DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Steve Shold

Email address: steve.shold@state.mn.us

Telephone number: 651-284-5312

Firm/Association affiliation, if any: Dept of Labor

Date: 12/21/23

Model Code: 2021 IECC-R

Code or Rule Section:

Code or rule section to be changed: Section R403.3 - Duct insulation

Intended for Technical Advisory Group ("TAG"):

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

Proposed Language

1. The proposed code change is meant to:

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

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

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

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

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

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.
   In a manner of speaking, yes, due to durability requirements located in MS 326B.118.

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.
   See language below.

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.
   Yes, this is part of a 7-proposal series that will align the affected or related sections including: R403.3, R402, R402.2.1, R402.2.7, Table R402.4.1.1, R502.3.2, and R503.1.2.

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 '21 model code language weakened requirements currently set in MN for duct insulation.

2. Why is the proposed code change a reasonable solution?
   This proposal carries forward requirements that have been in place in MN since 2015.

3. What other factors should the TAG consider?
   Proposals #25-30 which are related.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   The code change should not impact costs compared to where MN is *now.* The insulation values are nearly identical to those currently specified, with the exception that Outdoor air intakes and Exhaust ducts within conditioned space will now need to meet R-4 as opposed to R-3.3 in the current 2015 MRE. However, a search indicates that R-3.3 is not something available to market with R-4 being widely available. The one difference is that the 2021 IECC would have allowed a weakening amendment from R-8 to R-6 for ducts less than 3" in diameter, so in some cases this could be perceived as a slight cost increase compared to the 2021 Model Code language.

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.
   Additional duct insulation can help prevent condensation within ducts and subsequent cosmetic damage.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
   There won't be an increase compared to current Energy Code requirements, but when compared to the '21 there may be a slight increase in cost for ducts less than 3" in diameter. Initially subcontractors would bear the cost for R-6 insulation, which will ultimately be passed on to the owner.

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?
   Builders and remodelers, HVAC designers and contractors, material suppliers, and building inspectors.

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
   Could stick with '21 Model Code.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
   More ductwork will be installed outside of the thermal boundary, and ducts 3" or less will be more susceptible to condensation. Cost consequences are unknown.

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.

See modified code language on next page

Summary

This proposal is #1 in a package of 7 related changes that seek to amend and clarify duct insulation, as well as provide guidance on how to address insulation in floors, walls, and ceilings where ducts are present, in both new and existing construction.

R403.3 Ducts. Ducts and air handlers shall be installed in accordance with Sections R403.3.1 through R403.3.7.
R403.3.1 Ducts ~~insulation.located outside conditioned space.~~ All ~~Supply and return~~ ducts ~~located outside *conditioned space*~~ shall be insulated according to Table R403.3.1. ~~an *R*-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter.~~ Ducts buried beneath a building shall be insulated as required per this section or have an equivalent thermal distribution efficiency. Underground ducts utilizing the thermal distribution efficiency method shall be listed and *labeled* to indicate the *R*-value equivalency.

TABLE R403.3.1
MINIMUM REQUIRED DUCT INSULATION

DUCT TYPE/LOCATION	REQUIREMENTS
Ducts outside conditioned space[a, b]	R-8, V and W
Outdoor air intakes within conditioned space[a, c]	R-4 and V
Exhaust ducts within conditioned space[a, c]	R-4 and V
Within concrete slab or within ground[a]	R-3.5
Ducts inside conditioned space	None Required

a. V means a vapor retarder in compliance with Section 604.11 of the *International Mechanical Code* or Section M1601.4.6 of the *International Residential Code*, as applicable.

b. W means an approved weatherproof barrier.

c. Insulation is only required in the conditioned space for a distance of 3 feet (914 mm) from the exterior or unconditioned space.

R403.3.2 Ducts located in conditioned space. For ductwork to be considered inside a *conditioned space,* ~~it~~ the duct system and air handler shall ~~comply with one of the following:~~ be located completely within the *continuous air barrier* and within the building thermal envelope where the required insulation value is not reduced on the unconditioned side of the duct. *(This section is NOT applicable to R405 Total Building Performance or R406 ERI paths – may need amendments to the tables in those chapters)*

~~1. The duct system shall be located completely within the *continuous air barrier* and within the building thermal envelope.~~
~~2. Ductwork in ventilated attic spaces shall be buried within ceiling insulation in accordance with Section R403.3.3 and all of the following conditions shall exist:~~

2.1. The air handler is located completely within the *continuous air barrier* and within the *building thermal envelope*.

2.2. The duct leakage, as measured either by a rough-in test of the ducts or a postconstruction total system leakage test to outside the *building thermal envelope* in accordance with Section R403.3.6, is less than or equal to 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m2) of *conditioned floor area* served by the duct system.

2.3. The ceiling insulation *R*-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation *R*-value, less the *R*-value of the insulation on the duct.

3. Ductwork in floor cavities located over unconditioned space shall comply with all of the following:

3.1. A *continuous air barrier* installed between unconditioned space and the duct.

3.2. Insulation installed in accordance with Section R402.2.7.

3.3. A minimum R-19 insulation installed in the cavity width separating the duct from unconditioned space.

4. Ductwork located within *exterior walls* of the *building thermal envelope* shall comply with the following:

4.1. A *continuous air barrier* installed between unconditioned space and the duct.

4.2. Minimum R-10 insulation installed in the cavity width separating the duct from the outside sheathing.

4.3. The remainder of the cavity insulation shall be fully insulated to the drywall side.

R403.3.3 Ducts buried within ceiling insulation. Where supply and return air ducts are partially or completely buried in ceiling insulation, such ducts shall comply with all of the following:

1. The supply and return ducts shall have an insulation *R*-value not less than R-8.

2. At all points along each duct, the sum of the ceiling insulation *R*-value against and above the top of the duct, and against and below the bottom of the duct, shall be not less than R-19, excluding the *R*-value of the duct insulation.

3. In Climate Zones 0A, 1A, 2A and 3A, the supply ducts shall be completely buried within ceiling insulation, insulated to an *R*-value of not less than R-13 and in compliance with the vapor retarder requirements of Section 604.11 of the *International Mechanical Code* or Section M1601.4.6 of the *International Residential Code*, as applicable.

Exception: Sections of the supply duct that are less than 3 feet (914 mm) from the supply outlet shall not be required to comply with these requirements.

R403.3.3.1~~1~~3 Effective *R*-value of deeply buried ducts. Where using the Total Building Performance Compliance Option in accordance with Section R401.2.2, sections of ducts that are installed in accordance with Section R403.3.3, located directly on or within 5.5 inches (140 mm) of the ceiling, surrounded with blown-in attic insulation having an *R*-value of R-30 or greater and located such that the top of the duct is not less than 3.5 inches (89 mm) below the top of the insulation, shall be considered as having an effective duct insulation *R*-value of R-25.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Steve Shold

Date: 12/21/23

Email address: steve.shold@state.mn.us

Model Code: 2021 IECC-R

Telephone number: 651-284-5312

Code or Rule Section:

Firm/Association affiliation, if any: Dept of Labor

Code or rule section to be changed: Section R402.2.7 - Floor insulation

Intended for Technical Advisory Group ("TAG"):

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

Proposed Language

1. The proposed code change is meant to:

   ☐ change language contained the model code book? If so, list section(s).
   Yes, R402.2.7 Floors. See language below.

   ☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   No.

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

   ☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   No.

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

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.
   In a manner of speaking, yes, due to durability requirements located in MS 326B.118.

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.
   See language below.

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.
   Yes, this is part of a 7-proposal series that will align the affected or related sections including: R403.3, R402, R402.2.1, R402.2.7, Table R402.4.1.1, R502.3.2, and R503.1.2.

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 code currently would allow ductwork to be installed in a floor cavity without requiring the minimum R-value of the cavity or assembly to be upheld.

2. Why is the proposed code change a reasonable solution?
   It is not necessary to have the floor insulation in contact with the underside of the subfloor, provided the perimeter of the floor assembly is insulated, so that item was removed. Language was added to clarify that when ductwork is installed within a floor cavity, the space between the duct and the unconditioned area must still meet a minimum R-value. This is important to prevent having floor cavities that lack insulation due to installing duct runs. This also helps the duct by keeping it to the conditioned side of the assembly. This helps to clarify and codify a long-standing interpretation for floor insulation that required minimum insulation between the duct and unconditioned space.

   Some may question why this is not located in the section regarding *Duct Insulation* (R403.3), that is because this content has to do with minimum ***floor*** insulation, whereas it had been in R403.3 "Duct insulation" not for the purpose of floor insulation, but only to indicate when ducts could be "considered" to be within conditioned space. With approval of RE-24, ducts would need to actually be *physically* located within conditioned space to be regarded as "within conditioned space". Therefore, any criteria regarding floor insulation belongs in Section R402 for the thermal envelope along with other requirements specific to floors.

3. What other factors should the TAG consider?
   Proposals #24-30 which are related.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   This proposal will have a minimal impact on cost. It will only affect instances where ductwork is run in thermally bounding floors and where there is a physical space limitation to accommodate both the duct and the insulation. Where the space is not there, the insulation *can* be reduced via an exception whereby the floor must instead meet an overall U-factor that aligns with the U-factor requirements for floors based on climate zone.

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 benefit will be maintaining minimum insulation levels in floor assemblies, lending to increased efficiency, and increasing the efficacy of air conveyed through the ductwork by keeping it on the interior side of the insulation. Moreover, the proposal gives clarity to insulation requirements for floors where ducts are present.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
   For the designs affected, initially subcontractors would bear the cost for insulation, which will ultimately be passed on to the owner. Owners will benefit from a more efficient thermal envelope.

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?
   Designers, builders, and remodelers, HVAC and insulation contractors, and building inspectors.

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
   No.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
   Cost consequences are unknown. Not adopting the change yields to continued confusion in design and enforcement, as well as a lack of insulation in floor assemblies containing ductwork.

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.

See proposed code modifications on next page…

Summary

This proposal is #2 in a package of 7 related changes that seek to amend and clarify duct insulation, as well as provide guidance on how to address insulation in floors, walls, and ceilings where ducts are present, in both new and existing construction. Additionally, this proposal removes one of the options that required floor insulation to be in constant contact with the subfloor. It also clarifies that a minimum amount of floor insulation must be maintained between the duct and unconditioned space where ducts are located within floor cavities.

R402.2.7 Floors. Floor *cavity insulation* shall be installed in accordance with manufacturer instructions to maintain required *R*-value and placement, and comply with ~~one of~~ the following:

~~1. Installation shall be installed to maintain permanent contact with the underside of the subfloor decking in accordance with manufacturer instructions to maintain required *R*-value or readily fill the available cavity space.~~

~~3.~~ 1. ~~A~~ Where a combination of cavity and continuous insulation ~~shall be~~ is installed, ~~so that~~ the cavity insulation ~~is~~ shall be in contact with the ~~top side of the~~ continuous insulation ~~that is installed on the underside of the floor framing separating the cavity and the unconditioned space below.~~ and ~~T~~the combined *R*-value ~~of the cavity and continuous insulation~~ shall not be less than ~~equal~~ the required *R*-value for floors. ~~Insulation shall extend from the bottom to the top of all perimeter floor framing members and the framing members shall be air sealed.~~

~~2.~~ 2. ~~Floor framing cavity insulation shall be permitted to be in contact with the top side of sheathing separating the cavity and the unconditioned space below. Insulation shall extend from the bottom to the top of all perimeter floor framing members~~ and the framing members ~~shall be air sealed.~~ Where floor insulation does not fill the framing cavity, the floor perimeter shall be insulated for the full height not less than the required R-value for walls.

R402.2.7.1 Floor cavities containing ducts. Where floor cavities over unconditioned space contain ducts, the floor insulation value in the space separating the duct from unconditioned space shall not be less than *R*-30, excluding the R-value of the duct.

Exceptions:

1. Floor cavities that contain ducts and are unable to meet the required *R*-value shall require the floor assembly to meet a *U*-factor of .033 in Climate Zone 6 and .028 in Climate Zone 7.
2. Portions of floor cavities containing ducts extended to an *addition* from an existing heating and cooling system shall not be required to comply with R402.2.7.1 provided the cavity is filled with insulation. Ducts shall be insulated in accordance with Section R403.3.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Steve Shold

Email address: steve.shold@state.mn.us

Telephone number: 651-284-5312

Firm/Association affiliation, if any: Dept of Labor

Date: 12/21/23

Model Code: 2021 IECC-R

Code or Rule Section:

Code or rule section to be changed: Table R402.4.1.1 - Floor insulation

Intended for Technical Advisory Group ("TAG"):

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

Proposed Language

1. The proposed code change is meant to:

   ☐ change language contained the model code book? If so, list section(s).
   Yes, Table R402.4.1.1.

   ☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   No.

   ☐ delete language contained in the model code book? If so, list section(s).
   No.

   ☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   No.

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

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.
   See language below.

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.
   Yes, this is part of a 7-proposal series that will align the affected sections including: R403.3, R402.2.1, R402.2.7, Table R402.4.1.1, R502.3.2, and R503.1.2.

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.)
   It is not necessary for floor insulation to be in contact with the underside of the subfloor provided that the perimeter of the floor is insulated like an exterior wall. Removing this requirement allows flexibility for the designer and installer. This also provides clarification for the intent of the floor insulation requirements and aligns the table with proposed language for floor insulation in proposal RE-25.

2. Why is the proposed code change a reasonable solution?
   See explanation directly above.

3. What other factors should the TAG consider?
   Proposal RE-25.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   Should have little to no effect on 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.
   NA

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

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?
   Designers, builders, and remodelers, HVAC and insulation contractors, and building inspectors.

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
   No.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
   Unknown cost implications, likely little to none.

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.

Summary

This proposal is #3 in a package of 7 related changes that seek to amend and clarify duct insulation, as well as provide guidance on how to address insulation in floors, walls, and ceilings where ducts are present, in both new and existing construction.

Table R402.4.1.1

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	~~Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extending from the bottom to the top of all perimeter floor framing members.~~ Where a combination of cavity and continuous insulation is installed, the cavity insulation shall be in contact with the continuous insulation and the combined *R*-value shall be not less than the required *R*-value for floors. Where floor insulation does not fill the framing cavity, the floor perimeter shall be insulated for the full height not less than the required R-value for walls.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Steve Shold

Email address: steve.shold@state.mn.us

Telephone number: 651-284-5312

Firm/Association affiliation, if any: Dept of Labor

Date: 12/21/23

Model Code: 2021 IECC-R

Code or Rule Section:

Code or rule section to be changed: Section R402.XX - Wall insulation

Intended for Technical Advisory Group ("TAG"):

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

Proposed Language

1. The proposed code change is meant to:

   ☐ change language contained the model code book? If so, list section(s).
   No.

   ☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   No.

   ☐ delete language contained in the model code book? If so, list section(s).
   No.

   ☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   No.

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

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.
   In a manner of speaking, yes, due to durability requirements located in MS 326B.118.

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.
   See language below.

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.
   Yes, this is part of a 7-proposal series that will align the affected sections including: R403.3, R402, R402.2.1, R402.2.7, Table R402.4.1.1, R502.3.2, and R503.1.2.

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 code currently would allow ductwork to be installed in a wall cavity without requiring the minimum R-value of the cavity or assembly to be upheld.

2. Why is the proposed code change a reasonable solution?
   This is important to prevent having wall cavities that lack insulation due to installing duct runs inside them. This also keeps the duct to the conditioned side of the assembly, increasing the efficiency of the duct. This proposal parallels that which was written for ducts in floors by maintaining the insulation levels between duct and unconditioned space. Where the space is not there, the insulation *can* be reduced but requires the assembly or overall U-factor requirements to be met for walls based on climate zone. Without this statement, there is not language to ensure insulation is not reduced to accommodate ductwork.

   Some may question why this is not located in the section regarding *Duct Insulation* (R403.3), that is because this content has to do with minimum ***wall*** insulation, whereas it had been in R403.3 "Duct insulation" not for the purpose of wall insulation, but only to indicate when ducts could be "considered" to be within conditioned space. With approval of RE-24, ducts would need to actually be *physically* located within conditioned space to be regarded as "within conditioned space". Therefore, any criteria regarding wall insulation belongs in Section R402 for the thermal envelope.

3. What other factors should the TAG consider?
   Proposals #24-30 which are related.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   This proposal will have a minimal impact on cost. It will only affect instances where ductwork is run in exterior walls and where there is a physical space limitation to accommodate both the duct and the insulation.

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 benefit will be maintaining minimum insulation levels in wall assemblies, lending to increased efficiency, and increasing the efficacy of air conveyed through the ductwork by keeping it on the interior side of the insulation. Additionally, the proposal aligns insulation requirements for walls and floors, if RE-26 is accepted.

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

For the designs affected, initially subcontractors would bear the cost for insulation, which will ultimately be passed on to the owner. Owners will benefit from a more efficient thermal envelope.

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?
   Designers, builders, and remodelers, HVAC and insulation contractors, and building inspectors.

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
   No.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
   Cost consequences are unknown. Not adopting the change yields to continued confusion in design and enforcement, as well as a lack of insulation in wall assemblies containing ductwork.

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.

Summary

This proposal is #4 in a package of 7 related changes that seek to amend and clarify duct insulation, as well as provide guidance on how to address insulation in floors, walls, and ceilings where ducts are present, in both new and existing construction.

NOTE: *The following section could be added in a couple places in R402 and moved around to suit since there is presently not a "wood wall insulation" section in R402. Depending on acceptance and placement, this could require renumbering other sections in R402 to accommodate.*

R402.XX Wall cavities containing ducts. Where wall cavities separating conditioned space from unconditioned space contain ducts, the wall insulation value in the space separating the duct from the unconditioned space shall not be less than the required R-value, excluding the R-value of the duct insulation.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Steve Shold

Email address: steve.shold@state.mn.us

Telephone number: 651-284-5312

Firm/Association affiliation, if any: Dept of Labor

Date: 12/21/23

Model Code: 2021 IECC-R

Code or Rule Section:

Code or rule section to be changed: Section R402.2.1 - Ceiling insulation

Intended for Technical Advisory Group ("TAG"):

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

Proposed Language

1. The proposed code change is meant to:

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

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

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

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

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

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.
   In a manner of speaking, yes, due to durability requirements located in MS 326B.118.

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.
   See language below.

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.
   Yes, this is part of a 7 proposal series that will align the affected sections including: R403.3, R402, R402.2.1, R402.2.7, Table R402.4.1.1, R502.3.2, and R503.1.2.

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 code currently would allow ductwork to be installed within attic insulation above a ceiling without requiring the minimum R-value to be upheld. The first sentence is stricken as it pertains to climate zones outside of MN.

2. Why is the proposed code change a reasonable solution?
   Adding insulation alongside and above ductwork in attic space is a relatively simple thing to do, as there is typically adequate space to accommodate the insulation, with minimal additional time or effort.

   Some may question why this is not located in the section regarding *Duct Insulation* (R403.3), that is because this content has to do with minimum ***attic*** insulation, whereas it had been in R403.3 "Duct insulation" not for the purpose of floor insulation, but only to indicate when ducts could be "considered" to be within conditioned space. With approval of RE-24, ducts would need to actually be *physically* located within conditioned space to be regarded as "within conditioned space". Therefore, any criteria regarding attic insulation belongs in Section R402 for the thermal envelope along with other requirements specific to attic insulation.

3. What other factors should the TAG consider?
   Proposals #24-30 which are related.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   This proposal will have a minimal impact on cost. It will only affect instances where ductwork is run in attic space under or within the insulation – primarily in slab-on-grade homes.

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 benefit will be maintaining minimum insulation levels in attic assemblies, lending to increased efficiency, and increasing the efficacy of air conveyed through the ductwork by keeping it on the interior side of the insulation. Additionally, the proposal gives clarity to insulation requirements for attics where ducts are present.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
   For the designs affected, initially subcontractors would bear the cost for insulation, which will ultimately be passed on to the owner. Owners will benefit from a more efficient thermal envelope.

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?
   Designers, builders, and remodelers, HVAC and insulation contractors, and building inspectors.

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
   No.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
   Cost consequences are unknown. Not adopting the change yields to continued confusion in design and enforcement, as well as a lack of insulation in attic assemblies containing ductwork.

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.

See proposed code modifications on next page…

Summary

This proposal is #5 in a package of 7 related changes that seek to amend and clarify duct insulation, as well as provide guidance on how to address insulation in floors, walls, and ceilings where ducts are present, in both new and existing construction.

Note: *The first sentence is removed as it does not pertain to MN climate zones. Section R402.2.1 is derived from R403.3.3 and relocated here since this has to do with maintaining ceiling R-value, and not the actual duct insulation. It was used in R403 to craft when ducts could be "considered to be located inside conditioned space", though they are not. I removed the provision to "consider" ducts in conditioned space in RE-24.*

R402.2.1 Ceilings with attics. ~~Where Section R402.1.3 requires R-49 insulation in the ceiling or attic, installing R-38 over 100 percent of the ceiling or attic area requiring insulation shall satisfy the requirement for R-49 insulation wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves.~~ Where Section R402.1.3 requires R-60 insulation in the ceiling, installing R-49 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-60 insulation wherever the full height of uncompressed R-49 insulation extends over the wall top plate at the eaves. This reduction shall not apply to the insulation and fenestration criteria in Section R402.1.2 and the Total UA alternative in Section R402.1.5.

R402.2.2 Ceilings without attics. Where Section R402.1.3 requires insulation *R*-values greater than R-30 in the interstitial space above a ceiling and below the structural roof deck, and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation *R*-value for such roof/ceiling assemblies shall be R-30. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section R402.1.3 shall be limited to 500 square feet (46 m2) or 20 percent of the total insulated ceiling area, whichever is less. This reduction shall not apply to the Total UA alternative in Section R402.1.5.

R402.2.3 Ceiling insulation containing buried ducts. At all points along each duct, the sum of the ceiling insulation *R*-value against and above the top of the duct, and against and below the bottom of the duct, shall be not less than the required ceiling *R*-value, excluding the *R*-value of the duct insulation.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Steve Shold

Date: 12/21/23

Email address: steve.shold@state.mn.us

Model Code: 2021 IECC-R

Telephone number: 651-284-5312

Code or Rule Section:

Firm/Association affiliation, if any: Dept of Labor

Code or rule section to be changed: Section R502.3.2 – Heating and cooling systems (for **Additions**)

Intended for Technical Advisory Group ("TAG"):

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

Proposed Language

1. The proposed code change is meant to:

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

   ☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   No.

   ☐ delete language contained in the model code book? If so, list section(s).
   No.

   ☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   No.

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

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.
   In a manner of speaking, yes, due to durability requirements located in MS 326B.118.

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.
   See language below.

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.
   Yes, this is part of a 7-proposal series that will align the affected sections including: R403.3, R402, R402.2.1, R402.2.7, Table R402.4.1.1, R502.3.2, and R503.1.2.

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 current exception listed in the '21 IECC-R Section R502.3.2 removes the requirement to insulate portions of *new* ductwork when existing ducts are extended to an addition (pertaining to portions of new duct that are outside the conditioned envelope). This would reduce the effectiveness of the added ductwork, and could allow condensation to form, lending to leaks and repair costs. The proposed change would mean that extended portions of ducts need to be insulated, but still allow them to be exempt from sealing and testing.

2. Why is the proposed code change a reasonable solution?
   MN required ducts outside conditioned space to be insulated in the current code cycle. The model code language would weaken current requirements.

3. What other factors should the TAG consider?
   Proposals #24-30 which are related.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   This proposal will have a minimal impact on cost, as this is how the Energy code currently regulates ductwork (see MR 1322.0100 Subp. 3 A). It will only affect instances where ductwork is extended into a new addition from an existing run and cannot be located within the conditioned envelope.

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.
   It will not cost more than current regulations require.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
   It will not cost more than current regulations require.

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?
   Designers, builders, and remodelers, HVAC and insulation contractors, and building inspectors.

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
   No.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
   Specific numbers are unknown. Cost consequences could be repairs necessary from condensation leaking into floor/ceiling assemblies, as well as lost efficiency and lost ductwork efficacy.

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.

Summary

This proposal is #6 in a package of 7 related changes that seek to amend and clarify duct insulation, as well as provide guidance on how to address insulation in floors, walls, and ceilings where ducts are present, in both new and existing construction.

Note: *R403.3.5 – R403.3.7 are the adjusted section references based on code change RE-24 -- R403 for Sealing, Duct testing, and Duct leakage.*

R502.3.2 Heating and cooling systems. HVAC ducts newly installed as part of an *addition* shall comply with Section R403.

Exception: ~~Where d~~Ducts extended to an *addition* from an existing heating and cooling system ~~are extended to an *addition*~~shall not be required to comply with Sections R403.3.4 through R403.3.6.

DEPARTMENT OF LABOR AND INDUSTRY

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Steve Shold

Date: 12/21/23

Email address: steve.shold@state.mn.us

Model Code: 2021 IECC-R

Telephone number: 651-284-5312

Code or Rule Section:

Firm/Association affiliation, if any: Dept of Labor

Code or rule section to be changed: Section R503.1.2 – Heating and cooling systems (for Alterations)

Intended for Technical Advisory Group ("TAG"):

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

Proposed Language

1. The proposed code change is meant to:

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

   ☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   No.

   ☐ delete language contained in the model code book? If so, list section(s).
   No.

   ☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   No.

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

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.
   In a manner of speaking, yes, due to durability requirements located in MS 326B.118.

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.
   See language below.

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.
   Yes, this is part of a 7-proposal series that will align the affected sections including: R403.3, R402, R402.2.1, R402.2.7, Table R402.4.1.1, R502.3.2, and R503.1.2.

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 current exception listed in the '21 IECC-R Section R503.1.2 removes the requirement to insulate portions of *new* ductwork when existing ducts are extended to an addition (pertaining to portions of new duct that are outside the conditioned envelope). This would reduce the effectiveness of the added ductwork, and could allow condensation to form, lending to leaks and repair costs. The proposed change would mean that extended portions of ducts need to be insulated, but still allow them to be exempt from sealing and testing.

   This also serves to align language with requirements for Additions (proposal RE-29).

2. Why is the proposed code change a reasonable solution?
   MN required ducts outside conditioned space to be insulated in the current code cycle. The model code language would weaken current requirements.

3. What other factors should the TAG consider?
   Proposals #24-30 which are related.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   This proposal will have a minimal impact on cost, as this is how the Energy code currently regulates ductwork (see MR 1322.0100 Subp. 3 A). It will only affect instances where ductwork is extended into a new addition from an existing run and cannot be located within the conditioned envelope.

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.
   It will not cost more than current regulations require.

3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
   It will not cost more than current regulations require.

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?
   Designers, builders, and remodelers, HVAC and insulation contractors, and building inspectors.

2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
   No.

3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
   Specific numbers are unknown. Cost consequences could be repairs necessary from condensation leaking into floor/ceiling assemblies, as well as lost efficiency and lost ductwork efficacy.

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.

Summary

This proposal is #7 in a package of 7 related changes that seek to amend and clarify duct insulation, as well as provide guidance on how to address insulation in floors, walls, and ceilings where ducts are present, in both new and existing construction.

Note: *R403.3.5 – R403.3.7 are the adjusted section references based on code change RE-24 -- R403 for Sealing, Duct testing, and Duct leakage.*

R503.1.2 Heating and cooling systems. HVAC ducts newly installed as part of an *alteration* shall comply with Section R403.

> **Exception:** ~~Where d~~Ducts extended to an *addition* from an existing heating and cooling system ~~are extended to an *addition*~~shall not be required to comply with Sections R403.3.4 through R403.3.6.

DEPARTMENT OF LABOR AND INDUSTRY

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: R408

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

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

Proposed Language

1. The proposed code change is meant to:
   ☐ change language contained the model code book? If so, list section(s).
   ☐ change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   ☐ delete language contained in the model code book? If so, list section(s).
   ☐ delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
   ☒ add new language that is not found in the model code book or in Minnesota Rule.

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.
   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: "Continue the uniform statewide energy code adoption process, evaluating and adopting national model energy codes to ensure aggressive energy savings and address energy code enforcement."[1] Adopting this proposal will help achieve this.

[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.

SECTION R408

ADDITIONAL EFFICIENCY REQUIREMENTS ~~PACKAGE OPTIONS~~

R408.1 Scope. This section establishes additional efficiency requirements ~~package options~~ to achieve additional energy efficiency in accordance with Section R401.2.~~5~~1. *Buildings* shall comply with either Section R408.2 or Section R408.3

R408.2. Heat pump equipment. Buildings shall comply with the following:

1. Heating and cooling equipment shall be electric heat pump equipment that meet the following requirements for cold climate heat pumps:
    1.1. COP at 5°F (-15°C) ≥ 1.75
    1.2 Percent of heating capacity at 5°F (-15°C) ≥ 70% of that at 47°F (8.34°C)

R408.3~~2~~ Additional energy efficiency credit requirements ~~package options~~. Additional efficiency ~~package options for compliance with Section R401.2.1 are set forth in Sections R408.2.1 through R408.2.5.~~ measures shall be selected from Table R408.3 that meet or exceed a total of 15 credits. Five additional credits shall be selected for dwelling units with greater than 5,000 square feet (465 m2) of living space floor area located above grade plane. Each measure selected shall meet the relevant subsections of Section R408 and receive credit as specified in Table R408.3 for the specific Climate Zone. Interpolation of credits between measures shall not be permitted.

Add new text as follows:

TABLE R408.3
CREDITS FOR ADDITIONAL ENERGY EFFICIENCY

Measure Number	Measure Description	Credit Value	
		CZ 6	CZ 7
R408.3.1.1 (1)	≥ 2.5% reduction in total UA	1	1
R408.2.1.1 (2)	≥ 5% reduction in total UA	3	3
R408.3.1.1 (3)	> 7.5% reduction in total UA	3	4
R408.3.1.2	0.22 U-factor windows	4	4
R408.3.2 (1)	High performance cooling system option 1	1	1
R408.3.2 (2)	High performance cooling system option 2	1	1
R408.3.2 (3)	High performance gas furnace option 1	8	8
R408.3.2(4)	High performance gas furnace option 2	7	7
R408.3.2(5)	High performance heat pump system option 1	29	25
R408.3.2 (6)	High performance heat pump	30	26

	system option 2		
R408.3.2 (7)	Ground source heat pump	30	26
R408.3.3 (1)	Fossil fuel service water heating system	2	2
R408.3.3 (2)	High performance heat pump water heating system option 1	5	5
R408.3.3 (3)	High performance heat pump water heating system option 2	5	5
R408.3.3 (~~3~~)4	Solar hot water heating system	5	5
R408.3.3 (5)	Compact hot water distribution	2	2
R408.3.4 (1)	More efficient distribution system	13	15
R408.3.4 (2)	Reduced total duct leakage	2	2
R408.3.5 (1)	2 ACH50 air leakage rate with ERV or HRV installed	15	8
R408.3.5 (2)	2 ACH50 air leakage rate with balanced ventilation	6	6
R408.3.5 (3)	1.5 ACH50 air leakage rate with ERV or HRV installed	18	11
R408.3.5 (4)	1 ACH50 air leakage rate with ERV or HRV installed	21	14
R408.3.6	Energy Efficient Appliances	4	5

Revise as follows:

R408.3~~2~~.1 Enhanced envelope ~~performance~~ options. ~~The total building thermal envelope UA, the sum of U-factor times assembly area, shall be less than or equal to 95 percent of the total UA resulting from multiplying the U-factors in Table R402.1.2 by the same assembly area as in the proposed building. The UA calculation shall be performed in accordance with Section R402.1.5. The area-weighted average SHGC of all glazed fenestration shall be less than or equal to 95 percent of the maximum glazed fenestration SHGC in Table R402.1.2.~~ The building thermal envelope shall meet the requirements of Section R408.3.1.1 or R408.3.1.2.

Add new text as follows:

R408.3.1.1 Enhanced envelope performance UA. The proposed total building thermal envelope UA shall be calculated in accordance with Section R402.1.5 and shall meet one of the following:

1. Not less than 2.5 percent of the total UA of the building thermal envelope.

2. Not less than 5 percent of the total UA of the building thermal envelope.

3. Not less than 7.5 percent of the total UA of the building thermal envelope.

R408.3.1.2 Improved fenestration. Vertical fenestration shall meet a U-factor equal to or less than 0.22.

Revise as follows:

R408.3~~2~~.2 More efficient HVAC equipment performance options. Heating and cooling *equipment* shall meet one of the following efficiencies:

Options:

1. Greater than or equal to ~~95 AFUE natural gas furnace and 16 SEER~~ 16.9 SEER2 and 13.4 EER2 air conditioner.

2. Greater than or equal to 15.2 SEER2 and 10 EER2 air conditioner.

3. Greater than or equal to 96 AFUE natural gas furnace.

4. Greater than or equal to 92 AFUE natural gas furnace.

~~2.~~ 5. Greater than or equal to ~~10 HSPF~~ 8.5 HSPF2/~~16 SEER~~ 16.9 SEER2 air source heat pump.

6. Greater than or equal to 8.1 HSPF2/16 SEER2 air source heat pump.

~~3.~~ 7. Greater than or equal to 3.5 COP ground source heat pump

For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load. In Climate Zone 5A, air-source heat pumps shall meet the following requirements for cold climate heat pumps:

1. COP at 5°F (-15°C) ≥ 1.75
2. Percent of heating capacity at 5°F (-15°C) ≥ 70% of that at 47°F (8.34°C)

R408.3~~2~~.3 Reduced energy use in service water-heating options. The hot water system shall meet one of the following efficiencies:

1. Greater than or equal to 0.82 EF fossil fuel service water-heating system.

2. Greater than or equal to 2.~~0~~9 UEF electric service water-heating system.

3. Greater than or equal to 3.2 UEF electric service water-heating system.

~~3.~~ 4. Greater than or equal to 0.4 solar fraction solar water-heating system.

5. Compact hot water distribution. For Compact Hot Water Distribution system credit, the volume shall store not more than 16 ounces of water in the nearest source of heated water and the termination of the fixture supply pipe when calculated using section R408.3.3.1 and documented in compliance with Section R408.3.3.2.

R408.3.3.1 Water volume determination. The water volume in the piping shall be calculated in accordance with this section. Water heaters, circulating water systems and heat trace temperature maintenance systems shall be considered to be sources of heated water. The volume shall be the sum of the internal volumes of pipe, fittings, valves, meters and manifolds between the nearest source of heated water and the termination of the fixture supply pipe. The volume in the piping shall be determined from Table R408.3.3.1. The volume contained within fixture shutoff valves, within flexible water supply connectors to a fixture fitting and within a fixture fitting shall not be included in the water volume determination. Where heated water is supplied by a recirculating system or heat-traced piping, the volume shall include the portion of the fitting on the branch pipe that supplies water to the fixture.

TABLE R408.3.3.1
INTERNAL VOLUME OF VARIOUS WATER DISTRIBUTION TUBING

OUNCES OF WATER PER FOOT OF TUBE

NOMINAL SIZE (inches)	COPPER TYPE M	COPPER TYPE L	COPPER TYPE K	CPVC CTS SDR 11	CPVC SCH 40	CPVC SCH 80	PE- RT SDR 9	COMPOSITE ASTM F1281	PEX CTS SDR 9
3/8	1.06	0.97	0.84	N/A	1.17	-	0.64	0.63	0.64
1/2	1.69	1.55	1.45	1.25	1.89	1.46	1.18	1.31	1.18
3/4	3.43	3.22	2.90	2.67	3.38	2.74	2.35	3.39	2.35
1	5.81	5.49	5.19	4.43	5.53	4.57	3.91	5.56	3.91
1 1/4	8.70	8.36	8.09	6.61	9.66	8.24	5.81	8.49	5.81
1 1/2	12.18	11.83	11.45	9.22	13.20	11.38	8.09	13.88	8.09
2	21.08	20.58	20.04	15.79	21.88	19.11	13.86	21.48	13.86

For SI: 1 foot = 304.8 mm, 1 inch = 25.4 mm, 1 liquid ounce = 0.030L, 1 oz/ft^2 = 305.15 g/m^2.

N/A = Not available

R408.3.3.2 Water volume documentation. Where compliance with Section R408.3.3(5) is required, construction documentation or final field inspection shall verify that the compact hot water distribution system meets the prescribed limit in Section R408.3.3(5) with one of the following:

1. Referencing ounces of water per foot of tube on plans as per Table R408.3.3.1.

2. Referencing ounces of water per foot of tube installed as per Table R408.3.3.1.

3. In accordance with Department of Energy's Zero Energy Ready Home National Specification (Rev. 07 or higher) footnote on Hot water delivery systems.

R408.3~~2~~.4 More efficient duct thermal distribution system option. The thermal distribution system shall meet one of the following efficiencies:

~~1. 100 percent of ducts and air handlers located entirely within the building thermal envelope~~.

~~2.~~ 1. 100 percent of ductless thermal distribution system or hydronic thermal distribution system located completely inside the *building thermal envelope*.

~~3. 100 percent of duct thermal distribution system located in conditioned space as defined by Section R403.3.2.~~

2. When ducts are located outside conditioned space, the total leakage of the ducts, measured in accordance with R403.3.5, shall be in accordance with one of the following:

3.1. Where the air handler is installed at the time of testing, 2.0 cubic feet per minute (0.94 L/s) per 100 square feet (9.29 m) of *conditioned floor area*.

3.2 Where the air handler is not installed at the time of testing, 1.75 cubic feet per minute (0.83 L/s) per 100 square feet (9.29 m) of *conditioned floor area*.

R408.3~~2~~.5 Improved air sealing and efficient ventilation system option. ~~The measured air leakage rate shall be less than or equal to 3.0 ACH50, with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed. Minimum HRV and ERV requirements, measured at the lowest tested net supply airflow, shall be greater than or equal to 75 percent Sensible Recovery Efficiency (SRE), less than or equal to 1.1 cubic feet per minute per watt (0.03 m /min/watt) and shall not use recirculation as a defrost strategy. In addition, the ERV shall be greater than or equal to 50 percent Latent Recovery/Moisture Transfer (LRMT).~~ The measured air leakage rate shall be one of the following:

1. Less than or equal to 2.0 ACH50, with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed.

2. Less than or equal to 2.0 ACH50, with balanced ventilation as defined in Section 202 of the 2021 *International Mechanical Code*.

3. Less than or equal to 1.5 ACH50, with either an ERV or HRV installed.

4. Less than or equal to 1.0 ACH50, with either an ERV or HRV installed.

Minimum HRV and ERV requirements, measured at the lowest tested net supply airflow, shall be greater than or equal to 75 percent Sensible Recovery Efficiency (SRE), less than or equal to 1.1 cubic feet per minute per watt (0.03 m3/min/watt) and shall not use recirculation as a defrost strategy. In addition, the ERV shall be greater than or equal to 50 percent Latent Recovery/ Moisture Transfer (LRMT).

Add new text as follows:

R408.3.6 Energy efficient appliances. Appliances installed in a dwelling unit shall meet the product energy efficiency specifications listed in Table R408.3.6, or equivalent energy efficiency specifications. The three appliance types from Table R408.3.6 shall be installed for compliance with this section.

TABLE R408.3.6 MINIMUM EFFICIENCY REQUIREMENTS: APPLIANCES

Appliance	Efficiency Improvement	Test Procedure
Refrigerator	Maximum Annual Energy Consumption (AEC) No greater than 620 kWh/yr	10 CFR 430, Subpart B, Appendix A
Dishwasher	Maximum Annual Energy Consumption (AEC) No greater than 270 kWh/yr	10 CFR 430, Subpart B, Appendix C1
Clothes Washer and Clothes Dryer	Maximum Annual Energy Consumption (AEC) for Clothes Washer[a] No greater than 130 kWh/yr Integrated Modified	10 CFR 430 Subpart B, Appendix J2 and 10 CFR 430, Subpart B, Appendices D1 and D2

	Energy Factor (IMEF) > 1.84 cu.ft/kWh/cycle	

a. Credit for Clothes Washer and Clothes Dryer pair is based on Clothes Washer efficiency

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.)
   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.

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

   This proposal builds on the additional efficiency options in the 2021 IECC by converting those package options into a points-based system similar to the "Additional Efficiency Credits" system in C406 of the commercial section of the energy code.[3] The proposal requires projects to select additional efficiency "credits"equal to achieve a target of 15. There are several options provided, covering all aspects of building performance. The Northwest pioneered the use of the prescriptive residential options that are currently in place in Washington, and formerly were used in Oregon, and found them to be an effective method of increasing efficiency for residential construction using the prescriptive approach. Additionally Illinois is expected to adopt a similar proposal later this year, although with nearly double the required energy efficiency credits. This proposal does not require performance energy modeling or HERS verification which will increase its usefulness. This type of flex points option can also be easily implemented in the U.S. DOE REScheck software. The purpose of this code change proposal is to improve overall residential building efficiency (heating, cooling and water heating energy) by roughly 15% and to create a scalable, flexible means of improving residential building efficiency for future IECC updates. Instead of requiring efficiency improvements to specific building components that are not equal, the new "credit" approach in Section R408 provides a multitude of options for builders that are calibrated to achieve the efficiency requirements of the IECC. Points-based approaches have been used for several years in Washington and Oregon. This proposal is similar to the Flex Points proposal for the 2021 IECC in overall structure, but the points table has been updated based on the updates included in the 2021 IECC and feedback received. Like the previous version, this proposal also includes alternative compliance pathways for builders who select the simulated performance alternative or the Energy Rating Index (ERI) and will bring roughly equivalent improvements to all three compliance paths.

   This additional efficiency credit proposal is cost-effective, since it includes a number of options to achieve 15 points that are cost-effective and will provide three distinct benefits for jurisdictions adopting the 2021 IECC:

   1. This proposal meets a clear need for efficiency improvements in the model energy code now and in the future. Although the 2021 IECC was determined to be roughly 9% more efficient than the 2018 IECC (PNNL 2021), major gains have plateaued. Buildings still consume an estimated 42% of the nation's energy, 54% of its natural gas, and 71% of

[2] RMI State Score Card, 2022, https://statescorecard.rmi.org/mn
[3] Reasoning and Cost Analysis were used from original IECC code proposal, https://energy.cdpaccess.com/live/proposal/436/html/

its electricity. Governors, legislators, and mayors are increasingly turning to building energy codes to meet energy and climate goals, and those codes should continue to provide reasonable improvements going forward. The U.S. Conference of Mayors, in its fourth consecutive resolution on the subject, reiterated their "concerted support for putting future triennial IECC updates on a "glide path" of steady efficiency gains that will improve the efficiency performance of millions of U.S. residential, multi- family, and commercial buildings."[4] Several jurisdictions have already created or are in the process of creating package-based compliance paths or improved code provisions to meet their policy needs. The result is improved efficiency, but a lack of consistency in both format and requirements. Incorporating Flex Points into the Minnesota code will not only provide a 15% boost in energy conservation but will also provide a realistic map for additional improvements going forward. And, by providing more uniform targets for the efficiency of building components, this proposal will contribute to economies of scale, potentially lowering prices for builders and ultimately consumers.

2. This proposal will provide maximum flexibility for builders to achieve improved efficiency. Additional efficiency credits trusts that builders and design professionals will select the most cost-effective and sensible efficiency improvements for a given project. There are several alternatives for compliance in each climate zone, along with options to comply in a performance- or rating-based path. There are alternatives related to more insulation, more efficient windows, reduced air and duct leakage and improved equipment. This approach provides the right incentives for builders to make long-lasting improvements in residential buildings that are in the best interests of homeowners. The credit values were calculated based on the present value of energy cost savings over the 2018 IECC (including relevant federal equipment efficiency standards) and would need to be updated; these values are provided here for reference and reflect the estimated useful life of each measure over an assumed 30-year life of the building. While a 30-year period is consistent with the typical life of a mortgage, it is a very conservative period given the likelihood that some measures will provide efficiency benefits for decades beyond the initial 30-year period. The analysis behind the 2021 IECC proposal, used the methodology and assumptions included in the U.S. Department of Energy's Methodology for Evaluating Cost-Effectiveness of Residential Energy Code Changes, including the economic equations to obtain the present value of energy costs within the calculation methodology.[5] The energy consumption calculations take into consideration heating, cooling, and water heating energy, using DOE-2 energy simulation across 105 TMY3 weather locations and 12 building types to account for varying stories, foundations, and fuel types for each of the baseline and upgrade measures. The analysis compares the annual energy savings between a home with and without an efficiency measure over the useful life of the efficiency measure using useful life data from NAHB and other sources. Energy costs were calculated using the most recent national EIA projections for natural gas and electricity.

3. This proposal will encourage efficiency improvements in building components that are currently difficult to regulate. Additional efficiency credits addresses two issues that have complicated model energy codes for many years. First, innovative building practices or emerging technologies can benefit from being listed in codes, but states (and national code developing organizations) are reluctant to require new technologies or practices before they are market-tested. As a result, there are high barriers to entry for new technologies, even when they could transform the marketplace and provide energy- or cost-saving benefits for homeowners. As an example, Heat Recovery Ventilators (HRVs

[4] Salcido et al; *Energy Savings Analysis: 2021 IECC for Residential Buildings;* PNNL 2021; available at *Uniting Cities to Accelerate Focus on the Economic and Climate Benefits of Boosting America's Building Energy Efficiency*, 2019 U.S.C.M. Resolution 86 (June 11, 2018), *available at* https://www.usmayors.org/the-conference/resolutions/?category=c9211&meeting=86th%20Annual%20Meeting.

[5] https://www.energycodes.gov/sites/default/files/2021-07/2021IECC_CostEffectiveness_Final_Residential.pdf

) are cost-effective and reasonable for much of the country, but individual circumstances or climate conditions may favor another approach. Rather than require HRVs in every case, or most cases with exceptions, HRVs and Energy Recovery Ventilators are included as one of several options available to builders. Not only will credits create an opportunity for good technology to be used in more buildings, but it will open the door for market forces to make these technologies more widely available (and presumably less expensive). As new technologies or practices become available, these advances can be quickly and easily added into the credit table, fast-tracking technology that is good for consumers. Second, much of the heating, cooling, and water heating equipment installed in residential buildings is subject to federal preemption under the Energy Policy & Conservation Act. As has been debated at length in ICC Code Development hearings over the last 15 years, including equipment efficiencies in performance trade-offs tends to weaken the efficiency of the energy code, since the federal minimum efficiency for nearly every covered product is well below the efficiency levels of commonly installed products. When these efficiency levels are used in trade-off baselines, builders use the improved efficiency of common heating, cooling, and water heating products as a means of trading away efficiency of more permanent building components and features, even though the equipment would have been installed anyway. This "free ridership" may provide short-term cost savings for homebuilders, but it saddles homeowners with unexpected high energy costs over the entire useful life of the building. Moreover, this equipment often carries a much shorter useful life, which is not typically captured in code compliance simulations. This credit structure creates a new incentive to improve the efficiency of covered products without resulting in efficiency rollbacks elsewhere in the code. Heating, cooling, and water heating improvements (among others) are included among the Flex Points options with points calculated according to climate-specific energy cost savings and the longevity of the equipment. Each of these upgrades will build upon the current IECC efficiency, rather than trading it away.

In sum, this proposal will improve efficiency by roughly 15% while unlocking the competitive market for new technologies or building components that are difficult to regulate – all without rolling back the effectiveness or efficiency of the IECC.

3. What other factors should the TAG consider?
   Relevant factors were discussed above.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
   The code change proposal will increase the cost of construction. Very difficult to estimate the exact cost amount because of the highly flexible and integrative nature of the proposal.

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.
   Requiring additional efficiency measures, such as more insulation, more efficient windows, reduced air leakage and duct leakage, and/or more efficient equipment, to save 15% energy will increase the cost of construction, but the resulting energy and cost savings will recoup the initial costs and will continue to benefit consumers over the useful life of the home. Additionally, the flexibility of this approach allows for the most cost-effective means of meeting the stated ICC energy reduction goals.

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 cost savings for reduced utility bills 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?
   Contractors will have more work to do 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.
   The other way to push for increased energy efficiency would be to move these requirements to the prescriptive portion of the code. This will reduce flexibility and increase cost further.

   The main argument will be around the upfront cost. This upfront cost should be recovered by homeowners who will see reduced utility bills and more resilient homes.

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?
   Increased utility bills, less resilient homes and more carbon and other air pollution.

4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.
   None that I am aware of.

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