

COMMON ELECTRICAL INSPECTION FAILURES

*Knowing your inspector
is just as important as
knowing the code*

Failing an electrical inspection isn't the end of the world, but it usually means pushing back some current work to fix the job that failed. And that means missed deadlines, unhappy customers, and damage to your reputation.

Obviously, it's best to avoid the problem in the first place. But what typically causes a job to fail an inspection anyway? To find out, I talked to inspectors, former inspectors, and contractors in the area where my electrical contracting company works. Here's what I learned.

Neatness Counts

The *National Electrical Code (NEC)* says, "Electrical equipment shall be installed in a neat and workmanlike manner." This regulation is open to interpretation, and it means that, technically, the inspector can fail a job simply because the work looks sloppy. When asked about the first thing they look for when they inspect a job, most of the inspectors said the same thing: Neatness. In fact, sloppy work is a tipoff to give the whole job some extra scrutiny (see Figure 1, page 39).

"If I walk on a job and the work is neat," says one of my local inspectors, "I will look around a little for any obvious violations, chat with the electrician, and leave. If I see sloppy work, I go into my investigative mode and I enforce all the violations I find."

Many electricians never realize how important neatness is because they aren't cited directly for a workmanship violation. Enforcing a workmanship violation can be difficult, but if the work is messy, inspectors say they usually have no trouble finding plenty of other violations to enforce.

Although neatness is subjective, there are certain guidelines to follow:



- Wires should be run in straight lines that are level and plumb.
- Romex should be unwound so it will lie flat without any twists.
- All electrical equipment should be installed level and plumb.

On my jobs, we even line up the slots on the screw heads on our boxes, fittings, and cover plates. That kind of anal-compulsiveness is derided by some, but it's a simple way to show you care how things look.

Code Violations

Most code violations are caused by ignorance of the *NEC* or blatant disregard of the code. In many cases, it's a little of both.

The *NEC* is updated every three years, and it's difficult to keep up with all the changes. Many states require electricians to stay current by taking an update course during each code cycle. Many electricians don't bother to take the update course, however, until near the end of the cycle. By the time they learn about current changes, the code is about to change again.

by Sean Kenney

A Matter of Interpretation

An inspector's interpretation of the code is often different from the electrician's interpretation. Swimming pools are a good example. Many municipalities in my area have printed up a sheet detailing how they want a pool wired, but I always ask the inspector his requirements for pool wiring before I do the work.

Tub or hot tub? Hydromassage bathtubs are another common source of code misinterpretations, because they are often confused with hot tubs. The rules for grounding and locating outlets

and switches around hot tubs are much stricter than those dealing with hydromassage bathtubs.

According to the current NEC, "a hydromassage bathtub is designed so it can accept, circulate, and discharge water upon each use," and a "spa or hot tub is not designed or intended to have its contents drained or discharged after each use."

A bathtub with massage jets is clearly not a hot tub, yet many inspectors will require them to be wired as if they were. You won't achieve much, however, by waving the NEC in your inspec-

tor's face and arguing the point. Just find out what the inspector requires before you do the job.

"Accessible Outlet" Confusion

In garages, all receptacles on the ground level must be GFCI-protected — with two exceptions. No GFCI protection is required on "receptacles that are not readily accessible," or on a receptacle that is "located within dedicated space" and intended for use only with a single appliance.

The confusion lies in the phrase "readily accessible." If a receptacle can-

Some Frequent Violations

Stapling Romex. Romex must be secured within 12 inches of the box and every 4½ feet thereafter. Not securing Romex properly is one of the most obvious code violations. It's one of those "neat and workmanlike" violations that tip off an inspector to check everything carefully.

Outside Receptacle. In new construction, some electricians will wire the outside receptacle from the kitchen appliance circuit. This is a

clear violation of the 1996 NEC. The outdoor circuit can come off of any other nearby circuit or be a homerun back to the panel.

Underground Service Riser. When running wires underground, many electricians forget to put clips on the conduit riser that houses the wire from the ground up to the meter socket. The riser must be secured within 3 feet of the meter socket. Some inspectors will pass a riser that's buried at least 2 feet deep — but some won't. The NEC says that you must clip the pipe to the house.

Many municipalities also require an expansion fitting on the PVC riser where it comes out of the ground to protect against ground movement damaging the equipment (Figure A).

Subpanels. Most electricians know that a subpanel must be wired using a four-wire feed rather than a three-wire feed, but many are still confused about where to connect the wires in the subpanel.

In the main panel, the ground and the neutral wires from each circuit are tied into a single neutral/ground bar. The subpanel has separate ground and neutral bars.

The ground bar must be bonded to the subpanel and the neutral bar must be isolated from the subpanel. The ground wire coming from the main panel will go to the ground bar and the neutral wire will go to neutral bar. All

branch circuits will be tied in with the ground wires on the ground bar and the neutral wires on the neutral bar. (For more on subpanel wiring, see "The Electrical Panel," 10/93.)

Circuits Labels. The NEC says "All panelboard circuits and circuit modifications shall be legibly identified as to purpose or use on a circuit directory located on the face or inside of the panel doors." Many electricians fail to mark the circuit breakers after doing work.



Figure A. The PVC riser that carries the main service feed to a house's electric meter needs an expansion fitting near the ground. Without it, the movement from the freezing and thawing of the soil could crack the pipe.



Figure B. When switching from one wiring method to another, code requires a changeover fitting (bottom) or a similar transition fitting made from standard parts (top).

Changeover Fittings. When you switch from one wiring method to another, you must use a changeover fitting. The most common place this violation occurs is in the cellar. When using a piece of pipe as a sleeve for Romex, many electricians do not use a combination connector (changeover fitting) at the top of the pipe to secure the Romex to the pipe (Figure B).

—S.K.



Figure 1. Sloppy wiring like this is an invitation to an inspector to check the job very carefully for further violations.

not be reached without a ladder, few people would consider it readily accessible. Many inspectors, however, will require a GFCI-protected receptacle for a garage door opener receptacle because this is often the “most accessible” outlet in the garage. Other inspectors consider it a dedicated, single-appliance receptacle and don’t require a GFCI.

Using Improper Equipment

Listing services like Underwriters Laboratory (UL) examine and test electrical equipment to be sure it complies with the NEC and other appropriate standards. Violations having to do with product listings come in two categories: using unlisted products, and not using a product according to its listing.

Unlisted products. Keep your eyes open. Many supply houses and home centers carry products that are not listed by UL or other listing services (Figure 2). These products usually don’t meet the standards set by the NEC. Their selling point is that they are usually much



Figure 2. An approval from Underwriters Laboratory is the accepted industry standard for materials used in electrical installations. But keep your eyes open — lots of home centers sell non-UL-listed equipment because it’s cheaper.

cheaper than their listed counterparts. These unlisted products most often turn up in very competitive markets where price is always a big issue.

These products can show up in a project for a variety of reasons. Sometimes it’s just because the electrician didn’t check the stock carefully; sometimes UL-listed stock is unavailable and the job needs to be finished. And occasionally an electrician will use unlisted products because of the cheaper price.

Many inspectors in my area keep an eye out for these unlisted materials and require the electrician to replace them with listed materials.

Ground clamps are a good example of an unlisted product being inferior to its listed counterpart. UL-listed ground clamps are made of brass, while unlisted ground clamps are usually made of cast aluminum. If you tighten an aluminum ground clamp firmly, it can break later, even if everything looks okay when you install it.

Follow listing instructions. The NEC says, “... equipment shall be installed, used or both, in accordance with any instructions included in the listing or labeling.”

The most common violation of this type has to do with circuit breakers. Many brands of circuit breakers are physically interchangeable, but don’t be fooled: Just because it fits doesn’t mean you can use it. The model number on the circuit breaker must be printed on the circuit breaker panel cover. Usually breaker panels will only accept breakers of the same brand.

Local Ordinances

Many municipalities have local ordinances that inspectors enforce along with the NEC. It is also common for a

town to have unofficial (and often unwritten) rules that affect electrical installations.

These local codes often lead to what I call “because I say so” violations. A few inspectors will require something that is not required by the NEC or local codes. When the electrician asks why he has to do it that way, the reply is: “Because I say so.” Thankfully, these inspectors are few and far between.

Picky, picky, picky! Many electrical inspectors actively enforce state law (noncode) violations. One inspector I talked to will not even inspect a job if the sign on the electrician’s truck is lettered improperly. In many states, an electrician must do business using his full name *exactly* as it appears on his electrical license. Many electricians letter their trucks with a different name.

These violations won’t actually cause the job to fail the inspection, but the inspector might shut down the job until the problem is corrected.

Permits and Licensing

Some electricians will perform work without pulling the necessary permits. If the inspector discovers this, he will shut down the job and often fine the electrician. In many areas the electrician will have to pay double for the permit if he is caught working without one.

Most states also require one licensed electrician for every helper on the job; some require a master electrician to be present if there is more than one journeyman on the job.

Another common problem crops up when electrical work is performed by someone without an electrician’s license, such as other tradespeople. HVAC contractors, remodelers, and alarm installers will sometimes do their own electrical work to save time and money. While nonelectrician tradespeople may know how to make something work electrically, they seldom know the codes involved. This can lead to some dangerous installations.

I once saw copper oil line used as a wiring raceway. The work was neat and the boiler was wired properly, but the presence of the oil line made it obvious that an electrician did not perform the wiring. ■

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