

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: CCLD Staff

Date: 5-13-2024

Email address: don.sivigny@state.mn.us

Model Code: MN Rules 1303

Telephone number: 651-284-5874

Code or Rule Section: 1303.2300 and 1303.2400

Firm/Association affiliation, if any: DLI

Topic of proposal: Radon (MN Rule 1303)

Code or rule section to be changed: 1303.2300 Subp. 5 Item D, 1303.2400 Subpart C.

Intended for Technical Advisory Group ("TAG"): 1300, 1301, 1302, 1303

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).

N/A

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

YES. MN Rules Chapter 1303. Section 2403. subpart C

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

N/A

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

YES. MN Rules Chapter 1303. Sections 2402 Subpart 5 item D, and 2403. Item C

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

N/A

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

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

1303.2402 REQUIREMENTS FOR PASSIVE RADON CONTROL SYSTEMS.

Subp. 5. Vent pipes.

D. Vent pipe accessibility. Radon gas vent pipes shall be provided with space around the vent pipe for future installation of a fan. The space required for the future fan installation shall be a minimum of 24 inches in diameter, centered on the axis of the vent pipe, and shall extend a minimum distance of 3 vertical feet. The access requirements of the International Mechanical Code, section 306.3, shall also be met.

Exception 1: Accessibility to the radon gas vent pipe is not required if the future fan installation is above the roof system and there is an approved rooftop electrical supply provided.

Exception 2: If the Radon Fan location is in an attic, where the insulation is installed on the floor of the attic, to meet the minimum R value for the Attic, and is installed in such a manner that travel into or through the attic is not required to install or service the Radon Fan

1303.2403 REQUIREMENTS FOR ACTIVE RADON CONTROL SYSTEMS.

When an active radon control system is installed, all the requirements for the passive radon control system in parts [1303.2400](#) to [1303.2402](#) shall be met. In addition, an active radon control system shall incorporate items A to ~~ED~~ in this part.

A. Radon gas vent pipe fan. A radon gas vent pipe fan manufactured for radon control systems and rated for continuous operation that provides a minimum measurement of 50 cubic feet per minute at 1/2-inch water column shall be installed in the vertical vent pipe. The fan shall be attached to a radon gas vent pipe that connects the air below the soil-gas membrane with outdoor air and relies on the fan to provide upward air flow in the vent pipe. The radon gas vent pipe fan shall be installed outdoors, in attics, or in garages. The radon gas vent pipe fan shall not be installed in conditioned spaces of a building, basement, or crawl space. The radon gas vent pipe fan shall not be located where it positively pressurizes any portion of the vent pipe that is located inside conditioned space.

B. System monitoring device. An audible alarm, a manometer, or other similar device shall be installed to indicate when the fan is not operating.

C. Luminaire and receptacle outlet. A switch-controlled luminaire and the receptacle outlet near the fan shall be installed according to the Minnesota Electrical Code. ~~The requirements of the International Mechanical Code, section 306, do not apply.~~

D. Fan(s) in attics with insulation. The access requirements of the International Mechanical Code, section 306.3, shall also be met.

Exceptions:

1. Accessibility to the radon gas vent pipe is not required if the future fan installation is above the roof system and there is an approved rooftop electrical supply provided.
2. If the Radon Fan location is in an attic, where the insulation is installed on the floor of the attic, to meet the minimum R value for the Attic, and is installed in such a manner that travel into or through the attic is not required to install or service the Radon Fan

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

This Code Change will amend Mn Rules Chapter 1303 “Minnesota Provisions to the Minnesota State Building Code (Including Radon).”

Need and Reason

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

This Proposed Change is needed because without this change, an individual, homeowner, or trades person will need to walk through the attic insulation that is blown in on the floor of the attic to service or install a Radon Fan. When doing so, they typically try to find and walk on the bottom portion (Cord) of the attic truss, to install or service a Radon Fan located in the attic.

When entering the attic to access for service, or to install a Radon fan, the following things happen that are creating violations to the State Building Code in many ways.

1. The attic insulation will be compressed and displaced as it is walked on and, walked through. This will create a disruption and compression of the attic insulation, reducing R-value (or increasing the U-factor) to levels which are not in compliance with the State Building Code. (See Mn Rules 1322, the Minnesota Residential Energy Code Table R402.1.1, Table R402.1.3 and Section R 402.2.1)
 2. The attic insulation will then, not be installed in accordance with the Manufacturers written installation instructions for performance of Loose Fill Insulation, or the State Building Code. (See Mn Rules Chapter 1322. The Minnesota Residential Energy Code Section R 303.1 (2))
 3. Individuals entering the attic are damaging the Electrical wiring systems when they step into and through the insulation. When doing this, they end up stepping down the insulation and do not even see the electrical wiring running across the Floor of the attic and its framing members. This then causes damage to the electrical wiring system that can cause a Break in the wiring which can then become a Fire safety issue. In doing so this is also creating a violation of the Electrical Code. (Article 334 for NM cable, Sections 320.23, and 334.23)
2. Why is the proposed code change a reasonable solution?
This change is a reasonable change to provide a Code Compliant attic insulation assembly, by not creating a situation that will lessen the performance of the Insulation to be less than that of the Minimum standards of the Code, create life safety issues within the building, or create other violations of the State Building Code by accomplishing the following :
 - a. Stop the reduction of attic insulation R value due to Displacement and Compression which will violate the Code.
 - b. Stop the damage caused by individuals entering the attic and damaging the Electrical wiring systems. when they step into and through the insulation. When doing this, they end up stepping down the insulation and do not even see the electrical wiring running across the Floor of the attic and its members. This then causes damage to the electrical wiring system that can be a Fire safety issue.

3. What other factors should the TAG consider?

TBD

Cost/Benefit Analysis

1. Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible. There will be no increase or decrease to the costs of complying with this Code change.
2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. If the benefit is quantifiable (for example energy savings), provide an estimate if possible.
N/A
3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
N/A
4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.
N/A
5. Will the cost of complying with the proposed code change in the first year after the rule takes effect exceed \$25,000 for any one small business or small city ([Minn. Stat. § 14.127](#))? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.
N/A

Regulatory Analysis

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

Builders and Building Officials as well as Home owners of the Buildings this code Change will be applied to based on the Scoping provisions for Residential Buildings

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

No

To Be determined

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

The Costs and Consequences will be in creased energy costs for the life cycle of the building, the possibility of Life safety issues from fires ignited by broken r bare electrical wires. These cost will mainly be affecting the future owners and occupants of these buildings

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

No

***Note: The information you provide in this code change proposal form is considered Public Data and used by the TAG to consider your proposed modification to the code. Any code change proposal form submitted to DLI may be reviewed at public TAG meetings and used by department staff and the Office of Administrative Hearings to justify the need and reasonableness of any proposed rule draft subject to administrative review and is available to the public.

****Note: Incomplete forms will be returned to the submitter with instruction to complete the form. Only completed forms will be accepted and considered by the TAG. The submitter may be asked to provide additional information in support of the proposed code change.

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: **C. Scott Anderson**

Date: **7/02/24**

Email address: **c.scott.anderson@minneapolismn.gov**

Model Code: **2024 IBC**

Telephone number: **612-246-7303**

Code or Rule Section: **1300.0040
Subp 2**

Firm/Association affiliation, if any: **City of Minneapolis**

Topic of proposal: **1300.0040 Subp 2**

Code or rule section to be changed: **1300.0040 Subp 2**

Intended for Technical Advisory Group ("TAG"):

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

Proposed Language

1. The proposed code change is meant to:

- change language contained the model code book? If so, list section(s).
- change language contained in an existing amendment in Minnesota Rule? If so, list Rule part(s).
1300.0040 Subp 2
- 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.
1300.0040 Subp 2

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

No

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

Subp. 2. Compliance. Structures classified under part 1300.0070, subpart 12b, as IRC-1, IRC-2, IRC-3, and IRC-4 occupancies not more than three stories above grade plane in height with a separate means of egress shall comply with chapter 1309 and other applicable rules. Other buildings and structures and appurtenances connected or attached to them shall comply with chapter 1305 and other applicable rules.

~~Exceptions: The following structures that meet the scope of Chapter 1305 shall be permitted to be designed to comply with Minnesota Rules, Chapter 1311;~~

~~1) Existing buildings undergoing repair, alteration, change of occupancy, addition, or being moved; and~~

~~2) Historic buildings.~~

1. Existing structures and existing buildings that meet the scope of chapter 1305 and undergoing repair, alteration, change of occupancy, addition, or being moved shall be permitted to be designed to comply with Minnesota Rules, Chapter 1311.

2. Historic buildings shall be permitted to be designed to comply with Minnesota Rules, Chapter 1311.

3. Structures classified under part 1300.0070, subpart 12b, as IRC-3 shall be permitted to be designed to comply with Minnesota Rules, Chapter 1305.

If different provisions of the code specify different materials, methods of construction, or other requirements, the most restrictive provision governs. If there is a conflict between a general requirement and a specific requirement, the specific requirement applies.

If reference is made in the code to an appendix, the provisions in the appendix do not apply unless specifically adopted by the code. Optional appendix chapters of the code identified in part 1300.0060 do not apply unless a municipality has specifically adopted them.

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

NO

Need and Reason

1. Why is the proposed code change needed? Please provide a general explanation as well as a specific explanation for any changes to numerical values (heights, area, etc.)
The current code restricting design of townhouses to the Residential code creates conflicts with water utility providers especially in more dense urban environments.
2. Why is the proposed code change a reasonable solution?
The revision allows more options for code compliance without reducing safety.

3. What other factors should the TAG consider?

None

Cost/Benefit Analysis

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

This change should not increase cost and under certain circumstances may reduce the cost of construction due to the potential reduction in the number of independent utility connections required under the Residential code that are not required under the commercial building code.

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

No cost change

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

NA

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

No

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

No

Regulatory Analysis

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

Architects, Contractors, Developers, Building Owners, Contractors, Building Officials

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

No

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

Continued conflict with utility companies and difficulty in achieving full code compliance.

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

No

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

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Joshua Kerber

Date: 7/1/24

Email address: joshua.kerber@state.mn.us

Model Code: 1303

Telephone number: 651-219-0785

Code or Rule Section: MN Rules 1303.2400-1303.2403

Firm/Association affiliation, if any: MN Dept. of Health

Topic of proposal: Radon (MN Rule 1303)

Code or rule section to be changed: 1303.2402: Add subpart 7 "Radon Testing"

Intended for Technical Advisory Group ("TAG"): 1300, 1301, 1302, 1303

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

Proposed Language

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- 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.

This proposal takes language from the new 2021 ICC Appendix AF and 2024 Appendix BE and adds it to MN Rule 1303.2402.

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

Yes

326B.106 Subd 6. Radon Code: "The commissioner of labor and industry shall adopt rules for radon control as part of the State Building Code for all new residential buildings. These rules shall incorporate the radon control methods found in the International Residential Code appendix as the model language, with necessary amendments to coordinate with the other adopted construction codes in Minnesota." Since the IRC appendix has been changed to require radon testing, MN building code should also be changed.

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

1303.2402 Subp. 7 **Radon Testing.** The building shall be tested for radon prior to the issuance of the certificate of occupancy.

- A. Testing shall be performed after the dwelling passes its air tightness test.
- B. Testing shall be performed after the radon control system and HVAC installations are complete. The HVAC system shall be operating during the test. Where the radon system has an installed fan, the dwelling shall be tested with the radon fan operating.
- C. Testing shall be performed on each unique foundation of the building (basement, crawlspace, slab on grade), whether or not that space is finished. Spaces that are physically separated and served by different HVAC systems shall be tested separately. All radon tests shall be conducted at the same time.
- D. Testing shall not be performed in a closet, hallway, stairway, laundry room, furnace room, bathroom or kitchen.
- E. Testing shall be performed with a radon test kit approved by a national radon proficiency program or testing shall be performed by a Minnesota Department of Health Licensed Radon Professional with a continuous radon monitor. Testing with test kits shall include two tests per testing location, and the test results shall be averaged. Testing shall be in accordance with this section and the testing laboratory kit manufacturer's instructions.
- F. Testing shall be performed with the windows closed and the exterior doors closed, except when being used for entrance or exit. Windows and doors shall be closed for at least 12 hours prior to the testing.
- G. Testing shall be performed by the builder or a Minnesota Department of Health licensed radon professional.
- H. Testing shall be conducted over a period of not less than 48 hours or not less than the period specified by the testing device manufacturer, whichever is longer.
- I. Written radon test results shall be provided by the test lab or testing party. The final written test report with results less than 4 pCi/L shall be provided to the code official prior to the issuance of the certificate of occupancy.
- J. Where the radon test result is 4 pCi/L or greater, the fan for the radon vent pipe shall be installed as specified in 1303.2403.
- K. Where the radon test result is 4 pCi/L or greater, the system shall be modified and retested until the test result is less than 4 pCi/L.

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

No

Need and Reason

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

Radon is a colorless and odorless gas that comes from the soil. The gas can accumulate in the home. Radon gas decays into fine particles that are radioactive. When inhaled, these fine particles can damage the lungs. Exposure to radon over a long period of time can lead to lung cancer.

It is estimated that 21,000 people die each year in the United States from lung cancer due to radon exposure. A radon test is the only way to know how much radon is in your home. Radon can be reduced with a mitigation system. In Minnesota, about 40% of the general housing stock has elevated radon levels: MDH Environmental Public Health Tracking Program – Radon (<https://data.web.health.state.mn.us/web/mndata/radon>).

The Proposed Change is needed because radon issues are still found in newly constructed homes. Buyers of newly constructed homes are given a false sense of security and often do not test for radon because they have a passive radon system. While the changes in Minnesota building code over time have been shown to generally lower radon levels, we routinely find elevated radon in homes built with passive radon control methods.

The Minnesota Department of Health conducted a study in 2015 of newly constructed homes in Minnesota to measure radon levels in “as-built” Minnesota homes (since the code change in 2009 to require radon resistant new construction). We found that approximately 20% of newly constructed single-family homes had radon concentrations above the USEPA’s Action level of 4 picocuries per liter (pCi/L) of air. This is compared to roughly 37% of homes built prior to 2009 in the same counties having radon over 4 pCi/L. In addition, activating the systems in homes with elevated radon (by adding a radon fan) reduced radon to under 4 pCi/L in 67 of 71 homes and overall by 94% to an average of 0.3 pCi/L. In the activated homes still over 4 pCi/L, a larger fan and/or sealing the slab and openings reduced radon to under 4 pCi/L. Sealing is the most critical piece often missed during the final building inspection.

https://aarst.org/proceedings/2015/MINNESOTA_DEPARTMENT_OF_HEALTHS_RADON_RESISTANT_NEW_CONSTRUCTION_EFFECTIVENESS_STUDY.pdf

Other studies have found similar radon reductions in passive and active RRNC homes. In a review of several studies, Professor William Angell (University of Minnesota) found passive systems produce about a 50% reduction, when built to standards, and that some new passive system homes have elevated radon.

https://sosradon.org/files/sosradon/RRNC_Codes/Radon%20Control%20In%20New%20Homes%20-%20Angell%20summary%20of%20research.pdf

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

The United States Action Level for radon is 4 pCi/L, as set by the USEPA. The only way to know how much radon is in any building is to test. Testing is easy, inexpensive, and easy to interpret. Adding this testing requirement is a means of “commissioning” the radon system and ensures the occupants are protected from radon. In addition, builders will be required to show a low radon level

has been achieved prior to receiving their certificate of occupancy, thereby lowering their liability. This is a simple solution to a life safety issue and improves public health.

Adding this testing requirement will not extend building completion schedules as there will be plenty of time to conduct the test during the latter parts of construction, and the testing can even be conducted over weekends when many of the trades may not be present in the building.

The language proposed is based on 2021 Appendix AF104 of the IRC (with two differences):

https://codes.iccsafe.org/content/IRC2021P2/appendix-af-radon-control-methods#IRC2021P2_AppxAF_SecAF104

The two differences from IRC code are as follows:

1. The Minnesota Radon Licensing Act (MRLA, MN Statute 144.4961) requires MDH licensed professionals conduct testing. Under IRC item 5, registered third party is changed to reflect this MN specific licensure.
2. The Minnesota Building Code (1303.2402, subp. 5, F) require separate radon gas vent pipes in each foundation. In addition, the MRLA rule (4620.7500, B, (2)) requires professionals test each foundation. Under IRC item 3, we propose the 'testing in lowest occupied floor level' is changed to reflect these MN specific code and rule requirements.

The proposed language was vetted through the ICC process and many affected parties came together to craft and support the language on a national level. Proponents of the language include State and Tribal Health programs, the professional radon trade association, radon practitioners, code officials, the US Environmental Protection Agency, and National Association of Home Builders (NAHB).

During testimony in favor of the proposed code language, NAHB stated its "members want to offer houses that meet safety standards" and this language "offers thorough and simple to follow instructions to meet those standards." NAHB supported the proposal. The final vote at the in-person hearing in Las Vegas in 2019 was 100 in support to only 7 negative votes. This approval carried through the online voting that followed as well.

For those interested in the final discussion of the IRC proposal, here is the link to the 2019 Las Vegas Code Hearing for RB289-19: <https://www.cdpassess.com/videos/3109/>

3. What other factors should the TAG consider?

Another major factor to be considered is health equity. This proposal ensures all occupants of newly constructed residential buildings will be living in a low-radon environment, not just those fortunate enough to be able to afford testing and mitigation after occupancy.

Cost/Benefit Analysis

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

This proposed code change will increase costs due to the purchase of two radon test devices for a typical single-family home or by hiring a licensed radon professional. The cost of a radon test kit is \$15-\$20 (x 2 so \$30-\$40 per house) while the cost of hiring a radon professional is between \$100-\$200/radon test.

If the radon levels come back elevated (4 pCi/L or more), then the installation of a radon fan, pressure gauge, and luminaire would be required per 1303.2403. The cost of a low-wattage radon fan is \$120 while the pressure gauge costs \$8. Adding the luminaire and receptacle outlet, will

range from \$75-\$350. A follow-up round of radon testing would need to be conducted after the system is activated to ensure low radon levels. These costs estimates are from verbal communications with radon professionals in the field, radon supply manufacturers, and radon industry reports on measurement professional costs.

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

By ensuring low radon levels in all new homes, we will lower the burden of radon-induced lung cancer. According to the National Cancer Institute, the cost of treating an individual with lung cancer is nearly \$200,000 (https://www.progressreport.cancer.gov/after/economic_burden). This code change will work in harmony with other radon risk-reduction initiatives occurring in Minnesota and have a positive effect on public health.

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

The cost increase will likely be borne by the builder and then on to the buyer of the new residential building.

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

Code officials will need to review simple to interpret radon test reports to verify the radon levels in the building. This review should only take a few minutes. If the system needs to be activated to reduce initial radon levels, then an inspection of the fan installation, pressure gauge, and luminaire will need to be conducted. Checking these three items will also only take a few minutes. Another radon test report will need to be reviewed after system activation to ensure low radon levels in the building.

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

It is unlikely any small business or city will incur \$25,000 in costs the first year of the proposed code change. Below are the estimated costs of activating a passive radon system and retesting after completion. These numbers use actual costs or the middle range of estimates if hard numbers are not available.

MDH Assumed Passive System Activation Costs:

Initial testing	\$30 (applies to every home build)
Radon Fan	\$120
Pressure Gauge	\$8
Electrical work:	\$212
<u>Post Testing</u>	<u>\$30</u>
Total	\$370 (applies to only 20% of new home builds)

Assuming only 20% of houses will need to be activated, then a builder with fewer than 50 employees would need to build 240 homes the first year and activate more than 48 of them to reach the \$25,000 threshold.

Initial Testing: \$30 x 240 = \$7,200

Activation:	\$370 x 48	=	\$17,760
Total:			\$24,960

Regulatory Analysis

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

Builders of newly constructed residential buildings and code officials.

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

Requiring all new homes have a fan installed would also achieve lung cancer risk reduction but would be much more costly to both the builder and the occupants overall. About 20% of single family homes with passive systems in MN are estimated to have elevated radon, so requiring fans in all homes may not be reasonable.

The only way to ensure low levels of radon are present in any building is to test and take action to reduce any elevated levels. If action is taken after occupancy, then additional regulations must be followed ([Minnesota Statutes 144.4961](#)) and additional costs borne by the new owner of the building.

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

The consequences of not adopting the code change would be the continuation of a false sense of security by occupants of newly constructed residential buildings because these buildings are not routinely being tested for radon (and some have elevated radon). In 2023, according to the census bureau, there were 25,667 housing units built in MN (based on permitting data, see (<https://www.census.gov/construction/bps/current.html>)). Of those housing units, 12,770 were single family, and based on our study and others (described above), we can estimate about 20% or about 2,500 new single-family homes were built in 2023 with elevated radon. The remaining units are mostly in multifamily buildings (5 units or more) and a portion (likely less than 20% but uncertain) also have elevated radon.

If IRC updates are not incorporated, this section of the building code would begin to stray away from what is statutorily required by 326B.106 Subd 6. In addition, as stated above, if radon-reduction action is taken after occupancy, the financial costs will be greater.

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

No.

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

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Gregory Metz

Date: 5/28/2024

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

Model Code: N/A

Telephone number: 651-284-5884

Code or Rule Section: MR 1303.1600,
Subp. 1

Firm/Association affiliation, if any: DLI/CCLD

Topic of proposal: Footing Depth for
Frost Protection.

Code or rule section to be changed: **1303.1600, Subpart 1 Footing Depth for Frost Protection.**

Intended for Technical Advisory Group ("TAG"):

General Information

Yes No

- | | | |
|--|-------------------------------------|-------------------------------------|
| A. Is the proposed change unique to the State of Minnesota? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| B. Is the proposed change required due to climatic conditions of Minnesota? | <input 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).
1303.1600, Subp. 1 Footing Depth for Frost Protection

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.

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

1303.1600 FOOTING DEPTH FOR FROST PROTECTION.

Subpart 1. **Minimum footing depth.** In the absence of a determination by an engineer competent in soil mechanics, the minimum allowable footing depth due to freezing is 73 inches in Zone I; 80 inches in Zone II; and 88 inches in Zone III. Less depths may be permitted when supporting evidence is presented by an engineer competent in soil mechanics.

Zone I (AFI 2200 to 3000) includes the counties of Anoka, Benton, Big Stone, Blue Earth, Brown, Carver, Chippewa, Chisago, Cottonwood, Dakota, Dodge, Faribault, Fillmore, Freeborn, Goodhue, Hennepin, Houston, Isanti, Jackson, Kanabec, Kandiyohi, Lac Qui Parle, Le Sueur, Lincoln, Lyon, Martin, McLeod, Meeker, Mille Lacs, Mower, Murray, Nicollet, Nobles, Olmstead, Pine, Pipestone, Ramsey, Redwood, Renville, Rice, Rock, Scott, Sherburne, Sibley, Stearns, Steele, Swift, Wabasha, Washington, Watonwan, Winona, Wright, Yellow Medicine.

Zone II (AFI 3000 to 3500) includes the counties of: Aitkin, Carlton, Cass, Clay, Cook, Crow Wing, Douglas, Grant, Hubbard, Lake, Morrison, Otter Tail, Pope, St. Louis (South of MN State Highway 1), Stevens, Todd, Traverse, Wadena, Wilkin.

Zone III (AFI 3500 to 4200) includes the counties of: Becker, Beltrami, Clearwater, Itasca, Kittson, Koochiching, Lake of the Woods, Mahnommen, Marshall, Norman, Pennington, Polk, Red Lake, Roseau, St. Louis (North of MN State Highway 1)

Exceptions:

1. For heated buildings with energy code compliant foundation insulation to the top of the footing, the minimum allowable footing depth due to freezing is 32 inches in Zone I; 44 inches in Zone II; and 60 inches in Zone III.
2. For unheated attached garages and semi-heated spaces with energy code compliant foundation insulation for heated spaces to the top of the footing, the minimum allowable footing depth due to freezing may match those as indicated in Exception 1 if 24 inches of horizontal insulation of R-10 or better is installed horizontally on the exterior side on top of the footing.
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, N/A

Need and Reason

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

The current frost depth criteria is not grounded in climate data or current frost depth data. Frost depth data available is developed by MNDOT and is not specific to heated buildings.

The ASCE 32 Standard for Frost Protected Shallow Foundations can be utilized to calculate foundation depths currently allowable within the code.

New climate data for Air Freezing Index collected from 1981-2010 can reasonably be incorporated into the Air Freezing Index data collected from 1951-1980 which is already in the ASCE 32 Standard to create a new average leveraging 60 years of data in lieu of only 30 years of data.

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

The ASCE 32 Standard is a nationally accepted standard for minimum foundation depths and is already allowed by both Minnesota Rule 1305 and Minnesota Rule 1309. Modifying Minnesota's foundation depth criteria to align with the ASCE 32 Standard and modify to utilize the complete dataset from 1951-2010 is a logical adjustment.

The current rule assumes foundations for heated buildings and does not address isolated foundations not supporting heated buildings or semi-heated buildings.

The Minnesota Energy Code already requires foundation insulation more than adequate to allow for consideration for foundation depth reduction in ASCE 32. Those are incorporated into the proposal since they are already mandatory.

Charging Language Rationale & Calculations for Isolated footings & foundations @ unheated structures.

Isolated footings and foundations to unheated buildings are addressed in ASCE 32 by Section 7.3 which requires horizontal insulation to extend out from under the footing to protect the soils below from freezing. The extent of the horizontal insulation is expressed as D_g . The insulation must be at least 10 inches below finished grade. The horizontal extension of D_g may be reduced by 1.25 inches for every inch in depth the bottom of the footing/foundation is below 10 inches.

Zone I (AFI 3000 or less): $D_g=79"$ $79/1.25 = 63" + 10"$ (original minimum depth) = 73" depth for isolated footings without heat and not requiring insulation.

Zone II (AFI 3500 or less): $D_g= 87"$ $87/1.25 = 70" + 10"$ (original minimum depth) = 80" depth for isolated footings without heat and not requiring insulation.

Zone III (AFI 4000 or less): $D_g= 97"$ $97/1.25 = 78" + 10"$ (original minimum depth) = 88" depth for isolated footings without heat and not requiring insulation.

Charging Language Rationale & Calculations for footings & foundations @ heated structures.

Foundation depth for heated buildings is addressed in ASCE 32 by Section 6 which requires the foundation to be constructed with vertical insulation allows for some insulation of the floor system, and sometimes requires horizontal insulation to extend out from the wall and corners of the building. Since horizontal "wing insulation" is currently not standard construction practice, Table A5 provides criteria for foundation depths with no horizontal "wing insulation" along the walls or at corners. Table A4 shows the minimum R-value requirement of the vertical foundation insulation when the floor/floor slab itself is insulated to an R-15 (more than typical) and the vertical foundation insulation ranges from R-6.8 to R10.2. The Minnesota Energy Code requires substantially more than this in all heated buildings.

Table A5 shows the following requirements:

Zone I (AFI 3000 or less): Minimum foundation depth of 32”.

Zone II (AFI 3500 or less): Minimum interpolated foundation depth of 44”.

Zone III (AFI 4000 or less): Minimum interpolated foundation depth of 60”.

Charging Language Rationale & Calculations for unheated garages attached to heated buildings and semi-heated buildings.

Attached garages and semi-heated buildings are not specifically addressed in ASCE 32, but the ASCE 32 standard does allow a significant amount of interpolation. A conservative but practical approach to semi-heated buildings and attached garages which uses the determined depth for isolated footings and unheated structures and reduces the depth to match that of heated structures without horizontal insulation using a factor of 1.25” of R-10 horizontal insulation to offset a reduction of 1” of vertical depth results in a 32” horizontal insulation projection for unheated structures at the same foundation depth of heated structures. Assuming that there is some heat from the space above, it is reasonable to determine that a reduction of 8” horizontal insulation from 32” to 24” will be more than offset by the heat from the semi-heated space above.

Zone I (AFI 3000 or less): Minimum foundation depth of 32” + 24” of R-10 horizontal insulation.

Zone II (AFI 3500 or less): Minimum interpolated foundation depth of 44” + 24” of R-10 horizontal insulation.

Zone III (AFI 4000 or less): Minimum interpolated foundation depth of 60” + 24” of R-10 horizontal insulation.

3. What other factors should the TAG consider?

ASCE does not consider soil types to make frost depth determinations. This pre-supposes that conservative measures were taken during the engineering and the prescriptive calculations include the most frost susceptible types.

Engineering that is project specific is still always available as an option if site conditions merit cost savings measures for shallower foundations.

Cost/Benefit Analysis

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

Generally, this will be a cost decrease for foundations associated with heated buildings.

The added language regarding foundation depths for semi-heated buildings and foundations not associated with heated structures will be a minor increase in excavation and materials. These are typically for post footings associated with decks and pole buildings.

Heated buildings in Zone I will realize a cost savings because footing depth requirements will decrease 10 inches in most southern counties in current Zone II and a decrease of 28 inches in Pine, Kanabec, Isanti, and Mille Lacs counties.

Non-heated buildings and isolated footings in Zone I will increase footing depth by 31 inches in most southern counties in current Zone II and an increase in footing depth resulting in a cost increase of 20 inches in Pine, Kanabec, Isanti, and Mille Lacs counties

Heated buildings in Zone II will realize a cost savings because footing depth requirements will decrease 10 inches.

Non-heated buildings in Zone II will increase footing depth by 2 inches in Stevens and Pope counties resulting in negligible cost increase. The remaining counties in Zone II

Non-heated buildings in Zone III will increase footing depth by 28 inches resulting in a cost increase.

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

Cost increases will be offset by added building durability and structure durability due to more specific construction to mitigate differential settlement due to frost heave.

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

Building owners will ultimately bear the costs. Most costs will be minimal and directed to those already building inexpensive structures like decks, detached unheated garages or pole buildings.

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

No.

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

No.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Architects, engineers, developers, home designers, builders, residential contractors, building inspectors.

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

No.

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

Most buildings will be over-designed for footing depth for frost protection resulting in higher construction costs. Some accessory buildings and structures will remain under designed and be at risk for differential settlement due to frost action on foundations.

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

No

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

Minnesota Footing Depth Requirements



ASCE 32 and Current Prescriptive Allowances

MR 1305

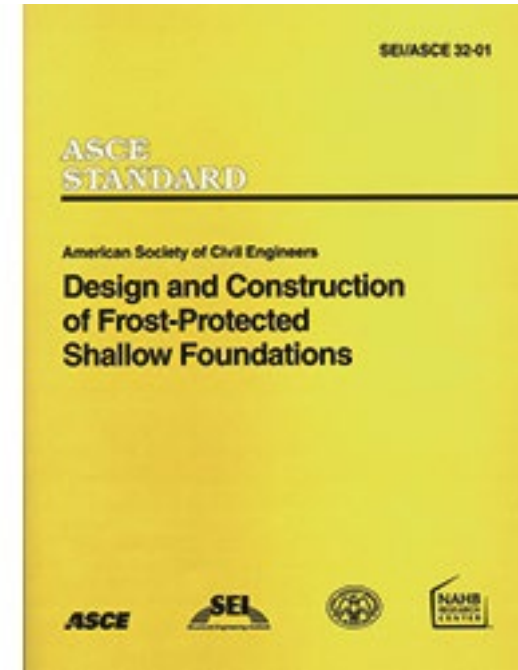
1808.5 Frost protection. Except where otherwise protected from frost, foundations and other permanent supports of buildings and structures shall be protected from frost by one of the following methods:

2. Constructing in accordance with ASCE 32

MR 1309

R403.1.4.1 Frost protection. Footings shall not bear on frozen soil. Foundation walls, piers, and other permanent supports of buildings and structures not otherwise protected from frost shall be protected by one or more of the following methods:

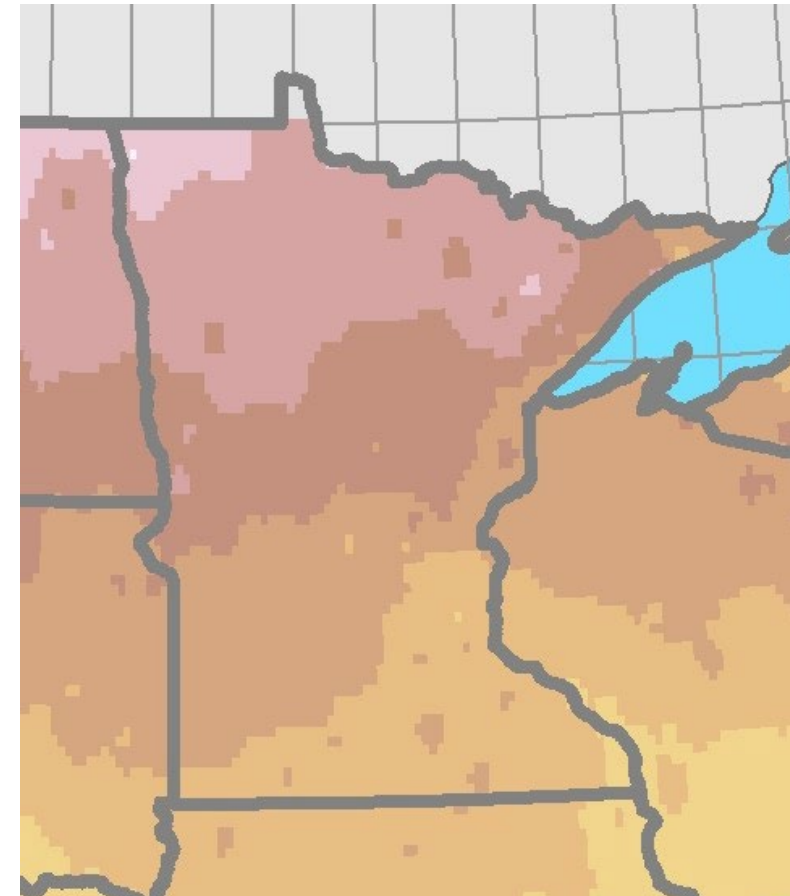
3. Constructing in accordance with ASCE 32.



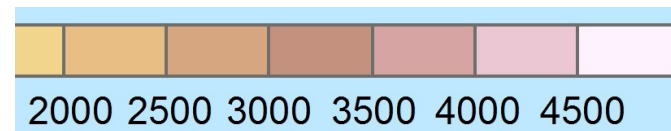
Air Freezing Index- New Data



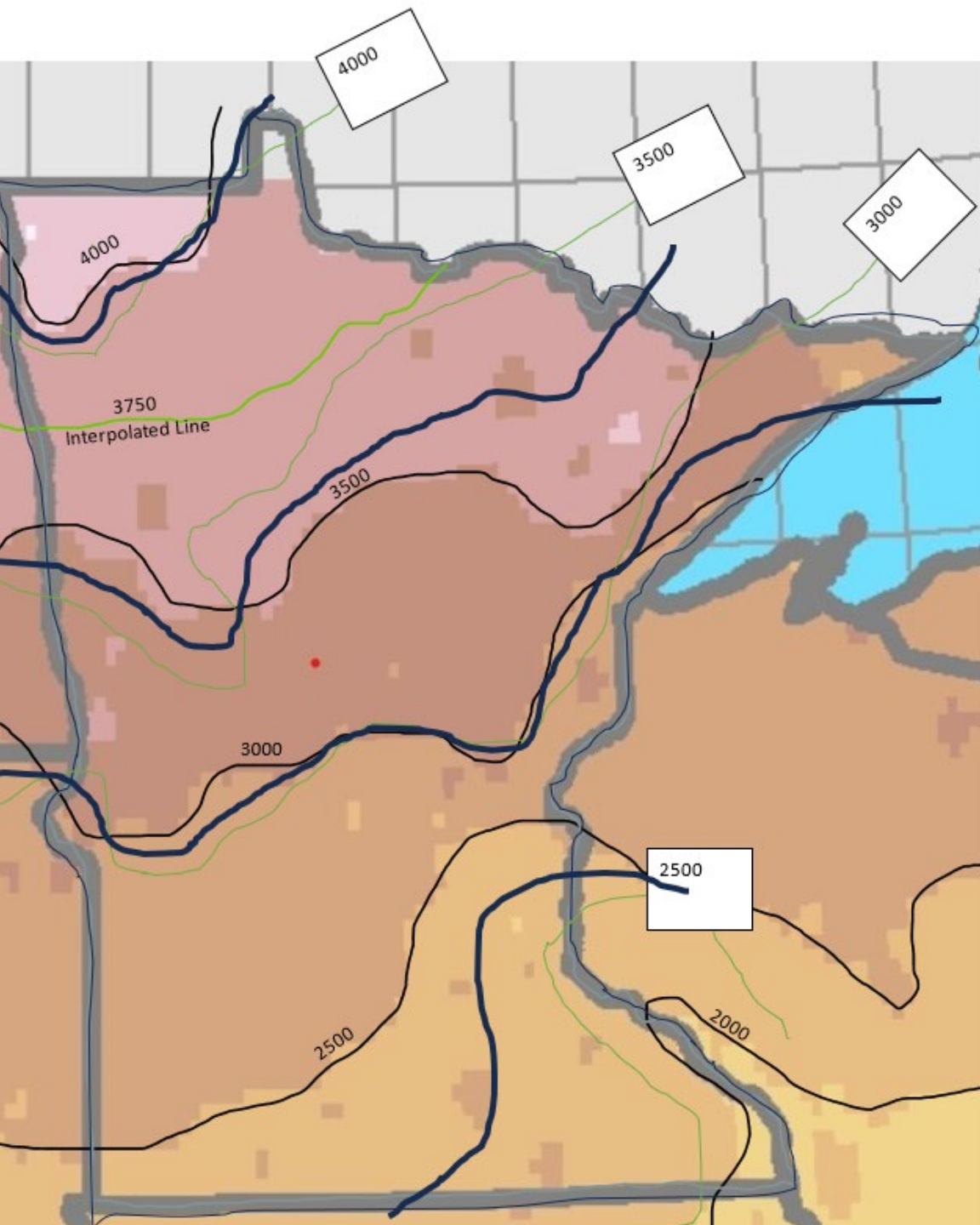
Original dataset 1951-1980



New dataset 1981-2010



Air Freezing Index- Consolidated

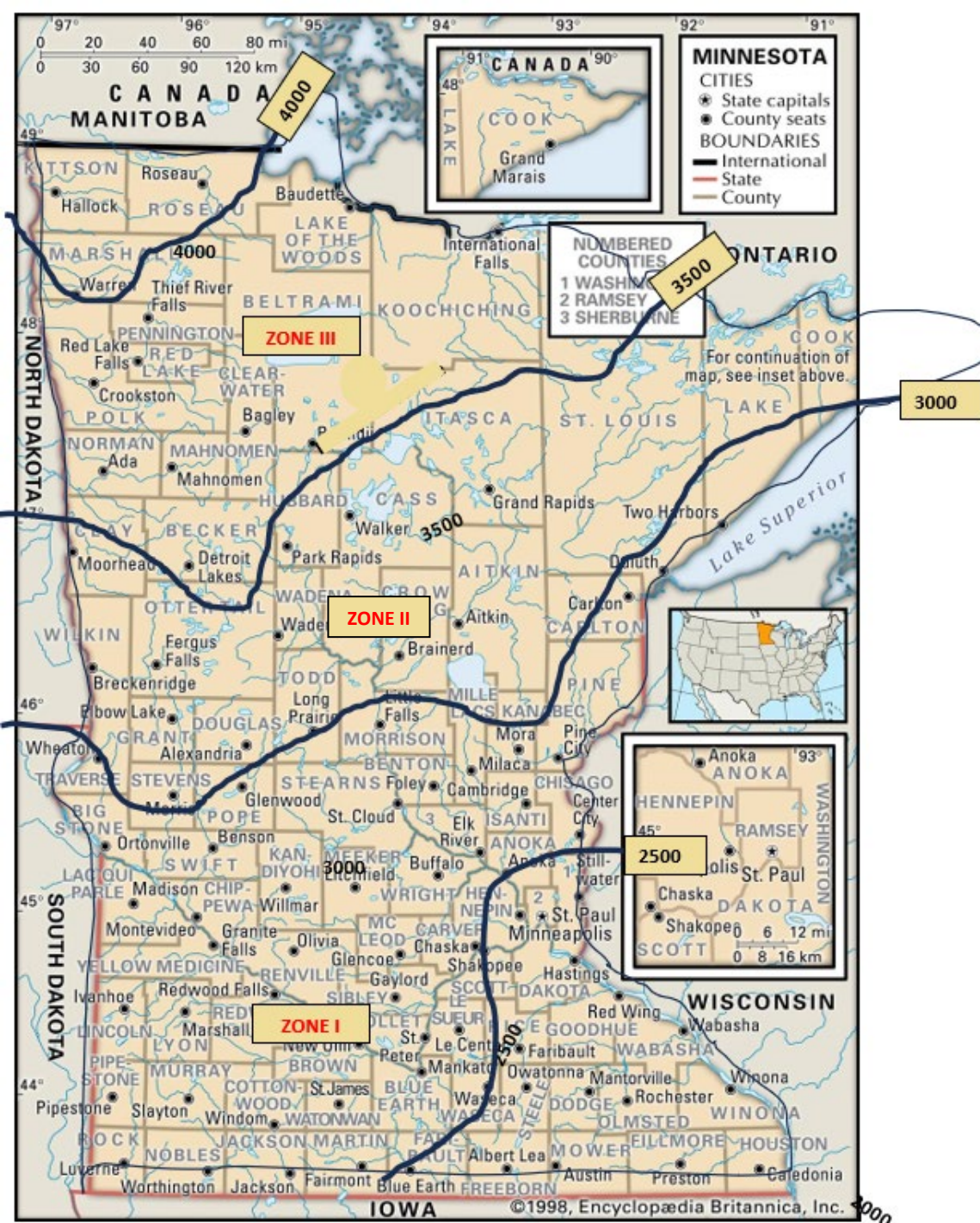


Light Green (thin) shows 1951-1980 Data

Thin Black shows 1981-2010 Data

Bold Black shows combined 1951-2010 Data

Air Freezing Index- Consolidated



Combined 1951-2010 data overlaid onto a County Map

Looking at three frost depth zones instead of two.

Targeting AFI 3500 and AFI 3000 as demising lines.

ASCE 32 Depth for **Unheated & Isolated Foundations**

D_g is the width of the HORIZONTAL projected insulation required under the footing to keep the ground from freezing.

- D_g can be reduced by 1.25 inches for every inch of depth below grade beyond 10" depth.
- For required frost depth without horizontal insulation D_g must be reduced to zero.

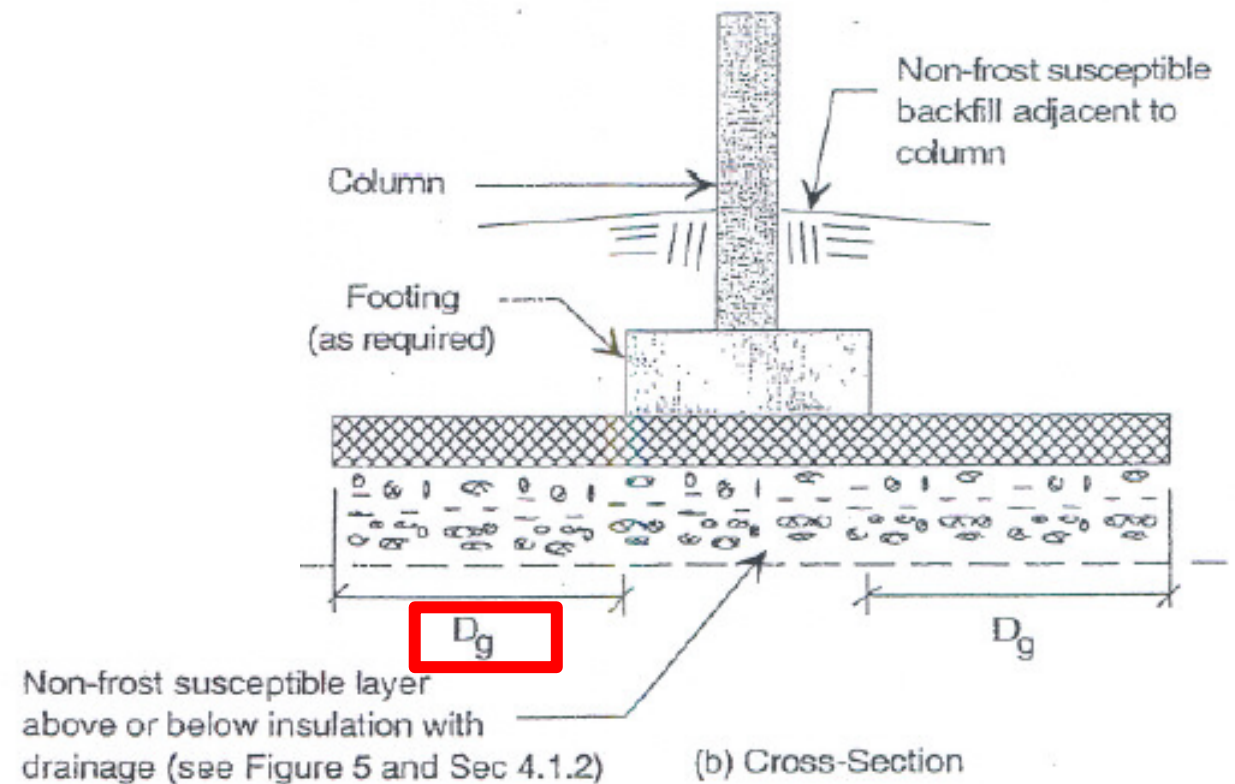


FIGURE 7. Column Foundation (Unheated Building)

ASCE 32 Depth for **Unheated & Isolated Foundations**

TABLE A8. Minimum Thermal Resistance (R-Value) of Ground Insulation, R_g , and Horizontal Extension, D_g , for Unheated Buildings

F_{100} (°F-days)	D_g (inches)	Mean Annual Temperature (°F):				
		≤ 32	36	38	40	≥ 41
750 or fewer	30	5.7	5.7	5.7	5.7	5.7
1,500	49	13.1	9.7	8.5	8.0	6.8
2,250	63	19.4	15.9	13.6	11.4	10.2
3,000	79	25.0	21.0	18.2	15.3	14.2
3,750	91 87	31.2	26.1	22.7	—	—
4,500	108 97	37.5	31.8	—	—	—

Interpolation shall be permitted.

ASCE 32 Depth for **Unheated & Isolated Foundations**

D_g can be reduced by 1.25 inches for every inch of depth below grade beyond 10" depth.

AFI 4000

$$D_g = 97'' \quad 97''/1.25 = 77.6''$$

$$77.6'' + 10'' = 87.6'' \approx 88''$$

Isolated Footing Depth
Zone III = 88" min.

AFI 3500

$$D_g = 87'' \quad 87''/1.25 = 69.6''$$

$$69.6'' + 10'' = 79.6'' \approx 80''$$

Isolated Footing Depth
Zone II = 80" min.

AFI 3000

$$D_g = 79'' \quad 79''/1.25 = 63.2''$$

$$63.2'' + 10'' = 73.2'' \approx 73''$$

Isolated Footing Depth
Zone I = 73" min.

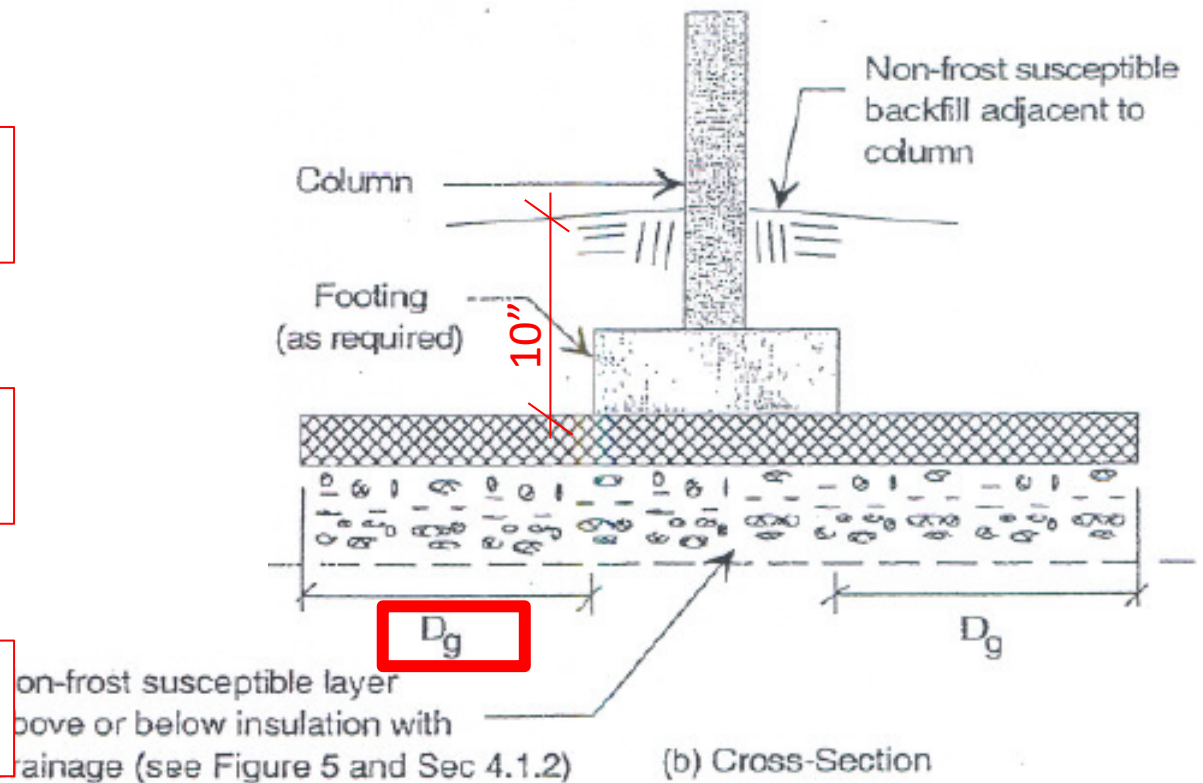


FIGURE 7. Column Foundation (Unheated Building)

ASCE 32 Footing Depth for **Heated Buildings**

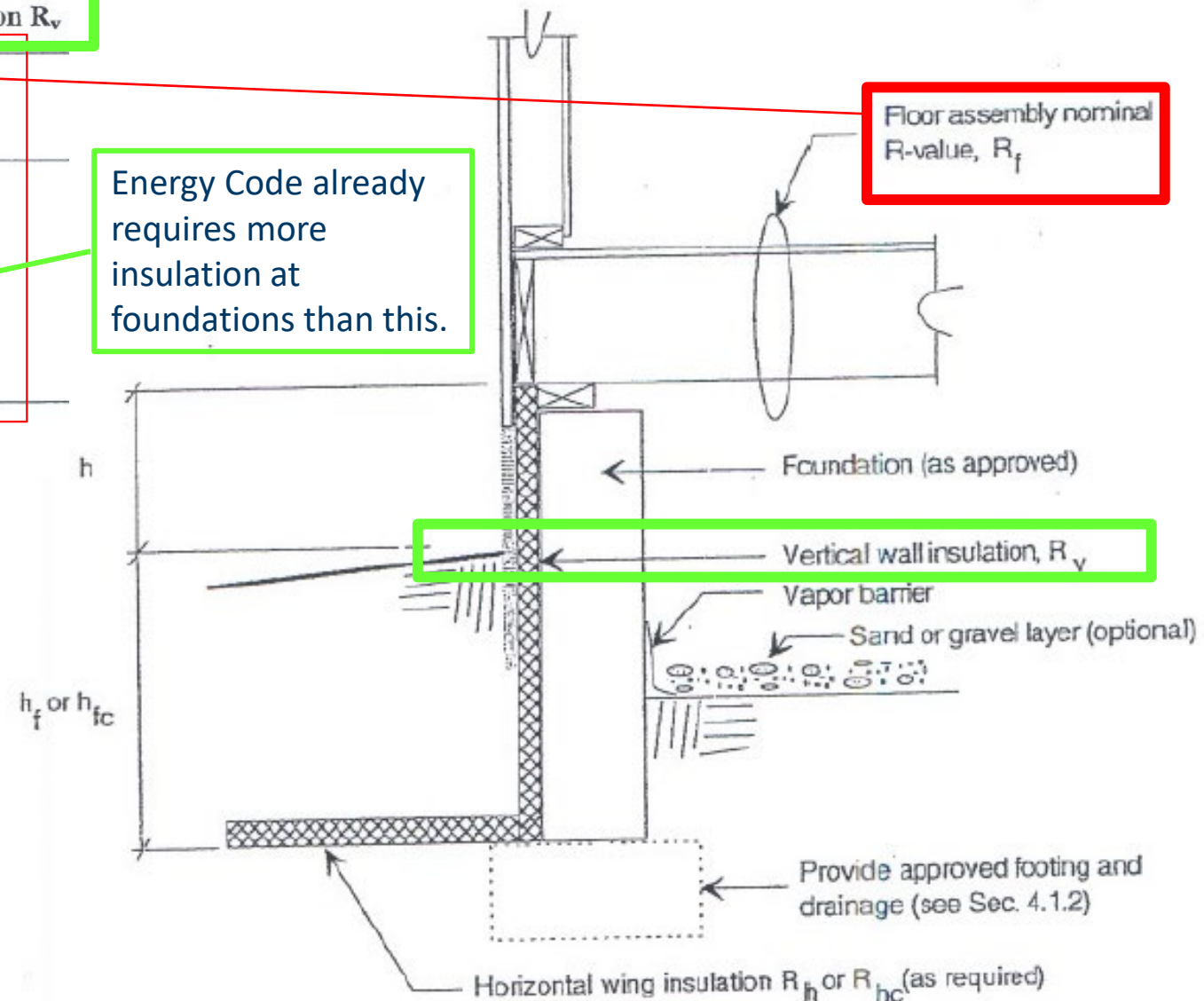
TABLE A4. Minimum Thermal Resistance of Vertical Wall Insulation R_v

F_{100} (°F-days)	$R_f \leq 6.0$		$R_f = 15.0$	
	$h \leq 12$ in	$h = 24$ in	$h \leq 12$ in	$h = 24$ in
375 or fewer	0.0	3.0	4.5	5.7
750	3.0	4.6	5.7	5.7
1,500	4.5	5.7	5.7	5.7
2,250	5.7	5.7	5.7	7.4
3,000	5.7	5.7	6.8	8.5
3,750	5.7	6.8	8.0	9.7
4,500	6.8	8.0	10.2	11.9

Interpolation shall be permitted.

R_f is the floor insulation that separates the heated space from the ground below. Typically minimal but can be up to R-15 (think heated floors)

- Note how the required vertical insulation (h) is always less than the Energy Code Requirement



ASCE 32 Footing Depth for **Heated Buildings**

Table A5 Allows interpolation
 Foundation depth at AFI 3500 is 44"
 No horizontal insulation required

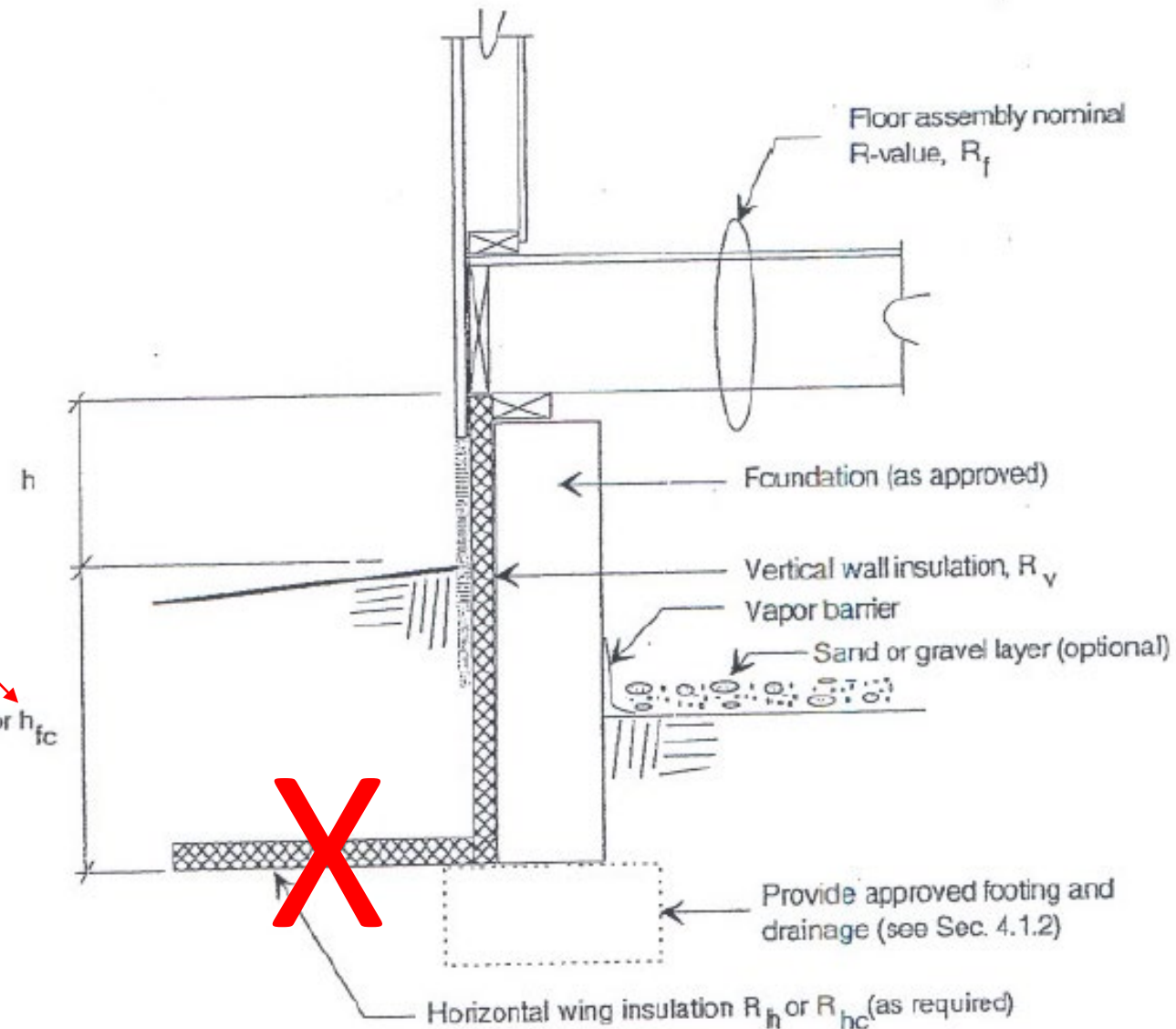
TABLE A5. Minimum Foundation Depths Without Wing Insulation

F_{100} (°F-days)	Foundation Depth Along Walls with No Wing Insulation	Foundation Depth at Corners with No Wing Insulation	
	h_f (in)	L_c (in)	h_{fc} (in)
1,500 or fewer	12	—	12
2,250	14	—	14
2,625	16	40	24
3,000	20	40	32
3,375	24	60	40
3,750	30	60	51
4,125	36	60	63
4,500	43	80	71

Interpolation shall be permitted.

h_f or h_{fc}

43.7

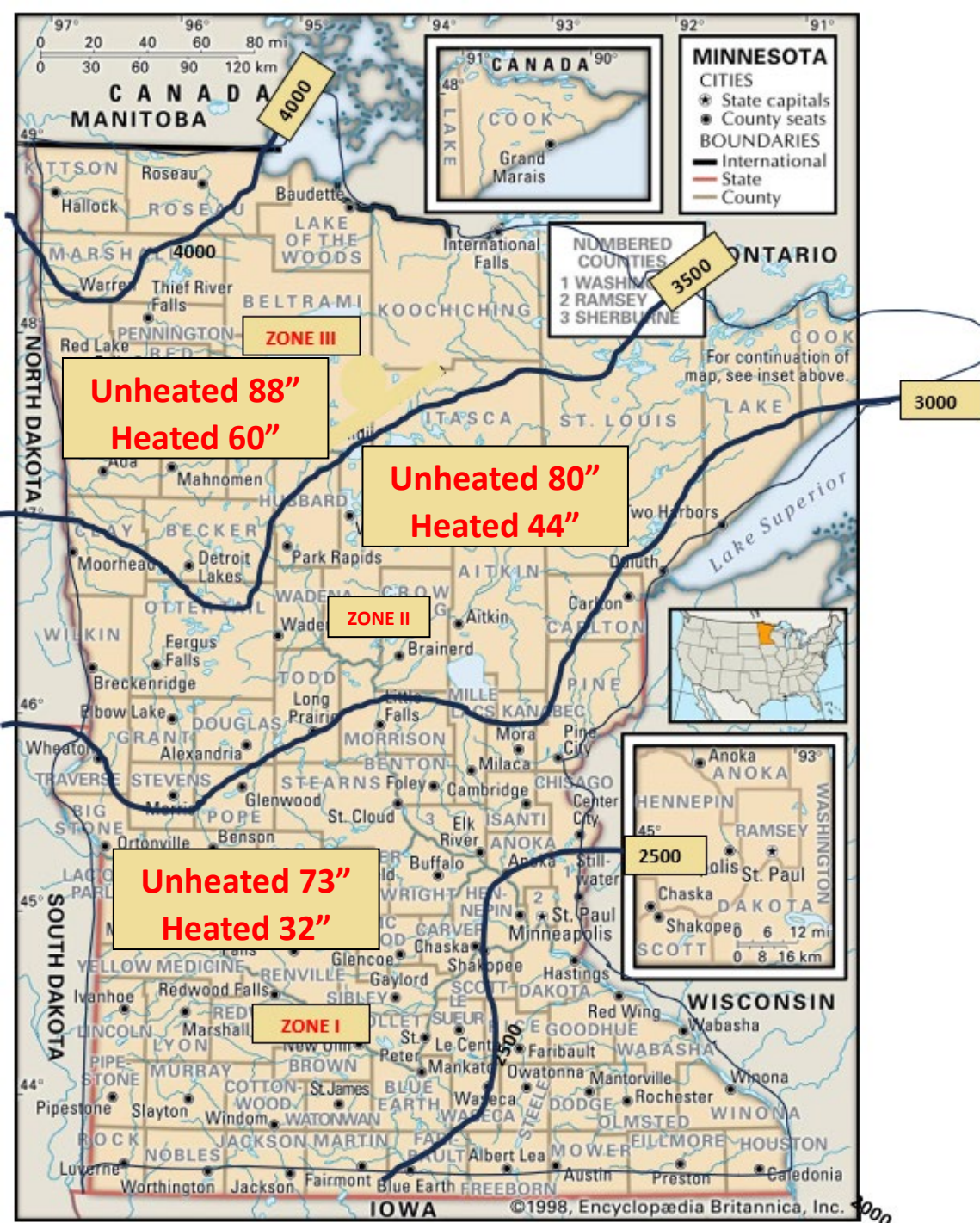


Air Freezing Index- Frost Depths

Combined 1951-2010 data overlaid onto a County Map

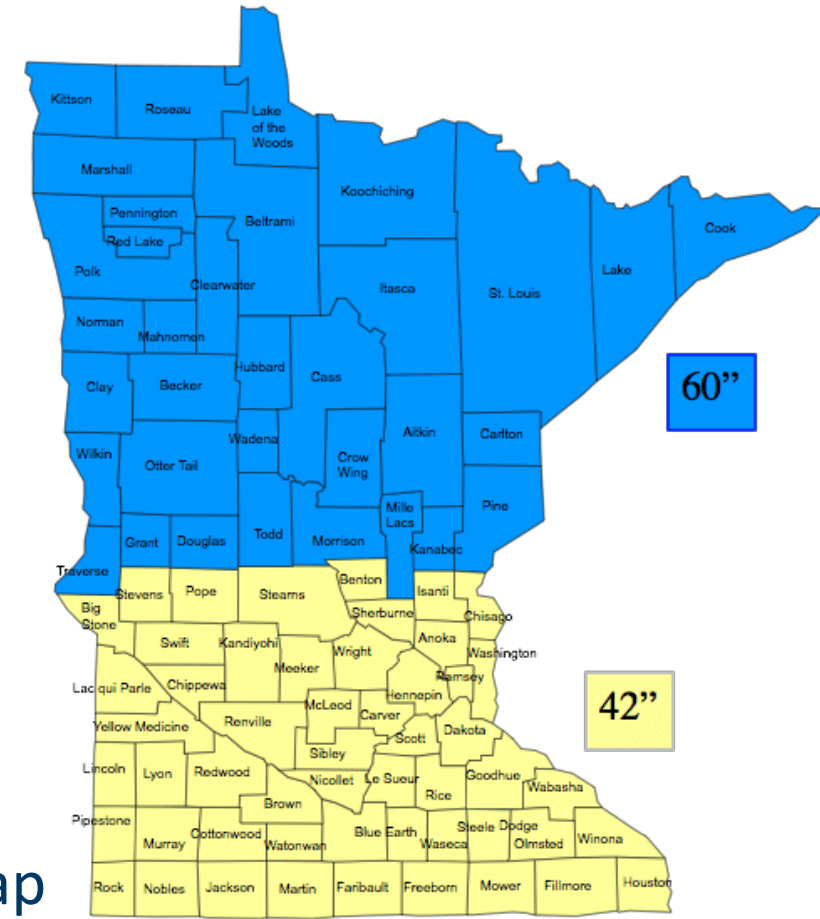
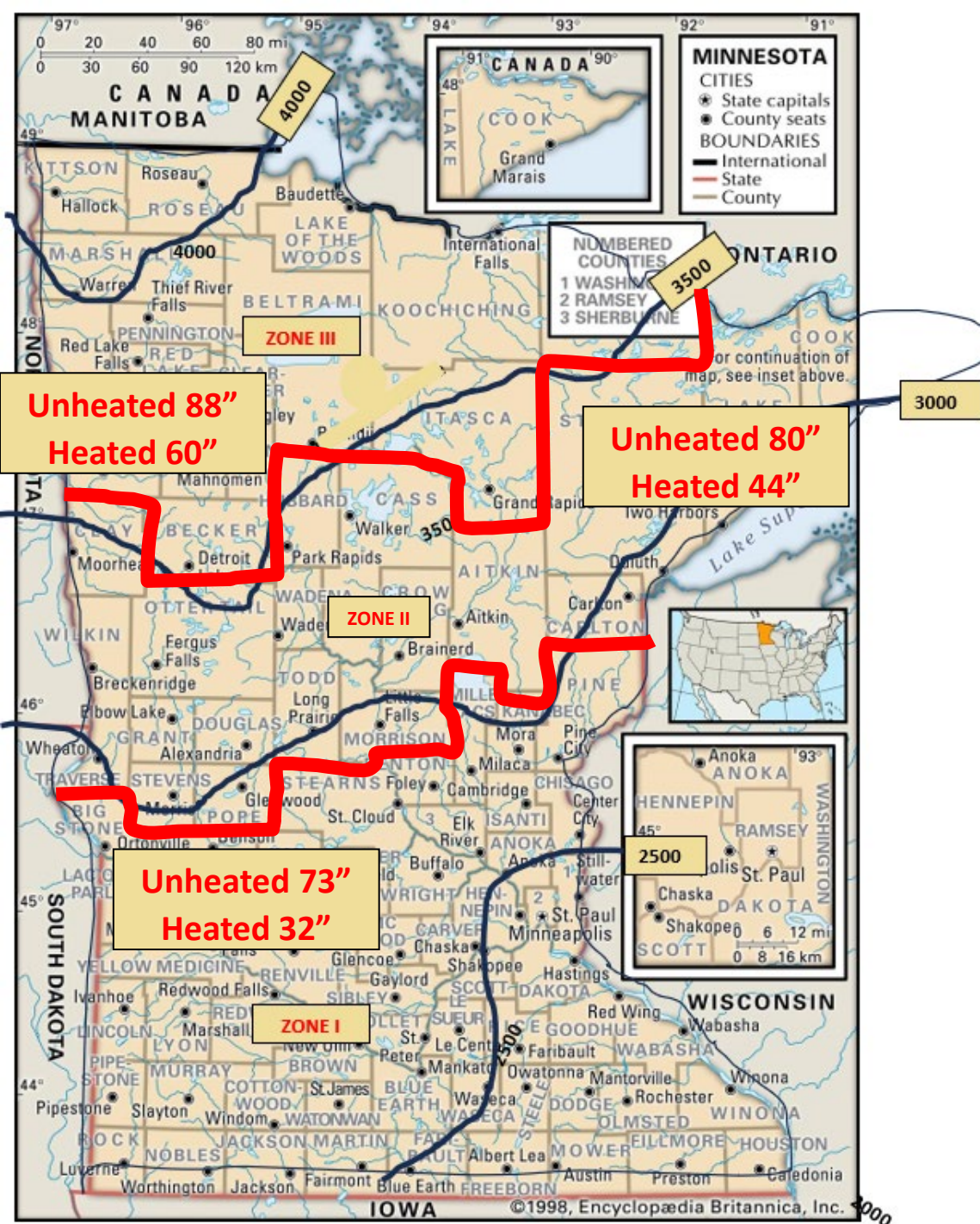
Looking at three frost depth zones instead of two.

Targeting AFI 3500 and AFI 3000 as demising lines.



Air Freezing Index- Frost Depths

Combined 1951-2010 data overlaid onto a County Map



Current Map