DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: **Jared Johnson, Phius Alliance Minnesota**

Marcy Conrad Nutt, Passive House Minnesota

Email address:

Telephone number:

Date: **August 29, 2023**

Model Code: **2021 IECC**

Code or Rule Section: **R402.4.1.3**

Firm/Association affiliation, if any: **Phius Alliance Minnesota, Passive House Minnesota**

Code or rule section to be changed: **R402.4.1.3 Leakage Rate**

Intended for Technical Advisory Group ("TAG"):

General Information	**Yes**	**No**
A. Is the proposed change unique to the State of Minnesota?	☒	☐
B. Is the proposed change required due to climatic conditions of Minnesota?	☒	☐
C. Will the proposed change encourage more uniform enforcement?	☒	☐
D. Will the proposed change remedy a problem?	☒	☐
E. Does the proposal delete a current Minnesota Rule, chapter amendment?	☐	☒
F. Would this proposed change be appropriate through the ICC code development process?	☐	☒

Proposed Language

1. The proposed code change is meant to:

☒ change language contained the model code book? If so, list section(s).

R402.4.1.3 Leakage Rate

☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☐ delete language contained in the model code book? If so, list section(s).

☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☐ add new language that is not found in the model code book or in Minnesota Rule.

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.

   No

3. Provide *specific* language you would like to see changed. Indicate proposed new words with underlining and ~~strikethrough~~ words proposed for deletion. Include the entire code (sub) section or rule subpart that contains your proposed changes.

   R402.4.1.3 Leakage Rate
   "When complying with Section R401.2.1, the building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate Zones 0, 1 and 2, and ~~3.0~~ 2.0 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2."

4. Will this proposed code change impact other sections of a model code book or an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.

   No

Need and Reason

1. Why is the proposed code change needed? Please provide a general explanation as well as a specific explanation for any changes to numerical values (heights, area, etc.)

   Tighter air sealing:
   Air leakage in cold climates creates unnecessary costs for property owners, as well as health and durability challenges in our Minnesota climate:

   - **In winter, leaks carry warm, moist air through building walls, causing condensation within the wall cavity. This, in turn, creates rot and mold, which lead to unnecessary health risks and maintenance costs. In addition, heating dollars and humidity are lost through the leaks.**

   - **In summer, air leakage results in lost cooling dollars. Leaks also let in allergens, increasingly common pollutants such as wildfire smoke, and humidity. Keeping humidity levels at a safe and healthy level is easier and cheaper in buildings that are well air-sealed.**

   Lowering the requirement from 3.0 ACH50 to 2.0 would provide better protection against the issues listed above and improve overall energy performance, while still remaining achievable with current construction materials and practices.

2. Why is the proposed code change a reasonable solution?

   Air-sealing uses materials and methods already common and affordable within the building industry. We believe the proposed change can be achieved with little more than education and attention to detail. According to RESNET: Of the 6,143 completed HERS-rated projects in Minnesota over the last 12 months, 75% of those projects have achieved an ACH level of 2.0 or lower.

3. What other factors should the TAG consider?

   Tighter air sealing has definite benefits, but requires balanced ventilation to maintain a healthy interior environment – the two must be considered together.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.

   As stated above, we anticipate any cost increase would be minimal. Air sealing is already standard practice, and the majority of new builds in Minnesota are already hitting these ACH levels.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. If the benefit is quantifiable (for example energy savings), provide an estimate if possible.

   The energy savings alone would quickly make up for the minimal extra cost. Extra insurance against moisture intrusion into walls is also a potential offset.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.

   Builders, who will pass it along to individual homeowners.

4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.

   No, there should not be extra compliance costs.

5. Will the cost of complying with the proposed code change in the first year after the rule takes effect exceed $25,000 for any one small business or small city (Minn. Stat. § 14.127)? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

   Not that we are aware of.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?

   Trade workers (siders, framers, specialized subcontractors)

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.

   People might argue against the idea of making air-tight walls, instead choosing to "let the walls breathe". There is an argument to be had in letting walls breathe, as it prevents moisture from sticking around for too long in any cavity. The problem with this approach in our Minnesota climate is that it prevents insulation from ever being used effectively. If we are

going to try to cut down energy usage in cold climates, insulation will have to be part of that solution, and protecting these insulated walls with tight air-sealing is a must.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?

   Over the long term, the amount of energy savings that will not be realized will be tremendous. Small incremental gains can create huge progress when multiplied over thousands and thousands of new homes. More homes will have wall moisture issues as well, which are expensive remediations in comparison to a little extra front-end air sealing work.

4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.

   We are unaware of any federal or state regulation or requirement related to this proposed change.

***Note: Incomplete forms may be returned to the submitter with instruction to complete the form. Only completed forms can considered by the TAG.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: **Marcy Conrad Nutt, Passive House Minnesota**
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Firm/Association affiliation, if any: **Phius Alliance Minnesota, Passive House Minnesota**

Date: **October 12, 2023 (REVISED)**

Model Code: **2021 IECC**

Code or Rule Section: **R401 / R409 / R410**

Code or rule section to be changed: **R401.2**, **Added sections: R401.2.5, R401.2.6, R409 & R410**

Intended for Technical Advisory Group ("TAG"):

General Information

	Yes	No
A. Is the proposed change unique to the State of Minnesota?	☐	☒
B. Is the proposed change required due to climatic conditions of Minnesota?	☒	☐
C. Will the proposed change encourage more uniform enforcement?	☐	☒
D. Will the proposed change remedy a problem?	☒	☐
E. Does the proposal delete a current Minnesota Rule, chapter amendment?	☐	☒
F. Would this proposed change be appropriate through the ICC code development process?	☐	☒

Proposed Language

1. The proposed code change is meant to:

☐ change language contained the model code book? If so, list section(s).

☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☐ delete language contained in the model code book? If so, list section(s).

☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).

☒ add new language that is not found in the model code book or in Minnesota Rule.

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.

No

3. Provide *specific* language you would like to see changed. Indicate proposed new words with underlining and ~~strikethrough~~ words proposed for deletion. Include the entire code (sub) section or rule subpart that contains your proposed changes. **PINK = language added following the previous submission**

R401.2 Application
Residential buildings shall comply with Section R401.2.~~5~~6 and either Sections R401.2.1, R401.2.2, R401.2.3 ~~or~~ R401.2.4~~.~~, or R401.2.5.

R401.2.5 Passive House Building Certification Option.
The Passive House Building Certification Option requires compliance with Section R409.

Section R409 Passive House Building Certification Option

R409.1 General. Projects shall comply with Section R409.2 or R409.3.

R409.2 Passive House Institute U.S. (Phius)
This section establishes criteria for compliance via the Passive House Institute U.S. (Phius) standard.

R409.2.1 Projects shall comply with Phius CORE or Phius ZERO, including its United States Department of Energy (USDOE) Energy Star and Zero Energy Ready Home co-requisites, and performance calculations by Phius-approved software.

R409.2.1.1 Phius documentation.

1. **Prior to the issuance of a building permit, the following items must be provided to the code official:**
   - i. **Phius 2021 (or newer) Verification Report which demonstrates project compliance with Phius 2021 (or newer) performance requirements.**
   - ii. **A statement from the CPHC that the verification report results accurately reflect the submitted plans.**
   - iii. **Evidence of project registration from Phius**

   OR

   - i. **A Design Certification Letter from Phius.**

2. **Prior to the issuance of a certificate of occupancy, the following item must be provided to the code official:**
   - i. **A Design Certification Letter from Phius.**
   - ii. **An updated Verification Report by the CPHC which reflects "as-built" conditions and test results that demonstrate project compliance with Phius (blower door and ventilation results).**

iii. A statement from the CPHC that the envelope meets the Phius hygrothermal requirements found in Appendix B of the Phius 2021 Certification Guidebook
iv. A statement from the Phius Certified Verifier or Rater that confirms the project test results and other Phius verification requirements are met.
v. A copy of the Phius workbook listing all testing results and as-built conditions.

OR

i. **A Project Certificate demonstrating final certification awarded by Phius.**

R409.3 Passive House Institute (PHI)
This section establishes criteria for compliance via the PHI standards.

R409.3.1 Projects shall comply with the PHI Passive House or Low Energy Building standard, which include performance calculations by PHI-approved software PHPP version 9 or later.

R409.3.1.1 PHI documentation.

1. **Prior to the issuance of a building permit, the following items must be provided to the code official:**
   i. **A list of compliance features;**
   ii. **Signed documentation from a PHI accredited Passive House Certifier of intent to certify the building.**

2. **Prior to the issuance of a certificate of occupancy, the following items must be provided to the code official:**
   i. A Design Certification Letter from a Certified Passive House Certifier.
   ii. An updated PHPP compliance report which reflects "as-built" conditions and test results (blower door and ventilation results) that demonstrates project compliance with PHI performance requirements;
   iii. A copy of the Passive House Verifier's or Rater's test results;
   iv. A statement from the CPHD that the project test results meet the model performance requirements, all the mandatory limits and any other mandatory requirements.

   OR

   v. A Final Certification Letter from a Certified Passive House Certifier

4. Will this proposed code change impact other sections of a model code book or an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.

   No

Need and Reason

1. Why is the proposed code change needed? Please provide a general explanation as well as a specific explanation for any changes to numerical values (heights, area, etc.)

BACKGROUND. Buildings built to the Passive House standard result in significant energy savings over a typically code-built home. Moreover, Passive House projects are more resilient, quieter, have better air quality and undergo a rigorous QA/QC process ensuring high quality construction. Passive House design is built on the following five principles:

- Using continuous insulation throughout the building envelope to minimize or eliminate thermal bridging.
- Building a well-detailed and extremely airtight building envelope, preventing infiltration of outside air and loss of conditioned air while increasing envelope durability and longevity.
- Using high-performance windows (double or triple-paned windows depending on climate and building type) and doors - solar gain is managed to exploit the sun's energy for heating purposes in the heating season and to minimize overheating during the cooling season.
- Using balanced heat- and moisture-recovery ventilation to significantly enhance indoor air quality.
- Minimizing the space conditioning system due to lower space conditioning loads.

Including Passive House (either the Phius or PHI passive house certification path) as an alternative compliance path:

-Provides an option in the energy code for homes that is significantly more energy efficient than those meeting the 2021 IECC. Passive house projects will reduce energy use between 40 and 60% compared with a code built home.

-Does not add any administrative cost to the code enforcement process. Passive House provides a third party design review and enforcement to ensure the single family or multi-family project meets the standard. This amendment simplifies the path for homebuilders/homebuyers who would like a home that is more energy efficient than a similar home built to the 2021 IECC.

-Will help Minnesota meet its goals set out in the Climate Action Framework[1] by:

- **Specifically: "…improving building codes and standards so that all new commercial and large multi-family buildings produce net-zero greenhouse has emissions by 2036."[2]**
- **Lowering demand on Minnesota's power grid, making a transition toward clean energy easier**
- **Protecting Minnesotans from extreme weather[3]**

[1] https://climate.state.mn.us/minnesotas-climate-action-framework
[2] https://climate.state.mn.us/next-step-our-clean-energy-transition
[3] https://climate.state.mn.us/protecting-minnesotans-extreme-weather

2. Why is the proposed code change a reasonable solution?

As an alternate compliance path, it gives the people of Minnesota an additional option. It is NOT mandatory. As Passive House uses third-party review and construction inspection, homeowners are assured of getting a high-quality, energy efficient home without adding new burdens to inspectors.

3. What other factors should the TAG consider?

Besides energy savings, the TAG should consider the co-benefits of a home meeting the Passive House standard. A house built under the standard will be (1) resilient in the face of extreme weather conditions, (2) have excellent indoor air quality, (3) reduce the intensity of noise from the outside, (4) have little or no thermal bridges reducing interior cold spots and reduce the risk of excessive moisture.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.

While a home built to the Passive House standard costs more to build than a home meeting the 2021 IECC, a number of mitigating factors should be taken into consideration:

1. **As it is an alternate compliance path, a builder is not subject to the additional cost if they choose not to pursue Passive House.**

2. Experience from other jurisdictions indicates that first costs drop rapidly as architects, engineers, builders and raters become more familiar with the standard. As the Passive House standard does not require any unknown technologies, materials or building techniques, the main cost driver is unfamiliarity with the requirements of the standard and what it takes to achieve it. Therefore, as more construction professionals gain experience with Passive House projects, the initial cost premium will invariably decrease.

Following are some examples:

1.As a result of a well-designed incentive structure, affordable housing in Pennsylvania has seen an increase in projects starting in 2015. Because these projects are funded by the Pennsylvania Housing Finance Authority, costs are tracked very closely. Following is a chart outlining the decrease in cost over a three year period; See Figure 1.

Figure 1: **Figure 1: COST COMPARISON BETWEEN PASSIVE HOUSE AND NON-PASSIVE HOUSE PROJECTS [1]**

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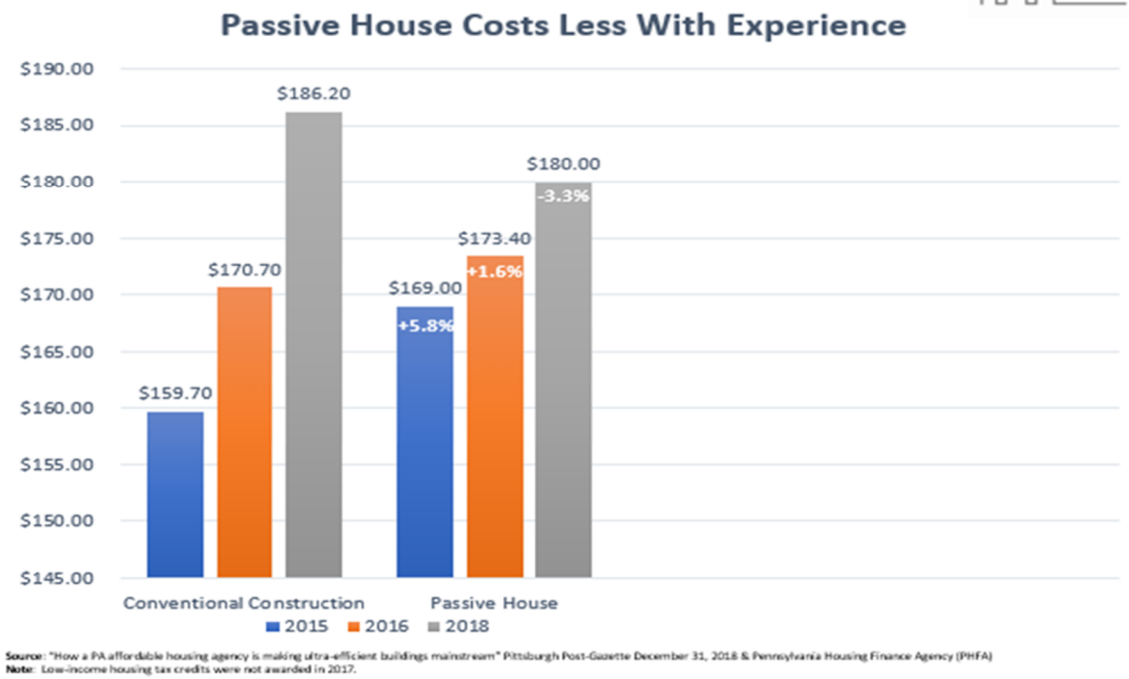
[1] "How a PA Affordable Housing Agency is Making Ultra-Efficient Buildings Mainstream" Pittsburgh Post-Gazette, December 31, 2016 & Pennsylvania Housing Finance Agency



2. The Massachusetts Clean Energy Center provided incentive funding for several Passive House multi-family projects to assess the incremental costs associated with Passive house. The study found that incremental costs ranged from 1.0% to 4.3%. These costs are expected to decrease with future projects:

Figure 2: Incremental Costs Associated with Passive House Projects Funded by the Massachusetts Clean Energy Center

Project	Number of Units	Incremental Cost
Old Colony; Phase 3C	55	2.8%
North Commons	53	4.3%
Depot Village/Hanson Village	48	4.1%
Finch Cambridge	98	1.4%
Harbor Village	30	1.8%
Mattapan Station	135	2.0%
Bartlett Station/Kinzie	52	1.0%

3. It is important to note that along with the minimal incremental costs, projects result in long-term energy cost savings.

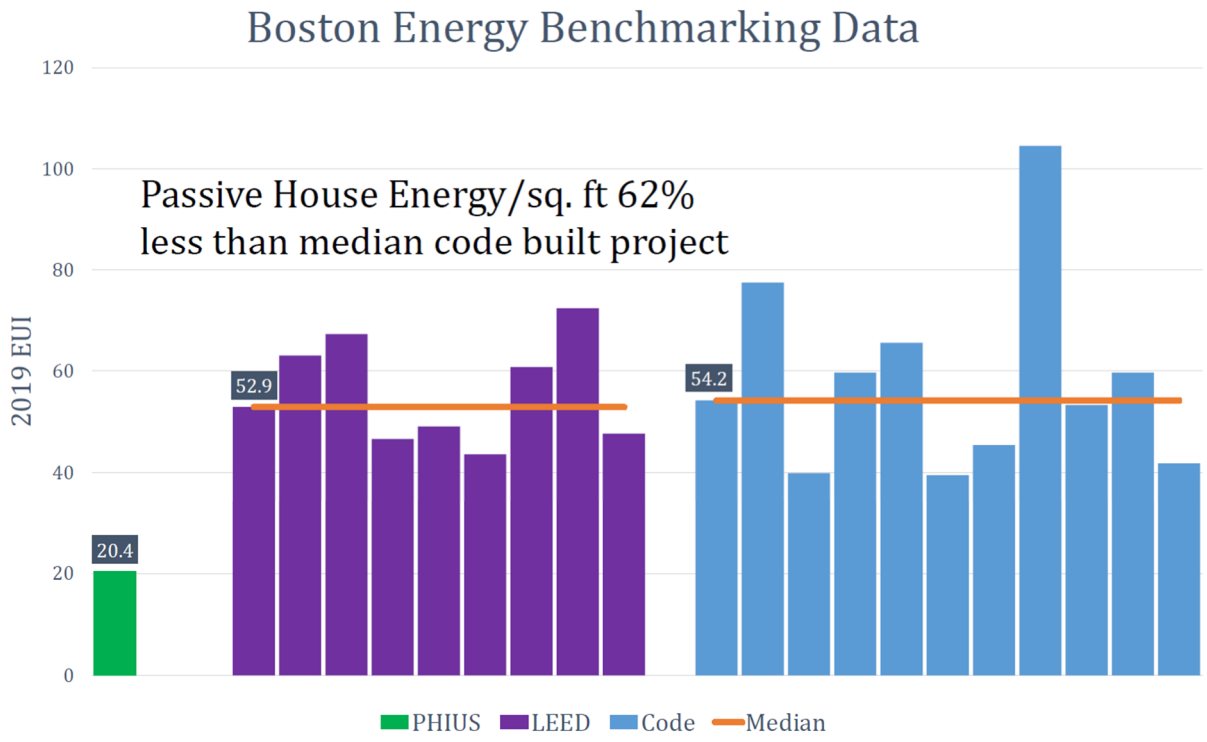
- **One study showed that the average multifamily Passive House building used 20.8 kBtu/sf/yr; as compared to 55.9 for multifamily building built to code (https://www.masscec.com/sites/default/files/documents/Scaling%20Up%20Passive%20House%20Multifamily_The%20 Massachusetts%20Story_20220824.pdf)**

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. If the benefit is quantifiable (for example energy savings), provide an estimate if possible.

There are several studies that highlight the energy savings that can be expected from buildings receiving the Passive House standard. One such study:

- **At the 2022 NESEA BuildBoston conference, the Massachusetts Department of Energy Resources presented the results of an analysis of the energy use of multi-family buildings. DOER found that Phius buildings had an Energy Use Intensity 60% below the code level energy use. Similar data from the Philadelphia benchmarking data analysis shows energy savings of around 50%. (Apigian, Michele et al. At the Finish Line: How Two Affordable passive Projects Crossed the Hardest Hurdles; BuildingEnergy Boston, February 28, 2022)**

Figure 3: Boston Energy Benchmarking Data (NESEA BuildBoston Conference 5/7/2021)



3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.

The building owner/builder will bear the costs. However, it should be emphasized that even if the costs are passed on to the home buyer, the reduced utility costs will over time, mitigate or eliminate the increased cost.

4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.

   As stated above, Passive House uses third-party review and construction inspection, so there is assurance of a high-quality, energy efficient home without adding new burdens to Inspectors. In fact, the cost of enforcement will decrease for those projects that choose the Passive House alternative compliance path.

5. Will the cost of complying with the proposed code change in the first year after the rule takes effect exceed $25,000 for any one small business or small city (Minn. Stat. § 14.127)? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

   No- this is an optional compliance path.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?

   Architects, building owners, builders, trades people

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.

   - **No; this is an alternative (optional) compliance path.**
   - **While this alternative compliance path may result in first-cost increases—which will be opposed to by anyone not wanting to increase first-costs, the fact that this is entirely optional means those who do not want to have potentially have increased costs (and the resulting energy savings), do not need to pursue this option.**

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?

   By not allowing this alternative compliance path, Minnesota is placing barriers and slowing change towards building methods that will lower energy use.

4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.

   No

***Note: Incomplete forms may be returned to the submitter with instruction to complete the form. Only completed forms can considered by the TAG.