



State President's Message

Andy DiLeo, PE, SE
SEAOA State President



Happy New Year SEAOA,

Things for the State Board have been relatively quiet. However, the convention planning is still under way. We are in final negotiations with the Doubletree Paradise Valley – Scottsdale. While things are not finalized yet we're working towards the dates of June 15 – 17. Keep an eye out for a Save the Date in your email once our contract and dates are finalized.

The SEAOA convention can only be as successful as the time, energy, ideas, and planning that goes into it. There is still time to make suggestions or volunteer to help with the planning. We always need help finding great speakers and topics, reaching out to new and existing vendors to join us in our exhibition hall, and suggestions for networking events during the convention. The SEAOA Convention Planning Committee needs your help to make the 2023 convention even better.

Please reach out to info@SEAOA.org with suggestions or to volunteer.

Here's to a great 2023!

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TUCSON CHAPTER MEETING

January 2023
TBA



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CENTRAL CHAPTER MEETING

January 17, 2023
5:30pm

[Application of Fiber Reinforced Concrete](#)

Central Chapter Chairperson's Message

Mark Forman, P.E., S.E.
Central Chapter Chair



Happy Holidays everyone!

I wish you and your families a great Holiday season! I am hopeful everyone has a safe and healthy New Year! It has been an honor to serve as the Central Chapter

Chairman for the fall of 2022, and I am looking forward to a great 2023.

The November central chapter meeting this fall was an overwhelming success. We had thirty members attend the live meeting and Tour of the Beam on Farmer. One of the first heavy Timber structures in Arizona. The presentation was by Christa Chau,

P.E., S.E., LEED AP, Partner/Director of Special Projects for PK Associates. Thanks to Mortenson Construction for allowing us to meet in their office and provide an informative tour.

January's meeting is a presentation by ASU professor Barzin Mobasher. The topic will discuss structural re-design and fatigue studies of track slabs for the light rail in Phoenix. Stay tuned for more information as it becomes available.

The winter-spring meetings are all planned; we have many structural experts lined up to present. Looking forward to a very interesting agenda.

I look forward to serving you as the central chapter chairman through the new year and I hope to see many of you attending our future meetings.

THE RIGHT BRAIN
© Brent Wright rightbrain.wrightengineers.com



This fuzzy math reminds me of the two engineers who argued over which of them was the smartest. One tells the other, "You don't know anything--I know at least twice as much as you!"

This Right Brain cartoon is a contribution from Brent Wright of Wright Engineers, an SEAOA supporting firm. If you would like to contribute an original cartoon, please email it to info@seoa.org

Tucson Chapter President's Message

Steven Hess, PE, S.E.
Tucson Chapter President



In a recent NCSEA magazine article about the ASCE 7-22 Wind Code provisions noted there were some changes to these provisions. These changes were simplifications of the wind zones on the roof from six to three and some other minor adjustments which lowered the uplift loads. For me this was an indication that practicing SE's exerted

their influence over the academics which typically results in more complex analysis. In my opinion frequently results in wind forces which may not be "accurate". In a past SEAOA State Convention, Ed Huston, Chair of the Wind Engineering Committee, noted a study where 20 registered SE's calculated the wind forces on a building. The result was 17 different answers with force values ranging from 50% to 200% of the intended answer. In my opinion, the wind provisions have not been simplified much since then.

The wind code provisions in the 1973 UBC were quite simple at 15 PSF for the first 30 feet and uplift was fairly simple as well. The total number of pages in the 1973 UBC Code was about 4 pages. The result was a more uniform interpretation of the code. That code was brief but looking back, the failures from wind generally was not due to low design wind forces but a lack of detailing.

I also noted in the article they posed the question if we need to take climate change into account in the code. I am a skeptic about the basis of the climate change discourse, but I have noted in my wide range of reading that the weaponization of weather for military considerations has occurred such that they can generate extreme weather in a desired location such as drought, extreme rains, and hurricanes. Such a topic I will leave to each individual to research on their own. I will ask if the engineering community needs to design for such conditions? Just a few thoughts for the start of the new year along with the recent Twitter revelations.

Need a Structural Engineer?

The SEAOA created a web page for members to add their name to a list of structural engineers who are available to consult on small residential and commercial projects. This list is very helpful for building safety staff in all jurisdictions. When an applicant receives a plan review comment requiring engineering for something like a new lintel in an existing wall, the first question the applicant asks is, "Can you tell me who to use?". Plan review staff are not allowed to make these referrals for several reasons. They can however refer to the website. Please contact Sarah Betts if you are interested in adding your name to this list.

Younger Members Group Chair's Message

Cesar Castro, E.I.T.
YMG Chair

seaoaymg@gmail.com



We are writing this letter to introduce you to the Young Member Group (YMG) of Structural Engineers Association of Arizona (SEAOA). The purpose of SEAOA YMG is to guide and support engineers in their transition between school and industrial practice while developing a structural profession. SEAOA YMG is geared

towards young P.E.s, E.I.T.s and Structural Engineering students who practice or have interests in the structural design industry. The main goals of this group are to:

- Minimize the learning curve for the young engineers with provided seminars, workshops and construction site-visits.
- Build a network among young engineers to exchange technical information and to share lessons learned from their career.

- Help the young engineers to develop leadership and management skills through a career enhancement program.

SEAOA YMG provides a platform for young engineers to exchange and share structural information, to network in a community environment, to enhance structural knowledge through design seminars and construction site-visits, and to develop leadership and management skills by being a part of the SEAOA YMG. Members will be exposed to in-depth structural methodologies, latest technologies and applications, and presentations on lessons learned from the past or ongoing projects in the industry. We aim to shape our members into more valuable structural engineers and to further educate them to grow and advance in their career.

We invite all E.I.T.s and P.E.s to join and to become actively involved in this group. Our next meeting, YMG - ASU mixer, will be held on Thursday, January 26th at 5:30pm at O.H.SO. (4900 E Indian School Rd, Phoenix). Please contact us at seaoazymg@gmail.com to RSVP or to e-mail questions, comments or suggestions. We look forward to hearing from you and meeting you at one of our future meetings and/or events.

2022 SEAOA Tucson Scholarship Award Recipients

The SEAOA would like to congratulate the 2022 Tucson Chapter Scholarship Award recipients, Ryan Hamman and George Saphir. Winners among four applicants, Ryan and George, University of Arizona seniors, were each awarded \$1500 scholarships at the Tucson Student meeting in November. Thank you to the Tucson Chapter Scholarship Selection Committee: Janelle Perry, Kelly Morales, Robert Campbell, Steven Hess and Scott Freestone (Chair). The Central Chapter Scholarship recipient, Alexander Owen from ASU, was highlighted in our October 2022 Newsletter.

Congratulations George and Ryan!



Ryan and George pictured with SEAOA At-Large Director, Allan Ortega

2022 SEAOA Tucson Scholarship Award Recipients (cont)



Dear SEAOA,

My name is Ryan Hamman and I am very thankful to you all for selecting me as one of the recipients for the Structural Engineers Association of Arizona Scholarship. This scholarship not only recognizes my hard work and academic achievements to date, it also will allow me to continue my education at the University of

Arizona to pursue my master's degree in Structural Engineering.

Growing up I didn't know I wanted to be a structural engineer, let alone any kind of engineer. I always had a passion to build things. I loved to play with Legos (especially Star Wars sets), quickly building more complex and detailed models. I was also very gifted in math and science-oriented classes. Ultimately these interests and talents led me to choose a civil engineering degree at the University of Arizona. Through this path, I came to realize wherever I went, I always saw something a structural engineer designed, whether that be bridges, buildings, canals, etc. I was hooked on structural engineering after taking my first structural design class, Structural Design with Concrete.

I am a very avid video game player. Some of my favorite games are Apex Legends and Rocket League. I am also a very big board and card game player. I grew up in a family who loves to play games. Outside of game play, I love to be outdoors. I like to hike, play sports, or go for a swim. I'm always rooting for the Diamondbacks, Suns, and Cardinals (as disappointing as that can be).

This spring semester, in addition to my academic coursework, I will be starting a new internship with ECI, where I will help design electrical lattice work. I will continue this work through the summer while continuing to look for full time career opportunities upon receiving my Master's degree. Thus far, I have managed to fund my education without incurring debt. In order to do this, I have been successful in obtaining academic and field related positions that both increase my knowledge and bank account. The jobs I have taken through my undergrad range from being a grader for several engineering classes, an independent tutor, and an internship with Psomas. Currently, I have applied to be a Residential Assistant in the engineering dorm during my master's degree program to offset housing costs. I am aligning my non-academic activities to the best benefit of both my time and continuing education so I will have the most focus on my studies. The SEAOA scholarship will help me accomplish this and allow me to gain as much knowledgeable as possible until I am ultimately ready to join the workforce alongside other structural engineers. I am very excited to finish my Master's program and find my place in the structural engineering field. (alternate – I am very excited for that opportunity!)

I plan to continue to prioritize my education, and to finish my master's degree by the fall of 2024, with my primary goal to not just graduate, but to learn as much about the field of structural engineering as I can. This scholarship will allow me to fully focus on my studies and reach that goal. I am sincerely grateful to be a recipient of the Structural Engineers Association of Arizona scholarship – thank you!

Sincerely,
Ryan Hamman

Email: Rhamman@arizona.edu Phone: (602) 919-8718

2022 SEAOA Tucson Scholarship Award Recipients (cont)



Dear SEAOA,

Thank you for your generosity and support of the newest generation of soon-to-be structural engineers at the University of Arizona. It is truly an honor to be awarded the SEAOA Tucson Chapter Scholarship. The purpose of this letter is to provide an overview

of my experiences, career plans, hobbies, and ways that this scholarship will positively impact me.

As a Tucson native and graduate of University High School in Tucson, I always wanted to represent my roots and proudly attend the University of Arizona. I came to the UofA in the fall of 2019 as an undeclared major, looking for a career path that would combine my love of problem solving and elaborate man-made structures. I had always been inspired by the astounding proportions of airports, skyscrapers, and bridges. Thus, when I reconnected with an old friend and mentor who told me all about civil engineering, I quickly realized my it was the perfect fit for me.

I am now in my senior year at the UofA, on track to graduate with my Bachelor of Science in Civil Engineering with an emphasis in Structures in May of 2023. During my studies I have done undergraduate research with CAEM Department Head and Professor, Dr. Dominic Boccelli, and more recently have begun doing thesis-track research on steel structures with Professor Dr. Robert Fleischman for my Accelerated Master of Science in Civil Engineering, which I intend to complete in May of 2024.

This scholarship will assist me in covering my educational costs, living costs, and the extra-curricular costs of being involved with so many student organizations like the American Society of Civil Engineers, Tau Beta Pi, and Camp Wildcat to name a few. Alleviating some of these costs allows me to prioritize my research, academics, and staying involved in student organizations.

Since January of 2022, I have been a part-time bridge engineering intern at HDR in Tucson, working alongside professional civil engineers to gain hands-on experience in the design of bridge structures. I will be taking the Fundamentals of Engineering (FE) Civil Exam in January of 2023 and register with the AZ Board of Technical Registration to become an Engineer in Training (EIT). After completing my Accelerated Master of Science in Civil Engineering with an emphasis in Structures in May of 2024, I plan to continue working in the bridge engineering field. My ultimate professional goal is receiving my Professional Engineer (PE) and Structural Engineer (SE) licenses.

In my free time, I enjoy hiking, camping, cooking, board games, live music, and DIY home projects. In the last year I have challenged myself with new hobbies like learning to weld for the ASCE Steel Bridge competition, learning to ski and snowboard, and cycling in the El Tour de Tucson 2022 63-Mile Race. I enjoy domestic road trips with my family, with my longest to date at 7,000 miles around the Western US in 35 days.

Thank you once again for your kindness and investment in me and my future.

Sincerely,
George Saphir

Email: Gsaphir@arizona.edu Phone: (520) 302-1524

2022 SEAOA Excellence in Structural Engineering Winner: Martin, White & Griffis Structural Engineers *Forensic/Renovation/Retrofit/Rehabilitation: University of Arizona Student Success District, Tucson, AZ*

One of the most iconic buildings on the University of Arizona Campus is Bear Down Gymnasium. MWG provided the structural design on this Design/Build project for renovations throughout the 60,000-square foot building that created a wide range of office programs, student recreation facilities, and resources for students to use.

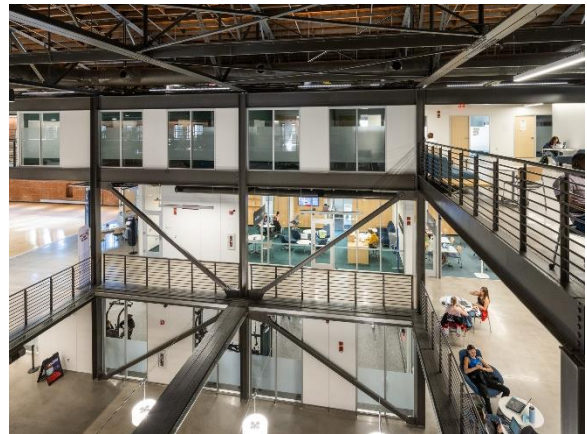


Listed on the National Register of Historic Places in 1990, the building could not have modifications that required exterior revisions to the existing exterior brick walls. The scope of the project required renovations to the basement level and additions above the first level where the main basketball court occurred. The key to this project to determining the structural integrity of the existing building shell could remain and the new interiors were self-supported not adding any lateral loads to the existing structure.

There were no as-built drawings, but only existing pictures during construction, which were very helpful in determining key issues. The contractor had a laser scan done of the building that was used for REVIT layout. Testing of the concrete, brick and mortar was performed. The existing structure is a steel frame structure with infilled 21-inch thick unreinforced brick walls. Steel barrel roof trusses span between columns. The roof diaphragm was wood planking spanning between the steel barrel joists. The roofing on the building had the “Bear Down” emblazoned that recently was installed and could not be altered.

Because the existing unreinforced 21-inch brick walls could not support additional vertical or lateral loads, a

structurally independent steel frame was chosen to support the new interior facilities within the building. The steel framed structure utilizes over 18 different steel braced frames, supporting the new interior floor and laterally bracing the existing exterior brick walls where the upper-level balcony area was removed. The steel frames inside the building carry loads like a three-story building and provided clear story spaces between levels.



When the lower level of the existing building was removed, bracing on the outside of the building was needed. The existing floor provided lateral support for the perimeter walls. The contractor used steel pipes and concrete “jersey” barriers as dead man weights to brace the walls. The removal of the mezzanine bleachers at the south portion of the building also required additions to the bracing. These areas needed to be built outside the building and left in-place until the steel framing and floors were complete.



2022 SEAOA Excellence in Structural Engineering Winner: MWG – UA Student Success District (cont)

The biggest issue was how the foundations for the new structure could be built inside the existing structure. Conventional concrete spread foundations were too large for the areas and would have required underpinning of the existing foundation, therefore drilled piers were used. The Architect designed a large opening in the south end of the building, which allowed drill rigs and concrete trucks to enter the building and provided a location to connect two pedestrian bridges to the steel supports at the opening. The bridge supports at the building have a lateral slip connection between the supporting buildings. All the construction was completed without impacting the “Bear Down” emblazoned on the roof.



Congratulations PK Associates! NCSEA Structural Excellence National Award Winner



The National Council of Structural Engineers Associations (NCSEA) recently announced the awards firms for Structural Engineers Excellence at the NCSEA Summit in November and in the December issue of [Structure magazine \(p.34\)](#). Congratulations to PK Associates on their [2022 Excellence in Structural Engineering Award](#) for the Helios Education Campus project in the New Buildings: \$30 Million category! The Helios project won an SEAOA Excellence award this past summer at our annual conference and the project was highlighted in our [October 2022 newsletter](#). The SEAOA is proud to see an Arizona project and team win this prestigious award at the national level! Congratulations to the design team at PK Associates!

2022 SEAOA Merit Award in Structural Engineering Winner: Martin, White & Griffis Structural Engineers *Forensic/Renovation/Retrofit/Rehabilitation: Pima County Courthouse Renovations*

The Pima County Historic Courthouse, designed by renowned architect Roy Place, was built in 1929, and has been a landmark in the hearts and minds of Southern Arizonan's ever since. The renovation of the building started in 2017 and involved multiple phases from a building assessment to an exterior and infrastructure renovation, to an interior renovation for tenant improvements.



Driving much of the creativity on the project was the historical classification of the building. The occupancy for the building was unknown when the building design process started, therefore the design loads were balanced with what was practical. The project was multi phased with two different contractors. The A/E team had to pass on their knowledge of the design methodology to the second contractors.



The existing building required significant strengthening for the lateral and vertical loads along with repairs needed on the concrete dome. A specialty contractor was used for the tile repairs on the dome. The concrete dome structure was analyzed using a modeling of a three-dimensional concrete shell. This resulted in no tension in the concrete structure, and only a new reinforced tension ring was required.



The area of the building near the concrete dome structure was studied early. New concrete shear walls were added from the ground floor to the 4th level on the north and south sides of the dome where lateral deficiency was determined. The new concrete walls were strategically placed to allow circulation on the different floors. The roof diaphragm and connections to the building were also identified as deficient early in design. New plywood diaphragm with wall anchors were added. Strengthening of the diaphragm connections had to occur below the roof and not impact the Historic look of the building.

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2022 SEAOA Merit Award in Structural Engineering Winner: MWG – Pima County Courthouse (cont)

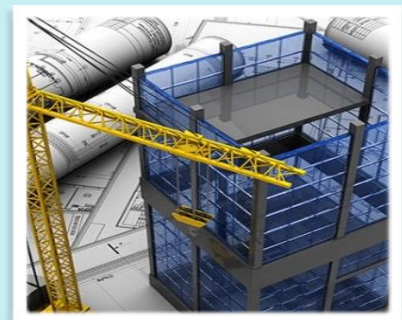


The strengthening of floors on 1st level was challenging. Fiber Reinforced Polymer was used on the one-way concrete pan joists. Only the positive moment and shear capacity were strengthened. Difficulty occurred in future phases of the project when the MPE contractor wanted to support equipment directly from the floor. Several openings in the existing floors were filled with metal deck with concrete topping. Generally infills in concrete floor

systems are not difficult, but many of openings require the distribution of load to adjacent framing. Some of the distribution methods included steel x-bracings and steel blocking panels. The mechanical systems in the building were changed to reflect the tighter building envelope required by the Arizona State Historic Preservation Office and the National Registration of Historic Places. These requirements required clearance issues for the mechanical systems throughout the building. Structural clearances lead to the use of FRP. Several locations later in design the traditional steel post and beam system was used. At the museum areas, the floor systems required strengthening only at the heavy display units. It was not economical to strengthen the entire floor area at the museum as a new tenant may have been in the space above or below.

REQUEST FOR NEWSLETTER ARTICLES

The SEAOA Newsletter committee always appreciates input from the membership about articles and information that you'd like to see in upcoming newsletters. The newsletter is an excellent place for the SEAOA membership to share opinions, ideas and information with the rest of the association. Also, anyone who could volunteer a little time every quarter to help publish the newsletter is most welcome. One easy way to help would be to "proof" the newsletter before it's published. Please contact Sal Caccavale (secbc@cox.net) or Mark Sipes (mark.sipes@maricopa.gov) if you have any articles that you'd like to submit, if there are any topics you'd like to see in future SEAOA Newsletters or if you'd like to help with publishing the newsletter.



2022 SEAOA Excellence in Structural Engineering **Winner: Schneider Structural Engineers**

Forensic/Renovation/Retrofit/Rehabilitation: JBE041 AWACS Alert Hangar – Joint Base Elmendorf-Richardson, Anchorage, AK

This hangar originally constructed in the 1950's at Joint Base Elmendorf-Richardson (JBER) in Anchorage, Alaska, was released as a Design/Build project to house a high-tech Airborne Warning and Control System (AWACS) aircraft, along with a new Alert Facility for the crew to live in, so the aircraft can deploy on a moment's notice. Our use of Buckling Restrained Braces was critical to the success of the project along with a team of dedicated engineers and designers who worked together to meet the expectations of The United States Air Force.



Rendering Courtesy of MCG Explore Design

The Air Force required that this building be brought up to current codes and be designed as a Risk Category III building. The original hangar utilized shop riveted trusses along with high strength bolted field connections. These trusses, due to their shape, are called giraffe trusses, as they are cantilevered over the aircraft, resting on two or three legs. The original design of the lateral system is considered ordinary braced framing today. As Anchorage is in a high seismic region, ordinary braced frames are not efficient and generate high lateral loading. We determined that a complete analysis and review of the entire structure, including all of its additions over the years had to be completed from roof decking to the foundations to determine the most efficient way to retrofit this structure.



Double Angle Braces that had to be Removed and Replaced

By using Buckling Restrained Braces (BRB's), which allow for a ductile failure mechanism, to replace the existing ordinary braced frames, we were able to reduce the seismic demand on the existing structure by half. This reduction went through the entire structure, down to its existing foundations. Without this reduction most of the existing structure, including its foundations, would have needed to be reinforced. In the end, our analysis revealed that only about 15% of the existing structure needed to be strengthened. We understand that this reduction on reinforcement helped our Design/Build team be more competitive than the other teams bidding this project.



New Buckling Restrained Braces (BRB'S) in Place