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Safety

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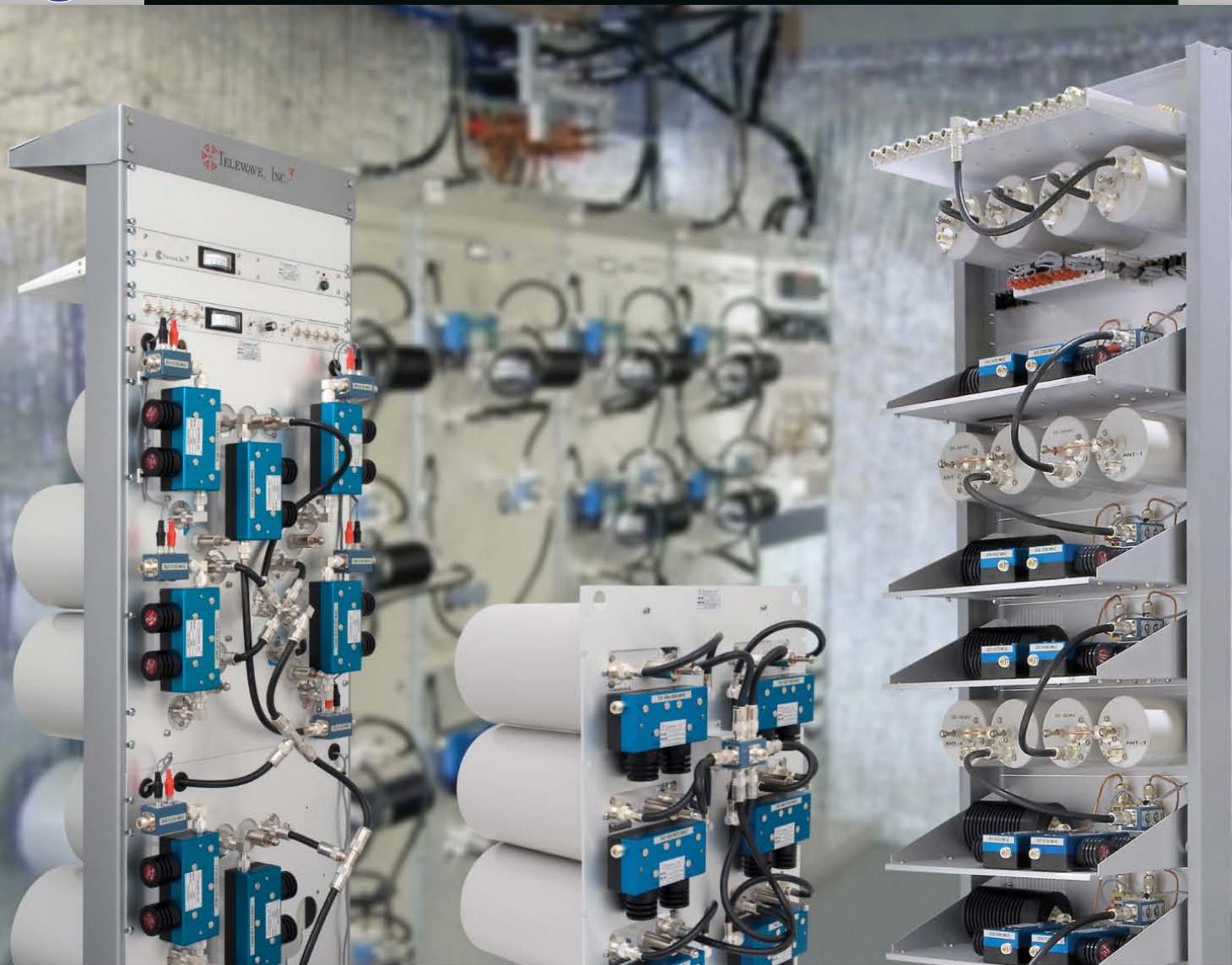
Fiber to the Tower



Wage and Hour Coverage

DAS System Integrators

Photo Competition page 41



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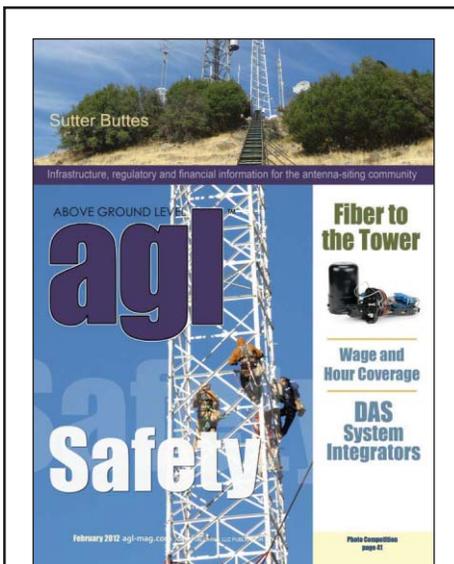
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on the cover

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editorial comment

Have a Safe Year

At the AGL Regional Conference in Hallendale, Fla., a TV documentary team led by Habiba Nosheen, a ProPublica reporter and producer, interviewed vari-



ous attendees about safety for workers who climb telecommunications towers. ProPublica describes itself as an independent, nonprofit newsroom that produces investigative journalism in the public interest. Nosheen said that the project involving

tower climbers is intended to produce a documentary for broadcast by the PBS series *Frontline*.

Safety for tower climbers receives attention from national news media every once in a while — every five to 10 years, it seems, except for breaking news stories about serious injuries or fatalities involving workers when they fall from towers or when equipment used on towers falls on them.

Working safely

The elements for working safely at elevation on towers are simple: training, proper safety equipment, inspection of the safety equipment, safety meetings and supervision, together with using the safety equipment continuously and in the proper way. That's the way I, as a nonclimber, have come to understand the steps that help to avoid accidents and protect employees from harm when accidents occur.

February concentrates attention on safety because it brings the annual convention of the National Association of Tower Erectors, a trade group that was formed with improving safety for tower climbers as its mission. This year, NATE's convention meets in San Antonio on Feb. 6–9. The convention

By Don Bishop, Executive Editor
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venue offers opportunities to participate in safety training provided by companies that train to or beyond the NATE Tower Climber Fall Protection Standard.

The association maintains an online education center that helps with safety information throughout the year. NATE also conducts an industry relations effort designed to take the message of safety beyond the realm of tower erectors to reach tower owners, general contractors, wireless telecommunications carriers and broadcasters.

Safety program goal

The new year has seen only two weeks pass as this column is being written, and no news about injuries or fatalities involving workers and towers has yet been seen for 2012. One hopes that this will be the year for a perfect safety record. The goal of safety programs for tower workers is not to reduce injuries and fatalities, it is to eliminate them.

Last year ended with the death of a worker, Nick Rouskey, 61, of Cape Coral, Fla., who was employed to service aviation obstruction marking lighting equipment. He died at a tower elevation of 750 feet. The cause of death has not been determined, but electrocution is suspected. The initial step to help Rouskey was a rescue attempt that then turned into a recovery effort when an emergency worker who reached him found that the climber had no vital signs.

A Vietnam War veteran, Rouskey enjoyed heights and had completed nearly 1,600 jumps as a skydiver.

Use the resources

Everyone with a stake in tower climber safety should use the resources available through companies, trade associations and government agencies to make 2012 a safe year for tower workers. Attending the NATE convention is a good way to begin the year. ■



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Infrastructure, regulatory and financial information for the antenna-siting community

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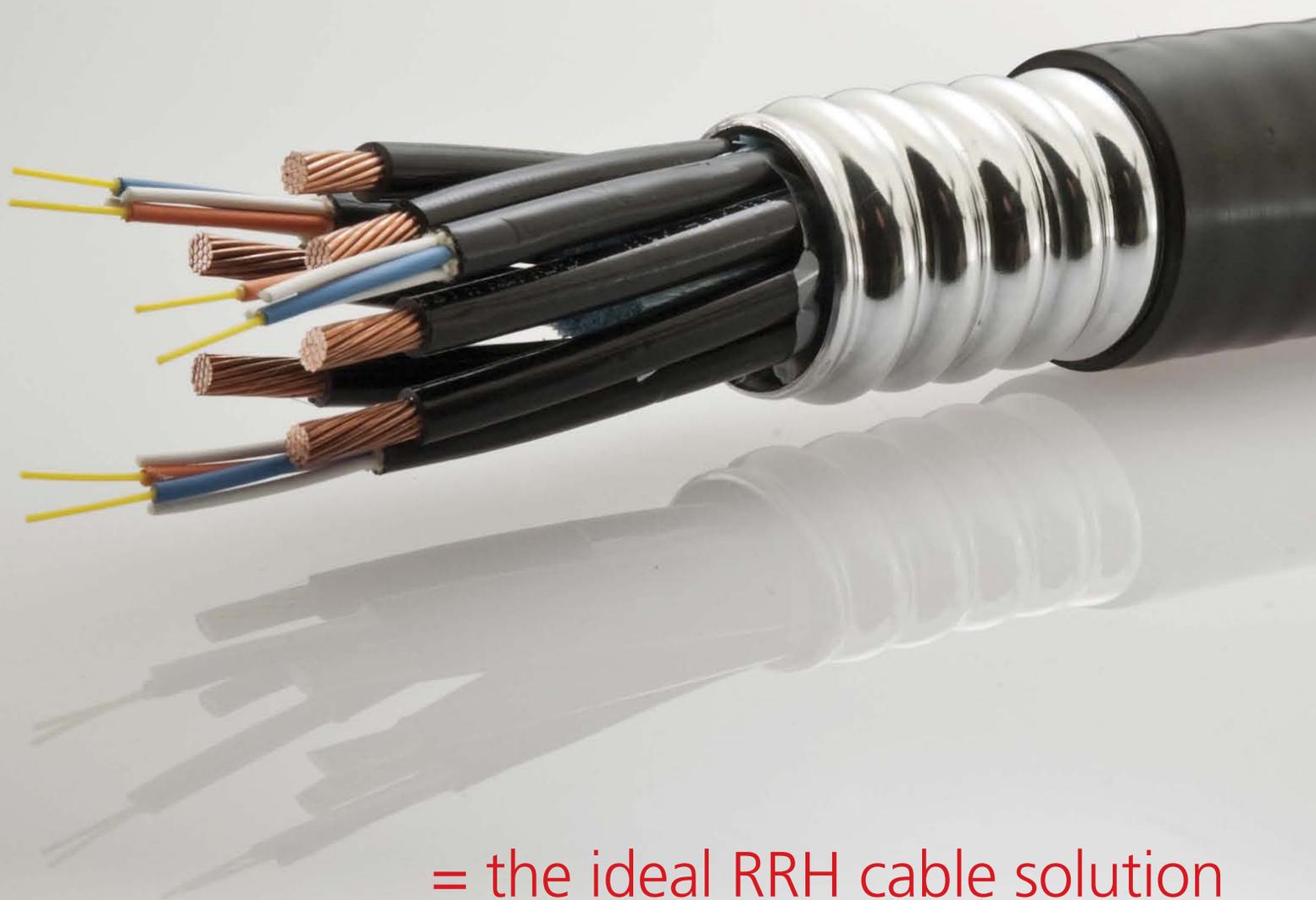
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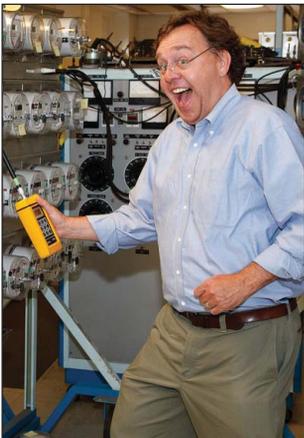


publisher's note

“May I Have 5 Megahertz for an Hour, Please?”

It is Girl Scout cookie time of year at my house (first year). I've been a regular consumer, but I never had the responsibility to find purchasers and thus consumers of those cookies. I've

become a sugar pusher in my community. It is kind of like selling towers (I know you were wondering how I was going to manage the segue). We keep hoping that more carriers will want to rent more space to radiate more



Photograph courtesy of mikefosterphotography.com

services and capacity to more people. We've become addicted to having more large carriers (or should I say, stable and financially reliable carriers) renting space from us for extended periods. I'm relying on the same principal to sell 200 boxes of cookies.

Coverage versus capacity

Now, imagine a more dynamic industry in which carriers may not need ubiquitous wireless coverage and may not want to have their antennas at the top of the tower. They may want to rent an antenna space at a given height for a given period. It may be disadvantageous to have the antenna too high because the corresponding coverage area could be directly at odds with capacity needs.

I routinely receive phone calls from investors, small tower companies, original equipment manufacturers, suppliers and graduate students who are completing their coursework, to discuss the status and future of the in-

dustry. I love the calls and the chance to compare some ideas and research. Sometimes all the research in the world has nothing to do with what actually happens. One thing I believe is that the number of places radiating energy is going to explode. You're not going to see towers going unused, and they will continue to be leased up. However, the role of the tower and the role of tower companies must expand as the number of sites skyrockets. "Sites" will be smaller, lighter and cheaper, but much more plentiful.

I'm also making another prediction. Remember Enron? Spot pricing? How much will you pay for 100 kilowatt-hours of power now? How about tomorrow? In northern Virginia, we are becoming used to the new highway concept of spot pricing for high-occupancy vehicle and toll road access. "The price to drive in this HOV lane is now \$2." Ten minutes later, at the height of rush hour, it could be \$5. In the middle of the night, it might be 50 cents.

Dynamic spectrum lessor

So, do you think we might ever see anything like this for spectrum? We've already seen Sprint try to aggregate the ability to use spectrum from Light-Squared and Clearwire. What's wrong with the idea of T-Mobile USA (or any other company; I'm just using some placeholder companies here) turning itself into a dynamic spectrum lessor? Do you need 5 megahertz of spectrum in Highland Park for two hours on Tuesday? No problem — we got yah covered.

The TV white spaces are already setting the stage for this. Although widespread acceptance of the TV white spaces idea has yet to be seen, I believe TV white spaces represent the beginning of a change in spectrum licensing and usage. Possibly, future radio-frequency spectrum assignments will be auctioned with the "use it or

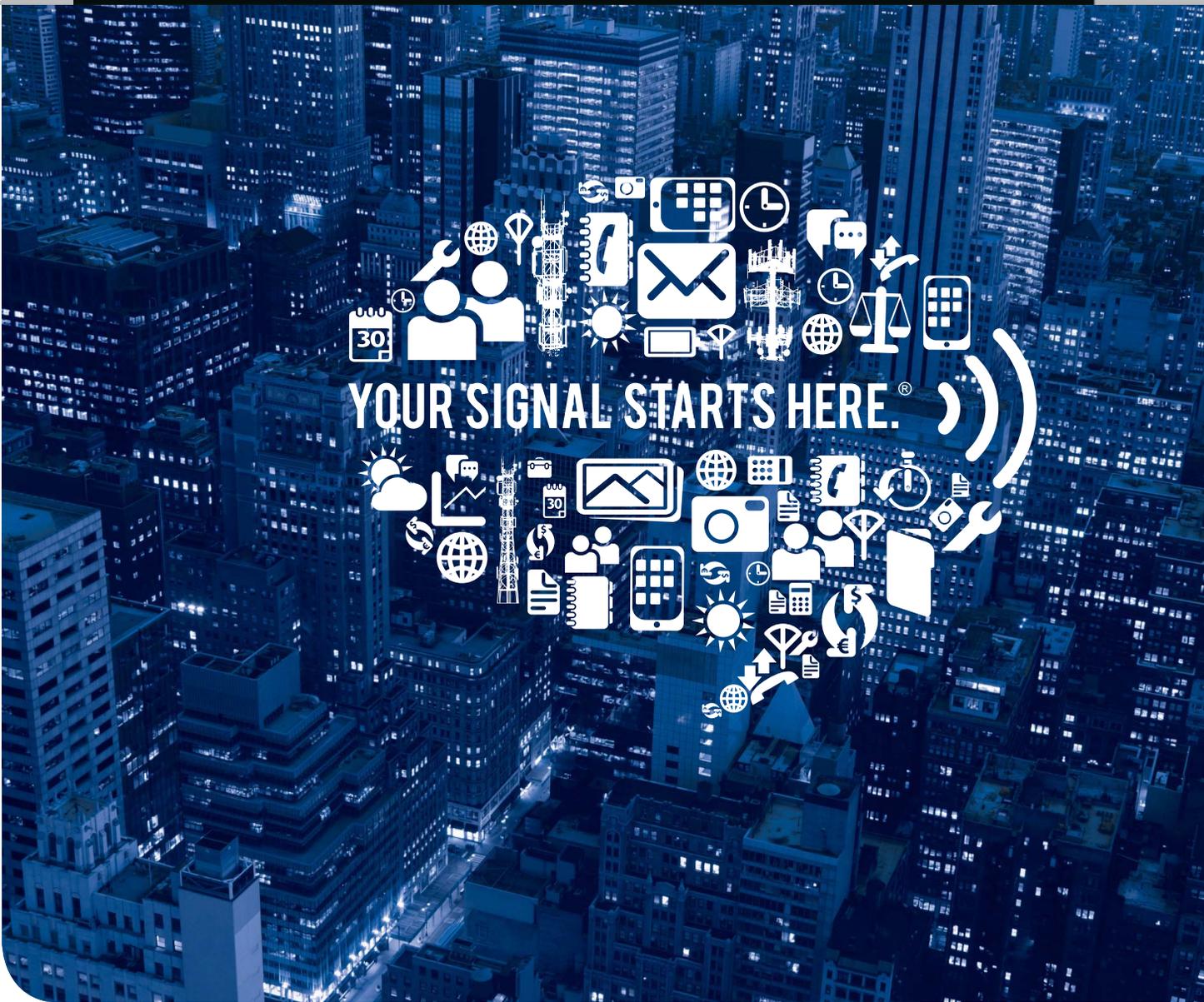
share it" notion. We used to have the "use or lose it" notion. Then, with the auctions, it was "use it or — well, don't worry about it." Hopefully, we'll move back into some kind of situation in which licensees are encouraged to use the spectrum or let others have a crack at it.

Budgets tighten; deployment slows

OK, to play fair to everyone in my house, I need to work the Cub Scout Pinewood Derby racing event into this somehow. We're now seeing 4G LTE deployments by carriers not previously on the LTE road. As I more often perform engineering work in rural, or at least, nonurban, areas, I see this continuing story: Every time there is a new technology, we speed down the track as quickly as possible to cover the most urban and densely populated suburbs first. Once we're out of the heat of battle, and we should be on the smooth, flat racetrack to the finish line, the budgets become tight and the technology deployment slows down or stops in the other areas. We're seeing this again with LTE. Densely populated areas have almost too much service, and carriers beat each other down in price. Meanwhile, less densely populated areas have little wireless service and often none. Unfortunately, a carrier could charge much more to bring the first and often only service into a market. It's just all mixed up.

People also ask why I tend to get on the issues of spectrum policy in a magazine dedicated to the antenna-siting industry. I hope it is clear that policy and spectrum usage dictate the demand for siting. Technology decisions made by both the FCC and licensees directly affect the number of sites and the density of site construction needed to deploy a service. Oh, and the second reason? Just like Girl Scout cookies, I love this stuff. ■

By Rich Biby, Publisher
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site profile

SUTTER BUTTES

By Charlie Feick

A view of Sutter Buttes — The Upper Site and tram tracks required for access to the communications facility.

The Sutter Buttes are a small complex of eroded volcanic lava domes that rise as buttes above the flat plains of the Central Valley of California. The highest peak, South Butte, reaches about 2,130 feet (650 meters) above sea level. The

Buttes are located just outside of Yuba City, Calif., in the Sacramento Valley, the northern part of the Central Valley. The Sutter Buttes are recognized as the world's smallest mountain range.

The range is actually circular with a

diameter of 10 miles and covers an area of about 75 square miles. The mountains are the remnants of a volcano that has been dormant for over a million years.

The steep elevation of the Sutter Buttes and close proximity to the rela-

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site profile

tively flat northern Sacramento Valley make the Sutter Buttes an ideal location for a radio communications site.

Site history

In 1967, L.A. Otterson, having recognized the benefit of locating a communications site atop the South Butte of the Sutter Buttes, formed TOR Broadcasting. He developed the site, buildings and towers atop South Butte in the Sutter Buttes Mountain Range. That was no small feat, given the steep access and rocky surfaces. Although the site was initially developed as a broadcast site, it is a true multi-user site with more than 50 radio service providers including broadcast FM and TV, cellular, commercial two-way



radio, earthquake monitoring, homeland security, microwave, mobile data, paging, public safety, government, vehicle tracking, utilities, weather monitoring and wireless Internet customers.

Markets served by this radio communications site include Sacramento,

| SITE NAME | Latitude | Longitude | AGL | AMSL | Tower |
|-----------------------------|-------------|-------------|-----|------|---------|
| Sutter Buttes (lower) | 39-12-16.75 | 121-49-1.44 | 120 | 1957 | Lattice |
| Sutter Buttes (Upper – New) | 39-12-20.7 | 121-49-13.6 | 240 | 2100 | Lattice |
| Sutter Buttes (Upper – Old) | 39-12-19.9 | 121-49-14.0 | 240 | 2096 | Lattice |

Woodland, Davis, Yuba City, Marysville, Sutter, Colusa, Williams, Chico, California State Highways 99 and 20, and Interstate 5 highway transportation corridors that connect them.

The site has grown over the years and includes two facilities referred to as the Upper and Lower sites. The Upper Site includes multiple buildings, two 240-foot self-supporting towers and secondary dish and antenna support structures. The Lower Site includes a building, two 120-foot self-supporting towers and secondary dish and antenna support structures. A massive emergency backup power generator supports both the upper and lower sites with a tram for access to the Upper Site.

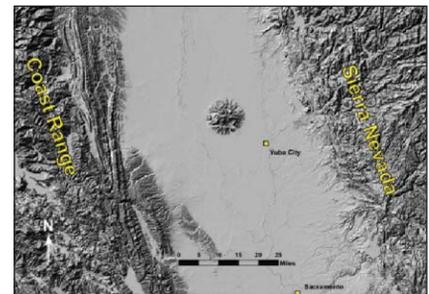
Licensing representative

In January 2003, after experiencing a period of slow business growth, TOR Broadcasting engaged ComSites West as its exclusive licensing representative.

From 2003 to 2011, ComSites West brought new customers to the site, which significantly increased the site's revenue while implementing site operating efficiencies that further increased the tower cash flow from 2003 to 2011. By 2007, the success of ComSites West's marketing filled the existing 240-foot self-supporting tower at the Upper Site.

To meet the site's increasing need for tower capacity, TOR Broadcasting's president, Ed Hulbert, and the company's operations manager, Jake Kley, successfully obtained a permit to replace an older 120-foot tower with a more robust 240-foot self-supporting tower designed to capture future growth and meet the latest G code engineering standards. Under Kley's management, the construction at the Upper Site commenced in late 2008 with the help of many talented professionals including Scott Dondelinger of the Antenna Company and Dave Fields of Fields Towers.

Because of limited access to the Upper Site, sections of the 240-foot tower were airlifted from the project's pre-assemble site at Colusa Industrial Park

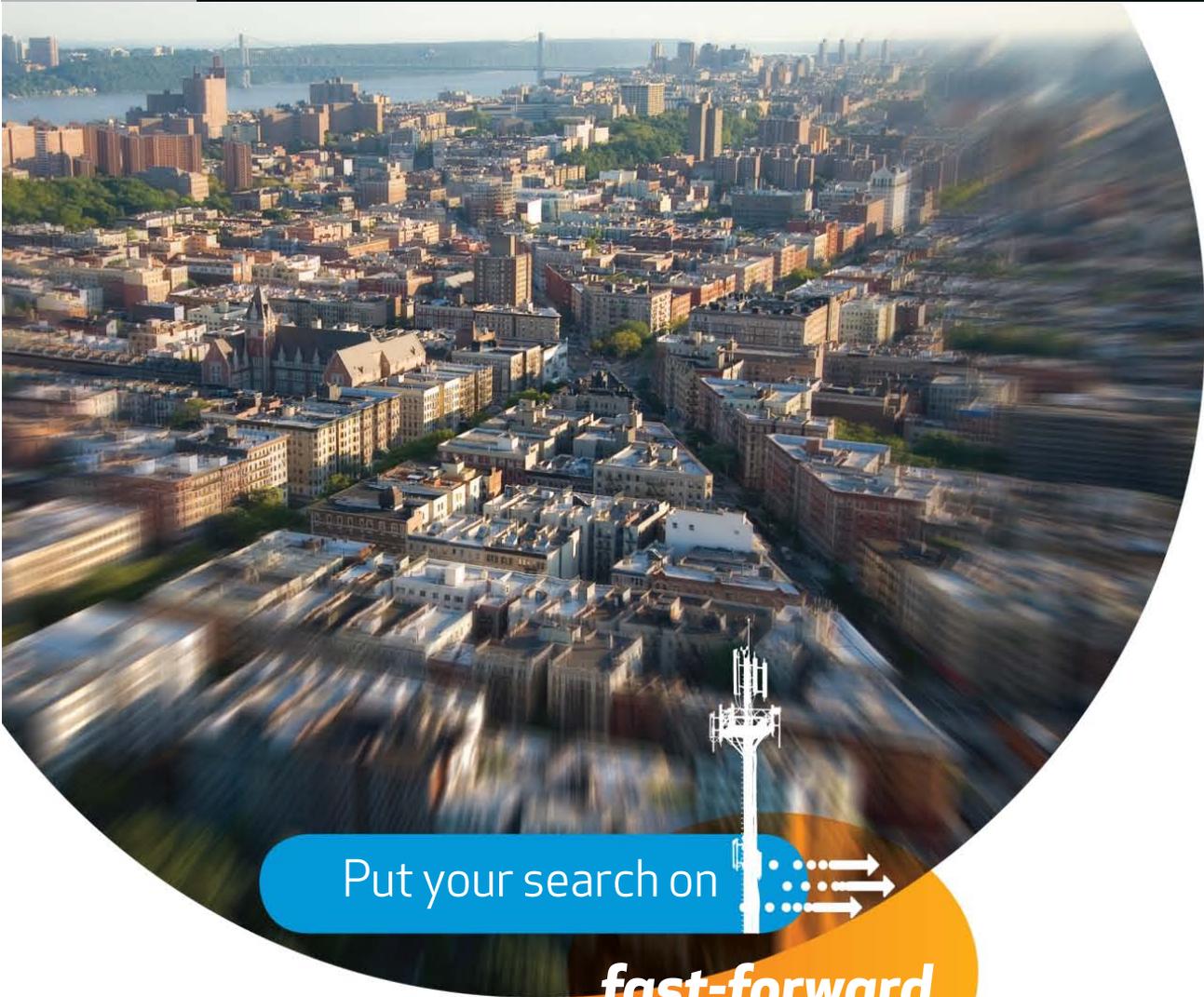


Rising 2,000 feet from the center of California's flat Sacramento Valley near Yuba City, the isolated Sutter Buttes were formed by volcanism more than 1 million years ago. Their dramatic isolation is well shown in this shaded-relief image. The base map is from U.S. Geological Survey elevation data.

to the Sutter Buttes for placement. The tower was transported in six sections using a helicopter operated by Siller Helicopter. Three 20-foot sections weighed 10,000 pounds each, one 40-foot section weighed 8,000 pounds, and two 60-foot sections weighed 13,000 pounds each. The helicopter that completed the lift and re-assemble process in three hours and 40 minutes had the capability of lifting up to 18,000 pounds. Keeping within its safety guidelines, Lyles Mechanical pre-assembled the sections for airlift. A video documentary of the tower project can be viewed at www.comsiteswest.com/tor.

Thanks to the project, TOR Broadcasting has a new tower asset that will accommodate virtually any new business and equipment. TOR Broadcasting maintains continuous operation with site reliability as a top priority. ■

Charlie Feick is director of sales at ComSites West, San Francisco.



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risky business

Wage and Hour Coverage

By David Saul, AAI



Employment practices liability insurance (EPLI) coverage has been available since the early 1990s. But not until a few years ago did insurers finally begin to tackle the most daunting employment-related exposure of all: wage and hour claims. In fact, wage and hour claims are the

single largest exposure for employers today and far exceed the dollar payouts resulting from discrimination claims as the leading source of payments to employee-plaintiffs.

Litigating wage and hour claims is extremely expensive. Often, the prevailing plaintiffs (both current and former employees) can recover double the actual damages, plus attorneys' fees. Multiplied damages, in part, account for many astronomical wage and hour awards and settlements. In fact, settlements in major wage and hour lawsuits against corporate

defendants rose 44 percent between 2008 and 2009. More specifically, the top 10 cases in 2009 settled for a total of \$364 million, compared with \$253 million in 2008, according to Seyfarth Shaw, a labor law firm that represents employers.

Advisen reported that a lawsuit filed against AXA Advisors, a unit of AXA Financial, a New York-based unit of the France-based AXA Group, alleges that thousands of its U.S. employees worked as many as 60 hours per week but weren't paid minimum wage or overtime. The complaint

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further asserts that employees of the company were paid a \$24,000 base salary plus a percentage share of any commissions earned by licensed brokers, if they were successful in obtaining new accounts for the brokers. The suit seeks unspecified back wages and overtime, damages, interest, attorney fees and costs. An attorney for the plaintiff believes that the damages exceed \$10 million.

Admittedly, the current scope of obtainable wage and hour coverage continues to be dwarfed by the magnitude of these exposures. But, for the first time, underwriters finally seem willing to address these claims, albeit in a limited fashion.

Wage and hour exposure

The Fair Labor Standards Act (FLSA), passed by Congress in 1938, is the source of the wage and hour claim exposure. The law established

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risky business

two broad classifications of employees.

Exempt employees: Those ineligible for and thus exempt from receiving overtime.

Nonexempt employees: Those not exempt and thus eligible to receive overtime pay.

The majority of wage and hour claims center on whether an employer wrongly failed to pay overtime because the employer mistakenly classified an employee as “exempt” and thus considered the employee ineligible to receive overtime pay under the FLSA.

In addition, there are other related exposures created by the FLSA that do not specifically involve misclassification of employees as either exempt or nonexempt.

Accordingly, the best way to categorize wage and hour claims is to view them as one of two types: (1) claims associated with exempt and nonexempt misclassifications, and (2) “all other” claims.

The following five categories of

employees are exempt from overtime pay:

- Executives
- Administrative personnel
- Professionals
- Computer-related employees
- Outside sales employees

To obtain a detailed explanation of these classifications, visit the U.S. Department of Labor’s website.

Wage and hour exclusion

Simply stated, the need for a wage and hour coverage endorsement arises from the fact that virtually *all* EPLI policies exclude coverage for wage and hour claims.

The EPLI policy excludes loss involving any wage and hour law. Importantly, based on the policy’s definition of loss, the wording of the exclusion precludes not only coverage for settlements and judgments, but, in addition, it eliminates coverage for the *defense costs* associated with wage

and hour claims.

The need for a wage and hour coverage endorsement under an EPLI policy arises because *all* EPLI policies contain an absolute (i.e., both defense and indemnity) exclusion of coverage for wage and hour claims. The effect of the endorsement is to remove this exclusion, so that coverage of wage and hour claims will be provided by the policy.

Advice for insureds

Now that wage and hour coverage is available, EPLI buyers and their representatives are faced with the decision as to how they should proceed. Following are several recommendations.

Take a look at your organization: Having reviewed the kinds of situations that are most likely to produce wage and hour claims, ask yourself: Are any of these conditions present at our company? If so, or if you are uncertain as to whether there are any problematic areas, consider taking the next step.

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|-----------|-------------------------|
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| LMR-SW540 | 3.15 dB/100 ft |
| LMR-SW713 | 2.50 dB/100 ft |

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risky business

Have a wage and hour audit: Given both the frequency and magnitude of wage and hour claims over the past decade, a number of organizations have sprung up in recent years that specialize in auditing businesses to identify practices that have the potential to cause wage and hour claims. The most effective of these organizations are law firms, usually because identifying wage and hour exposures

requires one to interpret the FLSA and state labor laws.

Considering the high risks associated with such claims, coupled with the often bewildering complexity of the applicable laws, the auditing fee will probably be money well spent. This is especially true if you are considering buying wage and hour coverage. If the audit identifies one or more potential problematic areas, you

will be in a better position to take the kinds of preventive action that could avert an eventual claim.

Complete an application and obtain a quote: Even if you believe that your organization faces little or no risk of receiving a wage and hour claim, it still pays to complete an application for coverage. If you are already purchasing EPLI coverage, the additional time and effort required to complete a supplemental wage and hour application is minimal. In addition, simply going through the exercise of answering the questions requires you to look carefully at your company's payroll and employment practices and home in on possible trouble spots.

Make a decision as to purchasing the coverage: Based on the look and feel of your company's operations, you might be pleasantly surprised to find that little or no additional premium is required to add \$100,000 or even \$250,000 (depending on the individual insurer) in defense coverage. This is especially true if you can present the results of a clean audit — coupled with a claim-free track record.

Although just a handful of insurers are now writing the coverage, insurers can now start compiling loss and exposure data, the nature of which will allow them to feel more confident about the wage and hour risk.

Within the next few years, wage and hour coverage will be much more available, and perhaps readily available. Hopefully, by that time, insureds will be able to buy both *higher limits* (i.e., such as those matching the regular policy limit) and *broader coverage* (i.e., policies covering indemnity as well as defense). ■

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fiber to the tower top

Taking Fiber to the Tower Top

As tower cabling infrastructure shifts to fiber, mobile operators grapple with new connectivity challenges — and new solutions.

By Stephen King

Much has been written recently about the shift in focus from wireless coverage to capacity.

Mobile data traffic has doubled in the past year due to the proliferation of smartphones, which can generate more

than a megabyte of traffic per day. This dramatic increase in traffic is expected to continue well into the future. According to an April 2011 white paper from 4G Americas, customer demand could outweigh network capacity by

mid-2013.

As operators fight to keep up with the demand for bandwidth-intensive services by increasing cell capacity, new tower builds have slowed — from 26,000 in 2000 to 6,100 in 2011, ac-

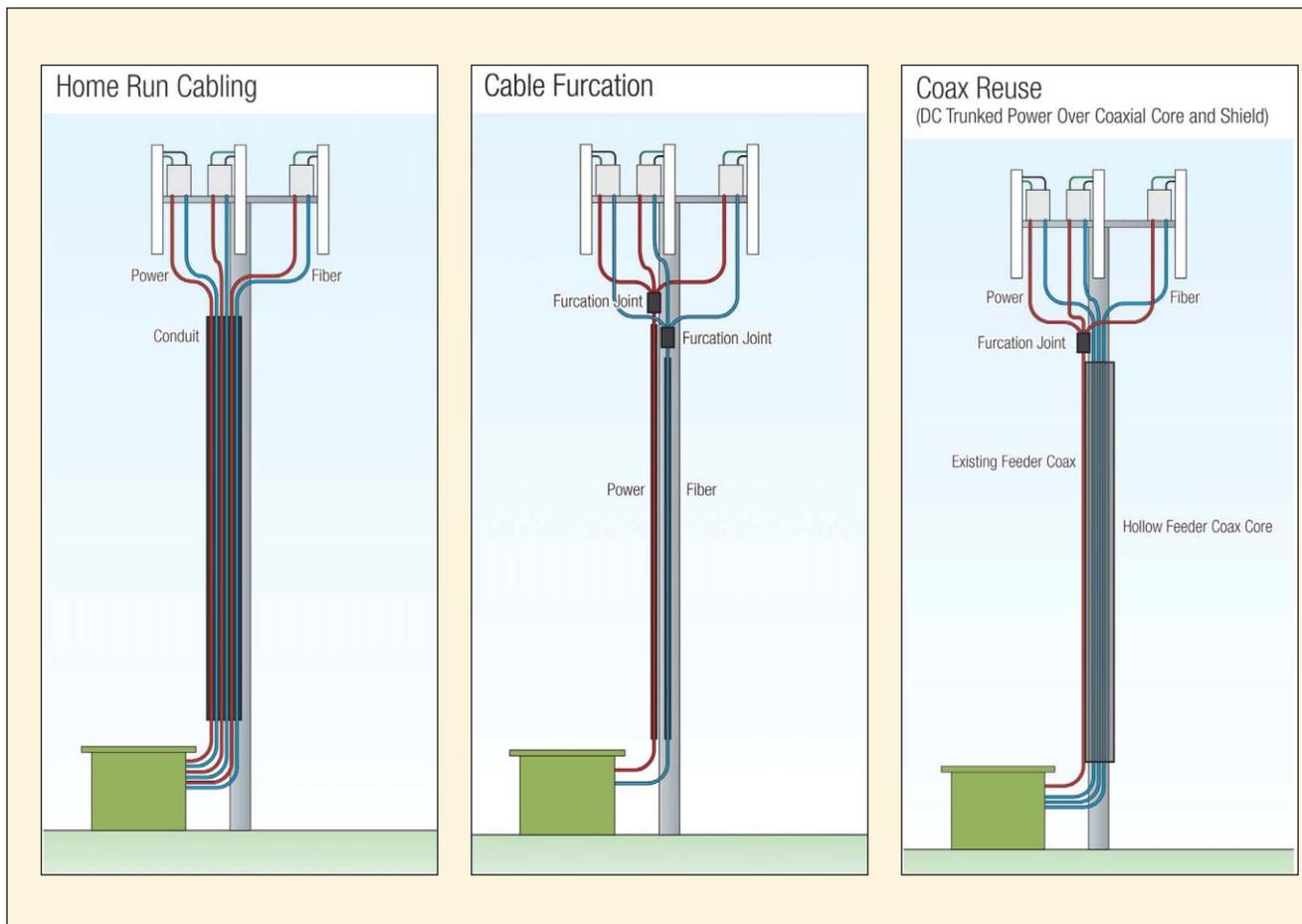


Figure 1. FTTA Architectures — New fiber-to-the antenna (FTTA) architectures leverage tower-mounted radios to deliver a number of benefits over traditional coaxial-based systems.

According to an article in the July/August 2011 issue of *AGL* — and interest in small cell technologies has grown. In small-cell architectures, utility poles, traffic lights and rooftops often replace traditional towers.

Even with this shift, the traditional cell tower remains the cornerstone of the wireless service industry. The fact that mobile operators everywhere are retrofitting their existing tower installations speaks to the continued importance of towers.

As 3G and LTE/4G services grow, mobile operators are taking fiber to the top of the tower. Next-generation, fiber-fed architectures are quickly becoming the new norm for tower builds and retrofits. These new fiber-to-the-antenna (FTTA) architectures leverage tower-mounted radios to deliver a number of benefits over traditional coaxial-based systems.

When it comes to installing fiber

networks with an operation geared toward hard-line coax, mobile operators face a new set of challenges, particularly in terms of connectivity. They must weigh the pros and cons

Next-generation, fiberfed architectures are quickly becoming the new norm for tower builds and retrofits.

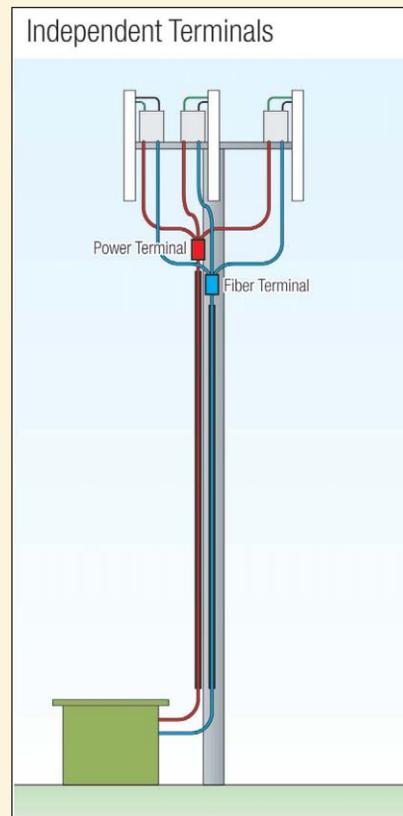
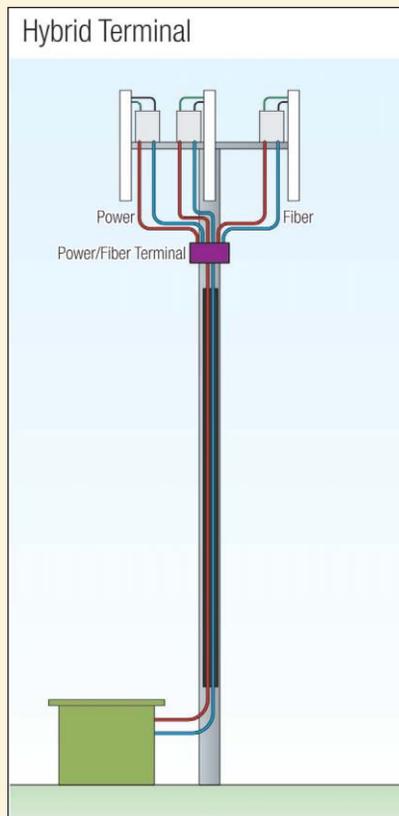
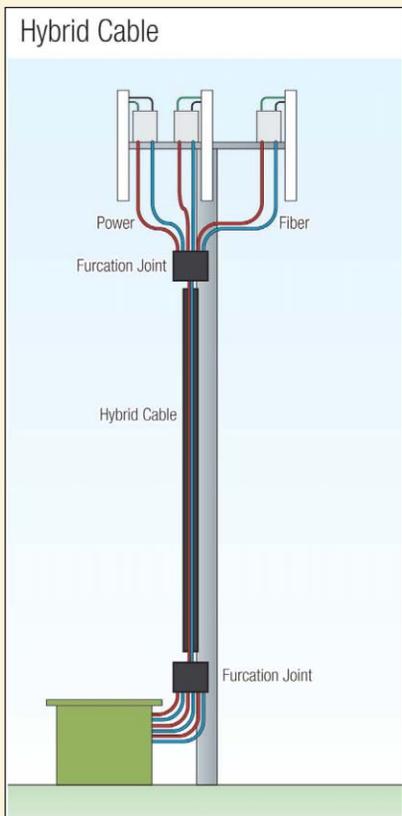
of factory-terminated versus field-terminated fiber cable. They have to consider the skill sets of their field technicians. And they should address the increased need for weatherproofing required by many new antenna designs in order to provide advanced services. New solutions from tower infrastruc-

ture suppliers are helping operators meet these challenges.

Why FTTA?

Mobile operators around the globe are choosing FTTA architectures for new builds and retrofits of cell towers (see Figure 1). They see FTTA as well-suited to meet current and future demand, reduce energy consumption and minimize footprint. Among its advantages:

- **Better signal integrity:** Conventional systems use coaxial corrugated cables to transmit high-frequency radio signals from the base station on the ground to a passive antenna on the tower. As much as 50 percent of the signal can be lost along the way, according to many industry estimates. These losses increase the signal-to-noise ratio, degrading the quality of the received signal. Signal loss is not a concern when fiber is used. FTTA systems use tower-



fiber to the tower top

mounted remote radio units (RRUs) to generate the signal at the top of the tower, near the antenna, with a coaxial jumper cable connecting the two. With a short distance to travel over coax, signal loss is minimal.

- **Increased energy efficiency:** Reducing carbon footprint (and energy costs) has become a ubiquitous goal in the communications industry. Remote radio systems can significantly reduce a tower's energy

consumption, according to the 2010 "ATIS Report on Wireless Network Energy Efficiency" developed by the Alliance for Telecommunications Industry Solutions. In a traditional base station design, transmitted radio signal power travels up the coaxial feeder cable to the antenna. As the frequency of the radio signal rises, the corresponding signal losses in the coaxial feeder increase. In the worst cases, twice as much signal

must be injected into the feeder coax as is needed to propagate out from the antenna. The radio-frequency (RF) power amplifier in the base station is one of the least efficient components of the system, and much of the extra energy required to drive RF power up hard-line coax is simply wasted as heat. This, in turn, drives up the energy costs even more because active cooling systems are needed to keep the equipment within its operating temperature ranges. Cooling typically accounts for 25 percent of a tower's energy use, according to the ATIS report. With a remote radio system, the RF power amplifier is located in the RRU. The tower-mounted RRU is cooled by ambient air flow, eliminating or de-

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Remote radio systems can significantly reduce a tower's energy consumption, according to the 2010 "ATIS Report on Wireless Network Energy Efficiency" developed by the Alliance for Telecommunications Industry Solutions.

creasing the need for active cooling in the base station and saving energy.

- **Increased capacity and coverage:** Remote radio units often support advanced antenna techniques such as multiple-input, multiple-output (MIMO) communications and remote electrical tilt (RET), which enable denser, more flexible coverage with fewer service gaps and higher capacity.
- **Smaller footprint:** FTTA systems consume less space because the fiber cable is much thinner and carries more signal than coaxial feeder cable. A fiber-fed system lessens — or at least doesn't add to — coaxial congestion and tower



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loading issues, reducing physical complexity and minimizing visual impact. Also, the removal of the inefficient RF power amplifier and its associated cooling systems decreases the need for a shelter or a large equipment storage cabinet to house the base band unit at the bottom of the tower.

Although FTTA architectures boast many advantages, operators face a

number of new practical challenges when it comes to installing fiber on towers. Mobile operators realize that fiber is generally better suited than coax to achieve advanced 3G and 4G data rates and to prepare their networks to meet future demand. However, a number of stumbling blocks stand in the way of implementation.

The so-called “fear of fiber” has been coined to describe concerns

that operators face as they consider next-generation architectures. The term alludes to the fact that fiber is relatively fragile and requires some care during installation. But the real reluctance to switch from coax to fiber is steeped in fundamental unfamiliarity with the media. Indeed, installing fiber requires a new skill set. That means retraining technicians or hiring new ones, which can be a time-consuming and costly proposition. Therefore, many recent deployments of FTTA networks have involved factory-terminated fiber. However, factory termination adds to the cost of the cable and requires various lengths to be stocked. Additionally, because it comes in predefined lengths, factory-terminated cable may create either a slack storage situation or turn-up

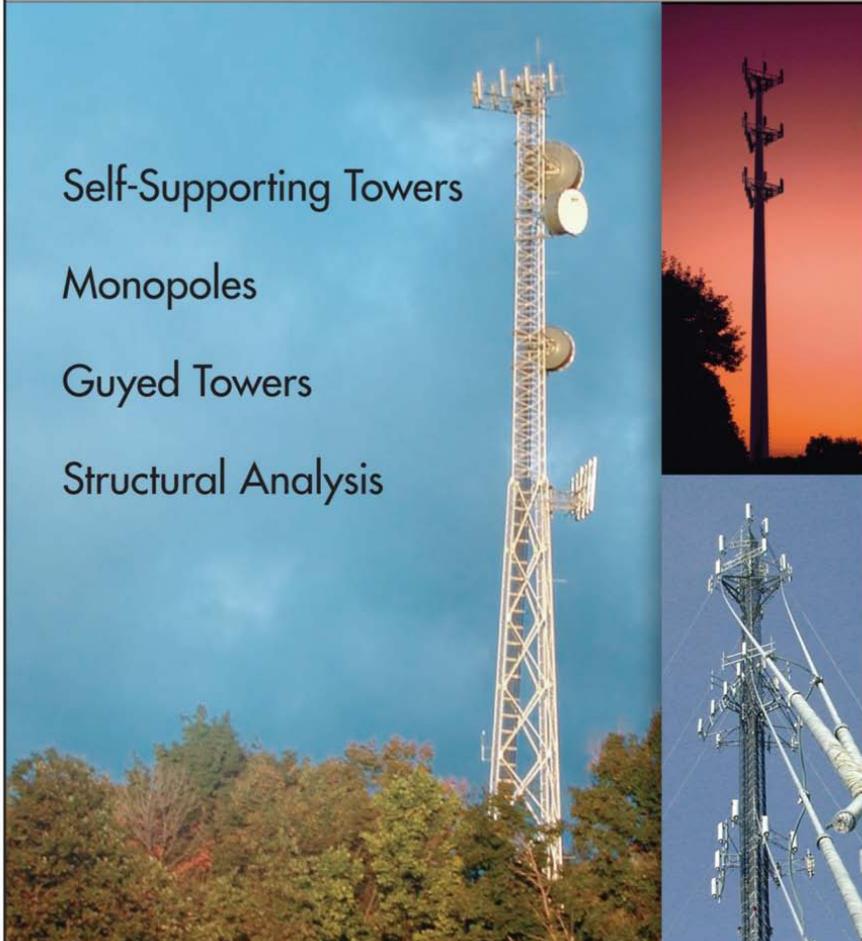
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To make fiber more craft-friendly, connectivity suppliers have developed solutions to help mitigate the cost and complexity of installing fiber in the field.

delays when the cable is too short, adding cost.

Those issues have fueled the emergence of field-terminated fiber connectors in the FTTA space. Field termination fits well with the prevailing practices used for hard-line coax. Specifically, hard-line coax is always cut and terminated on-site to ensure a proper fit. New field-mount fiber connectivity solutions allow the same paradigm to be used for fiber deployments. Simply roll out a spool of fiber and field-terminate it at the site, and you have a custom installation every time with no messy slack storage or missed deadlines due to inadequate cable lengths.

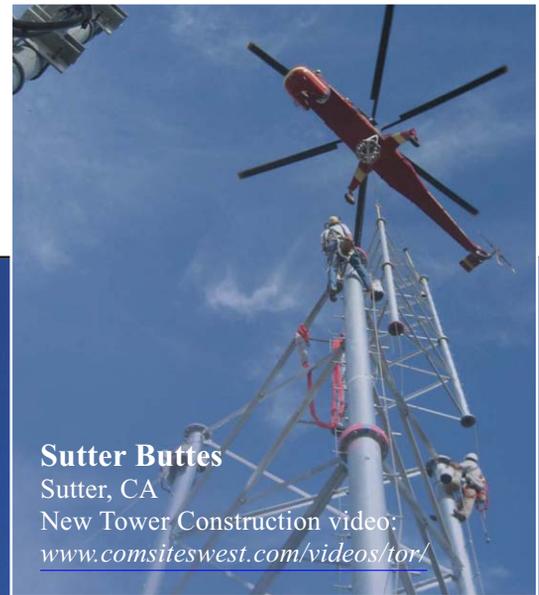
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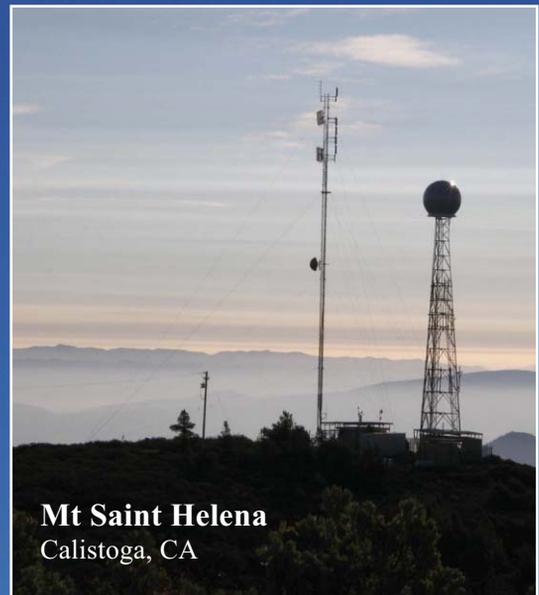
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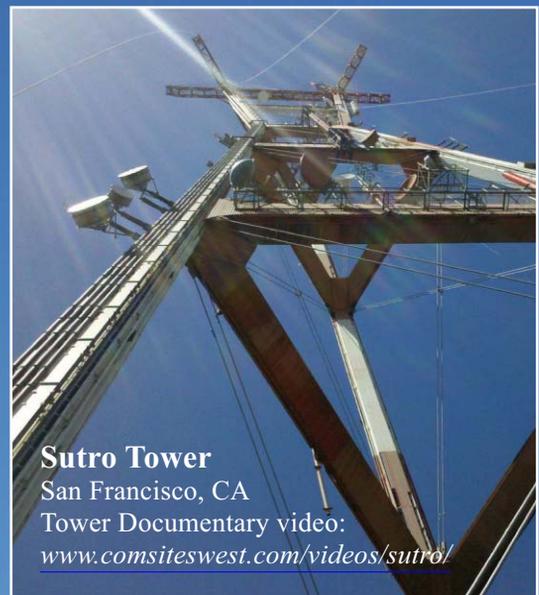
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Photo 1. The 3M tool-less connector series makes the process even simpler with an innovative fiber cable strength member capture mechanism.

(continued from page 22)

To make fiber more craft-friendly, connectivity suppliers have developed solutions to help mitigate the cost and

complexity of installing fiber in the field. For instance, new no-polish connectors allow quick and easy termination of fiber cables at the site without

the need for delicate fiber ferrule polishing. For the small fiber counts used in FTTA installations, no-polish connectors are faster than fusion splicing because only one end of the fiber needs to be prepped and the installation tool requires no power or care. For installations requiring integrated strain relief, tool-less connectors have been developed to make the process

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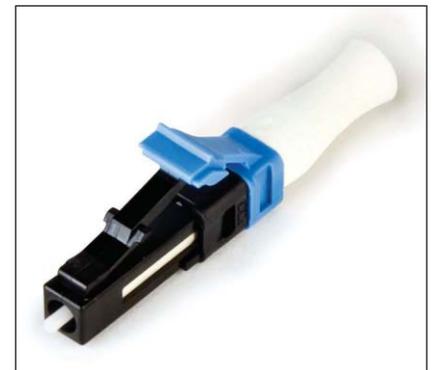


Photo 2. The 3M no-polish connector allows quick and easy termination of fiber cables at the site without the need for delicate fiber ferrule polishing.

even simpler with an innovative fiber cable strength member capture mechanism. Proven solutions, no-polish and tool-less connectors are currently deployed in environmentally demanding applications around the world (see Photos 1 and 2).

Similarly, fiber terminals installed on the tower allow quick and easy connection of the RRU fiber jumper to the tower fiber cabling in a trunked-fiber tower architecture. Rugged and hermetically sealed, these terminals protect against weather yet are re-enterrable for easy maintenance. Most importantly, tower-mounted fiber terminals permit the quick and easy replacement of the RRU fiber jumper — the element of an FTTA architecture most prone to damage due to foot traffic or impact — without having to

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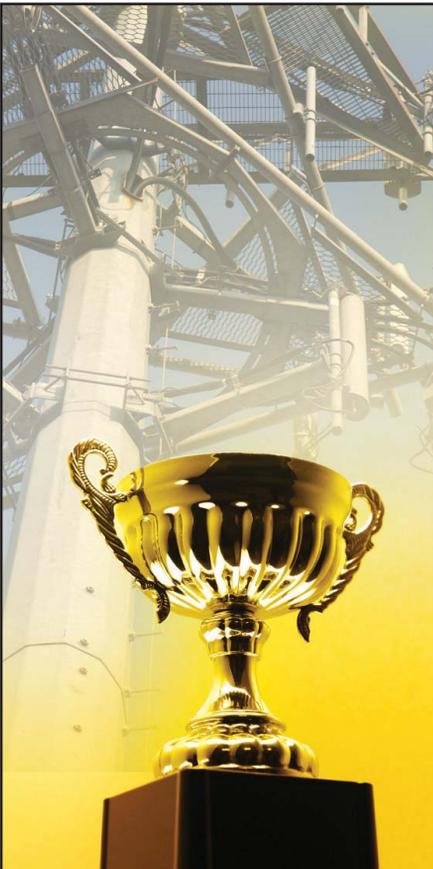
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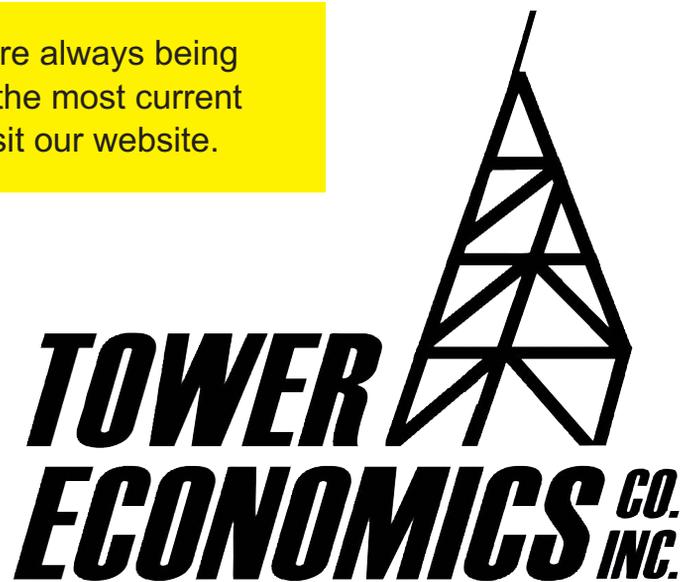
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Photo 3. The 3M fiber dome terminal enclosure allows quick and easy connection of the RRU fiber jumper to the tower fiber cabling in a trunked-fiber tower architecture.

repeat the laborious process of hauling an entirely new fiber cable up the tower (see Photo 3).

Guarding against the weather

Mobile operators must also address new weatherproofing challenges when installing next-generation tower networks. Emerging designs, such as MIMO, incorporate multiple connection points and higher-density connections than traditional two-port antenna designs. These connection points require effective weatherproofing to ensure reliability. However, traditional solutions for weatherproofing, such as tapes and mastics, are often too cumbersome to apply on tightly spaced connectors.

Proper weatherproofing of RF connections tops the list of essentials to ensure network reliability, and it

is relatively inexpensive. A small investment in weatherproofing can help safeguard against expensive service interruptions. The importance of weatherproofing cannot be overstated.

Traditional solutions for weatherproofing, such as tapes and mastics, are often too cumbersome to apply on tightly spaced connectors.

Even connectors with internal gaskets/weatherproofing are not fail-safe. Moisture buildup around the connec-

tor can cause corrosion, allowing RF signals to mix and generate passive intermodulation (PIM) distortion. PIM can interfere with neighboring frequencies, prompting a host of legal and regulatory headaches for the operator. It's no wonder that major cellular antenna manufacturers recommend external weatherproofing around sealed RF connectors. The security in performance and reliability for minimal spend is simply too high to ignore.

Historically, weatherproofing on the tower has been accomplished with a variety of mastics and vinyl tapes. While inexpensive, these sealing solutions are best suited for permanent installations as they require significant effort to remove and replace. In order to facilitate easy installation and re-entry for test and service, wireless industry suppliers have developed

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Photo 4. 3M developed the one-step closure for wireless (OSCW) for weatherproofing critical coax connections on the tower.

mechanical closures designed to weatherproof critical coaxial connections at the RRU and antenna. Used extensively on towers worldwide, these closures lock out moisture, helping preserve signal integrity. The closure's sealing gel provides an effective barrier against moisture and water, yet it doesn't stick to the connector. Compact, one-piece design and tool-less, single-handed closing and opening allow quick and easy installation and maintenance. The most compact of these designs permit closures on

adjacent RF connectors with as little as 50 millimeters of center-to-center spacing (see Photo 4).

Conclusion

Next-generation, fiber-fed networks enable the 3G and 4G services that subscribers demand. However, mobile operators accustomed to coaxial-based systems face new challenges when installing fiber on cell towers. Regardless of the type of fiber cabling architecture chosen, operators must consider installation method (field

versus factory termination) and new weatherproofing needs. Solutions newly available on the market can help wireless operators resolve those issues and assist them in building reliable fiber networks, from base station to antenna. ■

Stephen King is a wireless applications engineer for the 3M Communication Markets Division. His email address is scking@mmm.com. Find out more about 3M solutions for cell towers at 3M.com/wireless.



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safety

With a Fall-arrest Pulley There's No Need for Permanent Vertical Safety Cables

Because it facilitates the use of lead climbing on telecommunications towers, an innovative auto-locking fall-arrest pulley can be used in place of permanently installed vertical safety systems.

By Wayne Ellis

For climbers, vertical safety systems offer continuous fall protection. Tower owners normally provide part of the hardware used in vertical safety systems, such as the fall-arrest cable, as a permanent installation on towers for use by employees and contractors.

Not only is the permanent installation sometimes expensive, its maintenance is beyond the realm of tower crews and individual climbers who, upon arriving at a tower site, may not have information to guarantee the condition of permanently installed components. Using their own equipment allows climbers to control inspection and maintenance at a level not possible with permanent systems.

Locking pulley

International Safety Components, a British company specializing in the design, development and manufacture of safety-critical engineered components, developed a locking pulley suitable for use in hauling materials and for lifting or lowering a person in the event of a fall arrest as part of a simple rescue system. The pulley



The concept of lead climbing (common in the rock climbing world) linked with using an autolocking pulley on specially designed pig-tail step bolts gave Gegen Absturz the idea for creating the Orca, the world's first industrial lead climbing system with a fully automated braking system capable of taking fall factor two loads within peak loads required by the American National Standards Institute (ANSI) and other international standards.

would automatically lock if the user ever lost control of or let go of the rope. The device had to be simple so that user training could be kept to a minimum and durable so that servicing and repair could also be kept to a minimum.

This involved grafting a combination of self-retracting lifeline and fall-block braking technology (SRL/fall block) onto a gripping wheel, and the R-ALF (rescue — auto-locking fall-arrest) pulley was born. Individually CNC-machined (computer numerically controlled) from solid aerospace aluminum and using stainless-steel wear parts, the fall-arrest pulley has an acceleration-sensitive overspeed brake built in. Whether the pulley is used as a 1:1 hauling system for tools and materials or as a 2:1 or 3:1 hauling system for larger items such as microwave dishes, or as a 5:1 hauling system for rescuing the victim of a fall, the user can be in full control. None-

theless, if for any reason the user loses control of the rope, the overspeed brake will kick in almost immediately and the load will be stopped from falling more than a couple of inches. The

The unit is fully serviceable; however, longevity tests of more than 22,000 cycles and multiple drops and fall arrests have so far shown minimal wear on any parts.

simple design of the pulley allows a competent person to thread the unit with 7/16-inch, low-stretch, semi-static rope in whatever configuration the job needs, so it is a completely

versatile piece of equipment.

Longevity tests

The unit is fully serviceable; however, longevity tests of more than 22,000 cycles and multiple drops and fall arrests have so far shown minimal wear on any parts. Although visual inspections at six-month intervals are recommended, it is unlikely that replacement parts will be needed at less than two-year intervals.

Although the fall-arrest pulley already is used in various applications from wind farms to confined-space rescue, it also spawned another solution to an expensive problem for tower climbers. A large German utility and telecommunications service contractor that was considering the installation of fixed vertical safety systems on its towers was struggling to justify such a huge investment. Short-duration maintenance, longer-term projects run by contractors and “first-man-up”

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issues all pointed toward the need for a safety system, but the irregularity of use and the cost of installation and up-keep motivated the contractor to seek alternatives to a permanently installed system. Gegen Absturz (www.against-falls.com), ISC's partner, had the idea of using the concept of lead climbing (common in the rock climbing world) linked in with using an autolocking pulley on specially designed pig-tail

step bolts to create the Orca, the world's first industrial lead climbing system with a fully automated braking system capable of taking fall factor two loads within peak loads required by the American National Standards Institute (ANSI) and other international standards.

The Orca lead climbing system is fully integrated, in that it can be kept in a box in the truck and used whenever it

is required by strapping it to the leg of a tower using the three 5000-pound-rated web straps, feeding rope through it and on to the lead climber's harness. The lead climber then sets off up the tower, and at 6- to 10-foot intervals, feeds the rope into the pig-tail step bolts. These bolts are the only permanently installed items.

Freedom of movement

The system provides much more freedom of movement either vertically or horizontally than a fixed system, and if a climber falls while ascending or descending, he will fall only as far as the next pig-tail where the R-ALF locking mechanism (the integral part of the Orca lead climbing system) catches and brakes the fall — all within ANSI/OSHA guidelines of 8-kilonewton peak loads. Thus, no additional stresses are applied to the person or the structure. Once the lead climber reaches the top, he would fit the rope to an approved anchor point, and the remaining climbers would use the rope as normal with an approved rope grab.

Rescue from ground level

If a rescue is required, it can be carried out from ground level, meaning that there is a significant reduction in risk (and training) for rescuers because they no longer need to climb up above an ill or injured worker to effect a rescue. Fit the tail rope through a couple of pulleys to create some mechanical advantage, raise and release the worker by pulling the rope through the device by only 3 to 4 inches, and then lower carefully. If at any point during the lowering the rescuer again loses control over the rope, the R-ALF device will lock immediately.

The Orca system is being launched in North America at the National Association of Tower Erectors conference and exposition in San Antonio, Feb. 6–9. ■

Wayne Ellis is commercial director at International Safety Components in the United Kingdom. His email address is wayne.isc@clarityonline.co.uk. To view a video demonstration of the Orca system online, visit www.against-falls.com or www.iscwailes.com.

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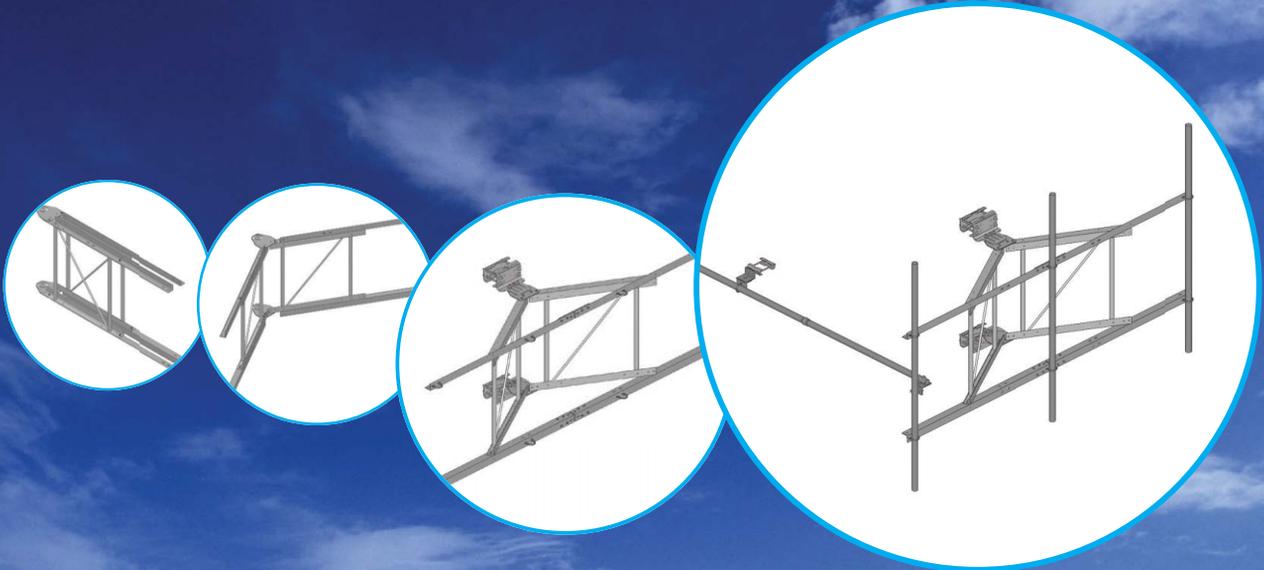
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the evolution of multicarrier das

The Rise of the System Integrators

For now, the distributed antenna system (DAS) market is hot enough that most DAS integrators are staying busy. However, changes in the industry are requiring that they expand their service offerings beyond depending on wireless carriers for their business leads.

By Seth Buechley

It usually doesn't take long to spot the smartest person in the room. With regard to knowing the most about how distributed antenna system (DAS) networks are designed and deployed, DAS

integrators stand alone. Changes in the wireless industry and, specifically, the multicarrier in-building business, are sifting the integrators into several categories while stretching them to expand

or refine their focus.

Typical DAS system integrators offer the following services.

1. Proposal development: Presenting the end-user with a project

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overview that typically includes a system one-line diagram, basic product specifications, and a firm fixed price for delivering a successful project.

2. System design: Collecting existing signal strength, defining the project conditions, running propagation models and presenting a comprehensive plan of how the system should be built. Sometimes a design must be delivered in a computer-assisted design format to integrate into project construction documents. Otherwise, iBwave telecommunications radio planning software has become the acceptable standard for communicating a design.

3. Carrier coordination: Managing the exchange of technical information between the building owner and carriers who will provide services over the DAS. This service is not the same as representing the leasing and financial transaction that may need to take place between the building owner and the carriers.

4. System implementation: Managing or self-performing the fiber

With standardization comes increased competition. What has been a specialized niche exclusive to experienced RF engineers and carriers is becoming a more common part of the low-voltage construction scope for large construction projects.

and coax installation, building out head-end room racks, getting power

to each remote location and mounting all remote equipment.

5. System optimization: Testing the system to ensure performance and proper antenna placement before carriers provide signal source. In some countries, this can also include verifying electromagnetic energy compliance.

6. Signal source integration: Working with each carrier or public safety agency to integrate their signal source delivering their licensed frequencies over the DAS. This phase is completed upon acceptance testing from each carrier.

7. DAS management: Ongoing maintenance and management of the DAS including, in some cases, monitoring, service-level agreements, extended warranty and other services provided to the end-user or carriers.

Few pure-play DAS integrators make a real attempt at delivering services on a national scale. Most integrators have

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chosen to align their business by geography or by a key vertical market such as government, hospitality or health care. Because most DAS installations do not require a permit or local business license, there is nothing that prevents a DAS integrator from pursuing installations in any market.

Enterprise-driven integrators sell multicarrier DAS solutions (and an occasional single-carrier solution) to

end-users who own or lease large buildings. Selling these larger, more complex systems requires the enterprise integrator to have sufficient in-house sales, engineering and project management professionals who can scope, sell, design, install and, in some cases, manage a turnkey solution including necessary carrier coordination.

Carrier-driven integrators derive the lion's share of their business directly

from the carriers. Therefore, they install many smaller, single-carrier solutions (a DAS that serves only one operator), and they are accustomed to competitively bidding dozens of small projects per year. Sometimes they are asked to specify DAS equipment, but often that choice or recommendation is made by a carrier that has a preconceived idea about which brand of DAS solution will fit the application. In many cases, an operator will leverage its supply-chain buying power to purchase equipment directly from the DAS manufacturer.

Public safety opportunities abound for DAS integrators that have earned the trust of the first-responder community. Many a cellular DAS engineer has wandered into the public safety space only to discover that the public safety community considers its own level of engineering to be significantly more complex, specialized and critical than commercial services. Learning how to address the nuances of public safety agencies and their RF concerns is a valuable attribute for a DAS integrator. The recent availability of DAS solutions that can manage UHF/VHF and commercial mobile services over a single converged platform offers an ideal tool for integrators to pursue public safety DAS solutions that will often grow to full, large-scale, multicarrier DAS solutions.

DAS management services also represent a growing opportunity for an integrator to expand its business and develop a stabilized recurring revenue stream. Building owners are not set up to manage DAS systems and carriers have been, at best, only skilled at maintaining single-carrier DAS. Services may include those listed below and are usually offered on a fixed-contract annual or hourly basis.

- **System monitoring and NOC services:** Only a few integrators have invested in an in-house network operations center (NOC) for the purpose of maintaining visibility and control of a DAS through a Web-based operations and management program. Other integrators have chosen to partner with a third-party NOC service to track trouble tickets and maintain a record of how each



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issue was resolved.

- **Scheduled inspection and maintenance:** On-site verification of system performance is often required for DAS systems providing public safety coverage or for educational venues that demand proof of DAS performance and capacity.
- **Field services:** When a system performance issue requires that a technician be deployed, the integrator, or its local designate, is required to visit the site.

With standardization comes increased competition. What has been

a specialized niche exclusive to experienced RF engineers and carriers is becoming a more common part of the low-voltage construction scope for large construction projects. Because several DAS manufacturers have been acquired by large structured-cabling businesses, the traditional structured-cabling contractor channel has gained exposure to the world of DAS. Armed with a basic understanding of DAS and a propagation prediction tool, these low-voltage cabling firms are increasingly representing themselves to building owners as experienced DAS integrators.

The biggest challenges to integrators may come to those who rely too heavily on carriers for their business. Carriers, often bound by supply chain requirements for competitive bidding, are nearly always shopping for low price and not necessarily the best RF engineering. Furthermore, carriers

The biggest challenges to integrators may come to those who rely too heavily on carriers for their business.

are prone to purchase DAS equipment directly from manufacturers, thereby eliminating the opportunity for product markup that would otherwise be earned by the integrator. In some cases, carriers are even bringing DAS design services in-house, which reduces the DAS integrator's scope of installation services.

For now, the DAS market is hot enough that most DAS integrators are staying busy. However, the changes in the industry are requiring that they reinvent themselves by expanding their service offerings, moving beyond total dependence upon wireless carriers for their business leads. ■

Seth Buechley is president of Solid Technologies USA, a provider of distributed RF and optical transport networks. For more information, visit www.solidtechusa.com.



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Self-retracting Lifeline

Capital Safety has introduced the DBI-SALA Nano-Lok self-retracting lifeline (SRL). These SRLs can be used in place of lanyards and can be directly attached to any harness, reducing fall clearances. At a weight of 1.6 pounds, the design provides comfort and productivity, while protecting workers who weigh as much as 420 pounds. The SRL technology maintains tension on the lifeline at all times, keeping it out of the worker's way and reducing dragging, snagging and trip falls. The automatic-activating arrester locks to stop falls within inches, reducing free fall distance and providing more protection at lower heights. It also features a six-foot web lifeline for added strength and multiple anchorage options.

www.capitalsafety.com



Harness

The ExoFit NEX full-body harness from **Capital Safety** offers safety, comfort, function and durability. Anti-absorbent webbing, padding and protective elements prolong the service life of the harness. The hardware allows for a one-time adjustment that stays in place throughout the day and improves safety by ensuring a snug fit. The Duo-Lok quick-connect buckles include a locking mechanism to eliminate slippage and constant readjustment. The Revolver ratcheting torso adjustor features a winding adjustment that spools the webbing as the user adjusts the harness for a proper fit. The adjustor locks into place and holds the adjustment, preventing slippage due to movement and added weight. It also eliminates excess webbing that can be hazardous near moving parts. Additional hardware includes breakaway molded lanyard keepers that allow the connection of any size snap hook and break away to help prevent snagging and tripping.

www.capitalsafety.com



Fall Protection System

The Miller Twin Turbo fall protection system from **Miller Fall Protection** provides continuous, 100 percent tie-off for climbers working at low-fall clearance. The system incorporates a D-ring connector on the back of a full-body harness with two Miller TurboLite personal fall limiters (PFLs) or self-retracting lifelines. The Miller Twin Turbo system features a connector that mounts to the back D-ring of any fall protection harness and increases worker freedom of movement. TurboLite PFLs swivel in multiple directions for mobility. Swivel action prevents webbing from twisting and binding inside the unit. Webbing extends and retracts without interruption.

www.millerfallprotection.com



RF Protection Garments for Climbing

Naptex shielding fabric for RF-protection garments is available from **UniTech**. Naptex offers encapsulated yarns to ensure that shielding fibers never fall out in use or washing. Close-fitting hood with user-replaceable fabric screen provides safety and a comfortable fit for climbers. www.unitech-rf.com

Personal Fall Limiter

The **Miller TurboLite** personal fall limiter (PFL) is an alternative to shock-absorbing lanyards. The 1.9-pound unit provides 6 feet of working capacity in a self-retracting lifeline and attaches directly to the harness back D-ring. Engineered webbing provides for greater abrasion resistance and long service life. www.millerfallprotection.com

RF Compliance Apparel

KW-Gard RF compliance apparel from **Euclid Garment Manufacturing** works on the principle of energy reflection. By integrating stainless-steel microfibers in a Nomex-based yarn, RF energy is reflected away from the fabric, reducing the field on the other side. The fabric uses 25 percent stainless-steel concentration for greater shielding effectiveness. KW-Gard's efficiency is not dependent on the orientation to the incident field because of its high surface conductivity. www.euclidgarment.com



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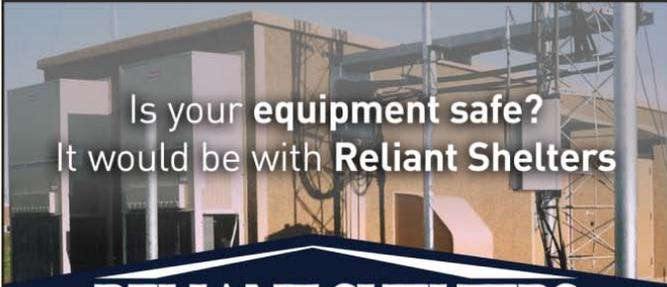
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