



CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: [Mike Moore, Stator LLC, Representing the Home Ventilating Institute](#)

Date: [November 24, 2023](#)

Email address: mmoore@statorllc.com

Model Code: [Residential Energy](#)

Telephone number: [303.408.7015](tel:303.408.7015)

Code or Rule Section: [Chapter 2, R403.6](#)

Firm/Association affiliation, if any: [Stator LLC](#)

Code or rule section to be changed: [Chapter 2, R403.6](#)

Intended for Technical Advisory Group ("TAG"):

General Information

Yes **No**

- | | | |
|--|-------------------------------------|-------------------------------------|
| A. Is the proposed change unique to the State of Minnesota? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| B. Is the proposed change required due to climatic conditions of Minnesota? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| C. Will the proposed change encourage more uniform enforcement? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| D. Will the proposed change remedy a problem? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| E. Does the proposal delete a current Minnesota Rule, chapter amendment? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| F. Would this proposed change be appropriate through the ICC code development process? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Proposed Language

1. The proposed code change is meant to:

- change language contained the model code book? If so, list section(s).
[Chapter 2, R403.6](#)
- 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.

Adoption of this proposed code change, which is based on requirements in the 2021 IECC, is supported (but not required) by Sec. 29. Minnesota Statutes 2022, section 326B.106, subdivision 1 which states, "(d) Notwithstanding paragraph (c), the commissioner shall act on each new model residential energy code...The commissioner may adopt amendments prior to adoption of the new energy codes, as amended for use in Minnesota, to advance construction methods, technology, or materials, or, where necessary to protect the health, safety, and welfare of the public, or to improve the efficiency or use of a building."

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.
Please see the text at the end of this code change proposal form for proposed modifications.
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.
These proposed changes will only affect other sections of MN Rules where such sections reference MN 1322.0403.5.

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 proposed code changes would update MN's energy code's ventilation provisions to better align with the 2021 IECC-R while improving energy savings versus current requirements.
2. Why is the proposed code change a reasonable solution?
The proposed code changes have been vetted through the model code process, including the requirement to demonstrate cost effectiveness.
3. What other factors should the TAG consider?
Minnesota's energy code has long required balanced mechanical ventilation. The latest version of the model energy code (the 2024 IECC) requires heat or energy recovery ventilators (HERVs) in climate zones 6, 7, and 8 based on cost-effectiveness that has been demonstrated versus a reference exhaust-only continuous dwelling unit ventilation system (i.e., the lowest first-cost ventilation system permitted by the model code). Cost effectiveness is even better when comparing an HERV to a reference balanced ventilation system (i.e., the case in MN). Because MN is currently considering updating its energy code to the 2021 edition, HVI's proposal is to align MN's code with the 2021 IECC-R requirement to provide an HERV for dwelling units in climate zones 7 and 8 (note that only climate zone 7 is referenced in the proposal because there are no climate zone 8 locations in MN). If the TAG is willing to consider the 2024 IECC-R as a precedent for MN's energy code, HVI would support MN's alignment with the 2024 IECC to expand the HERV requirement for MN beyond climate zone 7, to also include climate zone 6.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
Where an HERV is not already being installed to meet MN's requirements for balanced ventilation, first-costs will increase. A rough estimate for the retail equipment price of a balanced system without heat or energy recovery is \$500. A rough estimate for the retail equipment price of an HERV is \$1000. Ducting and installation costs are expected to be approximately equal for the balanced system without heat recovery and the HERV.

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 2024 IECC-R is expanding the HERV requirements from climate zones 7 and 8 (as required by the 2021 IECC) to climate zones 6, 7, and 8, based on a cost-effectiveness analysis. The proposal that was submitted to the IECC resulting in expansion of HERV requirements to climate zone 6 showed ~\$100 in natural gas savings in the first year of operation, based on building energy simulations for a typical home and a natural gas cost of \$1.18/therm. These savings would support a simple payback of approximately 5 years or less in climate zone 6 (based on a \$500 difference in first costs between a balanced ventilation system without heat recovery and an HERV). Monetized energy savings in Minnesota's climate zone 7 would be higher due to higher indoor to outdoor temperature differentials versus those in climate zone 6, resulting in an even shorter payback.
3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
Homebuyers would bear the initial cost of the increase. However, financing the \$500 incremental cost of the HERV equipment over a 30-year mortgage at 7.5% would result in an annual incremental difference in the mortgage of \$41.95. This would be more than offset by the ~\$100 in heating energy savings attributed to the HERV, making homebuyers cash-positive in year 1.
4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.
None are anticipated.
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.
The cost of complying is not expected to exceed the \$25,000 threshold.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Homebuilders, contractors, and homebuyers could all be affected by this proposed code change.
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.
An alternative to requiring HERVs in Minnesota's climate zone 7 (and potentially 6) would be to maintain the current requirement for balanced ventilation. The proposed change is preferable to the alternative because homebuyers should be cash positive in each year of HERV ownership.
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?
If MN does not adopt this code change proposal, homebuyers may not realize the monetized energy savings associated with specifying an HERV versus a balanced ventilation system, potentially resulting in less available cash that could otherwise be invested or spent by homebuyers in their communities.
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 be considered by the TAG.

**HVI Proposal
November 27, 2023**

Modify Chapter 4 of the 2021 IECC-R as follows:

R403.6 Mechanical ventilation. Buildings and dwelling units shall be provided with mechanical ventilation that complies with the requirements of the *International Residential Code* or *International Mechanical Code*, as applicable, or with other *approved* means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

R403.6.1 Heat or energy recovery ventilation. Dwelling units shall be provided with a heat recovery ventilation system (HRV) or energy recovery ventilation system (ERV) in Climate Zones 7 and 8. The system shall be balanced with a minimum sensible heat recovery efficiency of not less than 65 percent at 32°F (0°C) at an airflow greater than or equal to the continuous ventilation rate design airflow. The sensible recovery efficiency shall be determined from a listed value or from interpolation of listed values. An HRV or an ERV shall have either:

1. A sensible recovery efficiency rating developed in accordance with HVI Publication 920 at -13°F (25°C) cold weather test; or
2. Compliance documentation prepared by a registered professional engineer, stating that the unit is designed to provide outdoor air at an outdoor temperature of -13°F (-25°C).

R403.6.2 Whole-dwelling mechanical ventilation system fan efficacy. Fans used to provide whole-dwelling mechanical ventilation shall meet the efficacy requirements of Table R403.6.2 at one or more rating points. Fans shall be tested in accordance with ~~HVI 916~~ the test procedure referenced in Table R403.6.2 and listed. The airflow shall be reported in the product listing or on the label. Fan efficacy shall be reported in the product listing or shall be derived from the input power and airflow values reported in the product listing or on the label. Fan efficacy for fully ducted HRV, ERV, balanced, and in-line fans shall be determined at a static pressure of not less than 0.2 inch w.c. (49.85 Pa). Fan efficacy for ducted range hoods, bathroom and utility room fans shall be determined at a static pressure of not less than 0.1 inch w.c. (24.91 Pa).

TABLE R403.6.2 WHOLE-DWELLING MECHANICAL VENTILATION SYSTEM FAN EFFICACY

FAN LOCATION	AIRFLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)
HRV, ERV	Any	1.2 cfm/watt
In-line supply or exhaust fan	Any	3.8 cfm/watt
Other exhaust fan	< 90	2.8 cfm/watt
Other exhaust fan	≥ 90	3.5 cfm/watt
Air-handler that is integrated to tested and listed HVAC equipment	Any	1.2 cfm/watt

For SI: 1 cubic foot per minute = 28.3 L/min.

a. Design outdoor airflow rate/watts of fan used.

<u>FAN TYPE</u>	<u>AIRFLOW RATE (CFM)</u>	<u>MINIMUM EFFICACY (CFM/W)</u>	<u>TEST PROCEDURE</u>
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Commented [MM1]: This sentence is from PCD2 of the 2024 IECC-R. It clarifies how the SRE is to be determined without changing the SRE requirement established in the 2021 IECC-R.

Commented [MM2]: This table is sourced from the latest draft of the 2024 IECC-R (Public Comment Draft 2: <https://www.iccsafe.org/wp-content/uploads/IECC-RE-PCD2.pdf>). The values and content are essentially equivalent to the 2021 IECC-R version of the table, with the exception that other exhaust fans exceeding 200 cfm are required to have a minimum fan efficacy of 4.0 cfm/W (i.e., aligned with ENERGY STAR, like the rest of the table). The 2024 IECC-R version also improves the layout of the table.

<u>HRV or ERV</u>	<u>Any</u>	<u>1.2^a</u>	<u>CAN/CSA C439</u>
<u>Balanced ventilation system without heat or energy recovery</u>	<u>Any</u>	<u>1.2^a</u>	<u>ASHRAE 51 (ANSI/AMCA Standard 210)</u>
<u>Range hood</u>	<u>Any</u>	<u>2.8</u>	
<u>In-line supply or exhaust fan</u>	<u>Any</u>	<u>3.8</u>	
<u>Other exhaust fan</u>	<u><90</u>	<u>2.8</u>	
	<u>> 90 and < 200</u>	<u>3.5</u>	
	<u>≥200</u>	<u>4.0</u>	
<u>Air-handling unit that is integrated to tested and listed HVAC equipment</u>	<u>Any</u>	<u>1.2</u>	<u>Outdoor airflow as specified. Air-handling unit fan power determined in accordance with the applicable US Department of Energy Code of Federal Regulations DOE10 CFR 430, or other approved test method.</u>

For SI: 1 cubic foot per minute = 0.47 L/s.

a. For balanced ventilation systems, HRVs, and ERVs, determine the efficacy as the outdoor airflow divided by the total fan power.



CODE CHANGE PROPOSAL FORM
(Must be submitted electronically)

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

Date: **August 29, 2023**

Marcy Conrad Nutt, Passive House Minnesota

Model Code: **2021 IECC**

Email address:

Telephone number:

Code or Rule Section: **R403.6.1**

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

Code or rule section to be changed: **R403.6.1**

Intended for Technical Advisory Group ("TAG"):

General Information

Yes No

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

Proposed Language

1. The proposed code change is meant to:

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

R403.6.1 Heat or Energy Recovery Ventilation

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 ~~striketrough~~ words proposed for deletion. Include the entire code (sub) section or rule subpart that contains your proposed changes.

R403.6.1 Heat or energy recovery ventilation

Dwelling units shall be provided with a heat recovery or energy recovery ventilation system in Climate Zones 6-8. The system shall be balanced with a minimum sensible heat recovery efficiency of 65 percent at 32°F (0°C) at a flow greater than or equal to the design airflow.

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.

This change would affect MN Amendment 1322.0403 Section R403, Systems. Subpart 2. R403.5.

Our intent is to build off the 2021 IECC. We want to avoid addressing the current Minnesota amendments to the energy code.

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.)

Fresh air is a requirement and best practice in all climate zones and during all seasons in Minnesota. R402.4.1.2 requires building envelopes to become more airtight, so buildings must rely less on air leakage than in times past.

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

The combination of air tightness requirements with balanced, efficient ventilation requirements go hand-in-hand, to avoid sick-building syndrome.

3. What other factors should the TAG consider?

Energy or Heat recovery ventilation allows fresh, filtered air to be brought into homes at all times of the year, while reducing the costs of bringing that air to indoor room temperature.

Cost/Benefit Analysis

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

It will increase costs, depending on the prices of the ERV and HRV units. This price will inevitably come down as adoption is more widespread. As of today's date, the RenewAire EV90 model is currently retailing at \$920 per unit. Combined with installation, the total cost comes to somewhere in the \$1500-\$2000 range.

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 will be an immediate offset cost in that purchase and installation of bathroom/kitchen exhaust fans will no longer be needed. The national average cost to install a bathroom fan is \$383 with equipment and installation. The energy savings gained from not having to recondition outside air in the frigid Minnesota winters will also help to offset those initial costs.

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.

There should not be extra compliance costs, as

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?

Building owners, builders, mechanical contractors

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.

We have heard the argument that folks can just open a window for fresh air. "Opening a window" is only a viable ventilation solution during the brief shoulder seasons in Minnesota, when desired indoor conditions and outdoor conditions are similar. Most of the year, opening a window comes with high costs for heating/cooling, comfort and/or air quality.

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?

Buildings with air-tight envelopes will require proper balanced ventilation in order to prevent sick-building syndrome. Not maintaining balanced ventilation in the winter will also be a source of energy loss due to the constant reconditioning of outside air.

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 not aware of any at this time.

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



CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Patrick Murray

Date: 9/18/23

Email address: Pmurray@j-berd.com

Model Code: 2021 IECC

Telephone number: (320) 656-0847

Code or Rule Section: R403.6.1

Firm/Association affiliation, if any: J-Berd Mechanical Contractors Inc.

Code or rule section to be changed: R403.6.1

Intended for Technical Advisory Group ("TAG"): Residential Energy Code Technical Advisory Group (TAG)

General Information

Yes No

- | | | |
|--|-------------------------------------|-------------------------------------|
| A. Is the proposed change unique to the State of Minnesota? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| B. Is the proposed change required due to climatic conditions of Minnesota? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| C. Will the proposed change encourage more uniform enforcement? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| D. Will the proposed change remedy a problem? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| E. Does the proposal delete a current Minnesota Rule, chapter amendment? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| F. Would this proposed change be appropriate through the ICC code development process? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

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).
R403.6.1

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.

~~**R403.6.1 Heat or energy recovery ventilation.** Dwelling units shall be provided with a heat recovery or energy recovery ventilation system in Climate Zones 7 and 8. The system shall be balanced with a minimum sensible heat recovery efficiency of 65 percent at 32 °F (0°C) at a flow greater than or equal to the design airflow.~~

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.)
Undue burden of cost. For Zone 7, Duluth MN, a typical 1-bedroom apartment will have a 30-year payback period, a 2-bedroom apartment will have a 23-year payback period, and 3-bedroom apartment will have a 17-year payback period. The average life expectancy of a residential HRV is 15 years.
2. Why is the proposed code change a reasonable solution?
In residential buildings, including multifamily, adequate ventilation is not an issue. Adding this type of equipment only adds cost with no increased benefit of ventilation.
3. What other factors should the TAG consider?
ERV/HRVs are notorious for being neglected. Without proper maintenance the life expectancy of the unit significantly decreases. Filters and cores that are not cleaned regularly could cause more harm than good when it comes to providing fresh air.
Additionally, lower income people generally live in apartments (multifamily residences). Even a small increase in housing costs is very significant for them.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
Decrease cost. Adding an HRV to a single multifamily dwelling unit will cost about \$2,500.
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.
Reduced cost in code enforcement. Fewer pieces of equipment to install, balance, and inspect for code compliance.

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.
Yes, if a multifamily building is constructed in one of these locations the additional cost to construct will exceed \$25,000. Many multifamily buildings that are 30-50 units are built, owned or operated by small businesses or individuals. Climate zone 7 in MN consists of mostly small towns with a few exceptions. Small towns get small apartments i.e. 30-50 unit buildings.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, engineers, general contractors, mechanical contractors, electrical contractors, plan reviewers, inspectors, energy modelers, tenants, homeowners, developers, and equipment manufacturers.
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.
Fuel and power prices can change payback period. If fuel costs increase HRV/ERV have a better pay back. Additionally, a higher flow rate of outside improves the payback of these systems.

An alternative to complete removal could be exceptions based on payback periods, outdoor air requirements, number of bedrooms, or square footage of a dwelling unit. A generous analysis to an HRV shows that it could pay for itself with the right conditions when used in a dwelling that is 1500+ sqft and 3 bedrooms or more. For code uniformity and simplification of enforcement it seems best to remove the requirement all together.
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?
Ultimately increased construction costs get passed on to the tenants. The tenants will bear the majority of the burden of these costs. Specific equipment manufacturers will sell less equipment.
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.



CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Ben Rabe

Date: 8/16/23

Email address:

Model Code: 2021 IECC

Telephone number:

Code or Rule Section: Residential Energy Code

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: R404.4

Intended for Technical Advisory Group ("TAG"):

General Information

Yes **No**

- | | | |
|--|-------------------------------------|-------------------------------------|
| A. Is the proposed change unique to the State of Minnesota? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| B. Is the proposed change required due to climatic conditions of Minnesota? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| C. Will the proposed change encourage more uniform enforcement? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| D. Will the proposed change remedy a problem? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| E. Does the proposal delete a current Minnesota Rule, chapter amendment? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| F. Would this proposed change be appropriate through the ICC code development process? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Proposed Language

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- 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, it does not, however, a requirement for EV charging in commercial and multifamily buildings passed during the 2023 legislative session.

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

Add new definitions as follows:

AUTOMOBILE PARKING SPACE. A space within a building or private or public parking lot, exclusive of driveways, ramps, columns, office and work areas, for the parking of an automobile.

ELECTRIC VEHICLE (EV). An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, and electric motorcycles, primarily powered by an electric motor that draws current from a building electrical service, EVSE, a rechargeable storage battery, a fuel cell, a photovoltaic array, or another source of electric current.

ELECTRIC VEHICLE READY SPACE (EV READY SPACE). An automobile parking space that is provided with a branch circuit and either an outlet, junction box or receptacle, that will support an installed EVSE.

Add new text as follows:

R404.4 Electric Vehicle Power Transfer Infrastructure. New automobile parking spaces for one- and two-family dwellings and townhouses shall be provided in accordance with this section. All other new *residential* parking facilities shall be provided with electric vehicle power transfer infrastructure in accordance with Section 8.9 of the Minnesota Commercial Energy Code.

R404.4.1 Quantity. Each *dwelling unit* with a designated attached or detached garage or other onsite private parking provided adjacent to the *dwelling unit* shall be provided with one EV ready space.

R404.4.2 EV Ready Spaces. Each branch circuit serving *EV ready spaces* used to comply with Section R404.4 shall comply with all of the following:

5. Terminate at an outlet or enclosure located within 3 feet (914 mm) of each *EV ready space* it serves.
6. Have a minimum circuit capacity of 9.6 kVA (or 40A at 240V).
7. The panelboard or other electrical distribution equipment directory shall designate the branch circuit as “For electric vehicle supply equipment (EVSE)” and the outlet or enclosure shall be marked “For electric vehicle supply equipment (EVSE).”
8. Where a circuit is shared or managed, it shall be in accordance with NFPA 70.

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.)

Preparing our homes for safe and convenient EV charging infrastructure is critical to deployment of electric vehicles. The transportation sector is the single largest source of GHG emissions in the nation. Near complete electrification of the transportation sector is necessary to achieve the GHG emission reductions needed to avoid the worst effects of climate change.

Electric vehicle sales increased by 80 percent from 2017 to 2018, and is expected to grow from 1 million vehicles at the end of 2018 to 18.7 million by 2030. As newer EVs with longer drive ranges enter the market, the older, shorter drive range EVs will move to the used vehicle market, and become readily accessible to a secondary market for which the accessibility of EV charging infrastructure at home and at work will be critical.

As electric vehicles (EVs) become more prevalent (as noted in reason statement) they will provide a valuable resource to the electric grid. EVs will essentially become mobile batteries that can help absorb load at renewable peak generation, or supply buildings to help smooth load peak demand or during emergency events. Beyond their contribution to buildings and the grid, EVs will remove another direct combustion source from climate the equation, helping prevent the worst impacts of climate change. Providing charging infrastructure to new residential buildings will help speed the EV transition.

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

This proposal will prepare homeowners for charging the large influx of electric vehicles predicted over the oncoming years.

3. What other factors should the TAG consider?

Cost benefit of installing electric vehicle charging infrastructure during new construction compared to adding via retrofit later.

Cost/Benefit Analysis

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

This code will only nominally increase costs.

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.

Research by NBI and partners indicate that the cost of adding a dedicated branch circuit to parking in a single-family home to create an EV Ready space would come to \$49 in materials – for 2-pole breaker, wiring, junction box and receptacle – and \$65 in labor – ½ hour for an electrician already on-site during new construction – for a total incremental cost of \$114.

Retrofit costs are highly variable, and can range from \$400-1700 (not including the cost of the charger itself) according to homeguide.com.

Neither of these costs include the cost of panel upgrades. Upsizing during new construction incurs minimal costs. All of the costs of a panel upgrade during new construction (panel, connection fees, potential wiring upgrades) are also part of the retrofit cost. If an EV space necessitates a service retrofit, the costs increase substantially with the cost of upgrading to a 200A service, averaging from \$1300 to \$2500 (also according to homeguide.com).

This change will also allow residents to purchase an Electric Vehicle which will save them money. According to AAA, an electric vehicle (EV) will save roughly \$1,039 per year in total fuel and maintenance costs compared to a comparable gasoline vehicle. Although Electric Vehicles are often more expensive than gasoline powered vehicles, Bloomberg New Energy Finance on battery costs suggests EVs could reach upfront cost parity with gasoline vehicles by the early-to-mid 2020s.

A small investment during new construction will save homeowners substantial future costs. Given the market trends identified in the reason statement, it is not a question of whether homes will need EV charging infrastructure, but when. Failing to adopt this proposal will be saddling future homeowners with substantially higher costs.

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

Cost will be passed to homeowner and will save cost over retrofit.

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

This system can be inspected during normal electrical inspection and will increase the cost of compliance.

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, see cost estimates above.

Regulatory Analysis

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

This proposed code change would require additional electrical work.

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.

I cannot think of another way to achieve the goals of this proposal.

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 homeowners the burden of upgrading their homes to provide electrical vehicle charging.

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, although a legislation passed in the 2023 Minnesota legislative session requiring adding electric vehicle charging to the commercial building code.

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



CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Ben Rabe

Date: August 23, 2023

Email address:

Model Code: 2021 IECC

Telephone number:

Code or Rule Section: Residential Energy Code

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: R404.4

Intended for Technical Advisory Group ("TAG"):

General Information

Yes **No**

- | | | |
|--|-------------------------------------|-------------------------------------|
| A. Is the proposed change unique to the State of Minnesota? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| B. Is the proposed change required due to climatic conditions of Minnesota? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| C. Will the proposed change encourage more uniform enforcement? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| D. Will the proposed change remedy a problem? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| E. Does the proposal delete a current Minnesota Rule, chapter amendment? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| F. Would this proposed change be appropriate through the ICC code development process? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

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, however solar ready homes will help the state meet the statutory goal of 100 percent clean energy by 2040.

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.

**SECTION R103
CONSTRUCTION DOCUMENTS**

Add new text as follows:

R103.2.3 Solar-ready system. The construction documents shall provide details for dedicated roof area, structural design for roof dead and live load, and routing of conduit or pre-wiring from *solar-ready zone* to electrical service panel or plumbing from *solar-ready zone* to *service water heating system* for the *solar-ready zone* shall be represented on the construction documents.

**SECTION R105
INSPECTIONS**

Revise text as follows:

R105.2.3 Plumbing rough-in inspection. Inspections at plumbing rough-in shall verify compliance as required by the code and approved plans and specifications as to types of insulation and corresponding R-values and protection and required controls. Where the *solar-ready zone* is installed for solar water heating, inspections shall verify pathways for routing of plumbing from *solar-ready zone* to service water heating system.

Add new text as follows:

R105.2.5 Electrical rough-in inspection. Inspections at electrical rough-in shall verify compliance as required by the code and the approved plans and specifications as to the locations, distribution, and capacity of the electrical system. Where the *solar-ready zone* is installed for electricity generation, inspections shall verify conduit or pre-wiring from *solar-ready zone* to electrical panel.

Revise numbering as follows:

~~R105.2.5~~ **R105.2.6 Final inspection.**

**SECTION R202
GENERAL DEFINITIONS**

Add new definition as follows:

SOLAR-READY ZONE. A section or sections of the roof or building overhang designated and reserved for the future installation of a solar photovoltaic or solar thermal system.

**SECTION R401
GENERAL**

Revise text as follows:

R401.3 Certificate. A permanent certificate shall be completed by the builder or other approved party and posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certification shall indicate the following:

8. Where a *solar-ready zone* is provided, the certificate shall indicate the location, dimensions, and capacity reserved on the electrical service panel.

**SECTION R404
ELECTRICAL POWER AND LIGHTING SYSTEMS**

Add new text as follows:

R404.4 Renewable energy infrastructure. The building shall comply with the requirements of R404.4.1 or R404.4.2

R404.4.1 One- and two- family dwellings and townhouses. One- and two-family dwellings and townhouses shall comply with Sections R404.4.1.1 through R404.4.1.4.

Exceptions:

1. A building with a permanently installed on-site renewable energy system.
2. A building with a solar-ready zone area that is less than 600 square feet (55 m²) of roof area oriented between 110 degrees and 270 degrees of true north.
3. A building with a solar-ready zone area that is shaded for more than 70 percent of daylight hours annually.

R404.4.1.1 Solar-ready zone area. The total area of the *solar-ready zone* shall not be less than 300 square feet (28 m²) and shall be composed of areas not less than 5.5 feet (1676 mm) in width and not less than 80 square feet (7.4 m²) exclusive of access or set back areas as required by the International Fire Code.

Exception: Townhouses three stories or less in height above grade plane and with a total floor area less than or equal to 2,000 square feet (186 m²) per dwelling shall be permitted to have a solar-ready zone area of not less than 150 square feet (14 m²).

R404.4.1.2 Obstructions. *Solar-ready zones* shall be free from obstructions, including but not limited to vents, chimneys, and roof-mounted equipment.

R404.4.1.3 Electrical service reserved space. The main electrical service panel shall have a reserved space to allow installation of a dual pole circuit breaker for future solar electric installation and shall be labeled "For Future Solar Electric." The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location.

R404.4.1.4 Electrical interconnection. An electrical junction box shall be installed within 24 inches (610 mm) of the main electrical service panel and shall be connected to a capped roof penetration sleeve or a location in the attic that is within 3 feet (914 mm) of the *solar ready zone* by one of the following:

1. Minimum ¾-inch nonflexible conduit
2. Minimum #10 Metal copper 3-wire

Where the interconnection terminates in the attic, location shall be no less than 12" (35 mm) above ceiling insulation. Both ends of the interconnection shall be labeled "For Future Solar Electric".

R404.4.2 Group R occupancies. Buildings in Group R-2, R-3 and R-4 shall comply with Section C405.13.

**SECTION R405
TOTAL BUILDING PERFORMANCE**

Revise table as follows:

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls

R404.4	Renewable energy infrastructure
--------	---------------------------------

The mandatory requirements table has been modified to include the new requirements for renewable energy as mandatory elements of the code amendments.

**SECTION R406
ENERGY RATING INDEX COMPLIANCE ALTERNATIVE**

Revise table as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
<u>R404.4</u>	<u>Renewable energy infrastructure</u>
R406.3	Building thermal envelope

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.)

Minnesota's new 2023 climate legislation plans out a goal for a 100% carbon-free electricity standard by 2040. In order to meet this goal, there will need to be a huge increase in renewable energy installation. Having solar ready homes vastly decreases the cost of adding solar to residential buildings. According to a recent study entitled "A New Roadmap for the Lowest Cost Grid", the least expensive grid involves a large amount of centralized renewables and a large amount of distributed renewables located on the building site. More renewables placed on site enables more clean utility-scale renewables to be deployed efficiently. It is therefore crucial for new residential buildings to be solar-ready so that the U.S. can reach its 100% carbon-free electricity goal by 2035 in the most cost-effective manner. Installing renewables on-site will also allow homeowners to economically benefit from the transition towards a low-carbon economy and benefit from additional resiliency during disruptions in centrally supplied power.

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

Installing the infrastructure for a future solar installation is a cost-effective way to provide a glidepath to carbon neutrality for homeowners.

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.

Recent analysis by NBI and partners using cost data from RSMeans indicates that adding the infrastructure to make a home solar ready would cost \$216 or \$0.09 per square foot for a typical home at the time of construction

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.

Installing solar ready infrastructure during construction will vastly decrease the cost of solar installation later.

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

Cost will be passed to homeowner and will save cost over retrofit.

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

Solar ready infrastructure can be inspected during the regular inspection schedule.

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?

This proposed code change would require additional electrical work.

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.

I cannot think of another way to achieve the goals of this proposal.

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 homeowners the burden of upgrading electrical capacity and installing conduit before adding a photovoltaic solar system.

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.



CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Jonny Kocher

Date: 8/29/23

Email address:

Model Code: IECC 2021

Telephone number:

Code or Rule Section: Res Energy Code

Firm/Association affiliation, if any: RMI

Code or rule section to be changed: R404.4

Intended for Technical Advisory Group ("TAG"): Residential Energy

General Information

Yes **No**

- | | | |
|--|-------------------------------------|-------------------------------------|
| A. Is the proposed change unique to the State of Minnesota? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| B. Is the proposed change required due to climatic conditions of Minnesota? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| C. Will the proposed change encourage more uniform enforcement? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| D. Will the proposed change remedy a problem? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| E. Does the proposal delete a current Minnesota Rule, chapter amendment? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| F. Would this proposed change be appropriate through the ICC code development process? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Proposed Language

- 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.
- Is this proposed code change required by Minnesota Statute? If so, please provide the citation. [In order to reach Minnesota's climate goals, the State developed the Minnesota Climate Action Framework. Under the Smarter Buildings and Construction initiative, one of the suggested state action steps included: "Develop clear options for building owners and families to make informed environmentally preferable selections for their building materials and products, including appliances such as furnaces, water heaters, and cooktops/ovens."¹ Creating readiness requirements will enable building owners to make these informed selections in the future without it being prohibitively expensive.](#)

¹ <https://climate.state.mn.us/sites/climate-action/files/Climate%20Action%20Framework.pdf>, page 19

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.

R404.4 Electric readiness. Water heaters, space heaters, household clothes dryers, and cooking appliances that use fuel gas or liquid fuel shall comply with Sections R404.4.1 through R404.4.5.

R404.4.1 Cooking appliances. A dedicated branch circuit outlet with a rating not less than 240-volts, 40-amperes shall be installed and terminate within three feet of conventional cooking tops, conventional ovens or cooking appliances combining both.

Exception: Cooking appliances not installed in an individual dwelling unit.

R404.4.2 Household Clothes Dryers. A dedicated branch circuit with a rating not less than 240-volts, 30-amperes shall be installed and terminate within three feet (304 mm) of each household clothes dryer.

Exception: Clothes dryers not installed in an individual dwelling unit.

R404.4.3 Space heaters. A dedicated branch circuit with a rating not less than either 240-volts, 30-amperes or 120V, 20-amperes shall be installed and terminate within three feet (304 mm) of each space heater.

Exception: Space heaters serving multiple dwelling units in a R-2 occupancy

R404.4.4 Water heaters. A dedicated branch circuit with a rating not less than either 240-volts, 30-amperes or 120V, 20-amperes shall be installed and terminate within three feet (304 mm) of each water heater.

Exception: Water heaters serving multiple dwelling units in a R-2 occupancy

R404.4.4.1 Water heater space. An indoor space that is at least three feet by three feet by seven feet high shall be available surrounding or within 3 feet of the installed water heater.

Exception: The water heater space requirement does not need to be met where a heat pump water heater or tankless water heater is installed.

R404.4.5 Electrification-ready circuits. The unused conductors required by Sections R404.4.1 through R404.4.4 shall be labeled with the word "spare." Space shall be reserved in the electrical panel in which the branch circuit originates for the installation of an overcurrent device. Capacity for the circuits required by Sections R404.4.1 through R404.4.4 shall be included in the load calculations of the original installation.

**TABLE R405.2
REQUIREMENTS FOR SIMULATED BUILDING PERFORMANCE**

SECTION	TITLE
<u>R404.4</u>	<u>Electric readiness</u>

**TABLE R406.2
REQUIREMENTS FOR ENERGY RATING INDEX**

SECTION	TITLE
<u>R404.4</u>	<u>Electric readiness</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

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.)
Currently it is very expensive for consumers to switch from furnaces, gas water heaters, gas stoves and gas dryers to their electric alternatives. The expensive cost is one of the primary barriers in the fuel switching needed to reach the state and countries climate goals.
2. Why is the proposed code change a reasonable solution?
This proposal enhances customer choice by making it easy for homeowners to choose either electric or gas appliances and water heating equipment. By ensuring that a home built with gas or propane can easily accommodate future electric appliances and equipment, this proposal protects homeowners from future costs, should natural gas become less affordable or even unavailable over the life of the building. As the electric grid becomes cleaner, and high-efficiency electric heat pump technology increasingly offers utility bill and pollution reduction benefits over gas, more customers may want to transition from natural gas to electric space and water heating. Federal, state, and local environmental and public health policies may also encourage, or even require the transition in some areas over the life of the building. Electric-ready requirements will protect customers from potential high retrofit costs.
3. What other factors should the TAG consider?
According to RMI's State Climate Policy scorecard, Minnesota's building sector is not on track to reach a 27% reduction in GHG emissions by 2030 from a 2005 baseline, the emissions target benchmark set during the Paris Climate Agreement.² To reach this goal, Minnesota will need to reduce its natural gas usage by 32% from today's levels and move towards selling only all electric appliances by 2030. This policy is fully aligned with reaching that goal.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
The cost will increase upfront costs. Sources from the New Buildings Institute, Group14 Engineering and the California Energy Commission estimate that the upfront costs of electric readiness ranges between \$500 to \$1,010.^{3,4,5}
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 cost of meeting these electric-ready requirements when the house is being built, walls are open, and the trades are already on-site, is marginal. In comparison, the cost of retrofitting a building for these requirements can be an order of magnitude higher and act as a barrier for the homeowner to choose electric appliances.

² RMI State Score Card, 2022, <https://statescorecard.rmi.org/mn>

³ NBI, Cost of Decarbonization Code, 2022, page 26

<https://newbuildings.org/wp-content/uploads/2022/04/BuildingDecarbCostStudy.pdf>

⁴ California Energy Commission, 2022, page 2-3

<https://efiling.energy.ca.gov/GetDocument.aspx?tn=238049&DocumentContentId=71300>

⁵ Group 14, 2020, page 12

<https://www.communityenergyinc.com/wp-content/uploads/Building-Electrification-Study-Group14-2020-11.09.pdf>

An electrification engineering study by Group 14 reports that the electrical modifications needed to install a HP heating system and a HPWH is \$2,100 as a retrofit compared to \$500 as an original install for a 3,000 sq ft single family home. The California Energy Commission cost study found that the retrofit cost to add electrical infrastructure for water heating, space heating, dryers and cooking appliances after construction is at least \$2,560 (likely higher), compared to the upfront cost of around \$1,010 to do it during construction. These studies indicate that it is about 3-4 times less expensive to do this work during construction. Not making new buildings electric-ready would leave homeowners exposed to potentially high retrofit costs in the future and will greatly inhibit customer choice.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
Construction contractors and developers will bear most of the costs. The substantial cost savings for reduced costs of future retrofits will benefit homeowners.
4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.
There will be a negligible impact in inspection and enforcement cost when code inspectors ensure this portion of the code is complied with.
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 will not impact businesses or cities. This is a residential code proposal.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Electrical contractors will have slightly more work because of this proposal
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.
This is the only feasible option to cost effectively prepare homes for future electrification required to reach the state's climate action goals. The main argument will be around the upfront cost, which I have already addressed by showing that this will save thousands of dollars of future retrofit 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?
If we continue to build with fossil fuels in new buildings without preparing for the future energy transition, we will simply not meet our climate goals, which is unthinkable.
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.
The Inflation Reduction Act currently has many incentives and tax credits for installing new clean energy technologies. By preparing for electric ready homes, consumers whose appliances break between now and 2031 will be able to easily take advantage of these tax credits. Ideally, future administrations will continue to extend these incentives and tax credits.

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



CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Ben Rabe

Date: 8/22/23

Email address:

Model Code: 2021 IECC

Telephone number:

Code or Rule Section: Residential Energy Code

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: R404.4

Intended for Technical Advisory Group ("TAG"):

General Information

Yes **No**

- | | | |
|--|-------------------------------------|-------------------------------------|
| A. Is the proposed change unique to the State of Minnesota? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| B. Is the proposed change required due to climatic conditions of Minnesota? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| C. Will the proposed change encourage more uniform enforcement? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| D. Will the proposed change remedy a problem? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| E. Does the proposal delete a current Minnesota Rule, chapter amendment? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| F. Would this proposed change be appropriate through the ICC code development process? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

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, but it would aid the state in meeting our state and local climate goals.

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

Add new text as follows:

R103.2.4 Electrification system. The construction documents shall provide details for additional electric infrastructure, including branch circuits, conduit, or pre-wiring, and panel capacity in compliance with the provisions of this code.

Add new text as follows:

R105.2.5 Electrical rough-in inspection. Inspections at electrical rough-in shall verify compliance as required by the code and the approved plans and specifications as to the locations, distribution, and capacity of the electrical system.

Revise numbering as follows:

R105.2.5 R105.2.6 Final inspection.

Add new definitions as follows:

ALL-ELECTRIC BUILDING. A building that contains no combustion equipment, or plumbing for combustion equipment, installed within the building, or building site.

APPLIANCE. A device or apparatus that is manufactured and designed to utilize energy and for which this code provides specific requirements.

COMBUSTION EQUIPMENT. Any equipment or appliance used for space heating, service water heating, cooking, clothes drying, or lighting that uses fuel gas or fuel oil.

EQUIPMENT. Piping, ducts, vents, control devices and other components of systems other than appliances that are permanently installed and integrated to provide control of environmental conditions for buildings. This definition shall also include other systems specifically regulated in this code.

FUEL GAS. A natural gas, manufactured gas, liquified petroleum gas or a mixture of these.

FUEL OIL. Kerosene or any hydrocarbon oil having a flash point not less than 100°F (38°C).

MIXED-FUEL BUILDING. A building that contains combustion equipment or includes piping for combustion equipment.

Revise text as follows:

R401.2.5 Additional energy efficiency. This section establishes additional requirements applicable to all compliance approaches to achieve additional energy efficiency.

1. For all-electric buildings complying with Section R401.2.1, one of the additional efficiency package options shall be installed according to Section R408.2.

2. For mixed-fuel buildings complying with Section R401.2.1, the building shall be required to install either R408.2.1 or R408.2.5 of the additional efficiency package

options, and any two of R408.2.2, R408.2.3, or R408.2.4 of the additional efficiency package options.

23. For buildings complying with Section R401.2.2, the building shall meet one of the following:
- 23.1. *All-electric buildings* shall have ~~One~~ one of the additional efficiency package options in Section R408.2 shall be installed without including such measures in the proposed design under Section R405; or
 - 23.2. The proposed design of the *all-electric building* building under Section R405.3 shall have an annual energy cost that is less than or equal to the 95 percent of the annual energy cost of the standard reference design; or
 - 3.3 Mixed-fuel buildings shall have either R408.2.1 or R408.2.5 of the additional efficiency package options, and any two of R408.2.2, R408.2.3, or R408.2.4 of the additional efficiency package options installed without including such measures in the proposed design under Section R405; or
 - 3.4 The proposed design of the mixed-fuel building under Section R405.3 shall have an annual energy cost that is less than or equal to 85 percent of the annual energy cost of the standard reference design.
34. For buildings complying with the Energy Rating Index alternative Section R401.2.3, the Energy Rating Index value shall be at least 5 percent less than the Energy Rating Index target specified in Table R406.5.

The options selected for compliance shall be identified in the certificate required by Section R401.3.

Revise text as follows:

R401.3 Certificate. A permanent certificate shall be completed by the builder or other approved party and posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certification shall indicate the following:

- 4. The types, sizes, fuel sources, and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric baseboard heaters.
- 8. The fuel sources for cooking and clothes drying equipment.
- 9. Where combustion equipment is installed, the certificate shall indicate information on the installation of additional electric infrastructure including which equipment and/or appliances include additional electric infrastructure, capacity reserved on the electrical service panel for replacement of each piece of combustion equipment and/or appliance

R402.1 General. The building thermal envelope shall comply with the requirements of Sections R402.1.1 through R402.1.5.

Exceptions:

- 1. The following low-energy buildings, or portions thereof, separated from the remainder of the building by *building thermal envelope assemblies* complying with this section shall be exempt from the building thermal envelope provisions of Section R402.
 - 1. Those containing no combustion equipment with a peak design rate of energy usage less than 3.4 Btu/h·ft² (10.7 W/m²) or 1.0 watt/ft² of floor area for space conditioning purposes.
 - 2. Those containing no combustion equipment that do not contain *conditioned space*.

Add new text as follows:

R404.6 Additional electric infrastructure. *Combustion equipment shall be installed in accordance with this section.*

R404.6.1 Equipment serving multiple units. *Combustion equipment that serves multiple dwelling units shall comply with Section C405.16.*

R404.6.2 Combustion water heating. *Water heaters shall be installed in accordance with the following:*

1. A dedicated 240-volt branch circuit with a minimum capacity of 30 amps shall terminate within 3 feet (914 mm) from the water heater and be accessible to the water heater with no obstructions. Both ends of the branch circuit shall be labeled with the words "For Future Heat Pump Water Heater" and be electrically isolated.
2. A condensate drain that is no more than 2 inches (51 mm) higher than the base of the installed water heater and allows natural draining without pump assistance shall be installed within 3 feet (914 mm) of the water heater.
3. The water heater shall be installed in a space with minimum dimensions of 3 feet (914 mm) by 3 feet (914 mm) by 7 feet (2134 mm) high.
4. The water heater shall be installed in a space with a minimum volume of 700 cubic feet (20,000 L) or the equivalent of one 16-inch (406 mm) by 24-inch (610 mm) grill to a heated space and one 8-inch (203 mm) duct of no more than 10 feet (3048 mm) in length for cool exhaust air.

R404.6.3 Combustion space heating. *Where a building has combustion equipment for space heating, the building shall be provided with a designated exterior location(s) in accordance with the following:*

1. Natural drainage for condensate from cooling equipment operation or a condensate drain located within 3 feet (914 mm), and
2. A dedicated branch circuit in compliance with IRC Section E3702.11 based on heat pump space heating equipment sized in accordance with R403.7 and terminating within 3 feet (914 mm) of the location with no obstructions. Both ends of the branch circuit shall be labeled "For Future Heat Pump Space Heater."

Exception: *Where an electrical circuit in compliance with IRC Section E3702.11 exists for space cooling equipment.*

R404.6.4 Combustion clothes drying. *A dedicated 240-volt branch circuit with a minimum capacity of 30 amps shall terminate within 6 feet (1829 mm) of natural gas clothes dryers and shall be accessible with no obstructions. Both ends of the branch circuit shall be labeled with the words "For Future Electric Clothes Drying" and be electrically isolated.*

R404.6.5 Combustion cooking. *A dedicated 240-Volt, 40A branch circuit shall terminate within 6 feet (1829 mm) of natural gas ranges, cooktops and ovens and be accessible with no obstructions. Both ends of the branch circuit shall be labeled with the words "For Future Electric Range" and be electrically isolated.*

R404.6.6 Other combustion equipment. *Combustion equipment and end-uses not covered by Sections R404.6.2-5 shall be provided with a branch circuit sized for an electric appliance, equipment or end use with an equivalent capacity that terminates within 6 feet (1829 mm) of the appliance or equipment.*

Revise table as follows:

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION ^a	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
<u>R404.6</u>	<u>Additional electric infrastructure</u>

Revise table as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION ^a	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
<u>R404.6</u>	<u>Additional electric infrastructure</u>
R406.3	Building thermal envelope

Revise text as follows:

R406.5 ERI-based compliance. Compliance based on an ERI analysis requires that the rated *proposed* design and confirmed built dwelling be shown to have an ERI less than or equal to the appropriate value for the proposed *mixed-fuel building* or the proposed *all-electric building* as indicated in Table R406.4 when compared to the *ERI reference design*.

TABLE R406.4 MAXIMUM ENERGY RATING INDEX

Climate Zone	<u>Energy Rating Index All-Electric Building</u>	<u>Mixed Fuel Building</u>
5	55	<u>47</u>
6	54	<u>46</u>
7	53	<u>46</u>

Add new text as follows:

R408.2.3 Reduced energy use in service water-heating option. The hot water system shall meet one of the following efficiencies:

4. Greater than or equal to 82 EF instantaneous fossil fuel service water-heating system and drain water heat recovery unit meeting the requirements of Section R403.5.3 installed on at least one shower.

- 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, it will not.

Need and Reason

- 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 order to meet the state's aggressive climate goals, Minnesota must not only reduce energy use through energy efficiency and move to utility scale and on-site renewable energy, but also begin to transition away from using combustion equipment in buildings to electric equipment. Therefore, it is crucial that new buildings built today can be cost-effectively retrofitted in the future with electric

equipment so that emissions are not “locked-in” by gas-dependent building infrastructure. Fortunately, heat pump technology has dramatically improved over the last few decades, giving contractors and building owners access to highly efficient electric heating and cooling, and water heating technologies.

One of the biggest expenses of electrification retrofits – and therefore barriers to electrification in existing buildings - is running electrical infrastructure through a completed and enclosed building that has combustion equipment. This significant future cost can be greatly reduced through making simple, low-cost modifications to buildings during construction that enable easier electrification in the future. The requirements in this proposed amendment ensure that the electrical infrastructure is in place so that building owners can convert -electric equipment in the future and ensures that unitized gas water heaters can be replaced with high-performance heat pump water heaters (HPWHs).

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

This proposed code change future proofs homes so that it will be technically and economically feasible for owners with natural gas water heaters to install efficient electric appliances in the future if they wish.

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.

This code will only nominally increase costs.

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.

Yes. If not enacted, costs to install an electric heat pump water heater in the future maybe too costly for buildings designed only for natural gas water heaters.

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

Cost will be passed to homeowner and will save cost over retrofit.

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?

This proposed code change would require additional electrical work.

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.

I cannot think of another way to achieve the goals of this proposal.

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 homeowners the burden of upgrading electrical capacity and installing conduit before when electrifying appliances.

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.



CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Ben Rabe *Date:* August 18, 2023

Email address: *Model Code:* 2021 IECC

Telephone number: *Code or Rule Section:* Residential Energy Code

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: R404.4

Intended for Technical Advisory Group ("TAG"):

General Information

Yes **No**

- | | | |
|--|-------------------------------------|-------------------------------------|
| A. Is the proposed change unique to the State of Minnesota? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| B. Is the proposed change required due to climatic conditions of Minnesota? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| C. Will the proposed change encourage more uniform enforcement? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| D. Will the proposed change remedy a problem? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| E. Does the proposal delete a current Minnesota Rule, chapter amendment? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| F. Would this proposed change be appropriate through the ICC code development process? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

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 ~~striketrough~~ words proposed for deletion. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Add definition as follows:

ENERGY STORAGE SYSTEM (ESS) . One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time.

Add new text as follows:

R103.2.4 Energy storage-ready system. The construction documents shall provide the location of pathways for routing of raceways or cable from the energy storage system to the electrical service panel, from the panelboard to dedicated branch circuits, the location and layout of a designated area for electrical energy storage system and system isolation equipment.

R105.2.5 Electrical rough-in inspection. Inspections at electrical rough-in shall verify compliance as required by the code and the approved plans and specifications as to the locations, distribution, and capacity of the electrical system. Where the energy storage system area is not in the same space as the electrical panel, inspections shall verify conduit or pre-wiring from the energy storage ready zone to the electrical panel.

R404.4 Electrical energy storage system. One- and two-family dwellings, townhouse units, and Group R-3 occupancies shall either comply with R404.4.1 or R404.4.2. Buildings with Group R-2 and R-4 occupancies shall comply with C405.15.

R404.4.1 Electrical energy storage energy capacity. Each building shall have an *ESS* with a minimum rated energy capacity of 5 kWh with a minimum of four *ESS* supplied branch circuits.

R404.4.2 Electrical energy storage system ready. Each building shall be energy storage ready area in accordance with Sections R404.4.2.1 through R404.2.2.4.

R404.4.2.1 Energy storage system space. Interior or exterior space with dimensions and locations in accordance with Section R328 of the International Residential Code and Section 110.26 of NFPA 70 shall be reserved to allow for the future installation of an energy storage system.

R404.4.2.2 System Isolation Equipment Space. Space shall be reserved to allow for the future installation of a transfer switch within 3 feet (305 mm) of the main panelboard. Raceways shall be installed between the panelboard and the transfer switch location to allow the connection of an *ESS*.

R404.4.2.3 Panelboard with backed-up load circuits. A dedicated raceway from the main service to a panelboard that supplies the branch circuits served by the *ESS*. All branch circuits are permitted to be supplied by the main service panel prior to the installation of an *ESS*. The track size of the raceway shall be not less than one inch. The panelboard that supplies the branch circuits shall be labeled "Subpanel reserved for future battery energy storage system to supply essential loads."

R404.4.2.4 Branch circuits served by ESS. A minimum of four branch circuits shall be identified and have their source of supply collocated at a single panelboard supplied by the *ESS*. The following end uses shall be served by the branch circuits:

1. A refrigerator.
2. One lighting circuit serving the primary path of egress the primary egress.
3. A sleeping room receptacle outlet.

Revise table as follows:

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
<u>R404.6</u>	<u>Energy storage infrastructure</u>

SECTION R406

ENERGY RATING INDEX COMPLIANCE ALTERNATIVE

Revise table as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION	TITLE
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
<u>R404.6</u>	<u>Energy storage infrastructure</u>
R406.3	Building thermal envelope

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.)

Energy storage is critical to achieving Minnesota’s goal of a carbon-free power sector by 2040. These systems also bolster the economy, present a cost savings opportunity for homeowners and increase resiliency to power outages. In 2020, 21% of the United State’s electricity is sourced from renewable energy, primarily wind, an intermittent source of energy. As the U.S. increases the amount of electricity generated from renewables, buildings must be prepared to aid in this transition by storing energy to match grid demands.

Policies to encourage energy storage will improve the U.S. economy. Energy storage is expected to grow by over 40% each year until 2025 and the U.S., because of its manufacturing background and experience in battery-storage technology for cars is becoming a clear leader in this market.

Energy storage will also present a cost-saving opportunity for homeowners. Battery prices have and will likely continue to fall in the United States, meaning that behind-the-meter storage will likely become more accessible and affordable in the short-term. More and more utilities are moving beyond voluntary programs and are expanding use of time-of-use rates for electricity as a tool for shaping demand. Ensuring homes are energy-storage ready now will allow them to cost effectively install storage systems in the future and take advantage of these voluntary programs.

Finally, energy storage will improve resilience to power outages. In 2020, DOE found that an average household in the United States goes without power for 8 hours in a year. Because of extreme weather events caused by climate change, those outages are increasing. These outages are estimated to cost the U.S. economy between \$25 billion to \$70 billion annually. Requiring

homes to be storage-ready will ensure communities are more resilient by allowing buildings to cost effectively install storage which can operate for a short-period of time without relying on the electricity grid.

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

Installing the infrastructure for a future energy storage is a more cost-effective way to future-proof homes.

3. What other factors should the TAG consider?

This proposal will help future proof homes for the clean energy transition.

Cost/Benefit Analysis

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

This code will only nominally increase costs.

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.

Commercial analysis for a similar measure showed no incremental costs. Some costs are expected on residential. Overall savings potential impacts are outlined in reason statement - costs of outages and other grid infrastructure are passed on to consumers, it just isn't as recognizable on an energy bill. Measure will also allow consumers the ability to install energy storage in the future, removing retrofit costs, and allowing homeowners to have resiliency onsite, which have quantifiable health, wellness, and comfort co-benefits.

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

Cost will be passed to homeowner and will save cost over retrofit.

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

This system can be inspected during normal electrical inspection and will increase the cost of compliance.

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?

This proposed code change would require additional electrical work.

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.

I cannot think of another way to achieve the goals of this proposal.

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 homeowners the burden of upgrading their homes have energy storage systems.

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.

Michael Morehead
[REDACTED]

November 30, 2023

VIA ELECTRONIC DELIVERY

Members of the Residential Energy Code TAG:

I recently reviewed letters, dated 1-8-2023, submitted by Housing First Minnesota and Central Minnesota Builders Association to the TAG Committee members. I believe the comments or arguments made by the two industry groups are misleading or, at a minimum, interpret legislation or other administrative rules in a self-serving manner. I offer my comments as rebuttals to these letters.

My background is simple. I have a degree in Ecology and a law degree. I did not work in any ecology related fields during my various careers. Over many decades I have maintained a keen interest in energy efficient homes. In 2013 we built a very energy efficient solar barn on 10 acres in [REDACTED]. After much research and planning we later built a PHIUS certified home which we moved into in late December of 2017. It has a HERS rating of 9. Every year since the entire property has produced more net energy than it has used. We are advocates for energy efficient buildings. We have hosted tours of our home for U of M Building Science students, architects, legislators, and other interested groups. In 2022 I made comments to Administrative Law Judge Lipman who was reviewing that years proposed code upgrades, followed by rebuttal comments. This year I have been casually following the TAG workings.

Most of my comments involve the Housing First Minnesota (HFM) letter since the Central Minnesota Builders Association largely repeats much of what is in the HFM letter.

First and foremost, the affordability of homes, or lack of affordability of homes, for all people has very little to do with building codes. Affordability is largely governed by economic and social factors including wages, employment, inflation, demand, marriage and divorce rates, and, most importantly, interest rates. The current cited 7.76% interest rate is close to the 40-year rate average. Note that throughout the 1980's interest rates stayed between 10 and 16% yet houses continued to be built, although at an adjusted pace. The 3 graphics included on page 2 and 3 of the HFM letter are based on Zonda data. A visit to the Zonda website found that they do not collect data from all 50 states. They have data from many warm climate states where homebuilding costs are lower and more affordable homes can be built. Noticeably absent are many cold weather states, in particular the New England states.

Second, Minnesota's median home price is higher because, as shown in Zonda figure #2, Minnesota builds far more expensive homes than Wisconsin. Look closely at the Fig #2 bar charts for Mpls/Stp versus Milwaukee to see the price ratio of new homes in the two locations to see the difference. Builders profits are a percentage of the price of a new home. The higher the home price the larger the profits. And USA homes keep getting bigger. A simple web-based search finds that national home sizes and square footage per occupant has steadily increased over the past 75 years. Average home size in 1949 was 767 sq ft with 224 sq ft per occupant. In 1969 average home size was 1640 sq ft with 514 sq ft per occupant. By 1989 average home sq ft was over 2000 and sq ft per occupant was 770. In 2014 average home sq ft was 2657 and 1046 sq ft per occupant. Today's homes only get bigger.

Third, main stream homebuilders do not aggressively market energy conservation. They will offer potential buyers upgrades to kitchens, master suites, costs to finish a lower level, deck additions, even costs for sport courts. For decades I have routinely visited Parade of Homes model homes in the Twin Cities, mostly homes advertised as being some level of “green”. What I generally find is homes that are slightly tighter with a HERS rating around 50 to 55. They have Energy Star rated appliances and better HVAC systems. They are not substantially more energy efficient than non “green” homes. They generally have double hung double pane ‘builders windows’, that are cheaper than more energy efficient triple pane casement windows. After visiting a model home, I took a look at a nearby home under construction that still had its window stickers attached. Indeed, the windows had stickers prominently listing them as Energy Star rated. In smaller print the label noted the windows were only Energy Star rated for the southern third of the USA. Yet the sales pitch was that the new home had Energy Star rated windows. What a slick questionably unethical ploy. Most potential new home buyers are woefully ignorant when it comes to energy efficient construction. I see no real effort by Minnesota’s home builders to offer or explain to consumers how they could build more efficient homes. Perhaps the solution lies with legislation that could mandate extensive energy efficient option explanations for potential new home buyers.

Fourth, builders can still make the same profits on homes that cost the same, albeit slightly smaller. If a builder earns 10% profit on a 3,000 sq ft home that sells for \$600,000, couldn’t they make the same profit on a 2,850 sq ft home that sells for \$600,000, but is far more energy efficient? The square footage reduction used in this example is 5% or about 150 sq ft. Shouldn’t a homebuyer, educated about home energy efficiency, be given an option to choose? Massachusetts leads the country in energy efficient home construction with an estimated 90% of the population governed by a “stretch” building code and a growing number of communities that are authorized by state law to enact what is net zero or close to net zero building codes. Massachusetts home builders fought code changes and lost. Estimated added costs to build homes to the stretch code vary from 3 to 5 %. In some cases, other factors allow the stretch code homes to be built with much lower added costs. In a few instances grants or subsidies allow stretch code buildings to be built at costs below the old base building code. Beginning in 2023 Massachusetts lowered its HERS rating for new homes from 55 to 52. Beginning in July 2024 mandated HERS rating for new buildings will vary from 42 to 45 depending upon the type of construction. The 9 communities that have adopted the new net zero code will require a HERS rating of 0. Throughout all of these changes home builders have adapted and homes continue to be built in Massachusetts.

Fifth, the Housing First November 8th letter seems to interpret Minnesota Statutes 326B.101 as a mandate that prohibits any code changes that increase housing construction costs. Cost is but one factor in the statute. Here is a closer look at the statute with my emphasis underlines added:

“The commissioner shall administer and amend a state code of building construction which will provide basic and uniform performance standards, **establish reasonable safeguards for health, safety, welfare, comfort, and security of the residents of this state** and provide for the **use of modern methods, devices, materials and techniques** which will **in part** tend to lower construction costs. The construction of buildings **should** be permitted at the least possible cost **consistent with recognized standards of health and safety.**”

There is a considerable amount of language in the statute pertaining to protecting all Minnesota citizens health and safety, followed by a mandate to use modern methods and techniques, with cost to only be considered “in part”. An estimated 40% of greenhouse gas emissions come from buildings, up to 70% in urban areas. I would argue that reducing emissions by building more energy efficient buildings to protect the environment and the health of all Minnesotans trumps added building costs.

In the next paragraph the Housing First letter makes a clear threat to litigate against any code changes they feel lack adequate rationale. I note that Administrative Law Judge Lipman, who conducted extensive reviews of proposed codes changes in 2022, concluded that he saw nothing wrong with the changes and ruled that DOLI could decide what action to take. I also note that the Montana case of Held vs. Montana ruled that group of children had rights to challenge a large industry associated with environmental pollution. The case may not have a direct correlation to Minnesota law. However, it’s an example of the growing shift by people, legislatures and the courts towards favoring environmental concerns.

Another comment on costs. As I monitor a few of the comments back and forth between TAG members I see arguments about reasonable payback periods for various proposed changes. Massachusetts has found that, in some cases, increased costs can be offset by grants or various government subsidies. Not mentioned are the increased costs to people and society caused by continued pollution by housing built to current codes versus housing built to stricter codes with lower greenhouse gas emissions. Arguments about increased costs should include information about overall increased costs to society as a whole. Knowledgeable people routinely calculate the impact of maintaining current status quo operations versus more ecologically alternatives. How many tons of greenhouse gases will be produced by a new home built to the current building code versus a new home built to ever increasing energy efficiency codes? The amount of future pollution associated with adhering to old building codes should be of great concern to Minnesotans who “... have recognized standards of health and safety.” as mentioned in MN Stat. 326B.101. TAG Committee discussions should have at least some discussions about overall environmental costs when discussing proposed code improvements.

I’d like to compare the automotive manufacturing industry to the home building industry. Over the course of decades, the Federal government has mandated hundreds of changes to the way cars and trucks are made. The goals were to improve occupant safety, improve mileage and reduce pollution. I have no doubt that there were many changes that, by themselves, could not be justified by claiming they created cost savings. Yet today’s cars, taking all improvements as a whole, are the safest cleanest most efficient vehicles ever made. Energy efficiency in home building should be viewed in a similar manner. Individual code changes, when viewed in isolation, may not be cost effective. However, when changes are viewed as an overall package, the package containing numerous changes, big and small, may be worth adopting. Adopting better home building codes will lead to improved occupant safety, utility cost savings, and a cleaner environment for all.

As I finish writing this today, November 30th, the world is discussing the perils of climate change at COP28, meeting from Nov. 30 through Dec. 12. The world is aware of the dangers of pollution affecting our planet’s climate resulting in potential catastrophic weather events. Everyone, including Minnesota’s homebuilders, need to do their best to slow pollution. Fighting building code improvements is not helping anyone. In 2022, for the first time ever, sales of electric heat pumps exceeded sales of gas furnaces. Heat pump technology has improved and works even better in homes designed to be more

efficient. The U.S. Climate Alliance, in a 9-23-2023 press release, set a goal of increasing heat pump usage from a current 4.7 million units to 20 million units by 2030, seven years from now. Minnesota is among the several dozen states that are members of the U.S. Climate Alliance.

In summary, I urge all TAG Committee members to take a broader view of all proposed code changes. I believe legislatures, courts, science and public opinion are all leaning towards doing things to slow pollution and curtail climate damage. Advocating for improved residential building codes is something that absolutely needs to happen. I urge Minnesota's home building industry to rethink their staunch resistance to building code efficiency improvements.

Respectively submitted,

Michael Morehead

MM/mrm