DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Amanda Spuckler

Email address: amanda.spuckler@state.mn.us

Telephone number: 651-284-5361

Firm/Association affiliation, if any: DLI

Date: 6/27/2023

Model Code: IECC-R

Code or Rule Section: R301

Code or rule section to be changed: R301, Figure 301.1, and Table 301.1

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 R301.1 and replace with list of MN counties and climate zones
Delete section R301.2 warm humid climates
Delete section R301.3 describing how to determine climate zone for locations not assigned to one
Delete Figure R301.1 US Map Depicting Climate Zones
Delete Table R301.1 Climate zones, moisture regimes, and warm humid designations by state, county, and territory

☐ 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.
   IECC Section R301 and all subsections are deleted in their entirety and replaced with the following:
   Section R301 Climate Zones.
   The following counties are located in climate zone 7: Aitkin, Beltrami, Carlton, Cass, Clearwater, Cook, Crow Wing, Hubbard, Itasca, Kittson, Koochiching, Lake, Lake of the Woods, Mahnomen, Marshall, Norman, Pennington, Pine, Polk, Red Lake, Roseau, St. Louis, Wadena. All other counties are located in climate zone 6A.

   Figure 301.1 is deleted.
   Table 301.1 is deleted.

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.
   The proposed change is necessary to coordinate with changes to climate zones in adopted part 1323.0514 which modifies ASHRAE 90.1-2019 section 5.1.4 Climate.

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.)
   The change is needed to coordinate with changes and updates to climate zones in adopted chapter 1323, the Minnesota Commercial Energy Code. The 2021 IECC and ASHRAE 90.1-2019 use the climate zone data from ASHRAE Standard 169, which assigns Fillmore, Houston, and Winona counites to climate zone 5A. The adopted chapter 1323 assigned those 3 counties to climate zone 6A to maintain two climate zones in Minnesota.

   The proposed change also eliminates a lengthy table that provides climate zone information for each U.S. county as well as section 301.3 which describes how to determine the climate zone for a location that is not assigned to one. The table and section are unnecessary because all MN counties are assigned to a climate zone by the proposed code change.

2. Why is the proposed code change a reasonable solution?
   The code change is a reasonable solution so both the commercial and residential energy codes assign counites to the same climate zones. The change will also eliminate a lengthy table and sections with climate zone information that is not applicable to Minnesota.

3. What other factors should the TAG consider?
   ASHRAE Standard 169 assigns the following counties that were previously in climate zone 7 to 6A: Becker, Clay, Grant, Kanabec, Mille Lacs, Otter Tail, and Wilkin. The updated chapter 1323 and the unamended 2021 IECC also assign those counties to climate zone 6A. The proposed code change also assigns those counties to climate zone 6A.

Cost/Benefit Analysis

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

No changes to costs, or minimal, because the 2021 IECC applies similar requires to climate zones 6A and 5A. Furthermore, Fillmore, Houston, and Winona counties currently comply with climate zone 6A requirements.

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 benefits of the proposed code change are uniformity and consistency with the commercial energy code. The addition of a third climate zone in Minnesota could result in confusion without the benefit of improved energy efficiency or cost savings.

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

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

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.
   N/A

Regulatory Analysis

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

   Building contractors, mechanical contractors, architects, engineers, municipal building officials, building inspectors, building managers and homeowners

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.
   None. Not adopting the proposed code change will result in unnecessary confusion with the commercial energy code.

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?
   The probable consequence is inconsistent application and enforcement of the code.

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.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: John G.Smith, P.E.

Email address: jgsmith76@gmail.com

Telephone number: 612 867-3145

Date: August 26, 2023

Model Code: Residential

Code or Rule Section: R302 Design Conditions

Firm/Association affiliation, if any:

Code or rule section to be changed: 1322

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:

   X☐ change language contained the model code book? If so, list section(s).
   Section R302

   ☐ 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.

   Add the following new subsection:

   R302.2 Climatic Data Design Conditions

   Climatic data design conditions to be used for the calculation of heating and cooling loads shall be determined by either of the following methods:
   Method 1: Use weather conditions identified in Table R302.1. Where the building city location is not listed, use the listed city that is the nearest.
   Method 2: Use weather data published as a part of ASHRAE Standard 169-2020 for the nearest city. This data is available at www.ASHRAE-meteo.info. Design temperatures shall be rounded to the nearest whole number. Winter design conditions shall be the mean extreme annual temperature. Summer conditions shall be the 1% annual cooling design conditions.

Table R302.1
CLIMATIC DATA DESIGN CONDITIONS

City	Winter Design db ºF	Summer db ºF/coinc wb ºF
Aitkin	-28	82/72
Albert Lea	-19	86/72
Alexandria AP	-23	85/70
Bemidji AP	-30	82/67
Brainerd	-27	85/69
Cloquet	-24	82/68
Crookston	-28	84/70
Duluth AP	-23	81/67
Ely	-34	82/67
Eveleth	-31	82/67
Faribault	-21	88/73
Fergus Falls	-26	85/70
Grand Marais	-19	73/62
Grand Rapids	-25	82/67
Hibbing	-31	82/68
International Falls AP	-35	82/67
Litchfield	-20	86/72
Little Falls	-26	86/70
Mankato	-16	86/72
Mpls/St. Paul AP	-17	88/72
Montivedeo	-19	88/73
Mora	-24	86/70
Morris	-23	86/72

New Ulm	-19	88/73
Owatonna	-19	86/72
Pequot Lakes	-31	85/68
Pipestone	-19	86/73
Redwood Falls	-19	88/73
Rochester AP	-19	85/72
Roseau	-31	84/72
St. Cloud AP	-24	86/71
Silver Bay	-28	82/66
Thief River Falls	-27	82/68
Tofte	-14	75/61
Virginia	-31	82/67
Warroad	-32	82/70
Wheaton	-23	86/72
Willmar	-22	86/72
Winona	-18	88/73
Worthington	-16	86/71

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.)
   The above table is the same as what is currently in the 2024 Commercial Energy Code which will go into effect in January of 2024. It is important to have the outdoor design conditions for uniformity in design and to help assure that HVAC systems will perform as expected. Option 2 clearly identifies which weather data conditions to use for the heating and cooling conditions as the data includes many different statistical data points.

2. Why is the proposed code change a reasonable solution?
   Maintains design conditions which are similar to what have used for many years in Minnesota.
   Provides a standard method of determining the design conditions.

   The 1% summer conditions track really close to our current Commercial Energy Code, and that is why I propose using those values for the summer conditions.

   The winter design condition gets a bit trickier. If you look at the various cities you do not necessarily see good correlation with our existing Conmmercial design conditions and either the 99.6 or mean average extreme value. When we have problems with mechanical systems (including damaging mechanical systems) it is typically during very cold conditions. That is why I would recommend the extreme mean value. From the overall selection of heating capacities, it will not make much difference.

   It is hard to convey the impact of very cold weather on mechanical systems or buildings in general, and these conditions can occur more often than a statistical analysis would indicate. When they do occur, it can cause some serious damage to mechanical and building systems. That is what I am trying to protect against. For

sure, -10.6F (the 99.6% value) for a Mpls design is too warm. The average mean temperature is a better number in my opinion.
I would also note that years ago winter design conditions were based on weather data from December, January and February. The new ASHRAE winter tabulated data is based on the full year – 8,760 hours. This can skew the winter design conditions.

3. What other factors should the TAG consider?
   None

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   No cost change

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.

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

4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.
   No

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

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
   Architects, Engineers, Construction Contractors, Building Officials, Owners and Inspectors.

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.
   None

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?
   There would be no uniformity of how heating and cooling loads are calculated.

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.
   None

***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: **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**

Jared Johnson, Phius Alliance Minnesota

Email address:

Telephone number:

Date: **August 29, 2023**

Model Code: **2021 IECC**

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

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

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.

   R401.2 Application
   Residential buildings shall comply with Section R401.2.5~~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 Phius 2021 standard.

R409.2.1 Projects shall comply with Phius 2021 Passive Building Standard, 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. A list of compliance features.
   ii. A Phius Design Certification letter.

2. **Prior to the issuance of a certificate of occupancy, the following item must be provided to the code official:**
   A Phius 2021 (or later) Final Certificate.

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

R409.3.1 Projects shall comply with the PHI Passive House 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. **<u>Prior to the issuance of a certificate of occupancy, the following item must be provided to the code official:</u>**
   <u>A copy of the final report submitted on a form that is approved by PHI to document compliance with the Passive House Standard.</u>

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

<u>Need and Reason</u>

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.**

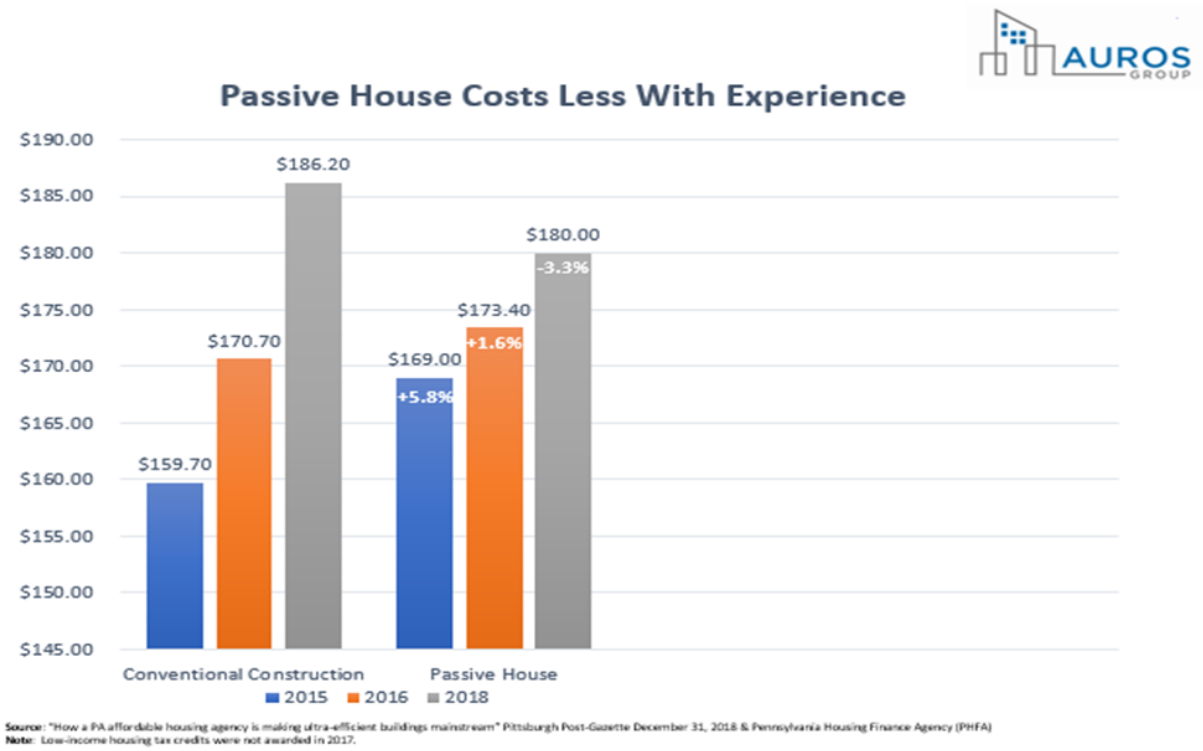
2. Experience from other jurisdictions indicates that first costs drop rapidly as architects, engineers, builders and raters become more familiar with the standard. As the Passive House standard does not require any unknown technologies, materials or building techniques, the main cost driver is unfamiliarity 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]**

[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.

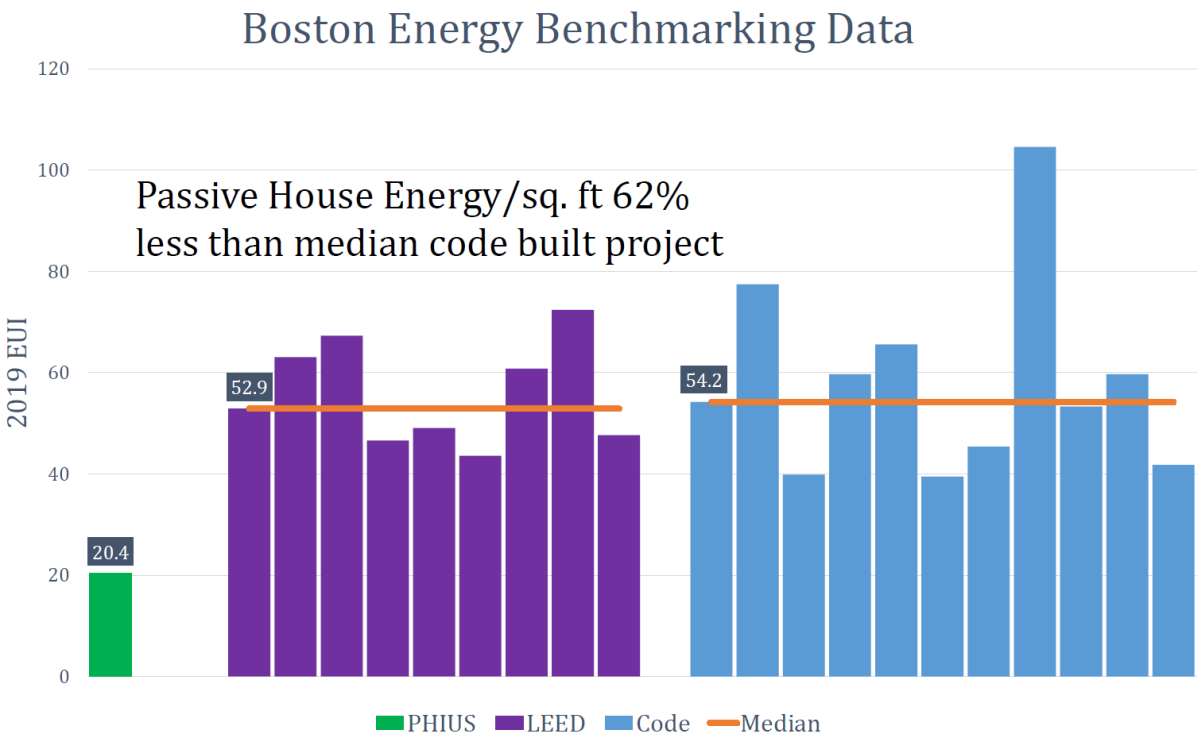
- **One study showed that the average multifamily Passive House building used 20.8 kBtu/sf/yr; as compared to 55.9 for multifamily building built to code (https://www.masscec.com/sites/default/files/documents/Scaling%20Up%20Passive%20House%20Multifamily_The%20 Massachusetts%20Story_20220824.pdf)**

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.

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: **Table R402.1.3**

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

Code or rule section to be changed: **Table R402.1.3**

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).

Table R402.1.3 Insulation Minimum R-Values and Fenestration Requirements by Component
(Dec. 2020 version)

☐ 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.

   Table R402.1.3 INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT (Dec. 2020 version)

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE	FLOOR R-VALUE
6	**0.30**	**0.55**	**NR**	**60**	***20+~~5ci~~ 10ci or 0+20ci***	**15/20**	**30**
7 and 8	**0.30**	**0.55**	**NR**	**60**	***20+~~5ci~~ 14ci or 0+20ci***	**19/21**	**38**

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.)

   In the Residential Chapter of the 2021 International Energy Conservation Code, the wall insulation requirement in Table R402.1.3 (for both Climate Zone 6 & 7) includes the option to use R20 + 5ci. R20 + 5ci is an insulation assembly that specifies R-20 for cavity insulation along with R-5 for exterior continuous insulation. This will likely pose moisture problems in Minnesota's climate zones.

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

   According to the study by the Building Science Corporation, BSD-163: Controlling Cold-Weather Condensation Using Insulation by John Straube, the exterior insulation R-value should be roughly 50% of the cavity insulation in Climate Zone 6. In the case of R20 + 10ci, the ratio of continuous to exterior insulation is 0.5 (10/20). In this case, there would be insufficient exterior insulation to protect against cold-weather condensation in the walls. By utilizing continuous insulation with a minimum R-value of 10, the optimal 50% cavity-to-continuous insulation ratio is achieved.

   In Climate Zone 7, the recommended ratio increases - the exterior insulation R-value should be approximately 70% of the cavity insulation due to colder winter temperatures. This results in a recommended continuous insulation R-value of 14 when utilizing R20 insulation within the cavity. (14/20 = 0.7)

3. What other factors should the TAG consider?

The additional exterior insulation would also generate substantial benefits to homeowners in added energy savings and thermal comfort.

Cost/Benefit Analysis

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

   Adding additional exterior insulation will slightly raise the cost. The difference between 1" of exterior insulation (R-5) and 2" (R-10) is about $19 per board (which is equivalent to 32 square feet). For a typical home, with roughly 1,800 square feet of wall area, the additional cost is about $1,050 per home.

   The difference between 1" of exterior insulation (R-5) and 3" (R-14) is about $40 per board. Under the same assumption, the typical cost increase would equal approximately $2,250 per home.

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.

   This cost must be weighed against both the additional energy savings as well as the saved cost from avoiding condensation within the wall cavity. The repair costs due to moisture problems in walls alone would strongly outweigh any additional cost.

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

   Individuals would bear the cost increase.

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

   There is no direct change in enforcement nor compliance costs with this proposal. Aligning the code with current building science recommendations could result in reduced litigation 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?

   Home buyers / renters, builders, trades, owners, manufacturers, architects

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.

Hygrothermal modeling of wall assemblies to determine condensation risk could be an option, but that would come with enforcement/compliance costs.

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?

   Homeowners will have to deal with wall insulation condensation issues and the associated costs of remedying those issues. Government entities may have to deal with legal challenges.

   The added energy savings of having a higher R-value wall will also bolster the cost-benefit outlook for this change. For the trades that install the CI, this is not a big shift in the practice from the baseline IECC 2021 code- it is simply installing a thicker board.

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: Ben Rabe

Date:

Email address:

Telephone number:

Model Code: 2012 IECC

Code or Rule Section: Residential Energy Code

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: R402.1

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.

Revise as follows: (Portions of table not shown remain unchanged.)

TABLE R402.1.2 (TABLE N1102.1.2) MAXIMUM ASSEMBLY U-FACTORS AND FENESTRATION REQUIREMENTS

CLIMATE ZONE	FENESTRATION *U*-FACTOR[f]	SKYLIGHT*U*-FACTOR	GLAZED FENESTRATION SHGC[d, e]
~~1~~	~~NR~~	~~0.75~~	~~0.25~~
~~2~~	~~0.40~~	~~0.65~~	~~0.25~~
~~3~~	~~0.32~~	~~0.55~~	~~0.25~~
~~4 except Marine~~	~~0.32~~	~~0.55~~	~~0.40~~
~~5 and Marine 4~~	~~0.30~~	~~0.55~~	~~NR~~
6	~~0.30~~ 0.28	~~0.55~~ 0.50	NR
7 ~~and 8~~	~~0.30~~ 0.27	~~0.55~~ 0.50	NR

For SI: 1 foot = 304.8 mm.

a. Nonfenestration U-factors shall be obtained from measurement, calculation or an approved source.
b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall U-factors shall not exceed 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.
c. In warm-humid locations as defined by Figure R301.1 and Table R301.1, the basement wall U-factor shall not exceed 0.360.
d. The fenestration U -factor column excludes skylights. The SHGC column applies to all glazed fenestration.
Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the
~~e. There are no SHGC requirements in the Marine Zone.~~
~~f~~. e. A maximum U-factor of ~~0.32~~ 0.30 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings
1. Above 4,000 feet in elevation above sea level, or
2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the International Residential Code.

Revise as follows: (Portions of table not shown remain unchanged.)

TABLE R402.1.3 (TABLE N1102.1.3) INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BYCOMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT*U*-FACTOR[b]	GLAZED FENESTRATION SHGC[b, ~~c~~]
~~1~~	~~NR~~	~~0.75~~	~~0.25~~
~~2~~	~~NR~~	~~0.75~~	~~0.25~~
~~3~~	~~0.40~~	~~0.65~~	~~0.25~~

~~4 except Marine~~	~~0.30~~	~~0.55~~	~~0.40~~
~~5 and Marine 4~~	~~0.30~~[i]	~~0.55~~	~~0.40~~
6	~~0.30~~ 0.28[i]	~~0.55~~ 0.50	NR
7 ~~and 8~~	~~0.30~~ 0.27 [i]	~~0.55~~ 0.50	NR

For SI: 1 foot = 304.8 mm.
NR = Not Required.
ci = continuous insulation.

a.*R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.
b.The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed ~~0.30~~ 0.28.
c."5ci or 13" means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.
d.R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs. as indicated in the table. The slab-edge insulation for heated slabs shall not be required to extend below the slab.
e.There are no SHGC requirements in the Marine Zone.
f.Basement wall insulation is not required in Warm Humid locations as defined by Figure R301.1 and Table R301.1.

g.The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, "13&5" means R-13 cavity insulation plus R-5 continuous insulation.
h.Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.
i.A maximum *U*-factor of ~~0.32~~ 0.30 shall apply in Climate Zones 3 through 8 to vertical fenestration products installed in buildings located either:

1. 1.Above 4,000 feet in elevation, or
2. 2.In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.

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.)

   This proposed change to the fenestration U-factor aligns the IECC with the ENERGY STAR Version 6.0 specification. The ENERGY STAR specification for windows in climate zones 5-8 has been in place since January 1, 2016. Products that meet the ENERGY STAR standard are widely available and have been for some time. In 2016 – the first year the ENERGY STAR Version 6.0 specification was in effect for all climate zones – ENERGY STAR windows already had an 83% market share.

   Replacing old windows with ENERGY STAR certified windows lowers household energy bills by an average of 12 percent nationwide. The Environmental Protection Agency performed a cost-effectiveness analysis of Version 6.0 and found it to be cost-effective. That analysis can be found here: http://www.energystar.gov/sites/default/files/ESWDS-ReviewOfCost_EffectivenessAnalysis.pdf EPA notes that manufacturers can meet the proposed specification for climate zones 5-8 using either double- or triple-pane windows. In general, EPA's data show that double-pane windows that meet the northern climate zone specification are cost effective for consumers. Feedback that EPA has received from stakeholders confirms that new glass technologies, improvements in frame performance, and/or better spacer performance can help many product lines meet the proposed Northern Zone criteria with double-pane windows.

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

   The cost of high efficiency window is negligible and saves homeowners in utility costs.

3. What other factors should the TAG consider?

   None

Cost/Benefit Analysis

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

   EPA estimates that the current market share of Energy Star version 6 products is very high: 86% for windows, 80% for hinged entry doors, 84% for patio doors, and 72% for skylights. This demonstrates that fenestration meeting the proposed requirements are ubiquitous and will not increase the cost of construction for the vast majority of homeowners. Nonetheless, for the minority of products that do not meet the Energy Star version 6 criteria, there will be a marginal increase in cost. EPA's analysis in 2012-14 of the change to the version 6 criteria "shows that average-cost products offer payback periods of less than 10 years in all but five cities and payback periods of less than seven years in half of the cities for which EPA performed energy savings analysis", and less for lower cost products. As the industry transitions to the Energy Star version 7 requirements, the cost and payback for these version 6 criteria will be even less. Additionally, there would be no increase in construction cost for locations meeting the altitude or windborne debris provisions in footnote f.

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.

   If there is any cost increase it will be recouped quickly in energy savings.

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

   Homeowner will be passed additional cost of high efficiency windows (if any additional cost).

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

   None, windows will be inspected as usual.

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.

Regulatory Analysis

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

Window manufacturers and installers.

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.

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?

   This proposal will save homeowner in energy costs for a negligible cost increase.

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.