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Guidance Paper: Installation of A2L Refrigeration Systems under the 2018 North Carolina Mechanical Code

Code: 2018 NC Mechanical Code

Date: 6/04/2024

Section: 105.2, Chapter 11

Purpose:

The purpose of this document is to provide clarification to Code Enforcement Officials (CEO) and designers on code requirements for appliances and equipment utilizing A2L refrigerant under the 2018 North Carolina Mechanical Code (NCMC). This guidance is not applicable to installations permitted under the 2024 North Carolina Building Codes.

This document is not to be solely used to determine compliance with the 2018 North Carolina Mechanical Code for any given method described within: please note the information in this newsletter is not code language, or formal interpretations of code language. This document is intended only as a reference document to provide an overview of potential options for installing A2L refrigerating systems under the 2018 NCMC. Compliance for the installation of A2L refrigerant systems must be determined in accordance with the 2018 North Carolina Building Codes, as well as other applicable standards, listings, agencies, occupational licensing boards, commissions or regulations.

Overview:

In order to accommodate the future federally-imposed deadlines for certain A1 refrigerants, many manufacturers have ALREADY switched over to A2L refrigerants, therefore installation requirements specific to these refrigerants are needed, even if ahead of any particular effective dates set by the EPA. Although equipment with common A1 refrigerants will be permitted to be installed for awhile, there is no guarantee that manufacturers will produce the quantity in demand, or will instead switch to producing the A2L equipment before published cutoff dates.

With these new federal regulations affecting the availability of common A1 refrigerants, there is a need to accommodate the installation of a greater number of refrigeration systems containing other classifications of refrigerant, such as A2L. A1 is classified by ASHRAE 34 as “No Flame Propagation” while A2L is classified as “Lower Flammability.” The 2018 NCMC addresses the additional flammability characteristics of A2L refrigerants primarily by restricting their usage outside of machinery rooms or in nonindustrial occupancies. While newer codes and standards, including the 2024 NC Mechanical Code, have been updated with language addressing how to install this type of equipment, North Carolina is on a six-year code cycle and manufacturers are beginning this equipment transition before the 2024 NC Building Codes are effective. As such,

due to the ongoing widespread adoption of A2L refrigerants in lieu of the A1 refrigerants commonly used, there is a need to allow A2L refrigeration system installation more widely while the 2018 NCMC is still in effect, and this paper describes three possible methods for how these systems can be installed under the 2018 NCMC.

Paths 1 & 2 provide alternative methods for evaluation using Section 105.2 of the 2018 NCMC, while Path 3 provides a broad overview on how A2L refrigeration systems can be installed under the prescriptive provisions of the 2018 NCMC. The prescriptive path is very restrictive, and an alternative method path is likely going to need to be utilized unless a project is able and willing to work within the constraints of the 2018 NCMC prescriptive code provisions. Refer to the end of this document for a chart visually illustrating the paths discussed below.

Path 1 – Utilizing ASHRAE 15-2022 under the 2018 North Carolina Mechanical Code, Section 105.2 “Alternative materials, methods, equipment and appliances”:

Section 105.2 permits code officials to approve alternatives to the code where the proposed design is satisfactory and complies with the intent of the provisions of the code and is, for the purposes intended, not less than the equivalent prescribed by the code in quality, strength, effectiveness, fire resistance, durability and safety. As stated in the overview, the listings and standards for refrigeration systems referenced by the 2018 NCMC have been updated multiple times to address the increasing number of A2L refrigerant systems that will need to be installed, but the code language has remained the same. The code is not intended to limit new ideas or technology, and as such the intent of Section 105.2 is to provide CEOs a method to evaluate situations which do not necessarily meet the prescriptive language of the code while ensuring that the intent of the code has been satisfied.

Section 1101.6 of the 2018 NCMC states that refrigerant installations shall be in compliance with the code and ASHRAE 15, while Section 304.1 requires in part that equipment and appliances shall be installed in accordance with the conditions of the listing and the manufacturer’s instructions. While ASHRAE 15 is not perfectly aligned with the NCMC language, it is a respected standard that the NCMC references heavily in terms of the requirements contained in Chapter 11. The updated ASHRAE 15 standards include provisions which allow A2L refrigerants to be utilized in high-probability systems for comfort cooling applications: so long as the A2L refrigeration system is installed in accordance with the provisions of that standard, in accordance with the conditions of the listing and in accordance with the manufacturer’s instructions, the intent of the 2018 NCMC has been met and the installation can be evaluated using the provisions of Section 105.2.^{1,1}

ASHRAE 15 works in a similar way to NCMC Chapter 11: the occupancy, refrigeration system classification, and refrigerant safety classification must be determined in accordance with the requirements of the standard, utilizing ASHRAE 34 as directed, and then following the provisions that are applicable from there. Note that ASHRAE 15 has different restrictions and allowances than the NCMC.^{1,1} It is best practice for the designer to incorporate this level of detail in the contract drawings.

ASHRAE Standards 15 and 34 can be viewed for free at the link below.

<https://www.ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards>

Path 1 Footnotes:

- 1.1) If utilizing the ASHRAE 15 as an alternative method under NCMC Section 105.2, the full standard must be complied with, not just certain provisions. Exceptions and allowances from ASHRAE 15 for A2L refrigerants are not permitted to be used in conjunction with the 2018 Chapter 11 prescriptive code provisions if the prescriptive code provisions are more restrictive than the standard: refer to note “3” under Path 3 for further information.

Path 2 - Utilizing Chapter 11 of the 2024 North Carolina Mechanical Code under 2018 North Carolina Mechanical Code, Section 105.2 “Alternative materials, methods, equipment and appliances”:

Per Section 102.5 of the 2018 North Carolina Administrative Code (NCAC), any rules that are adopted by the Building Code Council and approved by the Rules Review Commission shall be accepted by the Code Enforcement Official as an alternate method of construction prior to the effective date if requested by the owner or his agent. The Rules Review Commission approved the 2024 NCMC and Chapter 11 amendments in April 2024. There were small changes to the 2024 NCMC language per RRC request but the language in Chapter 11 was not altered. In order to utilize Chapter 11 of the 2024 NCMC as an alternative method, both the 2024 NCMC and the approved Chapter 11 amendments must be applied. As long as the A2L refrigeration system is installed in accordance with the provisions of Chapter 11, in accordance with ASHRAE 15^{2.1} as applicable, in accordance with the conditions of the listing and in accordance with the manufacturer’s instructions, the intent of the 2018 NCMC has been met and the installation can be evaluated using the provisions of Section 105.2.^{2.2}

Chapter 11 of the 2024 NCMC without the amendments can be viewed at the link below as Item B-1:

<https://www.ncosfm.gov/news/events/building-code-council-meeting-june-13-2023>

Approved Amendments to Chapter 11 of the 2024 NCMC can be viewed at the link below as Item B-5:

<https://www.ncosfm.gov/news/events/building-code-council-meeting-december-12-2023>

Path 2 Footnotes:

- 2.1) The 2024 NCMC references ASHRAE 15-2022.

- 2.2) If utilizing Chapter 11 of the 2024 NCMC as an alternative method under NCMC Section 105.2, the full Chapter 11 must be complied with, not just specific provisions. Exceptions and allowances from ASHRAE 15 for A2L refrigerants are not permitted to be used in conjunction with the 2024 NCMC Chapter 11 prescriptive code provisions if the prescriptive code provisions are more restrictive than the standard, per NCMC Section 102.8.1.

Path 3 - 2018 North Carolina Mechanical Code, Prescriptive:

The prescriptive code path limits the types of systems, amount of refrigerant and locations where refrigeration systems can be installed. If a designer is willing and able to work within the constraints of the 2018 prescriptive code, then the prescriptive code provisions can be followed for A2L refrigeration system installations. A2L is a subset of A2 for the purposes of the applying the 2018 NCMC prescriptive code provisions: the NCMC does not have any specific provisions for A2L refrigerants.^{3.1}

After determining the refrigerant classification, occupancy and system classification in accordance with 1103.1^{3.2}, 1103.2 and 1103.3 respectively, the applicable provisions of Chapter 11 can be followed. Some provisions are included below to highlight the constraints that the 2018 prescriptive provisions place on installations of flammable refrigerants, but please note that this is not an all-inclusive list of provisions that are applicable to A2L refrigerants under the 2018 NCMC.

1. Section 1104.3.2, which applies to nonindustrial occupancies, states in part that A2 refrigerants shall not be used in high-probability systems where the quantity of refrigerant in any independent circuit exceeds the amount shown in Table 1104.3.2. Table 1104.3.2 provides an allowance for sealed absorption systems and unit systems^{3.3}, such as PTACS or window units. There is not an allowance for other types of mechanical systems, such as a typical split system heat pump. If the system or systems installed utilize A2L refrigerant and are high-probability systems, then the restrictions of 1104.3.2 would be in effect, both with respect to system type and with respect to allowed amount of refrigerant. In addition, per 1104.3.3, the total of all Group A2, B2, A3 and B3 refrigerants other than R-717 (ammonia), shall not exceed 1,100 pounds except where approved.

TABLE 1104.3.2 MAXIMUM PERMISSIBLE QUANTITIES OF REFRIGERANTS

TYPE OF REFRIGERATION SYSTEM	MAXIMUM POUNDS FOR VARIOUS OCCUPANCIES			
	Institutional	Assembly	Residential	All other occupancies
Sealed absorption system				
In exit access	0	0	3.3	3.3
In adjacent outdoor locations	0	0	22	22
In other than exit access	0	6.6	6.6	6.6
Unit systems				
In other than exit access	0	0	6.6	6.6

For SI: 1 pound = 0.454 kg.

Source: 2018 North Carolina Mechanical Code

2. For low-probability systems, the machinery room requirements of both 1105 and 1106 would be in effect, unless the installation meets one of the exceptions.
3. Per Section 304.1, the appliances/equipment shall be installed in accordance with the manufacturer’s instructions and the conditions of the listing. Per Section 304.2, if the code provisions are more restrictive than the manufacturer’s instructions or listing, then the code provisions shall apply and if the manufacturer’s instructions or listing is more restrictive than the code, then those requirements shall be applicable to meet the intent of the code. Under the 2018 NCMC, there may be conflicts with regards to the manufacturer’s instructions/listing and the code provisions. For instance, the manufacturer may allow certain high-probability systems to be installed in locations that would be prohibited by the provisions of 1104.3.2. The manufacturer may require protection and labeling of the refrigerant piping that otherwise may not have been required by the 2018 NCMC. The most restrictive requirements shall apply to the installation.

Path 3 Footnotes:

- 3.1) Exceptions and allowances from ASHRAE 15 for A2L refrigerants are not permitted to be used in conjunction with the 2018 Chapter 11 prescriptive code provisions if the prescriptive code provisions are more restrictive than the standard, per NCMC Section 102.8.1.
- 3.2) Section 1102.2 states in part that refrigerants not identified in Table 1103.1 shall be approved before use: ASHRAE 34 is an acceptable standard to reference for refrigerants not listed on that table.
- 3.3) Refer to “REFRIGERATION SYSTEM, SELF-CONTAINED,” in Section 202 for the description of “Unit systems,” as used in Table 1104.3.2.

References:

2018 North Carolina Mechanical Code: [A] 105.2 Alternative materials, methods, equipment and appliances. The provisions of this code are not intended to prevent the installation of any material or to prohibit any method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material or method of construction shall be *approved* where the code official finds that the proposed

design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety. Where the alternative material, design or method of construction is not approved, the *code official* shall respond in writing, stating the reasons the alternative was not approved.

This chart is not to be used to determine compliance with the 2018 North Carolina Mechanical Code for any given method described within: this is intended only as a visual aide to illustrate some options for installing A2L refrigerating systems under the 2018 NCMC as described in the document above. Compliance for the installation of A2L refrigerant systems must be determined in accordance with the 2018 North Carolina Building Codes, as well as other applicable standards, listings, agencies, occupational licensing boards, commissions or regulations.

A2L System Installation under the 2018 North Carolina Mechanical Code

