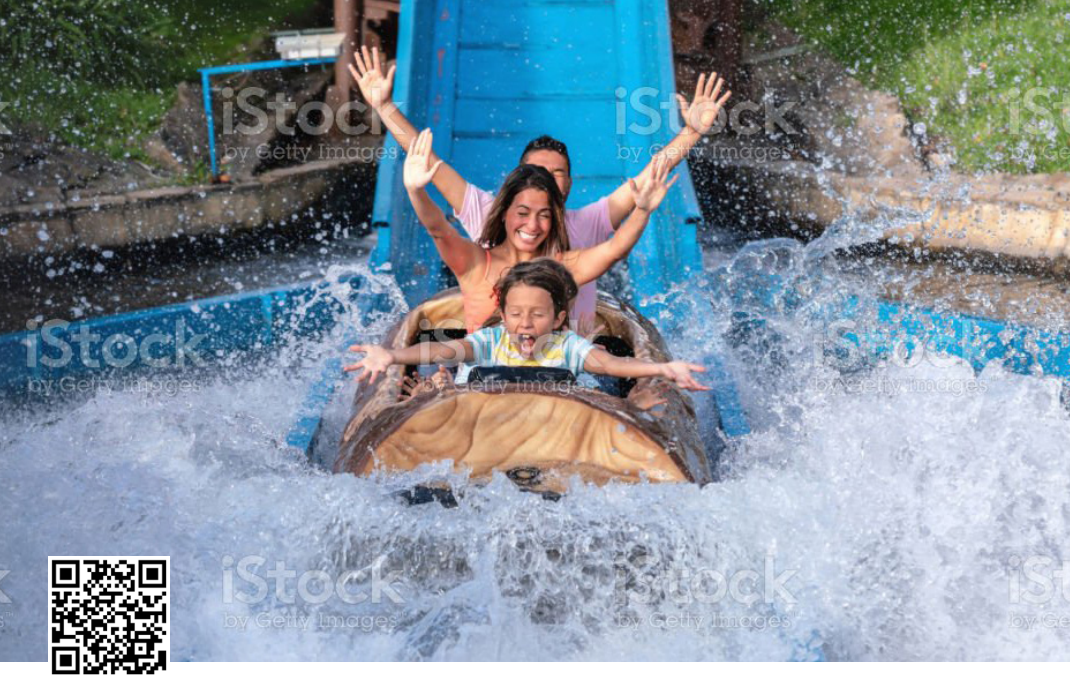

ELECTRICAL DESIGN – AESTHETICS & SAFETY

By John Whitcraft, PE, CLD, LEED AP BD+C,
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Tampa is known for its outdoor activities: a thriving commercial economy with multiple golf courses, tourist attractions, theme parks, and plenty of dining under the stars.

I've worked on several outdoor projects–from swimming pools to roller coasters–and safety is paramount without compromising aesthetics. I recently designed the electrical power upgrades for the cellular host distributed antenna system for SeaWorld in San Diego – a theme park known for its amazing naturescape and scream-worthy rides. The improved cellular service in a large park with hidden antennas, which all carriers can use, improves family communication. A parent can now FaceTime® a motion picture of a son or daughter and immediately share it with a grandparent. My job may not have involved a design feature, but I'm satisfied knowing the park has the necessary cellular antennas and illumination for a better and safer experience.

Outdoor Play – Theme Parks Make It Happen

Busch Gardens in Tampa is a famous tourist attraction for amusement park rides and a zoo. Andy De La Parte, President, A & A Electric Services Inc. of Tampa, FL, emphasizes that electrical engineering design for safety was the primary concern. His design work includes the Gwazi and Kumba roller coasters, the Rhino Rally, and R.L. Stine's Haunted Lighthouse. De La Parte said, "You can see the intent on the blueprints, but you don't know the outcome until it is finished. It's not only interesting; it's fun. It's not normal construction" (Electrical Contractor Blog).

I too take great pride in performing electrical engineering design work for theme parks. In addition to the antenna work I performed at SeaWorld, I have also worked for LEGOLAND, California. I measured existing loads to determine if additional power was unutilized, which allowed for safely adding circuits and prevented overloading the existing electrical service. As a result, my electrical design allowed LEGOLAND and SeaWorld to add cellular-based telephone power equipment to the park without requiring new power circuits.

Mark Rose, Vice President of Design and Engineering at Busch Gardens in Tampa, points to the substantial efforts that are employed to ensure safety at large amusement parks. According to Rose, "At Busch Gardens, every ride is inspected every day. Fifty-five mechanics and nine electricians inspect rides to make sure they're safe. Some of our rides will get you a little dizzy, but they should not harm you in any way. In addition, Busch Gardens hires third-party inspectors who are Professional Engineers" (Hidden Dangers Article).

Rose believes that the industry gets bad press from traveling shows, pointing

Licensed Professional Engineers
Competent and Ethical

Hiring a licensed professional electrical engineer is vital. "Only a licensed engineer can sign, seal, and submit plans and drawings, oversee work in the private sector, [and/or] serve as a fully qualified expert witness.... Many government agencies and academic institutions emphasize the importance of a PE license" (Institute of Electronic and Electrical Engineers).

A Professional Engineering license is granted by a state authority. In Florida the agency is Florida Board of Professional Engineers. A state agency requires its applicants to hold an ABET accredited engineering degree, pass an examination administered by the National Council of Examiners for Engineering and Surveying, demonstrate a few years of experience in the engineering field, provide five written references that reflect an applicant's engineering experience, and throughout his/her career must remain current on the latest trends in the industry. It is imperative that PEs adhere to the code of ethics established by the National Society of Professional Engineers.

NSPE President, Rick Guerra, P.E., states the reasons for professional licensure:

"Each of us has our own unique and personal PE story. We all share a commitment to a high standard of competence, professionalism, and ethical behavior that sets us apart.... As PEs, we place service before profit, the honor and standing of our profession above personal advantage, and the public welfare above all other considerations. In today's world, that makes us extraordinary." (Blog Post).

Extraordinary professionalism and quality of workmanship are paramount today as fires, floods, and other natural disasters increase every year. In addition, Florida residents are still reeling from the 12-story condominium's collapse that occurred in June 2021, allegedly caused by faulty design and construction. The safety of people and buildings is more important than ever. Professional Engineers are using social media to carry their message: #ProudPE.

For information on the Florida condominium collapse and emergency exit lighting recommendations, please read an article I wrote for ***Construction Monthly***: "Constructive Lessons from Florida to Texas – Professional Engineers Improving Safety."

to issues that can arise with carnival rides that have to be repeatedly erected and dismantled. Florida requires the inspection of all temporary amusement rides each time they're erected at a new location, but not all states do.

According to the National Society of Professional Engineers, "Florida requires a professional engineer or qualified inspector to annually inspect permanent rides, but exempts large parks with over 1,000 employees with their own full-time inspectors" (NSPE).

> ***Professional engineers stress safety. We have "made the commitment to protect the public's health, safety, and welfare," which is one of the fundamental canons of licensure. The National Society of Professional Engineers (NSPE) believes the public should be confident that engineering decisions affecting their lives are made by qualified and ethically accountable professionals.***

People may prefer swimming to riding roller coasters and sightseeing at a theme park. Again, safety must be paramount.

Swimming Pools

While most people view a swimming pool as a fun way to exercise, relax, and cool off, electrical engineers look at this recreational amenity from a safety first/aesthetics second point of view.

Tampa has the third highest number of pools out of all cities in the U.S., after Phoenix and Miami (Aqua Magazine).

When I was the electrical engineer of record for a swimming pool project at Grant Union High School in Sacramento, CA, safety and function were key considerations. My role was threefold:

- Generated sketches to address the contractor's Requests For Information regarding underwater lighting and stadium lights;
- Designed a new lighting panel to control the underwater pool lights; and
- Designed a control panel in the coach's office to allow manual control of stadium lights.

My underwater lighting design considered underground wiring, electrical outlets, lighting, water pumps, heating, and other factors that only a professional engineer or electrician consider as special equipment. In addition to following the NEC requirements that are highlighted below, Timothy Thiele, a licensed electrician for 30+ years, outlines several recommendations.

Highlights: Pools and spas come in every shape and size, and most require some electrical equipment to maintain water quality, power lights, run pumps, and more. Electric power and lighting around Swimming Pools is addressed in a Special Equipment article in the National Electric Code: Article 680. Of course, electrical installations must be done according to the electrical code in your area, and must be installed by a licensed electrician. The following are just a few of the most common code requirements from the NEC. Local rules may vary; however, most states adopt the NEC as their own with slight modifications.

Underground Wiring

Underground wiring is not allowed under a pool or spa unless necessary for the operation of the pool equipment (680.11).

Electrical Outlet Receptacles

The rules for electrical outlets exist to prevent the possibility of shock:

Receptacles for pumps and motors must be located not less than 6 feet from the pool walls, and they must be ground fault circuit interrupter (GFCI) protected and locked (680.22A). It is an inexpensive electrical device that can be either installed in the electrical system or built into a power cord to protect people from electrical shocks. GFCIs have played a key role in saving lives.

In residential pools, at least one GFCI outlet is required between 6 and 20 feet from the pool wall, eliminating the use of extension cords for ordinary appliances.

Outlet receptacles for general use can be no closer than 20 feet from a pool or in-ground spa if not GFCI-protected, and no closer than 6 feet away if they are GFCI protected.

Maintenance Disconnect

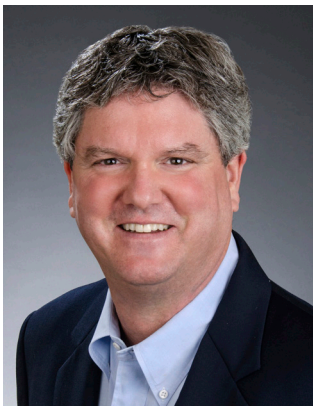
A maintenance disconnect is required for shutting off power to a pool or spa pumps, filters, and other utilization equipment. The disconnect must be installed within sight of the pool or spa but no closer than 5 feet from the pool or spa (680.41). Therefore, the power controls must not be touched by an individual standing in the pool or spa. Public spas must have an emergency disconnect that is visible and at least 5 feet from the spa.

Special Regulations for Self-Contained Spas and Hot Tubs

Spas and hot tubs that are stand-alone units rather than integrated with a swimming pool require the following:

- Outlet receptacles must not be closer than 6 feet from a hot tub or spa and must be GFCI-protected if less than 10 feet away.
- Lights or ceiling fans must be not less than 12 feet above the spa or hot tub if there is no GFCI protection, or not less than 7.5 feet above if there is GFCI protection.
- Wall switches must be at least 5 feet from the water.
- Outlet or direct-wired circuit that powers the motor or heater in a self-contained spa or hot tub must be GFCI protected.

Outdoor recreation is a necessity in most people's lives. I am honored to play an integral role in creating a safe environment. Hearing the joyful noise and laughter from a pool or theme park ride gives me pride in the work that I have accomplished with a safe electrical design.



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