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CREATING A SAFETY CULTURE

BY CHUCK BAKER, PowerPro 360

It was 1983, and I was a first-year apprentice in the IBEW L.U. No. 1760 in South Bend, Indiana. My leadman and I were going to the manufacturing plant to disconnect and isolate the distribution transformers in a portion of the plant that was being torn down. On Day 1, the first substation, the first transformer: a 1500 kVA GE transformer. This unit had standard low-voltage switchgear; the primary had an askarel-filled disconnect switch with a pot head transitioning to a lead-sheath cable. The cable went up to the ceiling, across to the brick wall, and down the conduit into the ground.

Fortunately, this substation was directly on the alley, and the manhole cover to access where that HV cable went was 10 feet from the transformer. I was instructed to cut the lead-sheath cable just above the disconnect switch and not to worry about secondary as the electricians were removing those. I climbed up the ladder, put the Sawzall against the lead-sheath cable, and hesitated. This just didn't seem right. Fortunately, my partner, a Journeyman, asked me what was wrong, and I was honest. **Point 1:** What created the environment that allowed a young apprentice who needed the job to say that?

My partner said he totally understood and asked me to climb down. He walked me outside into the alley where the manhole cover was removed and showed me that the high-voltage cable I was going to cut went through the floor and directly into the manhole. You could see that the cable end was cut off with only about 12 inches dropping into the manhole — a dead end, not connected to anything.

We walked back into the substation and I climbed the ladder, and again… I was nervous and hesitated. **Point 2:** What created the environment that allowed a young apprentice who needed that job to hesitate? My partner didn't hesitate and told me to step down again… the first words he said were *"never go to a place or perform a task you are not comfortable with."*

We got a 55-gallon drum, pump, and hose and drained the 35 gallons of Askarel from the switch, removed the 24 bolts holding the cover plate on, pried it off, and with a tic-tracer verified that the transformer, switch, and cable were energized with 13.2 kV. The unit was being back-fed.

CREATE A SAFETY PROGRAM

So when people build an effective safety program, they include OSHA requirements, company requirements, first aid… but how does the program get into the head and heart of everyone… including a 20-year-old apprentice? How do we make sure supervisors provide an open avenue that allows everyone on their crews to freely share concerns?

Step 1

The first step is to look at your safety program and culture. Give an anonymous survey to all employees, encourage honesty, and use the information generated. It is also important to watch out for some very common messages or beliefs, identify them, and eliminate them.

Examples of these beliefs include:

1. Safety culture takes years to change. Picture encountering a major safety violation that took the lives of several of your employees. How long would it take to make major changes… not long. Let's do the same exercise up front before this occurs.

2. If I report a safety concern, my supervisor will feel I am slowing things down. This requires a solid program and training for supervisors who hold this influence. It needs to be a part of your program.

3. Danger is just part of this job. Convey that this thought is not acceptable. Although certain jobs carry more risk than others, every safety problem can be managed and avoided.

4. Safety is not my job; it is the safety manager's job. Communicate that everyone has equal responsibility and authority when it comes to safety.

5. Our culture does not support safety. Make sure your culture (from the very top) doesn't contain any beliefs that working safely is not as productive.

Step 2

The second step is to share with everyone what their rights are regarding safety. OSHA has detailed worker rights and protection that encourage a safe workplace. In these regulations, the employer must keep the workplace free of health and safety hazards. Each person has the right to speak up about hazards without fear of retaliation.

Now that they know their rights, how do you create an environment where they feel open to share or voice their concerns?

Step 3

The third step is to establish a strong safety culture, train them on the risks they will see, train them

on their legal rights, and implement your program with a "trusted management safety program" vs. a regulated safety approach.

With a regulated safety approach, your program is to sit them down and relay:

- What they must do
- What they can't do
- The areas of risk they will see

This person leaves the training and tries to work to follow the rules.

A trusted management safety program is different. It changes their perspective. It:

- Shows them the risks they will see.
- Trains them on regulations for safety including their rights.
- Explains that you trust that their eyes will always be open, safety will play a part in every decision, and they will always go home at the end of day, as safe as they were when they came into work that morning.
- Shares that you trust their ability to manage a perfectly safe career.

CREATE A CULTURE OF SAFETY

This is especially important when employees have ever-changing environments. Electrical field service crews always find something they have not seen before. If they feel responsible and trusted for safety, they will qualify the area and potential risks for themselves and their crews.

This is going to be a little idealistic, but imagine giving that message, and when they return from the first job, you ask them what safety problems they saw, ask them how they managed safety for that job, and share how impressed you are with what they have seen and done. This may not be practical, but if after every job, crews were asked these questions and appreciation was shown for their success, it would begin to invade the culture. "They care about safety as much and maybe more than anything else," they would say.

Implement a monthly safety newsletter showing a summary of work done and how safely it was done across the company. Publish safety suggestions from the field — from all employees. Include articles relating to the safety culture written by management.

CONCLUSION

You can see the benefits of building a culture like this, and I believe we all strive for a better and safer workplace. If you make safety a priority, if you live it every day, wonderful things will happen that you will never see… a 20-year-old apprentice hesitating to cut the high-voltage cable. And wonderful things will happen that you will see… a safe company delivering services.

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CABLE FAULT LOCATION ...NOT FOR THE FAINT OF HEART

BY TOM SANDRI, Protec Equipment Resources

The mere mention of cable fault location sends shivers down many a spine. Don't lose heart, all is not lost. Remember, cable fault location, like any other craft, simply requires some basic skills, proper tools, and a sound procedure.

But don't be fooled into oversimplifying the problem or solely relying on a single technique or instrument for every situation. Although many faults exhibit similar properties, all faults are unique and therefore different. A fault-locating technique or instrument that works well in one situation may be completely useless in another.

A skilled golfer must be able to analyze a situation before reaching into his or her bag and selecting a club. A variety of clubs and knowledge of their performance allows a golfer to select the most efficient tool for the job. The same is true for a skilled cable fault locator. Just as in diagnosing any complex problem, following a step-by-step procedure will help in arriving at the solution or in this case, locating the fault efficiently.

SET A PROCEDURE

Gather as much information as possible about the cable you are about to test. Understand the test and measurement equipment available to you and the application each piece was designed for. Know how to properly operate the equipment as well as its performance capabilities and limitations.

Even with the proper equipment and experience, locating a cable fault can present challenges. These challenges are minimized significantly by understanding the equipment and techniques available and, perhaps most important, developing and adhering to a sound procedure.

The first step in a healthy procedure is to conduct basic performance tests to determine the nature of the problem. Tests and equipment available for this step include (but are not limited to):

Table 1: *Basic Performance Tests and Equipment by Cable Type*

Cable Type	Tests Performed	Test Equipment
Low-Voltage Signal and Control Wires	Continuity	• Ohmmeter • Time Domain Reflectometer (TDR)
	Insulation Integrity	• Insulation Tester (Megohmmeter)
Low-Voltage Electric Power	Continuity	• Ohmmeter • Time Domain Reflectometer (TDR)
	Insulation Integrity	• Insulation tester (Megohmmeter)
Medium-Voltage Electric Power	Continuity	• Ohmmeter • Time Domain Reflectometer (TDR)
	Insulation integrity	• Megohmmeter • DC Hipot / VLF Hipot • Tan Delta Bridge • PD Detector

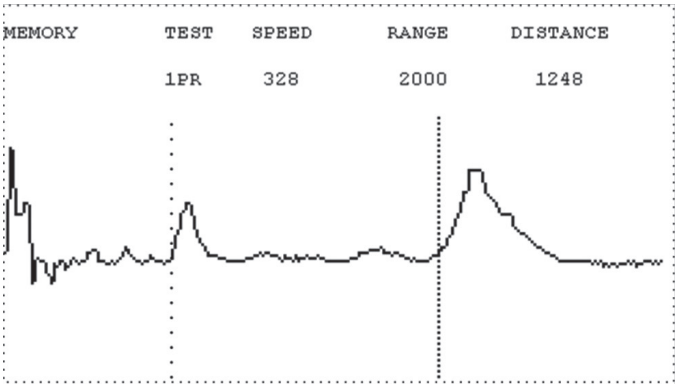


Figure 1: *Cable Termination Detected with TDR at 1,248 Feet*

PRE-LOCATING TECHNIQUES

After the cable has been tested, the results must be interpreted and the type of failure identified. Properly interpreting test results and selecting the fault-location technique best suited for the identified parameters will save time, money, and stress to both the technician and the cable under test.

Fault-locating techniques can be placed into two categories: pre-locating techniques and tracking techniques. Pre-locating techniques allow measuring the approximate distance to the cable fault from a single test point on the circuit (Figure 1).

Table 2: *Pre-Locating Techniques*

Cable Type	Pre-Locating Techniques	Best Conditions/Limitations
Low-Voltage Signal and Control Wires	Time Domain Reflectometry (aka TDR, Pulse Echo, or Cable Radar)	Ideal for locating open circuits, low-resistance short circuits, and splice/joints. **Limitations:** Typically will not detect high-resistance short circuits (above 400 ohms).
	Resistive Fault Location/Resistive Ratio Bridge	Ideal for locating short circuits and high-resistance short circuits. **Cautions:** This technique requires a good cable pair (reference) and far-end strapping between good pair and faulted pair. Cable size and temperature is required for best results. **Limitations:** Will not locate open circuits; water in the cable can affect results.
Low-Voltage Electric Power	Time Domain Reflectometry (aka TDR, Pulse Echo, or Cable Radar)	Ideal for locating open circuits and low-resistance short circuits between conductors. **Limitations:** Will not locate a fault to earth.
	Resistive Fault Location/Resistive Ratio Bridge	Ideal for locating short circuits and high-resistance short circuits. **Cautions:** This technique requires two good conductors (reference) and far-end strapping between good conductors and faulted conductor. Cable size and temperature is required for best results. **Limitations:** Will not locate open circuits; water in the cable can affect results.
Medium-Voltage Electric Power	Time Domain Reflectometry (aka TDR, Pulse Echo, or Cable Radar)	Ideal for locating open circuits, low-resistance short circuits, and splice/joints. **Limitations:** Typically will not detect high-resistance short circuits (above 200 ohms).
	Arc Reflection (Figure 3)	This technique incorporates low-voltage TDR and high-voltage testing and is ideal for locating most faults in medium-voltage power cable. **Caution:** Systems are typically rated by output voltage and energy of the high-voltage device (capacitive discharge/surge generator, or thumper). An under-rated high-voltage unit will hamper the performance of this technique.
	Impulse Current (Figure 4)	This technique relies on capturing a transient waveform created during cable breakdown. **Caution:** Transient waveforms can be difficult to interpret and require experience.

Figure 2: *Cable Insulation Testing with VLF Hipot*

TRACKING AND PINPOINTING TECHNIQUES

A tracking technique requires the technician to probe or test along the entire cable path in search of the fault (Figure 2). Tracking techniques in most situations will also serve as pinpointing techniques.

Most cable fault locating failures and wasted time can be attributed to technicians not properly

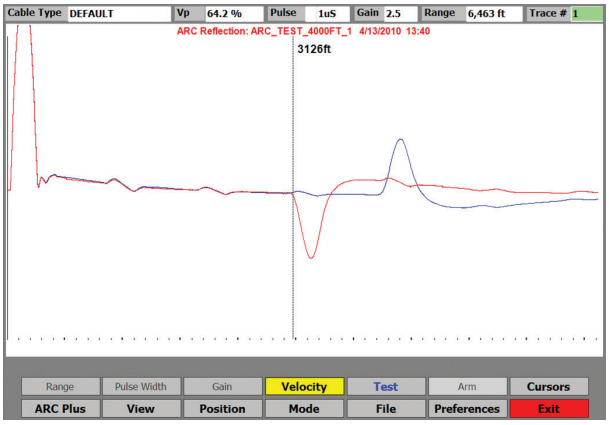


Figure 3: *Art Reflection Test Reveals Fault at 3,126 Feet*

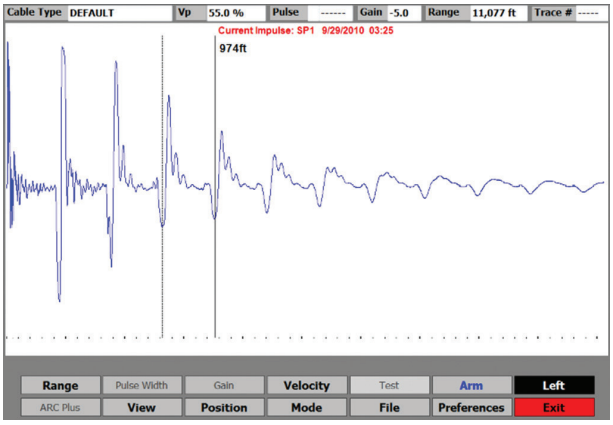


Figure 4: *Impulse Current Test Reveals Fault at 974 Feet*

interpreting test results, selecting the wrong tools for the job, or taking short cuts in the process.

Obtaining an approximate location of a fault prior to tracking along the cable path saves time and effort and reduces potential stress to the cable. Keep in mind that although an approximate location can be obtained, a pinpointing technique is still advised.

CONCLUSION

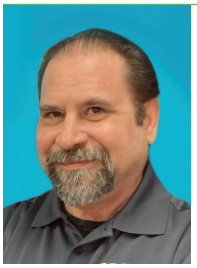
When faults occur, the pressure is on, but keep a cool head and stick to your step-by-step procedures; they will serve you well and keep you on the right path. Never rush out to the job site without collecting some basic information about the task at hand. This will allow you to prepare the right tools for the task and will greatly improve your success.

Table 3: *Tracking and Pinpointing Techniques*

Cable Type	Tracking/Pinpointing Techniques	Best Conditions/Limitations/Cautions
Low-Voltage Signal and Control Wires	Voltage Gradient	Ideal for locating and pinpointing ground faults. **Limitation:** Best suited for direct buried underground cable.
	Tone Tracing	Can be used for locating and pinpointing open circuits and/or ground faults when cables travel in conduit, pipe, or trays. **Caution:** Low-frequency (audio) tones should be used.
Low-Voltage Electric Power	Voltage Gradient	Ideal for locating and pinpointing ground faults. **Limitation:** Best suited for direct buried underground cable.
	Tone Tracing	Can be used for locating and pinpointing open circuits and/or ground faults when cables travel in conduit, pipe, or trays. **Caution:** Low-frequency (audio) tones should be used.
Medium-Voltage Electric Power	Capacitive Discharge aka Thumping	Best suited for medium-voltage electric power cable. The capacitive discharge technique is performed with a surge generator. This device converts line power into high-voltage, unidirectional impulses that are transmitted into a faulted power cable. The surges create breakdown at the point of the cable fault (fault within the dielectric material of the cable). The discharge of energy through the fault gap creates an audible thump that can be detected on the surface of the ground directly above the flashing cable fault. **Caution:** This technique can cause stress to service-aged cable and can accelerate the channel growth of trees in an aged dielectric. Care should be taken to minimize the voltage applied to the cable. **Limitation:** This technique alone will not locate a solid short in the cable (a spark gap is required to produce the audible thump). In areas of heavy traffic and background noise, it is strongly recommended to use acoustic listening devices (Figure 5).
	Voltage Gradient	Ideal for locating and pinpointing sheath faults on jacketed medium-voltage cable. **Limitation:** Best suited for direct buried underground cable.
	Tone Tracing (Figure 6)	Can be used for locating and pinpointing open circuits and/or ground faults when cables travel in conduit, pipe, or trays. **Caution:** Low-frequency (audio) tones should be used.

Figure 5: *Acoustic Pinpoint Using Thumper and Acoustic Detector*

Figure 6: *Tone Tracing a Direct Buried Cable*



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CREATING A COMPREHENSIVE EMPLOYEE DEVELOPMENT PROGRAM: A CASE STUDY

BY STEPHANIE McLAUGHLIN,
Hood Patterson & Dewar Engineers, Inc.

Once upon a time in 2018, Hood Patterson & Dewar (HP&D) was struggling with the same concerns many midsize companies encounter as they expand: As you grow, how do you ensure you continue to retain the culture that made you a success while also confirming that knowledge is effectively being transferred to new employees?

Our leaders realized that we needed a comprehensive employee development program to address these concerns, but they were not sure how to get started. They decided to bring in a dedicated employee who could focus on creating a formal employee development program while allowing billable employees to stay focused on client satisfaction. Happily, I was hired to do just that.

Employee development programs have numerous benefits for a company's stakeholders, especially for job candidates and current employees. According to a 2020 LinkedIn Learning report, 94% of employees say they would stay at a company longer if it invested in their learning and development, and in 2019, a Sitel Group report showed that 79% of employees say it is important to them that prospective employers offer formal training programs. These are powerful statistics since employee recruitment and retention are vital in our industry, especially right now with labor shortages and the retirement of experienced workers.

HOW DO YOU GET STARTED?

We knew it was crucial for us to create an employee development program that would meet our unique needs, and once I was hired, I was ready to start the process.

One of the first steps in creating an employee development program is determining the type of program needed. There are primarily three types of employee development programs: one-size-fits-all, custom, and hybrid. While each type has its pros and cons, a hybrid program works best for most companies as you can use canned approaches where appropriate and customized solutions where required. HP&D's unique organizational structure

Employee Recruitment

Employee Retention

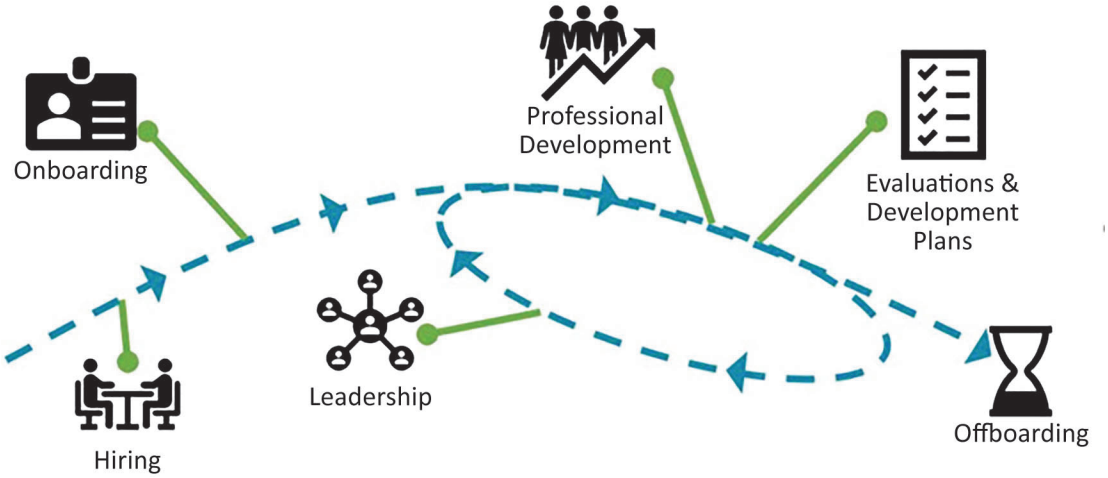

Figure 1: *The Employee Journey*

and considerable number of traveling employees led us to determine that a hybrid approach was the best option for us. This approach allows us to tailor our program to provide opportunities for highly technical employees, while also using pre-developed elements for some of our more general leadership and onboarding training classes.

To create an employee development program that would truly be customized for our people, we completed a needs analysis that included interviewing a representative sample of the different teams and departments within our organization to identify all of the distinctive needs that existed. This process, which included interviews with about 30% of the total employee population, took about a month.

Once the data from these interviews was compiled and analyzed, I was able to create a plan for our employee development program that provides new employees with the support they need to achieve success during the onboarding process while also supporting current employees as they continue to grow professionally.

THE EMPLOYEE JOURNEY

In 2019, we launched our employee development program, which was titled The Employee Journey, specifically to meet the needs of our people and to provide them with the support they need to continue to grow and develop their technical, leadership, and other soft skills. Using online and in-person training, we provide our employees with flexible avenues (Figure 1) to progress professionally. Employee development is a long-term initiative, but it also leads to short-term benefits, such as increased loyalty and improved performance and engagement. We focus on making growth a priority because growth compounds and accelerates as you remain intentional about it.

The components of our employee development program (Figure 2) span the employee's entire journey from hiring to retiring and everything in between. These include:

Figure 2: *Program Elements*

- **Core competency books** (CCBs) are based on the concept of providing new and newly promoted employees with a comprehensive list of all the onboarding tasks that need to be completed as well as a list of soft, hard, and technical skills

to be mastered throughout their time in that position. Each role has a unique CCB that allows employees to take the reins of their onboarding and professional development and also serves as a tool for mentors and supervisors for development discussions during onboarding and throughout the employee's career.

- We created our **mentorship program** to support new employees and newly promoted leaders during their onboarding and transitioning periods, since these are likely to be times when employees will experience additional stress and would benefit from having extra support. Mentors serve as role models and confidants for their mentees, demonstrating behaviors that result in success, providing a safe environment for free discussion, and devoting time to help with personal and professional development.

- A combination of in-person and online **training classes** are offered to meet employees' needs. These courses include technical, soft skills, and leadership topics.

- All new employees start with **on-the-job (OTJ) training**. Depending on their prior experience, OTJ training will continue until the employee is able to complete tasks without support. OTJ training can also be scheduled when people are learning new skills or cross-training for new positions.

- During the annual evaluation process, employees are encouraged to create **development plans** that include goals for future professional development. We feel that when you make a formal plan, you are more likely to achieve your goals.

- We use **360-degree surveys** for employees who want to receive feedback from the people with whom they work, including colleagues, supervisors, and direct reports. This provides them with a more comprehensive view of how they are perceived by others.

HOW DO YOU IMPLEMENT IT?

Starting an employment development program requires buy-in and ongoing support from all levels of management. The process can be time-consuming, and it has a price tag. A phased approach helps make the implementation more manageable and cost-effective. Flexibility is also a key to success.

We used a phased approach to prioritize what was most crucial to launch immediately and determine what could be introduced at a later date. By following a phased approach, we were able to focus on specific tasks, develop a plan for execution, and then move on to the next priority. This allowed us to achieve some immediate and visible success, which resulted in additional buy-in and support.

Throughout this process, it is vital to continually evaluate success and adapt as needed (Figure 3). To this end, we meet with our senior leaders quarterly to ensure ongoing alignment with their needs. We also include feedback surveys at the end of every in-person and online training course. This allows us to judge the effectiveness of our training classes and continuously improve as we progress.

As part of the mentoring program, we have established a regular cadence to follow up with the mentor and the mentee to ensure that the partnership is successful — and to gently remind the mentor to

Figure 3: *Evaluating Success and Continuous Improvement*

reach out to the mentee. Since our people tend to get very busy, this gentle reminder has been very effective in encouraging regular communication within the mentorship relationship.

Finally, we include updates about our employee development program in our company's monthly newsletter that is distributed to all employees. Comprehensive yearly updates are also included in the company's annual shareholder report. These touch points have allowed us to stay connected to our employees, which allows us to remain aware of the needs of our people and adjust as necessary when those needs change.

LESSONS LEARNED

The initial implementation of our employee development program is complete, and we have achieved positive feedback from our employees regarding what we have produced for them. This period of time has been filled with opportunities to improve and refine our program, allowing it to continue to grow organically to meet the evolving needs of all of our people. We have learned quite a few lessons that can be applied to other organizations embarking on a similar journey:

- Be flexible! Your business needs can change very quickly. (I'm looking at you, COVID.)
- Differentiate your program for various teams or groups so you are meeting them wherever they are.
- Ensure buy-in of senior leaders and seek champions across the company. As time progresses, identify slow adopters, and strive to get them onboard.
- Communicate, communicate, communicate!
- Don't wait to get started.
- Be prepared to talk to people — a lot!

START NOW!

The business case for a well-executed employee development program is only getting stronger: 93% of employees say well-planned employee training programs positively affect their level of engagement according to Axonify. As skilled construction industry labor shortages and strong competition for the best employees continues, give your company a key advantage. Satisfied employees create better outcomes for you and your clients.

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WHAT CAN A MENTOR DO FOR YOU?

BY MIKE DOHERTY, eHazard

Mentoring has been a critical and foundational component in the electrical sector since its beginning. The basic tenants of electrical tradesperson apprenticeships and electrical engineers in training have always been coaching and mentoring by those with the interpersonal skills, relevant expertise, and knowledge to be able to pass it on.

The electrical sector has always taken particularly great pride in emphasizing and teaching the safety requirements involved in electrical work. The overall probability of serious electrical incidents across all sectors is generally low, but the physical consequences of shock, electrocution, and/or arc-flash incidents can be staggeringly high. The social, moral, and economic costs are all potentially very high as well.

PASSING ON THE EXPERIENCE

It is extraordinarily clear that the continuing electrification of society is essential for ongoing prosperity and success for all concerned. Highly skilled electrical sector tradespeople, technicians, technologists, and engineers have been and will continue to be required. With so many of these extremely skilled people soon to leave the workforce in next few years, it is essential that the culture of electrical safety and high-end technical excellence is passed on to the outstanding workforce that is already in place or starting out.

But time to do so is definitely running out. Leaders in the electrical sector must step up to ensure that their existing safety and technical best practices are sustainable and will be in place even after they move on. Outstanding formal mentoring programs within the electrical sector need to be developed and executed in an accountable and due-diligent manner.

Those with decades of experience are generally no smarter than those who are just starting out, and it is obvious that the only sure way to gain experience is to put in the time and effort that experience facilitates. However, passing on the hard-won wisdom that was realized over the course of a mentor's working life by those willing to share is one of the main goals of a mentoring program.

ENSURING A GREAT RELATIONSHIP

The professional relationships between mentors and mentees must be respectful, honest, truthful, and caring. Mentoring is intended to be extremely beneficial to both parties. It should be equal parts insight, motivation, and inspiration. To be successful, the mentor and the mentee need to be sounding boards for each other. To ensure a great relationship, they must honestly listen to each other's concerns and be able to brainstorm any suggestions with tremendous clarity. Mentors must enjoy and be invested in the success of others. In particular, along with great listening skills, mentors must be exceptionally good at receiving and giving feedback. They must also be willing to not impose their own beliefs too strongly. They must be able

to relate to the person they are working with and put themselves in that person's shoes. Ideally, a great mentor was a mentee themselves at one time.

The Mentor's Role

A mentor is a person who provides the means, counseling, help, and feedback you need to flourish in your career, so it is very important for the mentor to select mentees who are genuinely interested in accessing his or her experience and knowledge. Therefore, it is important for mentees to let the mentor know what it is they require.

Mentors must continue to ask thought-provoking questions, steer the relationship, and ensure successful outcomes. One of the most valuable things a mentor can provide is exceptional networking opportunity. Mentors typically are highly respected, and when they recommend a mentee to an important connection, the possibilities can be remarkable.

W. Edwards Deming said:

"If you do not know how to ask the right question, you discover nothing."

Insightful and respectful questions by both parties are the best means to meet the goals of a mentoring relationship.

The Mentee's Role

It goes without saying that a mentee must be on time, be prepared, and be truly professional. They must also follow up on ideas, recommendations, action items, or corrective action plans. It is also critical for the mentee to ask great questions of the mentor, and it is up to the mentor to facilitate and guide those questions. Examples:

- What led you to the education you currently have? Was your path well-planned or did it just happen?
- What was the most important thing that you learned at school?
- If you could have done anything differently in your education, what would it have been?
- What was your very first job as a student, and what was your very first full-time job after your formal education was complete?
- Who are the three most impactful people you have worked with and why? Who have been the three most impactful managers you have worked with?
- How long has electrical safety been a vital part of your personal culture? Who has had the most influence on the things you believe specifically about electrical safety?
- How will this mentoring relationship benefit me going forward? How will it benefit you?
- Did you have mentors yourself, and what did you learn? How have they inspired you?
- What's the very best advice you can give me?
- What is your own individual style? What personality traits make you a good mentor?
- What three specific values do you believe are the most important within the electrical sector?
- What are three or four of your favorite books and why?
- If you could only tell me one electrical safety story, what would it be?

Passing on the hard-won wisdom that was realized over the course of a mentor's working life by those willing to share is one of the main goals of a mentoring program.

HOW TO FIND A MENTOR

Not everyone in your place of employment can be expected — or is even willing — to be a mentor. Inevitably, you will find one or two within your group who could be outstanding as mentors. They most often tend to be quiet and unassuming, but without question, they are very competent in their tasks and show great empathy within the workplace.

Take your time and open your mind when looking for an exceptional mentor. It is a practice that requires some due diligence and an understanding that the right fit is critical. You can always ask others you trust who they might suggest as the perfect mentor for you personally.

Remember, choosing and selecting an exceptional mentor is a process that can and will deliver

fantastic dividends to your personal safety and to a very satisfying and fulfilling career.

CONCLUSION

Mentoring in the electrical sector will be critical for the rest of this decade in particular. It will build skills, decrease employee turnover, and certainly increase loyalty. High-end formal mentoring programs can also significantly improve retention rates for high-quality electricians, technicians, technologists, and engineers by building stronger company loyalty, safety, and technical excellence.

MIKE DOHERTY *is an independent Electrical Safety Consultant and training contractor for e-Hazard and is President/Owner of Blue Arc Electrical Safety Technologies Inc. Mike has over 47 years of industrial and electrical utility experience as an instrumentation technician, licensed electrician, training professional, electrical utility safety professional, and electrical safety consultant. He is a Senior Member of IEEE and IEEE (PCIC) Emeritus; Chair of ULC CAN/ULC-S801-14,* Standard on Electric Utility Workplace Electrical Safety for Generation, Transmission and Distribution*; and Past Chair of the Association of Electrical Utility Safety Professionals (AEUSP) in 2018 and 2019. He was Chair of CSA Z462 Technical Committee* Workplace Electrical Safety *Canada from March 2006–December 2018 and continues to serve as a Z462 Technical Committee voting member on the current edition. Mike was the 2013 recipient of the IEEE IAS Petroleum and Chemical Industry Committee (PCIC) Electrical Safety Excellence Award, the 2017 Technical Presentation Award — Best of Electrical Safety at NETA's PowerTest Conference, and the 2019 IEEE Electrical Safety Workshops Outstanding Service Award.*

Doble Engineering Company

Generator Protection

This 4-hour class is designed for engineers, technicians, managers, supervisors, and insurance personnel involved with generator relay application and settings criteria. Several elements applied to protect the generator will be discussed in detail along with guidance for setting these elements. Basic theory of distance relaying is included to ensure comprehension of some of the protective elements such as loss of field, etc.

Elements Covered

- Differential protection (differential & current transformer performance)
- Stator ground fault (including 100% winding protection)
- Negative sequence
- Loss of field
- Out-of-step
- Reverse power
- Backup protection
- Rotor ground fault
- Over/under frequency
- Accidental energization
- Rotor ground fault
- Reclosing
- Torsional vibration

Participants will take away a sound understanding of relay protection applied at generators. This will enable them to move forward confidently with projects involving generator protection, review of settings, and troubleshooting system events.

Transformer Differential

Doble Engineering's 4-hour course on transformer differential protection is intended to provide information on all aspects of transformer differential protection. It starts with the basic theory of differential protection as implemented in electromechanical and microprocessor relays and goes into detailed application of differential relaying applied at transformers. The impact of CT performance and testing methods are part of this course.

Topics Covered

- Detailed theory of differential
- Magnitude and phase compensation
- Restraint slopes
- Current transformer performance
- Harmonic blocking/restraint
- High set/unrestrained instantaneous element
- Testing procedure for SEL 487E and GE T90

RTS Essentials Training Course

Periodic and regular testing of protective relays is not only essential for the proper operation of our electrical power system, it also is now required for many relays in the bulk electric system. RTS offers users a simple and efficient way to test protective relays and store test results as well as other historical data. This 2-day course offers a good mix of theory and hands-on experience using the RTS software with test equipment and relays.

Learning Outcomes

- Create System Routines
- Communicate with test equipment and microprocessor relays
- Use RTS to test relays
- Save test results
- Create new FasTest tests
- Perform basic troubleshooting

RTS Developer

The RTS interface is built entirely for test manipulation. The RTS Developer Training course will expose attendees to the numerous tools and techniques available for creating or customizing any test routine. Moving beyond test plan modification, attendees will learn about RTS commands, gain insights that will be useful as they develop new test routines of their own, and learn basic troubleshooting techniques. This class is a primer for understanding and utilizing BASIC code as it relates to RTS test functionality. The class focuses on some of the most commonly used BASIC commands in RTS and proper syntax.

Learning Outcomes

- Creating new test routines using the FasTest module
- Features within the FasTest module to assist in routine customization
- Methods to automate the population of settings into SETTINGS tab
- Introduction of RTS COMMANDS
- Displaying messages to Users
- Utilizing RTS COMMANDS to create intelligent routines
- Working with string variables
- Communication to the SEL relay

Visit www.doble.com/events for more information.

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- **Electrical Maintenance** Overview (70B)
- **Electrical Safety Audit Protocols**
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WHERE — **On-site** or **Online** to make it efficient for you

WHEN — **Scheduled** to accommodate shift times

WHAT — **Customized** to meet specific guidelines or facility issues of your organization

WORKS for YOU

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Why Choose e-Hazard®

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We Are Focused On You

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Taking a Comprehensive Approach to Electrical Safety

*Approved courses qualify for NETA credits (CTDs).

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Many people refer to the OMICRON Academy in Houston as "An Engineer's Playground". This is because, in addition to classrooms, we also have a state-of-the-art indoor substation with a variety of apparatus to perform hands-on testing, including transformers, circuit breakers, protective relays, PD testing area, and our recently installed distribution automation wall. Our instructors also use this playground for our virtual training courses.

Training topics

- Protection Relays and Meters Testing
- Digital Substations and IEC 61850
- End-to-End Testing
- Generator Protection
- Protection Theory
- Reclosers and Distribution Automation
- Power Transformer Testing & Diagnostics
- Circuit Breaker/Switchgear Testing
- Instrument Transformer Testing
- Partial Discharge Testing
- And More...

"Amazing! 10 out of 10. This was very very helpful and knowledgeable...
...Many thanks to OMICRON..."

- M. Shaik, webinar participant

SCAN ME FOR MORE INFORMATION!

OMICRON Academy

Protec Training Series 2022

New for 2022! Protec is hosting a series of training opportunities for the electrical testing industry. Join us for our free monthly "Third Thursday" webinar series on numerous practical learning topics. Receive additional fee-based training in **Electrical Safety, Electrical Maintenance, and Electrical Fundamentals**. For more information on training courses, visit **protecequip.com/training**.

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UPCOMING WEBINARS

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August 18, 2022 | Presenter: Tom Sandri | Free

Medium Voltage Cable Fault Location Sponsored Webinar for NETA PowerTest TV
September 15, 2022 | Presenter: Tom Sandri | $$

Testing for Partial Discharge – Exploring Online Techniques (2.0 NETA CTDs)
October 20, 2022 | Presenter: Tom Sandri | Free

Transformer Turns Ratio Testing (2.0 NETA CTDs)
November 17, 2022 | Presenter: Tom Sandri | Free

Transformer Excitation Current Testing (2.0 NETA CTDs)
December 15, 2022 | Presenter: Tom Sandri | Free

PREVIOUS WEBINARS

View previous webinars on our GoTo channel:
GoToStage.com/channel/ProtecEquipmentResources

HOW TO JOIN A WEBINAR

- Protec webinars are held on the 3rd Thursday of every month
- Time: 1:00pm CST
- Cost: Webinars are FREE

Webinar Registration:
protecequip.com/webinars

PROTEC EQUIPMENT RESOURCES

Since 2004, Protec has been an industry leader in electrical testing equipment rental, sales, calibration, and asset management. With eight locations across the United States, we are large enough to serve your needs, small enough to care! For more information on training opportunities, visit **protecequip.com/training**.

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