

NC Department of Insurance
Office of the State Fire Marshal - Engineering Division
1202 Mail Service Center, Raleigh, NC 27699-1202
919-661-5880

Carbon Monoxide Alarms in One-and-Two-Family Dwellings and Townhouses

Code: 2012 Residential
Section: R315

Date: September 16, 2015

Code: Fuel Gas
Section: 311

Code: Mechanical
Section: 313

Code: Plumbing
Section: 315

This interpretation supersedes the July 2, 2012 R315 interpretation. It has been updated to reflect changes to the code by the Building Code Council and to address more questions.

Soon after the adoption of the 2012 Code, it was noted by Rules Review that there was a conflict between R315.1 and GS 143-138(b2), so new language was added to remove the conflict. This change is reflected in the following code amendment.

Figure 1: Current Effective Code¹

2012 NC Residential Code

R315 Carbon monoxide alarms. (110308 Item B-6b)

R315.1 Carbon monoxide alarms. In new construction, one-and two-family dwellings and townhouses within which fuel-fired appliances or fireplaces are installed or that have attached garages shall be provided with an approved carbon monoxide alarm installed outside of each separate sleeping area in the immediate vicinity of the bedroom(s) as directed by the alarm manufacturer.

R315.2 Where required-existing dwellings. For ~~In~~ existing dwellings, where interior alterations, repairs, ~~fuel-fired appliance~~ replacements, or additions requiring a building permit occurs, or where one or more sleeping rooms are added or created, or where fuel-fired appliances or fireplaces are added or replaced, carbon monoxide alarms shall be provided in accordance with Section 315.1.

Exception:

Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck, or the installation of a fuel-fire appliance that cannot introduce carbon monoxide to the interior of the dwelling, are exempt from the requirements of this section.

R315.3 Alarm requirements. The required carbon monoxide alarms shall be audible in all bedrooms over background noise levels with all intervening doors closed. Single station carbon monoxide alarms shall be listed as complying with UL 2034 and shall be installed in accordance with this code and the manufacturer's installation instructions. Battery powered, plug-in, or hard-wired alarms are acceptable for use.

The delayed effective date of the highlighted portion of this Rule is January 1, 2011.

The delayed effective date of the underlined portion of this Rule is January 1, 2015.

The Statutory authority for Rule-making is G. S. 143-136; 143-138.

¹ See the following link:

http://www.ncdoi.com/OSFM/Engineering_and_Codes/Documents/2012_NCBuildingCode_amendments/2012-2015ApprovedCumulative.pdf

The following list of questions and answers pertain to the current effective R315 code. References to code sections all refer to the code excerpt shown in Figure 1: Current Effective Code.

New Buildings

Question 1:

When is a Carbon Monoxide alarm required in a **new** one-and-two-family dwelling and townhouse?

Answer:

A carbon monoxide alarm requirement is triggered by any of the following--**all** new one-and-two-family dwellings and townhouses that have **any** of the following present:

- A fuel-fired appliance,
- A fireplace
- An attached garage

Please note the originally adopted 2012 Code required Carbon Monoxide alarms in all new one-and-two family dwellings and townhouses. However, it was determined after adoption that NC GS 143-138 paragraph (b2)², prevents the building code from requiring carbon monoxide alarms in all one-and two family dwellings, but only in those that have a **combustion heater, appliance or fireplace or attached garage**. Therefore the language was amended as appropriate to comply with the statute language.

Question 2:

Do the requirements for carbon monoxide alarms include homes without any fuel-fired appliances, fireplaces or an attached garage?

Answer:

No.

The code requirement was changed to align with the statute that requires there to be at least one of the following before a carbon monoxide alarm is required: **a fuel fired appliance, fireplace, attached garage** (per R315.1).

Question 3:

Does the **Exception** apply to both Section R315.1 and R315.2?

Answer:

Only R315.2.

In new construction, the R315.1 language reads "...within which fuel-fired appliances or fireplaces are installed..." Therefore if you have a new house with an exterior fuel-fired appliance, R315.1 would not require the installation of a carbon monoxide alarm for said exterior appliance.

² http://www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/BySection/Chapter_143/GS_143-138.html Refer to paragraph (b2) for carbon monoxide language for one-and-two-family dwellings.

Question 4:

Are the carbon monoxide alarms required to be hard-wired units?

Answer:

No.

Per R315.3, which applies to both new (R315.1) and existing (R315.2) one-and-two family dwellings, the amended code text specifically allows the use of alarms that are hard wired, battery operated, or plug-in. The detectors must be labeled as compliant with the requirements of UL 2034 and must be installed in accordance with the device manufacturer's installation instructions. Prior to the amended text, the interpretation also did not require a hard-wired alarm.

Existing Buildings

The vast majority of questions have been "when are carbon monoxide alarms required in an existing one-and two family dwelling?". After issuance of the first interpretation, it became apparent that the term "permit" requires additional clarification in order to clarify the intent of the amended section, as some departments offer "blanket permits" with subcategories for the trades, whereas others write out individual permits for general contracting and the trades.

R315.2 Existing dwelling carbon monoxide alarms

R315.2 Where required-existing dwellings. ~~For~~ ~~in~~ existing dwellings, where interior alterations, repairs, ~~fuel-fired appliance replacements~~, or additions requiring a building permit occurs, or where one or more sleeping rooms are added or created, or where fuel-fired appliances or fireplaces are added or replaced, carbon monoxide alarms shall be provided in accordance with Section 315.1.

Exception:

Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck, or the installation of a fuel-fire appliance that cannot introduce carbon monoxide to the interior of the dwelling, are exempt from the requirements of this section.

General Code Language Interpretations of R315.2**Question 5:**

Would a permit issued for a trade such as mechanical, electrical, or plumbing be considered a "building permit" as described in R315.2 above?

Answer:

No.

The "building permit" referenced in R315.2 is meant to apply to general contracting work, such as wall additions and removals.

Please note you have to continue reading the entire paragraph, and the Exception following, and, if necessary, R315.1 to determine if a carbon monoxide alarm is required by R315.2.

Question 6:

In general, what work and/or permit issuance triggers the installation of carbon monoxide alarms in an existing residence?

Answer:

The installation of a carbon monoxide alarm is triggered by any of the following:

- The issuance of a building³ permit, requiring compliance with the NC Residential Code, for interior alterations or repairs, where the building has any of the following (per R315.1)⁴: **a fuel-fired appliance, fireplace, attached garage.** Or-
- The issuance of a permit, requiring compliance with the NC Residential Code, for a building addition, where the building has any of the following (per R315.1): **a fuel-fired appliance, fireplace, attached garage.** Or-
- The issuance of any permit (building or trades) for the installation and/or replacement of a fuel-fired appliance or fireplace, (since the work involved the installation of a fuel-fired appliance or fireplace, obviously the conditions of R315.1 were met) , Or-
- The addition or creation of one or more sleeping rooms where the building has any of the following (per R315.1): **a fuel-fired appliance, fireplace, attached garage.**

Question 7:

Relative to the addition or creation of one or more sleeping rooms--Does this mean that if a homeowner converts an existing room from a study or some other use into a bedroom, which does not require a building permit, and the bldg. has any of the following (per R315.1): **a fuel fired appliance, fireplace, attached garage;** that the installation of a carbon monoxide alarm is required?

Answer: Technically all work must comply with the requirements of the codes and the installation of the alarms would be required. However, since a permit was not issued, there is no way that the local inspections department can verify compliance.

Follow-up to Question 7:

Does this mean that if a homeowner finishes off a previously unfinished space in the homeowner's dwelling for a bedroom, doing the work himself without getting a permit (the HVAC and electrical may have been installed earlier), and the bldg. has any of the following (per R315.1): **a fuel fired appliance, fireplace, attached garage;** that the installation of a carbon monoxide detector is required?

Answer: Technically all work must comply with the requirements of the codes and the installation of the alarms would be required. However, since a permit was not issued, there is no way that the local inspections department can verify compliance.

³ See Question #5 under Existing Building Section for "building permit" clarification.

⁴ The revised code language in this section is not trying to make the requirements for existing buildings any stricter than that for new buildings, although a strict reading of the code language may not communicate this to the reader. However, based on our opinion of NC GS 143-138 paragraph (b2), the rationale for sending the reader back to R315.1 is to only require a carbon monoxide alarm in an existing building if there is at least a fuel fired appliance, fireplace, or attached garage, and to install it to the manufacturer's requirements.

Trade Permit Interpretations of R315.2

Question 8:

When the permit is issued for the installation of appliances, equipment, fixtures or devices covered by the trade codes (such as the renovation of a bathroom that encompasses only plumbing fixtures with no building related issues, or the change out of an electrical panel) would the requirements of R315.2 apply?

Answer:

Yes.

However, after evaluating the requirements of R315.2, there may not be a trigger for the installation of a carbon monoxide alarm. If there are no building related issues and a building permit is not issued, and no fuel-fired appliance is being installed or replaced, and the bldg. does not have any of the following (per R315.1): **a fuel fired appliance, fireplace, attached garage**, then the requirement for carbon monoxide alarms is not triggered.

Question 9:

I have an inspection for the replacement of an electric water heater, of equal capacity and wattage, and per the General Statute for permits this replacement does not require the issuance of a permit. (the permit was requested by the plumber for his protection). Would this installation evoke the requirement for carbon monoxide alarms given that it is not “required by the Residential Code?”

Answer:

No.

If there are no building related issues and a building permit (requiring compliance with the NCRC) is not issued and a fuel-fired appliance is not being installed, the requirement for carbon monoxide alarm installation is not triggered.

Question 10:

The work involves the installation or replacement of a heat pump, (or other all-electric appliance); and there is an existing fuel-fired appliance, fireplace, or attached garage present in the one-and-two-family dwelling. Is a carbon monoxide alarm required as part of this work?

Answer:

No.

The replacement or installation of the electric appliances did not require a “building permit” as discussed in this interpretation, and the appliance(s) installed or replaced is not fuel-fired, therefore, even though there are existing conditions in the dwelling that would require a carbon monoxide alarm on a new house, the replacement or installation of a heat pump (or other all-electric appliance) would not require a carbon monoxide alarm on an existing dwelling.

Question 11:

The work involves the installation of a non-fuel-fired appliance to replace an existing fuel-fired appliance, such as the installation of an electric range to replace an existing gas range or a heat pump to replace an existing gas furnace. Does this replacement require the installation of a carbon monoxide alarm if there is: **a fuel fired appliance, fireplace, attached garage** (per R315.1) somewhere else in the bldg. after the replacement occurs?

Answer:

No.

The replacement or installation of the electric appliances did not require a “building permit” as discussed in this interpretation, and the appliance(s) installed or replaced is not fuel-fired, therefore, even though there are existing conditions in the dwelling that would require a carbon monoxide alarm on a new house, the replacement or installation of an electric appliance to replace a fuel-fired appliance would not require a carbon monoxide alarm on an existing dwelling.

Question 12:

If I am an electrical contractor installing an electric fence in the yard of an existing dwelling, would I be required to install carbon monoxide alarms in the dwelling?

Answer:

No.

In this case, there are no building related issues and a building permit (requiring compliance with the NCRC) is not being issued; therefore, the requirement for carbon monoxide alarms is not triggered.

Question 13:

How does a code official (or contractor) determine whether or not an **exterior fuel-fired** appliance can introduce carbon monoxide to the interior of the building?

Answer:

The code is silent on this matter. In general, if it is an outdoor fuel-fired appliance installed in accordance with its manufacturer’s installation instructions, and the code with regards to venting and clearances to building openings, overhangs, etc., and **there is no interconnecting ductwork**, it would not be required to have a carbon monoxide alarm. Here is a partial list of items that are typically encountered, and our interpretation:

- Water heaters - No
- Package units with fuel-fired heat – Yes. Although the design of modern package units makes it unlikely to introduce carbon monoxide into the bldg., there are cases where it has happened.
- Direct-vent appliance installed in living space, attic, basement, or crawl – yes.
- Outdoor boiler connected via only piping – No.
- Outdoor furnace connected via ductwork – Yes. Similar logic as a fuel-fired package unit.
- Permanently installed generators – No, not by this code section. Check manufacturer’s installation requirements, some instructions require one as part of the installation.
- Portable generators⁵. – These are not regulated by the Code. Although the misuse of these has proven to be a major percentage of carbon monoxide poisonings, Code Section R315.1 or R315.2 would not require a carbon monoxide detector.

⁵ <http://www.cpsc.gov//Global/Research-and-Statistics/Technical-Reports/Home/Portable-Generators/GeneratorsandOEDTFatalities-2014-FINAL.pdf>

- Outdoor permanently installed fuel-fired cooking appliances with no attached roof or horizontal projection of the dwelling over the appliance – No
- Outdoor fire pits or decorative appliances⁶ on attached decks with no attached roof or horizontal projection of the dwelling over the equipment - No
- Portable grilles – No, they are not subject to these code sections.

Miscellaneous Scenario Interpretations

Question 14:

Do the provisions of R315.1 and R315.2 apply to one-and two-family dwellings that are rented out?

Answer:

Yes.

There may be additional requirements placed on the structure by landlord ordinances⁷ that are beyond the review and enforcement of the building code, but may be enforced by minimum housing standards.

Question 15:

Does the existence of stubbed out, but capped off gas lines for future appliances not installed or required at time of final inspection require a carbon monoxide alarm? (There are no fuel burning appliances presently installed at certificate of occupancy stage). An example would be a stub out for a gas range, but the actual installed range is all-electric.

Answer:

No.

If and when the appliance is installed, the requirements would be triggered. Of course, this assumes no other items in R315.1: **a fuel fired appliance, fireplace, or attached garage** are present.

Question 16:

A fire damages part of a dwelling requiring the entire space to be refinished and some prior walls, ceiling, roof trusses and roofing to be replaced. The scope of work does not add any new space or any new rooms, and there is at least one item present under R315.1: **a fuel fired appliance, fireplace, attached garage.**

Answer:

Yes.

Per R315.2, the work required a building permit, and the scope of work was beyond the Exception, and the dwelling had at least one of the items referred to in R315.1.

⁶ Every code-compliant installation we have seen to date does not allow any roof or horizontal projection over the equipment, but the industry is in constant motion, and we may not be aware of all products.

⁷ http://www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/BySection/Chapter_42/GS_42-42.html § 42-42. Landlord to provide fit premises.[Item 7]

Question 17:

A fire damages part of a dwelling requires the entire space to be refinished and some prior walls, ceiling, roof trusses and roofing to be replaced. The scope of work does not add any new space or any new rooms, and there is **NOT** at least one item present under R315.1: **a fuel fired appliance, fireplace, attached garage.**

Answer:

No.

Per R315.2, the work required a building⁸ permit, and the scope of work was beyond the Exception, **BUT** the dwelling **does not** have at least one of the items referred to in R315.1: **a fuel fired appliance, fireplace, attached garage.**

Question 18:

A kitchen is renovated (building permit) with countertops, updated electric, lighting, possibly sinks, dishwashers, but existing gas range is not replaced. Is a carbon monoxide detector required for this scope of work?

Answer:

Yes.

Per R315.2, there was a building⁹ permit required for the scope of work, and there is existing fuel fired appliance(s) present, therefore a carbon monoxide alarm is required.

Question 19:

A kitchen renovation is performed, but no building permit is required, but a permit was pulled for trades of electrical and plumbing for electrical lighting work and sink replacement. There is an existing gas range. Is a carbon monoxide alarm required as part of this scope of work?

Answer:

No.

A building¹⁰ permit was not required, and no fuel-fired appliance was repaired or replaced per R315.2.

⁸ See Question #5 under Existing Building Section for “building permit” clarification.

⁹ See Question #5 under Existing Building Section for “building permit” clarification.

¹⁰ See Question #5 under Existing Building Section for “building permit” clarification.

Code Official Certificate Requirement Interpretations

Question 20:

Since this is an amendment in the NC Residential Code, can a mechanical or plumbing inspector do the inspection on the carbon monoxide installation or does it require a certified building inspector?

- Note, since the amendment, companion language was also put into the mechanical, plumbing, and fuel gas codes.¹¹

Answer:

For either plug-in or battery-powered units there is little in the Code to inspect other than the location “in the vicinity of the bedrooms” and compliance with UL 2034. The manufacturer’s instructions will be onsite with the device. The mechanical or plumbing inspector should be able to inspect those items, but that is the local jurisdiction’s decision as referenced in Question 8 above. If it is a hard-wired device, then an electrical permit is appropriate, and the code official would have to hold a minimum of Level I electrical certificate.

Question 21:

If the installation of a carbon monoxide alarm is triggered by an item in 315.2, is there a special permit for the carbon monoxide alarm or is it lumped with any permit that initially triggered the installation as stipulated in R315.2?

Answer:

There are no requirements to issue a special permit for compliance with the code amendment. Each jurisdiction should decide individually how to best handle enforcement. The DOI feels that most of the devices will be either plug-in or battery-powered units, for retrofits, that could be inspected without a separate permit. If it is a hard-wired device, then an electrical permit is appropriate.

Question 22:

As an inspections department, we just recently became aware of the code amendment. Must compliance be required for all permits issued since the beginning of the year or can we draw a line in the sand and begin enforcement as of this date?

Answer:

The amendment requirements are to be enforced for all applicable projects with permits that are currently open and issued on or after January 1, 2011. Please note the changed requirements in place since Jan 1, 2011, and subsequent effective date of Jan 1, 2015.

¹¹ See the following link:

http://www.ncdoi.com/OSFM/Engineering_and_Codes/Documents/2012_NCBuildingCode_amendments/2012-2015ApprovedCumulative.pdf

Contractual Question Interpretations

Question 23:

When multiple trades are involved in a project scope and more than one trade or general contracting scope of work could have triggered the carbon monoxide installation requirement, which contractor is responsible for providing and installing the carbon monoxide alarm?

Answer:

The code does not address contractual responsibility. This would be handled on a case-by-case basis by the permitting department and permit holder(s).

Question 24:

Are the carbon monoxide alarms allowed to be installed by the homeowner?

Answer:

Yes.

When the work requires a carbon monoxide alarm to be installed, the code official has to verify its (their) existence and proper installation, but the homeowner can provide and install it (them¹²). The permit would not be closed out until verification of proper installation. The detectors must be labeled as compliant with the requirements of UL 2034 and must be installed in accordance with the device manufacturer's installation instructions. As discussed in an earlier question, it can be battery operated, plug-in, or hard-wired. Of course, the hard-wired alarm would require an electrical permit.

¹² In some situations, more than one alarm is required if the manufacturers installation instructions are followed.