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# agl Magazine™

## RISKS TO TOWER WORKERS

### YEAR OF THE CLIMBER

Time Constraints  
Root Causes of Accidents  
Remembering Daniel Arnold

### FEATURES

Environmental and Historic Preservation  
1,000X Network Capacity Increase  
Mergers, New Spectrum and DAS Upgrades

October 2015 /// Volume 12 /// No. 10

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*Design by Courtney Duggan*

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# Camouflage Success

Could the results of camouflaging and concealing cellular communications antennas be too successful? Maybe, according to U.S. Sen. Richard Blumenthal (D-Conn.)



and U.S. Rep. Anna G. Eshoo (D-Calif.). In a letter they sent to FCC Chairman Tom Wheeler, the

solons said that such antennas can be undetectable to the untrained eye, leading to situations in which workers unknowingly place themselves too close to the antennas, maybe in line with the antennas' focused beam, possibly exposing themselves to excessive radio-frequency (RF) radiation.

The number of workers who are sent to cell sites specifically to work on the telecommunications equipment contained there could be on the order of 30,000. The lawmakers estimated that each year as many as 250,000 people work in close proximity to cellular antennas.

Besides the antennas that are hidden in some way, antennas placed on apartment buildings, schools, hospitals, places of worship and other public and private buildings create a possible hazard to workers if required precautions aren't taken. "It is unacceptable that RF warning signs have been found missing, mislabeled, unintelligible or out of date, and that strategies to control access (e.g., barricades, locks and fences) are in disrepair," the letter reads.

In what *AGL Magazine* calls "The Year of the Climber," we have been

offering more extensive coverage of safety matters this year than usual, concentrating on tower worker safety. This includes steps to prevent overexposure to RF, but it generally has more to do with preventing falls that can lead to injuries and fatalities. Blumenthal and Eshoo offer a reminder that the matter of safety at cell sites extends to other workers, too, with special attention required for sites that use structures besides towers and sites that use camouflage or concealment.

## Tower & Small Cell Summit

I hope you had the opportunity to attend the Tower & Small Cell Summit, conducted Sept. 9–11 in Las Vegas. Collocated with CTIA Super Mobility 2015, the Summit offered a pavilion in the exhibition hall and a conference programmed in part under the leadership of AGL Media Group Editor J. Sharpe Smith.

Those who rely on wireless infrastructure construction and maintenance for their business have eyes on the wireless carriers, and conference speakers were nearly unanimous in forecasting higher carrier capex spending in 2016.

Thanks to co-registration and a shuttle bus, I visited the nearby InterDrone convention where the use of unmanned aerial vehicles for tower inspection was among the highlights.

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# Network Build Outs: More, or Less?

Wow, that was fun.

In checking out the markets and in trying to use the things they taught me in MBA school, it looks as though there are many pending changes within the industry. Or is it likely to be just more of the same?



Verizon announced it will continue to focus on optimizing company assets, indicating an eventual slowdown in new deployments. We've seen how aggressive they've been over the past couple of years, and for many smaller companies, Verizon has been the capex savior, continuing to deploy while many others have paused. Verizon said its network deployment has plateaued, indicating that things will slow down, perhaps not all at once, but at least a gradual slowing. That's something to put into a 2016 sales forecast. As Verizon has leaped ahead in deployment during the past couple of years, a pause would make sense. Yet, we're seeing AT&T and Sprint make bold statements about network growth for the next few years.

I've been a longtime Verizon customer with my personal wireless service, but I also have always had a GSM phone for AT&T drive testing, a prepaid T-Mobile SIM in my pocket and a Sprint phone, just because.

Emptying my backpack of all the phones is analogous to clowns climbing out of a VW Beetle. I had a little fit of phone rage in Savannah last week. I had my iPhone 6+ screen replaced once



(\$250) by Apple, and it worked perfectly. I was in a bit of a hurry and went to a ZAGG kiosk in a mall. It worked for about an hour. I returned a few days later; they re-fixed it. It worked for about an hour. With the screen in some kind of random dance mode as I tried to use it, my phone was deleting all of my contacts, mail and appointments. Trying to hold the phone in just a certain way to stop this activity, I heard the sound of an unsettling crack. Having the third screen replaced did not make sense, so I decided the iPhone's final resting place would be a construction dumpster in Savannah.

The Galaxy Note 3 on Sprint has been a very nice experience. I've been constantly surprised by Sprint's coverage area, and although Sprint's LTE coverage is noticeably limited, I've been nothing but impressed with the availability of 3G coverage and phone

service. I've seen Sprint give fantastic coverage where there is no service available with Verizon or AT&T. If only Sprint had good coverage at my house.

I'm making some long-term bets and predictions that we'll see some new life in Sprint. Its assets are too great, its spectrum holdings are very strong, and there is too much good there for Sprint not to finally set the world on fire.

Regardless of some slowdowns or speedups, with Verizon kicking off 5G tests, AT&T deploying AWS 2.3-GHz spectrum and Sprint kicking it up a notch, no one is going to be bored for very long.

**Rich Biby, Publisher**  
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PUBLISHER'S NOTE

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# The Impact of Sprint's Network Funding Options

By **Iain Gillott**



**M**uch has been written in the past year about Sprint's need to upgrade its network. Sprint management has been public about plans to densify its network and make more use of the 2.5-GHz spectrum. The question of how Sprint is going to fund this improvement was on everyone's mind, with perhaps an underlying assumption that Softbank in Japan would step up with its checkbook open or perhaps Sprint would go to the debt or equity markets.

Sprint's second-quarter earnings announcement and conference call gave some answers as to how Sprint planned to find the cash to improve the network. The answers led to more questions. The essence of the announcement was that Sprint would not go to the debt or equity markets for the investment dollars.

## No New Debt Offering

Softbank said it would not be opening its checkbook or backing a new debt offering for Sprint.

There was also the comment that Softbank was disappointed in the U.S. regulatory environment and that it was now committed to moving forward with a turnaround for Sprint. You can read into this that Softbank bought Sprint originally with the goal of merging quickly with T-Mobile USA and taking the battle to AT&T Mobility and Verizon Wireless. It does not appear that there was any intention of fixing the company Softbank purchased, but rather doing a quick Sprint/T-Mobile deal. Now that the feds have closed that avenue (and T-Mobile is in the process of talking to Dish Network), Sprint is forced to go it alone, for the short term anyway. In other words, Softbank has no option other than fixing what they bought.

The plan is to establish a new mobile device leasing company, with some investment from Softbank, that will take ownership of new device purchasing and leasing. In other words, Sprint will not be paying out capital to buy new Galaxies and iPhones, but instead will lease the devices from the newco and pass the cost along to the consumer. Exactly what lease rates

Sprint and the consumer will pay remains to be seen, but given the competition from the other operators, it can be assumed the lease rates will be attractive to the consumer. And it can be expected that other smaller mobile operators would want to participate as well.

## Improvement War Chest

If I am reading the financial statements correctly, in the second quarter, Sprint used about \$554 million of capital to buy devices and then pass them to consumers. This capital will now be available to add to the network improvement war chest. Sprint has not said yet if the new leasing company will be on- or off-book, but many expect it to be off-book.

The second part of the plan is far less baked and is still in discussion, while plans are well underway to establish the new device leasing company. This part of the plan calls for establishing a second leasing company to own the network equipment. Essentially, the new network leasing company will buy network equipment from the vendors and will then lease access to Sprint. Hence, Sprint does not have to use its own capital to buy network equipment and build

GUEST OPINION

a network. In essence, Sprint will own the spectrum but will lease access to the network equipment.

Exactly how these companies will be structured, how much Sprint will own of each and how much Sprint will save remains to be seen. There is also the important question of involvement by other operators. For example, will T-Mobile and others be allowed to participate in the device leasing company? Will other operators be able to lease their network equipment? And will other operators be able to lease the same network equipment that Sprint may use (i.e., network sharing)?

The final issue is perhaps the most important — timing. AT&T

just closed on the DirecTV acquisition and is already offering new packages. Verizon Communications is about to launch the new over-the-top video service. And T-Mobile is of course discussing options with Dish Network. By the end of 2015, the mobile industry in the United States could look different. Sprint needs to start improving its network now (actually, it should have started months ago). But the new leasing companies must be established and operational before Sprint can start saving for the network improvements. How long will this take? It would seem that the device leasing company is already in the works and could be ready in a

quarter or two.

But the network leasing company is now only being discussed and may not be ready until late in 2015 or early 2016, at the earliest. This would therefore lead to Sprint not starting network improvements until at least the first quarter of 2016. This would seem to be a long time to wait, certainly given the new level of mobile video competition that is likely to develop in the remainder of 2015. Time will tell, but lack of cash is not Sprint's only issue. They are also short of time.

---

*Iain Gillott is the founder and president of iGR and iGR Semiconductor Research. His email address is [iain@iGR-inc.com](mailto:iain@iGR-inc.com).*

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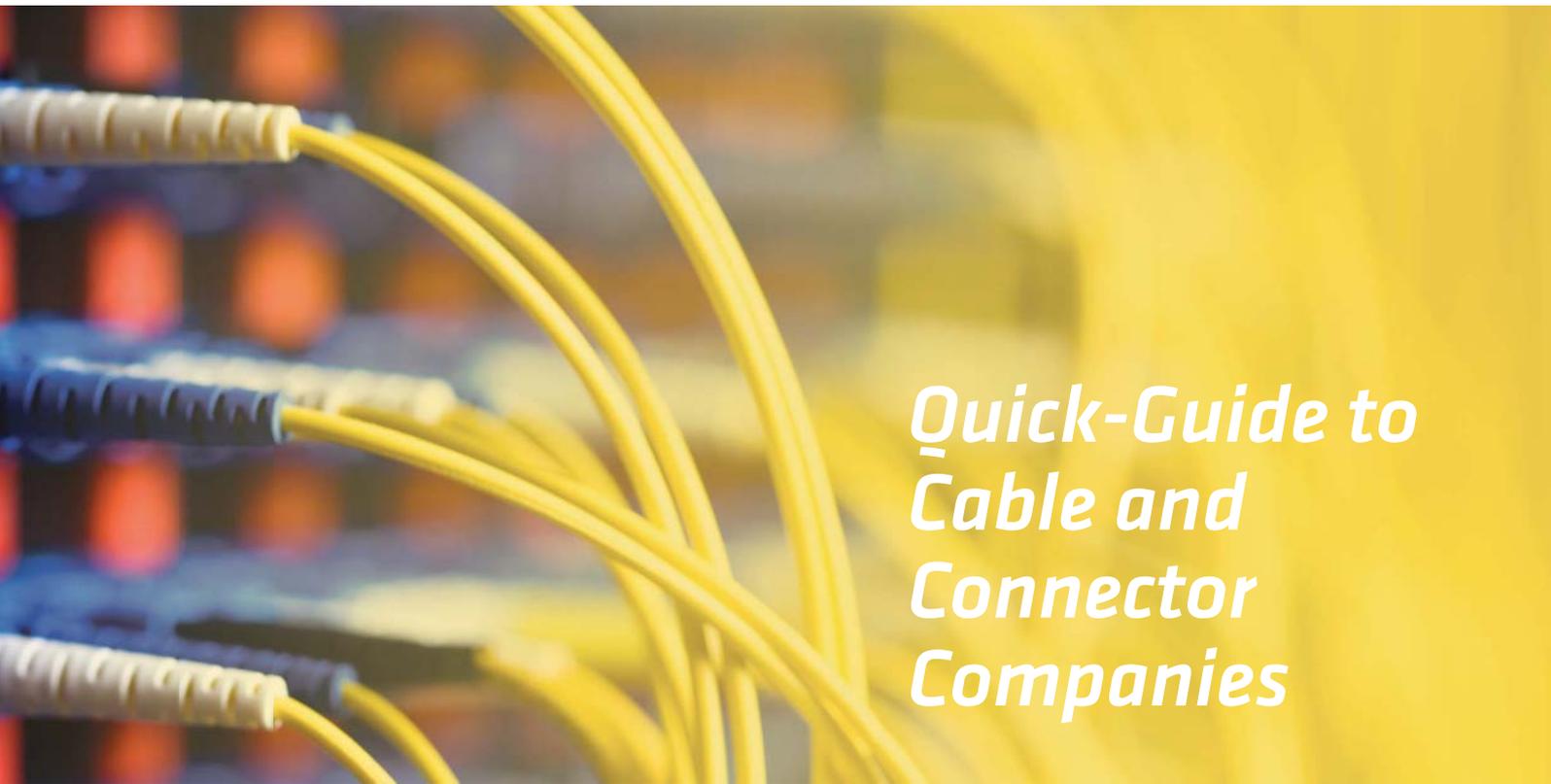
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# Quick-Guide to Cable and Connector Companies

As a supplement to *AGL Magazine's* January Buyers Guide, a list of cable and connector 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.

BUYERS GUIDE



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**Products and services:** cable, connectors, adapters, cable assemblies, power, signal, protection, service and installation, custom cable design

**Amphenol RF**

4 Old Newtown Road  
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800.627.7100  
[www.amphenolrf.com](http://www.amphenolrf.com)

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### Clearfield

7050 Winnetka Ave. N  
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[jchilds@clfd.net](mailto:jchilds@clfd.net)  
[www.seeclearfield.com](http://www.seeclearfield.com)

**Products:** cable, connectors, cable assemblies, fiber management

### Comcables

2607 W. 8th Ave.  
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Leigh Anne Smith  
303.952.1800  
[Info@comcables.com](mailto:Info@comcables.com)  
[www.comcables.com](http://www.comcables.com)

**Products:** cable, connectors, adapters, bulk wire, cable assemblies

### EMR

17431 N. 25th Ave.  
Phoenix, AZ 85023  
Alan Leffler  
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[alan@emrcorp.com](mailto:alan@emrcorp.com)  
[www.emrcorp.com](http://www.emrcorp.com)

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[www.hubersuhner.com](http://www.hubersuhner.com)

**Products and services:** cable, connectors, adapters, cable assemblies, power, signal, protection, service and installation

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**See ad on page 23**

/ DEPARTMENTS /

# Trilogy

COMMUNICATIONS, INC.

## Trilogy Communications

2910 Highway 80 East  
Pearl, MS 39208

Edmund Lee  
601.667.9133  
[elee@trilogycoax.com](mailto:elee@trilogycoax.com)  
[www.trilogycoax.com](http://www.trilogycoax.com)

**Products:** cable, connectors, cable assemblies

**Company description:** Leading U.S. manufacturer of advanced

air-dielectric coaxial cable technology for wireless market, Trilogy's AirCell Transline, Radiating and Plenum cables eliminate water migration and offer the best attenuation. Trilogy offers PIM-certified jumpers. Trilogy also provides complete turnkey construction services for operator network deployments. AirCell cable, 100 percent made in the U.S.A.

## WESTEK Electronics, Inc.

### Westek Electronics

185 Westridge Drive  
Watsonville, CA 95076  
Michael Hushaw  
831.740.6300  
[mhushaw@westek.com](mailto:mhushaw@westek.com)  
[www.westek.com](http://www.westek.com)

**Products:** cable, connectors, adapters, bulk wire, cable assemblies, power, audio/video, protection

**Company description:** Westek is a leading custom cable manufacturer offering an extensive array of connectivity products and testing equipment with advanced and patented prototyping techniques for your custom cable solutions. From telecommunications to aerospace, military and medical industries, we've been designing and providing custom cable configurations for over 30 years.

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# Environmental and Historic Preservation: Tribal and Government Perspectives

Twilight Towers, DAS and small cells near and within historic sites, surveying historic sites, educating historic district proponents and residents, and, not surprisingly, more funding are on the minds of stakeholders in environmental and historic preservation.

By Don Bishop

**E**fforts to preserve historic properties and efforts to position antenna sites used by more than 100 wireless telecommunications service providers — including Verizon Wireless, AT&T Mobility, T-Mobile USA, Sprint and U.S. Cellular — are governed and influenced at American Indian tribal, Alaska native, federal, state and local levels. Speaking at a session at the Wireless Infrastructure Show in April, representatives of the federal government and associations that represent state and tribal interests talked about issues that affect telecommunications antenna site development and operation. Dr. Amos J. Loveday, president of Atchley Hardin Lane, a consulting firm that advises businesses and government agencies on historic preservation and related cultural issues, led the session.

Loveday said that in October 2014,

the FCC issued a wireless infrastructure report and order dealing with distributed antenna system (DAS) networks and small cells that had quite an effect on historic preservation in connection with Section 106 of the National Historic Preservation Act of 1966 (NHPA). The act requires federal agencies to take into account the effects their actions have on historic properties and requires them to give the Advisory Council on Historic Preservation an opportunity to comment about them. He said the FCC, in adopting the report and order, made a commitment to work on additional rules and adaptations of technology affecting antenna siting.

## Twilight Towers

One thing about the report and order Loveday said disappointed him was its failure to deal with what are called Twilight Towers, towers built

between March 16, 2001, and March 7, 2005, that were not specifically required to submit to a Section 106 review and for which Section 106 review documentation is unavailable. “Nobody knows precisely how many Twilight Towers there are that could accept collocations if there were some ways to efficiently and effectively clear them,” Loveday said. “Also, small cells and DAS could go on those towers. Resolving the Twilight Towers problem needs to be done. It’s low-hanging fruit.”

Loveday said that the philosophy behind older agreements, the programmatic agreement and the collocation agreement that the FCC mentioned in its report and order was to keep wireless facilities away from historic sites. He emphasized that keeping wireless facilities away from historic sites was the entire philosophy behind the collocation agreement, and

the idea was to make it easy to locate antennas away from historic sites.

“It is no longer going to be possible to keep small cells and DAS away from historic sites,” Loveday said. “As a matter of fact, I would argue that the next real question is going to be, how do historic sites accommodate these collocations of DAS and small cells? They’ve got to go there. Otherwise, the wireless systems are not going to work. There are so many historic districts and communities now. So many transportation corridors are being declared historic corridors that without some accommodation inside historic corridors and historic districts,

DAS and small cells are not going to reach full potential.”

### **Wireless Telecom Bureau**

Chad Breckinridge, associate chief of the FCC Wireless Telecommunications Bureau, said that the bureau’s primary focus is on expanding on the report and order’s initiative with DAS and small cells. The bureau is considering whether to take an exemption for deployments on utility poles that was included in the October order and extend it to other structures. If small deployments fit within a defined size that would involve new ground disturbance and meet other criteria laid

out for utility pole collocations, the bureau might go further and say that the criteria should apply to other structures, too.

Breckinridge also said the bureau is looking for ways to define certain types of deployments that generally don’t have any effect, even in a historic district.

As for Twilight Towers, Breckinridge said the matter is trickier than it first appears. First, the FCC doesn’t know how many there are. Second, most or all of them haven’t been through review, and the FCC needs to figure out a process for determining which towers have documentation that needs to be addressed in some manner.

### **Advisory Council on Historic Preservation**

ACHP is an independent federal agency that promotes the preservation, enhancement and productive use of historic resources and advises the president and Congress on national historic preservation policy. The goal of the National Historic Preservation Act (NHPA), which established the ACHP in 1966, is to have federal agencies act as responsible stewards of U.S. resources when their actions affect historic properties. The ACHP is the only entity with the legal responsibility to encourage federal agencies to factor historic preservation into federal project requirements.

### **FCC Wireless Telecommunications Bureau**

The WTB manages the tower registration process, oversees nearly 2 million licenses and conducts auctions to award services licenses. It develops and executes policies and procedures for licensing all wireless services from fixed microwave links to amateur radio to mobile broadband services.

### **National Conference of State Historic Preservation Officers**

NCSHPO is the association of state government officials who carry out the national historic preservation program as delegates of the U.S. Secretary of the Interior pursuant to the National Historic Preservation Act of 1966, as amended (16 USC 470).

### **National Conference of Tribal Historic Preservation Officers**

NCTHPO is a national nonprofit membership organization of tribal government officials who implement federal and tribal preservation laws. Tribal historic preservation officers (THPOs) have the responsibilities of state historic preservation officers on tribal lands and advise and work with federal agencies on the management of tribal historic properties. NCTHPO monitors the U.S. Congress, the federal administration and state activities on issues that affect tribes and monitors the effectiveness of federally mandated compliance reviews and identification, evaluation and management of tribal historic properties.

/ FEATURES /



**Charlene Dwin Vaughn**, assistant director of the Federal Permitting, Licensing and Assistance Section, Advisory Council on Historic Preservation.



**Dr. Amos J. Loveday**, president, Atchley Hardin Lane.



**Chad Breckinridge**, associate chief, FCC Wireless Telecommunications Bureau.



**D. Bambi Kraus**, president, National Conference of Tribal Historic Preservation Officers.



**Erik Hein**, executive director, National Conference of State Historic Preservation Officers.

*Photos by Don Bishop*

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The FCC also has a priority to facilitate the roll out of the First Responder Network Authority's nationwide public safety network. "We want to manage our Section 106 and NEPA responsibilities in a way that doesn't impede FirstNet's roll-out," Breckinridge said.

The last top-level priority Breckinridge identified for the FCC is defending the wireless infrastructure report and order from petitions that say in taking the action it did, the FCC violated the Administrative Procedures Act and possibly some provision to the U.S. Constitution.

**ACHP**

Charlene Dwin Vaughn, assistant director of the Federal Permitting, Licensing and Assistance Section at the Advisory Council on Historic Preservation, said that with the Twilight Towers, the FCC has to be in front on the issue. She said something akin to amnesty would have to be applied for the towers that have been operational

for a decade or more.

"It's inconceivable that anyone would ask somebody to tear those down, so it's a matter of what kind of compensation we get from the carriers and what kind of regulatory compliance is appropriate," she said.

"We've talked to FCC about the Twilight Towers every year since 2004. We haven't received any direction or consensus on what to do, but clearly something has to be done. In view of the meteoric explosion of the telecommunications industry, this matter has to be fixed, and fixed sooner rather than later," she said.

Vaughn said ACHP is looking at program alternatives for DAS and small towers, FirstNet and Twilight Towers to see which tools the FCC and ACHP has that they can use under their regulations to craft some creative solutions. She also said industry representatives have a role to play because "they have more answers than we do. They're invested financially as well as programmatically. We have to look to

them for some of the answers."

She said a formal relationship with industry is needed along the lines of what ACHP did when it negotiated the Nationwide Programmatic Agreement for the collocation of wireless antennas.

Vaughn said ACHP is trying to figure out what broadband telecommunications does and what its implications are in response to a presidential memo issued on March 23, asking that federal agencies form a work group to expand and expedite the deployment of broadband. She said ACHP has to work with all of the carriers that would be involved.

With respect to FirstNet, she said ACHP has just started that conversation, and it needs to figure out what compliance with Section 106 and NEPA would require.

**NCSHPO**

Erik Hein, executive director of the National Conference of State Historic Preservation Officers (NCSHPO), said

state historic preservation officers (SHPOs) have diverse needs, including a primary focus of having to reauthorize the U.S. Historic Preservation Fund, the federal mechanism that funds SHPO and tribal historic preservation officer (THPO) offices.

NCSHPO works with every federal agency on programmatic agreements. Hein said SHPOs are interested in resolving the Twilight Towers issue, which he said is raised among NCSHPO members each year when they review the Nationwide Programmatic Agreement for the collocation of wireless antennas.

Hein said NCSHPO was pleased when it met with ACHP and the FCC, and they committed to reviewing FCC Forms 620 and 621 to update them in ways that could help reduce what he called the mountains of paperwork states are receiving that they don't want or need in connection with tower development. He said that in some states the FCC forms depart so wildly from forms the states use that it has caused some friction. "It's been more than 10 years since the forms were created," he said. "If we find ways to streamline the information we receive, SHPOs might be able to create faster review times."

**NCTHPO**

D. Bambi Kraus, president of the National Conference of Tribal Historic Preservation Officers, said she wanted to correct some misperceptions. Tribes and THPOs are not SHPOs, she said.

"First, there's a unique relationship between tribal governments and the U.S. government. Although discussions tend to comingle

SHPOs and THPOs, it's the tribal governments that operate THPO programs and their relationship with the federal government."

Second, Kraus said NCTHPO's mission is to work not just with THPOs. She said she sends information to all Indian tribes and Alaska native corporations, especially with

respect to matters involving the National Historic Preservation Act.

Kraus said the Tower Construction Notification System helps tribes, agencies and industry participants work well together. "It's the best system going in the entire country," she said. "It's the best system any federal agency has developed that

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works with the industry, the FCC and Indian tribes.”

The NCTHPO president said that unevaluated sites are a big issue in Indian country. Tribes receive little money to perform as THPOs. She said the average THPO grant is less than \$60,000 a year, not enough to fund one staff person. With that money, THPOs are expected to perform all kinds of federal development compliance work. She said that as a result, many Indian sacred sites and historic properties are being considered unevaluated and therefore not worthy of protection. “That’s not true,” Kraus said. “If tribes had the money and the resources, they would do a lot of more of this nomination and protection.”

### No Funds for the Survey

Loveday said SHPOs are a matching program of state and federal funding and, de facto, the THPOs are matching programs because they don’t receive enough federal money to do their jobs. The fund from which these both are paid is called the U.S. Historic Preservation Fund and it draws funds from the offshore oil reserve money. The amount Congress originally designated was \$150 million a year, but Loveday said Congress has never appropriated more than \$75 million a year, leaving the program underfunded, based on what Congress wants THPOs to do. He said an important matter that is falling through the cracks because of the federal funding issue is a survey to identify historic sites.

“When the U.S. Historic Preservation Act was passed in 1966, it was estimated that it would take four years to survey historic sites in the whole country and produce a complete

list of sites,” Loveday said. “It was also estimated that that would cost \$40 million a year at the time. The problem was, Congress passed the law requiring the survey, yet never appropriated the money to do the work. The reason you have to go out and do a survey for every tower can be traced back to 1966 when President Lyndon Johnson withdrew the line from the budget and Congress agreed.”

Loveday said the compromise was that agencies would have to do the surveys out of their own money instead of Congress paying for it. That’s why surveys have to be done with every site instead of surveys being done in advance.

### SHPOs and the Survey

Vaughn, from ACHP, said the survey of historic properties would be easier for SHPOs. “They have information, but it is incomplete,” she said. “As a result, every time you propose to site a DAS or small cell, you have to perform the identification and evaluation.”

She said that if SHPOs were given money to integrate into a comprehensive program that surveys resources within a state on a systematic basis, the program would work more effectively and efficiently. “When you have to stop, look, listen and engage not only SHPOs and tribes but also other consulting parties about what’s historic within the area of potential effect, it takes time and leads to unknown disclosures,” Vaughn said. “If SHPOs were given more money and they could have a systematic approach to identification, they could move more quickly and probably would be in a better position to make concessions and to negotiate.”

Vaughn said it could help to lessen the effect of small cells and DAS on historic sites if a working group could look at historic buildings to characterize what’s historic, what features cannot be altered, and what features could accommodate DAS equipment in an innocuous manner. Although regulations outline a four-step process that isn’t likely to change, they don’t preclude the industry, SHPO and the agencies from looking at guidance and how to take a more efficient and effective approach to using the technology and the historic sites in a more compatible manner. She said such a working group could include the National Park Service and SHPOs.

Hein, from NCSHPO, said there’s no question that additional survey funding would be of use for SHPOs. “In addition to there simply being no data in certain areas that have never been surveyed, a huge number of members have reported that there is no recent survey data where survey data exists,” he said. “I remember working for a city and our historic district survey data at that time was 20 years old. And I doubt that it has been updated since then. Much survey data is in paper records and binders, not digitized and not linked to an active geographic information system. Investments in such infrastructure would speed things up and make them much easier.”

### Education About DAS

Hein also said some people may not fully understand DAS and envision satellite dishes being applied to buildings up and down main streets. Educating historic district proponents

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and residents about DAS would lead to better conversations, he said.

Breckinridge, from the FCC Wireless Telecommunications Bureau, said the U.S. Secretary of the Interior's Standards for Historic Preservation Projects are tailored to the idea of building in historic districts. "I want to explore whether using them for small cell and DAS installations would address some of the problems we're worrying about and also whether there are particular approaches to concealment that we ought to be thinking about to reduce visibility without reducing the utility of the installations," he said. "A working group that brings the sharpest minds together to suggest program alternatives would be helpful."

Kraus, from NCTHPO, said she

can easily understand the need for DAS and small cell technology. She said the tribes are not anti-technology, and they would like to see more good-faith tribal consultation.

### Tribal Fees

Kraus linked the matters of tribal fees and noncompliant towers (Twilight Towers). "I link them together because most towers are not in the bad category," she said. "Most tribes in terms of charging fees for compliance work are not bad tribes. There's a give and take of how do you make a perfect system. There is no such thing as a perfect system. But it would be good to deal with these non-compliant towers and whether or not collocation starts immediately or what this means in the long term."

Breckinridge said he hopes the

FCC soon will be in a better position to devise a solution for Twilight Towers when it receives more information from the tower owners. "That's when we will reach out to the THPOs, to NCTHPO, individual tribes and SHPOs to try to find an approach that reflects the fact that many of those towers are probably completely benign, but some are not," he said. "We don't have a firm thought in place about what direction to go, whether it would be a blanket amnesty or sending all of these towers through a review process. There are many possible approaches, and we need to take them one step at a time, which is aggravating and slow. But the first step for us is figuring out how big the problem is."

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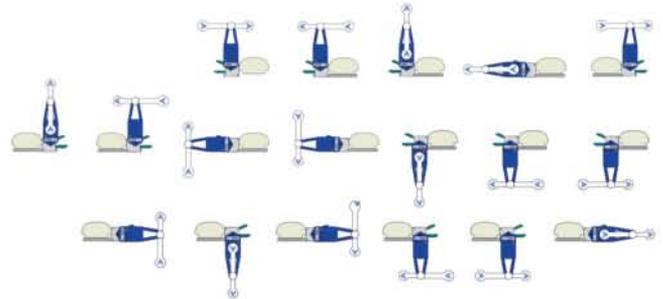


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# Carrier Mergers and New Spectrum Lead to DAS Upgrades and Decommissioning



Rick Rausch, south region sales engineering manager, Advanced RF Technologies. Photo by Don Bishop

Part Two — Vendors have to adapt and make their services and equipment adjust to the bandwidth and the technologies that wireless carriers deploy. Some older distributed antenna system (DAS) networks can't cope.

By Don Bishop

**A**t the Wireless Infrastructure Show in April, Advanced RF Technologies' south region sales engineering manager, Rick Rausch, talked about the need to replace equipment at cell sites. His experience goes back to the days of Advanced Mobile Phone Service (AMPS), Integrated Digital Enhanced Network (iDEN) and time-division multiple-access (TDMA) technology. "Since then, we realized that the kids that are in college today never even saw these technologies," he said. "It's a real tribute to the industry how fast we're developing. It reflects the focus of carriers to make a wireless world." ADRF provides in-building wireless communications equipment and services.

Rausch spoke at the session "Decommissioning Aging Cellular Infrastructure" led by Rich Berliner, the

chief executive officer of Red Wing Electric. He attributed some of the decommissioning activity to mergers among wireless carriers. His observation is that the larger carriers buy the smaller carriers as multiple operators merge to make a larger one. "We see so much of that in this business that everyone is trying to get the latest and greatest and provide the best things that they can to all of us as wireless users," he said.

Recalling mergers, Rausch said Sprint bought Nextel Communications with its iDEN technology, and Clearwire with its wireless microwave access (WiMAX) technology. T-Mobile USA, a subsidiary of Deutsche Telekom, merged with MetroPCS and bought SunCom Wireless. "I was a part of the SunCom acquisition," he said.

As carriers merge with and acquire

others, they end up with networks that weren't theirs originally. Rausch said that in order for the networks to change and adapt, they end up decommissioning towers, merging other tower locations with base stations and making their macronetworks that much better for coverage and capacity.

When carriers acquire more radio-frequency spectrum to use with their networks, that causes changes to be made, too. "Spectrum is gold," Rausch said. "Wireless carriers need more spectrum for more capacity to serve all of the users that are out there in the world. The older technologies can't handle that capacity. Because they need more and more people to be on their networks, those newer technologies allow more users in smaller footprints of the wireless carriers' cell site coverage."

Rausch said the wireless carriers

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influence the FCC, leading to changes in which communications services use which frequency bands. He said they influenced the FCC to push the 700-MHz band, the Broadband Radio Service band and the Wireless Communication Services band, bands that commercial wireless carriers weren't using 20 years ago when AMPS and iDEN and TDMA were in use.

Because the needs of wireless carriers are behind what companies that provide equipment for them to use support, vendors have to adapt and make their services and equipment adjust to the bandwidth and the technologies deployed. Rausch spoke of the need to upgrade base transceiver stations that every wireless carrier has at the base of every tower, the growing use of in-building wireless and outdoor distributed antenna system (DAS) networks, along with the use of small cells.

"In a capacity-driven wireless world, DAS is being driven by users' desire to have coverage in convention centers, hotels, hospitals and universities," Rausch said. "We need to have support of so many things not only with the wireless carriers, but also for public safety where the first responders need to use their wireless hand-

sets." He said all of these wireless services have aging infrastructure, that they all have to be migrated, and something has to be done with the previously installed equipment. "When I was working for one of the carriers, we actually sold our old TDMA equipment to a company that was reselling it to a third-world country," he said. "They took our old TDMA and they put it up in a South American country as a new technology for them."

For DAS, Rausch said supporting wireless carriers presents a challenging spectrum situation with 4G LTE, a much more efficient way of handling data for smartphones and the services carriers offer inside buildings and various venues. Existing frequency bands are being refarmed as the older PCS and cellular frequencies are being reused and migrated from 2G, 3G and 4G. "With DAS, we have to be flexible to support any technology on all of these bands," he said. "With the carriers, in public safety and with all of the support mechanisms that we have provide, whenever they're ready to shut off one, we have to be ready to bring up the other. We have to be agnostic with DAS."

Rausch gave as an example the tier-one carriers using all of the fre-

quency bands for multiple technologies. He said it requires considerable flexibility on the part of DAS providers to support LTE, GSM and CDMA on the same spectrum. "We have to be futuristic in our way of thinking," he said. "Whenever the technology of the DAS networks is being developed, the best way to handle what the carriers are doing is to make it ultimately completely flexible so all they need to do is add front-end and back-end equipment that will handle whatever is out there."

When it comes to decommissioning, Rausch said some of the older DAS networks weren't built with enough flexibility. They can't support 4G technology or the additional frequency bands. "The key aspect is the spectrum," he said. "If the spectrum can't be supported, then they would have to build a whole other DAS on top of the older DAS. When carriers are looking for a DAS platform, they have to be selective to ensure whatever is going to support them today will support them five years from now because with all of these Gs that we have, from 1G to now coming up to 5G, technology changes are going to continue."

DECOMMISSIONING

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September, Part One, Equipment: "How to Decommission Equipment on Cell Towers"

October, Part Two, Technology and Spectrum: "Carrier Mergers and New Spectrum Lead to DAS Upgrades and Decommissioning"

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# Three Steps Increase Network Capacity by 1,000 Times

For Qualcomm, the road to 1,000X the current wireless network capacity in 10 years involves more small cells densely deployed, more radio-frequency spectrum and newer ways of accessing spectrum and boosting network efficiency.

By Don Bishop

Qualcomm's director of technical marketing, Prakash Sangam, said that the purpose of 4G cellular communications technology was to make wireless networks more efficient and to give them what he called a fat pipe — a high bandwidth to carry more data traffic, such as video. Speaking to an audience at the Wireless Infrastructure Show in April, he said the use of Long Term Evolution (LTE) technology will continue for a long time, even after the roll out of 5G technology, because 4G and 5G systems will be used for different purposes. 5G technology will be used for critical wireless services that require low latency compared with LTE, which can have 30 to 50 milliseconds of delay.

In the session "On the Edge of the Data Tsunami" led by Don Bach, vice president of engineering at SAC Wireless, Sangam said that 5G would support applications that need immediate response, such as autonomous cars or remote surgery. 5G also would unify the radio interface to scale up to extremely

high data rates, probably based on orthogonal frequency-division multiplexing (OFDM). It would unify spectrums, which started happening with LTE unlicensed where the same technology uses high and low bands of spectrum going from millimeter waves and 60 GHz to 700 MHz, 600 MHz or even lower.

A unified, single radio interface working across these spectrums requires technology that works on licensed and unlicensed spectrum. Licensed spectrum offers a guaranteed quality of service because only one network operator can use it. Unlicensed spectrum is shared. Sangam said Qualcomm expects to have a way to use both in a seamless way.

Meanwhile, more complex business models for wireless service would replace the current, simple model in which there is a network operator and a user with a monthly or prepaid service contract, Sangam said. Business cases for 5G are for a variety of devices and a variety of use cases. A connected car or a self-driven car probably doesn't need



Prakash Sangam, director of technical marketing at Qualcomm.  
Photo by Don Bishop

constant connectivity, but when needed, it has to be right there with extremely low latency and high data rates. From Qualcomm's perspective, 5G would not represent doing more of the same, but instead would bring convergence, a unified network and a unified interface.

"Just to re-emphasize, it will not replace 4G," Sangam said. "We expect LTE to continue for a very long time, running in parallel. In many cases,

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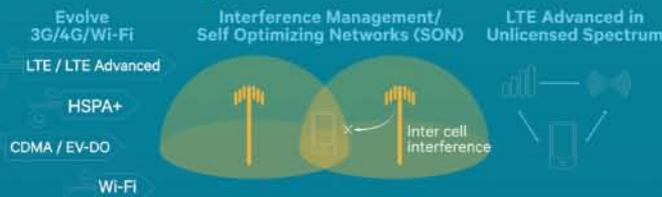
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many of these new innovations that we're talking about with 5G have started happening with LTE to some extent. In LTE Releases 13 and 14, something called ULL is becoming a part of low latency. And then with LTE unlicensed, you can actually do it with Release 10 in countries like the United States, Korea and China. But it's being standardized as part of Release 13 as well, which deals with license assisted access. So some of the innovations started with 4G, and 5G will take them to an even higher level."

### Data Surge

Sangam said that early on, Qualcomm saw a huge surge of data coming. It was more than three years ago when the company started campaigning internally and externally for what it called 1000X. The premise was an annual doubling of data consumption. Doubling each year for 10 years equals a multiplier of 1,024 or about 1000X.

"That's specifically how we came up with the 1000X challenge, first to come up with a vision and then to develop solutions that will increase network capacity by 1,000 times," Sangam said. "Many of the solutions now are graduating from concept to prototyping, testing and being ready to be commercially deployed."

The vision had three parts. The best of the vision was many small cells deployed in a highly dense way. The small cells would be everywhere people use their smartphones and all other wireless devices in residences, offices and enterprises whether indoors or outdoors. The small cells not only would be deployed by the network operators, but also by users. And in many cases, the small cells would



Qualcomm tested UltraSON, a self-organizing, self-optimizing network with Sprint in a trial network in the Phoenix International Raceway with more than 30 cells with a density equivalent to a thousand small cells in a square-kilometer area.

support Qualcomm's 3G, 4G and Wi-Fi.

"The key challenge was how to deploy them densely," Sangam said. "If you have lots of sites, small cells, in this case in a very closed area, there's so much interference you hardly get any capacity improvement by adding more and more. Addressing the interference and making sure they work together in a dense environment was very important. We developed many solutions that make that happen."

The second part was more spectrum. To get access to more spectrum, Qualcomm brought in innovations such

as licensed shared access (LSA), which involves using spectrum already assigned to somebody else via 3G or 4G.

And the third part was increasing efficiency across the network, not only on specific components, but also the network efficiency as a whole should be increased by two to four times.

### Interference

Using densely placed small cells poses a challenge not only to overcome interference but also to avoid the need for optimizing as would be done with a macro network. With thousands and



thousands of small cells, sending a technician for optimization or to conduct a drive test would be too expensive. Qualcomm developed what it calls UltraSON, self-organizing network techniques that also self-optimize.

“We tested UltraSON with Sprint in a live network, what at the time was one of the densest networks in the world,” Sangam said. “It was a trial network in the Phoenix International Raceway, a NASCAR arena. We had more than 30 cells where the density was so close, the density was equivalent to a thousand small cells in a square-

kilometer area. We demonstrated the self-organizing capabilities and an exponentially increasing data rate and managed interference with many techniques to increase the performance.”

### Licensed Shared Access

It can take many years to clear a spectrum and then auction it for network operators to use. Qualcomm used what it calls authorized shared access (ASA) or licensed shared access (LSA) as part of the FCC’s release of 3.5-GHz spectrum. Sangam gave an example of LSA with spectrum assigned to the U.S. Navy

for nationwide use, but most of the time, the Navy uses the spectrum only on the coast. The Navy and 3G and 4G operators formed an agreement to let 3G and 4G operators access it.

LSA differs from unlicensed spectrum that anyone can use at any time. With LSA, 3G and 4G operators can use the spectrum on a geographic or time basis with full control of the spectrum as part of their own networks in the 3.5-GHz band.

Last year, Qualcomm introduced the third part of 1000X, network efficiency. Sangam said it drew a lot of attention at the Mobile World Congress this year. Qualcomm uses LTE in the 5-GHz Unlicensed National Information Infrastructure band. It is possible to use the LTE waveform and have an LTE network using 5-GHz unlicensed spectrum with the help of carrier aggregation. According to Qualcomm, carrier aggregation combines carriers at the device to increase the user rates across the cell coverage area, be it close to the cell or at the edges. In the first step, the carrier aggregation is only in the downlink and is across two 10-megahertz carriers, doubling the data rates for all users in the cell.

“You’ll have an anchor in the LTE licensed frequency band coming from a small cell or a macrosite,” Sangam said. “Then you aggregate LTE working on 5-GHz unlicensed spectrum. In this way, operators and users get a fat pipe, and they’ll be able to use the unlicensed spectrum in a seamless way and provide software to increase capacity.”

Sangam said Qualcomm saw the data tsunami coming early on. “We set the vision,” he said. “We developed solutions and are trying to bring them to market. Some of them are very close to market now.”

# How the FCC Wireless Infrastructure Order Clarifies Tower Regulation

Eligible facilities requests under Section 6409 and how the shot clock pertains to wireless facility permit applications are among matters that the FCC defined for the wireless communications industry.

By Don Bishop

**A**ndy Rotenstreich, an attorney and shareholder with the Baker Donelson law firm in Birmingham, Alabama, led a session about the FCC's 2014 Wireless Infrastructure Order during the Wireless Infrastructure Show earlier this year.

In 2012, President Barack Obama signed into law the Middle Class Job Creation and Tax Relief Act, which contains helpful language for the wireless infrastructure industry, Rotenstreich explained. Section 6409(a) covers wireless facilities deployment and generally prohibits local jurisdictions from denying collocations and modifications to existing telecommunications structures if certain criteria are met. Because there is some confusion about the exact meaning of some of the language of 6409(a), in October of 2014, the FCC issued a ruling and an order that defines some of its terms. In particular, the session covered shot clock provisions and eligible facilities requests (EFRs).

## Antenna Collocation

Section 6409(a) applies to all FCC activity dealing with wireless, including the structural enhancement or hardening of structures but not the replacement of existing towers. Thus, antenna site developers have an opportunity to use the Act when adding collocations on existing telecommunications structures, but it may not apply to drop-and-swap installations that replace existing structures. It doesn't apply to alternative support structures such as previously existing church steeples without antennas, and it doesn't apply to utility poles not already used for wireless, such as power poles not in the right of way that do not have telecom equipment on them.

One of the terms in 6409(a) that Rotenstreich said needed defining is "base station," and in its order the FCC defined it as the radios in general.

## Defining Substantial Change

Liz Hill, director of state and local government affairs for American Tower,

said most questions about Section 6409(a) coming from local government have to do with the definition of a substantial change in reference to how much a collocation or modification might widen a tower's profile or increase its height. The FCC established an objective standard and detailed what a substantial change does and does not include. For towers outside of the right of way, which includes most structures in the tower companies' inventories, Hill said the limit is 10 percent. "I call it the 10 percent/20-foot rule," she said. "It's a little more refined than that. But the FCC's definition basically allows a tower height increase of 10 percent or 20 feet, with some limitations."

Section 6409(a) allows the tower profile to expand as much as 20 feet from the edge of the tower. "For those of you who live and breathe the world of the National Environmental Policy Act and the Nationwide Collocation Programmatic Agreement, that would sound familiar," she said. "The FCC took that language from that document."



**Liz Hill**, director of state and local government affairs for American Tower.

For towers in the right of way and for nontower structures, the limit is a height increase of 10 percent or 10 feet with a 6-foot horizontal spread.

### No Blooming Towers

Meanwhile, the starting point has been defined for towers that existed before the Act became law as the height of the towers as of the date of the Act. For towers built since then, it's their original height.

"The tower can't continue to grow," Hill said. "It's been called the blooming tower problem — it's going to be 10 percent, and then another 10 percent, and then another 10 percent. The FCC said no. There's a starting point, and then you get an envelope of 10 percent or 20 feet. You can modify the tower incrementally if you want. You can do it 2 feet at a time if you want. There's an envelope past which you cannot go. It's not a blooming tower. This is familiar to those who deal with the NPA and the installation of more than the standard number of cabinets — no more than four. You cannot excavate outside of the existing site."

Hill said that although the FCC order doesn't provide for excavating outside of the site, expanding the compound



**Yejin Jang Cooke**, associate legislative director, National Association of Counties.

could be protected under state statute.

Rotenstreich said when Section 6409(a) first came out, the industry was on the side of saying it could extend a tower by 10 percent or 20 feet with every application. It could turn a 100-foot tower into a 200-foot tower over time by adding carriers that wanted higher elevations for their antennas. After a tower has been extended by 10 percent or 20 feet under Section 6409(a), Section 6409(a) will not apply to the next carrier wanting to raise it another 10 percent or 20 feet. To do that will require looking at another alternative.

Meanwhile, Rotenstreich said some thought jurisdictions might rewrite portions of their ordinance in response to Section 6409(a) to reduce the common maximum height for a tower from 199 feet to 179 feet so the 20-foot increases allowed under Section 6409(a) would only bring the tower up to the maximum height the jurisdictions already had in mind.

"We've seen this in North Carolina," Hill said. "North Carolina was on the front edge because they adopted their statute right after the Act was passed. That's something to watch for. As you're dealing with ordinance changes, you may see height limitations for new



**Andy Rotenstreich**, attorney and shareholder, Baker Donelson law firm.

towers drop by about 10 percent or 20 feet. The jurisdictions are thinking about it as the new tower plus the insubstantial change. So they're sort of baking Section 6409(a) in — just something to keep in mind."

Some jurisdictions might ask applicants to sign away their Section 6409(a) rights in exchange for an initial permit, and Hill said she wasn't sure whether any applicants would agree to that, but they could. Rotenstreich said it could depend on how loaded the tower is. "If you already have most of the major carriers on the tower, the likelihood of making a concession like that might be higher," he said. Hill said she doubted a tower owner would agree to it on day one on a new tower "because you don't know what's going to happen. You might need that 20 feet."

### Preexisting Conditions

Meanwhile, if the modification would defeat existing concealment elements, it would not be protected by Section 6409(a). But changes that do not comply with preexisting conditions unrelated to elements that the FCC defined are protected, so if a tower has a condition of zoning approval saying it can only be 150 feet tall, then the named condition in the approval does not prohibit a

height increase, but the site still would have to comply with the other conditions of approval — landscaping or the character of the cabinets, for example.

### Requiring Permits

According to Hill, something that was unclear in the interim between the statute and the order was whether or not jurisdictions could ask for a permit application for the modification. The FCC said yes, they can still require permits. She said they can require a permit, but they don't have to. Also, building codes still apply.

The order limits what the jurisdictions can ask for during the application process to information necessary to determine whether the site is an eligible facility. Other information, such as having to prove RF need, can't be required for an EFR.

Jurisdictions have 60 days to approve applications, a shorter period than the 2009 shot clock provides. If a jurisdiction doesn't act in 60 days, the application is considered to be deemed granted. In order to claim deemed granted status, the applicant must send a letter saying, "It is day 61, and you have not ruled on my application. It is an EFR, I am therefore deemed granted." According to Hill, if the applicant doesn't send that letter, the application is not deemed granted.

Then a 30-day period follows during which the jurisdiction can challenge the qualification for an EFR in court.

### Clarifying the Shot Clock

Another benefit of the FCC order was to clarify aspects of the 2009 shot clock. Hill drew a distinction between the shot clock, which applies to new towers and that gives 90-day and 150-day time-

lines, and the EFR timeline, which applies to modifications and collocations.

"First of all, the shot clock doesn't apply to all FCC-authorized activity," Hill said. "It was an interpretation of a specific section of the Telecom Act, so it applies to those services that are authorized under that section of the Act. The 6409(a) section has much broader application. It applies to all FCC-authorized activities, so a much larger group of potential applicants can claim protection."

### Complete Application

Hill said the FCC order clarified some of the interim key parts of the 90/150 timelines, or what happens in the middle. "The clock starts when the application is filed, whenever the jurisdiction officially takes the application, not when the jurisdiction says it's complete," she said. "When someone files the application, the jurisdiction has a period in which to say whether the application is complete. But the clock starts on day one, and then they have 30 days to tell you what's missing in the application."

The FCC order addressed whether the clock could stop and start, as when a jurisdiction notifies an applicant that the application is incomplete. Hill said that some applicants experience a back-and-forth process in which the applicant provides a missing document and the jurisdiction says, "No, that's not what we wanted, we wanted something different."

"The FCC clarified what should happen during that process," Hill said. "First, when the jurisdiction gives the applicant a notice of incompleteness, now it has to list everything that's missing. They can't come

back later and add something new to the list. Also, they have to tell you what to include in the application."

The requirements must be publicly available; they can't be hidden in someone's desk, Hill explained. The requirements must be in an ordinance, on a website or on a sign at the town hall. The applicant has to have notice of what the jurisdiction is expecting before the jurisdiction can claim the application is incomplete because something is missing and stop the clock. "They can tell you they want it, but the request won't stop the clock unless they told you in advance that it was required for the application," Hill said.

### Deemed Granted

Rotenstreich said he saw a collocation application filed with a city that didn't respond within 60 days, so the Section 6409(a) shot clock expired. The wireless carrier decided that the application was deemed granted, so it sent the city a letter that said 60 days had passed, and the carrier would proceed with deemed granted authority. The city did not respond.

"Thus, you have a tower company that is looking to the applicant, the carrier, to provide documentation that it met local zoning requirements, but if the city doesn't provide anything, where are you?" he asked.

Hill said that sometimes tenants tell American Tower that no permits are required for their projects. "If they're claiming they're deemed granted, we'll ask for a copy of the deemed granted letter, which must have the language referring to Section 6409(a)," she said. "At that point, it becomes a business decision for American Tower. Do we agree that the application is deemed

granted? Will we allow an installation without a permit? We may ask the customer whether the city is not going to issue a permit or whether it just needs another few days. But what we will be looking for is the deemed granted letter. For vendors, that's the message. If you want to claim protection of Section 6409(a), we'll have to have that letter."

### Eligible Facilities Request

When local governments receive a deemed granted letter, Hill advised they should not hesitate about responding. She said when local governments look at the materials the applicant provides, it should be a gateway to evaluating whether the application represents an eligible facilities request. If it is an eligible facilities request, it should be given a building permit. Normally, a building permit is issued within 60 days, or the applicant is told that no building permit is required.

"Many applications are going to be eligible facilities requests where no permit is required under the building code," Hill said. "You may not even need an electrical permit. Then, we would be dealing with a no-permit letter from the applicant and not a deemed granted letter. The answer would be that the jurisdiction doesn't require a permit for this type of application." Hill said she expects that tower companies would be dealing with more of that type of response than with deemed granted applications. "I believe deemed granted is going to be a very narrow population," she said.

Rotenstreich said the FCC order outlines the steps when it says the jurisdiction has time to appeal when it receives a deemed granted letter. Then the applicant can file an action to force the

jurisdiction to issue a permit. "Sometimes you actually need a piece of paper in order to move on to the next stage," he said. "Sometimes you need a copy of the electrical permits so they'll drop your meter or whatever. If the applicant needs a permit, they can file a lawsuit in order to force the jurisdiction to issue a permit so they can move forward. The order actually spelled those options out. So if you hit the 60 days, those are the things that happen if you send your deemed granted letter."

### Original Documentation

Section 6409(a) requires that a tower comply with any conditions imposed by the original zoning approval before the section's provisions can be used to increase the height of the tower. Rotenstreich said he has seen at least one outside consultant to local jurisdictions require that the applicant provide the original documentation to demonstrate compliance with the original zoning conditions.

He said that it may not seem as though it would be difficult for a tower company to provide restrictions issued when the tower was granted, but with towers changing hands as many times they do, not all documentation passes to the most recent purchaser of that tower. The jurisdiction should have the information in its files, but the jurisdictions may respond that if years have passed, it may not have the information readily available. "If a consultant is requiring the applicant to produce that original documentation, what does that do and how do we try and deal with that situation?" Rotenstreich asked.

### FOIA Request

Another participant at the session,

Yejin Jang Cooke, associate legislative director, National Association of Counties, said Albemarle County, Virginia, has considered the situation and is likely to suggest the applicant submit a Freedom of Information Act request, pay the fee they've calculated as the cost to provide copies, and then the applicant would receive what it requested.

Hill said she liked the Freedom of Information Act request idea. "It should only have to be done once, because after the jurisdiction has the documentation in one file, the next tenant to file an application could refer to it," she said.

The evolution of ordinances through the years compounds the problem with older towers that may have been built when the ordinances were less complex, Hill said. A building permit issued at the time may refer to the ordinance. If the ordinance was changed many times, the applicant could be faced with sorting out which version of the ordinance was in effect when the tower was approved and then submit that version with the application. "It starts to get a little bit complicated," she said.

### Compliance

Hill pointed to the local government's interest in the information, which is making sure that the tower is in compliance. If there's a violation, the tenant's application itself doesn't create the violation, according to Hill. The only thing that disqualifies the application is an existing violation on the tower. In that case, the tower was already out of compliance on the date of application, and the local government has police power to handle the violation outside of the application process.

“Nevertheless, some jurisdictions are going to say, ‘I want a copy of absolutely every permit that was ever issued for this tower,’” she said. “We’re going to see that again.”

Rotenstreich said if consultants are involved in driving jurisdictions to make these demands in an effort to hold up the process, that’s the main issue to address. “I’m not so sure I would see a lot of jurisdictions on their own forcing that issue,” he said. “But we were concerned with consultants, and having heard that it was being done in one jurisdiction, we were concerned about whether it might spread.”

### Monopines

In discussing conditions imposed on the original zoning approvals, the participants mentioned that jurisdictions are becoming less enamored with towers disguised as pine trees than they once were. Rotenstreich said disguises, especially the trees, deteriorate with time. “Eventually, they no longer look like trees,” he said. “Jefferson County,

Alabama, no longer allows monopines to be defined as stealth. They don’t want to deal with them anymore.”

Hill said some cities in North Carolina are considering reclassifying towers to say a monopine is not considered to be disguised anymore, and applications for monopines won’t receive the streamlined process that other disguised towers receive. She said the question is whether they still qualify under Section 6409(a) if the jurisdiction reclassifies the tower in its code.

“I think the language of the order will protect collocations on monopines because they were designed to look like something other than a wireless facility,” she said. “The question is whether the modification qualifies or whether it defeats the effect of the stealthing. You may have to re-branch the tree to screen the collocation. If the jurisdictions believe that they’re going to be able to declassify collocations on monopines, that’s going to be tricky under the language of the order because the order is specific that

as long as the structure or facility was designed to look like something other than a wireless facility, that’s what stealth is. Then it just becomes a question of maintenance.”

### Visual Profile

Hill said sometimes it makes sense for applicants for new towers to let jurisdictions know that a monopole has a lower visual profile than a monopine. “Point out to them that a monopine is wider, so from a distance, unless monopines have absolutely a phenomenal role to play in the deployment in certain areas — in rolling hills that are wooded — a monopine in a field is not going to work very well. Just let us build the monopole.”

She said it’s the tower companies’ and the wireless carriers’ responsibility to educate local governments about changes in the wireless industry. “It’s on us to educate them about stealth and the differences between the types of applications and the positives and the negatives,” she said. “For example, canister-style towers are not great for upgrades. Local governments need to know that if they require a flagless flagpole, it may mean that the customer can’t upgrade to the next generation of technology because they can’t fit their antennas inside the canister.”

Rotenstreich said that, to him, zoning hearings are like explaining rocket science to fifth graders in three minutes. “It’s not because the folks that sit on the board are not smart,” he said. “It’s just because they don’t know the industry, and we have to explain it to them. And we have to explain to them why something may not be a good idea.”

*Photography by Don Bishop*

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**WIRELESS CARRIER**

ENTEL

**YEAR CONSTRUCTED**

2014

**LOCATION**

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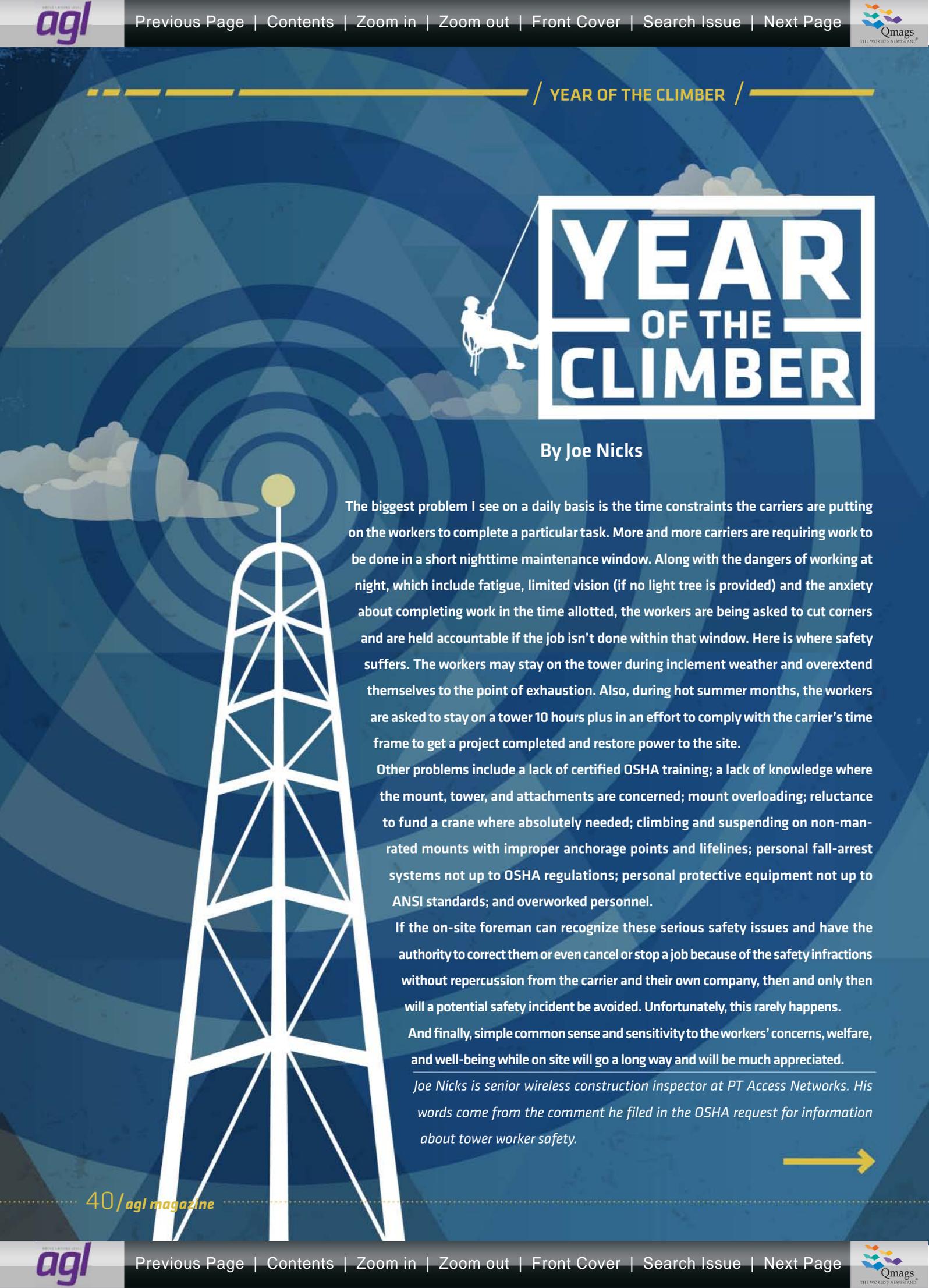


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A stylized illustration featuring a person in silhouette climbing a rope that extends from a white rectangular box containing the title. The background consists of concentric circles in shades of blue and green, suggesting a target or a path. To the left, a white lattice tower structure is visible, topped with a yellow circle. The overall theme is climbing and reaching a goal.

# YEAR OF THE CLIMBER

By Joe Nicks

The biggest problem I see on a daily basis is the time constraints the carriers are putting on the workers to complete a particular task. More and more carriers are requiring work to be done in a short nighttime maintenance window. Along with the dangers of working at night, which include fatigue, limited vision (if no light tree is provided) and the anxiety about completing work in the time allotted, the workers are being asked to cut corners and are held accountable if the job isn't done within that window. Here is where safety suffers. The workers may stay on the tower during inclement weather and overextend themselves to the point of exhaustion. Also, during hot summer months, the workers are asked to stay on a tower 10 hours plus in an effort to comply with the carrier's time frame to get a project completed and restore power to the site.

Other problems include a lack of certified OSHA training; a lack of knowledge where the mount, tower, and attachments are concerned; mount overloading; reluctance to fund a crane where absolutely needed; climbing and suspending on non-man-rated mounts with improper anchorage points and lifelines; personal fall-arrest systems not up to OSHA regulations; personal protective equipment not up to ANSI standards; and overworked personnel.

If the on-site foreman can recognize these serious safety issues and have the authority to correct them or even cancel or stop a job because of the safety infractions without repercussion from the carrier and their own company, then and only then will a potential safety incident be avoided. Unfortunately, this rarely happens.

And finally, simple common sense and sensitivity to the workers' concerns, welfare, and well-being while on site will go a long way and will be much appreciated.

*Joe Nicks is senior wireless construction inspector at PT Access Networks. His words come from the comment he filed in the OSHA request for information about tower worker safety.*



# Verizon Wireless Speaks Up About Tower Worker Safety

Verizon Wireless explains its contractual relationships that affect safety. Edited for length and style, the following information comes from the Verizon Wireless comment in the OSHA proceeding about tower worker safety.

By Margaret M. Salemi

Verizon Wireless provides wireless service to end users throughout the United States. In providing this service, we have equipment on towers. We own some of these towers, although in many instances, Verizon Wireless equipment is placed on towers or structures owned by others. The maintenance of existing towers and the construction of new towers are necessary to ensure a vital telecommunications network that not only allows people to communicate, but also supports vital 911 and other emergency services.

OSHA has recognized that the construction and maintenance of such towers is highly specialized work. Because Verizon Wireless does not have special expertise in the design, construction or maintenance of towers, it endeavors to engage parties with this expertise. Just as Verizon Wireless does not have architects to

design or construction crews to build its own stores or offices, it does not engineer or build the towers upon which its equipment is placed. Instead, it relies on experienced companies that can use skilled people for each specialized job function to do so.

Verizon Wireless supports OSHA's desire to make tower work safer. We

*“With the exception of a spike in 2013, OSHA's tower-fatality data shows a generally improving trend.”*

particularly support government and industry collaboration efforts to develop standards for tower worker training, development and certification. Verizon Wireless hopes that its comments will help OSHA take constructive steps to improve tower worker safety without inadvertently creating requirements that conflict

with or confuse established standards or hamper adoption of improved safety technology in the future.

## Incident Trends

Without question, improving safety is always an important objective; no one wants any tower fatalities or injuries. Thus, the industry continues to seek ways to further improve cell tower worker safety, and those efforts appear to be helping. With the exception of a spike in 2013, OSHA's tower-fatality data shows a generally improving trend. This apparent decrease in total fatalities over time has been achieved despite an approximately three-fold increase in the number of tower workers today compared with 10 years ago. More data is needed before quantitative conclusions can be reached. But from the data available, it is clear that the total number of fatalities is, at a minimum, not increasing over time and that fatality

/ YEAR OF THE CLIMBER /

rates are significantly diminishing. This data indicates that the industry efforts should not be sidelined, but instead OSHA should work with the industry organizations to further improve the current industry efforts to achieve the goal of an incident-free workplace.

### Existing Standards

A number of organizations have been actively addressing tower climbing, construction and maintenance safety concerns. There are industry standards, both existing and under development, that address communications tower safety. To the extent possible, Verizon Wireless encourages OSHA to work with these organizations instead of attempting to independently develop new requirements that may inadvertently undercut or impede current safety efforts.

In addition to promoting worker apprenticeship and certification efforts, Verizon Wireless encourages OSHA to consider the standards of the Telecommunications Industry Association. Current standards include:

- TIA 222-G Structural Standard for Antenna Supporting Structures and Antennas
- TIA 1019-A Standard for Installation, Alteration and Maintenance of Antenna Supporting Structures and Antennas

When considering the need for any regulation, OSHA also should take care not to stifle development of new standards (such as TIA 322 and the American National Standards

Institute A10.48) or to impede any technological improvements.

### Complex Business Relationships

OSHA has described what it calls complex business relationships in tower construction and maintenance, suggesting that this complex structure poses unique challenges to safety. These business relationships are not, in fact, complex or out of the ordinary. Instead, the business relationships and the placement of responsibility for worker safety in the construction of towers are basically identical to the business relations

*“ Wireless carriers have a core competency in designing and maintaining wireless networks. They are not experts in constructing or maintaining towers. ”*

and the placement of responsibility in the general construction industry.

When Verizon Wireless requires a tower to be constructed or work to be performed on a tower, it typically hires a general contractor. Although Verizon Wireless does not use turfing vendors as that term is described by OSHA, the general contractors often hire subcontractors to perform some of the work, including what OSHA acknowledges to be highly specialized work. However, there is nothing unsafe about this practice. In this way, tower construction is fundamentally no different than any other construction work. When a building is constructed, it is not at all

unusual for the prime contractor to hire landscapers, masons, plumbers, electricians and any number of other specialists to help build the structure.

Wireless carriers have a core competency in designing and maintaining wireless networks. They are not experts in constructing or maintaining towers. Thus, Verizon Wireless cautions against OSHA taking steps that interfere with the ability of wireless carriers to hire contractors with the expertise to oversee the construction, maintenance and other activities that take place on towers. It is important that the expert tower

design, construction and maintenance contractors, and not the generalists, determine the necessary actions and precautions and that the experts be held accountable for safety related to their actions. OSHA's efforts would be better placed on initiatives to standardize the skills, training and experience that should be possessed by quality contractors and their employees and to ensure that the information is available and clear to all parties in the contracting process.

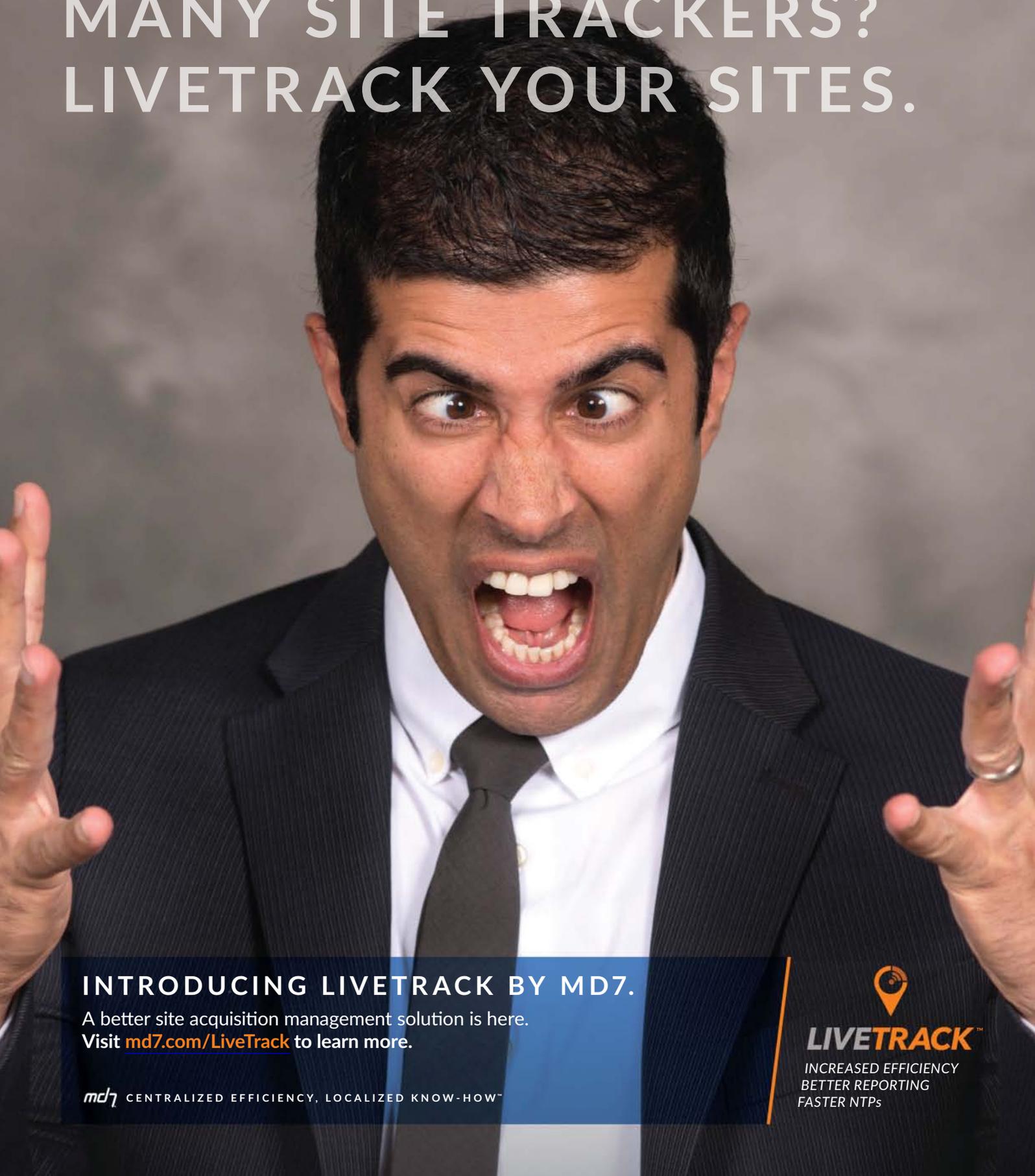
### Training and Certification

OSHA asked whether there is a need for a standardized, industrywide training and certification program. For employers that contract out work, it asked what contract language or oversight mechanisms are used to ensure that work is done by trained or certified workers.

Verizon Wireless endorses recognition of industrywide training or certification standards. We are encouraged by the efforts of the

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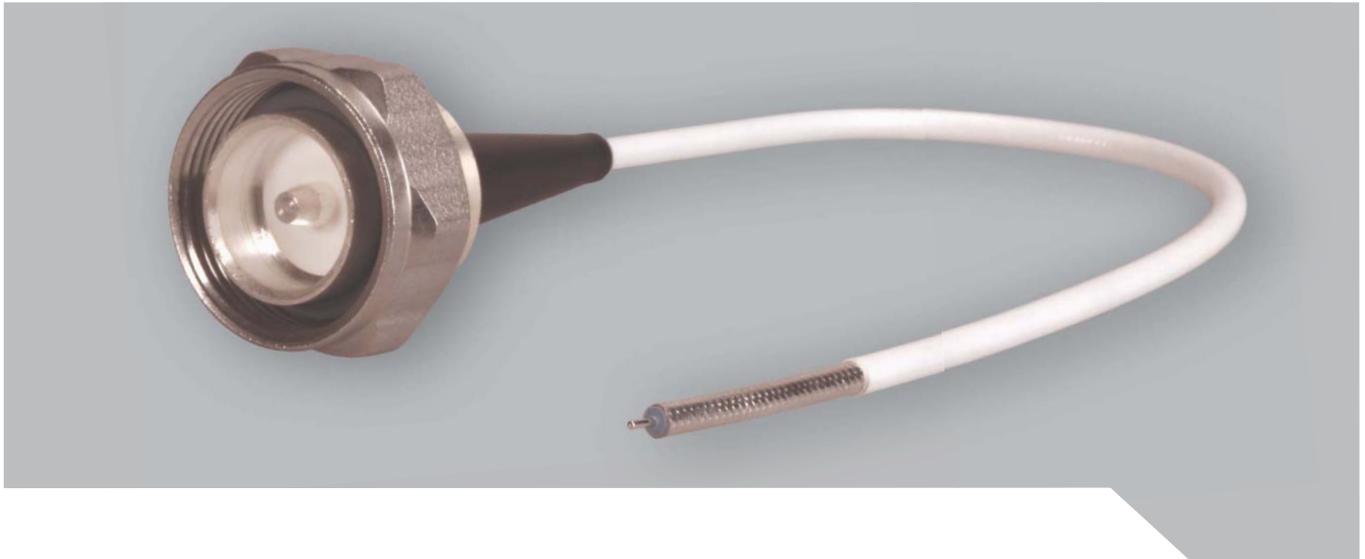
Telecommunications Industry Registered Apprenticeship Program, the National Association of Tower Erectors and others to standardize training, development and certification with a readily identifiable mechanism such as an independent licensing or certification board. A consensus on appropriate levels of training or required experience would assist everyone in efforts to ensure that contractors use only properly trained employees.

Verizon Wireless's contracts require all contractors to meet all safety requirements and to take responsibility for the safety of their employees. A failure of a contractor to hire qualified employees or a failure

of a contractor to act responsibly to ensure its employees' work safety is a contract violation that could result in a number of contractual remedies, including contract termination or a loss of further business. Additionally, Verizon Wireless considers safety performance and capabilities of contractors along with the contractors' ability to provide quality service and build quality towers. Verizon Wireless reviews accident rates, the existence of safety programs and employee training and other factors in making its selection decisions. However, not being experts on tower construction, Verizon Wireless relies on the contractors to determine the content and extent of the required

training for each task. Development of industry standards for training or certifications necessary for a contractor's employees to work safely would assist wireless carriers such as Verizon Wireless in assessing contractors.

Any training standard should adhere to some basic principles. To be effective any standard must draw on the experience and knowledge of the tower worker community. Verizon Wireless lauds OSHA's attempt to do just that. A new standard must recognize that there is a considerable base of trained, qualified workers. It should address training or apprenticeship for new workers as well as documenting the qualifications of experienced workers. Any required



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training should include a rational, phased implementation, particularly with regard to existing tower workers. Unnecessarily taking qualified workers out of the market until they complete training would lead to a reduced workforce and could lead to overworking the remaining workers, with potential negative effects on safety.

### Structural Issues

OSHA asked 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. It asked what steps employers are taking to prevent collapses.

Verizon Wireless and, we believe, the industry in general rely on TIA standards for tower structural integrity.

Under those standards, responsibility for structural work is shared between the qualified structural engineer and the general site contractor. The engineer is responsible for designing a tower that is structurally sound, and the general contractor is responsible for building to the engineer's specifications. When equipment is added to a tower outside of its documented design capabilities, the tower is again subject to review by a structural engineer who will specify any necessary structural changes. This is similar to the general construction industry where it is common for an architect to design a building and then a general contractor to actually build it.

On Verizon Wireless projects, the structural engineer provides written plans in advance of any structural work. Those plans are used by the

general site contractor. Typically, the structural engineer is available on call to the site contractors should questions arise during any construction or modification.

Also under TIA 222-G, tower owners arrange a structural inspection of towers by experienced contractors at least every three years for guyed towers and every five years for self-supporting structures. Identified issues are addressed, and relevant information is provided to parties performing work on the towers.

### Hoisting Materials and Personnel

OSHA asked what are the roles of different levels of the contracting chain in managing rigging and hoisting activities.

Verizon Wireless seeks to hire contractors with the requisite skills and

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expertise and has contracts in place that require this work to be performed competently and in compliance with all applicable safety requirements. Verizon Wireless considers established TIA standards and their requirements for rigging plans in contracting tower work. We specify conformance with the requirements of TIA 1019-A regarding rigging plans in the contracts, but otherwise defer to the expertise of the tower contractor. Verizon Wireless considers safety performance in the selection of contractors. To the extent that OSHA or other industry consensus standards require specialized certification or training for anyone involved in the rigging and hoisting activities, such requirements would be made part of Verizon Wireless's contractor hiring decisions and would be welcome by Verizon Wireless, providing that such requirements are developed in consideration of Verizon Wireless's comments about training and certification.

### Radio Frequency Hazards

OSHA asked what methods employers used to protect workers from overexposure to RF. It asked whether there is a need for employers to institute comprehensive RF monitoring programs on communications tower worksites, and if so, what a good program would look like.

Verizon Wireless has practices designed to address RF exposure and requires contractors to have the same. The FCC has an open proceeding on RF requirements. Instead of developing perhaps conflicting requirements, Verizon Wireless encourages OSHA to participate in the open FCC rulemaking on RF matters.

### Contracting and Work Oversight

Verizon Wireless takes safety in tower contracting seriously. We typically let contracts for each project through a competitive bidding process. Prior to bidding on communications tower work for Verizon Wireless, a vendor is prequalified through a due diligence process associated with the granting of a general services agreement. In addition, the general services agreement requires compliance with applicable employee safety and health rules as well as industry standards for tower work safety.

Safety and regulatory compliance is a contractual obligation of every contractor and subcontractor on all Verizon Wireless projects. Generally, oversight is provided by our qualified prime contractor, because under Verizon Wireless contracts, contractors are responsible for the performance of their subcontractors. Additionally, if Verizon Wireless becomes aware of a safety-related contractual violation, it has taken a variety of steps, depending on the nature of the violation, to address the noncompliance, including stopping work and removing the noncompliant individual or contractor from the job.

### Tower Design

If technical standards are adopted in response to the OSHA inquiry, they should adhere to some basic principles. Any tower design rules should incorporate existing industry standards wherever available. Incorporating existing standards will help to ensure both familiarity and uniformity between existing and new structures. Any standards should recognize the diversity of tower structures. Safety precautions are likely to work differently on

a lattice tower than they would on a monopole, a multipurpose tower or a unique structure built to conform with local aesthetic requirements. Any technical standards should not be so rigid as to preclude future technological improvement and new innovations.

### Regulatory Approaches

The most effective approach to address tower safety concerns is for OSHA to help existing associations and organizations develop standards, training and certifications that relate to tower climbing, tower construction and tower maintenance. The existence of OSHA-recognized standards for worker training and certification could be used to help evaluate and select vendors.

### Nonregulatory Approaches

OSHA should continue to support the development and adoption of voluntary industry safety standards. OSHA also should continue publicizing tower safety information and industry standards and best practices as these are developed. OSHA can work with trade associations to implement codes or certifications.

### Conclusion

Verizon Wireless supports OSHA's stated goal of making tower work safer and strongly supports those steps that will assist carriers in selecting appropriate contractors. This can best be accomplished through cooperative industry efforts, many of which already exist or are under development.

*Margaret M. Salemi is executive director of network engineering, operations support and compliance at Verizon Wireless.*

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# Investigation Results Detail Risks to Tower Workers

For NIOSH, it's all about investigation results. Edited for length and style, the following information comes from the National Institute for Occupational Safety and Health's comments in the OSHA request for information about tower worker safety.

Submitted by Dr. Paul Schulte

**T**he National Institute for Occupational Safety and Health supports the effort of OSHA to prevent injuries and fatalities during tower work.

The NIOSH Fatality Assessment and Control Evaluation (FACE) program completed 17 investigations of telecommunications tower-related fatalities from 1990 through 2010 in Colorado, Missouri, Nebraska, New Jersey and New York. The investigations looked at what employers did to identify and control hazardous conditions. The investigation reports reveal that employers addressed fall hazards through many means. Of the employers in the 17 incidents, 12 had written safety and health programs, and the remaining five had on-the-job training or tailgate safety meetings.

Specific training on fall prevention and safety was reported in only one case, in 1997, where safety topics covered rigging safety, climbing safety and first aid. The company for

this investigation also had a policy of three-point contact at all times if not tied off. In another investigation in 2005, the employer was a member of the National Association of Tower Erectors and was one of the four companies that wrote the initial guidelines for tower erection safety. The employer in the 1997 investigation managed a comprehensive and detailed safety program on the project that addressed employee hazards. However, the incident occurred in spite of these policies, showing the need for employers to continually remind all employees to follow established safety rules and procedures at all times.

Although written safety and health programs were in place in most cases, the incidents suggest employers, workers, tower owners, tower manufacturers and wireless service carriers may not fully appreciate or recognize the serious hazards associated with construction and maintenance of

telecommunications towers. Employers, workers, tower owners, tower manufacturers and wireless service carriers need to follow safe work procedures that include 100 percent use of fall protection. In 2001, the investigations identified the following contributing factors in fatal falls from telecommunications towers.

- Hoist failures
- Hoists not rated for personnel hoisting
- Truck-crane failure
- Inadequate fall protection
- Failure to attach the lanyard to the tower
- Terminal devices on the lanyard that are not compatible with tower components
- Attachment of lanyard to unstable tower components
- Failure to ride the hoist line under prescribed conditions
- Inadequate worker training
- Potential worker fatigue

- Repetitive strain

NIOSH recommends that employers and workers comply with OSHA directives, maintain equipment and take measures to prevent injuries and deaths when constructing or maintaining telecommunications towers.

Information in the 2001 NIOSH telecommunications tower construction and maintenance alert still reflects the current hazards, and the recommendations provide guidance for preventing fatalities. NIOSH recommends that employers:

- Ensure that hoisting equipment used to lift workers is designed to prevent uncontrolled descent and is properly rated for the intended use.
- Ensure that workers use 100 percent fall protection when working on towers at heights above 25 feet.
- Provide workers with a 100 percent fall-protection system compatible with tower components and the tasks to be performed.
- Ensure that gin poles are installed and used according to the specifications of the manufacturer or a registered professional engineer.
- Ensure that tower erectors are adequately trained in proper climbing techniques, including sustaining three-point contact.
- Provide workers with OSHA-required personal protective equipment and training in its proper use.

- Ensure that workers inspect their equipment daily to identify any damage or deficiencies.

- Provide workers with an adequate work-positioning device.

In addition, NIOSH recommends that employers of telecommunications tower workers provide worker training on hazard recognition and safe working procedures associated with the specific tasks to be performed at each tower site. Employers should also provide workers with task-specific training based on a job hazard analysis at each jobsite.

*“ NIOSH recommends that telecommunications tower owners obtain a complete structural analysis (with a corrosion test) to confirm structural integrity before contractors work on a tower. ”*

### Fall-protection Equipment

In 12 of the 17 FACE investigations, employers reported providing fall protection to their workers, such as full body harnesses with saddle belt and three 6-foot nylon rope lanyards, wire rope sling and positioning lanyard, full body harness with two lanyards, wire rope sling and positioning lanyard, full body harness with two lanyards, and saddle-style positioning belt. However, in some cases, the fall protection may not have been appropriate for the tasks being performed. In one case in 1992, the

victim was using a lineman’s belt that he owned and had modified to make the seat strap more comfortable. Another investigation in 1998 reported the victim was not wearing any fall protection.

NIOSH recommends that employers provide the workers with 100 percent fall-protection systems compatible with tower components and the different tasks being performed, instruct workers in the proper use of the systems and equipment, and ensure their use. A FACE investigation in 2009 found that workers were required to purchase their own fall-protection equipment, gloves and climbing helmets. If a worker did not have the required equipment, the company would purchase it and then deduct the cost from the worker’s paychecks. The company provided safety glasses and hard hats for the workers.

Regarding the provision and proper use of fall-protection equipment, NIOSH investigated a 1997 incident in which a worker fell from a tower after he had disconnected or was reconnecting his fall-protection system to move down the structure. Standard fall protection for telecommunications tower tasks is more effective when the worker is stationary and tied onto the structure. NIOSH recommends that other methods of fall protection be used to protect workers while they are moving as well as when stationary. For example, a lifeline system or cable safety climb device provides a tie-off point for the employee to hook onto and provides fall protection

coverage at all times.

NIOSH recommends that employers:

- Provide workers with 100 percent fall-protection systems compatible with tower components and the tasks to be performed.
- Conduct scheduled and unscheduled worksite safety inspections using a qualified person to ensure that required personal-protective equipment is worn whenever possible. No matter how comprehensive, no safety program is effective unless implemented in the workplace. Although safety inspections do not guarantee the elimination of occupational injury, they do demonstrate the employer's commitment to enforcement of the safety program.

NIOSH recommends that workers:

- Inspect their personal protective equipment daily and before every use for signs of wear, damage or other deterioration and defective components.
- Remove faulty equipment from service for repair or replacement.
- Destroy damaged equipment to prevent inadvertent use.

### Failing to Use Fall Protection

Factors that contribute to workers failing to use fall protection while climbing include lack of adequate fall-protection training, lack of personal-protective equipment, incorrect use of fall-protection equipment,

lack of fall-protection enforcement, and free climbing.

In an example from 1992, a worker used his safety belt and lanyard as the fall-arresting system. Only one tie-off was used while maneuvering on the tower, instead of two tie-off points, which would have allowed the worker to maneuver on the tower while maintaining 100 percent fall protection. A self-retracting lanyard or a standard lanyard equipped with a rope grab attached to the lifeline would have provided a second suspension point for fall protection.

In another example from 1999, a

“Incidents suggest employers, workers, tower owners, tower manufacturers and wireless service carriers may not fully appreciate or recognize the serious hazards associated with construction and maintenance of telecommunications towers.”

worker tied off to the same point twice instead of tying to two independent points. A second tie-off point would serve as a backup to prevent a free fall. NIOSH recommends that employers train workers how to maintain 100 percent fall protection and ensure that workers are provided with 100 percent fall-protection systems compatible with tower components and the tasks to be performed.

In an example from 1998, workers fell from cellular telephone towers after attempting to connect their fall

protection to be tied off. In another example from the same year, a worker fell from a tower after connecting his fall equipment to a partially attached section of a cable tray. In each of these cases, NIOSH recommended that employers instruct tower workers to maintain 100 percent fall protection during tower construction.

In an example from 1992, a worker fell from a tower after he apparently disconnected his fall protection in order to move up the structure. NIOSH recommends that fall protection be used to protect workers while they are moving as well as when stationary.

### Protection and Anchorage Failure

Anchorage points fail when they are not properly installed. Failures in anchorage points can be prevented with proper anchorage training, such as not using gin poles for ascent or descent and proper evaluation of anchor points before attaching

fall-arresting equipment. NIOSH recommends testing the connection of the anchorage point prior to releasing a grip on the structure.

Failures in fall-prevention systems can be prevented by developing, implementing and enforcing a comprehensive written safety program that includes a commitment to 100 percent fall protection. The safety program should emphasize separate fall-protection systems for all workers and training on proper use of work-positioning systems and the limitations of the systems.

“ NIOSH recommends that employers provide the workers with 100 percent fall-protection systems compatible with tower components and the different tasks being performed, instruct workers in the proper use of the systems and equipment, and ensure their use. ”

In a New Jersey case from 2010, none of the workers had separate

fall-protection systems. In another case in 1999, one lanyard had been altered to function as a make-shift work-positioning device. Workers should also be trained to conduct a job hazard analysis for each tower climb.

**Built-in Fall Protection**

OSHA asked whether it should require built-in fall-protection measures on new towers and maybe even existing towers, and

whether such a requirement would enhance worker safety.

NIOSH supports implementation of prevention-through-design concepts whenever possible. Based on those concepts, NIOSH recommends that:

- OSHA consider having embedded fall protection on new towers and, if possible, consider retrofitting embedded fall protection on existing towers.
- Manufacturers consider installing fall-protection fixtures on towers during fabrication or erection.
- Tower owners consider installing fall-protection fixtures on tower components to facilitate the use of

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fall protection.

Built-in fall protection could have prevented at least two fatalities investigated by NIOSH and state FACE partners. In a 1999 Missouri case, the worker sat down into his positioning belt and started to descend onto the guy wire. After sliding out several feet, the worker discovered that his positioning lanyard was not attached to his loop strap.

Built-in protection measures could prevent fatalities related to attachment of a lanyard to unstable tower components. Fall-protection fixtures that can be engineered into the tower design and added during component fabrication or erection would facilitate the use of fall-protection systems. Manufacturers and tower owners should install fall-protection fixtures for workers to use as anchor points on tower components during fabrication or erection. These systems can include installation of safety-climb devices or systems on all tower legs, installation of permanent horizontal and vertical lifelines, and installation of anchorage points.

NIOSH practices for preventing falls from heights in the building construction industry can be incorporated in tower construction as well. NIOSH recommends that facility designers, owners, constructors, and safety and health professionals collaborate on safety design to explore and address hazards likely to occur over the life cycle of a tower. The prevention-through-design approach incorporates safety features into the design, addresses fall hazards in construction plans, and establishes safety criteria for buying equipment.

A review of some 230 fatalities in NIOSH FACE reports determined that 42 percent of the fatalities could have been prevented if prevention through design had been used. The most important design issue identified was lack of

embedded safety features, such as parapet walls or permanent guardrails on roofs, concrete straps, anchor points for use with appropriate personal fall-arrest systems and lifelines, and guardrail supports. Structures



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also can be prefabricated and subsequently lifted into place rather than constructed at elevation. The prevention-through-design approach requires collaboration with design professionals such as architects and design engineers to make decisions that improve construction safety.

### Structural Issues

OSHA said that when new equipment is added to telecommunications towers, the additional equipment 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. OSHA said that telecommunications tower collapses have resulted in numerous fatalities during the past two years, and it asked 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. It asked what steps employers are taking to prevent collapses.

NIOSH recommends that telecommunications tower owners obtain a complete structural analysis (with a corrosion test) to confirm structural integrity before contractors work on a tower. The analysis would assess the integrity of the existing tower structure, identify any risk factors associated with the work to be conducted, and assist in developing necessary control and

protection measures. Guy wires need to be properly installed, tensioned and secured to ground anchors according to manufacturer specifications. Missing or poorly tensioned guy wires compromise structural integrity and increase the risk of tower buckle or collapse. Replacing guy wires involves removing existing guy wires, attaching new guy wires to the tower and ground anchors, and tensioning and securing the new wires. Temporary guy wires must be installed prior to replacing old guy wires to maintain the tower stability and protect workers from serious injury or death. NIOSH recommends

*“Failures in fall-prevention systems can be prevented by developing, implementing and enforcing a comprehensive written safety program that includes a commitment to 100 percent fall protection.”*

that tower contractors conduct a job hazard analysis, develop standard operating procedures prior to maintenance, and provide employee training on hazard recognition and safe working procedures for the specific tasks to be performed at each tower site. Telecommunications tower owners should maintain tower manuals and tower construction and maintenance records.

### Weather

Only one of the 17 NIOSH FACE investigations of telecommunications

tower-related fatalities from 1990 to 2010 stated that weather conditions mandated whether the crew ascended the tower or worked on the ground.

According to “Effect of Elevation Change on Work Fatigue and Physiological Symptoms for High-rise Building Construction Workers” by D.J. Hsu, Y.M. Sun, K.H. Yang, Yow-Jer Stone Juang and Fu-Lin Chang, published in *Safety Science* in August 2008, “The effects of extreme weather conditions, such as thermal or cold stress, or strong winds, on the performance and safety of high-rise construction workers is greater than those of ground-level workers.” The article went on to say that levels of luminance and ultraviolet light were found to increase with increasing floor height; therefore, working at higher elevations increases exposure to UV light. Stronger winds at greater heights also pose a threat for high-rise construction workers. Strong wind conditions are a safety

concern because at high elevation, workers may be working off balance or dealing with the risk of falling or flying objects.

### Fatigue

OSHA said that fatigue can affect telecommunications tower workers in several ways. Climbing a telecommunications tower is physically demanding, and OSHA is concerned that fatigue because of exertion can be hazardous for tower workers. Accelerated timelines can also result in tower workers

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working very long hours. And OSHA understands that telecommunications tower workers may travel long distances to reach remote worksites, which can result in workers being fatigued before they even begin work.

OSHA asked 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. It asked what effect this can have on other crew members.

FACE investigations identified potential worker fatigue from repetitive strain as a factor in fatal falls from telecommunications towers. In one incident, the victim's arm may have cramped because of fatigue, causing him to lose his grip on the tower. NIOSH recommends providing workers with sufficient rest to decrease the risk of fatigue. Fatigue may prevent a tower worker from performing a self-rescue. Self-rescue from elevation requires the worker to perform a rapid hazard assessment using proprioceptive and visual or auditory cues and recruit the musculoskeletal system to respond. Fatigue decreases the effectiveness of the musculoskeletal system and impairs the neurocognitive functioning needed to respond to emergency situations.

Some common causes of worker fatigue at telecommunications tower worksites include repetitive strain, physiologic changes at elevation, changes in proprioception, and length of time suspended in a harness at elevation.

When a climber prepares to climb, he should attach to a functional safety climb device. The climber's legs should carry most of the weight. The arms and hands

*“ Research has indicated that tasks that are initially easy may become more difficult when performed at higher elevation workplaces. ”*

should be used only to maintain balance and the climber's position. Whenever possible, a climber should remain on the outside of the graduated slope of the tower. Using this method, the climber is naturally pulled toward the structure, lessening the effects of fatigue. Climbers should be instructed to limit their climbing runs (i.e., distances without stopping) to a comfortable distance, stopping before they begin to feel the effects of fatigue.

Fatigue is a workplace hazard that affects the ability to think clearly and respond appropriately, and is associated with workplace injury. Construction workers are prone to fatigue from heavy workloads, awkward working postures and prolonged working hours. Chronic waist and shoulder pain among high-rise building construction workers results from repetitive workload and maintaining awkward postures for long periods. These effects can be generalized to tower workers because

they work at elevation in awkward postures. Further, research has indicated that tasks that are initially easy may become more difficult when performed at higher elevation workplaces.

Sensory suppression related to elevated levels of vibration at a construction site may increase the risk of a worker losing balance. Construction workers at heights may be at an increased risk of falling if they experience vibrations under their feet. The risk may be significantly greater when in an unstable posture. Further, medical conditions that impair proprioception, such as neurovascular damage from diabetes, can further intensify the risk of losing balance.

**Other Common Hazards**

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

One FACE report involving a fatal fall from a water tank noted that the employer was a construction contractor that specialized in installing antenna mounts on towers. The company did not have a safety program or any written safety procedures. The employer provided training for welding and climbing. The water tank was mounted on six structural steel legs each made of welded plate steel with structural steel braces. Although not specifically designed for climbing, these

INVESTIGATION

braces were spaced near enough that they could be used as a ladder. Many communications towers have similar structural configurations. In this case, the workers were required to climb the supporting members of the tower leg. The angle of the supporting members was not designed to provide sure footing and therefore presented a slipping hazard. To prevent slipping, NIOSH recommends that employers provide stable, moveable work platforms such as stationary or suspended scaffolds built against the tower. Employers should also provide a system of fall protection that protects workers at all times when working at elevations.

The New Jersey FACE report

stated that although no evidence linked the welding equipment to the victim's fall, the timing of the two events suggested that the victim may have been shocked before falling. Following electrical safety practices while welding will prevent shock-related falls or electrocution. Such practices include using no-load, low-voltage devices to ensure that only extremely low voltage is available to the electrode holder when welding is not taking place; inspecting welding equipment to ensure that cables, connections and the equipment grounds are sound; checking operating voltages periodically to make sure they are within specifications;

ensuring that workers and surrounding work areas are dry; and providing the worker with proper personal protective equipment.

*Paul A. Schulte, Ph.D., is director of the Education and Information Division at the National Institute for Occupational Safety and Health in Cincinnati, Ohio. Although Dr. Schulte submitted this information to OSHA in response to OSHA's request for information about tower worker safety, a NIOSH representative said that NIOSH as an organization wrote the comment, not Dr. Schulte individually. The NIOSH document contains numerous citations and hyperlinks to source material that are not included here.*

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# Root Causes of Tower Worker Accidents

Training and supervision that follow proper hiring make the difference. Edited for length and style, the following information comes from Dave Anthony's comment in the OSHA request for information about tower worker safety.

**By Dave Anthony**

**W**hat follows comes from my experience and perspective after 42 years of work in the telecommunications industry. My initial exposure to telecommunications began in 1973 when I entered the U.S. Air Force. After spending six years in telecommunications, I left the service to return home. I worked as a telephone lineman for six months and then as a telecommunications technician for Columbia Gas Transmission Corp for seven years. In 1983, while working for Columbia Gas, I founded Shenandoah Tower Service. I left Columbia in 1987 to devote full time to STS. We had just enough experience and recognition to have the honor to build the first cellular towers in our area for both the A and B carriers in the early '90s.

For the past 32 years, STS has operated as a small, family-owned tower services contractor in the Mid-Atlantic region. We provide turnkey construction services,

modification services, lines and antenna installation services and a full range of tower maintenance service. Our customer base is broad and diverse. It includes government agencies, localities, carriers, tower owners, utility companies, broadcasters and two-way radio shops.

STS is a charter member of the National Association of Tower Erectors. I served a total of 10 non-consecutive years on NATE's board of directors. I currently serve and am a founding member of the Telecommunications Industry Registered Apprenticeship Program (TIRAP). I am a member of the Telecommunications Industry Association and serve on the TR14 committee. I also serve as a senior advisor to Warriors 4 Wireless.

## What Needs to Change

To improve safety in the tower industry, we need to understand why tower workers are getting seriously injured and killed. I have the

following convictions about what needs to change.

Safety of the worker is not the primary concern of the industry — profits are. This misplaced emphasis derails us from the get-go. You can run a safe enterprise and still be profitable, but it does cost a lot of time and money. What efforts can we make to change the mindset of corporate (telecommunications and tower industry) America? Many companies awarding work to tower contractors are primarily looking for the lowest-cost entity, not the most qualified or the safest operating entity, to do the work. If work were awarded based on who was best qualified and could do it safely rather than cheaply, we would see an immediate end to serious accidents on tower sites.

## Hiring Practices

To keep a worker safe, you must hire teachable and manageable employees. Worker safety is dependent on

excellent hiring practices. Rogues, outlaws, substance abusers and the disobedient need to be dismissed. Many of the accidents the industry has suffered are caused by employees failing to properly use fall-protection equipment. This is often a choice the employee made. This shouldn't automatically excuse the employer, though, because it is the employer's responsibility to thoroughly train the employee and then enforce compliance with that training. Before the employer can be excused when claiming employee misconduct, he must first be able to prove that he has rigorously enforced company and industry safety policies.

To keep employees safe, they deserve to receive adequate safety training, appropriate personal protective equipment, adequate scope of work training and adequate experience in doing the work correctly and safely. Training should lead to mastery of subject matter, not just exposure to it. Tower training requires execution of the basic skill under direct supervision, multiple times, to become effective. Our industry is guilty of recruiting workers, giving them some basic tools and equipment, maybe exposing them to some training information and then pushing them out to the battle. Many have already suffered terribly. This is a practice that must stop immediately. I believe the efforts of the U.S. Department of Labor, the Telecommunications Industry Registered Apprenticeship Program, the National Wireless Safety Alliance, NATE and Warriors 4 Wireless will effectively address this deficiency. In addition, the

Labor Department, the FCC, the FAA, NATE, NWSA, PCIA, TIRAP, the Telecommunications Industry Association, wireless carriers, tower companies and other stakeholders are developing a collaborative relationship that is helping to address the issues in the industry.

### Supervision

To keep an employee safe, they must be under the vigilant supervision of a competent person for the scope of work at all times. When an accident happens on a site, you can be sure the competent person failed to perform the role adequately. What does a competent person need to know? How much experience and training does an employee need to be a competent person? OSHA and the industry need to revisit what it takes to qualify as a competent person. From my experience, it takes two or three years to develop a truly competent person for tower erection, maintenance, and line and antenna installations. Some scopes of work require even more experience and proficiency.

The project or scope of work needs to be designed with employee safety in mind. For example, why do we build sites in close proximity to overhead high-voltage power lines? Move the site back a safe distance. Why do we produce tower-mounted radios with no provision for safely lifting them built in? Why do we install these radios below the bottom of the sector mount? Why do we install these radios and antennas on sector mounts that were designed for a much lighter load? Why do we install them on sector mounts consisting of round mem-

bers attached to round members creating the potential for pipes to rotate under load? Antennas with bottom-fed connectors are also a problem that is easily solved. Why should we be suspending employees under mounts to install and connect anything? This can all be eliminated during the design phase. Worker safety starts at the design table. Safety needs to be engineered into every product and project, just as highway and auto safety are systemically engineered.

### Clearing the Climbing Path

Climber access has been compromised over the years with antenna installations directly in the climbing path. Employees are falling because they fail to circumnavigate these obstructions safely. Because the climb facility is obstructed, many times there are no adequate fall-arrest tie-off points on the structure for the worker to use in passing around the obstructions. This is particularly true of monopoles. These tie-off points cost time and money to install, but they are essential to worker safety.

Tower workers are not machines. They are human and need to be cared for appropriately. Working too many hours in a day or a week or a month is getting people hurt and killed. I use U.S. Department of Transportation hours of operation rules to regulate the time my employees are working and climbing. Sixty hours is more than enough to work in a week, and anything more is ineffective and dangerous. Site conditions must also be taken into account, and no one should be pushed to work beyond their own personal limits.

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## Significant Hazards

OSHA asked what are the most significant hazards that tower climbers encounter, and what circumstances or conditions create or contribute to these hazards.

Today's telecommunications structures carry a much greater antenna load than they did years ago. The increased antenna and radio loading on the towers often creates obstructions to the climbing path, forcing the climber to negotiate around the obstructions. This increases the possibility of a fall. The climber has to be highly proficient, patient and careful to negotiate around the obstructions safely. In some cases, there are no appropriate fall-arrest tie-off points available to the climber during this negotiation. This is particularly true on monopoles.

In addition, once the employee reaches the desired work station, the employee often has to perform the work while suspended under the antenna mount. Radios are being mounted on pipes projecting below the bottom of the sector mounts, and many antennas are suspended with their bottom-fed connectors below the bottom of the mounts as well. An employee may be suspended under the mounts of a sector site most of the day in performance of their work. Working in this position greatly increases the possibility of a fall, adds to worker fatigue, takes much longer than working from a standing position and erodes proficiency of the task. Eliminating the need for this practice would require adjustments from original equipment manufacturers, carriers, tower owners and tower contractors. It would help save lives, decrease job costs, decrease employee fatigue and

improve employee proficiency.

## Work Practices

OSHA asked what steps climbers take to complete their work safely, and what safety-related work practices should be in place.

Every climber has been thoroughly trained to climb safely and to use 100 percent tie-off measures, 100 percent of the time and 100 percent correctly. Our equipment is in excellent condition. Employees inspect it before each use and the company performs periodic inspections as well. We observe each other while climbing and make sure no one is forgetting to hook up or that no one hooks up improperly. An improper hookup is equivalent to no hookup.

We make sure to use rigging equipment that cannot fail. In addition, we don't use rope to lift anything up the tower that weighs more than 500 pounds. We use a winch line instead, and we rig so we cannot have a rigging failure.

The company provides most of our training in house. Occasionally, an outside, third-party trainer is utilized. We also use a third-party trainer for OSHA 10/30 training as well as for first aid, cardiopulmonary resuscitation and blood-borne pathogen training.

A scheduler assigns work to each climber or crew. A full-time safety and training manager conducts most of the initial training, and our crew chiefs and subject matter experts conduct most of the field training or on-the-job training. Any safety issue not resolvable by the crew and the competent person on-site is reported back to the safety manager and upper management. If work cannot be done safely, it is not to be done until a solution is provided so it can be done safely.

## Making Work Safer

OSHA asked what steps employers could take to make tower work safer, and the first step is improved and repeated training. Fitness for duty of every individual on site must also be monitored and maintained. Fitness for duty includes being drug- and alcohol-free, being physically, mentally and emotionally capable of performing the task, and for the crew to be able to work harmoniously.

OSHA asked how the design or configuration of towers and equipment installed on them affects the ability to work safely. Monopoles, stealth poles, wooden poles, water tanks and rooftops present the most challenges. Ease of access up and down the structure as well as laterally is important to climber safety. Adequate, properly placed tie-off points are also important. On the structures of the type mentioned, we often have to improvise or use alternate means to maintain an appropriate level of safety.

## Training and Certification

I prefer to hire employees who are not familiar with tower work. Much of what the transient employee has learned is incorrect or inconsistent with existing standards or best practices. It is difficult to retrain someone who believes they have been successful doing things the wrong way. The saying "practice makes perfect" is incorrect. Only perfect practice makes perfect.

We provide all training, tools and equipment required for the scope of work to our employees. The following is a partial list: OSHA 10/30, FA/CPR/BBP, authorized and competent climber and rescuer, job hazard analysis, personal protective equipment, radio-

# TOWER SAFETY REACHES NEW HEIGHTS

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The **NATE EXCHANGE** is a convenient, consumer-driven, "one-stop-shop" platform for tower construction and maintenance companies and individual tower technicians to gain access to the most sophisticated and up-to-date training courses in the tower industry.

We encourage you to utilize this website tool to select the courses and training companies that best fit your specific workforce needs.



frequency emissions, Telecommunications Industry Association standards, rigging, hazard communication, material handling, ropes and knots, capstan hoist, winch, driver, forklift, crane and specific scope-of-work tasks.

As for the possible need for a standardized, industrywide training or certification program, TIRAP, NWSA and W4W are on the right path. It is going to cost tower contractors a lot of money to implement. I'm concerned about how this is going to be paid for. Generally speaking, our customers are not paying enough at present to adequately cover the cost of properly training and equipping tower industry employees.

It is our practice to make every employee demonstrate their knowledge and reliability. The employer can't make an assumption or blindly trust the validity of an employee's training record. We start by recertifying our employees as authorized or competent climbers.

### Suitability for Work

OSHA asked how employee physical fitness requirements are assessed, and how fitness requirements and assessments are addressed in contracting agreements. We use observation, a DOT physical, and drug and alcohol testing.

### Hazards and Incidents

OSHA asked many questions about fall hazards and said it believes many falls result from improper use of fall-protection equipment or the failure to use any fall-protection equipment at all. It said it wanted to know how employers are addressing fall hazards and asked how fall-protection systems and anchorage points on towers fail. OSHA asked what factors contribute

to employees failing to use fall protection while climbing or working.

Employee misconduct is rampant in our industry. Employers must hold their employees strictly accountable to comply with all safety and training requirements. Employees who fail to comply with 100 percent fall protection should be dismissed immediately. This is the only policy that will work. Many companies are lax or have given up on enforcement. I believe this is negligence on their part. Non-enforcement encourages misconduct. For clarity, let me state that many of the falls have been a result of employees willfully failing to properly use the training and equipment they had been given. I believe substance abuse is often a contributing factor.

Employers should be required to provide all safety-related equipment to their employees. Many companies require employees to provide their own gear. This is an attempt to cut operational expenses and to possibly shift blame to the employee if involved in an accident and improper equipment is cited. If employers can't afford to properly equip or train a new employee, then they shouldn't be hiring them at all.

Safety climb systems on telecommunications structures must be properly maintained and replaced once they begin showing signs of wear, just like the fall-arrest harness has to be replaced once it shows signs of wear or has been in service to expiration date. Safety climb systems should be thoroughly inspected before climbers use them. We have found many safety climb systems fail under load when we inspect them. In order to properly and safely inspect the safety climb system, the first climber must climb

using his double-lanyard system. If the top connection is compression type, the safety climb system needs to be tested under pressure. A visual inspection is not enough.

### Structural Issues

OSHA said that when new equipment is added to communications 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," OSHA said. "Communications 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?"

Structural modifications involving welding, replacing structural members or guy wires should only be handled by truly competent contractors. In my opinion, the failures that have occurred resulting in loss of life were performed by unqualified contractors or employees. There was no truly competent person on the job site. They simply couldn't see what was coming.

TIRAP and TIA are responding to this question, and I support their position. The standards are in place to prevent these accidents from happening. However, the standards are not being enforced. The failure begins when the modification is engineered and then when it is bid out. Critical structural members need to be identified to protect all parties. Only fully

vetted contractors should be allowed to bid this type of work. The contractor selected to perform the work must have full support of the tower owner and the engineer of record to design ways and means of performing the work that protect everyone's interest.

TIRAP and NWSA are also working to produce the training required for the competent person, the qualified riggers and welders on the job site. In the interim, the tower owner and the engineer of record must validate the contractors on the bid list and work closely together to identify and address predictable hazards associated with the modifications. Again, not just any contractor should be attempting to perform this type of work.

### Hoisting Materials and Personnel

OSHA said 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 said. "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."

OSHA asked when are personnel hoists used, what types of hazards are associated with personnel and material hoists and what are the best practices for safely managing those hazards. It asked how capstan hoists are used in tower work and in what types of operations can they be used safely. It wants to know what are the most common types of rigging hazards that occur on communications tower worksites and what employers can do to eliminate or minimize those hazards. It asked whether there are methods, other than the use of a hoist or a crane, that can be used to lift material and personnel at a communications tower and which methods and procedures are the safest. It wants to know what are the roles of different levels of the contracting chain in managing rigging and hoisting activities.

The problems here are manifold. Most of the line and antenna contractors and their employees are untrained in proper rigging principles. They lack the proper rigging equipment on the jobsite. This means there is no

competent person on the jobsite for the scope of work. Rigging accidents are a direct result of a failure on the part of the competent person on the jobsite, or the wrong company was hired to perform the work.

### Other Hazards

OSHA asked about radio-frequency hazards. Sufficient rules are in place for radio-frequency emission hazards, but enforcement is lacking from the industry as a whole.

OSHA asked about specific weather-related hazards to which communications tower workers are exposed and how a crew monitors and responds to changing weather conditions, including storms. Weather is monitored and reacted to by competent personnel on a daily basis. If proper action isn't taken, it is clearly a failure of the competent person.

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

Fatigue is a real issue. Tower access should be kept as free of obstacles as possible. Working at height needs to be designed to avoid overexertion. Hours of service per day and per week need to be limited. Tower workers are people, not machines. We use DOT

### Seven Deadly Sins

- Safety as a mantra, but profits as the most important goal
- Hiring the wrong person or company to do the scope of work
- Insufficient employee training
- Failure of the competent person
- Design flaws creating unsafe conditions
- Compromised climber access/climbing facilities
- Climbers are people, not machines. Therefore, do not over-tax them.

hours of operation rules as a standard to prevent fatigue and burnout.

### Possible OSHA Standard

OSHA asked what would be the advantages and disadvantages of an OSHA standard that covers both construction and maintenance

activities on communications towers.

All segments of the wireless telecommunications industry and government need to work closely together to improve the safety of our employees. The poor workmanship and poor safety record in the tower services industry is largely caused by systemic

problems within the industry. The systemic problems were created by many choosing to do what is expedient or what is best for the immediate bottom line, rather than taking the long view and answering the one prevailing question: How does this action, this decision, this design, this plan, this product, this training, this standard, etc., affect the safety of the employees who will be doing the work?

There is currently a true synergy within and between the broader wireless telecommunications industry and with DOL, OSHA and the FCC. We need to take advantage of this phenomenon so we can ensure that all rules, standards, equipment designs, best practices, training requirements and minimum credentials for positions, both developed and forthcoming, are well thought out, clearly communicated and universally supported at every level in the industry.

I have long been in favor of a negotiated rulemaking for the tower erection and service industry. I sat in as an observer for the crane and derrick rulemaking and therefore believe in the efficacy of the process. Our industry is growing in size and complexity. The work we do, the structures on which we work and the people we employ are truly unique. I believe we need and deserve to have our own set of rules.

*Dave Anthony is chief executive officer of Shenandoah Tower Service, Staunton, Virginia. He is a member of the Telecommunications Industry Registered Apprenticeship Program board of directors. He submitted these comments to the U.S. Department of Labor in response to OSHA's request for information about tower worker safety.*



Photo: Grant Delin

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## Providing Support by Standing Together

“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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[www.towerfamilyfoundation.org](http://www.towerfamilyfoundation.org)

# Remembering Daniel Arnold



A remembrance of a worker who died of injuries sustained in a fall from a microwave tower puts the need for an emphasis on safety into perspective.

By Dr. Bridgette Hester

Alex Arnold with a portrait of her father Daniel.

**I**n the business of constructing and maintaining telecommunications towers, we often are tangled in deadlines, demands and endless hours. Somehow, the human element becomes lost. I advocate for the climbers, and families of the fallen are and always will be my focus, my heart.

Planning, orchestrating, and living through the time up to the funeral of your loved one are no small feats. It's a chasm of sorts, a wide divide between realizing the loss you are enduring and being able to attach some modicum of finality. Not closure. Finality. This chasm, if you allow it, will stretch out so far it looks like an insurmountable ravine. Fortunately, God places people in your path who create a human bridge. Arms, hearts, kisses, hugs, sorrowful expressions of wanting to take your pain, homemade casseroles and an endless supply of pure humanity — all of these elements in the human spirit interlock with you and others to guide you safely to the other side.

When we lose a loved one, the first days and weeks are filled with mourners and support from a bridge of loved ones, family and friends. After those first weeks however, existence without that person we love becomes desolate, lonely, surreal and otherwise unbearable. After a few weeks, the calls stop, the visits become fewer and further between. It isn't that people don't love you or don't want to be there for you, it's just that life goes on. To the one suffering the loss, it seems cruel and unfair to be in a world where their loved one is not. It's difficult to find a way to exist without them. It's done, the funeral is over, the visitors have waned, and your loved one is buried. A new chapter, a new normal has to begin. There isn't a more terrifying time, never a time when a spouse, children or family feels more lost.

What about years after that loss? What about 10 years? This is where the Arnold family is in 2015. On Aug. 3, 2005, Daniel Arnold, 37, of Alton, Illi-

nois, died in Poplar Bluff, Illinois, from injuries he received in a fall from a microwave tower he was repairing. Ten years later, the pain is still present. When Daniel died, he didn't just leave behind a few people. Daniel was special; he was loved; he was important to so many. Daniel left behind two parents, a wife, a daughter, two stepchildren, two sisters, two brothers-in-law, a niece, a nephew and many aunts and uncles. His death rippled through the lives of many people.

Daniel wasn't just someone who died at work. Daniel was a man who adored his life, a man full of vitality and love for other people. A man who enjoyed the outdoors, carpentry, camping, and doting on his beautiful daughter, Alex, and his stepchildren Danielle and Drew, and other members of his family.

His niece, Taylor, still gets joy and a smile out of remembering the nickname he gave her, "Piggy Poo Goofy Roo."

One of his sisters, Suzanne Arnold-Andrews, remembers her brother as

“the type of person who would walk into a room, and you could just feel the love from him. He was always famous for his huge hugs and kisses. He never knew a stranger and was always willing to help anyone who needed him for anything. He would give you the shirt off his back or his last dime. He was the best daddy even to Alex’s brother and sister, if he had one, he usually had all three, and he treated them as if they were his own. The song ‘Live Like You Are Dying’ had just come out when Danny passed, and it fit him perfectly. He loved his family very much, and we were always there for each other when needed. I miss him so much.”

Daniel’s other sister, Lisa, said that she was the one he always reached out for. “I wasn’t there to protect him this day,” she said. “I miss him so much, and I know he is an angel looking out for Alex and us all. It tears me up to talk about how wonderful of a brother and a person he was. I also laugh because of the nickname he gave me, ‘Warden.’ We were raised with and blessed with such a close family. Not a day went by without talking with each other and telling each other we loved them.”

Laura, Daniel’s former wife and the mother to his daughter Alex, wanted to tell other workers to “please take your time and don’t take shortcuts. Ensure your equipment is functioning properly and fits properly. It is beyond painful to watch your child cry themselves to sleep every night because they miss their dad. There is not enough money in the world to replace your value in your child’s life.”

Alex is a smart, beautiful young woman, and far wiser than her 20 years. In part, she had this to say.

As a child, they never teach you how to carry on living your life when you lose a parent. There’s nothing you can say to a child that will prepare them for a life of pain and heartache that comes along with such a loss at such a young age. For me, it happened when I was just 10 years old. They say that pain goes away in time, and the only cure for that kind of pain is time itself. However, I do not believe that it ever really goes away completely; I think you just learn how to live with it. You learn how to go about everyday tasks while carrying the pain.

I remember how safe and loved I felt when he would wrap his arms around me for a hug. I remember his voice, and how I felt whenever I was around him. I felt like I was on top of the world when I was with my dad. I felt like I could do anything and I felt like nothing bad would ever happen to me when I was around him, because he wouldn’t let it.

However, I also remember the day he died as if it were yesterday. We were having a yard sale when my mom got the call. The next thing I remember is that there were tears falling from my mother’s eyes as she listened to what they were telling her. One thing that you should also know, I had only seen my mother cry a few times in my life before that day. The words she spoke, I can still hear them clearly in my mind as if she spoke them yesterday. “Honey, I don’t know how to tell you this” — she pauses as she chokes back tears — “but your dad has died.” “You’re joking,”

I said. “That’s not possible.” My dad was my hero. Nothing bad would ever happen to him. But it did. And that’s when I stopped seeing the world in the same way. I didn’t want to believe it. I didn’t know why it had happened, and I didn’t feel so safe anymore. No one ever prepares you for how to live your life beyond that point. But you do it. You wake up and go about your daily life, regardless of how much pain you are in, you get up, you start your day, and you push through the pain. You keep living.

Knowing that you will never be able to hold them again, and never again will you hear their voice calm you like it had so many times before. Words cannot fully describe in what ways the loss of my father has affected my life. I look around, and I am so thankful for everyone who is in my life. I live every day thankful to be alive. I wake up every day knowing that every day that I am alive is truly a gift from God. Losing him shifted the way that I think about life in such a huge way. I live every day thinking that it could be my last because accidents do happen. I am thankful to be alive. I still miss my dad every day. Time flies and I am 20 now. I hope that I have made him proud.

Does life go on? As Alex clearly states, yes, it does. Moms work, family members hang out with friends, Christmas and Thanksgiving come and go, bills are paid, sisters, nieces, nephews, and children continue to grow, graduate, marry and have kids of their own. In the midst of going on with life, people often make the

/ YEAR OF THE CLIMBER /

mistake of believing that families get over it. I assure you this doesn't happen. Families learn to live with it, but getting over it isn't an option. With every milestone, families often hear, "If only Daniel had been here to see this," or "Your dad would be so proud of you." Don't get me wrong, it doesn't mean there isn't real joy in those moments — there is — but it's tempered with a melancholy feeling that there is someone missing.

In some moments, 10 years seems like a lifetime ago. In other moments, it feels like you just got the call. There isn't rhyme or reason to emotions, there isn't a definitive place or moment in time where one loved one is remembered more often than another. They are always there. They are there in every second of every day

whether someone utters their name or not. Some might find that sad, but I think that is the actual comfort. They can never leave you again because their memory is burned into your soul; their love occupies a place in you no one else is allowed to have. Their eyes and laugh echo in the expressions and voices of their children and family members.

Thus, even though events and milestones are tempered with a melancholy for Daniel's family after these 10 years, they are also infused with the joy, laughter and love of the man they knew and loved. I have had the distinct privilege and honor of knowing Daniel's family. Alex is a beautiful, sweet, kind soul. She is smart, funny and determined. His sisters are amazing, loving and

sweet. From the outside looking in at just the ones who loved Daniel, I get a sense of what Daniel must have been like. You see, the traits that are in Alex, Suzanne and his other sister, Lisa (and all of his family members), aren't just theirs, they are reflections of the one they love, the one they miss. These are the things that he must have loved about them and the things they loved about him. I believe that tells us a great deal about the man, Daniel Arnold.

*Bridgette Hester, Ph.D., is a family and workplace strategist. She is the founder and president of the Hubble Foundation, which is dedicated to promoting the safety of tower workers, site crews and all workers at heights. Her email address is [bridgette@hubblefoundation.org](mailto:bridgette@hubblefoundation.org).*

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# Product Showcase – Cables and Connectors



## High-performance Plenum Cable

**Ventev's** highly flexible plenum cable has minimal signal loss and is best suited for indoor spaces with plenum requirements such as dropped ceilings and raised floors. The plenum cable has an outer jacket made of orange, fire-retardant PVC and has dual-ply outer conductors for shielding properties greater than 90 decibels. Ventev plenum cable is UL-listed and carries the CMP (plenum) rating. Designed as an alternative to RG-142 cable, this plenum cable is compatible with a variety of connectors. Available in series 195, 240 and 400, the cable can be ordered in bulk and in standard and custom cable assemblies.

[www.ventev.com](http://www.ventev.com)



## Coaxial Cables and Assemblies

The TFT 50-ohm coaxial cables and assemblies from **Times Microwave Systems** compare favorably with semi-flexible (solder-braid) coax and RG-type coax for RF and microwave interconnects in military and commercial applications. Unlike solder-braid cables, the flat-braid shield on TFT cable is not susceptible to cracking when bent, which permits installation in tight spaces without the risk of compromising performance. Compared with standard RG cables, the flat-braid shield is designed to provide much better shielding and lower attenuation. The FEP jacket is designed to provide protection in corrosive environments and is highly resistant to UV, making these cables suitable for outdoor installation. TFT cables are also CMP (plenum) rated and provide better than -160 dBc (decibels relative to the carrier) PIM performance when properly terminated, making them useful for interconnects in cellular base stations and critical DAS installa-

tions. The cables feature low passive intermodulation (PIM) distortion; a UL910 plenum rating that satisfies building code requirements; and stable loss, phase, and VSWR versus flexing.

[www.timesmicrowave.com](http://www.timesmicrowave.com)



## Heavy-duty Universal Barrel Cushions

Patented heavy-duty universal barrel cushions made by **Wanho Manufacturing** are designed to provide versatility in all applications. The product can be mounted with a wide range of cable sizes in a single cushion with a single attachment point, which helps to reduce material and installation costs. The unique design allows the cushions to be individually installed using butterfly hangers or stacked out with stackable hangers. The barrel cushions are RoHS-compliant and are constructed from UV-resistant EPDM rubber, which is durable in extreme temperatures and

harsh environmental conditions. The barrel cushions are intended to accommodate what the industry demands for installation of fiber, power, elliptical and coaxial cable requirements.

[www.wanho.com](http://www.wanho.com)



### Low PIM 4.3-10 Standard Connector Portfolio

**Spinner's** MultiFit connector design conforms with the 4.3-10 connector standard, includes all of Spinner's mobile communications connectors and fits most common cable. The connectors have low PIM (passive intermodulation) distortion and are available as 4.3-10 screw, hand-screw and push-pull types for most commercially available corrugated foam-dielectric LF and SF cables. Besides connectors, all kinds of adaptors from 4.3-10 to 7/16 DIN, Type N and 3.5-millimeter are available to support customers on their migration path toward the new mobile communications standard 4.3-10.

[www.spinner-group.com](http://www.spinner-group.com)



### Power Cable

**Southwire** offers the TelcoFlex cable,

said to be the premier LSZH Central Office power cable used for all levels of telecom equipment installations and battery backup in Central Offices, DAS and remote locations. The cable features nine color choices in braided or non-braided constructions. Other features include UL and CSA certification and non-halogen, low-smoke, lead-free, non-silicone thermoset rubber insulation. The cable is also audited and is said to have met all 33 requirements of Telcordia Technologies GR-347-CORE and the ATIS-0600017.2014 standard.

[www.southwire.com](http://www.southwire.com)



### Plenum Cable

**Trilogy Communications'** AirCell AP6012J50 air-dielectric 6-GHz plenum cable for the wireless distributed antenna system (DAS) in-building environment is designed to meet the most stringent National Electric Code (NEC), UL-910 and NEC-CMP (code-making panel) for communications equipment. The plenum cable has a 94 percent velocity of propagation and low attenuation (30 MHz to 6 GHz) when compared with other plenum cables. Because of its design, the cable's connecting process is intended to be the easiest and the fastest to install, providing labor cost savings up to 80 percent. The product is made in the United States.

[www.trilogycoax.com](http://www.trilogycoax.com)



### Fiber Installation Panel

**Clearfield's** SmartRoute Panel is designed to simplify and speed up fiber installations when landing a small number of fibers in a 1RU fiber panel in any interconnect or cross-connect environment. The panel is designed to provide unmatched savings in installation time, labor costs and performance. Combining micro distribution cable, spooling technology and multifiber push-on (MPO) connectorization in a single panel to help relieve cable congestion, the panel is designed to simplify ordering and eliminate incorrect cable lengths for intrafacility fiber cable or outside plant cable assemblies while saving labor and installation costs. The panel contains two internal spools that can hold up to 200 feet each of 3-millimeter, 12-fiber micro cable or Clearfield's FieldShield cable. The panel can provide 24 subscriber connector (SC) or 48 Lucent connector (LC) connections in front and MPO, stub or SC/LC on the cabled or far end. The panel is suitable for cell sites, cell towers and other applications where fiber is exposed to the elements, especially when used in conjunction with Clearfield's FieldShield ruggedized microduct.

[www.clearfieldconnection.com](http://www.clearfieldconnection.com)

DEPARTMENTS



**Fiber Patch Panel**

The **Alliance** FiberLite Clearhub 6 factory-terminated fiber patch panel provides a simple solution for wireless carriers using nonproprietary connections, ensuring ease of future additions and network upgrades while providing a robust, watertight and flexible distribution solution. The panel has a single inbound multifiber push-on (MPO) connector for the trunk fiber connection instead of a multifiber Lucent connector (LC) breakout, reducing installation time and reducing potential fiber damage. The panel has individual quick connections for as many as 12 runs of fiber, eliminating the need for a contractor to enter the module. Individual single-mode jumpers are connected to the distribution module and then to the original equipment manufacturer radios. Connections to the panel's distribution terminal use factory-ordered fiber connectors rated IP67 for ingress protection. Moves, adds or changes may only require a new jumper. The panel mounts to walls, pipes and towers and can be installed back-to-back to serve any number of sectors or radios. A clear cover allows viewing connections and provides protection from the elements.

[www.alliancecorporation.com](http://www.alliancecorporation.com)



**Factory-fit Jumpers**

Mobile operators worldwide can deploy LTE, 5G and small cell networks faster with **Radio Frequency Systems'** new family of jumper cables equipped with next-generation connectors. Based on the 4.3-10 interface standard, the new jumpers use RFS innovations in passive intermodulation (PIM) and cable corrugation to deliver the highest voltage standing wave ratio (VSWR) and PIM performance available in jumper cables with similar connectors. The new RFS jumper cables are equipped with smaller connectors. The compact design reduces equipment footprint requirements and allows for a higher connector density.

[www.rfsworld.com](http://www.rfsworld.com)



**LC Fiber Looping Tool**

**Westek's** dual Lucent connector (LC) fiber loopback plug and coupler allow a technician to have all loopback needs in one package. The rugged case provides protection from dust and moisture. The product versions

for single-mode, angled physical contact (APC) multimode and laser-optimized testing are color-coded for easy identification. The product has a two-year warranty.

[www.westek.com](http://www.westek.com)



**Low-PIM Cable Assemblies and Adapters**

**San-tron** SRX low-PIM cable assemblies and adapters are designed to solve the problem of passive intermodulation distortion issues plaguing critical signal transmissions. These cable assemblies are phase- and attenuation-stable, provide satisfactory shielding, support UL/NEC Plenum-class CMP, are corrosion-resistant, are low in weight, and are highly flexible. They feature intermodulation performance as low as -168 dBc (decibels relative to the carrier) with an eSeries 7/16 DIN connector terminated on flexible -141 cable. Typical performance across the lineup of assemblies terminated with SMA style and Type N style connectors is -158 dBc. SRX cable assemblies come in variety of in-cabinet, jumper and long-haul styles, and in many cases are plenum-rated for fire retardation, which is commonly required of in-building wireless or distributed antenna systems.

[www.santron.com](http://www.santron.com)

PRODUCT SHOWCASE

# Product Showcase – Tower Lighting



## LED Lighting Systems with Integrated Monitoring

**TWR Lighting** offers the L550-L864-L865 dual-LED model with integrated monitoring and a red/white, medium-intensity LED obstacle light. The L550 incorporates advanced optical engineering design and LED technology, enabling a cost-effective solution for the medium-intensity obstruction light market. The L550's unique design concept allows for a single controller

and single cable installation with multiple flash heads. The obstacle light system includes a digital wireless remote-monitoring system with digital interface to the CIP300-TWR PLC controller. It also includes either a GPRS (AT&T or Verizon) wireless modem or TCP/IP Ethernet connection and battery backup system. This product design makes the system simple to install.

[www.twrlighting.com](http://www.twrlighting.com)



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PRODUCT SHOWCASE

DEPARTMENTS

- |   |   |   |
|---|---|---|
| <p>C2*.....3Z Telecom<br/>                 9.....Advantage Engineers<br/>                 19.....AFL<br/>                 36.....AGL Conferences<br/>                 74.....Allstate Tower<br/>                 68.....American Heart Association<br/>                 25.....Bard Manufacturing<br/>                 12.....BB&amp;T – Atlantic Risk Management<br/>                 47.....Black &amp; Veatch<br/>                 57.....Drake Lighting<br/>                 45.....Dynamic Environmental Associates<br/>                 57.....Electric Conduit Construction<br/>                 52.....Emergency Preparedness</p> | <p>7.....FieldSense USA<br/>                 64.....Firearm Safety<br/>                 C3*.....GME Supply<br/>                 44.....Huber+Suhner<br/>                 74.....Hudge Structural<br/>                 34.....Hudson Design Group<br/>                 53.....Hughey &amp; Phillips<br/>                 55.....IWCE's Network Infrastructure Forum<br/>                 20.....Keep America Beautiful<br/>                 43.....MD7<br/>                 13.....Media Venture Partners<br/>                 21.....MultiWave Sensors<br/>                 61.....National Association of Tower Erectors</p> | <p>5.....Network Building + Consulting<br/>                 74.....ProVertic<br/>                 17.....Quantum Group<br/>                 C4*.....SBA Communications<br/>                 74.....Slatercom-WCD<br/>                 51.....The Shelter Pet Project<br/>                 23.....Times Microwave Systems<br/>                 65.....Tower Family Foundation<br/>                 69.....UNCF<br/>                 35.....Waite Institute for Violence Prevention</p> |
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\*C2, C3 & C4 indicate cover pages



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