September 1989

Focus on construction

IT INSTALLER TECHNICIAN

The training and educational magazine for cable television technical personnel.

Special pull-out poster

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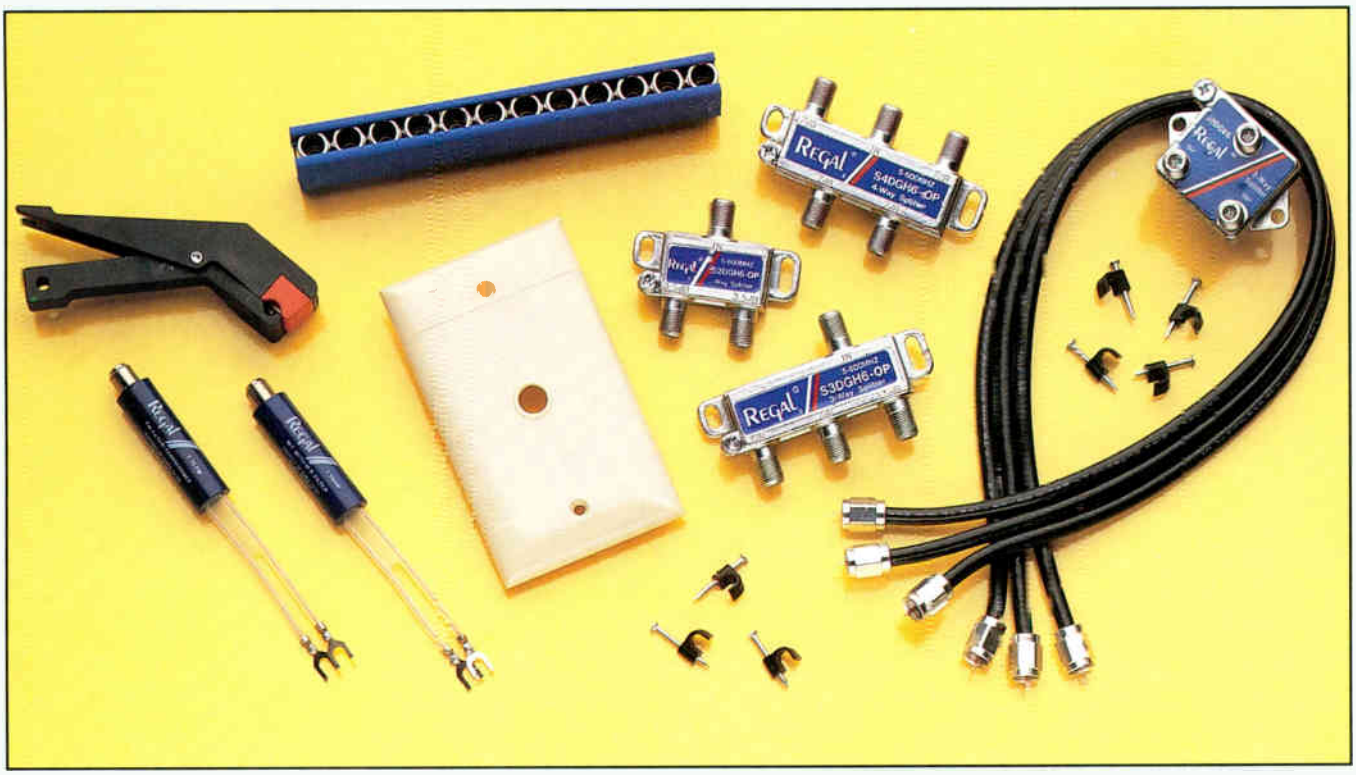

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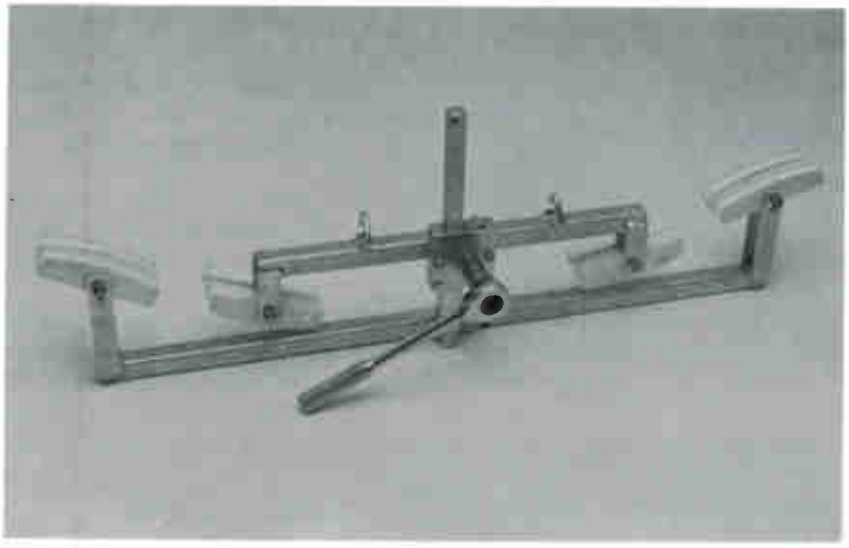
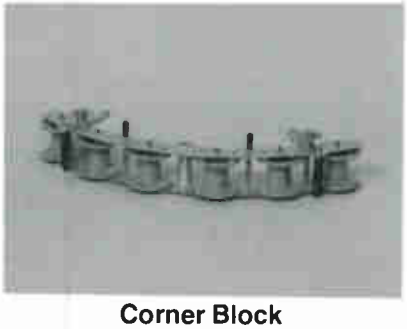


Bender

Cable Block



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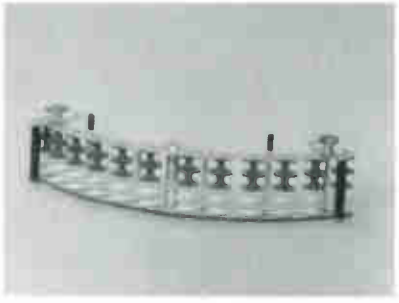

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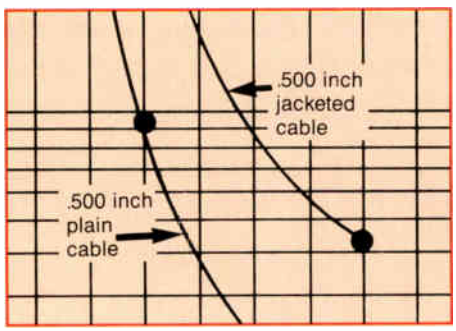

Loop life 40

Features

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How Most People Reacted When Told We Could Improve Their Image.

Introducing the new CAT100R, a startling new development from Uniden Satellite Television. The CAT100R features direct entry in 1 MHz steps, so you get pinpoint tuning. Pictures come through with incredible clarity, and the sound, in unbelievably rich stereo.

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Reader Service Number 3.

"I am always searching for information about our industry to help me select new equipment, stay in touch with the latest developments and to aid in our training efforts.

*"**Installer/Technician** not only provides valuable technical information, but also contains articles dealing with customer relations, safety and career progress.*

*"**Installer/Technician** is the right tool for the job."*

—Herb Dougall III
Technical Manager
Cox Cable Omaha

Batteries not included

Remember all those great toys you got for birthdays and holidays. The ones you had to have because, after all, Joey and Emily down the street had them? Remember unwrapping them, expecting to see this marvel of toydom? And remember what came out of the box? Pieces of metal and plastic, maybe some stickers and instructions that read: "Insert Tab A into Slot A and fold. Drill hole through X and attach to Panel 2 with ¾-inch tack. Turn inside out, making sure Slots C and D are aligned. Glue thoroughly and perforate with 1-inch exacto knife. Sprinkle liberally with flour and sugar. Bake at 350° F for 30 minutes. Cool and hammer. Throw out the window. Batteries not included."

Of course, mom and dad usually bailed you out (sometimes before they ever gave you this toy wonder), spending hour upon hour inserting, folding, drilling, attaching, perforating, sprinkling, baking, hammering and probably cursing. Hopefully they did it right the first time, because if they didn't you were back within an hour commanding them to put the wheel back on or find the lost tack—now! I mean please?

Now that you're older, you may have kids of your own, or nieces and nephews, or neighbor's kids. Anyway, I'm sure you know how demanding they can be and how upset they get when their new favorite toy is not put together correctly.

Now think about your system's subscribers. Don't they get upset too when their toy of choice, namely cable television, breaks down? And don't they want it fixed—now?! Of course they do. So, like that new toy you had to have as a kid, it's important that you put together that cable system right during construction. Unlike that toy, there's substantial money to be lost if you don't.

Although you may work on a limited part of the construction, knowledge of the overall "instructions" may help you understand where you fit in the plan. "Planning for construction" by Cardinal Communications' Gregg Nydegger gives an overview of how to prepare for a project. Working from a clear strand map, doing a makeready and obtaining permits are all important for a smooth construction. Inserting Tab A into Slot A is not.

It seems that every day you hear of some new development in fiber optics—an improved product, a new project, etc. In "News," for example, is an item about a new FO digital system being developed by C-COR and COMLUX. And, as Tom Brooksher points out in "From the NCTI," if your system isn't involved in fiber yet, chances are it will be. Bruce Westendorf's article discusses two methods of constructing with fiber that you may need to know now or someday soon.

And there are other articles that will expand your knowledge of the construction process, or at least refresh your memory. So: "Turn page. Read articles and columns. Absorb information. Enjoy. Batteries not included."

Innocent bystander

Are you an innocent bystander? You do your work and learn from watching others or your own mistakes. You might even put in a little overtime. That's enough, isn't it? Maybe, but for those of you who want to do the best job possible and make the most of your career, you need to do more than just let things happen to you. You need to take an active role in improving your work skills. As he says in this month's "You and the SCTE," Jack Trower wants to see the involvement of more individuals in Society programs. But, you may argue, the SCTE is for engineers. Au contraire. The Society's Installer Certification Program is the perfect way for you to fine-tune your abilities. And you get a nifty certificate.

Besides, the Society hopes to convince industry management that every installer and installer/technician, both in-house and contractor personnel, should be certified. So quit "standing by" and take some positive action.

Tom J. Barnett

IT INSTALLER TECHNICIAN

A Transmedia Publication

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Normalization: A Valuable Tool for CATV System Sweeping

Normalization is not a new concept although its application in the CATV industry is fairly recent. The normalization process is simply the mathematical comparison of two independent measurements. The first measurement is called the reference value; the normalization process simply subtracts the reference value from the measured value.

$$V_{measured} - V_{reference} = V_{normalized}$$

In a typical implementation, a sweep response trace is stored at the headend testpoint; this becomes the reference trace. When normalization is used, the stored reference trace is subtracted from the trace being measured. The resulting difference or normalized trace is displayed on the screen of the sweep receiver. This normalized response trace is simply the difference or change between the measured trace and the reference trace. When a remote point is measured, say, at an amplifier in the cascade, the normalized trace represents the system response degradation from the headend to the amplifier measured.

New tricks are available when the receiver can store more than one reference trace. Additional reference traces can be stored at any point in the cable plant. The operator can then select which reference the current trace is being compared to, thereby effectively measuring system response between any two points in the system.

For more information on normalization or the CALAN 1776/1777 Integrated Sweep System, call 800-544-3392 (in PA 717-828-2356).

News

SCTE seeks nominations, issues call for papers

EXTON, Pa.—The Society of Cable Television Engineers is seeking nominations for candidates to run for vacant positions on its board of directors in its upcoming national election. The board needs to fill vacancies in eight of the Society's 12 regions across the country as well as one at-large position. Upon their election, directors will serve two-year terms beginning March 1990.

In other news, SCTE is soliciting proposals for technical papers and/or workshops to be presented at Cable-Tec Expo '90 in Nashville, Tenn. Technical papers that are accepted will be presented at the Society's 14th Annual Engineering Conference June 21. Submissions, which should include an abstract of the proposed paper or workshop, should be sent to Bill Riker, Expo '89 chairman, no later than Dec. 1. For further information, contact SCTE national headquarters.

Great Lakes Expo '89 announces tech agenda

COLUMBUS, Ohio—The cable television associations of Illinois, Indiana, Michigan, Ohio and newcomer Wisconsin will present "A challenging picture" at this year's Great Lakes Cable Expo. The regional show, scheduled for Sept. 20-22 at the Convention Center here, is expected to draw over 2,000 attendees for the first time. As usual, the show will feature technical workshops coordinated by the Society of Cable Television Engineers and its local chapters and meeting groups.

C-COR, COMLUX plan fiber digital system

STATE COLLEGE, Pa.—C-COR Electronics announced an agreement in principle with Mountain View, Calif.-based COMLUX, which designs and manufactures fiber-optic equipment. Under the agreement, the companies will jointly develop and produce a digital fiber system for transmission of TV signals with the features, performance and price for practical use in multichannel CATV trunk lines. The planned system will use off-the-shelf optical and digital video components used in broadcast TV equipment.

According to C-COR, these readily available high-power laser transmitters and sensitive receivers can provide a highly reliable TV transmission system capable of ranges of over 40 km without signal degradation or the need for repeaters. The planned technology, says C-COR, will be ideal for point-to-point and point-to-multipoint distribution systems. C-COR anticipates that the new digital technology will provide the quality needed for transmission of high definition TV.

In other developments, C-COR and the David Sarnoff Research Center recently completed testing of the first cable transmission of ACTV-I (Advanced Compatible Television-I), the initial phase of Sarnoff's advanced TV system.

US West awarded Hong Kong franchise

HONG KONG—The Hong Kong government recently awarded the world's largest single CATV franchise to Hong Kong Cable Communications (HKCC), a consortium comprised of US West International and four companies based here and in Europe. In addition to winning the rights to provide cable television to 1.5 million potential customers, the consortium also was awarded a license to provide data telecommunications services to businesses and residential customers throughout the territory.

Work on the project will begin immediately and service to Hong Kong customers is expected to be available in 1991. HKCC plans to install a digital network to provide cable TV and high-speed data communications.

A 25 percent equity by US West is seen as one of the major factors that gained HKCC the rights to this franchise.

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- ☐ Microwave or Telephone Company
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- ☐ MDS, STV or LPTV Operator
- ☐ Government Agency
- ☐ Educational TV Station, School or Library
- ☐ Other _____ (please describe)

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- ☐ Inside Plant (working within one specific office)
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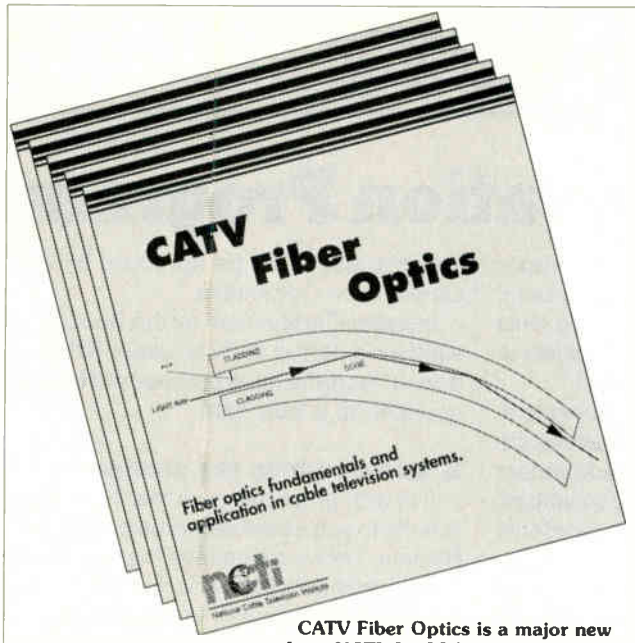


CATV Fiber Optics is a major new course from NCTI. Its 22 lessons cover virtually all aspects of fiber optics and its use in cable TV.

Now you can learn Fiber Optics from the industry's broadband training source!

Introducing NCTI's CATV Fiber Optics

Fiber Optics is undeniably a part of cable television technology. If your system isn't already involved in fiber, chances are it will be in the next three years. And, if you're like most of us, your training and experience is in coaxial cable-based systems, not optics.

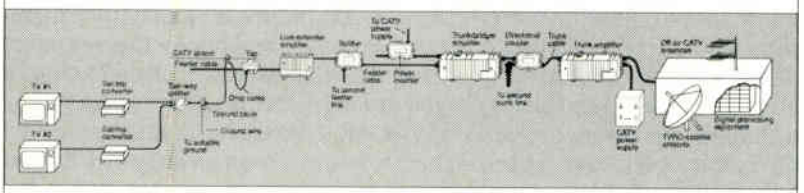
CATV Fiber Optics, can bring you into the age of optics. It provides you with a thorough understanding of fiber concepts from transmission and attenuation to bandwidth and dispersion. It will bring you up to speed with the application of fiber from cabling basics and types of lasers, to amplifiers and splicing. Finally, it will complete your knowledge of fiber use in cable television systems with a review of fiber architectures, modulation techniques, RF interfaces, components, testing and monitoring, construction and maintenance.

And best of all, it is an NCTI self-study course. That means you decide when and where to learn about fiber optics. You don't have to travel to an expensive seminar. You can learn in the convenience of your office or home.

For a limited time only! Pre-publication discounted price...$295*

* Regular price is $345. Pre-publication discount applies only to enrollments received before October 1, 1989.

NCTI Career Path Courses



NCTI offers five career path courses to help develop your expertise in all areas of the cable plant.

Installer
Installer Tech
Service Tech
System Tech
Advanced Tech

In addition, NCTI's CATV System Overview provides an excellent opportunity for non-technical and new employees to learn about the technical side of the cable business, and Broadband RF Technician provides employees with extensive electronics training a complete understanding of cable television technology. Use the coupon at the right to order your FREE Training Kit. TODAY!

Please rush me the following:

- ❑ More information on CATV Fiber Optics.
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MSO affiliation_____

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Mail this form to:

National Cable Television Institute
P.O. Box 27277, Denver, CO 80227
(303) 761-8554

Reader Service Number 7.

Update: Installer Certification Program

The goals of the Installer Certification Program are to establish minimum skill requirements for installers and installer/technicians in the cable television industry. Once they have mastered the elements of the program and successfully completed the required examinations given by the Society of Cable Television Engineers (SCTE), the Society will award them a certificate indicating their competence in this area.

Local SCTE chapters and meeting groups, under the guidance and direction of SCTE national headquarters, will conduct the training and examination of all candidates. Installer training workshops and certification examinations also may be given by any national SCTE director, members of the national SCTE staff or other individuals designated by the Installer Certification Program Committee.

Installers and installer/technicians applying for certification will be charged a $25 registration fee. This fee will entitle the applicant to one full year's installer membership in the SCTE, as well as covering the cost of the installer manual and the initial certification examination fees. Annual dues for renewing the installer level of SCTE membership will be $20. Additional copies of the manual alone are available at $15 each. The first edition of the installer manual was recently published and is currently available for purchase from the Society.

Installer membership in the Society entitles the individual to all of the discounts afforded SCTE members at conferences, meetings and seminars, as well as discounted prices on all products, publications, materials and videotapes sold by the Society. Installer membership does not include voting privileges, holding an SCTE office at national or local chapter and meeting group levels, insurance coverage or any other active membership benefits that require an expenditure of Society funds. A special membership card will be issued for installer members of the Society.

The certification program will consist of training conducted by local chapters and meeting groups using the installer manual as the basis for classroom training as well as hands-on training in proper drop cable preparation and fitting installation, signal level meter reading, safe and proper ladder use, and proper pole climbing. Trainers for ladder and pole climbing must have prior certification by the Society in order to provide this instruction.

Upon completion of the training program, a 50-question written examination provided by SCTE national headquarters will be administered to the candidates. Chapter and meeting group presidents will be authorized to proctor this examination. Other local chapter or meeting group members also may receive approval to act as proctor following application to the Certification Committee. Prerequisite requirements for proctors include national membership for at least three years and a statement of ability from the chapter or meeting group.

Written examinations must be scheduled with SCTE national headquarters at least 45 days prior to the examination date. The number of examinations and answer sheets required must be submitted two weeks prior. All tests and answer sheets must be returned to SCTE national headquarters within two days following the examination date. The results and certificates will be returned to the chapter or meeting group within 30 days for the group to award to successful candidates at an appropriate gathering. In addition, the endorsement will be placed on the installer's membership card indicating certification by the Society. In order to reimburse groups for their training and testing efforts, each chapter and meeting group will receive $5 for each certificate issued through their group.

In addition to the written examination, four practical examinations will be conducted. The areas covered under the practical examinations are:

1) proper drop cable fitting preparation and installation
2) signal level meter reading
3) proper and safe ladder use
4) proper pole climbing techniques (optional)

Each of the practical examinations, when successfully completed, will be recognized with special seals that are to be attached to the certificate. The pole climbing certification is considered optional in areas where pole climbing is not required. Proctors for the practical examinations also must be approved by the Certification Committee.

Installer Certification by the Society is valid for a period of three years. The triannual recertification process will be announced at a later date.

A message from the president

It is with great pleasure that I am able to write to you as the new president of the Society. I honestly believe that my election as president indicates that any member of the Society can be elected to the top leadership position. I cherish this honor and promise you that the job will not be taken lightly.

One of the goals I would like to see this year is the involvement of more individuals in Society programs. The success of any organization is the participation of its members. We have now a cadre of members who are always ready to answer the call when projects or programs are started. We have, in the past few years, added to this small group with some new faces. We need more new faces. We are no longer a small group of people joined by a common goal but a much larger group that still sees that there is much to be accomplished toward our goals as a Society. So with this letter I challenge each of you to get more involved in the Society. Do more than just carry a membership card. The Chapter Development Program is an excellent place to start. If you are not a member, then join a group. If you don't have one in your area, help start a group. It's not an easy task to start a new group or to work in any group, but it is very rewarding when you see the results.

We also want this year to be one in which we solidify all our programs. We want to make sure that when we take another large step, we'll be ready to launch from solid footing. I will certainly want any suggestions you have that will keep all of our programs successful. We need everyone's input. Yours is important.

Jack Trower
President and Region 8 Director

SCTE chapters and meeting groups

As a service to SCTE members, the

following is an up-to-date listing of the Society chapters and meeting groups, with each group's contact person and phone number. Members should take this opportunity to join a local group.

For more information on becoming a member, contact Pat Zelenka at the SCTE national headquarters, (215) 363-6888.

Appalachian Mid-Atlantic Chapter
Contact: Richard Ginter, (814) 672-5393
Cactus Chapter
Contact: Harold Mackey, (602) 866-0072
Caribbean Area Chapter
Contact: Jerry Fitz, (809) 766-0909
Cascade Range Chapter
Contact: Peter Rumble, (503) 779-1814
Central Illinois Chapter
Contact: Tony Lasher, (217) 784-5518
Central Indiana Chapter
Contact: Lou Zimmerman, (317) 632-2288
Chapparral Chapter
Contact: Bob Baker, (505) 763-4411
Chattahoochee Chapter
Contact: Jack Connolly, (912) 741-5068
Chesapeake Chapter
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Delaware Valley Chapter
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Florida Chapter
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Gateway Chapter
Contact: Darrell Diel, (314) 576-4446
Golden Gate Chapter
Contact: Tom Elliott, (408) 727-5295
Great Lakes Chapter
Contact: Daniel Leith, (313) 549-8288
Greater Chicago Chapter
Contact: Joe Thomas, (312) 362-6110
Heart of America Chapter
Contact: Wayne Hall, (816) 942-3715
Hudson Valley Chapter
Contact: Wayne Davis, (518) 587-7993; or Bob Price, (518) 382-8000
Inland Empire Chapter
Contact: Randy Melius, (509) 484-4931
Iowa Heartland Chapter
Contact: Dan Passick, (515) 266-2979
Michiana Chapter
Contact: Dave Miller, (219) 259-8015
Miss/Lou Chapter
Contact: Mike Latham, (601) 226-2886
Mt. Rainier Chapter
Contact: Sally Kinsman, (206) 867-1433
New England Chapter
Contact: Jeffery Piotter, (508) 685-0258
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North Country Chapter
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Razorback Chapter
Contact: Jim Dickerson, (501) 777-4684
Rocky Mountain Chapter
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Tennessee Chapter
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Tip-O-Tex Chapter
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Dairyland Meeting Group
Contact: Bruce Wasleske, (715) 842-3910
Dakota Territories Meeting Group
Contact: A.J. VandeKamp, (605) 339-3339
Dixie Meeting Group
Contact: Greg Harden, (205) 582-6333
Great Plains Meeting Group
Contact: Jennifer Hays, (402) 333-6484
Hawaiian Island Meeting Group
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Planning for construction

By Gregg A. Nydegger
Regional Engineer, Cardinal Communications Inc.

Everybody knows there is nothing to cable TV construction. You just decide to build an area, order the stuff, hire construction crews and let them tell you when it's done. Then let the installs begin. Right? Wrong! Actually, CATV construction is a complicated process, but with proper planning and attention to detail it can go smoothly and result in a good-looking, properly functioning finished product.

Strand maps

A key to good construction is to begin with accurate maps. Maps riddled with errors and inaccuracies will tie construction crews in knots.

What makes up a good strand map? Different MSOs and systems desire various things on their strand maps, but the following are some basics:

- Pole locations, ownership (power, telco, etc.) and attachments (i.e., transformers, capacitor banks)
- Pole numbers: These are often required when submitting maps to local utilities for permission to attach to their poles. Also, these are invaluable to construction crews in helping them locate beginnings, endings and where they are on a cable run. If crews must count poles to discover where an amp or other equipment goes, it may end up on the wrong pole. However, if the strand/design map shows a trunk amp goes on pole #432-1234, crews need only look for this tag on the pole.
- All pole footages, house counts and vacant lots with potential for future homes.
- All duplex, triplex and apartment complexes with their counts.
- For underground mapping: power or telephone pedestal numbers, if it's a power transformer location or anything else that might help the construction crew to know where to locate the pedestal. This can save much grief caused by putting pedestals in the wrong places.
- Accurate "plow line" footages between pedestals. Underground does not always go pedestal-to-pedestal in a straight line. Pedestals often are inset in lots (for aesthetic reasons) forcing underground crews to plow more footage than it might at first seem and causing designers to figure that footages are an extra 10 to 25 feet longer for each span.

With this information on the maps the designers can do their jobs better; when the design is good, the construction goes much more smoothly.

Makeready

Completed strand and design maps are still only the beginning of the construction process. Unless the whole build is to be underground, the crews will be attaching lines to utility poles. These poles may be owned by the power company, telco or even the municipality. In any case, there will be existing cables and lines on these poles, and there may or may not be room to add a cable TV line.

This is where the makeready process starts. Makeready means just what it sounds like: It is the task of *making* sure a pole is *ready* to attach to. It typically goes something like this: A copy of the CATV strand maps is given to all utilities involved well in advance of the planned start of construction date. A representative of each utility and the CATV company meet and drive out the area to be built. Each pole to be contacted is surveyed to check several things, for example:

- The condition of the pole (rotted, broken, etc.)
- Current attachments by other utilities or cable companies and if these are in accordance with the National Electrical Safety Code (NESC) and other codes or regulations of the utilities or municipalities involved.
- If there is room or clearance for a CATV cable to be placed.

The cable representative must be well-versed in and have copies of the NESC and other applicable local codes and utility regulations. Among other things, these codes specify separation between conductors (i.e., CATV and power, CATV and telephone) and distance between a conductor and the ground (i.e., CATV to a driveway or road surface).

Ample room often exists to add a CATV cable to an existing pole. In other cases there may be no room. In the latter case some local utilities may say, "Go ahead and stick it up there, but be careful," or "We'll get around to the makeready later. Build it." This is how construction accidents happen. Proper clearance from

power lines is spelled out in all the codes for one main reason—safety. When clearances are compromised, so is safety.

There are several ways to make room on poles without existing clearance for cable. For example:

- Ask the telco to lower its line if it can.
- Ask the power company to change out old three-wire secondary to lashed construction secondary.
- Ask the power company to rearrange its facilities.
- Request that the pole be changed out. (This is usually very expensive, though.)
- Place extension arms or cross arms.

Also, it may be more feasible in some cases to bury around makeready problems. It may be cheaper and quicker to bury several spans than to pay makeready costs. Above all, the makeready process is a negotiating process. Being knowledgeable of all codes can make all the difference in the world.

If there is makeready work to be done, the construction process becomes tied to the local utilities' work schedules. Needless to say, CATV work is not always a priority, even if it is paid for up front. These

"Before the first foot of strand is ever hung, construction procedures must be set in concrete."

delays are often overlooked or underestimated when planning construction projects and projecting timetables.

Construction

Assuming the poles are ready, the materials are in the warehouse and the maps couldn't be better, now is the time to turn the crews loose, right? Wrong!

Before the first foot of strand is ever hung, construction procedures must be set in concrete. It's surprising how often a scenario like this takes place: The construction crew arrives in town, is handed a strand and design map, a city-county map with the area to be built highlighted, and told to "Go ye therefore and build!" So they do. However, when a local tech inspects the work, he finds that loops are on the wrong side of the pole, downguys are piggy-backed to existing utility anchors instead of CATV anchors being run and other problems.

In short, it must never be assumed that a construction crew will build plant the way the local system has always had it done. The crew has probably come from a job where the standards (and the electronics, passives and cable) were different. It's best to have a written set of construction standards, complete with illustrations if necessary, to hand out to all members of the crews.

A preconstruction meeting is a great place to do this. All necessary information can be passed on and most questions answered up front, if possible. There will always be questions that arise after the construction starts, but the more that can be answered at the start, the better the construction will be. This holds true for both aerial and underground.

Safety

Most crews want to do a good job, but it is up to the local CATV company to say what a good job is. This includes safety as well. What some crews consider safe may fall short of Occupational Safety and Health Administration (OSHA) and local standards.

Hard hats, signs, flags, cones, etc., sometimes never quite make it off construction trucks and trailers. These things are more than ornaments. They must be used. Some crews may look at placing these (and moving them as work progresses) as a hindrance to their speed. Sure, using safety equipment may slow crews down slightly, but it is designed to not only protect them but also the public. It is a good idea to stop by and occasionally check that crews are using proper safety equipment and practices.

Depending on the location and type of construction, a variety of permits may be needed. There are highway right-of-way, highway crossing, city/county right-of-way and road bore/cut permits. Sometimes the number of permits seems endless. Are all of them necessary? How many times has something like this been said at a local system: "Who'll ever know? Let's get our guys to stop traffic and we'll get that line run across all four lanes in a few minutes." Or how about, "Let's bore the road. If they catch us, we'll get a permit. But who's going to tell them?"

These scenes are played out countless times each year. Permits take time to get. But they are required for one main reason —safety. Many horror stories can be told to back up the need for permits before construction starts. They are a must.

Many elements are necessary for a successful construction project. This article has addressed some of them. Each step must be planned carefully and, at times, coordinated with others. Trying to rush things along or skip certain steps such as makeready or permits only leads to poor and unsafe construction. As the old adage says, "Anything worth doing is worth doing well." ■

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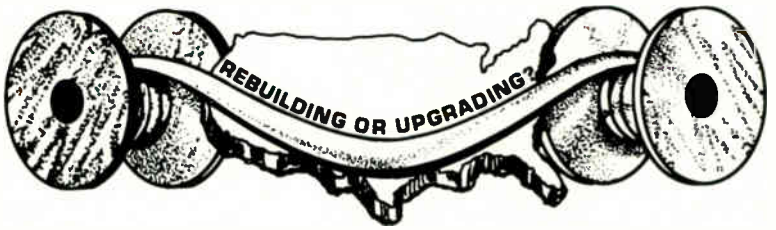

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Reader Service Number 11.

Constructing with fiber

By Bruce Westendorf
Plant Manager, Jones Intercable Inc.

With the future of fiber looking very promising, many MSOs are planning some type of fiber project. Now is the time to creatively develop the methods of construction that best suit our industry, in terms of initial construction cost and ease of damage repair procedures. Most of the existing fiber was placed by techniques brought to the project by contractors who gained their expertise through involvement with telco projects.

Two methods of construction will be described: the no cut store slack method (for lack of a better name) by which most of the existing fiber plant has been placed and the coaxial trunk rules method being used in Jones Intercable's Broward County, Fla., system. Strong emphasis on restoration of damaged plant is central to both methods. Although aerial plant is described here, the theory of each method can be applied to either underground or aerial plant.

No cut store slack method

The basic concept of this method is to place fiber uncut from device to device, usually 4 kilometers or more, and to strategically lashback or store extra cable at various locations along the run. This method evolved historically as a natural consequence of "early day" splicing difficulties and because the technical performance of fiber allows for extremely long spacing between amplification devices. This, coupled with the physical properties of the fiber itself (i.e., the ability to withstand excessive handling), leads to the mind-set that since it can, it must be placed in one contiguous pull.

It is important at this point to discuss one such property that allows this. Unlike coaxial cable, fiber can be pulled off the reel and laid on the ground in a figure eight configuration or rewrapped onto an entirely different reel without suffering in any way—no cracks, no deformation, no memory loss. This procedure can be repealed at any point in a run where the pulling tension becomes too great or some other obstacle requires it.

Different techniques can be used to place the fiber: drive off (at times requires lifting the reel over tangent telco takeoffs), and end of run or center of run stationary reel pull off. Both stationary reel methods require extensive use of the figure eight procedure depending on the length and difficulty of the pull.

During the lashing procedure slack is stored in various ways: by looping the cable back on itself for a specified distance, usually 50 meters, and overlashing it to the through cable; by coiling it and attaching it directly to the strand; or coiling it and placing it in a pole or ground-mounted container. Damage restoration is accomplished by delashing all cable between the damaged area and the nearest slack storage location, pulling the slack toward the damage, installing a splice and relashing the cable.

Coaxial trunk rules method

The method being used in the Broward system was devised while brainstorming over all the elements involved in a fiber build, like initial capital dollars, the need to have system personnel involved in the construction from the start and the need to have a simple repair procedure. It is pretty much self-explanatory.

The fiber is to be built using the same rules normally associated with coaxial trunk construction. The system is designed with a splice point at approximately 1 kilometer intervals, generally at areas that would require extraordinary effort such as

rise locations, locations with too many degrees of pull, etc.

There are major differences between the two methods. The inherent problem in the no cut store slack scenario is the amount of labor needed to accomplish the initial construction, which directly translates into higher per mile construction costs. Average labor bids, based on this design philosophy, were 56 percent higher than those normally associated with a coaxial build. In addition, Murphy's Law being what it is, the stored slack will rarely be near the damaged area, which means higher labor costs for restoration.

Any way you splice it...

In any method of fiber construction, with today's technology it is important to understand that splicing must be performed in as clean an environment as possible. This means that the cables to be spliced must be long enough to be brought into a specially-equipped fiber splicing vehicle. When the slack is stored on the strand and damage occurs, both sides radial to a cut may require delashing in order to get the tails into the vehicle. Initial designs of the Broward system using this method gave us a total of 17 kilometers of slack stored in the field and did not come close to covering all of the areas where possible damage could occur.

With the trunk rules method, slack is not stored on the strand but in one reel of generic cable (containing all possible color codes) stored in the safety of the construction yard. The cable reel can be transported directly to a damaged area. Restoration is accomplished by simply overlashing between splice points and resplicing. This method works best for the Broward system because the additional splices do not compromise our loss budget and, since splicing is done by trained in-house personnel, labor costs on this function of the build are not increased.

There probably is not a method that will fit all conditions in systems everywhere. The engineering department looking at a fiber build should be creative and develop the specs that will best fit the needs of the system, be the most cost-effective and facilitate simple repairs. How about hanging aerial conduit? Slack can then be stored and easily pulled to the damaged area. How about developing a unique environmentally-controlled cabinet, compact enough to be temporarily strand mounted and that can be used as a portable splicing station? As a result, length of tails is not a consideration. In any case, the future will hold many new developments for us if we break with traditions and think creatively. ■

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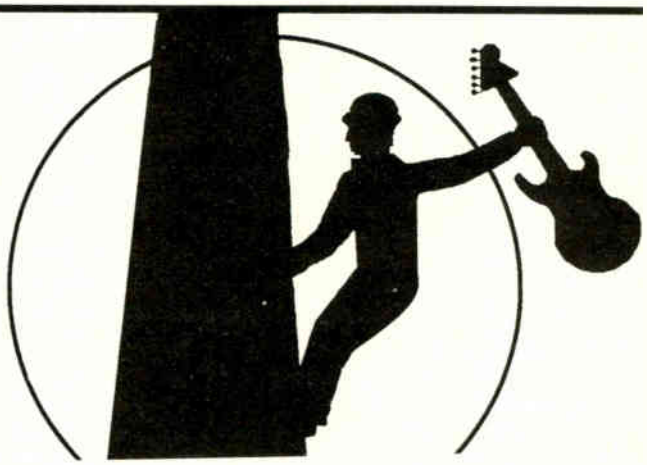

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Reader Service Number 12.

Proper utility pole anchoring

By David Chandler
President, Foresight Products Inc.

Placing guy strand and lashing coaxial cable on new and existing utility poles has created a boom in utility pole anchoring. Most of the boom is taking place where existing poles are used since new loads are placed on the poles and, in many instances, the old anchors are beginning to lose their holding capacity and starting to pull out.

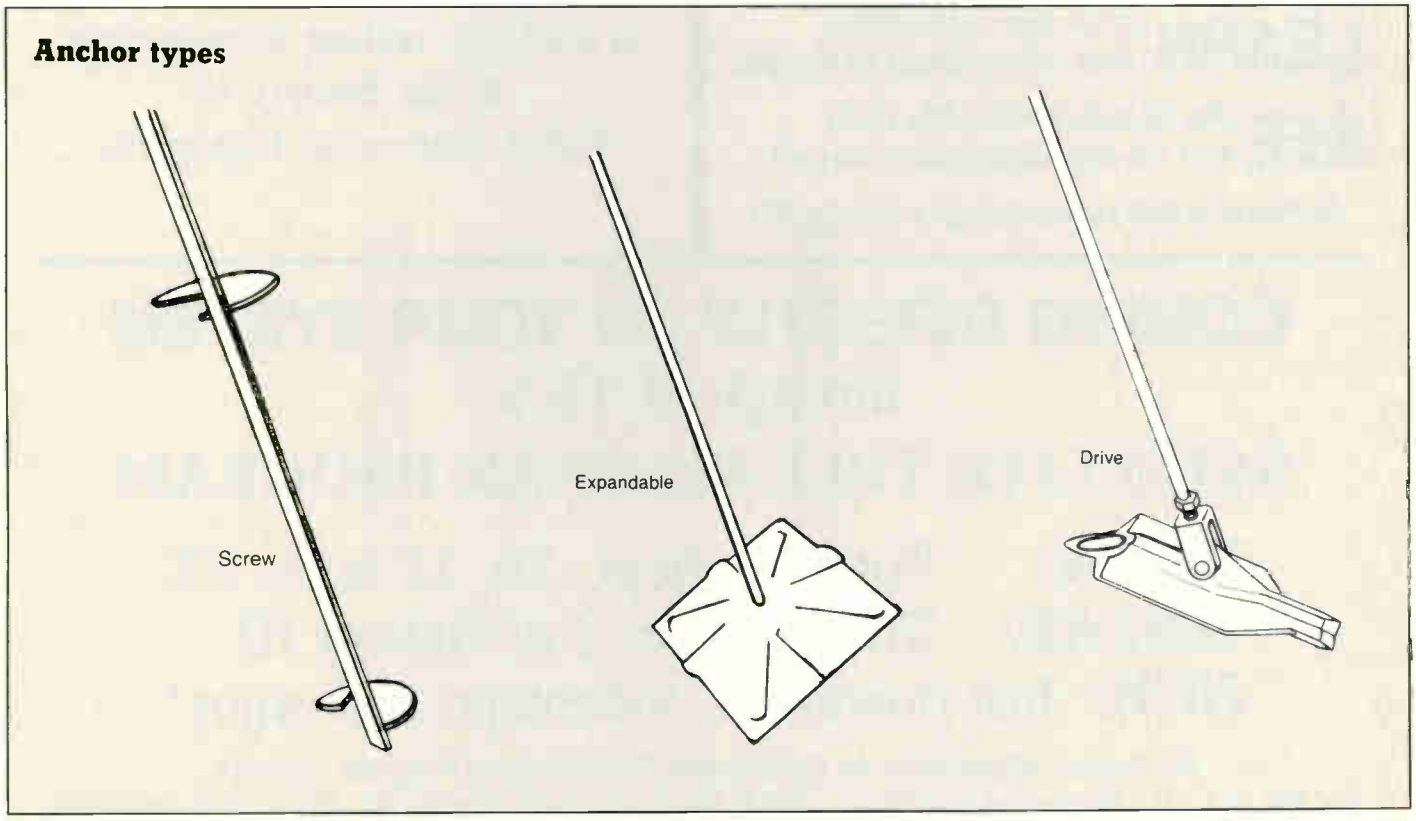
There are three types of anchors in general use: screw type, expandable or plate type, and drive type (see accompanying figure). Screw type anchors are screwed into the ground by digger derricks mounted on trucks. The cost of this equipment can range from $50,000 to $150,000.

Expandable or plate type anchors are placed in pre-drilled or pre-dug holes in the ground. The pre-drilling of the hole is done by a large power auger mounted on a truck; the digging of a hole is done by a crew of men using shovels. Most utilities and contractors report that no more than two expandable anchors can be installed in one day when the holes are hand-dug by crews.

Drive type anchors, the newest to be introduced to the industry, are driven into the ground about 7 feet deep by one or two men using a jackhammer. Then an anchor setting device called a "load locker" pulls up on the anchor rod, which rotates the anchor into load lock position in the ground much like a toggle

Drive type anchors are driven into the ground by one or two men using a jackhammer.

Anchor types



bolt in the earth. The cost of the equipment needed to install this type of anchor is under $2,000.

The drive type anchor can be installed in tight, hard-to-reach places inaccessible to trucks and hole-digging crews. Examples of tight places are residential backyards, flower beds, beside fences, in alleys, in wooded areas, and between sidewalks and streets in urban areas. Other advantages include ease and speed of installation (about 20 minutes or less in normal soils), compaction of the soil during installation (as opposed to disturbing the soil), and the fact that a gauge on the load locker tells the installer exactly how many pounds of holding capacity is locked in at any moment during installation. No other type of anchor system has this feature.

Know your soils

Equally as important as the types of anchors used in CATV system construction is knowledge of soil types in which anchors are to be installed. Engineering students are taught that soil mechanics is not an exact science and all engineers must face the reality that there is a limited dependability of soil investigation results. They also learn that few soil analyses provide highly accurate results; most provide rough estimates at best.

Although various soil testing methods are available, there often is not enough time for soil testing in the field when anchors are being installed. With screw and expandable types of anchors the holding capacity achieved is often a matter of guesswork based on past studies of soils in various regions of the country. The drive type anchor's load locker gauge tells exactly the number of pounds of holding capacity that have been locked in, regardless of the type of soil in which the anchor is being installed.

Soil classifications

Soil class #	Description of soil
1	Bedrock
2	Hardpan: dense-very dense sand; compact gravel laminated rock; slate schist; sandstone
3	Hardclay; dense sand; shale; broken bedrock; compact clay gravel mixtures
4	Very stiff-hard clay; clay pan; medium-dense sand, gravel; compact gravel and sand
5	Very stiff clay; medium sand; loose sand and gravel
6	Stiff-very stiff clay; medium sand; clayey silt
7	Medium-stiff clay; loose sand; fill; silt
8	Very soft-soft clay; very loose sand; swamp; marsh; saturated silt; humus

All anchor holding capacities vary with the moisture content of the soil. Frozen soil provides a greater holding capacity than soil that is not frozen, and soil that has been subjected to spring thaws provides less holding capacity than dry soil. Anchor holding capacity decreases as moisture content of the soil increases.

In the soil class numbers on the accompanying table, soil class number 1 is solid rock. No anchor can penetrate solid rock except special rock anchors, although the drive type anchor can be used if a hole is pre-drilled through the rock. Soil class numbers 2 through 7 are suitable for the power installation of all three types of anchors under discussion here, although class 2 is very tough for any anchor. In soil class number 8 it is usually necessary to install the anchor to a greater depth, hoping to reach a class 7 soil or better. ■

Keys to a successful upgrade

By Frank Walker
Marketing Manager, Kennedy Cable Construction Inc.

Many systems are being upgraded or scheduled for upgrading in the near future. I am sure you have many questions as to how the construction work within the system will affect your workload. The system may incorporate fiber-optic technology into the upgrade, which will really get your curiosity up. i will try to give you the answers as to why, when and some pitfalls.

Let's start with an upgrade vs. a complete rebuild of the old system. Usually it comes down to the fact that the cost of the upgrade is considerably less than a complete rebuild, but cost is not the only factor by any means. There are numerous other factors that must be considered.

The decision to upgrade a system usually stems from needing more channel capacity to remain competitive, thwarting an overbuild, making political concessions for the franchise renewal or responding to customer complaints about the old system. Also, the new cumulative leakage index (CLI) required by federal regulations must be considered because of the severe consequence for failure to comply. For some of the older systems, it may be cheaper to upgrade than to repair the system to meet CLI standards. Those who wait until early 1990 to try to meet standards may find a shortage of contractors to perform any major construction quickly because of all the construction scheduled in 1990 by major MSOs.

Make a good plan, Stan

Whatever the reason, planning is the single most important factor that will make an upgrade smooth and successful, or turn it into a nightmare for everyone involved. When planning an upgrade, everything must be taken into consideration including cost, customer interruption, safety, material, mapping, makeready, construction schedules and many more areas too numerous to mention in this article. A well-defined plan must not only be executed properly to ensure that the upgrade work runs smoothly but must have a project manager with the experience in upgrade construction to oversee the contractors.

Where does a good plan start? Once the decision is made that the system's cable is good and will handle the new electronics, then how many channels are needed is the biggest question. There are a variety of ways to get the needed channel capacity and the corporate enginer usually makes the selection on how to complete the upgrade.

There are different upgrade methods that are presently used. The easiest is the drop-in upgrade in which the amplifiers are replaced by changing out the same name brand modules and using the existing housing. In a resplice upgrade, a new amplifier is spliced in at the old amp location. The line extenders are usually moved and tap value or tap plates will be changed out on the distribution system. These are general statements because each MSO has different specifications in each upgrade.

The newest technology to affect upgrades is the use of fiber-optic cable and electronics. Fiber-optic technology adds a great variety of ways to design an upgrade. One can design an upgrade using present specifications and knowing that if more channel capacity is needed in the future, all that has to be considered is fiber optics. Another option would be to incorporate fiber optics now and take full advantage of all its benefits.

I had the opportunity to witness the activation of the first AM/FM fiber-optic network in Augusta, Ga. It was exciting to see that the new technology has arrived in our industry. It was as though we were looking at a clear VCR picture instead of a picture delivered from a cable system. Your customers will definitely notice if your system incorporates fiber optics because of the improved signal quality.

If at this point you are wondering how this technology will affect you, don't worry. Fiber-optic technology presently has a lot of myths surrounding its application. If you read the many articles that are being written about fiber optics you will find most authors are trying to shed new light about fiber. The majority of the articles will give you a good foundation in learning about fiber optics if you read everything you can get your hands on. Once you start reading you will see that there is no need to worry. Also, there are correspondence courses, trade magazines and vendors that are good sources of information on fiber optics. Again, all you have to do is apply yourself in getting this information.

Engineering and design

Now, back to the upgrade. Once a plan is made, the next step is the engineering and design of the upgrade. The field work for this phase is very crucial. Improper field work will affect the project all the way through unless the problems are caught before the construction contractor starts work. A good set of specifications for field work should be given to the mapping contractor before it begins.

Once the maps are received at the system level, they should be physically audited in the field to verify all required information. Errors should be brought to the mapping contractor's attention immediately. Many times this procedure is not taken care of before construction and the contractor usually loses money because of mapping errors. To overcome this, select contractors that do mapping and construction. Then, it is their fault if their maps are in error. The worst mistake a company can make is selecting a contractor to do field work and strand maps, and another to do design work. Who is in error if the maps are wrong?

A makeready walkout with the utility companies and easement and right-of-way permits must be obtained before construction begins. Failure to do makeready and permitting usually causes construction delays once the project is underway. Again, close attention to planning is a necessity.

Before the start of construction, the system and construction contractor must have an accurate accounting procedure for materials. Material inventory control can be established by power supply or maps and should be on personal computers for larger projects. Inaccurate accounting will cause someone to lose money on the project. →

On-time delivery of materials to the job site by the vendors is another area that must be closely monitored. Vendors are swamped with orders because everyone wants their materials yesterday and may not have ordered far enough in advance to allow for the delays. If the materials are not ordered in advance, you will see delays and additional costs.

Actual construction work of the upgrade is different than new construction or rebuilding a system. There are more service interruptions during an upgrade and customers must be dealt with constantly during the construction period. It is of the utmost importance that the system and contractor work very closely together on keeping the customers informed of when and where the work will be affecting their service.

Meeting deadlines

There are daily deadlines that must be met in order to restore service each day. For instance, most work on the trunk will be from midnight to 6 a.m. Most distribution work will be completed by 3 p.m. to take care of any service calls before 5 p.m. The customer service representative and service department must know on a daily basis about the construction schedule and the areas being worked on by crews.

The contractor must provide a supervisor or supervisors with good communication skills because the system personnel must be kept abreast of all construction work. This will make communications with your customers easier and keep complaints to a minimum. Additionally, the supervisor should have experience in upgrade construction on larger projects.

Furthermore, the contractor must have journeymen splicing crews with experience in upgrades. They must know exactly how much equipment can be removed and returned to service by the daily deadlines. Too much equipment out will result in not meeting deadlines and too little will result in construction delays. Experience in upgrade construction projects is a major factor in selecting a construction contractor.

If the contractor is meeting daily deadlines, the system personnel will not be affected too much by the upgrade. On the other hand, if the contractor does not perform and meet deadlines, everyone in the system affected by the construction will suffer mostly from outages and customer complaints.

Overall, the keys to a successful and smooth upgrade are good planning, error-free engineering and design, and an experienced construction contractor. ■

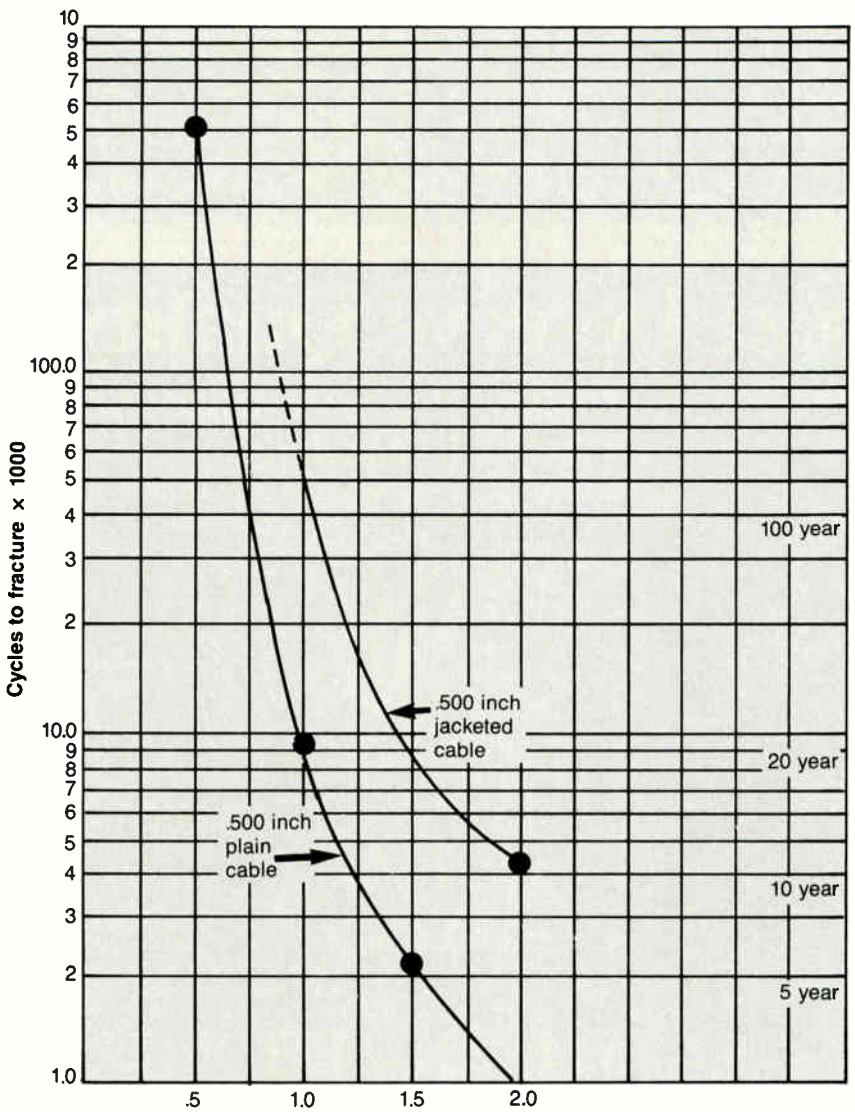
Effects of weather on expansion loop life

By Tim Dugan
Manager, Product and Application Engineering
And John Palmero
Field Engineer, Times Fiber Communications

The purpose of this article is to report on some findings regarding expansion loop life. This work was initiated in response to input from engineers in the field who reported premature expansion loop fractures, and believed long spans and solar heating of the cable to be responsible.

From the onset, it was obvious that jacketed and plain cables are heated by different amounts due to sunlight; not so obvious was to what extent. Another interesting fact uncovered was that jacketed and plain cables have different expansion loop lives. Also investigated were the effects of radiative cooling during clear nights and wind loading on differential cable length. Not included in this article are the effects of seasonal temperature changes and the amplitude and frequency of wind load (gusts), which should be areas of future investigation. There are, however, some basic guidelines that can be concluded from the information thus far collected on span legnths and the effects of sunlight.

Figure 1: Expansion loop flex life excursion vs. cycles to failure



Test data

Expansion loops were formed in plain and jacketed cables. The loops were formed using a Lemco Looper Model No. G120. The loops were cycled until the aluminum sheath fractured. The flex life vs. total excursion length is shown in Figure 1. The cable loop was installed in its unstressed condition at mid-cycle so that it would flex plus and minus one-half the total excursion distance.

The temperature difference between the ambient air temperature and plain and jacketed cable was measured June 14-22, 1984 in Wallingford, Conn. (approximately 41 degrees 32 minutes North, elevation 190 feet). The maximum difference, with the cables perpendicular to the sun's incident radiation with no clouds and no winds, was 24° F above ambient on bare aluminum cable and 45° F above ambient on black polyethylene jacketed cable.

The same test was conducted during the same period on clear nights between 11 p.m. and 5 a.m., with no wind. The maximum difference was 4° F below ambient on plain cable and 8° F below ambient on black jacketed cable, which is attributed to radiative cooling. Assuming that the maximum daily ambient air temperature change can be 50° F and that an additional change of 35° F on plain cables and an additional 60° F on black jacketed cables can occur, the total daily temperature change of 85° F on plain cable and 110° F on jacketed cables were used for differential length movement calculations.

The length calculations also included the fact that the steel support strand is a factor in the differential aluminum cable movement. Its change in length is both a function of temperature and stress. Figures 2 and 3 show the differential aluminum cable movement for plain and jacketed cables respectively vs. span length and various initial sags.

Finally (and it should be noted that additional work is required here), Figure 4 shows the effect of wind loading on differential cable movement for various spans and sags. Information on extreme wind over a 50 year period is given in Figure 250-2 on page 249 of the *National Electrical Safety Code*, 1984 Edition.

From Figure 1, expansion loop life is dramatically affected by differential cable movement or excursion length. It would seem that if a 20-year expansion loop life is desired, the total excursion due to

"Differential change in length is drastically affected by wind loading."

temperature changes on plain cable should be limited to about 0.9 inches (which includes a moderate safety factor) and about 1.3 inches on jacketed cable.

From Figures 2 and 3 it is clear that additional sag minimizes cable movement while longer span lengths increase cable movement. It should be pointed out that both Figures 2 and 3 assume that cable can move freely with temperature change, which requires that the lashing wire be loose and that it takes no force to expand and contract the loop. It also is clear that cable movement is more pronounced on jacket than on plain, mainly because of the larger temperature change and, to lesser extent, the greater cable weight.

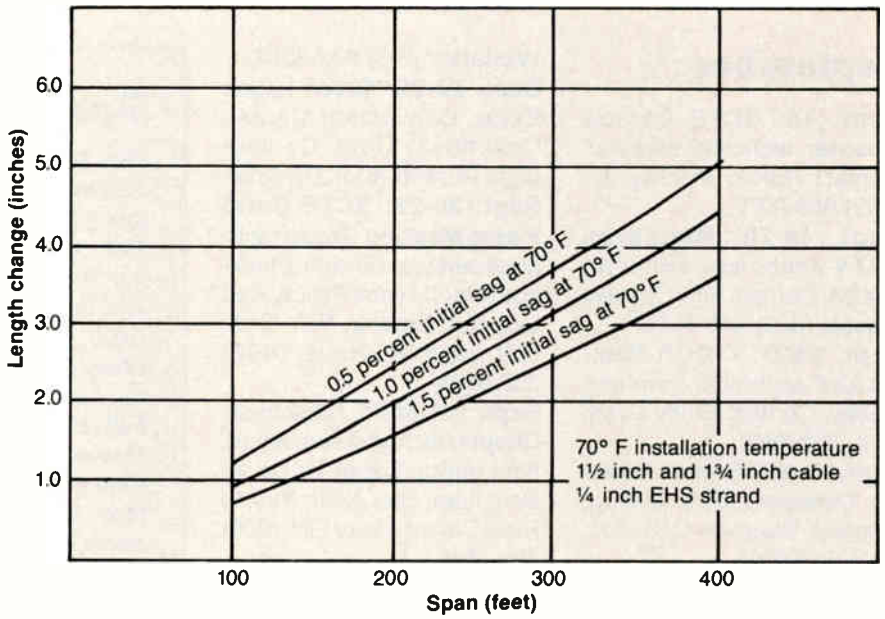
Figure 4 shows some surprising results, at least to the authors. It indicates that the differential change in length is drastically affected by wind loading. Of course, these differential cable movements cannot be applied to the flex life curves unless information abouts gusts and frequency also are known. However, since the additional length available in an expansion loop is only about $2^1/_8$ inches, an absolute upper bound is placed on the span length and initial sag if the extreme wind loading is known. Before assuming that tighter sags are better for areas with high winds, one also must consider the loading on the strand that may exceed safety limits.

Figure 4 does suggest that open areas or areas with high winds will be prone to expansion loop fracture and center conductor suck-outs if the expansion loop is absorbed.

For purposes of discussion, assume that average wind gusts are about 20 mph above the ambient wind and occur at a rate of four times per minute for a duration of three hours and can occur 10 times or 7200 cycles per year. Therefore, to obtain a 20-year expansion loop life, the loop must be capable of withstanding 144,000 cycles of wind gusts. As shown in Figure 1, 144,000 cycles would be equal to 0.6 inch maximum excursion for plain cable and 0.8 inch maximum excursion for jacketed cable. If gusts are larger and/or more frequent, substantial degradation in expansion loop life will occur.

Ignoring for the moment the effects of wind, the maximum span that an expansion loop can accommodate is 130 feet of plain cable (0.9 inch maximum excursion and 1.5 percent sag) and 135 feet of jacketed cable (1.3 inch maximum excursion and 1.5 percent sag). These values should be reduced if longer lives are desired or if tighter sags are needed. It should also be pointed out that these values do not reflect seasonal temperature changes that reduce these values further. To discover how much further will require additional testing.

Figure 2: Length change vs. span length for plain cables (temperature = 70°F to 125°F to 40°F)

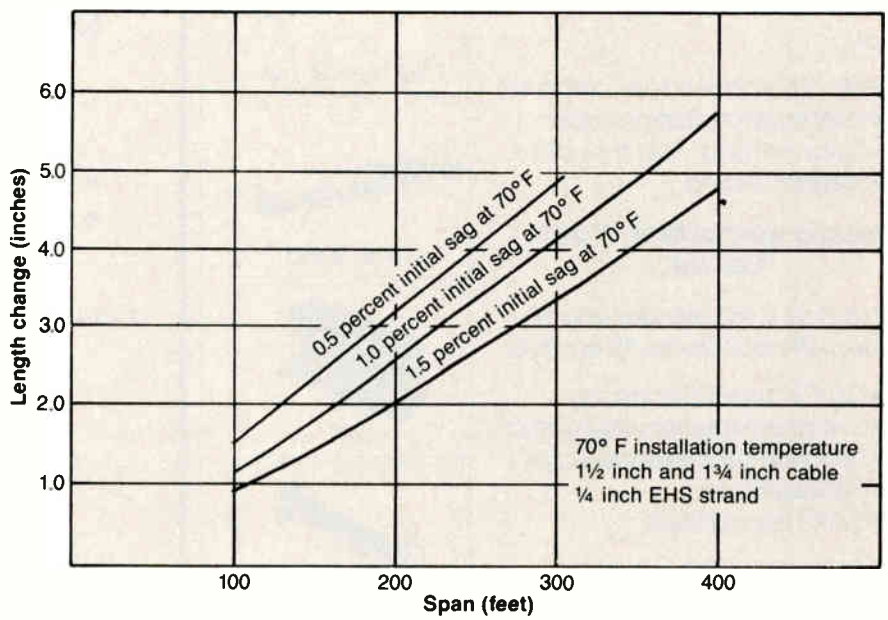


For longer spans than those described above, other techniques such as dual expansion loops should be considered. For still longer spans, alternate methods may be needed to accommodate cable expansion and contraction.

The implications of extreme wind loading is clear. What is not clear is the amplitude of wind gusts or their frequency

(Continued on page 53)

Figure 3: Length change vs. span length for jacketed cables (temperature = 70°F to 145°F to 35°F)



Calendar

September

Sept. 16: SCTE Cactus Chapter technical seminar. Contact Harold Mackey Jr., (602) 866-0072.

Sept. 18-20: Magnavox CATV technical seminar, Detroit. Contact Amy Costello Haube, (800) 448-5171.

Sept. 19-21: C-COR Electronics technical seminar, Dallas. Contact Binky Lush, (814) 238-2461.

Sept. 20: SCTE North Country Chapter BCT/E testing. Contact Douglas Ceballos, (612) 522-5200.

Sept. 20: SCTE Razorback Chapter technical seminar, Days Inn, Little Rock, Ark. Contact Jim Dickerson, (501) 777-4684.

Sept. 20: SCTE Dairyland Meeting Group technical seminar. Contact Bruce Wasleske, (715) 842-3910.

Sept. 20-22: Great Lakes Expo, Convention Center, Columbus, Ohio. Contact Dixie Russell, (614) 272-0860.

Sept. 20-22: SCTE Great Plains Meeting Group technical seminar on signal leakage and CLI compliance, Red Lion Inn, Omaha, Neb. Contact Jennifer Hays, (402) 333-6484.

Sept. 22: SCTE Caribbean Chapter technical seminar on fiber optics, Cable TV Co. of San Juan, San Juan, Puerto Rico. Contact Jerry Fitz, (809) 799-4665.

Sept. 25-27: Magnavox CATV technical seminar, Indianapolis. Contact Amy Costello Haube, (800) 448-5171.

Sept. 25-28: Siecor Corp. technical seminar on fiber-optic installation and splicing for LAN, building and campus applications, Hickory, N.C. Contact (704) 327-5539.

Sept. 26: SCTE Satellite Tele-Seminar Program, "Tech marketing training tape" and SCTE music video, 12-1 p.m. ET on Transponder 2 of Galaxy III. Contact (215) 363-6888.

Sept. 26-28: International Construction and Utility Equipment Exposition, Kentucky Fair and Exposition Center, Louisville, Ky. Contact (312) 321-1470.

Sept. 27: SCTE North Country Chapter BCT/E testing. Contact Doug Ceballos, (612) 522-5200.

Sept. 27: SCTE Piedmont Chapter technical seminar on fiber-optic technology. Contact Rick Hollowell, (919) 968-4631.

Sept. 28: SCTE Dixie Meeting Group technical seminar, Hilton Hotel, Perdido Beach, Ala. Contact Greg Harden, (205) 582-6333.

Upcoming

Oct. 3-5: Atlantic Show, Convention Center, Atlantic City, N.J.

Oct. 17-19: Mid-America Show, Hilton Plaza Inn, Kansas City, Mo.

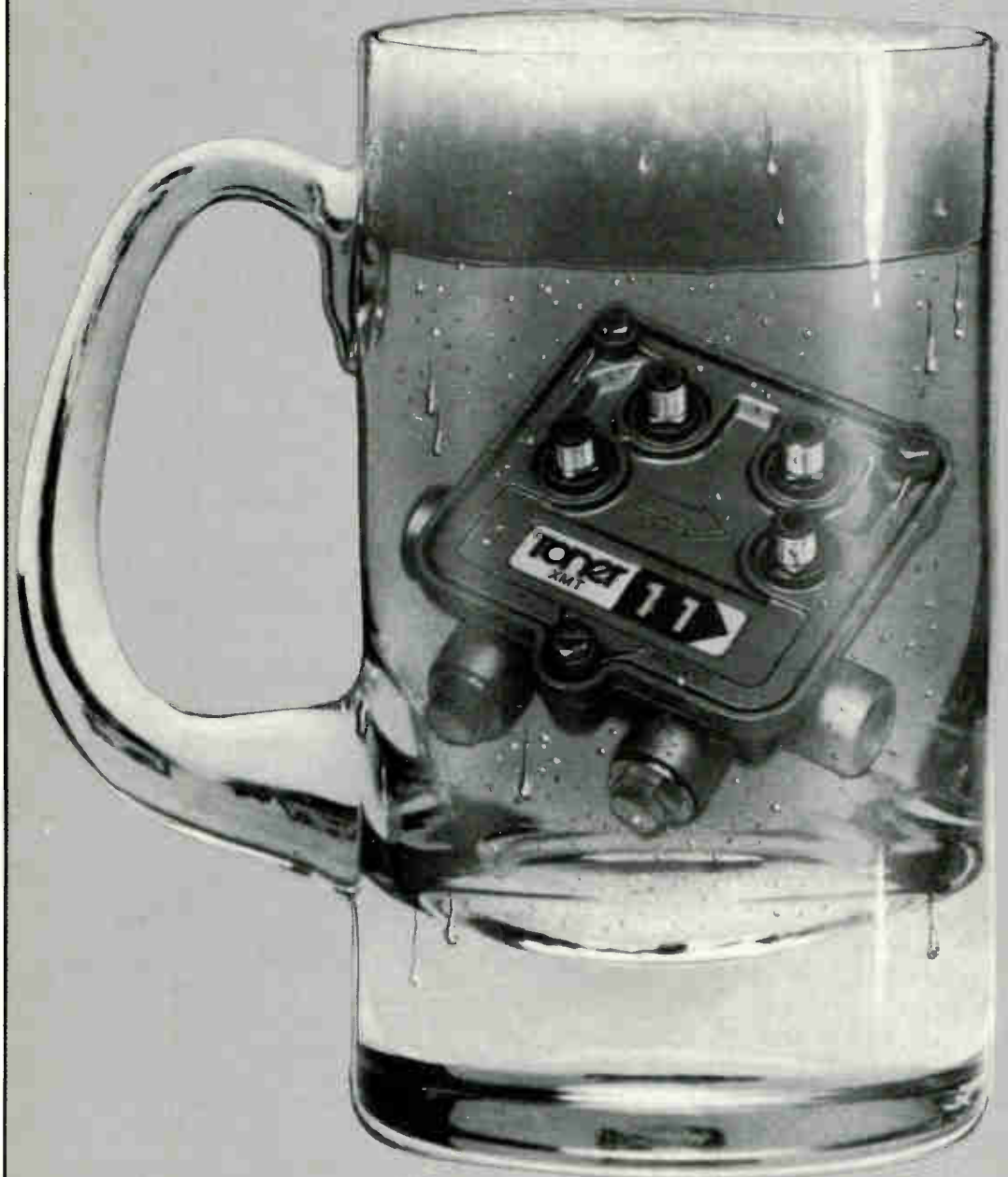
Dec. 13-15: Western Show, Convention Center, Anaheim, Calif.

Feb. 21-23: Texas Show, Convention Center, San Antonio.

May 20-23: National Show, Convention Center, Atlanta.

June 21-24: Cable-Tec Expo, Nashville, Tenn.

on tap at Toner



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Reader Service Number 26.

GET "MUGGED" BY TONER AT GREAT LAKES SHOW IN BOOTH 352

Lawn winterization

By John F. Crowley Jr.
Service Technician, Harron Cablevision of Cape Cod

At this time of the year, everyone living in the North knows that there's something coming as inevitably as death and taxes: winter. People and businesses begin to prepare for Mother Nature, winterizing property and vehicles. There is one activity in particular I wish to discuss because I believe it may be of some interest to the cable industry—lawn winterization.

Yes, lawn winterization. No, I'm not talking about wrapping shrubbery in cute little burlap blankets. I'm talking about those "reflectors on a stick" that are seasonally driven into lawns, along the edges of streets and driveways. Naturally this means that they're very often put right smack-dab in the middle of the utility easement (up to 10 feet from the edge of the pavement, depending on local regulations). These reflectors are supposed to prevent the local plow-jockey from removing a 100-odd square foot section of turf and loam from the front lawn along with the first good snowstorm.

A case study

Mr. X lives on a country way in a development with underground utilities. Every year, as soon as Willard Scott utters the deadly s-word (snow), Mr. X winterizes his lawn with three big, bright State Highway Department reflectors, complete with 2-inch by 56-inch galvanized steel sign posts. (He found these just lying on the side of the road a few years back.) He digs out his trusty hammer and pounds them into his lawn (which he worked so hard on all summer) about 20 feet apart and as close to the pavement as possible. When the spring thaw comes, they're pulled up and put back on the shelf in the garage.

Of course, Mr. X cannot put them in exactly the same spot every year. "The odds are that I won't hit anything underground," he thinks as he hammers. In this case the possibilities include power cables, telephone cables and, of course, CATV cable, in addition to Mr. X's gas and water service pipes. "I know whereabout everything is buried," he continues, "and I must be right because I've never hit anything before." Mr. X has been playing the odds, banging the posts in and pulling them back up for about five years.

This year the odds caught up with Mr. X. He drove one of his reflector posts through the CATV distribution cable, interrupting service on two streets. His neighbors were not pleased.

"No activity that disturbs a utility easement is too small or insignificant to ignore."

The on-call service technician from the local CATV company was not pleased either. He had to leave his nice warm home on a cold and windy Sunday morning to dig up Mr. X's beautiful but half-frozen front lawn (which Mr. X had worked so hard on all summer) in order to splice the cable back together. Mr. X is going to get a bill and he's not going to be pleased at all.

The moral of the story

No activity that disturbs a utility easement is too small or insignificant to ignore. The rules, regulations and specifications set by agencies such as Dig Safe must always be followed. Educate and cooperate with your customers. It's good preventive maintenance.

A parting thought: What do you think could have happened to Mr. X if he hit a primary power line rather than a CATV cable? ■

What's in it for you?

By Frank Walker
Marketing/Safety Director, Kennedy Cable Construction

I know you have read article after article on safety and have attended no telling how many safety meetings each year. Is safety a lot of hype or is there really something in it for you? Before you try to answer the question, let's take a look at what safety means to the company, you and the industry. Only you can make the decision to say "yes" or "no" as to whether or not safety will benefit you in your career goals.

Many people feel as though safety procedures are just another set of company rules to be broken or nothing is going to happen to them. Industrywide, companies spend millions of dollars annual trying to encourage the employees to change their attitude toward safety. Usually, the money spent is well worth the investment because employees do change their attitude when the company has an effective safety program.

Get with the program

Each company has a different program on how to get their employees to perform their duties in a safe and expeditious manner. Why do the companies spend so much money trying to accomplish a safe working environment? Bottom line, safety affects a company's profit. Surprised? You shouldn't be! A company with an effective safety program will probably show a better profit than one ignoring safety.

At least 99.9 percent of all companies in the CATV industry are in business to make a profit. By keeping accidents and injuries to a minimum, a company can cut down on its operating expenses. Also, exposure to large liability law suits are reduced. The cost of medical payments, lost employee production, workmen's compensation insurance premium, liability insurance premium, etc., adds to the overhead and greatly reduces the profit. The larger the company, the greater the cost added to the overhead.

So the company wants to keep more of its money. Great, but you still may not see where you fit into the big picture, being only one employee. If the company makes more profit will it benefit you? Will you get more money? Yes. Very possibly the money saved through good safety procedures may give the company more money to purchase or replace needed equipment for your use. Also, the company may be willing to pass that profit on in larger pay raises.

Okay, so maybe the company will not pass on the profits. How can you get more money from being very active in your company's safety program? Performing your duties in a safe and expeditious manner with quality production is your contribution toward helping your company make a profit. Every company wants employees that will help improve profit, so management is constantly looking for these employees. Executing your duties safely and producing quality work will get their attention. Also remember that employees who don't maintain company equipment or are accident prone will get attention.

Formula for success

Safety + efficiency + quality + production = profit. Take a look at this formula and try to change your work habits to follow it. Once you have started improving on safety, efficiency, quality and production, let your supervisor know what you are doing for the company. In other words, ring your own bell and have confidence in your work. Chances are if the supervisor knows you are improving in these areas, it is easier for him to justify a pay raise or promotion. Make his job easier. Believe me when I say that there is always someone looking for an exceptional employee and it may be someone in another company.

"A company with an effective safety program will probably show a better profit than one ignoring safety."

Do you realize that the CATV industry has unlimited opportunities for individuals that are aggressive and want to progress in a career? Naturally, it will take more than just being safety conscious, but there are so many different avenues to take in getting the training you need to progress, including professional organizations and correspondence courses. You're off to the right start by reading this trade magazine, which will definitely give you some direction in your career.

Look at someone within your company holding a position that you may want in the future. How did they get the position? Usually, proper training is the answer but you can bet that they probably have a good safety record with the company. They did not accomplish their goals by wrecking company trucks or falling off ladders or poles.

There are many people in high corporate positions in cable that started out in an entry level installer trainee position. They probably accomplished their goals in relatively short time as compared to other industries. Determination, education and hard work got them to the top. You have the very same opportunity and it may not be within your present company! Safety is for your protection as well as the company. Safety is serious business but look at it as an opportunity to stay healthy and alive in addition to being an avenue to progress in your career. ■

Installer's Tech Book

Converting dBmV to μV/m

By Ron Hranac
Senior Staff Engineer, Jones Intercable Inc.

Channel 22 or I (169.250 MHz)

dBmV	μV/m	dBmV	μV/m	dBmV	μV/m	dBmV	μV/m
-60	3.55	-36	56.33	-10	1123.95	16	22425.80
-59	3.99	-35	63.20	-9	1261.10	17	25162.16
-58	4.47	-34	70.92	-8	1414.97	18	28232.41
-57	5.02	-33	79.57	-7	1587.63	19	31677.29
-56	5.63	-32	89.28	-6	1781.34	20	35542.50
-55	6.32	-31	100.17	-5	1998.70	21	39879.34
-54	7.09	-30	112.40	-4	2242.58	22	44745.36
-53	7.96	-29	126.11	-3	2516.22	23	50205.12
-52	8.93	-28	141.50	-2	2823.24	24	56331.07
-51	10.02	-27	158.76	-1	3167.73	25	63204.50
-50	11.24	-26	178.13	0	3554.25	26	70916.61
-49	12.61	-25	199.87	1	3987.93	27	79569.75
-48	14.15	-24	224.26	2	4474.54	28	89278.72
-47	15.88	-23	251.62	3	5020.51	29	100172.38
-46	17.81	-22	282.32	4	5633.11	30	112395.25
-45	19.99	-21	316.77	5	6320.45	31	126109.55
-44.99	**20**	-20	355.43	6	7091.66	32	141497.24
-44	22.43	-19	398.79	7	7956.97	33	158762.52
-43	25.16	-18	447.45	8	8927.87	34	178134.47
-42	28.23	-17	502.05	9	10017.24	35	199870.17
-41	31.68	-16	563.31	10	11239.53	36	224258.01
-40	35.54	-15	632.04	11	12610.95	37	251621.63
-39	39.88	-14	709.17	12	14149.72	38	282324.11
-38	44.75	-13	795.70	13	15876.25	39	316772.86
-37.04	**50**	-12	892.79	14	17813.45	40	355425.00
-37	50.21	-11	1001.72	15	19987.02		

Channel 7 (175.250 MHz)

dBmV	μV/m	dBmV	μV/m	dBmV	μV/m	dBmV	μV/m
-60	3.68	-36	58.33	-10	1163.80	16	23220.81
-59	4.13	-35	65.45	-9	1305.80	17	26054.17
-58	4.63	-34	73.43	-8	1465.13	18	29233.26
-57	5.20	-33	82.39	-7	1643.91	19	32800.26
-56	5.83	-32	92.44	-6	1844.49	20	36802.50
-55	6.54	-31	103.72	-5	2069.56	21	41293.08
-54	7.34	-30	116.38	-4	2322.08	22	46331.60
-53	8.24	-29	130.58	-3	2605.42	23	51984.91
-52	9.24	-28	146.51	-2	2923.33	24	58328.03
-51	10.37	-27	164.39	-1	3280.03	25	65445.13
-50	11.64	-26	184.45	0	3680.25	26	73430.64
-49	13.06	-25	206.96	1	4129.31	27	82390.53
-48	14.65	-24	232.21	2	4633.16	28	92443.70
-47	16.44	-23	260.54	3	5198.49	29	103723.54
-46	18.44	-22	292.33	4	5832.80	30	116379.72
-45.30	**20**	-21	328.00	5	6544.51	31	130580.20
-45	20.70	-20	368.03	6	7343.06	32	146513.39
-44	23.22	-19	412.93	7	8239.05	33	164390.73
-43	26.05	-18	463.32	8	9244.37	34	184449.43
-42	29.23	-17	519.85	9	10372.35	35	206955.67
-41	32.80	-16	583.28	10	11637.97	36	232208.08
-40	36.80	-15	654.45	11	13058.02	37	260541.75
-39	41.29	-14	734.31	12	14651.34	38	292332.65
-38	46.33	-13	823.91	13	16439.07	39	328002.63
-37.34	**50**	-12	924.44	14	18444.94	40	368025.00
-37	51.98	-11	1037.24	15	20695.57		

Channel 8 (181.250 MHz)

dBmV	μV/m	dBmV	μV/m	dBmV	μV/m	dBmV	μV/m
−60	3.81	−36	60.32	−10	1203.64	16	24015.81
−59	4.27	−35	67.69	− 9	1350.51	17	26946.19
−58	4.79	−34	75.94	− 8	1515.30	18	30234.12
−57	5.38	−33	85.21	− 7	1700.19	19	33923.24
−56	6.03	−32	95.61	− 6	1907.64	20	38062.50
−55	6.77	−31	107.27	− 5	2140.41	21	42706.83
−54	7.59	−30	120.36	− 4	2401.58	22	47917.85
−53	8.52	−29	135.05	− 3	2694.62	23	53764.71
−52	9.56	−28	151.53	− 2	3023.41	24	60325.00
−51	10.73	−27	170.02	− 1	3392.32	25	67685.76
−50	12.04	−26	190.76	0	3806.25	26	75944.67
−49	13.51	−25	214.04	1	4270.68	27	85211.32
−48	15.15	−24	240.16	2	4791.78	28	95608.68
−47	17.00	−23	269.46	3	5376.47	29	107274.70
−46	19.08	−22	302.34	4	6032.50	30	120364.19
−45.59	**20**	−21	339.23	5	6768.58	31	135050.85
−45	21.40	−20	380.63	6	7594.47	32	151529.54
−44	24.02	−19	427.07	7	8521.13	33	170018.94
−43	26.95	−18	479.18	8	9560.87	34	190764.39
−42	30.23	−17	537.65	9	10727.47	35	214041.17
−41	33.92	−16	603.25	10	12036.42	36	240158.14
−40	38.06	−15	676.86	11	13505.08	37	269461.86
−39	42.71	−14	759.45	12	15152.95	38	302341.18
−38	47.92	−13	852.11	13	17001.89	39	339232.39
−37.63	**50**	−12	956.09	14	19076.44	40	380625.00
−37	53.76	−11	1072.75	15	21404.12		

Channel 9 (187.25 MHz)

dBmV	μV/m	dBmV	μV/m	dBmV	μV/m	dBmV	μV/m
−60	3.93	−36	62.32	−10	1243.49	16	24810.82
−59	4.41	−35	69.93	− 9	1395.21	17	27838.20
−58	4.95	−34	78.46	− 8	1565.46	18	31234.97
−57	5.55	−33	88.03	− 7	1756.47	19	35046.22
−56	6.23	−32	98.77	− 6	1970.79	20	39322.50
−55	6.99	−31	110.83	− 5	2211.27	21	44120.57
−54	7.85	−30	124.35	− 4	2481.08	22	49504.09
−53	8.80	−29	139.52	− 3	2783.82	23	55544.51
−52	9.88	−28	156.55	− 2	3123.50	24	62321.96
−51	11.08	−27	175.65	− 1	3504.62	25	69926.39
−50	12.43	−26	197.08	0	3932.25	26	78458.70
−49	13.95	−25	221.13	1	4412.06	27	88032.11
−48	15.65	−24	248.11	2	4950.41	28	98773.65
−47	17.56	−23	278.38	3	5554.45	29	110825.86
−46	19.71	−22	312.35	4	6232.20	30	124348.66
−45.87	**20**	−21	350.46	5	6992.64	31	139521.50
−45	22.11	−20	393.23	6	7845.87	32	156545.69
−44	24.81	−19	441.21	7	8803.21	33	175647.16
−43	27.84	−18	495.04	8	9877.37	34	197079.35
−42	31.23	−17	555.45	9	11082.59	35	221126.67
−41	35.05	−16	623.22	10	12434.87	36	248108.20
−40	39.32	−15	699.26	11	13952.15	37	278381.98
−39	44.12	−14	784.59	12	15654.57	38	312349.72
−38	49.50	−13	880.32	13	17564.72	39	350462.15
−37.91	**50**	−12	987.74	14	19707.94	40	393225.00
−37	55.54	−11	1108.26	15	22112.67		

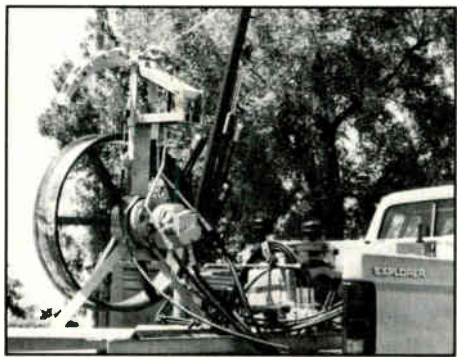
(For the formula used to derive the conversion data in these charts, see May 1989's "Installer's Tech Book.")

Products

Voltmeter

Available from Etcon Corp., the AC705 clamp-on volt/amp/ohmmeter offers ranges of zero to 600 amps, zero to 750 VAC, zero to 1,000 VDC and zero to 20,000 ohms. According to Etcon, the unit captures and measures peak surge current with a nominal surge acquisition time of 20 ms and provides accuracy of better than ±2 percent of the reading, plus or minus one digit. Protection for out-of-range readings is built into the meter that can read circuits from 40 to 400 Hz.

For more details, contact Etcon Corp., 7750 Grant St., Burr Ridge, Ill. 60521, (312) 325-6100; or circle #127 on the reader service card.



Winch system

Duct Plus Industries is offering a new cable winch system said to allow a single operator to deploy and monitor each winch unit in the field to maximize underground cable placement resources. The primary winch can be configured to provide 6,000 pounds of pulling force and the cable feed and intermediate assist winches are supplied with DPI's integrated cable lubrication system that delivers lubricant at a rate proportional to the amount of cable placed, said to reduce lubrication costs by 20 percent.

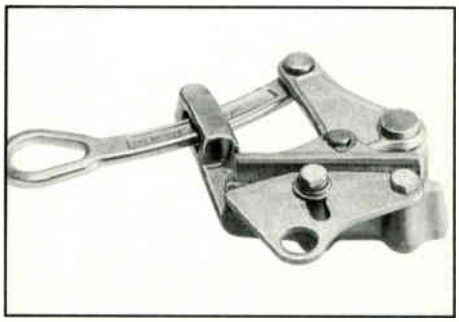
For further details, contact Duct Plus Industries, P.O. Box 1409, Midlothian, Texas 76065, (214) 228-2504; or circle #125 on the reader service card.

Auger

Allied's AHA2 is a hydraulically driven two-man auger said to be powerful enough to drill four-, six- and eight-inch holes in all types of soils and clays. The 72-pound vertical bore is fitted with twin hydraulic hoses that are plugged into an

Allied hydraulic power pack. Both auger and power pack operate at a flow rate of 5.3 gallons per minute with an operating pressure of 1,500 to 2,000 psi.

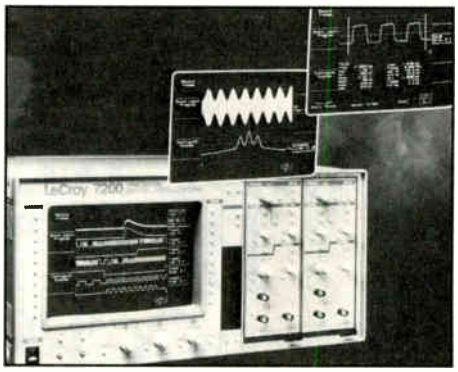
For more information, contact Allied, 5800 Harper Rd., Solon, Ohio 44139, (216) 248-2600; or circle #123 on the reader service card.



Cable puller

Now available from Klein Tools, the Model 1685-30 "Chicago" grip cable puller is said to be capable of pulling a wide range of cable sizes (0.625 to 1.25 inches in diameter) and types. The parallel jaws are 4.5 inches long and have a rounded inside contour to help protect insulation and provide greater gripping power. The design includes a latch plus a large-diameter eye that accommodates large hooks on hoists, winches and tackle blocks.

For more details, contact Klein Tools Inc., 7200 McCormick Blvd., Chicago, Ill. 60645-2791, (312) 677-9500; or circle #132 on the reader service card.



Digital o-scope

LeCroy introduced the 7200 Series precision digital oscilloscope, said to be the only oscilloscope that simultaneously digitizes four channels at 1 GS/second for transient signals and at 20 GS/second for repetitive signals with 400 MHz bandwidth. Each signal has its own ADC providing between 8 and 11 bits of resolution depending upon frequency response required.

For further information, contact LeCroy, 700 Chestnut Ridge Rd., Chestnut Ridge, N.Y. 10977-6499, (914) 425-2000; or circle #134 on the reader service card.

Enclosures

Hennessy Products' outdoor enclosures are designed specifically to house meters, timers, telecommunication and electronic equipment placed outdoors requiring vandal and environmental protection. These enclosures are U.L. listed in 3R, 4, 4X and 12 ratings. The enclosures are constructed of .125-inch 5052 marine grade aluminum and there are over 40 enclosure models to choose from.

For further details, contact Hennessy

Products Inc., 910 Progress Rd., P.O. Box 509, Chambersburg, Pa. 17201, (717) 264-7146; or circle #130 on the reader service card.

FO test set

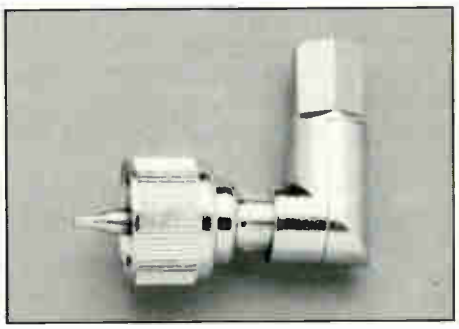
Fotec is offering its Model T412 optical loss test set for single-mode fiber. The test set incorporates the Model M411 fiber-optic power meter, which has measurement ranges for absolute power in both dBm or microwatts and a relative dB range for cable plant loss, and the S480 laser source series, which offers 1,300, 1,500 nm or dual wavelength outputs. The T412 is said to be capable of measuring loss in single-mode cables of 40 dB or more.

For additional information, contact Fotec Inc., The Schrafft Center, 529 Main St., P.O. Box 246, Boston, Mass. 02129, (617) 241-7810; or circle #129 on the reader service card.

Driving cap

According to Champion Electrofab, its post driving cap prevents damage to the ends of stakes, posts and/or ground rods, and limits possible injuries to the installer's hands and legs. The large hitting surface of the driving cap also allows the installer to concentrate more forceful blows than what is possible to the small, irregular surfaces of ends of posts and ground rods. The product is compatible with most commonly used posts and stakes such as V-shape, U-shape, hat-shape and half-round, plus ground rods up through 5/8-inch in diameter.

For more information, contact Champion Electrofab, Rt. 1, Box 422, Strafford, Mo. 65757-9634, (417) 736-2135; or circle #109 on the reader service card.



UHF connector

A UHF connector in the twist-on style is available from Cambridge Products. The right angle connectors are used to exit a piece of equipment and transmit a signal along a cable without the need for a right-angle adapter or other attenu-

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ation-producing hardware. One-piece UHF twist-ons match RG-8, RG-8X, RG-58, RG-59 and RG-62 variety cables. Cable is trimmed and inserted into the connector creating a self-contained, self-energized contact requiring no solder or special tools. Typically used below 500 MHz, the connectors' center conductor resistance is 1.0 milliohms and the outer conductor is 0.2 milliohms.

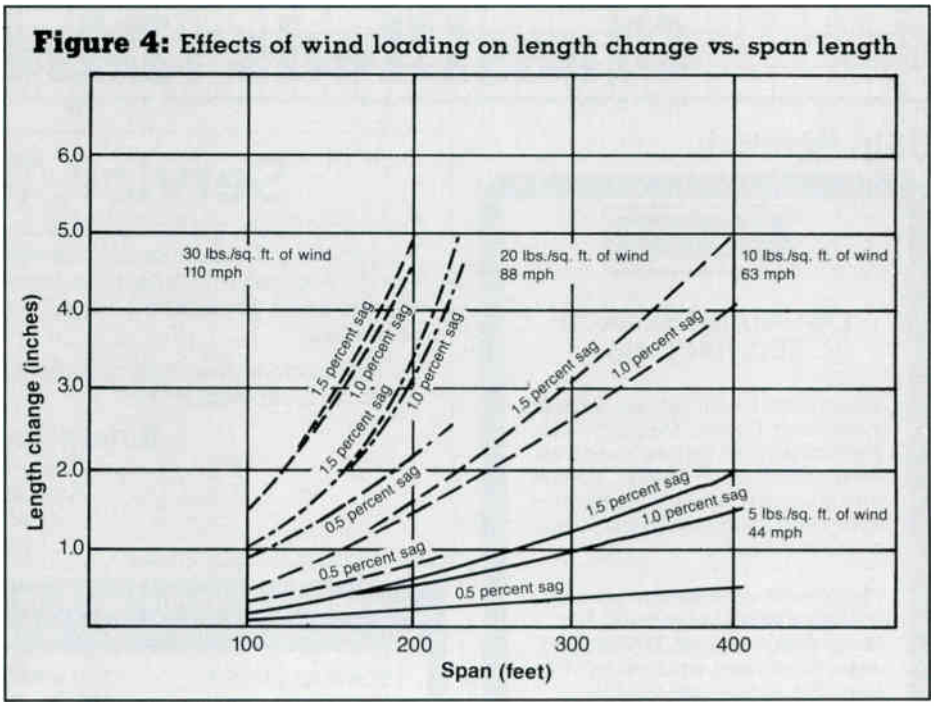
For additional information, contact Cambridge Products, Tridex Corp., 244 Woodland Ave., Bloomfield, Conn. 06002, (203) 243-1761; or circle #126 on the reader service card.

Brochure

Marconi Instruments released a brochure describing its Model 6950 analog RF power meter. The 6950 power meter offers a dynamic range (depending on sensor) of +20 dBm (100 mW) to −70 dBm (0.1 nW) extendable to +37 dBm (5 W). The combined frequency range is 30 kHz to 26.5 GHz. A rotary switch enables 10 ranges to be selected in 5 dB steps to suit the power sensor used.

For additional information, contact Marconi Instruments, 3 Pearl Court, Allendale, N.J. 07401, (201) 934-9050; or circle #135 on the reader service card. ■

Figure 4: Effects of wind loading on length change vs. span length



Loop life

(Continued from page 41)

of occurrence, which can substantially degrade loop life. For example, if a 20-year life is 144,000 gust cycles (20 mph over ambient wind) and corresponds to 0.6 inch excursion on plain cable and 0.85 inch on jacketed cable, the impact of a 1 inch excursion would be to reduce the plain cable's life to about 1½ years and the jacketed cable's life to about 7 years (Figure 1). ■

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Are you trained for our fiber future?

By Tom Brooksher
Marketing Director, National Cable Television Institute

Fiber optics. It seems like everywhere you turn these days it's being talked about. The industry's magazines, both technical and management, are full of fiber-optics articles. It's on the program at every industry function. It's so important that Cable Labs, the industry-sponsored research and development organization, chose fiber optics as the topic for its first seminar last month.

But it sounds futuristic. What does fiber optics mean to you? Is it just a lot of talk or will it affect your job? And if so, when? This year? Next year? In five years?

Fiber optics is futuristic in that it will play a crucial role in the future of the cable industry, but for many of us it is a fact of life today. The number of systems with fiber already installed or fiber construction projects going on is increasing every day. If your system or MSO isn't involved in fiber yet, chances are good that it is actively researching fiber, costing out designs, computing efficiencies and talking with suppliers.

So how far are you, personally, removed from having to understand how fiber works and how to work with fiber? If your system is owned by one of the growing number of MSOs who made a commitment to installing a significant amount of fiber plant in the next few years, you have a greater need to know about fiber than most. Likewise, since most of the fiber installation in the next few years is expected to be installed in the trunk system, if you work in that area of the plant you have a greater need to begin learning about fiber. However, if you're not included in either of those groups and don't have any training in fiber optics, don't assume fiber won't impact your job. Since fiber is destined to become an integral factor in cable television technology, if you expect to have a career in the technical side of the cable industry, fiber is in your future.

We at the National Cable Television Institute (NCTI) also have heard all the talk about fiber. We've spent several years looking at the technology, keeping up on the product announcements, studying the various architectures being proposed and following the initial construction projects. We've also been listening to our 5,000 active students and more than 30,000 past students who have asked us when we were going to have a fiber-optics course available. Interestingly enough, the number of inquiries about a fiber-optics course has increaseed many-fold since the first of the year. It's clear that the interest in learning about fiber optics has accelerated in direct proportion to the amount of fiber-optic activity in the industry.

A course of action

So when will NCTI have a fiber course available? Late this month. The course is called CATV Fiber Optics. Like all of NCTI's courses, it is presented in a self-study format so you can get your fiber-optic training in the convenience of your home or office, and can study at a time that's best for you.

"Fiber optics is futuristic in that it will play a crucial role in the future of the cable industry, but for many of us it is a fact of life today."

CATV Fiber Optics is a full-length NCTI course. It contains more than 20 lessons and covers virtually every aspect of fiber optics and its use in cable television. The first group of lessons contains a complete review of the background, fundamentals, theory and components involved in optical systems. Lesson titles include Introduction to Fiber Optics, Fundamentals of Fiber Optics, Applications of Fiber Optics, Types of Fibers, Cabling, Transmitters, Receivers, Connectors, Splicing, Couplers, Tools and Accessories, Integrated Optics, and Measurements.

The next group of lessons deals with the application of fiber optics in various telecommunications uses, including long-distance, short-haul, and subscriber telecommunications and video transmission. The final group of lessons deals with the integration of fiber optics in cable systems. It teaches the advantages of fiber, modulation techniques, RF interface, current architectural models, network traffic issues, system components, status monitoring, digital, FM and AM repeating, attenuation factors, testing, construction and maintenance.

The course is designed to give you a thorough background in how fiber optics works, and its application to cable so that you are prepared to deal with fiber when it becomes a factor for your system. Fiber optics. If you think you've heard a lot about it over the past few years, that's just the beginning. Fiber is with us for the long haul.

If you would like more information on CATV Fiber Optics or any other NCTI courses just call Jerry Neese or Tom Brooksher at (303) 761-8554. Or you can write to us at NCTI, P.O. Box 27277, Denver, Colo. 80227. ■

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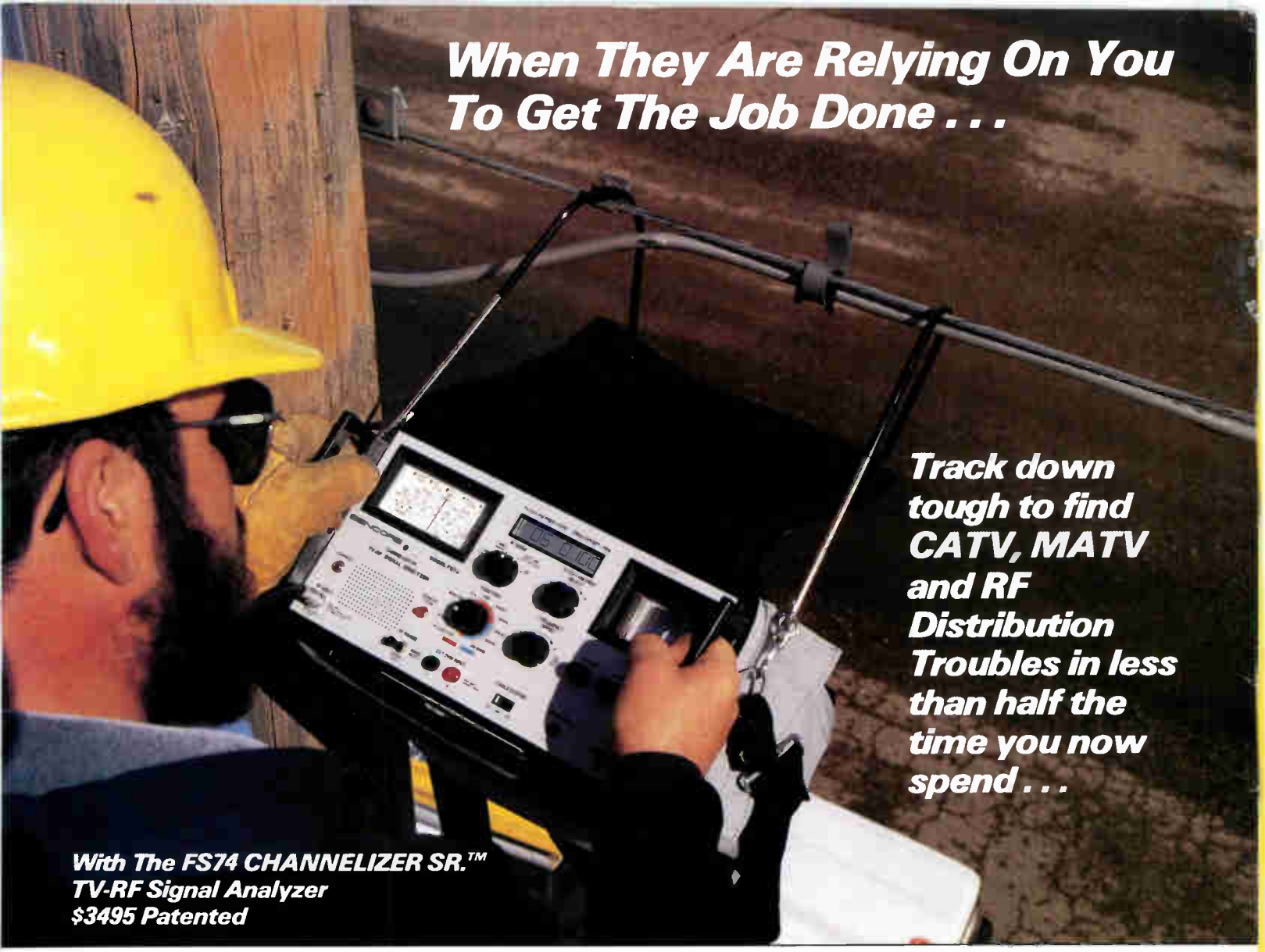

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