ABOVE GROUND LEVEL
agl Magazine™

OSHA ASKS, NATE ANSWERS

- Verizon/AOL Merger
- Wi-Fi Backhaul
- FCC on Spectrum Sharing
- Enterprise DAS Maintenance
- Macrosites in Mexico
- Rural 4G LTE
- Tower Workers Should Organize

July 2015 /// Volume 12 /// No. 07

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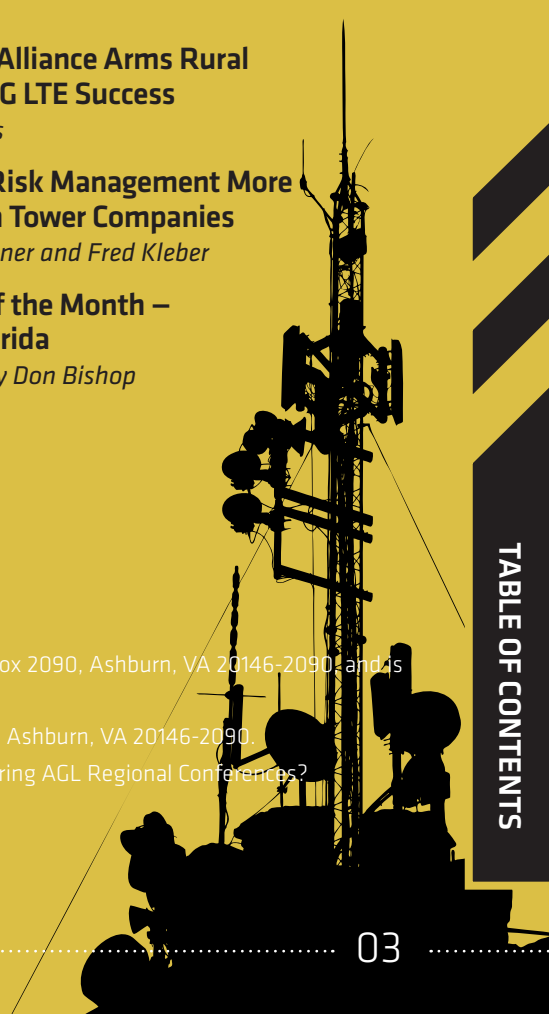

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Stephanie Gurney

News from Texas brings the sad notice that Stephanie Gurney, a woman who was climbing a telecommunications tower near the town of Eden, fell from the tower on March 28 and died of the resulting injuries. Gurney had two sons and two daughters, and she worked in child care. Available reports leave the details somewhat unclear about whether she was a possible applicant for a job as a tower climber.

Joseph Grimes, the owner of Jostan Communications, was on the site, as was Jostan Communications employee and Gurney's boyfriend, Jerry Butler. Butler was on the tower with Gurney, and Grimes had been on the tower with the two of them but had climbed down before Gurney fell, according to reports.

The Occupational Safety and Health Administration sent an investigator to the site. Whether OSHA will claim jurisdiction and issue any possible citations to Jostan Communications seems to turn upon whether Gurney had a connection with the company as a job applicant, because apparently she was not an employee.

Her death, which may be counted as the first job-related tower worker fatality of the year, points out the need for extra safety precautions that need to be taken for job applicants and new trainees.

AGL Magazine's publisher, Rich Biby, and I saw those precautions firsthand last summer when Biby participated in a training exercise in Springfield, Virginia, and I was there to write a story and take photographs. Experienced climbers rigged safety lines, and the trainees were connected with the safety lines whenever they were off the ground.

Whether Gurney was at a tower to share an experience with her boyfriend or to be evaluated as a possible employee, extra precautions should have been taken beyond the minimum fall protection required of trained climbers.

It seems likely that many tower owners would not approve of letting someone who's a trained climber share the experience of tower climbing with someone who isn't. Some don't allow training exercises on their towers at all. It's good that some allow training exercises on their towers when the proper safety measures are taken.

I remember signing an all-encompassing waiver of liability at the Springfield site. Liability is a big factor, and Gurney's mother is looking into the possibility of a lawsuit involving responsibility for wrongful death.

Those who are supervising untrained tower climbers have to make up for what the untrained don't know that they don't know by providing extra measures for safety.

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I Love New York

We kicked summer off with the *AGL* regional event on June 25 in northern Virginia. It's always a fun time to see old friends and meet some new ones. We were honored that Jonathan Adelstein, president and CEO of PCIA – The Wireless Association, started our day with a keynote speech. I can't thank him and PCIA enough for their support of our local events.

We're hearing many of the same notes that we've heard before, as the pounding of the drum gets louder. "Spectrum, more data and small cells" is the message. Everyone is anticipating deployment of the AWS-3 spectrum in 2016.

Meanwhile, the rules for the 600-MHz incentive auction are expected to be adopted by the FCC in July. The auctions may begin sometime in early 2016 and, unfortunately, they are structured in such a way that they may go on for quite some time, perhaps for as long as a year. The 600-MHz spectrum, which is much like the 700-MHz band, really is the last great spectrum land rush.

Discussion centers on Verizon Wireless' continued aggressive deployment of small cells and site modifications. AT&T really seems to have pulled back on deployment activities while continuing to make some site modifications. T-Mobile USA looks to be working on strategic deployments and modifications, and Sprint seems to be active, but not aggressively.

With the exception of Verizon's urban-area small site deployments, we're all still trying to figure out exactly when and where we'll see these mysterious small sites appear. Because the requirements for siting, zoning, permitting and environmental evaluation are not much different for a 60-foot pole than they are for a 160-foot pole, it would make sense that the carriers deploying these early, small, probably single-carrier sites would have a competitive advantage sometime soon. Many knowledgeable people are shaking their heads in puzzlement, wondering why Verizon is spending so much energy on small sites while everyone else is just watching. Is Verizon crazy? Like a fox, most likely.

Wi-Fi calling appears to be taking off — and I'm glad about it. The costs of Wi-Fi will always be attractive, and if Wi-Fi is used to fill in the nooks and crannies, for either stationary traffic or slow-moving foot traffic, it is a natural fit.

My hat is off to the New York State Wireless Association. I attended its NYSWA Forum at Chelsea Pier in mid-June. This was an absolutely wonderful event. New York City is a little pricy, let's be honest, but what a wonderful venue on the Hudson River in a historically significant location. The meeting was very well attended and boasted wonderful speakers. And, honestly, the best food I've ever had at a state wireless association's function. My apologies to all of the other states.

Accolades aside, the presentations and conversations from this event seem to mirror what we're talking about everywhere.

Rich Biby, Publisher
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PUBLISHER'S NOTE

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Quick-Guide to Collocation and Acquisition Companies

As a supplement to *AGL Magazine's* January Buyers Guide, a list of collocation and acquisition companies offers more detail to help you choose a vendor for your next project. Where shown, logos and company descriptions were provided by and paid for by each company.

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See ad on page 5

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Charlie Feick
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www.comsiteswest
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Company description: ComSites West owns, operates and develops wireless communications sites in California and Nevada, including tower and rooftop communications facilities. We develop towers jointly with landowners and acquire towers through outright purchases and through purchase-leaseback programs.
See ad on page 45

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Rich Reichler
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rjrwireles@aol.com
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Boca Raton, FL 33487-1307
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Verizon/AOL Merger Will Promote Network Densification

Content delivery and the ability to market to the user will become the focus of competition for network operators as their coverage maps become more similar with the LTE build out.

By J. Sharpe Smith

From a network architecture point of view, Verizon's proposed $4.4 billion purchase of AOL Network will add to the business case for network densification and increase the need for intelligence at the edge of the network, feeding the ability to target content and marketing to the user, according to Tormod Larsen, chief technology officer of ExteNet Systems.

"With the acquisition of AOL by Verizon, we see the value in content delivery and the service application layer providing revenue beyond the more traditional subscriber model," Larsen said. "With content-rich applications, we anticipate a direct correlation between the delivery of the content and increased revenue."

As content-rich applications become more critical to revenue, the ability of the network to handle high-quality content will be critical. Densification will increase the network's capability to provide that high-value content.

"You might even see the carriers driving the network into areas to provide service based on where it is more valuable to provide that content," Larsen said. "It is not always the content; it is also the Big Data."

> *"The play for a distributed network provider such as ExteNet is to provide the carrier with a network within the larger network, where the intelligence resides at the edge of the network, not in a data center states away."*

Content-driven Delivery

Before cellular systems were voice-centric, carriers were inclined to build the same network everywhere, but now with data-centric service, and even more so with content-driven delivery, heterogeneous networks have come to the fore. The wireless infrastructure industry has moved from coverage networks to capacity-driven networks. Now the goal is smart-capacity networks.

"What we see evolving is the concept of small networks within the big networks — basically an architecture of networks within networks. For example, a stadium network has different functionality, and it is more independent of the macro environment because it is its own ecosystem," Larsen said.

Content delivery will be tailored based on the location, whether it is a stadium, a hospital or a hotel. The content can be targeted to specific audiences at specific times, based on how the network is architected. For network infrastructure providers, it is an opportunity to provide more infrastructure because there will be more demand for network capability, especially when a carrier wants

granular Big Data analytics.

"What the user expects from a network in a stadium is different from what he or she expects the network to do along the highway," Larsen said. "With Verizon's purchase of AOL's platforms, the carrier can know exactly which subscriber is sitting in which seat and what their habits are, thus allowing targeted content delivery and advertisements." Additionally, advertising and content can follow the user from the stadium to a hotel room.

Becoming Competitive

Network coverage is currently the differentiator, and each carrier has its signature coverage map. But soon those networks will be built out with LTE, and the map discussion will become a moot point from a marketing standpoint. Thus, carriers are looking to content delivery for the advantage that will allow them to shine, compared with their competition.

Verizon is not alone in its foray into content. AT&T plans to use its relationships with automakers to offer advertiser-supported or paid content exclusively for connected-car users, according to Reuters. Connected-car users will see content, such as videos and games, that can be streamed onto personal mobile devices later this year.

"When you talk about the carriers, currently, you talk about the network," Larsen said. "But when you talk about Google, you talk about the subscribers and service, not the network, even though they have one of the most complex networks. More and more carriers are moving into the service and applications. The network will not be the differentiator going forward. The differentiator will be the service and applications that the network enables."

The play for a distributed network provider such as ExteNet is to provide the carrier with a network within the larger network, where the intelligence resides at the edge of the network, not in a data center states away.

"It's about being smarter about how you route your traffic in the network based on location, who the user is, the type of content and the event," Larsen said. "The carriers may need some partners that are more nimble to help them adjust the network in a venue for a special event. We will need to be able to support that dynamic behavior."

Wi-Fi Backhaul Connectivity for Baltimore's Famed Inner Harbor

Hallmarks of the City of Baltimore's free Wi-Fi service include easy Internet access and an unobtrusive appearance. The use of 60-GHz backhaul allows the network to reach Wi-Fi access points where the use of fiber-optic cable was neither feasible nor economical.

By Ilan Moshe

Baltimore now provides free Wi-Fi at its historic Inner Harbor using 60-GHz radios to transport the communications traffic.

Sixty-gigahertz technology was selected not only for its ability to provide gigabit throughput to support peak Wi-Fi usage by tourists and local visitors, but also for its unobtrusive profile.

When Baltimore initiated a free Wi-Fi project for the Inner Harbor, the city turned to local experts at Port Networks, a Baltimore Wi-Fi service provider. The city wanted to provide visitors to the Inner Harbor with easy Internet access, but because of its historic landmark status, creating an unobtrusive network was of paramount importance.

The city owns and operates a fiber

A lamppost in Baltimore that supports an access point for the city's free Wi-Fi at the historic Inner Harbor. Above: A 60-GHz EtherHaul-600T backhaul radio made by Siklu is small enough to be hardly noticeable. Millimeter-wave technology combines high throughput and low interference for a high level of network capacity.

The Baltimore Inner Harbor. *Photo: James Cridland (Flickr: Baltimore Inner Harbor)*

backbone, but the fiber would not reach every Wi-Fi access point in the harbor, and disrupting operations to lay more fiber was neither feasible nor economical.

Port Networks identified millimeter waves as the optimal solution, with their combination of high throughput and low interference. The provider opted for a compact-sized radio that would make it far less noticeable when deployed at the Inner Harbor.

"The radio is literally palm-sized," said Carl Peterson, Network Manager of Port Networks. "It was the smallest radio we could find that operated in the 60-GHz spectrum.

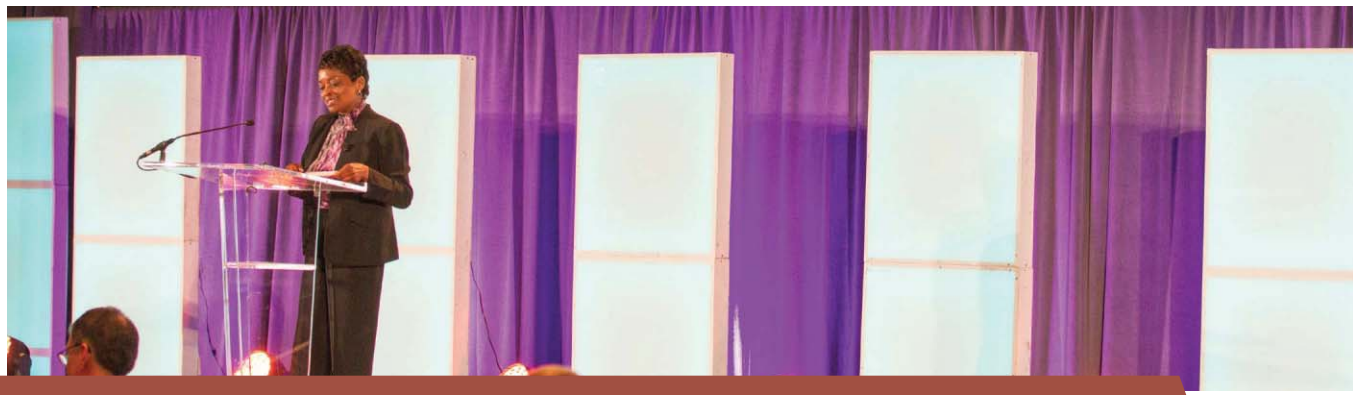
The radio provides gigabit throughput that can easily handle peak Wi-Fi performance and is interference-free. Units can be installed in close proximity if needed. It also keeps operation costs low by operating over unlicensed spectrum.

Port Networks installed the entire Wi-Fi network, including the backhaul connectivity links. "Installing the radio was very easy," said Peterson. "Its small size and light weight make the physical installation very simple, and aligning Inner Harbor with the link was surprisingly uncomplicated and fast."

The network's performance has been flawless since installation. It will be able to handle anything Baltimore's Wi-Fi network can throw at it. The 60-GHz radio has proven performance under peak Wi-Fi conditions, even in situations where the upload rate greatly exceeds the download rate."

Port Networks, impressed by the radio's performance, is planning to incorporate similar radios in its other Wi-Fi connectivity networks. "Adding 60-GHz radios will allow us to easily boost our network capacity," explained Peterson.

Ilan Moshe is head of Siklu's North American operations. Siklu makes the EtherHaul-600T 60-GHz radios described in the article. Visit www.siklu.com.



FCC Mulls Steps Involving Spectrum Sharing and Historic Preservation

As returns from repurposing federal radio-frequency spectrum diminish, spectrum sharing grows increasingly appealing. Expanding exclusions from historical preservation review is under consideration.

By Mignon Clyburn

This is an incredible time when it comes to all aspects of the commercial wireless industry. In July 2009, when I began my tenure at the FCC, those following the trends in the industry predicted that smartphones would spike demand for mobile broadband services. A short time later, tablets were introduced, and it became even more clear that we were on the cusp of experiencing unprecedented, explosive demand for mobile broadband services.

Quickly to follow were policy priorities — to find more radio-frequency spectrum that could be repurposed for commercial wireless services. Collaboration among the FCC, Congress, PCIA, the commercial wireless industry and other stakeholders resulted in the passage of the Middle Class Tax Relief and Job Creation Act of 2012.

This Act directed all of us to hold several auctions, particularly the FCC, including the successful H-Block and AWS-3 auctions, which will be followed next year by the world's first voluntary reverse auction of broadcast television spectrum. In fact, the AWS-3 auction set the record for the highest number of total winning bids. And we expect more than $40 billion will be eventually deposited with the U.S. Treasury for the FirstNet public safety broadband network and other domestic policy objectives.

There are several reasons why we expect the incentive auction to also be successful. The 600-MHz band has superior engineering characteristics. And we adopted a band plan, spectrum aggregation rules and a strong interoperability mandate in order to encourage robust participation from small and large carriers. So we should continue to see great demand from large and small carriers for the spectrum offered in the incentive auctions.

It goes without saying that spectrum is one of our most valuable resources. But in order to keep pace with consumer demand, commercial wireless

companies need more of that spectrum. They must also, as you know, build and site antenna towers, base stations and other infrastructure in order to deploy that spectrum. When I toured the Wireless Infrastructure Show exhibit floor, I was amazed by all of the innovative solutions being developed to help commercial carriers make the most efficient use of this valuable resource.

The process of siting infrastructure faces difficult policy challenges, just as the process for finding more spectrum for commercial use did. We can successfully meet those challenges if we continue to collaborate just as we did and as we are in continuing to find spectrum for commercial use. The FCC has adopted a number of rules and has taken a number of other actions to promote important infrastructure policies.

Last October, as you know, we adopted an order to accelerate the approval in siting of wireless broadband infrastructure. Prior to constructing communications towers and other facilities, entities must navigate a complex web of federal, state and local rules that were enacted to protect the historical character of properties and the environment. Too often, this process of attaining these necessary approvals proves to be incredibly expensive and time-consuming.

Moreover, due to technological advances, infrastructure deployment is substantially changing.

Before the October order, the old FCC rules for deploying infrastructure were drafted during a time when antennas were huge and bolted to the top of enormous towers. While that kind of macrocell architecture will continue to exist, the industry is using complementary technologies that are less likely to have an adverse effect on the environment or on historical properties. Distributed antenna networks and other small cell systems use components that are a fraction of the size of macrocell deployments. And they can be installed with little or no effect on utility poles, buildings, and other existing structures.

FCC Commissioner Mignon Clyburn: "The primary reason we can turn the page and adopt a spectrum policy that leads with sharing is because of the tremendous cooperation between staff leaders here and at the U.S. Department of Defense as well as the NTIA."
Photo by Don Bishop

We updated our rules to account for these changes in wireless infrastructure. And we, like you, are bringing about more efficiency to the process of approving wireless facilities.

The old FCC's environment and historic review procedures excluded collocations of antennas from most of the requirements, recognizing the benefits of using existing structures over constructing new ones. In order to facilitate faster deployment of wireless infrastructure, we expanded that categorical exclusion to include equipment associated with antennas such as wires, cables, backup power equipment, utility poles, electric transmission towers that meet certain conditions and collocations within a building.

We also adapted a 60-day period of review before a collocation application can be deemed granted pursuant

to Section 6409(a) of the Middle Class Tax Relief and Job Creation Act. I was able to support this time frame for two key reasons.

First, my colleagues agreed to move the effective day for the rules we adopted from 30 days to 90 days after *Federal Register* publication.

Second, the night before the open meeting to vote on the order, PCIA and CTIA agreed to make a number of commitments that could help resource-constrained municipalities transition to these new streamlined rules. Specifically, the two organizations agreed to make a number of voluntary commitments that could help resource-constrained municipalities transition to the new streamlined rules we adopted. Those commitments included drafting a model ordinance and creating a checklist for local governments to use as they conduct their reviews. I am pleased that last month, PCIA and CTIA were able to release those documents.

In that order, we also announced that the Commission staff will work with the Advisory Council for Historic Preservation and other stakeholders to develop a program alternative that will promote additional efficiencies in the historic preservation review of DAS networks and other small cell deployments. Program alternatives allow federal agencies to tailor the historic preservation review process to the agencies' programs for defined categories of projects.

Among other things, the staff is considering proposals that will allow for deployments on structures other than utility poles and transmission towers without historic preservation review where the deployment meets specified volumetric limits or involves no new ground disturbance or the deployment is neither listed in the National Register of Historic Places nor formally determined eligible for listing by the keeper of the National Register. Staff is hard at work on these proposals.

PCIA's advocacy was also helpful in the adoption of our order on the 3.5-GHz band, which has physical characteristics that make it particularly well suited for mobile broadband employing small cell technology. That order represents a significant moment in spectrum policy because we adopted a number of important paradigm shifts in our approach to make more spectrum for commercial wireless services available.

> *"Commission staff will work with the Advisory Council for Historic Preservation and other stakeholders to develop a program alternative that will promote additional efficiencies in the historic preservation review of DAS networks and other small cell deployments."*

In the past, our primary strategy for finding more spectrum commercial wireless services was through the National Telecommunications and Information Administration identifying bands that could be repurposed from federal use. This model is not a sustainable one because spectrum is finite and finding more bands to repurpose only becomes more difficult. Wireless consumers and forward-looking entrepreneurs deserve a new approach to spectrum management that is as tech-savvy and innovative as they are.

Spectrum sharing is one such approach. Driven by technological advances such as databases and environmental sensing as well as just good old-fashioned willingness to cooperate, spectrum sharing has become more acceptable to both the wireless industry and federal agencies. We are seeing databases that allow TV white-space devices alongside broadcasters and medical body-area networks sharing spectrum with aeronautical telemetry services.

But the primary reason we can turn the page and adopt a spectrum policy that leads with sharing is because of the tremendous cooperation between staff leaders here and at the U.S. Department of Defense as well as the NTIA. Another notable paradigm shift is the move away from highly fragmented long-term exclusive-use licenses to shorter-term priority-access licenses with a rule to use it or share it with general authorized-access users.

These new regulatory approaches will create enough certainty to fuel investment in equipment for the 3.5-GHz band, and the new priority-access license will have lower administrative cost and allow for micro-targeted network deployments. I appreciate PCIA's support for our proposal that priority-access licenses will be available to all entities.

Speaking at the Wireless Infrastructure Show on April 29, FCC Commissioner Mignon Clyburn said: "It may be that we need to rethink the safety provisions in the contracts between wireless companies and service vendors. All regulatory options should be on the table." *Photo by Don Bishop*

I would also like to thank PCIA for its collaboration on tower climber safety. Our wireless networks are expanding at an amazing rate and we are meeting the critical information needs of our nation like never before. Even with these enormous benefits, we must never lose sight of those who build these networks and the dangers that they face. They are often young people. Some may be relatively inexperienced and others may not be represented by unions. So collectively, we have a special responsibility when it comes to their safety. According to some reports, the fatality rate for tower climbers is as high as 10 times the rate of the general construction industry.

I am aware of the toll it has taken, particularly in my home state of South Carolina when in June of 2007, a 30-year-old tower technician fell 140 feet from a tower in Bluffton. And in that same month, a technician fell 170 feet from a tower in Summerville, South Carolina. One tower worker fatality is one too many. Our goal should be that no more families should have to suffer.

To get to zero will require 100 percent of the effort from 100 percent of all of us to build the safety systems we need from wireless companies to service providers to tower companies — 100 percent of the power and 100 percent of the tools to achieve 100 percent safety.

New and innovative tools for identifying and addressing specific risks need to be further developed. It may be that we need a sign-before-you-climb approach that assesses climber-specific and job-specific risks at each jobsite in advance and on the day of the job before any worker even climbs a tower.

It may be that we need to rethink the safety provisions in the contracts between wireless companies and service vendors. All regulatory options should be on the table. Let's continue to have conversations about how these and other initiatives can further our common objectives of building, deploying and continuing to provide the critical infrastructure our nation needs.

Mignon Clyburn is an FCC commissioner. She delivered these remarks to an audience at the Wireless Infrastructure Show in Hollywood, Florida, on April 29.

Enterprise DAS Maintenance: Who's Responsible?

As DAS becomes more pervasive and an integral component of the wireless network, maintenance is key to continuing to deliver expected service levels.

By John Spindler

As with any part of the cellular network, a distributed antenna system (DAS) may need to be maintained or upgraded to keep up with wireless application trends over time. Sometimes the DAS has a problem such as a disconnected antenna (which requires maintenance), and in other instances, new frequency bands become available and user capacity demands change, so the DAS needs to be upgraded. Because a DAS can be owned by the venue covered, a mobile operator or a neutral host operator, the question arises as to who is responsible for maintenance and upgrades. The following information looks at the DAS life cycle, DAS maintenance and DAS upgrades, and examines the various business models under which DAS maintenance and upgrades can be carried out.

Mobile operators, venue owners and neutral host operators each manage DAS deployment in different ways. If the DAS is venue-funded, the company buys the DAS itself and works with a DAS vendor and a mobile

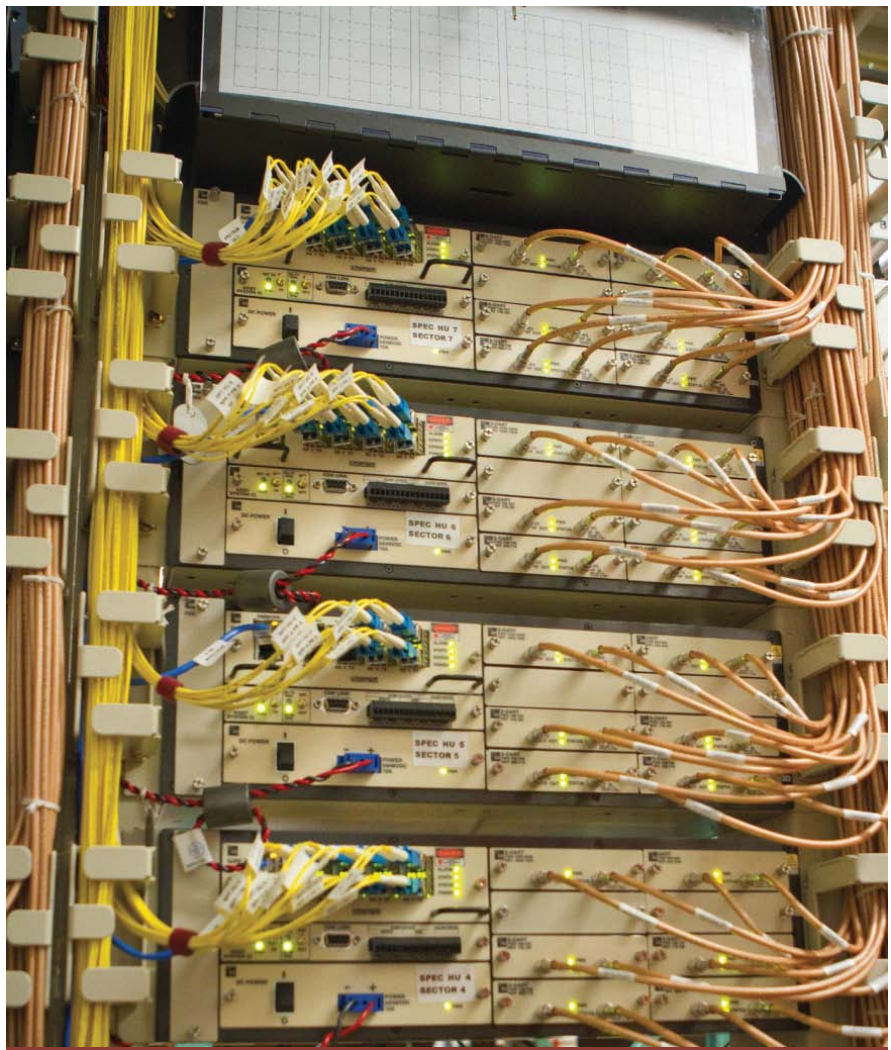


Figure 1: A DAS head-end is where most maintenance takes place.

operator to deploy it. If a mobile operator funds the DAS, that operator works with the venue owner and the DAS vendor to accomplish the deployment. If a neutral host operator funds the DAS, this entity works with the mobile operators, venue owner and DAS vendor to get the system deployed.

Life Cycle

The DAS life cycle consists of planning, deployment, maintenance, and upgrades. Planning and deployment can take anywhere from a few weeks to a year, depending on the size and complexity of the venue. Once the DAS is deployed, the maintenance phase begins, and it continues for the life of the DAS. Typically, the mobile operator or neutral host operator will enter into specific maintenance agreements, whether using its own resources or by hiring the tasks out.

In an operator-funded DAS, the operator uses its own maintenance crews, but resources are scarce because these teams are primarily occupied with maintaining the macro network. Neutral host operators have dedicated maintenance teams tasked with DAS activity, and neutral host-owned DAS may be the best maintained of all. Venue-funded DAS networks are often not maintained. Instead, the company simply responds to reports of problems, either by using in-house technicians or by calling the DAS vendor or reseller. Alternatively, the venue may choose to incorporate DAS monitoring and maintenance into systems already in place for managing the IT network.

Maintenance and Monitoring

Typically, there is not a lot of maintenance necessary in a DAS. Technicians may check on the batteries in the uninterruptable power supply or clean cooling fans in the DAS equipment once a year or so. But in many cases, this maintenance is deferred until technicians respond to a trouble report or need to upgrade the system.

Figure 2: Ceiling-mounted DAS antennas require little maintenance, but they may be inadvertently unplugged during other work in the area.

Anecdotal evidence suggests that a DAS has historically been very much a deploy-and-forget technology. In one facility, the mobile operator hadn't been on the site in seven years, and only visited after seven years because it responded to a trouble call from the venue owner. In many legacy deployments, the only way a venue owner knows there is a problem is if users complain about a lack of service in all or part of the building. The most common issue is that electrical contractors or other crews will inadvertently disconnect an antenna.

However, times are changing and with the increasing importance of DAS in cellular networks the system owners — especially mobile operators and neutral host operators — are more likely to use SNMP-based management and alarming systems to proactively monitor the DAS on a day-to-day basis. This way, the DAS owner may be able to send technicians to fix a problem before users even know the problem exists.

DAS products vary in their ability to provide alarms for the entire system. More advanced DAS systems

have VSWR (voltage standing wave ratio) monitoring built into them. These systems provide monitoring all the way to the passive antenna points. In systems without VSWR, the monitoring only stretches as far as the last amplifier, so the DAS could have nonworking antennas and yet show no alarms because the amplifiers are still functioning properly.

Maintenance Business Models

Mobile operators that own DAS use their own maintenance technicians, but these departments are often fully burdened with maintaining the macro network. Because of this, mobile operators often maintain a DAS only when they need to upgrade it or when a problem is identified by a mobile user in the venue.

Neutral host operators offer a valuable service because they strive to meet the needs of the venue owner and mobile operator. They have the responsibility for maintaining a DAS, and they relieve the operator and the venue from this burden. As a result, neutral host-funded DAS networks are typically better maintained because these operators have special teams dedicated to maintenance, and they have service level agreements with their mobile operator and venue partners.

Venue owners are not accustomed to dealing with DAS — they have typically paid someone else to deploy it and have then ignored it unless something breaks. In the event that there's an antenna disconnect or another problem, venue owners may try to use in-house maintenance personnel, or they may reach out to the DAS vendor or reseller for assistance. In rare instances, venue owners will tie monitoring of the DAS into their existing IT infrastructure monitoring systems.

DAS Upgrades

DAS solutions often need upgrades to accommodate new frequency bands, a shift in configuration such as moving from single-input, single-output SISO communications to multiple-input, multiple-output (MIMO) communications, or because the initial deployment no longer meets the coverage and capacity needs of the venue. As the government opens up new frequency blocks and auctions off those blocks, operators pay billions for spectrum licenses. Naturally, mobile operators want to roll out these new frequency blocks to upgrade services, so this means upgrading DAS infrastructure. Although the core infrastructure of a DAS can typically support any frequency, changes are usually needed to base stations, amplifiers and sometimes antennas. The approach to these upgrades varies depending on the party responsible for the DAS.

Mobile operators may order an upgrade from the DAS vendor themselves. If a neutral host operator is involved, the mobile operator will request an upgrade from them, but the mobile operator will likely pay for the upgrade or add its cost to the ongoing neutral host contract.

With venue-funded DAS, upgrades can be a major issue. Most enterprises think that they only buy a DAS once, but then operators come along with new frequency bands and the venue owner is left with a system that doesn't support all the latest services. Usually, a venue owner won't pay for such upgrades. Instead, they ask that mobile operators or the neutral host operator pay for the upgrades. In the end, mobile operators wind up paying for most DAS upgrades, regardless of who owns the system.

Future Trends

New services, higher data rates and user demand are leading to increasing densification of the mobile network. DAS, along with small cells, is seen as a primary way to deliver more capacity and density. DAS is now being treated as a core part of the network instead of as an appendage. As such, DAS maintenance and upgrade models are evolving from the days of deploying the system and forgetting it to now actively monitoring and maintaining DAS deployments. Neutral host operators and mobile operators are investing heavily in DAS, and there is increased focus on becoming more efficient at maintaining and upgrading them in order to maintain network key performance indicators and extend the DAS life cycle. As enterprises increasingly take on an ownership role with DAS, they too will incorporate the DAS into their standard monitoring infrastructure. And from a vendor perspective, there will be continued focus on making DAS easier to deploy, actively monitor and maintain.

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INSPIRING INNOVATIONS

Macrosites Prevail in Mexico as Small Cells, Fiber Lag

The CEO of Mexico Tower Partners, Jose Sola, sees a future for small cells and fiber to the tower in Mexico, but a tortuous project approval process has carriers favoring macrosites for some time to come.

By Don Bishop

At the Tower & Small Cell Summit in Las Vegas in September 2014, Jose Sola, chief executive officer of Mexico Tower Partners, spoke at a session about new opportunities in the tower business led by Jake McLeod, president of Gray Beards Consulting. Mexico Tower Partners owns and operates about 600 towers in Mexico. In May 2014, Macquarie Mexican Infrastructure Fund and Digital Bridge announced that they merged their tower portfolios to create Mexico Tower Partners, a 50-50 joint venture of the two companies. The business had its beginning in October 2011 when the Macquarie fund and Global Tower Partners acquired 199 towers in Mexico from Telefonica. The towers remained with Macquarie when American Tower bought Global Tower Partners in September 2013. Sola previously was senior vice president for Latin America at Global Tower Partners. Prior to that, he worked at Telefonica.

What follows are Sola's remarks from the session, edited for length and style.

To embrace upcoming business opportunities, tower owners have to make decisions about capital allocation. In Latin America, we tend to put capital to work on macrocells rather than microcells because of the potential demand from the various wireless communications carriers. We like to build towers that can hold at least three to four carriers, expecting that the tower will be leased to at least three carriers.

> *"The new law defines a predominant player as one having more than 50 percent of the market share in a specific service – it can be wireless, fixed or OTB."*

Building towers in Latin America requires obtaining multiple permits and checking the real estate title. To make it worth all this effort, it's better to build a tower that can hold at least three to four carriers. Although we focus on macrocell sites, we may eventually need to consider the financial returns of small cells.

Planning and Zoning

The complicated process for cell site development in Mexico usually requires applying for four permits —aviation, environmental, land use and construction. We usually spend a month checking to see whether there is a clear path for obtaining the permits. After analyzing what a municipality requires, sometimes we decide a site is not feasible, and we drop the search ring from the carrier. Mexico has about 2,500 municipalities, and each has different rules for the use of land and for building

Jose Sola, chief executive officer of Mexico Tower Partners, at the Tower & Small Cell Summit. *Photo by Don Bishop*

permits. This means we have to go case by case, analyze, and make a decision on every single site.

For example, as we were about to start constructing a site, we received a request from a municipality for $30,000. Another municipality nearby did not ask for such a payment. What municipalities request in exchange for permits varies widely.

Chile, Peru and Costa Rica have clear regulations. Colombia, Mexico and many other countries in Central America do not. Site development feasibility requires case by case analysis, which slows construction and frustrates tower owners.

New Business Ideas

A lack of fiber-optic cable routes for backhaul in Mexico and in most of Latin America offers opportunities to deploy fiber to the sites. Deploying fiber is linked with the permit problem, so it has a high execution risk that we don't feel comfortable handling.

Construction is booming in Mexico and most of Latin America with new office buildings and shopping centers spreading across all major cities. They lack wireless communications coverage and capacity, but there is no clear path for landlords, carriers or tower companies to provide in-building wireless service.

Reform

Mexico Tower Partners works independently from the four major carriers in Mexico. We build towers for Telefonica, Telcel, Iusacell and Nextel, and we have master lease agreements with them. Reform approved in Mexico aims at opening the market — so far, it's more devoted to the carrier and service side than to the infrastructure side. The new law defines a predominant player as one having more than 50 percent of the market share in a specific service — it can be wireless, fixed or OTB. A predominant player is subject to certain conditions and limitations in order to provide the service.

The government of Mexico is trying to boost competition. Reform is positive for the market and is expected to be good for infrastructure providers such as Mexico Tower Partners.

The next Tower & Small Cell Summit will be held Sept. 9–11, 2015, at the Sands Convention Center in Las Vegas. The Summit is collocated with Super Mobility Week, a convention owned by CTIA. The Summit is owned by UBM Tech. AGL Media Group provided programming for the 2014 Summit sessions as the conference's content partner.

NetAmerica Alliance Arms Rural Carriers for 4G LTE Success

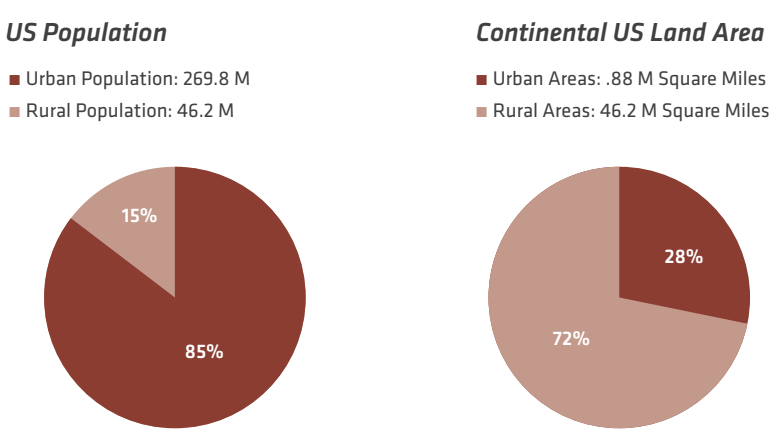
Leveraging the newly formed SMART program (Small Market Alliance for Rural Transformation), NetAmerica and Sprint arm rural telecommunications carriers to compete with the duopoly and deliver a Tier-1 service experience to rural consumers for 4G LTE.

By Chuck Harris

The market served by the NetAmerica Alliance is defined as rural communication service providers, mostly family- or cooperative-owned phone companies serving towns with populations in the range of 2,000 to 20,000 people. An area with which the rural market has always struggled is one defined by a lack of scale caused by the fact that rural America makes up 15 percent of the U.S. population but accounts for 72 percent of the land mass. In rural areas, precious few people reside in a large geographic area. Telecom infrastructure is capital- and operationally intensive and therefore, historically, it has been an uneconomical market for communications services. Thus, the rural market has been bolstered by government support programs mostly tied to the wireline business. But those programs are changing or going away. Moreover, the public switched telephone network is sunsetting, and the rural business model is changing.

Our market research showed that rural consumers had the same demand for broadband and mobile broadband services as their metropolitan-domiciled counterparts. They also had the same expectation that their local service provider needed to deliver them a Tier-1 service experience, and their preference was to do business with their local provider. Thus, we knew that rural communications carriers would have to make a bold move into 4G LTE mobile broadband if they were to serve their communities with next-generation services, and we wanted to establish a model to help them remain independent but

Rural Population Relative to Service Area - Scale Issue



Source: US Census, 2012

BUSINESS

NetAmerica Alliance - Formed to Provide Scale

Our Market

Mid to Small Tier Rural Service Providers

- Cooperatives, town-or family-owned rural communication service providers
- Focused on community, family & service to others
- Lack of scale due to size, population & geography
- 4G LTE and broadband is as strategic to them as it is to a tier-1 carrier

Our Mission

To revitalize rural America by empowering the delivery of lifestyle- and livelihood-enhancing 4G Solutions through an alliance of indepentant carriers

Our Members

Our members are rural carriers

They own, build, operate local networks

Join NetAmerica

NETAmerica alliance

Scale

- 4G LTE Core
- Services
- Programs
- Capabilities

also gain the benefits of scale while mitigating technical and business risks as they transitioned their networks to 4G LTE. That's why we formed NetAmerica Alliance.

The idea behind NetAmerica Alliance is simple. Independent carriers build, own and operate their own local networks. They own the radio access network. They own the customer. When they join the NetAmerica Alliance, we provide the heavy lifting, big scale-oriented infrastructure, programs and services that they need to gain scale. For example, we host a 4G LTE network core, we have marketing programs to help them drive revenue, and we have program management to make sure their networks are built on time and on budget. We have resource partners and a services development team that works with rural carriers to bring new services onto their networks.

We have made those investments on behalf of our alliance members so that they don't individually have to replicate them, which would be costly and inefficient. We launched this federated, alliance business model in 2010 and deployed a pilot network in 2011, and our members deployed commercial service in 2012. By the end of 2013, we were operating in 11 markets in six states, mostly with fixed 4G. But we knew this was not enough. We knew that we had to solve the mobile broadband problem for rural carriers.

In rural areas, the mobile broadband problem is that the duopoly of Verizon and AT&T deployed either different technologies in their networks or deployed spectrum that was in a different band class than that which the rural carriers operate in. This meant that the rural carriers were not part of the ecosystem for handheld devices and did not have a network capable of national reach. Therefore, they were islands of fixed 4G LTE service. To solve the problem, we developed a program called the Small Market Alliance for Rural Transformation (SMART) and approached Sprint about leveraging their Tier-1 ecosystem to enable rural carriers to compete with the duopoly.

The SMART program delivers to rural carriers the things they need to compete in the 4G LTE market. It brings spectrum, devices and infrastructure at strategic pricing comparable to Sprint cost, and Sprint's national footprint allows them to deliver a Tier-1 service experience

out of a shared SMART cloud core consisting of portions of Sprint's and NetAmerica's network infrastructure. Using this as the foundation, NetAmerica members are able to be part of a Tier-1 ecosystem and can significantly wring opex and capex out of their 4G business models compared with going it alone.

We are focused on providing the tools our members need to maintain control of their own networks and of the customer experience because although they may share certain parts of the network, we knew they would demand and would be sensitive to maintaining control. We therefore drove our alliance mindset all the way into our governance model. Our board of managers is made up of our members, and we report to them. We have technical and marketing committees whereby our members have direct input to the road map for ongoing service development and through which they share best practices for their individual and collective success. Strength in numbers and scale through the alliance without giving up independence is a hallmark of what we do.

Planning and Zoning

When it comes time for rural carriers to build towers and put up their networks, they have great relationships with their communities and zoning boards. Under the alliance model, we leave it to them to build the infrastructure, but we have a resource partner program that consists of tower companies, radio-frequency design firms, drive testing and optimization firms to help them meet the timing and quality standards they need to be successful. There are about 30 partners in the program. When a rural carrier decides to build a 4G LTE network under the SMART program, we can refer it to our resource partners, which helps ease it through the process of designing, building, and bringing its service online.

Research Results

What ultimately drove us to form the alliance was encapsulated in a nationwide research study we executed with rural consumers to understand what was truly important to them and what they expected from their rural provider. We commissioned a primary market research study that reached out to 1,000 people via phone survey covering 16 states, and we combined this with face-to-face interviews and focus groups whereby we parachuted into multiple rural towns and had sit-down discussions in coffee shops, small town gatherings, schools, barns, businesses and libraries. Our mission was to discover what was important to rural consumers, what their views were on mobile broadband and how they felt about their local communications provider.

The results were that 76 percent of the people believed their communities absolutely needed broadband connectivity and that it adds to their quality of life. Among the people in the study, 64 percent said they believed broadband connectivity enables them to live in a rural community where they prefer to live. Eighty-seven percent said they believe broadband connectivity is vital to the economies of their towns and communities. Ninety-two percent — and this is the key number — 92 percent of the people surveyed said they prefer to buy from their local rural provider. Eighty-nine percent said they felt compelled to do so because they viewed their community as an extension of their family and they felt obligated to support local business.

Nevertheless, the support for the local rural provider is qualified. The people surveyed said they needed coverage and capacity, and if they can't obtain a Tier-1 service experience from the local provider, they would switch to a carrier in the duopoly that could give them that experience. They drew the line in saying, "You need to treat me fairly; I need to have devices, and I need to get a Tier-1 service experience, but I prefer to buy that from you."

Rural consumers deserve and demand a Tier-1 service experience, and rural carriers must have the capabilities, technology and assets to deliver it, and that forms the foundation of why we delivered the SMART program to the rural market.

Chuck Harris is executive vice president and chief development officer at NetAmerica Alliance. His email address is chuck.harris@netamericaalliance.com. *This article is based on remarks he made at the Tower & Small Cell Summit in September 2014 in Las Vegas in a session about competing with the duopoly in rural markets. The session was led by Jake MacLeod, president of Gray Beards Consulting. The Summit is owned by UBM, and it is collocated with Super Mobility Week, owned by CTIA. The next Summit is Sept. 9–11, 2015, at the Sands Convention Center in Las Vegas. AGL Media Group provided programming for the 2014 Summit sessions as the conference's content partner.*

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Photo: Dustin Wright/Seminole (Texas) Sentinel

How to Use Risk Management More Effectively in Tower Companies

Reliance on a highly trained and disciplined staff using a high-quality business process can ensure the desired high levels of compliance and mitigate a great deal of risk.

By George Wagner and Fred Kleber

Think high-risk accidents can't happen to you? Think again. A 300-foot self-supporting tower collapses in a derecho (straight-line) wind and slices a church building in two. A private aircraft flying too low rips a guy wire off a tower and crashes, and several people perish. A contractor ignores directions and tries to maneuver his crane under a live power line, and one worker has his foot blown off by the surge. Another loses half of his posterior when he was leaning against the crane, which came in contact with high voltage.

You probably are familiar with the risks associated with working around towers. OHSA, carriers, tower companies and tower services vendors are keenly aware of them. Although tower accidents are generally high profile, sufficient risk coverage gaps can also exist among other businesses such as Mike's Taxi Dispatch, Mac's Site Builders, Joe the AC repairman and Bob's Widgets. True risk management means covering all the bases with a comprehensive plan, not only on paper, but also verified in practice. Tower companies and carriers are ripe targets for litigation. Having your risk-management house in order can drastically reduce losses should a claim arise.

When accidents happen, regardless of who is at fault, litigants go after deep pockets. Take the airplane incident, for example. The most likely lawsuit targets would include the tower manufacturer, the contractor who last adjusted the guy wires, the contractor who painted the tower, the lighting company, the monitoring company, the lighting maintenance company, the ground owner and, lastly, the tower owner. It is in these situations that the risk manager and his chain of command will breathe a sigh of relief knowing that proper coverage is in place

and compliance has been verified.

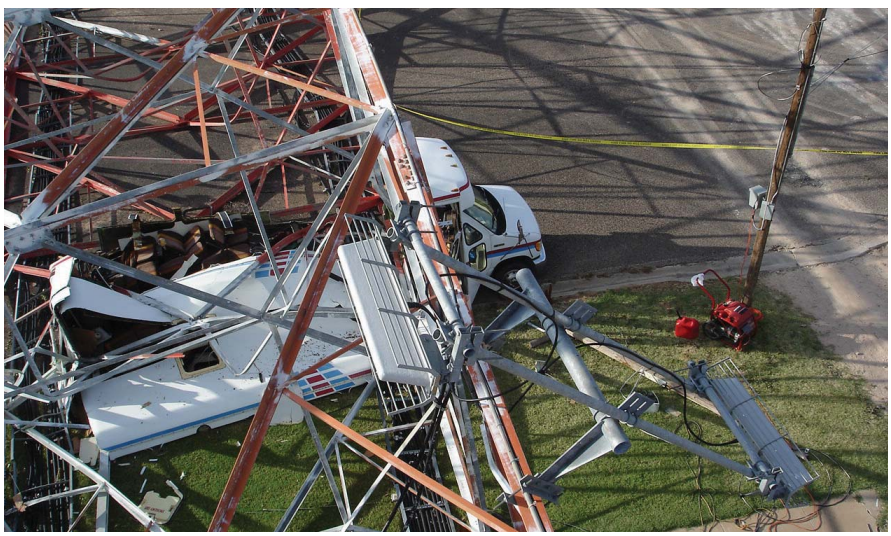
For tower companies specifically, the following information deals with the risks associated with their wireless carriers (tenants), general construction contractors, equipment vendors and various types of service providers, and how to mitigate those risks with proven business practices. The information is also relevant to many other types of industries, such as manufacturing, transportation and energy, because the principles apply broadly across any industry that has contractual relationships with outside parties. In most organizations, acknowledgment of risk is openly discussed; however, tangible mitigation activities are often lacking.

Risk is everywhere in business. There is market risk, investment risk, currency risk, people risk, process risk, technology risk and supply chain risk. The list goes on. Who worries most about the myriad types of risk? The C-level executive — the CEO, CFO, the general counsel and the risk manager; that is, if the organization

Business Review

These are some key elements of a full review of business processes that lead to satisfactory risk management.

- Identify the key stakeholders in the organization with a C-level executive as sponsor.
  - Form an intra-organizational team and launch the project.
- Conduct a comprehensive review of all lease agreements and contracts.
  - Determine if there is a need to reduce the number of agreement forms in use.
  - Are there legacy agreements or those acquired through acquisitions that need to be integrated, revised or even eliminated?
  - Ensure all future master lease agreements incorporate acceptable risk-management terms.
  - Review all T&Cs for insurance, permits, licensed, safety, etc. for being current and comprehensive.
  - Engage an insurance consultant to review insurance T&Cs if necessary.
- Review all tenant, contractor and vendor files.
  - Determine that all agreements are in place and have not expired.
  - Determine if there is any opportunity to eliminate non-performing or no-longer-needed service providers.
  - Review the staff, processes and technology being used to manage the paper: certificates of insurance, insurance policy endorsements, permits, licenses, safety EMR documents, W9s, etc.
  - Conduct a thorough assessment of all job functions and revise as needed.
  - Determine how staff is being trained, and conduct an effective training program.
  - Determine what technology is being used, and what improvements are needed.
- Evaluate internal solutions vs. outsourcing to a third-party firm specializing in risk mitigation.
  - Evaluate the cost of engaging a third-party outsourcing solution vs. these potential benefits:
    - Higher enterprise valuation due to orderly management of risk
    - Potential underwriter discounts and reduced retentions
    - Reductions in claims paid and related expenses
    - Reductions in staff and other costs such as salaries, benefits, training, IT
- Present a final report to the C-level sponsor.
  - Document and quantify major areas of risk to the firm.
  - Recommend solutions and their costs and benefits.
  - Implement the preferred solution.



On June 26, 2007, a high wind felled a 300-foot tower in Seminole, Texas. It damaged the roof of the Agape Church and crushed the church's bus. *Photos by Ron Robinson*

has such a position. For the C-level executive burdened by these many forms of risk, there is comfort in believing that there are well-written, comprehensive contracts and leases in place that protect the organization from failures among the many lessees, contractors, vendors and suppliers that the business depends upon for its success. Believing that the house is in order is fine until an unfortunate accident happens and it catapults risk management into the spotlight. After all, risk management doesn't add to the bottom line, but one mistake can incur significant loss. That same C-level executive doesn't want to be answering to his board of directors about how liability could have been avoided.

Certainly, the contracts and leases, or master lease agreements, are the firm's first line of defense. But it goes beyond having the contracts and lease agreements in place. Are all contractors, vendors, tenants and suppliers under contract? Are all of these agreements active and truly in place, or are some expired or otherwise lying fallow? Are any third-party suppliers or vendors working on a handshake or brother-in-law basis? Additionally, are all of the terms and conditions (T&Cs) of the agreements current and up-to-date? For example, are the insurance T&Cs in conformance with current insurance industry practices, or is there a need for a review by a trusted and knowledgable insurance consultant? What about the T&Cs for permits, licenses, safety or other regulatory requirements? Are the

requirements for these properly represented by the agreements?

Assuming that all of the agreements contain up-to-date and comprehensive T&Cs and are in place with all outside parties, the C-level executive must rely on his organization to have people and processes reviewing and monitoring all documentation needed to ensure that everyone is fully compliant. For the average-size firm, this documentation — certificates of insurance, insurance endorsements, permits, licenses, W9s and safety experience modifier rating reports — is quite voluminous. Much of it expires annually. To perform this job properly, staff must be well trained and must use efficient processes to produce cost-effective, high-quality outcomes that result from outside parties complying with their contractual obligations. An audit of this process should reveal that no less than 90 percent of all tenants, contractors, vendors and suppliers are fully compliant. Significantly lower compliance levels will indicate trouble. Ask any C-level executive his opinion of his organization's compliance level, and he may indicate that it is high, but an audit may prove otherwise.

Unless you're in the insurance business, risk management isn't one of your company's core business competencies. Instead, it is a necessary evil that comes with the territory and is just part of doing business. Given the evolutionary speed of the wireless industry (yes, even in these times), risk management frequently takes a back seat to core functions of most wireless industries.

Historically, the responsibility for managing the documents required from vendors, contractors, and tenants has been handled by the CFO or risk-management organizations. Unfortunately, experience has shown that not a great deal of attention has been given to training staff on how to interpret the documents, especially complicated certificates of insurance and policy endorsements, and how

to validate permits and licenses. In addition, many times efficient processes have not been put in place to help the staff; instead, because IT is too busy, staff members have created spreadsheets and file folders to assist in managing the never-ending inflow of paper. A guaranteed, eventual result will be tenants, contractors, vendors and suppliers being out of compliance. This lack of compliance has serious consequences for the risk equation when the noncompliant outside party causes an accident or loss that results in costly litigation landing on the general counsel's desk.

Now that this unattractive picture has been painted, what should you do about it? First, a complete review of the business process is called for. Many approaches are available for conducting such a review. Here are some of the key ingredients.

Identify the key stakeholders in the organization with a C-level executive as sponsor, form an intra-organizational team and launch the project.

Conduct a comprehensive review of all lease agreements and contracts. The review will determine where there is a need to reduce the number of agreement forms in use. It's possible that legacy agreements or those acquired through acquisitions will need to be integrated, revised or eliminated.

Ensure that all future master lease agreements incorporate acceptable risk-management terms. Review all T&Cs to ensure that insurance, permits, licenses and safety policies are current and comprehensive. If necessary, engage an insurance consultant to review insurance T&Cs.

Review all tenant, contractor and vendor files and determine whether all necessary agreements are in place and that none of them has expired. Determine whether an opportunity exists to eliminate nonperforming service providers or those that no longer are needed.

Review the staff, processes and technology being used to manage the paper, such as certificates of insurance, insurance policy endorsements, permits, licenses, safety EMR

documents and W9s. Conduct a thorough assessment of all job functions and revise as needed. Determine how staff members are being trained, and conduct an effective training program. Determine what technology is being used, and what improvements are needed.

Evaluate internal solutions versus outsourcing to a third-party firm that specializes in risk mitigation. Evaluate the cost of using a third-party outsourcing solution versus the potential benefits. Some potential benefits include achieving a higher enterprise valuation because of the orderly management of risk, possible underwriter discounts and reduced retentions, reductions in claims paid and related expenses, and reductions in staff and other costs such as salaries, benefits, training and IT.

Present the final report to the C-level sponsor who documents and quantifies major areas of risk to the firm and recommends solutions along with their costs and benefits. And then, implement the preferred solution.

Every business has many elements of risk, but one type of risk that can be mitigated with careful attention to detail is the risk associated with outside parties working under contractual agreements. Simply having a third-party sign an agreement is not enough. There must be constant vigilance ("Trust, but verify," as President Ronald Reagan put it) to make sure that all of the terms and conditions of each agreement are being complied with. Reliance on a highly trained and disciplined staff using a high-quality business process can ensure the desired high levels of compliance and mitigate a great deal of risk that may be lurking in the organization.

George Wagner consults for Business Credentialing Services as a project director. His email address is gwagner@bcsops.com. *Fred Kleber is president of Wireless Advisors, a consultancy. His email address is* kleberf@bellsouth.net.

SITE NAME
OCHOPEE

HEIGHT
221 FEET

TOWER TYPE
GUYED

CELLULAR CARRIERS
VERIZON WIRELESS
AT&T MOBILITY

OWNERS
EMBARQ FLORIDA
(CENTURYLINK)

YEAR CONSTRUCTED
2001

LOCATION
BIG CYPRESS
NATIONAL PRESERVE
OCHOPEE, FLORIDA

Photography by Don Bishop

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YEAR OF THE CLIMBER

By Don Bishop

Speaking at the NATE Unite convention in February, Beau Aero, president of GME Supply, talked about tower worker safety as he introduced two speakers at an educational session. GME Supply specializes in tower climbing gear, safety equipment and professional tools.

"Why do we take safety so seriously?" Aero asked. "We go to work each day so we can go back home and enjoy our families and pursue our dreams. No one should be injured while on the job. The good news is that it doesn't require any additional expensive equipment – although as a distributor, I wouldn't mind. It requires personal effort to combat complacency. Complacency kills. Why do we have safety plans? Because accidents happen when we least expect them to. So having a well-thought-out safety plan that we practice, that we put in place every day and that we review ensures that we get home safe and that our people, whom we work with, our teammates, get home safe as well. Make your safety programs come alive and be meaningful in your workplaces. Accidents happen when we least expect them. That's the time we need to be prepared for."

Tower Workers Should Organize to Obtain Safer Working Conditions

Tower workers fear punishment and blacklisting for speaking up about health hazards. Organizing helped iron workers reduce job-related fatalities, and it would help tower workers, too.

By Wally Reardon

The Workers at Heights Safety and Health Initiative was the first of its kind. From its inception, the organization has focused entirely on the best interests of climbers.

Between 1984 and 1993, there were 69 fatalities among tower workers. In 1994, OSHA promulgated 100 percent tie-off. The fatality rate doubled. Why? The fall protection available at the time 100 percent tie-off was implemented wasn't specifically designed to meet tower climbers' needs.

I was a climber at the time, and I was determined to keep using my tree belt. No one was going to make me wear a full body harness, but I later changed my mind. In 1996, my best friend, Jeff Hartman, fell 100 feet and survived. He died a few years later from a brain tumor. Remembering him is what drives me today.

I have interviewed dozens of companies that employ tower workers. Each one has a safety policy in a thick booklet that they give to every employee; and every employee is responsible for understanding it. Unfortunately, many employees are overwhelmed by the booklet, so they throw it into the back seat and forget about it. That's unfortunate. But the company also bears some responsibility if it doesn't follow through with safety training for employees.

> *"Neither the National Association of Tower Erectors, nor the carriers nor the industry as a whole have brought climbers together to talk openly and honestly about safety problems they see every day."*

Although many companies do not properly vet employees, my focus is on the climbers, and I don't spend much time blaming climbers. Many organizations already do that. Workers at Heights was started because many professional climbers are concerned about safety, and they see safety shortcuts being made daily.

Not only is 100 percent tie-off often ignored, proper employee training is severely neglected. Many employers provide little to no training for new hires. Minimal training is done in the name of certification, and is used legally as a substitute for experience.

Many accidents involve fly-by-night crews (some with well-established companies) that performed poor installations. Some of these incidents have shown up in OSHA reports in fatality and injury

cases. Much of the blame is placed on the new hires who lack experience and who have no experienced climbers to properly train them. Are the climbers that bad? Or are other institutional problems creating or exacerbating the problem?

The workers' point of view must be heard. Neither the National Association of Tower Erectors, nor the carriers nor the industry as a whole have brought climbers together to talk openly and honestly about safety problems they see every day. Climbers should be able to talk about safety problems without fear of retribution. Climbers lack control over their safety at the jobsite. If a climber attempts to exercise control by bringing a hazard or unsafe practice to the employer's attention, many times the employer will say, "Well, we'll find somebody else to do it. Apparently, you don't want to work for us."

I have been flooded with calls this year from climbers who have been wrongfully fired for raising concerns, such as asking why they had not yet been paid after weeks of work. When they did that, the company owner would pigeonhole them and talk to coworkers, who also weren't getting paid, saying, "We'll pay you guys, but unfortunately, we're going to let this other guy go. He's a troublemaker." The one who speaks up becomes the bad guy for taking a stand. This is what climbers face, and it has to change.

Free Climbing

There is far too much free climbing going on in this industry. Companies don't want to talk about it. Climbers don't want to talk about it because they're probably like me, and they enjoy doing it. They like the thrill of the job. It's what attracts people like us to this industry. According to my analysis, 74 percent of the fatalities in this industry were related to free climbing.

Free climbing is any climbing done while not connected with the structure. This includes workers who are riding the winch line, riding loads up a tower, riding a capstan on a rope or riding a rope being pulled up a tower by a truck. I consider these workers to be free climbing because they are not protected from a fall of 6 feet or more as OSHA requires. In essence, they are not following a 100 percent tie-off policy.

> *"Like it or not, the OSHA Act of 1970 was created to protect the safety and lives of workers from employers who put them into harm's way. OSHA is there to protect workers."*

Free climbing is a problem in this industry because contractors think it's the most convenient way to get the jobs done more quickly. Crews that do follow 100 percent tie-off daily make sure they are properly equipped and run safety lines up the tower as a standard practice. They are not slowed by 100 percent tie-off; however, they are in a minority. The majority of crews don't practice 100 percent tie-off, and so they struggle when forced to comply.

When I spoke with tower climber trainer Wilton Wilcox about this in 2008, he said he had a difficult time imagining that free climbing took place anymore. He blamed it on older guys like me who had a cowboy attitude. But what I was seeing in the field was completely the opposite. I climbed towers from 1992 until an injury stopped me in 2002. I've monitored the industry ever since. I've seen dozens of crews in the field sent by companies large and small. But I've only seen two companies that were following 100 percent tie-off.

Standards

The industry lacks standardization for tower climber training. For years, membership organizations such as NATE, companies that employ tower climbers and the tower climbers themselves have been saying that the industry must correct itself. I disagree. We need government involvement to scare companies into compliance. I know that idea is not popular, but OSHA needs to be properly funded so it can send compliance officers into the field to monitor for free-climbing and other safety violations. Companies used to be scared of OSHA coming to a jobsite. But since ProPublica published an article describing OSHA's shortcomings, some employers have become emboldened, and they don't seem to worry about OSHA enforcement. That must change. Like it or not, the OSHA Act of 1970 was

created to protect the safety and lives of workers from employers who put them into harm's way. OSHA is there to protect workers.

Engineering

With some tower builds, the structural engineering is inadequate. Other towers are overloaded and therefore unsafe to climb. Some have improperly installed appurtenances that pose a risk when a load, even sometimes a slight load, is placed on them. This is a matter I've tried to raise with OSHA, but OSHA cannot go to a jobsite to investigate if no workers are there. OSHA goes to investigate whether workers are properly protected by employers while they are on site. So there is no oversight group with the power to red-tag a site for structural problems. The next crew may not even see the flaw, and someone could be hurt. Many climbers are making it known that they're having problems with the condition of towers in the field. I have heard many stories of tower legs rusted and corroded completely through the leg, poorly installed hardware, broken welds, and poorly installed and maintained safety climbs.

When I researched OSHA investigation reports, I found that 17 percent of the fatalities among tower workers were directly related to structural failures and tower collapses.

Workers' Rights

When I was climbing, we were paid travel time to and from the jobsite every time. If the employer didn't do that, he wouldn't be able to keep a workforce. There's an incredible demand on the industry right now, so travel time is not quite such a premium anymore. Many climbers are not paid until they reach the jobsite and start working.

This practice increases the danger considerably on the jobsite. You may have workers driving cross-country all day and all night for a couple of days. They fully understand that when they roll onto the jobsite, their work week is just beginning. This results in workers using headlamps and shop lights, working at night to compensate for the time lost in travel and not taking time to properly rest.

Extended travel puts stress on workers' families. When I was

actively climbing, my former employers put an extra effort into keeping us close to home. When they didn't have enough work to keep us close enough to home to come home every day, we were home almost every weekend. My family understood that occasionally I would not be home for a couple of weeks out of the year, especially when we were sent out of state to work. That was uncommon for us 15 to 20 years ago. But now, many climbers are away from home for weeks at a time. Climbers have to pay premiums to get last-minute plane tickets home for a week of rest. Some companies pay for the trip home; other climbers have to pay out of pocket.

What goes on at home affects what happens in the field. You take problems at home to the jobsite with you; it's not an easy thing to ignore. It's a helpless feeling when a wife or child is having a crisis and you are a day or more drive away from home. I had an experience with a climber who threatened suicide while on a tower site with me. It was one of the most terrifying experiences I ever had.

Another time, I sat in a crowded restaurant and a coworker started screaming at his wife on the phone because they were arguing. These kinds of things go on a lot, and they put immense pressure on climbers. It's what leads to the problems with alcohol and drugs. Extended time away from home perpetuates the problem. It makes treatment extremely difficult.

Reporting Injuries

Fatalities receive more documentation and reporting than injuries. With many injuries, the name of the employee is withheld under the premise that it protects the worker's right to privacy, but it also provides excellent cover for employers. When a climber falls from a tower, finding the name of the company involved can be challenging. If there is no news story about an incident and the climber survives, data about the injury is difficult to find. To its credit, in the past, NATE has worked on initiatives to try to gather this information from its members. I don't know how that has turned out.

In 2015, OSHA is requiring employers to report injuries that require hospitalization. But this leaves out injured workers who aren't hospitalized. Many climbers are walking wounded. They may be injured and refuse treatment. They stay in the field and keep working. Tower injuries go vastly underreported. Some injuries do not heal and become more problematic. Many climbers obtain medical treatment under their own insurance at the instruction of employers. Some forfeit workers' compensation without fully understanding they should file a compensation claim for a work-related injury. Almost any climber who has climbed for a few years can testify to having these types of experiences.

The industry has not closely tracked fatalities other than those resulting from falls, not to mention the number of climbers and workers on the ground who are injured while loading and unloading trucks or injured during manufacturing. That's a story waiting to be told. The fatalities are the tip of the iceberg in this industry when it comes to getting to the bottom of the real dangers that tower work poses. Falling from a tower is not the only way to be hurt or killed.

Deadline Pressure

I was a foreman for many years when I was climbing. I would receive calls from project managers from wireless carriers, turf vendors or the larger contractors we were working for. I don't remember ever having calls with any of them that didn't end with the question, "You're going to be done today, right?" They weren't going to accept any answer other than yes.

It doesn't matter whether I was expecting the job to be completed that day or not. It could take a week or a week and a half. But every day, I would have a talk with construction managers who would ask, "Wally, come on, you're going to get this done today, right?" This puts immense pressure on the foreman to get the climbers to perform. Once again, this is where my opinion differs from that of many others in the industry. The interests of the tower workers are not the same as the interests of their employers because the workers are so deeply affected by practices such as these. Climbers are taking the risk with their own lives.

The industry is vehemently anti-union, but I'm a little bit more open-minded. In 1994, the same year the tower industry's fatality rate doubled, the Iron Workers Union's fatality rate decreased. It didn't go down by much at first — from 53 during the period from 1984 to 1993 to 47 during the period from 1994 to 2003. Then, during the period from 2004 to 2012,

the rate plummeted to 14. The iron workers became a success story because of 100 percent tie-off. Why did that happen? Because rank-and-file workers were involved in the process through unions. Now, experience is earned through on-the-job training with master tradesmen. Time to learn and specialized training are provided to workers as an incentive to learn more. Iron workers own their role and can take pride in their trade. It's a process that takes years. It can't be accomplished with a video shown in the shop to new hires who then are sent out the door to stack steel or hang antennas.

I strongly support organizing workers in this industry. It's the only way we're going to get a group together that can talk about these issues without being punished for it and without fear of being blacklisted. I have talked with many climbers who are fired, not paid, and then harassed by employers for doing exactly what the industry expects them to do — pointing out a hazardous situation and asking to have it abated.

Employers have been known to discipline a climber by putting him on administrative leave while investigating a safety complaint. Other climbers come to the site to continue work while the disciplined climber is sequestered in his motel room and not allowed to speak with his coworkers.

In one instance, when his climbers asked when they would be paid for the prior week's work, an employer called the police and reported his truck stolen.

Climbers often don't have a voice. The carriers and the turfers don't want to be involved in safety complaints. Paying attention to worker safety might cost them money

because it could take more time to complete the job. Carriers might be on the receiving end of citations from OSHA, especially if they are directing the work on a site. I don't believe carriers are enthusiastic about getting involved, but aren't the carriers already dictating the pace of the work by setting the deadlines?

Actions for the Future

All deaths in this industry have been preventable. If the industry cares about the climbers and their families, it should try to determine the specific cause of every fatality and share exactly what happened. But that's not how big business operates. Big business is focused on profits, and the push to get the job done as cheaply as possible makes them money.

Furthermore, a dead climber is a cheap climber. When there's a death or an injury, the bills are catastrophic and families are left to rely on public services to survive. This cost is transferred to taxpayers. Injured climbers end up in the workers' compensation system, having to prove that they're disabled is an injustice on a scale that I can't even imagine.

Climbers have to realize that remaining silent about these issues will not make this industry safer. If this industry is ever going to be safer, climbers need to work together to make sure they receive fair treatment and respect for the effort and sacrifices they make. Climbers deserve the opportunity to work as safely as possible with reasonable timelines and to ensure that new climbers learn to work safely without the senseless risks climbers face today.

Wally Reardon is project coordinator for the Workers at Heights Safety and Health Initiative conducted in partnership with the Occupational Health Clinical Centers of Upstate Medical University, Syracuse, New York. On Oct. 1, 2014, in Albany, New York, he received a safety and health award for empowering workers, building coalitions and standing up for safer workplaces from the National Council for Occupational Safety and Health during an NCOSH conference, along with four other health and safety activists.

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OSHA ASKS, NATE ANSWERS, IN TOWER SAFETY INQUIRY

OSHA continues to focus on tower worker safety with an inquiry that could lead to a fresh round of regulation, enforcement or both.

By the *AGL Magazine* staff

Earlier this year, the Occupational Safety and Health Administration issued a request for information (RFI) about communications tower safety. The National Association of Tower Erectors (NATE) is among respondents, and the following information includes OSHA's questions and NATE's answers.

NATE's executive director, Todd Schlekeway, told OSHA that NATE's membership is comprised of more than 800 companies including tower construction firms, general contractors, tower owners, vertical realtors, wireless carriers, engineering firms, manufacturers, distributors, public safety entities and training companies.

"NATE strongly supports programs to enhance climber safety and has partnered with OSHA and other agencies on a variety of initiatives," Schlekeway said. "NATE's safety resources and best practice manuals, coupled with the industry's recent efforts to actively collaborate with workers, companies, organizations and agencies, are helping to achieve long-term, sustainable safety and quality improvements."

Schlekeway said the collaboration also resulted in the industry coming together to establish the National Wireless Safety Alliance (NWSA), the assessment and certification organization that is being developed to provide thorough, independent assessments of knowledge and skills and provide verifiable worker certification in order to enhance safety, reduce workplace risk, improve quality, encourage training, and recognize the skilled professionals who work on towers and other nonstandard structures.

Questions for Tower Climbers

OSHA: As a tower climber, what are the most significant hazards that you encounter on the job? What circumstances or conditions create or contribute to these hazards?

NATE: NATE member companies and their employees stressed anchorage points as the most significant hazard climbers encounter on the job. They added that incorrect installation of equipment such as safety climbs, or no safety climb, also present problems. Additionally, they expressed concern over antenna mounts or other obstructions that could put the climber in undesirable situations. Other hazards referenced include guy anchor corrosion; loose bolts or materials on the tower, along with substandard mounting equipment; and dropped tools or materials.

OSHA: What steps do you take, at this time, to complete your work safely? What safety-related work practices do you think should be in place?

NATE: NATE respondents cited tailgate safety meetings, which incorporate hazard awareness and assessment, and discussions of work plans and site-specific rescue plans, along with regular, detailed equipment inspection and proper

training by competent trainers, as essential safety steps.

Comprehensive training is needed for the safety and technical aspects of the intended work. Although safety is the most important element of working at height, training to a level of understanding of the technical aspects is also important for overall project safety. Requiring 100 percent tie-off 24/7 has become a primary, enduring theme of many safety programs.

NATE offers the industry substantial best practice resources that assist workers in conducting their work safely. NATE's Accident Prevention, Safety and Health Program Guide, our Tower Site Hazard Recognition Guide and our Equipment Basics Checklist are prime examples of a few of the resources available.

OSHA: What safety rules and work practices are provided to you, and who provides you with that information?

NATE: Employers provide company safety rules, personal protective equipment (PPE) and training required for the type of work performed. NATE member companies and employees are required to follow OSHA regulations, industry standards and NATE best practices guidelines. Safety rules and work practices as well as appropriate education and training are provided by companies' respective safety training directors and implemented daily by company foremen at the tower site. Companies utilize the 4th Edition NATE Tower Climber Fall Protection Training Standard (CTS) guidelines for fall protection and rescue for safety training. The ANSI fall protection code provides the basis for the 4th Edition NATE CTS, from which safety directors are trained. Other relevant information is available through OSHA Best Practices for Fall Protection, and the TIA standard (particularly TIA-1019-A), and employees also receive training in RF awareness, first aid/CPR/AED, rigging, gin pole, hoist, crane signaling, and OSHA 10 Hour/30 Hour. Additionally, the NATE EXCHANGE website portal is a convenient platform for tower construction and maintenance companies and individual tower technicians to gain access to the most pertinent and up-to-date training courses in the tower industry.

> *"Although safety is the most important element of working at height, training to a level of understanding of the technical aspects is also important for overall project safety."*

OSHA: Who assigns and oversees your work? Who provides your training and checks your equipment? When at a jobsite, to whom would you report a potential safety issue?

NATE: Project managers assign work and crew supervisors and foremen oversee on-site work activities and are responsible for carrying out company safety policies. Training is provided by company personnel, and third- party vendors, on-site, online, and at the company itself. In general, company training officers are responsible for purchasing all personal protection equipment and fall protection items. The trained Competent Climber inspects the equipment before each use. Safety issues and concerns are reported to the crew supervisor or safety director.

OSHA: What specific steps do you think employers can take to make tower work safer?

NATE: NATE member companies emphasized the overriding importance of proper training, capable supervision and crew oversight, greater understanding and mandating of the TIA-1019-A standard for structural towers and ensuring that the equipment purchased is ANSI-approved. It is our recommendation that employers utilize the guidelines outlined in the 4th Edition NATE CTS and the NATE Accident Prevention, Safety and Health Program Guide to help facilitate a safer working environment for their employees. In addition, member companies suggested a strict no tolerance drug and alcohol program, including mandatory pre-employment testing and continued random testing.

Moreover, we strongly advocate that all employers continue to participate in industry programs that seek to properly define and enhance worker safety issues, including participating in the National Wireless Safety Alliance (NWSA) assessment

and certification organization that is under development.

OSHA: How, and to what extent, does the design or configuration of towers, and equipment installed on towers, affect your ability to complete your work safely?

NATE: There is sufficient safety equipment for all three types of towers currently in use (guyed, self-supporting and monopole). The design or configuration of towers, and equipment installed on towers, have a tremendous impact on the way in which tower workers and tower companies perform their work. For example, it is critical to have proper anchorage points; the lack of such anchorage points, compounded by the poor design of some structures, makes it difficult to do the necessary work safely and efficiently. Having anchorage points engineered into the design of the tower could and would make tower work safer. NATE respondents also advised that other design issues that need to be addressed include the use of conventional anchors vs. nonconventional anchors. On guyed towers, NATE strongly recommends doing away with conventional anchor systems, which are far more prone to corrosion. We also believe that it is imperative to mandate the TIA-1019-A standard and that everyone involved with tower construction and maintenance activities understand it.

Training and Certification

OSHA: Tower hands/climbers, please describe the training and certification required for your job. Employers, please describe the types of training and certification you require for your employees.

NATE: Certifications are required for many aspects of the work that is performed. All climbers, at a minimum, are trained in: OSHA 10 Hour/30 Hour, Authorized Climber, Competent Climber, Competent Rescuer, RF Safety Awareness, Crane Spotter, Capstan Use and Safety, Competent Rigger and first aid/CPR/AED courses.

> *"Tower climbing is unique from other industries in that before you can start working, you first need to receive some basic training that is intended to keep you safe and prepare you for a career in the tower industry."*

OSHA: What commercial training programs are currently available? What are the topics covered by the programs? Are the programs adequate to prepare employees to work safely on communication towers?

NATE: There is a wide range of commercially available training programs, including classroom, field-based and on-the-job training. Classroom training alone is not sufficient to provide certainty that employees understand the material. Practical use and demonstration techniques are key to comprehension and understanding. Some companies employ internal training programs that address site-specific and industry-specific training based on company-by-company needs.

Training topics covered should outline the 4th Edition NATE CTS for the aforementioned activities and responsibilities related to fall protection and rescue training. The NWSA organization will provide standardized assessments and certification programs for various levels of worker categories, which will ultimately enhance worker safety, quality and productivity.

OSHA: Is there a need for a standardized, industrywide training or certification program?

NATE: Yes. The NWSA assessment and certification organization is currently under development. It is the mission of the NWSA to provide thorough, independent assessments of knowledge and skills and provide verifiable worker certification in order to enhance safety, reduce workplace risk, improve quality, encourage training and recognize the skilled professionals who work on towers and other nonstandard structures.

In order to accomplish its objectives, the NWSA organization is in the process of developing written and practical assessments for various levels of worker categories outlined in the National Wireless Skills-Based Training Standard. The NWSA is also forging strategic partnerships with a nationally renowned, third-party testing firm and a prominent website

certification database firm. A board of governors representing a broad cross-section of industry stakeholders will be appointed in the near future to provide oversight for the organization.

The organization and operation of the NWSA will be in compliance with the International ISO/ANSI/IEC Standard 17024. The NWSA will evaluate workers to credential their skill level via practical tests and computer-based knowledge tests in accordance with ISO/ANSI/IEC Standard 17024. Testing will not favor or endorse any training method. The NWSA does not train.

The NWSA will help to ensure that industry workers in the future will be capable of performing the competencies required in their respective work categories. NATE suggests that OSHA and other government agencies support the NWSA to ensure that all tower workers receive uniform, consistent credentialing that is national in scope.

OSHA: From your perspective given your role in the contracting chain, what does a tower climber need to know to do his or her job safely?
NATE: First and foremost, tower climbers must successfully complete the appropriate education and training courses offered by their company. Initially, a climber should be trained as an Authorized Climber and become acclimated in hazard recognition. Other required initial training includes first aid/CPR/AED, basic RF awareness, and OHSA 10 Hour/30 Hour classes. As noted elsewhere in this submittal, once they have gained the skills and knowledge, and logged proper time on towers, they should complete and receive certification for such things as Competent Climber/Rescuer, Competent Rigger per TIA-1019-A, Crane Spotter/Signal Person, and Capstan Hoist operation. They should also be well versed and certified in areas addressing tower construction, loading and assembly; tower modification or maintenance; gin pole operations; and base-mounted hoist operations.

Participants in the tower industry supply chain have been active in developing the NWSA to standardize safety and job skills industrywide.

OSHA: How do employers evaluate employees to ensure that they have been adequately trained, especially when employees receive their training or certification elsewhere? How do companies determine if employees are proficient in the topics covered by the training or if re-training is necessary? Do employers offer site-specific training that addresses specific types of towers and equipment?
NATE: First, employees must complete a course with a curriculum that is based on the 4th Edition NATE CTS, and must pass a written exam. There is a practical on-site test and evaluation of climbing techniques, and employees must demonstrate a clear understanding and deployment of PPE and fall protection as well as the ability to perform both a self-rescue and the rescue of a fellow climber.

Written evaluations are kept for each employee and retraining is designated when a crew leader or a safety officer determines the individual requires additional training.

In addition, there are daily assessments for general safety practices being utilized on-site, performed by the site foreman/safety director. A qualified individual evaluates all new employees before they are sent to a job site; a refresher course might be undertaken after assessment. Competent Climbers complete site-specific training annually, and complete a competent climber ascent with appropriate evaluation and discussion. There is a continuing educational program whereby all employees retrain every year.

The NWSA organization will offer national, portable worker certification that will be verifiable through a database to ensure the credentials are current.

OSHA: For employers who contract out work (e. g., carriers, turfing vendors), what contract language or oversight mechanisms do you use to ensure that work is done by trained and/or certified workers?
NATE: The contractual obligation to meet all federal and state OSHA regulations and itemized terms require the contractor's compliance. Site audits and inspections are used to verify compliance without specifying the contractor's means and methods.

Suitability for Work

OSHA: Are employees directly engaged in tower work assessed for physical fitness? If so, how? Are physical fitness requirements and assessments addressed in contracting agreements?
NATE: Yes. One element of physical fitness is addressed in Department

of Transportation requirements for a medical examination for drivers. Additionally, some companies require fitness exams as a condition of employment.

Another factor relating to fitness for duty is alcohol or drug impairment that is observed by a crew leader, which could require that individual to be removed from the site and possibly terminated. To ensure and enhance the safety of tower workers and the integrity of the structure, NATE encourages the implementation of a formal drug-free workforce program.

OSHA: What physical limitations should employers be aware of when assigning an employee communication tower work? What hazards might be associated with such limitations, and how could those hazards be mitigated?

NATE: It must be clear that the individual is capable of performing the work or task required. Working at height and the act of climbing with significant weight are tasks that require individuals to not only have the necessary physical abilities, but also the mental ability to perform the task. Appropriate use of an approved hoist when available may be utilized to minimize the risk of fatigue and repetitive stress injuries.

NATE is supremely aware of and sensitive to concerns about both safety and privacy; we also remain concerned with the limitations placed on employers in seeking information about physical limitations. If a potential employee has the right to limit his/her disclosure of physical abilities, it places an excessive burden on potential employers and puts potential colleagues (as well as infrastructure) in jeopardy.

Hazards and Incidents

OSHA: Falls are currently the leading cause of fatalities among communication tower workers. OSHA believes that many falls result from the improper use of fall protection equipment or the failure to use any fall protection equipment at all. How are employers addressing fall hazards?

NATE: First and foremost, our 100% Tie-Off 24/7 Awareness Campaign is a critical program that has gained broad acceptance within the industry. Training coupled with fall protection systems and hazard recognition is also essential. Employers are further addressing fall hazards by implementing the 4th Edition NATE CTS training standard, which highlights the proper use of equipment and climbing techniques.

Tower climbing is unique from other industries in that before you can start working, you first need to receive some basic training that is intended to keep you safe and prepare you for a career in the tower industry.

The NATE Tower Climber Orientation is an invaluable resource designed to introduce prospective tower climbers to the profession, focus on the unique responsibilities of a tower climber and shine a spotlight on the prominent role a tower climber plays in the industry. This orientation program is also a valuable refresher resource for current workers.

The NATE Tower Climber Orientation allows a prospective tower climber to gain a greater understanding of the physically challenging, yet rewarding aspects of the job, the OSHA regulations that govern the industry and how to effectively utilize tools and fall protection safety equipment that all workers in the profession are required to use.

Additionally, NATE has spearheaded a PPE Subcommittee that is currently challenging fall protection equipment manufacturers with developing, testing and marketing new and innovative fall protection products to meet the needs of the tower climber of the future. In order to facilitate innovation and allow each participating fall protection equipment company the opportunity to maintain confidentiality from their competitors, the working group has paired host contractors with participating equipment manufacturers to collaborate and provide real-time feedback from tower climbers who will be testing the prototype systems that will be developed.

OSHA: Are employers providing appropriate fall protection equipment to employees? Is it maintained and replaced when necessary?

NATE: Yes. The employer must provide equipment that meets the ANSI specifications, and the equipment, which is inspected by trained employees before each use, is replaced whenever needed. NATE's Equipment Basics Checklist is an essential resource for tower workers.

Awareness campaigns, such as NATE's 100% Tie-Off 24/7 initiative, have spotlighted PPE inspection and replacement. OSHA's Safety Stand-Downs of 2014 and 2015 have also


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successfully highlighted inspection and replacement procedures.

OSHA: What factors contribute to employees failing to use fall protection while climbing or working?

NATE: A climber can be loaded up with a significant amount of weight, including his/her personal fall arrest system, tools and clothing. The absence of a ladder safety climb system (double clicking) or first-man-up technique is much more fatiguing than using a functional safety climb. Immaturity and ego are factors with younger climbers. And allowing poor habits to continue without proper discipline or enforcement can also contribute to failure to use fall protection. Ultimately, personal responsibility is essential. So, too, is due diligence by the appropriate crew members on-site, along with proper training and planning. If an employee is trained to the 4th Edition NATE CTS standard, then the decision is on the individual to apply the training. The more employees get in the habit of doing things the right way, the more natural actions become, and muscle memory takes hold. Some companies indicated that their safety officers spot check all crews, and their employees are given bonus incentives for safety.

OSHA: Are there situations in which conventional fall protection (safety nets or personal fall arrest systems) is infeasible? What alternatives can employees use for fall protection in those situations?

NATE: First, safety nets are both difficult and impractical, in part due to the fact that they can create wind load on smaller structures. Fall protection can always be met, but it requires proper planning and trained individuals with experience. It is imperative that everyone involved understand rigging and rigging plans. We also note that conventional fall protection could be inadequate because of the absence of anchorages, improper anchorages and the installation of temporary step bolts and uninstallation. Climbers may be forced to improvise because of these factors or obstructions, which can force them to take unnecessary or excessive risks.

> *"Allowing poor habits to continue without proper discipline or enforcement can also contribute to failure to use fall protection. Ultimately, personal responsibility is essential."*

Companies can seek a variance that authorizes the employer(s) to use an alternative means to comply with the requirements of a standard when they can prove that their proposed methods, conditions, practices, operations or processes provide workplaces that are at least as safe and healthful as the workplaces provided by the OSHA standards from which they are seeking the variance. In addition, the employer must notify employees of the variance application, and of their right to participate in the variance process.

In certain limited conditions, such as broadcast antennas, the antenna masts that outwardly appear to be monopoles are in fact the broadcast antenna, and as such typical safety climb cables cannot be left in position because the system will affect the radiation pattern, may cause reflective energy and otherwise have a parasitic effect on the signal or pattern. Many of these broadcast antennas are sufficient in diameter that pole straps cannot be used, and in other regards typical fall protection measures are infeasible. In addition, some types of fall protection create a greater hazard, where the employer must design alternate means and methods to protect workers who may need to access the antenna obstruction lighting (AOL) or to inspect the antenna in a single climb.

In these situations, the employer must:

- Establish infeasibility.
- Define alternate fall protection plans as a last resort, allowed only where other options have been exhausted. The competent person is responsible for preparing and approving any changes to the fall protection plan, meeting site-specific conditions, documenting the reasons, providing written details, implementing the fall protection plan needed, and identifying how and where the fall protection plan will be used.

OSHA: What are the ways in which fall protection systems or anchorage points on communication towers can fail? How can these failures be prevented?

NATE: Fall protection systems can fail because of a variety of causes, such as improper use or installation, or poor maintenance. When anchorage points are not of adequate capacity, or if they are not adequately maintained or inspected prior to connection, they can also fail. The improper use and side loading/rollout of snap hooks could also result in the failure of a fall protection system or personal fall arrest systems. Cable safety-climb systems cannot be inspected at the top cable anchorage point(s) prior to the climb; they should be tested by the connection of the cable grab and placing all of one's weight on the system before ascent. Additionally, antenna mounts can be greatly overloaded, leading to failure. NATE strongly believes that mandating the industry standards that exist for all structures will mitigate the fall protection failures.

OSHA: Should OSHA require built-in fall protection measures on new towers? Existing towers? Would such a requirement enhance worker safety?

NATE: Yes. OSHA's jurisdiction does not currently include tower owners, carriers, architects, engineers or fabricators, unless those entities have employees who climb towers. Employers do not have the authority to permanently modify a tower they do not own. The addition of the permanent safety system requires an engineering study to determine the impact on the structure. Most tower owners recognize the financial benefits of installing a safety climb system on an existing tower.

The cost to the tower owner to install and remove temporary safety climb systems far exceeds the cost of a permanent safety climb system.

NATE has organized a Structures Subcommittee that is currently working with industry engineers and tower structure manufacturers to discuss what advancements and additional tie-off access points can be made to structures in order to help make the industry safer for tower climbers. Additionally, the Structures Subcommittee is collaborating with representatives from the TIA TR-14 Engineering Committee to explore potential updates to the TIA standards that encompass the manufacturing and design of tower structures.

Manufacturers and industry experts have met previous challenges facing our industry, and we are confident that the current efforts of the Structures Subcommittee will ultimately help create a safer environment for tower technicians who work at elevation.

> *"Most tower owners recognize the financial benefits of installing a safety climb system on an existing tower."*

OSHA: Structural issues: When new equipment is added to communication towers, the additional loading of the tower has the potential to overload or destabilize the structure. Older towers may need additional reinforcements to maintain their structural integrity as new equipment is added to them. Communication tower collapses have resulted in numerous fatalities in the past two years. Which contractual party bears responsibility for ensuring that any structural work on the tower — such as modification or demolition — is done safely from a structural perspective? What steps are employers currently taking to prevent collapses?

NATE: The short answer is to follow the TIA-1019-A standard. Qualified contractors must be hired. The contractor who has employees performing the work has the responsibility to make sure that a site-specific rigging plan is developed, the rigging plan is reviewed by a structural engineer and the rigging plan is followed by the employer. Proper supervision and oversight are needed to make sure the rigging plan is followed. According to TIA-1019-A (and upcoming A322) and A10.48, rigging plans are required when lifts over 650 pounds are required.

The NATE Planning Advisory Notice (PAN) resource is designed to advise and educate the many stakeholders of the industry including tower owners, carriers, broadcasters, general contractors and tower erectors to understand that quality and safety can only truly be achieved by understanding the scope of work and the standards that may apply, and

how to apply these standards.

Each PAN consists of a brief synopsis of issues or concerns that are addressed by specific standards.

OSHA: Hoisting materials and personnel: Base-mounted drum hoists are often used to hoist materials and personnel to working heights on communication towers. Hazards arise if hoists that are not rated for lifting personnel are used for that purpose. OSHA is aware of incidents in which hoists have failed under such conditions. Also, overloading material hoists and improper rigging procedures can result in loads striking the tower structure or workers located on the tower. OSHA knows of several deaths in the past two years that have resulted from these types of incidents. When are personnel hoists used?

NATE: As suggested elsewhere in this submittal, personnel hoists (or more properly, "man-rated hoists") are used primarily when employees are at risk of fatigue due to multiple climbs, climbs to multiple locations on the structure or climbing on tall towers. NATE's extensive collaboration with OSHA's Directorate of Construction on the initial compliance directive and the two subsequent revisions (including the most recent, CPL 02-01-056) detailed the many benefits of riding the line to safety as well as to productivity, competitiveness, homeland security and the nation's vital communications capabilities.

OSHA: What types of hazards are associated with personnel and material hoists? What are the best practices for safely managing those hazards?

NATE: There are a variety of hazards associated with personnel and material hoists, including weather (wind, rain, ice), lost communication between the operator and personnel, line of sight, mechanical or power failure, and contact with the structure itself while hoisting.

Contact with the structure during the hoisting operation can be mitigated by using a tag or trolley line.

Properly following OSHA Compliance Directive CPL 02-01-056 and the previous iterations has not resulted in one injury or fatality. All instances of employee harm have been the result of not following the then-current compliance directive(s).

The best practices for safely managing hazards include education and training, proper planning and awareness of conditions, use of certified equipment, ensuring that only qualified contractors are utilized, thorough inspections of equipment, and following the mandates of hoisting personnel 100 percent of the time.

NATE offers several best practice resources that can help workers safely manage and address hazards. For example, NATE's Hoist Operators Educational Requirements Manual outlines the parameters of the position from understanding hoist operations, systems, rigging, qualifications and best practices.

NATE has also created a Personnel Hoisting Safety DVD to be utilized as part of the industry's education and training programs. Additionally, the NATE Tower Safety Signals manual provides recommendations and descriptions of signaling methods used on tower sites.

OSHA: How are capstan hoists used in tower work? In what types of operations can they be used safely?

NATE: Capstan hoists are the most commonly used hoist in the industry. They are used to raise and lower relatively light pieces of equipment, but are well suited for small antennas and transmission lines.

OSHA: What are the most common types of rigging hazards that occur on communication tower worksites? What can employers do to eliminate or minimize those hazards?

NATE: The proper sizing and application of rigging to the tower has the potential to create localized stresses that may negatively affect tower stability. Other common hazards could include: absence of an appropriate rigging plan; improper knots; rigging to sharp structure members; lack of communications between operator, tower personnel and tag personnel; and fly-by-night companies that do not utilize or offer appropriate education and training programs.

Employers can eliminate or at least minimize those hazards by ensuring proper use of equipment and proper training from standardized training organizations. Proper inspection of rigging equipment and proper sizing are critical. The TIA-1019-A, the upcoming TIA 322 and the A10.48 Telecommunication Tower Standard all require and describe rigging plans and proper rigging techniques.

OSHA: Are there methods, other than the use of a hoist or a crane, that can be used to lift material and

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"The Nevada Wireless Association supports the efforts of the Tower Family Foundation and has made them a recipient in our annual charity golf tournament. Best of luck to the Foundation as you continue to grow and help those in need!"

Chris Wener
Nevada Wireless Association President

"As a climber with 17 years of experience, I've seen firsthand the hurt and the pain caused by the loss of a fallen friend and fellow tower climber. I am grateful and humbled to know there is an organization that has resources to assist tower climbers and their families during times of need."

John Gates
Tower Climber from ATS

"I want to thank everyone involved for making this happen! Synergy Concepts will be donating to the Tower Family Foundation and encourages other companies in the industry to donate as well."

Russ Chittenden
Vice President of Synergy Concepts, Inc.

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personnel at a communication tower? Which methods and procedures are the safest?

NATE: Hoists or cranes are the best options.

Properly designed bucket trucks and man-lifts can be utilized to a certain height in areas where access permits. All man-rated equipment, properly used, can be the safest means to lift material and personnel. When absolutely necessary, helicopters could be used for materials only.

OSHA: Radio frequency hazards: Much research has been done on the health effects of overexposure to radio frequencies. General health effects reviews have found that high levels of exposure to radio frequencies may result in burns. In addition, the link between exposure to radio frequencies and cancer, reproductive diseases, and neurological effects has not been thoroughly explored. What methods are employers using to protect workers from overexposure to radio frequency?

NATE: RF awareness training, RF monitors and RF safety plans are examples of resources being used to prevent workers being exposed to RF hazards. Several prominent NATE RF safety resources are utilized by employers and employees. For example, the NATE RF Awareness Booklet is a manual for understanding the background behind exposure to radio frequency waves. It contains information on OSHA compliance, FCC maximum permissible exposure (MPE) rules, general safety awareness, background references and additional information. NATE has developed a DVD that highlights RF safety and awareness best practices.

OSHA: Is there a need for employers to institute comprehensive radio frequency monitoring programs on communication tower worksites? What would a good program look like?

NATE: Yes. The FCC and OSHA have exposure limits for workers working on structures that support RF emitters. In addition, the FCC requires licensees and in some cases tower owners to designate site-specific RF safety programs.

Broadcasters have developed comprehensive site-specific RF safety plans on their tall towers as have owners of numerous rooftop and cell sites. These plans identify near-field and far-field safety areas and employers can use these tools to develop site-specific RF safety plans.

> *"Planning helps prevent failure. As part of everyday tailgate meetings, the weather and potential of approaching weather are discussed and action/exiting plans are developed."*

OSHA: Weather: Communication tower workers work outside during all seasons, and in all climates. They can be exposed to heat, cold, wind, snow and ice. Storm conditions can quickly arise when workers are at elevation, and it can be difficult to descend the tower quickly. What are the specific weather-related hazards to which communication tower workers are exposed?

NATE: Wind can make climbing difficult and verbal communication challenging. Rain makes walking and working surfaces and climbing facilities slippery and dangerous. Ice makes working, walking and climbing surfaces slick. Cold can expose workers to frostbite and hypothermia. Heat can expose workers to heat exhaustion and heat stroke. Properly grounded towers make excellent lightning rods, which can be dangerous when personnel are near the tower, transitioning from the tower to the ground or near the tower or guy anchors. Climbers should descend the tower quickly when bad weather approaches.

OSHA: How does a crew monitor and respond to changing weather conditions, including storms?

NATE: Planning helps prevent failure. As part of everyday tailgate meetings, the weather and potential of approaching weather are discussed and action/exiting plans are developed. Tower employees will review forecasts, utilize radar and mobile phones, and employ visual observation. The

home office will also provide additional information about impeding weather conditions.

OSHA: Fatigue: OSHA believes that fatigue can affect communication tower workers in several ways. Climbing a communication tower is physically demanding, and OSHA is concerned that fatigue due to exertion can be hazardous for tower workers. Accelerated work timelines can also result in tower workers working very long hours. And OSHA understands that communication tower workers may travel long distances to reach remote worksites, which can result in workers being fatigued before they even begin work.

What hazards are faced by a worker who finds it physically challenging to perform expected tasks, such as climbing a tower or performing a self-rescue? What impact can this have on other crew members?

NATE: Fatigue is a substantial factor. It can reduce strength as well as mental acuity, thereby affecting sound decision-making. This can greatly affect the fatigued worker as well as the colleagues who depend on the other members of the team during both normal work and rescue operations. And, as part of the team aspect of tower work, workers must also be sure to be forthright: they must concede when their fatigue or other impairment might put themselves or others at risk. NATE's successful collaborations with OSHA on the initial riding the line policy directive and the two subsequent revisions were designed in large measure to reduce climber fatigue as well as repetitive stress injuries while facilitating tower construction and, now, tower maintenance or modification.

In September 2012, NATE coordinated a tower site tour in Washington, D.C., with seven senior OSHA officials, to help them better understand tower climbing and the challenges associated with the activity, such as fatigue and repetitive stress. During the tour, OSHA officials tried on the equipment that elevated tower workers wear when accessing their work stations. This equipment, including the harness and tools, weighed over 60 pounds.

OSHA: What are the common causes of worker fatigue at communication tower worksites?

NATE: Multiple climbs during the course of a day, climbing without rest or with limited rest, dehydration, extreme weather conditions and obstructed climbing.

OSHA: What are the effects of fatigue on tower worker safety, and what types of incidents occur as a result of worker fatigue?

NATE: Fatigue can jeopardize each worker, even those who are not themselves fatigued. Physical as well as mental fatigue poses enormous risk. The arms and legs can start cramping, which in addition to heavy breathing takes the workers' focus off climbing. A fatigued worker may exhibit difficulty in climbing properly or observing proper safety protocols. The mind can become confused and disoriented due to fatigue.

Other Common Hazards

OSHA: What other hazards are present in communication tower work, and what types of incidents are resulting from those hazards? What can be done to protect employees from those hazards?

NATE: Poor workmanship by a previous crew can create hazards that are not readily apparent or noticeable. Improperly sized bolts, bolts that are left or become loose and mounts that are not attached properly are all common hazards. Other hazards include objects falling from climbers, improper rigging, stinging insects and birds.

OSHA: What are some health and safety considerations involved in working with communications equipment installed on non-dedicated tower structures, such as water towers, buildings, silos, electrical transmission towers, etc.?

NATE: NATE member companies cited inadequate climber anchorage points or the absence of anchorage points on non-dedicated tower structures. Moreover, there is the risk of uncertain structural integrity or unknown structural loads. Also, the maintenance of non-communications tower equipment could compromise communications equipment. Electrical transmission towers have the added hazard of live power lines in close proximity to workers and rigging.

For example, one NATE resource that addresses work involved on non-dedicated structures is our Suggested Fall Protection – Rooftop Work Area Protocol manual, which provides

> *"Personnel hoists (or more properly, 'man-rated hoists') are used primarily when employees are at risk of fatigue due to multiple climbs, climbs to multiple locations on the structure or climbing on tall towers."*

information on OSHA regulations, applicable standards, safety systems and definitions.

Contracting and Work Oversight

OSHA: Describe your role in the contract chain and the key safety-related provisions typically included in your contracts. How do contracting parties oversee or enforce those provisions? What are the consequences if a party fails to fulfill those contractual requirements?

NATE: Currently, language requires general contractors, contractors and subcontractors to adhere to existing safety rules while performing the contracted work. Project managers employ or otherwise dispatch construction managers to coordinate, oversee and sometimes audit the work of contractors performing tower-related work.

Minor infractions may result in written warnings. More serious issues can shut down a project until the hazards are satisfactorily resolved. More egregious incidents may result in removal from the site up to and including termination of a contract.

NATE's Qualified Contractors Evaluation Checklist is a great resource available to the industry that was primarily designed to serve as a tool to help carriers and owners evaluate a contractor's dedication to safety. Unqualified contractors have an obvious advantage in gaining work in the industry. They have the potential to underbid their competitors who have invested in training, practices, procedures and proper equipment for their employees. Furthermore, situations featuring multiple layers of contractors can create the impression that safety is a priority, but beneath the surface, as work is subcontracted out, the company that can do the job cheaply can still underbid the company that will do the job right.

OSHA: What characteristics of past safety performance does your company use in selecting potential contractors and subcontractors? What safety-related criteria does your company use in this selection process?

NATE: Contractor qualifications are rigorously checked and evaluated prior to offering contracts. Projects are then checked and audited. Trends are reported and safety-related issues are dealt with immediately.

Experience modifier rates (EMRs), insurance loss runs and many other factors like those established in NATE's Qualified Contractor Evaluation Checklist are used to find the best companies suitable for subcontracting. Recently, vertical real estate companies and carriers have required all subcontractors to be pre-approved prior to dispatching to a project.

OSHA: Are safety-related factors considered in determining whether to remove a contractor/subcontractor from an ongoing project or from future selection processes? If so, what specific factors are considered?

Nate: Yes. NATE developed a Checklist for Evaluating Qualified Contractors and those fundamental ideas are among a number of specific factors evaluated. Among the factors are:

- Proper insurance coverages such as Workers Compensation, liability and automobile (fleet) policies. Some require installation or builders risk coverage.
- Must have the necessary experience, references and capability
- Written safety program and agrees to conduct regular safety audits
- Site-specific safety plans, including rigging plans, structural and RF safety procedures and fall protection plans
- Must agree that a competent and qualified person will be present on all sites and will conduct daily safety audits
- Maintain written records of safety audits for at least one year
- Contractor requires pre-employment

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physical agility or physical fitness tests to determine ability to perform job tasks
- Contractor conducts drug screening for employees
- Contractor ensures that workers have been properly trained and understands OSHA regulations
- Contractor agrees to conduct pre-job hazard assessments to determine required PPE and equipment
- Maintain written documentation of all training records
- Review OSHA 300 logs for the previous three years
- Notify in writing in advance if a subcontractor is to be used
- If a subcontractor is to be used, all required safety procedures and protocols of the contractor will be met by the subcontractor
- If personnel hoisting is to be utilized, all aspects of OSHA Compliance Directive CPL 02-01-056 will be followed
- Maintain a clean and safe site

OSHA: What are the ways in which the multi-leveled contracting environment (i.e., where entities such as the carrier, tower owner, turfing vendor, subcontractor, and contractors hired by the subcontractor all have some role in the project) impacts employee safety at communication tower worksites?

NATE: The single most important element is that the employer who has employees working on the tower has control over the means and methods used to perform the work. Other participants in the contractual agreements all have elements of responsibility that are tied to performance in some manner. The contracts speak for themselves.

OSHA: What practices might companies in the contracting chain adopt to encourage communication and coordination among employers at tower work sites? What obstacles stand in the way of communication and coordination between different parties in the contracting chain?

NATE: Over the course of the last one and a half years, NATE has led efforts

to bring the industry together in unprecedented fashion, actively supporting and collaborating with industry workers, companies, organizations and agencies to pursue the common goal of achieving long-term, sustainable safety improvements. These collaborations have been outstanding and the industry is continuing to discuss issues involving contracts, on-site safety issues and a method of proper oversight and supervision.

Legal and financial liabilities are potential obstacles.

Tower Design

OSHA: Can towers be designed and built with elevators for lifting personnel or materials? Can towers be built with booms or davits aloft to aid in hoisting materials?

NATE: Yes. Some towers are actually elevator-equipped. As it is important to note that even properly designed booms or davits could become hazards in a short time span due to the extreme weather conditions that can be present above ground, we advise against building towers with these designs.

Tall broadcast tower structures can be designed and built with elevators for lifting personnel and/or equipment and materials. Historically, towers over 1,200 feet in height are typically designed and built with elevator systems. The choice of incorporating an elevator into the original design for tall broadcast tower structures is born from a decision involving both economics and tower access.

It is rare, however, to install an elevator system after original construction. Tall broadcast tower structures should be designed around the decision to include an elevator system.

OSHA: How would elevators or davits affect productivity/efficiency, e.g., the amount of time spent on the tower? How would elevators or davits address or cause any safety hazards at the site? For example, would elevators or davits address hazards related to employee fatigue?

NATE: Personnel hoists that enable workers to "ride the line" are efficient and proven alternatives to tower elevators. Using properly maintained elevators could similarly be an asset for climbers to limit fatigue and repetitive stress injuries. NATE members also noted that the wind energy industry uses climber-assist devices regularly but they don't have to deal with obstructed climbing paths.

Elevators greatly reduce the amount of time it takes to both climb and return to the ground from any significant elevation. The time savings is most significant for individuals who do not climb tall broadcast tower structures as part of their normal job responsibilities.

OSHA: What are the industry standards for providing fall protection anchor points on new towers?

NATE: Per ANSI/TIA-222-G – Structural Standard for Antenna Supporting Structures and Antennas, antenna supporting structures exceeding 10 feet in height shall be equipped with a minimum of one climbing facility manufactured with a safety climb device. When a safety climb device is not continuous over the entire height of the structure, climber attachment anchorages shall be available at a maximum spacing of four feet. The minimum vertical nominal design load on a climbing attachment anchorage shall be 3,300 pounds. For most tower structures, the main tower bracing members are suitable as climber attachment anchorages.

Regulatory/Non-regulatory Approaches

OSHA: What would be the advantages and disadvantages of an OSHA standard that covers both construction and maintenance activities on communication towers?

NATE: There is no need for an OSHA standard once the ANSI/ASSE A10.48 standard is adopted.

We recommend that OSHA should collaborate with NATE, NWSA, ANSI and the American Society of Safety Engineers in order to take advantage of the expertise that currently exists in the industry.

Once the ANSI A10 Committee finalizes the A10.48 standard, it will provide more information in a more expedient manner than a government agency could create. It was created by many subject matter experts from many facets of the industry.

OSHA: What effects have the North Carolina and Michigan regulatory approaches had on work practices and climber safety in those states?

NATE: Both Michigan and North Carolina have become actively involved in demonstrating to other states that state-run state plans can be effective and useful in providing essential references for workers in states where no such language exists.

OSHA: Should an OSHA standard be

limited to work performed on communication towers, or should it also cover towers used for other purposes?

NATE: To reiterate, NATE does not believe that OSHA should write a communications tower standard. Instead, the agency should partner with private industry's variety of efforts, including the NWSA's assessment and certification organization and the ANSI/ASSE A10.48 standard writing development.

The NWSA, like NATE today, will become another valuable resource for the entire industry to use.

OSHA: If OSHA does not initiate a dedicated rulemaking for work on communication towers, what other types of regulatory actions might be necessary and appropriate?

NATE: OSHA should allocate whatever resources are available into actively participating in the ongoing private sector initiatives outlined earlier in this response to the RFP. In so doing, the agency could be an active partner in the industry's enhanced emphasis on tower safety, while placing the responsibility upon the customers seeking contractors to perform work on towers to only hire qualified and certified contractors.

OSHA: What non-regulatory approaches could OSHA take to address hazards faced by employees working on communication towers?

NATE: Again, we strongly encourage OSHA's support for ongoing industry-wide efforts such as the NWSA. Additionally, we commend OSHA for conducting the widely regarded National Safety Stand-Downs in 2014 and 2015. We encourage OSHA to continue outreach efforts with industry.


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Product Showcase – Surge Suppression and Grounding

Shielded Enclosures

Pioneer Energy Products (Pepro) offers shielded outdoor networking cabinets designed to help reinforce coverage in hard-to-serve areas and provide secure housing for mission critical equipment. The cabinets use a patented Faraday cage design to ensure that communications are not interrupted by radio-frequency interference, electromagnetic interference, passive intermodulation, lightning strikes and transient voltage. The cabinets are available in three sizes, starting at 16-rack units, and can be stacked or expanded to accommodate more equipment. The cabinets feature aluminum all-welded construction, a UV-resistant powder coat and standard HVAC, power distribution and surge protection. The cabinets are available in 16-, 27- and 42-rack unit sizes, measuring 36 inches, 54 inches and 81 inches high, respectively. All of the cabinets are NEMA 4- or 4X-compliant, confirming their weatherproof exterior and access points.

www.peprollc.com

Surge-Protection Devices

Raycap offers various connectivity and surge-protection solutions for remote radio-head architectures, including advanced connectivity solutions for the FTTA/PTTA wireless network infrastructure. Designed to support any site scenario for wireless operators, the FTTA/PTTA wireless-site products include but are not limited to: FTTA, PTTA and hybrid distribution enclosures and enclosureless solutions. The products feature the patented Strikesorb surge-protection technology, which can be integrated with the products to provide various levels of protection, depending upon specific site requirements. Raycap's connectivity and protection systems are designed to ease management and installation of long runs of power and fiber-optic cables. The systems also ensure the availability and reliability of the radio and baseband equipment with which they are connected.

www.raycap.com

Two-hole Lug Washer

The Bondwasher (BWUSA) for electrical bonding applications is available from **Ingenuity Industries**. The product features two holes in one continuous piece, designed to improve on the standard of using two separate washers with gaps between them. The product spreads the clamping force evenly between

PRODUCT SHOWCASE

the lug and the ground bar, resulting in a uniform clamping force and a gas-tight seal. The clamping force is said to create an intimate electrical connection, resulting in the lowest-possible resistance between lug and ground bar. Low resistance and gas-tight seals also prevent corrosion between lug and bar. The product is designed to reduce the chances of passive intermodulation interference. It is made of 300-series stainless steel produced in conformance with the Defense Federal Acquisition Regulation Supplement. Using every hole in the ground bar allows the product to eliminate cutting or shaping of flat washers, and it also reduces the chances of flat washers rotating and loosening hardware over time. The product is approved by AT&T and Ericsson, among others.

www.bondwasher.com

Quarterwave Stub Lightning Arrestors

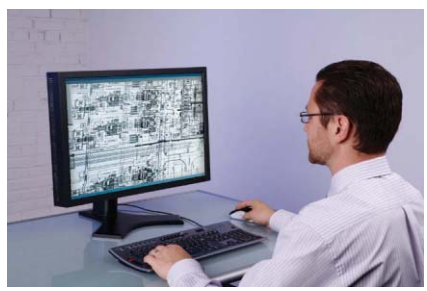
The QWS600 SurgeGuard series of quarterwave stub lightning arrestors is available from **NexTek**. The arrestors come with Type N connectors in male-to-female or female-to-female configurations; they also feature provisions for an M8 mounting or grounding attachment to allow for multiple mounting options. Designed specifically for Long Term Evolution, Wi-Fi and WiMAX applications, the arrestors are extremely compact, measuring 63.9 millimeters (2.52 inches) long by 39.6 millimeters (1.55 inches) wide. They feature bidirectional protection, as low typical voltage standing wave ratio (VSWR) of 1.05:1, a typical insertion loss of 0.15 dB, and high RF power and ultralow let-through energy ratings. Made from robust materials, such as nickel-plated brass, gold-plated beryllium copper pins and Teflon insulators, the maintenance-free arrestors are ruggedized, weatherproof to IP68 standards and can withstand multiple lightning strikes as well as high transients up to 60 kiloamperes. The arrestor is available with Type N connectors in male-to-female or female-to-female configurations and also features provisions for an M8 mounting or grounding attachment to allow for multiple mounting options.

www.nexteklightning.com

Gas-discharge Lightning Arrestors

The SurgeGuard K1 series from **NexTek** is based on a multiple-gas-discharge tube design with serviceable replacement elements. The PTR7AF7AFxxK arrestors measure 119 millimeters by 45 millimeters, have 7/16 DIN female to 7/16 DIN female connectors, and can deliver a maximum of 50 kilowatts of RF power at a maximum through-current of 25 amperes. The K1 series products can use a range of 1.4-kilovolt to 3.5-kilovolt gas-discharge tubes and have a nominal impedance of 50 ohms. Additional specifications include a low return loss of 1.20 to 1.30 maximum and an insertion loss of only 0.10 dB to 0.20 dB. All SurgeGuard products are considered military grade and are designed to be both waterproof and dustproof (IP68 Standard). This series provides multiple-strike protection and up to 40 kiloamperes-plus (8 x 20µs waveform) of surge capability for a single event.

www.nexteklightning.com



Grounding Systems

Alltec offers lightning protection, surge suppression and grounding products to ensure that vital facilities remain functional in severe conditions. The grounding products are designed to protect telecommunication and broadcasting facilities and activities that are vulnerable to electrical noise, lightning-induced surges and transients caused by switching components. The products are based on soil resistivity reports and site surveys either supplied by the client or

produced by Alltec's engineering department, to ensure each grounding system meets Motorola R56 or client-specified requirements.
www.alltecglobal.com

Vertical/Horizontal Ground Rods

The ComRod ground rod from **Comsite Hardware** is designed to produce low ohm readings, even in the most difficult sites and soils. The ground rod is stocked in both vertical and horizontal configurations. A vertical version can be dropped in the hole left by the soil-test boring; the horizontal model can be placed in a shallow trench. The natural-earth salts draw moisture from the atmosphere through the vent holes and gradually leach into the soil to continuously provide a low-resistance ground. The product's galvanic backfill contains a portion of bentonite clay to retain moisture. Unlike pure bentonite, the ground rod's galvanic backfill does not shrink away from the soil, a phenomenon that can reduce efficiency. The galvanic backfill contains materials that actually increase conductivity, enhancing the electrical contact with the earth. Each ground rod, which comes with a test well and backfill, has a 20-year warranty.
www.comsitehardware.com

Lightning Surge Protection for Tower Lighting

In response to last year's extremely active lightning season that damaged many tower-lighting controllers, FAA obstruction light OEM and distributor **Slatercom** now offers the LB series surge protection system. The system is provided in a 12-inch-by-10-inch polycarbonate enclosure and includes 40-kiloampere surge devices to effectively absorb transient high-energy pulses that may be conducted from tower-mounted light fixtures or from near lightning strikes. Full power-line protection as well as lighting fixture wiring is routed through the LB protection system prior to entering the lighting controller, thus absorbing the majority of surge energy. Systems are custom-manufactured for use with any new or existing lighting systems.
www.slatercom.com

Grounding System

The XIT grounding system from **Lyncole Grounding Solutions** is designed to protect sensitive equipment and facilities in every possible way, including data collection and soil resistivity testing; design, including all grounding needs for the facility; system installation; and inspection and testing. The grounding system is made to eliminate downtime and reduce the risk of financial loss. The system can reduce transient impedance by as much as 80 percent, while providing extremely low ground resistance in a variety of climates and soil conditions. The system has a 30-year warranty with an expected 50-year serviceable life. In addition to protecting sensitive equipment, the grounding system reduces voltage between earth and equipment to alleviate the possibility of accidents and fatalities.
www.lyncole.com

Pluggable Surge-protective Device

Phoenix Contact's VAL-MS BE/O is the first pluggable surge-protective device for use in a rack-mounted enclosure. The 2U- (3.5-inch) high base element maximizes surge protection density, allowing as many as 24 VAL-MS surge-protective devices in a common 2U-high, 19-inch wide rack enclosure. The VAL-MS BE/O has an orthogonal base element designed for both AC and DC applications. The base element accepts all of Phoenix Contact's VAL-MS series of pluggable surge-protective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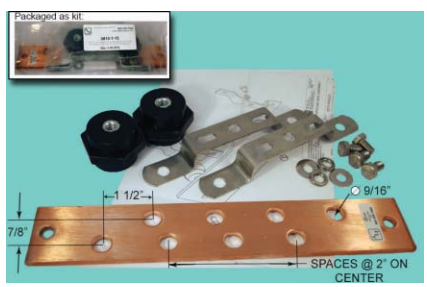
devices, including the VAL-MS 60 and VAL-MS-T1/T2 48. Each surge-protective device has an LED status light on the front, indicating whether or not it is still providing protection. When the LED goes off, the user knows that unit must be replaced. Rather than disassembling the equipment and disconnecting the power, the user simply removes the surge-protective device and plugs in a replacement. The VAL-MS BE/O features easy DIN rail-mounting, a pluggable interface through the enclosure face, and wiring straight out the back.

www.phoenixcontact.com

Intuitive Remote Site Management

The OspreyFMS Enterprise Dashboard provides visibility into tower facilities with an emphasis on alarm presentation and remediation. It is compatible with almost all lightning protection, surge suppression and ground monitoring devices and supports SNMP, BACnet and Modbus protocols. The software polls for defined alarm criteria and presents those alarms on the dashboard, distributes them via email or forwards them to other IP addresses including the NOC for dispatch and corrective action. The software automatically keeps tower light logs for multiple years and provides automatic reports for corporate compliance, local staff and NOC. The dashboard has tools for sophisticated analysis, measurement and control and offers flexibility giving each user a completely tailored experience: alarm management, multisite monitoring and control, multisite analytics, weather event reports, equipment integrity and resource optimization.

www.questcontrols.com



Ground Bars

Advanced Lightning Technology offers grounding materials and specializes in custom-made ground bars in any requested configuration, material and size. The ground bars are UL-listed, packaged in kits or sold individually and manufactured in Texas. They are available in standard sizes, too. Also available are lugs, rebar bonding assemblies, advanced grounding electrodes and surge suppression products.

www.altfabrication.com

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