

Q When does the electrical code require pigtails for connecting devices in residential wiring?

A Ben Giles, licensed electrician and owner of South Shore Electrical Contractors, in Wakefield, R.I., responds: “Pig-tail” is a slang term in the electrical trades for a junction of a group of conductors, where a lead conductor is added to connect that junction to a device or fixture **(1)**. Using a pigtail allows the circuit to run continuously whether or not the device is attached; that is, the circuit won’t be interrupted or affected if the device is removed. Pigtails are common in outlet and switch wiring, particularly where there are more than one or two sets of conductors in the electrical box, and the installer doesn’t want to rely on the device attachment screws to carry the load of the circuit. They are also common in those instances where the code requires pigtails, such as for attaching ground conductors to a device.

NO PIGTAILS IN THE CODE

To the best of my knowledge, the term “pigtail” never appears in the code. Instead, the code approaches the situation from a reverse angle by laying out instances where using the screws on a device to continue certain conductors is not allowed. One example of this approach is section 300.13b in the code, which states: “In multiwire branch circuits, the continuity of the grounded (neutral) conductor shall not depend on device connections such as lamp holders, receptacles, and so forth, where the removal of such devices would interrupt the continuity.”

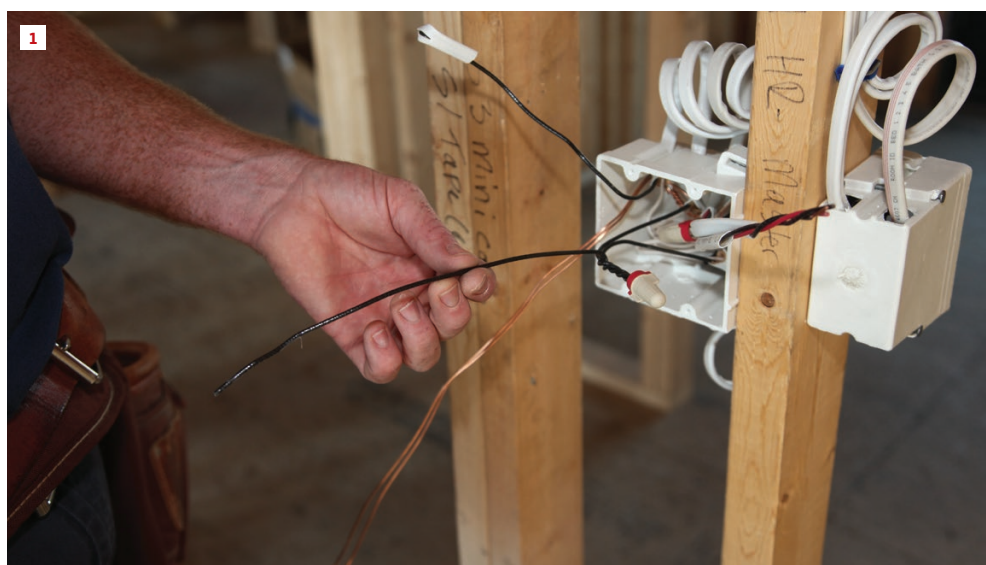
In multiwire branch circuits, more than one circuit coming

from the main electrical panel shares the same neutral conductor, such as when 3-wire cable runs from the panel with the black conductor and red conductor controlled by a two-pole breaker while using the same white (neutral) conductor. The code says that when you are using one neutral to serve two separate 120v circuits, you have to junction and pigtail the neutral at each device. That way, if you remove the device, you don’t accidentally disconnect the neutral that is also serving the second circuit.

In another example, section 250.148b in the code states: “The arrangement of grounding connections (the bare ground wires) shall be such that the disconnection or removal of a receptacle, luminaire, or other device fed from the box does not interfere with or interrupt the grounding continuity.” This means that ground conductors should always be pigtailed so that removing a receptacle or switch does not disconnect the ground to the rest of the circuit. When pigtailing the grounds in new construction, I twist all of them together with several turns and then cut off all but one for each device in the box **(2)**. I then secure the ground junction with a copper crimping sleeve **(3)**.

If you want to use the screws on a device to continue a regular two-wire, 120v circuit, nothing in the code prohibits it as long as the circuit you are continuing falls within the UL-listed pass-through ampacity rating of the device you are using. In other words, the device—such as a receptacle—would have to be heavy-duty enough to handle the load of the entire circuit downstream from the device.

A pigtail is a short length of conductor that is added to a junction to connect to a device (such as a switch or receptacle). The alternative would be to attach the conductors directly to the device. With the pigtail connection, the circuit would not be interrupted if the device failed or was removed.



Photos by Roe Osborn

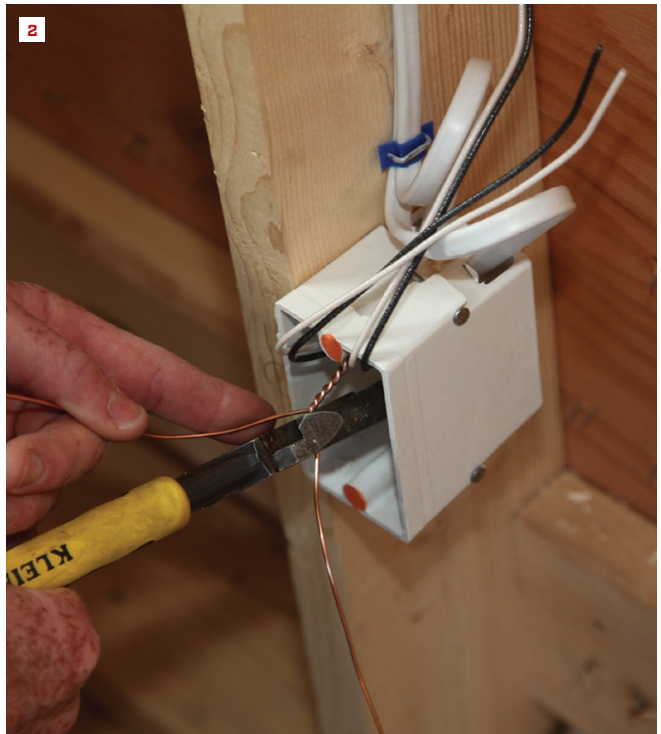
Some local jurisdictions require pigtails for connecting devices. And in fact, some states have amendments to the code requiring that all devices having more than one set of conductors be connected to the circuit with pigtails rather than via the screws on the device. The other part of this equation follows common sense. If you have three or four sets of conductors but only two screws on a device, you probably wouldn't want to use both screws and both sets of backstabs to continue a circuit.

PIGTAILS IN EVERYDAY WIRING

In my everyday work as an electrician, I use pigtails for connecting devices whenever there are more than two sets of conductors passing through a device in a residential application. I would never attach conductors to all the screws and then add another conductor to the backstabs on a device as well. I try to wire the switches and receptacles in every house in a consistent manner ("Wiring Receptacles and Switches," Sep/17), so I've never had an issue troubleshooting a circuit or felt that it made any tangible difference to pigtail instead of using device screws. I also use pigtails on circuits where I don't want to rely on the devices to carry what may potentially be a higher load, such as in a kitchen or on a garage workbench.

As a matter of course, I pigtail the devices in all commercial and industrial work. Troubleshooting an electrical problem in a busy office or shop can be difficult enough while people are working, and I don't want to have to tell employees to take a break while I remove a device. If the outlets are all pigtailed, I can remove one and leave the rest of the circuit hot and usable while I inspect or replace the faulty device. Also, the load applied to any circuit is likely to be higher in a commercial application. Whether the business is a hair salon, a bakery, a restaurant, or other establishment, people tend to overuse the power provided, and I trust the junctions and pigtails that I make more than I trust the devices themselves to handle excessive loads.

I know that this reply is likely to run contrary to what some electricians believe: that it's required by code to pigtail the conductors at every outlet. I think that belief is probably just an example of people mistaking how they were initially trained with the actual code requirements. That said, be sure to follow any state or local code amendments in your area that may have added a requirement for using pigtails at every device. Pigtail-ing devices is certainly a good practice that I can't argue with, but from a business standpoint, I can't justify the extra time spent on the practice in situations where I know the loads will be lower or where troubleshooting will be relatively easy, such as in residential bedrooms.



The code requires that all ground conductors be connected so that the continuity of the ground is not interrupted if the device is removed. This requires a pigtail, but making a pigtail for ground conductors requires a specific approach: First, twist the bare ground conductors together for several turns, and then cut off all but one for each device in the electrical box (2). To secure the junction, slide a copper sleeve onto the twisted conductors and crimp the junction with pliers (3).