

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Greg Metz

Date: 12/30/2020 Revised 1/26/2021; 2/15/21

Email address: Greg.Metz@State.MN.US

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 651-284-5884

Code or Rule Section: 6.1.1.4 Prohibition of
Conditioning Commercial Parking

Firm/Association affiliation, if any: DLI/CCLD

Code or rule section to be changed: MR 1323

Intended for Technical Advisory Group ("TAG"): IBC and IBC/IFC Coordination

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 checked="" type="checkbox"/> | <input type="checkbox"/> |
| E. Does the proposal delete a current Minnesota Rule, chapter amendment? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| F. Would this proposed change be appropriate through the ICC code development process? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Proposed Language

1. The proposed code change is meant to:

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

Add: **4.1.1.7 Prohibition of Conditioning Public Commercial Parking**

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). **MR 1323.0100, Subpart 7. Prohibition of Conditioning Public Commercial Parking**

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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Delete Minnesota Rule 1323.0401, Subpart 2 Section C401.3 in its entirety.

Add ANSI/ASHRAE/IEC Standard 90.1, Section 6.1.1.4 to read as follows:

6.1.1.4 Prohibition of Heating Public Commercial Parking.

Heating commercial parking facilities is prohibited in accordance with Minnesota Statute 216C.20, subdivision 3. Commercial parking facility as applied to this section means a parking facility that includes three or more motor vehicle parking stalls.

Exception:

1. Parking facilities exclusively for private motor vehicles appurtenant to non-transient multi-family housing.
 2. Parking facilities exclusively for emergency response vehicles.
 3. Parking facilities exclusively for private motor vehicle sales.
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?

To ensure continued compliance with the ban on public commercial parking heating and to clarify the scope of the prohibition for more uniform enforcement.

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

It inserts the current rule language into the body of the model code where it is more likely to be found and followed. It clarifies exactly where the prohibition applies.

3. What other considerations should the TAG consider? None

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

No cost change. The modification carries forward an existing requirement.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.
N/A

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

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, Engineers, Construction Contractors, Building Officials and Inspectors.
2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.
3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?
No.
4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.
No.
5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

None
6. What are the probable costs or consequences of not adopting the proposed rule, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?

The requirement could be missed, heating equipment installed in public commercial parking garages at a waste of taxpayer dollars.
7. Are you aware of any federal regulation or federal requirement related to this proposed code change? If so, please list the federal regulation or requirement and your assessment of any differences between the proposed rule and the federal regulation or requirement.

No.
8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

N/A

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Diana Burk

Date: 2/10/2021

Email address: diana@newbuildings.org

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 404-290-5442

Code or Rule Section: 3.2., 5.4.3.1, 12

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: 3.2., 5.4.3.1, 12

Intended for Technical Advisory Group ("TAG"): Commercial Energy Code TAG MR 1323

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 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 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).
Section 5.4.3.1
- 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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Section 3.2, Add definition as follows:

High-rise building: A building with an occupied floor located more than 75 feet (23 m) above the lowest level of fire department vehicle access.

Section 5.4.3.1, Revise text as follows:

5.4.3.1 Continuous Air Barrier

The *exterior building envelope* and the *semiexterior building envelope* shall have a *continuous air barrier* complying with Sections 5.4.3.1.1 and 5.4.3.1.2.

Exceptions to 5.4.3.1

1. *Semiheated spaces* in Climate Zones 0 through 6, except as required to complete the *continuous air barrier* of an adjacent *conditioned space*.
2. Single wythe concrete masonry *buildings* in Climate Zone 2B.

5.4.3.1.1 Whole-Building Air Leakage

Whole-building pressurization testing shall be conducted in accordance with ASTM E779, ANSI/RESNET/ICC 380, or ASTM E1827 by an independent third party. The measured air leakage rate of the *building envelope* shall not exceed 0.25 ~~0.40~~ cfm/ft² under a pressure differential of 0.3 in. of water, with this air leakage rate normalized by the sum of the above-grade and below-grade *building envelope* areas of the *conditioned space* and *semiheated space*. Where a *building* contains both *conditioned space* and *semiheated space*, compliance shall be shown

- a. separately for the *conditioned space* and for the *semiheated space*, with the air leakage rate for the *conditioned space* normalized by the *exterior building envelope* area of the *conditioned space* and the air leakage rate for the *semiheated space* normalized by the *semiexterior building envelope* area of the *semiheated space*; or
- b. for the *conditioned space* and for the *semiheated space* together, with the air leakage rate for the overall *space* normalized by the sum of the *exterior building envelope* area and the *semiexterior building envelope* area minus the *semiexterior building envelope* area that separates the *conditioned space* from the *semiheated space*.

Reporting shall be in compliance with Section 4.2.5.1.2.

Exceptions to 5.4.3.1.1

1. For *buildings* having over 50,000 ft² of *gross conditioned floor area*, air leakage testing shall be permitted to be conducted on less than the whole *building*, provided the following portions of the *building* are tested and their measured air leakage is area-weighted by the surface areas of the *building envelope*:
 - a. The entire *floor* area of all *stories* that have any *spaces* directly under a *roof*.
 - b. The entire *floor* area of all *stories* that have a *building entrance* or loading dock.
 - c. Representative *above-grade wall* sections of the *building* totaling at least 25% of the *wall* area enclosing the remaining *conditioned space*. Floor area tested per (a) and (b) shall not be included in the 25%.
2. Where the measured air leakage rate exceeds 0.25 ~~0.40~~ cfm/ft² but does not exceed 0.40 ~~0.60~~ cfm/ft², a diagnostic evaluation, such as a smoke tracer or infrared imaging shall be conducted while the *building* is pressurized, and any leaks noted shall be sealed if such sealing can be made without destruction of *existing building* components. In addition, a visual inspection of the air barrier shall be conducted, and any leaks noted shall be sealed if such sealing can be made without destruction of *existing building* components. An additional report identifying the corrective actions taken to seal leaks shall be submitted to the *code official* and the *building owner* and shall be deemed to satisfy the requirements of this section.

3. For high-rise buildings and buildings greater than 100,000 ft² of gross conditioned floor area, an approved third party shall verify the design and installation of the continuous air barrier design and installation verification program in accordance with Section 5.9.1.2.
4. For buildings or portions of buildings enclosing Group R or Group I occupancies, the measured air leakage shall not exceed 0.30 cfm/ft² (1.5 L/s m²) of the testing unit enclosure area at a pressure differential of 0.2 inch water gauge (50 Pa). Where multiple dwelling units or sleeping units or other occupiable conditioned spaces are contained within one building thermal envelope, each unit shall be considered an individual testing unit, and the building air leakage shall be the weighted average of all testing unit results, weighted by each testing unit's enclosure area. Units shall be tested separately with an unguarded blower door test as follows:
- Where buildings have fewer than eight testing units, each testing unit shall be tested.
 - For buildings with eight or more testing units, the greater of seven units or 20 percent of the testing units in the building shall be tested, including a top floor unit, a ground floor unit and a unit with the largest testing unit enclosure area. For each tested unit that exceeds the maximum air leakage rate, an additional two units shall be tested, including a mixture of testing unit types and locations.

Add new language to Chapter 12 Normative Reference:

Reference	Title
<u>ANSI/RESNET/ICC 380</u>	<u>Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems</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?

This amendment requires air leakage testing for all commercial buildings less than 100,000 square feet and includes specific air leakage testing guidance for multifamily buildings. These changes align the Minnesota commercial energy code more closely with changes to air infiltration testing requirements considered in ASHRAE 189.1 and with the multifamily testing requirements in the 2021 IECC.

Air leakage can be a significant source of energy waste in buildings, contributing to higher heating and cooling costs for building owners and occupants, and increasing risk related to comfort and durability. Air tightness testing can result in more attention to envelope assembly air barrier sealing and significantly reduced building leakage. Adequate control over air leakage can provide many benefits, including reduced HVAC equipment sizing, better building pressurization, and energy savings due to reduced heating and cooling of infiltrated outside air. In moist climates, ensuring lower air leakage through whole-building testing can also result in better humidity control and reduced risk of durability issues. While it is important that the materials and assemblies have limited leakage, that alone does not guarantee a low leakage building. Recent research shows that 40% of buildings constructed without an envelope consultant have air leakage exceeding the currently optional test standard requirements, while buildings with envelope consultants all had leakage below 0.25 cfm/ft.¹ Testing is the most reliable means of ensuring that the intent of this code

¹ Wiss J. 2014. *ASHRAE 1478-RP Measuring Airtightness of Mid- and High-Rise Non-Residential Buildings*. Elstner Associates, Inc. for ASHRAE. <https://www.ashrae.org/resources--publications/periodicals/enewsletters/esociety/2014-12-10-articles/completed-research-december-2014>.

section—limiting unintended energy waste in buildings due to air infiltration—will be achieved. Durston and Heron’s review (2012) of the 0.25cfm/ft² requirement by the U.S. Department of Defense (DOD) shows that without testing, the range of building leakage can exceed the requirement by more than double (0.9 cfm/ft). However, with testing included as part of the construction process, the average leakage of buildings was determined to be below the 0.25 cfm/ft limit and in many cases lower leakage levels in the range of 0.15 cfm/ft² can be achieved.² Therefore, a test limit of 0.25 cfm/ft is considered to be both a realistic and achievable goal and would align the Minnesota state code with the testing requirements under consideration in ASHRAE 189.1.

This amendment proposes exempting testing for high-rise buildings and buildings of 100,000 ft² because of the technical and practical issues with testing these large buildings. This amendment also proposes different test procedures and thresholds for multifamily structures (Group R and I occupancies) that align with the test procedures and thresholds outlined in the 2021 IECC to reflect current industry practice in blower door testing for the multifamily market.

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

This code amendment aligns Minnesota state code with testing requirements in the 2021 IECC and those under consideration in 189.1. In colder climate zones, the importance of air barrier tightness is critical to the performance of building heating systems. Ensuring the air barrier for new construction in MN will increase occupant comfort and reduce energy use across all commercial building types.

3. What other considerations should the TAG consider?

None.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

The code change proposal will increase the cost of construction

This measure will increase the cost of construction of new commercial buildings as whole building air leakage testing will be required except for primarily residential buildings (Group R and I building occupancies). Based on a national survey of professional commercial building air barrier testing companies, it was determined that the cost of air leakage testing fell into three ranges:

- \$350 or \$0.12 to \$0.07 per square foot for buildings up to 5000 square feet
- \$0.50 to \$0.15 per square foot for buildings between 5000 and 50,000 square feet
- \$0.15 to \$0.09 per square foot for buildings between 50,000 and 100,000 square feet, with decreasing costs for larger buildings.

As demand for air leakage testing in commercial buildings increases, more companies will enter the market to provide these services. Therefore, a gradual decrease in cost is expected as more companies are available to do the testing.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.

² Durston JL and M Heron. 2012. *Summary and Analysis of Large Building Air Leakage Testing for the U.S. Department of Defense*. Atlanta, GA. https://cdn.ymaws.com/www.nibs.org/resource/resmgr/BEST/best3_durston.2.9.pdf.

An analysis of energy impact shows that annual energy savings from air barrier improvement resulting from testing due to the measure ranges from \$5.07 to \$71.88 per thousand square feet of floor area in offices in climate zones where testing is recommended. Testing was highly recommended in colder climate zones like Minnesota and found to be not as cost effective in warmer climate zones.

Pacific Northwest National Laboratory performed a cost-effectiveness analysis using the established DOE methodology.³ Results of the analysis indicate that the average savings-to-investment ratio (SIR) and simple payback period (SPP) for commercial building testing with a limit of 0.40 cfm/ft² (1.5 L/s · m²) at a pressure differential of 0.3 inch w.g. (50 Pa) in office buildings vary by size, as shown in the table below. If buildings meet a threshold of 0.25 cfm/ft² instead of 0.4 cfm/ft², cost effectiveness will only improve. We expect the SIR will increase and the SPP will decrease at this higher threshold because of increased energy savings with a minor or non-existent addition to cost.

Building size range, floor area square feet	<5000	5000 to 50,000	>50,000
Average SIR	7.3	2.2	3.2
Average SPP (years)	7.1	13.1	10.2

A measure is cost-effective when the SIR is greater than 1.0, indicating that the present value of savings is greater than the incremental cost. Under ASHRAE 90.1 criteria, cost-effectiveness is proven when the simple payback is shorter than the scalar threshold of 22.2 years. Based on the cost-effectiveness analysis results, air barrier testing is specified for buildings that have both an SIR greater than 1 and a simple payback that is less than the 90.1 scalar threshold based on climate zone and building size.

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

No. Air-barrier testing is already an option in the energy code.

4. 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? 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. There should be no impact as air-barrier testing is already an option in the energy code.

Regulatory Analysis

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

All parties will be affected by this proposed code change.

2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.

No.

3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?

³ Hart R and B Liu. 2015. *Methodology for Evaluating Cost-effectiveness of Commercial Energy Code Changes*. Pacific Northwest National Laboratory for U.S. Department of Energy; Energy Efficiency & Renewable Energy. PNNL-23923, Rev. 1. <https://www.energycodes.gov/development/commercial/methodology>.

No.

4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.

No.

5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

See answer in cost/benefit analysis above.

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

Building owners will pay increased utility bills if this amendment is not accepted. Building occupants will have reduced comfort. Increased consumption of fossil fuels for heating will impact statewide air quality and reduce likelihood of achieving Minnesota's climate goals outlined in the Next Generation Energy Act of 2007.

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

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

There is no additional cumulative effect of the rule when accounting for other federal and state regulations.

***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: Greg Metz

Date: 1/4/2020

Email address: Greg.Metz@State.MN.US

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 651-284-5884

Modify Section 5.5.3.1 Roof Insulation

Firm/Association affiliation, if any: DLI/CCLD

Code or rule section to be changed: MR 1323

Intended for Technical Advisory Group ("TAG"): 1323 Minnesota Energy Code

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 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 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 type="checkbox"/> | <input checked="" type="checkbox"/> |

Proposed Language

- The proposed code change is meant to:
 - change language contained the model code book? If so, list section(s).
5.5.3.1 Roof Insulation
 - 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.
No.

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

Modify 5.5.3.1 Roof Insulation as follows:

5.5.3.1 Roof Insulation

All roofs shall comply with the insulation values specified in Tables 5.5-0 through 5.5-8. Skylight curbs, mechanical curbs, and other roof curbs shall be insulated to the level of roofs with insulation entirely above deck or ~~R-5.0~~ R-10, whichever is less.

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?

Skylight and equipment curbs are a major thermal bridge/heat loss location costing energy resources and contributing to interior condensation and microbial growth. Equipment curbs are currently not even addressed in the code. Increasing the thermal resistance will significantly mitigate both the heat loss and the condensation development.

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

Equipment curbs insulated to R-10 are readily fabricated, and prefabricated curbs to the same insulation level are available. Ducts from rooftop units that pass through curbs are not required to be insulated, but ducts that are exposed to the exterior are required to be insulated to a minimum R-12. Were there no curb, the duct would be insulated to R-12 instead of R-5. It is reasonable to require at least R-10 which is available with 2 inches of extruded polystyrene foam insulation.

3. What other considerations should the TAG consider? Ductwork from rooftop units typically pass through the curb area with minimal insulation, yet the curb is directly exposed to the exterior. Increasing the thermal resistance to R-10 more closely approximates the R-12 required for ducts exposed to the exterior as found in Table 6.8.2. Curbs for flues and kitchen exhaust would be exempted.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

Minimal cost increase.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. The increased costs are easily offset by the energy savings. The additional insulation will keep the inside of the curbs dry during cold weather and reduce moisture related microbial growth and wetting of other building materials.
3. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain. No.
4. 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? A small business is any business that has

less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, Engineers, Construction Contractors, Building Officials and Inspectors.
2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.

3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?
No.
4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.
No.
5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

Cost of an insulated curb is minimal.

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

Continued perpetuation of moisture related damage within buildings due to condensation build-up during cold weather, and continued energy losses through under-insulated curbs.
7. Are you aware of any federal regulation or federal requirement related to this proposed code change? If so, please list the federal regulation or requirement and your assessment of any differences between the proposed rule and the federal regulation or requirement.

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

N/A

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Greg Metz

Date: 1/4/2020

Email address: Greg.Metz@State.MN.US

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 651-284-5884

*Modify Section 5.5.3.2 Above Grade Wall
Insulation*

Firm/Association affiliation, if any: DLI/CCLD

Code or rule section to be changed: MR 1323

Intended for Technical Advisory Group ("TAG"): 1323 Minnesota Energy Code

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 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 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 type="checkbox"/> | <input checked="" type="checkbox"/> |

Proposed Language

1. The proposed code change is meant to:

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

5.5.3.2 Above Grade Wall Insulation

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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Modify 5.5.3.2 Above Grade Wall Insulation as follows:

5.5.3.2 Above Grade Wall Insulation

All above-grade walls shall comply with the insulation values specified in Tables 5.5-0 through 5.5-8.

Exception to 5.5.3.2

Alternatively, for mass walls, where the requirement in Tables 5.5-0 through 5.5-8 is for a maximum assembly U-0.151 followed by footnote “b,” ASTM C90 concrete block walls, un-grouted or partially grouted at 32 in. or less on center vertically and 48 in. or less on center horizontally shall have un-grouted cores filled with material having a thermal conductivity of 0.44 Btu in./h ft² F. Other mass walls with integral insulation shall meet the criteria when their U-factors are equal to or less than those for the appropriate thickness and density in the “Partly Grouted, Cells Insulated” Column of Table A3.1-3.

When a wall consists of both above-grade and below-grade portions, the entire wall for that story shall be insulated on either the exterior ~~or the interior~~ or be integral.

- ~~a. If insulated on the interior, the wall shall be insulated to the above-grade wall requirements.~~
- b. ~~If insulation is on the exterior or integral,~~ The below-grade wall portion shall be insulated to the below-grade wall requirements, and the above-grade wall portion shall be insulated to the above-grade wall requirements

~~In addition, for Climate Zone 0, above-grade walls shall comply with one of the following:~~

- ~~a. For east and west walls, a minimum of 75% of the opaque wall area shall have a minimum SRI of 29. For the portion of the opaque wall that is glass spandrel area, a minimum solar reflectance of 29% determined in accordance with NFRC 300 or ISO 9050 shall be permitted. Each wall is allowed to be considered separately.~~
- ~~b. For east and west walls, a minimum of 30% of the above-grade wall area shall be shaded through the use of shade providing plants, man-made structures, existing buildings, hillsides, permanent building projections, on-site renewable energy systems, or a combination of these. Shade coverage shall be calculated at 10 a.m. for the east walls and 3 p.m. for the west walls on the summer solstice. The building is allowed to be rotated up to 45 degrees to the nearest cardinal orientation for purposes of calculations and showing compliance.~~

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?

There is typically a significant thermal short circuit that occurs at the top of a foundation wall when transitioning to the above grade construction condition. Moving the insulation to be on the exterior side or integral to the wall will reduce or eliminate this thermal short circuit. In addition, moving the insulation to either the exterior or an integral part of the exterior wall will significantly reduce the likelihood of condensation on the interior surfaces thereby ensuring better indoor air quality.

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

Insulation on either the exterior or the interior requires a finish. Moving the insulation toward the exterior reduces or eliminates the thermal short circuit at the top of the foundation wall.

3. What other considerations should the TAG consider? Moisture control, microbial growth mitigation, potential complexity in exterior finish treatment at grade.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

Minimal cost increase due to potential for additional exterior insulation protection at grade.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.
The increased costs are easily offset by the energy savings and reduction in moisture damage to building materials.
3. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain. No.
4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, Engineers, Construction Contractors, Building Officials and Inspectors.
2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.
3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?
No.
4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.
No.
5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

Potential incremental cost of exterior insulation protection at grade.

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

Continued perpetuation of moisture related damage within buildings due to condensation build-up during cold weather, and continued energy losses through thermal short circuits at foundation wall to floor/exterior wall transition.

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

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

N/A

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Greg Metz

Date: 1/4/2020

Email address: Greg.Metz@State.MN.US

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 651-284-5884

Modify Section 5.5.3.3 Below-grade Wall Insulation

Firm/Association affiliation, if any: DLI/CCLD

Code or rule section to be changed: MR 1323

Intended for Technical Advisory Group ("TAG"): 1323 Minnesota Energy Code

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 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 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 type="checkbox"/> | <input checked="" type="checkbox"/> |

Proposed Language

1. The proposed code change is meant to:

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

5.5.3.3 Below Grade Wall Insulation

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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Modify 5.5.3.3 Below-grade Wall Insulation as follows:

5.5.3.3 Below Grade Wall Insulation

Below-grade walls shall have a rated R-value of insulation no less than the insulation values specified in Tables 5.5-0 through 5.5-8. Walls shall be insulated on the exterior side of the wall or integral to the wall.

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?

There is typically a significant thermal short circuit that occurs at the top of a foundation wall when transitioning to the above grade construction condition. Moving the insulation to be on the exterior side or integral to the wall will reduce or eliminate this thermal short circuit. In addition, moving the insulation to either the exterior or an integral part of the exterior wall will significantly reduce the likelihood of condensation on the interior surfaces thereby ensuring better indoor air quality.

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

Insulation on either the exterior or the interior requires a finish. Moving the insulation toward the exterior reduces or eliminates the thermal short circuit at the top of the foundation wall.

3. What other considerations should the TAG consider? No

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

Minimal cost increase.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.
The increased costs are easily offset by the energy savings. The additional insulation will keep the inside of the curbs dry during cold weather and reduce moisture related microbial growth and wetting of other building materials.

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

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, Engineers, Construction Contractors, Building Officials and Inspectors.
2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.
3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?
No.
4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.
No.
5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

Potential incremental cost of exterior insulation protection at grade.
6. What are the probable costs or consequences of not adopting the proposed rule, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?

Continued perpetuation of moisture related damage within buildings due to condensation build-up during cold weather, and continued energy losses through thermal short circuits at foundation wall to floor/exterior wall transition.
7. Are you aware of any federal regulation or federal requirement related to this proposed code change? If so, please list the federal regulation or requirement and your assessment of any differences between the proposed rule and the federal regulation or requirement.

No.
8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

N/A

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Greg Metz

Date: 1/4/2020

Email address: Greg.Metz@State.MN.US

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 651-284-5884

*Modify Section 5.5.3.5 Slab-on-grade Floor
Insulation*

Firm/Association affiliation, if any: DLI/CCLD

Code or rule section to be changed: MR 1323

Intended for Technical Advisory Group ("TAG"): 1323 Minnesota Energy Code

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 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 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 type="checkbox"/> | <input checked="" type="checkbox"/> |

Proposed Language

1. The proposed code change is meant to:

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

5.5.3.5 Slab-on-Grade Floor Insulation

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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Modify 5.5.3.5 Slab-on-grade floor Insulation as follows:

5.5.3.5 Slab-on-Grade Floor Insulation

All slab-on-grade floors including heated slab-on-grade floors and unheated slab-on-grade floors, shall comply with the insulation values specified in Tables 5.5-0 through 5.5-8. Perimeters shall be insulated on the exterior side of the slab foundation wall. All slab-on-grade floors in conditioned spaces shall have minimum R-5 continuous insulation under the slab in Climate Zone 6 and minimum R-10 insulation in Climate Zone 7.

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?

There is typically a significant thermal short circuit that occurs at the top of a foundation wall/slab edge when transitioning to the above grade construction condition. Moving the insulation to be on the exterior side will eliminate this thermal short circuit.

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

Moving the insulation toward the exterior eliminates the thermal short circuit at the top of the foundation wall/ slab edge. It is an easy low-tech solution.

3. What other considerations should the TAG consider? Requiring a minimum of R-5 under all slab-on-grade conditions. Ground temperatures are low enough that the slab condition even mid-building can represent a significant heat loss.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

Potential minimal cost increase to protect exterior insulation from ultraviolet exposure.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.

The increased costs are easily offset by the energy savings.

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

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, Engineers, Construction Contractors, Building Officials and Inspectors.
2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.
3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?
No.
4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.
No.
5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

Potential incremental cost of exterior insulation protection at grade.
6. What are the probable costs or consequences of not adopting the proposed rule, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?

Continued significant energy loss at the building perimeter foundation connection. Perpetuation of moisture related damage at the base of wall due to condensation build-up during cold weather.
7. Are you aware of any federal regulation or federal requirement related to this proposed code change? If so, please list the federal regulation or requirement and your assessment of any differences between the proposed rule and the federal regulation or requirement.

No.
8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

N/A

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Greg Metz

Date: 1/27/21

Email address: Greg.Metz@State.MN.US

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 651-284-5884

Modify Section 5.5.3.7 Below Grade Slab-on-Ground Insulation

Firm/Association affiliation, if any: DLI/CCLD

Code or rule section to be changed: MR 1323

Intended for Technical Advisory Group ("TAG"): 1323 Minnesota Energy Code

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 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 type="checkbox"/> | <input checked="" 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.

5.5.3.7 Below Grade Slab-on-Ground Floor Insulation

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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

5.5.3.7 Below Grade Slab-on-Ground Floor Insulation

All slab-on-ground floors more than 24 inches below finished grade shall have a minimum R-5 continuous insulation below the slab.

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?

Soil temperatures in Minnesota average approximately 45 degrees throughout the year. This represents a significant source of heat loss during the heating season. In addition, during the summer months, the uncontrolled cooling effect is accompanied by uncontrolled condensation leading to dampness and potential microbial growth.

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

Insulating floor slabs below ground will mitigate energy loss through the slab during the heating season and allow the slab to stay warmer in the summer, thereby mitigating dampness below grade.

3. What other considerations should the TAG consider? Increasing the R-value to R-10 in Zone 7 where soil temperatures are even colder.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

R-5 insulation is approximately \$0.62/sf and R-10 insulation costs approximately \$0.81/sf.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.

The increased costs are easily offset by the energy savings.

- With R-5 insulation, the annual energy savings for a 1000 sf basement is \$350 with a return on investment for the insulation in 3.5 years.
- With R-10 insulation, the annual energy savings for a 1000 sf basement is \$375 with a return on investment for the insulation in 4.3 years.

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

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, Engineers, Construction Contractors, Building Officials and Inspectors.
2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.
3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?
No.
4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.
No.
5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

Potential incremental cost of exterior insulation protection at grade.
6. What are the probable costs or consequences of not adopting the proposed rule, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?

Continued significant energy loss at the building perimeter foundation connection. Perpetuation of moisture related damage at the base of wall due to condensation build-up during cold weather.
7. Are you aware of any federal regulation or federal requirement related to this proposed code change? If so, please list the federal regulation or requirement and your assessment of any differences between the proposed rule and the federal regulation or requirement.

No.
8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

N/A

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

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

Date: February 13, 2021

Email address: jsmith@michaudcooley.com

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 612 -867-3145

Code or Rule Section: 6.4.2 Calculations

Firm/Association affiliation, if any:

Code or rule section to be changed: MR 1323

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

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 checked="" type="checkbox"/> | <input type="checkbox"/> |
| E. Does the proposal delete a current Minnesota Rule, chapter amendment? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| F. Would this proposed change be appropriate through the ICC code development process? | <input type="checkbox"/> | <input checked="" 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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Add the following new subsection:

6.4.2.1.1 Climatic Data Design Conditions

Climatic data design conditions to be used for the calculation of heating and cooling loads shall be determined by either of the following methods:

Method 1: Use weather conditions identified in Table C6.4.1. Where the building city location is not listed, use the listed city that is the nearest.

Method 2: Use weather data published as a part of ASHRAE Standard 169-2020 for the nearest city.

This data is available at www.ASHRAE-meteo.info. Design temperatures shall be rounded to the nearest whole number. Winter design conditions shall be the mean extreme annual temperature.

Summer conditions shall be the 1% annual cooling design conditions.

Table C6.4.1		
CLIMATIC DATA DESIGN CONDITIONS		
City	Winter Design db °F	Summer db °F/coincident wb °F
Aitkin	-24	82/72
Albert Lea	-15	85/72
Alexandria AP	-21	86/70
Bemidji AP	-24	84/68
Cloquet	-20	82/68
Crookston	-27	84/70
Duluth AP	-20	81/67
Ely	-29	82/68
Eveleth	-26	82/68
Faribault	-16	86/73
Fergus Falls	-21	86/71
Grand Rapids	-23	81/67
Hibbing	-19	82/68
International Falls AP	-28	83/67
Litchfield	-18	85/71
Little Falls	-20	86/71
Mankato	-15	86/72
Mpls/St. Paul AP	-15	88/72
Montivedeo	-17	86/72
Mora	-21	84/70
Morris	-21	84/72
New Ulm	-15	87/73
Owatonna	-16	86/73
Pequot Lakes	-23	84/68
Pipestone	-15	85/73

Redwood Falls	-17	89/73
Rochester AP	-17	85/72
Roseau	-29	82/70
St. Cloud AP	-20	86/71
Thief River Falls	-25	82/68
Tofte	-14	75/61
Warroad	-29	83/67
Wheaton	-20	84/71
Willmar	-20	85/71
Winona	-13	88/74
Worthington	-14	84/71

Need and Reason

1. Why is the proposed code change needed?

The above table is currently in the 2020 Energy Code and was in the version previous to the current code. ASHRAE 90.1 includes no information of what design conditions to use, and the reference to Standard 183 similarly does not. It is important to have the outdoor design conditions for uniformity in design and to help assure that HVAC systems will perform as expected. Using Method 2 identified above provides very similar results as using the table, however, the data for many more cities is available at the ASHRAE site. Method 2 clearly identifies which weather data conditions to use for the heating and cooling conditions as the data includes many different statistical data points.

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

Maintains design conditions which have been used for many years in Minnesota. Provides a standard method of determining the design conditions.

3. What other considerations should the TAG consider? None

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

No cost change. The modification carries forward an existing requirement.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.

N/A

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

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, Engineers, Construction Contractors, Building Officials, Owners and Inspectors.
2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.

3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?
No.
4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.
No.
5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

None

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

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

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

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

N/A

MINNESOTA WEATHER DATA

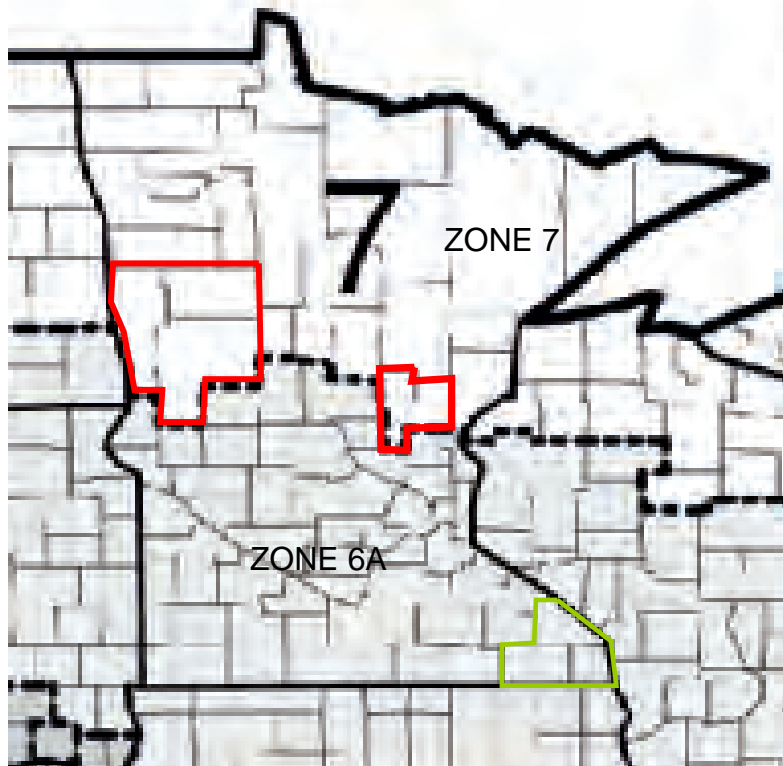
	ASHRAE 1981					2020 Minnesota Energy Code		2017 ASHRAE Climatic Data						
	Winter		Summer			Winter	Summer	Winter		Summer				
	Design db	97.50%	Design db w/coincident wb	1%	2.50%	5%	Design db	db w/coinc wb	99.6%	99.0%	Extreme Mean	Design db w/coincident wb	0.4%	1.0%
Aitkin						-24	82/72	-20.0	-14.8	-28.1	85.9/74.8	82.4/72.1	81/70.4	
Albert Lea	-17	-12	90/74	87/72	84/71	-15	85/72	-11.8	-7.7	-18.5	89.6/73.9	86.1/72.2	83.5/70.9	
Alexandria AP	-22	-16	91/72	88/72	85/70	-21	86/70	-18.0	-12.8	-23.1	87/9/72	84.7/70	82/68.5	
Bemidji AP	-31	-26	88/69	85/69	81/67	-24	84/68	-22.5	-17.2	-30.3	86.4/70	82.4/67.3	80.7/65.9	
Brainerd	-20	-16	90/73	87/71	84/69			-18.6	-12.9	-27.4	88.3/72.3	84.8/69.3	82.2/68.1	
Cloquet						-20	82/68	-18.0	-12.7	-24.4	84.2/70.8	81.6/68.2	79.1/66.2	
Crookston						-27	84/70	-24.1	-18.1	-28.2	87.8/72.7	83.9/70.1	81.5/68	
Duluth AP	-21	-16	85/70	82/68	79/66	-20	81/67	-17.2	-12.0	-23.4	84.2/69.7	81.1/67.1	78.2/65.3	
Ely						-29	82/68	-26.6	-20.0	-33.9	84.3/69.2	81.6/67.4	79.1/65.2	
Eveleth						-26	82/68	-22.4	-17.1	-30.7	85.8/69.4	82/66.9	80.5/65.7	
Faribault	-17	-12	91/74	88/72	85/71	-16	86/73	-13.7	-8.4	-20.6	90.1/74.3	87.6/72.7	83.9/70.7	
Fergus Falls	-21	-17	91/72	88/72	85/70	-21	86/71	-18.2	-15.0	-26.0	88.5/72.5	84.5/70.2	82.1/68.6	
Grand Marais								-12.8	-7.5	-18.5	76.8/61.9	73.1/61.7	70.1/60.4	
Grand Rapids						-23	81/67	-19.5	-15.0	-24.6	84.2/69.8	81.6/67.4	79.2/65.4	
Hibbing						-19	82/68	-23.6	-17.6	-31.4	85.5/70.1	82.3/67.8	79.7/65.8	
International Falls AP	-29	-25	85/68	83/68	80/66	-28	83/67	-26.1	-20.5	-34.6	85.4/69.8	82.3/67.4	79.5/65.8	
Litchfield						-18	85/71	-15.0	-9.1	-19.9	89.6/73.6	85.8/72	82.3/69.4	
Little Falls						-20	86/71	-18.2	-12.8	-26.3	90/72.9	85.9/69.9	82.1/67.5	
Mankato	-17	-12	91/72	88/72	85/70	-15	86/72	-12.3	-8.2	-15.9	89.8/73.7	86.3/71.9	83.5/70.6	
Mpls/St. Paul AP	-16	-12	92/75	89/73	86/71	-15	88/72	-10.6	-5.8	-16.7	90.8/73.3	87.8/72	84.9/70.2	
Montivedeo						-17	86/72	-14.8	-9.0	-19.1	90.2/73.4	87.7/72.8	84/70.3	
Mora						-21	84/70	-18.0	-11.8	-23.9	80.8/70.1	85.5/70.3	81.5/67.8	
Morris						-21	84/72	-17.8	-12.9	-22.6	89.6/74.1	85.6/72	82.3/70.1	
New Ulm						-15	87/73	-14.0	-8.6	-18.6	90.2/74.2	87.6/73	83.9/70/9	
Owatonna						-16	86/73	-14.5	-8.6	-19.1	89.9/74.2	86.4/72.3	83.7/71	
Pequot Lakes						-23	84/68	-23.4	-17.2	-30.5	88.9/69.8	85.4/68.3	81.8/66.2	
Pipestone						-15	85/73	-12.3	-8.2	-18.7	89.6/73.7	86.2/72.7	83.6/71	
Redwood Falls						-17	89/73	-13.4	-8.7	-18.8	91.3/74.2	88.4/72.6	85.6/70.8	
Rochester AP	-17	-12	90/74	87/72	84/71	-17	85/72	-12.4	-7.6	-18.7	87.7/73.3	84.7/71.7	82.2/70.3	
Roseau						-29	82/70	-25.5	-19.5	-31.1	87.6/74.6	83.6/71.5	81.2/69.6	
St. Cloud AP	-15	-11	91/74	88/72	85/70	-20	86/71	-16.8	-11.3	-24.2	89.4/72.5	86.3/70.7	83.4/68.7	
Silver Bay								-19.5	-14.7	-28.3	84.1/68.1	81.5/65.7	79/64.1	
Thief River Falls						-25	82/68	-22.2	-17.5	-27.3	85.8/70.9	82.2/68.4	80.8/67.1	
Tofte						-14	75/61							
Virginia	-25	-21	85/69	83/68	80/66			-22.4	-17.1	-30.7	85.8/69.4	82/66.9	80.5/65.7	
Warroad						-29	83/67	-24.3	-18.4	-32.1	84.3/71.2	81.7/69.7	79.3/67.2	
Wheaton						-20	84/71	-17.4	-11.3	-22.6	89.8/72.9	86.1/71.6	82.5/69.3	
Willmar	-15	-11	91/74	88/72	85/71	-20	85/71	-17.4	-11.3	-21.7	89.7/73.2	86/71.8	82.5/69.9	
Winona	-14	-10	91/75	88/73	85/72	-13	88/74	-8.9	-4.3	-17.7	90.8/73.2	88.4/72.6	84.2/70.4	
Worthington						-14	84/71	-11.2	-7.6	-15.8	88.4/72.3	85.6/70.9	82.3/69	

ASHRAE 1981: Winter: Months of December, January, and February
 Summer: Months of June, July and August

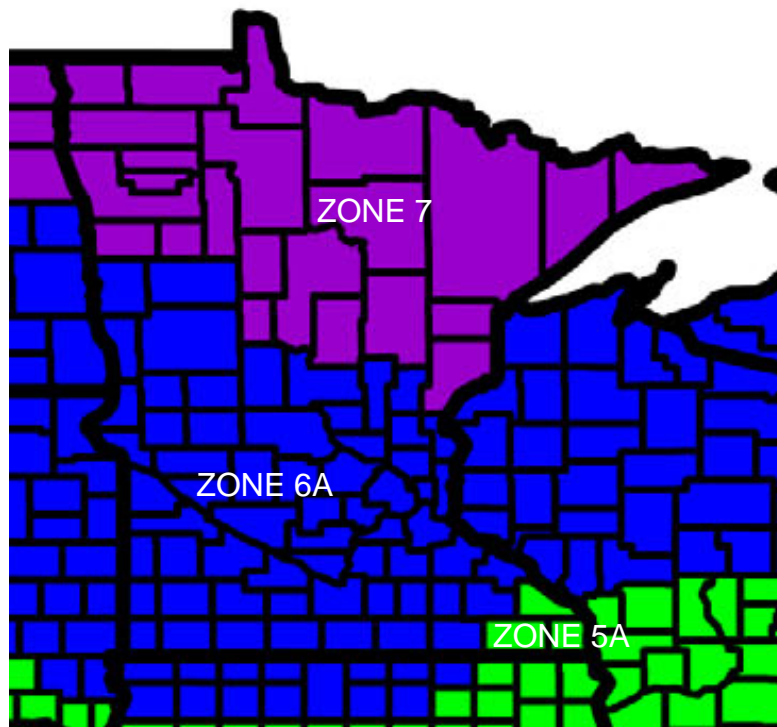
Latest ASHRAE weather based on 8760 hours of the year

**Table C6.4.1
CLIMATIC DATA DESIGN CONDITIONS**

City	Winter Design db °F	Summer db °F/coinc wb °F
Aitkin	-24	82/72
Albert Lea	-15	85/72
Alexandria AP	-21	86/70
Bemidji AP	-24	84/68
Cloquet	-20	82/68
Crookston	-27	84/70
Duluth AP	-20	81/67
Ely	-29	82/68
Eveleth	-26	82/68
Faribault	-16	86/73
Fergus Falls	-21	86/71
Grand Rapids	-23	81/67
Hibbing	-19	82/68
International Falls AP	-28	83/67
Litchfield	-18	85/71
Little Falls	-20	86/71
Mankato	-15	86/72
Mpls/St. Paul AP	-15	88/72
Montivedeo	-17	86/72
Mora	-21	84/70
Morris	-21	84/72
New Ulm	-15	87/73
Owatonna	-16	86/73
Pequot Lakes	-23	84/68
Pipestone	-15	85/73
Redwood Falls	-17	89/73
Rochester AP	-17	85/72
Roseau	-29	82/70
St. Cloud AP	-20	86/71
Thief River Falls	-25	82/68
Tofte	-14	75/61
Warroad	-29	83/67
Wheaton	-20	84/71
Willmar	-20	85/71
Winona	-13	88/74
Worthington	-14	84/71



2020 Minnesota Energy Code



ZONE 7 -> 6A

- Becker
- Clay
- Grant
- Kanabec
- Mile Lacs
- Otter Tail
- Wilkin

ZONE 6A -> 5A

- Fillmore
- Houston
- Winona

ASHRAE 90.1-2019

Climate zones

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Diana Burk

Date: 2/10/2021

Email address: diana@newbuildings.org

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 404-290-5442

Code or Rule Section: Section 3, 6.4.8

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: 6.4.8

Intended for Technical Advisory Group ("TAG"): Commercial Energy Code TAG MR 1323

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 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 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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Modify language in Section 3:

DX-dedicated outdoor air system units (DX-DOAS units): a type of air-cooled, water-cooled, or water-source factory assembled product that dehumidifies 100% *outdoor air* to a low dew point and includes *reheat* that is capable of controlling the supply dry-bulb temperature of the dehumidified air to the designed supply air temperature. This conditioned *outdoor air* is then delivered directly or indirectly via an independent ventilation system to the *conditioned spaces*. It may precondition *outdoor air* by containing an enthalpy wheel, sensible wheel, desiccant wheel, plate heat exchanger, heat pipes, or other heat or mass transfer apparatus.

Add new language in Section 6.4 (Mandatory Provisions):

6.4.8 Dedicated outdoor air systems (DOAS)

Buildings with occupancies as shown in Table 6.4.8 shall be equipped with an independent ventilation system meeting the requirements of this section and designed to provide not less than the minimum 100-percent outdoor air to each individual occupied space, as specified by the International Mechanical Code. The ventilation system shall meet the requirements for total energy recovery in Section 6.4.9.

Exceptions:

1. Occupied spaces that are not ventilated by a mechanical ventilation system and are only ventilated by a natural ventilation system in accordance with Section 402 of the International Mechanical Code.
2. Buildings where the primary heating equipment efficiency exceeds the minimum heating efficiency requirements in Section 6.8 by 10 percent
3. Buildings where the primary cooling or heat rejection equipment exceeds the minimum cooling and heat rejection efficiency requirements in Section 6.8 by 10 percent. Where multiple cooling performance requirements are provided, the equipment shall exceed the annual energy requirement, including IEER, SEER, and IPLV.

Table 6.4.8 Occupancy Classifications Requiring *DX-DOAS*

<u>IBC Occupancy Classification</u>	<u>Inclusions</u>	<u>Exempted</u>
<u>A-1</u>	<u>All occupancies not specifically exempted</u>	<u>Television and radio studios</u>
<u>A-2</u>	<u>Casinos (gaming area)</u>	<u>All other A-2 occupancies</u>
<u>A-3</u>	<u>Lecture halls, community halls, exhibition halls, gymnasiums, courtrooms, libraries, places of religious worship</u>	<u>All other A-3 occupancies</u>
<u>A-4, A-5</u>		<u>All occupancies excluded</u>
<u>B</u>	<u>All occupancies not specifically exempted</u>	<u>Food processing establishments including commercial kitchens, restaurants, cafeterias; laboratories for testing and research; data processing facilities and telephone</u>

		<u>exchanges; air traffic control towers; animal hospitals, kennels, pounds; ambulatory care facilities.</u>
F, H, I, R, S, U		All occupancies excluded
E, M	All occupancies included	

6.4.8.1 Controls. The HVAC system shall include supply-air temperature controls that automatically reset the supply-air temperature in response to representative building loads or to outdoor air temperatures. The controls shall reset the supply air temperature not less than 25 percent of the difference between the design supply-air temperature and the design room-air temperature.

6.4.8.2 Energy recovery ventilation with DOAS. The DOAS shall include energy recovery ventilation. The energy recovery system shall have a 50 percent *enthalpy recovery ratio* in accordance with Section 6.5.6.1. For DOAS having a total fan system motor nameplate hp less than 5 hp, total combined fan power shall not exceed 1 W/cfm of outdoor air. For DOAS having a total fan system motor hp greater than 5 hp, refer to fan power limitations of Section 6.5.3.1. The airflow rate thresholds for energy recovery requirements in Tables 6.5.6.1.2-1 and 6.5.6.1.2-2 do not apply.

Exceptions:

1. Occupied spaces with all of the following characteristics: complying with Section 6.5.6.1, served by less than 5000 cfm, with an average occupant load greater than 25 people per 1000 square feet (93 m²) of floor area (as established in Table 403.3.1.1 of the International Mechanical Code) that include demand control ventilation configured to reduce outdoor air by at least 50% below design minimum ventilation rates when the actual occupancy of the space served by the system is less than the design occupancy.
2. Systems installed for the sole purpose of providing makeup air for systems exhausting toxic, flammable, paint, or corrosive fumes or dust, dryer exhaust, or commercial kitchen hoods used for collecting and removing grease vapors and smoke.

6.4.8.3 Heating/cooling system fan controls. Heating and cooling equipment fans, heating and cooling circulation pumps, and terminal unit fans shall cycle off and terminal unit primary cooling air shall be shut off when there is no call for heating or cooling in the zone.

Exception: Fans used for heating and cooling using less than 0.12 watts per cfm may operate when space temperatures are within the set point dead band (Section 6.4.3.1.2) to provide destratification and air mixing in the space.

6.4.3 Decoupled DOAS supply air. The DOAS supply air shall be delivered directly to occupied space or downstream of the terminal heating and/or cooling units.

Exceptions:

1. Active chilled beam systems.
2. Sensible only cooling terminal units with pressure independent variable airflow regulating devices limiting the DOAS supply air to the greater of latent load or minimum ventilation requirements.
3. Terminal heating and/or cooling units that comply with the low fan power allowance requirements in the exception of Section 6.4.8.2

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

No. This proposed code change will not impact other sections.

Need and Reason

1. Why is the proposed code change needed?

The majority of commercial HVAC systems are based around a central air handling delivery system. This system typically provides heating, cooling and ventilation air from a single source. Since cooling is typically the largest instantaneous load, the fans must be sized large enough to deliver enough air to meet the peak cooling requirements. When the ventilation is integrated, these large fans must operate during all occupied hours to deliver ventilation effectively to the space. This leads to very high fan energy use. With ventilation separated from the heating and cooling delivery, the large heating/cooling fans can be shut off unless there is a call for heating or cooling and the much smaller ventilation-only fans can operate to deliver fresh air to the space. Furthermore, when the ventilation air is delivered using either Energy Recovery Ventilation (ERV) the heating energy requirements associated with tempering the ventilation air are significantly reduced or eliminated. Compliance with this proposed code amendments requires the following:

- A.** 100% ventilation air delivered directly to each zone separate from the heating/cooling system.
- B.** Ventilation air delivered using an ERV
- C.** Run heating and cooling equipment (fans and pumps) only when there is a call for conditioning in the zone.

Note that designs based around a DOAS is not new and it has long been established that this design direction leads to more energy efficient buildings. The General Services Administration has required DOAS as the baseline design for all new GSA buildings unless otherwise directed by design programming since 1998.¹ The specifications require perimeter and interior systems have 100 percent outside air ventilation systems which are completely independent of any other air distribution system. Enthalpy heat recovery must be included if the outside air required or equipment capacity exceeds a stated amount.²

This proposed code change is similar to the requirements currently adopted in the Washington State Energy Code which requires buildings of only certain occupancy types to have a DOAS system. A DOAS would be required in buildings whose occupancy is intended for Business (Group B), and Educational (Group E). A DOAS would also be required in certain Assembly occupancies (Group A) for performing arts or motion pictures (except for television and radio studios), casinos, and lecture halls, community halls, exhibition halls, gymnasiums, courtrooms, libraries, and places of religious worship. A DOAS would not be required in buildings where the cooling or heating system is 10 percent more efficient than code requirements.

A DOAS would also not be required in the building for occupancies for Mercantile (Group M), Residential (Group R), Factory and Industrial (Group F), High Hazard (Group H), Institutional (Group I), Storage (Group S), and Utility and Miscellaneous (Group U).

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

Requiring DOAS for the majority of commercial buildings in Minnesota will yield significant energy and cost savings for building owners in the state.

3. What other considerations should the TAG consider?

None.

¹ Mumma, Stanley A. "Designing Dedicated Outdoor Air Systems." *ASHRAE Journal* (May 2001) 28-31.

² General Services Administration. GSA 2003 Facilities Standards (P100), 5.5 HVAC Baseline Systems. Accessed September 27, 2014. <http://www.gbci.org/Files/References/GSA-2003-facilities-standards.pdf>

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

The proposed code change will increase costs. On average the incremental cost of adding a DOAS for several building prototypes (small, medium and large office, retail, and schools) was found to be \$0.88 per square foot.³

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.

The increased cost of requiring DOAS systems is more than offset by operating cost savings. When compared to a code-minimum system upgrade, very high efficiency DOAS can reduce commercial building energy use by an average of 36%, and HVAC energy use by an average of 65%.⁴ In California, installing a DOAS was found to save on average \$4-\$5 in operating costs for every additional dollar spent to install a DOAS in a building.³ Buildings with DOAS systems not only save energy but also exhibit improved indoor air quality which is especially important in businesses and schools.

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

No.

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

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

All parties will be affected by this proposed code change.

2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.

There are no additional costs.

3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?

³ *Nonresidential HVAC Controls*, Codes and Standards Enhancement (CASE) Initiative 2022 California Energy Code, Sept. 2020, title24stakeholders.com/wp-content/uploads/2020/10/2022-T24-Final-CASE-Report-HVAC-Controls.pdf.

⁴ Very High Efficiency Dedicated Outside Air Systems, Northwest Energy Efficiency Alliance, betterbricks.com/solutions/hvac/dedicated-outside-air-system-doas.

No.

4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.

No.

5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

The probable costs (\$0.88 per square foot) are outlined in the cost/benefit analysis section above.

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

The operational cost savings (\$4-\$5 of operational cost savings for every \$1 spent in incremental costs) would be lost if this rule were not adopted.

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

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

There is no additional cumulative effect of the rule when accounting for other federal and state regulations.

***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: Diana Burk

Date: 2/10/2021

Email address: diana@newbuildings.org

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 404-290-5442

Code or Rule Section: 6.5.3.7

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: 6.5.3.7, 6.5.3.8

Intended for Technical Advisory Group ("TAG"): Commercial Energy Code TAG MR 1323

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

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).

X 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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Add new Section 6.5.3.7 as shown (I-P units).

6.5.3.7 Low Power Fans. Fans that are not covered by Section 6.5.3.6 and having a *fan nameplate electrical input power* of less than 180 W or having a *motor nameplate horsepower* less than 1/12 hp shall meet the fan efficacy requirements of Table 6.5.3.7 at one or more rating points.

Exceptions to 6.5.3.7:

1. Fans in *space-conditioning equipment*.
2. Intermittently operating dryer exhaust duct power ventilators, domestic range hoods, and domestic range booster fans.
3. Fans in *radon mitigation systems*.
4. Fans not covered within the scope of the test methods referenced in Table 6.5.3.7.5. Ceiling fans regulated under 10 CFR 430 Appendix U.

Modify Section 6.5.3.8 as shown (I-P).

6.5.3.78 Ventilation Design. The required minimum *outdoor air* rate is the larger of the minimum *outdoor air* rate or the minimum exhaust air rate required by Standard 62.1, Standard 62.2, Standard 170, or applicable codes or accreditation standards. *Outdoor air ventilation systems* shall comply with one of the following:

- a. Design minimum *system outdoor air* provided shall not exceed 135% of the required minimum *outdoor air* rate.
- b. Dampers, *ductwork*, and *controls* shall be provided that allow the *system* to supply no more than the required minimum *outdoor air* rate with a single *set-point* adjustment.
- c. The *system* includes exhaust air *energy* recovery complying with Section 6.5.6.1.

Table 6.5.3.7 Minimum Fan Efficacy for Low-Power Fans

<u>System Type</u>	<u>Minimum Fan Efficacy^{a,b}, cfm/W</u>	<u>Test Method and Rating Conditions</u>
<u>HRV^c, ERV^d, or other system with exhaust air energy recovery</u>	<u>1.2</u>	<u>CAN/CSA 439-18</u>
<u>Transfer fans; in-line ^e supply or exhaust fan</u>	<u>3.8</u>	<u>ASHRAE Standard 51</u>
<u>Other exhaust fan, <90 cfm</u>	<u>2.8</u>	
<u>Other exhaust fan, >90 cfm and <200 cfm</u>	<u>3.5</u>	
<u>Other exhaust fan, >200 cfm</u>	<u>4.0</u>	

a. Fan efficacy is the volumetric fan airflow rate divided by total fan motor electrical input power at a specified static pressure difference.

b. Fans shall be tested in accordance with the referenced test method. Fan efficacy shall be reported in the product listing or shall be derived from the fan motor electrical input power and airflow values reported in the product listing or on the label. Fan efficacy for fully ducted HRV or ERV, balanced, and in-line fans shall be determined at a static pressure difference not less than 0.2 in. of water for each airstream. Fan efficacy for other ducted fan systems shall be determined at a static pressure difference not less than 0.1 in. of water.

c. A heat recovery ventilator (HRV) is a mechanically powered ventilating device with separate intake and exhaust airstreams and a heat exchanger to transfer a portion of the sensible energy, heat, from one airstream to the other.

d. An energy recovery ventilator (ERV) is a mechanically powered ventilating device with separate intake and exhaust airstreams and a heat exchanger to transfer a portion of the total energy, heat and moisture, from one airstream to the other.

e. An in-line fan is an exhaust or supply fan installed with ductwork on both the fan inlet and outlet.

Table 6.5.3.7 Minimum Fan Efficacy for Low-Power Fans

<u>System Type</u>	<u>Minimum Fan Efficacy a, b, cfm/W (L/s/W)</u>	<u>Test Method and Rating Conditions</u>
<u>HRV ^c, ERV ^d, or other system with exhaust air energy recovery</u>	<u>.57</u>	<u>CAN/CSA 439-18</u>
<u>Transfer fans; in-line ^e supply or exhaust fan</u>	<u>1.8</u>	<u>ASHRAE Standard 51</u>
<u>Other exhaust fan, <42.5 L/s</u>	<u>1.3</u>	
<u>Other exhaust fan, >42.5 L/s and <94.4 L/s</u>	<u>1.7</u>	
<u>Other exhaust fan, >94.4 L/s</u>	<u>1.9</u>	

a. Fan efficacy is the volumetric fan airflow rate divided by total fan motor electrical input power at a specified static pressure difference.

b. Fans shall be tested in accordance with the referenced test method. Fan efficacy shall be reported in the product listing or shall be derived from the fan motor electrical input power and airflow values reported in the product listing or on the label. Fan efficacy for fully ducted HRV or ERV, balanced, and in-line fans shall be determined at a static pressure difference not less than 50 Pa for each airstream. Fan efficacy for other ducted fan systems shall be determined at a static pressure difference not less than 25 Pa.

c. A heat recovery ventilator (HRV) is a mechanically powered ventilating device with separate intake and exhaust airstreams and a heat exchanger to transfer a portion of the sensible energy, heat, from one airstream to the other.
d. An energy recovery ventilator (ERV) is a mechanically powered ventilating device with separate intake and exhaust airstreams and a heat exchanger to transfer a portion of the total energy, heat and moisture, from one airstream to the other.
e. An in-line fan is an exhaust or supply fan installed with ductwork on both the fan inlet and outlet.

Renumber section 6.5.3.8:

6.5.3.89 Occupied-Standby Controls

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?

This code proposal change is based on ASHRAE addendum a to Standard 90.1-2019.¹ Standard 90.1 is developed under ANSI-approved consensus procedures, and is under continuous maintenance. ASHRAE publishes changes to Standard 90.1 as individual addenda to the preceding Standard, and then bundles them together to form the next published edition. Because addenda are typically not recognized as part of Minnesota's energy code, it is important to incorporate the most crucial addenda to the Minnesota commercial energy code during the adoption process. This addenda establishes minimum fan efficacy requirements for low-power ventilation fans. It also establishes Standard 62.2 as the reference for determining the minimum ventilation rates for non transient dwelling units.

Efficacy requirements for low-power ventilation fans were introduced in the 2012 IECC for whole-house ventilation in low-rise residential buildings. Both mid-rise residential and small commercial buildings often use small ventilation fans which has left a loophole in the code for common energy loads. These fans are often used for point-of-source contaminant exhaust and ventilation in multifamily buildings making them a common and potentially significant energy load. A large number of products on the market can meet these requirements and in fact, the requirement is far below the market average efficiency for bath fans and close to the market average for in-line fans.

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

Exhaust fan efficacies were introduced in the code in 2012 IECC for whole-house ventilation in low-rise residential buildings, but have never been included in the commercial provisions of the IECC. Mid-rise residential occupancies and small commercial buildings often utilize the same small ventilation fans leaving a loophole for a common energy load. These fans are used for point-of-source contaminant exhaust and are frequently utilized as part of a ventilation strategy in multifamily buildings. These fans are also smaller than the threshold for fan size (1/12 HP) that is attached to the other commercial fan requirements. This makes them a common load, and a potentially significant load in multifamily buildings, that is completely unregulated in commercial buildings.

This proposal adopts the table approach already utilized for these fans in the residential section of the code. However, it updates the efficiency requirements. The current residential IECC fan efficacies are from an older version of Energy Star (Version 2.0), so these have been updated to align the latest

¹ *ANSI/ASHRAE/IES Addendum a to ANSI/ASHRAE/IES Standards 90.1-2019*, ASHRAE Standards Committee, 7 Oct. 2020, https://www.ashrae.org/file%20library/technical%20resources/standards%20and%20guidelines/standards%20addenda/90_1_2019_a_20201030.pdf

Energy Star requirement Version 4.0. These fan efficacy values are very conservative based on what is currently on the market.

It sets the efficiency requirement at a level that can reasonably be met by a large number of products available on the market. According to the HVI database of fans, the average efficiency of bath fans is around 7 CFM/W, and the average efficiency of in-line fans is 3.1. This proposal, therefore, places the requirement far below the market average efficiency for bath fans and close to the market average for in-line fans, making this a reasonable requirement.

3. What other considerations should the TAG consider?

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

According to a similar amendment (CE140-19) to the 2018 IECC, increasing fan efficacy could increase the cost of construction. The amendment states: "Cost for the kinds of fans covered by this requirement are not driven solely by efficacy. Cost is also a function of flow rate, finishes, design and noise and whether they include other features like lights, sensors, or heaters. In some cases, fans that meet this requirement can be obtained for less other fans that do not. Nevertheless, a comparison of the low-cost exhaust fans shows that this proposal can result in no incremental first costs or short simple paybacks where incremental costs are incurred."

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.

If a cost is incurred, it will be offset by energy savings.

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

No.

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

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

All segments of the industry will be affected by this code change. Architects and engineers will have to specify fans that meet this code requirement. Construction contractors will have to install that fan and building officials and inspectors will have to ensure the fans meet the requirement in code.

2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.

None.

3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?

No.

4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.

No.

5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

As stated above, the incremental costs associated with this change are either negligible or very small resulting in very short payback periods. Building owners and individuals paying utility bills will be the parties who are most affected by this code requirement.

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

Not adopting this code requirement would result in increased utility bills for individuals living in mid-rise multifamily housing and small commercial business owners.

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

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

There is no additional cumulative effect of the rule when accounting for other federal and state regulations.

***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: Greg Metz

Date: 1/5/2021

Email address: Greg.Metz@State.MN.US

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 651-284-5884

*Modify Section 7.1.1.3 Service Water Heating-
Alterations to Existing Buildings*

Firm/Association affiliation, if any: DLI/CCLD

Code or rule section to be changed: MR 1323

Intended for Technical Advisory Group ("TAG"): 1323 Minnesota Energy Code

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 type="checkbox"/> | <input checked="" 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.
7.1.1.3 Service Water Heating- Alterations to Existing Buildings

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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

7.1.1.3 Alterations to Existing Buildings

Building service water-heating equipment installed as a direct replacement for existing building service water-heating equipment shall comply with the requirements of Section 7 applicable to the equipment being replaced. New, existing accessible piping within the work area, and replacement piping shall comply with Section 7.4.3. Where alterations replace storage water heaters, vertical pipe risers shall comply with Section 7.4.6.

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?
Equipment is frequently replaced with no change to piping even where the piping is readily accessible. The proposed code change will significantly mitigate heat loss by insulating piping where it can be accessed, and installing heat traps when replacing water heaters so that heat is not lost into the existing water lines.
2. Why is the proposed code change a reasonable solution?
It only requires installation of heat traps when the water heater is being replaced and the adjacent piping can be readily modified because it is already disconnected. The additional insulation on existing piping is only required in the work area and only required where piping is accessible, so the impact on existing conditions is minimal.
3. What other considerations should the TAG consider? None

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

There will be a slight increase in insulation cost for insulating some additional existing piping, and there will be a slight increase in water heater installation cost for replacement of units that pre-date the heat-trap requirement in the 2009 Minnesota Energy Code.
2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.
The increased costs are all offset by the energy savings.
3. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain. No.
4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, Engineers, Construction Contractors, Building Officials and Inspectors.
2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.
3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?
No.
4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.
No.
5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

None
6. What are the probable costs or consequences of not adopting the proposed rule, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?

Existing service hot water piping will continue to waste energy by leaching heat from hot water storage tanks.
7. Are you aware of any federal regulation or federal requirement related to this proposed code change? If so, please list the federal regulation or requirement and your assessment of any differences between the proposed rule and the federal regulation or requirement.

No.
8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

N/A

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Diana Burk

Date: 2/10/2021

Email address: diana@newbuildings.org

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 404-290-5442

Code or Rule Section: 7.5.3

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: 7.5.3

Intended for Technical Advisory Group ("TAG"): Commercial Energy Code TAG MR 1323

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 type="checkbox"/> | <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). Section 7.5.3 Buildings with High-Capacity Service Water-Heating Systems
 - 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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

7.5.3 Buildings with High-Capacity Service Water-Heating Systems

New *buildings* with gas *service water-heating systems* with a total installed gas water-heating input capacity of 1,000,000 Btu/h or greater, shall have gas service water-heating *equipment* with a minimum thermal *efficiency (Et)* of ~~90~~92% or a UEF of not less than 0.92 UEF. Multiple units of gas water-heating *equipment* are allowed to meet this requirement if the water-heating input provided by *equipment* with thermal *efficiency (Et)* above and below 90% provides an input capacity weighted average thermal *efficiency* of at least ~~90~~92% or a UEF of not less than 0.92 UEF.

Exception to 7.5.3

1. Where ~~25~~50% of the annual *service water-heating* requirement is provided by *site-solar energy* or *site-recovered energy* not including any capacity used for compliance with any other section of this Standard.
 2. *Water heaters* installed in individual *dwelling units*.
 3. Individual gas *water heaters* with input capacity not greater than 100,000 Btu/h.
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?

This proposed code change (CE156-19) was an amendment made to the 2018 IECC and is currently in the 2021 IECC. This amendment affects only high-capacity commercial service water heating loads like laundries and larger boilers used for central heating in R-occupancies. When the amendment was made, the following reason statement was provided: "Water heating is one of the largest loads in R-1 (hotels) and R-2 (multifamily) occupancies. It composes around 25-35% of the total building load in typical multifamily buildings. Advancing efficiency here is an important provision of the energy code. This proposal includes a modest increase in the efficiency requirement for C404.2.1 from 90% to 92%. This improvement can be met without making major technology shifts since achieving a 90% E already generally requires condensing technology. Of the 2782 boilers that meet the 1,000,000 Btu/h threshold, 852 meet the existing 90% requirement and 792 meet a requirement of 92%, so market availability will be minimally impacted."

This proposed code change also adds for measurement with the ability to use the UEF metric as was done in the IgCC. While some combinations of boilers with a combined capacity above 1,000,000_Btu/h always triggered the requirement, this modification removes the exemption for multiple smaller water heaters or boilers unless they are located in individual dwelling units.

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

This proposed code changes requires a modest increase in efficiency for high-capacity water heaters that can be met easily through existing technology and would provide significant energy savings in many building types.

3. What other considerations should the TAG consider?

None.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

This proposal could have an impact on cost. However, it only disqualifies about 7% of the boilers that meet the existing requirement, so the impact should be minimal.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.

The increased cost would be offset by the benefit of annual energy savings.

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

No. If code officials are made aware of the efficiency requirement when trained on the new energy code, there are no compliance cost increases.

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

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

All segments of industry would be affected. Architects and engineers must specify higher efficiency high-capacity water heating equipment. Construction contractors must install it and building officials and inspectors must ensure that it meets code requirements.

2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.

No.

3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?

No.

4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.

No.

5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

The probable costs could have limited impact on cost. However, as stated above, it only disqualifies about 7% of the boilers that meet the existing requirement, so the impact should be minimal.

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

The probable costs of not adopting the proposed rule are associated with increased utility bills for owners or occupants of the building with inefficient high-capacity water heating equipment.

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

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

There is no additional cumulative effect of the rule when accounting for other federal and state regulations.

***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: Greg Metz

Date: 1/6/2021

Email address: Greg.Metz@State.MN.US

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 651-284-5884

Delete Section 8.4.2 Automatic Receptacle Control

Firm/Association affiliation, if any: DLI/CCLD

Code or rule section to be changed: MR 1323

Intended for Technical Advisory Group ("TAG"): 1323 Minnesota Energy Code

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 type="checkbox"/> | <input checked="" 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).
8.4.2 Automatic Receptacle Control
- 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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

8.4.2 Automatic Receptacle Control- Deleted

The following shall be automatically controlled:

- ~~a. At least 50% of all 125V, 15 and 20 amp receptacles in all private offices, conference rooms, rooms used primarily for printing and/or copying functions, break rooms, classrooms, and individual work stations.~~
- ~~b. At least 25% of branch circuit feeders installed for modular furniture not shown on the construction documents.~~

This control shall function on

- ~~a. A scheduled basis using time-of-day operated control device that turns receptacles off at specific programmed times – an independent program schedule shall be provided for controlled areas of no more than 5,000 ft² and not more than one floor (the occupant shall be able to manually override the controlled device for up to two hours);~~
- ~~b. An occupancy sensor that shall turn receptacles off within 20 minutes of all occupants leaving a space; or~~
- ~~c. An automated signal from another control or alarm system that shall turn receptacles off within 20 minutes after determining that the area is unoccupied.~~

~~All controlled receptacles shall be permanently marked to visually differentiate them from uncontrolled receptacles and are to be uniformly distributed throughout the space. Plug-in devices shall not be used to comply with Section 8.4.2.~~

Exceptions to 8.4.2

~~Receptacles for the following shall not require an automatic control device:~~

- ~~1. Receptacles specifically designated for equipment requiring continuous operation (24/day, 365 days/year).~~
- ~~2. Spaces where an automatic control would endanger the safety or security of the room or building occupants.~~

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?
Requiring automatically controlled receptacles perpetuates the use of electrical extension cords to by-pass the controls. Energy conservation education is a far safer method of achieving overall energy conservation rather than requiring the expense of extra circuits and controls for systems that are frequently bypassed.
2. Why is the proposed code change a reasonable solution?
It significantly reduces the electrical construction costs through office and classroom spaces, reducing the wiring and number of circuits by half. Occupants are frustrated by outlets that “don’t work” because they can not be relied upon to provide continuous power. Elimination of these controlled outlets will reduce the number of extension cords and power strips used to by-pass the controls.
3. What other considerations should the TAG consider? None

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

There will be a decrease in construction costs.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.
No increase.
3. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain. No.
4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, Engineers, Construction Contractors, Building Officials and Inspectors.
2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There will be no additional costs to state agencies.
3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?
No.
4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.
No.

5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

None

6. What are the probable costs or consequences of not adopting the proposed rule, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

Increased risk of fire due to heightened extension cord use to by-pass the controlled outlets.

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

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

N/A

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Diana Burk

Date: 2/10/2021

Email address: diana@newbuildings.org

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 404-290-5442

Code or Rule Section:

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: 3.2, 8.4, 9.4, 12

Intended for Technical Advisory Group ("TAG"): Commercial Energy Code TAG MR 1323

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

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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Modify Section 3.2: Definitions as follows:

greenhouse: a structure or a thermally isolated area of a building that maintains a specialized sunlit environment exclusively used for, and essential to, the cultivation, protection or maintenance of plants. Greenhouses are those that are erected for a period of 180 days or more.

photosynthetic photon efficacy (PPE): photosynthetic photon flux divided by input electric power in units of micromoles per second per watt, or micromoles per joule as defined by ANSI/ASABE S640.

Modify Section 8.4 as follows:

8.4.3 Electrical Energy Monitoring

8.4.3.1 Monitoring

Measurement devices shall be installed in new *buildings* to monitor the electrical *energy* use for each of the following separately:

- a. Total electrical *energy*
- b. HVAC systems
- c. Interior lighting
- d. Exterior lighting
- e. Receptacle circuits
- f. Lighting used for plant growth and maintenance.

For *buildings* with tenants, these *systems* shall be separately monitored for the total *building* and (excluding shared *systems*) for each individual tenant.

Exception to 8.4.3.1

Up to 10% of the load for each of the categories (b) through (fe) shall be allowed to be from other electrical loads.

Add new language in Section 9.4: Mandatory Provisions:

9.4.4 Lighting for plant growth and maintenance

Permanently installed luminaires used for plant growth and maintenance shall meet the following requirements:

- a. Photosynthetic photon efficacy of not less than 1.7 $\mu\text{mol}/\text{J}$ for *greenhouses* and not less than 1.9 $\mu\text{mol}/\text{J}$ for all other indoor growing spaces, rated in accordance with ANSI/ASABE S640.
- b. Shall be controlled by a time switch lighting control.

Exception

- i. Buildings with no more than 40kW of aggregate horticultural lighting load.

Add new language to Chapter 12 Normative Reference:

Reference	Title
<u>ANSI/ASABE S640</u>	<u>Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms)</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?

Indoor agriculture energy usage is projected to grow substantially nationwide over the next several years, driven in large part (but not entirely) by the legalization of medical and recreational marijuana. Minnesota currently allows for the use of medical marijuana and there is a new push in Minnesota to legalize marijuana for recreational use, which would greatly expand the market and make this the fastest growing energy use in the state, and it has in other states with legalized recreational use,

A total of 46 million square feet of grow area in the U.S. is lit by electric horticultural lighting, 58% of which was in supplemental greenhouses, 41% in non-stacked indoor farms, and 1% in vertical farms.¹ The majority of luminaires in indoor farms and greenhouses are inefficient high-pressure sodium and metal halide high intensity discharge lamps. Because of the large opportunity for energy savings by requiring more efficient luminaires in these applications, the 2021 IECC regulates lighting in these applications although ASHRAE 90.1-2019 does not. Illinois, Massachusetts and California, plus many cities across the country, have completed the process of regulating this use of energy for indoor horticultural.² The most common luminaire's used in horticultural lighting are single-ended High Pressure Sodium and Metal Halide fixtures which have a typical efficacy of 1.02 $\mu\text{mol}/\text{J}$.³ The luminaire efficacy requirement for indoor and vertical farms of 1.9 $\mu\text{mol}/\text{J}$ can easily be met by almost all LED luminaires on the market for this purpose. The proposed requirement of 1.7 $\mu\text{mol}/\text{J}$ for greenhouses can be met using a more efficient double-ended high pressure sodium lamp³, and were set following consultations during 2020 with the industry in California. The exception to these requirements for farms with a total connected horticultural lighting load of less than 40 kW helps minimize any financial burden on smaller growers.

Adoption of a requirement for higher efficacy luminaires such as LEDs for electric horticultural lighting would benefit the state's controlled environment horticulture industry through a significant reduction in energy use and an associated reduction in both operation and maintenance costs.

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

This proposed code change closes a loophole in the energy code for lighting efficacy requirements in indoor agriculture.

3. What other considerations should the TAG consider?

If Minnesota were to adopt this proposed code change, it would join a national push to enact lighting efficacy requirements for indoor agriculture.

¹ *Energy Savings Potential of SSL in Agricultural Applications*, U.S. Department of Energy: Office of Energy Efficiency and Renewable Energy, June 2020, www.energy.gov/sites/prod/files/2020/07/f76/ssl-agriculture-jun2020.pdf.

² *Final CASE Report: Controlled Environment Horticulture*, California Statewide Codes and Standards Enhancement (CASE) Program, Oct. 2020, title24stakeholders.com/wp-content/uploads/2020/10/2022-T24-NR-CEH-Final-CASE-Report.pdf.

³ Nelson JA, Bugbee B (2014) *Economic Analysis of Greenhouse Lighting: Light Emitting Diodes vs. High Intensity Discharge Fixtures*. PLoS ONE 9(6): e99010. <https://doi.org/10.1371/journal.pone.0099010>

1. Will the proposed code change increase or decrease costs? Please explain.

In June of 2020, California Statewide Codes and Standards (CASE) Enhancement published a study outlining the associated incremental costs in equipment and maintenance for this new proposed lighting standard. These costs are listed in the table below. ⁴

15-Year Lighting Incremental Cost Per Square Foot of Canopy Building Type	Incremental Equipment Cost	Incremental Maintenance Cost	Total Incremental Cost
Indoor	\$109.96	(\$37.35)	\$72.61
Greenhouse	\$4.32	\$13.49	\$17.81

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.

According to the CASE study cited above, the costs associated with a requirement to switch to higher efficacy luminaires in controlled environmental horticulture application are more than offset by the energy and maintenance cost saving. In fact, for every dollar spent on additional equipment costs, the owner would reap between \$5.30 to \$6.40 in operating and maintenance cost savings.

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

No.

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

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

This code change would affect all segments of the industry if adopted.

2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.

3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?

⁴ *Final CASE Report: Controlled Environment Horticulture*, California Statewide Codes and Standards Enhancement (CASE) Program, Oct. 2020, title24stakeholders.com/wp-content/uploads/2020/10/2022-T24-NR-CEH-Final-CASE-Report.pdf.

No.

4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.

No.

5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

The costs are outlined above.

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

The additional utility costs will be born by growers and consumers.

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

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

There is no additional cumulative effect of the rule when accounting for other federal and state regulations.

***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: Diana Burk

Date: 2/10/2021

Email address: diana@newbuildings.org

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 404-290-5442

Code or Rule Section: 8.4.5

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: 8.4.5

Intended for Technical Advisory Group ("TAG"): Commercial Energy Code TAG MR 1323

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 checked="" type="checkbox"/> | <input 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

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).

X 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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

8.4.5 Electric Infrastructure for Combustion water heating equipment. Gas-fired water heaters with a capacity less than 300,000 Btu/h (88 kW) shall be installed in accordance with the following:

1. A dedicated 208/240-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, and
 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.
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.

Need and Reason

1. Why is the proposed code change needed?

Section 8.4.5 includes a size threshold so that it only applies to smaller, unitary water heaters. It provides a series of requirements that ensure that the building can accommodate a heat pump water heater in the future. Heat pump water heaters are currently less than 1% of the market but their market share is growing, seeing a 15% compound annual growth rate from 2011 to 2019.^{1,2} Although currently, heat pump water heaters cost \$800 more than a standard electric water heater, a family of four can save \$3,750 over the 13-year lifespan of the system by installing a heat pump water heater instead of a standard electric water heater.³ The cost effectiveness of Heat Pump Water Heaters are only expected to improve in the future. An Electrification Futures Study from NREL expects the cost of heat pump water heaters will drop 30% from 2020 to 2040.⁴ In addition, as Minnesota tries to reach its climate goals, policy makers may wish to incentivize efficient electric appliances that can be powered through renewables over combustion appliances that burn fossil-fuels and can affect the health of a building's occupants. Therefore it is critical that Minnesota future proof it's buildings to allow for the future installation of Heat Pump Water Heaters.

This amendment was placed in Section 8: Power of ASHRAE 90.1-2019 because it requires electric infrastructure to be placed in the building. Requirement 1 ensures that there is a branch circuit ready to support the future installation of a heat pump water heater. Requirement 2 ensures that the condensate generated by a heat pump water

¹ Heat Pump Water Heater | Technology Solutions, U.S. Department of Energy, rpsc.energy.gov/tech-solutions/hpwh.

² ENERGY STAR® Unit Shipment and Market Penetration Report Calendar Year 2019 Summary

³ Save Money and More with ENERGY STAR Certified Heat Pump Water Heaters, ENERGY STAR, www.energystar.gov/products/water_heaters/high_efficiency_electric_storage_water_heaters/benefits_savings.

⁴ Jadun, Paige, et al., Electrification Futures Study: End-Use Electric Technology Cost and Performance Projections through 2050, National Renewable Energy Laboratory, NREL/TP6A20-70485, 2017, <https://www.nrel.gov/docs/fy18osti/70485.pdf>

heater compressor can be easily drained away. Requirement 3 ensures that the water heater location is physically large enough to accommodate heat pump water heaters that are frequently wider and/or taller than code-minimum gas water heaters. Requirement 4 ensures that a future heat pump water heater has access to sufficient air volume to effectively operate.

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

This proposed code change future proofs multifamily construction 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 considerations should the TAG consider?

None.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

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.

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

No.

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

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

All segments of the industry will be impacted.

2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.

There are no additional costs to state agencies.

3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?

No.

4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.

No.

5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

None.

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

The costs are identified above.

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

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

There is no additional cumulative effect of the rule when accounting for other federal and state regulations.

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CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Diana Burk

Date: 2/10/2021

Email address: diana@newbuildings.org

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 404-290-5442

Code or Rule Section: 8.4.6, 8.4.7

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: 8.4.6, 8.4.7

Intended for Technical Advisory Group ("TAG"): Commercial Energy Code TAG MR 1323

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"/> |
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| 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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- 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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

8.4.6 Electric infrastructure for residential spaces. *Combustion equipment and end-uses serving individual dwelling units other individual residential spaces shall comply with Sections 8.4.6.1-8.4.6.3.*

8.4.6.1 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 Section R403.6 of the 2015 Minnesota Residential Energy Code 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.

8.4.6.2 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.

8.4.6.3 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.

8.4.7 Electric infrastructure for other combustion equipment. *Combustion equipment not covered by Sections 8.4.5-6 shall be provided with conduit that is continuous between a junction box located within 3 feet (914 mm) of the *appliance or equipment* and an electrical panel. The junction box, conduit and bus bar in the electrical panel shall be rated and sized to accommodate a branch circuit with sufficient capacity for an equivalent electric appliance, equipment or end use with an equivalent equipment capacity. The electrical junction box and electrical panel shall have labels stating, “For future electric equipment”.*

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.

Need and Reason

1. Why is the proposed code change needed?

Although the majority of space heating in Minnesota comes from natural gas, the market for electric heat pumps has grown by 4% over the last decade as heat pump technology has advanced to compete with natural gas heating systems in colder climates.¹ The Center for Energy and Environment tested heat pumps in cold weather conditions in Minnesota and found they can

¹ Jossi, Frank. *Minnesota Homeowners Haven't Embraced Electric Heat Yet*, AP News, 26 May 2019, apnews.com/article/b17dd03f9b274910b2d19f5354dfb491.

comfortably heat a home when it is 13 degrees below zero.² In addition, a 2018 report by the McKnight Foundation found that for Minnesota to meet its target of reducing carbon emissions by 80% three-quarters of the state's residential space heating would need to be electrified.³

The proposed code language ensures that gas equipment can be more easily and cost-effectively retrofitted with electric equipment in the future. Section 8.4.6 requires infrastructure to allow electric heat pumps. IRC Section E3702.11 sets the requirement for sizing a branch circuit serving a heat pump and relies on the size of the actual equipment to be installed. Since there is not an actual equipment size to reference and equipment size can vary depending on the size of the home and the climate, the section references Section R403.6 to establish the size of the heat pump equipment that would be required for the specific dwelling unit.

The addition of 8.4.6.2 and 8.4.6.3 and 8.4.7 includes requirements to improve the feasibility of future electrification retrofits for other combustion equipment in a building such as combustion clothes drying and cooking. The requirements ensure that adding future electric branch circuits is relatively simple. The section does not include any requirements for branch circuits or electrical panel capacity since it addresses equipment that may be quite large or for which the electric infrastructure needs of future electric equivalent may be uncertain, including heating systems and loads.

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

This code change helps future proof construction so that it will be technically feasible for buildings built today with combustion equipment to be fossil fuel free in the future without having to undertake expensive retrofits.

3. What other considerations should the TAG consider?

None.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

Buildings can choose to install both combustion equipment and the electric infrastructure, or save costs by just installing electric heating. Where a building selects to go all electric, the overall costs for construction will decrease. Where a building selects to install combustion equipment and the electric infrastructure there will be a small incremental cost increase.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.

Yes. The benefit of adopting this amendment will be to reduce costs for building owners who would like to be able to cost-effectively switch from combustion equipment to electric only equipment in the future.

² *Field Assessment of Cold-Climate Air-Source Heat Pumps in Minnesota*, Center for Energy and Environment, Mar. 2019, [www.mncee.org/resources/resource-center/presentations/field-assessment-of-cold-climate-air-source-he-\(2\)/](http://www.mncee.org/resources/resource-center/presentations/field-assessment-of-cold-climate-air-source-he-(2)/).

³ *Minnesota's Smarter Grid: Pathways to a Clean, Reliable, and Affordable Transportation and Energy System*, McKnight Foundation, 31 July 2018, www.mcknight.org/wp-content/uploads/Minnesotas-SmarterGrid_FullReport_NewFormat.pdf.

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

No.

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

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

All parties will be affected by this code change.

2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.

There are no additional costs to state agencies.

3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?

No.

4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.

No.

5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

Costs of complying with the proposed rule are minimal.

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

Not adopting this code change will affect building owners who would like to cost effectively switch from combustion equipment to electric equipment in the future.

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

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

There is no additional cumulative effect of the rule when accounting for other federal and state regulations.

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ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 404-290-5442

Code or Rule Section: 3.2, 8.4, 10.4

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: 3.2, 8.4, 10.4

Intended for Technical Advisory Group ("TAG"): Commercial Energy Code TAG MR 1323

General Information

Yes No

- | | | |
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| A. Is the proposed change unique to the State of Minnesota? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Modify Section 3.2: Definitions as follows:

electric vehicle: an automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, electric motorcycles, and the like, primarily powered by an electric motor that draws current from a rechargeable storage battery, a fuel cell, a photovoltaic array, or another source of electric current. Plug-in hybrid electric vehicles are electric vehicles having a second source of motive power. Off-road, self-propelled electric mobile equipment, such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, boats and the like, are not considered electric vehicles.

electric vehicle supply equipment (EVSE): the conductors, including the ungrounded, grounded, and equipment grounding conductors and the *electric vehicle* connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the *electric vehicle*.

electric vehicle supply equipment (EVSE) space: a designated parking space with dedicated *electric vehicle supply equipment* capable of supplying not less than 6.2 kW to an *electric vehicle* located within 3 feet (914 mm) of the parking space.

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.

EV-capable space: a parking space that is provided with conduit that meets the following requirements:

1. The conduit shall be continuous between a junction box or receptacle located within 3 feet (914 mm) of the parking space and an electrical panel serving the area of the parking space with sufficient dedicated physical space for a dual-pole, 40-amp breaker.
2. The conduit shall be sized and rated to accommodate a 40-amp, 208/240-volt branch circuit a minimum nominal trade size of 1”.
3. The electrical junction box and the electrical panel directory entry for the dedicated space in the electrical panel shall have labels stating “For future *electric vehicle* charging.”

Modify Section 8.4 as follows:

8.4.3 Electrical Energy Monitoring

8.4.3.1 Monitoring

Measurement devices shall be installed in new *buildings* to monitor the electrical *energy* use for each of the following separately:

- a. Total electrical *energy*
- b. HVAC systems
- c. Interior lighting
- d. Exterior lighting
- e. Receptacle circuits
- f. *Electrical vehicle* charging

For *buildings* with tenants, these *systems* shall be separately monitored for the total *building* and (excluding shared *systems*) for each individual tenant.

Exception to 8.4.3.1

Up to 10% of the load for each of the categories (b) through (fe) shall be allowed to be from other electrical loads.

Modify Section 10.4: Other Equipment as follows:

10.4.8 Electric vehicle charging infrastructure

Parking facilities shall be provided with electric vehicle charging infrastructure in accordance with Table 10.8-7 based on the total number of parking spaces and rounded up to the nearest whole number. Where more than one parking facility is provided on a building site, the number of parking spaces required shall be calculated separately for each parking facility. EVSE and EV capable spaces may be counted toward meeting minimum parking requirements. EV spaces shall be uniformly distributed throughout the parking facility. Each EV capable space shall be provided with a minimum reserved capacity of 8.8 kVA in the panel to which it is connected. EVSE spaces may be used to meet requirements for EV capable spaces. Location of designated EVSE spaces, and EV capable spaces in parking facilities shall be clearly identified in construction documents.

TABLE 10.8-7 Electric Vehicle Charging Infrastructure Requirements

Occupancy	EVSE Spaces	EV Capable Spaces
<u>Group B Occupancies</u>	<u>5%</u>	<u>25%</u>
<u>Group M Occupancies</u>	<u>2%</u>	<u>25%</u>
<u>R-2 Occupancy</u>	<u>5%</u>	<u>25%</u>
<u>All other Occupancies</u>	<u>2%</u>	<u>25%</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?

The widescale adoption of electric vehicles (EVs) is a key climate strategy to reduce GHG emissions from the U.S. transportation sector. In the United States, EV sales increased by 80 percent from 2017 to 2018.² The number of EVs on U.S. roads is projected to grow from 1 million vehicles at the end of 2018, to 18.7 million by 2030. To recharge these new EVs, the U.S. will need 9.6 million charge ports, a substantial portion of which will be installed in single and multi-family residential buildings.³ The lack of access to EV charging stations continues to be a critical barrier to EV adoption, with the most significant logistical barriers for residents of multi-family dwellings. By installing required infrastructure for EV charging at construction, the impact of the cost for installation of charging stations in the future becomes minor, reducing barriers to the adoption of EVs.

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

Making new buildings EV ready is a cost-effective way to accelerating Minnesota’s transition to a low-carbon economy.

- 3. What other considerations should the TAG consider?

None.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

The proposed code change will increase costs marginally. According to a 2015 study by the Department of Energy, the cost of a single port EVSE Level 2 unit ranges from \$400 to \$6,500 for Level 2 charging. Installation costs vary depending on the whether the site is new construction or existing with a cost range of \$600 to \$12,700 for Level 2 charging.¹ Installation costs for EVSE infrastructure for new construction fall in the lower end of the range given.

According to a recent analysis in California, Costs can be prohibitive for installing electric infrastructure for existing sites because of electrical upgrades needed to support an EVSE unit and the cost of installing new conduit through existing concrete to connect the EVSE to electrical service. It was estimated that: “\$7,000 per parking space can be avoided with multiple installations of Level 2 charging stations. An estimated \$8,000 per parking space can be avoided when an individual Level 2 charging station is installed. These retrofit costs do not include the cost of the electrical vehicle supply equipment (EVSE).”²

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.

As mentioned above, the cost of installing EV charging at the new construction phase is much lower than installing EV infrastructure as a retrofit.

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

No.

4. 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? 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.

Regulatory Analysis

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

All will be affected.

2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.

None.

3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?

¹ *Costs Associated With Non-Residential Electric Vehicle Supply Equipment: Factors to Consider in the Implementation of Electric Vehicle Charging Stations*, U.S. Department of Energy, Energy Efficiency and Renewable Energy, Nov. 2015, afdc.energy.gov/files/u/publication/evse_cost_report_2015.pdf.

² *EV Charging Infrastructure: Nonresidential Building Standards*, California Air Resources Board, 15 Nov. 2019, ww2.arb.ca.gov/sites/default/files/2020-08/CARB_Technical_Analysis_EV_Charging_Nonresidential_CALGreen_2019_2020_Intervening_Code.pdf.

No.

4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.

No.

5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

The probable costs are included above.

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

As shown above, retrofit costs for installing EV chargers as a retrofit are very high.

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

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

There is no additional cumulative effect of the rule when accounting for other federal and state regulations.

***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: John G. Smith, P.E.

Date: February 1, 2021

Email address: jsmith@michaudcooley.com

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 612 -867-3145

Code or Rule Section: 9.4.4 Parking lot lighting

Firm/Association affiliation, if any:

Code or rule section to be changed: MR 1323

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

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 checked="" type="checkbox"/> | <input type="checkbox"/> |
| E. Does the proposal delete a current Minnesota Rule, chapter amendment? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| F. Would this proposed change be appropriate through the ICC code development process? | <input type="checkbox"/> | <input checked="" 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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Add ANSI/ASHRAE/IEC Standard 90.1, Section 9.4.4 to read as follows:

9.4.4 Parking lot lighting.

Parking lot lighting is regulated by the Minnesota Department of Transportation in Minnesota Rules chapter 8885. Lighting lamps shall have initial efficiencies of not less than 70 lumens per watt.

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?

To make clear to the lighting designer of parking lot lighting that there are Department of Transportation requirements. This is slightly revised wording of the current code requirements under C401.5 Parking lot lighting. The 70 lumen per watt information was included to assist the lighting designers without having to look up chapter 8885.

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

It inserts the current rule language into the body of the model code where it is more likely to be found and followed.

3. What other considerations should the TAG consider? None

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

No cost change. The modification carries forward an existing requirement.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.
N/A

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

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, Engineers, Construction Contractors, Building Officials and Inspectors.
2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.
3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?
No. Current lighting technologies provide easy compliance with the minimum 70 lumen per watt requirement.
4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.
No.
5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

None
6. What are the probable costs or consequences of not adopting the proposed rule, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?

The requirement could be missed.
7. Are you aware of any federal regulation or federal requirement related to this proposed code change? If so, please list the federal regulation or requirement and your assessment of any differences between the proposed rule and the federal regulation or requirement.

No.
8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

N/A

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Diana Burk

Date: 2/10/2021

Email address: diana@newbuildings.org

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 404-290-5442

Code or Rule Section: 11.2, G1.2.1

Firm/Association affiliation, if any: New Buildings Institute

Code or rule section to be changed: 11.2, G1.2.1

Intended for Technical Advisory Group ("TAG"): Commercial Energy Code TAG MR 1323

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 checked="" type="checkbox"/> | <input 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

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).

X 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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Revise Section 11.2 as shown (I-P and SI units).

11.2 Compliance. The *proposed building design* shall comply with all of the following:

- a. Sections 5.2.1, 6.2.1, 7.2.1., 8.2.1, 9.2.1, and 10.2.1.
- b. The *design energy cost*, as calculated in Section 11.5, does not exceed the *energy cost budget* as calculated by the *simulation program* described in Section 11.4.
- c. The *energy efficiency* level of installed components and systems that meets or exceeds the *efficiency* levels used to calculate the *design energy cost*.
- d. For new buildings, one of the following is met:
 1. The *building envelope* complies with Section 5.5, “Prescriptive Building Envelope Compliance Path.”
 2. Using Section 5.6, “Building Envelope Trade-Off Option,” the *proposed envelope performance factor* shall not exceed the *base envelope performance factor* by more than 15% in multifamily residential, hotel/motel, and dormitory building area types. For all other building area types, the limit shall be 7%. For buildings with both residential and nonresidential occupancies, the limit shall be based on the area-weighted average of the gross conditioned floor area.
- de. Verification, testing, and *commissioning* requirements of Section 4.2.5 shall be met.
- ef. Proposed *building systems*, controls, or *building envelope* documented in Section 11.7(b) that do not have criteria in Sections 5 through 10 shall have verification or testing to document proper installation and operation in accordance with Section 4.2.5.

Revise Section G1.2.1 as shown (I-P and SI units).

G1.2.1 Mandatory Provisions. The *proposed building design* shall comply with all of the following:

- a. Sections 5.2.1, 6.2.1, 7.2.1., 8.2.1, 9.2.1, and 10.2.1.
- b. The interior lighting power shall not exceed the *interior lighting power allowance* determined using either Tables G3.7 or G3.8 and the methodology described in Sections 9.5.1 and 9.6.1.
 1. Table G3.7 and the methodology described in Section 9.6.1, or
 2. Table G3.8 and the methodology described in Section 9.5.1.
- c. For new buildings, one of the following is met:
 1. The *building envelope* complies with Section 5.5, “Prescriptive Building Envelope Compliance Path.”
 2. Using Section 5.6, “Building Envelope Trade-Off Option,” the *proposed envelope performance factor* shall not exceed the *base envelope performance factor* by more than 15% in multifamily residential, hotel/motel, and dormitory building area types. For all other building area types, the limit shall be 7%. For buildings with both residential and nonresidential occupancies, the limit shall be based on the area-weighted average of the gross conditioned floor area.
- ed. Energy efficiency levels of installed components and *systems* that meet or exceed the efficiency levels used to calculate the *proposed building performance*.
- de. Verification, testing, and *commissioning* requirements of Section 4.2.5 shall be met.
- ef. Proposed building systems, controls or building envelope documented in Section G1.3(c) that do not have criteria in Sections 5 through 10 shall have verification or testing to document proper installation and operation in accordance with Section 4.2.5.

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?

This code proposal change is based on ASHRAE addendum cr to Standard 90.1-2019.¹ Standard 90.1 is developed under ANSI-approved consensus procedures, and is under continuous maintenance. ASHRAE publishes changes to Standard 90.1 as individual addenda to the preceding Standard, and then bundles them together to form the next published edition. Because addenda are typically not recognized as part of Minnesota’s energy code, it is important to incorporate the most crucial addenda to the Minnesota commercial energy code during the adoption process. The following is the explanation provided by ASHRAE on why this addenda should be considered:

Currently, Section 11 and Appendix G allow unlimited trade-offs between building envelope and other building systems. Studies have concluded that weaker building envelopes can permanently limit building energy performance, even as lighting and HVAC components are upgraded over time, because retrofitting the envelope is less likely and more expensive. This issue has been raised by states and jurisdictions around the country. Language to limit the envelope trade-offs on projects following performance path of compliance (aka the envelope backstop) will be included in the New York City and Washington State energy codes among others. Addendum cr builds on this prior work, striving to preserve design flexibility and minimize documentation effort while improving the long-term building performance. Projects can comply with the proposed envelope backstop by either meeting the prescriptive envelope requirements in Section 5.5 or using Section 5.6 “Building Envelope Trade-Off Option” to demonstrate that the energy cost penalty from the proposed below-code envelope does not exceed the set margins. The backstop margins (15% for residential building area types and 7% for nonresidential building area types) were tested on projects in Climate Zones 2A, 4A, and 6A building types, including multifamily residential, hotel, office, school/university, and standalone retail, light weight, and mass wall construction with high and low window area.”

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

Providing a reasonable backstop for the envelope components of projects limits how much efficiency they can “trade-off” from the prescriptive building envelope requirements and is reasonable because trading these envelope requirements off by using higher efficiency lighting or HVAC systems affect a building’s long term energy performance.

2. What other considerations should the TAG consider?

None.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

This code change neither increases or decreases cost. It simply provides a back-stop so that designers can not drastically decrease prescriptive glazing and insulation requirements in a building through efficiency trade-offs with other building systems such as lighting and HVAC that have short lifespans when compared to the envelope components.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.

¹ ANSI/ASHRAE/IES Addendum Cr to ANSI/ASHRAE/IES Standards 90.1-2019, ASHRAE Standards Committee, 16 Dec. 2020, www.ashrae.org/file%20library/technical%20resources/standards%20and%20guidelines/standards%20addenda/90_1_2019_cr_20201216.pdf.

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

No. Compliance costs will not increase but education is required so that code officials and the building industry understand code requirements.

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

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

Architects, engineers and building officials are the most affected by this proposed code change. Architects and engineers have slightly less flexibility in designing a building. Building officials will have to make sure energy models meet the requirements of the code.

2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

None

There should be no additional costs to state agencies.

3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?

No.

4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.

No.

5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

None.

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

The costs of not adopting the proposed rule will be felt in the future from building owners who to reduce utility bills and improve building performance have to implement costly upgrades to the building envelope.

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

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

There is no additional cumulative effect of the rule when accounting for other federal and state regulations.

***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: Greg Metz

Date: 2/15/21

Email address: Greg.Metz@State.MN.US

Model Code:

Telephone number: 651-284-5884

Firm/Association affiliation, if any: DLI/CCLD

Code or rule section to be changed: MR 1323.0010 Incorporation by Reference

Intended for Technical Advisory Group ("TAG"): IBC and IBC/IFC Coordination

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 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 checked="" type="checkbox"/> | <input type="checkbox"/> |
| F. Would this proposed change be appropriate through the ICC code development process? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Proposed Language

1. The proposed code change is meant to:

change language contained the model code book? If so, list section(s). 2 Scope

change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
1323.0010, Subparts 1, 2, and 3

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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

1323.0010

Incorporation by Reference of the INTERNATIONAL ENERGY CONSERVATION CODE-
COMMERCIAL ENERGY PROVISIONS ASHRAE 90.1 ENERGY STANDARD FOR BUILDINGS
EXCEPT LOW-RISE RESIDENTIAL BUILDINGS

Subpart 1. General. The commercial provisions of ~~Chapters 2 to 4 and 6 of the 2018 edition of the International Energy Conservation Code (IECC) ANSI/ASHRAE/IES 90.1-2019 Standard, Chapters 2 to 12, Normative Appendix A, Normative Appendix C, Normative Appendix G, and Annex 1 as promulgated by the International Code Council, Inc. (ICC), Washington, D.C., American National Standard Institute, the American Society of Heating Refrigeration, Airconditioning and Engineers, and the , Atlanta, Georgia~~ are incorporated by reference and made part of the Minnesota State Building Code except as qualified by the applicable provisions of Minnesota Rules, chapter 1300, and as amended in this rule chapter. Portions of this publication reproduce excerpts from the ~~2018 IECC, International Code Council, Inc., Washington, D.C., copyright 2017, ANSI/ASHRAE/IES 90.1 Standard, copyright 2019, reproduced with permission, all rights reserved. The IECC~~ ANSI/ASHRAE/IES 90.1 Standard is not subject to frequent change, and a copy of the ~~IECC~~ ANSI/ASHRAE/IES 90.1 Standard, with amendments for use in Minnesota is available in the office of the commissioner of labor and industry.

1323.0010 Subp. 2. Mandatory Chapters. The commercial provisions of the ~~2018 IECC-CE Chapters 2(CE) to 4(CE) and 6(CE), ASHRAE 90.1-2019 Standard, Chapters 2 to 12, Normative Appendix A, Normative Appendix C, Normative Appendix G, and Annex 1~~ shall be administered by any municipality that has adopted the code, except as qualified by the applicable provisions in Minnesota Rules chapter 1300, and as amended by this rule chapter.

1323.0010 Subp. 3. References to administration. References to Chapter 1 ~~(CE) of the 2018 IECC of the ANSI/ASHRAE/IES 90.1 Standard~~ and any references to code administration in this code are deleted and replaced with Minnesota Rules, chapter 1300, Administration of the State Building Code.

4. Will this proposed code change impact other sections of a model code book or an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.
Yes. All of Minnesota Rule 1323 Minnesota Commercial Energy Code. Changing the model code will affect all existing amendments at least to the extent that the code section reference numbers will change to reflect the different code structure of the new model code.

Need and Reason

1. Why is the proposed code change needed?

The United States Federal Department of Energy bases construction criteria for energy conservation not upon the International Energy Conservation Code (IECC) but on the ASHRAE 90.1 Standard.

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

As federal government mandates change, it is more expedient and more consistent with federal guidelines to adopt the same standard that the federal government utilizes as their basis for consideration.

3. What other considerations should the TAG consider?

Re-evaluation of current state amendments, the current IECC code language and language included in ASHRAE 90.1-2019 to ensure consistency and progress toward greater and more appropriate energy efficiency measures.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.

No change for most projects. Decrease in construction costs for historical buildings utilized for residential and three stories or less in height.

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.
N/A
3. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain. Enforcement and compliance costs should decrease due to the reduction in the number of code path alternative and the confusion over enforcement requirements between the six compliance paths (three pair of parallel similar paths) and ultimately the three remaining compliance paths.
4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain. N/A

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, Engineers, Construction Contractors, Building Officials and Inspectors.
2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be a cost reduction to state agencies due to less complexity in review/inspections.
3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?
No
4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result. No
5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals? N/A
6. What are the probable costs or consequences of not adopting the proposed rule, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?

Continued high potential for loopholes between various code compliance paths such that every state amendment must be duplicated for both model codes because the IECC includes ASHRAE 90.1 as one of it's compliance paths.

7. Are you aware of any federal regulation or federal requirement related to this proposed code change? If so, please list the federal regulation or requirement and your assessment of any differences between the proposed rule and the federal regulation or requirement. N/A
8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

The cumulative effect will result in a simplification of commercial energy code compliance by a reduction in the number of very similar options available to designers and building inspectors needing to be keenly aware of the subtle differences in code compliance paths and inspecting to multiple standards.

***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: Greg Metz

Date: 12/30/2020

Email address: Greg.Metz@State.MN.US

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 651-284-5884

Code or Rule Section: Section 3.2 Definitions

Firm/Association affiliation, if any: DLI/CCLD

Code or rule section to be changed: MR 1323

Intended for Technical Advisory Group ("TAG"): 1323 Minnesota Energy Code

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 checked="" type="checkbox"/> | <input type="checkbox"/> |
| F. Would this proposed change be appropriate through the ICC code development process? | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Proposed Language

1. The proposed code change is meant to:

change language contained the model code book? If so, list section(s). 3.2 Definitions

change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
1323.0202 General Definitions: Building Entrance,

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

delete language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
1323.0202 General Definitions: Infiltration, U-Factor,

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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Modify definition of Building Entrance as follows:

Building Entrance. "Building entrance" means any doorway, set of doors, revolving door, vestibule, or other form of portal that is ordinarily used to gain access to the building ~~or to exit from~~ the building by its users and occupants. This does not include doors solely used to directly enter mechanical, electrical, and other building utility service equipment rooms.

Retain the Minnesota definition for Computer Room and delete the ANSI/ASHRAE/IEC Standard 90.1 definition for Computer Room.

COMPUTER ROOM. "Computer room" means a room whose primary function is to house equipment for the processing and storage of electronic data and that has a design electronic data equipment power density of greater than 20 watts per square foot (20 watts per 0.092 m²) of conditioned floor area or a connected design electronic data equipment load of greater than 10 kW. (difference underlined).

Delete Minnesota amendment defining "Infiltration." ANSI/ASHRAE/IEC Standard 90.1 is the same.

Delete Minnesota amendment defining "U-Factor." ANSI/ASHRAE/IEC Standard 90.1 is the same.

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?

The current language does not include administrative provisions and does not integrate with the body of Minnesota State Building Code chapters.

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

It incorporates the administrative provisions common to all Minnesota State Building Code chapters into the Minnesota Energy Code.

3. What other considerations should the TAG consider?

None.

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain.
More of a clarification than a code change. No anticipated increase in costs.
2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.
3. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.

No increase in costs. The change is a clarification.

4. 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain. No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, Engineers, Construction Contractors, Building Officials and Inspectors.
2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies and no effect on state revenue.
3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?
No.
4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result. No.

5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

No additional costs to comply with the revision.

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

The rule will reference model codes no longer adopted.

7. Are you aware of any federal regulation or federal requirement related to this proposed code change? If so, please list the federal regulation or requirement and your assessment of any differences between the proposed rule and the federal regulation or requirement. No.
8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

None.

***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: Diana Burk

Date: 2/4/2021

Email address: diana@newbuildings.org

Model Code:

ANSI/ASHRAE/IES Standard 90.1-2019

Telephone number: 404-290-5442

Code or Rule Section: 3.2, 4, 6, 7, 10, 11,
Appendix G

Firm/Association affiliation, if any: New Buildings
Institute

Code or rule section to be changed: 3.2, 4, 6, 7, 10,
11, Appendix G

Intended for Technical Advisory Group ("TAG"): Commercial Energy Code TAG MR 1323

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"/> | |
| o Will the proposed change remedy a problem? | | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| D. Does the proposal delete a current Minnesota Rule, chapter amendment? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| E. 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). Section 6, Section 7, Section 10

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 words proposed to be deleted. Include the entire code (sub) section or rule subpart that contains your proposed changes.

Modify Section 3.2 as shown (I-P and SI units).

3.2 Definitions

on-site renewable energy: ~~energy generated from renewable energy resources produced~~ harvested at the *building* site.

renewable energy resources: energy from solar, wind, biomass or hydro, or extracted from hot fluid or steam heated within the earth.

site-solar energy: thermal, chemical, or electrical ~~energy~~ derived from direct conversion of incident solar radiation at the *building* site and used to offset consumption of purchased ~~fuel~~ or electrical ~~energy~~ supplies. For the purposes of applying this standard, *site-solar energy* shall not include passive heat gain through ~~fenestration systems~~.

Modify Section 6 as shown (I-P and SI units).

[. . .]

Exceptions to 6.5.2.1:

[. . .]

4. Zones where at least 75% of the *energy* for *reheating* or for providing warm air in mixing systems is provided from *site-recovered energy* (including condenser heat) or ~~site-solar energy~~ on-site renewable energy.

[. . .]

Exceptions to 6.5.2.3:

[. . .]

4. *Systems* serving *spaces* where specific humidity levels are required to satisfy process needs, such as a vivarium; museum; surgical suite; pharmacy; and *buildings* with refrigerating systems, such as supermarkets, refrigerated warehouses, and ice arenas, and where the *building* includes *site-recovered energy* or ~~site-solar energy~~ on-site renewable energy that provide *energy* equal to at least 75% of the annual *energy* for *reheating* or for providing warm air in mixing systems. This exception does not apply to *computer rooms*.

5. At least 90% of the annual *energy* for *reheating* or for providing warm air in mixing systems is provided from *site-recovered energy* (including condenser heat) or ~~sitesolar energy~~ on-site renewable energy.

[. . .]

Exceptions to 6.5.3.5:

[. . .]

5. *Systems* in which at least 75% of the *energy* for *reheating* (on an annual basis) is from *site-recovered energy* or ~~site-solar energy~~ on-site renewable energy.

[. . .]

Exceptions to 6.5.6.1.2:

[. . .]

3. Heating energy recovery where more than 60% of the *outdoor air heating energy* is provided from *site-recovered energy* or ~~site-solar energy~~ on-site renewable energy.

[. . .]

Exceptions to 6.5.6.2.2:

[. . .]

2. Facilities that provide 60% of their *service water heating* from ~~site-solar energy~~ onsite renewable energy or *site-recovered energy* or from other sources

[. . .]

Modify Section 7 as shown (I-P and SI units).

Exception to 7.4.5.2: *Pools* deriving over 60% of the *energy* for heating from *site-recovered energy* or ~~site-solar energy~~ on-site renewable energy.

[. . .]

Exceptions to 7.5.3:

1. Where 25% of the annual *service water-heating* requirement is provided by ~~site-solar energy~~ on-site renewable energy or *site-recovered energy*.

[. . .]

Modify Section 10 as shown (I-P and SI units).

10. OTHER EQUIPMENT

10.1 General

10.1.1 Scope. This section applies only to the *equipment* described below.

[. . .]

10.2 Compliance Paths. Other equipment shall comply with Section 10.2.1 and Section 10.2.2.

10.2.1 Requirements for All Compliance Paths. Other equipment shall comply with Section 10.1, “General”; Section 10.4, “Mandatory Provisions”; Section 10.5, “Prescriptive Path” and Section 10.8, “Product Information.”

[. . .]

10.5 Prescriptive Compliance Path ~~(Not Used)~~

10.5.1 Renewable Energy Resources. *Buildings* shall be served by *renewable energy resources* complying with Section 10.5.1.1.

10.5.1.1 On-Site Renewable Energy. The *building* site shall have *equipment* for *on-site renewable energy* with a rated capacity of not less than 0.25 W/ft² or 0.85 Btu/ft² (2.7W/m²) multiplied by the sum of the *gross conditioned floor area* for all floors up to the three (3) largest floors.

Exceptions to 10.5.1.1:

1. Any *building* located where an unshaded flat plate collector oriented toward the equator and tilted at an angle from horizontal equal to the latitude receives an annual daily average incident solar radiation less than 3.5 kWh/m²·day (1.1 kBtu/ft²·day).

2. Any *building* where more than 80% of the *roof area* is covered by any combination of *equipment* other than for *on-site renewable energy systems*, planters, vegetated space, *skylights*, or occupied *roof deck*.

3. Any *building* where more than 50% of *roof area* is shaded from direct-beam sunlight by natural objects or by structures that are not part of the *building* for more than 2500 annual hours between 8:00 a.m. and 4:00 p.m.

4. New construction or *additions* in which the sum of the *gross conditioned floor area* of the three largest floors of the new construction or *addition* is less than 10,000 ft² (1000 ²). *Alterations* that do not include *additions*.

Revise Section 11 as shown (I-P and SI units).

11.4 Simulation General Requirements

11.4.1 Simulation Program. The *simulation program* shall be a computer-based program for the analysis of *energy* consumption in *buildings*. For components that cannot be modeled by the *simulation program*, the exceptional calculation methods requirements in Section 11.4.5 shall be used.

Exception to 11.4.1: When approved by the *adopting authority*, a separate computer-based program shall be permitted to be used to calculate *on-site renewable energy*.

Informative Note: ASHRAE Standing Standard Project Committee 90.1 recommends that the *simulation program* implement the rules of Section 11 that control simulation inputs and outputs be adopted for the purposes of easier use and simpler compliance.

[. . .]

11.4.3 Renewable, Recovered, and Purchased Energy

11.4.3.1 On-Site Renewable Energy and Site-Recovered Energy. *Site-recovered energy* shall not be considered *purchased energy* and shall be subtracted from the *proposed design energy* consumption prior to calculating the *design energy cost*. *On-site renewable energy* shall be subtracted from the *proposed design energy* consumption prior to calculating the *design energy cost* provided that the building owner

- owns the *on-site renewable energy system*,
- has signed a lease agreement for the *on-site renewable energy system* for at least 15 years or
- has signed a contractual agreement to purchase *energy* generated by the *on-site renewable energy system* for at least 15 years.

The reduction in *design energy cost* associated with *on-site renewable energy* that exceeds the *on-site renewable energy* required by Section 10.5.1.1 shall be no more than 5% of the calculated *energy cost budget*.

On-site renewable energy included in the *budget building design* shall be subtracted from the *budget building design energy* consumption prior to calculating the *energy cost budget*.

11.4.3.2 Annual Energy Costs. The *design energy cost* and *energy cost budget* shall be determined using rates for *purchased energy* (such as electricity, gas, oil, propane, steam, and

chilled water) that are approved by the *adopting authority*. Where *on-site renewable energy* or *site-recovered energy* is used in excess of what is required in the *budget building design* by Table 11.5.1, the *budget building design* shall be based on the *energy* source used as the backup

Table 11.5.1 Modeling Requirements for Calculating Design Energy Cost and Energy Cost Budget

<i>Proposed Design (Column A)</i> <i>Design Energy Cost (DEC)</i>	<i>Budget Building Design (Column B)</i> <i>Energy Cost Budget (ECB)</i>
15. On-Site Renewable Energy	
<p><u><i>On-site renewable energy</i> in the <i>proposed design</i> shall be determined as follows:</u></p> <p>a. Where a complete <i>system</i> providing <i>on-site renewable energy</i> exists, the model shall reflect the actual <i>system</i> type using actual component capacities and efficiencies.</p> <p>b. Where a <i>system</i> providing <i>on-site renewable energy</i> has been designed, the <i>system</i> model shall be consistent with design documents.</p> <p>c. Where no <i>system</i> exists or is specified to provide <i>on-site renewable energy</i>, no <i>system</i> shall be modeled.</p>	<p><u><i>On-site renewable energy</i> shall be included in the <i>budget building design</i> when required by Section 10.5.1, and shall be determined as follows:</u></p> <p>a. Where a <i>system</i> providing <i>on-site renewable energy</i> has been modeled in the <i>proposed design</i>, the same <i>system</i> shall be modeled identically in the <i>budget building design</i>, except the rated capacity shall meet the requirements of Section 10.5.1.1. Where more than one type of <i>on-site renewable energy</i> system is modeled, the total capacities shall be allocated in the same proportion as in the <i>proposed design</i>.</p> <p>b. Where no <i>system</i> exists or is specified to provide <i>on-site renewable energy</i> in the <i>proposed design</i>, <i>on-site renewable energy</i> shall be modeled as an unshaded photovoltaic system with the following physical characteristics:</p> <ul style="list-style-type: none"> • <u>Size: Rated capacity per Section 10.5.1.1</u> • <u>Module Type: Crystalline silicon panel with a glass cover.</u> 19.1% nominal efficiency and temperature coefficient of –0.47%/°C; performance shall be based on a reference temperature of 77°F (25°C) and irradiance of 317 Btu/ft²·h (1000 W/m²). • <u>Array Type: Rack-mounted array with installed nominal operating cell temperature (NOCT) of 103°F (45°C)</u> • <u>Total system losses (DC output to AC output): 11.3%</u> • <u>Tilt: 0-degrees (mounted horizontally)</u> • <u>Azimuth: 180 degrees</u> <p>If the <i>on-site renewable energy</i> system cannot be modeled in the simulation program, Section 11.4.5 shall be used.</p>

energy source, or electricity if no backup *energy* source has been specified. Where the proposed design includes *on-site electricity generation systems* other than *on-site renewable energy systems*, the baseline design shall include the same generation systems excluding its *site-recovered energy*.

Modify Section 4.2.1.1 as shown (I-P and SI units).

4.2.1.1 New Buildings. New buildings shall comply with Sections 4.2.2 through 4.2.5 and either the provisions of

- a. Section 5, “*Building Envelope*”; Section 6, “*Heating, Ventilating, and Air Conditioning*”; Section 7, “*Service Water Heating*”; Section 8, “*Power*”; Section 9, “*Lighting*”; and Section 10, “*Other Equipment*,” or
- b. Section 11, “*Energy Cost Budget Method*,” or
- c. Normative Appendix G, “*Performance Rating Method*.”

When using Normative Appendix G, the Performance Cost Index (PCI) of new *buildings*, *additions to existing buildings*, and/or *alterations to existing buildings* shall be less than or equal to the Performance Cost Index target (PCI_t) when calculated in accordance with the following:

$$PCI_t = [BBUEC + (BPF \times BBREC) - \underline{PRE}] / \underline{BBP}$$

Where

PCI = Performance Cost Index calculated in accordance with Section G1.2.

BBUEC = baseline *building* unregulated *energy* cost, the portion of the annual *energy* cost of a *baseline building design* that is due to *unregulated energy use*.

BBREC = baseline *building* regulated *energy* cost, the portion of the annual *energy* cost of a *baseline building design* that is due to *regulated energy use*.

BPF = *building* performance factor from Table 4.2.1.1. For *building* area types not listed in Table 4.2.1.1 use “All others.” Where a *building* has multiple *building* area types, the required BPF shall be equal to the area-weighted average of the *building* area types.

BBP = *baseline building performance*.

PBP = *proposed building performance*, including the reduced, annual purchased energy cost associated with all *on-site renewable energy* generation systems.

PBP_{nre} = *proposed building performance* without any credit for reduced annual energy costs from *on-site renewable energy* generation systems.

PBP_{pre} = *proposed building performance*, excluding any *renewable energy* system in the proposed design and including an *on-site renewable energy* system that meets but does not exceed the requirements of Section 10.5.1.1 modeled following the requirements for a *budget building design* in Table 11.5.1.

$$\underline{PRE} = \underline{PBP}_{nre} - \underline{PBP}_{pre}$$

When $(\underline{PBP}_{pre} - \underline{PBP}) / \underline{BBP} > 0.05$, new *buildings*, *additions to existing buildings*, and/or *alterations to existing buildings* shall comply with the following:

$$\underline{PCI} + [(\underline{PBP}_{pre} - \underline{PBP}) / \underline{BBP}] - 0.05 < \underline{PCI}_t$$

Informative Notes:

1. PBP_{nre} = *proposed building performance*, no *renewable energy*
2. PBP_{pre} = *proposed building performance*, prescriptive *renewable energy*
3. PRE = prescriptive *renewable energy*

Modify Section G2.2 as shown (I-P and SI units).

G2.2 Simulation Program. The *simulation program* shall be a computer-based program for the analysis of *energy* consumption in *buildings* (a program such as, but not limited to, DOE-2, BLAST, or EnergyPlus). The *simulation program* shall include calculation methodologies for the *building* components being modeled. For components that cannot be modeled by the *simulation program*, the exceptional calculation methods requirements in Section shall be used.

Exception to G2.2: When approved by the *adopting authority*, a separate computer-based program shall be permitted to be used to calculate *on-site renewable energy*.

Modify Table G3.1 as shown (I-P and SI units).

No.	<i>Proposed Building Performance</i>	<i>Baseline Building Performance</i>
18.	<p><u>On-Site Renewable Energy</u></p> <p><u>On-site renewable energy in the <i>proposed building performance</i> shall be determined as follows:</u></p> <ol style="list-style-type: none"> a. <u>Where a complete <i>system</i> providing <i>on-site renewable energy</i> exists, the model shall reflect the actual <i>system</i> type using actual component capacities and efficiencies.</u> b. <u>Where a <i>system</i> providing <i>on-site renewable energy</i> has been designed, the <i>system</i> model shall be consistent with design documents.</u> c. <u>Where no <i>system</i> exists or is specified to provide <i>on-site renewable energy</i>, no <i>system</i> shall be modeled.</u> 	<p><u>On-site renewable energy shall not be included in the <i>baseline building performance</i>.</u></p>

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.

Need and Reason

1. Why is the proposed code change needed?

This code proposal change is based on approved ASHRAE addenda by, ck, and cp to Standard 90.1-2019.¹ Standard 90.1 is developed under ANSI-approved consensus procedures and is under continuous maintenance. ASHRAE publishes changes to Standard 90.1 as individual addenda to the preceding Standard, and then bundles them together to form the next published edition. Because addenda are typically not recognized as part of Minnesota's energy code, it is important to incorporate the most crucial approved addenda to the Minnesota commercial energy code during the adoption process. These addenda establish a prescriptive requirement for onsite renewable energy of 0.25W/s.f. of the three largest floors of all commercial buildings. The size of the required on-site renewable energy is small (on average 4.5% of building energy use) and is a more cost-effective way to require all new commercial buildings to be solar ready. Without this code requirement, it may either not be technically possible or it would be economically prohibitive to add solar to new commercial buildings in the future without this proposed code change.

In addition, this proposal will update and expand the definitions of renewable energy resources and onsite renewable energy to be consistent with the definitions that will be in Minnesota's next commercial code. Finally, this addenda clarifies how to treat renewable energy in the performance pathway

Addendum by adds a minimum prescriptive requirement for onsite renewable energy. The renewable energy resources are defined within the addendum; however, the specific resource to be used are left up to the designer or building owner. The listed capacity requirement, as well as the scalar evaluation, is based on photovoltaic generation, as that is the most ubiquitous and cost-effective renewable energy resource and equipment/system currently available across the industry. The renewable energy capacity component was determined through a comparative analysis exercise considering economics, (roof) space competition, annual energy production/ contribution to the building energy budget, and equivalences against other energy efficiency measures. The annual purchased energy reduction budget for this renewable energy proposal, based on the PI prototype models considered, is 4.5%. The building prototypes and solar zones evaluated passed the ASHRAE scalar assessment² for cost effectiveness.

Addendum ck adds language to Section 11 to address new renewable energy requirements in Addendum by. The approach allows a proposed design that does not include renewable energy required by Section 10.5.1 a trade-off against other prescriptive requirements in the standard. In that case, the renewable energy allowance included in the budget building design will be based on a horizontal photovoltaic array with a rated capacity equal to but not to exceed the requirement in Section 10.5.1.1. For proposed designs that include an on-site renewable energy system, the budget building design allowance will be based on the proposed renewable energy system design with a rated capacity equal to but not to exceed the requirement in Section 10.5.1.1. This addendum impacts an optional performance path in the standard designed to provide increased flexibility and therefore was not subjected to cost effectiveness analysis.

Addendum cp adds language to Normative Appendix G to address the new proposed renewable energy requirements in Addendum by. The approach allows a proposed design that does not include renewable energy required by Section 10.5.1 a method of trade off against other prescriptive requirements in the standard. In that case the renewable energy allowance included in the budget building design will be based on a horizontal photovoltaic array with a rated capacity equal to but not to exceed the requirement in Section 10.5.1.1. For proposed designs that include an on-site renewable energy system, the budget building design allowance will be based on the proposed renewable energy system design with

¹ ANSI/ASHRAE/IES Addendum by, ck, and cp to ANSI/ASHRAE/IES Standards 90.1-2019, ASHRAE Standards Committee, 31 July 2020, https://www.ashrae.org/file%20library/technical%20resources/standards%20and%20guidelines/standards%20addenda/90_1_2019_by_ck_cp_20200731.pdf

² The scalar ratio is used specifically for Scenario 3, the ASHRAE SSPC 90.1 Scalar Method. Using this approach, the payback is calculated as the sum of the first costs and present value of the replacement costs, divided by the difference of the energy cost savings and incremental maintenance cost.

a rated capacity equal to but not to exceed the requirement in Section 10.5.1.1. This addendum impacts an optional performance path in the standard designed to provide increased flexibility and therefore was not subjected to cost effectiveness analysis.

- Why is the proposed code change a reasonable solution?

This proposed code change will ensure that new commercial buildings built in Minnesota will both have a nominal amount of renewable energy installed on-site and will ensure additions of renewable energy in the future will not be cost prohibitive or technically infeasible.

- What other considerations should the TAG consider?

None.

Cost/Benefit Analysis

- Will the proposed code change increase or decrease costs? Please explain.

This proposed code change will increase costs modestly. NBI and Steven Winter Associates received stakeholder feedback on three common commercial building types being built in Minnesota. The first is a 4-story multifamily building that is 3,040 s.f. The second is a 10-story multifamily high-rise that is 76,000 s.f. and the third is a 3-story office building that is 53,633 s.f. The following table lists the required amount of PV that would be required under this proposed code amendment, the approximate installed costs for solar on these buildings, annual energy cost savings in the first year of production and the simple payback period.

	PV (kW)	PV Cost	Annual Energy Cost Savings	Simple Payback Period
Multifamily Medium (4-story, 3,040 s.f.)	0.57	\$ 1,140	\$ 104	10.9
Multifamily High Rise (10-story, 76,000 s.f.)	5.7	\$ 11,400	\$ 1,044	10.9
Office (3-story, 53,633 s.f.)	13.4	\$ 26,817	\$ 1,877	14.3

- If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain.

The increased costs will be offset by annual energy cost savings, and by preparing the building for future expansion of solar capacity.

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

No.

- 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? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.

No.

Regulatory Analysis

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

All segments of the industry will be affected by this proposed code change.

2. What are the probable costs to the agency and to any other State agencies of implementing and enforcing of the proposed rule? Is there an anticipated effect on state revenues?

There should be no additional costs to state agencies.

None.

3. Are there less costly intrusive methods for achieving the purpose of the proposed rule?

No.

4. Can you think of other means or methods to achieve the purpose of the proposed code change? If so, please explain what they are and why your proposed change is the preferred method or means to achieve the desired result.

Some of the purpose of the proposed code change may be achieved by requiring buildings be solar ready. However, solar-readiness is not strictly cost-effective because there is no energy payback associated with making a commercial building solar ready.

5. What are the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals?

The probable costs are listed in section 1 above.

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

By not adopting this requirement, commercial buildings may find it technically infeasible or cost prohibitive to install solar at their building in the future.

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

No.

8. Please include an assessment of the cumulative effect of the rule with other federal and state regulations related to the specific purpose of the rule.

There is no additional cumulative effect of the rule when accounting for other federal and state regulations.

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