

# Summer The TJCAA Quarterly

# 2017

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Message from the President

Employment Opportunities

Our Newest Licensed Engineer

- TJCAA's Business Certifications
- Alameda County Small, Local Emerging Business
  - Bay Area Green Business Program, Green Business
  - City of Oakland Local Business Enterprise
  - California DGS Micro Business (SB (micro))
  - Port of Long Beach SBE
  - Port of Oakland LIABE/SBE/VSBE
  - San Diego County Water Authority SBE
  - SoCal Network SBE
  - CA PUC WBE
  - Sacramento Municipal Utilities District (SMUD)

## Message from the President, Gianna Zappettini



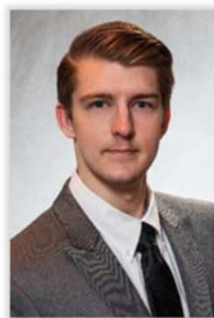
The NBA Champion Golden State Warriors held their victory parade in Oakland, CA on Thursday, June 17, 2017. It was a day of celebration for all basketball fans and a treat for the members of TJCAA's Oakland office who watched from our 4<sup>th</sup> Floor as the parade progressed down Broadway. The Warriors were successful throughout their pursuit of the championship because of their team dynamic. TJCAA also has an excellent team dynamic that provides our clients with great results on every project. If you are looking for an effective team to champion your next project, look no further than TJCAA.

## Employment Opportunities

TJCAA is looking for qualified engineers to work on great projects with great people. To view and apply for open career positions, visit our website at [www.tjcaa.com](http://www.tjcaa.com).



## Our Newest Licensed Engineer, Lee Meyer, P.E.



We are pleased to announce that Lee Meyer, a TJCAA Electrical Engineer in our Oakland office, has earned his P.E. Lee has a variety of experience in electrical power and control systems engineering for the water and wastewater industry. His work has included the full scope of low-voltage (under 600 V) design including control panels, motor control centers, utility metering, transformers, switchboards, load centers, variable frequency drives, programmable logic controllers, and SCADA. His design experience also includes Ethernet and fiber optic networking, radio telemetry, and relay logic. Lee also has application-level familiarity with NEC, NFPA, ISA, UL508A and UL698A standards, and he provides engineering services during construction.

Our clients benefit from the extensive knowledge and high levels of competency that our engineers have, and we seek to provide a workplace that encourages professional growth. TJCAA's staff currently includes eight Professional Engineers.

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The National Society of Professional Engineers points out that around a century ago, there was no requirement to demonstrate competency in order to work as an engineer. In the United States, professional licenses are now regulated at the state level. California created its state board of licensing for engineers in 1928, not coincidentally the year after the St. Francis Dam failed, killing hundreds of people on the Santa Clara River north of Los Angeles. ([nspe.org](http://nspe.org))

The NSPE explains that in order to obtain a P.E. license, "engineers must complete a four-year college degree, work under a P.E. for at least four years, pass two intensive competency exams and earn a license from their state's licensure board. Then, to retain their licenses, P.E.s must continually maintain and improve their skills throughout their careers."

We are proud to work in a field that helps to protect public health and safety, and we are glad that only Professional Engineers have the authority to sign and seal engineering plans.

Please join us in  
offering Lee our  
congratulations!

### Did you know?

#### What's hydrodynamic sloshing?

Does hydrodynamic sloshing sound fun? It may sound a little like a hot new ride at your local water park, but it's really a type of wave action caused by earthquakes. You probably knew that TJCAA Structural Engineers must consider the effects that seismic events have on the liquid-containing structures we design, but did you know that we also must consider what happens to the liquid *within* the structure during an earthquake?

The shaking accompanying an earthquake causes the liquid to begin sloshing back and forth within the tank. Sometimes, the waves that result have a fairly benign effect, such as a small splash over the side of a process basin. On the other hand, when the waves are larger, and/or within a covered or enclosed tank, the sloshing can rupture a steel tank, damage internal equipment in a process basin, or cause connections between the intersecting walls of a concrete structure to fail. Catastrophic failure of the structure can result.

TJCAA's Terry Cavanagh explains the phenomenon by comparing it to a child's glass of milk. "Any parent knows that when a glass of milk is shaken back and forth, the milk is likely to slosh high enough to overflow the glass onto the table." The same thing occurs in a basin or tank during an earthquake.

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## Did you know?

The theory for determining hydrodynamic sloshing effects was first developed by Housner in 1963, and has remained unchanged since then. TJCAA's Structural Engineers are experts in determining the internal forces caused by hydrodynamic sloshing, both on a structure itself and on the structure's systems and components. This expertise allows us to design configurations that minimize operational impacts during and after a significant earthquake.

The sloshing waves cause two problems. First, the water causes increased pressure and inertial load on the side of the tank. Second, if the structure has a top, like a cover over a buried reservoir or a roof over a steel tank, and there isn't room for the full height of the wave to form, the fluid is constrained, and it adds upward pressure to the roof of the tank.

Some very interesting effects may result, especially if the wave forms at a different frequency than the rigid elements of the tank do, or if the whole thing shakes because a wave is not allowed to form. When there is a lack of energy dissipation (through wave oscillation, for example) the energy can end up causing significant damage instead.

If you've ever heard us talk about impulsive and convective forces—and we're not talking about the impulse to buy a sports car—here's a situation in which they come in. Impulsive forces

are associated with a lower segment of water that we treat for analysis as a rigid mass. These tend to occur at the bottom of the tank. Convective forces tend to be at the top of the tank. Terry thought it was important that you know about these. We're just glad that the TJCAA Structural Engineers know about them, and that our clients' tanks stay in service when needed.

In terms of design, what's needed is some slosh room freeboard. Sometimes it's permissible to let a wave form, spill over the wall, and dissipate its energy that way. Other times, it's critical to keep the fluid in the tank (for example, when wastewater or another pollutant could cause damage outside the tank). Some tanks must be covered to protect their contents, for example, a potable water reservoir. In these cases, we must calculate how high up the wall the wave will reach, or its slosh height.

Taking into consideration the latest design requirements, which use higher ground motions than previously applied, we have found that slosh heights within tanks can approach 10 to 15 feet. Ideally, we just "design in" the height. When that's not practical, we design the cover to handle the resulting upward pressure. Another option, common for existing tanks, is to make operational adjustments, for example, by reducing the maximum water surface elevation that is allowed in the tank.

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One type of tank failure that can result from earthquakes and accompanying waves is commonly referred to as an “elephant’s foot.” This refers to a bulging out of the steel at the bottom of a tank shell, caused by a compression failure. The failure results from stress created by an overturning force on the tank shell.



Many tanks also contain equipment that is vulnerable during an earthquake. Tanks in a treatment plant may contain equipment related to scum collection, flocculation, and other functions, and may have internal piping, rotating equipment, and internal walls. All of these additional features can be damaged during an earthquake, as can the connections between the equipment and the structure.

If you have questions regarding your tank and how it might behave during an earthquake, please contact us.

## Entertainment News - *Hamilton: An American Musical*

The *Oxford Dictionary* ([oxforddictionaries.com](http://oxforddictionaries.com)) defines “hype” as “extravagant or intensive publicity or promotion,” and the proverbial illustration next to that definition in 2017 must surely be a playbill for *Hamilton: An American Musical*. The Broadway musical—for which its creator Lin-Manuel Miranda is a Tony, Grammy, and Pulitzer Prize winner—may have freshly defined “smash hit,” as well.

Want to go see it in San Francisco? Scoring tickets to the show requires careful planning, insider knowledge, perseverance, luck, and/or piles of cash. For those of us who don’t have tickets, we offer some impressions from TJCAA Structural Engineer Richard Thow, who took his family to see it in celebration of his son Lochlan’s birthday in May.

We asked him what we all want to know—is it worth the incredible hype? The short answer was, “Yes.” Because it’s fresh, interesting, and extremely well done, Richard says. He explains that all of the show’s dialog is presented to music, and the primarily hip-hop soundtrack was an exciting way to tell the story. With the American Revolution and our country’s formative years as a backdrop, the play covers Hamilton’s life, death, and his relationship with political rival Aaron Burr.

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The three-hour production is riveting, "Great from start to finish," Richard notes. He explains that the excitement level was kept high by having many cast members on stage at once, and with a visually spectacular stage that uses inner and outer moving circular platforms.

Lochlan, for his part, was also impressed. "I liked all of the history that was behind it," he says. "The choreography was really energetic and goes well with what they're trying to explain within Hamilton's life." He also enjoyed the special stage and felt that the set changes were done very cleverly. "The cast in the background would be moving the furniture, and would be like extras in the scene." The next thing you know, he explains, the set would be something different.

"I especially liked one scene where Washington and Hamilton are quarreling and yelling at each other and the music and lyrics added together to form this really huge thing." The actors toss off lines quickly, and the fast lyrics are quite impressive, Lochlan adds. The soundtrack is a family favorite.

*Hamilton: An American Musical* is at the Orpheum Theatre in San Francisco through August 5. Very few tickets are available. Feeling **really lucky?** Check [www.hamilton.shnsf.com](http://www.hamilton.shnsf.com) for information on a daily release of tickets via lottery.

## Dates to Note

- |                        |  |
|------------------------|--|
| June 21                | The Summer Solstice  |
| June 25                | Kelly Park 16 piece Big Band, 5:00-7:00PM, at The Sound Room, 2147 Broadway, Oakland   |
| June 24-25             | Maker Faire®, Kansas City  |
| July 3-16              | The Championships at Wimbledon   |
| July 1-23              | Le Tour de France  |
| July 10-13             | Intersolar North America, San Francisco  |
| July 14-30             | California State Fair  |
| July 16-23             | The 146 <sup>th</sup> Open at Royal Birkdale   |
| August 12              | Perseids Meteor Shower   |
| August 20              | Junius Courtney Big Band, 3:00PM, Golden Gate Library Jazz Series, Featuring Denise Perrier, Doyle-Hollis Park, Emeryville. Bring your lawn chairs! (FREE) |
| August 28-September 10 | US Open Tennis Championship  |
| September 5            | Junius Courtney Big Band, 8:00PM (one show only), at Yoshi's Oakland   |
| September 7            | NFL Season Opener—Patriots v. Chiefs   |