

APPRENTICE GUIDE

An Introductory Guide
to the Electrical Trade

VERSION
1.00



ELITE
ELECTRICIAN
CONTENT DEVELOPMENT

EVOLUTIONARY SKILLS
EVOLUTIONARY MINDSET



APPRENTICE GUIDE

An Introductory Guide to the Electrical Trade



Version 1.00

Brought to you by the Electrician U Discord team,
in partnership with Elite Electrician.

Designed and developed for no cost
distribution by Electrician U

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Intent:

This guide is intended to assist individuals interested in joining the electrical trade, as well as individuals already in the electrical trade, early in their career.

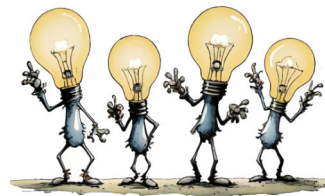
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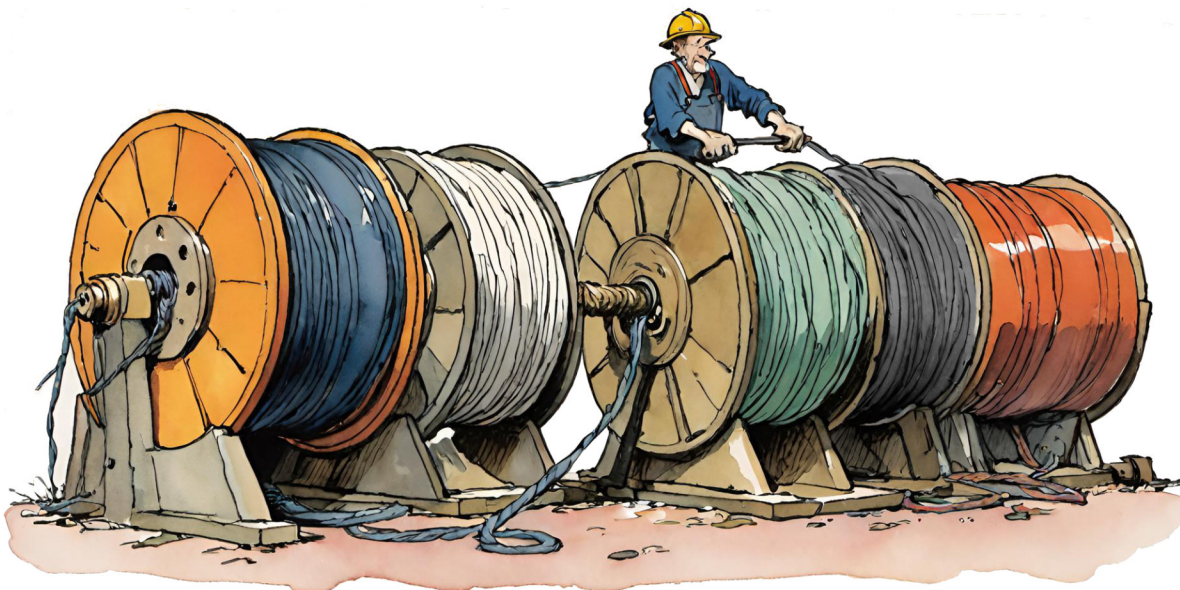
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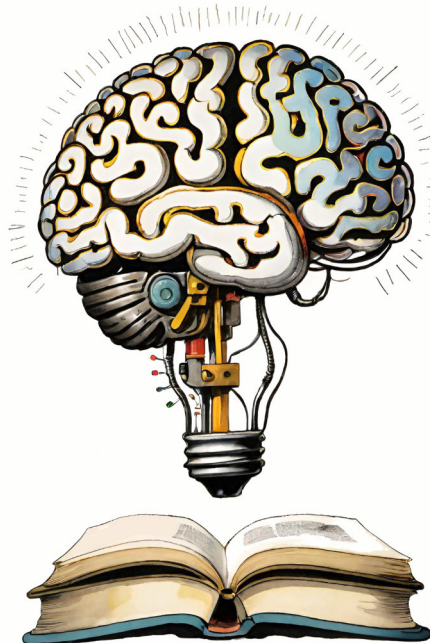
(START HERE) ABOUT THIS GUIDE

This guide was designed and developed for those with an interest in joining the electrical trade, or for those who have already decided and are embarking on their electrical trade journey. I recommend reading this guide from cover to cover, and then revisiting the sections that interest you. This guide is intended to evolve over time, so check back in for additional content.

The content in this guide was developed by several experienced trade professionals. The individual articles were written, revised, and edited by the contributing authors as notated. The contributing authors may conduct additional refinements and clarifications in future updates to this guide.

Additional content is planned for future revisions of this guide. Please submit requests for additional content you feel would be valuable to yourself and others entering the trade. If you feel certain articles or general content would be served by including additional clarification or refinement, please feel free to voice your ideas for improvement at the electrician U discord.

Knowledge = tools
for your mind



ABOUT THE ELECTRICAL TRADE

The electrical industry is vast in scope. Electricity is our civilizations primary system of energy. The electrical trade services nearly all end users of electrical energy with the exception of high voltage transmission and distribution. As an electrical tradesman you'll have the opportunity to engage in a wide range of different types of work. The electrical industry is generally subdivided into the following categories:

New Construction: New structures built from the ground up.

- **Residential:** Wiring of new homes, apartments, and other living structures.
 - **Commercial:** Offices, warehouses, retail spaces.
 - **Industrial:** Manufacturing facilities, chemical plants, refineries, civil infrastructure.
-

Service: All sub categories under service include significantly more troubleshooting than new construction. Often repair work and upgrades to existing systems. It also requires direct contact with customers and customer relation skills.

- **Residential:** Panel replacements, rewires, fixture replacements, appliance installation.
 - **Commercial:** Office lighting upgrades, new circuits for office equipment or food equipment.
 - **Industrial:** Control system upgrades, machine circuits, and other manufacturing needs.
-

Specialty: Additional services offered by many of the above variants of electrical contractors, though sometimes companies target the following areas as their primary focus.

- **Solar Installation:** Installation and maintenance of solar energy systems.
- **Communications and Networking:** Cat 5e/6, fiber optics, coax lines.
- **Specialty testing:** Thermal imagery, ground testing, transformer testing, insulation testing.

IS THE ELECTRICAL TRADE RIGHT FOR YOU?

Do you have what it takes to enter the electrical field?

As electricians we're providing society with the the means of accessing electricity at the end user level. That access includes the means to control and utilize electricity in a safe and logical manner. In order to engage in the process of installing and maintaining the means of end user electricity utilization, there are a few underlying ability requirements, both physical and psychological. Let's go over what you can expect.

Physical requirements:

Like all trades, there is a significant physical demand placed on the electrician as they engage in their field craft. Being in good physical shape is important in both accomplishing the task at hand, but also in ones ability to avoid injury. Constant movement and physical manipulation of tools and materials are part of the job. Our work is primarily in the physical realm. Further up the ladder of career evolution you'll find design work, management positions, safety officers, and others that are not engaging in physical installation, but the bottom line is the value our industry creates is solidified by the hands of the professionals at the scene of the project.

Psychological requirements:

The electrical trade has been called "the thinking trade" for good reason. As electricians we are expected to understand both field craft and book smart materials. We are analyzing observers, strategic planners, problem solvers, advisers, and risk mitigation safety inspectors, to name a few. Though we will learn quite a bit of valuable field craft skills on the job, it is impossible to become a well rounded electrician without the pursuit of knowledge growth through personal studies and book knowledge training materials.

In addition to the book smart trade content, there are personal perspective and coping skills that need to develop as well. Your perspective will dictate your interpretation and response to various situations. The best mindset will always be one that promotes professionalism, personal self control, proactive action, serving those around you, and a general growth minded focus. Coping skills are required to address the often difficult nature of the work. Like many things in life, you should expect there to be a range of peaks and valleys. This extends to both the physical aspect, as well as interpersonal aspect of working with a wide range of personalities and perspectives that may not align consistently with yours.

ADVICE ENTERING THE ELECTRICAL TRADES

Advice quotes from the Electrician U Discord Leadership Team

“Understand that you enter the trades completely expendable as an entry level applicant. It is your job to become irreplaceable, or at the very least, enough to make it painful for them to let you go, as fast as possible.”

- Master Electrician, Contractor, Richard “Grimlock” Outman

"Someone might tell you 20 things, and you might know 19 of them, but if you shut up and listen you just learned something."

- Master Electrician, Jeff T. - “Cocoa”

“As an apprentice, your job is to anticipate need. Watch the people around you, think about what they’ll need next, and get it for them before they have to ask for it. At first, you won’t know what’s going on but before long you’ll become indispensable and it’ll make you an incredible journeyman, keeping this mindset as you grow into a crew-lead.”

“As long as you’re doing your best work every day, and you walk away from the things you touch knowing they’re done better than the day before, you’ll end up being one of the best in your field.”

“Electricity is complex and challenging to understand. It requires a lot of self-study outside of work and will take you many years before you get your head wrapped around it. On top of it, there are all the codes that change every three years, as well as the experience needed using tools, installing materials, and solving problems. Play the long game. You won’t impress anyone for years, so don’t be in a hurry...but don’t take your sweet time either.”

- Master Electrician, Electrician U Founder, Dustin Stelzer



“Mindset of an Apprentice”

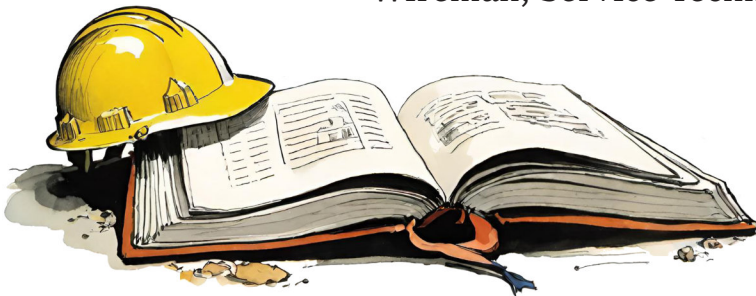
Advice article presented by Matt “Rotag56” Bergman

“The first day of your apprenticeship is going to be a rush of a lot things being thrown at you all at once. Your first day on the job no one expects you to be able to do much work. Sweeping, cleaning, or organizing the connex or other job site boxes is a very common task for brand new electricians. We all know the pain of getting all your tools unboxed, organized and put into place for your first day of work, only to be told “here's a broom, I need you to clean this place up while I work.” You have to embrace that job, grab that broom and clean up your assigned area until it's spotless then go back to the person you are working with and ask them what's next. Verbiage matters a great deal when you first start out, always get into the habit of asking some variation of “what's next” as it implies you are eager for the next task no matter how menial or labor intensive it may be.

Actively watching your lead person work when you are done with your tasks is what you should be doing with “down time”. What is actively watching? Actively watching is observing your lead person doing a task, absorbing what is happening and trying to predict their next move or next part they will need and have it ready and waiting before they even ask for it. This takes some time and experience to get down but not a lot of people will be mad at someone who is trying to expedite the job and not just scroll on their phones. Phones are always an object of friction in the workplace and school, when you are working your phone only needs to come out if you have to look up one item on a list you are given, and should not be done in eyesight of your co-workers.

The biggest thing apprentices should be doing to get ahead of their peers is to study off the clock. That may sound like an unhealthy habit but it is necessary because you will have questions that don't get answered on the job due to one reason or another. Having the mindset of a student and learning about our trade is going to set you above your peers at every stage of your journey in the trade.”

- Wireman, Service Technician, Matt “Rotag56” Bergman



TIPS ON PROFESSIONALISM AND MINDSET

This section provides a range of professionalism and mindset tips and recommendations for your consideration. The final decision on conduct and appearance rests on you and your employer.

Clothing:

Some recommendations in this section do require some expenditures. It is understandable that you may need to wait a bit to follow the advice. Some items are more significant when you are interacting with customers directly, or in their presence. But how you present yourself is seen by management, your coworkers, and supervisors regardless of the type of electrical work you engage in. So it still matters.

Logo Free: For optimal professional appearance you want to avoid shirts and hats with logos such as sports teams, brands, or other non-work related art. Blank hats or hats with modest stitched logos that are the same color as the hat are passable. If your shirt has art or a logo it should be relevant to your company or the trade specifically.

No shorts: Ever, even in the summer heat. Situations where it is appropriate are so rare that I am completely excluding them from professional attire. Also, an important consideration regarding shorts is that it exposes your legs to injury.

Avoid casual pants: Blue jeans are best avoided in favor of less common colors such as brown, green, grey. It is optimal to acquire pants with pockets and slots for tools and materials. Blue carpenter pants are acceptable as well. The issue with blue is that it is common. We want to stand out and be unique.

Work Boots: Wear footwear designed for use in construction environments. Seeing someone in our trade wearing sneakers, is portrayed as an individual with lack of experience. Experienced individuals understand that sneakers increase your risk of injury and are quickly damaged and ruined on projects.

Clothing condition: Ideally we want to keep our clothing looking clean and fresh, but customers and other tradesman are actually fairly forgiving of mild wear. The same applies to your work boots. Ripped clothing and the general ripped style should be avoided.

Personal Care:

This is mostly obvious stuff people already do anyway, but is relevant enough to include as a reminder. It's always best to maintain yourself to the best of your abilities, it's natural for others to formulate an opinion of you based on this. Keep your nails trimmed and clean, keep your hair orderly, take showers regularly, wear deodorant so you don't melt anyone's lungs when they are forced to work in close proximity to you.

Time management:

Be on time: To your workshop, office, or project. Ideally, for your sake, arrive early so you have time to adjust into work mode with less pressure on you to act immediately. Arriving early will also promote your reputation as someone who wants to be there, is proactive, and reliable. This is very important, you are just getting started and your reputation will have a significant impact on your day to day work experience.

Focus on your assigned task: While your primary focus as someone new to the trade should first be on accuracy and quality (doing it right), you need to ensure the time it takes you to complete the task is not increased by distractions, goofing off, or procrastination.

Understand your task: Part of using your time effectively is understanding what you're supposed to be doing, and what the end result looks like. Ask questions until you fully understand. Even if it annoys the person you're assigned to work with. You have a greater responsibility to your work results than to the emotional state of your supervisor.

Be proactive: Take action immediately once you are in a ready position. Seek out tasks that increase your usefulness to those you are teamed up with. Think ahead and be useful with your time and avoid wastefulness. This will dramatically increase your value and make others want you on their team. If layoffs come, you'll be much more likely to be retained.

Your Attitude and work ethics:

"Your attitude determines your altitude"



Attitude of service: Your primary role, and you must really understand this, is to serve the skilled producers. Your value is in increasing the efficiency and productivity of those skilled enough to produce the value the end user (customer) is trading their value (money) for. This may be in the form of maintaining the work vehicle, moving tools and materials in and out of the project, cleaning and keeping things orderly, as well as installation tasks that allow the skilled individual to focus on more complex tasks. Seek to be of service and you will be appreciated and valued, even if you end up with a supervisor that doesn't express that.

Seek to understand. Be curious and focus beyond the "what" into the "why". The faster you absorb the why, the faster you will transition from a producer support role, to an actual producer role. That means greater rewards for your time, effort, and acquired knowledge. "What" is intelligence, "why" is wisdom. Expand your mental tool kit with both!

“General Thoughts on Professionalism”

Deep dive on professionalism,
Advice article presented by Journeyman Zachary “zmettin” Mettin

A dictionary definition:

“professionalism : def; a person's abilities, competence, and behavior in a particular profession. It's a combination of skill, good judgment, and polite behavior.

Going into the trades or really any field as a new hire or an apprentice electrician can come with a myriad of different emotions. These can range from nervous, scared, anxious, excited, and even angry.

So why was professionalism mentioned before this? Glad you asked.

The professionalism I will speak to has very little to do with how you are feeling. Or how you are being treated. It is more so on how to conduct yourself in a manner I personally believe as an industry best practice.

You will find yourself at times frustrated, or working under someone who you do not particularly care for. Whether it's how they talk, how they dress, how they smell. If they smack their food when they eat at lunch. Or if they smack their lips before, during, and after they speak.

You may work under someone
you don't particularly care for!!!



You might also work with someone who you honestly believe would be better off doing something unsanitary to themselves. For lack of a better way to put it. They are just an all around ass hole. You don't like them. They grind your gears. You hate going to work with them. You can't understand why your boss's boss has you working with them. Why would they do that to me? Why?

Welcome to your first few years of being an apprentice. (Generally.) This is where my version of professionalism comes in. You don't have to like them, you don't have to agree with what they are saying, or how they are treating you or others. You don't. It isn't right. It isn't fair. It isn't okay.

This does not excuse their behavior or choices. If they are abusing their position there is a way to handle that. This is not the use case for this advice. This is for you to have in your back pocket.

You don't have to agree, like, or enjoy their company. You simply have to comport yourself as a professional. That means putting aside your ego, your pride, and doing the job. You are going to find yourself one day in a position where you are working for someone who you just really don't like. But you have a skill set that is required to get the job done, and get paid to do it. Regardless of your personal feelings for the individual you find yourself facing. Your duty not only to yourself, but your employer is to put aside your ego, and do the work. (That is if it isn't either A illegal, or B immoral to do so.)

Another take on professionalism is treating those around you better than you have been treated thus far.

If you mirror all the same bad traits you dislike, instead of spreading these ideals and how you wish to be treated. Regardless of what that is to you. The environment around you will never change.

And nobody will want to work with you probably like nobody wants to work with that guy in this example.

Going far and fast in this trade depends entirely on how much you soak up, how fast that happens, and whether or not you work well with others. Try to conduct yourself in this example of a professional and learn exactly everything you can. Including what not to do.

- Journeyman Zachary “zmettin” Mettin

Be a positive example regardless of the pressures of difficult people!!!



Additional thoughts on professionalism and coworker relations

presented by Master Electrician, Dustin Stelzer

“You will come across people that don’t like you, and won’t speak kindly to you. Realize this is a them problem. You won’t get along with everyone in life. Remember high school? It’s the same in all areas of life. Don’t quit a thing just because someone doesn’t like you. You don’t have to be friends with everyone, you just have to work with them. There are 8 billion of us on this planet, we’re not supposed to like and get along with everyone. Just do your work to the best of your ability and keep pushing through. If it’s truly a toxic environment with multiple people that’s different. Sometimes going to a different company can change everything. Just don’t do the wrong thing for right reason - or the right thing for the wrong reason, for that matter.”

- Master Electrician, Electrician U Founder, Dustin Stelzer



“Understanding the Task at Hand”

Advice article presented by Matt “Rotag56” Bergman

Your ability to perform a task is your ability to understand and be understood.

I find myself saying to apprentices many many times you were born with two ears and one mouth. Listen twice as much as you speak.

This is a very very old way of thinking in concept. But can put the right frame in the apprentices head. You are here to learn. If you don't understand. Say that. “I don't understand THIS part of what you just said, could you say that again?” this simple thing can save HOURS of work later.

Now don't say this like a magic get out of jail free card. Because it isn't that. But it is something a lot of apprentices won't do. “Hey Mr. Foreman, I am not understanding this set of instructions.”

If they heard that rather than “I know I know, alright Ill do that.” and then off they go. Only for the Journeyman or foreman to come passing through thinking they understood the entirety of the project only for them to completely miss the entire concept, and cause the need to redo the entire thing from the beginning again. (in the worst case.) That simple “hey, I don't get THIS part.” and getting a few more minutes of instruction could have saved HOURS of time.

Advocate for your own education. If you are missing something. ASK. Listen. Ask again for clarity. If you still do not understand. You can always learn outside of work.

See how this goes much past the listen twice as much as you talk? That's because you should listen. Learn. Ask. Learn more.”

- Journeyman, Matt “Rotag56” Bergman



PLANNING YOUR CAREER PATH

“Planning your career path”

Advice article presented by Dustin Stelzer

Think of this career as a mountain, and it's your job to make it to (or somewhere near) the top. There are several paths up to the top, some smooth and gradual with paved roads but they take time and you won't climb very far, very quickly. Others are a little more rocky, steeper, and require a bit more work to climb successfully. There are also deviations to be aware of, which will result in you somehow ending up back at the bottom shaking your head because they waste time and effort. As with hiking, it doesn't matter which path you take - the goal is to rise to the top. Some people prefer more stability over many years, others prefer flexibility and to be rewarded based on their merits. There are no wrong answers, it's all personal preference.

In general, the union is a great option for those seeking stable pay, benefits, and insurance and don't mind playing the long game on a little bit more of a paved path. They ensure you're trained, schooled, and protected in your career. There are some phenomenal union electricians working out in the world; there are some terrible ones, too. Merit shops (non-union) are less stringent, much more flexible, and negotiable however, you may not get the same kinds of benefits the union otherwise guarantees. Some merit shops pay for schooling, others don't care if you go to school or not.

On the topic of schools - all companies want skilled, experienced workers. School can be a great benefit to someone who already knows what they're doing in the field with their hands. School is never a replacement for hands-on experience. I'll hire someone with 2 years wearing tools everyday and no schooling over someone with 4 years of classes who's never wired a house. It's more beneficial for me as a Master Electrician to tell you to put your tools on and bend some conduit, install 10 recessed can lights in a room, and wire a 4-way switching system in the room, and you actually be able to do it. I'm paying you for what you can do in exchange for money - not what you've read about but can't do. I couldn't care less if you know what capacitive coupling and inductive reactance are if you can't wire a switch.

Many schools are a ripoff because, unless they provide you with hands-on experience, they're just selling you a product you have to pay for. A school is a business above all else. They require people to be in classes, and they require

money to survive. So if you're debating on whether or not to go to trade school, ask the school what accreditation they have, how many hours you will gain toward your license, and how much the curriculum is based on real hands-on learning. Some schools lie. Many have been duped into paying \$10,000 for a 12-month school apprenticeship and were told they'd come out with an electrician's license. This is not how licensing works. In nearly all states, you have to work in the field under a master electrician for 4-5 years to even qualify for a license. School may help chip down 400-800 hours but when you need 8,000-10,000 hours to qualify, you can see the value of school is not in securing licensure. School is for extra knowledge that cannot be gained in the field. Things like electrical theory, safety procedures, and electrical codes - are taught in classrooms as most employers don't have the time to talk for hours every day to teach you.

The best path (in my humble opinion) is to do something that combines 4 years of hands-on experience on the job with 4 years of schooling. It sounds like an insane amount, and you may have to pay for school if your employer will not. However, the combination of book knowledge and hands-on experience is potent and often yields the best electricians. Field experience will only get you so far. To troubleshoot effectively or build new and insane buildings with the latest technology requires adeptness with electrical codes and theory.

For the segments you can choose, it's my opinion that starting out in new construction is the best, because without much struggle mentally it gets you used to the ocean of materials we install and teaches you how to use tools extremely well. It doesn't matter if you go residential or commercial first, but I think residential is the easier path into the trade. It's often easier for residential electricians to transition into commercial than the other way around - but not always. After a few years of doing residential new construction, I'd recommend going into commercial new construction next. This opens you up to a new world, and the materials are a little different - and there's a lot more to know from a material and theory standpoint.

After a few years in commercial new construction, I recommend transitioning to a company that does purely residential and commercial service work. If you can find one that does commercial and industrial instead, even better. This is where you've gotten a ton of experience and understand codes and theory. Now it's time to move from being a big fish in a small pond to a small fish in an ocean. Service electricians do maintenance on existing installations, so they're running into problems every day that need fast, effective solutions. This will require you to up

your code and theory game rather quickly and will, overall, make you a far better electrician. You'll need to understand motor controls and automation, which requires all of the experience before, as well as a boatload of new information you've never known existed.

After you've done commercial and industrial service work for a few years, you will be in the upper 90th percentile of electricians in our industry. You will have learned that most people up until this point know far little and care far less about their craft than you do. At this time, you can seek out higher opportunities nationwide, and you'll likely get hired anywhere you want. You could go into more specialized work like data centers, industrial-scale solar, power generation, and distribution, or you can just go bigger and try to run megalithic structures such as high-rises, stadiums, and much more. If you enjoy being out in the field every day and still want to stick with that, you may end up being a superintendent or foreman in charge of large jobs with many people under you. If, instead, you're tantalized by the idea of running your own company, you can test for a Master Electrician license (some states call it something else) and get your contractor's license, and open a business. From there, the sky is the limit.

So, whatever path you choose is up to your personal preference. Talk to people, join groups online, watch videos, read books, listen to podcasts, get opinions, drop the ones you don't resonate with, keep the ones you do, and start crafting your own path. Hell, I never thought talking to my phone nearly a decade ago would result in me using my electrical knowledge to speak on videos reaching over 100 million people. It's afforded me the opportunity to work with nearly anybody I want to, and to have developed an entire learning system that schools and businesses are beginning to use to train their employees. I'm a prime example of designing your own path and staying focused over the long term. So, I really do mean the sky is the limit - it just depends on your level of commitment to your craft and your dedication to self-study and work ethic. All of that said though, you need to get experience - over many, many years - before the big opportunities will come your way. So understand you're playing a long game, but in the meantime, impress yourself every day and push yourself to work harder and know more than everyone else around you. I promise the chips will fall in your favor in a few years. If it's not you doing that, it'll be someone else around you. Don't let them catch you slipping.

- Master Electrician, Electrician U Founder, Dustin Stelzer

HOW DOES LICENSING WORK?

Purpose of licensing:

Licensing is imposed primarily to protect the public. It's a tool used to set a standard for skilled tradesman competence.

Who needs A license:

Licensing is a state requirement. Who needs to acquire one is determined by the state licensing and regulation board. Typically the "skilled trades" such as electrical, plumbing and HVAC are required to acquire a license. The requirement typically begins at the apprentice level.

Most states offer several levels of licensing as you progress in your career. Seek additional information from your appropriate state licensing authority.

"How Do i Get My License?"

Additional explanatory segment presented by Matt "Rotag56" Bergman

"While each state varies greatly in requirements for apprentices and journeymen, the best way to get started if you have no clue, is to simply find your state's department of licensing website and find the requirements for Electrical Apprentice. Now it is almost universal that there is some kind of fee to get your license, you will also have to do some form of Continuing Education. The amount of hours varies state to state but it should be on your state's Department of licensing webpage.

Now you have your apprenticeship card, how do you move forward? The first step is you have to make sure whatever shop you are working for has a master electrician on staff. Not having a master electrician on staff is a red flag in several matters, but in this context if you spend time working for that company, all those hours you worked may not count towards your state required hours of SUPERVISED work. If an electrical contractor does work without a master, you may not get any hours counted towards your typical 8000 hours of work in your apprenticeship.

Now that you have your 8000 hours, what now? It is time to start testing to get your journeyman's license. The figurative golden ticket in our trade, it should be every apprentice's goal entering into the trade to at least achieve this level of certification."

- Wireman, Service Technician, Matt "Rotag56" Bergman

RESUME TIPS

Tip #1: Keep it to a single page.

When I have a whole stack of resumes in front of me, I will ball my fists up when I have to read a 4-page resume (or just throw it away). If you've done so many things that are impressive, pick the top ones that are the MOST impressive - then, in the interview, you can talk about the other stuff.

Tip #2: Be truthful.

We'll find out sooner or later. Many people try to craft an Instagram-perfect shiny image on a resume. Most employers know resumes are 50% B.S. Be the person whose resume is truthful, impressive, and concise. Make it easy on the person reading it to stick yours in the callback pile. And don't make things up. We'll fire you once we realize you lied.

Tip #3: Be specific.

Talk about the things you know and what experience you've earned while at your school or previous employers. I don't care what school or company you worked at; I want to know what jobs you've done and what skills I can rely on you already having.

Tip #4: If you don't have much experience, try to make it look like you're smart and that you're a hard, dedicated worker.

I got a job once by telling the owner that I don't have much experience but I have a work ethic like nobody they've ever seen. I said I'm not here to prove what I know; I'm here for an education, and you have an outstanding reputation, so I'd like to learn from you. They didn't even look at my resume after that. I walked out with the highest offer I'd ever gotten until that point because they realized my attitude was one of extreme value, which sometimes matters more than a wealth of experience.

Tip #5: Keep a portfolio of images and videos of your work.

Instagram is an outstanding resource for cataloging your work. If you share a link to your Instagram and tell the employer, "Check out my work here," they will, and it will often tell them more than 1000 words on a page ever could.

- Resume Advice presented by Dustin Stelzer

SAFETY RULES

Safety Considerations for Those Entering the Trades

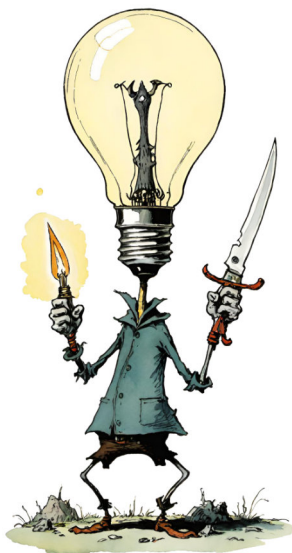
Working in construction exposes you to a significant number of hazards. Electrical specifically has many unique hazards you need to be aware of and constantly seeking to identify to mitigate and avoid injury.

Fundamental Safety Rules

Never work on live circuits as an apprentice. Only a highly experienced electrical professional under very specific circumstances should engage in live work. This is typical for troubleshooting scenarios, of which you will not be qualified to perform. Do not allow anyone to pressure you into working on energized electrical systems for any reason. Your first responsibility on the job is your personal safety and exposure to live electrical systems is exceptionally dangerous.

Do not distract others while they perform dangerous tasks. If your coworker is troubleshooting a live electrical system, working in an elevated position such as up on an extension ladder, or working in any other situation where tasks involve navigating increased danger, it is your responsibility to not reduce their attention or ability to focus on their task. Simply asking a question at the wrong time could result in significant negative consequences.

Electricity is
DANGEROUS!!!



Never make assumptions when the assumptions may expose you to risks you could otherwise avoid by confirmation and mitigation. Confirmation means you check before you act. Mitigation means after you check you take actions to further reduce the risks. For example, you check the soil to make sure it's solid enough to support your extension ladder, then you further mitigate by using a strap to secure the ladder.

Analyze your surroundings like an investigator at a crime scene. Your target, potential risks to your safety and those around you. You need to be actively identifying risks before they become injuries.

Avoid the effects of alcohol and drugs. I did not say avoid alcohol and drugs at work, I said avoid their effects. That means you need to think about how your weekend and evening activities will be affecting you at work during the following day or week. Obviously, do not use drugs at work,

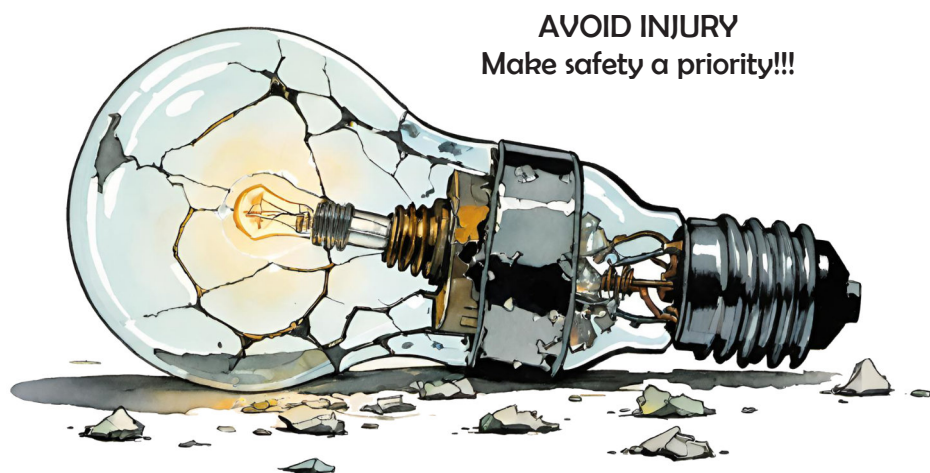
and yes, alcohol is a drug too. Your ability to identify and mitigate risks will be significantly reduced if you are not responsible.

Task on, safety gear on. That means wearing the appropriate safety gear for the task at hand. Gloves, eye protection, knee pads, hearing protection, face shield, whatever is needed, USE IT!

No jewelry at work. Jewelry such as rings and necklaces have resulted in significant injury. Wearing conductive materials and objects that can catch and snag is not a good idea due to increased risk of injury you could otherwise easily avoid. There are enough risks, don't needlessly introduce more!

Use tools as they were intended. Do not use the wrong tool for the job, it can increase the risk of injury to yourself or others. As intended also means not worn out. Dull blades will cause more injuries than sharp ones. This also means using your ladders correctly, they are tools too. Follow manufacturer's instructions.

Remain alert and stay focused on your task and the surrounding activities. Do not allow yourself to be drawn into distractions such as your cell phone or other personal items. It's best to avoid the use of headphones while working on an active construction site. Others may assume you can hear them working near you, or if they have to call out a warning for an imminent danger.



SAFETY EQUIPMENT

This section is intended as a basic introduction on safety equipment used in the electrical trades. This isn't meant to be a deep dive. It's important that you know this gear exists so you can prevent others who may be reckless with your safety from placing your safety in a compromised position.

What's your personal gain in cutting corners on safety equipment usage?:

If you catch yourself in a situation where you are about to sacrifice safety for speed, pause for a moment and consider the following exercise: Do a quick calculation on the amount of time you will save. For this example, 15 minutes. Now take your hourly wage and divide it by four. Now, ask yourself, is the risk involved worth that fraction of your hourly wage? Is it a fair trade if you are injured?

Definitions:

PPE: You'll hear the term "PPE" used, it means "personal protective equipment". All of the following examples provided for your general knowledge classify as PPE.

Arc Flash: "An arc Flash, or flash-over, is an electrical explosion or discharge where an electric current leaves its intended path and travels from one conductor to another, or to ground."

-Salisbury/Honeywell, Arc Flash PPE Manufacturer

Lock Out Tag Out: A process used to lock power sources in the off position. Clamping mechanisms and locks are used to lock a control point in the off position. A tag is placed as a warning, typically with contact information.

Safety Equipment in the Electrical Trade:

Hearing Protection: You'll generally see two varieties on construction sites; ear plugs and earmuffs.

Eye Protection: Eye glasses, side shields for prescription glasses, full face shields.

Head Impact Protection: Hard hats class "E" rated for electrical.

Work Gloves - General: Leather, fabric, latex, rubber coated

Work Gloves - Live Work: Tested at regular intervals to ensure damage and wear has not degraded their ability to protect the user. Often used with leather gloves worn over the rubber portion to prevent damage to the rubber. For comfort some individuals additionally wear thin fabric gloves under the rubber.

Rubber insulating mats and blankets: Used to provide a non-conductive surface to stand on, or to cover conductive surfaces around a location where live work is likely or unavoidable.

Arc Flash coverings/suit: Designed to take the impact of an arc flash at the level of it's rating. This includes a hood or face shield, bibs/overalls/over-pants, and a coat. Gloves are also included and selected based on the risk and work being performed. Complete arc flash suit sets often resemble a bee-keepers protective suit.

Knee protection: Overlooked by most, a good set of knee pads can prevent future knee pain and increase speed and efficiency on the job. They are a quality of life item worth adding to your tool set.

Lung Protection: N95 is the industry standard dust mask of choice. Throw away masks are the norm but cartridge masks can be acquired for longer duration usage.

Lock Out, Tag Out Kit: A kit of clamps, covers, and clasps designed to mount on electrical equipment and devices. The purpose is to ensure an equipment or device remains in a de-energized state. Most are designed to allow a small padlock to be attached, locking them in place. A warning tag is displayed, typically with contact information to communicate with the individual responsible for the lock out.

Fall protection: 5-point harness is the most common. Additional types of lanyards are available for climbing, such as belly lanyards used to scale towers. Fall protection also includes the doors on lift equipment such as scissor lifts.

Tool lanyards: Lanyards for drills and other heavier tools are available. Protects individuals in your work space as well as protects the tools from fall damage.

GFCI Shock Protection: (Ground Fault Circuit Interrupter). Plug in GFCI adapters are available for cord connected tool usage. GFCI protection should be used with ALL cord connected tools.

SAFETY TIPS

Included here are a few general safety tips to help avoid contributing to work site risks. Keep these in mind as you progress through your tradesman journey.

Do not place metal objects on top of electrical panels. That means conduit fittings, metal boxes, and especially easy to miss metal objects such as metal box blanks, lock rings, straps, and other small fasteners. If missed during clean up it could create a very dangerous situation in the future if the panel cover is opened and the part is accidentally knocked off and falls into a live panel.

Avoid synthetic fiber clothing. Unfortunately when synthetic fibers melt, they become sticky, molten, goo that sticks to whatever it is in contact with. That means your skin if you're wearing it, and an electrical explosion occurs in your proximity on a project. Instead wear natural fibers such as cotton, hemp, or wool. Natural fibers will burn off into ashes and not stick to your skin.

Keep your work area clean and free of debris that may cause you or others to stumble or slip. Some cables, conduit, and flexible raceway tubing can produce short scrap pieces that are well known to cause slipping injuries. As the apprentice one of your primary tasks will likely be orderliness. Take initiative and clear hazards.

Just because the other guy is taking senseless risks does not mean you should too. You must think of your safety first. If your journeyman brought a ladder that is too short for an installation, do not allow them to talk you into standing on the top to complete the task.

Avoid breathing dust produced from drilling concrete. It contains crystalline silica particles and can cause a risk of developing serious silica-related diseases in the future.

Toxic substances exist in older structures such as asbestos and lead paint. Seek more information on these.

If your senses scream
"SKETCHY"
reevaluate your
situation!!!



TOOLS - TIER 1 - (GETTING STARTED)



A few initial thoughts on acquiring tools:

Acquiring tools and building your personalized set will be an ongoing process throughout your career. Getting started it's best to focus on the basics. Some tools will be specific to a niche in the electrical industry, but some are fairly common regardless of the type of work you engage in. It's a good idea to talk to your supervisor, union representative, or project manager to see if you need some additional tools specific to your work environment. In this "Getting Started" section we'll cover the basic tools every entry level electrician needs. Purchase the best quality tools your budget will allow for. You don't "need" the most expensive, high-end tools getting started, but it's important to note that some poor quality tools will actually increase the difficulty of performing some tasks.

Basic Tools: (Additional tools may be required by your employer or union)

Note: Tool images used as examples only, no recommendations implied.



Lineman pliers: splice work, impacting, wire pull head prepping, general cutting.



Needle nose pliers: Fine point gripping, cutting.



Wire strippers: Insulation removal, screw cutting (if equipped), general cutting.



Box cutter knife: Cable outer sleeve and product packaging removal.



Torpedo level: Level device plates and other.



Tape measure: Measure as required.



Screwdriver set: (5-piece)

x1 #2 Square head.
X1 Full sized phillips.
X1 Full sized flat head.
X1 Small sized phillips.
X1 Small sized flat head.



Stubby screwdriver: Multi-bit for space efficiency.



Hammer 20-24oz: Fiberglass, smooth head.



Pouch/Bag/or Belt: A belt is best for entry level.



Addition recommendations:

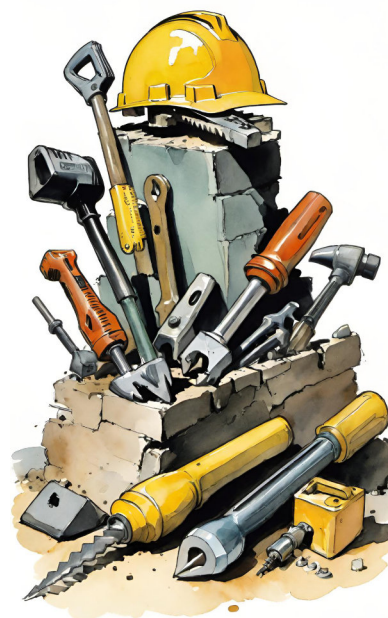
Small pocket flashlight
Pocket knife: Tanto, serrated
Fabric gloves: Unless provided
Pencil, pen, markers
Small pocket note pad

TOOLS - TIER 2 - (PENDING FUNDS)

Expand your arsenal of tools:

As funds become available you'll want to expand your tool set. Some of the items listed on this page may already have been required by your employer or union program at entry. As you fill in your tool set you'll want to further avoid low quality tools. Consider upgrading your basic, "getting started" tools during this stage if you had to compromise on quality previously. You may also wish to acquire an additional handbag, tool box, or other additional tool carrying case.

Cordless tools: You may find that acquiring a cordless screw-gun at this phase amounts to a huge quality of life improvement on the job. A basic "drill", two batteries, and a charger should be the initial target. You can expand your set after you fill in your core tool set. Flashlights that use your tools battery are a great add.



Screw Gun "drill": Quality of life and general efficiency boosting tool. Tool, 2 batteries, 1 charger



Screw gun bits: Nut drivers, screw driver bits.



Plug tester w/gfci button: Test your outlets after installation is complete.



Non-contact voltage tester: Quickly identify live wires and surfaces.



Drywall knife: Common hand saw.



Mini screwdriver: Multi bit, used for terminations.



Vice grips: Hold/grip stuff



Nut drivers: (3-pc min) 1/4", 5/16", and 3/8" Additional sizes as req.



10 in 1 screwdriver: Multi purpose, *does not replace all uses for standard.



Hex key set: Multi-key folding, best first version.



Aviation snips: Sheet metal sheers used to clip device brackets on install.



Adjustable pliers: Used to tighten fittings. Qty x2



Diagonal cutters: Used to cut wires and other.



Crimper: Crimp on forks and other adapters.

TOOLS - TIER 3 - (ESTABLISHED)



Advanced tool acquisition: At this point in your tool set evolution journey you're going to be adding additional specialty tools and upgrading tools to higher quality levels. Replaced tools become backups for when tools fail, are lost, or stolen. You may be closer to learning basic troubleshooting skills and should acquire a digital multi-meter for safety checks. You may also consider expanding your cordless tool set to include more tools. You may be tasked with greater responsibilities. That means additional tools used in demo and installation should be considered.

Note: Tool images used as examples only, no recommendations implied



Digital multi-meter: Voltage, current, and continuity are the core functions (see T5-600).



Upgrade tools: Per your individual needs and situation, upgrade tools.



Expand cordless set: Add additional tools as you deem beneficial.



Security bit set: Allows access past abnormal screw heads.



T-Handle hex key set: Used where folding versions will not work.



Wood chisel: Used in demo and installation.



“Cats paw” pry tool: Used during demo and install preparations.

Center punch: Used to dent a point for a drilling.



Code literature: NEC and/or other reference materials. Illustrated guide to NEC as a great example.

Addition recommendations: (per your own needs)



Magnets - neodymium, ceramic: Multi purpose, holds tools/parts, can find stud drywall screws.
Magnetic pick-up tool.
Flexible and angle bits.
Wire PVC pipe cutter.
Headlamp flashlight.
“Magazine” drop pouch 1 or 2
 Use to hold tools/trash/parts

ELECTRICAL BASIC CONCEPTS

Electrical Basics You Should Know:

While you won't be doing on the job calculations for a while, it's important that you are competent in some basics of electricity. It won't feel very good to be clueless when you hear others discussing these basics. Also, your competency reputation will be reduced if it is discovered that you don't know these basics. It's like working at a race track pit stop and not knowing which pedal does what in an automobile.

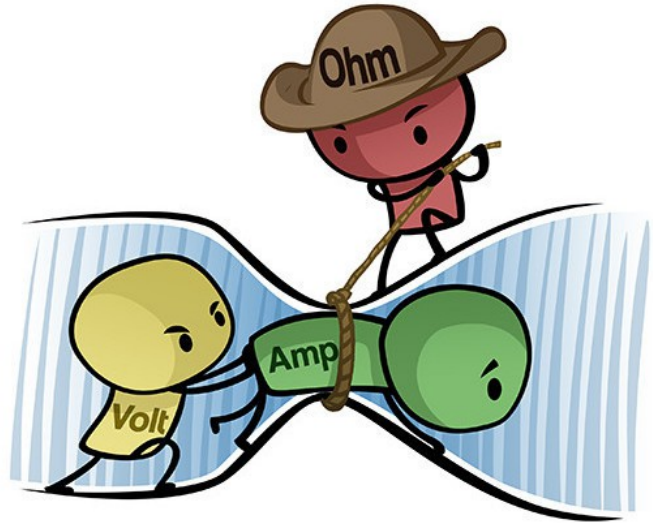


Image Credit: build-electronic-circuits.com

Watts: Watts are a measurements of how much power is needed for something that runs on electricity to perform it's purpose. An incandescent light bulb for example may require 60 watts of electricity to fully light up. A space heater may take a significantly higher wattage to produce heat, typically around 1400 watts.

Volts: Volts are a measurement of pressure. Imagine a water pipe with water flowing through it. Volts would be similar to how hard the water is flowing. For example, you could partially block the end of the hose and the water would begin to spray out further, though not necessarily be more or less water exiting the hose. The increased pressure out of the end would be like increased voltage in electrical.

Amps: Amps are a measurement of flow at a given point. Continuing with the water hose analogy, amps would be how much water is passing at any single point along the water hose. The hose represents a path electricity is flowing through, such as a wire routed from a wall switch up to a ceiling fan.

Resistance: Resistance is a property that describes how difficult it is for electric current to flow through a material. Materials with high resistance (Insulators), like rubber or plastic, make it difficult (or nearly impossible) for electricity to flow through them. Conversely, materials with low resistance, like metals such as copper or aluminum, allow electricity to flow more easily. The main issue with resistance is that it can cause voltage to decline the further you get from the source feeding the circuit (voltage drop). This can cause appliances to not function properly. Resistance also generates heat as a byproduct.

Basic Electrical Formulas You Should Know:

Math related to electricity can get exceptionally complex. Luckily for us electrical tradesman we can leave most of that to the electrical engineers. However, there are a few simple electrical formulas that are common enough that you should memorize them. It's important to note that further studies related to electrical theory should be pursued through proactive, independent study. There are a lot of websites that offer additional clarification on the topic of electrical formula. "Ohms law", "Watts law", or "electrical theory" are the search terms you should be inputting into your search engine. The following formulas originate from Watts law, but are also utilized in similar fashion in Ohms law, but deeper information related to Ohms law is outside of the scope of this guide.

In the field, we are primarily going to be working with the following values, converting between them, determining a third value based on two available values:

Volts, Amps, and Watts

Resistance is an important aspect of electrical circuitry, but I am excluding it from this basic formula section for two reasons. First, in the field it is most often used to make cable size adjustments to mitigate voltage drop. You definitely won't be doing that early on in your career. Secondly, it is covered extensively by websites dedicated to teaching electrical theory.

Watts / Amps = Volts

Watts / Volts = Amps

Amps X Volts = Watts

Real world example: You have to install an appliance that is rated at 1000 watts. You know the circuit you would like to use has two 750 watt appliances already. This is a 20 amp rated circuit, 120 volts. The total proposed watts equals 2,500.

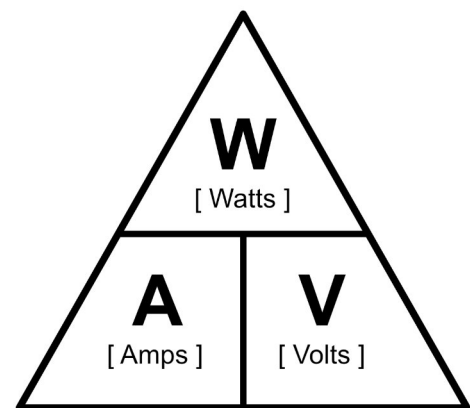
20 [amps] x 120 [volts] = 2400 [existing circuit]

Note: 80% is the industry standard max load = 1,920 watts

2,500 [watts] / 120 [volts] = 20.8 [amps]

2,500 [watts] / 20.8 [amps] = 120 [volts]

(A new circuit would be required)

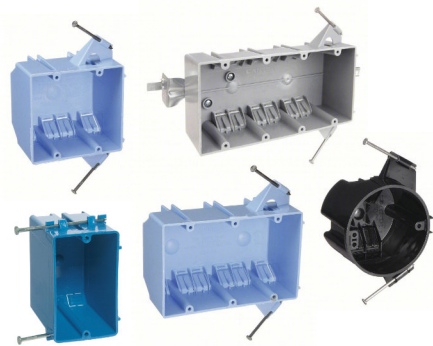


An easy way to remember the basic electrical formulas is with the "WAVE" pyramid. Stacked values divide, side by side values multiply. The unused value is what the answer represents.

MATERIALS YOU SHOULD KNOW

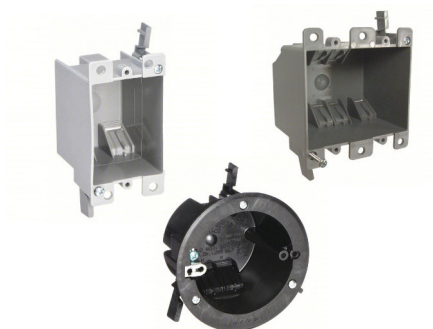
Materials You Should Know:

It's important that you know some basic electrical materials that you'll encounter on the job. Here's a collection of commonly used materials. You'll see variants of these produced by a wide range of manufacturers. Some parts are more common on residential or commercial projects. The NEC doesn't commonly specify if a part or method is strictly commercial or residential.



“Nail on” boxes (“New Work” PVC/Plastic boxes)

Most commonly used on residential new construction and renovation projects. Can be used for commercial if the local code allows. Comes in a variety of depths to accommodate more wires or larger devices. The round boxes are used for lights.



“Cut-in” boxes (“Old Work” PVC/Plastic boxes)

Most commonly used on residential renovation projects. Can be used for commercial if the local code allows. Comes in a variety of depths to accommodate more wires or larger devices. The round boxes are used for lights. Clamp “wings” are vised against the inside of the wall while a lip holds the box to the face of the wall exterior, holding it in place securely.



“Bell” boxes (Weatherproof Metallic boxes)

Exterior use box. The conduit entry points use a standard threading to allow conduit connectors to be attached. Common in both residential and commercial projects. Accessories include a variety of covers and box extensions. Typically made out of aluminum. They also come in a round configuration.

MATERIALS YOU SHOULD KNOW



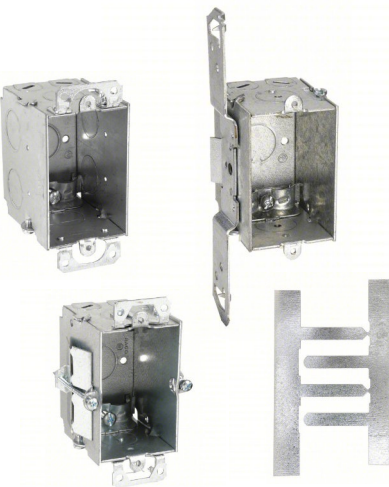
Square metal boxes (“1900” “4-square” “4-11”)

Most commonly used on commercial new construction and renovation projects. Is sometimes used in residential as a junction box. Comes in a variety of depths to accommodate more wires or larger devices. Covers include various blanks, “Industrial” covers used for surface mounted boxes with devices, extensions to increase capacity, and “plaster rings” installed before drywall. Drywall installers cut an opening in the drywall the size of the plaster rings protruding lip when drywall is installed.



Round metal boxes (“Octagon”, “Pancake”, “Fan”)

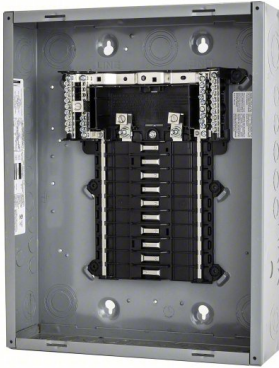
Round metal boxes are most commonly associated with light fixture installation. The deeper type round box is most commonly used on commercial new construction and renovation projects. The flat “pancake” type round boxes are mostly used in residential installations. The heavy duty box with the metal bracket is used for heavy chain mounted lights and ceiling fans.



“Gangable” boxes (Combine-able metallic boxes)

Used to install devices in existing wall materials such as drywall. The side plate can be removed to allow multiple boxes to be combined together to create a larger box. The box is secured using an attached bracket or clamping mechanism. If the box has no bracket or mounted clamping mechanism, bendable sheet metal clamp/supports are used (see image).

MATERIALS YOU SHOULD KNOW



Electrical panel (“Main panel”, “Sub-Panel”)

An enclosure that houses the circuit breakers, branch circuit feeders (“home runs”), grounding bus, main feeder or sub feeder.

Single Phase = 2 lines feeding (Residential, Comm)

Three Phase = 3 lines feeding (Commercial)

“**Main breaker**” (MBR) or “**main lug only** (MLO)” signifies if the main lines will attach to a breaker or to lugs. A “sub panel” is a panel fed after/from another panel, typically the “main panel”.



Circuit Breakers (Standard, AFCI, GFCI)

Over-current safety devices used to create a means of disconnecting power to a branch circuit or other connected load/appliance. The circuit breaker is intended as the weakest link in the circuit, a controlled failure point. Should complications arise, the breaker should “trip” before any other point in a circuit fails catastrophically, such as a splice or termination point. A variety of breakers exist to meet various energy control and safety needs.

Standard = Thermal and magnetic trip functions only

AFCI = Arc fault circuit interrupter

GFCI = Ground fault circuit interrupter



Grounding parts

Grounding is installed to create a path for electricity that has escaped its intended safe path. It allows the load to quickly exceed the breaker rating, tripping it so no live electricity remains exposed.

Ground Rod (5/8 x 8' most common)

Ground clamps: “acorn clamp” (L), “pipe clamp” (R)

Solid copper wire, typically #6 or #4

MATERIALS YOU SHOULD KNOW



NM-B Cable (“Romex”)

Most commonly used on residential projects. Is sometimes used in commercial where local codes allow. Comes in various lengths. Most commonly used by contractors in 250’ rolls and 1000’ spools.



UF Cable (“Direct burial cable”)

Similar in appearance to NM-B “Romex”. Typically gray in color with an outer sheathing that is considerably more durable and difficult to work with when compared to NM-B “Romex”.



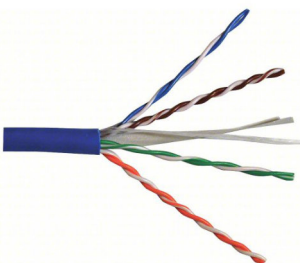
MC Cable (Metal Clad Cable)

Very common on commercial projects. Comes in a variety of conductor sizes and quantities. Is rarely used on residential projects. MC uses connectors specifically designed for use with MC. Prior to using a connector, a red bushing is placed on the end of the cut metal jacket between the jacket and the wires, to protect them from sharp edges.



THHN/THWN wire (Solid, stranded)

Spools of solid or stranded wire, typically in 500’ lengths. Most common in commercial but often used in residential where wire is pulled through conduit. Larger sizes are often cut to length and installed as main feeders in both commercial and residential.



Cat-5E, Cat-6 data cable

Used for networking, phone, and other low voltage and control purposes. Not all electrical contractors install networking but Cat-5E and Cat-6 is pretty common. They are typically pulled from a 1000’ box.

MATERIALS YOU SHOULD KNOW



EMT Conduit

Metal pipe used to route electrical wires and cable. EMT is the most common metal conduit used. Various sizes and lengths are available to meet project needs. Painted EMT is sometimes used on projects for separate systems such as fire alarm wiring.



Rigid Conduit

Heavy duty metal pipe used to route electrical wires and cable. Rigid is the second most common metal conduit used on projects. The ends are factory threaded and typically come with one threaded coupling provided, threaded onto the end of the conduit.



PVC Conduit

Made from plastic materials for optimal protection against corrosion. Commonly used for underground electrical routing. Is used generally in damp and wet locations, especially areas where corrosion is an issue such as in coastal areas.



Conduit Connectors and Couplings

“Male adapters” and “Couplings” are the most common parts to connect conduit/raceway to each other or boxes/enclosures. Each type of conduit will have connectors and couplings specific to it. PVC must be glued, other types use screws or vicing parts.



Conduit Straps

A variety of strapping methods are available for the various raceway types.

MATERIALS YOU SHOULD KNOW



Non Metallic Liquid Tight Flexible Conduit (LFNC)

Liquid tight tubing typically used for short lengths. Commonly used for AC unit connection in residential installations. Used in commercial where equipment may be prone to vibration. Uses specific connectors designed for LFNC.



Metallic Liquid Tight Flexible Conduit (LFMC)

Liquid tight tubing typically used for short lengths. Used in commercial where equipment may be prone to vibration. It's manufactured with an inner metal core for added durability. Less common in residential installation. Uses specific connectors designed for LFMC.



Metallic Flexible Conduit (FMC)

Metallic Flexible Conduit tubing typically used for short lengths. Used in commercial where equipment may be prone to vibration. Commonly used to route wires to and from transformers. Used in residential for in cabinet lines, such as island outlet and switch installations. Uses specific connectors designed for FMC.



Conduit bodies (“LB”, “LL”, “LR”, “C”, “T”, “SLB”)

It's common for these to all be incorrectly called “LB”s. These are used to add both a pull point and a means to interconnect to an enclosure or piece of equipment. The actual “LB” is the one with the hub on the end and the back (center bottom).

MATERIALS YOU SHOULD KNOW



Electrical Tape

Available in many industry standard colors. Used during installation as a tool to hold wires together when handling wire/cable. Used for color tagging wires (phase taping), and to insulate. Comes in standard vinyl as well as many other less common varieties such as rubber, or other materials for more specialized use cases/requirements.



Wire Nuts

Used to splice wires together. Comes in a variety of sizes to accommodate different sizes and quantities of wires. Some specialty wire nuts exist for aluminum wire splicing (typically purple) and exterior/damp location splicing (typically blue/red).



Common Screw Threading

6-32 Screw - Devices, switches & receptacles.

8-32 Screw - Light fixture mounting.

10-32 Screw - Ground screw.

10-24 Screw - Ceiling fan mounting.



Drywall Screws (Fine and coarse threaded)

Fine - Metal stud framing

Coarse - Wood framing

Useful screws for multiple purposes.



Hex Head Screws (Self Drilling & Coarse Threaded)

Self Drilling - Cutter head, drills through metal

Coarse - Used mostly with wood and soft materials

MATERIALS YOU SHOULD KNOW



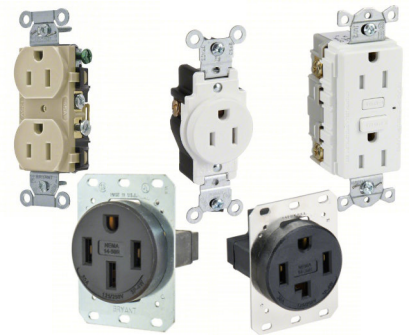
Switches

Single Pole: Controls from a single location.

3-Way: Controls from two locations.

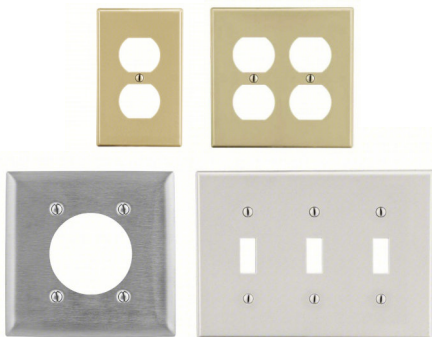
4-Way: Added between two 3-ways, adds an additional control point.

Tandem: Two switches filling one switch space.



Outlets/Receptacles

Points of access to electrical energy. These can be standard duplex receptacles or other devices with more complex pin configurations for different voltages and use cases. GFCI and AFCI receptacles have additional properties. GFCI and AFCI devices should be researched for additional understanding.



Trim plates

“Midway” is the current size standard used by most, in general. There is a smaller and larger size available for situations that could benefit from the smaller or larger sizes. Trim plates are used to cover and decorate any electrical device ranging from switches to receptacles and other device types.

FAQ



What is the “NEC”? (National Electrical Code)

This is the book that contains the vast majority of codes related to the electrical industry. It is adopted by individual municipalities as well as entire states. The contents are only enforceable when they are adopted into law. When adopted, it is often amended or slightly altered by the adopting authority to best meet the needs of the local population, or unique needs of the region. For example, you may find that cities near the ocean have banned the use of EMT and other metals that may degrade due to the salty water, when in a certain proximity to the shoreline, and openly exposed to the elements.

Who enforces the code written in the NEC?

The “AHJ” (authority having jurisdiction) is the term used in our industry. They are usually part of a code enforcement department.

Do I need to know the code in the NEC when I start out in the trade?

No, you will be working under the supervision of individuals who understand the code. Follow their instructions and do your best to understand why things are being done a certain way. This will help you greatly when you start learning the code later.

Do I need to be able to understand construction documents?

You will not need to be able to interpret the design drawing when you first start. This is something you should make an effort on though, as part of your evolution.

Will I need to work with live electricity?

No, you should never work on live circuits as an apprentice. There is considerable risk and you have not had the opportunity to learn all of the risk mitigation methods more experienced tradesman have learned. Also, there is only a limited number of circumstances where working live is unavoidable, such as in troubleshooting. You will not have the knowledge to effectively troubleshoot complicated electrical puzzles.

What should I learn first?

The basics. Learn the tools and materials, followed by how to effectively use them in field. Code will come with time but initially you are under the supervision of someone who already knows all of that. Follow their lead. When you have the funds pick up a book specific to the industry area you are working in. Actually read it. I know it can feel difficult, but the hesitation to carve out the time is the barrier you have to push thorough to greater success. These personal barriers often exist for things of value in our lives. Defeat them to advance!

What is a permit?

A permit is a document issued by a municipality or the AHJ. It's essentially authorization from them stating you have met their criteria to start working on a project within their jurisdiction. The requirements vary but it's common for them to require a contractors license, insurance, and for larger projects a set of design drawings or a written letter stating the work to be done. This is something you won't have to be concerned about, it's a business management level task.

What if my boss or coworker is difficult to work with?

This is a tough one. It depends on a wide range of factors. If they are difficult to the point of being abusive you should find options to remove yourself from the situation. That could mean speaking to upper level management to transfer you to a different crew or project (Be wise and careful how you present the situation to them). It could also require looking elsewhere for employment.



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GUIDE EXTRAS AND BONUS CONTENT

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Future revisions to include:

QR codes to state licensing boards

Application tracker work sheet

Additional articles

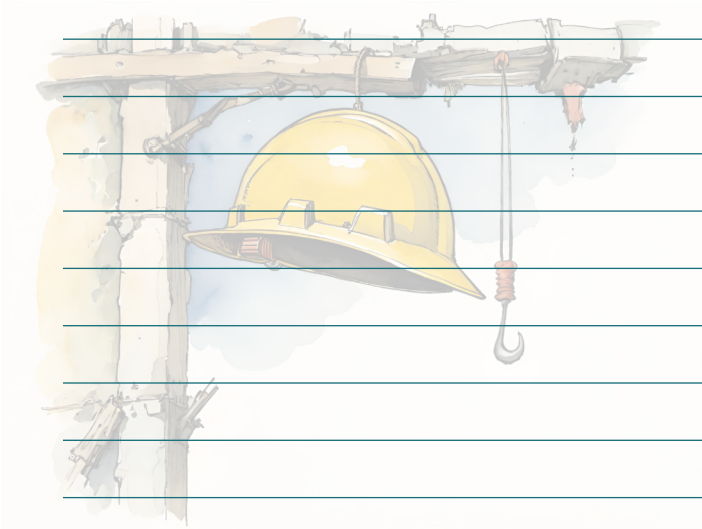
Existing content expansion & refinements



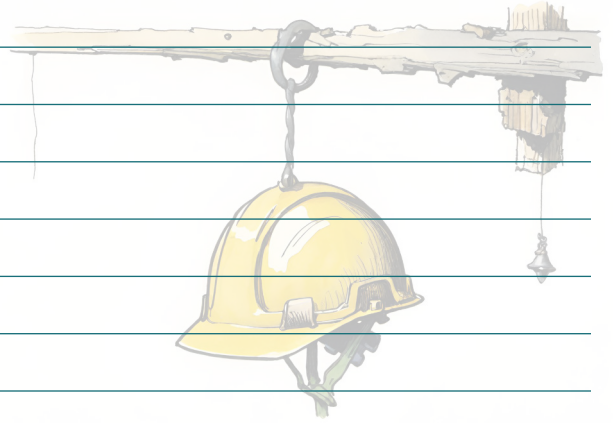
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This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.