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JUNE 2008

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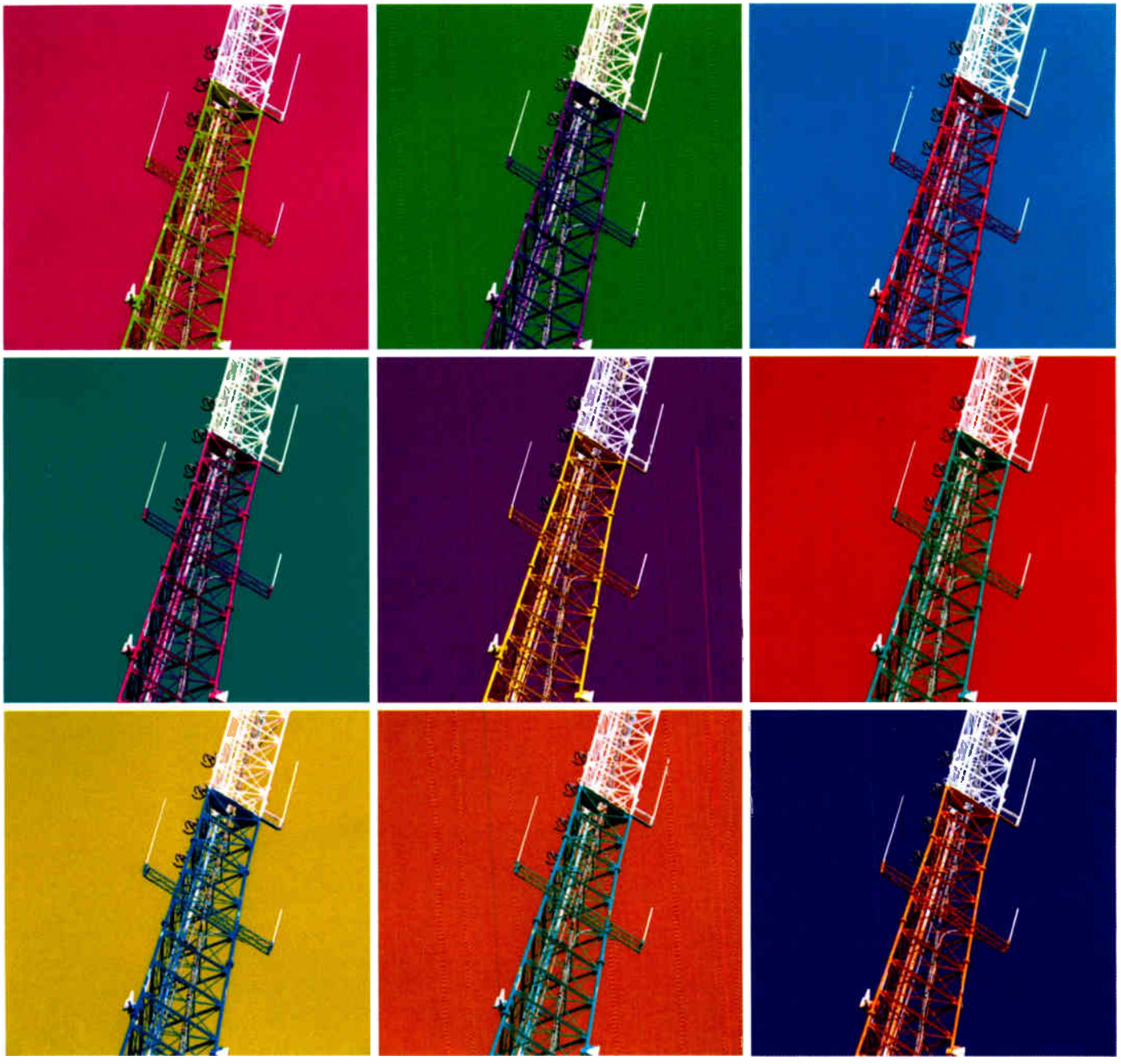

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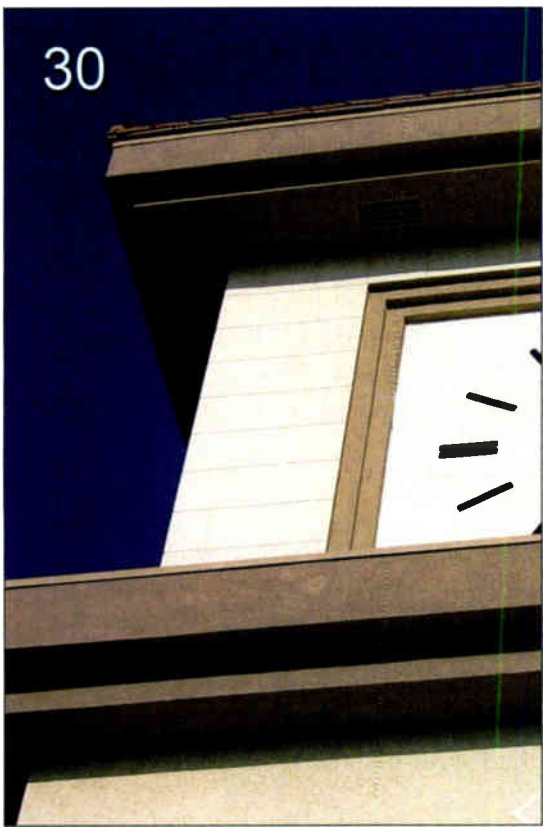
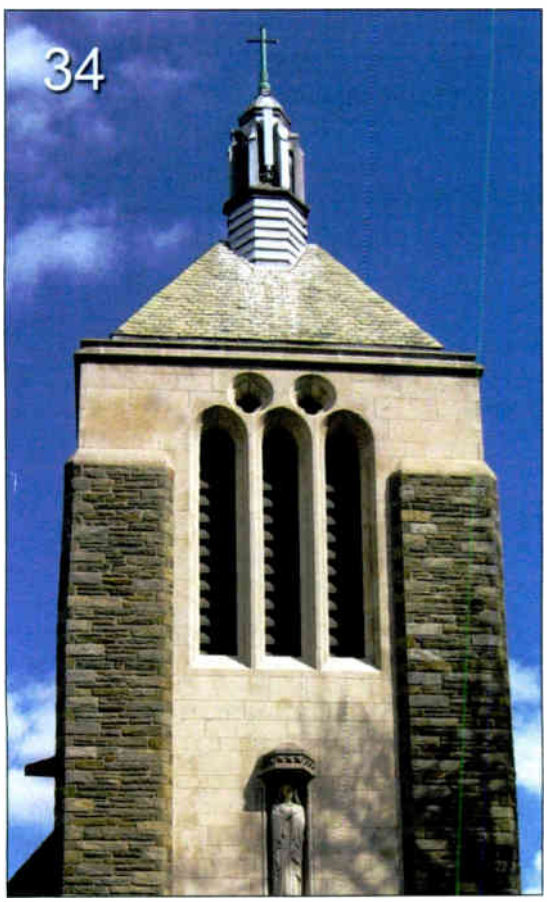
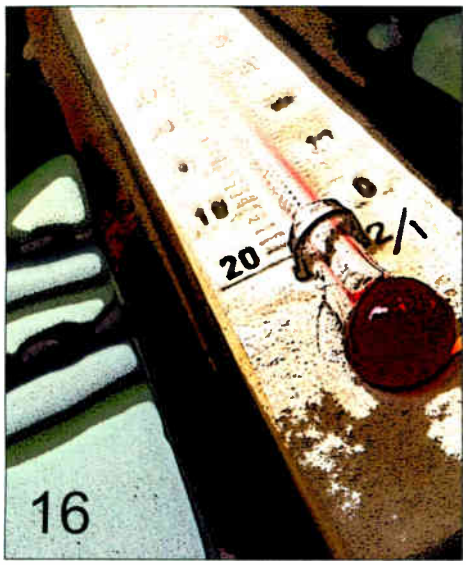
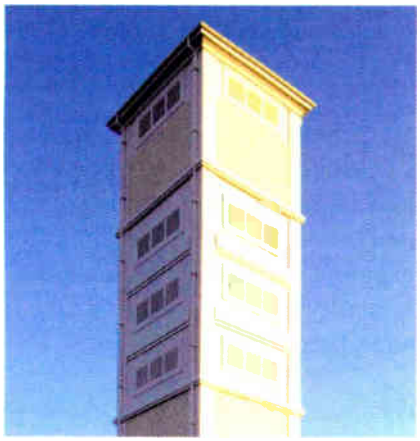




Features





on the cover

Our cover image this month was photographed in Sterling, VA. This 100-foot Invisible Towers structure is attached to the Loudon County Safety Center and is reminiscent of an old-fashioned hose tower. The concealment project blends with the pre-existing building and services each carrier in the market.

Photo courtesy of Invisible Towers

Departments

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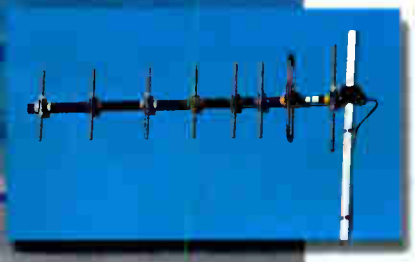

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We're a codependent family. What? Yes, I may have gone off the deep end because of exciting times these last few weeks here in Northern Virginia. Our friends at Sprint Nextel Xohm are about to become Sprint, Nextel and Xohm. Let's take a look at these pieces and what the effect may be for our family, the tower industry.

First, core Sprint: nice company, deploys networks, has some more network that needs to be deployed to survive customer demand for coverage. Sprint is getting back to its core CDMA (now Rev. A) network. As it puts more money into that network through additional sites, it will be a good thing for us wireless infrastructure types — in addition, we hope, to stopping Sprint from hemorrhaging customers.

The Nextel network was never fully integrated into the Sprint family of sites and antenna systems. Why? Primarily due to the different frequency block at which the iDEN network operated, and the different modulation of that network — a GSM-like system — but primarily because the licenses were issued as fixed-location licenses assembled by buying numerous two-way radio systems. With fixed-location licenses, Nextel is not free to position antenna sites anywhere in the market, whereas PCS and cellular licensees such as Sprint, Verizon and T-Mobile may do just that. The Nextel network has and always will suffer from throughput disadvantages, due to those licensing constraints. The merger with Sprint was supposed to help because where Sprint's CDMA network is well suited to broadband data services, Nextel has always had an advantage with its push-to-talk network. For many, the Nextel service has become analogous to a public safety solution.

So, as the original force behind Nextel, Morgan O'Brien has failed to find a partner in the 700 MHz D Block FCC auction just concluded, the Public Safety Spectrum Trust (PSST) has no partner to build the complementary half of a two-way network. It will be at least a year or more while the FCC works out what to do, and then at least a couple more years while a network is being built. Thus, the idea of picking up Nextel as a Cyren Call (or part of the family with the PSST) operating service to provide public-safety-specific functionality makes sense. Use the Nextel network as a playground to create solutions, build capability and do all of the "what-if" work now, and come out further ahead when the D Block partner is eventually known. It would help the public safety folks, and it would not really compete with the core Sprint direction. Good news for us: More sites would need to be deployed to beef up coverage, and we would have *two* tenants on sties where only a few years ago, two tenants merged into one. We won't double our money, but we'll have some upswing.

Now, what I'm excited about: Xohm and Clearwire. I may be wrong — does anyone remember Ricochet? — but the future of WiMAX looks pretty darned good. A few billion dollars more just got injected into the "new Clearwire." Sprint will control 51 percent of the company, and the old Clearwire and the new money people from Intel, Google and some cable companies will control the balance. Sprint will lose a few good people, but it will not have to invest much money, and it will be able to realize the deployment of a WiMAX network. agl

by Rich Biby, Publisher
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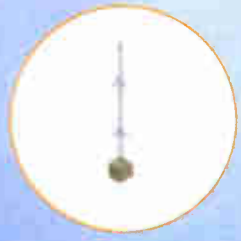

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Now You See It; Now You Don't

On the subject of camouflaged, disguised, concealed and otherwise unobtrusive or undetectable telecommunications sites, sometimes I compare them to a good toupée: If a toupée is really good, you can't tell it's there. If it is not quite so good, you find yourself staring at someone's hairline ... *ah* ... or a tower's radiation centerline ... or something like that. Just as a good toupée is a thing of beauty — with beauty in the eye of the beholder, of course — a well-concealed or camouflaged antenna site is wonderful to behold. Yes, I realize I'm talking about toupées right next to my mugshot. Yes, I realize I'm getting too poetic for the subject. Hardly anyone cares for the beauty of a telecommunications antenna site. But if you do, you probably already looked at our "Tower of the Month."

There's a lot of money in camouflaged, disguised and concealed sites. Sometimes there is more money in them than carriers like to contemplate. One multicarrier site that represents the high end of tower concealment carried a price tag approaching $1 million upon completion. Yet some much simpler concealments, especially on rooftops and the sides of buildings, may only cost several thousands of dollars.

That's it! A giraffe!

I don't know whether all of the concealments are worth the money spent on them. Sometimes, they look like the result of some compromises made in the back-and-forth final moments of reaching a settlement at a zoning hearing when someone says, "I've got it! The tower is near the zoo ... *um* ... let's make it look like a *giraffe*."

I'm using a ridiculous example because I don't want to belittle someone's specific, best effort to satisfy opposing interests in reaching a compromise that allowed a site to be built when otherwise no construction would have been authorized.

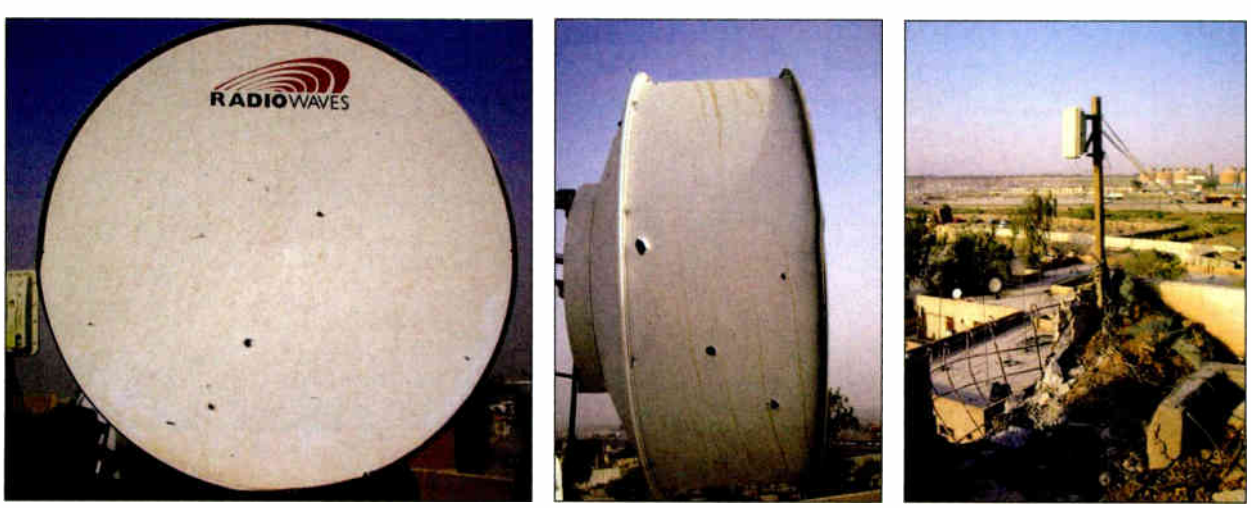
But you've noticed some of the less-effective attempts at camouflage and concealment, haven't you? Various web pages and blogs display examples, if you go looking for them. Most of the time, we're more interested in displaying examples of camouflage and concealment that work well, but poorly made site disguises make us appreciate the first-class ones all the more. And that goes for toupées, too.

UTC correction

Karnel Thomas, the vice president for member services at Utilities Telecom Council (UTC), was generous with his time in helping with the article "Summit Draws Utilities for Collocation Confab" in the May issue. I so well recall attending the many conventions that UTC conducted under its previous name, United Telecom Council, that the older name continues to resonate with me. In the article, I gave UTC its previous name in error. I also incorrectly mentioned that UTC is an affiliate of the UtiliSite Council, and Thomas sent a note to remind me that the relationship is the reverse, and asked me to pass that along to you. agl

by Don Bishop, Exec. Editor
dbishop@agl-mag.com

Pictures of the Month:



The Radio Waves microwave dish shown in two views at the left was struck by debris from a 107 mm rocket that impacted the corner of the rooftop shown at the right. The antenna was installed at a forward operating base in Iraq. The antenna at the right is of unknown manufacture. Photo: 'Steve'in Iraq; www.microwaves101.com.

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Federal Regulation and Site Design: The View from DC

– by Jacqueline McCarthy, esq. –

Federal regulations play an influential role in site selection and design. Currently, many of those regulations are in flux, and the changes that are afoot will impact the site development process. PCIA's Government Affairs Team is engaged with key policymakers on these issues to communicate the importance of balanced approaches that encourage wireless site deployment during a time when speed to market is of particular importance. The issues described here have been particularly active.

FCC Backup Power Requirement

In October 2007, the Federal Communications Commission (FCC) issued a revised order mandating that carriers provide eight hours of backup power at *all* wireless facilities. Carriers can only avoid this requirement if they prove that the addition of backup power at a site (a) conflicts with local, state or other federal law; (b) threatens "public health and safety,"; or (c) conflicts with a contractual agreement (e.g., a lease). PCIA participated in legal challenges to the order, articulating why the requirement is unreasonably burdensome for sites at which the addition of backup power is infeasible due to spatial or structural constraints, and why the order fails to provide for continuity of wireless communications in emergencies. In March, the Court of Appeals for the D.C. Circuit, which was set to hear oral arguments on the appeal on May 8, granted Sprint's motion for stay of the order. This motion, which PCIA supported, delays the effectiveness of the order until the appeals process is complete, and the court found that granting the motion was appropriate in light of the "risk of irreparable harm" of the order. We understand how the order could threaten a wide variety of our members' sites, and we are committed to pursuing more reasonable and effective measures with the FCC and in the courts.

Avian/Tower Interaction

The regulatory effect of a recent federal court decision regarding avian/tower interaction significantly threatens timelines and procedures for environmental concerns at proposed tower facilities. On February 18, the D.C. Circuit concluded that the FCC "failed to apply the proper NEPA standard ... and to provide meaningful notice of pending tower applications" with respect to the impact of certain Gulf Coast towers on avian migration. *See American Bird Conservancy v. FCC*, D.C. Cir. No. 06-1165. The court instructed the FCC to re-visit its environmental review procedures to

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ensure proper compliance with its NEPA obligations. This decision and its consequences at the FCC have critical implications for tower development, and, PCIA continues to advocate for minimizing burdensome and time-consuming review processes. In the coming weeks, we will address this issue with FCC policymakers, and we will continue to represent wireless infrastructure providers' concerns at the Stopping Avian/Tower Interaction Committee (STATIC), a working group of wireless industry representatives and environmental groups, including the American Bird Conservancy. Please "stay tuned," as this issue promises to remain active in the near future.

Remote Monitoring (FCC Part 17)

Fortunately, federal regulators sometimes appreciate the technological developments of our industry, and, through effective advocacy, can recognize that such developments often call for updated regulations that incentivize efficient wireless network management. Current FCC Part 17 site monitoring regulations do not address the remote monitoring systems used by most site operators. While some of our members that operate remote monitoring systems have obtained waivers from this requirement, we continue to pursue wholesale revision of Part 17 to exempt site operators using approved remote monitoring systems from physical site inspection requirements. Earlier this year, we presented our requests for a long-overdue update to Part 17 to FCC commissioners' legal advisors. In the midst of a particularly active time at the FCC, PCIA has positive indications that the FCC is preparing to move forward with these revisions.

Please join us in our advocacy efforts by contacting the PCIA Government Affairs team at 703-739-0300 with any questions, concerns or updates. **agl**

PCIA Advocacy Team Update

We are pleased to announce the addition of Mike Saperstein as PCIA's Public Policy Analyst. Mike is a 2007 graduate of Catholic University's Columbia School of Law, where he focused on communications law and had practical experience at both the FCC and the National Association of Broadcasters. Mike's addition to our team brings us valuable knowledge and insight, and we are thrilled to have him on our team.

—PCIA

Pole Attachments and Upcoming Events

by Jacqueline McCarthy, esq

The complex negotiation and regulatory process involved in pole attachments can create delay, burden and expense for distributed antenna system (DAS) providers. For this reason, the DAS Forum focuses on pole attachment regulatory reform where opportunities and needs dictate. This year, pole attachment reform is a particularly active issue at the federal and state level.

On March 7, the DAS Forum submitted comments in the FCC rulemaking reviewing federal regulations regarding pole attachments in FCC WC Docket No. 07-245. The federal regulations apply in 31 states — so-called "non-certified" states — that do not have their own state regulations of pole attachments. The DAS Forum's comments explained why access to poles is a necessary element for DAS and described the difficulty many DAS providers face when negotiating pole attachment terms and rates with pole owners. The comments emphasized the appropriateness of the National Electric Safety Code (NESC) standards for structural integrity as a benchmark for federal approval of pole attachment designs. Finally, the comments urged the FCC to use its policy-making influence to stop the unreasonable practices of certain pole owners in denying pole access, or in charging cost-prohibitive rates to DAS attachers.

The FCC pole attachment rulemaking has attracted a significant amount of comment from all sides of this contentious issue. The FCC received more than 50 comments on the issue from wireless, wireline, cable and utility representatives. At a utility industry conference, officials expressed the view that the pole attachment rulemaking was the most significant happening in relations between utilties and telecommunications service providers since passage of the Telecommunications Act of 1996. The DAS Forum will present its key advocacy points on the pole attachment rulemaking to FCC policymakers and commissioners to ensure that its unique voice is heard, and that any resulting regulation improves the regulatory landscape for wireless attachers.

In the 19 states with their own pole attachment regulations — "certified" states — the DAS Forum sees various opportunities to pursue improved pole attachment procedures and regulatory treatment of DAS. The DAS Forum has requested that the Connecticut Department of Public Utility Control initiate a rulemaking process to ensure improved access, make-ready procedures and regulatory treatment of wireless attachers. Likewise, the DAS Forum participated in a Pole Attachment Workshop sponsored by AT&T on April 3–4 to address regulatory reform before the California Public Utilities Commission. Finally, the DAS Forum is providing assistance to Vermont's Department of Public Service as it reviews pole attachment regulations in an effort to provide wireless and broadband access to underserved areas of the state.

Recent and upcoming events provide the DAS Forum with exposure for its key advocacy issues. On April 1, I participated in a panel discussion at the Tower Summit on the legal and regulatory issues surrounding DAS. At this panel, pole attachment reform was discussed as a critical need for the continued development of DAS as a viable wireless deployment method.

For more information about the DAS Forum, its progress on advocacy issues of importance to DAS, and the upcoming events described here, please visit *www.thedasforum.org*. agl

McCarthy is director of government affairs for PCIA and the DAS Forum.

Photography by Grace King

The DAS Forum announces its next "DAS-in-Action" Event in Washington, DC on June 11–12, 2008. This event will include discussions on the engineering, legal and regulatory issues of particular importance to DAS deployment, and will include participation from key federal decision-makers. The event will also explore a case study of an innovative DAS deployment in suburban Washington, offering attendees an opportunity to view the facility. Please join us in our nation's capital for this exciting and informative event. —*The DAS Forum*

Meet: MoKan Wireless Association

by Jay Webber, MoKan president

Missouri/Kansas Wireless Association (MoKan)

Meeting Location:
St. Louis and Kansas City

Date Formed:
Jan. 16,2006

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jay.webber@wfinet.com

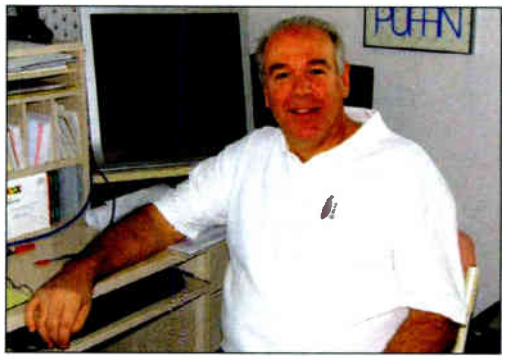
Seven years ago the concept of a state wireless association was born just like good whiskey in Tennessee. The idea was to have a local forum for the industry to get together outside of the competitive marketplace, provide for a positive image, offer a concerted voice of response and concern, deliver educational opportunities and provide a platform to execute this vision.

Following that vision, MoKan Wireless was formed over two years ago and is doing exactly that. When asked to represent this association as president, I never once doubted the potential for it to become a great conduit for all things wireless. We started with a membership of less than 100 and have now brought our "family" to more than 450 members. Each and every one of those members that makes MoKan the remarkable association that it is. To date, we have conducted two successful golf tournaments and have put our money where our mouth is: $24,000 in two years for the Foundation for Fighting Blindness, showing the community that we care.

Additionally, we have been able to provide low-cost training opportunities to members, most recently with our lectures on NEPA/SHPO/Environmental Issues, a City Planners Forum and a panel discussion on all aspects of stealth siting of towers. Because of the diverse two-state area, we alternate events between St. Louis and Kansas City, MO, to allow members from both states an equal share of travel time.

On the regulatory front, we have been fortunate to have many members provide responses to proposals by municipalities looking to rewrite telecom ordinances. A recent example involved a community in St. Louis that received more than 30 emails from members at the 11th hour in support of an offer to assist the city in writing their revision. The ordinance was on the docket to be approved by the city council. With the help of local member attorneys, PCIA, ATC, Crown Castle, Cricket, T-Mobile and many other members, we persuaded the council to remand the ordinance back to the planning and zoning department. Subsequently, many hours were spent outlining the risk the city was taking in adopting certain provisions, both economically and legally. This type of response and enthusiasm throughout the MoKan membership is precisely what we are all about, locally and nationally.

As we move through 2008, our vision remains the same with every event seeming to get bigger and better. I'm told that we may need to use all 27 holes to play our golf tournament this August because of demand. It's an exciting time to be in wireless and I'm proud to be associated



MoKan President Jay Webber

with all the outstanding professionals that we have in MoKan, especially our board and committee members. **agl**

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Calendar/Events

June 11: 2nd Quarter Meeting – *St. Louis*

Aug. 19: 3rd Annual Golf Tournament – *St. Louis*

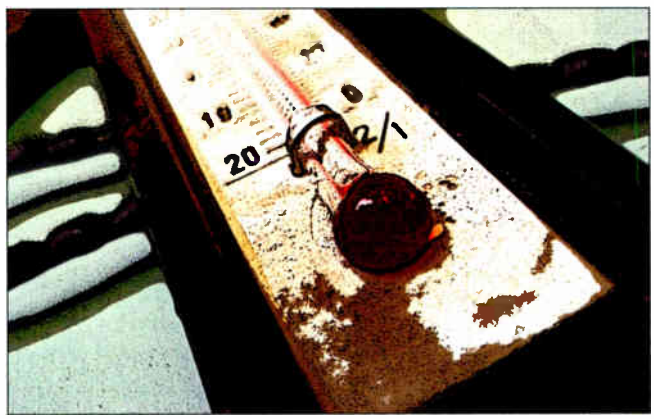
Dec. 3: Holiday Party – *Location TBD*

Outdoor Workers Face the Heat

by David Saul, AAI

Summer heat can be more than uncomfortable; it can be a threat to your health. Don't let the summer heat get the best of you.

Heat-related illness often does not receive as much as attention as other workplace hazards and is often underreported. High-profile cases of heat illness have increased public awareness of how dangerous heat can be. Perhaps the most highly publicized case of heat stroke in 2001 was that of Korey Stringer, a 27-year-old member of the Minnesota Vikings football team. He collapsed after two-and-a-half hours of practice in 90-degree heat. At the hospital, his core body temperature was recorded at 108 degrees. He died shortly thereafter of major organ failure. Many were shocked at how sudden and serious the consequences of heat exposure can be, but his tragic story brought to light a serious workplace hazard that concerns thousands of workers every year.



Heat can cause a variety of illnesses whose consequences range from minor discomfort to death. They include exhaustion, cramps, fainting, rash, fatigue, and — most seriously — heat stroke. Heat-related illness occurs when normal cooling mechanisms cannot adequately cool the body. Usually, sweat evaporates off the skin, cooling the body. However, when humidity is high, the sweat will not evaporate and the body will not cool. When the body cannot cool, its temperature rises.

While heat-related illness isn't the largest workplace hazard, it may be the most preventable. The human body is capable of adjusting to differing temperatures — even hot ones — but it needs time. Allowing the body to acclimate is crucial when working in hot weather. In fact, most workers who have suffered fatal heat-related illnesses did so within their first four days of employment. Workers who are new to the job, or who have just returned from vacation or leave, should be especially careful their first week. This may include working altered hours, including, for example, avoiding working during the hottest hours of the day, doing lighter labor, taking more breaks, and drinking a lot of water. Once the body has had time to adjust to the heat, it will be much more capable of adequately cooling itself, reducing the chances of serious injury.

Taking breaks and keeping hydrated are essential, even if the worker doesn't feel tired or thirsty

Workers employed outside should wear loose-fitting, light-colored clothing and a hat, and take short, frequent water and shade breaks. Employers and workers should also schedule the hardest physical work for cooler hours of the day. Taking breaks and keeping hydrated are essential, even if the worker doesn't feel tired or thirsty. In fact, heat-related illness can actually make a worker feel that he or she is not thirsty.

Don't assume you're safe just because it isn't scorching hot outside. While heat-related fatalities are more common when temperatures are over 90 degrees, just last year workers died while working in 75-degree heat. Also keep in mind that each person's body reacts differently, and factors such as overall health, obesity, age, and medications affect one's risk.

Tips for staying cool

- *Drink plenty of water.* In hot weather, drink enough to quench your thirst. An average adult needs eight 8-ounce glasses of water a day, even more during heat spells.
- *Dress for the weather.* When outside, wear lightweight clothing of natural fabric and a well-ventilated hat.
- *Stay inside whenever possible.* Do errands and outside chores early or later in the day.
- *Eat light.* Replace heavy or hot meals with lighter, refreshing foods.
- *Think cool!* Take a cool shower or apply a cold compress on your pulse points. Or, visit an air-conditioned mall.

For a detailed list of heat-related illnesses, along with their causes and symptoms, check out these online resources:

OSHA's Fact Sheet for Protecting Workers in Hot Environments — *www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=FACT_SHEETS&p_id=167&p_text_version=FALSE*

"Working in Hot Environments" by the National Institute for Occupational Safety and Health: a comprehensive guide to heat–related illness at work — *www.cdc.gov/niosh/hotenvt.html*

David Saul is executive vice president of Atlantic Risk Management, Columbia, MD, and an accredited risk advisor in insurance (AAI). His email address is: *dsaul@atlanticrisk.com.*

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Co-existence for Antennas and Water Tanks

Solid design, low costs, and good timing for both a city government and a wireless carrier tenant make the difference when it comes to new site construction or facility reconditioning involving telecommunications antennas on water tanks.

by Daniel J. Zienty

More than a decade has passed since the inception of the Telecommunications Act of 1996 and wireless communication is now a mainstay in our everyday lives. Mergers, acquisitions and technological advances in the telecommunications industry drive the need for new telecommunications sites or equipment upgrades or both.

Over the years, construction of telecommunication sites on municipal buildings and water storage facilities have become commonplace. Installations and upgrades of telecommunication sites, from the planning phase to activation, can extend over multiple years creating an unpredictable construction season. Careful planning with extreme ambient conditions on either side of the spectrum has become a standard in the industry.

Even greater difficulties can arise when water storage facilities require reconditioning. Important considerations should be addressed upfront, including whether tenant attachments will be painted as part of the storage facility reconditioning, or whether they will be removed during painting. Addressing these case-by-case complexities during planning helps to minimize problems during the project and ensure a win-win for project stakeholders.

New site construction planning

With new construction, planning begins when a city government receives a formal construction application from a proposed tenant. Next, the tenant's

Water Tank Styles

A tank in Vadnais Heights, MN, offers an example of the pedestal type of water tank tower. The nickname for this type of water tank is the 'golf ball and tee.'

A fluted steel column supports this tank. Some large-diameter columns include space inside for equipment and machinery storage, even offices, meeting rooms and multiple floors.

An elevated or legged type tank is supported by steel columns placed around its perimeter. Though inexpensive to construct, today it represents the least popular design.

Tanks placed on high ground may need no elevation above the grade to sustain water pressure, and when their walls are high enough, they still offer favored antenna mounting space.

Welding Considerations

How recently a tank was painted or is scheduled for reconditioning are important considerations, as these factors determine the type of attachment method to be used for the antenna mounts. For example, if the tank has been slated for reconditioning within a two-year period, mounts should be permanently welded to the tank. Areas damaged during welding, especially damage to an immersed area, can be properly repaired during reconditioning. Conversely, if the tank has recently been painted, considerations should be made for bolting, capacitor-discharge stud welding, or other attachment methods to minimize damage to the newer coating system.

project engineer conducts a site walk-through with city's staff or city representatives or both to develop a comprehensive set of plans. When designing an installation on a water storage facility, the style of the tank plays a major role in determining the routing and method of equipment attachment.

The best antenna installations are those that are kept simple. In keeping with this philosophy, telecommunications installations should be designed to:

- protect the functionality of the site.
- minimize damage to the tank and existing coating systems.
- minimize negative aesthetic effects.
- minimize the effect on daily tank operation and maintenance.

Key questions from a coating perspective should include:

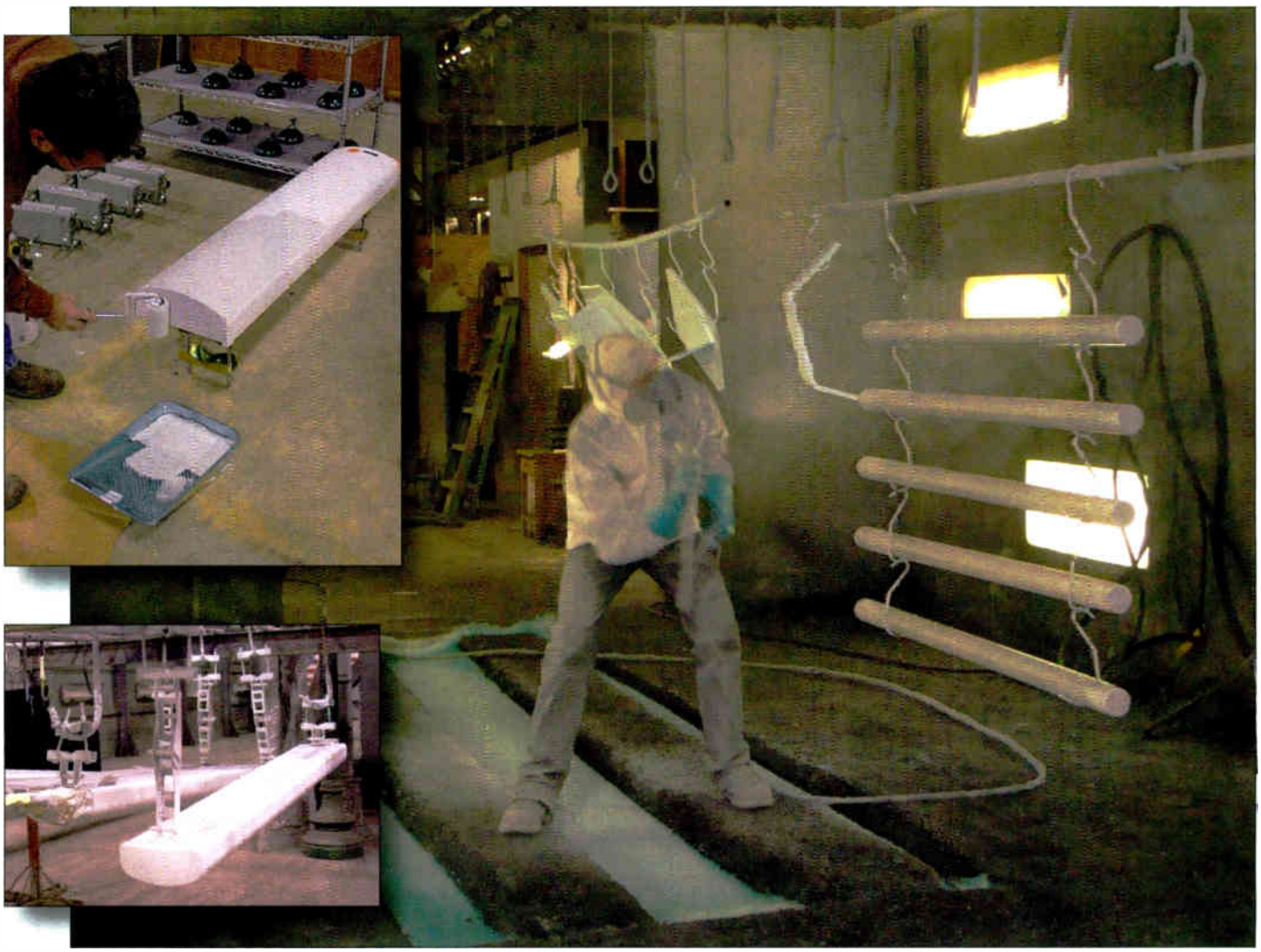
- How recently was the tank painted?
- What type of coating system was used?
- Who was the coating manufacturer?

How recently a tank was painted or is scheduled for reconditioning are important considerations, as these factors determine the type of attachment method to be used for the antenna mounts. For example, if the tank has been slated for reconditioning within a two-year period, mounts should be permanently welded to the tank. Areas damaged during welding, especially damage to an immersed area, can be properly repaired during reconditioning. Conversely, if the tank has recently been painted, considerations should be made for bolting, capacitor-discharge studwelding, or other attachment methods to minimize damage to the newer coating system.

When designing an installation on a water storage facility, the style of the tank plays a major role in determining the routing and method of equipment attachment.

During the conceptual planning period, any proposed facility maintenance should be immediately communicated to the tenant. A tenant may elect to delay construction or coordinate it with tank reconditioning or both. The choice can save costs associated with temporary removal and replacement or provide additional time to complete the design with future work in mind. Tenant agreements are often developed in concert with construction plans and language can be included in the lease that addresses future maintenance as well as third party plan review and inspection services.

Whichever direction the tenant takes, the existing coating system should be properly identified to determine



For installation components that require painting, specifications should be written to include painting in a shop environment. Shop painting ensures a controlled environment for surface preparation and painting operations in accordance with the paint manufacturer's recommendations, and can simplify the inspection process for the city's staff or its engineer.

compatibility with the new coating and prevent coating failure. Providing records about the existing paint system and manufacturer to the tenant's design engineer will assist in providing a better color match for the finish coat. Prior to the final coating plan approval, a color drawdown should be requested. Older coating systems tend to lose their gloss and may necessitate a change in tinting or overall color selection.

In addition to specifics regarding color and generic system selection, pre-design discussions should include installation materials that are corrosion-free and do not require protective painting. These materials include plastics and galvanized materials. For installation components that require painting, specifications should be written to include painting in a shop environment. Shop painting ensures a controlled environment for surface preparation and painting operations in accordance with the paint manufacturer's recommendations, and can simplify the inspection process for the city's staff or its engineer.

Antenna attachments, along with coaxial cable penetrations, are the major contributors to paint touchup due to the welding process and add to the list of weather sensitive issues:

- touchup painting around coax penetrations and other weldments.
- painting coaxial cables.
- painting the antennas.
- site restoration.

A change in attachment methodologies can benefit the tenant, as well as the city government. When possible, engineers should consider alternative methods of antenna attachment and coaxial cable attachment. In addition, increased use of beam clamps can reduce or eliminate damage to water tank exterior or interior surfaces or both. A change in means and methods can save both time and money by reducing potential damage to the tank during installation, compressing the project schedule for weather-sensitive

Increased use of beam clamps can reduce or eliminate damage to water tank exterior or interior surfaces or both. Left: A beam clamp secures a coaxial cable. Right: Another type of clamp designed for attachment to structural angles is part of a mounting assembly for two panel-style antennas.

tasks, and more effectively completing open punch list items.

As an example, if the ratio of coaxial cables to antennas is one-to-one, or as the structural integrity of the tank allows, drilled holes and insertion of a manufactured standard firewall grommet to seal jumper cables can work in lieu of a welded pipe coupling penetration. Another situation relates to exposed coaxial cables on ground storage reservoirs

or elevated legged tanks that can be visually obtrusive.

These examples include two issues: *routing* and *color*. With respect to color, no matter how well the preparation and painting process is completed; in time, paint will flake or begin to peel off. A number of facilities have been successfully planned using manufactured colored coaxial cable. Coaxial cable is readily available in white and gray; which blends well with most common tank colors. This alternative not only eliminates upfront painting and has a positive effect on the project schedule, but also reduces future maintenance issues.

Tank reconditioning planning

At some point, a city's water storage facility will need reconditioning. Water tanks with multiple tenants and antenna installations can add numerous complications to a reconditioning project. Though many lease agreements require tenant notification of as little as 30 to 90 days, the sooner tenants are brought into the project planning process, the higher the probability for a successful project.

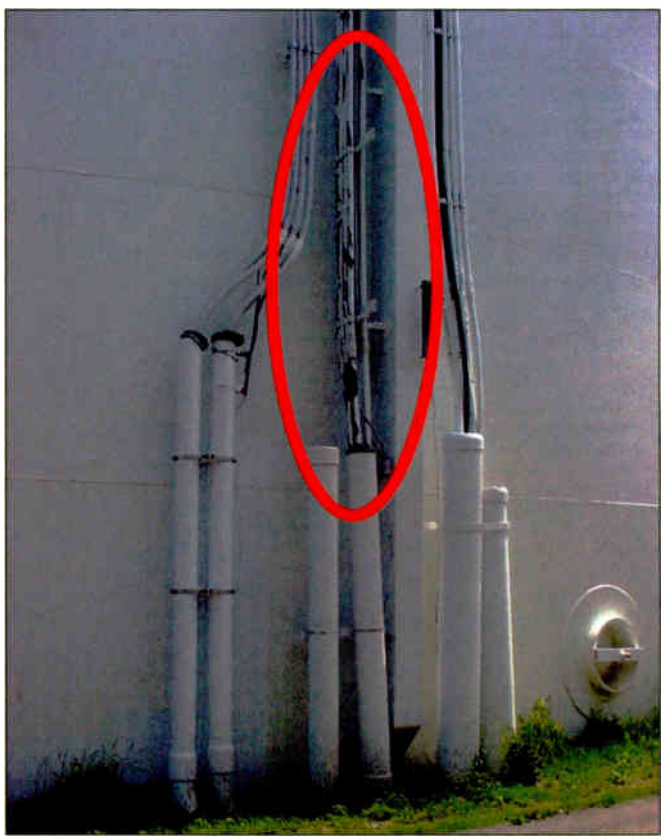
Whether the city or a contracted engineering firm develops the project in-house, the first step in planning is to review the lease information associated with that facility. As installations may reflect different tenants, sited over many years, the terms related to individual tenant/landlord (city) responsibilities may be different.

Lease language important to the project includes:

- project notification.
- protection of lessee equipment.
- pre- and post-testing of equipment.
- temporary removal.
- temporary sector shutdown.
- equipment (antennas and attachments) painting.

Planning for and completing a tank reconditioning, following a design, bid and build process evaluation through painting can take 12 months or more.

Painting Coaxial Cable or Using Colored Cable



No matter how well the preparation and painting process is completed, in time, paint will flake or begin to peel off, as shown at the right in the photo of cables along the outer wall of a ground storage reservoir. A number of facilities have been successfully planned using manufactured colored coaxial cable. Coaxial cable is readily available in white and gray; which blends well with most common tank colors. This alternative not only eliminates upfront painting and has a positive effect on the project schedule, but also reduces future maintenance issues. An example of manufactured white cable is shown at the left.

Protecting Telecom Equipment During Tank Reconditioning

Additional labor may be required by the painting contractor to carefully and safely conduct abrasive blasting and painting operations around brackets, coaxial cables, and antennas. This work can be further complicated if installed equipment protrudes from the tank in a manner that interferes with the operation of the containment system. In these examples, the contractor has shrouded coaxial cable that could not be removed.

Therefore, tenant notification and a request to meet should be scheduled following review of the lease.

At a minimum, tenant notification should include identification of the project site, project scope, and contact information. In addition, references to specific paragraphs of the lease agreement that identify the above points should be included.

The invitees to the planning meeting should include representatives of each tenant. This may include the installation contractor, city staff and the city's engineer. As a reconditioning project is not only a large maintenance expense to the owner, it also can present major costs to the tenant, including:

- temporary removal and mobilization of a cell-on-wheels or COW.
- temporary shutdown.
- internal management and coordination.
- painting.

However, a properly planned reconditioning project can result in a win-win for both the city government and the tenant. In the case of an equipment upgrade, the original installation may have included a lesser method of attachment such as capacitor stud weld. Also, because standard components have evolved as well as placement and routing of equipment, an opportunity for a better installation may now present itself.

In many cases, the installation of telecommunications equipment on water storage facilities adds time and cost to the project. Additional labor may be required by the painting contractor to carefully and safely conduct abrasive blasting and painting operations around brackets, coaxial cables, and antennas. This work can be further complicated if installed equipment protrudes from the tank in a manner that interferes with the operation of the containment system. To assist the city and tenants in identifying these costs, the engineer should consider breaking out specific tasks on the project *Bid Form*, including:

- protection of telecommunications equipment.
- painting of telecommunications equipment.
- exterior surface preparation and painting with equipment in place.
- exterior surface preparation and painting with equipment removed.

A tenant may elect to temporarily remove their equipment and erect a temporary cell-on-wheels (COW) to maintain consistent service throughout the project.

If the ratio of coaxial cables to antennas is one-to-one, or as the structural integrity of the tank allows. drilled holes and insertion of a standard firewall grommet, shown at the right, to seal jumper cables can work in lieu of a welded pipe coupling penetration, shown above.

The cost difference between leaving the equipment in place and removing the equipment represents an additional labor cost associated with the project and is passed on to the tenants.

Finally, though language contained within the lease may not have taken this into consideration, a tenant may elect to temporarily remove their equipment and erect a temporary COW to maintain consistent service throughout the project. A meeting and site walkthrough soon after notification provides each tenant with the necessary lead-time to set up their

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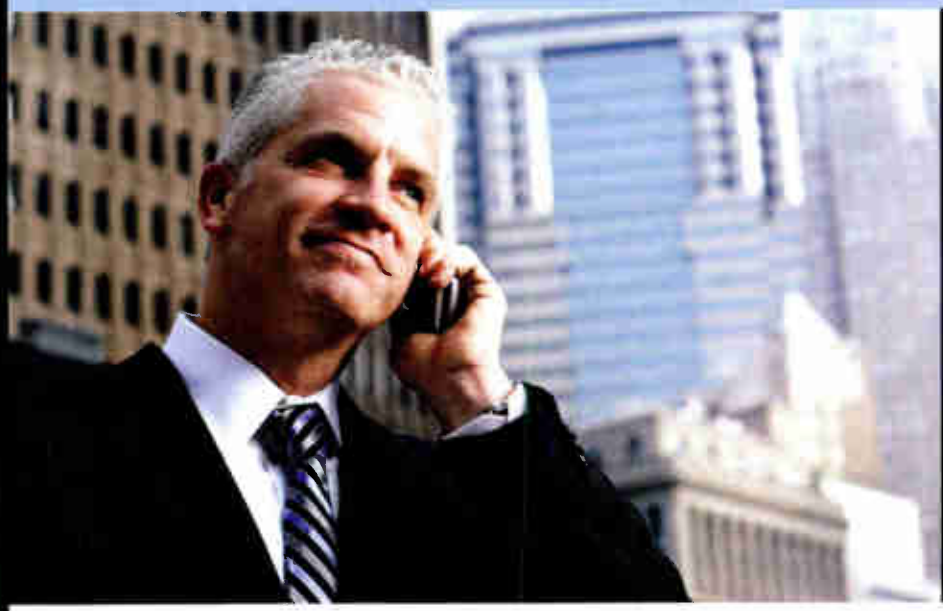

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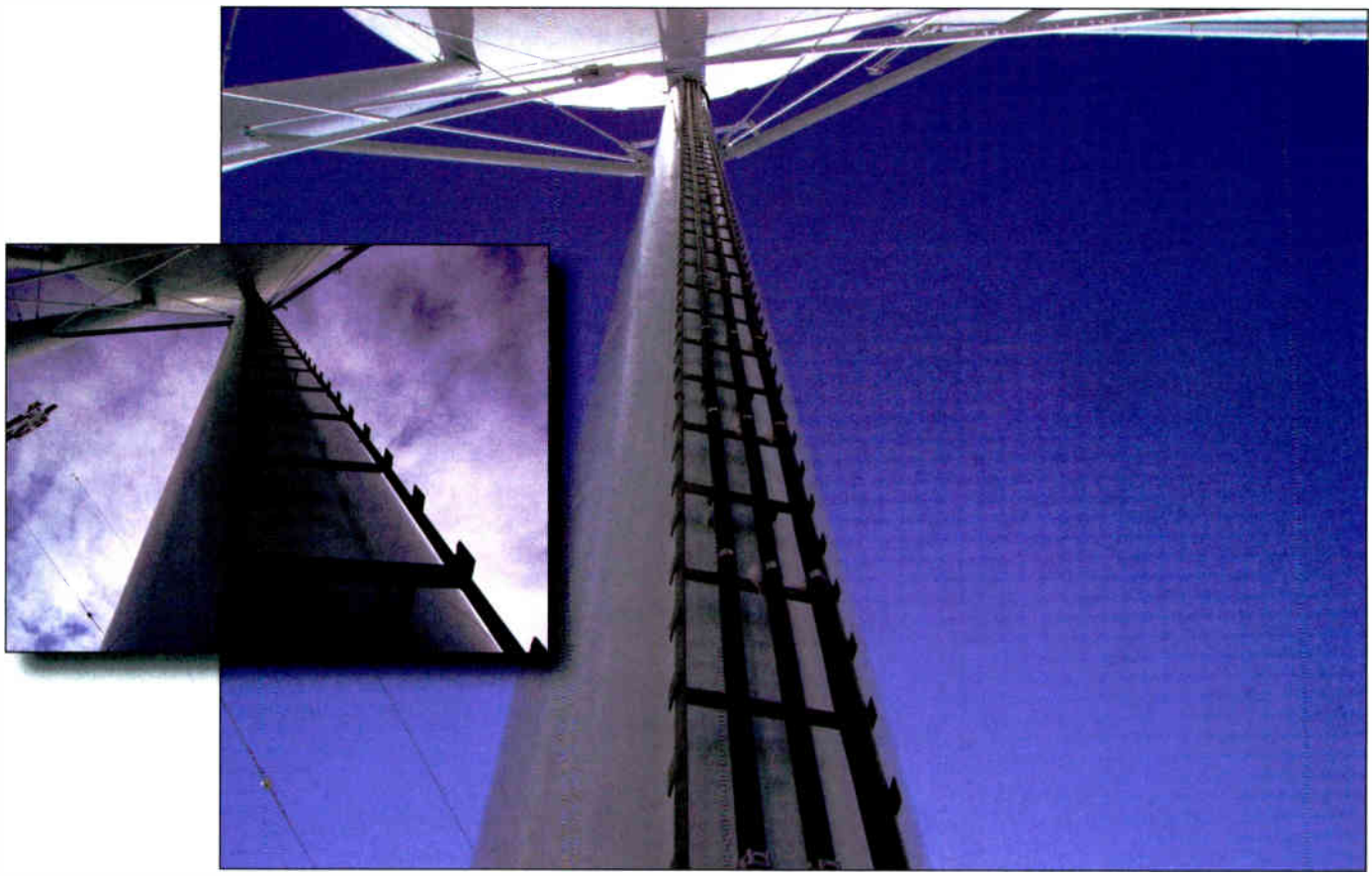

A finished project: A freshly coated multi-leg water tank was fitted with coaxial cable anchors along one leg. The inset shows the antenna from a cell-on-wheels (COW) peeking in from the left, as carriers removed some equipment from the water tank to allow blasting and coating. The photo at the right shows coaxial cables installed along the inside of one of the legs.

temporary system or plan for any site upgrades prior to mobilization by the coating contractor. Upgrades related to changing out antennas may be minor, however, upgrades may include an opportunity to properly seal or reset weld brackets by aligning them on the inside face of the support column on legged, elevated tanks. Additional options include the opportunity to change out coaxial cables and replace them with maintenance-free manufactured-colored cables that are more aesthetically pleasing as well as being more cost effective over the long term.

A well-thought-out planning process that aligns the needs of both the tenant and city is key to a win-win proposition. This process calls for solid design, low costs, and good timing for both parties.

Summary

Telecommunications installations are an integral part of our everyday lives. For many communities, their existence on our local water tanks and other city-owned infrastructure can provide the city with additional revenue. However, for the two to harmoniously co-exist it is important that functionality is maintained for both the telecommunication site and the water tank. To successfully achieve this result, a well-thought-out planning process that aligns the needs of both the tenant and city is key to a win-win proposition. This process calls for solid design, low costs, and good timing for both parties. Whether it be a new site construction or facility reconditioning: Antennas and water tanks can co-exist. agl

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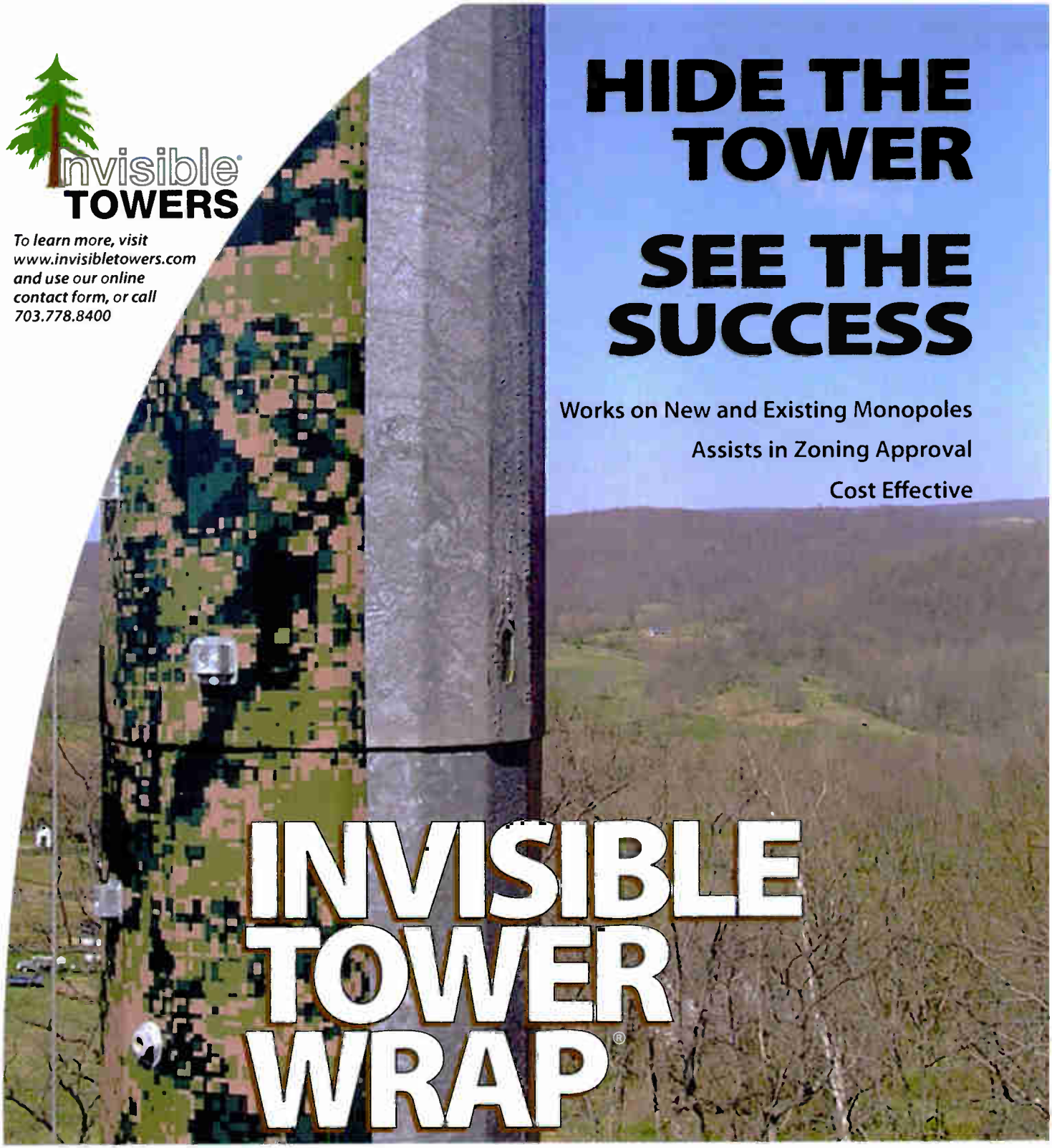

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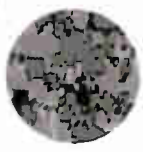

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Why TMAs Improve CDMA Networks

Escalating consumer dependence on wireless data networks is placing growing pressure on existing CDMA wireless infrastructure. This is highlighting the role of tower-mount amplifiers as an economical solution for improving BTS receiver sensitivity – thus improving overall network performance and network revenue.

by Rodrigo Oliveira

In the space of a few short years, tower-mount amplifiers (TMAs) have become globally indispensable in many mobile wireless communications networks. Initially widely deployed in first-generation networks, then global system for mobile communications (GSM) networks to overcome link budget imbalances between uplink and downlink, TMAs essentially boost the uplink signal to overcome receive-path losses, thereby improving base transmitter station (BTS) uplink sensitivity.

Historically, however, TMAs have not found as wide an acceptance in code division multiple access (CDMA)-based networks. Early network planners considered that TMAs would increase the noise floor of the spread-spectrum technology, leading to reductions in cell capacity. Moreover, since CDMA was adjudged an "interference limited" system, popular opinion supposed that improving uplink sensitivity would be masked by user interference as cell-loading increased.

Developments in BTS technology — along with the established global dependence on TMAs for wideband CDMA systems such as universal mobile telecommunications system (UMTS) — have altered this scenario from both a technical and ideological point of view. In fact, TMAs are now becoming an essential component of CDMA-based networks, particularly those that are uplink-limited, where they promote not only coverage improvements, but also capacity enhancements.

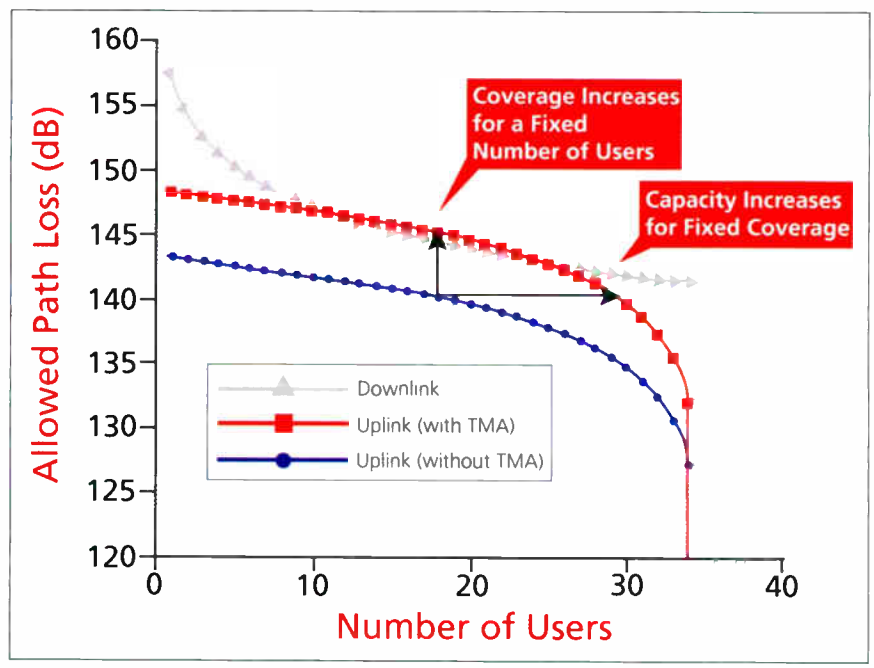

Figure 1. In a conventional 'uplink-limited' scenario, the variation of the 'allowed path loss' of both the uplink and downlink affects the number of users in a cell. The introduction of a TMA to the uplink increases the allowable path loss for a given number of users, yielding a corresponding increase in coverage area.

Uplink city limits

Put simply, the balance between the CDMA uplink and downlink has changed since the early days of CDMA. For one thing, base transmitter power has improved significantly, from 10 W

or 20 W up to around 100 W. With the downlink thus bolstered, any uplink limitations become more of a factor.

Moreover, a characteristic of spread-spectrum CDMA networks is the dynamic relationship between downlink and uplink, where the uplink performance is uniquely dependent on the number of users in a cell. This means that as the user demand on urban networks escalates — particularly the volume of transmitted data — the variability of uplink performance has a much more significant impact on the network.

This uplink variability in CDMA-based systems is known as "cell breathing," and results from the BTS commanding specific handset output powers to achieve the minimum signal-to-noise ratio in the receiver. As the number of users in a cell increases, the power output of handsets near the outer limits of the cell is eventually exceeded and calls are dropped. Hence the uplink boundary of the cell begins to shrink — or "breathe."

Significantly, CDMA cells can be either purely uplink limited, or a dynamic mix of downlink and uplink limited. Whether a cell is one or the other can often be difficult to predict. It is largely dependent on the "orthogonality factor" — a measure of the effect of multi-path dispersion — of the downlink, along with BTS technology and the number of users. If the downlink orthogonality factor is high, and the propagation path protracted, the downlink limitations are more likely to come into play, and the cell is more likely to be a mix of uplink and downlink limited.

Nevertheless, in both types of networks, the deployment of TMAs to amplify the uplink signal can play a key role in improving overall network performance and, ultimately, network revenue.

TMAs to the rescue

Consider first a typical purely uplink limited scenario. Figure 1 illustrates the variation of the "allowed path loss" of both the uplink and downlink with the number of users in a cell. The introduction of a TMA to the uplink clearly increases the allowable path loss for a given number of users, yielding a corresponding increase in coverage area.

However, an alternative view is that for a given coverage area (or allowed path loss), the number of users able to communicate increases. In other words, with a TMA installed to boost the uplink signal, cell breathing is delayed to a higher cell loading, thereby improving overall capacity of the cell.

In contrast, Figure 2 illustrates a mixed scenario where the cell is uplink limited in terms of coverage for a moderate number of users, but downlink limited in terms of capacity beyond a specific number of users. Introduction of a TMA to the uplink improves the uplink coverage, or alternatively allows increased capacity for a given coverage area until the downlink limitation is reached. In such capacity-downlink-limited networks, TMAs will provide the greatest benefit in rural or suburban cells, where capacity is less of an issue.

Irrespective of whether a cell is uplink or downlink limited, TMAs significantly reduce the power generated by consumer mobile handsets, compared with non-TMA use. Essentially, the BTS monitors the signal provided by the handset, instructing the handset to increase its power as required to reduce the bit error rate (BER). When TMAs are employed, the BTS demands less power from the handset, thereby maximizing its battery life. This reduction of handset power also reduces inter-cell interference, which has a flow-on effect of increasing the capacity of adjacent cells.

TMAs are now an essential component of CDMA-based networks, particularly those that are uplink-limited, where they promote not only coverage improvements, but also capacity enhancements.

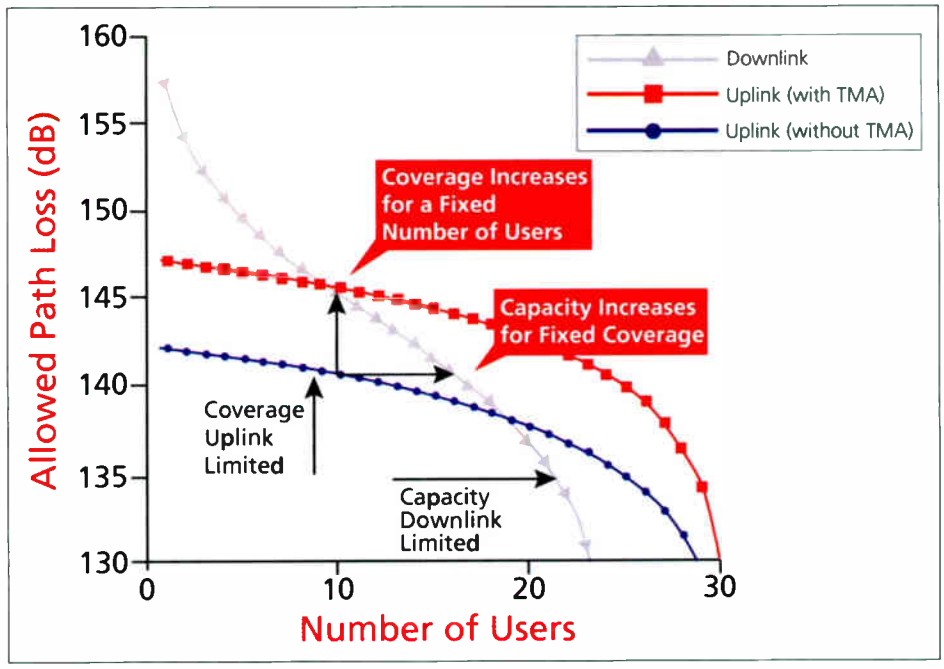

Figure 2. In this mixed scenario, the cell is uplink limited in terms of coverage for a moderate number of users, but downlink limited in terms of capacity beyond a specific number of users. A TMA in the uplink improves uplink coverage or allows increased capacity for a given coverage area until the downlink limitation is reached.

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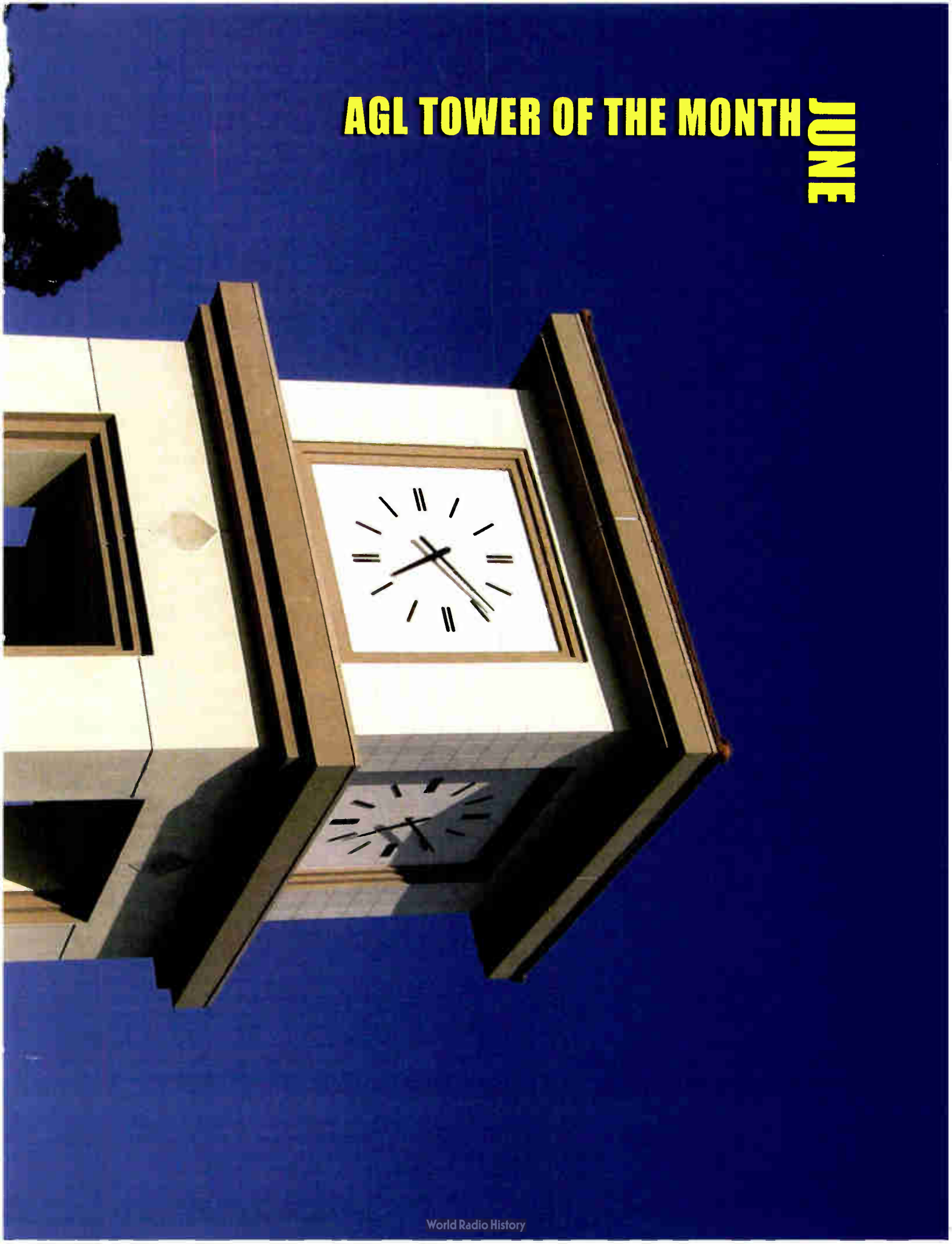

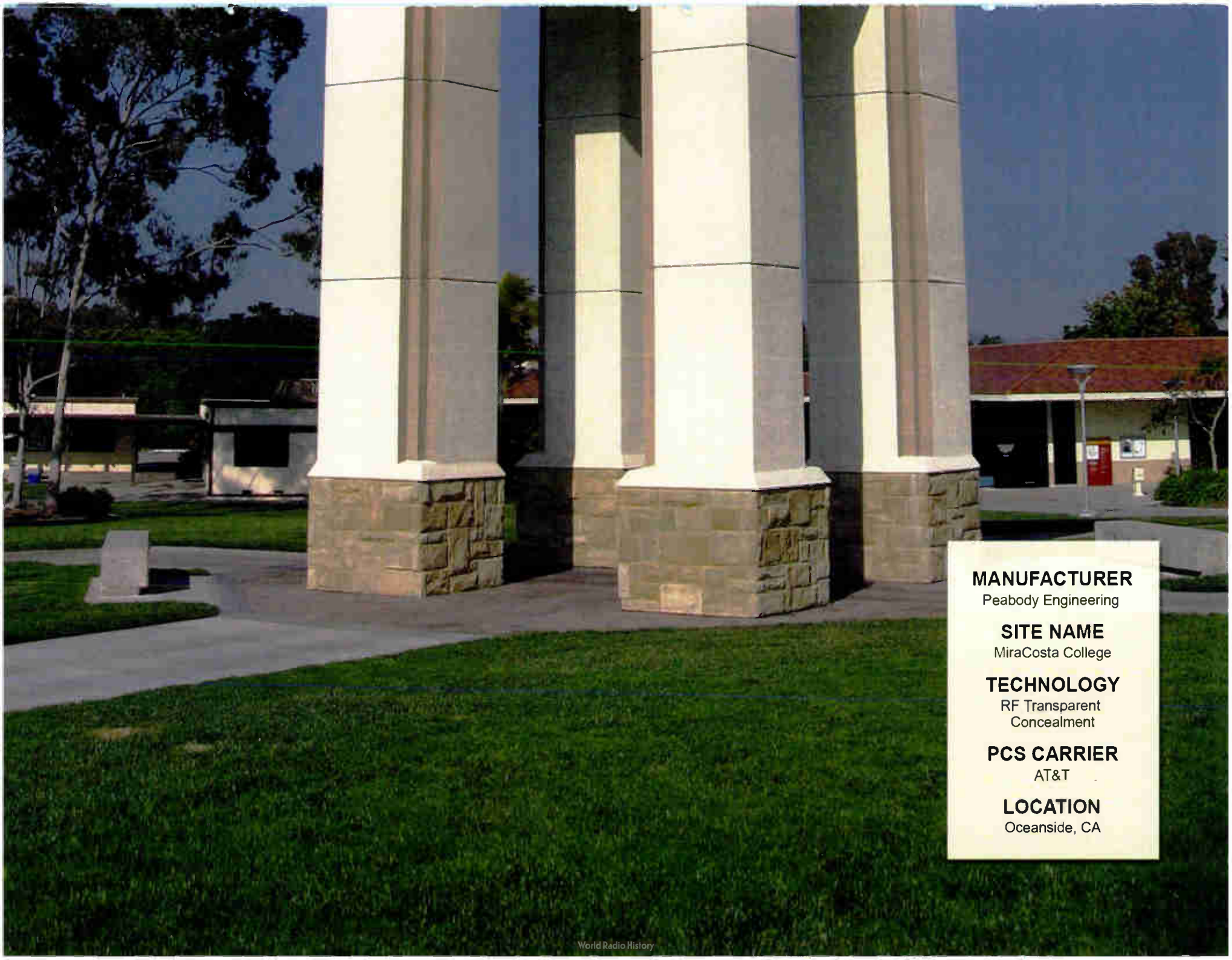

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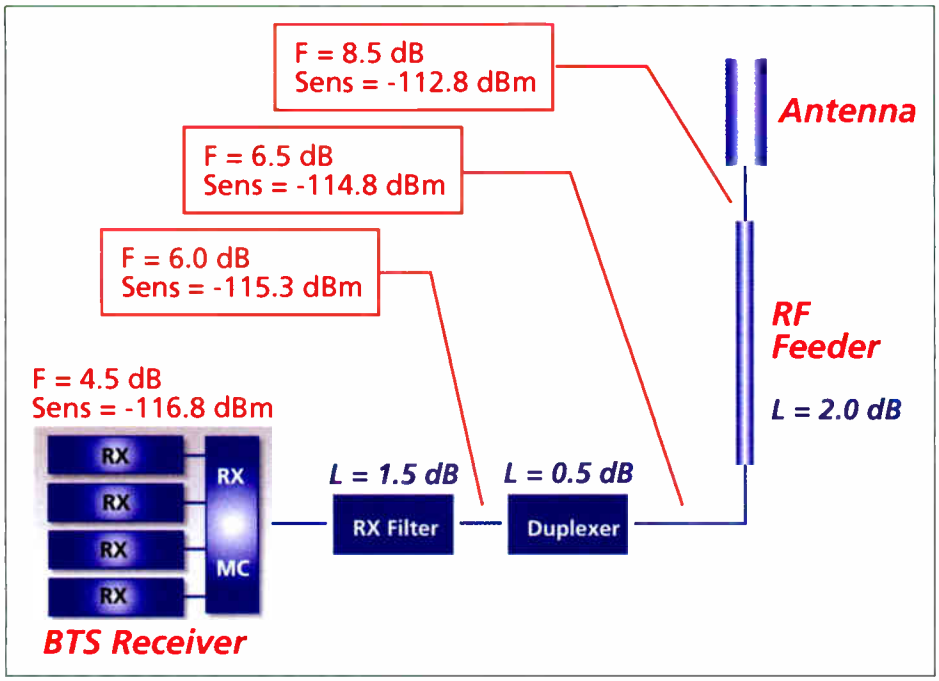


Figure 3a. For a typical scenario where no TMA is installed, the RF receive path and signal losses are due to the different line components installed between the antenna and the base station receiver.

Improving sensitivity

In principle, a TMA is a low-noise amplifier installed in the RF receive path as close as possible to the receive antenna. Its purpose is to overcome or mask the affect of the receive path — which might include transmission line, duplexers and filters — on the system noise figure, which has a direct effect on receiver sensitivity.

For example, the sensitivity of a receiver channel is a function of the sum of three fundamental factors:

- Ambient noise power (NP)
- Carrier-to-noise ratio (C/N)
- Noise figure (NF)

Network operators have no influence on the first two. The *ambient noise power* is a measure of the noise in nature and therefore fixed for a specific carrier bandwidth. *Carrier-to-noise ratio*, a function of BTS design, is a measure of the relative strength between the received signal and noise floor. *Noise figure*, on the other hand, can be addressed.

When TMAs are employed, the BTS demands less power from the handset, thereby maximizing its battery life. This reduction of handset power also reduces inter-cell interference, which has a flow-on effect of increasing the capacity of adjacent cells

Noise figure is the decibel equivalent of "noise factor" (F), which is the ratio of signal-to-noise ratio (SNR) "in" to SNR "out" of an RF line component. In other words, NF is a measure of the degradation of SNR caused by components in the RF signal chain. Consequently, it is the "system NF" that becomes the targeted parameter for improvement.

The following example illustrates how installation of a TMA, which is an active device, close to the antenna can mask the losses attributed to the passive devices in the RF chain, thereby substantially improving receiver sensitivity.

Figure 3a illustrates, for a typical scenario where no TMA is installed, the RF receive path and signal losses due to the different line components:

- The "ideal" sensitivity of the BTS receiver is 121.3 dBm.
- The system NF is 4.5 dB (receiver circuitry) + 4 dB (RF line components) = 8.5 dB.
- The "actual" receiver sensitivity is consequently 112.8 dBm.

Now consider Figure 3b, where a TMA is installed close to the receive antenna. The system noise factor, F, from which the "effective system NF" is determined, is in this case defined by the following formula:

$$F = F1 + (F2 - 1)/G1$$

where

F1 = the noise factor of the TMA
F2 = the noise factor of the BTS receiver
G1 = the gain of the TMA

The noise factor formula uses non-decibel figures, where (in the current example)

F1 = 1.4 (from 1.5 dB)
F2 = 7.1 (from 8.5 dB — the system NF defined above)
G1 = 20 (from 13dB)

This yields a system noise factor value of F = 1.7, which corresponds to an effective system or cascaded NF of 2.3 dB. In other words, the effective losses of the system are 2.3 dB with the active TMA installed, instead of the 8.5 dB losses associated with the passive RF line. This means that the "actual" sensitivity of the receiver becomes –119dB instead of –112.8dB (when no TMA was installed), an improvement of 6.2 dB.

This calculation also illustrates why it is essential to install the TMA close to the antenna: If the TMA were located

at the bottom of the tower, the losses incurred to that point would need to be added to the cascaded NF. This would negate much of the positive impact of including an amplifier.

The ideal gain

It follows that the two TMA parameters of most importance are the noise factor/figure and gain. Ideally, TMA noise figures should be less than 1.4 dB. As for gain, the industry range is generally 8 dB to 16 dB: Less than 8 dB engenders insignificant system NF improvement, while more than 16 dB results in amplification of the noise floor and excessive BTS dynamic range compression. In practice, a gain of around 12 dB has been found ideal in terms of balancing all these system considerations.

In addition to the low-noise amplifier, TMAs include highly selective bandpass filters to provide protection against out-of band signals. Ideally, these eliminate potential receiver blocking issues, which can affect the detection of weak in-band receive signals. TMAs should also include an internal bias-tee, which removes the DC current from the input port to power the amplifier.

The physical design of TMAs is also crucial for both environmental and structural reasons. Visual effects and tower loading are ever-present issues, leading TMA designers to focus on compact and lightweight units that are easy on both the eye and the pocket from a site leasing point of view. The same drivers are also leading to an expanding range of multi-band and multi-functional TMAs that offer base station developers maximum flexibility.

For example, many carriers are using the same base station sites for 800 MHz and 1900 MHz services. One scenario would be to deploy a TMA on the 1900 MHz uplink only, in an attempt to balance the coverage of the two services. Alternatively, if both cells are uplink limited, including a dual-band TMA would improve the coverage/capacity of both cells. Such advanced dual-band TMAs even feature integrated diplexers to permit a single TMA to support a system using shared feeders.

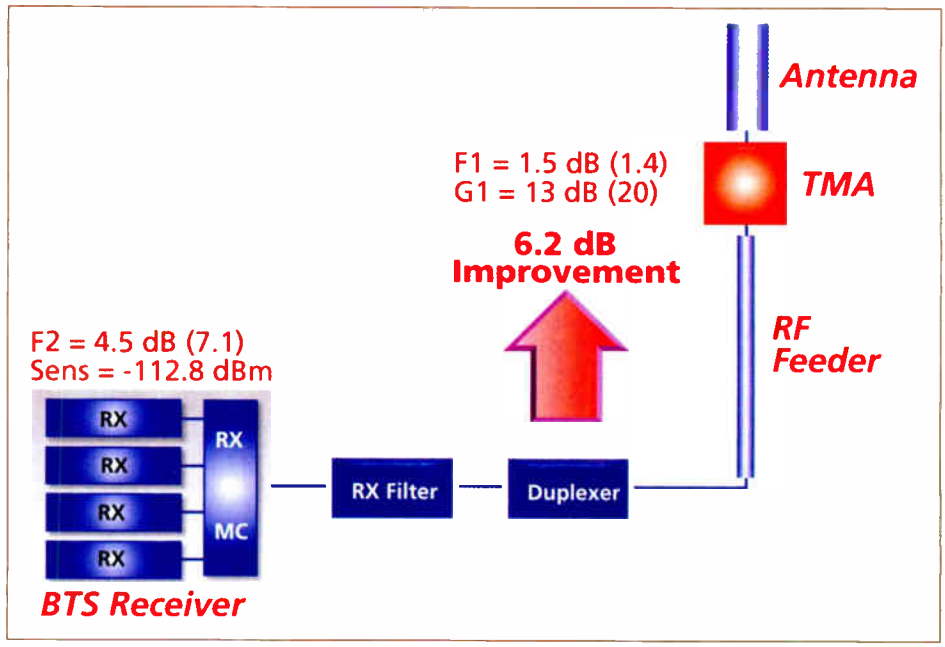


Figure 3b. Where a TMA is installed close to the receive antenna, the 'actual' sensitivity of the receiver becomes –119dB instead of –112.8dB (when no TMA was installed), an improvement of 6.2 dB.

Conclusion

There is little doubt that the escalating volume and speed of transmitted data in cell-based wireless communications networks is placing corresponding pressure on existing network infrastructure. Significantly, the cell breathing effect that is unique to CDMA services has caused the number of cells that are at least partially uplink limited to surge. Use of TMAs in CDMA networks should therefore not be discounted, as the advantages to be gained greatly outweigh the cost.

A TMA demonstrably improves BTS receiver sensitivity, by masking the effect of the RF receive path on the signal. This results in an abundance of benefits:

- improved coverage for a set number of users
- improved capacity for a set coverage
- improved performance through minimizing BER
- improved handset battery life.

These enhancements are especially noteworthy in networks that are purely uplink limited; however, the effects are still significant in networks that experience both uplink and downlink limitations, depending on cell-loading. agl

Visual effects and tower loading are ever-present issues, leading TMA designers to focus on compact and lightweight units that are easy on both the eye and the pocket from a site leasing point of view

Rodrigo Oliveira is area product manager for Wireless Infrastructure Solutions with Radio Frequency Systems, *www.rfsworld.com*. His email address is *rodrigo.oliveira@rfsworld.com*.

Antennas in the Belfry

Part 1 — The local neighborhood church can provide support, in more ways than one, for a wireless telecommunications facility.

by Mario Calabretta, P.E.

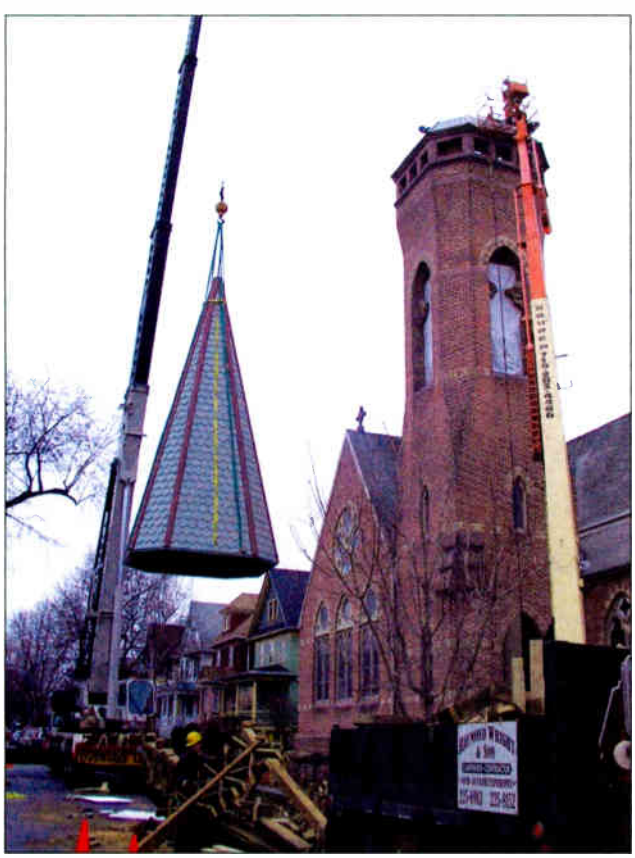
The landscape has changed for the wireless industry, figuratively and literally.

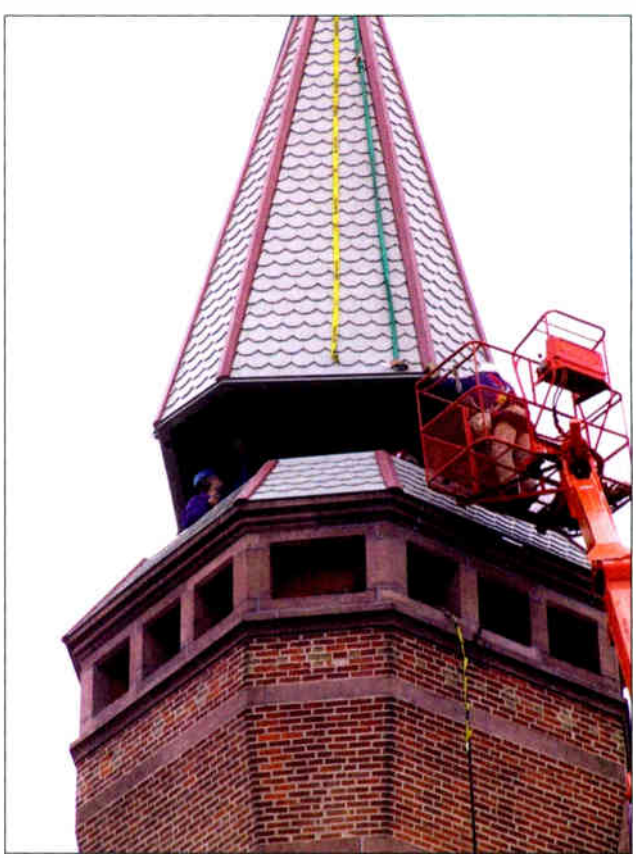
From changes in technology and mobile applications to new regulations and carrier consolidation, the wireless world today is different from the one to which I was introduced almost ten years ago. This is not really news. Change in the wireless industry's figurative landscape is natural and even expected, something one would find in any growing and developing industry.

As a professional engineer involved in the design of upwards of 1,000 telecom sites, I have observed that there is another, more *literal* sense, in which the wireless landscape has changed, specifically related to the *built environment*. In recent years I have noticed a shift in carrier focus from large-scale build-outs focusing on *coverage* to smaller-scale infill builds focusing on *capacity*. A byproduct of this shift is a change in perspective regarding the utility and viability of non-standard structures for use as telecom facilities. For the creative design team, this shift poses both challenges and opportunities.

Coverage!

My involvement in the wireless industry began in the late 1990s when "Coverage!" was the battle cry on the lips of every site acquisition specialist I knew. These specialists were being prodded, badgered and harrowed by radio frequency engineers who





Typical steeple installations utilize readily available manpower and equipment. Photos: Fiberglass Specialties.

were trying to implement broad-based, workable wireless systems. I mean no offense in characterizing my good friends, the RF engineers, in this way — I admire their effort and zeal.

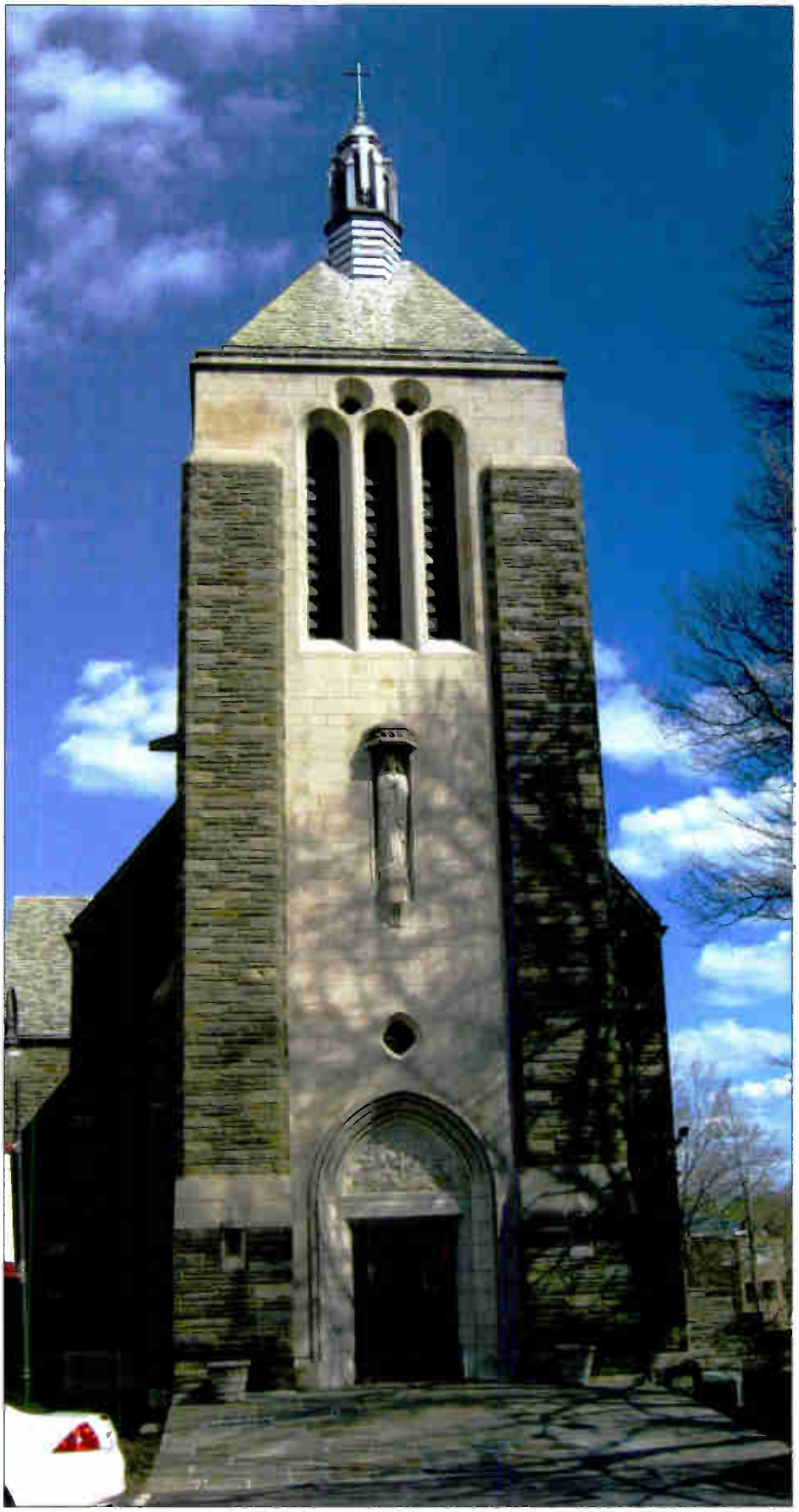
"Coverage" was not easy to achieve in southeastern Pennsylvania and New Jersey, my main geographical area of focus. A two-hour drive in any direction can take you to the heart of downtown Philadelphia, to the rolling farmland of Amish country, to the ski resorts of the Pocono Mountains or to the boardwalk at the New Jersey shore. Each environment has its own set of design and jurisdictional challenges. Despite these challenges, national carriers have been successful to a high degree in achieving many of their coverage goals for this region.

I haven't discussed "coverage" with my RF engineer friends for some time. I can't remember the last time my phone flashed "No Service Available." The only error message I see on my mobile phone lately is "Call Failed," and this happens in areas I know to have adequate "coverage." Although this evidence is anecdotal — and there well may be other contributing factors for this state of affairs — the density of wireless users in a given area is often the underlying cause.

Capacity!

Today, my discussions with RF engineers often relate to *capacity*. This does not mean that new coverage sites are not being built as markets expand, but it does mean that capacity improvements are receiving attention in the more well-developed and mature core areas of various markets. In my experience, the new battle cry seems to be "Capacity!"

With capacity in mind, consider the physical infrastructure that all telecom facilities need, namely the antenna support structures themselves. I am,



On some occasions, camouflage doesn't have to be elaborate. The antennas on this project mimic adjacent architectural elements to blend into the existing cupola. Photo: Mario Calabretta, CMX Engineering.

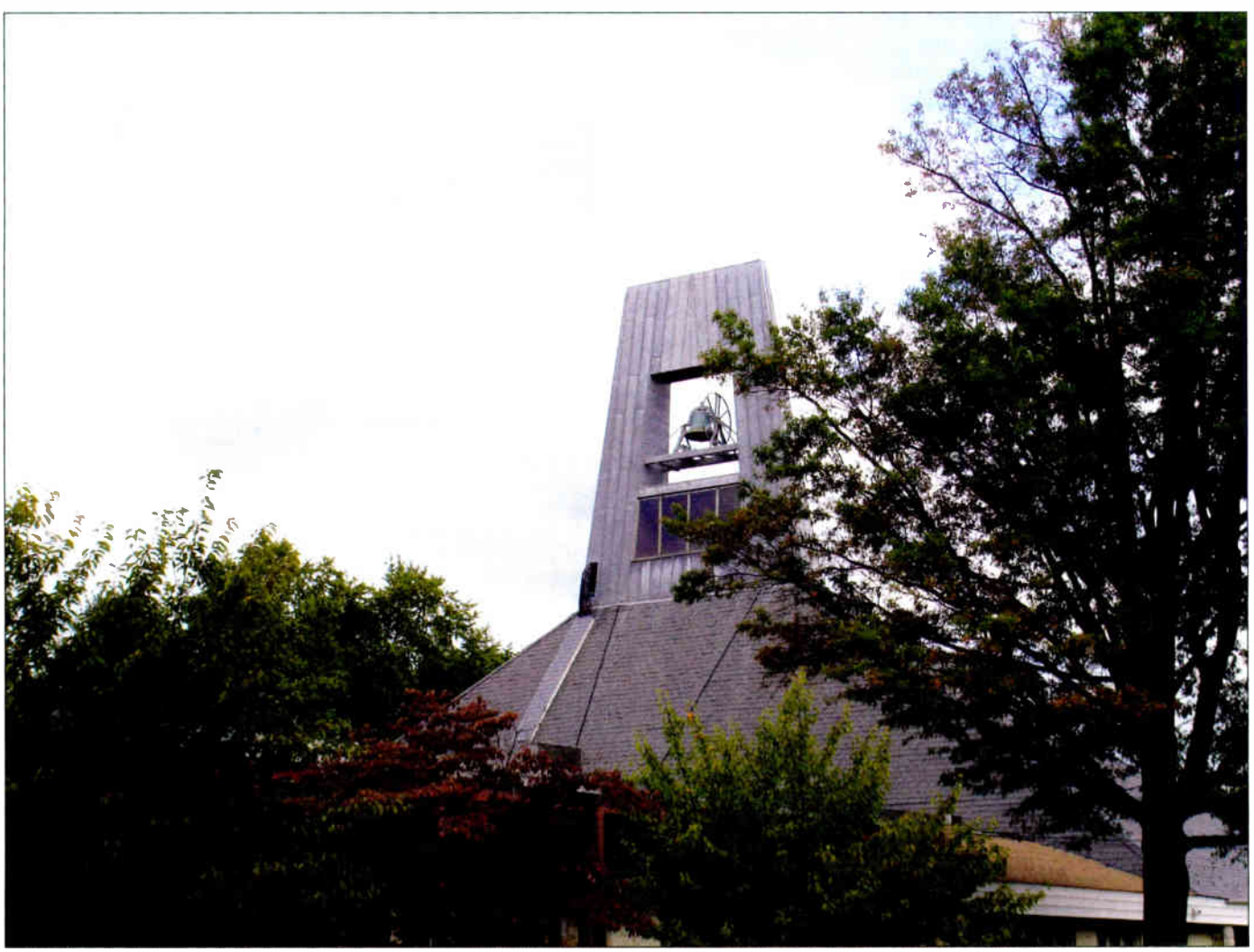
after all, a civil engineer, and if I don't talk about buildings and other various structures, after a while, I get fidgety. The most common antenna support structures are *monopoles, lattice towers, water tanks* and *tall buildings*. When "Coverage!" used to be the battle cry, proposed structures were designed and built to place antennas as high above grade as practical. Usually close to 200 feet was considered optimum, although if my RF engineer friends were feeling particularly jovial on a given day, they might settle for 190 feet.

It was not unusual to provide substantial structural extensions on water tanks and smokestacks to make them "viable" as telecom sites. As the emphasis has shifted to *capacity* as a major factor for site location, shorter antenna support structures that would not have been considered before have become viable, and in some cases, preferable. One such structure is the church steeple.

Renaissance

I am enamored with church architecture. It's the Italian in me. Even with the intervening five centuries, as a people and a culture, we Italians haven't quite gotten the Renaissance out of our blood. I am particularly drawn to church towers, spires and steeples. A major portion of my undergraduate and graduate work involved architecture as well as engineering. As I travel, whether in the countryside or in the city, I have a camera close at hand in case I stumble upon a noteworthy church steeple. A soaring and graceful steeple never fails to remind me of the harmony possible between architecture and engineering. I bemoan the fact that such a significant architectural feature is often omitted from new church buildings, particularly since a remarkable opportunity exists for both the churches and the various wireless carriers. For the building owner, this opportunity is for the most part financial in nature. For a wireless carrier there are other, sometimes overlooked, opportunities that make such an installation a viable alternative to traditional telecom sites in several notable ways.

First, *churches tend to be where the people are*. In urban and suburban markets in particular, they are usually found at the centers of highest population density and often in prominent locations



Even a modern bell tower can lend itself to a concealed telecom solution. Photo: John Baptista, CMX Engineering.

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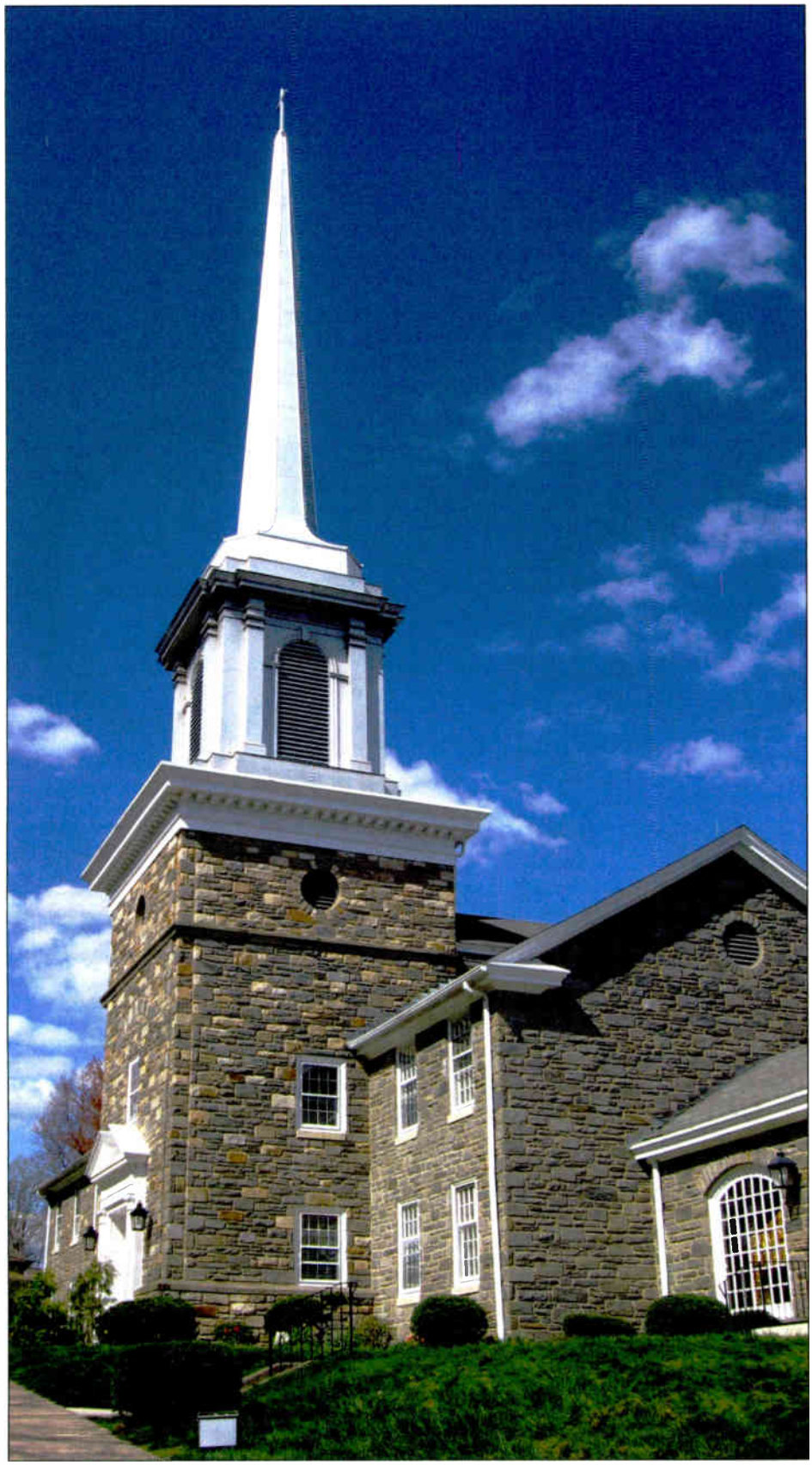

One, two, three carriers and counting... Who would know? Photo: Mario Calabretta, CMX Engineering.

in the landscape or cityscape. Because churches typically draw most members of their congregations from a limited nearby area, wherever you find a significant number of people you will find a church or, more likely, several churches. Believe it or not, there are more than 300,000 churches in the United States. That's more than 10 churches in the United States for every McDonald's restaurant franchise *worldwide*. It may be difficult *not* to find a church or two within a given search area.

Second, *steeples are viable structures for collocation*. Existing churches, particularly older ones, often have a tall, pointy thing sticking up above their roofline — a bell tower, cupola or steeple. These are almost always thinly clad, hollow structures with sufficient room within their envelope for antennas and coaxial cables and sometimes also for equipment cabinets.

RF compatibility

From a practical standpoint the steeple sheathing is almost always incompatible with RF transmission and must be replaced with composite or fiberglass panels at the elevation of the antennas and painted to match the existing conditions. Antennas can even be mounted on the exterior of a steeple, but in this case must be camouflaged with some sort of architectural treatment to make them acceptable to the church and the local zoning board.

Although height is usually the most important consideration from an RF perspective, steeples often have several usable rad centers between 50 and 80 feet and sometimes even higher. A few years ago I would have felt foolish to even suggest such a low rad center to any of my RF engineer friends, but recently many rooftop sites and even some monopoles that I have worked on have had rad centers below 75 feet and a few under 50 feet. Steeple sites are not boomer sites, nor are they meant to be, but as an infill solution in a mature network, they are an optimal choice for many circumstances.

Third, *churches have certain advantages from a zoning and community perspective*. Zoning boards almost

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Why Church Steeples?

1. Churches tend to be where the people are.
2. Steeples are viable structures for collocation.
3. Churches have certain advantages from a zoning and community perspective.

always prefer existing structures as telecom sites. In some districts, an existing steeple may be the only tall structure within a given area that is acceptable to a highly restrictive board. Concealment, which many zoning boards prefer, if not require outright, is almost guaranteed when a steeple is used. A concealed site does not usually raise the hackles of the community as much as a raw land solution.

A church's positive relationship

Add to this that, as a rule, churches tend to have a positive relationship with the local community and you are well on your way to diffusing the typical NIMBY reaction that telecom sites often engender. If you attend as many zoning hearings as I do, you know that it is not unusual to have six to ten (or more) attendees in opposition to a particular telecom project. The church board, usually the decision-making body for the church, can often be counted on to appear at approval hearings as a group along with other members of the congregation to show support for the proposed site. A church can easily have a dozen or more supporters at a hearing – something those of us who regularly give testimony before such boards find immensely helpful.

Obtaining such support from the church board, the elders, the congregation or some combination may be the most challenging aspect of such a project. It requires tact, patience and a willingness to understand the perspective of a unique sort of landlord. It is not the same as dealing with a commercial property manager, a municipal authority or the owner of a public storage facility.

New steeple option

Clearly, several advantages are evident for using existing steeples as

antenna support structures, but what about modern churches that often do not have a steeple? A common approach is to build a stealth flagpole or even a stealth cross somewhere on the church property, but I would like to suggest that a new steeple is also an option. Stealth flagpoles and large freestanding crosses are not traditional features of church buildings and often attract more attention than is desired. Besides enhancing the appearance of an existing structure, a new steeple often receives favorable zoning treatment.

An RF-transparent, pre-manufactured fiberglass steeple can be shipped to the church site in one piece and installed in less than a day. Steeples and cupolas can also be built on-site using prefabricated support frames and composite panels. Of course, the existing building must be analyzed and perhaps reinforced to make sure that a new steeple is feasible. Although supplying a new steeple is probably not a first choice, it may be the only possibility in some situations and should at least be considered. In such a circumstance, the question of increased cost immediately comes to mind. Yet my experience has shown that even traditional telecom sites on rather non-exceptional buildings sometimes encounter sufficient difficulties with the landlord, burdensome zoning requirements or technical and structural issues that the cost of such an installation ends up being two-to-four times more than expected. A non-traditional, alternative site such as a new or existing steeple should not be dismissed out of hand due to preconceived notions regarding cost, particularly if good design principles are properly exploited.

Yes, the wireless landscape continues to change. Those involved in designing, leasing and building telecom facilities provide a valuable benefit to the end-users of these systems. By utilizing stealth steeples as alternative telecom structures, the physical landscape can benefit as well, particularly if aesthetic and engineering principles are carefully integrated. Perhaps even telecom can experience a "renaissance" of sorts.

Next: Watch for Part 2 of this series, which will focus on the aesthetic and design challenges of a church telecom installation as well as the unique issues that must be considered when a church is the landlord. agi

Mario Calabretta is a registered professional engineer in the Lansdale, PA, office of CMX Engineering and also serves as the Secretary of the Pennsylvania Wireless Association.

ConcealmentTech

Sean McLernon, CEO of Stealth Concealment Solutions (left) and Curtis M. Holland, esq., of Polsinelli Shalton Flanigan Suelthaus P.C. take questions from the audience at a meeting of the MoKan Wireless Association.

A concealment company executive and a land use attorney spoke at a meeting of the MoKan Wireless Association. Here are their remarks, edited for length and clarity.

speeches by Sean McLernon and Curtis M. Holland, esq

SEAN MCLERNON We do every type of concealment there is. Our claim to fame is highly customized concealments.

We deal with a small market because we deal with carriers, and there are only a few large ones. Plus sometimes the field grows smaller, as it does with consolidation, such as Sprint merging with Nextel.

Carriers sometimes hire contractors to do concealments who haven't done much of it before. It's hard to believe, but not many tower contractors have installed rooftop concealment products. That can be a problem with our product, because our concealment is carpentry. When you have a tower crew on a carpentry job, it can be like putting a square peg in a round hole.

Some highly customized concealments are expensive and built to accommodate four and five carriers at a time. Many are built on spec. Some entrepreneurs are building concealment sites outside the carrier and then going to find the carrier. Some get built quickly.

When we are involved in the project early, we can make a world of difference. There are better economies to be had if we know the project is coming. Until now, concealment has been an afterthought, like life insurance. Everybody has to have it, but if you ignore it until the last minute, it may cost you more than you want.

We hear the constant refrain about

...ology: Pros & Cons

concealment: expensive, expensive, expensive. But expensive compared to what? Not getting the site built? Getting the site, but not having the desired coverage, and dropping the calls?

Concealment definitely costs more than what was originally planned, but the concealment is almost always more expensive when we're not involved until it is a purchase decision and not a strategic decision going in.

Concealment done right, done well and done early can be as inexpensive as possible. We have 16 years of experience working with all the carriers so we understand what each carrier is doing, and we bring that experience to the table when we do a project. It's not often we get to use that experience.

We've never been called in by a carrier who said, "This is our build for the year, and we think 20 percent will be concealed. Take a look and give us an estimate of the costs." Unfortunately, that has never happened.

Turnkey installation

It is not unheard of for a concealment company to provide everything turnkey, with the full installation and handing over the completed site, with the possible exception of the electronic equipment installation. We have done primarily prefabrication in the past where the product gets picked up and put on the roof with as few moving parts as possible.

On both coasts, a trend among carriers is to ask, "Can you build this for us and can you install it for us?" We're doing a lot of turnkey installation on the West Coast and some in the Midwest, with a foothold in the East. We work with strategic partners who we know can do the job and stand behind it. That's a different kind of business for us.

This is a big year for poles. It is early in the year, but if our quoting is an indication, the flagpole design is going to have a good year.

We handle concealment ranging from a small shroud that fits on the roof to a site in Texas over 190 feet tall. We have two or three of those really large and ornate jobs in the pipeline, discussions, but no orders yet. The larger Texas project has lights and a cross and a stone texture in order to mimic the look of the church. It includes antennas for three carriers.

The carrier, the architect, and the pastor — everyone was involved. Everyone treated each other like partners, not vendors. When we can play that role, we can help it go as smoothly as possible.

Maintenance

Let's talk about maintenance because routine maintenance doesn't often get done on concealments.

Concealment sites don't last forever. They need maintenance, especially trees and rooftops. The chance exists for things to fall off or bolts to work loose. You need to know that's out there. The carriers are talking more about that. The maintenance part of the industry will grow as more people learn about concealment and how it can be used to save money and hassle.

Take trees for example: We would advise a tree should be visually inspected every six months and if you have had weather in the meantime, sooner than that — after every major storm. You don't have to test every connection, but inspect the branches. If you see something suspicious, such as rusting, the steel might not have been hot-dipped galvanized and instead may have been cold galvanized, which does not offer maximum protection and may be more prone to rusting.

You may see pieces of the branches falling off. Maybe not the trunk, but if you go to the site and see some branches lying around, you know you have a problem. It goes back to the manufacturer's warranty as to how long they will stand behind it.

Sunlight can fade the paint on tree poles, depending on the type of paint. The needles can fade, depending on whether the material used in their manufacture was UV tested. With our product, the needles are replaceable without replacing the branch. We test all materials for UV or buy UV-tested materials.

Paint has been resilient and held up well. The panels have, too. The trees are assaulted from 360 degrees, so it is harder to predict what will happen.

Some trees are fitted with cladding rather than paint. Cladding is unnecessary, but if the town requires it, it's expensive because it involves a lot of handwork.

Another component is having a proper installation crew. If the wrong crew installs it and doesn't put things in or forgets and damages it, it shortens the lifespan of the product.

Product design

Speaking problems with flags being torn on concealment flagpoles, we are under some limitations with the design of that product because it has to be RF transparent. The bolts that hold the antenna cylinder are there in name only. You have to pull each one off individually, and then you have the problems at the tops and bottoms of the cylinder. In R&D, we are looking for a different way to do that. We have sold thousands and thousands of flagpoles nationwide and we have a failure rate of less than 1 percent.

Yet, we recognize the need there. With a flagpole, the real flagpole, it has to be smooth or the rope will catch and the flag will be torn up. We sell so many flags because they get torn. Anything, the slightest thing coming off that canister, is going to catch the rope.

We hear the constant refrain about concealment: expensive, expensive, expensive. But expensive compared to what? Not getting the site built?

We're working on options such as a

Concealment poles such as flagpoles, trees and custom structures, begin their fabrication process at Stealth Concealment Solutions as raw steel tubes. The factory has tools for steel punching and shearing, automated steel cutting, and welding.

recessed buckle you would clamp down that wouldn't catch on anything. I can promise you that help is on the way.

We had one fail in a storm and brought it back and discovered that not all the bolts had been installed — that's $3,000 later. That's why we have partners on the installation side so things get done the way we want it to be done, not just hammering in three screws and take the crane down later. It's not a perfect product. It's not built to be taken down and put back up and taken down and put back up.

CURTIS M. HOLLAND The zoning application process can be summed up this way: The jurisdiction doesn't want a tower and the carrier wants to improve service. An attorney representing the carrier has to understand what the client needs and what the jurisdiction doesn't want and try to find a compromise.

A rooftop concealment can be the most cost-efficient option while blending in with existing structures. Chimneys, screens, side-mounted boxes and penthouse structures can be the fastest to build, have the highest ability to expand and be the easiest to install resulting in the shortest timeline to getting a site on the air.

When the Telecom Act was passed in 1996, many communities began changing zoning regulations. A number imposed moratoriums for a while. Our law firm became involved in those battles where the community was changing zoning regulations to address a flood of applications. We had a round of those in the mid-'90s, but in the last 10 years or so, five or six years, all of that has settled down. You haven't seen a lot of changes in communities for their regulations until recently.

I don't know what happened to stimulate recent activity, but for example, in Kansas City, KS, a lawsuit is pending. In other communities, we're seeing proposed amendments to wireless regulations in Kansas City, KS and Olathe, KS. There also is a particularly ornery regulation proposed in Camden County, maybe the most egregious I've seen.

Disguise and concealment

There has been a trend by the local community government pushing the delivery of wireless services to a stealth or concealment proposal. What I see here are efforts in two ways.

1. *The regulatory change* — When you make an application for zoning approval, we're seeing *special use* or *special exceptions* — they call them different things in different communities — specific requirements such that on your application you must explain why you can't do something with stealth.

If you're proposing a project on raw land, regulations you start finding

If you're proposing a project on raw land, regulations you start finding now ask why you can't do something stealth. We're meeting those things on the regulatory side.

The communities themselves are trying to incent the carriers and tower business toward these applications by making the approval process easier if you come in with a stealth-type application.

In a typical zoning application for a tower you have to go through the planning commission and hearings, the city council and hearings, and it can become ugly when neighbors participate. The regulations provide incentives so you don't have to go through that process and instead receive administrative approval. If you are going to attach antennas to a building or inside a bell tower, more frequently you will see these things allowed by administrative approval and not the zoning process.

We're still struggling with other stealth technologies such as the flagpoles, the trees, the flagpole without the flag, and frequently you have to go through hearings.

With rooftop collocation, water tanks and church steeples, frequently the jurisdictions are allowing them by administrative approval or building permit.

In short, you're seeing changes within zoning regulations that are incenting carriers to stealth.

2. Less regulatory and more practical — If regulations are silent about stealth if you're applying for a new facility, you will be asked, "Why can't you do that?" Everyone knows we've already thought through those kinds of things, but you have to provide the explanation. Every time we come for a new facility, the search ring will dictate whether

	ROOF TOPS Screens/Penthouses Side Mounted Boxes	CONCEALMENT POLES Flagpoles/Trees/Custom	CONCEALMENT STRUCTURES Bell/Cross/Clock Towers
Ease of Installation	Simple	Simple	Challenging
Required Site Prep	Least	More	Most
Time to Complete	Fast	Fast	Slower
Average Price	$-$$$	$$-$$$$	$$$-$$$$$...
Flexibility for Expansion	High	Minimum (unless purchased in advance)	Medium (based on design selection)
Retrofit Expense	Least	Most	More
Serviceability	Easy	Driven by Height/Location	Driven by Height/Location
Cost Drivers	Architectural Complexity Size Façade Matching Existing Structure Limitations	Degree of Customization Size/Flag Size Number of Carriers Diameter/Antenna Needs	Fully Concealed or Open Design Size Number of Carriers Level of Customization
Post Installation Cost to Own	Minimal to Medium	Medium (flag, branch and landscape factors)	High
THE BOTTOM LINE	**Most Versatile Easiest to Build Least Expensive Invisible**	**Least Versatile Can Be Fast May Be Expensive Landscape Enhancement**	**Endless Variations Longest to Build Most Expensive Architectural Enhancement**

This copyrighted table from Stealth Concealment Solutions compares rooftops, concealment poles and concealment structures used in typical wireless telecommunications carrier installations. A copy in poster form is available from the company at *www.stealthsites.com*.

stealth or concealment methods.

In our area, you have two scenarios: urban metro Kansas City with suburbs, and rural areas including the outskirts of town and along the highways and in the agricultural areas. There are different opportunities for stealth in those two areas.

Urban vs. rural areas

In urban areas, there are high-rise buildings, more churches and more parks. There are high-voltage transmission lines and more frequent opportunity to use stealth in urban areas than in rural areas.

In rural areas, the question of stealth hardly ever comes up. Sometimes you have a member of a board who travels and sees a stealth antenna elsewhere and asks, "Can it be done here?"

We are seeing a trend in the efforts from communities directed to carriers to motivate them or require them to look at alternatives to towers, and by regulation to make them give an answer why they can't use alternatives. For example, in Kansas City, KS, you have to explain on your application that you can't replace your coverage with two shorter poles rather than one tall pole. You have to explain in the application why that doesn't work for you.

Community policy and tower height

We know it costs twice as much or more to achieve the same coverage with multiple, shorter towers. Each community has been different. It is a community policy whether to have more and shorter towers or fewer and taller. Depending on the zoning director, you will get more specific direction. In Kansas City, KS, the zoning director prefers more towers around town.

When they have an initiative like that, it also says you have to build to have two or three carriers on a pole. It

monopine if the initial carrier is taking the top two spots, and the trees in the surrounding area are 60 and 70 feet tall.

When looking at the alternatives, explain to the city that you can build the shorter towers if they want — 80-foot poles, for example — but the flipside is you will have to have more of them

Shorter vs. taller towers

When looking at the alternatives, explain to the city that you can build the shorter towers if they want — 80-foot poles, for example — but the flipside is you will have to have more of them. The taller the tower, the better the opportunity for collocation. Often with stealth, they are single-use applications.

This pushes back and forth between the industry and the communities for stealth, whether it makes sense in an area. I think the industry looks at that before the application is filed. If you can include stealth from the start and you know it will be easier, you should do it. Time is money.

For example, one of our clients proposed a facility where the search ring included the golf course at Leawood South Country Club in Leawood, KS. They have many tall trees on the golf course. The proposal was for a monopine. The Kansas City area previously had no monopines. They are more common along the East Coast.

Approval for the monopine was difficult to obtain because approval is difficult to obtain for everything in Leawood.

Computer-driven cutting and milling sculpts foam into any form. Precision cuts define architectural details. Spray foam creates a broad range of textures. The application of a polyurea coating ensures durability of outdoor installations.

Two views of the monopine concealment pole at the Leawood South Country Club golf course in Leawood, KS. The pre-existing, green-painted maintenance shelter near the base of the pole was lengthened to house base transmitter station equipment. Antenna feedlines between the shelter and the pole are buried. Eight newly planted pine trees circle the pole and are intended to further conceal the site as they grow. Sabre Towers & Poles fabricated the pole.

matter into a two- or three-party battle. Some with homes near the fairway were opposed to it. Oftentimes the reason neighbors oppose towers isn't because of the look or of cancer, it is the fear of EMF that is out there, so educating the public about that is important.

Oftentimes the reason neighbors oppose towers isn't because of the look or of cancer, it is the fear of EMF that is out there, so educating the public about that is important

Others with homes near the fairway wanted the tower because their cellular telephone service was poor.

The area has a homeowners' association, and the country club has a governing board. The country club was the landlord, but the homeowners in the area were members of the association, so you had the Leawood South Association opposed the facility.

We had a zoning meeting one night with a roomful of angry neighbors who also belonged to the country club where we met. Members of the country club in the meeting were being attacked. Then you had the city planning commission in the middle, so it became an interesting battle. It probably had more media coverage than any other local zoning meeting. Every one of the primary news media, the TV affiliates, was at the meeting with the neighbors.

That was a thorny zoning case, and the carrier, Sprint Nextel, they did a particularly good job for support for having their RF experts there. They reached out to their customers who live in Leawood and elicited support.

We proposed a 95-foot tower and were approved for a 75-foot version. We have no 90-foot pine trees in the Midwest. The monopine is taller than most pines, but it fits in with the other trees. Depending on how this works, there may be an op-

portunity to do more, maybe in Leawood, and some other of the communities are looking at this, too.

Site acquisition teams already consider stealth, but carrier representatives, including their attorneys, have to prepare to answer the questions whether by regulation or the community's preference for collocation and stealth. You have to answer the question and at least consider those alternatives.

Some regulatory action by Olathe and Kansas City, KS, is being considered, and I wouldn't be surprised if more are on the way. Overland Park, KS, is talking about some.

Inspections

Much of today's zoning requires a maintenance inspection and requires the owner to provide a report to the city. Cities like to have a report every year. We like to limit them to five years. There will be some routine inspections you should do on you own, regardless, but in regulations or conditions of zoning approval, cities are requiring some inspections. agl

Seen with the first monopine in the Kansas City area during its construction in March, Paul Wrablica III, president of Telecom Realty Consultants, Prairie Village, KS, and a member of the MoKan Wireless Association, was hired by Sprint to find an antenna site to fill a coverage gap. The company works with wireless carriers and consults on the need for using camouflage or concealment applications in difficult zoning areas. McGilton Construction built the site.

Sean McLernon is CEO of Charleston, SC-based Stealth Concealment Solutions. The company designs, engineers and fabricates antenna concealment screening systems. McLernon's email address is seanmc@stealthsite.com. Curtis M. Holland, esq., of Polsinelli Shalton Flanigan Suelthaus P.C., is an attorney focusing on zoning, land use and real estate development. The law firm has 300 attorneys in nine locations including Holland's office in Overland Park, KS. Holland's email address is cholland@polsinelli.com.

3G/4G Nets: Triple Play at Home and Away

'G's mean continued spending in a capital-intensive industry, said the host of a roundtable breakfast meeting featuring panelists from a carrier, a general contractor and a DAS system provider.

by Don Bishop

Speaking in Las Vegas, NV, on April 1, several industry technologists gave their take on the subject, "Telco vs. Tech as 3G/4G Networks Supply the Triple Play at Home and Away." Ric Prentiss, head of equity research for telecommunications services at Raymond James & Associates hosted a breakfast roundtable as the venue for the speakers during the 11th Annual Tower Technology Summit, collocated with the CTIA Wireless convention.

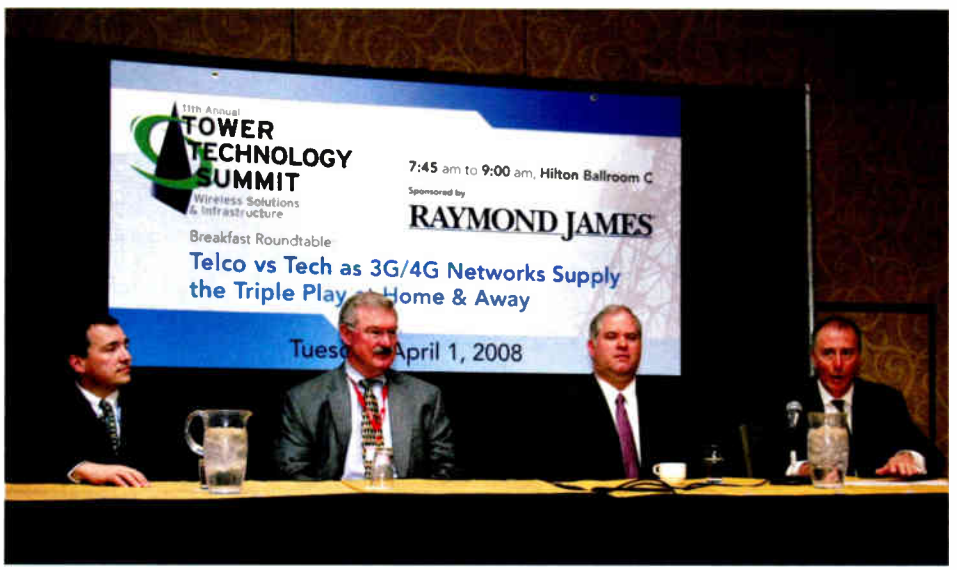
Prentiss explained the panel session's title: "You want voice, data and video, and you want it mobile and in the home. We say it is three products and two locations. It could be fixed at home or fixed in the office. That's the triple play, at home and away."

J.S. "Jake" MacLeod, principal vice president and chief technology officer at Bechtel Communications, differed slightly with Prentiss: "Video is one among many variables involving voice, data and mobility, so it's a quad play instead of a triple play." He said that "triple play, at home and away," is a good way to put it, but "it doesn't have the appeal of a quad play. Or, we call it 'fourplay,'" he joked.

In-building penetration

All the speakers, MacLeod included, spoke of the increasing importance of in-building penetration for wireless network signals. "What's coming up is integration of femtocells in the system," he said. He added that although there is acceptance overseas to the idea of adding a Wi-Fi connection to the handset, there is resistance to that in the United States. Regarding distributed antenna systems (DAS), MacLeod pointed out that one of the world's larges is in Moscow. "It's an extensive system, well designed. I think we can learn a lot from our European colleagues," he said.

NextG Networks, where David Cutrer, Ph.D., works as chief technology officer, specializes in DAS. He said his company specializes in building right-of-way sites, using traffic-signal poles, light poles and utility structures. NextG installs fiber along rights of way, giving the company a platform for high-speed backhaul. "We look forward to the high-speed networks, with an ability to use voice and data inside the homes where we find demand for the systems we offer. Getting all that data from the terminal location to the switch is something people are keen on."



From left: John Storch, Clearwire; J.S. 'Jake' MacLeod, Bechtel Communications; David Cutrer, Ph.D., NextG Networks; and Ric Prentiss, Raymond James & Associates.

'Spectrum pipe'

Cutrer said that NextG looks upon traditional data systems as a spectrum pipe. "We can take a carrier spectrum from a switch location to the antenna. We can do that because we leverage the broad bandwidth of the fiber and translate the signals from the low range to the high range," he said. Prentiss mentioned the spectrum auction, and Cutrer added, "That's where the technology comes in hand. You have carriers with 700 MHz, 800 MHz and 2.4 GHz spectrum. Having the platform that can carry all that bandwidth and capacity is useful."

"At 2.4 GHz the systems tend to be propagation limited because of the frequency. You look at the carriers deploying in that band, they have a lot of spectrum. Xohm has 8 MHz. You're propagation limited, but you have plenty of spectrum. In the 700 MHz band, it's tempting to say you could build high sites and offer a lot of area. But you say if I own the A band, I only have 6 MHz up and down. For a high-speed data network, that won't be viable. The 700 MHz band from the get-go will be capacity driven rather than coverage driven," Cutrer said.

High RCLs at 700 MHz

Bechtel's MacLeod offered a different take: "I'm not sure I agree with that simply because of the propagation characteristics. It's designed for coverage. Granted it's limited by spectrum but spectral efficiency constantly increases. It's going to be a balance. You remember in the analog days, we won [the San Francisco cellular license] and covered it all with 23 sites including Oakland. Those were high RCL [radiation centerline], 300-footers. As the subscribers increase, you begin to lower the RCL and you have to build more cell sites. I think that's the way the 700 band is going to go. Given its good propagation, you will have high RCLs and as applications increase, you will see RCLs coming down."

John Storch, vice president of Network Deployment for Clearwire, said lower and closer antenna radiation (rad) centers give the necessary view into residences. "If you're looking into residential buildings, you're seeing more penetrable surfaces such as windows. With a high site, you're overshooting the penetrable openings. You're shooting into the canopy, such as roofs, and sometimes steel roofs," he said.

"You will see in the OFDM world companies developing intelligent in-band repeaters that will play well with some structures that are otherwise impenetrable, and where you have to rely on DAS or in-building repeaters," he added.

As the session turned to quality of service, Prentiss asked the panelists about the throughput required: "What about the big pipe and getting it back to the Internet cloud?"

MacLeod said throughput is easy to design in a system now. "We are getting to the point where the threshold will change with HSPA and eventually OFDM systems in 4G like WiMAX and LTE. When you want to get north of 200 Mb/s uploading and downlink like DoCoMo is demonstrating now, to get that rate, the quality for that system is dependant on the grounding systems – no high-resistance grounds – and the antenna placement, orientation and downtilt. Weatherproofing has to be precise and impenetrable."

Given its good propagation [700 MHz], you will have high RCLs and as applications increase, you will see RCLs coming down

David Cutrer, NextG Networks: 'We leverage the broad bandwidth of the fiber.'

Ric Prentiss: 'The development order is spectrum, network, devices, and applications.'

Bechtel Communications' Jake MacLeod: [700 MHz] 'is designed for coverage.'

He added, "If there are any quality problems in high-bandwidth systems, it's like trying to take a 500-horsepower super-duper NASCAR racer and run it down a muddy, pothole-ridden street. There's plenty of power, but you can't realize the potential of that vehicle. The infrastructure quality will be critical to realize the potential."

Cutrer said that ensuring quality is a big part of what NextG Networks does, in addition to obtaining rights to access. "It involves engineering and optimization services. We do drive-by tests to validate coverage for every site. Workmanship standards are important. Having more sites is a key to network quality. That's something that DAS offers network operators: more sites than they traditionally would have and the flexibility to strategically place those sites."

He pointed to the example of the NextG DAS installation in San Diego, CA, as one of the company's first large deployments. "For a long time, DAS was meant to address special locations, like a tunnel and a convention center. San Diego was a breakout. We built 300 sites in less than a month, multibandwidth-capable sites. In San Diego, you look at the rad centers of traditional sites. They're not that high. In L.A., the average rad center is about 45 feet. You look at that and look at a utility pole, and it becomes a viable alternative," Cutrer said.

Prentiss recalled that Clearwire has been vocal about its own backhaul. "What

about spending capital on backhaul vs. other sources?" he asked Storch.

The Clearwire executive responded, "We're vocal about a high backhaul need for a data site. We deploy proprietary microwave. It's relatively inexpensive in the IP world. For he ability to transmit the volume you need, the payback is short. Small size dishes go on utility poles, and utilities are fine with that."

Storch continued, "There's a lot of above ground and below ground fiber. We see cable TV companies getting into it. You look at the best economic value you can get for the money. Quality is important, and sustainability of that fiber transport system."

Prentiss prompted, "You're not committed to 100 percent owned backhaul?"

Storch said, "You start with leased circuits and consider the value of an owned system. Microwave costs were considerably higher in the time division environment. In an IP environment, you don't need the channelization equipment and it plays better with a survivable network, the ability to create IP rings which aren't necessarily available or easily done with switched equipment. There are some opportunities where there is no line of sight," he said.

Mobility: spectrum first

Concluding the breakfast session, Prentiss summarized, "We tell people taking the 1G to 4 G path, you have to have spectrum first to do mobility whether fixed or mobile. Then you have to build the networks, and then come devices to handle the speed, and then the applications. You have people with applications chomping the bit, but you have to have the device to make the flow of data happen. Think of the bubble days of 2000 and 2001, people were thinking 3G but were using candy bar photos. The development order is spectrum, network, devices, and applications. Then comes the ability to bill for it or to understand the revenue sharing. You have to bill it and collect it," he said.

"The 'Gs' mean continued spending. This is a capital-intensive industry. You have to build networks and address capacity. It is not a static industry. It is one that constantly looks to the next G and the revenue there," Prentiss said. agi

'Copper Theft' Draws 120 to Association Relaunch

The relaunch meeting of the Louisiana-Mississippi Wireless Association drew plenty of attendees and speakers with the timely subject of copper thieves and wireless communications antenna sites.

AGL Report

More than 120 people came to the Louisiana-Mississippi Wireless Association (LMWA) luncheon April 24 at the Marriott Metairie at Lakeway, LA. "The subject of copper theft was eye-opening," said George W. Davis, the association president and a vice president of TowerCom.

LMWA invited a number of speakers to participate in a panel session, including Michael Saperstein, a public policy analyst with PCIA; Sgt. Jeffrey Scott of the Jackson, MS, police department; Terry Evans, AT&T's field operations manager for New Orleans; David Devun, site manager for Global Tower Partners' Gulf Region; and Michael J. Korbuly, vice president for national accounts with SNC.

Saperstein said that copper thieves are going to great lengths — or great heights — to steal copper from telecommunications sites. He cited a Duluth New Tribune story that said police there reported a suspect or suspects involved in a copper theft from a cell tower climbed 360 feet to cut the wire and make off with it.

Michael Saperstein, a public policy analyst with PCIA, spoke to an audience at the Louisiana-Mississippi Wireless Association meeting on April 24 on the subject of copper theft. He said that 40 states have at least considered anti-theft legislation.

The policy analyst showed national maps tracking the progress of metal theft legislation making its way through state legislatures. "Twenty-two states have had this legislation ratified as of today, with several more, it seems, on the way," he said. "Equally encouraging is that 40 of the 50 states have at least considered some kind of legislation regarding copper theft."

Saperstein said it is too early to see the true effects of the laws against metal theft, but he said there is anecdotal evidence that the legislation has had an effect. Unfortunately, "there are still many copper thefts daily," he said.

AT&T's Evans

spoke of his company's effort to help the New Orleans police capture a thief who apparently would revisit sites after copper stolen from them had been replaced. "We deployed a web cam at one site that had been hit. We deployed some trail cameras and assisted in the apprehension of a copper thief at one site using trail cameras," he said.

A trail camera takes an exposure when it senses motion. The trail cameras AT&T used were fitted with infrared photoflashes so the triggering of the flash would not alert the intruder.

"Five days later, a theft happened again. When my technician retrieved the pictures and took them to the New Orleans Police Department, someone recognized the guy, who had a record, and they went and arrested him," Evans said.

Copper theft 'industry'

Global Tower Partners' DeVun told the audience, "Copper theft is occurring so much it's to the point that the Department of Industry doesn't call it an epidemic, they call it an industry itself. That's how profitable it has become for the copper thieves."

DeVun passed along do's and don'ts recommended by insurance carriers to prevent copper theft. He showed pictures of Gemini Development Group's vandal-proofing equipment.

DeVun also described what occurred during the act of stealing copper at some specific sites, including a site in Los Angeles where he said one suspect "dropped off another guy who proceeded to go into the site to steal copper while the first man left to go to another site. The second man went to steal the copper in a switchbox connected to a generator, and the instant he cut into the generator cable, it fried him."

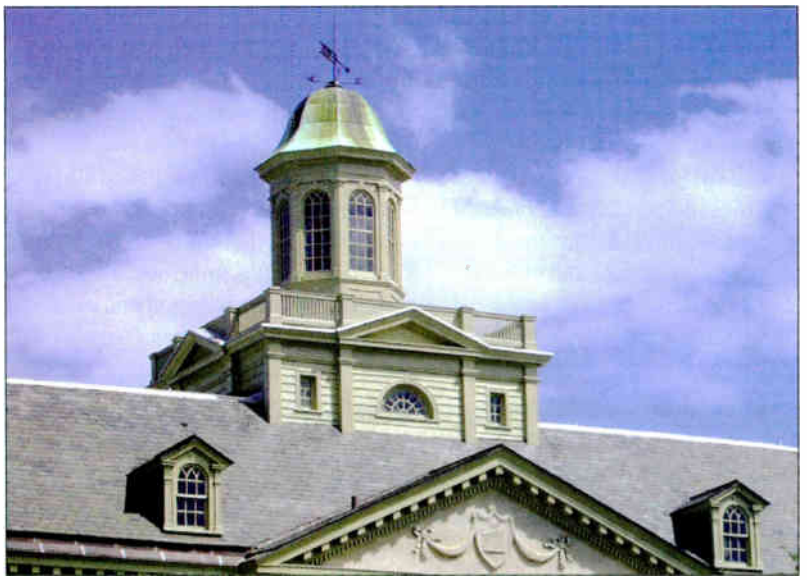
Video — and police — capture thieves

SNC's Korbuly, whose company sells security and communications systems, showed video clips from surveillance cameras picturing suspects in the act of intruding upon sites and stealing copper, and police responding to calls resulting from the surveillance.

He showed a photograph of the body of a man who sacrificed his life for the crime when he cut into a live electrical circuit. The picture of the dead man's charred body only could be described as gruesome. Davis, the LMWA president, said, "That was a show stopper."

Sharrie Renfro, office manager at Peak Industries in Spangle, WA, brought their product to show at the meeting. "Our motto is, 'Out of sight, out of mind.' If they can't see it, it will keep an honest thief honest," she said. The company's products, Copper Keepers enclosures, are powder-coated steel boxes that envelop the copper bus bars, concealing them from view and protecting them from cutting equipment used by thieves.

April's meeting relaunched LMWA. Founded in 2005, it had to be reconstituted after the landfalls of Hurricanes Katrina and Rita interrupted the businesses of its members and caused some to relocate out of the area. agl



Three Material Components Offer Concealment Choices

StealthSkin V materials and design methods from **Stealth Concealment Solutions** balance several criteria: cost-effectiveness, structural integrity, RF transparency, and cosmetic appeal. Designs employ three major material components: steel, fiberglass and StealthSkin V panels. Custom concealment applications include: louvers, dormers, steeples, various towers, side-mounted boxes, signs, silos, chimneys and acrylic windows.

www.stealthsite.com/products/custom.html

Palm Tree Antenna Offers Color-matching

Sabre Towers and Poles offers a variety of replica trees, including palm trees that offer a balance between cell coverage and maintaining the natural environment. Designed to blend into the landscape, these replica trees look authentic. They feature simulated bark, a pineapple ball and palm fronds. The underlying structure is a galvanized, slip-sleeve monopole for ease of construction. The simulated bark coating is color matched to the surrounding area and installed on the monopole to give it the appearance of a tree trunk.

www.sabretowersandpoles.com

Tower Enclosures Meet Aesthetic Requirements

FWT has developed tower enclosure products including the Tree-Cell, flagpoles, church and clock towers, stadium light poles, self-supporting towers with cladding, as well as painted monopoles that match the surrounding elements. FWT's flagpole is both a communications site for cellular and a virtually undetectable, yet fully functional flagpole. Concealed lighting communications sites offer a way to meet aesthetic requirements.

www.fwtinc.com

Artisans Use Epoxy to Create Natural Look

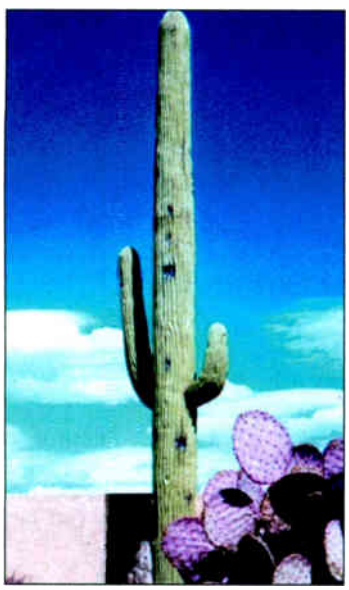
Using a process of seamless epoxy composite **Larson Camouflage** replicates multiple species or textures or bark. Larson artisans then finish the bark with appropriate painting and highlighting, creating naturalistic looking shells to resemble a saguaro cactus, pine trees, palm trees, boulders and architecture.

www.utilitycamo.com

Antenna Enclosures for Architectural Settings

Fiberscreen fiberglass panels available from **Peabody Engineering** are custom molded to conceal an antenna in an architectural setting. Concealments are made to the exact size, texture and look as required for each site, whether it is matching split-face brick, stucco, Spanish tiles, wooden shingles or cement walls. Fully built and ready to install on site, the panels have molded-in returns that connect together and to the building from behind.

www.peabodyconcealment.com



Hidden Antenna Poles

Concealment solutions from **Rohn Products,** a division of Radian Communication Services, are intended to help conserve and preserve the environmental landscape and to comply with stringent zoning laws. In commercial and residential areas, Rohn products include flagpoles, street lighting, bell towers, palm trees and cactus camouflage antennas.

www.radiancorp.com

Wrap Camouflages Towers

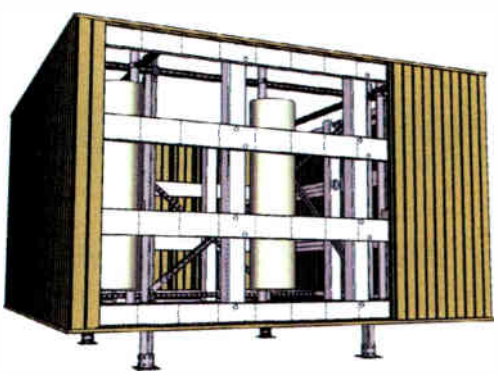
Invisible Tower Wrap (ITW), available from **Invisible Towers,** is designed to conceal any telecom site element, including: equipment enclosures, antenna arrays, rooftop structures, generators and monopoles. ITW was developed in partnership with the creator of the digital camouflage patterns used on battle dress uniforms by the U.S. military. ITW is available in 15 standard patterns or can be customized to specifically match the environment.

www.invisibletowers.com/wrap.asp

Pine Tree Antenna Fits Seven Carriers

The MonoPine is available from **Valmont PennSummit** at heights up to 200 ft., and the design may accommodate as many as seven carriers. The branches are "RF friendly" and contain no metal or other reflective materials and come 4-ft., 6-ft., 8-ft. and 10-ft. sizes. Light, medium and heavy branch densities are available. The base pole is galvanized and clad with bark, camouflaged paint, standard paint, or partial bark and paint.

www.pennsummit.com



Custom Antenna Enclosures

Radio frequency transparent antenna enclosures from **ConcealFab** are pre-engineered, pre-fabricated PVC enclosure systems designed to be RF transparent up to 76 GHz. Architectural site design, structural engineering and site analysis are used to ensure that concealment structures meet the user's specifications.

www.ConcealFab.com

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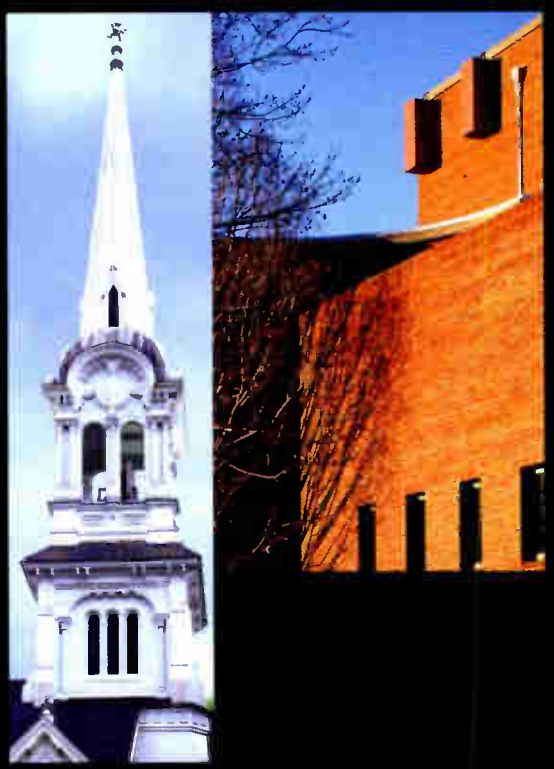

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