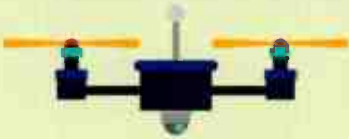


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Cover Design by Courtney Duggan

Drone On

It might not be much longer before tower construction and maintenance companies and equipment installers will be using drones. Drones — the com-



mon name for unmanned aerial vehicles — generally are restricted from commercial use in the United States, although the Federal Aviation Administration has granted some exceptions.

The big news is that the FAA has proposed rules to integrate commercial use of drones into the nation's airspace. Not willingly. Congress passed legislation that requires the FAA to take that step by the end of this year. The FAA released its proposed rules in February, and it is gathering comments as it prepares to issue the rules.

Fortunately for the wireless infrastructure business, the proposed rules appear to allow drones to be used in ways operators would want to use them around telecommunications towers and perhaps most rooftops. Read more about drones in articles on pages 46 and 50.

White House Drone

Some operators use drones for commercial purposes contrary to the FAA ban. Sometimes the results of drone use for photography and filming are seen on television and on real estate sales websites. The National Association of Realtors has warned its members not to use drones to show property for sale.

A drone operated by a federal gov-

ernment employee during his non-working hours crash-landed on the White House lawn. The Secret Service is conducting nighttime drone test flights near the White House with the apparent purpose of learning ways to jam drone control signals, take over the remote control or knock drones down with nets or projectiles.

Last year, for safety and noise considerations, the National Park Service banned drones on any land and water it administers. The agency might adopt rules to permit some drone use, as it has for using other equipment for commercial photography and filmmaking.

In September 2014, a federal court fined a German filmmaker whose drone fell into Lake Yellowstone. The court also placed him on probation and banned him from Yellowstone National Park for a year.

InterDrone

If you attend CTIA Super Mobility in September in Las Vegas, your CTIA badge will let you visit BZ Media's nearby InterDrone expo at no additional charge. Free express shuttle buses will take you between the venues. More than 3,000 drone builders, flyers and buyers are expected to attend.

As soon as the FAA gives the go-ahead, commercial drones might be seen almost everywhere.

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PCIA and Florida

Yay! April! PCIA's Wireless Infrastructure Show. Oh, and Florida too!

Like daylight saving time, it took us all a year to get used to PCIA in the spring and CTIA in the fall; however, we're all on the same page now. If NATE ever changes from February, however, I'll never get my internal clock straight again.



I love the Wireless Infrastructure Show as a special event. It's not only a unique combination of people, it really is the gathering of the industry. The financial analysis and industry trends are carefully watched, in addition to the emerging technology directions. I love the annual reading of the tea leaves — trying to figure out what is going to have an effect on the industry, good or bad, when and why. Microsites? 5G?

PCIA announced a new vice president position and hired Marissa Mitrovich to lead new business activities and project initiatives, including training and education. I'll be very interested to keep an eye on PCIA's Telecommunications Industry Registered Apprenticeship Program (TIRAP) and how it progresses. This is new ground, and I hope it will be an excellent model for the future of the industry.

FCC Auctions

Because the FCC radio-frequency

spectrum auctions have finally concluded, now comes the question of when we will see action in the field. Obviously, AT&T Mobility, Verizon Wireless and T-Mobile USA have been at this game long enough to know what to do and how to roll out additional spectrum; however, what the new kid on the block, Dish Network, is going to do is a bit of a mystery. Is this just a spectrum play for Mr. Ergen? Or will he actually want to build a network and move into terrestrial voice and data in addition to the satellite services he currently owns. Remember TerreStar and all that spectrum? Well, it is not going to lay fallow for too long. It will be fun to see how Charlie Ergen works this deal. Building out a new carrier, having to launch a new brand (or lever the Dish brand?) and learn all of the unfun things a carrier has to do to get to the first minute of revenue is a real undertaking. However, trading some spectrum for revenue or becoming a mobile virtual network operator makes a lot more sense and takes a lot less effort. Ergen has amassed a lot of assets and has lain pretty low with them so far. I believe that is going to change.

The AWS-3 spectrum will take years to integrate into the carriers' networks. The first thing we're likely to see is some horse trading as carriers figure out not only what they won, but also what they will trade with each other to obtain what they want. Once spectrum is locked in and aligned with their existing

markets and with their plans, the rest of us will see action. Much as it was with the LTE build outs, the industry outlook is nothing more than as rosy as ever. Structural capacity, backhaul and qualified, safe workers are the only things that would hold anything back.

Things are still about as rosy-looking for this year as anyone can remember. All the carriers have budgets and are spending on their networks this year, and that should continue into 2016, too. We've seen some worrisome news about small cells recently, with AT&T deciding to cut from its build out plan the 40,000 small cells it previously slated to deploy this year. That may sound like a bigger deal than it is. I don't know where they would have found the resources to deploy 40,000 small cells in the first place, so I'm not sure you can really be disappointed by losing a plan for something that was not very likely to become a reality. Nevertheless, AT&T keeps kicking along that it will make the same (and larger) number of deployments as last year and the years before.

Please make sure to say hello at PCIA. I'm very much looking forward to it.

Rich Biby, Publisher

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Grading the FCC on Net Neutrality: Fail, Must Work Harder

By Iain Gillott

Unless you have been staring at your TV or PC screen waiting for the Netflix series “House of Cards” to load and you’ve watched or read nothing else, you have no doubt heard about the FCC’s net neutrality vote and ruling. The timing of the release of the third season of Netflix’s hit drama was apropos, given the discussion about the need for fast lanes on the Internet.

Before we get started, the goal here is not to rehash the FCC’s announcement. To be extremely brief, the new rules reclassify broadband as a regulated telecommunications service and ban blocking, throttling and prioritization of traffic over broadband and mobile networks, with some exceptions for medical devices, among others. The FCC did not vote to require last-mile unbundling or impose price restrictions. In short, the FCC took parts of the Communications Act (1934) and the Telecommunications

Act (1996). The much-discussed Title II stipulation that classifies Internet service providers (ISPs) as common carriers is in the 1934 Act.

So, back to “House of Cards.” Our family loves this series, and we were waiting (probably along with half of U.S. households that subscribe to Netflix) for when the latest season was released. About 7 p.m. that Friday, I fired up the browser on the living room Mac and went to the Netflix site. Signing in took a while (it was extremely slow), and then it took — no joke — about 15 minutes to get the first episode running. We then made the mistake of pausing

“I suspect that if prioritization were possible, the ISPs could have better managed the whole Internet performance.”

the stream. It took about 15 seconds after restarting for the video to catch up with the audio. Not a good experi-

ence. By Monday night, things were back to normal.

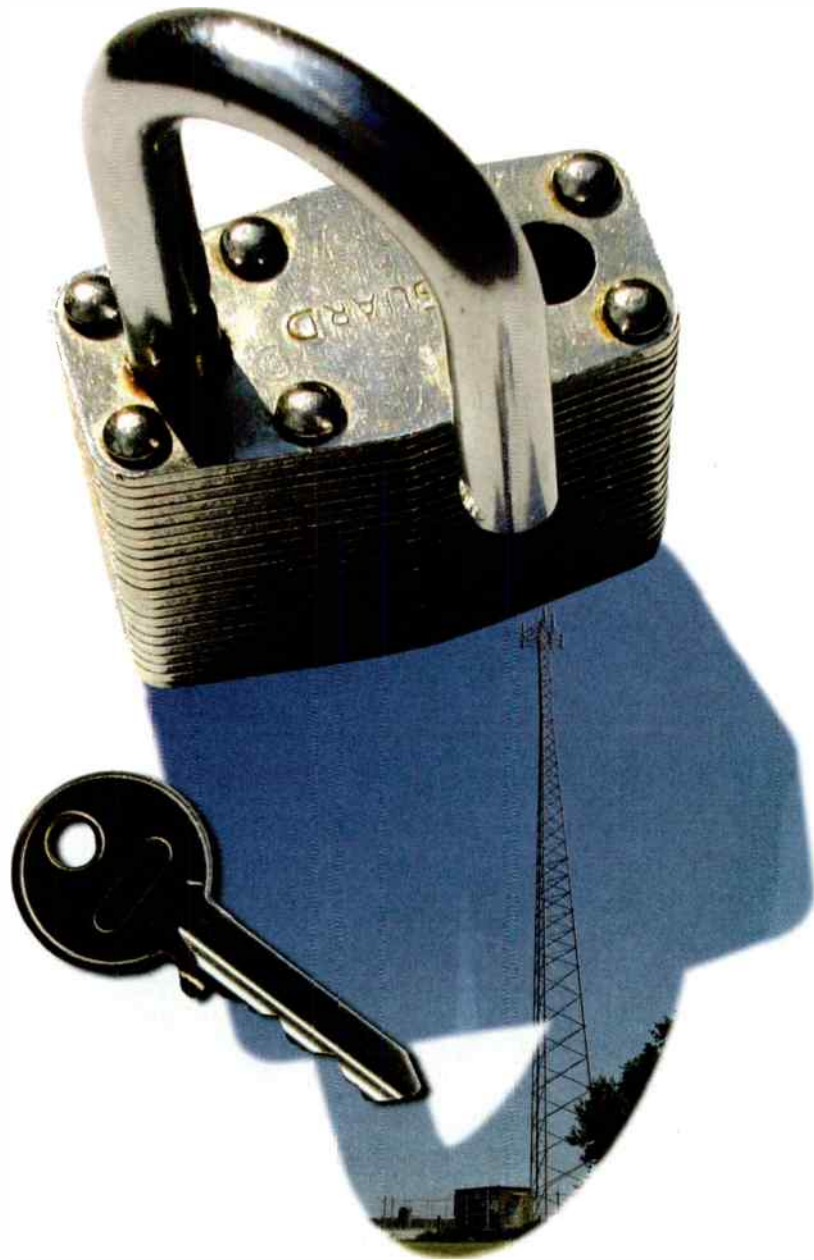
Cause of Delay

We have 100 Mbps broadband service to the house, courtesy of Time Warner Cable. The Mac uses a wired Ethernet connection (not Wi-Fi) straight into the router. So the delay was highly unlikely to be on our end; it looked and felt as though everyone was trying to access the same content on that Friday night.

Prioritization

If I take a strict interpretation of the FCC’s new rules, then the ISPs cannot prioritize “House of Cards” upon release, except for network management issues, which probably must then be documented and defended. But in reality, could Netflix have offered a premium service for Friday night to give “House of Cards” a fast lane? Certainly — and I would have paid for it. The service would have been better and, frankly, when it costs about \$25 for two people to go to the movie theater on the weekend, paying \$10 to \$15 looks like a bargain. So in this respect, I want prioritization of traffic for payment.





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World Radio History

I suspect that if prioritization were possible, the ISPs could have better managed the whole Internet performance. By knowing ahead of time who wanted prioritized service and who did not, surely network management as a whole would have been improved.

Now, to mobile. Mobile ISPs are particularly susceptible to demand for certain content. If everyone starts watching Netflix on their smartphones at the same time, the serving cell will have some problems. And the new ruling applies to mobile ISPs as much as broadband. Look ahead a few years to the widespread commercial availability of LTE Broadcast, and you can see that having a

high-quality, prioritized service for “House of Cards” would not only be possible, but also most likely preferable and beneficial overall.

“The FCC has failed, miserably, to consider not only how people consume content today, but also the effect of new technologies.”

For example, with LTE Broadcast, the operator can designate an LTE channel to broadcast mode and then

push the content over that channel to all who are interested (the device has to “listen” for the broadcast and therefore be scheduled). This accomplishes two things: It gives a better experience for those wanting “House of Cards,” and it moves all of the unicast content requests off of the regular LTE channels, thereby improving performance as a whole.

Additional Fee

Would this be possible with the new net neutrality rules? It’s unlikely, because the mobile operators would be prioritizing one piece of video content over others by putting it on LTE Broadcast. Charging an additional fee would certainly

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be out of the question.

Which brings us neatly to my main criticism of the new rules: The FCC has failed, miserably, to consider not only how people consume content today, but also the effect of new technologies. To use legislation passed in 1934 and 1996 for the 2015 com-

munications market appears nothing short of insane. Proponents will argue that the original legislation was good and could be applied across multiple technologies — it is technology-neutral, so to speak.

Well — no. The Internet and broadband services as we have them today

were not conceived in 1996, let alone 1934. Few people ever thought that mobile networks could provide primary access to the Internet, that entire seasons of popular shows would be released in one go, that movies could be streamed on demand to any device, or that streaming music would be free with ads. All of these services have changed the way we use the networks, both wired and wireless, and have therefore changed the way networks are built, managed and valued.

As for prioritization, that was never even a consideration in 1934 or 1996.

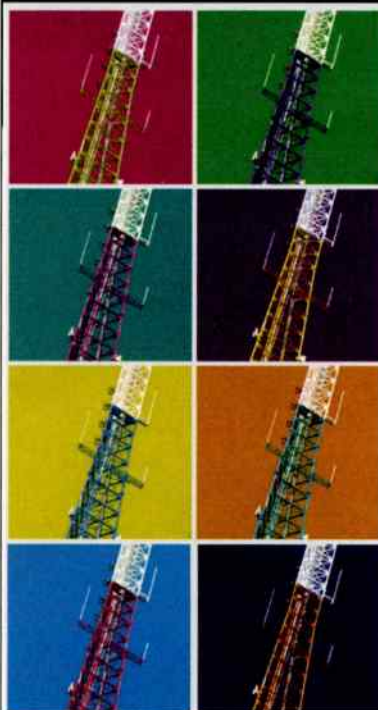
The expectation was that you would pick up a phone and hear a tone (or in 1996, push “Send” and get a connection). But today, I want the packets for my home alarm system, nanny video monitor, car navigation, and video calls to be given priority over email, Dropbox/iCloud/Drive syncing, calendar and contact updates, photo syncing and a host of other apps that can wait a few more milliseconds. And yes, I would want the option to pay for a better Netflix experience on some weekends.

Too Little Thought

President Frank Underwood (Kevin Spacey’s character in “House of Cards”) is having trouble getting things done after he gains the presidency. It seems to me as though the FCC thought too little about net neutrality and needs to work harder, as does Spacey’s character. Go back to the drawing board and come up with some regulations that make sense in today’s world, not in 1996 and certainly not in 1934.

Iain Gillott is the founder and president of iGR and iGR Semiconductor Research. His email address is iain@iGR-inc.com.

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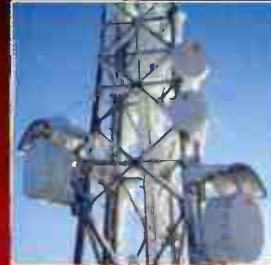
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Company description: Engineered Endeavors is a leader in the design and fabrication of monopoles, disguised monopoles (slimline), flagpoles, temporary ballast poles and custom-concealed antenna structures. We also specialize in retrofits of existing canister monopoles such as antenna/equipment upgrades. We have in-house engineering/drafting and PE certification in all 50 states.

See ad on page 59



Environmental Integration

18 Chase Court
Orange, MA 01364
Thor Holbek
413.219.9547
taholbek@environmentalintegration.com
www.environmentalintegration.com

Product: camouflaged

Company description: Free estimates and quick turnaround. DAS, rooftop structures, monopines and flagpole expansion. Experienced developing concealment design option for presentation to cities and towns. Monopine branch canopy withstanding 150 mph winds with a 10-year warranty.

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Robin Schimming
660.882.9333
info@glenmartin.com
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David Ullrich
541.548.0812
sales@hitechcomposites.com
www.hitechcomposites.com

Products: camouflaged, water tower, rooftop

Company description: HTCS is a full-service provider of RF-friendly concealment systems factory assembled and shipped in large component pieces for quick field installations. Our objective is to provide you with high-quality products in a timely fashion within your budget. Contact us today for all your concealment needs.



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Products: guyed, self-supporting, transportable, water tower, rooftop

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Tucson, AZ 85703
Tom Fedderson
520.792.1686
fedderson@larsoncamo.com
www.larsoncamo.com

Products: camouflaged, water tower, rooftop

Company description: Larson pioneered cellular camouflage with the first monopine cell tower in 1992 and has been leading the industry ever since. Products include pines, palms, elms, cypress, cacti, rooftops, water towers and steeples, DAS implementations, etc. We also refurbish trees with field-installed branches and fronds.

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World Radio History

monopoles

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13435 Estelle St.

Corona, CA 92879

Mark Peabody

888.511.6828

sales@peabodyconcealment.com

www.peabodyconcealment.com

Products: camouflaged, rooftop

Company description: We have been

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See ad on page 52



Peak Industries

1408 E. Stutler Road

Spangle, WA 99031

Rick Covey

509.443.0479

contact@peakindustriesinc.com

www.peakindustriesinc.com

Products: mobile cell towers (COWs, TOWs, COLTs, referbs)

Pioneer Energy Products (Pepro)

671 Colbert Ave.

Oil City, PA 16301

William Rupert

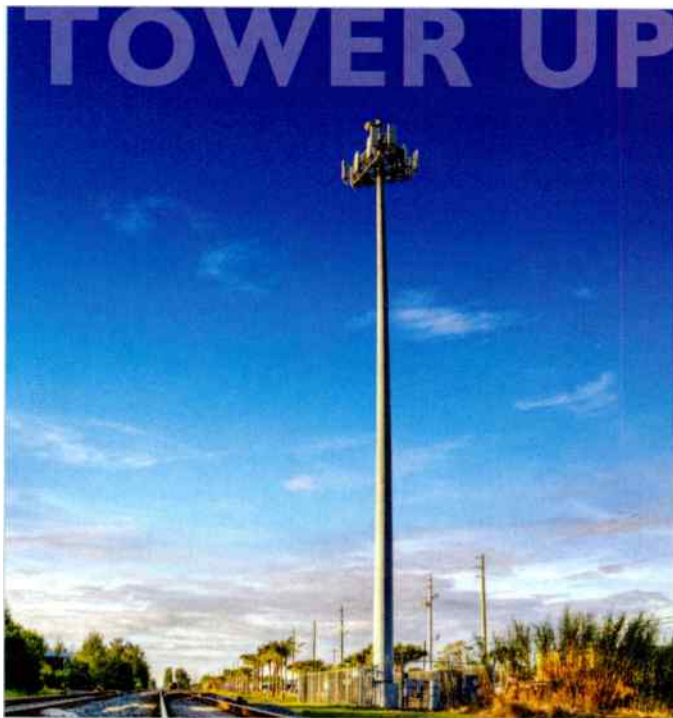
814.676.5688

wrupert@peprollc.com

www.peprollc.com

Products: self-supporting, monopoles, transportable, rooftop

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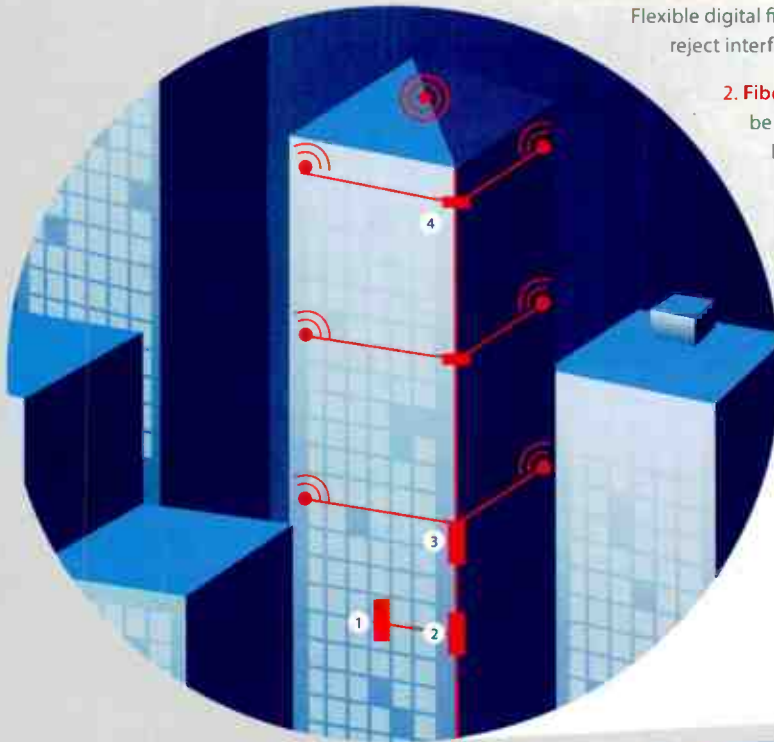
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TIA/EIA-222G wind load standards. Pepro is a veteran-owned small business located in Oil City, Pennsylvania.



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164 Malbert St., Building B
Perris, CA 92570
Vito Milano
951.940.9090
info@porterrf.com
www.porterrf.com

Products: camouflaged, water tower

Company description: Porter Site Concealment creates quality concealment solutions including roof-

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1 Fairholm Ave.
Peoria, IL 61603
Tim Rohn
309.566.3000
trohn@rohnnet.com
www.rohnnet.com

Products: guyed, self-supporting,

monopoles, transportable, rooftop

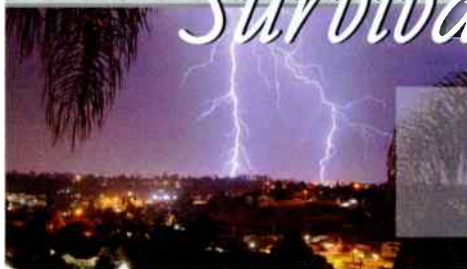
Company description: Rohn has been designing and manufacturing vertical structures and towers for nearly seven decades. Guyed towers to 200 feet, self-supporting towers to 900 feet, monopoles to 375 feet. Complete design and fabrication facilities in Peoria, Illinois, USA. Worldwide after-sale customer support. Contact us now for a competitive quotation. Never accept second-best.



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www.sabreindustries.com

Products: guyed, self-supporting, monopoles, transportable, camouflaged

Company description: Sabre Towers and Poles designs and manufactures guyed and self-supporting towers, monopoles and concealment structures. In addition, we design, fabricate and install tower and monopole upgrade components.

See ad on page 9



SOLAR COMMUNICATIONS
INTERNATIONAL

**Solar Communications
International**

8885 Rio San Diego Drive
Suite 207
Steve Holborn
619.243.2750
sholborn@rftransparent.com
www.rftransparent.com

Products: monopoles, camouflaged, concrete/silo, water tower, rooftop, monoecalyptus

Company description: Solar Communications International (SCI) offers wireless telecom more than a decade of concealment product innovation with value-added service that comes with experience. SCI is a full-service, design-to-deployment concealment company in Southern California. Our products and services include conceal-

ment systems, structural engineering, concealed site modification and maintenance, and custom product manufacturing.

See ads on pages 13 and 61

Sollenberger Silos

5778 Sunset Pike
Chambersburg, PA 17202
Bob Francis
717.816.4592
silobob@sollenbergersilos.com
www.sollenbergersilos.com

Product: concrete/silo

Stealth Concealment Solutions

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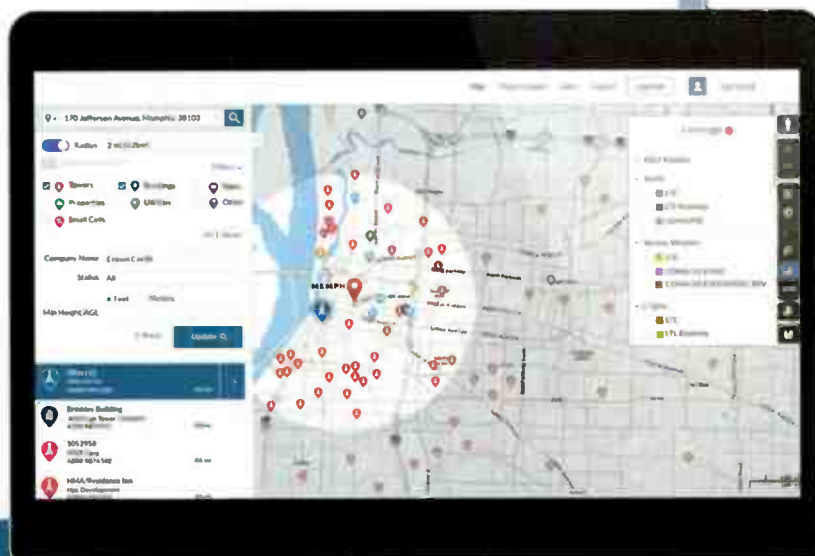
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Products: monopoles, camouflaged, concrete/silo, water tower, rooftop



Steelhead Metal & Fab

P.O. Box 3850
Salem, OR 97302
Damon Johnson
877.900.6798
damon@steelheadmetals.com
www.steelheadmetals.com

Products: self-supporting, monopoles, transportable, camouflaged, concrete/silo, water tower, rooftop, tower accessories, site steel

Company description: Steelhead Metal & Fab offers a diverse and creative product portfolio of engineered steel structures to major wireless carriers, project management companies, contractors and vertical real estate companies such as concealment and rooftops, monopoles, self-support towers, tower reinforcement modifications, cable installation accessories, site components and small cell solutions.

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tashjian@msn.com

www.tashtowers.com

Products: guyed, self-supporting, monopoles, transportable, camouflaged, water tower, rooftop

US Tower

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Chuck Diehl
559.564.6000
sales@ustower.com
www.ustower.com

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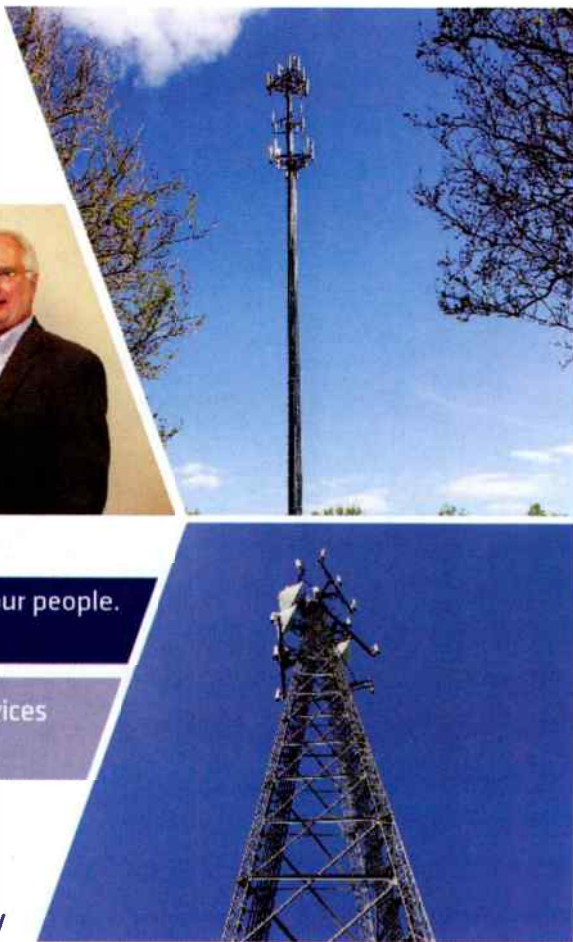


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 www.utilityservice.com/wireless
 Product: water tower



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 Sean Gallagher
 503.589.6616
 sean.gallagher@valmont.com
 www.valmont-towers.com

Products: guyed, self-supporting, monopoles, transportable, camouflaged, rooftop



Vector Structural Engineering
 9138 S. State St., Suite 101
 Sandy, UT 84070
 Lori Hiatt
 801.990.1775
 lori@vectorse.com
 www.vectorse.com

Products: guyed, self-supporting, monopoles, transportable, camouflaged, concrete/silo, water tower, rooftop

Company description: Engineers at Vector have been designing telecom structures since 1995. We are licensed in all 50 states, Washington, D.C., and

Puerto Rico. Our structural experience is extensive and includes monopoles, towers, rooftop concealments and camouflaged trees, poles, water tanks, clock towers, steeples, etc.



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 Kevin Raddatz
 971.283.0576
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 www.westernutilitytelecom.com

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rooftop

Company description: Western Utility Telecom is becoming the industry's most innovative designer and manufacturer of steel structures and related compo-

nents. With decades of combined experience, our design and engineering teams work closely with our production teams to produce the most efficient, practical and cost-effective structures with the highest quality and standards.



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Travis Powell
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tpowell@willburt.com
www.willburt.com

Products: transportable

Company description: Will-Burt and sister company ITS, both ISO 9001:2008 certified manufacturers, are recognized as premier OEM sources for rapid-deployment mobile tower and mast systems, COWs and COLTs, and integrated mobile command and communication centers. We support emergency response, temporary and long-term communications, surveillance, test and other requirements for a global clientele.



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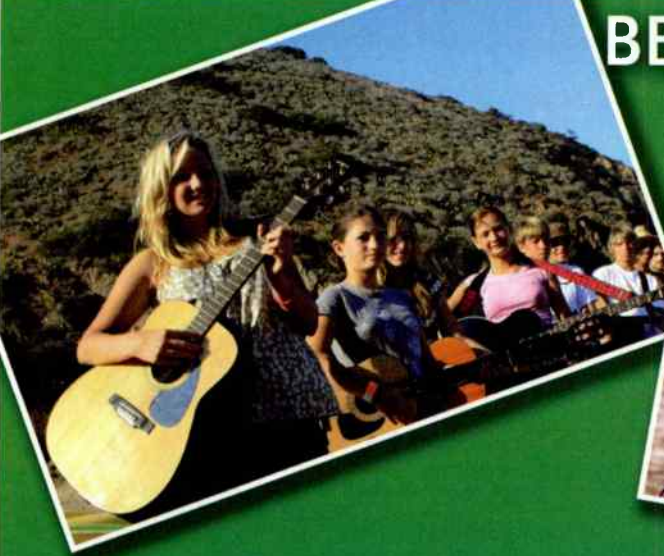
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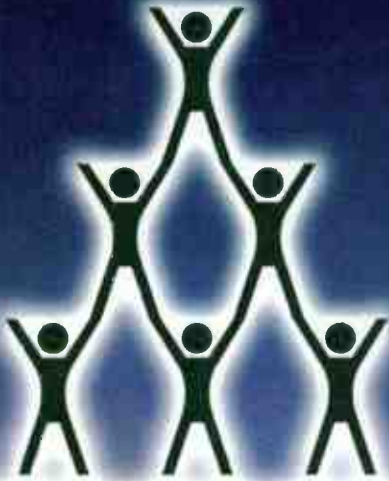
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Chris Wener

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.

TOWER INDUSTRY FAMILY SUPPORT CHARITABLE FOUNDATION

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Demand for Better-value Antenna Concealment Solutions

As jurisdictions become more intelligent about options for concealing antenna sites, including wireless telecommunications towers, they are spurring carriers toward higher-quality concealment and camouflage.

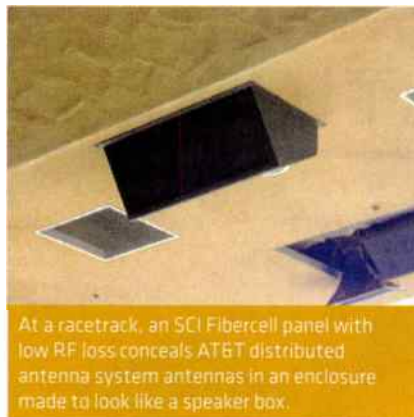
By Mike Breslin

Just as consumers and businesses continuously demand fuller geographic coverage together with faster and more powerful cellular communications, communities and cellular providers are demanding more concealed, more durable solutions to hide cellular antennas and related equipment.

Over the past 20 years or so, camouflaging has progressed from clumsy attempts to conceal antenna arrays with some of the ugliest pine trees ever created, to today when camouflaging specialists are offering new, creative products of higher quality. Now, communities want to blend leading technology with eye-pleasing concealment that stands the test of time. For carriers, good-looking camouflaging design proposals expedite site and technical approvals and result in smoother, less-costly, faster startups.

Progression

"Our business today can be summed up in one word: progression," said



At a racetrack, an SCI Fibercell panel with low RF loss conceals AT&T distributed antenna system antennas in an enclosure made to look like a speaker box.

Stephen Holborn, director of business development for Solar Communications International (SCI), better known in the industry for its RFTransparent brand of camouflage solutions. "For a long while, our industry was completely cost driven and a lot of bad-looking products went out. These days, camouflage is well established and familiar to carriers. Today, they come to us and say we need something new, different and low-maintenance. It's at a point where we can design sites that actually work both technically and aesthetically. It's progressing constantly

to a point where it can be fun at times."

RF Transparency

One of the early innovators in concealment, SCI started 17 years ago with the intention of building remote solar power sites, but soon began developing RF-transparent products. The company's fibercell panels have low RF loss, only 0.25 dB to 0.04 dB versus typical fiberglass-reinforced panels that may have more than a 5-dB loss.

Holborn said that SCI completes 300 to 400 projects per year with a small, tight-knit staff. The company partners with a steel company in Oregon and an engineering firm in Utah, and it operates a manufacturing plant in Maquiladora, Mexico, for its fiberglass products. "On the West Coast, we believe we're the most competitive company," he said. "Our primary market area is the western states because we've been so busy there over the past three or four years with companies like AT&T, Verizon



An SDI light pole with a decorative nacelle for a T-Mobile distributed antenna system in San Diego.



An SCI custom oak tree made for AT&T and placed at an antenna site in Sacramento, California.



An SDI two-carrier, 75-foot water tower designed and built for AT&T in Livermore, California.

and Sprint. But we do business nationwide with many carriers in the Midwest and along the East Coast. We have projects going into Philadel-

phia and have done work in Long Island with T-Mobile."

SCI designs and manufactures an extensive line of camouflage

products. Its concealed height systems consist of tree-disguised monopole towers including pine, elm, oak, cypress and a patented

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An SCI 100-foot multicarrier eucalyptus built for Verizon Wireless in Oxnard, California.



A Chameleon Engineering 3-D simulated model of a proposed antenna site disguised to look like an oil derrick.



The Chameleon Engineering oil derrick as constructed; it is shown as a model in the photo to the left.

eucalyptus. Among other concealed height products are towers, crosses, water tanks, rocks, signs, windmills and light poles. Structures on the West Coast vary from 55 feet to 100 feet high, but Holborn said that they have provided 150-foot-tall pine tree poles for other states. The company's tallest eucalyptus trees to date are 110 feet high and can accommodate as many as five carriers. Water tanks can be 65 feet to 125 feet tall and handle three carriers inside the tank and another carrier below a steel deck. In addition, the company offers rooftop, wall-mount, pole-top and veneer RF-transparent systems.

Camouflage Types

"Trees are the most challenging types of camouflage — pines, broad-leafed trees and palms — the single-pole type of products," Holborn said. "We're at a point in the industry where the amount of equipment that the likes of AT&T, Verizon and Sprint want to install on the tree-pole type of products is causing structural is-

sues because of weight and wind loading. Not only that, it's making it virtually impossible to camouflage equipment using normal processes. We are being challenged technically to hide single-pole structures with artificial foliage in such a way as to hide all this equipment and still look good. It's a huge, huge challenge."

Heavy Equipment

"On single-pole tree structures, for example, AT&T is now installing 12 8-foot-tall antennas, 14 inches wide and 8 inches deep, and in some areas 24 to 36 top-mounted radios behind the antennas. We are tasked to design a tree in such a way that it can hide this vast amount of heavy and very large equipment," said Holborn.

To address these problems, SCI designed and patented its eucalyptus tree tower, which has become a signature product. It solves the capacity problems on the single pole with a product that conceals all that equipment with enough branch coverage to look as natural as pos-

sible. The eucalyptus extends PVC branches out to a 25-foot radius to conceal antennas and equipment, keeping it all 2 feet to 3 feet inside the branch layout. "In California, it's become a huge product for us," Holborn commented.

Chameleon Engineering

Another West Coast-based concealment company is Chameleon Engineering, headquartered in Nevada. A staff of 20 design and manufacture a wide range of camouflaged structures such as monopole trees and water towers. Chameleon's sales are divided 11 percent internationally, 62 percent West Coast and 27 percent in the Midwest and on the East Coast. Chameleon also partners with other tower manufacturers to make their branches. The company focuses on longer-lasting products backed by a 5-year limited warranty, whereas a 1-year warranty is typical in the industry. Chameleon is one of only two companies that make eucalyptus tree towers,



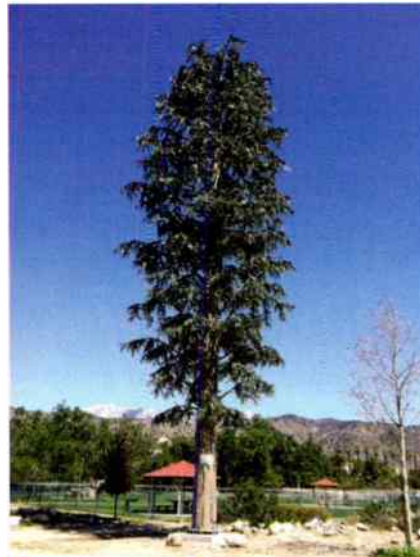
A Chameleon Engineering simulated view of a eucalyptus tree with 8-foot branches for a camouflaged antenna site.

and in line with its focus on quality and realism, it is the only company that offers different foliage options for each tree species.

3-D Images

To support site development, Chameleon specializes in making computer-generated 3-D images to reflect the exact specifications of the tower being proposed.

“Instead of submitting generic photo simulations of other trees that may or may not look like what will end up at a site, we make 3-D renderings with high-resolution still images from different views, or make full-motion 3-D movies available, showing 360-degree views of the camouflage product,” said Rienk Ayers, Chameleon’s general manager. “With our images, carriers can show the exact tree or structure proposed. They can see the precise branch count, branch length, number of tips and tip color, and overlay images show the size and number of antennas and



As built and installed, the eucalyptus tree is represented by the simulated view to the left.

how they are laid out. We can show lighting, shadow and everything on the tree from any angle — something not possible with generic photo simulations. Due to the true WYSIWYG nature of this tool, our 3-D imaging can often save weeks and even months for getting sites approved. Plus, we can prove that fewer quality branches look better than lots of inferior branches, so there is often no additional cost.”

Ayers said that during the past 10 years, carriers and tower companies wanted concealment at lower



Two 8-foot eucalyptus branches in a wind tunnel prior to testing. Photo: Chameleon Engineering

and lower cost. It did not matter how good a tree product was, or how many branches it had, or what the long-term maintenance implications were, he said, jobs typically went to low bid. Ayers said that sometimes during the presentation of proposals, jurisdictions would be shown a picture of something such as a pine monopole that looked acceptable, but when the tower was built, the jurisdiction then felt it had been baited and switched because what was promised was not delivered.

Pushback

Chameleon’s general manager said that these issues have caused pushback from many jurisdictions. In addition, he said that branches on low-bid trees would break in a year or two, or excessive foliage would fall off. Ayers said he believes that jurisdictions are now insisting on more guarantees, and carriers are beginning to realize they have to seek better-quality products because jurisdictions are insisting on it. He said he believes this is happening more and more across the country.

“There seems to be a disconnect when it comes to understanding the difference between price and



Two 8-foot eucalyptus branches subjected to 150 mph wind in a wind tunnel. Photo: Chameleon Engineering

cost,” said Ayers. “The lowest price does not equal the lowest cost or the best value. I think that’s starting to be seen, and people need to pay attention to how long products last. The needles on a pine tree, for example, are highly susceptible to damage caused by ultraviolet light and wind. After a year or two, most trees will start turning blue because they are losing their yellow tint because of ultraviolet light. We have the capability, for instance, to protect our plastic with coatings that make the color last five years or more, something no one else does. We also can make our own tree

leaves. We use Santoprene plastic, a highly flexible plastic that’s used for such things as the rubber tracks on lunar rovers. It’s expensive, but it lasts, and its flexibility looks realistic and handles the wind. We injection-mold branches from solid plastic around a laminated fiberglass-reinforced panel internal structure so the branches can sustain a 600-pound direct load. Because our branches are designed to mimic real trees, their shape fills more space than the flat branches of other companies, which allows us to fill in a tree much better, or with fewer branches.”

Change in Thinking

The cost-value equation appears to be a big change in concealment thinking. As jurisdictions become more intelligent about options, they are spurring carriers toward higher quality. It may cost carriers and tower companies a little more up front, but in the end it will save them time and money. Design and technical innovations that make concealment products look better and last longer make everyone in the industry look good.

Mike Breslin is the owner of Breslin Productions, Midland Park, New Jersey. His email address is mbrez@aol.com.



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World Radio History

The Aging Cellular Infrastructure and DAS

Towers require reinforcement, replacement and reengineering to keep pace with the rapid growth in wireless data and the heavier, bulkier 4G cellular equipment. The use of distributed antenna systems can improve the user experience while mitigating degradation of performance on adjacent macro networks.

By Jim Estes

Meeting increasing consumer data demands with an aging infrastructure and a major shift from landlines has increased the burden on the country's cellular system. Using distributed antenna system (DAS) networks may be one of the solutions to mitigate part of this problem.

With half the 350,000 cell sites in the United States being more than 10 years old, the business of retrofitting and upgrading is moving forward at an accelerated pace. However, consumers have placed new burdens on this system and now expect fast data delivery across multiple networks, outside and inside buildings, at recreational venues and even underground. The use of small cells has helped to relieve some of the burden on overtaxed sites, but this approach doesn't completely remediate the main issue. DAS is

another piece of the solution. With lower power requirements and a closer proximity to subscribers, DAS is an effective technology for high-capacity data demands in concentrated areas. As an added bonus, DAS also has the ability to deliver signals underground. One significant example is the DAS system deployed by Transit Wireless in the New York City Subway system, which provides voice and data coverage.

New data compiled by Velocitel, a wireless network services company, and CTIA, a membership organization for companies in the wireless industry, paints a compelling overview of a critical industry in a state of flux.

According to the CTIA's annual Wireless Industry Survey, wireless data usage increased from 1.468 terabytes in 2012 to 3.23 terabytes in 2013, reflecting a rapid increase in



consumer demand. Marketing by content producers such as Netflix and cellular providers offering high-capacity data plans have pushed the expectation of mobile video on small-footprint smartphones and tablets, moving the consumer experience from desktops, laptops and Wi-Fi. This requires a more robust 4G or

LTE network. Consumers now demand easy access to clear transmission that does not lag, which places a major and increasing burden on our existing infrastructure to provide more data.

Velocitel has been developing and erecting towers and cell sites since 1987 and has been an active participant in the growth of the U.S cellular infrastructure. The oldest sites in the United States date back more than 30 years, with a significant number being from 15 to 30 years old. According to Velocitel data, in 2013, 58 percent of all connections were 3G and 22 percent were 2G. Thirteen percent of wireless connections in 2012 were 4G, jumping to 20 percent in 2013. This number will only increase, which places an additional burden on an aging infrastructure. In the case of cell towers, 4G equipment puts more weight and wind load aloft. All these connections (2G, 3G and 4G) are creating a crowded environment at the tops of our towers.

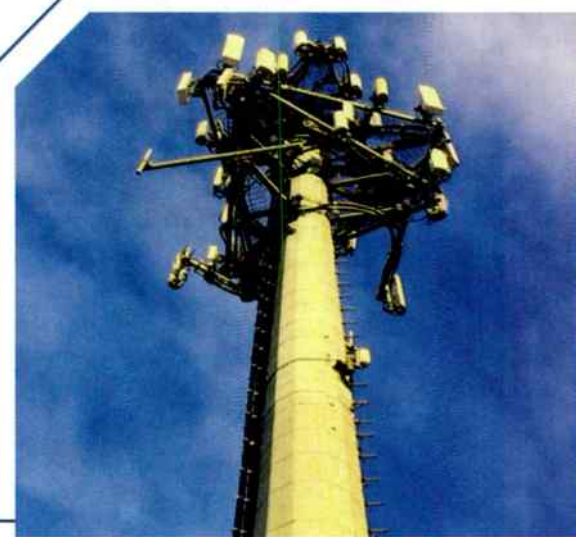
This issue is exacerbated because the earliest generations of cell towers were designed for a single tenant, not to support bulky, multiple-antenna arrays that are being bolted on to serve consumer demands. The result? A shortage of real estate on overburdened towers that represent a critical component of our wireless infrastructure. The solution? Reinforce, replace, reengineer and take advantage of DAS technology.

Consumer expectations have also changed from merely using voice and texting to streaming video and posting data-intensive video files. Although many consumers can rely on indoor Wi-Fi for their streaming

needs, the popularity of localized usage concentrations during events can become a serious drain on resources. This is exacerbated by another sea change that affects our aging infrastructure: nearly 40 percent of the population has abandoned landlines and now relies exclusively on cellular services. Let's look at how all these moving parts come together in a typical example that occurs every night of the week somewhere in this country.

A popular local outdoor venue draws 10,000 people for a weekly concert. The concertgoers who are close to the stage hold their smartphones in the air to capture clips of the program, which they then post to social networks. Those farther back are watching the streaming clips and angling to get their own content online. As more users tap into the local network, not only does the wireless communications experience for the concertgoers quickly erode, but also the wireless communications experience for the surrounding neighborhood suffers. Soon, the wireless system lags so much that it's difficult to post, stream, talk or even text. The system is overloaded. Although the neighborhood's existing macrocellular infrastructure can accommodate typical needs, a sudden spike in use compromises the integrity of normal communications and emergency services. Take this example and multiply it by three to five times the number of users, and you'll have an idea of the load a major sporting event places on a neighborhood.

Adding a DAS system solves these types of problems by absorbing large spikes in traffic and allowing mac-



ronetworks to operate normally. For indoor and outdoor mixed venues, a combination of DAS (indoor) and small cells (outdoor) provides a seamless method by which these situations can be addressed through combining multiple technologies to support the aging infrastructure. Venues such as these aren't always in use, and when they're not, the existing systems may provide users with all the connectivity they require. Requiring this amount of connectivity is becoming a moving target as data demands increase and more landlines are abandoned. However, at this time, there is a clear place for DAS to provide dramatically improved end-user performance and mitigate the degradation on adjacent macronetworks. And these are just two of the elements that are in play to manage our aging infrastructure. Details about some of the other elements will follow in a future article.

Jim Estes is chairman of Velocitel, a company that develops and maintains wireless communications systems. Visit www.velocitel.com.



The Promise of Drones for Tower Inspection

Congress told the Federal Aviation Administration to issue rules by the end of 2015 to incorporate the use of drones into U.S. airspace. In February, the federal agency released proposed new rules.

By Mike Harrington

Proposed new rules from the Federal Aviation Administration fit perfectly with how most of the telecom tower industry would use unmanned aerial vehicles (UAVs), commonly known as drones. Tower inspection by drone typically involves simple up-and-down flight in airspace already off limits to all other aircraft.

The FAA bans commercial use of drones, though the agency has granted a small number of exemptions for operators in the oil, entertainment and aerial photography

industries. Once the FAA allows drones to be used in connection with the construction and maintenance of telecommunications towers, three factors might have much to do with whether drones are put to use for inspecting towers: the cost of the drones, the ease of their operation as technology evolves and the certification required for commercial use.

On Feb. 15, 2015, the Obama administration proposed lifting the ban on commercial drones, with the following stipulations. Drone op-

erators would have to pass a written test every two years. They would have to be able to see the aircraft without the aid of binoculars, cameras or other devices. The drones could be no heavier than 55 pounds. The drones could not fly higher than 500 feet or faster than 100 miles per hour. The drones could only be used during daylight hours and could not be flown over people who are not involved in their use.

Because there was already a strong likelihood that the FAA would grant an exemption for

tower inspection and maintenance, the odds are that many *AGL Magazine* readers are already gearing up for drone technology, checking drone websites and speculating on the type of drones to buy for their businesses.

Twenty years ago, an article about businesses employing drones for inspecting and maintaining work would have sounded like science fiction. Even 10 years ago, talk of commercially available drone technology was still a pie-in-the-sky fantasy. Now, with Amazon lobbying the FAA to allow it to use drones for package delivery and with many consumers buying drones for non-commercial use, the technology has arrived, big time. Type in “I want to buy a...” and Google’s autofill feature offers “drone” as the second most likely choice, after “house.”

Commercial Drones

Although the sky was always the limit for hobbyists to buy and freely fly drones, the FAA was quick to ban the commercial use of drones, and then granted only a handful of industry exceptions. Many commercial businesses see a double standard in how drones are now being regulated, especially considering that camera-equipped hobbyist drones have been spied peeking into the windows of high-rise apartment buildings and, in an alarming incident, landing on the White House lawn.

The main reason for unregulated hobbyist drones is that the FAA has grown to respect the safety guidelines and track record of the model aircraft industry. But considering that hundreds of thousands of drones are expected to take flight in the coming months, many expect that wider,

more stringent drone regulations will soon be enacted for hobbyists.

After all, what’s to keep hobbyist drones from colliding with airplanes, crashing into buildings or knocking pedestrians off their feet? That, of course, is the rub. And that’s what the FAA is trying to figure out. The agency that manages the busiest and most complicated airspace in the world, with more than 68,000 manned flights per day, is dealing with the regulatory nightmare of integrating a swarm of unmanned aircraft that can be as small as a sparrow or as large as an eagle.

The biggest issue for businesses wanting to employ drones commercially is the possibility that the FAA still might require all commercial drone operators to acquire a pilot’s license. That scenario seems unlikely, especially for the telecom tower in-

Proposed FAA Rules for Drones

- **Drone operators must pass a written test every two years.**
- **Drone operators must be able to see the aircraft without the aid of binoculars, cameras or other devices.**
- **The drones can be no heavier than 55 pounds.**
- **The drones cannot fly higher than 500 feet or faster than 100 miles per hour.**
- **The drones can only be used during daylight hours and cannot be flown over people who are not involved in their use.**

dustry. Such a requirement, a major hurdle for self-taught drone operators with no experience in the cockpit, would effectively end the possibility of drones being used for most commercial applications, including communication tower maintenance.

Tim Ondracek, a drone pilot for Safety One Training International in Littleton, Colorado, said he believes the commercial use of drones for telecom tower inspection is inevitable. In an interview conducted just before release of the proposed new FAA rules allowing commercial use of drones, Ondracek said, "Drones are powerful tools that save time and money in many industries including power transmission, communications, law enforcement, search and rescue and entertainment. Once the industry as a whole sees the potential of unmanned aerial vehicles, a drone will be a tool that most companies will use on a routine basis."

Ondracek said there needs to be some regulation, including some kind of training, along with regulations on altitude and distance. "The FAA's responsibility lies in keeping the skies safe for all," Ondracek said. "If you are using the airspace, you need to follow the rules. The FAA needs to set the rules so that everyone, including commercial aircraft and the public, remains safe. But the rules need to be within reason; you can't expect companies to spend thousands of dollars on permits, training and useless paperwork — and requiring a full-scale pilot's license would be excessive."

Meanwhile, the National Air Traffic Controllers Association receives daily reports of drones flying danger-

ously close to passenger aircraft. The incidents mostly happened at low altitudes as planes were on final approach to landing, but some have occurred at cruising altitudes as high as 10,000 feet.

Many recreational drone operators seem to be unaware or perhaps unconcerned that there are FAA guidelines for the safe use of model aircraft. These include not flying above 400 feet, near crowds, beyond the line of sight of the operator or within five miles of an airport. Those voluntary limitations, issued in 1981, have been largely followed by traditional model airplane makers, who put considerable effort into building their airships and developing aeronautical skills.

Rather than highlighting the dangers of drones, the White House lawn crash landing illustrates the hodgepodge of rules governing the drone industry in the United States. That's why the FAA is proposing rules that will allow for commercial drone operation in only a limited way. These rules, including requiring flights to remain under 500 feet high and within sight of the operator, work well for most of the tower maintenance industry.

Under pressure from Congress to speed access to U.S. skies for commercial drones, the federal government granted four companies permission in December 2014 to use drones for aerial surveillance, construction site monitoring and oil rig flare stack inspections. These permits brought the total number of companies granted permits for commercial operations to 13. The most recent permits, exemptions to the

FAA's ban against commercial use of drones, were granted to Trimble Navigation Limited, VDOS Global LLC, Clayco, and Woolpert, which received two permits. The permits allow the use of drones weighing less than 55 pounds, and the firms have said they will keep the unmanned aircraft within the line of sight of the operator.

Previously, the only permits the FAA issued were to two oil companies in Alaska and five aerial photography companies associated with television and film production. The FAA said it has received 167 requests for exemptions from commercial entities.

Drones for Telecom Tower Inspection

Dave Anthony, CEO of Shenandoah Tower Service in Staunton, Virginia, said there are compelling reasons to deploy drones for some aspects of tower inspections. "One reason is economics and another is safety," he said. "If drones are approved for safe, cost-effective tower inspection, it is conceivable they could be used to monitor and enforce appropriate safety practices by crew members."

Anthony said that drones can be used to collect visual information about tower-mounted components as to their condition, placement, size and orientation. "They can also be used for post-construction inspections by third-party inspectors," he said. "Engineering firms, contractors and government agencies will find the allure of using drones to reduce costs and exposure to heights irresistible." Anthony, quick to point out that there's no replacement for human eyes and hands

on the scene, also said that there are many times a visual will suffice and thus save deploying two people and exposing them to the climb.

Todd Schlekeway, executive director of the National Association of Tower Erectors, said there is no question that drones could be used to perform communications tower inspections, and that features could be tailored specifically for the tower industry. "If you can limit or reduce the climbing that a technician has to go through on a daily basis, even if it's just for one service, like inspection, from a safety standpoint, that's a good thing," he said.

Schlekeway also pointed out that drones will "never replace the need for the skills of elevated workforce, antenna and line work, and everything that tower technicians do up on a tower. I don't believe drones, no matter how technology advances, will ever be in a position to replace the sophisticated skill set that the workforce has," he said.

Anthony concurs. "Unless a drone can turn a wrench or replace a light bulb, the advocates are overstating the value of drones," he said. "Without overstating their value, I can see them being deployed economically and as a safety enhancement for a segment of the industry. From an inspection and mapping standpoint, I certainly believe that there will be drone applications in the future. And I believe they have great potential when it comes to those areas. You

never know as the product evolves and gets in the marketplace, what other applications it may have."

Safety One Training's Ondracek believes that drones will make the tower industry safer and more efficient. "A simple drone with a camera

“Drones are powerful tools that save time and money in many industries including power transmission, communications, law enforcement, search and rescue and entertainment. Once the industry as a whole sees the potential of unmanned aerial vehicles, a drone will be a tool that most companies will use on a routine basis.”

and video downlink costs anywhere from \$500 to \$10,000 depending on what you want to do with it," he said. "If you could cut the number of times a climber has to go up and look for a problem or figure out what tools and equipment are needed, you cut the risk of an employee getting hurt or killed, which is priceless."

Ondracek also emphasized that the ideal use for UAVs in the tower industry will involve simply going up and then back down. "The advantage of the UAV is that one flight can

cover a lot of ground at a much cheaper cost than using a commercial helicopter or airplane," he said.

"A drone can fly several miles using multiple types of cameras (high-definition, forward-looking infrared, ultraviolet) and a GPS-guided course looking for problems on the tower. If a problem is spotted, then a more thorough inspection can be done. The biggest safety factor using a UAV is that it can do the inspection without having a person ever stepping foot off the ground."

Gordon Lyman, president of Safety LMSystems, a tower safety training business with headquarters in San Antonio, Texas, said he is excited about the possibility of using drones. "If there is a use, the industry will find a way," he said. "I am not sure what kind of maintenance drones could do, but inspections are very likely. Drones could do the following: inspect the climbing route; inspect for hazards on the tower, including loose bolts, rust, missing members and damaged members, and check the condition of an antenna."

When asked if he's bought a drone, Lyman said, "It is too early in the game for me personally."

So, the big question is when will commercial operators be allowed to use drones?

"It all comes down the FAA ruling," Todd Schlekeway said.

Mike Harrington is a freelance writer in Prairie Village, Kansas.



Drone Makes and Models from Web-based Suppliers

A roundup of sources for remote-controlled, unmanned aerial vehicles (drones) helps you start research that may lead to your acquiring a UAV for use in your antenna site business.

By Mike Harrington

Remote-controlled aircraft are commonly called drones, but — possibly because of the military connotation — makers of the smaller, more maneuverable multiple-rotor versions of these autonomous aircraft prefer to call them unmanned aerial vehicles (UAVs). There are two kinds of UAVs: the big, fixed-wing airplane drones that can carry payloads (including bombs) and perform long-range surveillance missions, and the rotary (or helicopter) drones, which are better suited to most commercial

applications. Because they can hover and maneuver in any direction, and often come with gimbal stabilization, rotary drones serve as excellent camera platforms for aerial photography and videotaping.

Rotary drones with cameras and GPS systems now range in price from less than \$100 to \$5,000 or more. Most of the models that seem to be best suited to the task of telecom tower inspection are in the \$300 to \$4,000 range. These rotary drones generally feature advanced capability cameras and GPSs with

gimbal stabilization. The smartphone-guided Parrot AR Drone 2 is particularly popular among hobbyists. Meanwhile, more expensive models such as the DJI Phantom series are becoming popular for commercial purposes, including tower inspection.

The following list provides a sample of popular UAVs in the marketplace, along with links to drone-maker websites. A variety of best-selling drones are available for sale by Amazon, eBay, BestBuy, Microcenter, Walmart, Sears and

other retailer websites.

Amazon

www.amazon.com

A company that hopes to one day deliver packages by drone, Amazon probably offers the biggest variety of makes and models of rotary drones, including many DJI, Parrot, Syma and Holy Stone drones.

Cheap Drones

www.cheapdrones.com

Cheap Drones offers a range of models for commercial drone applications. The site also allows buyers to custom-build their own drones starting with a frame and then adding components from different suppliers, piece by piece. Products at this site include the Cheap Drones Aphid X-450 ARF quadcopter FPV kit with Naza flight

controller, the Hubsan 61170-02 4-channel 2.4-GHz RC quadcopter with 720p HD camera (green/black) and the Syma X5C quadcopter drone with HD camera and extra battery in a black-and-red design.

DJI

www.dji.com/products

DJI manufactures a range of electronic products, including flying cameras such as the Inspire and Phantom series of quadcopters. The Phantom quadcopters are mainly intended for aerial cinematography and photography applications. The Phantom 2 Vision+ features a camera and a gimbal system. It is capable of taking 14-megapixel still shots and filming a high-definition, 1080p video. Products include the Phantom 1, Phantom 2 Vision+, Phantom FC40 and the Inspire 1

T600 Inspire 1 quadcopter with a 4k video camera and a controller, and the Phantom Aerial UAV drone quadcopter Version 1.1.1 for the GoPro Hero camera models 1 2 3 Hero3+ silver and black.

Eagle Scout

<http://ageagle.com/>

According to the company's website, the Eagle Scout X Vision+ flying drone camera is simple to set up and super easy to fly, making it the first aerial filmmaking system suitable for everyone. The description says that users can shoot fully stabilized video from the sky, right out of the box. The three-axis high-precision camera stabilization brings smoothness to aerial videography. The unit offers stable hovering with an integrated GPS autopilot system for position holding and altitude lock to give a stable flight that allows the operator to concentrate on photography or filming.

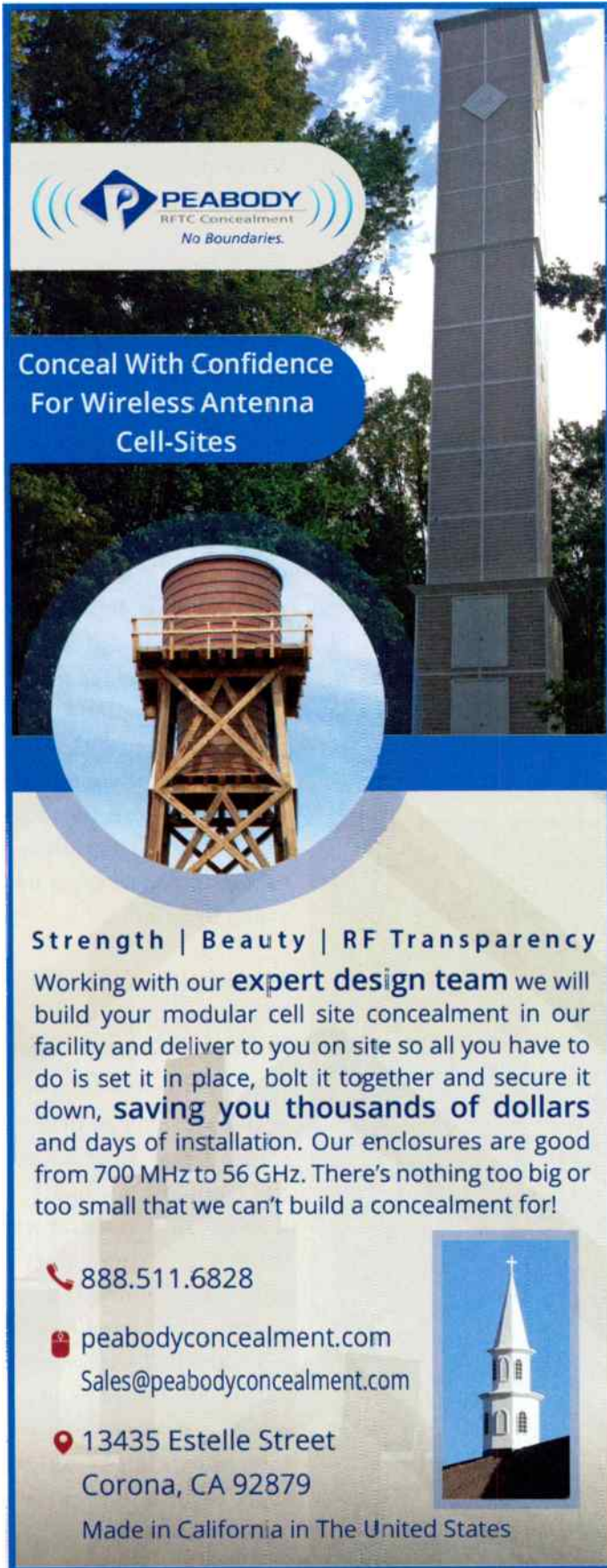
3D Robotics

<http://3drobotics.com/>

3D Robotics offers the Iris+ the Aero and the X8+ rotary unmanned aerial systems at prices ranging from \$750 to \$1,950. According to the company's website, the 3DR Iris+ provides the user with everything necessary to start shooting photos and video from new perspectives. Powered by 3DR's autopilot, the IRIS+ is a robot that will automatically fly itself where the operator directs it to go, while keeping a camera dead steady with two-axis gimbal stabilization.

Drone Suppliers

- Amazon, www.amazon.com
- Cheap Drones, www.cheapdrones.com
- DJI, www.dji.com/products
- Eagle Scout, <http://ageagle.com>
- 3D Robotics, <http://3drobotics.com>
- Parrot, <http://ardrone2.parrot.com>
- Hubsan, www.hubsan.com
- AEE Technology, <http://en.aee.com/drone>
- Yuneek, www.q500typhoon.com




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Parrot

<http://ardrone2.parrot.com/>

In January 2010, Parrot introduced the Parrot AR drone-flying hardware and Open API game development platform, www.ARdrone.org. In 2012, Parrot bought 57 percent of Swiss drone company senseFly. Products include the AR.Drone 2.0 Qauadricopter and the AR.Drone 2.0 power edition Quadricopter that features 36 minutes of flying time.

Hubsan

www.hubsan.com

Shenzhen Hubsan Technology started in 2010. The company developed into an enterprise that integrated the research and development, production, and sales and service for hobbies and toys. The company's signature model is the Hubsan X4 Pro rotary drone.

AEE Technology

<http://en.aee.com/drone>

Shenzhen AEE Technology is a manufacturer of multiple-rotor UAV systems, including one of the first integrated multiple-rotor UAV systems.

Yuneek

www.q500typhoon.com

Yuneek offers the Q500 Typhoon Quadcopter with 1080P 60FPS HD video camera, three-axis gimbal and personal ground station, among other products.

Mike Harrington is a freelance writer in Prairie Village, Kansas.

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Tower Companies: Great Business Versus the Networks Themselves

Stacked against wireless network operators, distributed antenna system network operators and small cells, the tower companies shine as investments for their predictability and credit-worthy customers.

By Don Bishop

At the Tower & Small Cell Summit in Las Vegas in September, Andrew Sinwell of N2 Capital, where he focuses on investments in technology, media and telecommunications, spoke at a wireless infrastructure investors session led by Ric Prentiss, managing director at Raymond James & Associates.

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

Warren Buffett's comment about Harley Davidson is that he likes a business where your brand name is tattooed on your customers' chests. There's a certain stickiness that that implies. Maybe the RF plan isn't tattooed on the engineers' chests, but it's harder to move cell sites than I think is commonly appreciated by Wall Street. We love the stickiness of the wireless infrastructure business.

We love the operating leverage

of adding another collocated tenant and the gross margin flow-through immediately to the bottom line. It's the best operating leverage of any business that I look at in the tech, media and telecom sector.

We love the barriers to entry, which are particularly high and not getting lower. The stunning thing to me is how much the stocks of the two tower companies that have become real estate investment trusts (REITs) are under-appreciated relative to other REITs. We look at that as kind of another leg of growth yet to come, as the REIT investors start to appreciate the quality of the tenants here versus Marshalls or whoever the anchor tenant is in a regional strip mall. Think about who's an anchor tenant in a mall versus the credit quality of the counterparties in wireless infrastructure, which is extraordinary. If you have a high-quality tenant such as

AT&T Mobility or Verizon Wireless, it's less risky. From an investor standpoint, that's something we look at.

In general, we like to invest where there's a big green arrow pointing one way, so even dummies like us can figure it out. Look at the imperative the wireless carriers have for investing in their networks to increase the quality of the customer experience. It's such a strategic imperative that it's clear, you have big green arrows pointing in one direction — big capex budgets and all four of the large carriers saying they have to invest in their networks. This is wonderful relative to some of the other times in the wireless infrastructure industry when not all four were building at the same time. Now, we have clear green arrows.

Maybe you wouldn't say investing in tower companies is value investing; maybe it's growth at a

reasonable price (GARP) investing. You pay for growth at a reasonable price. Many people push back on tower valuations. When I changed from private equity investing to public equity investing in 2003, I wanted some investments in the tower business. Many people in the private equity market said tower multiples at the time were unsupportably high at 13 times forward EBITDA (earnings before interest, taxes, depreciation and amortization). We invested, thank goodness. Within a couple of years, they were just about where they are now — at 17 to 18 times forward EBITDA.

Results Delight

Valuations have hovered in this range since 2005. That valuation is a multiple of something: It's a multiple of EBITDA, and every year, that EBITDA delights. Now, we're looking at adjusted funds from operations (AFFO) instead of EBITDA. But either way you slice it every year, the tower companies manage to delight us in delivering results. A year goes by and you look out yet another year forward, and you have a big number that you're multiplying that multiple by.

I looked at what a dollar of investment in SBA Communications would have done at the supposedly unsupportably high valuation it was when we bought shares in 2003. It's up 33-fold since 2003. I'll pay a price for that growth. That's good growth at a reasonable price.

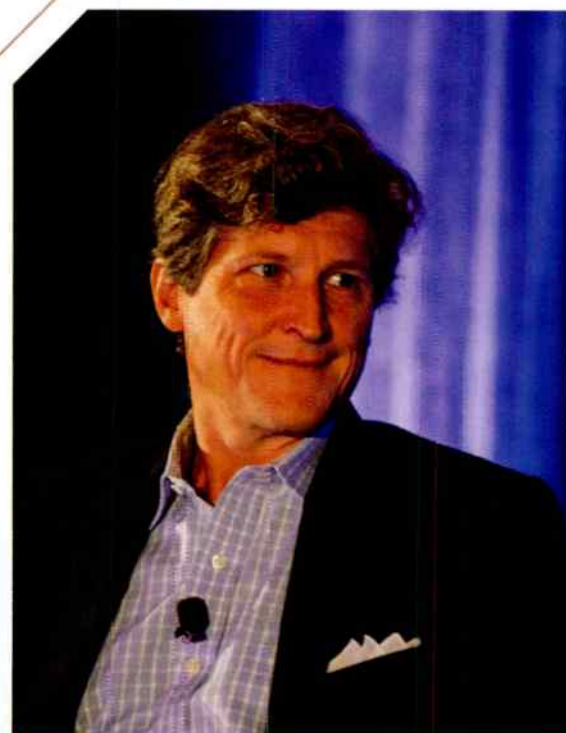
The prospects of the tower busi-

ness justify investing where you see "only" a 20 percent upside, whereas in our normal portfolio, we may say we want to see a 30 to 50 percent upside in a year and a half. With towers, we'll accept a lower upside because it's so predictable. A second thing is that the tower business lets you look a couple of years forward in projections. With other businesses, that's a no-no to look two years out and three years out where things are going to be. With towers, because of the predictability, we're able to use a two-year forward multiple, for instance.

For all of our investments, we look at free cash flow per share, and I emphasize per share for a reason. If a company uses its excess free cash flow at the end of the year to exploit opportunities to reinvest in the business, which is the thing they know how to do best, we love them to do that. If the company decides expansion opportunities aren't there, if they then turn around and [buy back shares and thereby] shrink the share count, we don't sell, so our slice of the pie grows: the value of our shares, and

“When you invest in public equities, what the next guy is going to worry about is a huge concern.”

the free cash flow attendant with each share, goes up. So we like looking at free cash flow per share as a final analysis for making comparisons across sectors.



Andrew Sinwell of N2 Capital at the Tower & Small Cell Summit. Photo by Don Bishop

Risk versus Reward

International investments look frothy. It appears as though a lot of private equity money is going into international auctions, competitive bidding for portfolios. It's easy to underestimate some of the sovereign risk, the currency risk. We were investors on the carrier side in India and loved it right up until 2008 when they granted seven new licenses, and one minister put a half-billion dollars of bribes in his pocket and got carted out a few years later in what was called the second-biggest abuse of government power since Watergate. That investment felt great for a while until it felt really awful.

I worry about things like zoning laws internationally. It's probably different if you're an operator like American Tower that's been doing investing overseas for perhaps a decade. Maybe they can surf some of those risks better than private equity investors. I also wonder whether there's going to be some stranded private equity capital: Right now, some of these private equity bidders just assume they're going to buy a big portfolio, front-run the operators and sell to the operators in a couple of years.

Some of the foreign portfolios are big, and they're beyond the size where they can be bought in total. So maybe they're thinking that they'll just have an IPO, but that's problematic. Infratel, I guess it's coming back, but it had a bad trade-off after its IPO. It's hovering around 10 times EBITDA, if I'm not mistaken; whereas people are paying double-digit multiples internationally to get into the sector. So an IPO at 10 times, that's their exit? I think you could see some internal rates of return that may not meet the expectations of some of these private equity investors who are just throwing money willy-nilly thinking, "I'm just going to front-run the operators."

DAS versus Macrocells

The first thing we asked ourselves about the distributed antenna system (DAS) business was, "Is this going to eat the macrocells?" We convinced ourselves that a carrier's preference is, "I want a macro site first. A DAS is what I'll take when I have to get coverage in places where I just can't get a macro, but a macro still makes the

they're quacking for.

I will say, I worry a little bit when telecom meets real estate. Real estate has a way of ruining telecom's margins and overgrasping for economics. It's important for us as investors to monitor the real economics as the DAS operators build and wire venues, to see what kind of economics the venues are demanding. So far, I confess, I'm somewhat unsure about the returns from DAS. Carriers and towercos need to do a great job educating us more to explain why it makes sense.

In my background, I have a lot of experience investing in laying metro fiber. We saw Crown Castle International acquire a fiber provider recently. We'll see more of that. Owning the fiber to get to the DAS location and to backhaul from the towers is more and more important. DAS and backhaul are necessarily going to have worse economics than the core tower business, so there's some explaining to do to make it clear to investors why this is a good thing.

Risks

When you invest in public equities, what the next guy is going to worry about is a huge concern. A tower company can fix a lot of its



most sense." We believe we moved the first question off the table. That said, it seems like the move toward small cells and DAS is inexorable. Therefore, the tower companies should be there in front of that demand, serving what the customers are eating—feed the ducks when they're quacking and serve them what

debt and not be subject to floating-rate debt. But you still ask the question of what happens when the interest rate environment goes up? Particularly when you have two tower companies trading as REITs, you wonder what a higher interest rate environment is going to do to REIT stocks and are REIT stocks going to sell off because the yield play is less compelling, and is that going to drag perfectly good tower companies with them?

It's an open question as to whether interest rates going up because the economy's getting stronger should cause REIT stocks to fall. Maybe it's not axiomatic that the REIT indices will fall. Maybe people will like the fact that the Marshalls of the world are doing better and better. But it's a question I ask, what's the reaction going to be of the people who are setting the price in the market?

Another matter is so-called left-field technologies. I spoke with a high-ranking tower company executive the other day, and he said when he changed over to this business nine or 10 years ago, his friends said, "What? Towers are going to be dead soon because the satellites are going to replace them." We know that's wrong, satellites won't be the answer because of latency, but we're always thinking about what new technology could hurt towers. And we ask the question about DAS. We're always trying to say, where could we really miss some-

thing that's coming out of left field? So far, I feel pretty good about technology substitution.

The Future Looks Good

Think about what the future roll out of Voice over LTE will do to link budgets. Think about the explosion of sensors that we think is coming in the Internet of Things, a trend that might be furthered by the Apple iWatch announcement. When I consider all that, I see technology as more of a help than a risk to towers. It makes me feel much more positive than negative.

“Some of the foreign portfolios are big, and they're beyond the size where they can be bought in total. So maybe they're thinking that they'll just have an IPO, but that's problematic.”

Beyond Passive Real Estate

The notion of tower companies forward-integrating in their business can already be seen in other countries where wireless network operators may have less operational ego. For example, in India, Bharti Airtel outsources parts of its business that a U.S. operator would say were absolutely core. It's much more common for a carrier in the international world to say, "I want a turnkey site. I want you to fuel my generator. I want

you to take care of security. I want you to do the maintenance."

Potentially, it's more likely that we'll see tower companies outside of the United States getting into owning the active parts of wireless networks. In the United States, wireless network operators have an operational control bent where they don't want to see core elements outsourced. But we've asked the question for a decade, why don't the tower companies own the back-up generators? Now, they're doing that.

You could ask the question, why aren't they supplying backhaul? Every tenant needs backhaul. It seems like an interesting opportunity. We talked about some of the worse economics of owning fiber and digging fiber. Right now, those opportunities don't look so bad, especially on the backhaul side, especially when that's a constraint for a lot of operators. To me, seeing that kind of forward integration makes a lot of sense.

Andrew Sinwell is with N2 Capital in Dallas. This article is based on remarks he made at the breakfast meeting of Raymond James & Associates led by Ric Prentiss, managing director, at the Tower & Small Cell Summit in September in Las Vegas. The Summit is owned by UBM, and it is collocated with Super Mobility Week, owned by CTIA. The next Summit is Sept. 9-11, 2015, at the Sands Convention Center in Las Vegas.

Planning for FirstNet, the Dedicated Nationwide Public Safety Network

How to make sure the network meets your requirements.

By TJ Kennedy

The First Responder Network Authority (FirstNet), grew out of a 9/11 Commission recommendation calling for interoperable communications for all U.S. first responders. Many emergency response teams — fire, emergency medical service and law enforcement — had difficulty communicating with each other on Sept. 11, 2001. Communications difficulties can slow response times, create confusion and, on 9/11, may have prevented public safety personnel from saving lives.

In response to the Commission report, Congress created FirstNet when it passed the Middle Class Tax Relief and Job Creation Act of 2012. An independent authority within the U.S. Department of Commerce's National Telecommunications and Information Administration, FirstNet is tasked with ensuring the establishment of a single wireless network dedicated to serving public safety professionals in the United States, including all 50 states, five territories and the District of Columbia.

The Act required the Federal Communications Commission to reallocate the 700-MHz D-block spectrum

for use by public safety entities, including law enforcement, fire and EMS. In addition, the Act required the FCC to grant a single license to FirstNet for the use of both the 700-MHz D block and existing public safety broadband spectrum. Consequently, the Act directs FirstNet to ensure the establishment of a wireless network that is intended to allow public safety to communicate seamlessly across the United States.

Dedicated Spectrum

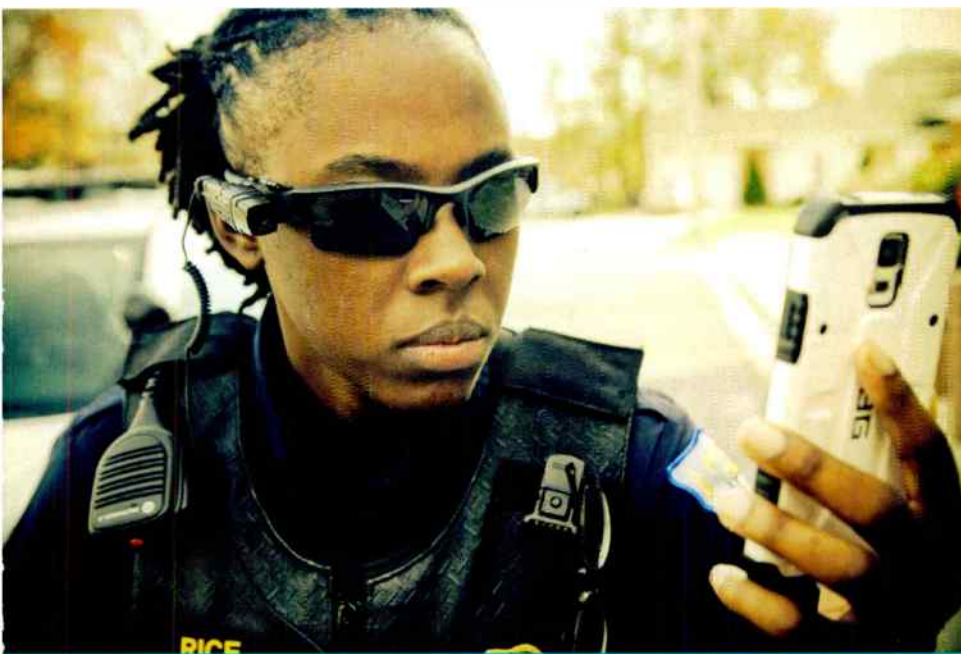
In addition to dedicated spectrum and a further reduction in the risk of network congestion via priority access for public safety, the network's standards-based architecture will most likely result in cheaper components and facilitate a shift in usage so users embrace services and apps. A goal of FirstNet is to allow first responders to take advantage of evolving, Internet-based mobile communications technology through intelligent devices such as smartphones and tablets and through wearable technology. By planning to incorporate continual advances in commercial technology into the net-

work, FirstNet intends to avoid the pitfalls resulting from other public safety network procurements.

Initially, the network is intended to provide Internet-based, high-speed data services that augment the voice capabilities of today's land mobile radio networks. FirstNet plans to enable users to send and receive data, video, images and text, to use voice applications, and to benefit from the ability to share applications.

Enhanced Operations

The network is intended to arm law enforcement officers, firefighters and paramedics along with other public safety stakeholders with modern tools to improve operations, whether under typical or extraordinary circumstances. During a routine traffic stop, the network could allow law enforcement officers to transmit real-time information to dispatch using their mobile data terminals, patrol car hotspots or license plate reader systems. As operational tempo increases, the ability for an officer to wirelessly communicate a large volume of in-



Laurel, Maryland, police officers such as Pfc. Capri Rice use smartphones and body cameras to enhance communications

formation in real time to a command center during a traffic stop — live video from a dash or body camera, for example — without ever having to speak into his or her radio could dramatically improve outcomes in life-threatening situations. FirstNet's goal is to enable a more informed, coordinated, and faster response across a number and variety of public safety organizations during disaster responses or terrorism incidents.

State Plans

FirstNet is consulting with the states, territories and the District of Columbia and will build an individual plan for each state or territory so that the network meets the needs of public safety there. FirstNet had its first initial consultation meeting with Maryland in July 2014, and by the end of 2014, it had held initial consultation meetings with eight states and Puerto Rico. Already this year, FirstNet has

conducted several initial consultation meetings and has scheduled many more. The collaborative consultation process is an opportunity for stakeholders to participate in the planning process with the state's single point of contact and FirstNet so they understand and support stakeholder needs. Each state consultation process is an important opportunity for stakeholders to directly inform the proposed plan for build out of the network in their state.

FirstNet's ongoing consultation efforts demonstrate its commitment to seeking public safety participation, listening to first responder feedback and designing the network in an open and transparent manner. Even if the consultation process has already begun in a particular state or territory, there is still time for stakeholders to participate in this highly iterative effort. Recurring topics of interest during consultation meet-

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PUBLIC SAFETY



Laurel, Maryland, police officers use smartphones and body cameras to enhance communications.

ings so far have included coverage, potential network users, priority of users, network capacity, coordination with federal agencies, affordability, use of existing assets and deployables.

To participate in consultation meetings, stakeholders should contact

their state's single point of contact. A list of state single points of contact is available at www.firstnet.gov.

TJ Kennedy is acting executive director of the First Responder Network Authority. Photos courtesy of the Laurel, Maryland, police department.



A license plate reader used by the Laurel, Maryland, police department.

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YEAR OF THE CLIMBER

By J. Sharpe Smith

On Feb. 12, the Occupational Safety and Health Administration proposed penalizing Sherwood Tower Service of Terre Haute, Indiana, \$114,800 for two willful violations and one serious violation of OSHA regulations involving an employee who died of injuries when he fell from a telecommunications tower on Aug. 10, 2014. OSHA said Sherwood did not provide him with an adequate fall protection system.

Thomas Lucas, 49, was painting a 500-foot tower owned by Midwest Tower Leasing when he fell from a height of nine stories. In addition to the lack of personal fall protection during tower climbing activities, OSHA inspectors found that the positioning device harness used by the fallen worker should have been replaced because it was heavily painted and showed visible signs of wear, damage and deterioration.

“Three children are without a father because of a preventable tragedy,” said Jacob Scott, OSHA’s area director in North Aurora, Illinois. “No one should have to endure such a painful loss ever. OSHA has seen a disturbing trend in preventable deaths and injuries in the telecommunications industry.”

The OSHA Files – Why Carla Valencia Died

The horrific nature of the accident that took Carla Valencia's life and the sheer disregard for worker safety involved is quite staggering. Tower owners, turfs and contractors should verify their subs' safety knowledge, and employees should stand up for their own safety.

By Dr. Bridgette Hester

If there is one question I am asked repeatedly, it is: "What really happened on that fatality? All we know is what the media said." The article series "The OSHA Files" responds to that question.

For research, I sent Freedom of Information Act requests to OSHA for every tower-related fatality from 1984 through 2013, a total of 315. I will send FOIA requests for all of 2014's fatalities once the investigations have been completed. I expressly set out to obtain the files for various research purposes. It is imperative to dissect each file for as much information as possible and make the public aware of that information for two main reasons.

First, you can't fix what's broken, if you in fact don't know what's broken. Correcting the safety problems in the wireless infrastructure industry requires a collective view of the true issues. One can speculate, read an OSHA summary or rely on the media reports,

or one can order a copy of the investigation report and read it.

The second reason is to start a movement of grassroots change. If after the publication of one or more of these articles, a crew, company or foreman uses them and perhaps also orders the OSHA file to use as a learning tool, then I will have accomplished what I set out to do.

A small team of active and retired climbers and other health and safety experts familiar with (and in) the industry are combing the files with me to answer my questions, provide insight and double-check my interpretation of information from the files (for example, the language, acronyms, pictures and equipment). With their assistance, I intend to summarize each OSHA file.

This is not to shame the company venture; thus, I am redacting some information in each file that was not already redacted when I received it,

such as the names of the employer and tower owner. This is not an effort to protect employers or tower owners. I don't want the focus to shift from education to blame. It wouldn't be productive, and it would defeat what I want to accomplish. I will, however, provide my own commentary.

Other information (such as surviving family) was found during a search by the author. These are my words unless indicated by the citation "(OSHA, 2000)."

Summary of Events

On Oct. 29, 2000, the company was hired to assess and correct problems resulting from a tower having been struck by lightning several weeks before the fatal incident. No written contract was made for the job, and the OSHA interview with the tower owner revealed that the tower owner worked with the company owner off and on for 25 years. He

The OSHA Files**Carla Valencia: 10/29/2000****Pertinent Information:***Inspection Number:* 300581410*Date of Incident:* 10/29/2000, 10:45 a.m.*Location:* Pecos, Texas*Gender:* Female*Age:* 39*Family:* No children, and survived by both parents, three sisters, three brothers, eight nieces; 11 nephews; nine great-nieces; 10 great nephews, one great-great niece, one great-great nephew, several uncles, aunts, cousins and very special friends.*Cause of Death:* "Blunt impact to torso, extremities, and head" (OSHA, 2000)*Toxicology:* Negative*Training:* NONE*Time on Job:* Approximately two weeks*Free Climbing Reported?* Yes*Company Years in Business:* 25 years*Total Number Employees:* 4 (including owner)*Reported to OSHA:* 13:00 on 10/30/2000 (the next day).*Others Injured:* Yes, one other employee injured*Height of Tower:* 500 feet*Height at Fall:* Approximately 270 feet*Tower:* Triangular, three-sided (42' per side), guyed, not equipped with a climbing device*Tower Condition:* Good*Operation:* "Installing plumbing, lighting fixtures" (OSHA, 2000)**Citations:**

- CFR29 1910.268 (e) - Serious - "The employer did not ensure that personal protective devices, tools, and equipment were carefully inspected by a competent person before each day's use to ascertain that they were in good condition." (OSHA, 2000). Proposed penalty: \$2,800.
- CFR29 1910.268 (g)(1) - Serious - "Employer did not ensure all safety belts and straps were inspected by a competent person before each day's use to ascertain that they were in good condition." (OSHA, 2000). Proposed penalty: \$2,800.
- Section 56(a)(1) of the Occupational Safety and Health Act of 1970 - Willful - "The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that employees were exposed to: Potential falls in excess of 400 feet." (OSHA, 2000). Proposed penalty: \$14,000.
- CFR29 1910.27 (d)(5) - Willful - "Cage protection or ladder safety devices in lieu of cage protection were not used on tower, water tank, or chimney ladders over 20 feet in unbroken length." (OSHA, 2000). Proposed penalty: \$14,000.
- CFR29 1910.268 (c) - Other - "The employer did not prepare a written certification record that showed each employee had received the training as required by paragraph (2) & (3) of this section." (OSHA, 2000). Proposed penalty: \$400.

TOTAL FINES PROPOSED: \$34,000**TOTAL FINES PAID: \$34,000**

stated to the investigator that he and the company owner had discussed safety in the past, and he was “quite certain” (OSHA, 2000) that the company owner had known about safety rules.

The investigation report revealed that this was Carla Valencia’s first tower-climbing job. She was reported to have been working for the company for about two weeks. She previously performed odd jobs around the house for the company owner. Valencia was not given any training. On the day of the accident, she free-climbed, and she was on the tower two or three times prior to that day. A coworker on the tower with Valencia who was injured during the same incident was a 21-year veteran, by his own statements. In addition to Valencia and the injured coworker, the company owner and a third employee were present.

The Incident

Both Valencia and the injured coworker had been “hoisted up the tower on a ½-inch load line” (nylon). She was connected with pelican clip “which was hooked through a loop that had been tied in the end of the load line with a half-hitch knot. The pelican hook was attached to a D-ring on one of the seat straps to Ms. Valencia’s safety belt by a small clevis.” The injured employee’s belt was a “tree saddle” and “was configured with a seat strap and he rode it as a boatswain’s chair. Ms. Valencia was connected to the same loop in the load line by one of her safety lanyards, presumably by the ‘Gorilla Hook’ and she was slightly above him” (the injured coworker). “Antenna parts to be replaced were tied to the loop in the load line also. The load line was run through

a 3-inch McKissick pulley that had been tied to the southeast face of the tower at about the 475-foot level by two pieces of ½-inch nylon rope. The free end of the rope had been run back down the tower through a small pulley, which had been attached near the base of the tower. The rope had then been run approximately 100 feet south of the tower and then wrapped around a ‘capstan head/cathead,’ which had been bolted to the left rear wheel of a Ford XLT Ranger pickup truck. The truck was sitting over a piece of plywood, and its left rear tire had been jacked off the ground. When witnesses arrived, the truck was sitting on a hydraulic jack. The owner was pulling on the free end of the rope to maintain the friction around the capstan head.” (OSHA, 2000).

The owner and the third employee tried to control a tag line that was also looped into the load line. The pickup truck’s engine stalled, and apparently when someone attempted to restart it, friction was lost and the employees fell. “It appears that the employees made contact with the guy wire connected to the tower’s east leg at about the 210-foot level and rode it to the ground, coming to rest approximately 210 feet east of the base of the tower. It is not known how they rode the guy wire down; however, burn marks on Ms. Valencia’s safety harness indicate she may have rode the guy wire down on her back.” (OSHA, 2000).

Witnesses were working about a quarter of a mile away in a field. When they saw the accident happen, they came to the aid of the crew. When they arrived, the third employee was returning from the east anchor point to which he and the owner had walked. The wit-

nesses asked him where the victims were. He pointed to the area and told the witnesses “he didn’t think there was anything anyone could do for them.” (OSHA, 2000).

The witnesses proceeded to try and render first aid and CPR to Valencia and the injured employee. In the process, Valencia’s belt was cut. The witnesses asked if anyone had called 911 or if the owner or the other employee had first aid kits. They answered no, so witnesses went to the ranch house on the property where they were working when they saw the accident to get first aid supplies. The owner was observed making calls on his phone during this time, and also was observed going to the pickup truck and lowering it from the jack and removed the capstan. According to the report, neither the owner nor the other employee offered aid to the injured employee or Valencia. The report also revealed that one of the witnesses had to go to the road to flag the ambulance, and she had to tell the owner to take over CPR for Valencia. The owner was also noted to have rope burns on his hands.

The injured employee, when interviewed in the hospital, stated that he and Valencia were being raised up the tower “attached to a ½-inch nylon rope with a pelican hook clip through a half-hitch in the rope. The pelican clip was attached to his belt and she was attached to his belt.” (It did not say how she was attached.) (OSHA, 2000).

He described the arrangement of the truck, cathead and rigging. He said he remembered trying to grab the tower during the fall. He stated Valencia was “too green to be up on that tower and she shouldn’t have been there.” (OSHA, 2000). He further stat-

ed that the owner had taught him “how to tie knots and do some rigging” and “the only training he got was what he got on his own.” (OSHA, 2000). He is also reported as stating to the investigator, “You gotta stop [the owner], SOB is going to kill someone else. I told him.” (OSHA, 2000).

The injured employee also admitted that both he and Valencia had free-climbed. He stated that he had been up the tower five or six times that day and Valencia had only been up twice. When they fell, it was her second time on the tower. He also stated he heard the other employee yell to the owner to restart the truck. He thought the owner forgot to press the brake before pressing the clutch, causing the rope to lose friction.

Information on the equipment revealed in the OSHA report that a tree saddle not rated for the type of work performed for this job was in use. “A ‘non-locking’ pelican hook was attached to the belt die seat ‘D’ ring by a small, screw-type clevis.” (OSHA, 2000). A shock-absorbing lanyard was “attached to the same D Ring. A rope lanyard equipped with double action clips was attached to buckle side seat ‘D’ ring, and a knot had been tied in the rope apparently to make it shorter.” (OSHA, 2000). “A new safety rope equipped with double action clips and a large, double-action clip ‘Gorilla Hook’ was present but not attached to either belt.” (OSHA, 2000).

Other notations in the file regarding equipment included descriptions such as, “the gate on the large pelican hook, which was in use, was defective. It did not always return to its fully closed position. This appears to be the result of wear, damage, and overuse.”

(OSHA, 2000). Another notation stated, “The clevis was worn and did not have a safety keeper to prevent its bolt from backing out while in use.” (OSHA, 2000).

Before an OSHA representative arrived on the site, the owner departed and took the pickup truck with him. Two subsequent appointments were made on Nov. 1 and Nov. 3, 2000, to meet with the company owner, but the meetings never materialized. The owner’s legal counsel contacted the investigator and stated that he had been retained and that his client would not be coming for meetings. Under the citation documentation and the opening conference notes, the OSHA report states that the company owner “pleaded the fifth to all requests for data and for all questions asked.” (OSHA, 2000).

Investigator Comments

According to the investigator’s conclusions, improper fall protection was used, employees were not properly trained, and no emergency action plan was in effect. Later interviews revealed that some first aid equipment was in the shelter, but none of the employees knew how to use it. “The employer failed to call 911 even though he had a cell phone on site, but instead called his wife. This delay might have contributed to the death of his employee. It appears the employer was trying to cover up the fact that the pick-up and capstan were being used in the manner that they were being used.” The investigator also stated that “had it not been for the witnesses seeing the truck up on the jack and the ‘capstan’ installed, we may not have been able to piece the mishap

together.” (OSHA, 2000).

Author’s Commentary

Upon reading this file for the first time, I found the horrific nature of the accident and the sheer disregard for worker safety quite staggering. With regard to this file, I would like to make a few points.

Some people will read this and say, “That’s an isolated incident,” or “That doesn’t happen as often as one might think.” To that I say you are deluding yourself. Do I think many employers behave in this manner? No, but the ones that do are out there. This owner had operated for 25 years before a fatality befell the company and his workers. How many other companies fit this same profile? How many have been in business for more than 20 years, using similar techniques, and by the grace of God they haven’t had such an incident? How many others are cutting corners to get it done when they lack the human and/or material capital to do the job safely? When you look at the fact that this was 15 years ago and that there is exponentially more work now than in 2000, I believe it is still clearly a cause for concern. It is something that needs to be addressed.

The tower owner in this case, as reported by the investigative narrative, told the investigator that he had discussed safety with the company owner in the past and he was “quite certain” (OSHA, 2000) that the company owner had known about safety rules. Although they may have spoken about it, I wonder to what degree contractors really verify the knowledge of the subs they hire. For that matter, how well do turfs verify safety knowledge?

Other than checking safety plans for companies and verbal verification, what stopgaps are in place to make sure that the information that is being given is accurate?

As always, instances such as this one worry me because the other employee who was injured knew unsafe work practices were happening but did nothing to report his employer. I understand that the fear of being fired is a real fear among employees, but why risk it? What can we do to protect employees more than we already do? The OSHA whistleblower program is in place, and it is an invaluable tool for workers to utilize. However, most employees believe that the employer can generally narrow down who the reporter is (if only

by assumption), and that makes the whistleblower program unappealing to the worker because he or she really doesn't feel protected.

I said at the outset that I didn't want this to be a shame session against the employer; nevertheless, I want to give my opinion. The disregard for human life and worker safety in this case is repugnant. Not all employers behave in this manner, and I fully acknowledge that, but in this particular case, I am still spitting nails. I am fuming not only because of the disregard, but because the employees did not stand up for their own safety. Let me be clear. I do not blame the deceased or the other employees in any way, I blame the culture of the industry and find it unacceptable that employees,

because of fear of retribution or loss of their livelihood, feel compelled to just take it, and that they do not feel empowered over their workplace safety or the protection of their lives. That is unacceptable.

As a final note, I would like to give kudos to the investigator in this case. The file was detailed and complete, and the OSHA summary found online was rather extensive in this case, compared with many others that I have read.

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.

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OSHA Employee Interviews – Leveling the Playing Field

Time is short. A new OSHA rule announced on Sept. 11, 2014, became effective on Jan. 1. Here are steps you can take to meet the requirements and prepare for inspections.

By Mark A. Lies II

As anyone who has ever experienced an OSHA inspection is well aware, a key element is the agency's interviews of employees by the compliance officers from the U.S. Occupational Safety and Health Administration. It is generally recognized that a majority of OSHA citations are based upon OSHA interviews of management and hourly employees. Unfortunately, a lot of confusion has occurred over the respective rights of OSHA, the employer and the employees. The following information will attempt to strip away the veil of misunderstanding in this area.

Inspection Misconduct

During any inspection, the compliance officer will request employee interviews (both management and nonmanagement employees) in order to gather facts as to whether there may have been violations of the agency's regulations. Many employers fail to advise their employees of their rights during such interviews,

and then these rights are never exercised. If the employee gives inaccurate, incomplete or confusing responses, these statements can be the basis for civil citations with monetary penalties, or worse, criminal liability. The general rights of the various parties follow.

Employee Rights

The employee has a right to a private one-on-one interview with the compliance officer, which is confidential and is considered "protected activity." The employee cannot suffer any "adverse action" from the employer for exercising this right. The compliance officer cannot disclose the contents of the interview.

The employee has a right to refuse to be interviewed by the compliance officer. Many employees are reluctant to speak to compliance officers because they have been emotionally affected by an accident in which a co-employee has been injured, or they are fearful of speaking to a govern-

mental representative. Some employees feel that they may be intimidated or manipulated during the interview to expose them to liability. In this regard, an employee cannot be forced to have a private one-on-one interview. These interviews are completely voluntary. If the employee declines to be interviewed (and the employee need not give any reason for the decision) the agency will have to decide whether to obtain a subpoena to require the interview. If the agency obtains a subpoena, the employee has the full scope of rights to respond, including the right to counsel.

The employee has a right to decline to have a one-on-one private interview and the right to have a person of their choice attend the interview and, if the compliance officer refuses to allow this person to attend, decline to be interviewed. Some employees feel comfortable being interviewed if they have another person present during the interview. Again, if the compliance officer refuses to allow

this other person to attend, the employee can decline the interview without giving a reason.

The employee has a right to end the interview at any time for any reason. Since the interview is completely voluntary (unless OSHA has obtained a subpoena in which case the employee has additional rights and should consult legal counsel) the employee can end the interview at any time and can leave without any explanation.

The employee has a right to refuse to sign a statement, to be recorded or to be photographed. Again, because the interview is voluntary, the employee cannot be required to sign a statement. Under most state eavesdropping laws, any individual can refuse to be recorded and no reason needs to be given. In a number of states, it is a criminal offense to record a conversation without the permission of all persons to the conversation. Finally, any person can refuse to have their photograph taken.

The employee has the right to refuse to provide any private contact information, such as home address and telephone number.

The employee has the right to require the interview to occur at the workplace.

OSHA Rights

The compliance officer has the right to interview the employee in private, if the employee consents.

OSHA has a right to have truthful responses to its questions.

Employer Rights

The employer has the right to inform its employees of their rights during

the inspection.

The employer must allow the employee to be interviewed by OSHA if the employee consents.

The employer has the right to participate in nonprivate employee interviews (those attended by a third party, such as a union representative) and, if the compliance officer refuses, require that the interviews occur on nonpaid work time.

The employer has the right to attend interviews of employer management representatives because they are agents of the employer.

The employer has the right to end the interviews if they become disruptive, that is, unreasonably interfere with ongoing work, or become confrontational, in which case the employer should consult legal counsel regarding the termination of the inspection.

Right to Legal Counsel

Because every employee has the right to decline a private interview unless the employee is allowed to have a person of their choice attend the interview, it is obvious that the employee has the right to have legal counsel present as that person. A more fundamental right of every employer (and citizen) is to have representation by counsel in any administrative or judicial proceeding. In addition, in most jurisdictions, the employer has an obligation to defend its employees when they are faced with liability for their acts that occurred within the scope and course of their employment. Thus, the right to have legal counsel if the employee so elects is unquestionable. If OSHA refuses this request, the employee

can decline to be interviewed.

Potential Criminal Liability

Another significant issue that may arise in an OSHA inspection after a serious accident involving a fatality or multiple injuries is potential criminal liability for the employer and individual employees. A basic right under the United States and state constitutions is the right against self-incrimination (under the Fifth Amendment).

Unfortunately, when the inspection occurs, it is impossible to determine whether criminal charges may result months or years later, by which time an employee may have incriminated him/herself in the OSHA interviews and exposed themselves to criminal liability. For this reason, it is even more important that legal counsel be consulted for the OSHA interviews.

No Criminal Miranda Warnings

Another potential problem that warrants legal counsel is the fact that the OSHA compliance officer is not required to give the employee the Miranda warnings that inform the employee that in the interview:

- The employee has a right to remain silent.
- The employee's statements can and will be used against them.
- The employee has a right to have an attorney.
- The state must provide the employee with an attorney if the employee cannot afford an attorney.

Thus, an employee may unknowingly expose himself to criminal li-

ability during the interview, and no warnings have been given by the compliance officer during the interview because they are not required to be given because the compliance officer is not a police officer, and the employee has not been placed under arrest. The employer should engage legal counsel to evaluate whether the employee may need to exercise

these rights.

Objections to Legal Counsel

Unfortunately, in many inspections, OSHA objects to the employee having another person present, including legal counsel. In those instances in which OSHA agrees to allow the employee to have legal counsel, the agency objects to allowing the em-

ployee to utilize the employer's attorney who has been provided at no cost to the employee. OSHA claims that such an attorney may have a conflict of interest from representing the employer and representing the employee in the interview. It should be noted that it is not OSHA's right to object to any potential conflict of interest. Rather, that is sole-

The following summary, "Employee Rights During An OSHA Inspection," can be used to prepare employees for interviews. Many employers also provide a copy to their employees. A number of employers have translated it into other languages.

Employee Rights During An OSHA Inspection

The following information is intended to provide general information regarding employee rights during an OSHA inspection. Please note that the Company is committed to the safety and health of our employees and is providing you this information because the OSHA inspector may not inform you of your rights and the Company wants you to be aware of this information so you can exercise your rights in an informed and voluntary manner.

From time to time, Company facilities may be inspected by the Occupational Safety and Health Administration (OSHA). During those inspections, the OSHA inspector may ask to speak with you about your experiences with or training regarding the Company's safety and health programs, or about certain events that have taken place at your Company location. You are entitled to certain rights and subject to certain obligations during an OSHA inspection as follows:

YOUR RIGHTS

- You have the right to speak with the OSHA inspector. You also have the right not to speak with the OSHA inspector. It is your decision whether to voluntarily speak with the inspector or not.
- You have a right to be interviewed at the Company's location and can decline to answer questions from an inspector who may contact you at home by telephone or in person. You can tell the inspector to arrange the interview at the Company's location.
- Your participation in an OSHA inspection is considered "protected activity," and the Company cannot and will not retaliate against you in any way because of your participation in an OSHA inspection.
- If you decide to speak to the OSHA inspector, it is your decision whether to speak with the inspector in private or with someone else present. You have the right to ask another partner or a member of Company Management to be present during your interview.
- You have the right to take a break or end the interview at any time for any reason. The interview is not supposed to take an undue period of time. Remember, it is your decision whether to speak voluntarily with the inspector at all.

ly the right of the employee who is free to accept the attorney so long as the attorney has discharged his legal obligation to discuss potential conflicts of interest with the employee and any potential conflict can be knowingly waived.

OSHA also objects to the employer's legal counsel being provided at no cost because the employee may be exposed

to retaliation by the employer for what is said in the interview. This argument is likewise without foundation because the employee is protected from retaliation under Section 11(c) of the Act for participating in the interview or inspection with OSHA. Thus, it is patently inappropriate and unfair for the agency to object to the presence of legal counsel provided at no expense

by the employer in an interview in which an employee could face potential civil or criminal liability arising out of an accident and which will force the employee to retain other legal counsel at the employee's expense if the employee wishes to exercise these rights. In most cases, the employee cannot afford to retain counsel and thus is effectively denied legal counsel.

- If you decide to speak to the OSHA inspector, you have the right to understand the questions being asked of you. If you do not understand a question, you may ask the OSHA inspector to repeat the question. The inspector is supposed to ask you for information and not to tell you that you must agree to certain information. If you have difficulty speaking or understanding English, you may request that an interpreter be provided for you. You also have a right to have another individual of your choice present to act as your interpreter.
- You have a right to decide whether to sign a statement at the end of your interview. You may decline to sign a statement if you so choose. You may sign a statement if you so choose. If you do decide to sign the statement, you are entitled to receive a copy at the time of the interview and do not sign it until the inspector tells you he or she will provide you a copy at the end of the interview. If you decide to sign a statement, make sure that you read it and tell the compliance officer to correct any errors or mistakes before you sign it.
- If the inspector wants to ask you questions about information contained in a written document, such as training records, safety programs or policies, you have a right to ask to be shown the document before answering the question or you can decline to answer any questions regarding any written document.
- You have a right to decide whether to be voluntarily photographed, videotaped, or recorded during your interview. You may agree to be photographed or recorded. You may decline to be photographed, videotaped or recorded.

YOUR OBLIGATIONS

- If you decide to voluntarily speak with the OSHA inspector, you must answer his or her questions truthfully.
- You can decline to answer any particular question during the interview and do not have to explain the reason for your refusal to answer.
- If you decide to voluntarily speak with the OSHA inspector, you must answer his or her questions based on your own personal knowledge and to the best of your recollection. You must not speculate about any events that you did not personally observe or for which you were not actually present to observe. You also must not relate "hearsay" (i.e., gossip or rumor), which may not be truthful or accurate.

Language Barrier Issues

Because of the diverse nature of many workplaces, an issue arises concerning language barriers between the employee being interviewed and the compliance officer. It is critical that a competent interpreter be made available by the employer to ensure that the employee being interviewed can understand the questions and respond accurately and truthfully. The employer frequently will make available a co-employee who is bilingual to perform this role. OSHA may attempt to discourage this other employee from participating in the interview by claiming that the compliance officer is bilingual and can interpret. As previously mentioned, the employee who is being interviewed has the right to refuse to be interviewed if the employee is denied the inter-

preter. In addition, the employer should be cautious about accepting an interpreter offered by OSHA because there is the potential for this interpreter to pose the questions to the employee in a technical manner that the employee may find confusing. In addition, there have been instances in which the OSHA interpreter does not speak the particular dialect of the language of the interviewed employee, in which case there is further opportunity for confusion. Unfortunately, when an employee gives responses that are confused or incomplete because the employee cannot understand the questions, this provides an opportunity for citations to be issued to the employer on the grounds that employees are not properly trained and do not understand the employer's safety and health programs.

Conclusion

Because OSHA will not inform employees of many of these rights, and the typical employee is simply unaware of these rights, it is critical that employees be advised of their rights prior to and during the inspection so that they can exercise them. There is nothing in the law that prohibits employers from informing employees of their rights prior to the employee interview. If employees are not so informed, they may waive significant legal rights and expose themselves and the employer to potential legal liability.

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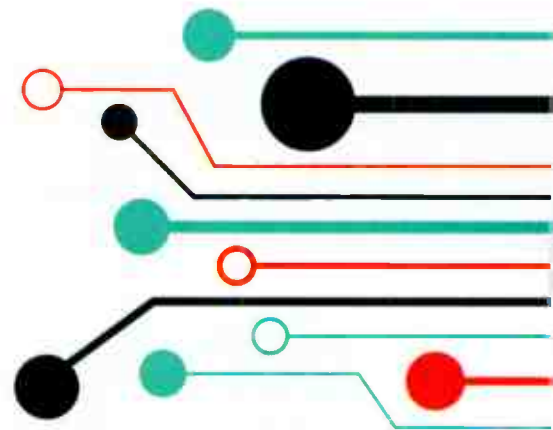
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Product Showcase: Site Camouflage



Composite Pole

CompSites International, sister company to Retel Services, offers a turnkey tower infrastructure, including the RevG-certified composite pole manufactured to meet client specifications for heights as much as 90 feet AGL. The pole's composite construction is lightweight yet strong enough to hold as many as five radiation centers. The poles come in an array of aesthetically pleasing designs, available in any color and finish. Integrated cabinets, revolving antenna shrouds, light poles and stealth cypress trees are some of the available options. In addition, the one-day direct-bury installation needs no concrete, thereby assisting with small footprints, challenging budgets and timelines.

www.retelservices.com



Church Towers

Stealth Concealment Solution's three-sided church tower at the Crossroads United Methodist Church in Phoenix is approximately 64 feet tall, with each face measuring 12 feet wide. The tower, designed to accommodate antennas for three carriers, includes RF-friendly panels from top to bottom. The tower also provides revenue to Crossroads United Methodist Church to assist with youth and other outreach programs. The manufacturer, which makes a variety of steeples from antique to completely modern, is also skilled at replacements, extensions, expansions and other antenna concealment solutions.

www.stealthconcealment.com



Concealment Towers

Designed to conceal four carriers' antennas, **Peabody Concealment's** Smoketree Tower (shown here in Richmond, Virginia) is intended to be a green cellular shelter. The sleek, 135-foot tall tower is encased by conventional siding on its lower portion. The uppermost 46-foot portion is fabricated from Peabody's proprietary FiberScreen modular panels. The wood-grain texture of the conventional siding blends upward into the concealment panels, converting this obelisk among the trees into a cellular refuge. The concealments come with a variety of surface textures and treatments that are painted and ready to install on-site to

save time and money.
www.peabodyconcealment.com



Concealment

Hi Tech Composites' concealment products include shop fabrication and preassembly before shipment for a job, with an assurance that the screening fits and can be installed quickly and efficiently. The combination of RF-compatible materials and exterior texture capability allows for

a finished product to come directly from the factory. The company has more than 40 years of contracting experience, including California state contractor's licenses with a D12 fiberglass specialty. The site shown in the accompanying photo is an example of the manufacturer's screening walls and faux windows on both levels of the structure. The company also makes church steeples, faux water tanks and cupolas. Its mold inventory of more than 100 different patterns and textures ensures the match of a variety of brick, wood siding and corrugated profiles.

www.hitechcomposites.com.

Trees, Branches and Foliage

The faux tree branches on **Chame-**



leon Engineering's camouflaged towers use injection-molded solid plastic over a structural fiber-reinforced plastic skeleton instead of PVC tubing to form tree branches.

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Foliage with a UV-inhibiting coating protects the original color for five years and beyond. The manufacturer's in-house design and tooling capability allows custom foliage molds for individual trees. Custom coloring is available for all foliage, including pine. Wind tunnel data on branch options provides verifiable engineering, even on branch mounts. Custom fiber-reinforced plastic panels for products such as water tanks, silos and flagpoles are made from aviation-grade materials and processes to yield strong, lightweight, RF-friendly products. In-house large-format computer, numerically controlled capabilities allow custom building of almost any concealment product imagined. The company offers a warranty as long as five years on its products.

www.chameleonengineering.com

Tree Branches and Other Concealment Designs

Environmental Integration's new monopine tree branches can withstand a 150-mile-per-hour wind load. The 17-foot-long branches



make the monopine appear natural and dynamic and blend in with natural landscapes. The product carries a 10-year warranty. Specializing in realistic reproductions for concealment designs, the manufacturer offers concealment products for monopole, rooftop and steeply applications. Branch canopy systems, including refurbish projects, are engineered for durability and longevity.

www.environmentalintegration.com

Vertically Polarized Antennas inside Poles

Antenna Products offers the Phazar brand of stacked, vertically polarized antennas, which can be installed inside of utility-grade fiberglass poles that



can be used as streetlights or flagpoles. The 2-inch-diameter omnidirectional antennas can be installed at the top of a pole, up to 54 feet high, for the best site performance. The pole is offered with custom designs and colors to match municipal requirements. The base of the pole can be expanded to include the RF equipment for a stealth site. As many as four omnis are offered within one antenna package covering

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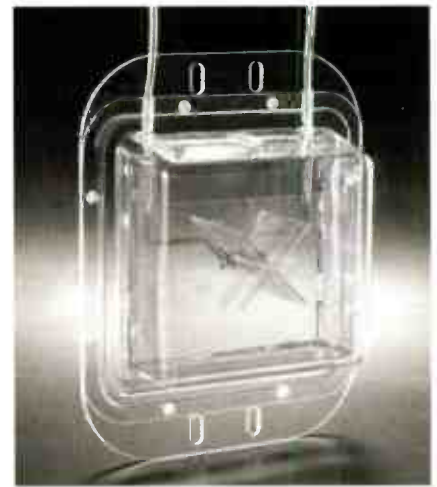
Porter Site Concealment fabricates all forms of unique specialty fiber-reinforced plastic structures, which are RF-transparent. Windmills, such as the one shown in the accompanying photo, may

be designed and fabricated to be operational with spinning blades. The concealment windmill structure, blade angles and overall designs are authentic to the original windmill construction and blend in with nearby structures. In addition to providing typical structures used for cellular concealment, such as screen walls, cupolas, radomes and mono-trees, Porter will work with customers to achieve specialty designs.

www.porterrf.com

Transparent Antenna

Radio Frequency Systems offers transparent antennas as an alternative to traditional camouflage. The new AllClear transparent antennas have minimal visual effect on the environment, blend into the color of the surroundings, can be used on all



buildings and are specifically designed not to look like a traditional antenna. The antennas are able to transmit in a 1.7-GHz to 2.7-GHz range, making them suitable for use in dense urban applications in 3G or LTE frequency bands.

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