The TJCAA Quarterly

spring 2019

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Message from the President

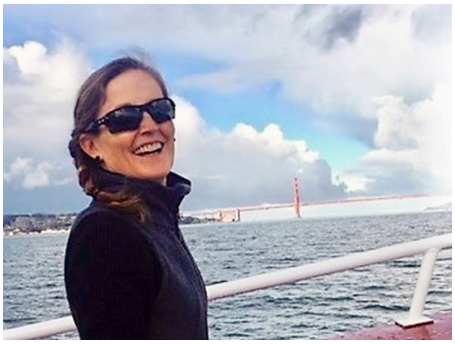
Employment Opportunities

Hey, what's on the slab?

TJCAA's Business Certifications

- Alameda County Small, Local Emerging Business
- Bay Area Green Business Program
- California DGS SBE
- City of Colton SBE
- City of Los Angeles SBE
- City of Oakland LBE
- Eastern Municipal Water District SBE
- Inland Empire Utilities Agency SBE
- Metropolitan Water District of Southern California SBE
- Sacramento Municipal Utilities District (SMUD) SEED Vendor
- San Diego County Water Authority SBE
- Port of Long Beach SBE
- Port of Oakland LIABE/SBE/VSBE
- PWC Registration—Dept of Industrial Relations (DIR)
- West Basin Municipal Water District SBE

Message from the President, Gianna Zappettini



Ahoy! We included a sailing theme in our newsletter to note opening day of the Northern California boating season. In doing so, it made me wonder about different sailing terms. The website I found had all letters of the alphabet on deck except for X and Z. (The top shows that "V" is unrepresented, but in fact there is one term under that letter.) With a last name starting with "Z," I am rather partial to terms that begin with that letter. If anyone knows any "Z" sailing terms, feel free to share them with me. A term I did come across was *spar,* which means "A wooden, in later years also iron or steel, pole used to support various pieces of rigging and sails." I know you will find that TJCAA has all the *pieces* to *support* your next engineering project; therefore, consider having TJCAA as part of your crew and it will be smooth sailing from there.

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.

Hey, what's on the slab?

"Hey, what's that over there on that nice slab?" We heard an engineer say this. Of course, some very interesting facilities and equipment get placed on slab foundations. Those facilities tend to eclipse the more mundane slabs below them, but we're here to tell you that slabs are not only important—they're more interesting than you might think.

Starting with the basics, not all slabs are alike. TJCAA founder, Terry Cavanagh, S.E. says "A slab is not always just a simple slab on grade; structural slabs are very different." The American Concrete Institute defines a slab as "a molded layer of plain or reinforced concrete, flat, horizontal (or nearly so), usually of uniform but sometimes of variable thickness, and supported by beams, columns, walls, other framework, or on the ground." (concrete.org)

The slab's job is this: it must support what's on top of it and not crack (significantly) when a load is applied. A load might consist of a large rack or piece of equipment, or perhaps a truck driving and/or parking on it.

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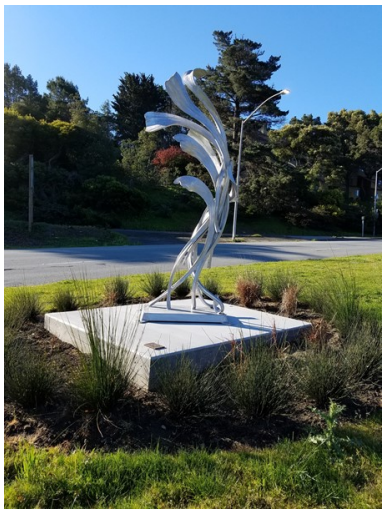
Hey, what's on the slab?

TJCAA has designed slabs for water and wastewater treatment plant structures, pump stations, generators, motor control centers, transformers, and other equipment at public facilities that provide critical public services. Our slab portfolio even includes slabs to support art installations.



TJCAA's portfolio includes this slab, supporting the artwork "Windswept" in South San Francisco.

Regardless of a slab's size or what is placed on top of it, Terry explains, a well-designed slab must support its loads, and must maintain that support when subjected to wind and seismic loads.

Slabs can vary in thickness, and sometimes it is simplest to make small slabs monolithic. Larger and more complex slabs are often required for the water-related and electrical facilities that TJCAA designs. A water basin, for example, might be 25 feet tall, and the feature keeping that tall basin from falling over is the forgotten concrete slab below it. That slab must support the wall of the basin, which is subject to both hydrostatic load (from the water against it) and hydrodynamic loads (from the waves caused by seismic events).

"Concrete cracks," Terry says, "that's just the way it is. One of our jobs as engineers is to design in controls for that cracking. By putting in reinforcing, we can hold the cracks together, keep them small, and minimize their impact on the structure."

Why does the concrete crack? First off, without special admixtures, concrete shrinks when it cures. Secondly, the concrete expands and contracts with changes in temperature. To prevent and control the effects of shrinkage and thermal changes, we include reinforcement and joints in our large slab designs.

"Without reinforcement," Terry continues, "a large slab would crack everywhere. Large shrinkage cracks would form throughout the slab, so we put in enough reinforcing to keep the slab watertight." For structural slabs, steel rebar is typically the reinforcement of choice but sometimes, fiber reinforcement can be mixed in with the concrete.

He explains that cracking caused by changes in temperature can be a critical design concern for some slabs. Major temperature swings can occur in large basins. In a 200-foot-long basin, for example, the temperature might swing 50 degrees, which, Terry points out, would cause the concrete to shrink 3/4 inch. "That's a lot of movement, and you have to design for that." Fortunately, Terry points out, the coefficient of thermal expansion for concrete is the same as that of reinforcing steel, so during thermal changes, the two will move with each other.

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Hey, what's on the slab?

Concrete joints are another design feature that can mitigate the issues caused by concrete's tendency to crack. Three of the joint types that might be used in a concrete slab are construction joints, partial contraction joints, and expansion joints.

- Construction joints use standard reinforcing crossing a joint between two pours of concrete. These joints help to limit the size of a concrete pour, which allows one section of concrete to cure and shrink before the adjacent section is placed.
- Partial contraction joints have only half the reinforcement crossing the joint between two adjacent concrete placements. These joints are used to form a "weak spot" where cracking will tend to occur, minimizing cracks at other locations in the slab.
- Expansion joints are literally gaps in the concrete. The joints typically incorporate a "bulb" waterstop. This allows one section of concrete to move relative to the other section without forming cracks in the concrete.

The ACI sums up the importance of joints by saying that they "have a powerful impact on the serviceability of floors and other slabs." (concrete.org)

Using supplemental reinforcing can address concerns when the supported structure creates challenges due to its architecture. Our clients often ask us to design foundations for large pre-engineered metal buildings that house equipment or cover expansive corporation yards. Long spans are usually desired for these structures, because the client does not want columns or bracing in the middle of the floor. Terry describes the challenge: "These buildings typically have clear-span moment frames with large horizontal reactions at the base of the columns. These forces must be restrained to keep the columns from moving outward. In a case like this, we reinforce the slab from one side of the building to the other, so that the outward thrust of one column is countered by the same force on the opposite side of the building. Without this reinforcing, the slab can fail and rip apart."

For other situations, innovative slab shapes might be used. As an example, for a large, circular reservoir, a monolithic "membrane" slab may be desired, but shrinkage would be a major concern. "Sometimes we design upturned footings so that when the concrete shrinks toward the center during curing, the footings don't act as anchors and restrain the slab from shrinking, which in turn can result in significant cracking."

Slabs can be more than just mundane, and we approach designing them with the inspiration and care we give to all of our work. If you would like to discuss a slab, or a project that includes a slab supporting your important equipment or facility, please give us a call.

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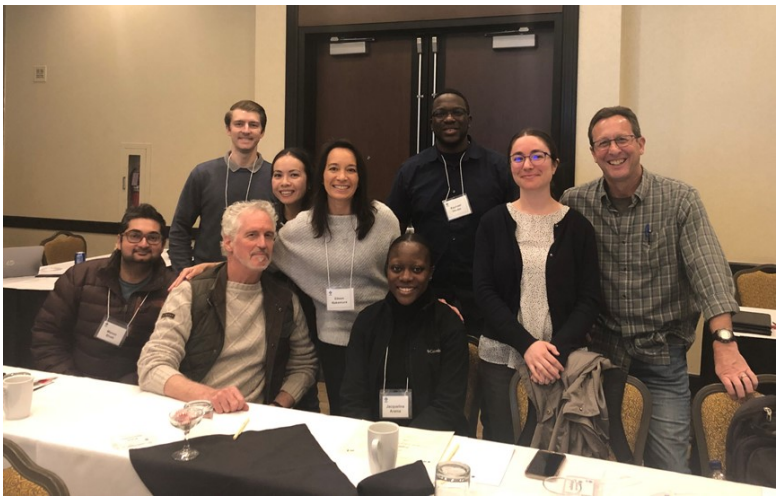
Industry News—What's in a name?

TJCAA Electrical Engineer Michael Erwin will be answering this question in detail on March 27 at the American Water Works Association conference in Sacramento. Among Mike's areas of expertise are standards for tag names and software variables, so we asked him, "What makes a good tag name?" and "What kind of problems can you run into if you don't have good names?" Equipment tags have a purpose, he explains, not the least of which is to uniquely identify every single component and signal in your control system. Names that are vague or non-unique can cause delays because they are non-informative. A good tag name provides operators information about the item itself, such as its characteristics and location, and can also provide info about associated components within the same process, sub-system, or equipment. Good tag names provide natural cross-references that can allow an operator to work more smoothly, without needing to carry around notebooks full of tag name reference tables. Want more detail about how a naming system can make your life better? Check out Mike's presentation at the conference or give us a call.

Fun Fact—Our Engineers Keep Current

Here is our Instrumentation, Controls, and Electrical group attending the IEEE SF/IAS Electrical Engineering Power Systems Seminar in February 2019.



Pictured are (left-to-right standing) Lee Meyer, Helen Tran, Eileen Nakamura, Raphael Okubo, McKenzie Campagna, and Michael Erwin, and (left-to-right sitting) Manan Bhatt, Paul Giorsetto, Jacqueline Arama.

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Entertainment—Opening Day on the Bay - April 28

April 28 is the official opening day for sailing on San Francisco Bay.

Photo: istock.com/aspenrock

Mike Erwin is also a sailor, and he called our attention to "Opening Day on the Bay," an annual boat parade (dating back to 1917) celebrating the official start of the sailing season on San Francisco Bay. The event is organized by the Pacific Inter-Club Yacht Association, which was formed in 1896. The parade sails from under Golden Gate Bridge to around Pier 39, and includes sailboats, fireboats, tug boats, and variety of other historic and contemporary craft. Imaginatively decorated vessels compete for prizes, and they form a colorful procession that's worth checking out. While you can see the parade from shore—the Presidio or Marina Green have good viewing—the traditional way to view the spectacle is from the water. Bay Area yacht clubs, tour boats, and charter companies offer special Opening Day packages including sailing and on-shore activities. Links to the various PICYA clubs can be found here.

Did you know?— Ropes also have names!

The various ropes on a sailboat have names. Why aren't they simply called, "ropes?" Actually, on a boat, most of them are called "lines" as a general term. Like equipment tags (see "What's in a Name?" above) the names for the various lines convey information about their functions. If it raises a sail, the line is called a *halyard*. A line attached to a sail for the purpose of changing its trim (the sail's position relative to the wind) is a *sheet*. A sheet that can help control the mailsail trim, for example, is a *mainsheet*. A line attached to a dinghy being towed is a *painter*. By using the specific names, the boat captain can indicate quickly what the crew should do, which is helpful for a fun day on the Bay, and is critical when racing. There are many more names for the various lines on a sailboat, and you can check them out in the glossary Gianna mentioned in her message above. Happy sailing!

IEEE Young Professionals Tour

In our **Dates to Note** section on the following page, you will see a March 30 event at the Dublin San Ramon Services District Wastewater Treatment Plant that is being coordinated by TJCAA's Electrical Designer Manan Bhatt in his role as the IEEE Young Professionals Affinity Group Chair. The event offers an opportunity for IEEE members and students to learn about wastewater treatment processes as they tour the plant. For more information on this free event, contact Manan at manan.bhatt.s@ieee.org.

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Dates to Note

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Mar 20	The Vernal Equinox
Mar 21	California Jazz Conservatory Band, 7 PM (Free), 2087 Addison St, Berkeley
Mar 21	Two years until the next America's Cup winner is crowned (The oldest trophy in sports!)
Mar 25–28	CA-NV AWWA Annual Conference, Sacramento
Mar 26	Prince Kuhio Day
Mar 28	Major League Baseball Opening Day (The earliest date in history!)
Mar 30	IEEE-YP DSRSD Wastewater Treatment Tour Event (Free), 9:30 AM–12:30 PM
Apr 7	Dave LeFebvre Band, 3-5 PM, Warehouse 416 Gallery (Donation), 416 26th St, Oakland
Apr 11–14	The Masters at Augusta
Apr 13	NBA Playoffs Begin
Apr 15	Taxes Due
Apr 22	Earth Day
Apr 25–27	NFL Draft
Apr 28	Opening Day on the Bay
Apr 28	Kelly Park Big Band, 5–8 PM, The Sound Room, 2147 Broadway, Oakland (The Sound Room is preparing their new concert space scheduled to open soon at a new location. Check the web site!)
May 4	145th Kentucky Derby
May 8	42nd Anniversary of Cornell '77 at Barton Hall
May 16–18	Preakness Stakes
May 17–19	Maker Faire Bay Area, San Mateo Event County Event Center
May 19	2019 Pac-12 Rowing Championships at Sacramento State Aquatic Center
May 20	Indy 500 Qualifying: Pole Day
May 25	Kelly Park Big Band, 8 PM, California Jazz Conservatory, Rendon Hall/ Fiddler Annex, 2040 Addison St, Berkeley
May 26	77th F1 Grand Prix De Monaco
May 26	103rd Running of the Indy 500
May 31–Jun 2	Intercollegiate Rowing Association National Championship at Lake Natoma, Gold River
Jun 7–Jul 7	FIFA Women's World Cup, France
Jun 8	Belmont Stakes
Jun 9–12	AWWA Annual Conference and Exposition, Denver