NWRS 2021: Learning to navigate complexity

BY JOE ALLEN

THE ENTERTAINMENT INDUSTRY is rapidly becoming more complex. Our community is evolving technologically, and in terms of social structure. Naturally, these changes are happening in tandem with the wider world. This situation poses real problems, though.

How does a shackle-twisting mouse find some cheese in this vast maze? Aside from hard-won experience or naive trial-and-error, solid education is the only way an individual can prepare for this increasingly complicated environment.

One reason a symposium is valuable, aside from fellowship, is to gather the finest minds to disseminate and discuss the newest ideas. Forced online this year, the 2021 New World Rigging Symposium was short on true fellowship—Zoom toasts notwithstanding—but as always, it was strong on crucial information. Here are a few highlights, skewed by this arena rigger's bias.

The three most informative sessions for me dealt with how to hang video walls, how to understand automated rigging systems, and how to choose the proper rope for the job. There was also a fascinating exposition on the future of arena design. (I warned you about my bias.)

Video Wall Rigging

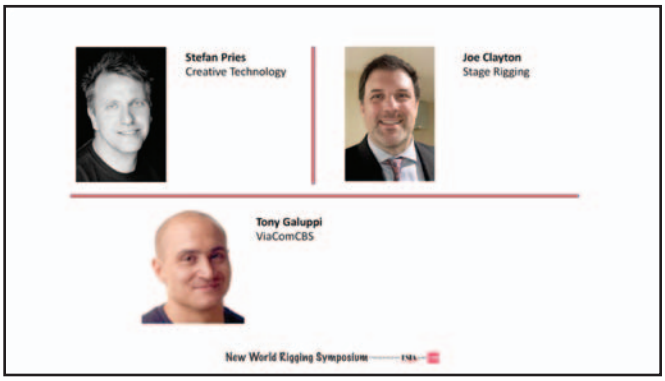
Having been hired to rig a massive video wall, a tour rigger has a few serious questions to ask. The most fundamental is "How do I hang this thing safely, before doors open?"

Joe Clayton was hanging video walls before most of us got the nerve to climb our first scaff tower. Drawing on that experience, Clayton delineates five tasks to accomplish during the design phase—before it's too late.

First, gather all of the relevant information from each department, and verify its accuracy. What are the true dimensions? What are the actual weights? Who are the vendors? Research their specs yourself. Look at the surrounding lighting, audio, props, and so forth—then ask: What are the possible obstructions?

Second, break this complex system into its basic elements. Always create your own integrated drawing. As you're working on this AutoCAD or Vectorworks plot, think ahead to the installation. How will the structure fit into the trickiest venues down the road? For the sake of efficiency and safety, what is the ideal sequence to hoist each component during load-in?

Third, procure load cells to monitor the system's forces whenever



Stefan Pries, Joe Clayton, and Tony Galuppi presented the session "Video Wall Rigging – What You Need to Know."

Joe Clayton shared a detailed checklist for developing his design plans to hanging today's massive video walls—all before he leaves the office.

possible. Sprawling video walls require numerous points, and can easily become unstable if one or more motors fails to take the load properly. This is especially true of curved video walls. Load cells are the only way to be certain you've supported the entire structure.

Fourth, choose the appropriate hardware. If you're using truss to hang the wall, bigger is not always better. Due to inherent contingencies, it's wise to err on the side of flexibility—so long as you stay within the allowable loads. If you can use turnbuckles instead of GAC flex for fine-tuning, do so.

Finally, be aware of the need for access. If a video panel goes out—which happens all the time—will a tech be able to climb to that section? If not, will it require creative access techniques or a lift to get there? Figure that out before you ever leave your office.

Clayton's checklist allows you to eliminate most headaches during the design phase. Otherwise, you risk having a gang of ornery techs breathing down your neck, demanding to know why you didn't consider that problem before rehearsals.

Automation vs. Motorization

As shows grow more elaborate, automation is employed to control these complex systems. Dynamic rigs that would require an army of Oompa Loompas to pull rope and push buttons in harmony—with ridiculous results—can now be controlled by one person from a central console. Used properly, automated systems are much safer, faster, and more precise.

The "Automation vs. Motorization" panel began with the caveman tech of hand-cranked winches, progressed through the push-button chain hoists we all know and love, and left us at the human-machine interface now prevalent in the robotic age. Perhaps unintentionally, Nils Becker, Joe Champelli, and Pete Svitavsky provided a superb crash course in cultural evolution.

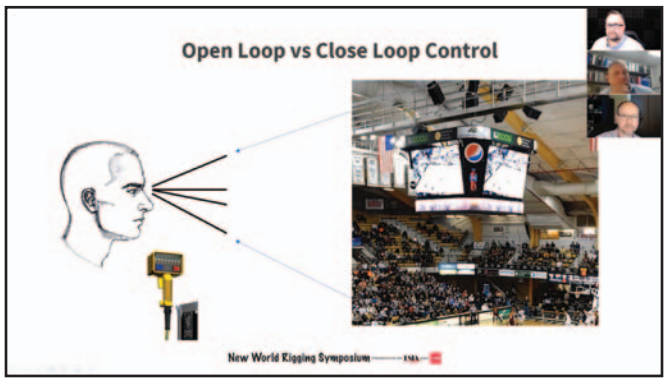
The panelists explained each element in painstaking detail: load arrest mechanisms, force sensors, position sensors, current sensors, e-stop/enable devices, motion control, and computer control networks. Having pulled the big machine apart, the presenters then described the variety one finds within different rigging systems.

For instance, a load arrest component could be as simple as an old school dead-man switch, or maybe something high-tech like a laser curtain. Similarly, force sensors range from a slipping clutch to digital load cells and tension meters. From one component to the next, their presentation conveyed the historical development of these technologies, while providing a practical guide to their appropriate use in varying situations.

How much automation should one add to any given system? For the mechanical engineer, the central question is: Is automation safer than human control?

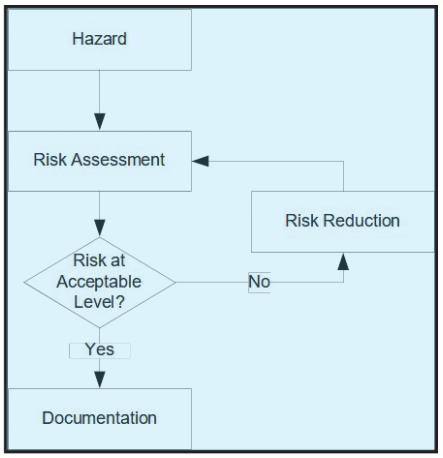
The decision-making process behind that requires careful risk assessment. Svitavsky offered a basic flowchart as a ready guide. Isolate each potential hazard (e.g., a moving set piece might strike

Pete Svitavsky, Joe Champelli, and Nils Becker presented the session "Automation vs. Motorization. Do You Know the Difference?"



The difference between open-loop and closed-loop control were covered in "Automation vs. Motorization." Is a human needed to monitor position?

a performer). Next, do a risk assessment. Is the risk at an acceptable level? If no, find a way to reduce the risks (e.g., adding more precise controls). Once the risk is determined to be acceptable, create ample documentation of how you arrived at that confidence.



Decision-making process for risk assessment

So, what happens to the naked apes when automation becomes pervasive? Svitavsky assures us, "They say the most sophisticated computer is only a fraction as sophisticated as the human brain. We need that judgment of a trained operator." However, Nils Becker offered a more forward-thinking, if ominous perspective: "I think it's also worth noting that while you can argue for the idea of the human eye or the human being closing the loop—and they are capable of doing amazing things—the fact is they are not as reliable and predictable as the mechanical solutions you oftentimes devise to substitute for the human attention span."

For instance, a digital sensor will react far faster than mere human reflex. This is especially true with a large number of motors, convoluted motions, and multiple moving parts. At the conclusion, Becker made the off-hand comment that a certain degree of complexity requires artificial intelligence.

There will always be a human in the loop, we're told. So that's *one* paycheck secured. It's worth considering how many others will be scrapped, and what happens next.

What's my Line?

There's an old joke: "What's a rigger without his rope?" Give up? A stagehand!

In archaic times, a length of hemp was good enough for rock 'n' roll. But the current era demands more specialized materials. That's why Bill Sapsis, Eric Rouse, and Andy Schmitz put together a primer for any rigger who might ask, "What's my line?" Throughout their panel, the history of our industry really came alive.

To begin with, the panelists identified the three primary types of rope used in our industry: twisted (or "laid"), braided, and kernmantle (static core with a braided sheath). Laid ropes go back to prehistory. These are typically made from organic materials—hemp, jute, or manila—and are still used in "hemp house" theatres today.

Andy Schmitz, Bill Sapsis, and Eric Rouse presented the session "What's my Line?"

The construction of laid rope was explained in "What's my Line?"

If I may add an aside: Kitty Ferguson writes in *The Music of Pythagoras* that the ancient Egyptians squared their architecture using hemp rope. An endless loop would be tied with three knots using the Pythagorean 3-4-5 method, then stretched out by hand, so that a pyramid's corners were at perfect 90° angles. That means rope-pullers stand at the dawn of civilization!

Back to the panel, braided rope began to appear in large quantities after the advent of machine bobbing during the Industrial Revolution. By the mid-20th century, the accumulation of technical advances saw the invention of kernmantle ropes and the rapid development of synthetic materials. Each variety has its own advantages and downsides, depending on relative strength, elasticity, durability, and cost.

With these amazing materials available, why would anyone continue to use wire rope in a counterweight system? Bill Sapsis put it succinctly: "There's a cost! We're not gaining anything, and we're spending more money for it. [Synthetics] have good abrasion resistance, but none of them compare to wire rope."

Revisiting the Chase Center

On an allegorical level, all this progress culminates in San Francisco's futuristic Chase Center Arena, which opened in September of 2019. During this session, Bob Powers, Jennifer Estremera, Ed Kish, and Michael Nishball described their observations on the ground—and in the air. For once, the architects and municipal planners listened to actual riggers before breaking ground. The results are stunning.

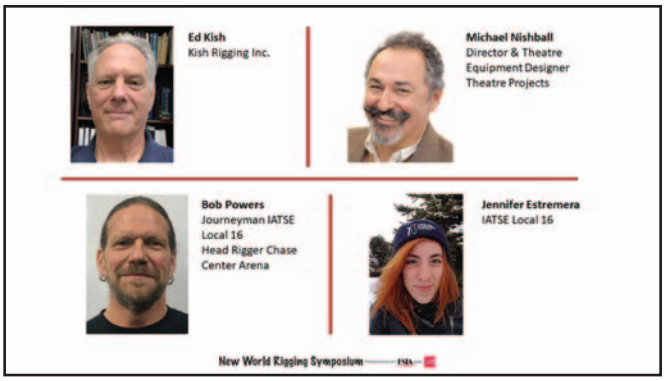
The building features two movable gantries above the scoreboard. These can hold up to 50,000 lb apiece. The gantries are also equipped with load cell feedback, eliminating the uneasy skepticism that comes with a super-heavy show. The rock 'n' roll grid has the same rating—50,000 lb—and the entire grid has a 500,000 lb total load capacity.

The concrete floor is etched with saw-cut lines that correspond exactly to the beams in the air, inspired by the Rock Lititz rehearsal venue. Unsurprisingly, after a breakneck opening season, Bob Powers reports that these saw-cuts speed up mark out times dramatically.

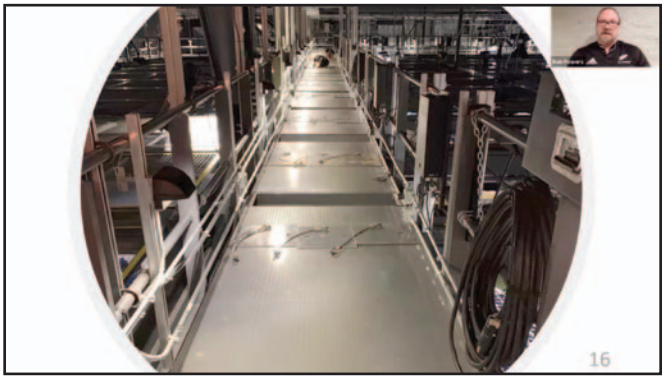
Up above the 96' grid, haul points have been installed over the beams to attach sheaves. In the long run, that means San Francisco's up-riggers might actually retire with their spines intact.

The main attraction is the arena-wide tension grid. This taut wire-rope net allows up-riggers to move around in the air as if they were walking on the ground. As Estremera notes, the up-sides are obvious: "Safety, efficiency, and inclusivity." She notes that workers who would normally shy away from heights are now able to join the crew upstairs.

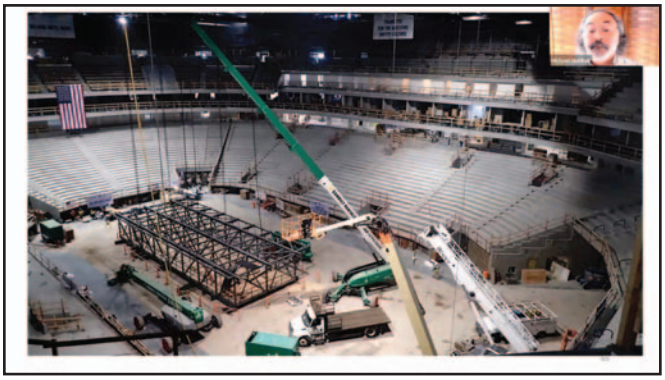
The potential downsides are more subtle. Up-riggers pride themselves on their guts and physical prowess. There's also the issue of pay. From the earliest days, the element of danger has ensured our higher wages. I wonder, what happens to that culture, and its benefits, when the playing field has been flattened?



Ed Kish, Michael Nishball, Bob Powers, and Jennifer Estremera presented the session "Revisiting the Chase Center – A Case Study of an Arena Tension Grid."



Catwalks provide solid access to the tension grid at the Chase Center Arena in San Francisco.



Michael Nishball described the installation of the over-head rigging elements. Gantries move under the scoreboard when it is retracted so rigging positions are provided there.

For now, that's something for San Francisco's Local 16 to hash out. But if Powers is correct, and tension grids are the future of rigging, that means big changes are coming to the rest of the world. As with most technological revolutions, the cultural loss can't be denied.

What's a stagehand up in the tension grid? A rigger.

Conclusion

Throughout recorded history, the tendency toward complexity has been part of the human condition. Judging by the fossil record, it's

2021 NEW WORLD RIGGING SYMPOSIUM SCHEDULE

TUESDAY, APRIL 6TH

Keynote Address
Presented by Jeanette Farmer

So, What Have You Been Doing?
Hosted by Eddie Raymond and Bill Sapsis

Video Wall Rigging – What You Need to Know.
Presented by Joe Clayton, Tony Galuppi, and Stefan Pries

Automation vs. Motorization. Do You Know the Difference?
Presented by Nils Becker, Joe Champelli, and Pete Svitavsky

Rigging Cornucopia

ESTA Lifetime Technical Achievement Award
Presentation to Roy Bickel.

WEDNESDAY, APRIL 7TH

What's My Line?
Presented by Eric Rouse, Bill Sapsis, and Andy Schmitz

Revisiting the Chase Center – A Case Study of an Arena Tension Grid.
Presented by Jennifer Estremera, Ed Kish, Michael Nishball, and Bob Powers

Focus on Mental Health
Presented by Dominic Housiaux, Jennifer Leff, and Taryn Longo
Moderated by Eddie Raymond

Rigging Cornucopia

THURSDAY, APRIL 8TH

Performer Flying/Rescue – Safe Travels.
Presented by Fred Caron, Stu Cox, Paul Sapsis, and Jim Shumway

Got Questions? Get Answers. Ask the Engineers.
Presented by Bill Gorlin, Dan Louis, Miriam Paschetto, and Jeff Reder

Cinema Rigging: How Did They Get a Camera There?
Presented by Robert Babin, J. Patrick Daily, and Brady Majors
Moderated by Kent Jorgensen

Rigging Cornucopia

surged in fits and starts for well over a hundred thousand years. For the planet as a whole, adaptive radiation is a defining feature of the 3.8 billion year-old process of biological evolution.

Even for those who reject the scientific narrative, the motif of simplicity yielding complexity can also be found in the book of Genesis, in the Hindu Vedas, as well as in Chinese etiology (from the Yin-Yang to the I-Ching's sixty-four hexagrams).

There's a sense of inevitability in the Myth of Progress. Life naturally tends toward greater complexity. That's how roadies went from stinky cargo vans to polished tour buses. It is how riggers went from being fearless steel-climbers to sheave teams. In 2021, this progress means a rapid shift toward robotics and social diversity.

How do we navigate this increasing complexity? The answer is as old as Athenian philosophy. Listen to the finest minds. Learn to adapt. And think for yourself. ■

Joe Allen has toured with Game of Thrones, Queen+Adam Lambert, the UFC, Rascal Flatts, and the Black Eyed Peas, among others. He's climbed steel upside-down and rightside-up, and still loves the view from the grid.