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FirstNet Update

Coexistence with Cellular

Statewide Broadband Network

August 2014   ///   Volume 11   ///   No. 08

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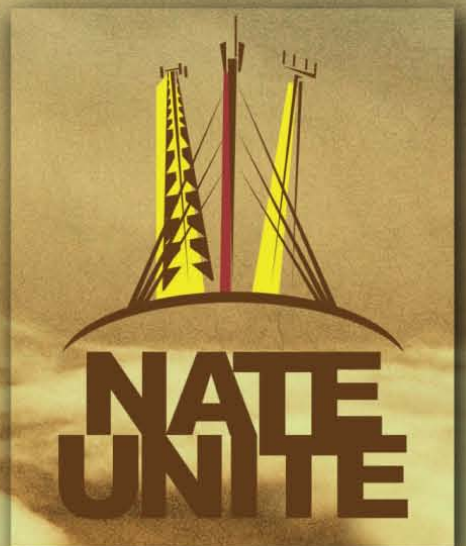
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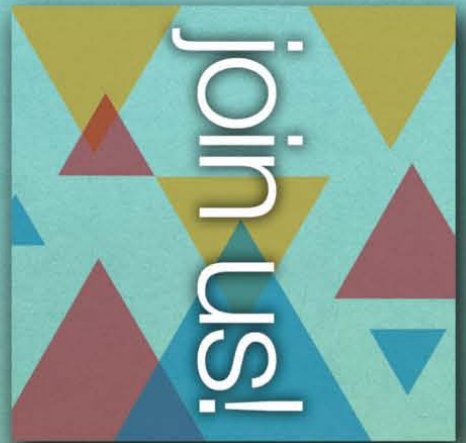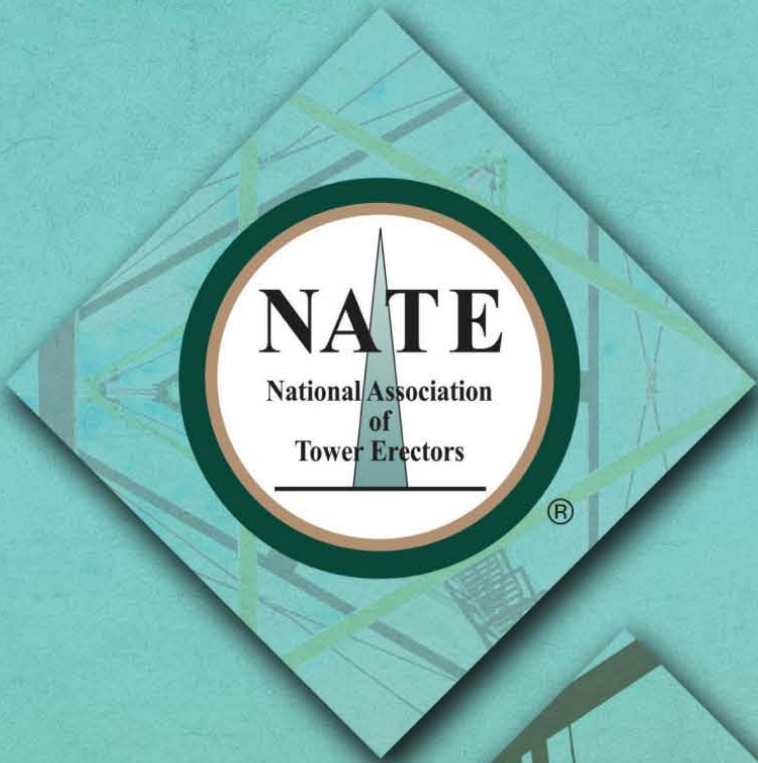
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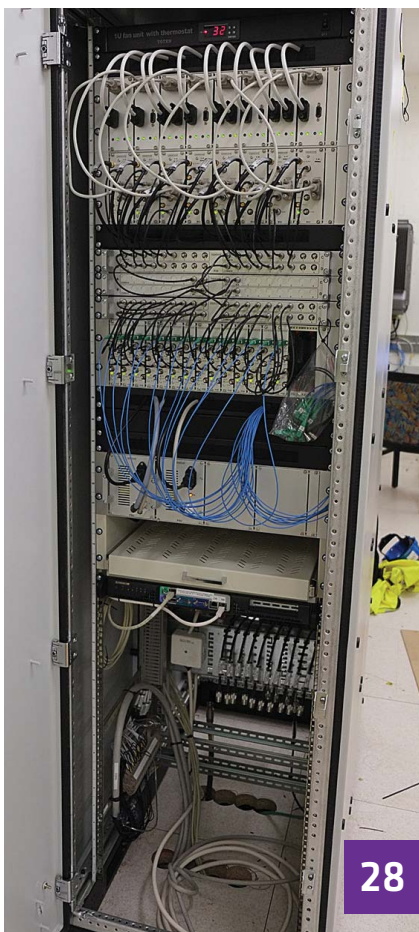**PROTECTING LIVES & PROPERTY**

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EDITORIAL COMMENT

AT&T Ratchets Down

When AT&T sneezes, many companies catch a cold. AT&T's pending acquisition of DirecTV made the telecom giant freeze capital expenditures. Vendors that rely on AT&T's spending for a sizeable portion of their revenue have had to cope with cutting back their own spending, in some cases involving layoffs.
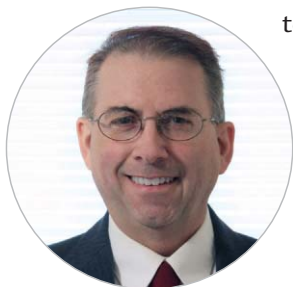
With the AT&T cutback, operations at tower construction companies MasTec Network Solutions, Velocitel and WesTower Communications became oversized, affecting their employee rosters. Additional vendors to AT&T that are affected include Ciena, Juniper Networks, JDS Uniphase, Alcatel-Lucent and Adtran.

According to *Barron's*, on the wireless side, AT&T is increasingly emphasizing Project Stream, which is a wireless video architecture leveraging Long Term Evolution (LTE) Broadcast. For the wireline network, AT&T reportedly wants to make sure its ongoing access and transport network builds are optimized to interoperate with the significant new cable headend architecture it is now planning to build.

AT&T, a steady, multiyear spender, suddenly became unpredictable.

Tower Worker Fatality

Joel Metz, 28, of Plainfield, Indiana, lost his life on July 2 when an antenna on a tower fell and a cable struck him, dismembering and decapitating him. An employee of Indianapolis-based Fortune Wireless, Metz was at 240 feet on the tower with another worker, and two more men were on the ground, when it happened. A father of four, Metz was engaged to be married.

The gruesome cause of Metz's death draws more attention to his demise than some other tower-related fatalities. But aside from that, his death sends no stronger message than other fatalities do that tower work is serious business that demands attention to safety from all perspectives, not just 100 percent tie-off. As for the use of personal protective equipment, Metz's body was left suspended in his safety harness for five or six hours before a high-angle rescue team could bring it down.

Whether a piece of equipment failed, something was improperly rigged or another mistake was made will be a matter for OSHA's investigators to determine. The results of OSHA investigations usually take six months to be released.

In the meantime, we are saddened by Metz's death and the terrible loss for his family. It is all the more reason to redouble efforts in equipment inspection, employee training, and supervision by employers.

Don Bishop, Executive Editor
dbishop@aglmediagroup.com

/ **DEPARTMENTS** /

Yada Yada Yada

Twenty-five years after the first episode of "Seinfield," it only seems right that we embrace a successful commercial TV show that was about not much of anything. We are celebrating 10 years of publishing *AGL Magazine*. The November issue will be our 100th issue, and the December issue will be our 10th anniversary issue. It seems right that this humble little magazine, which is really only about those ugly little metal things on the side of the road, should celebrate a birthday with "something about nothing."

The market-efficient antenna collocation business, with its humble beginnings as an offshoot of the cellular industry, has become a major indicator of U.S. economic growth. We are a stable economic powerhouse, and all major publicly traded firms have achieved real estate investment trust (REIT) status. Folks, we are officially grownups — I'm about to be 50, and I can't say that expression is dear to me, however, let's be honest, we are definitely grownups.

Carriers need what we do, and we need carriers. Over time, the carriers have had less and less need for our exact, "perfect" fixed locations. Rather, we are embarking (or perhaps we are already out to sea) on another explosion of growth with small sites and microsites. No carrier's business is to secure and build towers or collocation infrastructure; the carrier's mission is to build a network and to make it work well. A carrier should be less and less concerned about backhaul — increasingly, that is someone else's job. It seems to be falling to the tower companies as they take responsibility for more and more parts of the physical network.

As the wireless infrastructure industry matures, I still believe we have one major issue to address: Will the tower companies ever take DAS to the next level? Will we ever own and take responsibility for (not necessarily operate) the network? If we can create a service level agreement (SLA) for backhaul reliability, why can't we create SLAs for RF on the street? Why are we not combining networks or operating the full RF network from antenna to fiber interface? Sure, the actual network operations (switching, customer care, billing, clearing and settlement) should rightfully always be handled by the carrier. Otherwise, what is a carrier?

There is a little secret we RF engineers don't like to share: LTE largely eliminates our jobs. All of the hassles of frequency planning and RF optimization are largely reduced with LTE. That could be a story for another issue of the magazine. As LTE becomes more widely adopted, the uniqueness of any particular network is greatly reduced. The secret sauce of one carrier or the other is becoming more about marketing and customer care than about network optimization. Of course, coverage is still important, as is data throughput. How do you compete when all of the technology is pretty close to the same? It goes back to the early GSM days in many European countries. It's about customer service and features, even though features are not as unique or special as they once were, either.

So, yada yada yada, it is more of the same. But this industry remains on fire, despite some bumps along the way, and it is not going to remain the same. It is changing. Keep up with it, or — well, there is no real hammer on the other side of that statement. Keep up, or just remain completely insane like the rest of us. We've made something from nothing. If you are paying attention, you can make something new from nothing once again.

APCO

I'm looking forward to attending the APCO convention this year. And no, not just because it's in New Orleans. With the changes in FirstNet and the convergence of virtually all communications to LTE, I'm eager to hear what the public safety side of the industry has to say.

I've been reading a little bit more about some zoning issues with some proposed cell sites on school properties in Maryland. I'll be digging in a little more and will report back soon.

I'm also looking forward to seeing you in Vegas for the Tower & Small Cell Summit collocated with Super Mobility Week in September.

Enjoy the rest of the summer, and try to relax a little, 'cause the rest of this year and the next one look like they will be challenging to keep current with.

Rich Biby, Publisher
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/ **DEPARTMENTS** /

Photo by Don Bishop

ENFORCEMENT

Tower and RF Exposure Violations

FCC Issues More Tower Violation Fines

By Michael L. Higgs Jr.

The FCC's Enforcement Bureau has been cracking down on tower violations over the past several months, and that continued with two more notices of apparent liability (NALs) released on June 9, both from the Philadelphia field office. Dalrymple Realty was fined $10,000 for failing to clean or repaint its antenna structure in Elmira, New York. The 320-foot tower was required by its antenna structure registration (ASR) to conform to the painting and lighting requirements of FAA Advisory Circular 70/7460-1F, FAA Chapters 3, 4, 5 and 9, which require that the structure be painted for daytime visibility and must display red obstruction lighting at night.

Repair

A few days following the FCC's inspection, Dalrymple repaired the lighting system, installed a remote monitoring system and applied to the FAA for permission to replace its painting obligations with white obstruction

lighting — which was subsequently granted. The lessons to take away from this case are that the monitoring of obstruction lighting needs to be more than casual, and if you are going to change from one method of obstruction marking to another, first obtain permission from the FAA and the FCC.

Northeast Passage

The Enforcement Bureau fined Northeast Passage $15,000 for several violations of the FCC's antenna structure rules. Northeast Passage was charged with failing to exhibit medium-intensity obstruction lighting on the tower during the daytime, failing to monitor the tower's obstruction lighting, failing to notify the FAA of a known light outage and failing to immediately notify the FCC upon a change in the tower's height.

Wrong Lighting

According to the FCC's antenna structure registration database, the tower should stand 242 feet tall and should have paint for daytime visi-

bility and red obstruction lighting for nighttime visibility. During the inspection, it was determined that the tower had the required red obstruction lighting, but in lieu of the required paint, it had white medium-intensity lighting. However, the agents also observed that one of the two medium-intensity lights at the mid-level and all of the daytime lights at the top level were extinguished. No NOTAM had been issued to warn pilots of the light outage. Also, according to a contractor working on the tower at the time of the inspection, the structure was significantly taller than was listed on its ASR.

2006 Application

According to FAA records, Northeast Passage filed an application in 2006 specifying a new structure height of 382 feet, which required a medium-intensity, dual-lighting system. However, Northeast Passage failed to notify the FCC of the new tower height and the associated change in lighting specifications. Some of the factual claims of Northeast Passage with regard to who was responsible for monitoring and

repairing the lighting system were determined by the Enforcement Bureau to be untrue.

Fine Adjusted Upward

Under the FCC's guidelines, the base forfeiture amount for failure to comply with prescribed lighting or painting is $10,000, and the base forfeiture amount for failing to file required forms or information is $3,000. The Enforcement Bureau found that the failure of Northeast Passage to notify the FAA of a known light outage, combined with its lack of diligence with regard to the monitoring of the requisite lights, represented a deliberate disregard for FCC rules critical to ensuring the safety of air navigation, and thus the bureau concluded that an upward adjustment of $2,000 was warranted.

Michael L. Higgs Jr. is a member of the telecommunications and cybersecurity practices of Shulman Rogers Gandal Pordy Ecker. His email address is mhiggs@shulmanrogers.com.

Verizon Wireless Fined for RF Exposure Violations

By J. Sharpe Smith

The FCC's Enforcement Bureau has concluded that Verizon Wireless violated its RF exposure limits and fined the carrier $50,000. Additionally, the carrier has agreed to implement a compliance plan to protect its employees, contractors and other people who may come into contact with RF emissions from its wireless facilities. The plan includes training, reporting

requirements and other safety measures.

The investigation came as a result of complaints that Verizon Wireless violated the RF exposure limits at rooftop antenna sites in the Philadelphia, Pennsylvania, and Hartford, Connecticut, metropolitan areas.

In response to the investigations, Verizon Wireless has already spent $4.2 million to inspect all of its 5,000 rooftop antenna sites to review and

update RF exposure warning signage at access and antenna points. Employees at the company's two network operations centers have been trained on how to inform individuals working near transmitter sites on safety measures.

J. Sharpe Smith is a contributing editor.

ENFORCEMENT

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Quick-Guide to Engineering Companies

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

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FirstNet Update

The First Responder Network Authority's director of government affairs says consultations with state governments are in focus, and a request for proposal is due by the end of the year.

By Don Bishop

It was February when *AGL Magazine* last visited the subject of the First Responder Network Authority (FirstNet) and its plans for constructing a nationwide public safety wireless network using 20 megahertz of spectrum in the 700-MHz band. At the time, FirstNet had Bill D'Agostino as its general manager. He resigned in April. Since then, TJ Kennedy, the deputy general manager, has been serving as acting general manager. In June, FirstNet announced a national search for a general manager.

Also at the time of our February coverage, Sam Ginn was FirstNet's chairman. He resigned as chairman in May and said he plans to remain on the board until his term expires this month. U.S. Secretary of Commerce Penny Pritzker elevated Sue Swenson from vice chairwoman to chairwoman. Ginn credited Swenson with leading FirstNet's efforts to negotiate spectrum agreements.

D'Agostino was general manager for

just short of a year. Ginn became First-Net's initial chairman in August 2012.

Looking Ahead Six Months

Ed Parkinson, FirstNet's director of government affairs, said Congress gave FirstNet $7 billion, 20 mega-hertz of spectrum and the authority to build the public safety wireless network. He said that during the next six months, FirstNet would focus much of its effort on developing state plans for using the network. "We're going to be working very, very diligently in understanding what works in Maryland and how that's different from what's needed in Florida, what's important in Texas and how that's different from what's needed in Alaska," he said.

Instead of designing the network to be one size fits all, Parkinson said it would be focused on local problems

> **Ed Parkinson:** "Nothing in the law forces public safety to use the network that we're building, so we have to ensure that we can provide coverage service at a cost that's competitive and equal, if not better, to what public safety experiences today when it comes to the data network."

and solutions. Congress required FirstNet to consult with state governments, and FirstNet is in the process of conducting those consultations. At some point, state governors decide whether their states will opt in to using the network.

"Nothing in the law forces public safety to use the network that we're building, so we have to ensure that we can provide coverage service at a cost that's competitive and equal, if not better, to what public safety experiences today when it comes to

the data network," Parkinson said. "I think something we will be able to provide really well that commercials can't is ruthless priority and preemption," he said, referring to the priority that public safety agencies expect their wireless communications to take in comparison with other users.

State Consultations

"The main focus is that the states drive the conversation," Parkinson said. "The states decide what kind of coverage they want. They decide the

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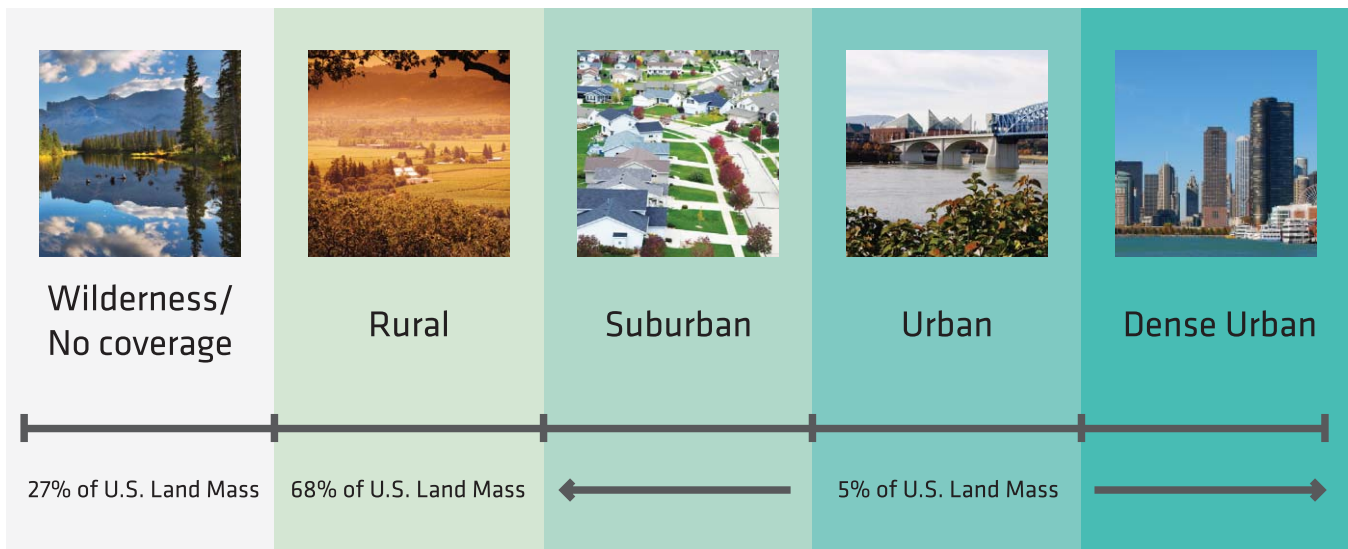| 27% of U.S. Land Mass | 68% of U.S. Land Mass | | 5% of U.S. Land Mass | |

Figure 1. The First Responder Network Authority defined five coverage categories. FirstNet's government affairs director, Ed Parkinson, pointed out that three of them — suburban, urban and dense urban — only cover 5 percent of the U.S. land mass. *Source: FirstNet*

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FirstNet is committed to issuing a draft of a request for proposal for a comprehensive network solution by the end of the year. The purpose is to identify what sort of network partnership is possible and to learn how comprehensive it could be. A second RFP would be issued a few months later for equipment and services.

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number of users and how those users are going to look within the states." Initial state consultations began at the end of July. The acting general manager said FirstNet hopes to complete 56 state and territorial consultations by the end of the year.

Finding What Works

Parkinson said FirstNet asked the states to include in the initial consultation a list of contracts the state already has with the private sector, including telecommunications towers and cell phones. "We want to get an idea of what works and what doesn't," he said. "This provides us with an opportunity to identify the best-case scenarios. What works fantastic for Maryland might not be so great for Virginia. This is another part of the forward-planning through consultation that we hope to engage in."

Interestingly, Parkinson said that the network could cover 99.7 percent of the U.S. population and still not cover 35 percent of the country's land mass. "It's our mandate to go where public safety needs to go," he said. "Disasters and terrorist attacks don't always just happen in dense urban areas. And so we have to take that into consideration as we build the network."

Five Coverage Categories

FirstNet defined five coverage categories

(see Figure 1). Parkinson pointed out that three of them — suburban, urban and dense urban — only cover 5 percent of the U.S. land mass. "Wilderness and rural is 95 percent of what we're looking at," he said. "The legislation gives us rural milestones that we have to accomplish. Rural America is one of the key constituencies that we have to ensure is covered. There will be many fascinating opportunities for rural telecom to work with FirstNet in providing coverage."

Parkinson said FirstNet, which has its headquarters in Reston, Virginia, would be opening regional offices according to the same regional divisions that the Federal Emergency Management Agency uses. FirstNet already opened a technical laboratory in Boulder, Colorado.

Seeking Experts

Along with the regional offices comes hiring. "We're going to be hiring public safety individuals from these regions to act as our outreach into local communities," Parkinson said. "We need to hire fire chiefs, police chiefs, 911 experts and emergency medical service people so that we can draw upon their expertise. They're already trusted members of that society, so they can be our advocates."

Two teams handle federal outreach. One has a federal coordinator for

interaction with the 566 federally recognized Native American tribes through each state's single point of contact. The second team is for federal users on the network. "Fourteen of the largest federal agencies have something to do with public safety communications," Parkinson said. "They all have a voice in the Emergency Communications Preparedness Center, so we're working through the center to ensure cooperation and coordination at the federal level."

Request for Proposal

FirstNet is committed to issuing a draft of a request for proposal for a comprehensive network solution by the end of the year. The purpose is to identify what sort of network partnership is possible and to learn how comprehensive it could be. A second RFP would be issued a few months later for equipment and services. "This means there will be a lot of very, very detailed information coming out of FirstNet over the next few months," Parkinson said. "This is our number one priority, to get the comprehensive network solution on the street by early next year."

Parkinson spoke of FirstNet's need to address cyberterrorism. "Because the network will be IP-based, the cyber aspects will be huge," he said. "We're working closely with the Department of Defense and the Department of Homeland Security to identify what we need to focus on. It's a little too early to talk about the parameters and tactics we'll implement. But the discussion has been on the hardware and the software. It's a fundamental part of the build."

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straints of the Federal Acquisition Regulation, so it has to take certain steps when it issues requests for proposals. Meanwhile, it is exempt from certain provisions of the Affordable Care Act, which Parkinson said helps to expedite the process.

BTOP Activity

Meanwhile, some additional activity related to FirstNet is taking place, thanks to funds set aside for the Broadband Technology Opportunities Program under the American Recovery and Reinvestment Act of 2009. Among the BTOP projects are seven for public safety. FirstNet signed spectrum manager lease agreements with four BTOP projects, and Adams County, Colorado, is among them.

Since June, Adams County has been using FirstNet spectrum to operate a six-site public safety communications network to identify what works and what doesn't. Parkinson said the Adams County project could help to show what kinds of communications systems could be operational for public safety and what kinds of devices could be used on them.

Focus on Deployables

A BTOP project in New Jersey focuses on deployables used to cope with emergencies. "What if, for example, we deploy X number of cells on light trucks (COLTs) or cells on wheels (COWs) to a site or to a region prior to a disaster coming through so that if a system goes down, we have that sort of redundancy already there?" Parkinson asked. "Also, utilities have a fundamental role to play. It's a matter of understanding from the states what they want as far as primary and secondary users are concerned. That's going to be a discussion the states are going to be driving."

This article is based on remarks Ed Parkinson made during the June AGL Conference in National Harbor, Maryland. The next AGL conference is in Dallas on Oct. 9. For information about AGL conferences, visit www.aglmediagroup.com/aglevents.

/ **FEATURES** /

Can Public Safety and Cellular DAS Coexist?

The use of a converged distributed antenna system (DAS) solves a host of problems when the objective is to provide commercial wireless and public safety wireless communications in the same building or area.

By Tom Kuklo

A distributed antenna system (DAS) network has been defined as any system that receives an RF signal either over the air or from a base station and redistributes or amplifies that RF signal into a defined area through a network of antennas and receives a signal from a network of antennas and amplifies that RF signal back to the base station. DAS networks have been deployed for both public safety and cellular communications.

The mission for DAS networks may have started out as coverage enhancement for both types of wireless communications — cellular and public safety. However, because of the increased demand for data coverage, the DAS mission for cellular networks has evolved into one that increases capacity within the cellular infrastructure. In a nutshell, a public safety DAS is deployed to protect lives and property, whereas a cellular DAS is designed for the user's convenience and to generate revenue for providers such as AT&T, Verizon and Sprint.

Public Safety Communications

DAS networks have been an integral part of public safety communications since TX RX Systems designed the first signal booster in the United States and installed it in an Illinois mine in 1979. Since their introduction, DAS networks have been installed to extend mission-critical communications coverage into disadvantaged areas such as parking garages, high-rise buildings, tunnels, campuses, shopping malls and airports. By definition, mission-critical public safety networks are put in place to protect the lives of first responders and the citizens that fire, police, and emergency medical personnel have sworn to protect.

During the past 10 years, there has been a significant increase in local and state legislation that sets minimum coverage standards for public safety communication systems. Along with new public safety building codes implemented by the International Code Council (ICC) and the National Fire Protection Association (NFPA), the minimum standards are driving the current demand for DAS networks. The requirements imposed by these new regulations include:

- Battery backup
- Monitoring the antenna network
- NEMA-4 enclosures for survivability
- Alarming that communicates to the central fire alarm panel
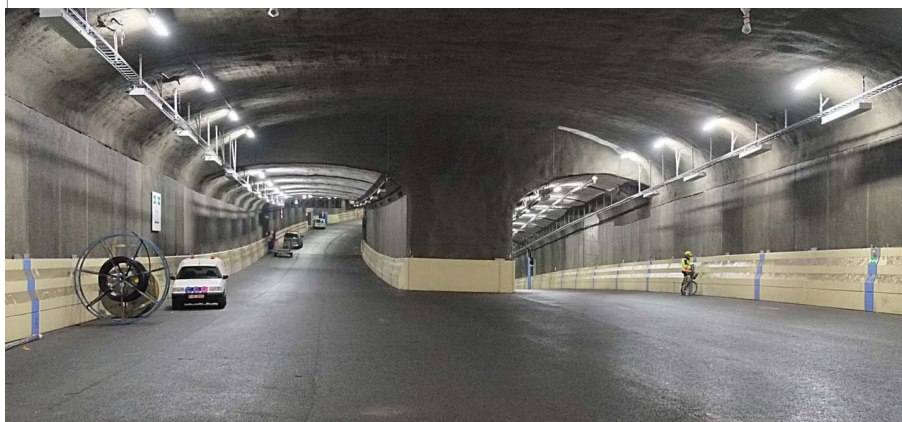
Tunnel system under construction.

Additionally, local fire and police chiefs demand proven coverage above designated thresholds to ensure that their officers are able to communicate to command vehicles and other safety forces. Public safety communication networks are designed to survive as long as possible in the event of either a natural or man-made disaster. These networks include hardened sites that can't be overwhelmed by a spike in voice or data traffic.

Converged vs. Separate Networks

DAS networks supporting mission-critical public safety communications have typically been installed as independent networks. This means that cellular communication is not typically installed on the same network or antenna system as the public safety system. In many cases, this separate network concept originates with public

safety's mandate to ensure always-on communications. Additionally, public safety DAS networks have history on their side. Public safety DAS networks were deployed in major cities and large structures long before there was a need for either cellular voice or data communication. As the demand for cellular coverage and capacity has increased within large structures and venues, the wireless carriers have installed their own DAS networks to ensure that their signals are being transmitted.

Many public safety communications experts today continue to insist on the separation of public safety and cellular DAS networks. Reliability or the lack thereof with cellular networks has been one of the major reasons for insisting on separate DAS networks. However, this reason or argument no longer has the same level of validity that it had five or 10

NFPA signal booster.

years ago. The cellular equipment manufacturers and providers have invested billions of dollars to upgrade their systems and improve the reliability of their equipment. It can be argued that cellular users are demanding the same level of always-on

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communications as the public safety communications officers, albeit for significantly different reasons.

Whether or not independent cellular and public safety DAS networks are installed in a particular venue, the two systems will interact or interfere with each other. A DAS is a complex network consisting of a head-end unit, RF-to-light converters, coax and fiber-optic cable, remote amplifiers, splitters, couplers, attenuators, RF loads, filters and antennas. All DAS networks must be designed with the needs of both cellular users and public safety communications requirements in mind. Additionally, the systems must be installed and tested in the same manner.

Recently, Bird Technologies became involved in a DAS systems problem at a Las Vegas casino. Bird signal boosters were installed and had been operating in the casino for several years as part of a public safety and internal security DAS network. The casino

A remote unit in a communications equipment room.

also had a fully operating cellular DAS network installed on the premises. After an upgrade to the cellular system, the public safety network lost coverage in more than 75 percent of the building. None of the cellular system operators believed they caused public safety

network coverage reduction. Independently, both systems had been designed and installed to provide the desired coverage. However, the upgrade to the cellular network introduced an interfering signal into the RF environment, resulting in the
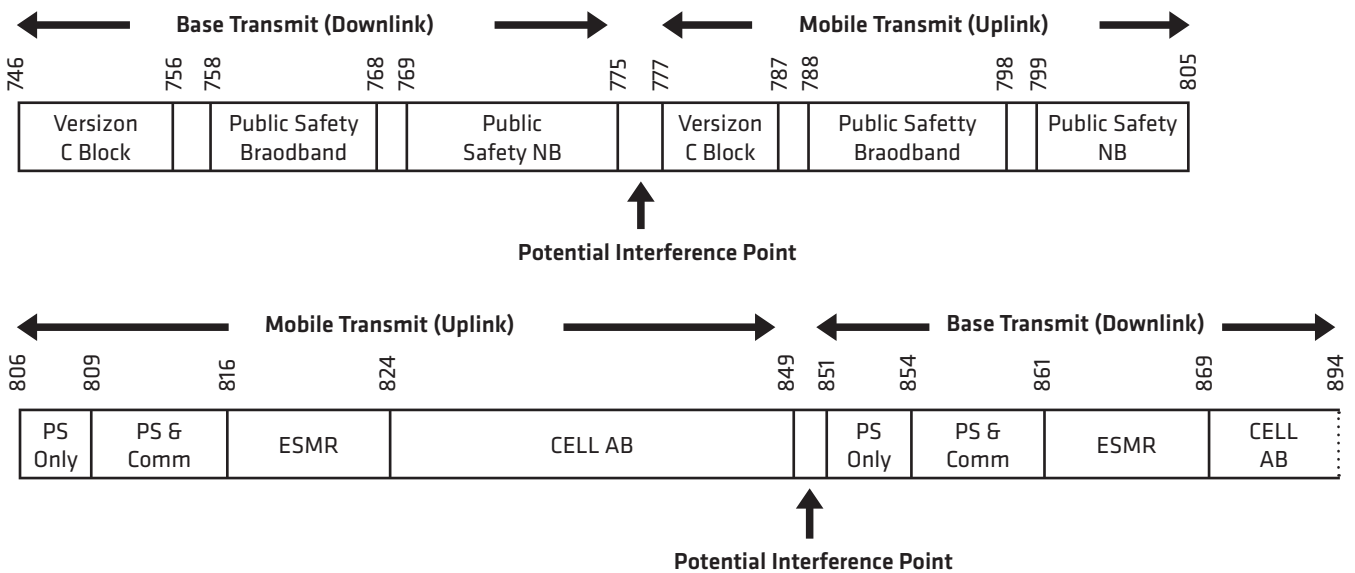
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Figure 1. The downlink path of a signal may interfere with the uplink path of a competing signal. This can most commonly be a problem in the 700-MHz and 800-MHz bands.

lost public safety coverage. Additional filtering was installed in the DAS network to eliminate the interfering signal, and full coverage was restored.

Converged DAS Advantages

Would a converged DAS have prevented the lost public safety coverage in that example? It is impossible to know for sure. However, it is known that the potential for lost coverage is significantly reduced when the system designers and installers understand the potential issues and conflicts between systems and take the necessary precautions to reduce or mitigate the potential for interfering signals.

What are the main advantages of a converged DAS?

- The system is designed and planned to accommodate the inherent interaction between cellular and public safety systems such as additional filtering (as described earlier) and antenna spacing.
- The system is designed to manage the wavelengths for the various bands and frequencies.
- There is design control for the entire system instead of independent control over the independent portions of the total network.
- The converged DAS is generally less expensive to install than separate systems.

What are the main potential areas of conflict when insufficient attention is given to the coexistence of cellular and public safety DAS networks?

- Interference from one signal, harmonics of a signal or intermodulation products may cause a dropped or lost signal.
- Null zones or areas where the competing signals may cancel or distort each other could be created.
- Installing inadequate filtering (rejection is not sharp enough) may create a multipath environment where a cellular network installation passes some of the public safety frequencies or the public safety network passes cellular signals.
- The downlink path of a signal may interfere with the uplink path of a competing signal. This can most commonly be a problem in the 700-MHz and 800-MHz bands (see Figure 1).

Regardless of whether a converged DAS is installed or independent cellular and public safety networks are installed, it is extremely important to know and understand the RF environment in and around the installation. The necessary information can be gathered by performing field studies of the RF environment where the RF signals are monitored for an extended period, stored and then analyzed. The field studies will identify existing RF signal levels, unwanted signals, noise levels and the presence of high-level carriers. Additionally, it is critical to design the DAS system with as much information as possible regarding the size of the building, the distance to the nearest base stations, the type of building materials used, restrictions in building codes regarding historic structures and the number of floors above and below ground level.

As wireless communications users, we are demanding more services and more always-on coverage from both our cellular networks and our public safety communications networks. Advances in RF technology during the past 10 years have led to a significant increase

A distributed antenna system (DAS) in a communications equipment room.

in the number of wireless devices and signals in the air. DAS networks are complicated and expensive to install when the objective is to provide multicarrier services along with wireless police, fire and emergency medical communications coverage. When designed correctly, converged DAS networks can overcome many of the objections of safety personnel and provide a robust communications network that meets the demands of both coverage enhancement for mission-critical public safety and capacity enhancement for cellular communications.

Tom Kuklo is vice president of business development at Bird Technologies. His email address is tkuklo@birdrf.com.

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Ice shield installation on Mt. Kearsarge.

Broadband Public Safety Network Transforms Statewide Communications

The NHSafeNet has helped to set a precedent for future statewide broadband projects by ensuring network resiliency, capacity and redundancy.

By Catherine Drouin

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Broadband technology has become increasingly important in the development of communities on a global level. According to USTelecom, an estimated $73 billion is spent on broadband technology annually in the United States. This investment stimulates economic growth, increases jobs, improves safety and creates greater connectivity within local communities and throughout the world.

New Hampshire is making strides to advance broadband networks and stay on pace with worldwide changes in technology. Through the U.S. Department of Commerce Broadband Technology Opportunities Program (BTOP) grant program, Network New Hampshire Now (NNHN), the state has implemented NHSafeNet, a point-to-point broadband network intended to increase wireless communications, public safety and departmental efficiency statewide.

NHSafeNet brings cutting-edge broadband technologies to public safety and education communications systems in all 10 New Hampshire counties. With 865 miles of fiber-

optic network and 20 mountaintop microwave broadband sites, the enhanced network integrated existing infrastructures to better serve the New Hampshire Departments of Safety, Transportation, and Resources and Economic Development, New Hampshire Public Television and the New Hampshire National Guard. NHSafeNet also provides increased broadband functionality, resiliency and bandwidth to the major stakeholder departments and other public safety offices throughout the state, including the state police, state forest rangers, the New Hampshire Department of Fish and Game, the New Hampshire Bureau of Trails, the New Hampshire National Guard and county sheriffs.

Funding and Management

BTOP, a $4 billion national grant program managed by the National Telecommunications and Information Administration, was funded by The American Recovery and Reinvestment Act of 2009. It was instated to help bring broadband technology to communities across the country, create more jobs and improve communication for education, health care and public safety. BTOP projects are also making strides to enhance the infrastructure of broadband Internet, improve and expand public computer centers, and contribute to the integration of broadband service across the country. The NHSafeNet project was funded by $44.5 million in BTOP grant funds and $22 million in private and in-kind contributions.

NNHN is a collaboration of public and private organizations led by the University of New Hampshire to improve broadband connectivity

Helicopter at Mt. Kearsarge.

throughout New Hampshire. NNHN, in partnership with New Hampshire Optical Systems and New Hampshire Fast Roads, managed the NHSafeNet project from its inception in July 2010 to its completion in December 2013. NHSafeNet was contracted by the University System of New Hampshire, the state's largest provider of post-secondary education, and was implemented in a project led by the University of New Hampshire.

Network Execution

Green Mountain, an integrated wired/wireless communication provider for businesses in the Northeast, was contracted by the University System of New Hampshire to design, develop and construct the NHSafeNet microwave network. New Hampshire was one of the first states in the country to integrate numerous existing parallel networks into a single closed broadband system. This presented unique challenges, given that no precedent was set for how to design and execute such a complex integration. Existing

protocols and configurations for the state departments of safety, transportation, and resources and economic development, and for New Hampshire Public Television and the national guard had to be streamlined so traffic could flow seamlessly across the network while also prioritizing stakeholder data transmission and allocating bandwidth limits based on the IT platforms of the stakeholders.

Additional challenges included the use of existing infrastructure, the development of new mVPN code for Cisco routers that could sustain video streaming over multiprotocol layer switching, the implementation of digital television datacasting and strategic planning for future expansion.

The existing infrastructure included several outdated towers that did not comply with current standards, including TIA/EIA Rev G. To address this challenge, new and upgraded equipment was designed to have a minimal effect on the structure of the towers and to integrate into existing structures that were already congested.

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Further complications arose with new wideband frequency microwave dish designs. Wind loading was a concern that was managed through strategic equipment design and placement on each existing tower. Lastly, Ceragon radios had to be configured in a lab environment and transported to mountaintop towers, along with other equipment. This was accomplished with extreme care and the use of about 40 helicopter lifts.

The network design for NHSafeNet incorporates service provider-grade capabilities only attainable through multiprotocol layer switching. Multiprotocol layer switching allows for the configuration of sophisticated quality of service metrics and data flow controls. The integration of multiprotocol layer switching contributed to the development of a highly efficient, scalable and secure network for NHSafeNet. The development of mVPN code to sustain video streaming through Cisco routers was another critical component in ensuring seamless transmission over multiprotocol layer switching. Green Mountain installed, configured, and tested various versions of the code and router configurations in order to achieve the best results. Feedback was exchanged between the Green Mountain team and Cisco Engineering to finalize code development and ensure uninterrupted video streaming.

Digital television datacasting also played an integral role in the NHSafeNet network design. In collaboration with New Hampshire Public Television, Green Mountain integrated this new technology into the NHSafeNet broadband network. The integration of this technology enables multicasting,

Mt. Washington winter conditions.

Wall-mounted dish on Mt. Washington.

or the ability to broadcast multiple signals simultaneously across a single network. Digital television datacasting through New Hampshire Public Television expanded the capacities of the NHSafeNet system and allowed Green Mountain to address a critical concern in the broadband network.

Sustainability and future expansion were critical in the strategic planning and implementation of NHSafeNet. Green Mountain equipped NHSafeNet

with an integrated network management platform that would monitor and maintain performance while providing support and network expansion opportunities for stakeholders. SNMP, HTML and console-based integrated management systems were leveraged to create a customized solution.

Benefits of NHSafeNet

NHSafeNet exemplifies NNHN's mission to provide a high-speed

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broadband network throughout New Hampshire and enhance communications capabilities for current and future stakeholders. The network's new Internet Protocol (IP) improves the transmission of emergency communication, including Amber Alerts, the state department of transportation's Intelligent Transportation System (ITS), the public safety 911 network and natural disaster warnings. Additionally, NHSafeNet enables data transmissions to be sent digitally across New Hampshire and neighboring states. This is achieved through connections with microwave networks in Maine and Vermont.

NHSafeNet expands broadband coverage statewide and contributes to increased access for the businesses, citizens and educational institutions of New Hampshire. The network connects New Hampshire's 320 community anchor institutions, including educational institutions, libraries, health care facilities and public safety entities, and hundreds of residences. With speeds up to 10 Gbps, the fiber-optic research and education network is on par with other research centers in Massachusetts, Texas and California. Strategic planning also ensured that NHSafeNet will save taxpayers money in the long term by lowering support and equipment costs.

The creative solutions implemented through NHSafeNet have helped set a precedent for future statewide broadband projects by ensuring network resiliency, capacity and redundancy. The network has also played a critical role in New Hampshire's statewide efforts to advance broadband communication and stay on pace with worldwide changes in technology. Broadband connectivity that is reliable and efficient is the way of the future for New Hampshire, as it is across the United States and the world, and will only continue to increase as new technologies emerge and consumer demand grows.

Catherine Drouin is vice president of Green Mountain. Her email address is c.drouin@greenmtncomm.com.

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3:25 – 3:55 pm	Antenna Systems Case Study (TESSCO)
4:00 – 4:30 pm	Antenna Mounts Design Case Study (VALMONT)

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SHERIFF'S OFFICE

TOWER OWNER
MORGAN COUNTY

TOWER TYPE
SELF-SUPPORT

HEIGHT
200 FEET

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AT&T MOBILITY
SPRINT PCS

ADDITIONAL USERS
MORGAN COUNTY
SHERIFF'S OFFICE
JACKSONVILLE POLICE
DEPARTMENT
ROYELL COMMUNICATIONS

YEAR CONSTRUCTED
2003

LOCATION
JACKSONVILLE, ILLINOIS

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AUGUST 2014

/ **FEATURES** /

Crews installed the chain wall for the East Baton Rouge Sheriff's Office 911 system in a single day.

SHELTERS

Chain Walls Elevate Shelters for Flood Protection

Because they don't need on-site poured concrete and they're prefabricated, chain walls dramatically speed shelter installation at telecommunications sites.

By Oliver S. Delery Jr., P.E.

In hurricane- and flood-prone areas such as the Gulf Coast, aboveground storage for communications equipment helps first responders stay in contact during and after extreme weather that may cause flooding. Several municipalities use chain wall precast concrete foundations for elevating shelters and other essentials at communications compounds. Consolidated Telecom Services used them for shelters in Galveston County, Texas, in 2013.

Perched off the coast of Texas in the Gulf of Mexico, Galveston Island is a haven for beachgoers all year long. But it's also in a precarious position each time a hurricane takes aim at the Gulf Coast. In 2008, the northern end of the island took a blow from Hurricane Ike, with winds of 110

Consolidated Telecom Services used a Kenner chain wall system to elevate a communications equipment shelter and propane tanks in Galveston County, Texas, in August 2013.

The Galveston County Emergency Communications District installation includes stairs and a grate alongside the shelter for access to the elevated shelter doors.

miles per hour and a 13-foot storm surge that inflicted long-term damage to residential and commercial properties.

The ever-present risk of flooding meant that two new Galveston County Emergency Communication District shelters, which house vital communications and electronic equipment for two-way-radio communication, had to be positioned at least 15 feet above sea level to ensure first responders can keep working during severe weather. To accomplish this, Consolidated Telecom Services (CTS) relied on a chain wall precast concrete foundation. For each site, the team installed two chain walls, one on top of the other, which elevated the shelters 7 feet, and then placed the communications shelters directly on top.

"The installation saved us hours of time versus fabricating the foundations ourselves," said Scheral Rivera, director of systems integration for CTS. Rivera estimated that the process also shaved labor and material costs.

"These are two of the best sites we've ever built," Rivera said of the compounds, which also include 350-foot-high and 400-foot-high communications towers. A double-stacked chain wall was also used to elevate two propane tanks at each compound.

Chain walls can be custom made to fit various shelter sizes and elevation requirements and can be delivered anywhere in the continental United States. Because the chain wall arrives as a pre-engineered structure and requires minimal site preparation, less than one day is generally all that is needed for installation.

The East Baton Rouge Sheriff's Office in Zachary, Louisiana, turned to the chain wall system for an above-grade shelter housing its emergency 911 call system. The installation date the contractor chose, Aug. 5, 2008, was no ordinary day. Tropical Storm Edouard was barreling its way through the northern Gulf of Mexico. But even the storm's rain bands 20 to 30 minutes apart did not stop the installation. Once the trench was prepared, the chain wall was installed in about 10 minutes — five minutes to hook it up to the crane, and five minutes to set it in the ground. Despite the storm, the project was completed that day.

Such an efficient installation would not have been possible with traditional methods, much less in a driving rainstorm. Traditional foundations require digging a trench

and forming and installing the rebar cage in the trench for reinforcing before the concrete truck comes out to pour a footer. If the foundation is not accessible, then a pump truck and concrete truck are needed. Much time is required to set the footer, the wall cage and vertical forms, along with several concrete truck visits to pour the slab and walls.

In contrast, once the precast chain wall is accurately leveled, it easily accepts shelter placement. The shelter attaches to the chain wall with a shear plate and bolts. Threaded rod anchors one chain wall with another. The bottom chain wall is placed on earth or, when necessary, securely anchored to pilings. The use of generator pads, stair footings and landing pads eliminates the need for pouring concrete in the field.

Common heights for the chain wall are 6 inches to 7 feet above grade, and chain walls can be stacked as high as 20 feet.

Oliver S. Delery Jr., P.E., is sales manager for Louisiana, Mississippi, Tennessee and Arkansas at Hanson Pipe and Precast. At facilities across the country, Hanson manufactures the chain wall system patented by Kenner Innovative Design Systems.

SHELTERS

/ **FEATURES** /

Protective Vents Increase Network Infrastructure Reliability

To evaluate the performance of Gore protective vents after extended exposure to real-world conditions, we tested vents that had been in telecommunications equipment worldwide for several years.

By Sara Ellis

Internal pressure fluctuations in telecommunications equipment put significant stress on the housing seals, which over time can result in compromising the seals and the equipment's reliability. These fluctuations are most frequently caused by sudden weather and temperature changes with equipment used outdoors. Once the seals fail, contaminants such as rain, dust and dirt can enter the housing and cause premature failure of the electronics.

Protective vents are engineered to eliminate stress and damage on seals by allowing air to flow freely in and out of electronic housings. Based on research into the effect pressure differentials have on sealed enclosures, W. L. Gore & Associates recommends maintaining internal pressure at or below 35 millibars. Our engineering team bases vent recommendations for each application on variables such as the volume of enclosure, the amount of internal free space, the level of water and contaminant protection required, the materials used to construct the enclosure and environmental conditions in which the device will be used. By evaluating these variables, we are able to specify the best venting solution to reduce the effect of pressure differentials and increase the lifetime of telecommunication equipment.

To evaluate the performance of protective vents after extended exposure to real-world conditions, we tested Gore vents that had been in telecommunications equipment worldwide for several years. Each vent was evaluated for water protection integrity and airflow.

Test Design

We purchased about 30 units of used telecommunication equipment — such as tower-mounted amplifiers

Equipment Type	Estimated Manufacture Date	Gore Protective Vent	Active Venting Area (cm^2)	Airflow Specification When New ml/min at 70 mbar
Combiner	2003	Screw-In Vent	0.50	201.1
Combiner	2003	Screw-In Vent	0.50	201.1
Combiner	2003	Screw-In Vent	0.50	201.1
Combiner	2003	Screw-In Vent	0.50	201.1
Combiner	2003	Screw-In Vent	0.50	201.1
Combiner	2003	Screw-In Vent	0.50	201.1
Combiner	2003	Screw-In Vent	0.50	201.1
Combiner	2003	Screw-In Vent	0.50	201.1
Combiner	2003	Screw-In Vent	0.50	201.1
Combiner	2003	Screw-In Vent	0.50	201.1
TMA	2005	Adhesive Vent	1.13	181.0
TMA	2005	Adhesive Vent	1.13	181.0
TMA	2005	Adhesive Vent	1.13	181.0
TMA	2005	Adhesive Vent	1.13	181.0
TMA	2005	Adhesive Vent	1.13	181.0
TMA	2005	Adhesive Vent	1.13	181.0
TMA	2005	Adhesive Vent	1.13	181.0
TMA	2005	Adhesive Vent	1.13	181.0
TMA	2005	Adhesive Vent	1.13	181.0
TMA	2005	Adhesive Vent	1.13	181.0
TMA	2005	Adhesive Vent	1.13	181.0
TMA	2005	Adhesive Vent	1.13	181.0
TMA	2005	Adhesive Vent	1.13	181.0
TMA	2005	Adhesive Vent	1.13	3200.0
TMA	2007	Adhesive Vent	1.27	3302.0
Combiner	2009	Screw-In Vent	0.50	226.2
TMA	2011	Adhesive Vent	1.13	370.9
TMA	2011	Adhesive Vent	1.13	370.9
TMA	2011	Adhesive Vent	1.13	370.9

Table 1. Equipment purchased for testing included combiners and tower-mounted amplifiers (TMAs).

(TMAs) and combiners — that were manufactured between 2003 and 2011. The purchases were made globally to ensure exposure to a full range of harsh environmental conditions — temperature, humidity, rain, salt and sand. Each unit contained a Gore adhesive vent or a Gore screw-in vent (see Table 1). These specific vents are engineered to meet IP67 ingress protection when initially installed.

Because the internal airflow performance of our venting products has improved over the past 10 years, we used the specifications that were published at the time the telecommunications equipment was manu-

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Photo 1. Adhesive vent position on sample equipment.

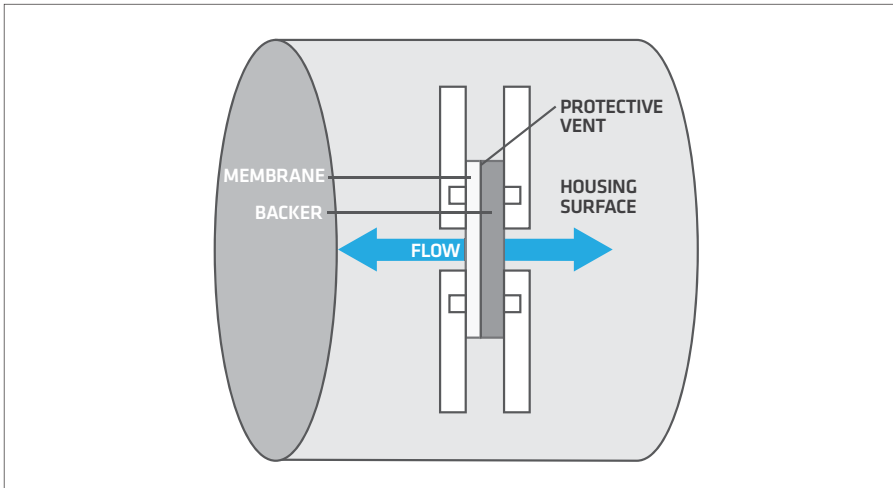Photo 2. Screw-in vent position on sample equipment.

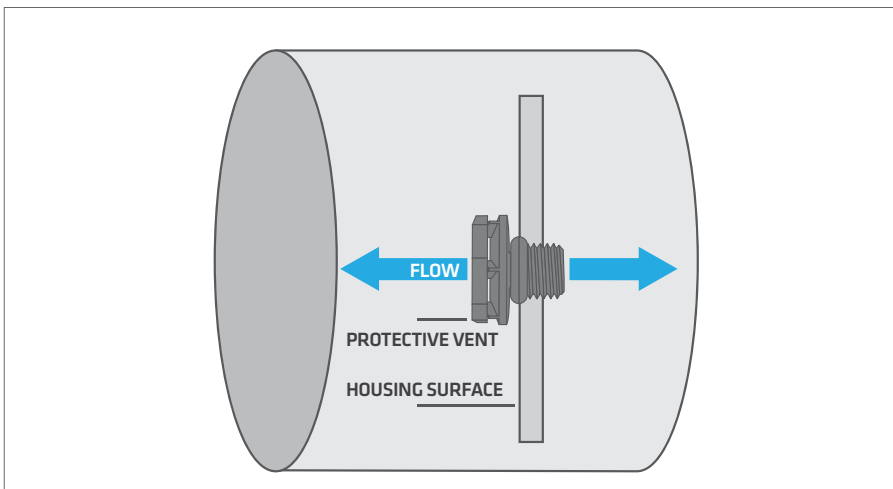Figure 1. Adhesive vent position during airflow test.

Figure 2. Screw-in vent position during airflow test.

factured to compare test results.

Each unit of equipment was opened to inspect the internal components and the vents for evidence of water and particulate ingress, corrosion and condensation (see Photos 1 and 2).

Then, we subjected each protective vent to airflow testing (see Figures 1 and 2). A sensor was placed on either side of the vent to measure the pressure differential. To do so, a back pressure of 70 millibars was placed on the vent to measure the forced air through the vent membrane. We then compared the vent's measured airflow with our performance specifications. Because airflow performance of the venting products has improved during the past 10 years, we used the typical airflow figures that were published when the equipment was manufactured.

Finally, the water resistance and bond integrity of the vents were tested by measuring the minimum pressure required to force water through the vent's membrane (see Figures 3 and 4). We maintained the water pressure at approximately 103 millibars to simulate 1 meter of water submersion as required by the ingress protection level of IPX7. To pass the test, the vent was required to withstand this level of water pressure for 30 minutes without allowing any water to pass through the membrane, and, in some cases, through the adhesive bond on the enclosure.

Inspection Results

An inspection of the equipment showed no evidence of condensation or corrosion (see Photo 3). In addition, the seals were intact with no indication of failure or extreme fatigue. Although the equipment could not be functionally tested, it can be assumed

Photo 3. Internal components of used equipment.

that the units were in working order because there was no evidence of water or particulate ingress. Also, the form of the vent (i.e., adhesive or screw-in vent) did not show significant signs of wear, as indicated in the results of the vent's airflow and water protective performance.

Visual inspection of the vents revealed that four were compromised. Because there was no evidence of damage to the electronics or housings in which these vents were installed, the damage most likely occurred during or after the equipment was removed from service.

Airflow Results

Of the 29 vents tested, 21 exceeded our typical airflow after several years of exposure to extreme environmental conditions (see Table 2). Although the airflow of the remaining eight vents was below Gore's typical airflow, they still provided sufficient airflow to equalize pressure due to the amount of free space in the equipment.

Water Resistance Results

For water resistance, 26 of the 29 vents withstood the specification of approximately 103 mbar for 30 minutes (Table 2). During inspection, we saw that the three vents that failed had physical damage that prevented them from maintaining their seals.

Failure was most likely caused by damage during or after removal from service because there was no evidence of damage to the electronics or housing in which the vent was installed.

Conclusion

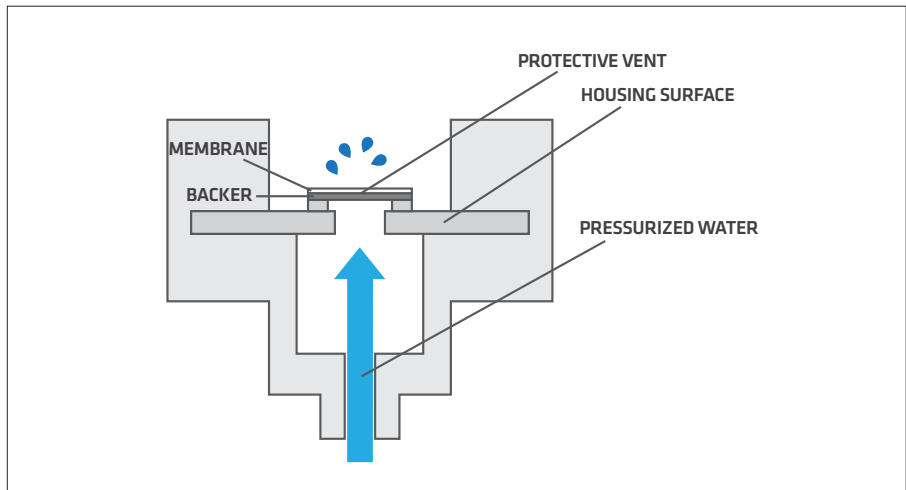The testing proved that our protective vents maintained excellent airflow

Figure 3. Adhesive vent position within water pressure testing equipment.
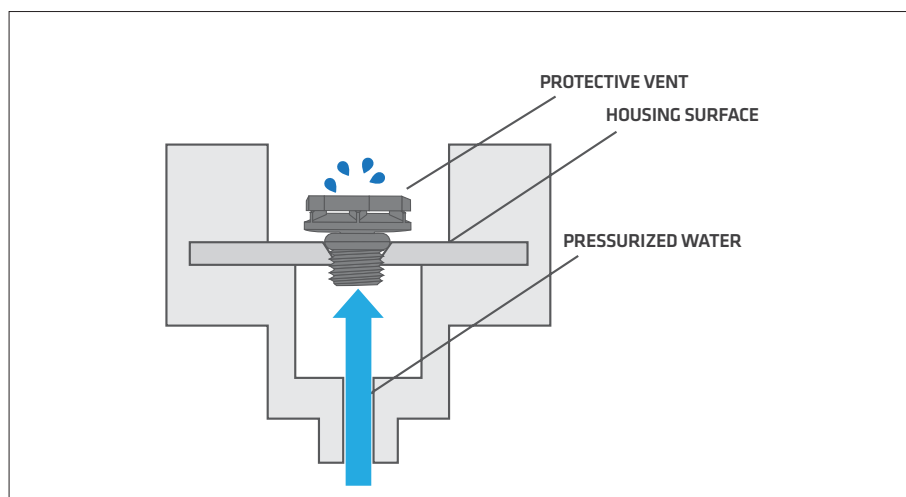

Figure 4: Screw-in vent position in water pressure testing equipment.

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The testing proved that our protective vents maintained excellent airflow and provided the specified water protection over the lifetime of the telecommunication equipment in which they were installed.

and provided the specified water protection over the lifetime of the telecommunication equipment in which they were installed. In cases in which the vent's airflow had decreased or the membrane failed the water test,

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Equipment Type	Estimated Manu-facture Date	Gore Protective Vent	Active Venting Area (cm^2)	Typical Airflow When New ml/min at 70 mbar	Measured Airflow Use ml/min at 70 mbar	Water Resitance Test
Combiner	2003	Screw-In Vent	0.50	201.1	217.1	Passed
Combiner	2003	Screw-In Vent	0.50	201.1	209.6	Passed
Combiner	2003	Screw-In Vent	0.50	201.1	195.5	Passed
Combiner	2003	Screw-In Vent	0.50	201.1	211.4	Passed
Combiner	2003	Screw-In Vent	0.50	201.1	175.7	Failed
Combiner	2003	Screw-In Vent	0.50	201.1	200.4	Passed
Combiner	2003	Screw-In Vent	0.50	201.1	238.3	Passed
Combiner	2003	Screw-In Vent	0.50	201.1	181.5	Passed
Combiner	2003	Screw-In Vent	0.50	201.1	217.0	Passed
Combiner	2003	Screw-In Vent	0.50	201.1	207.0	Passed
TMA	2005	Adhesive Vent Series	1.13	181.0	310.5	Passed
TMA	2005	Adhesive Vent Series	1.13	181.0	271.0	Passed
TMA	2005	Adhesive Vent Series	1.13	181.0	298.2	Passed
TMA	2005	Adhesive Vent Series	1.13	181.0	279.8	Passed
TMA	2005	Adhesive Vent Series	1.13	181.0	285.8	Passed
TMA	2005	Adhesive Vent Series	1.13	181.0	285.8	Passed
TMA	2005	Adhesive Vent Series	1.13	181.0	276.9	Passed
TMA	2005	Adhesive Vent Series	1.13	181.0	274 .9	Passed
TMA	2005	Adhesive Vent Series	1.13	181.0	277.0	Passed
TMA	2005	Adhesive Vent Series	1.13	181.0	287.6	Passed
TMA	2005	Adhesive Vent Series	1.13	181.0	1464.4	Passed
TMA	2005	Adhesive Vent Series	1.13	181.0	411.4	Passed
TMA	2005	Adhesive Vent Series	1.13	181.0	453.4	Passed
TMA	2005	Adhesive Vent Series	1.13	3200 .0	1453.1	Passed
TMA	2007	Adhesive Vent Series	1.27	3302.0	1199.2	Failed
Combiner	2009	Screw-In Vent	0.50	226.2	168.2	Failed
TMA	2011	Adhesive Vent Series	1.13	370.9	320.9	Passed
TMA	2011	Adhesive Vent Series	1.13	370.9	283.6	Passed
TMA	2011	Adhesive Vent Series	1.13	370.9	509.8	Passed

Table 2. Airflow and water resistance after field use.

the equipment housing and electronics did not show damage by corrosion or condensation, and the seals were intact. Therefore, the damage to the vents most likely occurred after the equipment was removed from service.

The performance in these tests indicated that the vents maintained their structural integrity for the life of the equipment. Although airflow in some vents was lower than typical airflow specified when new, the measured airflow levels indicated that the membrane was not significantly blocked by contaminants. All of the vents continued to provide sufficient airflow to maintain an internal pressure below the 35 millibars that we stipulate for reliable performance.

The testing also showed that the vents maintained their bond integrity throughout the field installation. The screw-in vent membrane stayed firmly attached inside the vent housing, and the adhesive vents remained securely bonded to the equipment enclosure. This indicates that the vents continued to perform reliably even after exposure to challenging environmental conditions such as hail, sand and rainstorms.

Gore protective vents are engineered to last the lifetime of the equipment in which they are installed. The testing proved that these venting products meet our commitment to ensure the reliability of the products in which they are installed.

We offer a variety of designs, sizes and product forms that are easy to integrate into outdoor electronics enclosures.

Sara Ellis is an applications engineer with W. L. Gore & Associates. Visit www.gore.com/protectivevents.

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* Subject to final confirmation. All other speakers confirmed

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From evidence of previous repair, it looks as though this wall has been penetrated more than once by thieves who avoid the shelter door and use brute force to enter the equipment building. *Photo courtesy of Westell Technologies*

SECURITY

Secure Your Site While Maximizing Network Availability

Lose less equipment to theft and vandalism and reduce technician visits to your cell sites. Let remote security management and control improve site performance and maximize network availability.

By Doug Menifee

Maintaining the security and safety of remote sites and equipment has become a major challenge in the last several years — and very costly to service providers from both theft and network outages. A fence around a cell site or tower enclosure no longer deters entry to a site. Personal safety has also become a major concern because of problems ranging from sites in unsafe areas to weather-related challenges such as snow, flooding or downed power lines after a storm.

Service providers and tower operators are addressing several important security concerns to prevent theft and vandalism and to provide warnings when problems occur in order to maximize network availability. They mitigate security concerns with

remote monitoring and remote management of site access, by monitoring for asset tampering, by using video surveillance and by adding intelligence to site enclosures.

Controlling Site Access

Access management is the first line of defense against theft and vandalism. It is important to understand who, why and when people are accessing a site to maintain the overall control of sites and their assets. Access management should include monitoring all access to a site, whether authorized or unauthorized, and specific areas within it, including the fence, gate and every door. The number of visits and duration of access should also be tracked, and an audit history of when

Service providers have major concerns about worker safety and equipment protection, which has led to an increase in safety measures. The use of video surveillance throughout a site is becoming common for remote and dangerous locations.

sites have been accessed should be easily available. Finally, an access management system should provide the ability to remotely accept access of authorized personnel, which is commonly needed during emergency and maintenance visits, when pre-authorization hasn't occurred.

Minimizing Asset Tampering

Copper ground bar theft at cell sites has increased dramatically in recent years, but with the proper technology, a ground bar can be monitored for tampering or theft. If the asset is disturbed, an alarm automatically notifies the service provider, relevant personnel or both. The information obtained can be used to determine appropriate action. As an added benefit, some asset tampering applications can act as a second-stage lightning and surge protector to further safeguard site assets. Operators can review

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Figure 1. A network operations center can receive this type of information at any time from an integrated solution to determine if someone is on-site (authorized or unauthorized), if a siren is configured (green indicates that a siren is available), and if doors are open or if motion is being detected.

historical trends by site location to determine where additional security may be required, and corrective action can be taken when necessary.

Video Surveillance

Service providers have major concerns about worker safety and equipment protection, which has led to an increase in safety measures. The use of video surveillance throughout a site is becoming common for remote and dangerous locations. Surveillance management can be used for remote monitoring of unauthorized and authorized access and for motion detection.

Many sites use Internet protocol (IP) cameras to capture images of site conditions. Motion detection can activate video to stream or record activity. When the system integrates surveillance management with the IP cameras, it can send site details to a centralized server for storage, and if motion is detected, the system can also trigger an alarm to automatically notify the appropriate personnel. The server keeps the camera and video

images for access by approved personnel to view live or stored images. When theft or vandalism occurs, prosecutors can use the information to bring actions against perpetrators. The information also increases the potential for cost and equipment recovery.

Gaining Intelligence

Sites often have one or more cabinets or enclosures at remote sites to hold network equipment and cabling and to protect them from external conditions, including human activity and weather. With the increasing use of different technologies from multiple vendors, it's more important than ever for sites to have intelligent enclosures that "understand" the surrounding equipment and environment.

An intelligent enclosure can provide the data necessary to minimize the expensive cost of theft and equipment replacement. For example, an enclosure with intelligence can monitor alarms and provide additional details on door intrusion, AC power failure, battery status, inside enclosure temperature,

video cameras, generators, fan fuses and rectifier faults.

Security Management

Network and telecom site owners and operators consider site security to be more critical now than ever. With mobile device users demanding network accessibility and reliability all day, every day, service providers are striving for five nines (99.999 percent) network availability. An integrated security management solution that provides real-time monitoring and management capabilities helps to prevent problems while minimizing equipment costs.

A comprehensive security management solution can intelligently monitor site access, its infrastructure and asset tampering without the need for a site visit. The proper security solution can automatically notify the site owner or operator if motion is detected, a cabinet door is opened, a siren is sounding or copper is being stolen, and can identify where on the site the alarm was generated. Figure 1 is an example

SECURITY

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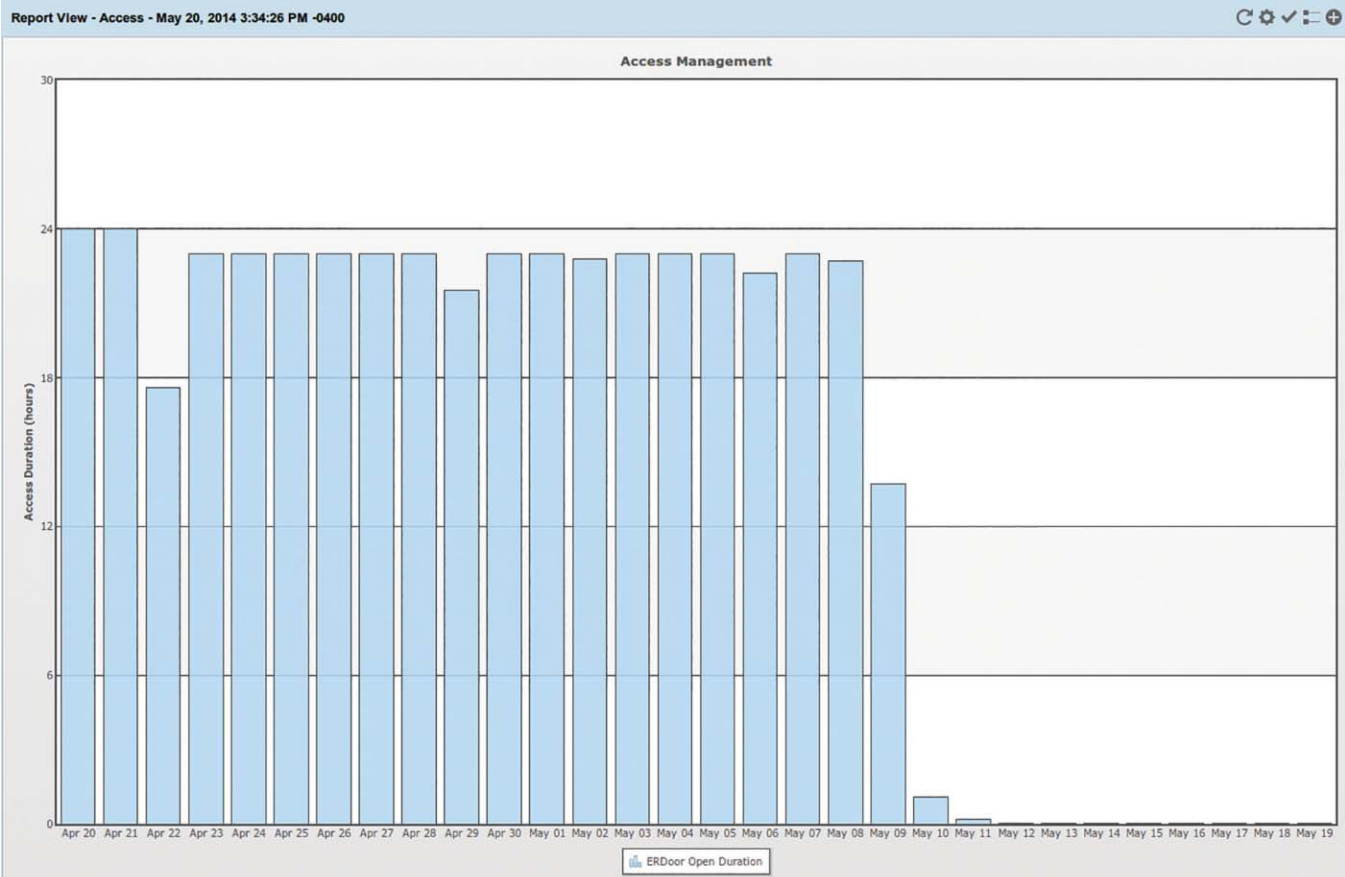
Access Management

Figure 2. With the use of outside contractors has come an increase in claims for services not completed. When checking bills for services rendered, a site operator can review access logs to determine who visited a site and for how long.

of the information that a network operations center (NOC) can receive at any time from an integrated solution to determine if someone is on-site (authorized or unauthorized), if a siren is configured (green indicates that a siren is available), and if doors are open or if motion is being detected.

An integrated security management solution enables a service provider to maximize network availability. For example, assume a technician receives an alarm identifying a site that has been accessed and where motion has been detected, but no one was scheduled to visit. A few minutes later, another alarm is received, and it indicates that a copper ground bar

is being disturbed. Regardless of whether the technician is at home, in an office, on the road or at another cell site, the technician can remotely access the security management system and view the video and images to decide how best to proceed.

The use of outside contractors has become more common as the number of cell sites has increased. Unfortunately, their use has also led to an increase in the number of claims for services that have not been completed. A service provider can review site access logs to determine who visited a site and for how long (see Figure 2). Camera images and video can also be reviewed to help determine what work

was completed during the visit to validate the contractor's service claims.

A tower operator in Mexico uses an integrated security management solution to monitor personnel access, motion sensors, video cameras, vibration sensors and copper theft sensors. The application includes monitoring site access (authorized and unauthorized) and specific areas within the site, including shelters, gates, fences and access doors. When someone gains unauthorized access, which is a common occurrence, it triggers a local alarm and the system also sends one or more alarms to the NOC. The siren at the site continues to sound until someone approves access, which can be accom-

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plished remotely, or until authorities arrive. With keypad controllers at each site door, when a door is accessed, data transfers to a centralized access control database using the security management solution. The security management solution enables the tower operator to minimize costly theft and vandalism while significantly reducing the number of site visits required.

A site operator can make good use of a security solution during and after inclement weather. After a storm, someone can view images or video from the IP camera to see whether the site is accessible and safe to visit. Have power lines fallen? Have trees fallen across the access area? Has wind dislodged any equipment? This information from the images can help determine which workers should visit the site.

A comprehensive security management solution enables service providers and tower operators to protect the large capital investment at sites while also helping to ensure worker safety. The integrated solution monitors, manages and controls access from a centralized location. When authorized site visits are necessary, the integrated solution improves safety by revealing whether the site conditions are acceptable and by verifying that no unauthorized personnel are at the site.

Proper security management minimizes asset theft and vandalism, improving network reliability and availability. It minimizes capital costs because it reduces the need for equipment replacement. Using remote management and control capabilities decreases operating costs. An integrated security management system

improves cell site performance and ultimately improves the user experience while maximizing network availability.

Doug Menifee is senior product manager at Westell Technologies where he provides vision and leadership in defining strategy for products and technology. He has 17 years of telecommunications experience in product roadmap development and delivery, product pricing strategy and product engineering. For more information, visit www.westell.com.

Weed and Weapons: Workplace Challenges Based on New Laws

Workers at isolated properties such as tower sites may want to carry weapons for self defense. Drug testing for any worker has been made more complicated by reduced public restrictions on marijuana use.

By Mark A. Lies II and Kerry M. Mohan

OSHA requires employers to provide a safe workplace for employees, which includes, among other things, ensuring employees are not impaired in a manner that creates a safety hazard for the employee and other employees, as well as protecting employees from workplace violence. However, new laws regarding medicinal marijuana and the right to carry firearms, including concealed firearms, have created additional uncertainty and anxiety for employers, human resource and safety professionals, and supervisors. These new laws have created uncertainty over a number of issues, including, but not limited to, when an employer can test an employee for suspected marijuana use, whether an employer can lawfully discipline employees for marijuana use, whether an employer can prohibit employees from bringing personal firearms to the workplace, and whether an employer can prohibit an employee from bringing personal firearms in company vehicles.

The following information addresses potential liability issues employers may face regarding employee drug use and testing and firearms in the workplace. Each state has its own laws regarding these two issues. Questions and answers provide basic knowledge on these issues. The authors have assisted employers in identifying the specific requirements of state law in these areas and advising about compliance requirements in particular situations.

Weed In the Workplace

Question: Is medical marijuana legal where I live?

Answer: So far, 20 states and the District of Columbia have enacted laws that decriminalize or authorize, to varying degrees, the use of marijuana for medical purposes. The states are Alaska, Arizona, California, Colorado, Connecticut, Delaware, Hawaii,
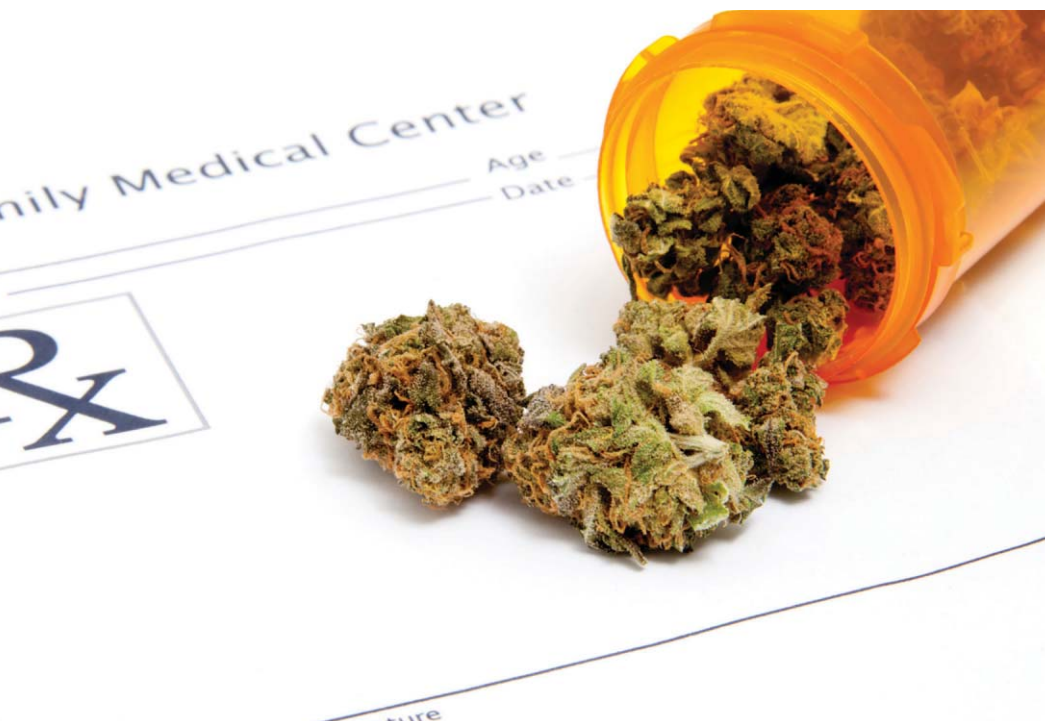
Illinois, Maine, Massachusetts, Michigan, Montana, Nevada, New Hampshire, New Jersey, New Mexico, Oregon, Rhode Island, Vermont, and Washington. Under federal law, use of marijuana for medicinal purposes is still unlawful.

Question: Can an employer prohibit its employees from using medical marijuana?

Answer: Most states permit an employer to establish reasonable rules regarding the use of medicinal marijuana. However, the states with the most recent medicinal marijuana acts, such as Delaware, Illinois, and Arizona, have explicitly prohibited employers from discriminating against medicinal marijuana users on that basis alone. In those states, an employer is permitted to prohibit medicinal marijuana use and discipline an employee for failing a drug test if it would put the employer in violation of federal law or would cause the company to lose a federal contract or money.

Question: Are medicinal marijuana users protected by disability discrimination laws?

Answer: Medicinal marijuana users have continually challenged policies prohibiting marijuana use on the basis of disability discrimination. Thus far, federal courts have found that marijuana use is not protected under the Americans with Disabilities Act (ADA) because marijuana use remains unlawful under federal law. Employers must be aware that if an employee discloses that he or she is legally authorized to use medicinal marijuana,

such disclosure could also involve revelation of an underlying disability that is protected under the ADA. Thereafter, if the employer decides to take any form of adverse employment action against the employee, it must be prepared to demonstrate that the adverse action was based upon a legitimate business reason having no relationship to an actual or perceived disability. In addition, because states (and many municipalities) have their own anti-discrimination laws, an employer may run afoul of a state's disability discrimination law by disciplining medicinal marijuana users for off-the-clock use. Finally, many state privacy laws can protect employees

for lawful conduct outside of working hours as long as such conduct does not create a hazard or violate any legal obligations at the workplace.

Question: Can an employer discipline an employee for having marijuana at the worksite or for being under the influence of medicinal marijuana while at work?

Answer: Yes. Even the most pro-user medicinal marijuana statutes permit employers to properly discipline employees who are found to have medicinal marijuana at work or who are under the influence of or impaired by medicinal marijuana while at work.

Recommendations for Employers

New medicinal marijuana and carrying concealed weapons laws have increased uncertainty and anxiety for employers nationwide. For instance, what may be lawful in one state is unlawful in another. Or, what is lawful under federal law may be unlawful under state law. For these reasons, employers must be aware of each state's specific medicinal marijuana and workplace CCW laws to determine what rights and restrictions employers may have in ensuring a safe and healthy workplace and should:

- Develop separate policies to deal with each of these potential hazards that complies with the particular state law
- Train employees, with documentation, on the employer's policies regarding the possession, transportation and storage of weapons and in the case of medicinal marijuana, the consumption, use and penalties for impairment
- Train supervisors in the requirements of these policies, particularly how to identify the signs and

symptoms of impairment and how to properly document such observations
- Conduct a competent and documented investigation and discipline employees who violate these policies in a consistent manner and, in the case of violation of medicinal marijuana usage, ensure that any discipline is not based upon a known or perceived underlying disability

SAFETY

Question: How can an employer determine whether an employee is under the influence of medicinal marijuana?

Answer: Obviously, medicinal marijuana use is easy to spot when an employee smokes or ingests marijuana in front of a supervisor, which is certainly not the typical scenario. However, determining whether an employee is under the influence or impaired may be difficult to do under the circumstances, and may be even more difficult for untrained staff. Thus, employers must train supervisors, managers and foremen on how to identify behavior that demonstrates potential impairment and the proper procedures for responding to and investigating alleged instances of impairment. Further, employers should develop a written definition and understanding as to what constitutes an impaired employee. For instance, Illinois' recent medicinal marijuana statute provides a comprehensive definition of when an employee is considered impaired. It is when (s)he:

Manifests specific, articulable symptoms while working that decrease or lessen his or her performance of the duties or tasks of the employee's job position, including symptoms of the employee's speech, physical dexterity, agility, coordination, demeanor, irrational or unusual behavior, negligence or carelessness in operating equipment or machinery, disregard for the safety of the employee or others, or involvement in an accident that results in serious damage to equipment or property, disruption of a production or manufacturing process, or carelessness that results in any injury to the employee or others.

The Illinois definition of "impaired" provides a broad spectrum of behavior that an employer can consider to be suspicious, and employers should consider whether to adopt this definition for their own internal workplace drug programs. Many states have similar definitions that could be incorporated into the policy. If the employer has properly trained the supervisor on this type of definition

SAFETY

and the supervisor properly documents the behavior that has been observed, the employer will be in a position to defend any adverse employment action that it may take against the employee.

Guns in the workplace

Likewise, the subject of guns in the workplace raises certain issues.

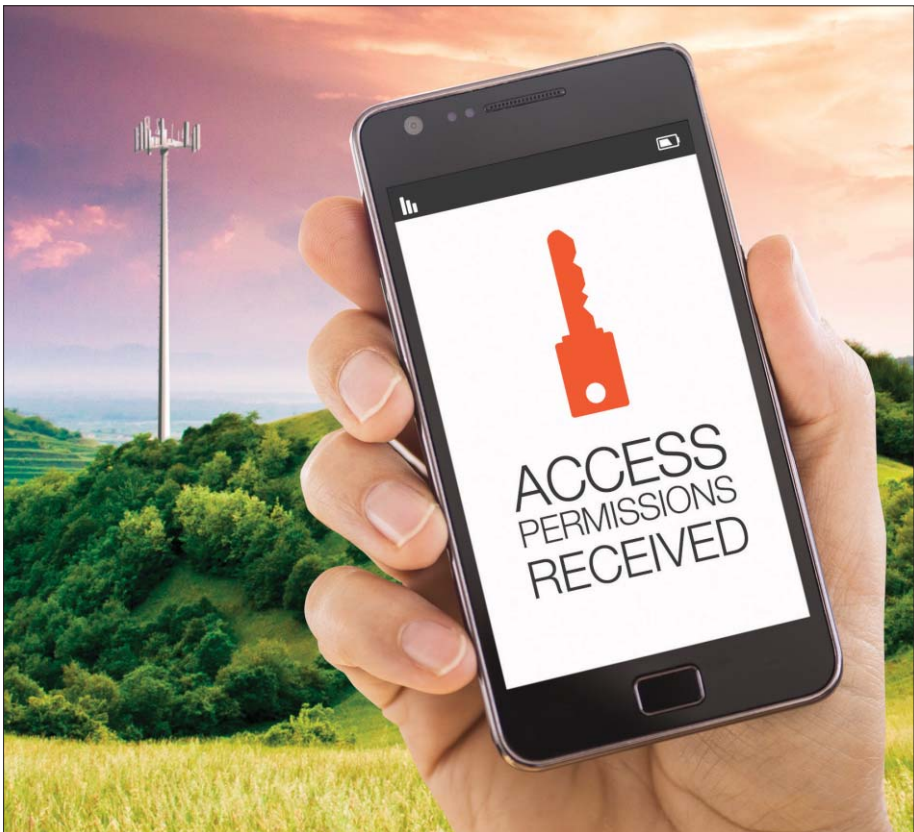*Question:* What is a carrying concealed weapons (CCW) law?

Answer: A CCW law sets forth the requirements for an individual to carry a concealed firearm in public. CCW laws vary by state and provide varying restrictions of where an individual can carry a firearm. For instance, many CCW laws prohibit firearms from being carried onto schools, hospitals, government buildings, and places that serve alcoholic beverages. Illinois has 23 identified places where concealed firearms are prohibited.

Question: Do CCW laws affect workplaces?

Answer: Yes. CCW laws vary state by state, and this is particularly true with their application to workplaces. Accordingly, employers must conduct a state-by-state analysis to determine what rights and restrictions employers may have to limit or exclude the carrying of firearms at the workplace, onto company premises, or in company vehicles.

Question: Can an employer prohibit the carrying of firearms by employees?

> *Employers must be aware that if an employee discloses that he or she is legally authorized to use medicinal marijuana, such disclosure could also involve revelation of an underlying disability that is protected under the Americans with Disabilities Act.*

SAFETY

/ **FEATURES** /

permit an employer to prohibit the carrying of firearms in the actual workplace, those same statutes often permit employees to carry firearms in their personal vehicles, even if they are located on an employer's premises, such as a company parking lot. Depending on the state, however, the employer may be permitted to require that the employee place the firearm out of sight and/or lock the firearm inside the glove box, truck, or secured area within the vehicle. An employer may also be permitted to require employees carrying firearms to park their vehicles at a separate, but nearby, parking lot.

Question: Can an employer prohibit an employee from carrying a firearm in a company-owned vehicle?

Answer: Most, but not all, states permit an employer to prohibit an employee carrying a firearm in a company-owned, leased, or rented vehicle.

Question: Can an employer prohibit other devices that could be used as a weapon from being brought into the workplace?

Answer: Yes. Employers should seriously consider prohibiting employees from bringing other devices, such as mace and pepper spray, into the workplace. These devices have been used by employees against co-employees and have resulted in serious injury or death.

Conclusion

New medicinal marijuana and CCW laws have increased uncertainty and anxiety for employers nationwide.

Answer: Many states have no law limiting an employer's authority to limit the possession and carrying of firearms at the workplace, on company premises, or in company vehicles (e.g., Arkansas, California, Massachusetts and New York). In those states, an employer can typically prohibit the carrying of firearms by employees. However, many other states, including Illinois, Michigan, Texas and Florida, limit an employer's right to prohibit employees from carrying firearms in certain circumstances when the employee possesses a lawful CCW license.

Question: Can an employer prohibit an employee from carrying a firearm into the workplace?

Answer: Of the states regulating an employee's right to carry a firearm into the workplace, almost every one permits an employer to prohibit the carrying of the firearm in the actual workplace (e.g., factory, construction site, offices). Those states, however, also require that the employer clearly and conspicuously notify employees that firearms are prohibited, which is typically done through a sign of specified design and size. For example, the required signage in Illinois is specified to be 4 inches x 6 inches.

Question: Can an employer prohibit employees from having firearms in their personal vehicles in the company's parking lot?

Answer: Even though many states

For instance, what may be lawful in one state is unlawful in another. Or, what is lawful under federal law may be unlawful under state law. For these reasons, employers must be aware of each state's specific medicinal marijuana and workplace CCW laws to determine what rights and restrictions employers may have in ensuring a safe and healthy workplace and should:

- Develop separate policies to deal with each of these potential hazards that complies with the particular state law
- Train employees, with documentation, on the employer's policies regarding the possession, transportation and storage of weapons and in the case of medicinal marijuana,

Many states have no law limiting an employer's authority to limit the possession and carrying of firearms at the workplace, on company premises, or in company vehicles.

the consumption, use and penalties for impairment
- Train supervisors in the requirements of these policies, particularly how to identify the signs and symptoms of impairment and how to properly document such observations
- Conduct a competent and documented investigation and discipline employees who violate these policies in a consistent manner and, in the case of violation of medicinal marijuana usage, ensure that any

discipline is not based upon a known or perceived underlying disability

If the employer follows these guidelines, it can greatly limit its exposure to these liabilities.

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SAFETY

/ **FEATURES** /

Don't Spill This Cup! Post-accident and Reasonable-suspicion Drug Testing

All employers should consider developing and implementing a drug testing policy to create a safer work environment. With proper steps, employers can substantially limit potential legal liabilities arising from illegal drug usage.

By Mark A. Lies II and Kerry M. Mohan

SAFETY

As we discussed in our article, "Weed and Weapons: Workplace Challenges Based on New Laws" on page 56, recent state legislative enactments have expanded the scope of marijuana use for medicinal and recreational purposes. As a result, we can all expect the use of marijuana will greatly increase across the country. These legislative developments have also led to increased uncertainty over whether and when an employer can test an employee for suspected marijuana use. Further, despite the fact that marijuana remains illegal under federal law, employers are subject to the whims of each individual state's marijuana laws.

The following information addresses an employer's ability to conduct two forms of drug testing: post-accident testing and reasonable-suspicion testing. We address these two forms of testing because although employers are generally permitted to conduct pre-employment drug screens for illegal drugs, uncertainty generally arises when a current employee has been involved in an accident or exhibits behavior that indicates impairment.

Prior to Testing

It is advisable that employers implement some form of a drug-testing policy providing for pre-employment, post-accident and reasonable-suspicion drug and alcohol testing. However, if an employer wishes to conduct drug and alcohol testing, the employer should first develop and distribute copies of its drug-testing policy to all employees in advance to allow them to adjust their behavior, including use of marijuana, prior to the effective date to avoid a positive drug test. If the workplace is subject to a labor agreement, the employer probably will have to bargain with the union over the terms and conditions of the policy. To withstand potential challenges, the testing policy should:

- Identify the types of testing, that is, pre-employment, for cause, and post-accident.
- Identify that the testing is limited to the presence of specific drugs.
- Use a scientifically valid testing method, which involves private specimen collection and chain of custody procedures to ensure proper identification, labeling, recordkeeping, handling and testing of specimens.
- Notify employees of the consequences that follow from a positive drug test.
- Reinforce the employer's commitment to maintaining the testing's confidentiality.
- Consider providing sources for help for drug abuse or alcohol misuse problems.

State-specific Restrictions

Many states (and municipalities) have

> *If an employer wishes to conduct drug and alcohol testing, the employer should first develop and distribute copies of its drug-testing policy to all employees in advance to allow them to adjust their behavior, including use of marijuana, prior to the effective date to avoid a positive drug test.*

drug testing restrictions specific for that jurisdiction. Thus, employers must analyze the laws of their states and municipalities to determine whether they:

- Impose written policy and notice requirements
- Regulate the specimen collection and testing process
- Impose rehabilitation requirements
- Restrict employers' disciplinary actions against employees who test positive
- Mandate appeal procedures

Certainly, no employer would want an employee to cause an accident because (s)he is under the influence, but the employer also would not want to be prohibited from taking corrective or disciplinary action because its policy does not comply with local requirements.

Post-accident Testing

Post-accident testing takes place after an accident has occurred in the workplace. Post-accident testing is often encouraged by an employer's workers' compensation carrier, which either specifically mandates the testing or offers reduced premiums for conducting such testing. The employer may also be able to successfully defend against an OSHA citation issued as a result of the accident on the basis of the employee's impairment that was unknown to the employer.

Though most states freely permit employers to conduct post-accident drug tests, a few states impose limitations on when post-accident testing can occur. For instance, some jurisdictions, such as Boulder, Colorado; Connecticut; Maine; Rhode Island; San Francisco and Vermont, permit

> *It is advisable that employers define reasonable suspicion in their drug testing policies and identify specific behaviors that may trigger such suspicion.*

post-accident testing only if the employer has reasonable suspicion to believe that the employee was impaired at the time of the accident. Further, some states, such as California, Iowa and Montana, require that the accident reach certain threshold levels for the extent of personal injury or property damage before an employee can be tested. Thus, employers must check applicable state laws to confirm such requirements.

Reasonable-suspicion Testing

Under most state laws, an employer is required to provide an employee a safe place to work. In addition, the Occupational Safety and Health Act requires that employers provide their employees safe and healthy places of employment, which means that the employer must identify and address potential hazards. As such, employers must ensure that employees operating equipment, driving vehicles or performing potentially hazardous work are not under the influence of drugs or alcohol that can create hazardous conditions for any employee who may be impaired or to co-employees who may be injured because of the impaired employee's actions. One component of ensuring safe operations is reasonable-suspicion drug testing. Under most jurisdictions, an employer is permitted to require a drug test when it has a reasonable suspicion, based upon specific, contemporaneous, objective and articulable facts con-

cerning an employee's appearance, behavior, speech or body odors, that an employee is under the influence.

One of the biggest concerns regarding reasonable-suspicion testing is whether the employer's suspicion was objectively reasonable under the circumstances. To avoid this issue, it is advisable that employers define reasonable suspicion in their drug testing policies and identify specific behaviors that may trigger such suspicion. To develop this definition, employers should look to their state and municipal jurisdictions, which may specifically define reasonable suspicion, "cause" or "probable cause." For example, the Illinois Compassionate Use of Medical Cannabis Pilot Program Act, which became effective on Jan. 1, 2014, defines impairment as follows:

"An employer may consider a registered qualifying patient to be impaired when he or she manifests specific, articulable symptoms while working that decrease or lessen his or her performance of the duties or tasks of the employee's job position, including symptoms of the employee's speech, physical dexterity, agility, coordination, demeanor, irrational or unusual behavior, negligence or carelessness in operating equipment or machinery, disregard for the safety of the employee or others, or involvement in an accident that results in any injury to the employee or others. If an employer elects to discipline a qualifying patient under this subsection,

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Once an employer has determined, through a timely investigation and documented positive drug test results, that there has been a violation of its drug testing policy, the employer must impose discipline in a uniform fashion in accordance with its policy.

it must afford the employee a reasonable opportunity to contest the basis of the determination."

It is also advisable that an employer implement a written "Reasonable Suspicion Checklist" for a supervisor to document incidents involving reasonable suspicion of impairment. The employer should complete the checklist within 24 hours of the observed appearance that led to the reasonable suspicion. The employer should also document all of the indications that led to the reasonable suspicion, such as:

- Breath/clothes smell like alcohol
- Breath/hair/hands/clothes smell like marijuana
- Breath smells like mouthwash, mints, or gum
- Physical appearance disheveled/ unkempt
- Eyes bloodshot
- Eyelids droopy or puffy
- Eyes glassy
- Eyes watery
- Pupils dilated
- Pinpoint pupils
- Involuntary eye movements
- Wearing sunglasses
- Face flushed
- Face pale
- Sudden, marked mood swings, particularly after breaks
- Sudden, marked changes in activity level
- Unusually argumentative, irritable or hostile
- Paranoid
- Sniffles
- Sleepy/drowsy
- Unusual sweating
- Speech slurred
- Speech incoherent
- Speech rambling
- Will not stop talking
- Will not talk
- Voice unusually loud or soft
- Stumbles, staggers or falls when walking
- Sways, sags or leans on support when standing
- Movements jerky or uncoordinated
- Acts hyperactive
- Moves very slowly
- Trembles/shakes
- Nausea or vomiting
- Sweating
- Erratic or violent actions
- Depressed
- Confused/disoriented
- Unusually anxious

The checklist should be signed and dated by the supervisor who made the observation on the same day as the observation. If possible, it should be countersigned and dated by another supervisor on the same day as the observation to corroborate the observation.

Impose Discipline

Once an employer has determined, through a timely investigation and documented positive drug test results, that there has been a violation of its drug-use policy, the employer must impose discipline in a uniform fashion in accordance with its policy, including:

- Written warning
- Suspension
- Termination
- Participation in a "second chance" agreement in lieu of immediate termination, requiring an employee who has tested positive to participate in a drug rehabilitation program for a specified period of time and thereafter to remain drug free. In the event of a future violation of the policy, the employee will be subject to immediate termination for violation of the policy and agreement.

Conclusion

All employers should consider developing and implementing a drug-testing policy to create a safer work environment. The authors are aware of numerous tragic workplace accidents that are the result of employee use of marijuana (and other drugs). It is important that employers review their local laws to ensure their testing policies do not inadvertently violate such laws. If the foregoing actions are taken, the employer can substantially limit its potential legal liabilities arising out of illegal drug usage that results in employee impairment.

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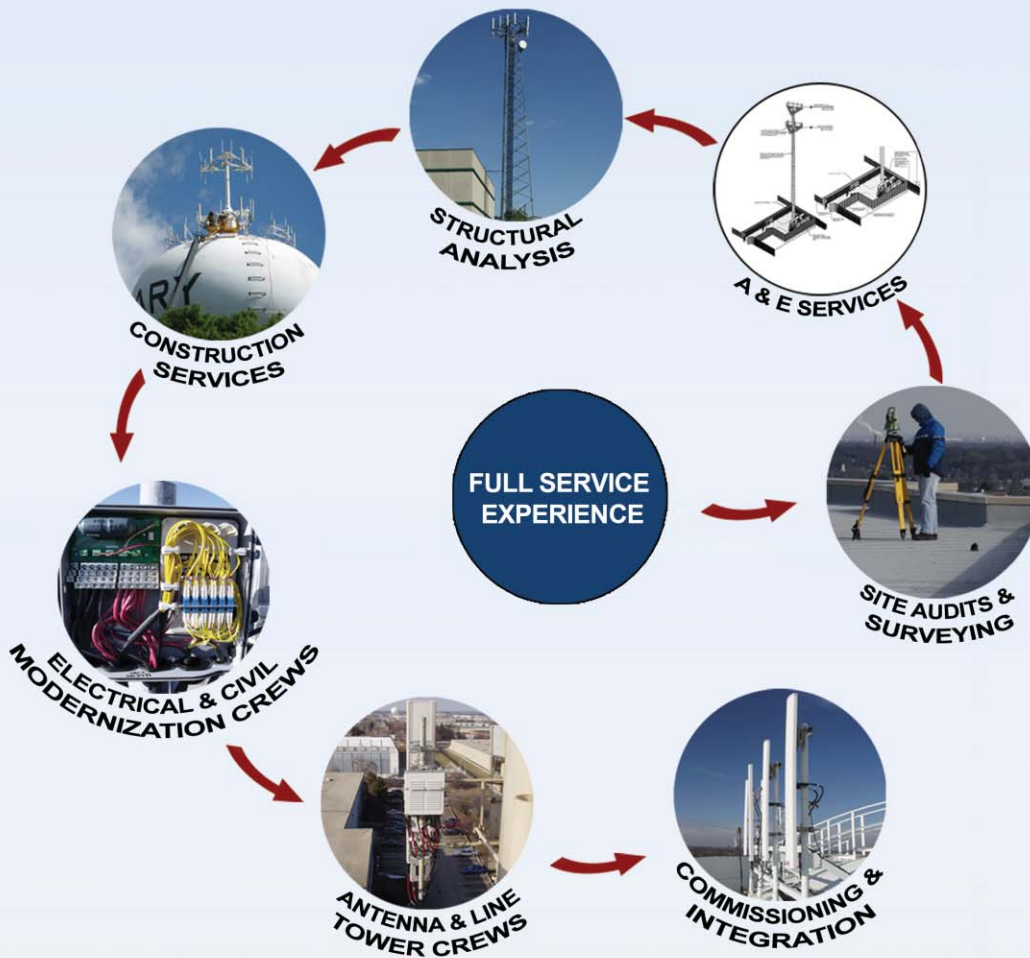
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/ **DEPARTMENTS** /

Product Showcase

Shelters and Enclosures

SHIELDED ENCLOSURES

Pioneer Energy Products (Pepro) offers a shielded outdoor networking cabinet that protects public-safety communications at LTE (Long Term Evolution) network telecom sites. The cabinets use a patented Faraday cage design to ensure that communications are not interrupted by radio-frequency interference, electromagnetic passive intermodulation interference, lightning strikes and transient voltage. The cabinets, which can be stacked or expanded to accommodate more equipment, feature aluminum all-welded construction, a UV-resistant powder coat and standard HVAC power distribution and surge protection. The cabinets are available in 16-rack, 27-rack and 42-rack unit sizes, measuring 36 inches, 54 inches and 81 inches high, respectively. All of the cabinets are NEMA 4 or 4X compliant, confirming their weatherproof exterior and access points.
www.peprollc.com

EQUIPMENT CABINET

The modular equipment cabinet from **American Products** features a design that allows for field expansion. The cabinet can be equipped to meet most outdoor applications. Standard features include front and rear access doors, adjustable racks from 19 inches to 23 inches, aluminum construction, stainless-steel hardware and light-textured powder coating.
www.amprod.us

SITE SUPPORT ENCLOSURES

Cube site support cabinets from **Charles Industries** allow providers to install new, high-efficiency rectifiers and batteries in a compact, durable, GR-487-compliant outdoor enclosure as a cost-efficient alternative to a shelter deployment. The cabinets address one of the biggest challenges wireless service providers face: to provide reliable power in an efficient and environmentally friendly manner. The cabinets support VRLA or NiCd batteries and are offered with many power distribution and thermal management options. Small, medium and large pad-mount cabinets protect network integrity with environmentally friendly, energy-efficient solutions.
www.charlesindustries.com

CONCEALMENT ENCLOSURES

Peabody Engineering custom-designs RF-transparent concealment enclosures and makes them to match any building details. The accompanying photo shows a new multitenant residence with cellular antenna structures concealed inside matching cupolas atop each end of the building. All structures are preassembled in Peabody's manufacturing facilities for quick on-site installation.
www.peabodyconcealment.com

PRODUCT SHOWCASE

OUTDOOR CABINETS

The Boxer family of outdoor cabinets from **Westell Technologies** is compact, lightweight and designed to house and protect a range of electronic equipment. To ensure that the enclosure will withstand harsh climatic conditions, such as rain, snow, sleet, high winds, ice and sandstorms, the cabinets are constructed of aluminum and covered with a powder-coated paint that exceeds NEMA outdoor cabinet requirements. Available in sizes ranging from 5 RU (vertical) to 30 RU, the cabinets can be easily wall-mounted or H-frame-mounted; they are also pad-mountable with the optional battery box or skirt. The cabinets suit a variety of applications, including wireless backhaul, metro Ethernet, DS1 and DS3 in the telecom market.

www.westell.com

CONCRETE BUILDINGS

Thermo Bond Buildings, which recently acquired the precast concrete assets of Mobile/Modular Express II, has increased its product line for the enclosure market to add a concrete offering to its existing lightweight buildings, cabinet enclosures and metal building offerings. The combination of the concrete shelter product line with the company's existing enclosures is intended to offer customers many additional options. Precast concrete shelters will now be produced as a new product line in the Thermo Bond Buildings equipment shelter line. Thermo Bond's standard precast concrete buildings are two-hour fire-rated and ballistic-rated (UL 752-Level 4) and, as can its other enclosures, they can be fully integrated with electrical, HVAC, grounding and custom equipment prior to shipment.

www.thermobond.com

UNDER-THE-SEAT WI-FI ENCLOSURE

The TerraWave under-the-seat Wi-Fi enclosure from **Ventev** is designed for open stadiums with no roof and for venues with high ceilings. These applications can be particularly challenging to Wi-Fi network administrators because installation of "top-down" high-gain antennas and access points may not be practical or even possible. The product provides "bottom-up" connectivity to the network for several rows of users. Powerful, small form-factor Bantam antennas connect to the access point and are housed inside a NEMA 4X-rated compact watertight enclosure to ensure capacity and dramatically improve the Wi-Fi experience. A flange installation kit allows mounting the enclosure onto a concrete or metal surface while also raising the enclosure off the surface to allow for water run-off. The enclosure is compatible with Cisco 2600/2700/3500/3600/3700 access points.

www.terrawave.com

SURGE PROTECTIVE DEVICES AND ENCLOSURES

Raycap's RRH product suite combines copper-cable and fiber-management solutions with the company's Strikesorb Class I surge-protective devices to safeguard vulnerable remote radio head and baseband unit equipment at cell sites. The product suite includes a large number of customizable watertight enclosures for installation at

PRODUCT SHOWCASE

the tops and bottoms of towers or rooftops. It includes cable distribution and protection enclosures built for installation in shelters or cabinets. The connectivity and protection systems are designed to ease management and installation of long runs of power and fiber-optic cables. The systems also ensure the availability and reliability of the radio and baseband equipment to which they are connected.

www.raycap.com

DAS SHELTERS

Oldcastle Precast's pre-engineered distributed antenna system (DAS) equipment shelters are designed to offer an instant, economical solution for wireless coverage and capacity. The precast concrete DAS shelters are designed and engineered to be cost-effective, secure, quickly deployable and expandable for future carrier equipment growth. The manufacturer's turnkey service offers the client single-vendor responsibility for DAS equipment shelters, including installation of electrical, environmental systems, alarms and lighting, together with on-site delivery, site construction,

CHAIN WALL SUPPORT FOR SHELTERS

The Kenner chain wall system, patented by Kenner Innovative Design Systems and manufactured by **Hanson Pipe and Precast**, provides a structurally sound on-grade or elevated foundation to support prefabricated shelters or equipment buildings. The system is custom-made to fit various shelter sizes and elevation requirements. It can be delivered anywhere in the continental United States. Because the chain wall arrives as a pre-engineered structure and requires minimal site preparation, installation can be completed in less than one day, helping to avoid delays caused by adverse weather, quality-control problems in the field and additional costs associated with cast-in-place or galvanized-steel platform alternatives.

www.hansonpipeandprecast.com

BUILDINGS AND SHELTERS

Sabre Building Systems by CellXion,

the shelter division of Sabre Industries, manufactures shelters and building systems including field-erectable shelters. The Envolock building systems provide a sturdy and flexible system that can be built in-house or delivered in kit form ready to assemble on-site. The buildings are designed as an alternative to conventional wood or steel-stud framing. Utilizing interlocking panels manufactured from material as heavy as 11-gauge steel, along with integral structural studs varying in depth up to 9 inches, the buildings provide a flexible alternative across many industries. The buildings are designed to be superior to wood buildings in a variety of ways, including strength and durability, pest and spore resistance and increased weather resistance.

www.sabrebuildingsystems.com.
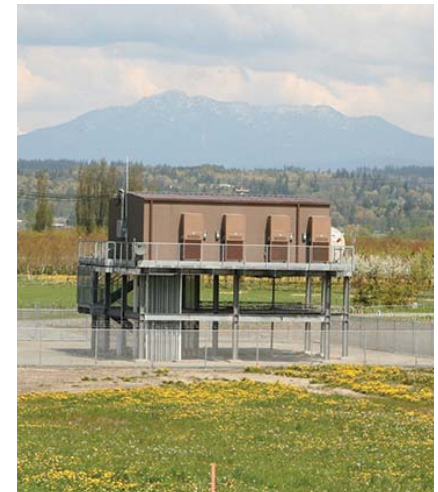
PANEL BUILDING

Dupont Building makes a steel interlocking-panel building that adds to the company's portfolio of fiberglass, lightweight shelters. The lightweight shelters, available in many design choices, are particularly economical to transport.

www.dupontbuilding.com

TELECOM SHELTER COOLING UNIT

The DC-free cooling unit from **Bard Manufacturing** offers rugged durability, dependability and innovation for telecom shelters. Features include a self-addressing unit, a sleek and flexible programmable logic control, a Web link and an exclusive handheld Tec-Eye. The unit is available in sizes from 3 tons to 5 tons with efficiencies of 10+ EER. Online and on-site training and certification are available.
www.bardhhvac.com

EQUIPMENT SHELTERS

In addition to its standard concrete shelter designs, **Fibrebond** can customize buildings with a variety of exterior finishes and size options for use where site accessibility is limited. Shelters can be designed according to customer specifications, particularly for confined spaces. Buildings also can be designed to match the exterior of an existing structure. Shelters also can be customized with any combination of stenciled or textured concrete, stucco, engineered stone accents and architectural metals for a more aesthetic look. The shelters are backed by a 10-year structural and roof warranty.
www.fibrebond.com

Product Showcase

Power Systems and Backup Power

DC-DC CONVERTERS

Phoenix Contact offers a DC-DC converter for converting output from 48-volt batteries to 24 volts DC to power the control system, making it suitable for telecom HVAC applications. The converter, part of the Quint Power family, can give an alarm based on battery voltage, notifying the user before the batteries go into deep discharge.

The converters can boost voltage over long wire runs, regulate battery voltage output and isolate ground loops. With Phoenix Contact's Selective Fuse Breaking technology, the converters provide up to six times nominal current for 12 milliseconds. The units also feature Power Boost technology, providing up to 125 percent of the rated output for demanding loads. The power supplies' advanced diagnostics, including DC OK and Power Boost, make it easy to check status.

The housings are made of extruded aluminum for improved cooling and longer service life. This also decreases the heat load in cabinets. The converters carry UL 508 Listing and Class I, Div. 2 approval. The DC-DC converter family also includes models for numerous other voltage conversions.
www.phoenixcontact.com/usa_home

PRODUCT SHOWCASE

/ **DEPARTMENTS** /

Product Showcase

Security

INTRUSION DETECTION SYSTEM

SmarterFence from **Smarter Security** is a fiber-optic perimeter intrusion-detection system that detects attempts to climb, lift or cut a security fence while minimizing false alarms. The system is immune to electromagnetic interference and lightning. The product's SmarterBeam component is a passive-infrared motion detector with precision engineering to withstand harsh outdoor environments. It accurately alarms incursions across an open area. Working together, the system's components are designed to stop copper theft. The product is available in three models.

www.smartersecurity.com

INTELLIGENT SITE MANAGEMENT SOLUTION

The Optima Management System from **Westell Technologies** is an intelligent site management solution designed to improve a service provider's and tower operator's monitoring, management and control of critical site infrastructure. The product is designed to meet the needs of field technicians and network operations center users who require a complete view and control of their networks from anywhere. The product's mobile applications allow easy access to monitor the functionality of site infrastructure from virtually any iOS or Android device. Power, security, communications and environmental management are critical applications that can be managed through the user's mobile device, providing dramatically improved ease of use and accessibility.

www.westell.com

ACCESS AND KEY CONTROL

The **CyberLock** access control system features electronic lock cylinders that install without wiring in virtually any type of mechanical lock hardware. To convert existing mechanical locks to a full-featured access control system, the user simply removes the cylinders from the mechanical locks and replaces them with electronic cylinders. The system can be used in lock hardware on doors and cabinets. The electronic locks and keys provide accountability by auditing openings and unauthorized entry attempts. CyberLock makes more than 255 cylinder designs and a family of electronic padlocks.

www.cyberlock.com/lock113

SECURITY SYSTEM

Viacam provides environmental, security, fuel, power and access-control systems for cell towers and remote site locations. The security system's centralized server software manages all deployed systems. It provides alerts and a mapping interface to view the situation on the ground. The system prevents fuel theft and controls access and management maintenance schedules for generator sets. It also ensures that cooling systems are running efficiently.

www.viacam-security.com

SPACE PROTECTION DEVICE

FutureSentry is a perimeter and targeted space-protection device that utilizes a variety of sensing devices to activate brilliant LEDs. Depending on input from sensors, the device rotates 360 degrees, strobes the target and continues to track it. The unit has an open architecture with

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two inputs and two outputs that allow it to interface with any alarm system to generate a signal. Camera-agnostic, the product is prewired to meet Cat 5 twisted-pair Ethernet cabling or BNC connection for IP or analog cameras. It uses a form of pulse-counting input technology that requires multiple inputs from activating zones so the device can be stationary long enough to work with analytics. From a functional standpoint, the platform is said to provide 360-degree detection and deterrence when matched with any IP or analog camera. **www.futuresentry.com**

OUTDOOR LIGHTING SURVEILLANCE SYSTEM

Hubbell Lighting, a supplier of lighting systems and lighting controls, and **Totus Solutions**, a provider of outdoor lighting-based security platforms, have formed a strategic partnership to develop outdoor light fixtures with advanced surveillance technology. Under the partnership, select Hubbell Lighting outdoor fixtures will be available with Totus Solutions' surveillance technology. The combined technology will include a single, integrated solution with advanced megapixel IP video surveillance, multiday media storage and secure wireless communications designed to transform passive surveillance into active deterrence, helping to prevent and deter crime instead of just recording it while it occurs. The system uses a hemispheric 360-degree view camera with recording and real-time viewing along with two-way audio for live listening and communication via an amplified speaker.
www.hubbelllighting.com

SECURITY SYSTEM

Videofied is a security system designed with all the necessary devices and accessories to make a site secure. The system allows for the freedom of wireless and cordless security by communicating over 3G cellular and running on batteries. The system can also be wired in and configured to com-

municate over Ethernet with IP. The control panel is the hub of the system, communicating with motion viewers and peripheral devices over military-grade RF. It transmits video alarms and signals over 3G cellular or Ethernet with IP to the central monitoring station. *www.videofied.com/us/en/applications/cell_sitestowers/*

REMOTE MONITOR

PageTek's Flex+IP is an Ethernet-capable remote infrastructure monitor that provides status and control of critical equipment at unattended remote sites. Located with the equipment to be monitored and controlled, the monitor communicates with the technician over local USB or serial ports, the public switched telephone network, TCP/IP Ethernet or a combination of them. The system can monitor up to 72 inputs in analog or digital modes with a variety of characteristics. Each analog-configured input has user-defined upper and lower limits, time delay, qualifier and schedule. It can measure voltages from 0 volts to 50 volts DC. Each digitally configured input has user-defined active level, time delay, qualifier and schedule parameters. The monitor automatically maintains a history of each input's activity. It can be expanded to 18 relay outputs, which may be programmed to function as normal, latching or momentary, remotely controlled or responding autonomously as programmed by the user. *www.pagetek.net*

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