cross sections

Magazine for the Structural Engineers Association of New York

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New York City 2012 by Phillip Bellis

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This issue of Cross Sections was written and edited prior to the emergence of COVID-19 as a public health emergency in New York City. Many of the future events mentioned in this issue have since been cancelled or postponed as a result of the social distancing measures enacted in order to slow the spread of the virus. Please refer to the official SEAoNY website (www.seaony.org) for the most up-to-date information regarding all future events.

While most have transitioned to working remotely, there are still many "essential" workers who must continue as if these hard times are normal circumstances. The Publications Committee would like to extend our sincere appreciation to these individuals. To you and everyone else: Stay safe.

President's Message

February marked our annual All Day Seminar, along with the halfway point of the SEAoNY calendar and my time serving as President. It's surprising how fast time passes.

As one of our signature events, I hope that all of our members were able to attend the All Day Seminar. The event provides wonderful education opportunities along with, new this year, a trade show that featured almost 20 exhibitors. Held in a new, larger space, the 2020 All Day Seminar was more comfortable, convenient, and featured better amenities for attendees to enjoy. The event was a success due to many groups. I would like to extend particular gratitude towards the Programs Committee/SEAoNY Board of Directors, the event speakers, and the sponsors/exhibitors.
The Programs Committee/SEAoNY Board of Directors: Thank you for your organizational efforts and dedication to the success of the event.
The Speakers: Thank you for taking time to create the informative presentations that all of us engineers enjoy so much.

The Sponsors: Your support is vital. Thank you for prioritizing the continued success of the engineering community.

My time as President has been a whirlwind. I am very thankful for the opportunity to serve our profession and do my small part to advance the pursuits of the industry. I often reflect on how many intelligent and passionate individuals I encounter in this role. Our world may be filled with challenges, but I know that engineers are up to the task. Please keep working hard at what you do!

With warm regards,

Jimmy Vignola, P.E.

Editor's Message

Thank you for taking time out of your busy schedule to read this issue of Cross Sections. The Publications Committee works hard to produce a quality magazine, but if not for you, our wonderful readership, Cross Sections would not be anything close to what it is today. Your comments and feedback provide the committee valuable information upon which we base our editorial decisions. First and foremost, this publication is for you.

That being said, we are always looking for new committee members. Fresh perspective is pivotal in order to continue the success of Cross Sections. If you have an idea you want to develop into an article, or just want to take part in the conversation, join our mailing list by sending an email to seaonypubs@gmail.com. All levels of professional experience are welcome. Involvement isn't just for a specific subset of SEAoNY members, it is for everybody.

We are proud of every issue we publish, but improvement is always possible. With your help, I believe that we can make Cross Sections a truly special publication. The Publications Committee appreciates you choosing to read Cross Sections.

We hope you enjoy this issue.
Regards,

Phillip Bellis

FAQs ABOUT ARCHITECTURALLY EXPOSED STRUCTURAL STEEL (AESS)

BY JENNIFER PAZDON, P.E. AND JACINDA COLLINS, P.E., LEED GREEN ASSOCIATE

The 2016 AISC Code of Standard Practice for Steel Bridges and Buildings (Code) [ANSI/AISC 303-16] introduced a category system to clarify requirements for the craftsmanship of Architecturally Exposed Structural Steel (AESS). As designers have become familiar with the AESS Category System, questions have arisen that are not expressly answered in the 2016 AISC Code nor the 2016 AISC Specification for Structural Steel Buildings (Specification) [ANSI/AISC 360-16]. To provide clarification and help design teams become more comfortable with the AESS Category System, SEAoNY Member, AISC, has compiled answers to the most frequently asked questions regarding AESS.

WHERE CAN INFORMATION ABOUT THE NEW AESS CATEGORY SYSTEM BE FOUND?

Section 10, Architecturally Exposed Structural Steel, of the 2016 AISC Code outlines the requirements of the five new categories: AESS 1, 2, 3, 4, and C (Custom). Publications and tools can be found on the special AESS website: www.aisc.org/aess. Here, project teams can find the 2016 AISC Code, an editable sample specification, an editable cost estimating tool, sample shop drawings, images, webinars, publications, and case studies.

WHEN DESIGNING WITH AN OLDER VERSION OF THE AISC SPECIFICATION [ANSI/AISC 360], CAN THE NEW AESS CATEGORY SYSTEM BE USED?

Yes, the 2016 AISC Code can be adopted in the contract documents for structural steel fabrication and erection even if the steel framing system is designed to building code conformance using an older version of the AISC Specification (published before ANSI/AISC 360-16). The contract documents should clearly establish the 2016 AISC Code as the standard of care, and all contract and approval document requirements of Section 10 shall be completed.

WHAT CATEGORY SHOULD BE SELECTED WHEN WORKING WITH WEATHERING STEEL?

AESS Custom Category is the suggested category for architecturally exposed weathering steel. When designing with weathering steel, groups should consider surface preparation conditions beyond the requirements of AESS Categories 1 through 4. For example, if advanced aging of the patina is required, the means and methods need to be clearly outlined in the contract documents.

Project teams will also need to address the variance of aging of different weathering steel grades, weathering steel welding electrodes, weathering steel high-strength bolts, and the surface preparation and

FAQs AESS

application of potential paints and coatings. The required mock-up when using the AESS Custom Category ensures that design, fabrication, and erection teams work together to achieve the final desired aesthetic.

WHAT CATEGORY SHOULD BE SELECTED WHEN WORKING WITH GALVANIZED STEEL?

AESS Custom Category is the suggested category for architecturally exposed galvanized steel. The surface preparation and finish as a result of the galvanization process may not provide the desired aesthetic if specifying AESS Categories 1 through 4.

Similar to weathering steel, welding on galvanized steel, surface finishing, and galvanized high-strength bolts need to be considered by the design team. The design team, fabricator, and galvanizer will also need to coordinate the placement, quantity, and size of potential vents and drainage holes. Again, the mock-up required under the AESS Custom Category ensures the final desired aesthetic is achieved.

WHY ARE SIGNATURE STAIRS AND CASTINGS EXCLUDED FROM THE NEW AESS CATEGORY SYSTEM?

Section 2.2, Other Steel, Iron or Metal Items, of the 2016 AISC Code, identifies those items that are not defined as structural steel. Stairs, castings, and other popular items are not structural steel, even though those items are at times shown in the structural design documents or are attached to the structural steel frame. Non-structural steel items are not within the scope of the 2016 AISC Code and, therefore, cannot use the new AESS Category System.

Project teams are encouraged to use the framework of a category system to outline the fabrication, erection, and finishing requirements of "Other Steel, Iron or Metal Items." To create this system, identify where additional craftsmanship will achieve the desired aesthetic for non-structural steel items, and apply tiers based on the viewing distance, visibility, context, lighting, architectural style, location, and finish.

PHOTO: Timothy Schenck courtesy of CAST CONNEX

AISC suggests pre-project meetings with fabricators and manufacturers of "Other Steel, Iron or Metal Items" to create a realistic in-house category system that captures project budgets of any size or architectural style.

AND WHAT ABOUT THE CONNECTION BETWEEN OTHER STEEL, IRON OR METAL ITEMS AND AESS?

Fabrication, fitting, and finishing of the connection between the steel and non-steel elements are suggested to follow the requirements of the AESS Category of the structural steel element.

The design team will first need to create guidelines to ensure that the non-steel element receives a level of finish that is similar to the AESS. Next, the design team will need to clearly identify and define the architecturally sensitive transitions/connections on the approval documents. Per

Section 10.3 of the 2016 AISC Code, architecturally sensitive connection details shall be submitted for approval by the owner's designated representative for design before completion of the approval documents. This process will ensure that the transition between AESS and non-steel elements achieves the desired aesthetic.

WHY IS STAINLESS STEEL EXCLUDED FROM THE NEW AESS CATEGORY SYSTEM?

Stainless steel, like "Other Steel, Iron or Metal Items," is not within the scope of the 2016 AISC Code and, therefore, cannot utilize the AESS Category System. Project teams are again encouraged to use the framework of a category system for stainless steel.

Fabrication, fitting, and finishing of stainless steel vary greatly from carbon steel. Stainless steel and carbon steel are traditionally fabricated in separate fabrication shops to ensure that dust or filings from carbon steel do not contaminate stainless steel items. Again, AISC suggests pre-project meetings with stainless steel fabricators to create a realistic in-house category system that ensures the life of the corrosion protection and captures project budgets of any size or style. AISC Design Guide 27, Structural Stainless Steel, is a useful source of information and can be used to facilitate the discussion and creation of a customized stainless steel category system.

PHOTO: Timothy Schenck courtesy of CAST CONNEX

WHAT ABOUT PAINT?

Proper surface preparation is necessary for painting and coating systems to achieve their optimal performance and longevity. The default surface preparation for AESS Categories 1 through 4, SSPC SP-6 Commercial Blast Cleaning, may create a surface that is too smooth or too rough for some paints and coatings. Design teams should verify the required surface preparation by reviewing the painting or coating manufacturer's specifications. If a surface preparation other then SSPC-SP 6 is needed, then design teams can use AESS Custom Category or clearly state within the contract documents the required surface preparation.

When applied to non-steel elements and adjacent structural steel elements, the same paint system may look different. Structural steel with intumescent coatings next to steel without the fire-protective coating may also look different even when the same paint is applied. We highly suggest all differences between materials (ASTM), primers, and paints are evaluated by the design team to ensure a cohesive paint aesthetic.

SHOULD AESS CATEGORY 4 BE SPECIFIED WHEN USING INTUMESCENT COATINGS?

Intumescent coating is an excellent method of providing fire protection for AESS. Intumescent coatings are often thicker than a typical paint system (notably higher-rated and exterior intumescent coatings). The thickness combined with the texture of the intumescent coating can hide the additional craftsmanship required for higher AESS Categories. This provides design teams the opportunity to use a lower category AESS Category or the AESS Custom Category to reduce the amount of craftsmanship for AESS that will receive an intumescent coating.

WHICH DRAWINGS SHOULD THE AESS CATEGORIES APPEAR, STRUCTURAL OR ARCHITECTURAL?

Per Section 10.2 of the 2016 AISC Code, all members designated as AESS shall be clearly identified to a Category, either AESS 1, 2, 3, 4, or C (Custom), in the contract documents. It is suggested that the AESS Categories appear on both the architectural drawings and the structural drawings. At a glance, including the designations on both drawings may seem redundant. However, having the Categories on both drawings ensures that the entire design team (architects and engineers) are in agreement with the level(s) craftsmanship required for the project. If design teams must select one location, the AISC Code in Section 3.2 states that, "All requirements… shall be shown or noted on the structural design documents." This requires that the AESS designations appear on the structural drawings, at a minimum.

MOCK-UP APPROVAL: WHO, WHEN, WHERE, AND HOW?

AESS Categories 3, 4, and Custom require a mock-up while AESS Categories 1 and 2 have the option of utilizing a mock-up. The approved conditions of acceptance shall be specified in the contract documents.

A mock-up can include everything from a sample of fabricated steel, a connection, a steel element, or a full-scale assembly. The project team must determine what size mock-up is practical and best expresses the intent of the project. The project team must then specify the nature and extent of the mock-up in the contract documents.

Generally, a mock-up is produced and approved in the fabrication shop and subsequently placed in the field, where it can become part of the final structure, if approved. The acceptability of the mock-up can be affected by many factors, including the distance of view, lighting, and finishing. The expectations for the location and conditions of the mock-up at the time of approval should be defined in the contract documents. Design teams should incorporate into the initial project budget and schedule the material and time necessary for the creation and approval of the AESS mock-up.

HOW MUCH DOES AESS COST?

By nature, the cost of AESS is higher than that of standard structural steel due to the additional labor required for the desired aesthetic. The more craftsmanship required, the greater the cost of the entire steel package (material and labor). The cost of the AESS steel package will rise as the AESS Categories increase. The AESS Custom Category can vary from being lower than AESS Category 1 to higher than AESS Category 4, depending on the labor selected for the desired aesthetic. Project teams are encouraged to use a mix of AESS Categories, including multiple AESS Custom Categories, to create aesthetic and budget-friendly projects.

To help design teams anticipate the cost implications of AESS, AISC has created an editable Cost Matrix. The Cost Matrix contains the approximate cost progression based on the overall AESS Category selected or the individual labor items selected. Teams can review the Cost Matrix to gain an understanding of the correlation between labor and the AESS Categories as well as determine what level of finish best fits the project budget.

Is there a list of quality fabricators who can perform AESS? Project teams can use the AISC Certification Programs as a means of finding quality structural steel fabricators and erectors for AESS projects. The AISC Certification Programs sets the quality standard for the structural steel industry and focuses on the entire process of fabrication and erection. The AISC Certification Program's goal is to build quality structures from the start by focusing on error prevention rather than error correction. Thus, design teams can specify AISC Certified fabricators and erectors to provide quality AESS craftsmanship.

INNOVATIONS & COORDINATION:

Maintaining and Developing New York City Building Codes

BY SAMANTHA BRUMMELL, P.E.

As a young engineer in the NYC structural engineering community, I've been fortunate to hear Gus Sirakis from NYC Department of Buildings speak several times. I know some of the history about the New York City Building Code (NYC BC), but it was interesting to hear about the full progressive timeline and get a behind-the-scenes look at how the code is changing. Many entry-level employees question why it's so important to know the details of the code or may see codes as a hindrance to design. However, our current NYC BC tells a story of the evolution of our city and provides history into lessons learned from other model codes and regions.

THE HISTORY OF THE MODERN-DAY NYC BC CODE CHANGES

At the time of the attacks on World Trade Center on September 11, 2001, New York City still had the 1968 code in effect and was calling it the "new code". It was "newer" relative to the previous code overhaul, 1938 NYC BC, which was still widely used for existing buildings. The 1968 NYC BC was difficult to evaluate relative to other codes and kept alive a lot of local practices that were not in line with other model codes (such as IBC). This catastrophic event launched engineers into action to rectify our code complacency.

In November of 2002, the Mayoral Commission was formed. Codes such as the NFPA5000 and others were reviewed, and eventually it was recommended to adopt ICC (International Code Council) with 3 caveats; adopt the ICC rather than the NFPA, achieve stakeholder inclusion via committee, and create previsions for periodic revision. By April 2003, code writers were seeking recommendations. It was important to bring NYC BC towards a model code, like the ICC. They were seeking stakeholder inclusion, which was abundantly important for our unique and dense urban environment. They were brainstorming on how to achieve consensus for the code adoption process because stakeholders would need to have bought in. Finally, there needed to be provisions for periodic revisions; we can't let another 40 years pass without an update.

The Technical Advisory Committees drafted the 2003 revisions, followed by a legal and technical review by the New York City Department of Buildings. Then the code change proposals were off to city's law department for additional comments. Unfortunately, some grammatical changes led to confusion, causing the DOB grief for not following the stakeholders' intent.

After four years of reviews, collecting input and refinement, by July 2007, the revised code was adopted. Forms needed to be updated, both the staff and the public needed to be trained and it generally took time for people to incorporate these changes into their work. The city recognized that this would not be a quick process, and so people were given until 2009 to come to terms with these changes and officially implement what we now know as the 2008 NYC BC.

INNOVATIONS & COORDINATION:

Through this first major code change cycle in more recent years, there were a lot of lessons learned. The most significant improvements were that the department staff drafts the proposals, but also participates in committees. This approach focuses committee work, improves efficiency of technical committee meetings, and allows for more feedback early on to (again) improve efficiency and get more buy-in from stakeholders.

The next code change cycle happened in 2014, which adopted the 2009 ICC codes (even though 2012 was already available). Everyone recognized that this was a step in the right direction, but in the future, we're looking to keep up with national standards. As always, the group aims to meet the best possible standards for New York. The goals for the current cycle include adopting the 2015 I-codes, continuing to correct errors, typos and inconsistencies, and hopefully adopt more recent model revisions in structural chapters. The Plumbing Code has now been enacted into law and will go into effect when the other disciplines (BC, MC, FGC) follow suit.

The next steps in advancing the current code change cycle include completing the committee work on the remaining code sections and the City Council legislative process. There will also be efforts to provide training and outreach via presentations and publications to help educate the industry and support the adoptions. And finally, the next code cycle will be right around the corner, so the whole process begins once again.

The next revision of the New York City Construction Code is expected to be adopted in approximately June 2021. Over 41,000 volunteer hours have been documented from industry professionals so far. This level of dedication and participation by the NYC Construction Industry at large is a great benefit to the City of New York and the general public. The thousands of hours donated by professionals help ensure that best practices are implemented in NYC keeping people safe while advancing construction, and has great credibility because the provisions are crafted with the very professionals who will use them.

THE COOP-Trained AAACE Mission TO Provide RELIEF after the 2019 ALBANIAN EARTHQUAKE

BY SOKOL HUTA, PhD, RA

The following article elaborates on the recent experience of a team of professionals deployed to Albania to assist in the aftermath of an earthquake. Post-disaster training evaluation and management proved to be valuable experience for the team. SEAoNY's SEER committee, in conjunction with the New York City Department of Buildings, has been working together to provide this training in the form of the DOB COOP and upcoming ATC SAP training.

On November 26, 2019 a 6.4 magnitude earthquake hit Albania, killing 52 people and injuring roughly 3,000 people. At least 45 individuals were rescued alive from the rubble. It was the strongest earthquake to hit the country in more than 40 years and it forced the local government to declare a four-month long State of Emergency.

Many Albanian expatriate professionals in the architectural, engineering and construction industry reside in New York City and are part of the NYC-based non-profit organization, Albanian Americans in Architecture, Construction, and Engineering (AAACE). Immediately following the earthquake, the AAACE Board held an emergency meeting and decided to send a volunteer team of structural engineers and architects to help with the structural assessment of the damaged buildings.

The AAACE Board contacted New York City Council Member Mark Gjonaj, who offered to find funding for the volunteer team (ultimately provided by the Albanian American Community Association) as well as provide logistical

PHOTO: Dr. Sokol Huta, R.A.

support and coordination with the local government. A team of six engineering and architectural professionals traveled to Albania from November 30 to December 8 to assist with the preliminary structural stability assessment of the damaged buildings.

The earthquake's epicenter was in very close proximity to Durres and Tirana, Albania's capital. The same area was previously hit by two earthquakes of 5.6 and 5.1 magnitudes on September 21, 2019, as well as by 1,300 aftershocks between November 26 and December 1, 2019.

The European Union office in Albania estimated that approximately 1.9 million people out of a total population of 2.8 million were affected by the earthquake. More than 14,000 buildings were damaged, of which 2,500 were condemned. According to data from the Prime Minister's Office, 36 schools suffered substantial damages, 438 buildings required demolition, and more than 13,000 people were left homeless. The buildings declared unsafe by the September 21 quake (5.6 Richter) were the first to collapse or to suffer substantial damages after the November 26 quake (6.4 Richter). Most of the buildings affected by the November 26 quake experienced more damages and were at greater risk by the aftershocks that followed.
NYC Department of Buildings was not directly involved in the initiative, but provided important support during the initial phases. Sokol Huta, an Assistant Chief Plan Examiner with the DOB, received additional training from the DOB's Chief Engineer, Timothy Lynch, PE, prior to the departure. Mr. Lynch provided valuable support regarding methods, materials, and resources, such as ATC 20-1 Field Manual: Post Earthquake Safety Evaluation of Buildings, which were the main tools used by the expedition team to successfully complete the mission. Per Mr. Lynch's recommendation, the expedition focused on the preliminary structural stability assessment of essential facilities, such as schools, hospitals, and other high-importance buildings that require a detailed evaluation. Images of the damage observed include shear cracks on concrete and masonry walls, beams and lintels. During a site assessment, the professionals draw from both training and experience to evaluate the visible damage in order to determine if occupants can safely return to their homes, schools, or places of work. It is through these expedient assessments that professionals can help restore normal life to the inhabitants and highlight the structures where reconstruction can be done rapidly to restore public services to the community.

The mission consisted of one week of field work and two weeks of documentation preparation. During the mission it became immediately clear that logistics such as transportation, inventory analysis, chain of command, chain of communication, and operations were among the most critical elements for a successful expedition. Such obstacles were overcome by the great engagement of

PHOTO: Dr. Sokol Huta, R.A.

Mark Gjonaj's NYC and Albania teams, local teams dispatched from the Minister of State for Diaspora, Mr. Pandeli Majko, and the team of Emergency Operations Leader for the post-earthquake situation, Mr. Bledi Cuci.

The mission concluded with the preliminary structural stability assessment for 66 buildings: 60 schools and 6 mixed-use. A complete report was drafted and delivered to the local authorities. Local Authorities have confirmed that the report is has been an integral part of the final and detailed assessment for the proposal of structural interventions..

Conclusions and Recommendations

This experience emphasized the need for all engineering and architecture professionals to have appropriate damage-assessment training for emergency response units. Such training would channel the professional expertise toward an operational status instead of logistical one. It also highlighted the importance of implementing a National Incident Command Structure which would be the central station for coordination and analysis for all local and international teams.

Similar to other major earthquakes, the structures built during periods of poor building regulation and lack of strong enforcement, did not perform well. Observations indicated that most of the buildings constructed in Tirana and Durrës after the early 2000's responded better to the earthquake. Even though this indicates construction in Albania is improving, the extent of the damages incurred from these earthquakes highlights the immediate need for improvement of the national Albanian Building Code and for increased enforcement of existing regulations.

Many thanks for a great effort to the AAACE Volunteer Team:

- Sokol Huta, AAACE Board, Vice President of Special Events and Coordinator of the Expedition
- Ilir Dulaj, AAACE Board, Vice President /Treasurer and Co-Coordinator of the Expedition
- Malvin Ndoci, AAACE volunteer
- Delin Bixha, AAACE volunteer
- Ediant Martinaj, AAACE volunteer
- Kreshnik Zalli, AAACE volunteer

Special Thanks to:

- Mark Gjonaj, New York City Council Member
- Vera Mjeku, Deputy Chief of Staff of NYC Council Member Mark Gjonaj
- Pandeli Majko, Minister of State for Diaspora of Albania
- Bledi Cuci, Emergency Operations Leader of Albania
- Timothy Lynch, NYCDOB's Chief Engineer, SEAoNY SEER Committee Member
- Armir Taraj, AAACE President
- Luis Puna, AAACE Vice President
- Elona Bano, Chief of Staff, Ministry of State for Diaspora in Albania
- Dorian Doka, Ministry of State for Diaspora in Albania
- Albana Ferraj, General Coordinator of the Engineers for the Emergency Operation Leader in Albania
- Erion Baboci, City of Tirana's Head of Planning and Urban Development
- Artenida Bylo, Albania volunteer
- Geri Selenica, Albania volunteer

YMG UPDATE

BY PAIGE SIEFFERT, P.E.
AND
ANTHONY PIDERIT, P.E.

SEAoNY NEWS

Deep into our fourth year as a committee, the Young Members Group remains devoted to its goals of increasing participation from engineers across the region. We aim to create opportunities for our members to network, engage, and develop within the industry and the greater community and are excited to share our upcoming 2020 events.

The YMG began the year with great turnout at the annual Pub Trivia Night and Holiday Party. In October, the Trivia Night attracted over 35 participants, including young members from 16 different firms and students from universities in the area. The third annual Holiday Party in December was also sold out at 50 attendees. These well attended events were great networking opportunities for Young Members, allowing participants to share their current projects and achievements with their peers.

Our first event of 2020 was a seminar on Project Management & Leadership for Engineers, presented by Anthony Fasano, P.E., M.ASCE. The lecture focused on engaging the people you work with, as well as other methods to improving leadership skills. While the subject matter was not technical, it did feature essential skills for developing professionals and future leaders in the industry. The event was also followed by a "Recap and Rewind" to continue the discussion in a more casual setting.

The YMG has many exciting events planned for the Spring of 2020. The first is a screening of *Leaning Out - An Intimate Look at Twin Towers Engineer Leslie E Robertson*. This documentary provides an impressive perspective on the life work of Leslie E. Robertson, the world-class structural engineer you may be familiar with. The screening is geared towards all audiences, so spread the word- family and friends are welcome!

Lastly, for our annual Spring Social, the YMG is organizing a trip to the newly built Edge observation deck at Hudson Yards. The Edge is the highest observation deck in the Western Hemisphere, featuring 360-degree views and a glass floor over 100 stories above the ground. The deck will be opening in March, and the YMG will have tickets available later this spring.

Stay tuned for details on these events in the coming weeks - please check our socials and keep an eye on your emails! You can also follow us on Instagram - @seaonyc

If you would like any more information, or to get involved (we meet once a month and are always looking for enthusiastic people to come along for the ride!) please email us at ymg@seaony.org.

NCSEA Recap

In November 2019, structural engineers from across the country gathered at the Disneyland Hotel in Anaheim, CA for the annual NCSEA Structural Engineering Summit. The four-day summit featured five keynote addresses, networking opportunities, a trade show, and a variety of educational sessions that touched upon some of the most critical issues in structural engineering.

As one might expect from a structural engineering conference in California, many of the sessions focused on seismic-related issues, such as: current and future codes, innovative designs, and lessons learned from past earthquakes. A greater theme was present, however, throughout the conference, as engineers discussed the future of the profession and how engineers can help get it there. The topics were varied and included new technology, SE licensure, resilient design, effective communication skills, and diversity in the workplace. The following are just a few examples of what conference attendees heard:

Keynote Address: Moving Beyond Life Safety for Community Recovery, Dr. Lucy Jones

In one of the Summits keynote addresses, Dr. Lucy Jones, a retired United States Geological Survey seismologist and current director of a nonprofit organization from California, spoke about potential improvements in seismic design and recovery from earthquakes. Her primary emphasis was on "urban disaster resilience." While current codes address life safety concerns, Dr. Jones focused on community function immediately following an earthquake.

In California, infrastructure is inherently located within a high-seismic zone. It is not possible to build within a lower-risk region. As a result, Dr. Jones noted, earthquakes must be addressed by looking not only at the strength of buildings and infrastructure, but the response and recovery within the community as a whole. Even when structures remain standing after an earthquake, they may not be occupiable and there are a variety of secondary effects that may be as devastating, or more devastating, than the earthquake itself. Fire, loss of water supply, damage to sewers, inoperable transportation, and lack of electricity are additional factors that can make a city uninhabitable. If not properly addressed, the resulting economic impact to a city can last for generations.

The city of Los Angeles took this into consideration while developing a plan for earthquake recovery in 2014. The city looked beyond life safety and the retrofit of existing structures, and also included plans for the protection of water supply and telecommunication systems. The goal was to create a functional recovery standard to mitigate economic losses and secondary impacts of the earthquake, in addition to the initial damage from the earthquake itself.

Dr. Jones concluded that engineers are able to create a more robust standard for the future, but changes within the industry are required. If engineers can effectively communicate the risks and benefits to lawmakers and the general public, it is possible to develop standards that make entire communities more resilient.

by Matt Sangen, SE & Dan Ki

How to Engage & Retain the Next Generation of Structural Engineers, Jonathan Bayreuther, PE (Veitas & Veitas Engineers) & Sabrina Duk, PE (Verahaus Structural, LLC)

Jonathan Baryeuther and Sabrina Duk, who are members of the NCSEA SE3 Committee, discussed the raw data collected, along with conclusions that were drawn, from the 2018 NCSEA SE3 Survey.

Sabrina began the presentation by sharing her personal experience and using it as a framework for explaining the mission of the SE3 Committee:

"To raise awareness and promote dialogue on engagement, retention, and equity in our profession. To attract and retain the best talent [engagement] and to ensure all structural engineers have a pathway to success in their careers [equity]."

Analysis of the survey results concluded that leading indicators for retention included (1) satisfaction with daily tasks/responsibilities, (2) emotional investment in the firms future, (3) perception of fair treatment by management, (4) gender, and (5) lack of dependents (i.e. children). The suggested best practices to increase retention were to invest in internships and to connect with members of the firm. Sabrina emphasized that a managers work ethic can serve as a huge morale booster, but at the same time, could have the opposite effect if viewed as poor by fellow employees. Additionally, according to the 2018 Survey, higher pay did not make up for a poor work-life balance (the average work hours are 42 hours/week [SE3 2018 Survey]).

Jonathan then continued where Sabrina left off by asserting the importance of mentorship; approximately 20% of people are more likely to leave if they do not have a mentor. He emphasized that a mentorship program does not need to be rigid and formal. The mentor, however, does need to demonstrate personal interest and provide consistent and frequent guidance.
Sabrina and Jonathan both emphasized that a firm must clearly define paths for advancement and prioritize creating "a culture of intentional engagement."

[insert quote apart from paragraphs: "Train people well enough so they can leave. Treat them well enough so they dont want to." - Richard Branson]

PERSPECTIVE ON THE SUMMIT:

I had the privilege of attending the NCSEA Summit for the first time this past November. I was excited for the opportunity, but somewhat unsure of what to expect. As a relatively young structural engineer, I had not attended a national conference before. I found the experience to be rewarding in a variety of ways.
During the Summit, I spent time with structural engineers from around the country, including many fellow SEAoNY members. It was interesting to hear the different perspectives each engineer brought to a conversation, as structural engineers have varied concerns in different regions of the country, particularly with regard to natural disasters.
The educational sessions were similarly rewarding, each covering a unique and interesting topic. I had a chance to learn about recent and upcoming code changes, effective communication skills, issues facing engineers throughout the country, and lessons learned from past seismic events. I enjoyed having access to a breadth of subjects that I am not exposed to in my day-to-day work.
Though SEAoNY Young Members may shy away from conferences for a variety of reasons, I would strongly recommend attending the NCSEA Summit. The event took me outside of my comfort zone, but I learned a lot and enjoyed meeting so many other structural engineers… escaping the cold weather in New York for a few days in southern California didnt hurt either!

Q & A

INTERVIEW *with* T. LYNCH

Principal Engineer for Forensic Engineering Unit and Chief Engineer for Enforcement Bureau, NYC Department of Buildings (DOB). Joined DOB 2005.

Questions By Alice Oviatt-Lawrence

What influenced you to go into the structural field? I grew up in the business. Going back to the 1890's, my family built churches, schools and institutional buildings.

Any particular mentor? Everyone. From our commissioner to our administrators. There are a couple in particular though: Robert Silman and Joe Tortorella in private practice and Michael Alacha for DOB. The transition from private to public service took some getting used to. I've been here 14 years and finally, getting the hang of things.

What is most challenging about forensic work? Working for the NYC DOB is about PUBLIC SAFETY. This is slightly different from the private sector, where, in addition to public safety, the preservation of the asset or some financial consideration may also be the objective for our forensic colleagues. The emergencies I work on for the city require immediate action and team cooperation. On my jobs, public safety usually is so imperiled, and the disruption to the day to day operations of the city is so significant, there is very little time to mull over and contemplate different options with ownership, FD, PD and our Emergency Management colleagues. Coming to a safe and prompt solution to immediately abate the emergency requires quickly tracking many alternate paths and their likely outcomes. After arriving at the site, it is not unusual for emergency stabilization work to start under our direction before we've even finished our coffee.

Any special SE-related pet peeve? Excluding fires and weather events, I have found that lurking behind a number of structural related accidents or incidents, many times there is some degree of pre-permit design error or omission. For some reason, this is especially true when it comes to resisting lateral loads, and the bracing thereof. This crops up mostly in smaller scale new or heavily altered buildings. When checked by our engineers, computations for resolution of code mandated wind (and seismic) designs are weak, and the design error showed up in construction. Wall failures are often lateral bracing issues. Another instance is in mid to late 19th century buildings. These are heavily prescriptive and their prior codes are typically design manuals for SAFE construction. These are plug and chug designs. Very simple, with simple rules of design: "all walls must be plumb straight and true" etc… Therefore, if it ain't straight, it may not be unsafe, but it's also likely not safe either. The elements could have been quickly checked for a diminished factor of safety. This is not complex. Many row houses and multiple dwellings under six stories have digitized floor plans on line. Use them – they're free.

Is any routine preventative safety inspecting of suspicious existing structures done by the department, or does the work involve only post - accident assessment and analysis? The Department has three main bureaus (kind of): Development (pre-permit / plan exam), Compliance, (conforming construction sites to permitted drawings and code compliance), and Enforcement (DOB turning up after receiving a building complaint, accident or incident). In addition to our construction inspections, our Compliance inspectors check our multiple dwellings and tenement housing, many of which date back to the middle to late 1800's. This always helps identify frail occupied buildings and makes sure

ownership maintains them in a SAFE and code complaint condition. The real issue here is numbers. There are close to 200,000 occupied multiple dwellings in NYC so it's a challenge getting to them all. Ultimately, owners have to do their part to keep our housing stock safe.

Do you have any thoughts about controlling/improving basic crane performance to achieve actual safe operations?

This is a heavy lift, answering this question. Fortunately, the Department is staffed by skilled and dedicated professionals and inspectors in the Cranes and Derricks Unit. I'm am always pleased to send any cranes questions their way. That way I don't mess up (not more than usually).

Given that not all older, failed construction systems have drawings available, how are investigations done to determine cause(s) of failures?

Most older buildings are surprisingly empirical or prescriptive. It's rare we would come across a unique building. Many drawings exist on line such as HPD ICards and old tax maps. Most buildings can also be sketched up from the street knowing some basic data from the site. Very few do not follow the prescriptive requirements of prior codes. This is especially true of multiple dwellings and 1 & 2 family homes. One must watch out for removal of critical structural elements (stairwell walls), rotting of wood bearing walls (very common), or undermining of foundations (excavation or underpinning). Here's a useful tip: If the load can't make it to grade and the building is still hung up in the air… I normally cancel my dinner plans.

Are there one or two types of failures that occur more often than others?

Old wood framed buildings with rotten roofs and buckled walls, or unmaintained URM bearing wall buildings are steady source of work for us. We also respond to many cases of cracked and failed brick, and terracotta building facades. These are particularly dangerous for the public as the façade components are brittle and cracks develop for multiple reasons. If a cracked or distressed architectural or structural element projects over the public way, it cannot be assumed to be safe. This is not an opinion based evaluation.

T. LYNCH Q&A

INTERVIEW *with* T. LYNCH

Is missing/bad URM foundation wall underpinning still a NYC problem?

Yes. Underpinning a URM (unreinforced masonry building) can be particularly risky. Many times it's work outside the property line of the developer site, typically on an adjacent occupied building that can be over 100 years old, to minimum code standards, and with a questionable maintenance history. The loads of the adjacent building are already in play and it can be difficult to predict where they act, and how the building moves. Given the opportunity, move it will. And when one least expects.

Are forensic engineers injured more than usual?

Not that I'm aware of although the worst injury I sustained recently was a paper cut on my left eyeball when I was eating a pastry out of a paper bag on rush job on Staten Island. Great pastry. Terrible sore eye for about a week. In a more serious vein, working in and around accident and incident sites requires extreme caution. Many partial collapses are followed by difficult to predict secondary collapses, so our engineers and others on the site must stay clear of these dangerous areas.

What percent roughly of the job involves technical knowledge and how much time is spent imparting corrective information to the industry?

For me and most of our engineers, it's nearly all technical knowledge learnt over years of design and "on site" presence. Little or no guess work. Most of my time is running calc's and scenarios in my head, reconciling old building laws and requirements with the site, and committing the site and conditions to memory as I walk around. Then discussing the various corrective options with our agency colleagues, and then with industry stakeholders. It's rare that our forensic evaluations turn up some difficult to predict initial failure. I'm always surprised at how many times we turn up a prior law or regulation that anticipated the situation that lead to a partial collapse or accident. Most of our forensic outreach to industry is "refreshers" on existing regulations, and "reminders" to our industry colleagues that design and construction is all about safety. That's a big part of our messaging to the industry.

How do the accident analysis findings find their way into code and/or enforcement changes?

Interestingly, codes, which are written for everyone, largely address changes in material science and new technology. Codes are regularly updated with new laws, rules and administrative requirements, such as fees, fines and the likes. Codes also deal with errors or changes in philosophies on how we contribute to the built environment around us. Accidents can be problematic from a code writing point of view. One could consider laws around a singular event, such as a worker error, however bad it may be. A singular accident may be more relevant to an enforcement strategy (industry outreach) than rewriting the code. Accidents, which derive from aging and worn out building components that place the public at risk, oftimes receive code attention. Mandating laws that address aging and degrading buildings, are complex. They are typically dealt with in Maintenance Codes.

In the early 20th century, engineers using early deflection theory (less conservative than the elastic theory) little considered aerodynamics and stiffness, thus leading to oscillation problems in, for example, the Whitestone Bridge, Manhattan Bridge and the collapse of the Tacoma Bridge. Today is the Forensic Department encountering similar (new or old structures) repeated overall design, technology, or other wrong-headed methods and materials leading to collapses?

Deflection theory, as I understand the question, is where the degree of structural element displacement (deformations) occurs under load. This does not really exist, as theory,

T. LYNCH Q&A

in the majority of our prescriptive 19th century buildings under 6 stories. Let me explain; although the engineering principles have been around for a gazillion years, calculating meaningful structural element deformations in 19th century wood and masonry buildings is a beast for a hundred different reasons. The effort rarely produces satisfactory numerical results and usually elicit: "the numbers don't work! what do we do ??". Historically, concepts of factors of safety, this thing is twice as strong or safe as that thing, or, we have an auxiliary bearing wall in the house to limit floor deflections… were easier to get one's head around for master builders and the regulators (FD, DOB's). Buildings over six stories, on the other hand, generally have defined structural frames and load paths and better conform to deflection theory and engineering computations.

How much of the following quote do you believe & tend to forgive? "Structural engineering is…molding materials we do not fully understand into shapes we cannot precisely analyze to resist forces we cannot accurately predict- - -all in such a way that the society at large is given no reason to suspect the extent of our ignorance." -J. Amrheim in Carper, k, ed. (1989) Forensic Engineering.
I don't know Mr Amrheim. Sounds good to me!

Is your personality most like wood, steel, masonry unit(s), rebar, insulation, iron cable, anchor bolt, scaffolding, weld, or other; and why?
I like them all, not to be mixed up with I'm like them all. I like to be safe, whist employing sound engineering principles and minimum standards.
What valuable lessons can you share that should be learned by the industry?
Follow the code and think safety first. Go back and check what one doesn't know, and do not be talked into making a poor engineering or field decision. Very few buildings have rare structural issues, nearly always the same problems occur again and again. Take no one's word for it – see for yourself. Double check your site notes and look for discontinuities in the building. Don't walk away from an unsafe condition – ask for help.

How can engineers best learn about any relevant DOB seminars that might be offered, or get involved with a local unsafe building reporting framework?
DOB regularly posts our presentations on our public domain website so check them: https://www1.nyc.gov/site/buildings/index.page. Subscribe to the Department's email blasts on Code Notes (https://www1.nyc.gov/site/buildings/codes/code-notes.page) and check our Safety page and Bulletins. These are very useful. Attend regular presentations as performed by our engineering, architectural and historic preservation community.

Nancy Hamilton, SE

Nancy Hamilton, SE, passed away this fall after a battle with cancer. The following testimonial has been submitted to SEAoNY by David Scott, P.E., one of her fellow volunteers during the Search and Rescue/Recovery operation at the World Trade Center Ground Zero site:

Nancy and I first went to Ground Zero four days after the attack. We each led small teams of engineers in different parts of the site, helping to assess safety issues for the Contractor. For the next few months, Nancy and I worked our allotted shifts at the WTC jobsite. Although we may never know what caused her cancer; we do know that rare forms of cancer, such as Nancy's, are more common among WTC First Responders than among the general population. Her death should be a poignant reminder to the SEAoNY WTC team and should remind us that we do not know the limits of our exposure. Nancy first contacted me about a year ago to tell me she was ill. Nancy ran her own business and did not want her illness to affect her work. She fought her illness with a level of determination that only she could.

Nancy was a remarkable engineer, drawn to solving the puzzle of integrated solutions. While at Arup in Los Angeles and New York, she chose large, challenging, complex, multidisciplinary projects: hospitals, performing arts centres, and airports. She successfully led the engineering on the New Jersey Performing Arts Center and Cerritos Performing Arts Center. She served as a chief engineer on the Second Avenue Subway Project and was involved with the post-fire evaluation and reconstruction of the 540m Ostankino Communications Tower in Russia, the tallest tower in the world at the time.

She eventually focused on airports and aviation projects after successful project delivery at JFK Terminal 4. Her work extended around the world, including Kunming, Toronto, and Jeddah airports. She also played a significant role on aviation projects in the US, including JFK Delta Terminal, La Guardia Terminal B, Salt Lake City, and eventually at O'Hare, in her adopted hometown of Chicago.

In 2011, Nancy joined HOK to establish their engineering practice and to work with Carl Galioto, with whom she had worked at JFK Airport. In 2015, she established her own practice, aptly named Be Integrated.
Nancy was a tough, determined, and focused woman in the world of engineering. She did not have time for fools and did not hold back if she thought you were speaking nonsense.

She was the seventh sibling in a family of nine children. During her illness, the love and support from her family was enormous comfort to her. She couldn't have had more love and support.

Nancy Hamilton, I know we will miss you. We will not forget you.

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