Do You Know The Code?

Enforcing AFCI requirements in new construction supporting the electrical code

ACBMA®
American Circuit Breaker Manufacturers Association

Did you know that there are only six approved ways provide AFCI protection on a circuit? Only two of them allow outlet AFCI's (OBC) to be used on a home run circuit in new construction, but they require special insulation of that wiring in either metal enclosed wiring or 2" of concrete. Yes...concrete.

You know why?

Because outlet type AFCI's have not passed a critical test in UL 1699 that is required of Dual Function and AFCI circuit breakers. Also, outlet type AFCIs cannot fully protect the home run from parallel arcing faults UPSTREAM like AFCI circuit breakers.

This leaves almost 30% of every new home at risk should a parallel arcing condition occur if you install AFCI outlets in the home run without metal enclosed wiring or 2" of concrete.

Lives can be endangered when the NEC is not followed. The AFCI outlet manufacturers quote chapter and verse the electrical code as it was passed in 2017 making it sound like their products are approved for new construction....but only if you protect in metal or concrete – which they fail to mention.

Don't let contractors mislead your inspection by cost, time or stories of AFCI Outlets protect just as good as AFCI circuit breakers.

Homeowner safety should be top of mind.

Six NEC Approved Methods of AFCI Circuit Protection*

Actual wall fire in test lab caused by an Outlet AFCI failing to trip a standard circuit breaker to close the circuit in a UL1699 test

**2017 National Electrical Code (NEC)*

- Combination AFCI Circuit Breaker
- Branch Feeder type AFCI plus AFCI receptacle
- Listed Supplemental Arc Protection Circuit Breaker
  - » No product combination is on the market plus AFCI Receptacle and there is no UL standard to test against for this classification.
  - » No standard circuit breaker can protect the home run from arcing faults. – That is why UL1699 test was created. Any product protecting the home run should test to this standard.
- Listed system combination
  - » No product combination currently exists in the market
- Non-metallic encased in no less than 2" of concrete with standard circuit breaker and AFCI receptacle (OBC)
- Using RMC/IMC/EMT or steel armored type AC cables with standard circuit breaker and AFCI outlet (OBC)

Learn more at www.acbma.org

Steps For Checking...

AFCI Outlets for NEC Compliance

1. Allow more time to inspect OBC AFCI receptacles properly

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2. Did the contractor mark all the first outlets in the home run?

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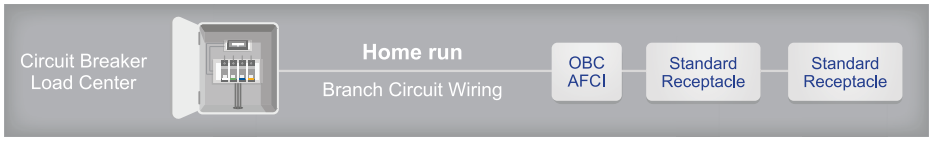
- Is that outlet following the accessibility requirements per the NEC?
- The rough-in inspection should reveal metallic conduit, armored cable or concrete if the intention is to use OBC's on any home run circuit. The inspector should make note of this during the rough-in inspection.
- All first outlest should be identified by some means by the contractor if the final inspection is to be performed sufficiently if OBC devices are being used.
- Circuit breakers are readily accessible per the Code
- Nothing is obstructed if the AFCI protection is at the panel level



3. The OBC AFCI has to be in position as the first outlet

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- Can you find all first outlets? Once drywall is up how do you inspect and enforce AFCI outlets to be in position from the home run if they have not been marked?
- If not, have the contractor pull all the home run covers off the outlets if OBC AFCI's are used to determine if they meet the NEC requirements for metal or concrete enclosure.

4. Did the contractor utilize metallic conduit, armored cable, or concrete?

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- If not, it needs to be tagged and AFCI Circuit Breakers or Dual Function Circuit Breakers must be installed to comply with the NEC or rework the home run to comply with the NEC.
- If you allow that arrangement to pass inspection without protection, there is a risk of a future fire as AFCI OBCs cannot effectively protect upstream for parallel arcing conditions.
- OBC devices in the home run CANNOT detect parallel arcing conditions if they do not meet any one of these six listed requirements from the NEC
- OBC's have not passed the minimum available fault current UL1699 test using standard circuit breakers

5. Are you in an NM cabling environment?

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- If yes, contractors must follow NEC options #5 and #6 if they use OBC AFCI's.
- Confirm if the first outlet is truly 50 ft for 14AWG or 70 ft for 12AWG downstream from the branch feeder circuit breaker?

6. If the above were not met, the contractor's installation is in violation of the NEC and should not be approved for occupancy until corrections are made.

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Check the circuits with transparency if an OBC AFCI is being used. The typical first inspection does not include the circuit breakers or outlets being installed.

How can an inspector verify compliance in the final inspection that the electrician has met the code requirement if they use an OBC AFCI if the walls are up hiding the wiring method? A look at the outlet connector may help but that may hide short cuts. A more proactive first inspection needs to take place guiding the electrician on the code requirements if AFCI outlets are planned to be used.

Contractors are under time pressure...

Don't be misled

AFCI (OBC) Outlet Manufacturers have created some slick promotional literature trying to avoid the actual code requirements by stating the technical aspects that don't provide an answer. Some Contractors may use that as a tool to persuade you to approve an installation that is not code compliant or request a variance. Here are some examples:

One OBC manufacturer states:

*"*Requires listing Nationally Recognized Testing Laboratory (NRTL – i.e. UL). Standard for listing expected in 2014. Always check with your local inspector or AHJ (Authority Having Jurisdiction for any questions on current local code requirements."*

This phrase does not provide any guidance to an electrical contractor. Basically no OBC manufacturer can provide a combination that passes UL1699 so they are referring you to your local code authority who would not know anything about the system listed combination as it doesn't exist. This is a confusion tactic to make it appear as a legitimate installation method in new construction. It's not.

Homeowners can cause an arcing condition by striking hidden wires when mounting routine items.

Another Outlet AFCI Manufacturer claim that AFCI outlets in combination with a standard circuit breaker are ok to use and less expensive for the contractor. Is it really?

"SAVE MONEY—With fewer callbacks, less inventory needed on the truck and faster installation, AFCI receptacles are a less expensive, code-approved alternative to AFCI breakers."

The OBC manufacturers claim that their OBC AFCI saves money as compared to AFCI or Dual Function circuit breakers. The only way you can save money is by making a **non-code compliant installation**. That means, you're skipping the safety component required by the code to protect the homeowner against OBC's inability to protect UPSTREAM for parallel arcs as required by UL1699. They don't calculate the time and money to install the conduit, concrete or armored cable. Is that truly a cheaper alternative? It's less safe for the homeowner, Oh...and about their warranty...it's only 5 years and circuit breakers are lifetime. Be careful of the claims that a contractor presents with their documentation. As an inspector, your role is to look out for the safety of the homeowner and not the contractor and OBC manufacturer.

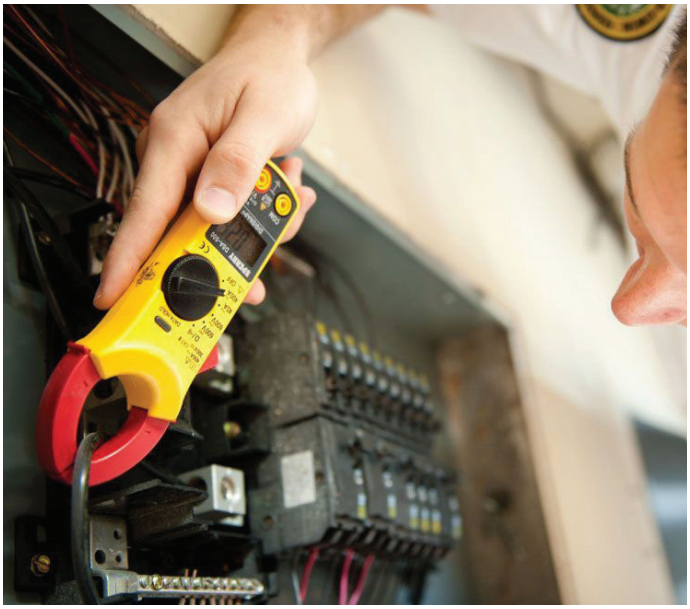
Shortcuts endanger homeowners. Don't reduce safety by not following the electrical code. It's there for the homeowner's protection.

ACBMA testing showed that standard thermal magnetic circuit breakers cannot protect the home run (the portion of the circuit from the circuit breaker to the first outlet) in all cases against parallel arcing faults.

The arcing current needs to exceed the magnetic trip level of the circuit breaker. If this is not the case the circuit breaker will not trip and a fire can result. There are no utility standards for available fault current levels for residences.That's why UL tests for minimum level as a part of UL1699.

The circuit breaker manufacturers developed AFCI circuit breakers back in 1999 to provide complete circuit protection downstream. Outlet AFCI manufacturers are saying the simple thermal magnetic circuit breakers can still protect for all arcing conditions in combination with their products. As the manufacturers of these devices, we go on the record stating that they were not designed for that application.

What are your options as an inspector?



You are the last line of safety for the homeowner. You're entrusted to protect them from dangers that they are not aware of. An electrical fire is the last thing anyone desires when someone opts to short change the guidelines to make a quick profit or meet a timeline.

Some OBC AFCI manufacturers are trying to get the National Electrical Code changed by claiming that a standard thermal magnetic circuit breaker can protect the home run against all potential parallel arcing faults. They were not designed for that purpose. Just overloads and short circuits.

These same manufacturers also forget to mention that the NEC requires OBC Dual Function receptacles to be " installed in a readily accessible location " which really isn't the case when you have a DF receptacle behind a refrigerator in a kitchen. How can a homeowner check that device?

Our AFCI and Dual Function Circuit Breakers are the simplest solution to AFCI/GFCI protection. It's all in one place in the load center, simple to install and easy to inspect. No hunting around for outlets.

We are the manufacturers of these circuit breakers and can confirm that they can't protect the home run against all parallel arcing faults. We have video evidence to prove it. Check it out on our website. This is why Circuit Breaker type AFCIs were created in the first place.

The ACBMA believes that the entire circuit should be protected against all hazardous arcing faults per the UL standard and that this level of protection should not be compromised.

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Learn more at www.acbma.org

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