

How to Perform Residential Electrical Inspections Course

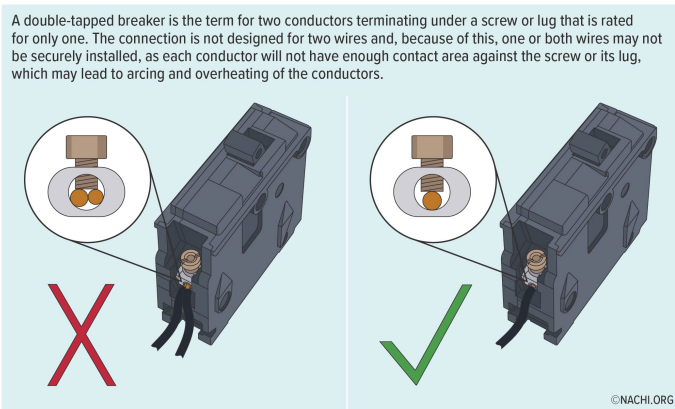
- + **Welcome to the Course**
- + **Student Resources**
- + ✓ **Course Textbook**
- + ✓ **Student Interactivity**
- + ✓ **Introduction**
- + ✓ **Video 1: Electrical Inspection With Ray**
- + **Home Inspector Safety and Dangers**
- + ✓ **Service Entrance**
- + ✓ **Grounding and Bonding**
- + ✓ **Video 2: Electrical Grounding and Bonding With Charles**
- **Service Panelboard**
 - ✓ Panelboard and Cabinet
 - ✓ Panelboard Basics
 - ✓ Breaker Panels & Breakers
 - ✓ The Main Disconnect
 - ✓ Service Amperage
 - ✓ Common Service Equipment Layout
 - ✓ Subpanel or Additional Distribution Panelboard
 - ✓ Inspecting Panelboards, Part 1
 - ✓ **Double-Tapping Hots & Neutrals**
 - ✓ Incorrect Wire Size for a Breaker
 - ✓ The AC Breaker Size
 - ✓ Inspecting Panelboards, Part 2
 - ✓ Fuse Panels
 - ✓ Inspecting Panelboards, Part 3
 - ✓ Problem Panels
 - ✓ Quiz #5
 - ✓ Three-Phase Panels
 - ✓ Panel Anomalies
 - Panelboard Inspection Checklist
 - ✓ Quiz #6
- + ✓ **Video 3: Electrical Inspection With Jim**
- + **Electrical Distribution**
- + ✓ **Video 4: Electrical Inspection With Paul and Ben**

Double-Tapping Hots & Neutrals

Double-Tapping Hots

Double-tapping is sometimes also called "double taps" or "double-lugging." This is when there are two conductors terminating under a screw or lug which is rated for only one. Home inspectors sometimes refer to double-tapped breakers as double-lugged breakers. The problem here is that each conductor will not have enough contact area against the screw or its lug, which may lead to arcing and overheating of the conductors. Most circuit breakers are designed to accept only one wire. For those breakers, there can only be one wire under the screw or lug. Two or more wires should not be twisted together and placed under the screw.

Double-Tapped Breaker



These should always be fully evaluated, as there are a couple of exceptions:

- breakers rated for two conductors (made by Cutler-Hammer and Square D); and
- conductors spliced together and pigtailed into a breaker or fuse.

The practice of attaching more than one conductor to a single circuit breaker, known as "double-tapping," is generally discouraged due to safety concerns. However, there are certain circuit breakers that are specifically designed to safely accept more than one conductor. These breakers are often referred to as "dual lug" or "multi-wire" breakers.

One manufacturer known for producing such circuit breakers is Square D. Square D offers certain circuit breaker models, particularly within their QO line, that are UL-listed for two conductors. These breakers are specifically designed with dual lug terminals, allowing for the secure attachment of two conductors.

The inspection images below show a Square D QO breaker with labeling that indicates the breaker type, the number of conductors permitted, and the conductor sizes allowed.

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- ✚ ✓ **Inspection & Writing Assignment**
- ✚ ✓ **Research & Writing Assignment**
- ✚ ✓ **Final Exam**
- ✓ **Final Examination**
- ✚ **Questions/Comments**

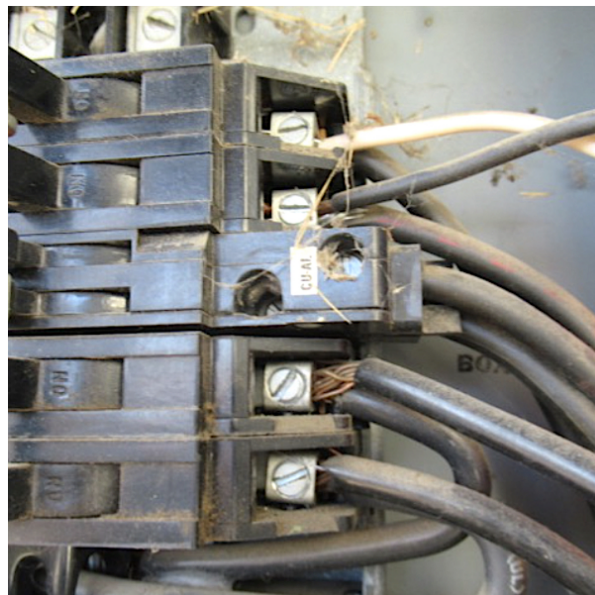
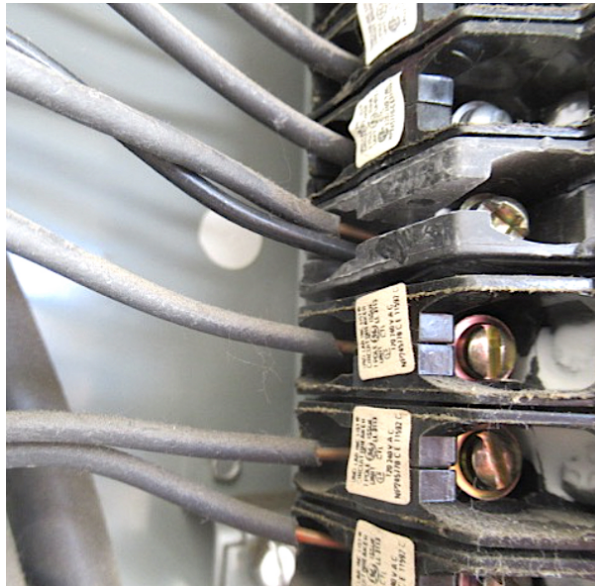


Some breakers (such as Square D QO breakers) are designed to accommodate two wires. Typically, these will have a loose plate under the screw with two slots or grooves for each wire end.

The primary reason double lugging or double tapping is not permitted is that the connection is not designed for two wires, and because of this, one or both wires may not be securely installed. This insecure installation of more than one wire at the breaker could lead to a disconnected circuit or micro-arcing that could damage the wire and breaker. Two heavily used circuits installed on the same breaker might cause overheating at the breaker or cause the breaker to trip excessively.

Two conductors that are sized according to the chart on the side of the breaker are inserted on either side of the screw. The screw tightens the plate down, securing the wire ends. An electrician or trained inspector can determine if two circuits on the same breaker are permitted. Additionally, the National Electrical Code (NEC) specifies the conditions under which multiple conductors can be connected to a single breaker. Home inspectors should be familiar with these regulations and the specific models of breakers that comply with them.

The following inspection images are of incorrect double-tapped breakers:

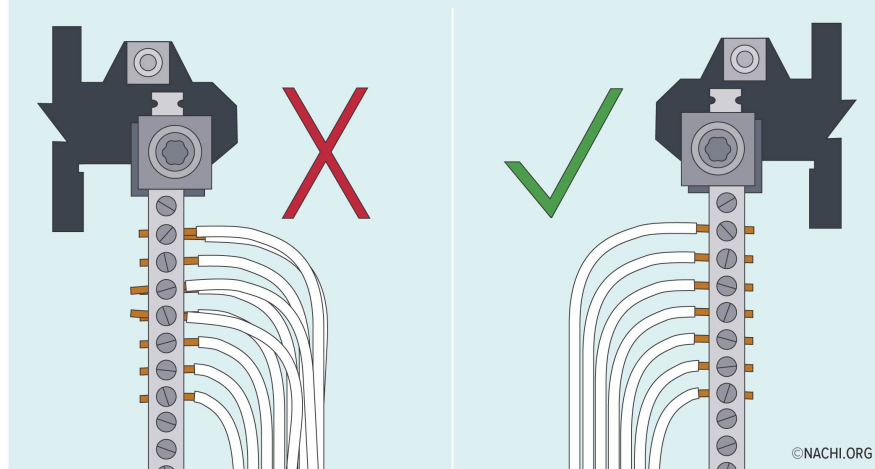


Double-Tapped Neutrals

The grounded conductors, commonly called neutrals, are the white wires inside a residential electrical panelboard. Only one neutral wire is permitted to be connected under one lug of the neutral bus bar. Refer to the illustration below for the neutral bus bar.

Double-Tapped Neutrals

A double-tapped neutral is the term for two neutral wires terminating although only one neutral wire is permitted to be connected under one lug of the neutral bus bar. Panelboard neutral bus bars are usually not listed for use with more than one wire per terminal. Neutrals should also not be combined with a grounding wire (bare copper or green wire).



Panelboard neutral bus bars are usually not listed for use with more than one wire per terminal. This rule can be thought of as the "one wire per hole" rule. Neutral wires should not be doubled or tripled-lugged under a lug (or fastener) of the neutral bus bar. Neutrals should not be combined with a grounding wire (bare copper or green wire) either.

There are several reasons that neutral wires should not be double-lugged at the neutral bus bar, including:

- The connections at the neutral bus bar are designed to accommodate one wire.
- Two wires might not be securely terminated.
- One wire might lose its connection.
- The circuits cannot be readily isolated if electrical work is being done on one of the circuits.

It is sometimes said that double-lugged neutrals were not prohibited by the National Electrical Code (NEC) until 2002. This is an incorrect interpretation of the NEC. Until 2002, the NEC simply stated that panelboards must be installed according to Underwriters Laboratory (UL) 67. UL 67 states, "An individual terminal shall be provided for the connection of each branch-circuit neutral conductor." The NEC has never allowed double lugging neutrals, even if it did not specifically address the topic until 2002.

Wire Designations

Wires in a panel must be correctly designated for their use. A white wire cannot be terminated or connected to a breaker unless it is permanently marked as an ungrounded conductor (hot). This is typically done by wrapping the white wire with black tape or marking it with a permanent black marker. Similarly, a black wire cannot be used as a neutral (white wire) without remarking it.

◀ Previous Page

Next Page ▶