

# A Skill Stack CUSTOM-ENGINEERED FOR INDUSTRY

BY: MIKE CHALMERS

Located in Tacoma, Washington, Casper, Phillips & Associates (CP&A) was founded in 1987 by Bill Casper and Rich W. Phillips, and has since served its ongoing clients across a range that includes crane engineering, structural engineering, specialty services, and custom software.



CP&A was hired by National Oilwell Varco to design a structure for a dockside whirley crane.

The firm's launch was bolstered by established worldwide recognition for both Casper and Phillips as structural engineers specializing in container cranes. As the story goes, Phillips had set out to start his own company, and then found out that Casper, with whom he'd previously worked, was doing the same thing—so they went out to lunch and decided it would be more beneficial to partner up than to compete. They were already experts in the industry, both with quality reputations, so the partnership made sense.

In the more than three decades that followed that lunch meeting, CP&A has expanded its staff and associates to include mechanical and electrical expertise—as to provide its clients with full, multi-discipline crane engineering services. The firm's current portfolio lists work in the areas of voyage bracing, structural engineering, earthquake engineering, failure analysis, and repairs.

Internally, CP&A is comprised of a small group of finely tuned specialists with a robust extent of personal experience, which allows them to offer the range of services they've become known for around the industry.

In fact, the company has intentionally limited staff growth over the years to high-quality, self-directed engineers, and in doing so, CP&A has grown, not by numbers, but by productivity per engineer—using extensive custom and commercial software.

“We really like our people, when they don't have billable work, to be making the company more productive,” explained Richard L. (Richie) Phillips, an associate mechanical engineer and son of co-founder Rich W. Phillips. “We're a small company, so when people aren't on a project, we encourage them to develop, write, or update programs for future projects—so we don't have to reinvent the wheel.”



CP&A was hired to perform a root cause investigation for a trolley travel system on a set of dockside container cranes.

To that end, CP&A hasn't seen much of a slowdown with work over the last two years—and are currently working within their backlog.

"Ports are using our services a lot right now," Phillips indicated. "They're trying to get a little more life out of their existing cranes. We're also helping ports plan their next purchase, and then when it comes in, we hope they use us to help them review the contractor's designs to make sure they're compliant with whatever local standards they need to be compliant with—whatever region they're in."

#### **EFFICIENT COMPLETION**

CP&A's first project was a rail-mounted, self-propelled 1,000,000 cubic foot building at a Boeing facility to protect sensitive equipment sites from being observed.

Since that project, Boeing has been a repeat client for dozens of projects for special structures, such as an aluminum platform subjected to deafening white noise, several overhead crane projects, and earthquake upgrades.

CP&A established itself early on by working in the container crane industry—and continues to offer a multi-discipline combination of mechanical, structural, electrical, and computer science engineering, as well as anti-corrosion coating technology. Moreover, they've expanded their crane expertise to now include most types of cranes from RTG, RMG, and Goliath cranes to B.O.P handlers on drill ships.

"We began with the more complex problems in that [container crane] industry—they're quite complex, those

cranes," said Phillips. "We just sort of pieced it down from there, really. We went from working on the larger components to doing the smaller parts too, and it was kind of a logical next step to then move into general material handling. From there, our evolution has been about diversifying our offerings and leveraging the experience we have."

Over time, the CP&A skill stack has evolved right along with its clientele. Beneath the Crane Engineering banner, the firm offers procurement, specification, design, design review, manufacturing review, voyage bracing, modifications and rehabilitation, accident investigation and repair, and condition surveys.

As for Structural Engineering, CP&A provides designs for steel, concrete, and wood structures of all types, including commercial buildings, offshore structures, and various types of crane structures.

Within the Specialty Services category, CP&A has been retained as experts to determine the cause of failure in many different accidents, and has supervised the flame straightening of complex structures. And beneath the Custom Software banner, they offer a series of commercial software packages for quick and efficient structural design of material handling equipment of all styles and types.

CP&A has developed a suite of computer programs that all work together, facilitating efficient completion of engineering designs. They've used such custom software



CP&A was hired by ZPMC to provide structural optimization to reduce the amount of steel on a set of container cranes.

to design a range of cranes, bulk-handling equipment, buildings, and other structures. Additionally, the firm has written custom software for Excel to write input files and to read the database files from finite element programs.

Tom Hubbell, Principal Structural Engineer, adds, “The CP&A proprietary software suite gives us a large competitive advantage. So we prioritize continually updating and extending its capabilities.”

Ultimately, ports and crane manufacturers around the world use CP&A’s services to design and procure all types of load-handling equipment.

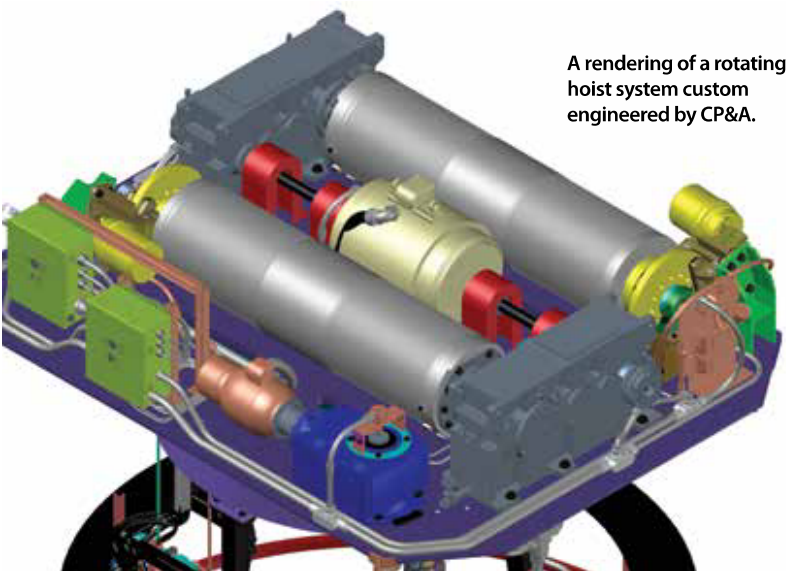
### DESIGN, BID, BUILD

“We have a couple legs in the business,” Phillips pointed out. “One of them is a container crane design review, which is what our primary software suite is set up to do. And then there’s custom projects—like the Interlock System, which is the second leg, the custom side.”

CP&A recently designed a custom interlock system for two 10-ton capacity bridge cranes at a facility where composite aircraft parts are made. They were contracted by a large commercial airplane manufacturer to design a system to allow parts to be carried between bridge cranes and workstations.

The bridge cranes pick up the parts from a workstation and take them to the next workstation on the assembly line. The automated manufacturing process was for a new-build facility, but a requirement for a system to prevent trolleys from driving off an improperly positioned bridge was only realized during the design process.

According to Phillips, the project was already underway before the end-user involved CP&A. “The crane and the workstations were being designed and manufactured by several different companies, but there wasn’t an off-the-shelf solution for the interlocks. For reasons unknown to us, it was not in the scope of work for the design teams already on the job and none of the other teams wanted to design a custom interlock system. Once our design was completed, the end-user partnered with a local machine shop to build it. This is what we call a design-bid-build project structure.”



A rendering of a rotating hoist system custom engineered by CP&A.

## SCHOOLS OF THOUGHT

In addition to upgrading its proprietary crane analysis software, used for pre- and post-processing during finite element analysis of cranes, other recently completed projects at CP&A include the remediation of three 40-metric-ton-capacity rail-mounted gantry cranes at a major North American port (after conducting a root-cause analysis following gearbox failure), and the development and installation of a revolutionary seismic isolation system on two quayside container cranes at Asyaport in Turkey.

This particular project included CP&A's crane base anti-seismic isolation system (BASIS)—built on nonlinear time history analysis (NLTHA), which can protect the crane main structure from damage even in contingency level earthquakes.

"There are basically two schools of thought within the seismic risks," said Phillips. "The current thinking is that the cranes can be damaged but they can't fall over. The crane might be damaged, and people might have a hard time getting down, but they'll be safe. However, the crane will likely be inoperable."

The new school of thought, he added, is the idea of base isolation. "We design a base isolation system for the crane, then much of the earthquake ground motion is not allowed to transfer into the crane. This minimizes the level



Richard L. Phillips Touring TMEIC's Fuchu Factory in Tokyo, Japan.



Jeff Hubbell (President) testing the initial assembly of the interlock system.

Mike Zhang supervising installation of a new gearbox on an RMG container crane.



of damage and allows the crane to be operable after an earthquake. We subscribe to this school of thought. Ports are critical links in the supply chain, they need to operate right after an earthquake to support the local area."

Mike Zhang, Chief Mechanical Engineer at CP&A added, "There are alternative crane seismic systems on the market, but BASIS outperforms them. The friction damper does not slip under normal operations, so the structure maintains the same dynamic and static stiffness as a crane without the seismic device. Also, a similar profile damper can be set at a different sliding force to accommodate various cranes and seismic zones."

Closely related, accident repair and failure investigations also land in the CP&A queue. "We'll help stabilize the crane, whatever needs to be done," noted Phillips. "For example, a crane boom might be down, and a ship leaves—hits and damages the boom. Depending on the severity, we can come up with a procedure to repair the damage. Alternatively, if there's legal implications, we can do the expert witness side of the accident."

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