful work to shape a safe, resilient and sustainable Built Environment, but are valued for our significant contribution.

While mentally composing this message, I took a walk downstairs to the 9/11 memorial. It was a beautiful fall day, the leaves were just starting to change color. Sunlight shimmered on the water cascading down the sides of the reflecting pools. I looked at the tourists snapping photos and office workers taking their coffee breaks and wondered how many of them think about the roles structural engineers played in the making of this complex structure: from the pioneering design of the original towers, to the 2nd responders who risked their lives at ground zero, to the new family of structures that rose in pride and remembrance. I saw the achievements and responsibilities of our profession coalescing in this neighborhood, with echoes from around the city and state. I would like others to see what I see.

Changing the societal perception of structural engineers is clearly beyond the capabilities of my one-year term. It is a multi-year, perhaps multi-decade undertaking, requiring efforts from structural engineers everywhere. Our parent organization, NCSEA, has launched a We SEE (Structural Engineering Excellence) social media campaign, to highlight our profession to others in the AEC industry and the general public. A number of our committees, such as Student Outreach, 9/11 SE Memorial, SE Licensure, and SEER are also working to advocate for the profession. In fact, Advocacy/Public Outreach is one of the three Strategic Plan focus areas selected for the next five years. You can see an overview of the strategic plan below.

The leadership survey had identified that our greatest organizational strength is our members and volunteers. The talent, energy, and diverse viewpoints of our people and the strong community we have formed will propel us forward through the challenges. If you have comments or ideas, we would love to hear from you at board@seaony.org

STRATEGIC PLAN OVERVIEW

SEAoNY Vision

Structural Engineers are **valued** for their significant contribution to a **safe, resilient, and sustainable Built Environment**

SEAoNY Mission

To advance the art of structural engineering by:

- Building a **community** of colleagues
- Sharing **knowledge**
- **Advocating** for the profession
- Promoting public **safety**

Premier Resource / Knowledge Leaders

SEAoNY is the recognized authority for structural engineering information in New York State, including industry advancements, emerging technologies, best practices, and emergency response.

Volunteer Engagement / Vertical Communication

SEAoNY engages diverse members and volunteers in fulfilling and enriching service, facilitating an understanding of how their work is strategically aligned with the direction of the organization and advancement of the profession.

Advocacy/ Public Outreach

SEAoNY is the voice of the New York structural engineering profession, communicating the value of structural engineers and enhancing public awareness of the critical role structural engineers play in public safety of the built environment.

MESSAGES

RIYA MANIAR, E.I.T.

EDITOR'S MESSAGE

For this final issue of 2023, we are excited to include reports from SEAoNY committees on their progress and achievements throughout the last year. This last issue is a great way to both look back at our progress and forward at the coming goals we work towards. Also included in this issue is an interview of this year's honorary member: Brian Falconer. It is always a pleasure to get a closer look into a master structural engineer's life, gaining perspective from an individual in the larger community we all share a part in. We would also like to extend our thanks to Migara Hewavitharana for conducting the interview that is also available for viewing on the SEAoNY website.

Thank you to the publication team, authors, and readers of Cross Sections for making this magazine informational and enjoyable both to create and read. Through Cross Sections, we are able to reflect the community knowledge base through the valuable and informative topics discussed. As you read through this issue, and the issues to follow next year, we hope you learn and connect with our community. Also, if you want to contribute to the publication and share your own knowledge on a relevant topic, feel free to reach out to publications@seaony.org. We sincerely hope you enjoy this issue of Cross Sections.

Thank you,
Riya Maniar, EIT

THE SPHERE AT THE VENETIAN

A STRUCTURAL GENOME

BY STEVE REICHWEIN
PE, SE(NV),
SECB SENIOR ASSOCIATE,
SEVERUD ASSOCIATES

BY CARLOS DE OLIVEIRA
MASC., PE
PRESIDENT AND CEO, CAST CONNEX TECHNICAL LEAD

INTRODUCTION

The Sphere at the Venetian (Sphere) is located just east of the Sands Expo and Convention Center, south of Sands Avenue and east of Las Vegas Boulevard in Las Vegas, Nevada. With approximately 606,000 square feet of area encompassed by a 515-foot diameter semi-spherical enclosure that rises 325 feet in height, this immersive experience performance venue has the capacity to entertain a seated audience of up to 18,500. Additionally, a 1,200-foot-long serpentine pedestrian bridge that follows Sands Avenue connects the entertainment venue to the Las Vegas Strip.

The overall structure of the venue has seven distinct parts:

- A foundation system composed of drilled shaft piles socketed into cast-in-place concrete caps interconnected by a grid of grade/tie beams
- The ground level slab on grade
- The stadia bowl and main venue superstructure
- Four (4) cast-in-place concrete shear wall cores and a proscenium shear wall founded on mat foundations supported on piles
- A one-story cast-in-place concrete "collar" structure coiling around the southern quadrant of the Exosphere
- The dome roof arch system (from which hangs the 160-thousand square-foot spheroidal immersive LED display plane), a hung grillage system (supported off of the roof and used to support the media plane, catwalk system, and A/V equipment), a two-story "Bridge/Service Building" to the south
- The geosphere exoskeleton (the "Exosphere")
- Although labeled as distinct structural systems, these structural systems act together to form a cohesive, balanced, elegant, and efficient superstructure which significantly benefits the overall structural performance. Additionally, a pedestrian bridge comprised of steel box trusses supporting slab on metal deck walking surface and a metal deck roof above will span between the venue and the Sands Convention Center.

Figure 1: Cross Section of the MSG Sphere at the Venetian

THE PARAMETRIC STRUCTURAL GENOME OF THE EXOSPHERE

Access to relevant data is essential for high quality, fact-based decision making. While engineers have always approached their work with a focus on fact-based decision making dependent on access to data, the modern project workflow has brought about a specific, significant change to the design process. Client expectations have grown beyond the concept of a "final" deliverable and now include a continuous influx of data upon which they base key business decisions.

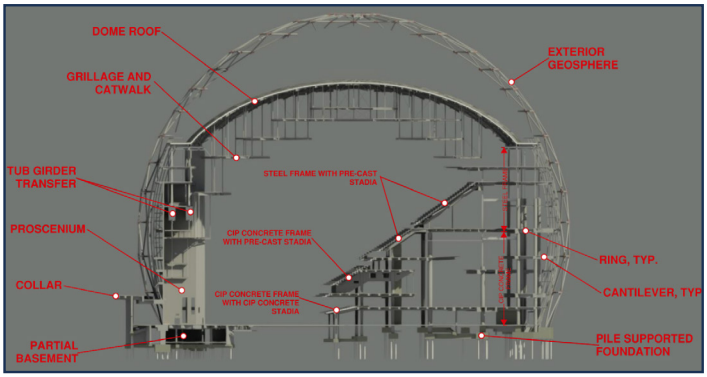


Figure 2: Structural Cross Section of the MSG Sphere at the Venetian

Engineers are now purveyors of data just as much as they are consumers of it. In the field of structural engineering, the potential data includes, but is not limited to structural steel tonnage associated with various framing configurations, economies of scale projections for repetitive connection types, or the relationship between steel tonnage and occupancy comfort for various serviceability considerations. The relevant data varies for each project. Thanks to technological advancements within the last decade, engineers have a powerful tool to use in all situations to meet the ever-growing demand for data: parametric algorithmic design, a process through which structural engineers can acquire the data most useful to clients in an efficient manner. Depending on the complexity of the problem, engineers can automate millions of simulations, process data, and have presentation-ready graphics in a matter of hours.

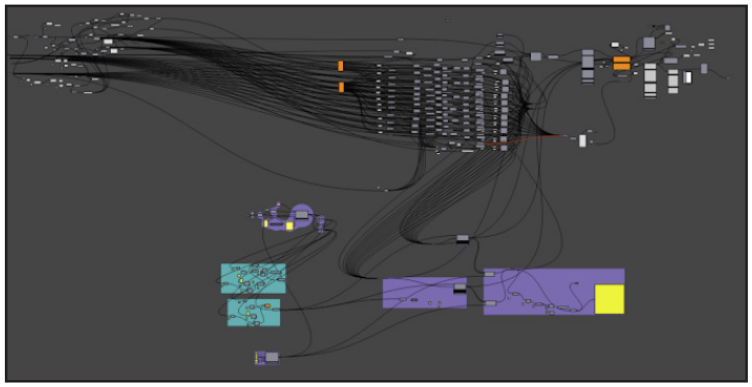


Figure 3: The Parametric Algorithm of the Geosphere

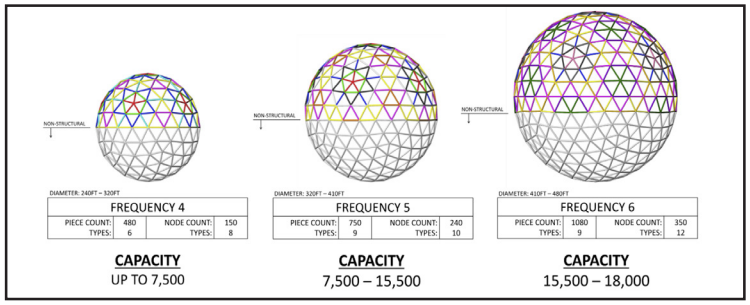


Figure 4: Traditional Geodesic Spheres Optimized for various Sphere Sizes (Capacity = number of patrons)

DESIGN ALTERNATIVES	GEODESIC		GEODESIC (GRID)		HYBRID (SYMM)	
	w/o APEX	w/ APEX	w/o APEX	w/ APEX	w/o APEX	w/ APEX
TONNAGE						
TONS	2100	3500	2400	3600	2600	3900
STRUTS						
COUNT	1470		1730		1410	
TYPES	13		16		18	
NODES						
COUNT	492		612		416	
TYPES	14		9		11	

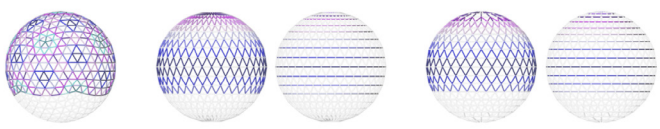
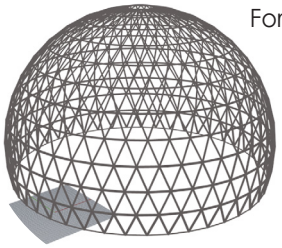


Figure 5: Comparison of the Various Structural Meshes Considered in the Optimization Process



For Sphere, parametric design was utilized early in the design process to help make informed design decisions (see Figure 3). Structural engineers rarely get an open canvas to fully optimize their structure; in this case, the size of the sphere was essentially given, but the framing arrangement was free for optimization with few architectural constraints. To start, we looked at more traditional geodesic sphere geometric configurations, following the blueprint laid out by Buckminster Fuller in the early 1900s. Utilizing a computational algorithm, we were able to optimize various sphere sizes with respect to the frequency of tessellations of the icosahedron (see Figure 4).

Once the results of the traditional geodesic sphere structures were catalogued, conversations regarding fabrication and erection started with W&W and AFCO Steel ("WWAS"), the project's respective steel erector and fabricator. Open dialog with the steel contractors early in the process allowed incorporation of realistic fabrication and erection considerations and costs into optimization functions. The result was a more constructable spherical geometry consisting of defined latitudinal rings and longitudinal diagonals (a geodesic grid), dubbed the "Geosphere" and later renamed the Exosphere. After consideration of costs, economies of scale, constructability, and tolerances, we concluded that although the finalized Exosphere weighed more than the traditional geodesic sphere design, the Exosphere would cost less and would be more readily fabricated and erected (see Figure 5).

With the framing geometry of the Exosphere determined, the next task was to complete a more thorough structural analysis of the Exosphere. A long-span grid shell structure such as this one warrants, second-order non-linear buckling analysis. To conduct this analysis, we exported the refined model into SAP2000 to perform the more advanced analyses; member sizes were further refined until the desired behavior and structural performance were achieved (see Figure 6).

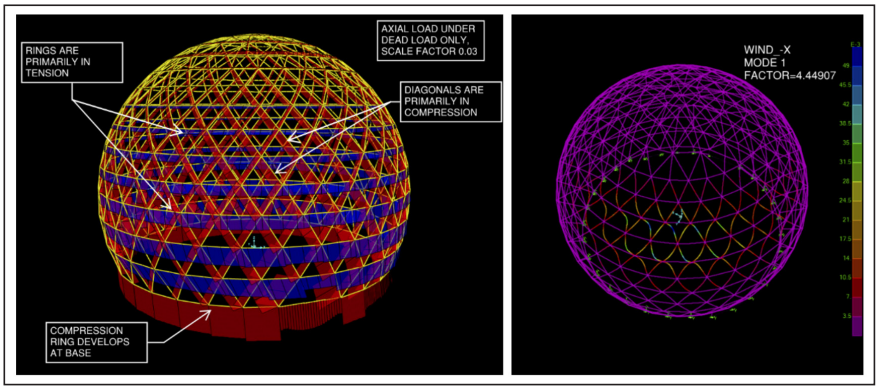


Figure 6: Results of the Advanced Structural Analysis and Performance

With the advanced analyses of the Exosphere completed, we could now consider the nodes and member connections. Several options for the nodes were developed (see Figure 7), all of which were discussed with WWAS and MSG. In the end, three node types were compared in granular detail. These three options were fully resolved complete with plate thicknesses, weld sizes, and bolt quantities. This allowed WWAS to provide detailed fabrication and erection estimates for each approach. For the cast node option, pre-engineered casting designer and manufacturer CASTCONNEX provided detailed conceptualization and cost data.

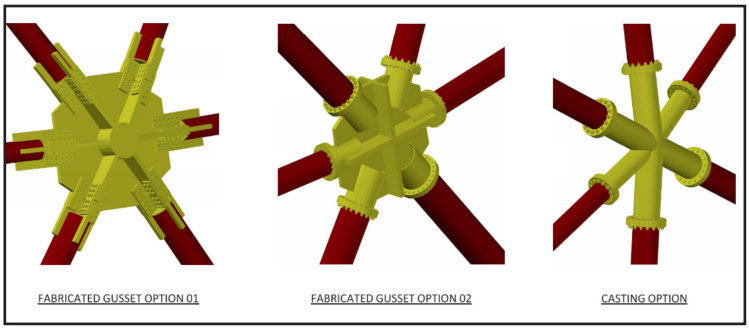


Figure 7: The Final Three - options of nodes that were considered.

Comparative analysis of three options showed that specifying cast nodal connections of the Exosphere offered significant technical advantages over conventionally fabricated nodes, including such benefits as material optimization, improved tolerances, and reduced construction risk (see Figure 8).

From a material optimization perspective, casting the nodes allows a more efficient use of material, enabling connection material to be positioned only where it is necessary from a strength, stiffness, and serviceability perspective. The result was a weight savings of over 40 percent in comparison to the two fabricated options considered. Compared to the fabricated gusset option 1 which relied upon lap spliced connections to the tubular members , the cast node option's end plate connection design offered a ¼ to ⅙ reduction in the number of bolts required. The cast nodes also had one-quarter of the surface area of the fabricated nodes, which offered significant savings in coating system cost (see Figure 9).

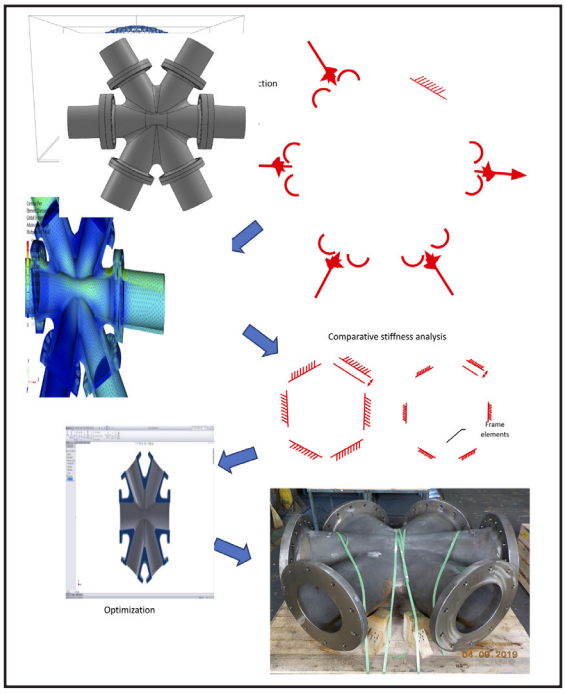


Figure 8: Cast steel node design and optimization

Another significant advantage offered by the cast node option related to manufacturing tolerances. The primary structural system of the Exosphere is comprised of straight lengths of round HSS members that frame between the nodes. As such, the two principal drivers of the Exosphere's geometry are the angular geometry provided by the nodes and the lengths of the members that frame between the nodes. In grid shell structures like the Exosphere, small variations in connection angles or member lengths quickly accumulate and can cause significant deviation away from the targeted geometric form. The conventional fabricated nodes featured large, multi-pass welds that would require significant heat input over multiple welding cycles, which would have resulted in distortion that would have been very difficult to control. Conversely, the cast nodes designed by CAST CONNEX incorporated computer numerical control ("CNC") machining of the end connection faces to precise canted angles with each bolt hole precisely located relative to its theoretical spatial position. As such, the tolerances of the cast node option were far more consistent and over an order of magnitude more precise than could have been achieved with the fabricated nodes. This in conjunction with the ability to make use of shim plates between the end faces of the nodes and the end plates of the Exosphere members,

ensured an ability to control geometry during erection. With these advantages, the cast node option was considered to provide a substantial risk reduction for the project relative to the conventionally fabricated nodes.

In total, there were 368 cast steel nodes produced in 21 unique node types. The nodes ranged in weight from 3,150 to 14,350 pounds for a total of 1,320 tons.

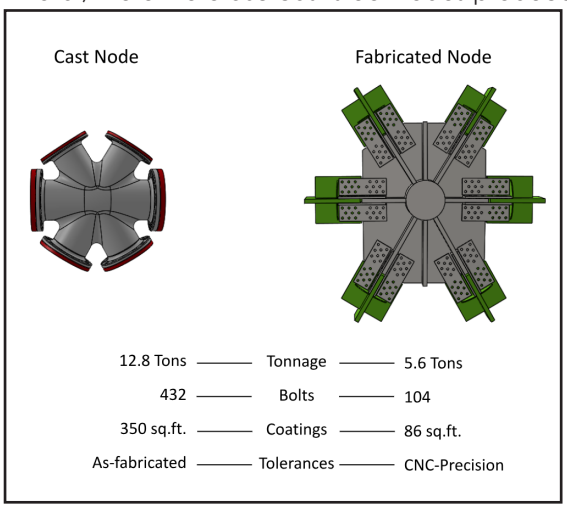


Figure 9: Direct comparison between fabricated and cast nodes engineered for Exosphere Latitude 3

Additional features were incorporated into the cast nodes to support field activities, including "up" arrows to facilitate a more rapid bent assembly and precisely located metrology marks on the nodes (see Figure 10). Survey targets were affixed to the metrology marks, enabling triangulation of the central work point of each of the nodes at various stages of construction such that the as-built geometry of the sphere could be directly compared to its staged construction analysis and ultimately to the final target geometry of the structure.

ERECTION PLANNING AND CONSTRUCTION

One of the benefits of the final geometry chosen for the Exosphere was that it had a full horizontal ring of steel at each latitude. Analysis of the various staged construction approaches showed that once a full ring was completed, that ring and the completed structure below it was very stable and did not require any shoring or temporary support. The plan was to build the sphere one latitude (referred to as Lats) at a time starting at the ground level and ending at the very top center, referred to as the Oculus (see Figure 11 for key elements of the Geosphere construction).

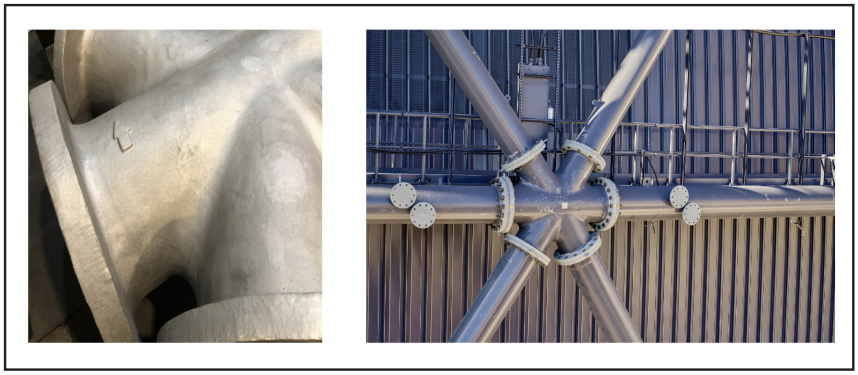


Figure 10: Erector-friendly features incorporated into the cast nodes, including "u" arrow for rapid bent assembly and metrology marks to aid in geometric control and monitoring during construction

The Exosphere base was a fabricated steel double pipe node that was anchored to the pile cap with anchor bolts and a shear key. Once fully anchored, the base node provided plenty of strength to start erecting the diagonal pipes that would support Lat 2 (see Figure 12).

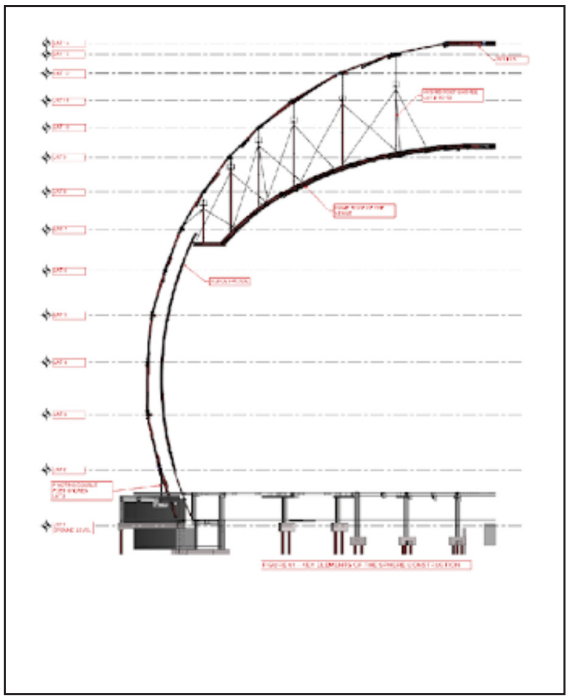


Figure 11: Key Elements of the Geosphere Erection

A staged construction analysis was conducted during the design phase to ensure that the diagonals could cantilever temporarily off a completed ring below while waiting for the top ring to be completed. In general, the sequence for the erection of the geosphere followed suit, where a latitudinal ring would be complete and a set of diagonals would temporarily cantilever to install the next ring above (Figure 13). Minimal temporary shoring off of the venue dome roof below was required to control geometry for the more horizontal diagonals.

The compression oculus was installed as one single piece, and its erection celebrated the topping out milestone for the primary structure of the exosphere (Figure 14). Once the oculus was installed, the erection of the trellis mega panels could commence. The mega panels contained the trellis sub-structure as well as the fully-attached LED system (Figure 15).

GEOMETRY CONTROL

All HSS members were detailed and fabricated short at each end and were sent with shim packs to allow for field adjustment of the total HSS length in order to achieve the required geometry. Staged construction analysis suggested that the final constructed shape could be achieved by cambering the sphere, and this was done by intentionally shortening or lengthening the HSS members (via the shims) in such a way that each finished lat would be built to

an intermediate cambered geometry. As additional lats were constructed, the previous lats would gradually deflect towards the detailed geometry and final shape.

The goal at completion was for the Exosphere's geometry to generally be within 2 inches of the target geometry with a tolerance between any two adjacent nodes of L/500. By the time the Exosphere was complete, there were only a handful of conditions that exceeded these tolerances, and these deviations from target geometry were carefully reviewed for any structural concerns. Minimizing geometric deviations was not only important for the Exosphere structure itself, but also for the trellis structure attaching to the Exosphere, as any deviations would have a direct impact on the trellis connections and could potentially cause LED pucks for the exterior screen to be too far apart, resulting in unwanted lines in the LED picture.

LET THERE BE LED

After the primary Exosphere structure was completed, the next step was to erect all the steel that would ultimately support the LED light bars that allow the entire structure to become one giant, spherical TV screen. The support steel consists of 8-inch round HSS bolted to the Exosphere structure using end plates. This structure, known as the trellis, has a panelized design and could have been erected piece by piece with the LED system being added after the fact. However, the schedule dictated that a faster method of installation was required; this necessitated a mega panel installation (see Figure 15) where the sub-frame and the LEDs were assembled on the ground and lifted into place in larger sections.

The Sphere is now open, with its entertainment schedule being kicked off with a U2 residency, and its exterior LED display has been wowing pedestrians with jaw-dropping animations since July 4, 2023. This amazing facility was envisioned to elevate the entertainment experience to a new level and thanks to the collaborative process and creative thinking that was poured into its design and construction, it will stand as an architectural and structural masterpiece as well.

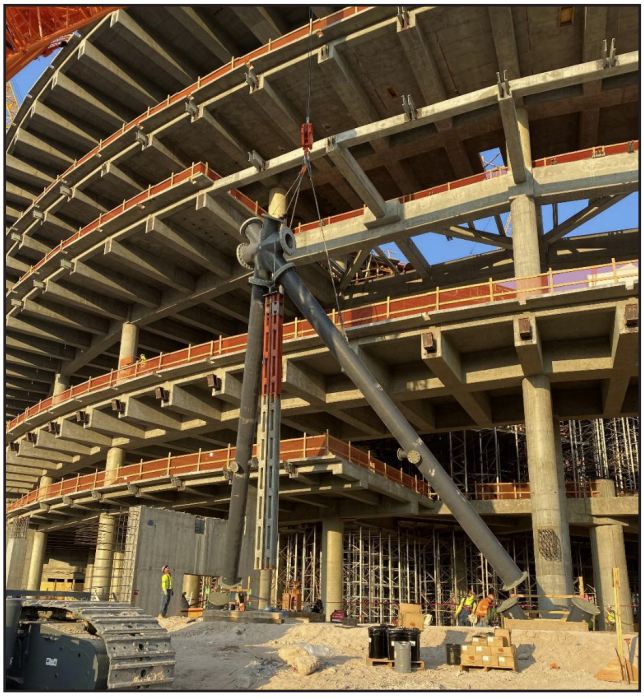


Figure 12: Cantilevered Inverted "V", the first erected

Figure 13: Progress photograph above the equator

Figure 14: Topping Out

Figure 15: Setting the LED Mega Panels

BEYOND THE BIO

INTERVIEW WITH HONORARY MEMBER BRIAN FALCONER

QUESTIONS BY MIGARA HEWAVITHARANA, PE
INTRODUCTION BY BRIAN FALCONER, PE

I'll give you a quick introduction so you have a bit of background that might lead you to ask me some questions. I'm not from New York, even though I work in New York, I was raised in the Midwest and I traveled around because my father was a minister. I ended up being raised in St. Louis and then I went to college at the University of Kansas; I studied architecture and engineering there, but I only ended up getting an engineering degree. I could have gone back for another year to complete an architecture degree, but I chose not to do that. Instead, I went to the University of Texas for a research assistantship. There, my advisor was Jack Breen, who at the time was the chairman of the American Concrete Institute, and I worked on a research project on post-tensioned anchorage zones in bridge decks. After that, I took some time off before I came to work. I planned to backpack around Europe for three months. Before I left, I made a pile of what might have been 50 or 100 resumés with cover letters to different offices. I left them with my parents all closed up and addressed with envelopes stamped, ready to go. Probably about three weeks before I was going to return to the US, my parents dumped all the resumés in the mail. When I returned, I interviewed in a number of places around the country and I decided that Severud was my best opportunity. I have not been disappointed.

I probably could have had a similar, or maybe equal career, somewhere else, but I don't think I really could have had a better one. I graduated from college when I was 25 and I had a dream that I would have a project on the cover of an architectural magazine before I was 30. While I didn't accomplish that before I was 30, I did when I was 30, so I was close. It was the Neurosciences Institute in La Jolla California and it actually won national Architectural Awards. It didn't win any big engineering awards, but it won an award from the American Council of Engineering Companies of New York. I was lucky; I wound up working under Ed Messina until basically the Pandemic when he semi-retired. Others in the office influenced me as well. I've been lucky to work with a lot of renowned American Architects. I've worked on a lot of museums, labs, some major renovations, medical work, and retail work. I haven't done much residential work except for maybe, there's no good way to say it, houses for really wealthy people. I've worked with all kinds of different materials. The obvious ones: steel, concrete, wood, and masonry, but I've also worked with glass, plexiglass, bronze, and aluminum. I was the kind of person that if you had something weird, it would get thrown my way, and then I would figure it out.

Thanks for that introduction, we'll jump into some of these questions here. So you've already kind of done a bit of reflection on your career with that introduction, what would you consider some very impactful moments or pivotal moments in your career as you progressed as an engineer? What skills do you find essential for a successful career in Structural Engineering?

Well first and foremost, a commitment to it! That and a love and a passion for it; if you don't have that, commitment and love and passion, I would say do something else because this is a pain! It is a painful career; you're going to go through pain if you're not loving it and it's not going to be good. This is a vocation and so I think that you have to be of that mindset.

As far as impactful moments, I kind of was thinking I wasn't going to do this at all and then something happened my freshman year in college. I had decided in high school not to do engineering and architecture and then I was sitting in my dorm and one of the guys I knew was studying something called architectural engineering. I hadn't really given it too much thought at that point, but then I asked him if I could look at the textbook he had, and I opened it and I could understand how these things work together. The very next day I went down and I changed all of my classes for the next semester. I went all-in on architectural-engineering. So that was a pivotal moment in my life.

When I was in this major, I thought for a while that I would do construction, but I definitely realized that I had a love of design and I also didn't know if I might want to teach someday or not. I started thinking near the end of my architectural-engineering degree, that maybe I should go to graduate school to get a Master's Degree. Without that, if I ever wanted

to go back for a PhD, it would have been too much of a deterrent. The decision to pursue my Master's Degree was very important and Texas was a great place to do it. I had great experiences, it had a great energy, and I was able to study. It was a broad enough faculty that I was able to take a lot of different classes. I got to study long span systems, masonry, post-tensioned concrete, prestressed concrete, and a lot of different things that I ended up using later on in my career. Just the decision alone to get my Master's Degree was really important and impactful then.

Where I chose to work was also a really big, impactful decision for a lot of reasons. I wasn't from New York so to come here was kind of an unusual thing. Most of my friends thought it was crazy, but the opportunity you get in New York is different from the opportunities if I had remained in Austin, Texas. It's not that I would have done nothing, but I wouldn't have had as much opportunity as I would in a place like New York. There are moments that have happened in my life since I've been here where I've got jobs, where I've lost jobs, but a lot of those aren't totally my decision or something that I control. You have to be in the room and when you're in the room some things are going to hit, but if you're not in the room then you're not going to get the opportunity. It's a harder uphill battle if you're not in the room.

What inspired you to pursue architecture and engineering? I know you mentioned that one of your roommates was doing architecture and engineering as well, but did you have an inclination to go that way already?

When I was younger, my father purchased a number of rental buildings around St. Louis and we worked together to renovate them. When I was in high school, we also renovated our own house. I was strong at math and science and actually art as well. My art teacher was really the one that was trying to push me towards architecture, but I would say I was better at engineering. In school I collaborated with architecture students. I would work with them on their projects, sometimes going through ideas that they had about how things could be done and how to collaborate. So by the time I started working, I already had quite a bit of experience collaborating with architects. If you've worked with me before you'll know that I usually try to give people at least three options; I don't try to simply tell somebody one way to do something. I try to tell them that there are a few different things that they could do, and then figure out what's most in-line with what they're trying to accomplish. It might be a blend of those ideas; it's not a one-size fits-all solution. How are we going to make this work? How are we going to approach it? How are we going to do something different that'll make it work? I've told people that my role with an architect is that I know where the edge is; if they want to get close to the edge, I take them to it. They may not know where the edge is, but I know where the edge is and it's awesome.

What were some of your biggest challenges at different stages of your career and even more recently? These could be projects or difficult decisions you had to make, maybe it was a tough client you had to manage?

I don't mind difficult clients. Okay, I don't like clients that don't pay, but I don't mind "difficult" clients. In fact, if there is an end to a goal that we're trying to achieve and the difficulty is centered around that, totally okay. I'm very much in favor of that. It can be stressful for me when clients react poorly to the stress of what's going on and I can forgive people for that too. As far as the biggest challenges, I have some big challenges that I'm doing now, and in some ways, I invent my own challenges. I see what's going on, and I think there's something interesting or different to be done here, and so then can we try to do it, but sometimes you don't get to. A case in point, we designed a building at Vasser to span over a creek that's dry most of the year, but is wet for a month each year or something like that. We designed it with about 150-foot span and, I was surprised that they were letting us do this, it was a curved building so it was a curved box spanning the 150-foot, and boy it was exciting. There was a foundation issue on another part of the building; so during value-engineering, we ended up dropping a column in the middle of our span and cutting our 150-foot span down to two 75-foot spans. On one hand, this was disappointing, but we still got to do 75-foot spans and we still designed the full thing.

I had challenges that may not seem as interesting, but I designed the blade stair at MoMA. It's on 53rd Street and it is hung from the ceiling. It hangs five stories off of the roof and it's made of architecturally exposed steel plates. It is very fine-tuned, meaning that it deflects as much as we'd let it deflect based on what they want to do. It's not when you design the framing for the floor and you say everything's W8x35 and W24x55 and the columns are W12x120 or whatever they are and that's just it. When you design something like this, you get very involved with the fabricator and the fabricator has their own engineer. In fact they do their own design of it sometimes and they'll argue about something you assumed and then they would say at some point well if you'll write me a letter saying that it's okay then I'll let it be. There was a whole thing with the contractor and their engineer. They said it didn't work so on that job my challenge at that point was to sit down with that engineer and go through everything and convince them that it worked which I did. In 1998, or around then, I designed a spherical theater that was going to be hung for the World Religion Museum in

Taiwan. Not a big thing, not the Sphere in Vegas, but probably a 40-foot diameter and we designed this sphere to be hung off of four cables hung from the structure above. The vibration was a bit of a concern, but there was a stair leading up into it and a stair coming down out of it and those were going to tie it to keep it from vibrating. Despite that, the engineers in Taiwan would not do it; they refused to do it and they ended up just putting it in framing to the floor rather than having it hung. I lost that one so you don't always win, I got it that far but I couldn't get it over the line.

What motivated you to actively participate in various professional organizations including SEAoNY? You were a past president of SEAoNY, what kind of got you to want to get engaged with these organizations? I believe you were also president of your National Society of architectural engineering back at Kansas University of Kansas as well, so clearly this has been something that you've done for a long time in your career and even back to your student days.

I never wanted to lead for the sake of leading, that wasn't ever my goal. When I thought that something needed to be led, I generally, sometimes with some trepidation, stepped up and did what I thought needed to be done. That isn't to say I haven't been involved when I wasn't in the leadership position. In fact, a lot of times I would prefer to be someone who's a board or committee member as opposed to in the front lead spot. That's kind of what happened: I was involved in volunteering for SEAoNY and then something happened and the current leader couldn't do it anymore. Then that's when I got asked to be president of SEAoNY! So I was asked, I agreed to run, and then I was elected and became president of SEAoNY. That's more how I've done things, I haven't really looked to become the president of everything that I've done.

Things that I'm proud about with SEAoNY, well I haven't finished yet, but it will be getting SE licensure in the state of New York.

What I had done was transformed SEAoNY financially. I realized when I got on the board that the fundraising wasn't necessarily as efficient and successful as I thought it could be, and so right away Scott Hughes and I got involved in that. From my exposure from some other nonprofits I've been involved with, we made a roadmap for SEAoNY on how to handle the funds. I haven't been on the board since then; so I don't know how good that's been, but I hear that turned out well.

Let's talk about the SE licensure. How long have you been trying to move that forward and where do you see it going? What challenges do you see coming to getting that passed?

When I became president of SEAoNY, or actually even president-elect in 2012, I thought "oh that would be a good thing to do while you're president, so simple to get it done in a year." Well I didn't get it. I didn't even start it when I was President! When you're president you have to deal with what needs to be done and what comes up. If you don't do it when you're president, the next person is supposed to do it. So when you're the president you don't get to pick and choose, you have to say, "okay what's the biggest thing that needs to be done here and then let's make sure we get that done." I started putting more effort and focus into SE licensure and a lot of it is just kind of deciding "okay well what is SE licensure? What will it affect? Who needs to get it? How do you get it?" After that, it becomes marketing and part of that is political. We need to get politicians behind the idea that there should be SE licensure and that it would be good for the general public, not good for structural engineers, but good for the general public.

There's a lot of structural engineering that isn't really even done in our firms. There's a lot of structural engineering that's done by contractors and mechanical engineers and stuff that doesn't really need to be impacted the same way. Defining what engineering needs to be done by SE's is done, but now it's more the marketing and then fundraising. We want to raise money now so we can hire lobbyists and approach elected officials to sponsor it, and then a whole bunch of people need to vote on it. There have been things that have happened during my career, September 11th, Hurricane Sandy, world events that highlight structural engineers and make the public realize that we're more important at certain times. There have historically been events where some buildings haven't performed the way people had hoped. If we achieve SE licensure, that's going to be less likely to happen moving forward. We're at this juncture where it's more of a marketing and a political campaign.

Where do you hope the industry will change for the future generations of Engineers? What's your hope for Structural Engineers of the future? The people who are maybe in high school now, thinking about pursuing engineering, what do you think their career paths are going to look like when they finally become fully realized Structural Engineers?

There's going to be a range of pay for a structural engineer. There's going to be remote work. The population is growing,

but not as many people are pursuing engineering, so there should be a maintained demand for structural engineering. I would say for the next 50 years, at least, it's not going to be a bad decision to go into Structural Engineering. AI may have an impact on us. Robotics may have an impact on us. There's unionization going on now in architecture firms and since we're a subset of that design field it might have an impact on us. I'll say, I don't really know for good or for bad, but that there might be an impact on Structural Engineers going forward. Getting back to the first thing, if you don't love it, we have people's lives in our hands and it's easy to lose money on a job that you didn't plan out properly or didn't get the fee you wanted for. It's very stressful, so if at the end of the day you don't love that feeling of saying I worked on this, why would you do this? So really it's the vocation; it's the passion; it's the love of what you're doing that I think has to guide you to be a structural engineer.

Where do you see AI's role in structural engineering? Do you feel there's any sort of worry that we will get replaced for some type of stronger software?

I don't know how it's going to affect us, but I don't think that it's going to be a big detriment. I don't really see a world in which structural engineers are completely replaced with AI. When CAD came into vogue, all of a sudden you could produce a lot more drawings with a lot fewer people. Then what happened is they kept moving the line six-inches that way back and forth, so you kept on redoing your drawings. Eventually, the hours that it took to meticulously do these hand drawings, where you would not change one small thing, and now you're using the same amount of hours to make these drawings in CAD and change them 20 times. With some of the softwares that came in, we became more efficient at designing complex things, and so then for those things we ended up not needing as many structural engineers. I don't think AI is going to be used to make things less expensive to design; I think AI is going to be used to make things more challenging architecturally and structurally and still be able to do it with a reasonable amount of people. I think we will always be that way, that certain things will become made more accessible by AI, but then there will still be people kind of out there on the edge doing challenging things.

I don't feel the need to be the person that's the first one using new innovations, but I'm happy to be the second after they work out all the bugs. When Revit became popular there were two or three softwares that were bidding to become "the thing" and so you either needed to be on three boats or you had to wait until there was only one boat.

Can you share some of your tricks to maintain a work life balance? Obviously you've been very busy throughout your career working on very challenging projects and getting involved with leadership stuff. How do you kind of balance it all?

I've handled it poorly, to be honest with you. I would say, though, that I did certain things with my children when they were growing up, to spend time with them, but I didn't spend my time on other things that maybe other parents did. To be honest that was the one thing my wife still tells me to this day- it's not necessarily how much time you spend, it can often be the quality of the time that you spend. If you can't put your job down enough to focus on these other things in your life and really give them the attention they deserve, then you're not really giving them anything. So sometimes it's not really a question of am I home for dinner every night and spending every evening with my kids, but maybe it is a question of when I spend two or three hours with them and I spend eight hours with them over the weekend, am I able to put work down and focus on spending that time with them.

Transitioning into our next topic, if you were to learn one new non-engineering topic what would that be?

Probably two things I've played with my whole life, but never really mastered, are speaking French and playing the guitar. Those are two things that interest me, but I have never really been able to devote a lot of time. In my free time I also run, swim, and surf a little bit.

If there was someone who you could choose that was maybe your biggest Mentor or role model during your time as a structural engineer, who would that person be?

Ed Messina, no question. There have been other people in my life that definitely put effort into me and so it's not that he's the only one, but we spent a lot of time together and he encouraged me to be creative. I would have some ideas and he wasn't one to tell me that'll never work or don't do it. He was always like "Let's look at that. Show me what you think. Show me what you come up with." I feel not enough structural engineers really do that, even myself. I tend to err on the side of conservative and what's been done more often than not.

I think to wrap things up, what advice would you give to your younger self?

Smile more. I think some people may even tell you, I smile a lot, but I think I still should have smiled more!

COMMITTEE UPDATES

REMEMBER TO FOLLOW SEAONY ON:

SUSTAINABLE DESIGN COMMITTEE

We are in the midst of a climate emergency. The building and construction industry is responsible for 39% of annual global greenhouse gas emissions. Roughly 28% of those emissions come from the operational energy used to heat and cool buildings, while the other 11% of emissions come from the embodied carbon of the structure. Embodied carbon is the sum of the CO2 emissions associated with the manufacturing, transportation, installation, and disposal of building materials that make up a structure. According to the World Green Building Council, embodied carbon will be responsible for half of the carbon footprint of all new construction between now and 2050. Just as building operating systems are becoming more efficient, we must look for ways to reduce embodied carbon in building construction. With awareness and intentionality in the design process, we can reduce, and ultimately eliminate, embodied carbon in structures.

As designers, engineers, and builders who strive to leave the world better than we found it, we must put sustainability at the forefront of our work.

The Sustainable Design Committee aligns with the SE2050 program to target the reduction of embodied carbon and ultimately achieve net zero in building construction. We empower structural engineering firms to commit to SE2050. We facilitate commitment to the program by outlining and simplifying the process. Our goal is to give structural engineers the resources and tools to incorporate sustainable practices into their projects and drive change within the industry. Additionally, we are committed to guiding and providing necessary information to the community about embodied carbon and relevant updates in the AEC industry. We aim to increase the number of New York firms officially committed to SE2050 and to add the structural engineering community's voice into legislative changes that are guiding the industry towards a sustainable future.

Join us virtually on the 2nd Wednesday of each month. Email sdc@seaony.org for the link to join! We look forward to designing a more sustainable future with you!

CO-CHAIRS: Candice Ogando, PE | Kim Avelar, EIT

YOUNG MEMBERS GROUP

YMG (Young Members Group)'s mission is to provide pathways for young engineers in the New York City area to network and become the bridge to the larger SEAoNY community.

This past year was busy for the YMG committee. We coordinated and hosted several in-person events including site visits to 270 Park Ave, the One Vanderbilt Observation Deck, in-person Pub Trivia, and the Annual Holiday Party. We also presented a technical lecture on the Design and Replacement of the Cable Supported JMA Dome (formerly known as the Carrier Dome at Syracuse University), and collaborated with the Sustainability Committee to organize a panel discussion aimed at young engineers on how they can initiate sustainability practices at their own firms. We resumed our PE Exam review sessions on applying for the exam and best test taking strategies. Furthermore, YMG launched its inaugural book club!

This upcoming year, YMG continues to strive towards developing opportunities and platforms for young engineers to come together. We aim to increase the participation of young engineers in SEAoNY YMG among the various firms in the metropolitan area. Additionally, we seek to supply avenues for young engineers to meet with leaders of the industry and hopefully open doors for advice and mentorship. Moreover, we hope to give back to our communities by participating in charitable initiatives. Finally, we want to give a special thank you to our committee members. Our committee is only as effective as its core group of volunteers; their continued support and volunteerism to execute YMG's ambitious plan is greatly and always appreciated. If planning events sounds like a fun thing to do, please join our committee (we welcome you with open arms!) or if you have any questions about us, please do not hesitate to contact us at youngmembers@seaony.org. Please also check out our webpage at seaony.org/YMG and follow us on Linkedin and Instagram (@seaonynyc).

CO-CHAIRS: Jimmy Liang, PE | Teddy Jeanty

DIVERSITY COMMITTEE

The Diversity Committee held two events this past year. In January, we hosted a panel event of four representatives from our local membership to discuss Diversity and Inclusion programming at their respective companies. The program was titled "Navigating Diversity and Inclusion at Your Firm: A DEI Knowledge Exchange". Panel members were Sharon Jankiewicz (Silman), Jennifer Mahan (Thornton Tomasetti), Safiya Townsley (Hilti), and Chi Chi Truong (ARUP). Panelists presented on current DEI initiatives, employee affinity groups, and advice on starting DEI initiatives. We held a Q&A session after the presentations and there were many questions from the audience about maintaining motivation and getting support from HR and upper management.

In June, we hosted a Speed Networking Event which was an opportunity for young engineers to learn about various career paths within structural engineering. Our mentors were Aditya Bhagath (Thornton Tomasetti), Ann Marie Bugler (Hilti), Chris Cerino (STV), Paul Evans (Turner Construction Co.), Erleen Hatfield (Hatfield Group), Stephen Reichwein (Severud Associates), and Delia Shumway (New Line Structures & Development). This was a fast-paced networking event where small groups rotated through each mentor every 20 minutes. The conversations were informative, and mentors were a great source of knowledge for each young engineer.

Left to Right: Chi Chi Truong, Safiya Townsley, Jennifer Mahan, and Sharon Jankiewicz

Left to Right: Left to Right: Chris Cerino, Aditya Bhagath, Stephen Reichwein, Paul Evans, Ann Marie Bugler, and Delia Shumway

CHAIR: Sharon Jankiewicz

RESILIENCE COMMITTEE

The frequency and intensity of extreme events have been escalating over the past decade, impacting urbanized communities and causing significant losses. These events can have devastating impacts on human lives, ecosystems, infrastructure, and economies. Understanding the causes and effects of these events is crucial for developing strategies for adaptation and mitigation. However, quantifying the frequency of extreme events and their impacts is challenging, as they are rare by definition, and often influenced by multiple factors. The goal of the SEAoNY Resilience Committee is to educate the structural engineering community on resilience approaches to planning, design, and construction through collective experiences in the multi-hazard urban environment. This committee covers a wide range of hazards including wind, flood, earthquakes, and wildfires, and provides a multidisciplinary collaboration platform to formulate recommendations and innovations to enhance resilience in the built environment.

Consider events during the summer of 2023 across the U.S. such as the impacts of smoke from Canadian wildfires on air quality in the cities in the U.S., heat waves across the country, devastating wildfires in Hawaii, and tropical storm Hilary in southern California. There is a pressing need to focus on adaptation and mitigation to create resilience against extreme climate events. Resilience can be enhanced by developing strategies, plans, policies, and practices that reduce vulnerabilities, increase capacities, and foster learning and innovation. Achieving resilience also requires collaboration and coordination among multiple stakeholders, sectors, and levels of governance.

CO-CHAIRS: Filippo Masetti, PE | Negar Elhami-Khorasani, PhD

SCHOLARSHIP COMMITTEE

The SEAoNY Education Fund (Golf) Committee held our annual golf outing at Mahopac Golf Club on June 12, 2023. We are happy to report it was a great success. The event was sold out, as usual (be sure to sign up your firm early next year!), and we had a beautiful day to play golf. We especially want to thank our Platinum Sponsor, Lockton. Think about having your firm act as our platinum sponsor for 2024. We'll produce a special gift featuring your firm's branding.

After play was completed on the course, Erik Madsen presented Henry Long and Gerard Renodo, Seniors at the Urban Assembly School for Design and Construction, with scholarships to go toward their first year of college. Two more scholarships were given to current structural students from City College at the annual meeting in September. The Education Fund has now given out over $300,000 in support for students studying structural engineering – and we've had a great time doing it.

CO-CHAIRS: John Pat Arnett, PE | John McCue

PROGRAMS COMMITTEE

Introduction
As the Programs Committee for the Structural Engineers Association of New York (SEAoNY), we are pleased to present our annual report for this past year and to provide insight into our plans for the upcoming year. Our mission is to organize and oversee a wide range of events and activities that contribute to the professional development, networking opportunities, and recognition of our members.

Year in Review (Last Year)
The past year was marked by significant achievements and successful events hosted by the Programs Committee. We continued our commitment to offering high-quality educational opportunities and to fostering a sense of community among our members. Here is a summary of our key accomplishments:

1. Continuing Education Events: The Programs Committee hosted a total of six continuing education events last year. These events included the highly anticipated all-day annual seminar, which provided attendees with valuable insights into the latest developments in structural engineering. We also organized the President's Breakfast Roundtable, a unique networking and knowledge-sharing opportunity.

2. Webinars and Seminars: In addition to the annual seminar and roundtable, we conducted four webinars/seminars that covered a range of important topics in structural engineering. These virtual events allowed us to reach a broader audience and provide valuable educational content.

3. Special Events: Our committee was proud to host the annual Boat Cruise, a delightful evening of networking and relaxation. We also organized the Structural Engineers in Excellence (SEE) Awards, which recognized outstanding contributions to the field and celebrated the achievements of our members.

Looking Ahead (This Year)
For the upcoming year, the Programs Committee is focused on enhancing the impact and efficiency of SEAoNY-wide events. Our primary goal is to ensure that all SEAoNY events are organized seamlessly and that resources and announcements are effectively communicated. Here are the key initiatives we plan to undertake:

1. Centralized Event Organization: Starting this year, all SEAoNY-wide events will be organized exclusively by the Programs Committee. This strategic shift is aimed at streamlining event coordination, ensuring consistent quality, and maximizing the overall impact of organization-wide activities. By consolidating these efforts, we can allocate resources more efficiently and improve event logistics.

2. Continuing Education: We remain committed to providing valuable educational opportunities to our members. In the coming year, we will continue to host the same successful events mentioned above. Additionally, we have three exciting continuing education events planned to close out the calendar year, covering topics of utmost relevance to structural engineers.
Recognition and Networking: While we focus on SEAoNY-wide events, we acknowledge the importance of fostering a sense of community among our members. Although we will not be organizing internal committee events such as monthly meetings, we encourage members to engage and connect through the various programs we offer.

3. Community Outreach: We are looking to host more events that actively engage the general community, to promote the structural engineering profession and educate the general public about our profession's value.
Annual All-Day Seminar: We are already in the planning stages for this year's annual all-day seminar, which promises to be a highlight of our calendar. Stay tuned for more details on the theme, speakers, and registration information.

Conclusion
In conclusion, the Programs Committee had a successful year hosting a variety of educational and networking events. Looking ahead, we are excited about our new responsibility to organize all SEAoNY-wide events and are committed to delivering exceptional experiences for our members. We appreciate the support and participation of our members and anticipate another year of growth and achievement.

Thank you for your continued trust in the SEAoNY Programs Committee. We look forward to serving you in the year ahead.

Jacinda Collins and Steve Reichwein
Co-Chairs, Programs Committee

CO-CHAIRS: Jacinda Collins, PE | Steve Reichwein, PE

9/11 COMMITTEE

We are very excited to announce that, on behalf of SEAoNY, the 9/11 committee is creating a short documentary highlighting structural engineers' efforts following the collapse of the World Trade Center on September 11, 2001. Structural engineers and other design professionals were called upon to help maintain the stability of the remaining structures and to allow for the safe movement of debris. After the initial effort, SEAoNY continued to provide services for the clean-up and investigation of the disaster site, as well as many other affected buildings south of Canal Street.

Our goal is to build upon the direct connection to this important history and to educate the public on the importance of structural engineering. Through the SEAoNY Education Foundation, a 501(c)3 non-profit organization, the 9/11 SE Memorial Committee is seeking to raise $100,000 in contributions to create a short documentary highlighting how structural engineers' expert knowledge and resources aided the heroic recovery effort and how our industry's collective memory of the tragedy will ensure future generations never forget.. The intended audience for this film includes students, young professionals, and the general public.

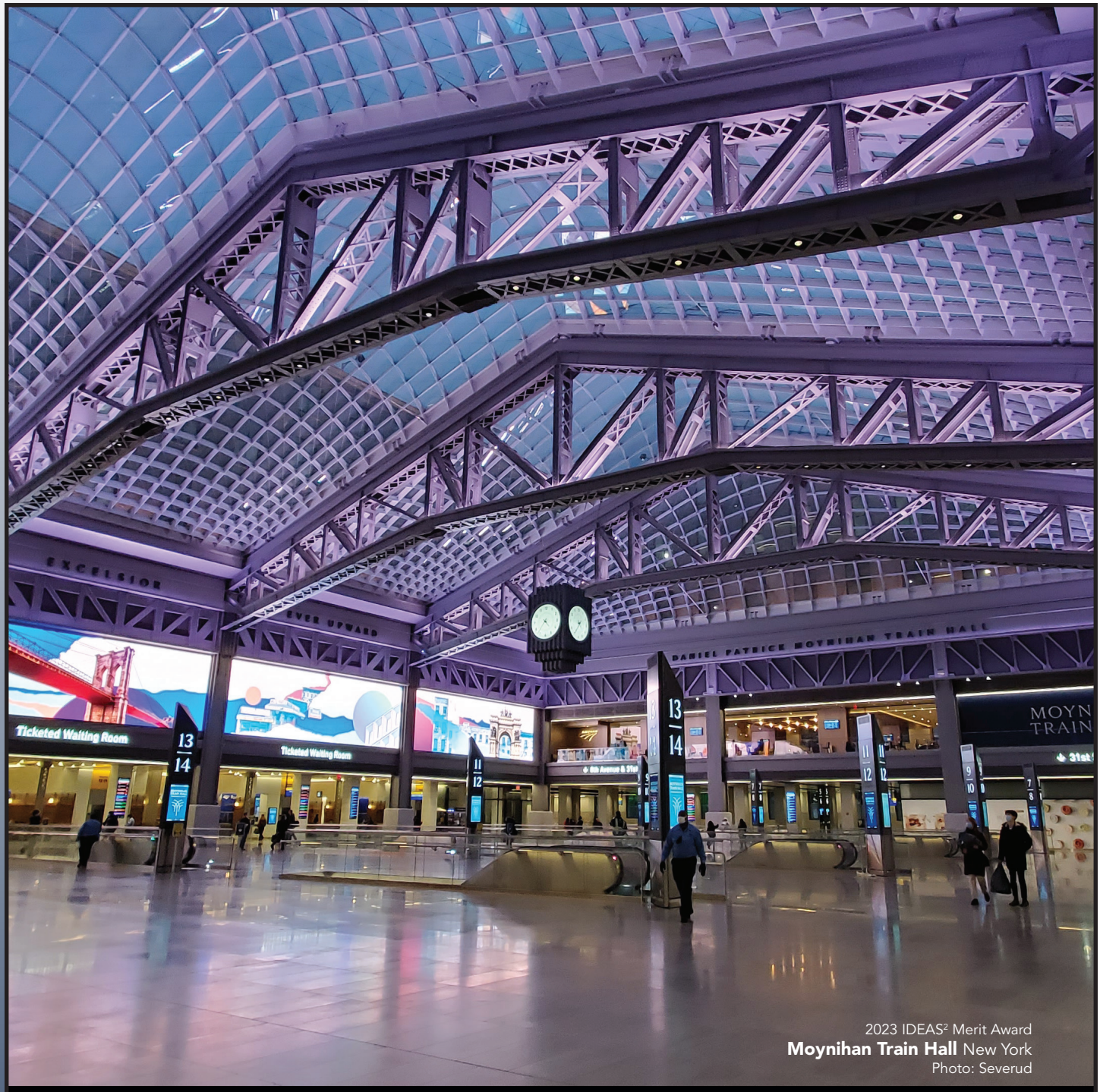
We will acknowledge each financial contributor by name within the film, on our website, and in our Cross Sections newsletter. By making a tax-deductible contribution to the SEAoNY Education Foundation 9/11 SE Memorial Committee, you will be helping SEAoNY meet our $100,000 goal, as well as playing a direct role in the production of this important, educational documentary for the profession.

To donate:
If you have any questions or require additional information, please do not hesitate to contact me, or Bill Lyons, 9/11 SE Memorial Fundraising Subcommittee Chair, at wlyons@euclidchemical.com or 201-401-3391

In addition to financial contributions, we are collecting photos and videos for our archive. If you or someone you know have photos or videos, please have them contact us at bkiefer@k-sengineering.com

Sincerely,
Bradford T. Kiefer
Co-Chair 9/11 Committee

CO-CHAIRS: Bradford Kiefer, PE | Jonathan Hernandez, PE



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