Top 10
Electrical Mistakes
and
How to Avoid Them

Volume 1

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Complimentary Copy
Introduction

Avoiding these mistakes will help ensure project success.

Ignoring them can lead to problems for you and your home.

Every day thousands of Do-It-Yourselfer’s, Handy Men and Women perform tasks to improve their home, most of the time saving themselves money and adding value to their home. Usually these projects go smoothly, but sometimes assistance is needed.

Opinions and information of all types from people with a variety of qualifications abound on-line and at the local level. Being a working licensed electrical contractor as well as operating Ask-The-Electrician.com with assistance from a small staff, I am in a unique position to receive an enormous amount of real-time information about what is happening when it comes to electrical applications and devices around the home. Code changes, energy efficient devices, safety requirements, and new tools and parts keep this industry constantly on the move. Filtering this information down to the public and contractor level becomes a communication challenge especially when people of various degrees of qualification become involved. Often times, wrong advice or a lack of understanding can turn a project into a nightmare.

Through Ask-The-Electrician.com, it is my sincere desire to help translate vital information into a useable and easy to understand format to help you decide whether to do your home project yourself or hire a qualified contractor to perform the work for you.

Found in this report are just a few of the most common electrical mistakes I see people make. Rather than photographing paid models to perform staged tasks, the following photos are from actual job sites. We are not sponsored or underwritten by any special interest groups or companies. As of this writing, our web site services are free, with the understanding that the user of this information accepts full responsibility for their actions and interpretations of the material found on Ask-The-Electrician.com. We are in no way held responsible for anything resulting from what you decide to do based upon the information found on the web site or any of its publications.

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Preface

Dedication and Memoriam

This book – which happens to be about Safety – is dedicated to my Father. My Dad taught me everything he knew about electricity, especially the importance of Respecting Electricity. By understanding the potential of electricity and respecting its incredible power, when working with and around it you will reduce the risk of being harmed by it.

Thanks Dad, for everything, and all the jobs we did together - You were Great!

Electricity is a wonderful thing, given to us from our mysterious creator; in fact, I personally believe electricity is an extension of the awesome power of God. Man has learned to use and serve one another in countless ways through electricity; however I personally feel that we haven’t even begun to fully realize its awesome potential. The great Nicola Tesla was the only one who really started to discover the full potential of the many things electricity could be used for. Unfortunately his work was throttled by man’s lust for power and the greed for money. Perhaps Tesla’s work will continue, thanks to the power of the Internet and the great minds that are at work learning more and more about this great force entrusted to mankind. May we use it wisely.

CAUTION

Always positively identify any circuit you plan to work on. Turn off the circuit at the panel, fuse box or power source, then attach a notice to advise others before performing any electrical work.

For More Information:

Electrical Safety
Troubleshooting Electrical Wiring

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Forward

Lets begin with the Biggest Problem that leads to a whole host of other problems:

Planning your project with a proper knowledge of all the components involved will prove to be the major contribution to your project success. What is shown in this picture is the cavity where a refrigerator is to be installed. The cabinet dimensions were never compared to the actual receptacle layout on the existing wall. The cabinets were delivered and the installer performed his duty of installing the cabinets, and ended up covering more than 50% of two receptacles in the wall. The end result was having to rewire the entire wall according to the cabinet layout, which was adopted to the job from that date forward.

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Mistake #1: Project Without a Permit

Electrical Code:
All electrical projects need to be wired according to Codes which are based upon Safety Standards. When working with a permit you are guaranteed that the work will be inspected and passed when the project is approved. Your local building department and inspector are great sources for information.
For More Information: [Home Electrical Wiring](http://www.ask-the-electrician.com)

Well Water Pump System

Problem:
The first problem is that a person unfamiliar with the codes required for this installation performed this project without a permit. By obtaining a permit and working with the inspector, the installer would have used the approved methods and materials.

This system was wired with indoor romex wire, was unprotected, and was without a protective connector at the pressure switch.

Solution:
Obtain a permit and install THW or THHN wiring inside a protective conduit and enter the pressure control switch using the appropriate conduit connectors. Have the project inspected and have full confidence that the system will never fail because you did it right.
For More Information: [Electrical Wiring](http://www.ask-the-electrician.com)
Mistake #2: Grounding Methods

Electrical Code:
The electrical system must maintain a continuous bonded ground throughout all of the installed wiring components and devices.

Double Duplex Receptacles

Problems:
Un-bonded ground wires prevent the ground path from being transferred to the second ground wire. The ground path essentially stops and does not continue even though there is a ground wire present.
Also: These 20 amp receptacles are installed on a 15 amp circuit.

Solution:
Bonding the ground wires as shown in this 2 gang box will cause the ground to travel through to the rest of this circuit.
Change the 20 amp receptacles to 15 amp receptacles

See More:
Electrical Outlet Codes
Wiring Outlets
Mistake #3: Box Sizing

Electrical Code:
Electrical boxes are measured in cubic inches of space available. This is transposed into how many of the 14, 12, or 10 gauge wires are allowed in the box.

Single Gang Receptacle Box

Problem:
Overloaded device box creates extreme box-fill. Also: Side wiring of more than one wire per screw terminal presents an unsafe wiring condition.

Solution:
Installing the right size electrical box for the number of conductors to be installed. Tail each set of wires creating a Series Wiring Method, which will not cause the circuit load to travel through the receptacle.

See More:
How Many Wires in a Junction Box
Electrical Junction Boxes
Electrical Wire
Mistake #4: Mixed Wire Gauges

**Electrical Code:**
Match the same size wire gauge throughout the circuit to maintain protection for the wire and prevent an overloaded condition.

**Multi-Gang Switch Box**

**Problems:**
Mixed wire of 12 and 14 gauges were installed and shared with this lighting circuit and the switches. This compromised the circuit integrity and could have resulted in a circuit overload condition.
Also: Switch frame ground screws, which are not bonded to the ground wires.

**Solution:**
Install the same size wire gauge for the lighting circuit and switches ensuring circuit integrity.

You will notice that the Yellow #12 Romex is installed in this 3-gang box. This box is installed in a bathroom and will provide for the required GFCI Receptacle, which will be placed next to the lighting switches.

See More:
- [Electrical Wiring Code](#)
- [Electrical Wire](#)
Mistake #5: Open Splice

Electrical Code:
Electrical Splices are to be made inside an approved junction box with a blank cover on the box.

Open Splice Found in Attic

Problem:
Open splice without a junction box and cover. Also: It was noted that this splice led to a wall-mounted fixture in a closet, which had a close proximity to the ceiling and the closet shelf.

Solution:
Install a junction box in an accessible area where the spliced wires will be installed using approved wire connectors and bonding the ground conductors, then place a blank cover on it. The fixture in the closet was changed out to be a compliant fluorescent light.

See More:
Electrical Codes for Wiring
Electrical Junction Boxes
Mistake #6: Cable Support

**Electrical Code:**
A cord clamp is to be used where the cord enters a junction box.

**Dishwasher Main Power Junction box**

**Problem:**
The cord does not enter the junction box through the provided knock out, but is attached to the main dishwasher wires by entering the junction box directly through the junction box cover opening. This prevents the cover from being fastened in place. Also: The ground wire from the cord was cut off preventing the dishwasher from being properly bonded to ground.

**Solution:**
Bring the cord through the half inch knock out opening using a 2 screw cord connector, attach the ground wire to the supplied ground screw and secure the cover in place.

See More:
[Electrical Wiring Codes](#)
[How To Identify Electrical Cords](#)
Mistake #7: Receptacle Polarity

**Electrical Code:**
Correct polarity must be maintained where the wiring attaches to any electrical device.

![](image)

**15 Amp - 120-Volt Receptacle**

**Problem:**
The Black Wire (hot) is attached to the Silver Neutral terminal screw and the White Neutral wire is attached to the Brass (hot) terminal screws.
This is a reverse polarity-wiring scenario.

![](image)

**Solution:**
Reverse this wiring by attaching the Black wire to the Brass screw terminal and the White wire to the Silver or Neutral screw terminal

**See More:**
[Electrical Wiring Methods](#)
[Electrical Codes for Outlets](#)
Mistake #8: Wrong Materials

Electrical Code:
Use only approved materials when installing electrical circuits, providing protection and reliability for the electrical device it is serving.

Underground Conduit Providing Outdoor Power

Problem:
Schedule 20 PVC Pipe was used in place of Schedule 40
Also: A plumbing PVC 90 Degree connector was installed on an electrical conduit.

Solution:
Install a Schedule 40 PVC Conduit and use a weatherproof junction box to splice the wiring and bond the ground wire.

See More:
Electrical Junction Boxes
Electrical Conduit
Mistake #9: Wrong Tools

Electrical Code:
Use tools in a manner that does not harm or damage the wiring components of an electrical circuit. Carefully select good quality tools for performing your projects.

Wire Stripped to Wrong Gauge

Problem:
Wrong use of a wire stripping tool or a non-stripping tool was used. This scored the copper portion of the wire, which caused the wire to break when making the splice.

Solution: Use the correct wire-stripping tool, being careful to strip the wire gauge in the correct gauge slot. Always use good quality insulated electrical tools.

See More:
Electrical Tools
Electrical Wiring Methods
Mistake #10: Skill Level

**Electrical Code:**
Make certain that you are qualified to perform any do-it-yourself project. Just because you can make something work does not mean that the task was done correctly and to code.

**Illegal Extension of a Circuit**

**Problem:**
The receptacle was removed to allow interior romex to be installed on the exterior of this home, serving a roof mounted evaporative cooler.
Also: A control switch was installed into the low receptacle behind this exterior box, which contained a switch to control the unit.

**Solution:**
All of the surface romex was removed. The outside GFCI protected receptacle was installed and the inside control switch was removed and an outlet was installed.

See More:
**Electrical Wiring Codes**
Resources

Wiring Diagrams
- Kitchen Electrical
- Bathroom Electrical
- Bedroom Electrical

Home Electrical Safety
- Smoke Detectors
- GFI Code
- GFCI AFCI Circuit

Home Energy Savings
- Energy Savings Guide
- Reduce High Energy Bills
- Save Energy Today

Wiring Switches
- Wiring Diagrams
- 3 Way Switch Diagram
- 4 Way Switch Diagram

Home Electrical Wiring
- Kitchen Electrical
- Bathroom Electrical
- Laundry Electrical Wiring

Hot Tub
- Hot Tub Wiring

GFI and GFCI
- Electrical Safety
- Smoke Detector
- GFI Requirements
- GFCI AFCI Circuit

Home Generator
- Home Generators
- Portable Generators
- Transfer Switches

Wiring Outlets
- Electrical Outlets 110 Volt
- Electrical Outlets 220 Volt
- GFCI Code Requirements

Ceiling Fan and Remote
- Ceiling Fans
- Ceiling Fan Installation

Electrical Parts Materials
- Electrical Wire
- Electrical Junction Boxes

Bath Exhaust Fans
- Bathroom Exhaust Fan
- Bathroom Fan and Light

Electrical Troubleshooting
- Troubleshooting
- Electrical Repairs

Home Electrical Projects
- Home Wiring Projects
- Garage Electrical Wiring
- Basement Electrical Wiring

240 Volt Electrical Circuits
- Wiring a Dryer
- Wiring a Range

Hot Tub
- Hot Tub Wiring

Hand and Power Tools
- Electrical Tools

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PREVIEW: Guide to Home Electrical Wiring

My new How to Guide for Home Electrical Wiring has 405 Pages that are loaded with Step-By-Step Instructions, On the Job Photos and Easy to Understand Wiring Diagrams. This was a three year writing project that i'm sure you will enjoy and find very useful. Browse through the sample pages and see for yourself!

Electrical Wiring Guide
»Click Here to Get Your Copy
»View the SAMPLE PAGES
»See the Table of Contents
»See Main Sections with Photos

Details and Description:
»Fully Illustrated Guide to Wiring
»Wiring for Specific Projects or Circuits
»Wiring Upgrades or Remodeling
»Complete Home Wiring

Over 400 Pages - Including:
»Over 370 Photos, On the Job, Instructional
»Over 23 Home Circuits - Fully Explained
»55 Essential Electrical Code Topics
»The 6 Most Commonly Used Code Tables
»11 Home Wiring Plans with Circuit Listings
»28 Wiring Diagrams and Illustrations
»Electrical Materials and Tools for Projects

Great for:
»Homeowners
»Handy Men and Women
»Home Inspectors
»Electricians and Contractors
»Students and Educators

Recent Testimonial

Hi Dave,
Thanks for the Guidebook!
This work is absolutely worth more than the price you are asking.
Bennie in Denver, CO.

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### Home Electrical Circuits

<table>
<thead>
<tr>
<th>Code</th>
<th>Location(s)</th>
<th>Category</th>
<th>Device(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>103(C)</td>
<td>feeders and services</td>
<td>subpanels</td>
<td>Multiple grounding conductors may be installed under the same terminal if they are the same size conductor and the maximum number of conductors does not exceed the manufacturer's instructions.</td>
<td></td>
</tr>
<tr>
<td>110(C)</td>
<td>panel service</td>
<td>subpanels, service equipment</td>
<td>Current circuit breaker types must be used on each panelboard. (Example: GE circuit breakers cannot be installed in Siemens Panels.)</td>
<td></td>
</tr>
<tr>
<td>205(C)</td>
<td>feeders and services</td>
<td>subpanels, service equipment</td>
<td>White insulated conductors used in Hot must be identified as such at all termination points.</td>
<td></td>
</tr>
<tr>
<td>21123(A)(C)</td>
<td>feeders and services</td>
<td>subpanels, service equipment</td>
<td>Wire feeder conductors to subpanels that supply lighting and appliance loads per the calculated load and according to Table 7 on page 36.</td>
<td></td>
</tr>
<tr>
<td>21132(B)</td>
<td>detached buildings</td>
<td>subpanels, service equipment</td>
<td>The neutral conductor must be bonded to the Equipment Ground Conductor or to the enclosure in a subpanel. A 6-require failure is required.</td>
<td></td>
</tr>
<tr>
<td>22524(A)(C)</td>
<td>panelboard, subpanels</td>
<td>grounding, bonding</td>
<td>Neutriem must be isolated in subpanels.</td>
<td></td>
</tr>
<tr>
<td>312(C)</td>
<td>feeders and services</td>
<td>subpanels, service equipment</td>
<td>Each cable outlet secured to panelboard enclosures. (Only listed cable connections.)</td>
<td></td>
</tr>
<tr>
<td>403.60</td>
<td>feeders and services</td>
<td>subpanels, service equipment</td>
<td>Main breaker is not required for subpanels if over current protection is provided for feeder conductors.</td>
<td></td>
</tr>
<tr>
<td>403.400</td>
<td>feeders and services</td>
<td>subpanels, service equipment</td>
<td>Each circuit breaker must be clearly identified as to its purpose. (If two circuits must be labeled the same.)</td>
<td></td>
</tr>
<tr>
<td>403.400</td>
<td>feeders and services</td>
<td>subpanels, service equipment</td>
<td>When labeling circuits, one circuit shall be identified in a manner that may be subject to potential changes in occupancy. (Example: Mill's Beach)</td>
<td></td>
</tr>
</tbody>
</table>

### Electrical Codes for Sub Panels

### Circuit Design: 240 Volt Clothes Dryer

**Device:**
- 50 Amp, 240 Volt

**Application:**
- Laundry

**Circuit Design Table: Dryer**

<table>
<thead>
<tr>
<th>Device</th>
<th>Circuit</th>
<th>Appliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Amp, 240 Volt</td>
<td>240 Volt Outlet Symbol</td>
<td>Laundry</td>
</tr>
</tbody>
</table>

**Circuit Note:**
- T-he 240 volt clothes dryer circuit is commonly 30 amp, 240 volt. When the dryer is on a 20 amp 120 volt circuit, it is overloaded. Depending on the load, the 240 volt circuit may be shared. (See 220 volt Circuit Design Table.) Some locations may require that both circuits are installed on the same panel. The dryer may be equipped with either gas or electric clothes dryer.

**Different Types of Clothes Dryers:**
- Gas: Requires a 120 volt outlet for the motor, and the gas piping for the heat.

Stack Units and Combo Units: Often found in apartments, condos, townhouses, and modular homes. Stacks units are two separate units that are stacked on top of each other, one is the clothes washer and the other the clothes dryer. Typically because these are two separate units, each unit requires two separate circuits, one for each unit. A Combo Unit is typically one unit with both the clothes washer and the clothes dryer and requires only one electrical circuit. Some Stack Units or Combo Units may have electric gas or electric heating for the dryer, which will have no effect on the circuit size. Consult the Installation Manual or the Manufacturer's specifications for the specific circuit ratings and amperage.

### Multi-Wire Circuits

**120/240 Volt Multi-Wire Circuits:**

A key requirement of a multi-wire circuit is a circuit breaker with a two-pole, also known as a 2-pole breaker.

- When correctly planned, multi-wire circuits can save on wiring because two circuits can share the same neutral wire if the load on the two circuits is balanced properly.

The main electrical service is a great example of a 120/240 Volt Multi-Wire circuit which shares the same neutral conductor.

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You Can Wire it Right with the help of my BIG New Guidebook
Tackle that project and Impress Your Family and Friends!

**Included in the Home Electrical Guide to Wiring Guidebook**

- Building Permits and Inspections
- Electrical Project Planning
- Electrical Parts and Materials
- Electrical Wiring Codes
- Commonly Referenced Electrical Code Tables
- Main Services and Sub Panels
- Methods for How to Wire the Home, Room by Room
- Circuit Design Tables for Commonly Installed Home Circuits
- 120 and 240 Volt Circuits
- Interior and Exterior Lighting
- Wiring for Telephones and Internet Data Communications
- Wiring Diagrams and Illustrations

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