

THE Signal

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Society of Broadcast Engineers



The Association for
Broadcast and
Multimedia Professionals

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Ennes Program at 2015 NAB Show: The All-IP Facility

While it's easy to think, "It's only February," now is the time to plan your trip to the 2015 NAB Show. As always, the Society of Broadcast Engineers has an active role at the convention, including being part of the NAB Broadcast Engineering Conference. Other major events for the society include the annual membership meeting, a meeting of the Board of Directors, and (of course) the Ennes Workshop, which leads off the convention presentations.

The 2015 Ennes program will be held on Saturday, April 11 at the Las Vegas Convention Center. This day-long program features several leading experts who will step through every aspect of IP technology and how it can best be applied to a broadcast media facility.

The day starts with a tutorial session, which begins with an intro to IP networking. Wayne Pecena, CPBE, 8-VSB, AMD, DRB, CBNE, will provide the foundation for the day's learning. He'll cover the basic hardware and software of IP that allows the networking technology to function.

Later that morning, Wayne will dive into the specifics of building and expanding a functional network.

The second section investigates the operation of an all-IP radio station. Barry Thomas, CPBE, DRB, CBNE, steps you through IP networks within stations and identifies recent developments and how they affect station network architecture. His tutorial focuses on back-office/business, systems control and monitoring, audio/media production and delivery, HD Radio and mixing/routing pieces, as well as the more nebulous points of contact between the business and media production pieces.

The morning is rounded out with a brief overview of LED studio lighting, led by Jay Holben. After lunch, John Lyons, CPBE, provides a tour of the newest RF facility in New York atop the new World Trade Center.

This is followed by Stan Moote diving



photo: LVCA

back into the IP theme to explain why everything in TV must be IP. He considers the reasons to implement IP in a TV facility, where IP is used now and how it can benefit the overall operation.

With the focus on broadcast engineering's future, there is still a great deal of legacy technology being used. Thomas Edwards considers looking beyond SDI and the effort of SMPTE 2022-6 to packetize the bit stream. He ponders the idea of letting go of SDI so we can consider separate elementary essence streams, device registration and auto-configuration, and the use of video codecs.

see [ENNES PROGRAM](#), p.8

Nominations Open for SBE Awards

Do you know an SBE member or chapter that you believe goes above and beyond the call of duty in his or her job, the broadcasting industry or to the SBE? Often these efforts go unrecognized. Don't let that happen this year. Nominate a deserving individual or SBE chapter for a National SBE Award.

In the last few years, the SBE Awards Committee has added two new awards to better recognize you; Best Social Media Site and Chapter Engineer of the Year. Here is a list of a few more award categories that will be accepting nominations: Best Chapter Newsletter, Most Interactive Chapter, Best Chapter Website, Best Social Media Site, Best Technical Article, Book or Pro-

gram by an SBE Member, the Technology Award and Best Chapter Newsletter.

The top two awards presented each year are the Robert W. Flanders Engineer of the Year and James C. Wulliman Educator of the Year.

To nominate a worthy individual or chapter, go to the SBE website to download and submit the nomination form. Nominations are due by June 15, 2015. Winners will be notified in July and the awards will be presented during the national meeting in October.

All the national awards were created to recognize the efforts of members and chapters. For more information, contact Megan Clappe at mclappe@sbe.org.

IN THIS ISSUE

- 3 Scherer Joins SBE Staff
- 3 SBE Fellows Nominations
- 4 Letter from the President
- 6 40 Years of Certification
- 12 Power Quality
- 15 Member Spotlight

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joe.snelson@meredith.com

VICE PRESIDENT

Jerry Massey, CPBE, 8-VSB, AMD, DRB, CBNT

Entercom Greenville, LLC | Greenville, SC
jmassey@entercom.com

SECRETARY

James E. Leifer, CPBE

iHeart Media - Miami | Boynton Beach, FL
jimleifer@hotmail.com

TREASURER

Andrea Cummis, CBT, CTO

AC Video Solutions | Roseland, NJ
acummis@gmail.com

DIRECTORS

Tim Anderson, CPBE, DRB, CBNE

GatesAir | Mason, OH
tim.anderson@gatesair.com

Benjamin Brinitzer, CPBE, AMD

iHeart Media | Charlotte, NC
bbrinitzer@sbe.org

Ted Hand, CPBE, 8-VSB, AMD, DRB

COX Media Group | Charlotte, NC
ted.hand@coxinc.com

Kirk Harnack, CBRE

Telos Systems | Nashville, TN
kirk@harnack.com

John Heimerl, CPBE

Fine Tuning Associates/H&A Inc. | Suffolk, VA
johnh@finetuning.com

Ched Keiler, CPBE, 8-VSB, CBNT

E Three | Ft Lauderdale, FL
ckeiler@ethree.us

Gary Kline, CBT, CBNT

Cumulus Media | Atlanta, GA
gary.kline@cumulus.com

**Wayne M. Pecena, CPBE,
8-VSB, AMD, DRB, CBNE**

Texas A & M University | College Station, TX
w-pecena@tamu.edu

RJ Russell, CPBE

Journal Broadcast Group - Tucson | Tucson, AZ
rrussell@jrn.com

Kimberly Sacks, CBT

CBS Radio - Washington D.C. | Lanham, MD
ksacks@cbs.com

Eric Schecter, CBRE

CBS Radio - Phoenix | Phoenix, AZ
eric.schecter@cbsradio.com

Dennis Wallace, CBTE

Meintel, Sgrignoli & Wallace | Waldorf, MD
dennis.wallace@mswdvtv.com

IMMEDIATE PAST PRESIDENT

Ralph Hogan, CPBE, DRB, CBNE

KJZZ-FM/KBAQ-FM | Tempe, AZ
rhogan@sbe.org

SBE NATIONAL STAFF

John L. Poray, CAE | Executive Director

jporay@sbe.org

Megan E. Clappe | Certification Director

mclappe@sbe.org

Kristin Owens | Education Director

kowens@sbe.org

**Chriss Scherer, CPBE CBNT | Member
Communications Director**

cscherer@sbe.org

**Debbie Hennessey | Sustaining
Membership Manager**

dhennessy@sbe.org

Scott Jones | Database Manager

kjones@sbe.org

Carol S. Waite | Certification Assistant

cwaite@sbe.org

The Signal is published bimonthly by the Society of Broadcast Engineers, Inc., 9102 North Meridian Street, Suite 150, Indianapolis, IN 46260. Questions or comments regarding editorial content or design should be referred to Chriss Scherer at 317-762-9723 or cscherer@sbe.org. For advertising, contact Debbie Hennessey at dhennessy@sbe.org. SBE is a registered trademark of the Society of Broadcast Engineers.

SBE National Office

317-846-9000 www.sbe.org

Scherer Joins SBE National Staff

Chriss Scherer, CPBE, CBNT has joined the national staff of the Society of Broadcast Engineers in the full-time position of Member Communications Director, announced Executive Director John L. Poray, CAE.

Scherer is familiar to many members of the SBE, having been a member since 1989. He has been active in SBE chapters in Kansas City and Cleveland, serving each chapter as its chairman, as well as other leadership positions. Scherer served on the national SBE board of directors from 1997 to 2001 and again from 2004 through 2010. He was elected vice president of the SBE, serving one term from 2004 to 2005, and was elected president of the SBE, serving two terms from 2005 to 2007. He is a Fellow and Senior Member of the SBE and holds the SBE's Certified Professional Broadcast Engineer and Certified Broadcast Network Engineering Technologist certifications.

Scherer's broadcast engineering career has included chief engineer responsibilities at radio stations in Florida, Connecticut, Pennsylvania and Ohio. His most recent position was as editor of *Radio* magazine;

a position he held for 17 years. He holds a Bachelor of Music in Music Engineering Technology and a minor in Electrical Engineering from the University of Miami.

Among his responsibilities as Member Communications Director are editing and production of *The Signal* and other society publications, management of the SBE website and the SBE social networking outlets. He is based in Overland Park, KS.

Poray commented, "We are excited to have the opportunity to bring Chriss on board the SBE staff. His unique combination of skills, talent and knowledge of our industry will be an asset to the society and our members." Scherer began work with the SBE on January 1.



Chriss Scherer

March 13 Is Deadline for SBE Fellow Nominations

By Troy Pennington, CSRE, CBNT
Chair, SBE Fellowship Committee

Nominations for SBE Fellows are to be received by the Fellows Committee no later than March 13, 2015. The Fellowship Committee will bring the names of nominees to the board of directors for consideration and election at its meeting on April 12, 2015.

Fellow membership is the highest level of SBE membership. It's a form of recognition for someone who has contributed significantly to the society, the field of broadcast engineering or its allied professions, or by disseminating their broadcasting knowledge and promoting its application in practice. Seventy-five members have been recognized with the honor in the society's 50-plus years of existence.

Do you know a member who has made a difference in your SBE chapter over an extended period of time; or someone who has exhibited a dedication to the advancement of the field of broadcast engineering and the Society of Broadcast Engineers? Consider nominating him or her for the SBE Fellow rank of membership.

To nominate a member, send a letter of nomination describing the nominee's professional qualifications and accomplishments. The nominee must be a member of the SBE in good-standing. Letters should

be addressed to the chairman of the SBE Fellowship Committee, Troy Pennington, CSRE, CBNT. The nomination letter must be submitted by a voting member of the society. The letter must be accompanied by at least five written endorsements from other voting members of the SBE. All nominations are to be kept confidential. No others besides the nominators and the members of the national Fellowship Committee should be aware of the nomination. The nominee should not be made aware that he or she has been nominated.

After the Board makes its decision, the SBE secretary will notify those elected. The Fellow honor presentation will be made at the SBE National Awards Dinner during the 2015 SBE National Meeting, to be held in Madison, WI, on Oct. 14, 2015.

Submit nominations to Fellowship Committee Chair Troy Pennington, 6156 Hampton Hall Way, Hermitage, TN 37076 or to troy.pennington@cumulus.com.



Certification Question

Answer on page 11

An AM station operating on 1070kHz has a two-tower directional array. The two towers are separated by 120 electrical degrees. The tower separation in feet is:

a. 306 b. 918 c. 280 d. 120



LETTER FROM THE PRESIDENT

By Joe Snelson, CPBE, 8-VSB
SBE President
jsnelson@sbe.org

A New Year and New Start

Abelated Happy New Year to all. By the time you read this, the Consumer Electronics Show (CES) will have already occurred in Las Vegas. To meet publishing deadlines I wrote this article before the show. What I always find interesting at the CES is the number of broadcasters walking the floor. This is not really a surprise, however, considering that it gives us an opportunity to see what products may be available to our listening and viewing audience within the next year. As I have said before, the consumer will ultimately vote on the technology introduced at CES with their wallets. The important thing for broadcasters is to be ready to step up to the plate and provide their customers with the services they want. And that's where we as broadcast engineers come in. We are the ones that ensure our stations can provide new and enhanced services with high quality and reliability. And the SBE remains committed to provide educational opportunities to expand the engineer's knowledge base for new technology.

The year 2015 promises to be a busy one for the SBE. We will share more in this and future issues of *The Signal*. I want to share a couple of them in my column this month. We are beginning our next 50 years in this issue of *The Signal* with the implementation of our new nameplate at the top of the first page. Notice the newly enhanced logo with the colored accent with the letters SBE in a larger font. Also note the use of our new tag line "The Association for Broadcast and Multimedia Technology Professionals," for which we have already received positive feedback. Our new tag line reinforces our commitment to serve all those who provide technical support to radio, television, production and other media outlets that specialize in getting program content to the masses.

Milestones and Activities

Last year was the 50th anniversary of the SBE. The year 2015 marks the 40th anniversary of the SBE's Certification Program.

It was in 1975 that the SBE Board of Directors approved moving forward with the Certification Program. I recall receiving the mailing, courtesy of the U.S. Postal Service, announcing the introduction of the Certification Program. It was not too long afterwards that I joined the SBE, took the exam and received my certification. If you do not hold an SBE Certification, make it a resolution to do so in 2015. And if you currently hold a level of certification and are eligible to advance upwards, do it 2015.

I am pleased to mention that as we were bringing 2014 to a close we saw a couple chapters revitalize. I find this exciting as local chapter meetings play a key role in keeping our members current on technology and trends in the industry. The SBE Education Committee, chaired by Wayne Pecena, with the help of SBE Education Director Kristin Owens, continue to develop a chapter leader training program. While an exact roll out date for this has yet to be announced, I believe we will see it launched this year. I share the excitement with Wayne and Kristin in getting this going and seeing all of our chapters succeed.

There are other activities the SBE is involved in that you may not be aware of on both the radio and television fronts. I mention these because both activities are important to radio and television stations as we move into the future. There will be decisions made this year by these organizations, as well as the FCC, that will chart the future for our industry.

One of the industry associations we follow closely is the National Radio Standards Committee (NRSC). SBE Immediate Past President Ralph Hogan, CPBE, DRB, CBNE, is an active participant in the NRSC representing the Association of Public Radio Engineers. He keeps us informed on information that is not confidential within the committees of the NRSC.

If you're not familiar with this organiza-

tion, it is jointly sponsored by the National Association of Broadcasters and the Consumer Electronics Association. Its purpose is to study and make recommendations for technical standards that relate to radio broadcasting and the reception of radio broadcast signals.

Subcommittees of the NRSC include the AM & FM Analog Broadcasting (AFAB) Subcommittee, Digital Radio Broadcasting (DRB) Subcommittee, Radio Broadcast Data Standard (RBDS) Subcommittee. The RBDS Subcommittee of the NRSC maintains the NRSC RBDS Standard (NRSC-4-B). It is a formulating group with the ability to develop and adopt NRSC standards, guidelines and reports.

On the television side, the SBE is a voting member of the Advanced Television Standards Committee (ATSC). The SBE is represented by Past President Vinny Lopez, CEV, CBNT. I am sure our TV members have heard about ATSC 3.0. It is the new television standard that will eventually replace our current standard, ATSC 1.0. From a high level, ATSC 3.0 is not backwards compatible with 1.0, but does promise to bring a robust signal that can be tailored by broadcasters to target their consumers. Advanced encoding and modulation standards will allow broadcasters the flexibility to define the services and quality they deliver whether it's audio, video or other supplementary services.

Vinny has appointed an ad hoc committee that will be tracking the activities of the ATSC and we will provide updates along the way as information becomes available. This work is on a fast track at the ATSC and I'm proud that the SBE and some of its members are taking a part in its development.

I want to also mention that we are working with Dr. Rich Chernock, Group Chair of the Technology Group on ATSC 3.0, to present a webinar on ATSC 3.0. It will be held Feb. 19 at 2 p.m. ET. Register at the SBE website, sbe.org.

The last item I want to share is the availability of an sbe.org forwarding email address to our members; and it's free! You can read more about it in this edition of *The Signal*.

As you can see we have a lot going on for 2015.

Society of Broadcast Engineers



The Association for Broadcast and Multimedia Technology Professionals



EDUCATION UPDATE

By Fred Baumgartner, CPBE, CBNT
Member, SBE Education Committee
k0fmb@arrl.net

Infrastructure and Workflows in the All-IP Facility

Arguably, most of us see our world converting to CAT-6 just for the sheer economic expediency. Wire, connectors, components and even the installers who can work with them are ubiquitous and inexpensive. And please don't take offense, but I know of only two kinds of broadcast engineers. The first type (the pragmatist)

engineers most need to know this year. This year it is about building the infrastructure and workflows (in its broadest meaning) for the all-IP broadcast enterprise.

In the beginning of the IT transition, we isolated islands of IP; designing them in the image of the control, audio and video networks we knew were secure, reliable, and

or the world can communicate is entirely unimaginable if not a bit creepy at times. As broadcast engineers, our relationship with IT has evolved while the simple protocol itself has remained pretty much the same. Much of what we do creatively and for efficiency as broadcast engineers is to connect things that seemingly don't really need to be connected; yet we marveled when our video and audio routers and our extensions of controls allowed us to utilize a machine in another studio in a production or build new paths to bring a station back to life. We were blown away when we could, from a single portal on a portable device, see the status and troubleshoot our transmitters to toilets from anywhere in the world.

We always start early at 8 a.m. on Saturday (April 11 this year) with a practical tutorial. This time we build a network from scratch. By the end of the day, we'll have learned how software defined routers work and why we need them, how to do the precise timing needed, how 4K video fits on four copper pairs, and as much of everything else as we can fit into a long day.

If you are one of those broadcast engineers who think a great way to spend a Saturday in Las Vegas is at an intense tutorial on near future realities of broadcast engineering, do try to put this on your calendar. Arguably, the SBE Ennes Session is the largest gathering of broadcast engineers in a single room each year, and for a good reason.



The annual Ennes Session at the NAB Show is one of the best-attended presentations at the convention.

sees running video on Ethernet wiring and switching as simply a physical layer thing – it's SDI and AES chopped up into packets so it can run on unshielded twisted pair. The other type of engineer (the dreamer) sees that same CAT-6 enabling a world of connected things smart and aware where everything can communicate with everything else. These views are profoundly different – and those firmly in one camp or the other often really don't understand the other.

Whether you think this is about yet another, possibly better, interconnect or that this is the paradigm shift that changes everything, it is pretty clear that we'll be filling our recycle bins with coax. The Ennes Educational Foundation Trust orchestrates a tutorial program the first day (Saturday) of the NAB Show, always with the objective of taking on what it is that broadcast en-

often redundant. IP, as it became part of the interconnect mix, appeared as just another of a plethora of standards and components, each fine-tuned to do their specific task.

Better Connections

Metcalf's law states that the value of a telecommunications network is proportional to the square of the number of connected users of the system (n^2). At first this seems a bit sterile but attractively cute to most of us; Besides, it is no big deal to imagine what can happen in an interconnected world, but it's not so easy to look around the corner and see what will happen. What happens when every element in your station

For more information on any SBE education program, contact Education Director Kristin Owens: kowens@sbe.org or 317-846-9000.

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CERTIFICATION UPDATE

By Jim Wulliman, CPBE
SBE Certification Committee Chairman Emeritus
jcwulliman@gmail.com

40 Years of SBE Certification

This year marks the 40th anniversary of the SBE Program of Certification. Jim Wulliman, CPBE, SBE president from 1973 to 1975 and the first Certification Committee chairman, looks back at how the program came to be.

The Certification Program developed out of a suggestion from then board member and later president Ben Wolfe. His suggestion was that the FCC exam should be upgraded for station chief engineers and those who wanted to be chief engineers. The problem with the FCC exam process was that many tech schools offered an exam preparation course that was simply a memory course. Ben started fresh and worked with several electronics instructors to generate sample questions for the SBE-proposed exam. He then worked with John Wilner to write a sample exam, which this group shared with the SBE Board of Directors for evaluation. After many meetings and discussions, this sample exam evolved into the basis for the Certification Program.

To further the program development, I became an observer member of the National Engineering Society Certification Commission, which allowed me to review certification programs from many of the engineering associations and incorporate their ideas into our SBE certification program.

The program was first presented at the 1977 NAB convention during an early bird

session. To get the program started, there would be a limited grandfather time period. Those engineers would take the sample exams for evaluation. As a thank you the grandfathered engineers who took the sample questions would receive their scoring grades, but the final certification exams would only give pass/fail results, which continues to this day. All the initial exams were reviewed by the University of Wisconsin - Milwaukee testing department chairman, who then suggested improvements for the question files. (His fee was the cost of taking his wife out to dinner.)

Further Development

At a meeting at Ben's TV station in Washington, DC, there was much discussion of the initial exam results and how the SBE might be able to proceed with the program. Ben and John had experienced some health problems and asked to be allowed to retire from their work on the Certification Program. After a coffee break, Bob Wehrman suggested that the SBE Board had decided that since I would not have anything to do when my term as SBE president ended, I could become the new Certification Committee chairman. There was a great deal of support from volunteers who wanted the program to be a success by providing sample exam questions. The Madison SBE chapter was very active in supporting the program, also.

Today, the question pool is maintained

in a computer database, which allows the Certification Committee to easily update and maintain the question pool. This database also allows us to easily generate exams by pulling different questions from the pool and changing the question order on each individual exam. Before we had the questions in a computer database, I remember that Certification Secretary Mary Brush had to retype the exams to revise the order of the questions for each exam session. Computers made a great improvement in that regard. The earliest use of a computer with the Program of Certification involved Gerry Dalton and I enduring many all-night sessions in the SBE office developing special software to prepare the certification exams.

Being the SBE Certification Committee chairman has always been a very fulfilling experience. I have met and worked with many dedicated people over the years to accomplish our goals.

Certification Today

Through the years, the SBE Program of Certification has become recognized in the industry as the primary method of verifying the attainment of educational standards. In 2003, the SBE Certification Program was recognized by the National Skill Standards Board. NSSB Certification Recognition promotes quality assurance in the certification marketplace and provides national recognition for certifications that meet the quality benchmarks. With the industry constantly changing, the SBE-certified engineer must keep up with those changes.

Since its inception, SBE certification has had three primary goals:

- To raise the status of broadcast engineers by providing standards of professional competence in the practice of broadcast engineering and related technologies.
- To recognize those individuals who, by fulfilling the requirements of knowledge, experience, responsibility and conduct, meet those standards of professional competence.
- To encourage broadcast engineers to continue their professional development.

SBE certification is available for a range of experience and skill level, from a station operator to the highest level of Certified Professional Broadcast Engineer.

MEMBERS ON THE MOVE



< **Ronald Anderson, CBTE, CBNE**, is now chief engineer at KEYE-TV, San Antonio, TX.

Brandon Monroe is now Chief Engineer at KFAI-FM, Fresh Air Radio, Minneapolis, MN.



< **Mike Ostlund** is now communications specialist at Hennepin County Emergency Management in Minnesota.

> **Marty Sacks** has been named the vice president of sales, support and marketing for the Telos Alliance. He was previously VP/executive director of Axia Audio.



Brian Zittlau, CTO, formerly of Lehigh Acres, FL, is now chief engineer at KMBC Hearst Broadcasting, Kansas City.

Have a new job? Received a promotion? Let your fellow SBE members know. Send your news to Chriss Scherer at cscherer@sbe.org.

SBE Certification Achievements

CONGRATULATIONS

LIFE CERTIFICATION

Certified Professional Broadcast Engineers® and Certified Senior Broadcast Engineers who have maintained SBE certification continuously for 20 years, are at least 59½ years old and are current members of the SBE may be granted Life Certification if so requested. All certified who have retired from regular full-time employment and are at least 59½ years old may be granted Life Certification if they so request. If the request is approved, the person will continue in his/her current level of certification for life.

Certified Broadcast Radio Engineer™ (CBRE®)
James Henry, Maitland, Fla. – Chapter 42

NOVEMBER EXAMS

Certified Senior Television Engineer™ (CSTE®)
Christopher Crumbliss, Kutztown, PA – Chapter 18
Dean Tracy, Costa Mesa, CA – Chapter 47

Certified Senior Radio Engineer™ (CSRE®)
William Bowin, Galion, OH – Chapter 52
Russell Hines, Cincinnati, OH – Chapter 33
George Marshall, III, Laurence Harbor, NJ – Chapter 15
James Stitt, Cincinnati, OH – Chapter 33

Certified Broadcast Radio Engineer™ (CBRE®)
Jeremy Preece, Corona, CA – Chapter 131

Certified Broadcast Television Engineer™ (CBTE®)
Donald Bergmann, Hillsdale, IL – Chapter 96
William Casto, Lincolnton, NC – Chapter 45
Richard Coutee, Shreveport, LA – Chapter 44

Certified Audio Engineer® (CEA®)
Josh Krohn, Omaha, NE – Chapter 74

Certified Video Engineer® (CEV®)
Philip Rohman, Golden, CO – Chapter 48

Certified Broadcast Networking Engineer™ (CBNE™)
Ernie Ensing, Bristow, VA – Chapter 37
Thomas Gray, Humble, TX – Chapter 105
Ryan Haraschak, APO, AE – Chapter 131
Ryan Krupa, Rocky Hill, CT – Chapter 14
Tom Matthews, Davie, FL – Chapter 53
Daniel Smith, Perris, CA – Chapter 131
Charles Stutsman, Norfolk, VA – Chapter 54
Dean Vaccher, Gettysburg, PA – Chapter 41

Certified Broadcast Networking Technologist® (CBNT®)
J. Barratt Godfrey, Seattle, WA – Chapter 16
Andrew Griffin, Peoria, IL – Chapter 49
Michael Margrave, San Antonio, TX – Chapter 69
Gerald Tremblay, Roseville, CA – Chapter 43
8-VSB Specialist™ (8-VSB™)
Mark Pace, Carrollton, IL – Chapter 55

Certified Radio Operator® (CRO®)
Sheryl Bowin, Galion, OH – Chapter 52
Ronald Richard, East Granby, CT – Chapter 14

Certified Television Operator® (CTO®)
Anthony Angeles, Redondo Beach, CA – Chapter 47
Serena Beltran, Covina, CA – Chapter 47
William D'Agostino, Las Vegas, NV – Chapter 128
Gerardo Guzman, Los Angeles, CA – Chapter 47
Charles Hunnell, Playa Del Rey, CA – Chapter 47
Ronald Richard, East Granby, CT – Chapter 14
Kimbra Ritchie, Orlando, FL – Chapter 42
Victoria Tate, Studio City, CA – Chapter 47
Patrick Thorpe, Gaithersburg, MD – Chapter 37
John Tolosa, Culver City, CA – Chapter 47
Darrick White, Carrollton, VA – Chapter 54

SPECIAL-PROCTORED EXAMS

Alabama Broadcasters Association
Certified Broadcast Technologist® (CBT®)
Joseph Norris, Millry, AL – Chapter 68

Advanced IP Networking for Broadcast Engineers with Chapter 53, Miami, FL
Certified Broadcast Networking Engineer™ (CBNE™)
Sam Brown, Simpsonville, MD – Chapter 37
Sean Carpenter, Clearwater, FL – Chapter 39
John Collinson, New Port Richey, FL – Chapter 39

Michael Galik, Dunedin, FL – Chapter 39
Dustin Hapli, Riverview, FL – Chapter 39
Steven Hess, Valrico, FL – Chapter 39
Charles Keiler, Ft. Lauderdale, FL – Chapter 53
Harold Kneller, Jr., Punta Gorda, FL – Chapter 39
Timothy McGuire, Archer, FL – Chapter 7

SBE CERTIFIED SCHOOL COURSE COMPLETION

DINFOS
Certified Broadcast Technologist® (CBT®)
Adrian Rogers, Jacksonville, FL – Chapter 7

CERTIFIED BY LICENSE

Certified Broadcast Technologist® (CBT®)
Isaiah Chavez, Lithia, FL – Chapter 39
Kenneth Hittson, Fort Smith, AR

Patrick Thornell, II, Aliso, Viejo, CA – Chapter 47
Werner Ullrich, II, New Castle, PA – Chapter 20

CERTIFIED RADIO OPERATOR® (CRO®)

St. Ambrose University
Allison Adams, Davenport, IA
David Baker, Bettendorf, IA
Haley Gibbs, Davenport, IA
Whitney Gillum, Davenport, IA
Zack Lundquist, Marengo, IL
Shelby Shepherd, Elgin, IL

Pasadena City College
Jonathan Ban, Rosemead, CA
Gabriela Banuelos, Pasadena, CA
Russell Corona, Los Angeles, CA
Anndy Curiel, Hollywood, CA
Piper Needham, Monrovia, CA
Austin Nellis, Azusa, CA

Daniel Orozco, Altadena, CA
Marley Otto, Los Angeles, CA
Gabriel Perez, Los Angeles, CA
Willis Quan, Monterey Park, CA
Rick Mann Quintana, Los Angeles, CA
Naramsen Shamoon, Pasadena, CA

CERTIFIED TELEVISION OPERATOR® (CTO®)

Elis Moore, Wichita Falls, TX
Jonah Nemec, Chicago, IL
Esequiel Reyes, Jr., Playa Del Rey, CA
Brendan Rivers, Port Orange, FL
Mike Shelton, Fort Myer, FL
Jorj Schulke, Scottsdale, AZ
Jared Young, Kalamazoo, MI

DIRECTV
Cheyenne Cockrell, Inglewood, CA
Travis Outler, Orange, CA
Luis Evangelista, Santa Monica, CA
Jared Fegan, Woodland Hills, CA
Scott Holton, Los Angeles, CA
Christopher Knight, Los Angeles, CA
Juan Marron, Santa Monica, CA
Trevor Medina, Los Angeles, CA
Jorge Munoz, Los Angeles, CA
Jeanine Rivas, Los Angeles, CA
Kyle Ross, Los Angeles, CA
Billy Smith, Los Angeles, CA

Sinclair Broadcast Group
Joe Bower, Kalamazoo, MI
Patrick Cahoon, Kalamazoo, MI
Ken Case, Kalamazoo, MI
Tim Hindbaugh, Kalamazoo, MI
Kelly Kiser, Kalamazoo, MI
Steve Nelson, Kalamazoo, MI

RECERTIFICATION

The following applicants completed the recertification process either by re-examination, point verification through the local chapters and national Certification Committee approval and/or met the service requirement.

Certified Professional Broadcast Engineer® (CPBE®)
Richard Pogson, Fairview, PA – Chapter 130

Certified Professional Broadcast Engineer® (CPBE®)
8-VSB Specialist™ (8-VSB™) AM Directional Specialist™ (AMD™)
Paul Christensen, Jacksonville, FL – Chapter 7

Certified Senior Radio Engineer™ (CSRE®)
Randall Kerbawy, Beckley, WV – Chapter 116
Alan Shea, Goshen, IN – Chapter 30

Certified Broadcast Radio Engineer™ (CBRE®)
Keith O'Malley, Chesapeake, VA – Chapter 54

Certified Broadcast Television Engineer™ (CBTE®)
Paul Nowakowski, Amelia, OH – Chapter 33

Certified Video Engineer® (CEV®)
Philip Dubs, Plantation, FL – Chapter 53

Certified Broadcast Networking Technologist® (CBNT®)
Paul Christensen, Jacksonville, FL – Chapter 7
Robert Dawson, Horizon City, TX – Chapter 131
Douglas Salewsky, Pasadena, Md. – Chapter 25
Alan Shea, Goshen, IN – Chapter 30
Brian Urban, Georgetown, TX – Chapter 67
Steve Westbrook, Smyrna, GA – Chapter 5

Certified Broadcast Technologist® (CBT®)
Gilbert Geer, Lancaster, Pa. – Chapter 41
Steven Pinch, Napa, CA – Chapter 40
Richard Scott, Tampa, FL – Chapter 39
James Walker, San Bernardino, CA – Chapter 47
Joseph Zeppuhar, Cocoa Beach, FL – Chapter 42

Certified Television Operator® (CTO®)
Yvonne Bennett, District Heights, Md.
Sam deGaliccia, Jacksonville, FL
Jon Elmore, Ft. Worth, TX – Chapter 67
Gregory Foss, Riverside, CA – Chapter 131
Karen Gentile, Santa Clara, CA
Cynthia Hall, Dayton, OH
Jonathan Hunt, Santa Monica, CA
Fred Liggett, Lee's Summit, MO
Alvaro Montealegre, Tampa, FL

A.J. Roberts, Shoreline, WA – Chapter 16
Terry Spring, Carnation, WA – Chapter 16
Tae Yu, Manassas, VA
Brian Zylstra, Tarpon Springs, FL
Certified Radio Operator® (CRO®)
Alvaro Montealegre, Tampa, FL – Chapter 39
Chris Wheatley, Ithaca, NY

Chapter 39 Recognizes Certifications

Members of Chapter 39 Tampa Bay Area attended the Advanced IP Networking for Broadcast Engineers class at Chapter 53 Miami on Oct. 17, 2014. On Oct. 18, Chapter 53 proctored an exam for attendees. Later, Chapter 39 presented certification pins to its newly certified members: (left to right) Sean

Carpenter, CBNE; Hal Kneller, CPBE, DRB, AMD, CBNE; Janet Hess, wife of Steve Hess, CBNE, who passed away in December; John Collinson, CPBE, 8-VSB, AMD, CBNE; Michael Galik, CBTE, 8-VSB, CBNE; Isaiah Chavez, CRO, CTO, CBT. Not shown: Dustin Hapli, CBNE.



SBE Leadership Development Course Set for August

The 2015 SBE Leadership Development Course will be held Aug. 4-6, 2015, in Atlanta, GA. This three-day course is an intensive study of successful leadership and management, designed specifically for broadcast engineers.

The course explores the nature of leadership, the difference between being a manager and being a leader, how to build a winning team, the importance of attitude in the leadership position, communication insights and so much more. An attendee of last year's course said, "Outstanding program! I found the material valuable and Rodney [Vandevveer] is an engaging teacher!"

Instructing the course for the fifth year will be Rodney Vandevveer, Professor of Technology Leadership at Purdue University.



Students engaged at the 2014 Leadership Development Course

Vandevveer brings more than 30 years of experience in human resources management, training, development and manufacturing. Vandevveer also owns a leadership training business, VanTech Training.

To register for this professional development opportunity, visit the Leadership Development Course page on the SBE website and click the Education tab. The enrollment fee is \$599 for mem-

bers of the SBE and \$650 for non-members. The course will be held at the Hyatt Place Atlanta Airport-South, which is conveniently located near Atlanta's Hartsfield/Jackson airport. The room rate is \$94 per night, plus tax. Questions? Contact Kristin Owens at kowens@sbe.org.

Nominations Committee Seeks Board Candidates

The annual election of officers and directors to the national SBE Board of Directors will take place this summer. The SBE Nominations Committee is seeking qualified candidates who are voting members (Member, Senior, Fellow or the designated representative of a SBE Sustaining Member) in good standing (dues paid). Candidates must hold an engineering level of SBE certification (CBT or higher or CBNE) and maintain it the entire duration of service on the Board, if elected. Candidates should have a desire to serve and lead, not only as a member of the board, but through service as a national committee chair or member. Members of the Board represent all members, not any one specific region, state, city or chapter. It is suggested that candidates have previous experience as a leader in his or her local chapter, or other volunteer leadership experience, prior to running for the national SBE Board.

Members of the Board are expected to attend two regularly called meetings each year; in the spring, held during the annual NAB Show, and in the fall, at the annual SBE National Meeting. Other meetings may be called via conference call during the year.

The national SBE board includes 12 directors, four officers and the immediate past president. Directors serve two-year terms and officers serve one-year terms. Six director seats will be contested in 2015 as will all four officer positions. The SBE By-laws limits the number of terms of elected members of the Board. Directors may serve three consecutive terms. The secretary and treasurer may

serve up to four consecutive terms and the president and vice president may serve up to two consecutive terms. The maximum number of years anyone may serve on the board is ten. The time spent as immediate past president does not count towards the ten-year total.

Members interested in offering their candidacy and serving on the national Board if elected are encouraged to contact the chairman of the SBE Nominations Committee, Ted Hand, CPBE, 8-VSB, AMD, DRB at ted.hand@coxinc.com or 704-335-4732. A slate of nominees will be assembled by the committee by April 29. Other qualified members may be nominated by members in good standing no later than July 6.

The election takes place from July 17 through Aug. 20. Candidates elected will be installed into office during the SBE National Meeting in Madison, WI, on Oct. 14.

ENNES PROGRAM from page 1

Peter Chan and Mark Hilton both have presentations focusing on SDN. Peter shows the role of SDN as a useful tool to abstract network infrastructure and simplify end-to-end management of increasingly complex systems. Mark will focus on the promise and limitations of a SDN controlled infrastructure whether it be traditional SDI- or IP-based components.

AES-67 is a newer standard that promises interoperability between audio over IP systems from different manufacturers. Kevin Gross overviews the current state of the standard's implementation.

As we move towards network-based technologies for live base-band production, the need for distribution of reference signals does not go away. Paul Briscoe looks at the evolution of synchronization requirements in the live network system era. He is followed by Charles Meyer, who covers the new workflow in an all-IP facility.

The practical side of IP implementation is covered by Mo Goyal as he details the specifics of how one broadcaster decided to build for the future with a high capacity packet core.

The day is rounded out with Steve Lampen, CBRE, going through the interconnection technology of accomplishing the all-IP facility.

The complete session timetable will be in the April issue of *The Signal* and in the NAB Show program.

To attend the program, full registration for the NAB Show is required. As an SBE member, you are eligible for a discount if your employer is not an NAB member. If you're attending PBS TECHCON, you can also attend the SBE Ennes session.

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Renewing Your SBE Membership Online Is Quick and Easy

The annual renewal for most SBE members begins this month. If you hold Member, Senior, Associate, Student or Fellow membership status, you will receive renewal letters and membership cards in the mail. The due date for membership renewal is April 1.

There is no change in any of the membership dues levels from 2014. You may renew your membership online at the SBE website, www.sbe.org. Click on "Renew Membership" in the upper right-hand corner of the home page. The online system is secure and accepts VISA, MasterCard and American Express. The system automatically generates a receipt, which will be sent to your email address. You'll need your member number and website password to access the renewal system. If you have forgotten your number or password, there is an automated retrieval system available to you on the renewal page.



If you're a Life Member of the SBE you don't have to renew your membership, but you will receive a letter in the mail in March that provides an update on SBE activities.

Balloting for the annual election of the national Board of Directors will be conducted online in July 2015. The move to electronic balloting has been very successful, with 90 percent of the election ballots cast in 2014 submitted using the Web-based ballot. All voting members will receive a unique link to access the electronic ballot. We encourage members to use the electronic ballot method as it is quick, easy and saves the society printing, mailing and postage expense.

If you prefer to vote by mail, you may opt-out of electronic balloting by checking the appropriate box on your member renewal form (paper renewal or online version). The letter to Life Members in March will also provide the opt-out opportunity.

Show Your SBE Pride: Get an sbe.org Email Address

The SBE is making available sbe.org domain forwarding email addresses to members. Any SBE member may request an email address. Messages will be forwarded to an address of your choosing that belongs to the requesting member.

The address format will be first initial last name @ sbe.org. The sbe.org forwarding address is available only to members of the SBE and is free, and requests for an sbe.org address will be made at renewal time in February.

Just check the box on the back of

YOU@sbe.org

the renewal form or the online form and include the email address you would like to have your email forwarded to. It must be your own email address.

SBE Life Members, who do not receive the annual renewal mailing, will receive a letter in March that will include information on how to request an sbe.org address.

Show your pride of SBE membership by getting and using an sbe.org email address in 2015.

WELCOME TO THE SBE

NEW MEMBERS

Nihad J. Ali Akbar - Alexandria, VA
Harry J. Allen - Stafford, TX
Tom Bole - Las Vegas, NV
Nathaniel Bonini - Brooklyn, NY
John F. Bradford - Dacula, GA
Richard C. Camburn - Springport, MI
Kristie A. Colombo - Rochester, NY
Darryl O. Cummings - Hollywood, FL
Rick Cutler - Anaheim, CA
Ryan P. Darmon - Bourne, MA
Jarret Deane - Berkeley, CA
Gary E. Embry - Norfolk, VA
Johnny A. Franco-Arboine - Morrisville, NC
Cory S. Haber - Silver Spring, MD
Kenneth T. Hittson - Fort Smith, AR
Jasmine L. Humphries - Potomac, MD
Robert J. Kerr - New Castle, PA
Alejandro Mesa - New York, NY
Confidence N. Nkosi - Potomac, MD
Chuck Poulton - Kent, OH
Michael J. Pretot - Cold Spring, KY
Jason Quintana - Hudson, CO
William B. Reynolds - Timberlake, NC
Ronella Rodney - Jamaica, NY
Steven W. Rosenblad - Sacramento, CA
Daniel L. Santiago - Elizabethton, TN
Amber L. Smith - Sanford, FL
Michael A. Stoeckle - Falls Church, VA
Judy Stokes - Merrick, NY
Tyler D. Stores - Lake Tapps, WA
Dwayne M. Terry - Lutz, FL
Jon-Michael T. Wallace - Nederland, TX

NEW STUDENT MEMBERS

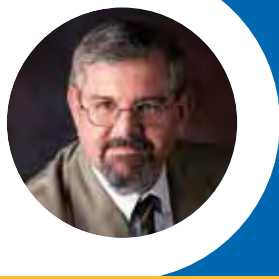
Nathan R. Avery - Fresno, CA
Ming Him Chan - Hong Kong
King Leung Chau - Hong Kong
Man Chun Chung - Hong Kong
Tang Ting Fung - Hong Kong
Ho Him Ho - Hong Kong
Kingsley Hong - Hong Kong
Yan Ling Ip - Hong Kong
Sum Yuen Lam - Hong Kong
Hin Cheuk Law - Hong Kong
Yin Long Lee - Hong Kong
Lucretia R. Lee-Arceneaux - Marietta, GA
Cheuk Ying Li - Hong Kong
Kwok Ho Liu - Hong Kong
Aaron D. Morrill - Spokane, WA
Mizanur Rahman - London, UK
Tsz Hei So - Hong Kong
Keng Kwan Tse - Hong Kong
Hang Wing Tsoi - Hong Kong
Tsz Yan Tsui - Hong Kong
Po Tong Yeung - Hong Kong

NEW ASSOCIATE MEMBERS

Jeremy S. Ashcraft - Kingston, TN

RETURNING MEMBERS

SeVern L. Ashes, Sr. - Vermillion, SD
Frank W. Bell - Clifton, NJ
Jose Bolanos - Grand Rapids, MI
Christopher W. Boone - Beaumont, TX
Mark S. Brown - Post Falls, ID
Jeff S. Carter - Fairmount, GA
Donavan J. Conway - Sacramento, CA
Donald E. Engelhardt - Salinas, CA
Jeffrey S. Galway - Sterling, VA
Scott Giles - Highlands Ranch, CO
Michael S. Graves - Grass Valley, CA
Chris L. Homer - Alexandria, VA
Jonathan C. Jones - Lexington, KY
Joshua R. Kelly - Independence, IA
Joshua A. Knapp - Raleigh, NC
Leroy E. Marburger - Brownsburg, IN
Robert L. Mardock - Montrose, CO
Steven R. Martin - Fayetteville, GA
Eugene McEfee - Rancho Palos Verdes, CA
George S. Melton - McDonald, TN
Alvaro A. Montealegre - Tampa, FL
William R. Mooney - Bigelow, AR
Michele I. Muller - San Mateo, CA
Bryan E. Noble - Menifee, CA
John J. Palumbo - Bala Cynwyd, PA
Jorj M. Schulke - Scottsdale, AZ
Steven C. Thompson - Conroe, TX
Edgardo Zavala - Houston, TX



LEGAL PERSPECTIVE

By Chris Imlay, CBT
SBE General Counsel
cimlay@sbe.org

FCC Tower Rules: Who's the Fall Guy?

Recently a client asked about his obligation as a tower lessee for compliance with FCC tower rules. His engineer had told him that everyone on the tower was jointly responsible for tower lighting outage reporting, fencing, RF signage, etc.

That was true once, but no more. Now, the FCC is comfortable with its jurisdiction over tower owners who are not themselves FCC licensees. Now, the tower owner and not tenants on the tower are responsible for FCC tower compliance.

Last August, FCC changed some of its tower regulations in Part 17 of the rules. A link to the August 8, 2014 Report and Order is noted below.

The idea was to streamline the rules and eliminate unnecessary requirements for antenna structure owners, and to harmonize its rules with the FAA's air hazard recommendations.

Now, the FCC will not require existing antenna structures to comply with any new lighting and marking requirements unless the FAA mandates application of the changes retroactively. However, tower owners must comply with the marking and lighting specifications issued in the FAA's "No Hazard" determination for new and modified structures. FCC retained the right to impose *additional* or *different* requirements in order to avoid an air hazard. This is important because some Western states have enacted regulations calling for lighting and painting of short towers below 200 feet in rural or agricultural areas. Wyoming, Idaho, Washington and Colorado have in an effort to protect crop dusters and other low-flying agricultural aircraft operation. The legality of those state statutes is very much in doubt because of the FAA's exclusive jurisdiction to protect the airspace, and the FCC's supplemental jurisdiction.

The FCC refused to allow structure owners to unilaterally adopt lighting configurations referenced in policy documents that reduce adverse effects to birds and other wildlife. The FCC has not yet made a determination as to what, if any, rules are needed to protect migratory birds. The report and

order clarified that changes to marking and lighting specifications on an ASR (Antenna Registration System) require prior approval from *both* the FAA *and* FCC.

Until last August, there was no definition of "alterations" to existing towers that would trigger a requirement for FCC approval for the change. Now, however, structure owners must receive FCC approval of any change or correction to a structure of *one foot or greater in height*, or *one second or greater in location*, relative to the existing ASR. These same criteria trigger a new aeronautical study and "no hazard" determination by the FAA. FCC does not require any specific method for conducting surveys or site measurements. Any survey method recognized by the FAA can be used.

Structure owners are now required to notify the FCC within five days of the date that a constructed tower reaches its greatest height; when a constructed tower is dismantled or destroyed; or when there are changes in structure height or ownership. The old rules required notification within 24 hours. The five-day notice standard is that of the FAA.

Tower owners still have the option to register structures even if not required by the FCC's rules. Registration is required of course when the overall height will exceed 200 feet or at certain lesser heights when close to an airport or heliport. Soon, the Form 854 will ask whether a new registration is voluntary. Part 17 marking and lighting requirements will not apply to towers registered voluntarily. Voluntary registrations may be withdrawn.

New on Numbers

There are new rules about posting tower registration numbers. The old rule required the ASR number to be displayed "in a conspicuous place so that it is readily visible near the base of the antenna structure." Because the base of the structure might not be accessible to the public, the new rule requires that owners display the ASR number so it is visible to the general public at the closest point of public access near the base of the antenna structure, except that if there are multiple publicly accessible access points, the number must be posted

at each location. Where a single perimeter fence encloses multiple antenna structures, the ASR number for *each structure* must be posted at *both* the access point(s) of the enclosure *and* at the base of each structure.

Tower owners can now provide all tenants with electronic notice of the ASR number and an electronic reference to the official registration rather than written notice.

Now, network operations center (NOC)-based monitoring systems can be exempted from the existing quarterly inspection requirements that apply to their automatic or mechanical control devices, indicators, and alarm systems. Tower owners must either make a once-a-day inspection to ensure lights are functioning properly; observe an automatic properly-maintained indicator at least once every twenty-four hours; or deploy an automatic alarm system designed to detect lighting failures and notify the tower owner of any failures. Systems with advanced self-diagnostic functions (alarm notification, 24-hour polling, manual contact), or which have an operations center staffed with trained personnel capable of responding to alarms 24 hours per day, 365 days per year, and a backup Operations Center that can monitor systems in the event of failure are eligible for the exemption. Otherwise, the quarterly inspection requirement applies, and antenna structure owners are not required to implement advanced monitoring capability.

Lighting required under an ASR must remain on or, if required lights become extinguished, the structure owner must promptly request a Notice to Airmen (NOTAM). Any exemption from quarterly inspections is *not* an exemption from obligations to comply with these requirements or protection from enforcement actions related to them. A NOTAM is cancelled after 15 days. If a lighting outage cannot be repaired within the FAA's original NOTAM period, the FCC requires the structure owner to notify the FAA and provide an estimated return-to-service date.

Antenna structure owners have to maintain records of known outages or improper functioning of structure lights for two years. They have to be provided to the FCC upon request.

The report and order has other provisions as well. Take a look.

LINK

August 8, 2014 Report and Order:
<http://bit.ly/FCCtowerRO>



FOCUS ON SBE

By John L. Poray, CAE
SBE Executive Director
jporay@sbe.org

SBE: Moving Past 50

On page 9 of this issue of *The Signal* is a reminder about the society's annual membership renewal. After a year of celebration of the society's 50th anniversary, we're looking ahead to the future, and the 2015 membership card is a reflection of this. The card features the traditional logo, but enhanced with a larger "SBE" in the middle of the circle for a bolder, easier-to-read look. When the logo appears in color, a thin gold ring borders the blue ring, a nod towards the SBE's history.

The card also includes the society's new descriptive tagline, "The Association for Broadcast and Multimedia Technology Professionals." This phrase serves to communicate the broader scope of SBE membership, reflective of how the broadcast industry, and specifically the technical side, has evolved. The phrase was developed by a Board-appointed committee consisting of a half dozen long-time members from across the country and chaired by former national president, Ed Miller, CPBE, of Chapter 70 Northeast Ohio. The phrase was approved by the Board last year and announced during last October's National Meeting in Verona, NY. It is being used on the SBE website, *The Signal* and in other electronic and print publications and releases.

The phrase is also symbolic of the effort the SBE is beginning to make to attract members who work in technical roles, other than engineering, at broadcast stations and related media settings. National Board member Tim Anderson, CPBE, DRB, CBNE chairs the SBE Membership Committee that is developing strategies to accomplish this, as well as ways to provide more support to our current members and chapters. The work of both Tim's and Ed's committees are part of the current strategic plan adopted by the Board of Directors last year.

The SBE and the ATSC

Since 2000, the SBE has been a member of the Advanced Television Systems Committee (ATSC), concentrating on task groups one and three that deal with television transmission. Then president, Andy Butler, CPBE, felt the members of the SBE should have a voice in the important work of the ATSC, which potentially have an

impact on those SBE members who work in television. He saw to it that the SBE became a member of the ATSC, and we have been ever since.

Each year a member of the SBE is appointed by the SBE president to serve as the society's official representative to the ATSC. This year and last, President Snelson appointed past SBE president Vinny Lopez, CEV, CBNT, to serve in this capacity. Vinny has assembled an ad-hoc committee to help advise and provide input on technical issues and, as appropriate, issues that require a vote by ATSC membership. Those on the ad-hoc committee include Fred Baumgartner, Sterling Davis, Ralph Hogan, RJ Russell, Dennis Wallace and President Snelson. We express our thanks to this group for its willingness to serve the SBE in this important capacity, providing the "in the trenches" television station engineer with a voice in the development of television broadcast transmission technology.



Answer from page 3

a. 306

The formula you need is: $\text{wavelength} = \frac{\text{velocity}}{\text{frequency}}$

The velocity of light is 983,571,056 feet per second. Dividing that by 1,070,000 (in hertz) yields a wavelength of 919.23 feet. 120 degrees is $\frac{1}{3}$ of a wavelength (360 degrees), so divide 919.23 by 3 and you get 306.41, which rounds down to 306.

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*Structural analysis per ANSI/TIA-222-G, TIA/EIA-222-F or as required by jurisdictions.



Engineering Perspective

By David Brender, PE

david.brender@copperalliance.us

National Program Manager, Electrical Applications, Copper Development Association

Power Quality for Communications Facilities

Radio and television stations represent not only revenue to the operator, but entertainment, news, and in many cases emergency information for the public. While battery power will suffice for receivers, the same is not true for the transmitters.

While there has often been technological updating on the broadcast side, the infrastructure to support it has frequently not been addressed. This often results in downtime, with its attendant loss of revenue, and loss of listeners. One prime example is a facility I visited a couple of years ago that was installing digital and other modern equipment in a facility that hadn't been updated since the 1940s.

While communications facilities have their own unique characteristics, the steps taken to ensure power quality are common to facilities of every type, and largely follow the wiring and grounding recommendations that are applied to any facility where sensitive equipment functions. This article will serve as a summary of the most common and easily addressed infrastructure changes that can greatly alleviate power quality issues before they arise.

In many instances a communications facility performs functions that can be described as life supporting. While a 911 center comes to mind, a telephone equipment room serving a senior citizen residential development can be just as critical.

In situations like this, building or retrofitting for power quality considerations is often very inexpensive compared to the risk of down-time.

Going Beyond Code Minimum

The National Electrical Code is somewhat nebulous on the requirements for low resistance grounding. The Code alludes to a desired minimum resistance to ground of 25Ω , but does not mandate that value. In fact, the Code mandates that certain facilities be used as grounding electrodes, if they exist, and provides rules for bonding the electrodes together. But, as for resistance, it stipulates that if 25Ω is not achieved, an additional electrode should be installed, and connected. There is no requirement for testing the resultant system, no protocol for how to test the system, or how often to repeat the testing. Just walk away.

Just because a facility may have met the NEC is no guarantee that it represents an optimal condition. Paraphrasing a famous expression, "Code is one step ahead of illegal." This warning applies to tower grounding standards, as well as the NEC.

Common Mistakes

The following are examples of common errors that can affect up-time:

Example 1: Equipment not bonded together. KPTM-TV occupies a studio facility in downtown Omaha, NE. Trouble started when a 365-foot tower was built adjacent to the studios to transmit the signals to their main transmitter 10 miles away (Figure 1). Lightning events caused \$30-40,000 worth of equipment damage per event, plus costly downtime.



Figure 1. Two towers are located at KPTM's downtown Omaha studios. A lightning strike to one of these towers followed waveguides directly into the adjacent studio building.

Upon examination by a professional, several common deficiencies were found, including main elements electrically connected together only through the coax. Retrofits included 100-ft deep copper-clad grounding rods, one for each tower, firmly bonded to the towers with 250-kcmil stranded copper. The final depth was selected as the point where resistance dropped below 2Ω . Next, each tower was surrounded with a buried 250-kcmil bare copper ring

ground. More copper bonded the rings to the tower's steel structure, to the deep electrodes and to each other (Figure 2).

In addition, 250-kcmil pigtails were run



Figure 2. Stranded 250-kcmil bare copper grounding cable connects the base of one studio tower with a buried ring-ground. Note the sturdy mechanical bond at the right.

from the rings to the station's satellite dish antennas, the transmitter room, and into the studio building. That put the entire facility at the same ground potential, eliminating ground-loop currents at their source (Figure 3).



Figure 3. Antennas at the KPTM studio site are grounded with 250-kcmil copper cable protected inside the white conduit. The grounding cables extend from the electrodes and ring-grounds surrounding the towers.

Inside the transmitter room, which is a small building adjacent to the studio, were mounted several $1/4"$ copper ground bars to serve as bonding points for conductors leading to the transmitters and equipment

see **POWER QUALITY**, p.14

- AC Video Solutions • 2014**
Andrea Cummis 201-303-1303
Consulting, Systems Design/Integration
- Advanced Broadcast Solutions • 2012**
Arco Groenberg 206-870-0244
Systems Integrator
- American Tower Corporation • 2000**
Peter A. Starke 781-461-6780
Development/Construction/Management
- ATCi • 2012**
Anthony Graves 480-844-8501
Satellite Communications Solutions Provider
- Audemat-Worldcast Systems Inc. • 2000**
Christophe Poulain 305-249-3110
Control Manufacturer
- AVCOM of Virginia, Inc. • 2010**
Warren McElfresh 804-794-2500
Spectrum Analyzers
- AVDB Group • 2014**
Maria Cody 720-940-7131
Audio/Video/Lighting & Control
- Avid Technology • 2011**
Rich Griffin 303-248-3259
Broadcast Products and Services
- Belden Electronic Division • 1991**
Steve Lampen 800-235-3361
Cable and Connectivity
- Bell Tower • 2014**
Bruce Burris 918-789-9020
Tower Manufacturing, Design & Installation
- Black Box • 2014**
Brian Kutchma 724-873-6719
HD-KVM Switching & Extension
- Blackmagic Design • 2012**
Terry Frechette 978-337-0991
Switchers, Digital Cameras, Routers
- Bracke Manufacturing LLC • 2012**
Patra Largent 949-756-1600
RF & Microwave Components
- Broadcast Electronics Inc. • 1978**
Tom Beck 217-224-9600
Radio Equipment Manufacturer
- Broadcast Microwave Services Inc. • 1997**
Jim Kubit 805-581-4566
Manufacturer, Transmitters, Receivers,
Antenna Systems
- Broadcast Supply Worldwide • 1986**
Shannon Nichols 800-426-8434
Audio Broadcast Equipment Supplier
- Broadcasters General Store • 2004**
Buck Waters 352-622-7700
Broadcast Audio Video Distributor
- Canon USA Inc. • 1985**
Larry Thorpe 201-807-3300,
800-321-4388
Broadcast Lenses & Transmission
Equipment
- Cavell, Mertz & Associates Inc. • 2011**
Gary Cavell 703-392-9090
Consulting Services
- Comark • 2013**
Jack McAnulty 860-763-1100
Manufacturer Broadcasting Transmission
Equipment
- Comrex Corporation • 1997**
Chris Crump 978-784-1776
Audio Codecs & Telephone Interface
Products
- Comsearch • 2004**
Tim Hardy 703-726-5651
Frequency Coordination Services
- Continental Electronics Corporation • 1976**
Michael Troje 800-733-5011
AM & FM IBOC Transmitters
- CueScript • 2014**
Michael Accardi 203-763-4030
Teleprompting Software & Hardware
- Davicom, Division of Comlab, Inc. • 2014**
Guy Fournier 418-682-3380
Site Remote Controls
- Dialight Corporation • 2006**
US Headquarters 732-919-3119
FAA Obstruct. Lighting, LED Based
- Dielectric • 1995**
Cory Edwards 207-655-8131
TV & FM Transmission & Cellular Products
- Digital Alert Systems, LLC • 2005**
Bill Robertson 585-765-1155
Emergency Alert Systems
- DoubleRadius, Inc. • 2012**
Jeffrey Holdenrid 704-927-6085
IP Microwave STL
- du Treil, Lundin & Rackley, Inc. • 1985**
Jeff Reynolds 941-329-6000
Consulting Engineers
- Drake Lighting • 2015**
Dave Sheppard 270-804-7383
FAA Obstruction Lighting - High Intensity
- DVE0 - Division of Computer Modules Inc. • 2011**
Laszlo Zoltan 858-613-1818
Everything About Transport Streams
- e2v • 1997**
Mark Strohecker 914-593-6831
Electronic Components, SATCom Amplifiers
- Econco • 1980**
Debbie Storz 800-532-6626,
530-662-7553
New & Rebuilt Transmitting Tubes
- Emerson Network Power/Avocet • 2014**
George Morgan 917-592-0956
Avocet High Performance KVM
- ENCO Systems Inc. • 2003**
Kenneth Frommert 800-362-6797
Audio Automation and Playout
- ERI - Electronics Research • 1990**
David White 812-925-6000
Broadcast Antennas, Transmission Line,
Filters/Combiners, Towers and Services
- Floral Systems • 2008**
Shawn Maynard 877-774-1058
Television Broadcast Automation
- FOR-A Corporation of America • 2013**
Adam Daniul 305-773-7608
Innovation in Video and Audio Technology
- Fujinon, Inc. • 1986**
Thom Calabro 973-633-5600
Broadcast & Communications Products
- GatesAir • 1977**
Dave Hopson (TV) 513-445-5243
Mark Goins (Radio) 513-899-9124
Broadcast Equipment Manufacturer
- Geppo/General Cable • 1995**
Dennis Thompson 407-405-0756
Innovative Cabling & Custom Solutions
- Graham Brock, Inc. • 2012**
Marilyn Matheny 912-638-8028
Technical Consultation - Radio/TV
- HD Radio/iBiquity Digital • 2014**
Rick Greenhut 443-539-4335
HD Radio Technology
- Heartland Video Systems, Inc. • 2011**
Dennis Klas 920-893-4204
Systems Integrator
- IEWC • 2014**
Matt Granard 425-286-1900
Global Connectivity Solution Provider
- Image Video • 1997**
Zach Wilkie 416-750-8872 x228
Under Monitor Tally Display Systems,
Monitor Design and Manufacture Broadcast
Equipment
- Inovonics Inc. • 2012**
Lukas Hurwitz 831-458-0552
Radio Broadcast Equipment
- Integrated Microwave Technologies • 2009**
Elena Waldhuber 908-852-3700
Microwave Video Transmission and Receive
Systems
- JAMPRO Antennas Inc. • 2011**
Alex Perchevitch 916-383-1177
DTV/DVBT & HD Radio-IBOC Solutions
- JVC Professional Video Products • 2014**
Lon Mass 973-317-5117
Professional Video Products
- Ka You Systems • 2011**
George Gimourginas 301-585-4302
Audio, Video, IP - Satellite
- Kathrein Inc., Scala Division • 1985**
Michael W. Bach 541-779-6500
Antennas for Broadcasting &
Communications
- LBA Technology Inc. • 2002**
Katie Sneed 252-757-0279
AM/MW Antenna Equipment & Systems
- LYNX Technik • 2007**
Steve Russell 661-251-8600
Broadcast Terminal Equipment Manufacturer
- Markertek Video Supply • 2002**
Andrew Barth 845-246-3036
Audio, Video, A/V Broadcast Supply
- Maxell Corporation of America • 1991**
Patricia Byrne 973-653-2423
Data/Broadcast Video Media
- Micronet Communications Inc. • 2005**
Jeremy Lewis 972-422-7200
Coordination Services/Frequency Planning
- Microwave Video Systems • 2011**
Warren J. Parece 781-665-6600
Microwave Equipment Rental, Sales &
Service
- Middle Atlantic Products • 2005**
David Amoscato 973-839-1011
Equipment, Mounting, Solutions
- MoreCom Inc. • 2009**
Kyle Moorehead 763-533-5535
Networking & AV Construction
- Moseley Associates Inc. • 1977**
Dave Chancey 805-968-9621
Digital STLs AM/FM/TV
- MusicMaster • 2014**
Shane Finch 352-351-3625
Advanced Music Scheduling Solutions
- Nascar Productions • 2014**
Abbey Kielcheski 704-348-7131
Live/Post Production Services
- National Association of Broadcasters • 1981**
Industry Trade Association 202-429-5340
- National Football League • 1999**
Ralph Beaver 813-282-8612
Game Day Coordination Operations
- Nautel Inc. • 2002**
Jeff Welton 877-662-8835
Radio Broadcast Transmitter Manufacturer
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Cables, Connectors, Assemblies and Fiber
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Kathy Hall 704-972-3050
Ruggedized Optical Fiber Systems
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David Rusch 480-403-8300
Audio Processing AMFMTV
- Pacific Radio • 2013**
Josh Phillips 818-556-4177
Cables, Connectors, Tools, Racks
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Christine Hammond 949-261-1920
Coax & Fiber Products
- Potomac Instruments • 2012**
Guy Berry 301-696-5550
RF Measurement Equipment Manufacturer
- ProAudio.com- A Crouse-Kimzey Co. • 2008**
Mark Bradford 800-433-2105 x560
Proaudio Broadcast Equipment Distributor
- Propagation Systems Inc. - PSI • 2010**
Doug Ross 814-472-5540
Quality Broadcast Antenna Systems
- Quintech Electronics and Communications Inc. • 2002**
James Herbstritt 724-349-1412
State-of-the-art RF Hardware Solutions
- QVC • 2011**
Kevin Wainwright 484-701-3431
Multimedia Retailer
- RCS • 2003**
Diana Stokey 308-284-3007
Audio and Video Content Management
- RDL • 2004**
Chuck Smith 928-778-9678 x142
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Manufacturer
- RF Specialties Group • 2008**
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Walt Gumbert 724-693-8171
Broadcast Transmitters, Test &
Measurement
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Darren Budrow 613-228-0688
Manufacturer, Television Broadcast
Equipment
- Sage Alerting Systems Inc. • 2010**
Gerald LeBow 914-872-4069 x210
Emergency Alert Systems Products
- SCMS Inc. • 2000**
Bob Cauthen 800-438-6040
Broadcast Equipment- New/Used
- Seacomm Erectors, Inc. • 1997**
John Breckenridge 360-793-6564
Tower/Antenna Erections
- SEG • 2014**
Chris Childs 913-324-6004
Supply Chain Products and Services
- Shively Labs • 1996**
Dale Ladner 888-SHIVELY
FM Antennas & Combiners
- Shure Incorporated • 2012**
Bill Ostry 847-600-6282
Microphones, Wireless Systems, Headsets
- Sierra Automated Systems and Engineering Inc. • 2011**
Al Salci 818-840-6749
Routers, Mixers, Consoles, Intercoms
- Signiant • 2012**
Steve Gillen 781-221-4000
Signiant Content Delivery Software
- Snell Inc. • 1995**
John Shike 818-556-2616
Video Equipment Manufacturer
- Solid State Logic • 2014**
Steve Zaretsky 212-315-1111
Digital Audio Consoles/Routers
- Sourcerer • 2014**
Eddy Vanderkerken 214-912-5007
Broadcast Equipment, T & M
- Staco Energy Products Co. • 2010**
Paul Heiligenberg 937-253-1191 x128
Manufacturer of Voltage Regulators, UPS
- Superior Electric • 1995**
Michael J. Miga 860-507-2025
Power Protection Equipment
- Sutro Tower Inc. • 1989**
Eric Dausman 415-681-8850
Broadcast Tower Leasing
- TC Electronic • 2008**
Laura Davidson 818-665-4902
DTV Audio Level Processing
- Tektronix Inc. • 1977**
Michael Brett 503-627-5888
Video Test & Measurement, Equipment
Manufacturer
- Teletream • 2013**
Mark Wronski 530-470-1337
Transcoding, Captioning, Workflow
Automation
- Telos Systems/Omnia/Axia • 2003**
Denny Sanders 216-241-7225
Telos Systems Talk-Show Systems
- Teradek • 2011**
Jon Landman 949-743-5783
Camera-top ENG Solutions
- Terrestrial RF Licensing Company • 2003**
Jennifer Smith 888-373-4832
FCC Broadcast Auxiliary Licensing Services
- The Durst Org. - 4 Times Square • 2004**
John M. Lyons, CPBE 212-997-5508
TV/FM/Microwave Tower Site
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Fiber Transmission Provider
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Matt Tietze 301-537-6288
Video Compression and Processing
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John Lackness 317-845-8000
POTS, ISDN, Codecs & A/V Products
- Tower Engineering Company • 2013**
Madison Batt 425-640-2266
Tower Engineering Analysis & Design
- Unimar Inc. • 2001**
Thad Fink 315-699-4400, 813-943-4322
Tower Obstruction Lighting Designer,
Manufacturer, Distributor
- Vislink Broadcast • 1991**
Mark Tommey 978-671-5700
Video Microwave Systems
- Wheatstone • 2010**
Jay Tyler 252-638-7000
IP Consoles, Routers & Processors
- WideOrbit • 2012**
Brad Young 214-923-6337
Broadcast Management Software,
Automation and Master Control
- Wireless Infrastructure Services • 2006**
Travis Donahue 951-371-4900
Broadcast Microwave, Tower & ENG
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The SBE Membership Drive will kick off on March 1. With 50 years of history, the SBE provides broadcast engineers the best in certification, continuing education, government relations and career opportunities. And you can help continue that tradition. The SBE is the only organization that is devoted to the advancement of all levels and types of broadcast engineering.

As a member, you know the benefits of membership. Chances are you have a colleague or two who are not familiar with SBE, but could benefit from membership. While anyone can join the SBE at anytime during the year, there's an added benefit to

joining during the SBE Membership Drive, held from March 1 to May 31.

If you recruit a new member during the Drive and your name is on the sponsor's line of the membership application, your name will be entered into the member drive drawing for prizes donated from our sustaining members. You will also have the opportunity to win the grand prize to attend the SBE National Meeting held in conjunction with the 2015 Wisconsin Broadcaster's Clinic in Madison, WI, Oct. 13-15.

And as a further bonus, for every new member you sponsor you will receive \$5 off your 2016 dues (up to \$25).



POWER QUALITY from p.12

cabinets. All electrical equipment in the room was bonded to the bars, and from there, to the exterior grounding grid.

The system is doing its job. Lightning has struck the studio towers numerous times over the five to six years since the initial event, but it has never again entered either the transmitter building or the studio, nor has the station lost air-time or suffered any damage to equipment.

A Radio Station Grounding Story

A radio station in New Mexico (the call letters cannot be identified because the necessary releases have not been signed) is likely typical of other stations in the use of non-recognized methods for grounding.

Note that the tower leg is grounded by lapping a conductor (possibly only #12) onto the steel leg, and secured with an automotive hose clamp (Fig. 6a). The tower is steel, the clamps stainless steel, the conductor copper or possibly aluminum. Three different metals in a joint is a recipe for corrosion.

The water pipe electrode is not much different, and one wonders about the continuity and consistency of the resulting resistance.

Techniques That Help

There are a variety of techniques that can help prevent or alleviate the effects of poor power quality. Most simply involve better electrical designs and installation of some additional wiring and grounding. These techniques are inexpensive to install, especially when a building is undergoing construction, and they may also be cost effective during retrofits.

The types of recommended practice for these facilities are generally found in the IEEE literature, with the caveat that grounding and surge protection are even more critical in a communications environment.

Interior Wiring

- Separate Sensitive Electronic Loads from Other Equipment

Do not mix standard loads and sensitive loads on the same circuitry (or panelboards if at all possible.) A dedicated circuit, consisting of phase conductors, a separate neutral, and a separate ground conductor, is a good idea for each piece of equipment.

Connections

All connections should be made properly using listed and recognized connectors of corrosion-resistant material. Connections need to be tight and maintained to avoid possible rectification of RF at poor joints. Corrosion and joint loosening need to be addressed on a regular maintenance schedule to ensure low impedance electrical continuity at all conduit joints.

- Voltage Drop

Although the NEC allows up to a 3 percent voltage drop in a branch circuit, recommended practice is to design for no more than a 1 percent voltage drop at full load on branch circuits feeding sensitive equipment. Feeder voltage drop should not exceed 2 percent. That means conductor gages should often be larger than required as code minimums.

- Conductor Material

The chances of problematic connections are decreased with the use of copper conductors. Because of copper's superior connectability, there is less risk of a power quality-related failure.

Grounding

- Ground Rings

A buried exterior ground ring is a technique to help achieve a low impedance from the building's grounding system to the earth itself, and a convenient means to connect various conductors and other ground-

ing elements leading from the building. At communications towers, ring grounds offer low impedance at high frequencies, and are sometimes supplemented by radials and vertical electrodes to achieve low resistance to ground. Ring grounds should be buried below the frost line, and sizes of 4/0 and larger are typically recommended.

- Grounding of Lightning Systems

Design considerations covering lightning systems are found in the National Fire Protection Association's Code #780, Code for Protection Against Lightning. Keep in mind that the conductor sizes in that document are minimums. A lightning collection system with a high resistance ground path is likely to cause more problems than it cures.

All Structures Need to be Connected

Comprised of towers, transmitter buildings, and ancillary gear, usually in a clear, high site, bonding of all ground elements into one interconnected system is important. Most professionals install grounding conductors larger than code minimums for grounding conductors. Use only listed connections.

The most serious consequence of poor power quality, frequently, is not the damage of physical hardware, but the reduced productivity and costly downtime. In the case of communications facilities, time off-the-air can be costly, and sometimes it can be safety-related. The cost to do the job right is minimal compared to the cost of failure.

MORE ONLINE

See www.copper.org/PQ for additional case studies and related material. Seminars are available for groups of 25 or more.

MARK YOUR CALENDAR

HD Radio Advancement and Trends - Webinar

February 4, 2015

Presenter: Alan Jurison, CSRE, AMD, DRB, CBNE

SBE Certification Exams - Local Chapters

February 6-16, 2015

Deadline to apply for the exam is closed.

ATSC 3.0 - Webinar

February 19, 2015

Presenter: Richard Chernock

SBE Certification Exams - NAB Show

April 14, 2015

Deadline to apply for the exam is March 20, 2015.

Member Spotlight: Kevin Schrader

Member Stats

SBE Member Since: 1995
SBE Certifications: CBTE
Chapter: 109
Employer: KCRG-TV, The Gazette Company
Position: Director of Broadcast Distribution and Operations
Location: Cedar Rapids, IA



Kevin Schrader standing in the KCRG-TV master control room. He was part of the team that transitioned the station to full HD playback.

experience, so I attended the Defense Information School's Broadcast TV Maintenance course at Lowry Air Force Base in Colorado and became an Instructor upon graduation, relocating with the school to Ft. Meade, MD, when Lowry AFB closed. I worked with a great team of instructors who helped fuel my interest in broadcast engineering. I began working in television when I left the Navy.

Q. *What do you like most about your job?*

A. I really enjoyed being part of a terrific team that helped our station (KCRG-TV9 in Cedar Rapids, IA) make the transition to full HD from acquisition to ingest to playback. It was a big project that we completed a few years ago, but was very rewarding to see that first newscast go on the air.

Q. *What do you do when you're not working?*

A. I like spending time with my family, watching my children in their various activities (baseball, dance, band just to name a few things), but I also like biking, snowshoeing, and watching baseball.

Q. *What do you enjoy or value most about your involvement with the SBE?*

A. I enjoy our chapter's monthly meetings since they are a great opportunity to share information on the latest issues affecting our industry, as well as meet with vendors and see demonstrations of the latest technology. I also enjoy meeting members of other chapters at the annual SBE membership meeting at the NAB Show.

Q. *What got you interested or started in broadcast engineering?*

A. I first became interested in broadcast engineering while I was on active duty in the U.S. Navy. I was fortunate enough to work in the Ship's Information Training and Entertainment division on my first ship. I really enjoyed the

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Chapter Engineers of the Year

Over the past several issues of *The Signal*, we have highlighted the winners of the various chapters' Engineer of the Year awards. We have one more recipient to highlight.

SBE Chapter 9 Phoenix honored its winner, Gary Smith, who works for Bonneville Media.

In the photo, Chapter Chairman Robert Reymont, CPBE (right), presents the plaque to Gary.

Congratulations to all the Chapter Engineer of the Year award recipients. The chapter award winners were all automatically entered into the national awards selection to be considered for the Robert W. Flanders Engineer of the Year.

The nominations for the 2015 national awards are now open. More information is on page 1. Nominate a member or your chapter today.



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