Apprentice's Guide to Entering the Electrical Industry

Trainer Harold De Loach's best advice, tips, and tricks for anyone new to the trade

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EXECUTIVE SUMMARY

A BRIGHT FUTURE FOR THE ELECTRICAL INDUSTRY

Preparing future generations of electrical professionals for success

By Michael Morris, Editor, *EC&M*

It's no secret that the United States continues to face a skilled labor shortage. In 2023, *EC&M* covered this important topic in our e-book, "Combatting the Skilled Worker Shortage." If you haven't already, I encourage you to give it a read (www.ecmweb.com/21269581). Although the labor shortage has been one of the greatest challenges facing the electrical industry for decades, there is still a bright future ahead.

Here at *EC&M*, we like to highlight the next generation of electrical professionals through our "30 Under 30" honor, and we strive to create content to prepare future skilled workers for success. Since 2021, Harold De Loach, master electrician, electrical trainer/instructor, and founder/director of The Academy of Industrial Arts L.L.C., has contributed training articles to *EC&M* for both print and our E-Train e-newsletter. These pieces have proven to be extremely popular with *EC&M* readers and cover a wide range of topics aimed at apprentices. This e-book series, which will be released in installments throughout the course of 2024, offers a collection of De Loach's most engaging articles that are aimed at preparing the next generation of skilled workers.

To kick things off, the first article is called "Tips for Passing an Electrical License Exam." In this piece, De Loach offers some tips for passing the electrical license exam that have produced consistently positive results with his students. This is a must-read for anyone preparing to take an electrical exam.

The next two articles, "Etiquette for Electrical Apprentices" and "How to Become the Best Electrician You Can Be," offer some great advice for anyone new to the field. These inside tips from the field on what electrical employers expect from new apprentices are important to know in order to be successful.

In addition to professional etiquette, it's important for apprentices to know the basics as well. That's why the fourth article, "Everyday Instructions for Electricians," covers Art. 110 requirements of the National Electrical Code (NEC) in detail.

To close out the e-book, De Loach shares eight ways to increase your chances of success as an apprentice in "The Apprentice's Guide to Success in the Electrical Construction Industry" followed by "No One Is Coming to Save Us," in which De Loach discusses how important it is to prepare the next generation for success.

Preparing the next generation is the only way to make sure the electrical industry will continue to thrive for years to come. If you're someone new to the industry, I hope this e-book is a valuable resource to you. And if you're an industry veteran, I know it will serve as a refresher on the importance of mentoring. I encourage you to share it with anyone considering a career in the electrical industry.

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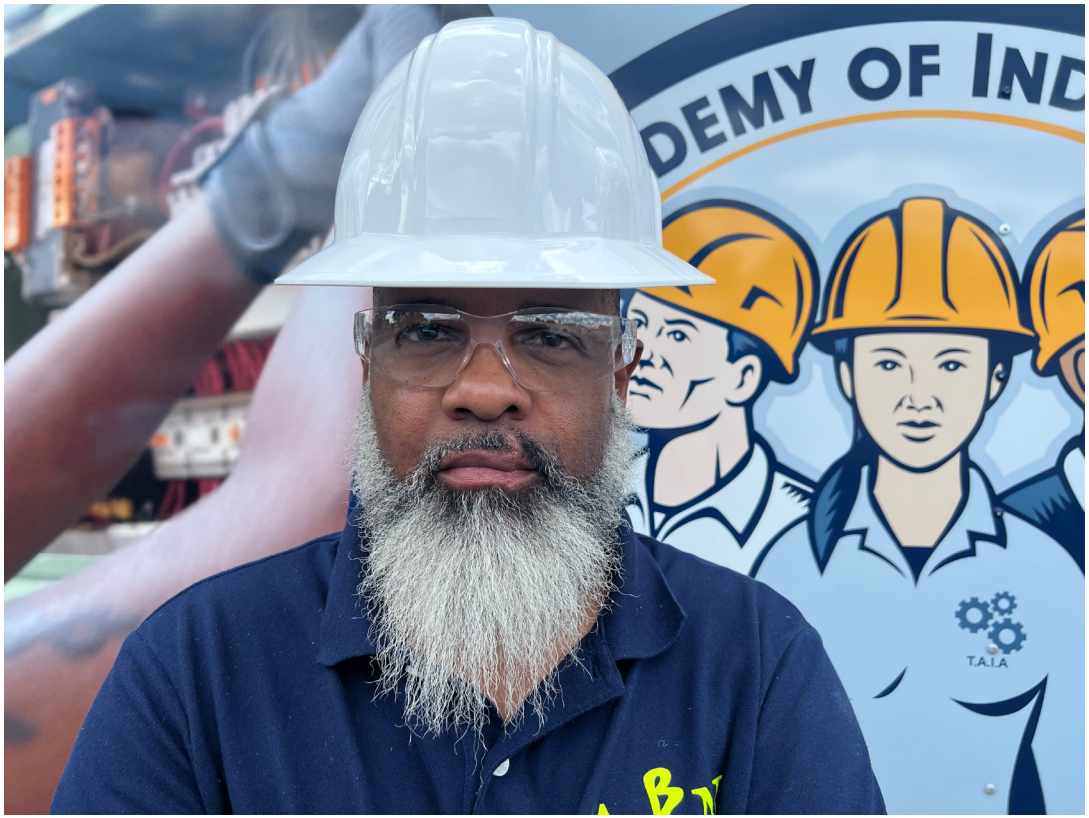
TIPS FOR PASSING AN ELECTRICAL LICENSE EXAM

The first step is to get your mind right.

By Harold De Loach

For many electricians, journeymen, and engineers, taking a licensing examination is one of the most important and challenging goals to achieve in their career journey. Once you accomplish this goal, you can create a more efficient and transparent path to success. In addition, your customers will have more confidence in you and your work. Being a credentialed tradesperson is the highest form of professionalism in the trades — it shows you're serious. This test is not just a test; it's a game changer. Being a licensed master electrician can change your life, your income level, and the legacy you'll leave behind.

As a master electrician, trainer, and instructor for more than 30 years, here are some tips that have produced consistently positive results with my students.



CREATE A STUDY PLAN, AND STICK TO IT.

Exams can be nerve-racking — they challenge our confidence and expose technical deficiencies. This exam will force you to face the areas in this craft where you do not excel. That's okay, but use this to your advantage by hitting any potential problem areas head on.

First, create a consistent study plan you'll stick with. Don't be greedy with your daily routine, piling up appointments and promises to others on your study days. Learn to say no to customers who add on additional items

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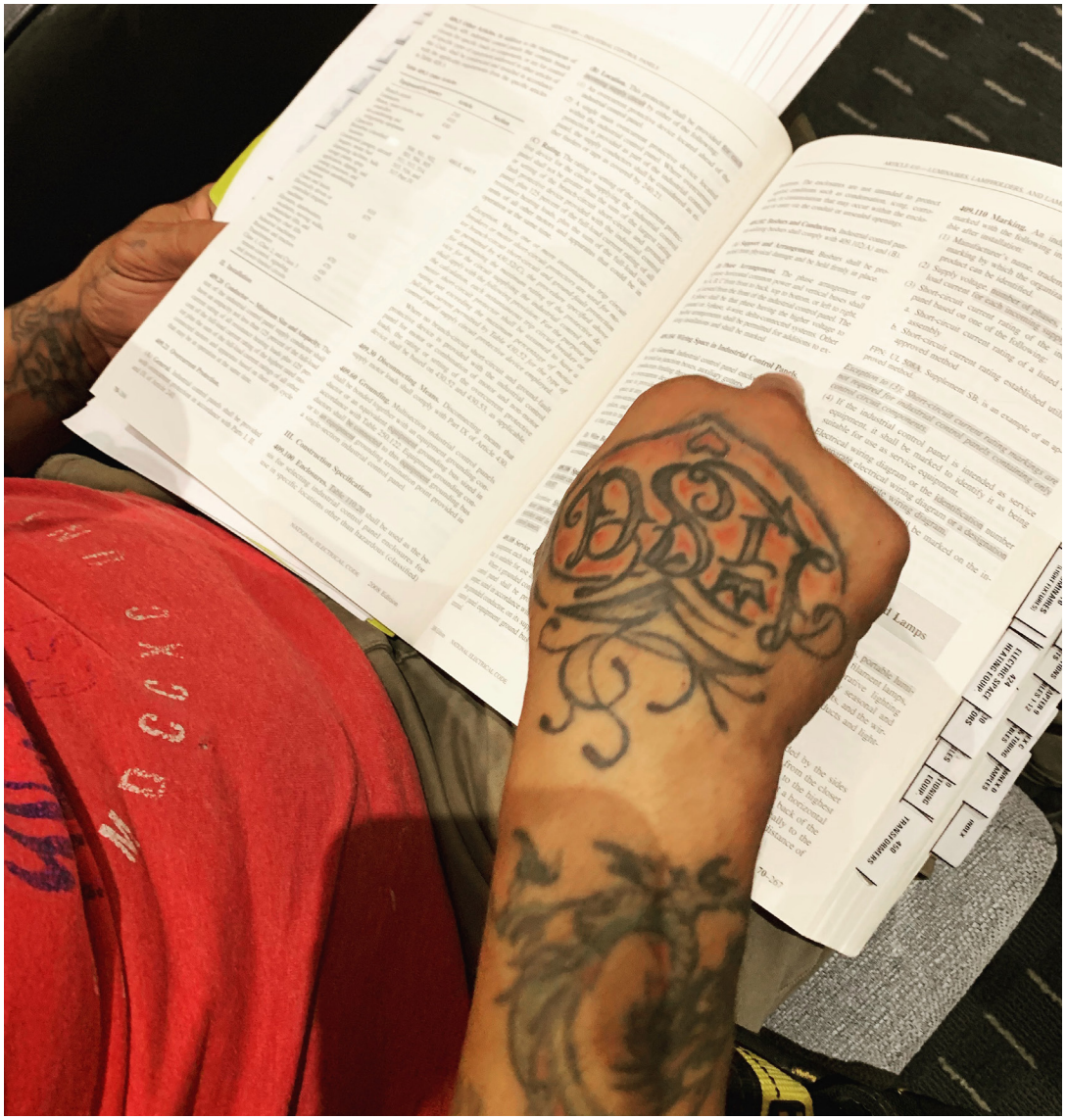

Most electrical exams are "open book" so find out in advance what you're allowed to bring into the testing center, such as the *NEC Handbook*.

at the last minute, typically when it's time to go. Just reschedule a return visit, and do it another time — no matter how hard it is. Practice being more conservative with your time when you must study, avoiding anything that will interfere with your routine. Once you break your study pattern, it's extremely hard to regain the rhythm.

Some electricians thrive on a "last-minute cramming" lifestyle, but this is certainly not the best way to ensure success. Most of us aren't natural test takers, so remember not to fall into this trap.

Set realistic goals for your study routine. Don't study when you're fatigued — you'll learn and retain information best with a fresh mind. Sort out your obligations, arranging them by priority, and then set up a timetable for when you're going to study. Organize what content or subject areas you plan to study when, giving some subjects more time than others (depending on your areas of deficiency). You must feel comfortable during your study period. Most people learn better when they isolate themselves, but do whatever works best for you. Watch YouTube videos. Read *EC&M* articles. But most importantly, remain focused.

Make sure your notes are neatly organized and that you have enough space to spread your textbooks, charts, and notes out. Work in a brightly lit area, use highlighters/sticky notes, and sit in a comfortable chair. Get rid of distractions — avoid computer games and family members during study sessions. Explain to them why you need at least a few hours per day to study at home, and stick to this regimen. In addition, always travel with study material, ensuring you'll make good use out of "all" of your downtime. This little secret will put you on the path to becoming a lifelong learner. Do whatever it takes to

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Author Harold De Loach, a master electrician and electrical trainer/instructor, has more than 30 years of experience in the field and teaching passionate people to enter the electrical trade. Pictured here are some of his students at The Academy of Industry Arts in Philadelphia.

intensify your focus on success, such as installing a vision board on the wall in front of you. Keep your motivation high. Don't let anything or anyone stress you out during this period.

Check the testing center's website for information on the specific exam you're taking. If you're taking a state examination, find information on the exam layout, subject matter, and content. Check with anyone you know who may have taken the exam recently or in the past.

Most state exams or major cities have exams that are five hours long. New York has a practical hands-on portion of the exam. Make sure you're mentally and physically prepared for that type of test.

Most electrical exams are "open book," so find out what you're allowed to bring into the testing center. Some test sites allow additional handbooks like the "Ugly's" electrical helper book, the English dictionary, and the *NEC Handbook*. Use every advantage you can. You can even call the testing center and ask questions ahead of time.

IT'S TEST DAY.

Get some rest the days leading up to the test. Don't arrive at the test center stressed, tired, or not feeling your best due to a late night of partying. Remember Murphy's Law — anything that can go wrong will go wrong on test day. So be prepared to do some serious time management planning in advance of the actual test day. Visit or plan a route to the testing center. Leave home early so that you don't have to speed. Arrive on time. The test center proctor may not be empathetic to your reason for being late. Have everything you need to complete the sign-in procedures at the testing center, such as a valid form of "non-expired" government-issued photo ID with your signature.

Be confident, and have your plan ready when you hit the start button.

HOW TO TAKE THE EXAM.

The test creator strategically arranges the questions (randomly) in a way that is designed to create stress, anxiety, and confusion. You may be given difficult questions right at the beginning of the exam, but don't let this throw you off.

Here's the No. 1 rule to follow: Skip questions. Don't take the exam in the order

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Location/Chapter	Title/Table/Figure	Purpose
Article 90	Figure 90.3: Code Arrangement	NEC chapter navigation.
Article 110	Table 110.26(A)(1): Working Spaces	Equipment clearances based on voltage.
Article 110	Table 110.28(A)(1): Enclosure Selection	Enclosure selection based on environment.
Article 210	Table 210.21(B)(3): Receptacle Ratings for Various Size Circuits	Helps you to determine branch circuit conductor and breaker size to receptacles.
Article 220	Figure 220.1: Branch-Circuit, Feeder, and Service Load Calculations	Helps you navigate the entire article. Save time by utilizing this handy map for the whole article.
Article 220	Table 220.12: General Lighting Loads by Occupancy	Helps you to calculate lighting loads by building square footage based on the type of occupancy
Article 220	Table 220.42: Lighting Load Demand Factors	Lighting load demand factor table for service calculations. Follow instructions in Annex D.
Article 220	Table 220.54: Demand Factors for Household Electric Clothes Dryers	Demand factor table for electric clothes dryers in dwelling units. Be careful; you might have to use the "minimum" dryer VA rating in 220.54 — not what they give you in the question.
Article 230	Figure 230.1: Services	Helps you navigate through the entire Article.
Article 240	Table 240.6(A): Standard Ampere Ratings for Fuses and Inverse Time Circuit Breakers	List of all the standard circuit breakers and fuse sizes. This table is very helpful when answering motor questions from Article 430.
Article 250	Figure 250.1: Grounding and Bonding	Helps you navigate through the entire Article.
Article 250	Table 260.66: Grounding Electrode Conductor for Alternating-Current Systems	This table will help size the grounding electrode conductor for the ground rod and the cold-water ground
Article 250	Table 250.122: Minimum Size Equipment Grounding Conductors for Grounding Raceway and Equipment	This handy table helps you select a grounding conductor based on the size of the breaker feeding the circuit. This will help you to be less dependent on the boss or the electrical inspector.
Article 300	Table 300.5: Minimum Cover Requirements, 0 to 1,000 Volts, Nominal, Burial in (Inches)	Minimum burial depths for electrical circuits based on the voltage and location. This handy table will make you less dependent on the boss.
Article 310	Table 310.15(B)(2)(A): Ambient Temperature Correction Factors Based on 30°C (86°F)	Correction factor table based on conductors from 310.15(B)(16). Use this table when "correcting" based on the temperature around the conductor.
Article 310	Table 310.15(B)(3)(a): Adjustment Factors for More Than Three Current-Carrying Conductors	Adjustment factor table based on number conductors in a raceway from 310.15(B)(16). Use this table when "adjusting" conductors to "derate."
Article 310	Table 310.15(B)(16): Allowable Ampacities of Insulated Conductors Rated Up To and Including 2,000 Volts, 60°C Through 90°C (140°F Through 194°F), Not More Than Three Current-Carrying Conductors in Raceway, Cable, or Earth (Directly Buried), Based on Ambient Temperature of 30°C (86°F)	The most important table in the NEC. Use this table to select your conductors based on ampacity, temperature, and insulation type. This is how you find your wire size for feeders, branch circuits, electrical equipment, and panelboards.

Highlight this important list of Articles and Figures, and see if you can bring this Table to the exam with you for reference.

in which it is given to you. Most testing software platforms will give you the option to "skip" a question and go to the next one. For the first few hours of the exam, answer questions that require the least amount of time. Focus on the "low-hanging fruit" first if you will — going from the least difficult to the most difficult.

Exam questions can be organized by the number of steps it takes to answer the question. Some may take only one; others could take

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up to five steps. For example, service calculations, some motors questions, and anything that requires a table typically require three to five steps to get an answer. Avoid these questions early in your exam; the goal is always to save time in the beginning. Doing this will leave you with enough time allocated to answer the more time-consuming questions at the end. This will also leave you time to review all of your answers before you hit "finish."

Also remember that all questions aren't created or weighted equally. The exams in my area, for example, have a "General Knowledge" section and a "Plans Reading" section that feature very time-consuming questions. Save those for the end.

PARTING TIPS

When preparing for any kind of electrical licensing exam, remember these golden rules:

- Re-arrange the questions in an order that makes you feel more comfortable, even if you have to skip the first 10 to 20 questions. Answer the easy ones first.
- Work on math and motor problems last. This will save you time.
- Associate Chapters with Articles. For more tips on how to do this, read my previous article (The NEC for Newbies in a Nutshell), and watch the accompanying webinar.
- Highlight the important Tables and Figures noted in this **Table** on page 6. If possible, bring a copy of this Table to the exam.

In summary, to pass an exam like this, "getting your mind" right from the start is one of the most important strategies you can use to your advantage. You must not only understand the flow of the test but also the nuances and language of the exam. Paying specific attention to all of these aspects of test taking will inevitably improve your score in the end as well as your chances for continued success in your lifelong journey of electrical learning.

Harold De Loach, a master electrician and electrical trainer/instructor, is the founder of The Academy of Industrial Arts in Philadelphia. He is also the director of education and training for www.necprepclass.com, which provides electrical license preparation courses for the city of Philadelphia and the Lehigh Valley Allentown, Pa., areas. With more than 30 years of experience in the field, he writes regular exclusive content for the E-Train newsletter and can be reached at info@taia-school.com.

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ETIQUETTE FOR ELECTRICAL APPRENTICES

Charm school — what every new electrical professional should know

By Harold De Loach

Electrical apprentices who get promoted within the company make the boss's job easier; they help to streamline the day.

Congratulations; it's official! You just got hired as an electrical apprentice. This is your first day on the job. You're surrounded by strange thunderous noises, sparks, and unfamiliar smells. Just take it all in. Don't worry about being the new guy or girl — this feeling will eventually pass. You're there because this company needs you on this specific project. They've made a place for you, and you should feel very proud of yourself. Someone decided to take a chance on you and your developing talents.

Now let's go over a few rules for you to live by as the next few days unfold. I'm giving you advice based on conversations I've had with hundreds of electrical contractors, foremen, and superintendents over the past 20 years. These tips will help you safely navigate your way through the first couple of weeks as you get settled into your new position.

Remember, this job opportunity is the first official investment in what's going to be a long career. Focus on helping the company reach its goals; in return, you will achieve yours. This is a chance to display what you have to offer the company, so make yourself indispensable — just do it without being a nuisance.

WHEN TO ASK FOR HELP

Never exaggerate your abilities, past experiences, or skill sets. This is one of the most significant pain points contractors experience with new hires. Little white lies can cause damage to property, equipment,

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and sometimes even fellow personnel. Remember, the boss only gets paid once for installing something. If the work has to be redone, he or she is paying for it to be installed twice.

So, if you don't know how to perform a task, ask for help. Don't worry about looking weak or inexperienced. And don't lose the boss's confidence by telling a lie; use diplomacy, ask for advice, and get it done right the first time. Your foreman or journeyman will take pride in showing you how to do something "the company way."

WHEN "NOT" TO ASK FOR HELP

On the other hand, never be a drain to the boss's brain. Bosses are impressed with apprentices who are self-motivated problem-solvers. How do you become one of these people? You have to pay attention to the smallest details of each task you've performed. When you are on the job site, watch what your journeyman does and how he does it. Then take mental notes. Be an active learner all day long, and don't ask for help with something you've already done repetitively. Electricians who get promoted within the company make the boss's job easier.

There may be occasions when you find yourself alone on the job without guidance. This may occur after you've been an employee for a while, or it could happen right away. Keep in mind this might even be a test. Before you ask for assistance, make sure it's not something you can solve on your own. You can ask technical questions, but try and avoid common-sense questions.

Do your research. One way to problem-solve on your own might be finding a schematic for the equipment you're repairing or installing, looking for the job-site blueprint, and studying all resources. Find videos or websites that can guide you safely through the installation. If all else fails, then make the call to the boss.

Make it a habit of pushing your brain into more complicated problem-solving exercises. Remember, your brain is a muscle; once you begin to stretch it and push it to new boundaries, those new muscles will stay with you. Staying in your comfort zone will stagnate your career — fear or laziness will pigeonhole you.

WHERE YOUR FOCUS SHOULD BE

Great apprentices always foresee their journeyman's next step. Focus on anticipating what their next move is. Pass them what's needed before they need to ask you for it. Great electricians install

MAKE IT A HABIT OF PUSHING YOUR BRAIN INTO MORE COMPLICATED PROBLEM-SOLVING EXERCISES. REMEMBER, YOUR BRAIN IS A MUSCLE; ONCE YOU BEGIN TO STRETCH IT AND PUSH IT TO NEW BOUNDARIES, THOSE NEW MUSCLES WILL STAY WITH YOU.

equipment and terminate conductors with precision, repetitively and consistently. Their work is immaculate and organized; it's their signature. Their tools represent an organized approach to each day and every task.

With so much to learn, there should never be a dull moment during the workday. So tighten up that belt, keep your pants up, and, most of all, put that phone away — no texting on the job!

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HOW TO BECOME THE BEST ELECTRICIAN YOU CAN BE

Inside tips from the field on what electrical employers expect from new apprentices

By Harold De Loach

Survivingthe first few weeks on the job as a new electrical apprentice is quite an accomplishment, but there's still so much to learn. In a few of my past columns, I went over etiquette for electrical apprentices and survival skills for new electrical hires to help electrical apprentices adopt best practices for future success. Now let's take a closer look at a few things that differentiate a good hire from a great hire.

GO FROM "GOOD" TO "GREAT"

Good journeymen/women can transition the electrical plan to a finished product by the proposed finish date. They can take the electrical drawing provided by the customer or the boss and layout or supervise the installation of the lighting system, heating and cooling equipment, and all the power distribution components. They also understand the basics of the National Electrical Code (NEC) and can navigate the routine chapters and sections. Good journeymen/women also show up on

As our industry continues to be plagued with skilled labor shortages, always make yourself stand out by learning more than you are required to.

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time, every day, without fail — even when materials don't show up for the day. They also make sure the gang box is locked and secured by 3 p.m. — every day, on time.

GO FROM 'GREAT' TO A 'MASTER'

Great journeymen/women have a dynamic skill set; they are an invaluable asset in the field and at the office. They have the technical knowledge to analyze blueprints. They can assess and articulate the customer's present and future needs by using excellent interviewing skills. When necessary, they can improvise by making technical adjustments based on exceptions from the NEC, and make logistical adjustments as changes occur to the plan as the project grows and develops.

DON'T GET SO LOST IN THE DAY-TO-DAY ACTIVITIES OF LIFE AND WORK THAT YOU ALLOW YOURSELF TO FALL INTO A RUT, DOING THE SAME BASIC JOB-SITE TASKS OVER AND OVER. THIS INDUSTRY FAVORS AND REWARDS ELECTRICIANS WHO CAN DESIGN A PROJECT FROM SCRATCH.

They are not blindsided by things "not taken into consideration" during a project's planning stage, using Chapter 2 of the NEC as their guide. Great journeymen/women are well aware of all the resources at their disposal and can "fairly" and "firmly" negotiate change orders caused by the customer. They understand that an essential element of judgment is proper planning and basing technical decisions on facts. They have learned from Art. 90 that improper planning can lead to electrical overloads, which leads to fires. And they often stay late in the office to ensure that the next day is adequately planned, which helps keep the project moving ahead of schedule.

DON'T BE ONE-DIMENSIONAL

A skilled electrician reads blueprints and understands the calculations required to size each feeder and branch circuit following local and national rules. An experienced electrician also can select the proper materials for the job.

Don't get so lost in the day-to-day activities of life and work that you allow yourself to fall into a rut, doing the same basic job site tasks over and over. This industry favors and rewards electricians who can design a project from scratch.

Bring more value to the job site and your company. This will help you become a problem-solver and trusted advisor.

As our industry continues to be plagued with skilled labor shortages, always make yourself stand out by learning more than you are required to. Remember to plan your career as you go. You will be presented with unique and different challenges along your journey. Make sure your tool arsenal includes one of the best investments you can make — yourself.

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EVERYDAY INSTRUCTIONS FOR ELECTRICIANS

A quick review of the requirements in Art. 110 for electrical installations

By Harold De Loach

Most of the rules that electricians follow in their daily routine can be found in Art. 110 of the National Electrical Code (NEC). Professional electricians know the difference between trade preferences, Code requirements, and wives' tales. Always remember the Code only sets the minimum requirements you must follow.

Article 110 covers general requirements for access to and spaces about electrical conductors and equipment. It also sets the minimum standard(s) for the use of electrical equipment. The equipment and conductors we use must be:

- Suitable
- Approved by the authority having jurisdiction (AHJ)
- Listed for its intended use
- Labeled for its intended use

SUITABILITY

This is typically accomplished by the product certification of the equipment or materials. Listing or labeling is the most common form of establishing suitability. This is a service that organizations such as Underwriters Laboratories perform for equipment manufacturers. These groups are recognized as qualified testing laboratories. Before the AHJ approves the installation of certain materials or equipment, the inspector or AHJ may require evidence of compliance with Sec. 110.3. So be careful if you buy inexpensive ground-fault circuit interrupter (GFCI) receptacles and electrical boxes on the internet; there may be a good reason those products are so cheap.

A female student at The Academy of Industrial Arts works on an electrical job.

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As professional electricians and progressive apprentices, always take pride in your work.

LISTING AND LABELING

Here's a perfect example of this requirement as related to outdoor GFCI receptacle installations. The NEC says the outlet must be identified as a weather-resistant type device, as per Sec. 406.9(A). Identification of suitability is typically listed on the product labeling or the information furnished with the equipment. So don't be surprised if the inspector or the AHJ examines the products you are installing.

Electricians must pay attention to every little detail of every project they work on. The quality of your work affects the safety of the individuals who work and dwell in the structures you're working on. We follow these guidelines for "the practical safeguarding of persons and property from hazards arising from the use of electricity."

BE PROFESSIONAL

As professional electricians and progressive apprentices, you need to take pride in your work. Spend the extra time it takes to perform clean, organized installations of your electrical equipment and wiring. Your work is your signature to the world. Make the boss proud. Make an impression on the inspector and the customer(s).

Use your torpedo level to set your raceways, boxes, and panels. Terminate your conductors neatly in your device boxes. Don't leave knockouts unsealed [Sec. 110.12(A)]; plug them up! When you're finished installing a panel, gear, or a piece of electrical equipment, it "shall not be damaged or contaminated by foreign materials, such as paint, plaster, cleaners, abrasives, or corrosive residues" [Sec. 110.12(B)]. There should also be "no damaged parts that may adversely affect safe operation or mechanical strength of the equipment."

A quality installation has no "parts that are broken, bent, cut, or deteriorated by corrosion, chemical action, or overheating." This is not hard to accomplish if you take your time, be patient, and remain focused.

In addition, your panels, boxes, or equipment shouldn't be loosely mounted or wiggly on walls, structures, or inside cabinets. "Electrical equipment shall be firmly secured to the surface on which it is mounted" [Sec. 110.13(A)].

Follow my column for more practical how-to articles and tips on electric basics and applying those concepts in the field, especially how to put NEC requirements into practice in real-world settings. For more information on why a structured approach is so important to navigating the NEC, read "The NEC for Newbies."

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THE APPRENTICE'S GUIDE TO SUCCESS IN THE ELECTRICAL CONSTRUCTION INDUSTRY

There is no elevator up to success; you must take the stairs.

By Harold De Loach

As an electrical instructor, mentor, and leader, I repeatedly get asked the same question: How long does it take to become an electrician? My response always comes in the form of another question: How long does it take to become a chef, barber, or surgeon? Unfortunately, there is no "set" amount of time or shortcut path to becoming proficient in the electrical trade. No six-month or five-year training program can completely prepare you for everything you'll see and experience in the workforce, but the good news is... time, persistence, and exposure will. There is no elevator "up" to success; you must take the stairs, which will require significant patience and endurance. To help you along your journey, I've developed a short list of tips to provide a basic framework for moving up in the electrical profession. Based on my years of experience in the electrical industry, here are eight sure ways to increase your chances of success as an apprentice:

1. BE PROFESSIONAL (VERBALLY AND NON-VERBALLY)

Ultimately, the success of your career in the electrical industry will be based on your ability to build rapport with other electrical professionals, who will serve as your advisors and resources. You must build trust and keep your word to move up the ladder. When communicating, always be mindful of your body language, facial expressions, and the tone of your responses. Always

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maintain eye contact when you're in engaged in conversations and discussions. Never make personal attacks, and be slow to take offense. Avoid using inappropriate language, and, most of all, avoid engaging in unprofessional behavior that will cause damage to your relationships and tarnish your reputation. Treat peers, customers, and their property with care. Remember — the boss needs someone they can trust; you are the company's representative and agent — an extension of the organization.

2. BUILD STRONG RELATIONSHIPS

Your attitude determines your latitude. Foster trust and gain respect from everyone, even those you might consider annoying coworkers. Be diplomatic and empathetic from the supply house to the job box. Be insightful: Do your due diligence on all assignments given to you. Demonstrate to your team and the boss that you are goal oriented. Be proficient in everything that you do. Be respectful; never do anything that will undermine your credibility. Always keep your word; strong relationships are built on consistency. This will help you to become a trusted team player. Show customers that the well-being of their project is priority No. 1! Always hold yourself accountable, and do your absolute best with the resources you have at hand. Reminder: Your ability to gain trust will get you access to more resources.

3. BUILD EXCELLENT COMMUNICATION SKILLS

Always communicate clearly, focus on being an active listener, and pay full attention to "all" the details the boss is delivering to you (e.g., customers, the boss, coworkers). Be patient, and ask for clarity to confirm you're on the same page. Wait for the speaker to finish his or her instructions without interruption before you speak. Show interest in the information being delivered to you; make sure you understand the needs and concerns of the person speaking or communicating. Use clear and concise language, avoid jargon/slang, and make your message easy to

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understand. Respond immediately if you can; don't let essential instructions or information languish in your email and text messages. Keep the timing of your response from causing issues down the road. Always use the most appropriate communication channels based on the situation; in other words, discuss sensitive issues face-to-face — sometimes, things get lost in translation in an email or text message.

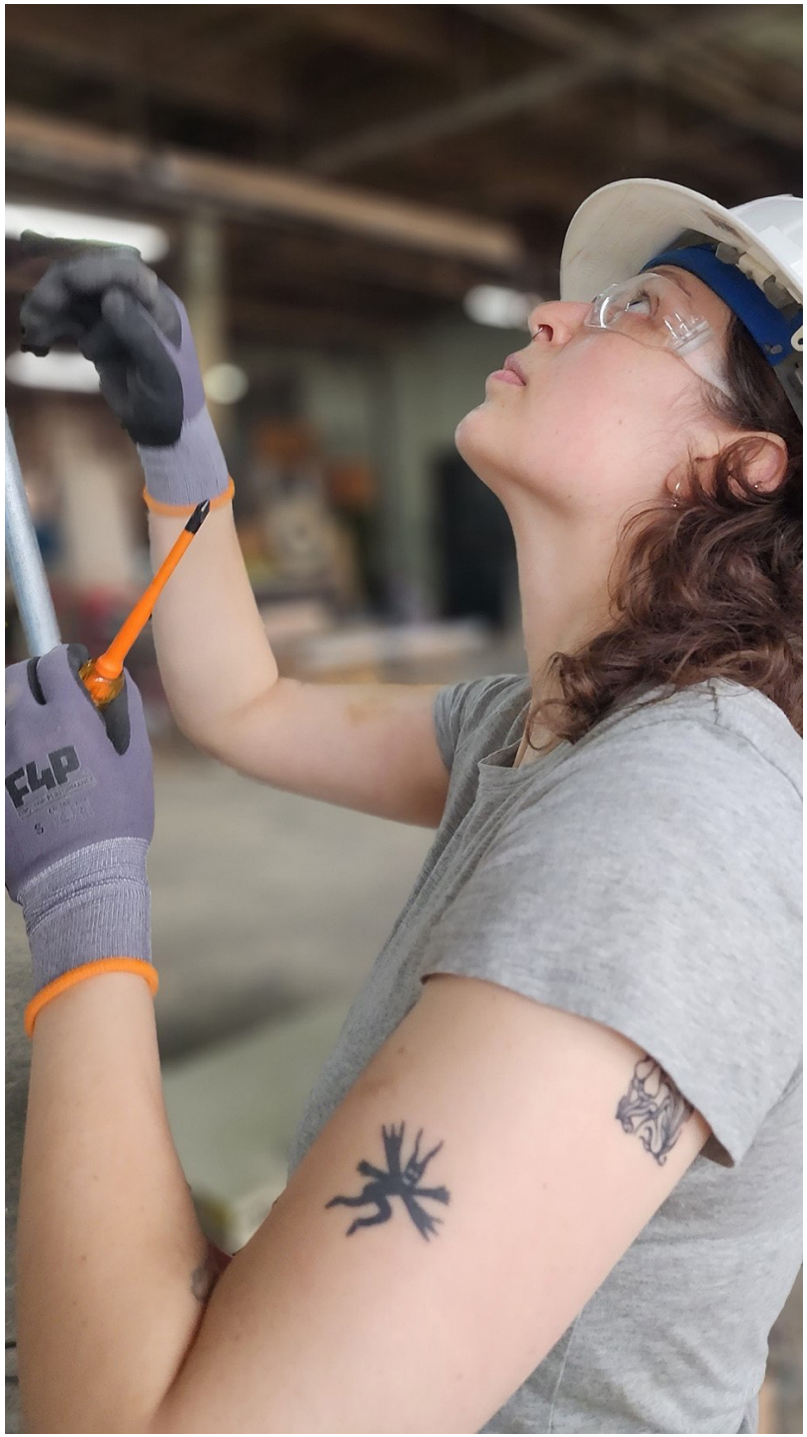
4. STAY PERSISTENT

Malcolm Gladwell, a famous researcher and author, once stated that he believes it takes 10,000 hours of intensive practice to master complex skills and materials. To be successful in the electrical industry, you must be persistent, and never give up in the face of obstacles and challenges. Learn from your mistakes, and course correct. Despite the fact that Michael Jordan missed more shots than he made, he ultimately became one of the greatest basketball players in history; his secret was just kept shooting. Always learn from your failures and mistakes; failure is a part of success. Stay committed to mastering an area of the electrical industry, find your niche, and master it! Here are a few examples of potential areas to become an expert:

- Pipe bending
- Fire alarm systems
- Mastering the NEC
- Solar photovoltaic systems
- Residential wiring guidelines
- Building automation systems

5. EDUCATION IS CRITICAL

The electrical trade is significantly affected by technological developments and legal legislation changes, which is why successful electricians are constantly learning and adapting to change. They read books/articles, attend seminars, and seek out resources that help them grow and perfect their craft.



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Professional electricians have a superior understanding of the NEC and have critical thinking skills. Poor or average electricians often need more resources to excel in this industry due to laziness, lack of training, or resistance to change. Having the correct information and training can give you access to resources that generate wealth. The best tool to have in your arsenal is your education. Never stop investing in yourself; it will pay you dividends indefinitely.

6. FIND A MENTOR

During the early years of my business, I grew and took on more significant projects because I had a mentor guiding me through every aspect of the project. He helped me to establish my first lines of credit accounts at a supply house I'd been shopping at for years. He helped me to avoid failing inspections on any of my jobs. He held me accountable for all of my decisions. When he retired, he gave me all of his old customers — they represented a significant portion of my revenue. He pulled me out of countless emergencies (day and night). A good mentor will help you grow as an electrical professional; you must find someone you admire to emulate. Identify someone who is a professional electrician or businessperson. Navigating the construction industry is challenging; a mentor can serve as a barometer for you and give you the confidence to confront challenges/identify solutions. A good mentor can open doors for you and make invaluable introductions, connecting you with vital resources necessary to grow "vertically" in the electrical trade.

7. BECOME A LEADER

To become a leader, you must be self-motivated. Leaders believe in doing the hard work and are dedicated to mastering the electrical craft. They understand that becoming a leader is a continuous journey. Leaders set a high standard for themselves and their teams. They hold themselves accountable and take responsibility

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for their actions or inaction. To be a leader, you must be able to seek and receive feedback from others. Leaders have clear goals for their daily work and personal goals; they build networks vertically and horizontally within the organization; they believe everyone is essential to the company's goal. Leaders can stay focused on the task at hand while simultaneously putting out fires; they are not one-dimensional; they have a unique ability to simultaneously achieve short-term and long-term goals. They do not waste company resources and supplies; they understand cause and effect.

8. BELIEVE IN YOURSELF

The most essential ingredient to success in the electrical industry is believing in yourself, setting goals, and being prepared to overcome any obstacle. Surround yourself with people who believe in you and your abilities. Seek out others who are looking to grow as you are. Remember: Iron sharpens iron, so avoid stagnant people. Positive people give you a sense of direction and purpose (personally and professionally). Be a lifelong learner — with research, practice, and patience, you will develop your skills over time to master this craft and move up the ranks. Be mindful of all your conversations throughout the day, and focus your energy on productive conversations, not idle chatter or gossip. You will become confident and successful if you surround yourself with smart upwardly mobile team members.

Harold De Loach, a master electrician and electrical trainer/instructor, is the founder of The Academy of Industrial Arts in Philadelphia. He is also the director of education and training for www.necprepclass.com, which provides electrical license preparation courses for the city of Philadelphia and the Lehigh Valley Allentown, Pa., areas. With more than 30 years of experience in the field, he writes regular exclusive content for the E-Train newsletter and can be reached at info@taia-school.com.

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NO ONE IS COMING TO SAVE US

In order to prosper and grow, the electrical trade must advocate for itself.

By Harold De Loach

Many young people don't see the skilled construction trades as a career option. It's up to us to change that perception.

As an electrical professional, you've probably resigned yourself to the fact that you'll be working much longer than you originally expected, or maybe you've concluded that the kids won't be taking over your contracting business when you hit retirement age. For a number of reasons, we continue to have the same conversation we had five years ago when it comes to the skilled labor shortage and lack of people entering the trades. Yes, that number is growing, but it's still not enough to cover the obvious gap.

The skilled labor force is shrinking in the electrical industry every year by thousands of electricians. The only way to solve this problem is to "reeducate" our society. In the past, vocational or trade schools seemed to be reserved for people who weren't cut out for the traditional four-year educational path. It's no secret that college has been painted as the best pathway to success for generations, but that's only true for some people.

Many students don't want their future to be deferred without a clear pathway. What do we do about this situation? There's no one answer that fits all, but here are some of my thoughts.

TALK TO POTENTIAL ELECTRICAL PROFESSIONALS ABOUT THE FACTS

As a society, we haven't done a good job discussing the opportunity costs of education versus vocational training. Even though many people who graduate from college make more money than those

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who do not, you still must factor in the overall cost of college, including compounded interest on student loans.

Let's say you have a principal balance of $100,000 at an interest rate of 6%. With a monthly payment of $600, with no extra principal payments made, it would take you 30 years to pay off your debt! Factor in interest, and your total repayment cost would be $215,838.

On the other hand, the income and opportunities you give up by deferring your move into the workforce by four to six years can be substantial. For example, you could have made $35,000/year over the four years you spent in college, which equates to $140,000. Add to this the cost of your tuition ($215,000), and you're looking at $355,000.

Vocational students who successfully transition into the building trades can make more money long-term because they have less debt, and they start their careers earlier than college students. College graduates who pursue careers as doctors, lawyers, accountants, and engineers are typically an exception and have a lower opportunity cost even with higher debt loads. But not everyone is cut out to be a doctor or lawyer.

We've been pushing reluctant kids in to college for too long. For many, it's a dead-end path as less than half of college students finish the degrees they start. A college acceptance letter isn't a guarantee of success or a path to a stable future.

School-age students should be exposed to a variety of paths that lead them to a successful future. That means they need to be exposed to vocational training early on. This could remove some of the negative stigma attached to choosing a vocational school over college.

ELECTRICIANS ARE INVISIBLE TO MILLENNIALS

Does the neighbor's kid understand why you can take three vacations a year or buy a new truck every three years? Take more time to educate everyone around you in your inner circle as well as your community who is workforce ready. The average person thinks you have to be born with a unique skillset for the trades or that you need a relative to "let you into the business." Invest the time it takes to dispel those myths, and explain to them that the legacy can start with them.

VOCATIONAL STUDENTS WHO SUCCESSFULLY TRANSITION INTO THE BUILDING TRADES CAN MAKE MORE MONEY LONG-TERM BECAUSE THEY HAVE LESS DEBT, AND THEY START THEIR CAREERS EARLIER THAN COLLEGE STUDENTS.

We've done a terrible job of making ourselves more visible and explaining what we do to the current generation of young workers. In fact, most people can't even differentiate one type of tradesperson from another.

We are invisible to most of society, especially Generation Y and Z; they don't understand what we do or how important our jobs are in the construction industry. They're also not aware of the financial freedom our trade has to offer, nor do they grasp how portable our skills are. We have expertise that can take us anywhere in the world; it's not relegated to a desk and can even handle market swings during pandemics and recessions.

A CALL TO ACTION

So what do we do to bring about change? We must create more affordable, easy-to-access training programs for the trades; even if you have to launch a grassroots program on your own. Start small. The word will spread, even if it's just a few students.

Align yourself with others interested in closing the skills gap. Talk to local contractors, supply houses, building inspectors, trade associations, or electrical inspectors. Do not seek approval;

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seek support and create awareness of your effort. Always have goals set for the future.

You can easily buy approved curriculums for training programs. Study existing training programs, and reach out to local colleges, churches, or schools to see if there is interest in partnering with you. Always seek diversity in your groups. Your goal should be to have a wide range of ages, genders, ethnicities, and religious affiliations. This is no longer a man's trade.

HOW TO GET STARTED

Find a curriculum first; maybe one approved by the state's apprenticeships or labor departments. Select a location for training; it can be in a church, a mosque, garage, school lunchroom, or civic association. Get everyone involved, but it's best to run the operation with a skilled, field-experienced tradesperson.

Here are a few things to consider before you start down this path. You may need child background clearances, depending on the age group and venue you launch your program in. This sometimes requires an FBI clearance, but the costs of these processes are insignificant.

Becoming a registered apprenticeship program takes time and money; it will require providing proof of local community support through letters and testimonials. It will also require patience and diplomacy.

If you look in the right places, there are millions of dollars in provincial and federal grants available. Perform online searches for local construction companies or registered contractors as approved apprenticeship program providers. Then call them, and ask questions.

START WITH A LONG-TERM PLAN

Becoming an accredited school or program takes time and requires a lot of documentation online. Teaching requires patience — it's hard work. You have to convey clear pathways of understanding to your students and audience. That's why it's so much easier if you have personal field experience in the subject matter.

Always remember: Don't teach what you don't understand yourself. You have to create clear pictures of what's in your head. There's no guidebook for this pathway; find a mentor. *EC&M*, for example, has the support of an expert panel of teachers and industry experts. Don't be shy to reach out to anyone who may be able to help answer questions.

BECOMING A REGISTERED APPRENTICESHIP PROGRAM TAKES TIME AND MONEY; IT WILL REQUIRE PROVIDING PROOF OF LOCAL COMMUNITY SUPPORT THROUGH LETTERS AND TESTIMONIALS. IT WILL ALSO REQUIRE PATIENCE AND DIPLOMACY.

So, the bottom line is: The only way to close the skills gap is to get personally involved — because no one is coming to save us.

Follow my column for more practical how-to articles and tips on electric basics and applying those concepts in the field, such as "The Apprentice's Guide to NEC Chapter 4," "Everyday Instructions for Electricians," "Introduction to Commercial Service Calculations," "Introduction to Residential Service Calculations," "The Apprentice's Guide to Non-Metallic Sheathed Cable," and "Introduction to the NEC." For more in-depth information on why a structured approach is so important to navigating the NEC and how to put its requirements into practice in real-world settings, read "The NEC for Newbies."

Harold De Loach, a master electrician and electrical trainer/instructor, is the founder of The Academy of Industrial Arts in Philadelphia. He is also the director of education and training for www.necprep-class.com, which provides electrical license preparation courses for the city of Philadelphia and the Lehigh Valley Allentown, Pa., areas. With more than 30 years of experience in the field, he writes regular exclusive content for the E-Train newsletter and can be reached at info@taia-school.com.

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