



CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: **Jared Johnson, Phius Alliance Minnesota**
Marcy Conrad Nutt, Passive House Minnesota

Date: **August 29, 2023**
November 7, 2023
January 10, 2024

Email address: **jared.t.johnson11@gmail.com**
marcy@phmn.org

Model Code: **2021 IECC**

Telephone number: **507-923-5415**
612-202-2791

Code or Rule Section: **R402.4.1**

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

Code or rule section to be changed: **R402.4.1.2 Testing; R402.4.1.3 Leakage Rate**

Intended for Technical Advisory Group ("TAG"):

General Information

Yes No

- | | | |
|--|-------------------------------------|-------------------------------------|
| A. Is the proposed change unique to the State of Minnesota? | <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).

R402.4.1.3 Leakage Rate

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

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

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

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

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

No

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

R402.4.1.3 Leakage Rate

“When complying with Section R401.2.1, the building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate Zones 0, 1 and 2, and ~~3.0~~ 2.0 air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2.”

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

Yes – if the leakage rate specified by R402.4.1.3 is improved, the leakage rates within Section “R402.4.1.2 Testing” should be updated to reflect this – the exception should be modified as follows:

R402.4.1.2 Testing

The building or dwelling unit shall be tested for air leakage. The maximum air leakage rate for any building or dwelling unit under any compliance path shall not exceed 5.0 air changes per hour or 0.28 cubic feet per minute (CFM) per square foot [0.0079 m³/(s × m²)] of dwelling unit enclosure area. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope have been sealed.

Exception: For heated, attached private garages and heated, detached private garages accessory to one- and two-family dwellings and townhouses not more than three stories above grade plane in height, building envelope tightness and insulation installation shall be considered acceptable where the items in Table R402.4.1.1, applicable to the method of construction, are field verified. Where required by the code official, an approved third party independent from the installer shall inspect both air barrier and insulation installation criteria. Heated, attached private garage space and heated, detached private garage space shall be thermally isolated from all other habitable, conditioned spaces in accordance with Sections R402.2.12 and R402.3.5, as applicable.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.

6. Supply and return registers, where installed at the time of the test, shall be fully open.

Exception: When testing individual dwelling units, an air leakage rate not exceeding 0.23 0-30 cubic feet per minute per square foot [0.0065] 0.008 m³/(s × m²)] of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pa), shall be permitted in all climate zones for:

1. Attached single and multiple-family building dwelling units.
2. Buildings or dwelling units that are 1,500 square feet (139.4 m²) or smaller.

Mechanical ventilation shall be provided in accordance with Section M1505 of the International Residential Code or Section 403.3.2 of the International Mechanical Code, as applicable, or with other approved means of ventilation.

*** NOTE: Previous references to the Total Building Performance Path (R405.4.2) have been moved to a separate proposal**

Need and Reason

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

Tighter air sealing:

Air leakage in cold climates creates unnecessary costs for property owners, as well as health and durability challenges in our Minnesota climate:

- In winter, leaks carry warm, moist air through building walls, causing condensation within the wall cavity. This, in turn, creates rot and mold, which lead to unnecessary health risks and maintenance costs. In addition, heating dollars and humidity are lost through the leaks.
- In summer, air leakage results in lost cooling dollars. Leaks also let in allergens, increasingly common pollutants such as wildfire smoke, and humidity. Keeping humidity levels at a safe and healthy level is easier and cheaper in buildings that are well air-sealed.

Lowering the requirement from 3.0 ACH50 to 2.0 would provide better protection against the issues listed above and improve overall energy performance, while still remaining achievable with current construction materials and practices.

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

Air-sealing uses materials and methods already common and affordable within the building industry. We believe the proposed change can be achieved with little more than education and attention to detail. According to RESNET: Of the 6,143 completed HERS-rated projects in Minnesota over the last 12 months, 75% of those projects have achieved an ACH level of 2.0 or lower.

Concerns raised by homebuilders for air sealing within 1) attached dwelling units (i.e. townhomes) and detached dwellings under 1500 sf are already addressed by an exception within the testing criteria, as noted above. This revision still intends to provide leniency in

such conditions as needed, while tailoring the requirements to the specific demands of Minnesota's climate zones.

3. What other factors should the TAG consider?

Tighter air sealing has definite benefits, but requires balanced ventilation to maintain a healthy interior environment – the two must be considered together.

Cost/Benefit Analysis

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

As stated above, we anticipate any cost increase would be minimal. Air sealing is already standard practice, and the majority of new builds in Minnesota are already hitting these ACH levels.

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

The energy savings alone would quickly make up for the minimal extra cost. Extra insurance against moisture intrusion into walls is also a potential offset.

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

Builders, who will pass it along to individual homeowners.

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

No, there should not be extra compliance costs.

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

Not that we are aware of.

Regulatory Analysis

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

Trade workers (siders, framers, specialized subcontractors)

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

People might argue against the idea of making air-tight walls, instead choosing to “let the walls breathe”. There is an argument to be had in letting walls breathe, as it prevents moisture from sticking around for too long in any cavity. The problem with this approach in our Minnesota climate is that it prevents insulation from ever being used effectively. If we

are going to try to cut down energy usage in cold climates, insulation will have to be part of that solution, and protecting these insulated walls with tight air-sealing is a must.

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

Over the long term, the amount of energy savings that will not be realized will be tremendous. Small incremental gains can create huge progress when multiplied over thousands and thousands of new homes. More homes will have wall moisture issues as well, which are expensive remediations in comparison to a little extra front-end air sealing work.

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

We are unaware of any federal or state regulation or requirement related to this proposed change.

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



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(Must be submitted electronically)

Author/requestor: **Jared Johnson, Phius Alliance Minnesota**
Marcy Conrad Nutt, Passive House Minnesota

Date: **January 10, 2024**

Email address: **jared.t.johnson11@gmail.com**
marcy@phmn.org

Model Code: **2021 IECC**

Telephone number: **507-923-5415**
612-202-2791

Code or Rule Section: **R405.4.2**

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

Code or rule section to be changed: **R405.4.2 Residence Specifications**

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"/> |
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Proposed Language

1. The proposed code change is meant to:

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

R405.4.2 Residence Specifications [TABLE R405.2(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).

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**TABLE R405.4.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be Climate Zones 0 through 2: 5.0 air changes per hour. Climate Zones 3 through 8: 2.0 3.0 air changes per hour.	The mechanical ventilation rate shall be in addition to the air leakage rate and shall be as proposed.
	The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than $0.01 \times CFA + 7.5 \times (N_{br} + 1)$ where: <i>CFA</i> = conditioned floor area, ft ² . <i>N_{br}</i> = number of bedrooms. The mechanical ventilation system type shall be the same as in the proposed design. Energy recovery shall not be assumed for mechanical ventilation.	

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.)

See CCP RE-4 (RE-4.2 Part A) (regarding R402.4.1.3 Leakage Rate). The primary intent of this proposed change is to maintain consistency between the prescriptive and Total Building Performance compliance pathways. The following information is repeated from Proposal RE-4.

Tighter air sealing:

Air leakage in cold climates creates unnecessary costs for property owners, as well as health and durability challenges in our Minnesota climate:

- **In winter, leaks carry warm, moist air through building walls, causing condensation within the wall cavity. This, in turn, creates rot and mold, which lead to unnecessary health risks and maintenance costs. In addition, heating dollars and humidity are lost through the leaks.**
- **In summer, air leakage results in lost cooling dollars. Leaks also let in allergens, increasingly common pollutants such as wildfire smoke, and humidity. Keeping humidity levels at a safe and healthy level is easier and cheaper in buildings that are well air-sealed.**

Lowering the requirement from 3.0 ACH50 to 2.0 would provide better protection against the issues listed above and improve overall energy performance, while still remaining achievable with current construction materials and practices.

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

Air-sealing uses materials and methods already common and affordable within the building industry. We believe the proposed change can be achieved with little more than education and attention to detail. According to RESNET: Of the 6,143 completed HERS-rated projects in Minnesota over the last 12 months, 75% of those projects have achieved an ACH level of 2.0 or lower.

3. What other factors should the TAG consider?

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As stated above, we anticipate any cost increase would be minimal. Air sealing is already standard practice, and the majority of new builds in Minnesota are already hitting these ACH levels.

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Trade workers (siders, framers, specialized subcontractors)

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

Over the long term, the amount of energy savings that will not be realized will be tremendous. Small incremental gains can create huge progress when multiplied over thousands and thousands of new homes. More homes will have wall moisture issues as well, which are expensive remediations in comparison to a little extra front-end air sealing work.

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To: Residential Energy Code Technical Advisory Group
From: Nick Erickson, Sr. Director of Housing Policy
Date: February 2, 2024
Subject: 2.0 Air Change Per Hour Proposals

This memo contains comments from Housing First Minnesota related to the two proposals related to R402.4.1 .2-3 Testing and R405.4.2 scheduled for review at the Feb. 5, 2024, meeting of the Residential Energy Code TAG. By way of background, Housing First Minnesota represents more than 1,200 member and affiliate firms, including the homebuilders and trade partners impacted by this change. Our mission is homeownership opportunities for all, which necessitates Minnesota supplying affordable, safe, durable and abundant housing.

Housing First Minnesota also operates Minnesota's Green Path, the largest energy efficiency new home program in the state. Since its inception in 2011, this program has collected data on more than 42,000 homes built in Minnesota.

MINNESOTA'S BUILDING CODE PURPOSE AND INTENT

For more than 50 years, Minnesota has had a single, uniform statewide building code (SBC). This is because the Minnesota Legislature saw need to protect housing affordability and occupant safety and create consistency across the state.

This intent is still reflected in Minn. State Statues 326B.101 (emphasis added):

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

While energy efficiency is important and valued by both our members and their buyers, nothing in the enabling language places efficiency over the SBC's three overarching principles: Affordability, Health and Safety.

MINNESOTA'S ENERGY EFFICIENCY

Minnesota consistently ranks as the most efficient mid- to high-volume production state for new home construction according to RESNET. From comments made during the TAG process, some members indicated that new homes are to blame. As noted by DLI's technical staff, while green-house gas emissions ties to housing in Minnesota have increased, the rate of increase is far below the increase in housing units and population. This is because of the incredible efficiency of Minnesota's new homes:

50 HERS

Minnesota Median
Rating

#1 Most Efficient

High Production State
Tied with Massachusetts

This also underscores the unspoken truth of energy efficiency in housing: That new homes are treated as the cause of the climate crisis because it is politically unpopular to address the largest source of the lack of efficiency, Minnesota's aging housing stock.

CONCERNS OVER PROPOSAL

The supporting rationale for this proposal are as follows:

- **R405.4.2:** "Air-sealing uses materials and methods already common and affordable within the building industry. We believe the proposed change can be achieved with little more than education and attention to detail. According to RESNET: Of the 6,143 completed HERS-rated projects in Minnesota over the last 12 months, 75% of those projects have achieved an ACH level of 2.0 or lower."
- **R402.4.1.2 Testing:** [Repeats above language with the following addition] Concerns raised by homebuilders for air sealing within 1) attached dwelling units (i.e. townhomes) and detached dwellings under 1500 sf are already addressed by an exception within the testing criteria, as noted above. This revision still intends to provide leniency in such conditions as needed, while tailoring the requirements to the specific demands of Minnesota's climate zones."

The proposals fail to ask *why* the 25% of homes did not reach an ACH of 2. This is a critical error. Home size, volume, type and choice of foundation play significant roles in determining the ACH rate for a new home. As noted by expert members during the past meetings on this topic, foundation type and attached vs. detached structures are leading factors. But building volume, which is influenced by both ceiling height and the number of stories, is also critical, yet these factors have been dismissed.

The equation for ACH uses building volume as the denominator. This underscores the leading issue with the proposal: smaller homes, such as a slab on grade, single-level home without more costly high ceilings, are in a disadvantage because they simply have less volume. There is no exception listed for slab-on-grade construction, nor is there a specific ACH exception for a standard 8-foot vs. a premium 12-foot ceiling (which is a 50% increase in volume over a standard, more affordable home).

Additionally, both proposals lack any specificity on costs or energy savings. Cost increases are vague and dismissed as minimal impacts. Massive savings are also projected, again, without specificity to support such a projection. The proponents, minimally, must present concrete facts on cost increase and payoffs, particularly as these proposals have the potential to block needed, new starter homes and missing middle housing in Minnesota. Absent specific cost increase and energy savings, this proposal appears to be incomplete and misplaced.

Lastly, in a previous meeting where these proposals were discussed, a TAG member speaking in favor of a similar proposal indicated that poor craftsmanship was to blame for the 30 percent of homes failing. This is not only false and uninformed, but unfairly casts dispersions on the skilled homebuilders, trade partners and code officials in Minnesota. As the data below indicates, size of the home is an important distinguishing factor. This TAG is making laws, and amending the code requires a rational basis and

supporting data, not personal beliefs on efficiency nor assumptions and accusations or poor workmanship.

Housing First Minnesota believes this proposal violates the *BATC v. DLI* court decision as it lacks a rational basis. Because of Proceeding forward with this proposal is grounds for a challenge to the adoption of the amended 2021 IECC.

DATA REVIEW

As noted, Housing First Minnesota operates the state's largest energy efficient new home program in state, providing our organization unparalleled insight into the data behind this proposal. Data Notes: The data set provided did not indicate foundation type, building volume (ceiling height) or attached vs. detached. Square footage was the leading indicator or size.

This data runs counter to the notion that a single ACH calculation works for all homes, even the 1,500 sq foot exception noted in one of the proposals. Examining the data for the calendar year 2023, it isn't until roughly the 2,300-2,4000 sq foot range when a majority of homes built of that size perform at less than or equal to 2 ACH.

Homes Under 2000 Sq. Foot

For the 893 Green Path homes less than 2,000 square feet tested and rated in 2023:

- Median HERS of 51
- Median ACH of 2.41
- 166 (18.59%) had an ACH of 2 or less
- 727 (81.41%) had an ACH greater than 2.

Homes 2,000 Sq. Feet and Larger

For the 3,361 homes Green Path homes 2,000 square feet or greater tested and rated in 2023:

- Median HERS of 49
- Medina ACH of 1.62
- 2,681 (79.77%) had an ACH of 2 or less
- 680 (20.23%%) had an ACH greater than 2.

Additional Observation

While attached and detached housing was not tracked, an identified townhome development in which the builder is exclusively building attached homes showed:

- Median HERS of 50
- Median ACH of 2.785
- 100% of Units Above 2

This same builder, through a different subsidiary building predominantly single-family detached homes showed that only 15.63% of its homes had an ACH above 2.

CONCLUSION

The arbitrary nature of the proposal invalidates its consideration by the TAG, which is seven months into its work, in part due to the continued reconsideration of defeated amendments.

In keeping with my previous comments throughout this TAG process, Housing First Minnesota believes:

- The performance path must remain intact and unamended.
- Net Zero and the 2024 IECC are too steep of a price increase for the market in light of the housing affordability crisis in Minnesota.

Given that the state legislature is looking at legalizing new starter homes and other missing middle housing types, it would be an unfortunate misstep by this TAG and the Department to increase barriers to their construction through the adoption of this or any similar proposal aimed at making smaller, more affordable homes more expensive.

Thank you for considerations of our comments.



161 St. Anthony Ave. #181
St. Paul, MN 55103

February 2, 2023

To the Esteemed Members of the Residential Energy Code Technical Advisory Group,

I am writing to you today on behalf of the Builders Association of Minnesota to express our deep concern regarding the proposed 2 Air Changes per Hour (ACH) standard for all housing in Minnesota. We believe this requirement lacks a rational basis and will have detrimental consequences for the state's housing market, particularly in the creation of much-needed starter homes and townhomes.

Firstly, the 2 ACH standard fails to comply with the Department of Labor and Industry ruling, which requires regulations to be based on a rational basis. We urge the Council to reconsider this proposal and ensure it adheres to this legal requirement.

Secondly, this proposal contradicts the State Legislature's recent efforts to remove barriers to the construction of "Missing Middle" housing. Implementing this standard will directly hinder the development of these much-needed affordable starter homes and townhomes, exacerbating the existing housing shortage in Minnesota.

Thirdly, the proposal unfairly penalizes smaller, more affordable homes by focusing solely on the ACH rate without considering the volume of the building. This fails to recognize that air leakage is a function of both tightness and size. It unfairly burdens builders and homebuyers seeking more affordable options.

Fourthly, the aging housing stock in Minnesota, not new construction, represents a far greater challenge to achieving the state's energy efficiency goals. Focusing on new homes and the IECC as the sole solution ignores the significant potential for improvement in existing structures.

Finally, the Builders Association of Minnesota strongly opposes any modifications to the performance path.

We urge the Council to not support these misguided approaches and instead prioritize solutions that address the true sources of energy inefficiency in Minnesota's housing sector. This includes investing in the renovation of existing buildings, providing incentives for energy-efficient upgrades, and promoting education and awareness about energy-saving practices.

While supporting the current standard of 3 ACH (air changes per hour) for new homes might not seem progressive, the real opportunity lies in addressing the energy inefficiency of older housing. Upgrading older homes to modern standards can lead to significant cost savings, potentially bringing them closer to the impressive efficiency showcased in the example townhome.

We are confident that by working collaboratively with the industry and other stakeholders, we can develop solutions that are both effective and equitable, ensuring a sustainable and accessible housing market for all Minnesotans.

Thank you for your time and consideration.

Sincerely,

Grace Kelihier

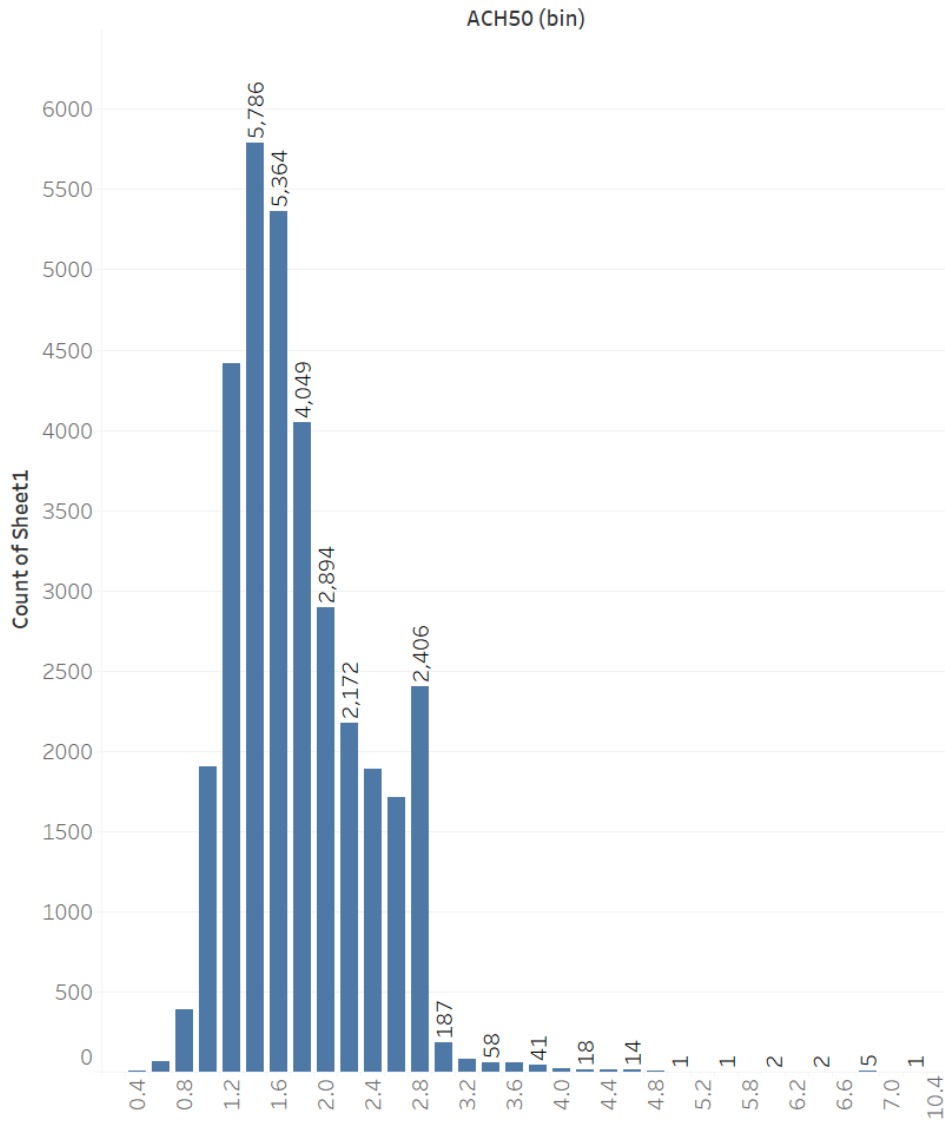
Executive Vice President - Builders Association of Minnesota

RESNET Data

- All MN Ratings 2020-2023

ACH50 – All House Types

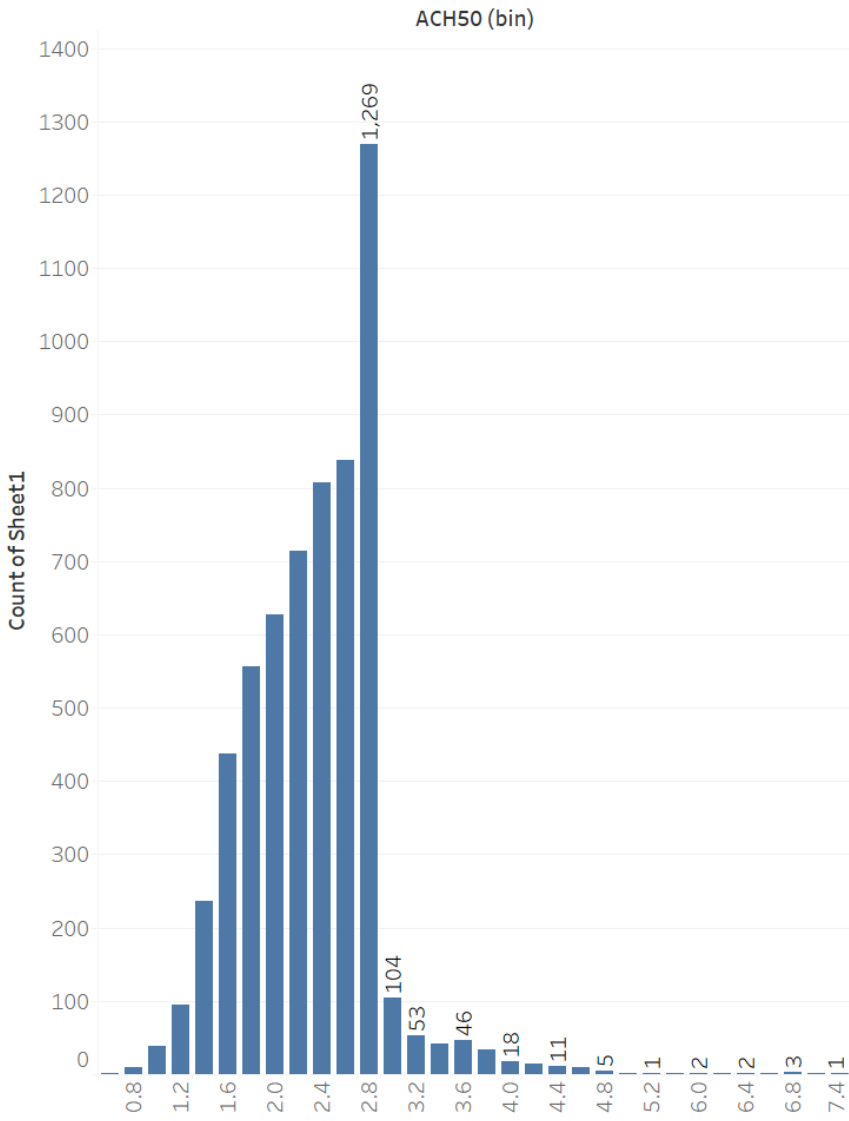
ACH50



- Home Type
- (All)
 - Duplex
 - Low-rise Mu...
 - Single-Family

ACH50 – Duplex and low-rise (no single family)

ACH50

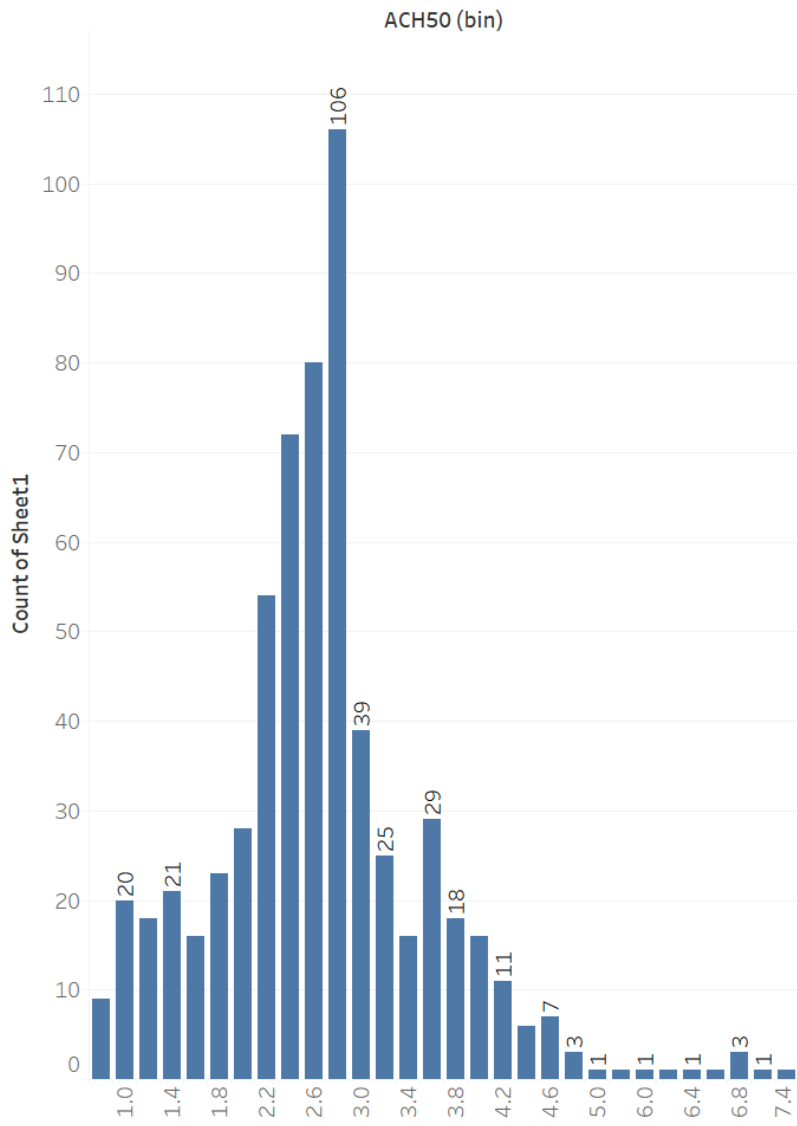


Home Type

- (All)
- Duplex
- Low-rise Mu...
- Single-Family

ACH50 – Duplex and Low-rise and <1,500 sq ft

ACH50



Conditioned Area

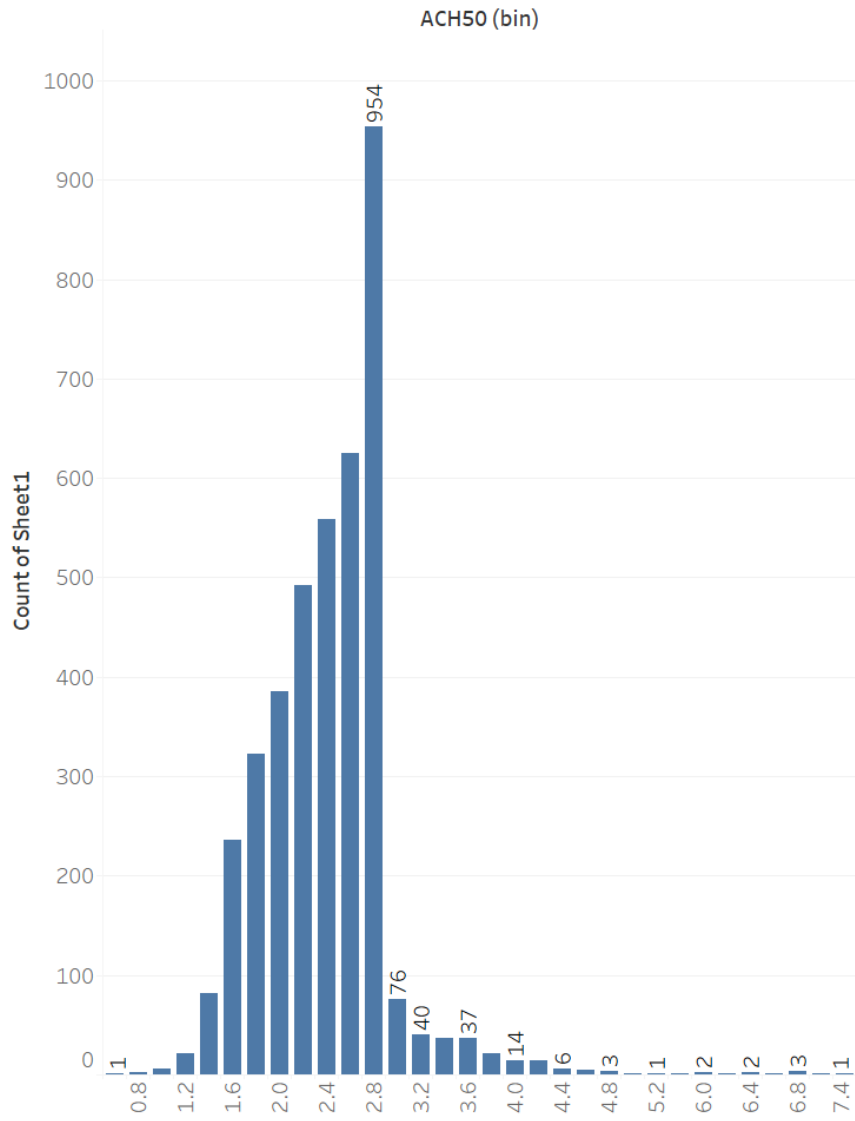
120 1500

Home Type

- (All)
- Duplex
- Low-rise Mu...
- Single-Family

ACH50 – duplex and low-rise and slab on grade

ACH50



Foundation Type

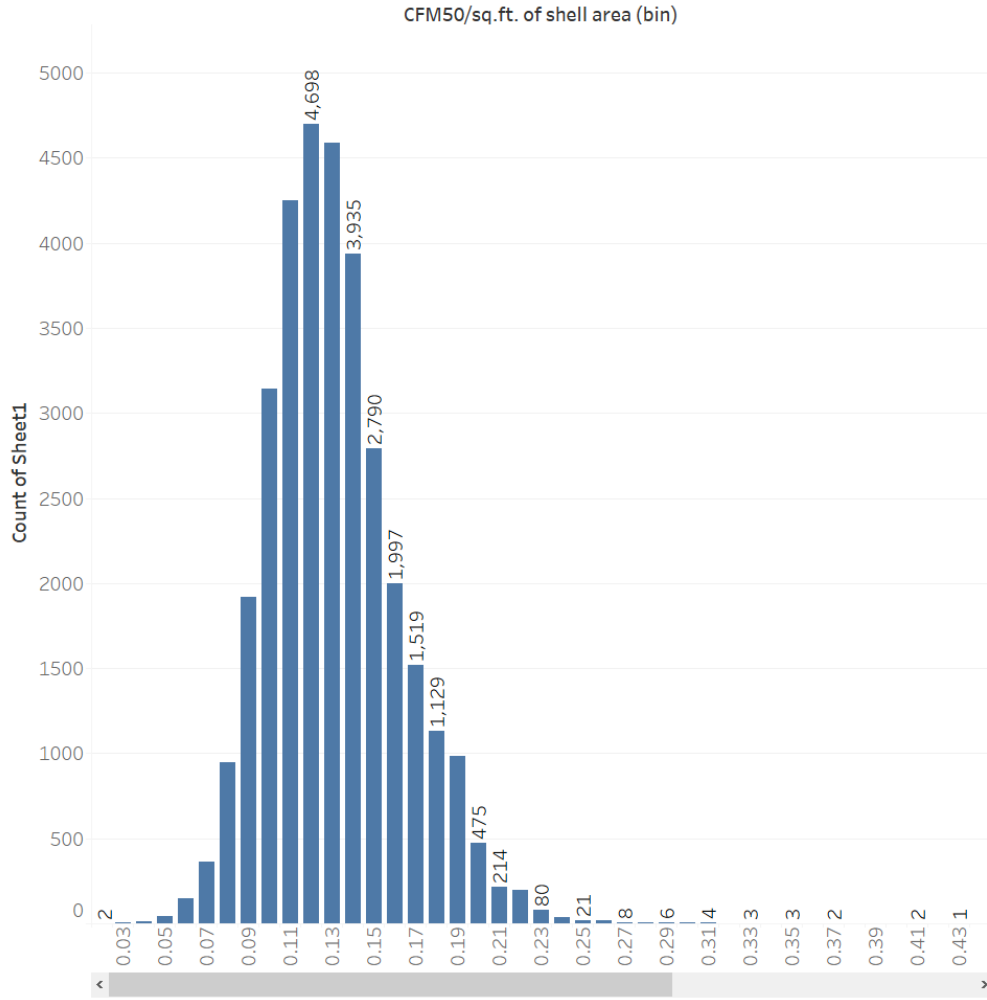
- (All)
- Null
- Apartment a...
- Conditioned ...
- Conditioned ...
- Enclosed cra...
- More than o...
- Open crawl ...
- Slab
- Uncondition...

Home Type

- (All)
- Duplex
- Low-rise Mu...
- Single-Family

CFM50/ELA – All home types

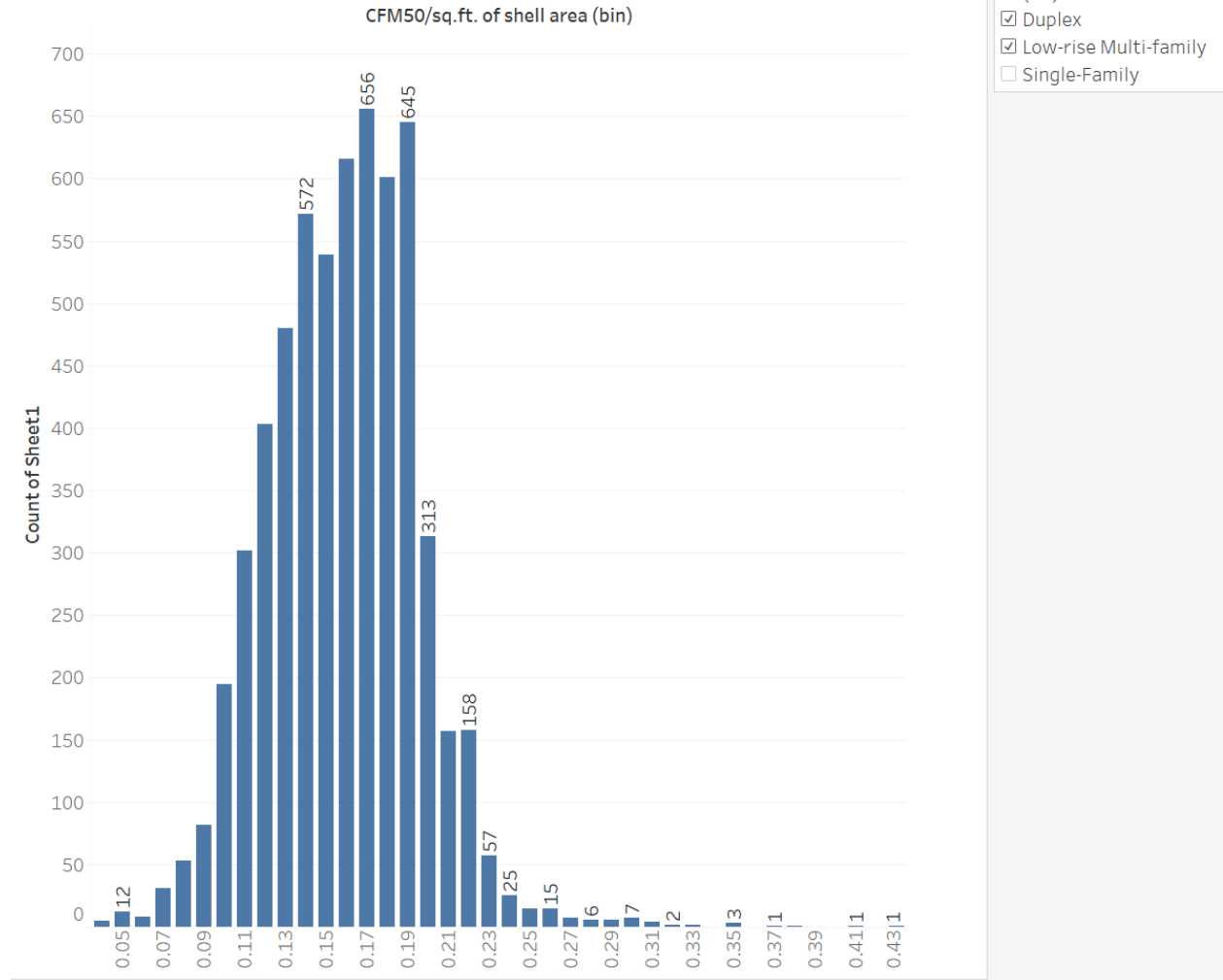
CFM50/ELA



- Home Type
- (All)
 - Duplex
 - Low-rise Multi-family
 - Single-Family

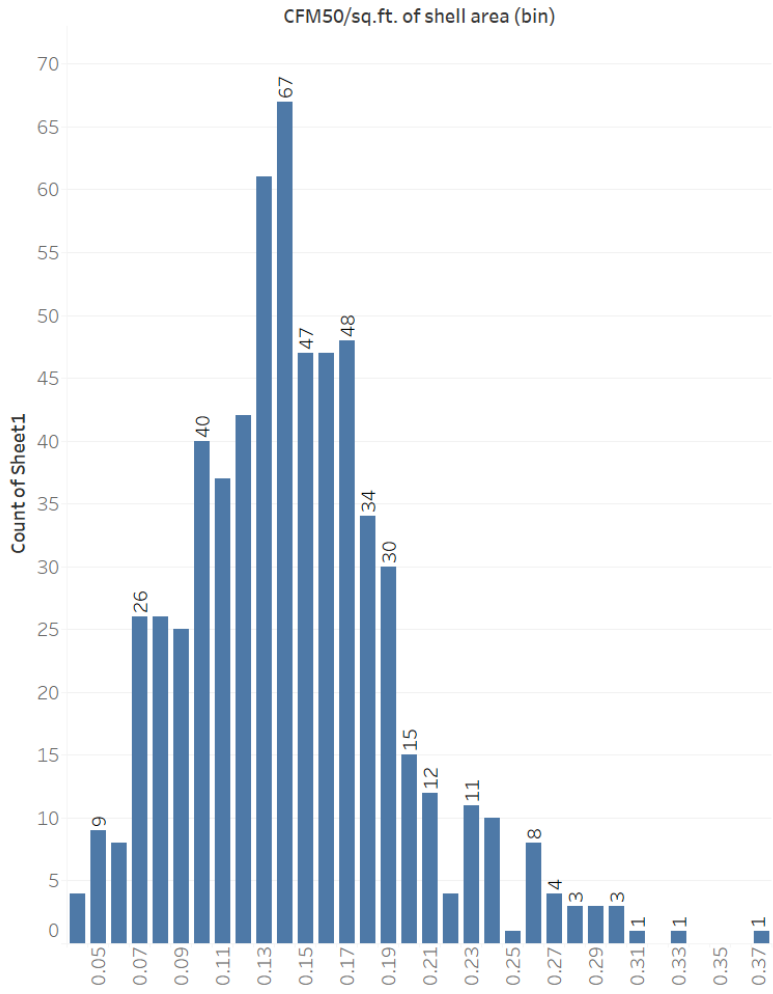
CFM50/ELA – Low-rise and Duplex

CFM50/ELA



CFM50/ELA – duplex and low rise and <1,500 sq. ft conditioned area

CFM50/ELA



Conditioned Area

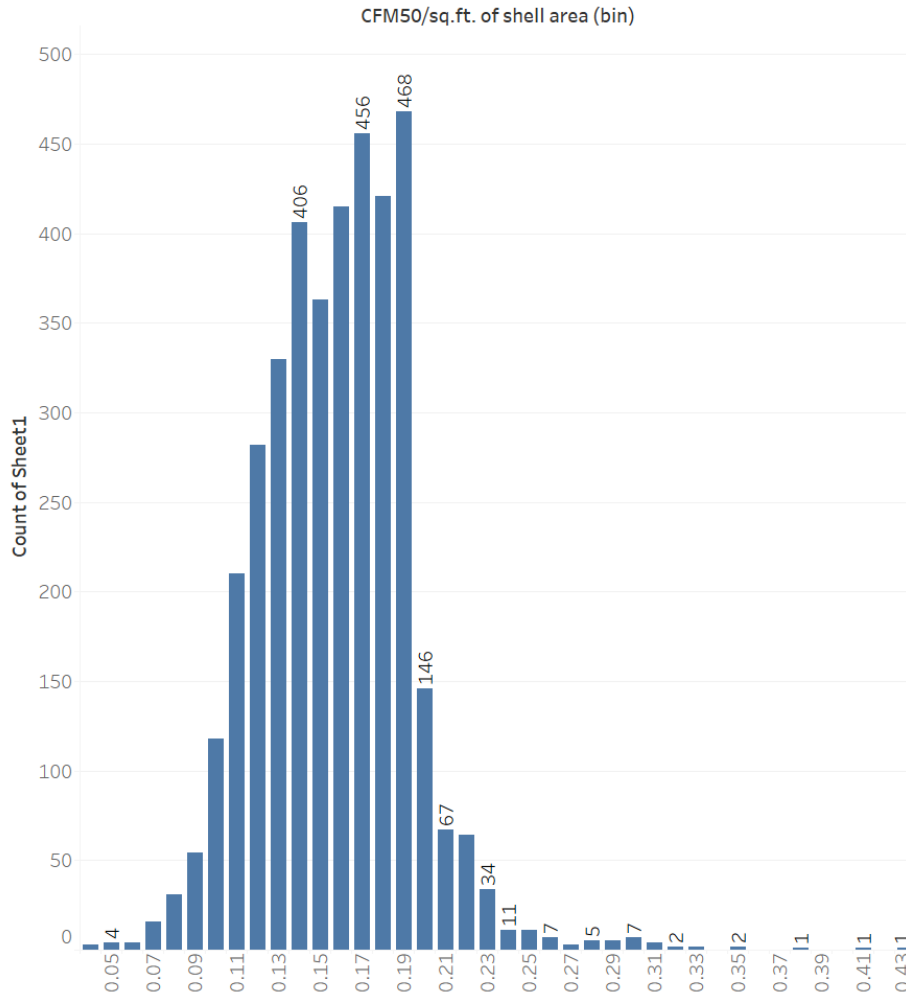
120 1500

Home Type

- (All)
- Duplex
- Low-rise Multi-family
- Single-Family

CFM50/ELA – duplex and low-rise and slab foundation

CFM50/ELA



Foundation Type

- (All)
- Null
- Apartment above con...
- Conditioned basement
- Conditioned crawl sp...
- Enclosed crawl space
- More than one type
- Open crawl space/rai...
- Slab
- Unconditioned basem...

Home Type

- (All)
- Duplex
- Low-rise Multi-family
- Single-Family

R402.4.1.3 Leakage rate. P

When complying with Section R401.2.1, the building or dwelling unit shall have an air leakage rate not exceeding 5.0 air changes per hour in Climate Zones 0, 1 and 2, and ~~3.0~~ **2.0** air changes per hour in Climate Zones 3 through 8, when tested in accordance with Section R402.4.1.2.

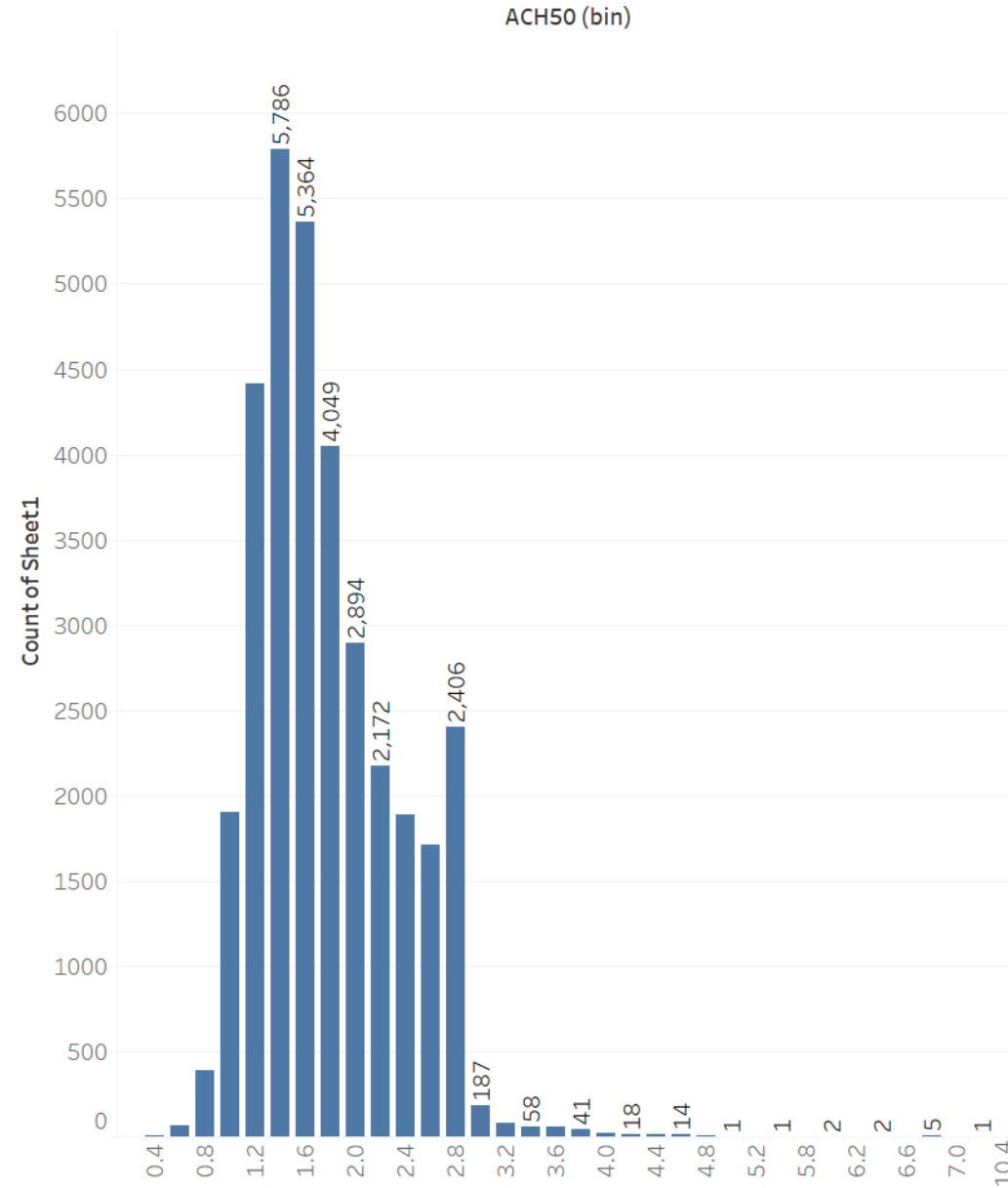
TABLE R405.4.2(1) SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

	<p>The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be</p> <p>Climate Zones 0 through 2: 5.0 air changes per hour.</p> <p style="text-align: center;">2.0</p> <p>Climate Zones 3 through 8: 3.0 air changes per hour.</p>	<p>The measured air exchange rate.^a</p>
<p>Air exchange rate</p>	<p>The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than $0.01 \times CFA + 7.5 \times (N_{br} + 1)$</p> <p>where:</p> <p style="padding-left: 20px;">CFA = conditioned floor area, ft².</p> <p style="padding-left: 20px;">N_{br} = number of bedrooms.</p> <p>The mechanical ventilation system type shall be the same as in the proposed design. Energy recovery shall not be assumed for mechanical ventilation.</p>	<p>The mechanical ventilation rate^b shall be in addition to the air leakage rate and shall be as proposed.</p>

All Dwelling Types (ACH50)

RESNET Data - All MN Ratings 2020-2023

ACH50

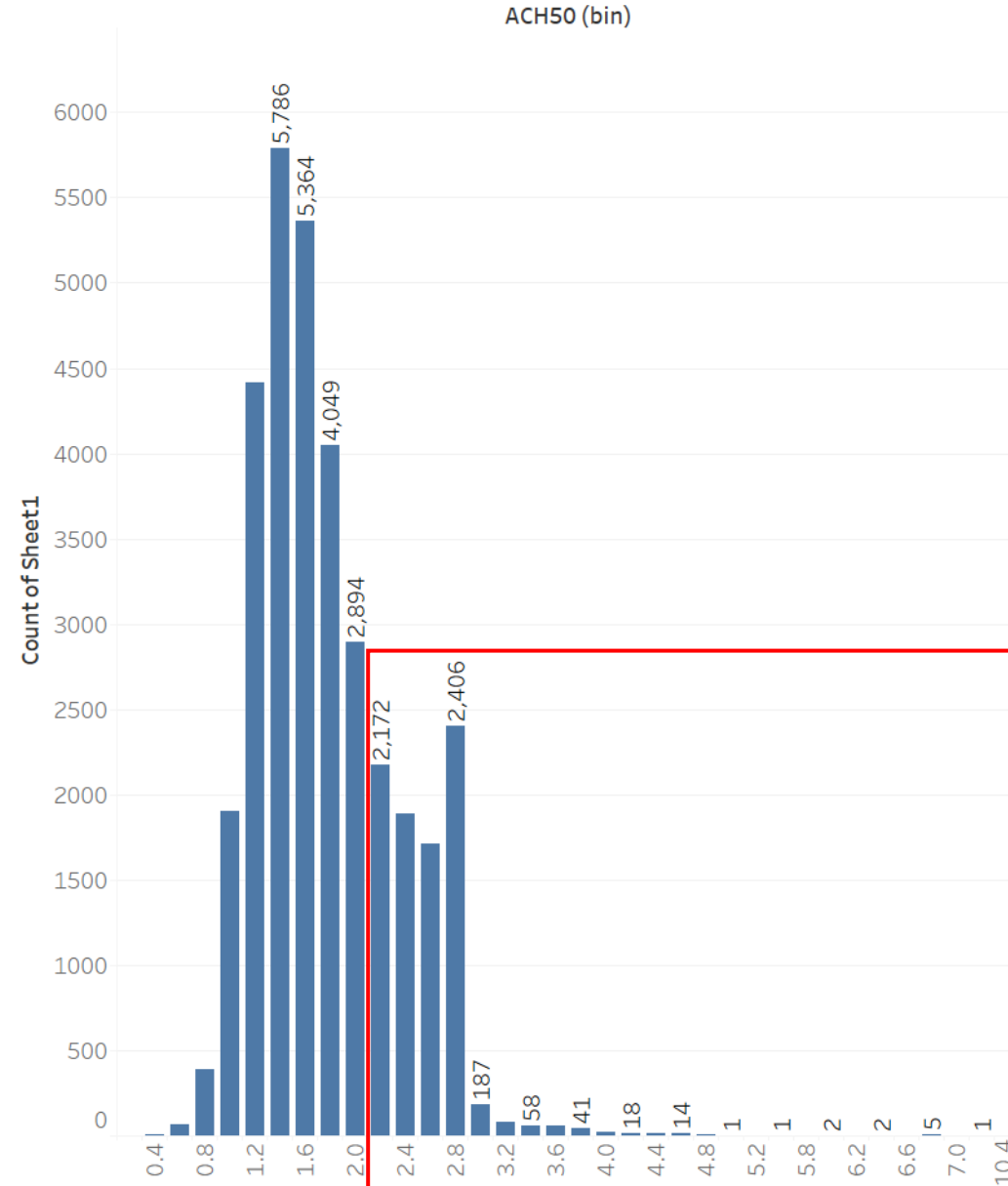


- Home Type
- (All)
 - Duplex
 - Low-rise Mu...
 - Single-Family

All Dwelling Types (ACH50)

RESNET Data - All MN Ratings 2020-2023

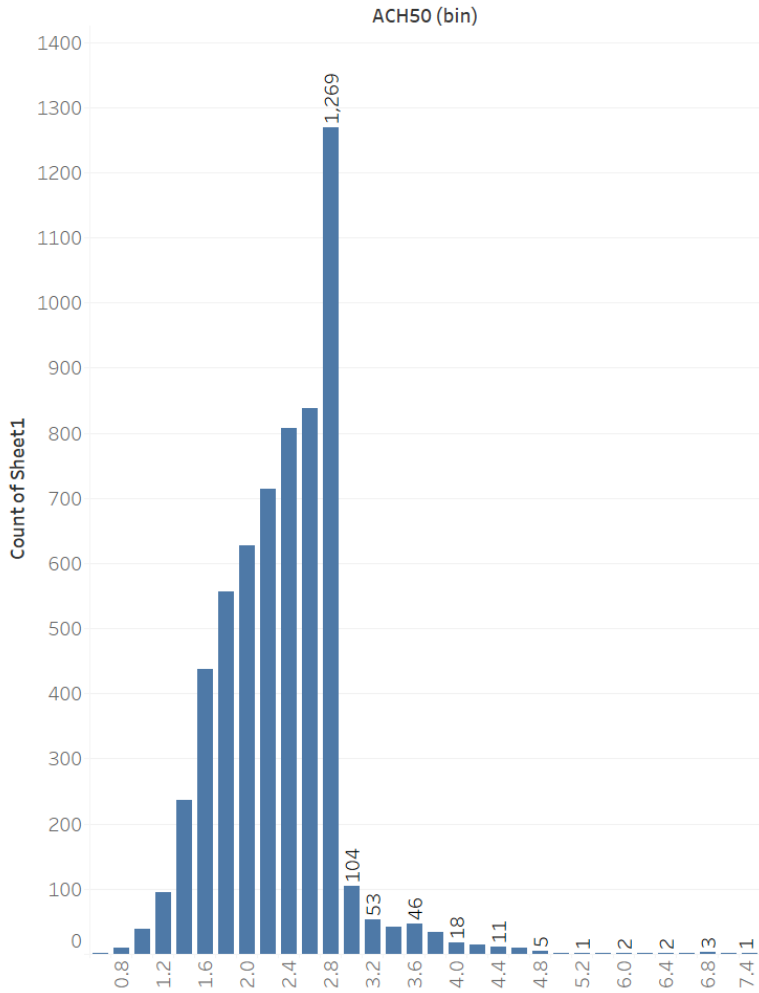
ACH50



- Home Type
- (All)
 - Duplex
 - Low-rise Mu...
 - Single-Family

Duplex and low-rise (<1500 ft²) (ACH50)

ACH50

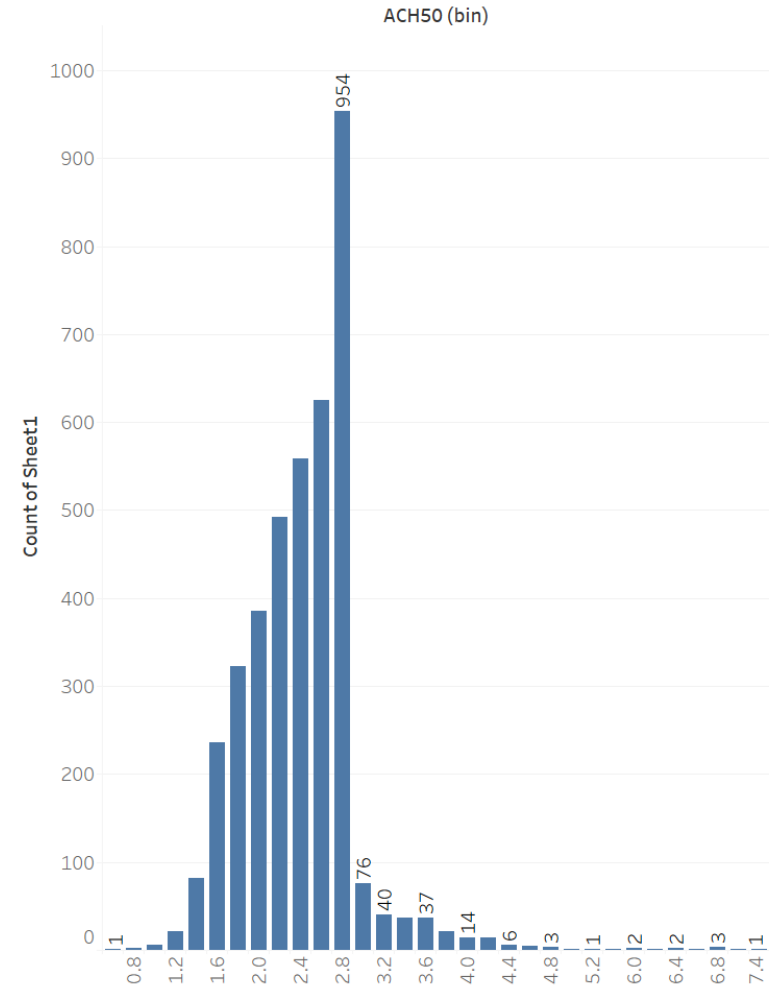


Home Type

- (All)
- Duplex
- Low-rise Mu...
- Single-Family

Duplex and low-rise (slab on grade) (ACH50)

ACH50



Foundation Type

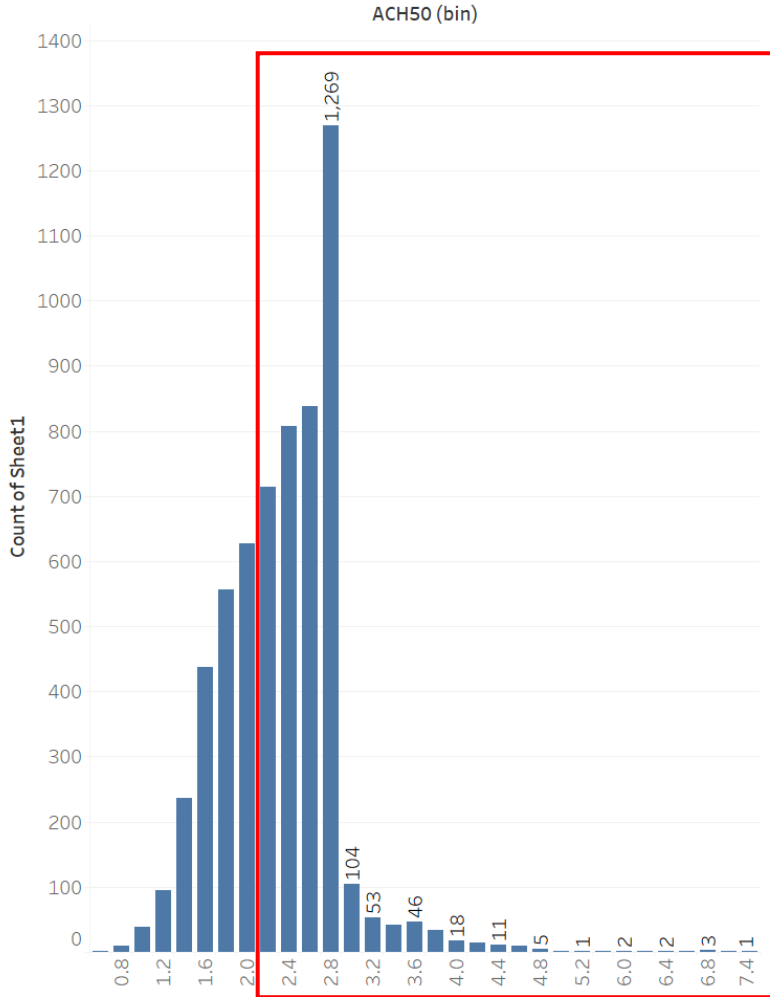
- (All)
- Null
- Apartment a...
- Conditioned ...
- Conditioned ...
- Enclosed cra...
- More than o...
- Open crawl ...
- Slab
- Uncondition...

Home Type

- (All)
- Duplex
- Low-rise Mu...
- Single-Family

Duplex and low-rise (<1500 ft²) (ACH50)

ACH50

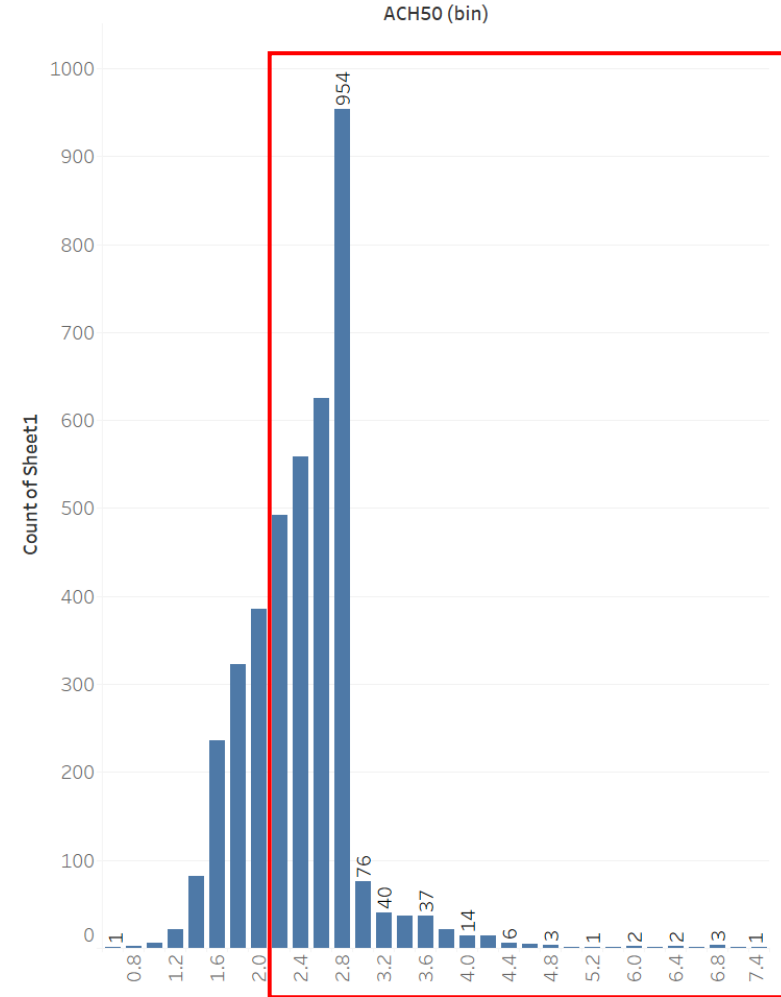


Home Type

- (All)
- Duplex
- Low-rise Mu...
- Single-Family

Duplex and low-rise (slab on grade) (ACH50)

ACH50



Foundation Type

- (All)
- Null
- Apartment a...
- Conditioned ...
- Conditioned ...
- Enclosed cra...
- More than o...
- Open crawl ...
- Slab
- Uncondition...

Home Type

- (All)
- Duplex
- Low-rise Mu...
- Single-Family

R402.4.1.2 Testing. **E** **P**

The *building or dwelling unit* shall be tested for air leakage. The maximum air leakage rate for any *building or dwelling unit* under any compliance path shall not exceed 5.0 air changes per hour or 0.28 cubic feet per minute (CFM) per square foot [$0.0079 \text{ m}^3/(\text{s} \times \text{m}^2)$] of *dwelling unit enclosure area*. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope* have been sealed.

Exception: For heated, attached private garages and heated, detached private garages accessory to one- and two-family dwellings and townhouses not more than three stories above *grade plane* in height, building envelope tightness and insulation installation shall be considered acceptable where the items in Table R402.4.1.1, applicable to the method of construction, are field verified. Where required by the code official, an *approved* third party independent from the installer shall inspect both air barrier and insulation installation criteria. Heated, attached private garage space and heated, detached private garage space shall be thermally isolated from all other habitable, *conditioned spaces* in accordance with Sections R402.2.12 and R402.3.5, as applicable.

Exception: When testing individual *dwelling units*, an air leakage rate not exceeding 0.30 cubic feet per minute per square foot [$0.008 \text{ m}^3/(\text{s} \times \text{m}^2)$] of the *dwelling unit enclosure area*, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pa), shall be an accepted alternative permitted in all climate zones for:

1. Attached single-family and multiple-family building *dwelling units*.
2. Buildings or *dwelling units* that are 1,500 square feet (139.4 m^2) or smaller.

R402.4.1.2 Testing. **E** **P**

The *building or dwelling unit* shall be tested for air leakage. The maximum air leakage rate for any *building or dwelling unit* under any compliance path shall not exceed 5.0 air changes per hour or 0.28 cubic feet per minute (CFM) per square foot [$0.0079 \text{ m}^3/(\text{s} \times \text{m}^2)$] of *dwelling unit enclosure area*. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope* have been sealed.

Exception: For heated, attached private garages and heated, detached private garages accessory to one- and two-family dwellings and townhouses not more than three stories above *grade plane* in height, building envelope tightness and insulation installation shall be considered acceptable where the items in Table R402.4.1.1, applicable to the method of construction, are field verified. Where required by the code official, an *approved* third party independent from the installer shall inspect both air barrier and insulation installation criteria. Heated, attached private garage space and heated, detached private garage space shall be thermally isolated from all other habitable, *conditioned spaces* in accordance with Sections R402.2.12 and R402.3.5, as applicable.

0.23

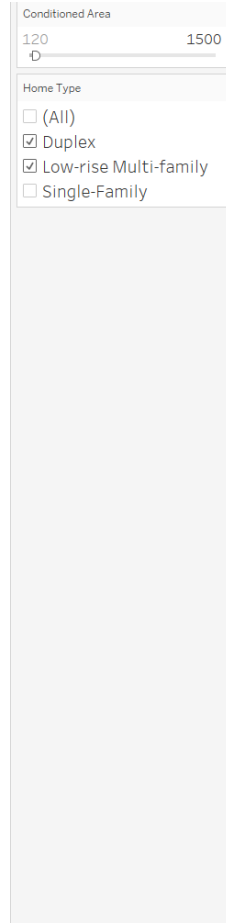
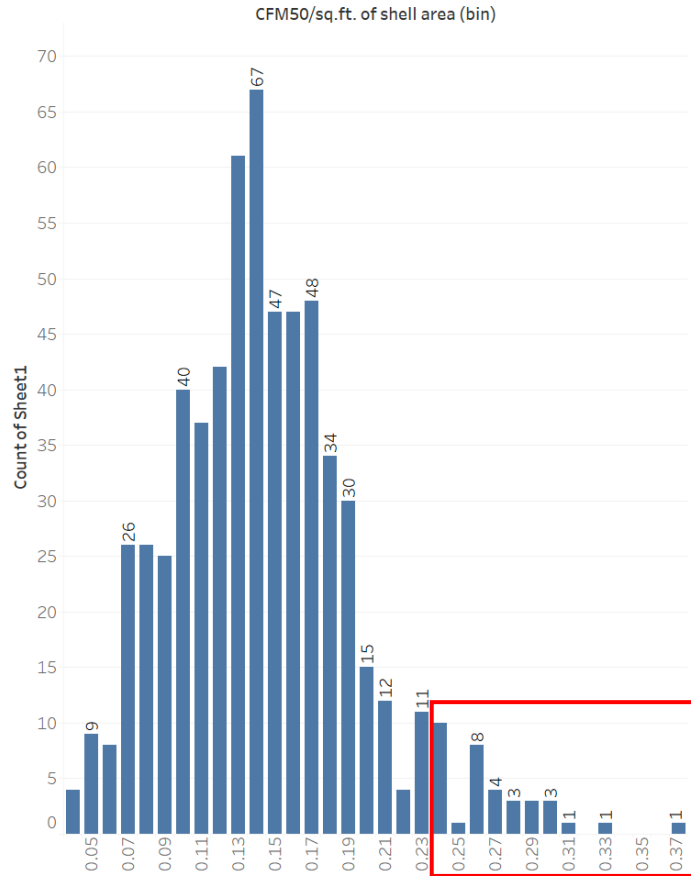
Exception: When testing individual *dwelling units*, an air leakage rate not exceeding ~~0.30~~ cubic feet per minute per square foot [$0.008 \text{ m}^3/(\text{s} \times \text{m}^2)$] of the *dwelling unit enclosure area*, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pa), shall be an accepted alternative permitted in all climate zones for:

1. Attached single-family and multiple-family building *dwelling units*.
2. Buildings or *dwelling units* that are 1,500 square feet (139.4 m^2) or smaller.

Duplex and low-rise (<1500 ft²) (CFM50/ft² ELA)

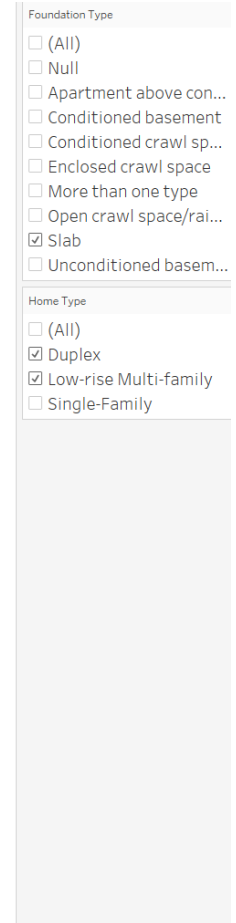
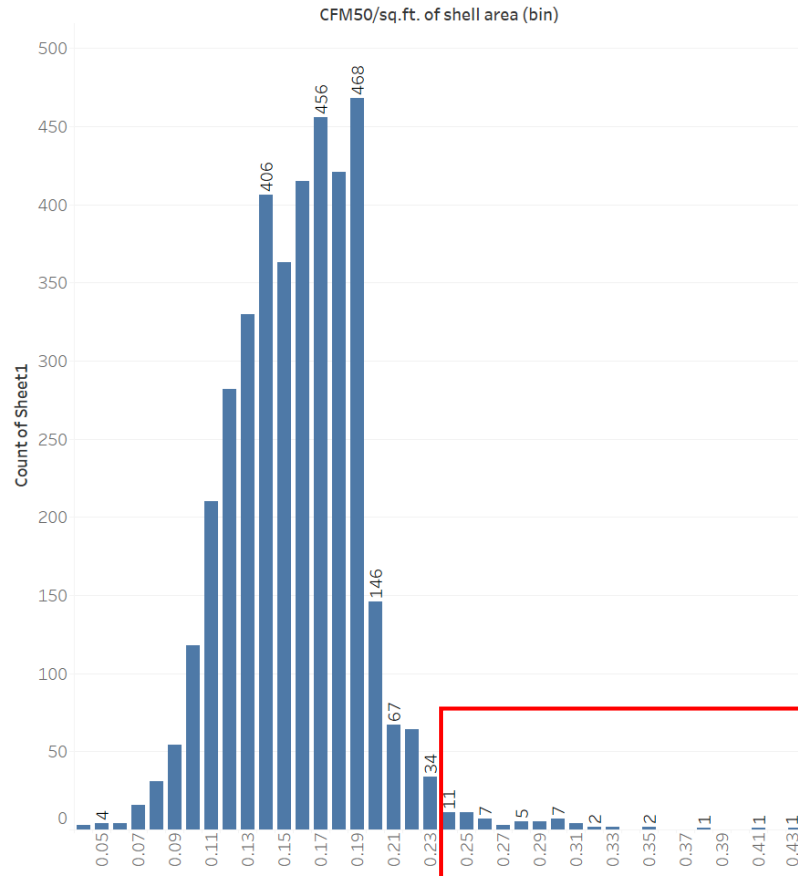
ELA = Effective Leakage Area

CFM50/ELA

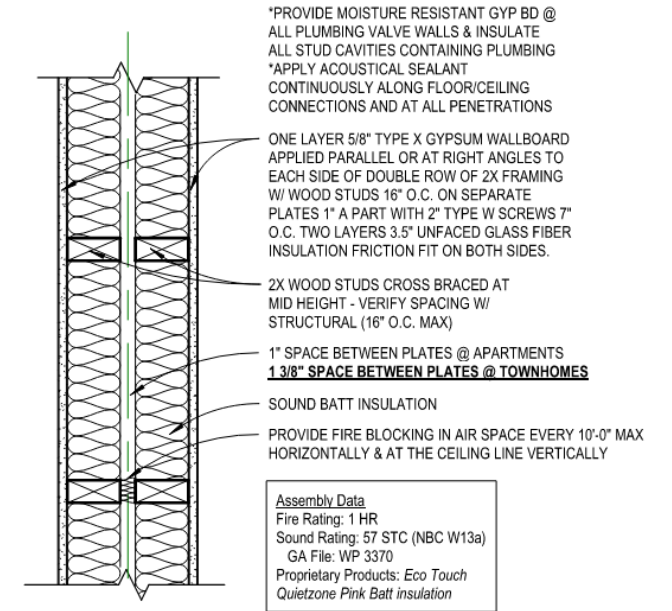
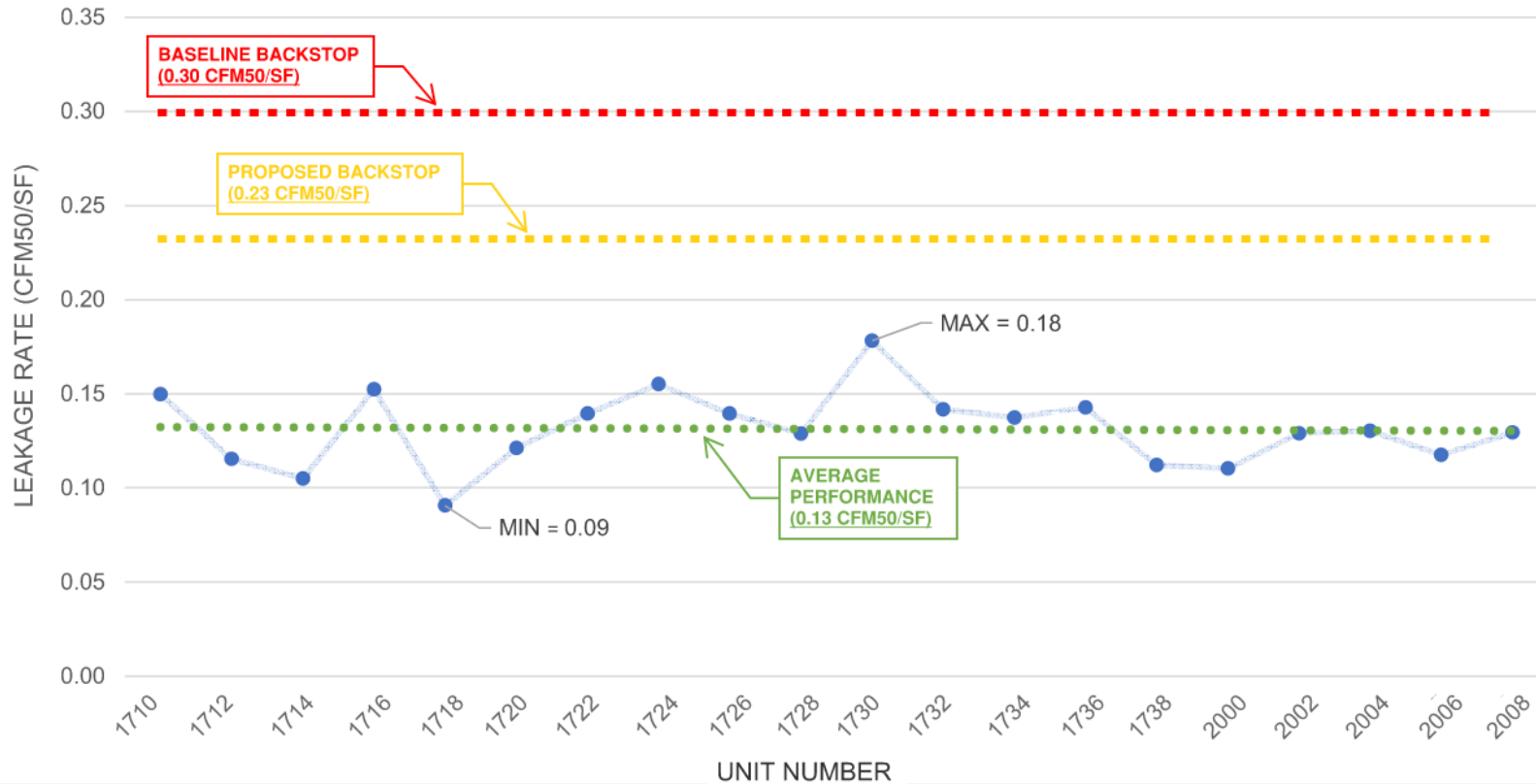


Duplex and low-rise (slab on grade) (CFM50/ft² ELA)

CFM50/ELA



BEAM TOWNHOMES - LEAKAGE RATE BY UNIT (CFM50/SF)

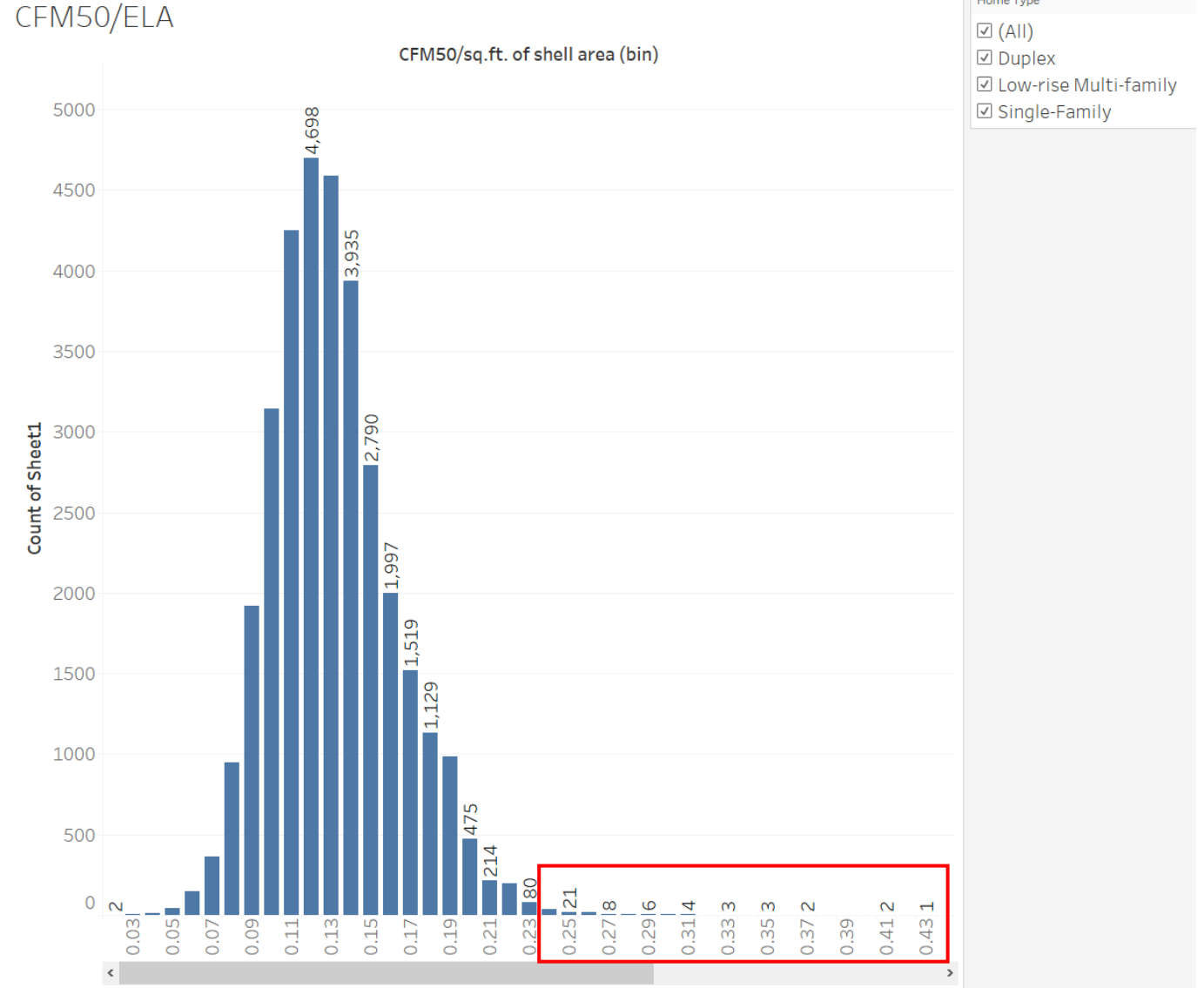


- P1 2x4 Interior Wood Demising Wall
- P2 2x6 Interior Wood Demising Wall
- P3 2x8 Interior Wood Demising Wall



- Income-restricted affordable townhomes
- Slab on grade, 2-story units, avg. floor area = 887 ft²
- Standard party wall construction

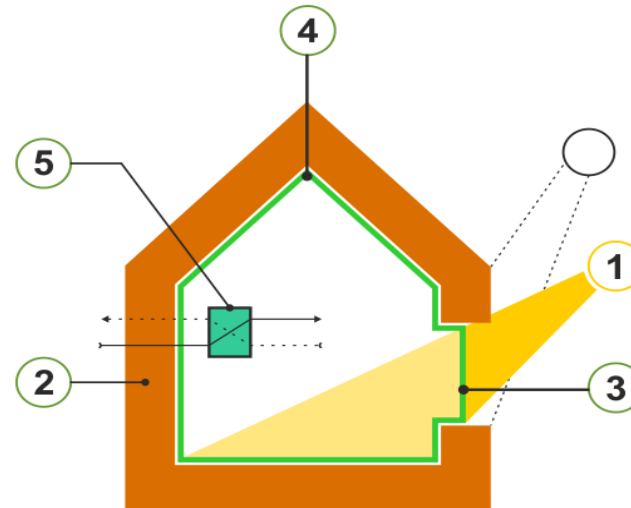
All Dwelling Types (CFM50/ft² ELA)



Impact of Improved Air Sealing

U.S. Department of Energy: “Reducing the amount of air that leaks in and out of your home is a cost-effective way to:

- **cut heating and cooling costs**
- **improve durability**
- **increase comfort**
- **and create a healthier indoor environment.”**



TOP 5 ENERGY EFFICIENCY PRINCIPLES

1. Super Insulated Envelopes.
2. Air Sealing
3. High-Performance Glazing
4. Thermal-Bridge-Free Detailing
5. Heat Recovery Ventilation

<https://hazelwoodhomes.com.au/what-is-passive-house/>

“Air leakage also can contribute to **moisture problems** that affect occupants’ health and the structure’s durability.”

“[Air barriers] help **prevent air leakage** into and out of your home, which **can account for 30% or more of a home's heating and cooling costs.**”

[U.S. Department of Energy. “Air Sealing Your Home.” https://www.energy.gov/energysaver/air-sealing-your-home#:~:text=Reducing%20the%20amount%20of%20air,create%20a%20healthier%20indoor%20environment.](https://www.energy.gov/energysaver/air-sealing-your-home#:~:text=Reducing%20the%20amount%20of%20air,create%20a%20healthier%20indoor%20environment.)

[U.S. Department of Energy. “Air Sealing for New Home Construction.” https://www.energy.gov/energysaver/air-sealing-new-home-construction](https://www.energy.gov/energysaver/air-sealing-new-home-construction)

Missing Middle Housing

From “**Missing Housing for Middle Incomes: Strategies to Reduce Cost and Add Affordability**” (ULI Minnesota Housing Report, 2020–2021)

In reviewing case studies, several barriers were identified by the panel members that hindered their ability to deliver housing affordable to middle incomes, including:

- **Cost of parking**; particularly the number of parking stalls required and lack of space for surface parking.
- **Cost of land**; particularly in desirable market locations.
- Ability to reduce design and construction costs is **impacted by local land use regulations** that tend to add to the overall costs of a project.
- **Higher cost impact of standard zoning restrictions on smaller, less dense developments.**



Missing Middle Housing

From “Missing Housing for Middle Incomes: Strategies to Reduce Cost and Add Affordability” (ULI Minnesota Housing Report, 2020–2021)

Focusing too heavily on cost containment in order to achieve more rental affordability to the tenant today may lead to higher capital expenditures in the future. Substituting different materials and or systems that are less expensive does reduce costs initially. However, the tradeoffs could mean that there may be higher capital maintenance costs and a higher rate of wear and tear due to lack of durability and increased energy costs. Over time, it may result in higher costs to the owner; typically passed on in rent increases to tenants.

Support lower cost heating and air conditioning systems. For multifamily projects, installing PTAC (packaged terminal air condition systems) results in \$5,000-\$8,000 per unit cost savings. These systems work well for projects under 100 units that are self-contained and do not rely on a duct system to operate but the cost savings are significant in reducing the overall unit cost to the project. Furthermore, PTAC units are easily serviced since they are more accessible and less costly to replace.





CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Steve Shold

Date: 1/25/24

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

Model Code: 2021 IECC-R

Telephone number: 651-284-5312

Code or Rule Section:

Firm/Association affiliation, if any: Dept of Labor

Code or rule section to be changed: Section R202 – Definition of Residential Building

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).
[Yes, see language below.](#)

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

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

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

add new language that is not found in the model code book or in Minnesota Rule.
[Yes, see language below.](#)

2. Is this proposed code change required by Minnesota Statute? If so, please provide the citation.
[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.
See language below.
4. Will this proposed code change impact other sections of a model code book or an amendment in Minnesota Rule? If so, please list the affected sections or rule parts.
Yes, this will have an impact on the application of the Scoping criteria.

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.)
Presently, due to the definitions and scoping, an accessory building is *technically* scoped to the Commercial Energy Code. In both the '15 MRE and the IECC-R, the definition for a "Residential Building" does *not* include "accessory structures". The definition for a "Commercial Building" states: "For this code, all buildings that are not included in the definition of "Residential buildings". It seems inappropriate to have an accessory building that is accessory to and supports a residential structure (IRC-1,2,3), and that is constructed as a residential building (IRC-4), to be scoped to the commercial energy code. Therefore, it seems fitting to include "accessory building" in the definition for Residential Buildings. The challenge, however, is drawing a distinction between accessory buildings that serve IRC-1,2,3 buildings, and those that serve *commercial* occupancies.
2. Why is the proposed code change a reasonable solution?
For buildings that are designed constructed under the Residential Building code, scoping them to the Residential Energy code makes more sense and promotes simpler design, construction, and enforcement of requirements.
3. What other factors should the TAG consider?
The definition and scoping language for the Residential Energy code need to work together. Additionally, the newly adopted MN Commercial Energy Code states the following below. Therefore, IRC-4 must be included in the scoping of the new Residential Energy code.

Subp. 3. **ASHRAE 90.1 section 2.** ASHRAE 90.1 section 2 is amended by adding two subsections to read as follows:

2.5 IRC-1 Single-family dwellings, IRC-2 Two-family dwellings, IRC-3 Townhomes, IRC-4 Utility buildings, and the portions of buildings containing occupancy groups I-1, R-1, R-2, R-3, and R-4 where the entire composite building structure is three or fewer stories above grade **shall comply with Minnesota Rules, chapter 1322.**

2.6 Where a building contains multiple occupancy groups and portions of the building are required to comply with Minnesota Rules, chapter 1322, those portions shall comply with Minnesota Rules, chapter 1322, and the remainder of the building shall comply with this rules chapter.

Statutory Authority: *MS s 326B.02; 326B.101; 326B.106*

History: *47 SR 983*

Cost/Benefit Analysis

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

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
[Designers, builders, and remodelers, HVAC and insulation contractors, and building inspectors.](#)
2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
No.
3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
[If the newest Residential Energy code does not include accessory structures in the definitions and scoping, enforcement will be confusing as the scoping will have to be reference from the new Commercial Energy code.](#)
4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.
No.

RESIDENTIAL BUILDING. For this ~~code~~ [chapter](#), includes ~~detached one and two family dwellings and townhouses as well as Group~~ [IRC-1 Single-family dwellings, IRC-2 Two-family dwellings, IRC-3 Townhomes, IRC-4 Accessory structures, and the portions of buildings containing groups I-1, R-2, R-3 and R-4 where the entire composite](#) buildings [structure is](#) three [or fewer](#) stories ~~or less in height above grade plane.~~

CODE CHANGE PROPOSAL FORM

(Must be submitted electronically)

Author/requestor: Jonny Kocher

Date: 1/29/24

Email address: jkocher@rmi.org

Model Code: IECC 2021

Telephone number: 510-761-5060

Code or Rule Section: Res Energy Code

Firm/Association affiliation, if any: RMI

Code or rule section to be changed: R404.4

Intended for Technical Advisory Group (“TAG”): Residential Energy

General Information

Yes No

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

Proposed Language

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

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

In order to reach Minnesota’s climate goals, the State developed the Minnesota Climate Action Framework. Under the Smarter Buildings and Construction initiative, one of the suggested state action steps included: “Develop clear options for building owners and families to make informed environmentally preferable selections for their building materials and products, including appliances such as furnaces, water heaters, and cooktops/ovens.”¹ Creating readiness requirements will enable building owners to make these informed selections in the future without it being prohibitively expensive.

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

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

R404.4 Electrification-ready circuits. Water heaters, space heating equipment, household clothes dryers, and cooking appliances that use fuel gas or liquid fuel shall comply with Sections R404.5.1 through R404.5.4. Electrical panel shall have spare circuits and be sized to meet the future load required by this section. Each spare circuit shall be labeled with the word "spare." Space shall be reserved in the electrical panel for each reserved circuit for the installation of an overcurrent device. Capacity for the future circuits required in this section shall be included in the load calculations of the original installation. ~~Electric readiness. Water heaters, space heaters, household clothes dryers, and cooking appliances that use fuel gas or liquid fuel shall comply with Sections R404.4.1 through R404.4.5.~~

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

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

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

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

R404.4.3 Space heaters-Heating Equipment. A circuit capable of feeding a future 240-volts, 40-amperes load ~~A dedicated branch circuit with a rating not less than either 240-volts, 30-amperes or 120V, 20-amperes shall be installed and terminate within three feet (304 mm) of each space heater.~~

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

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

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

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

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

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

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

SECTION	TITLE
<u>R404.4</u>	Electric readiness <u>Electrification-ready circuits</u>

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

SECTION ^a	TITLE
R404.4	Electric readiness Electrification-ready circuits

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

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

Cost/Benefit Analysis

- Will the proposed code change increase or decrease costs? Please explain and provide estimates if possible.
The cost will increase upfront costs. Sources from the New Buildings Institute, Group14 Engineering and the California Energy Commission estimate that the upfront costs of electric readiness ranges between \$500 to \$1,010.^{3,4,5} Because this proposal only requires electrification of the panel, the esimated cost is around \$0 to \$440.

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

³ NBI, Cost of Decarbonization Code, 2022, page 26
<https://newbuildings.org/wp-content/uploads/2022/04/BuildingDecarbCostStudy.pdf>

⁴ California Energy Commission, 2022, page 2-3
<https://efiling.energy.ca.gov/GetDocument.aspx?tn=238049&DocumentContentId=71300>

⁵ Group 14, 2020, page 12
<https://www.communityenergyinc.com/wp-content/uploads/Building-Electrification-Study-Group14-2020-11.09.pdf>

2. If there is an increased cost, will this cost be offset by a safety or other benefit? Please explain. If the benefit is quantifiable (for example energy savings), provide an estimate if possible.
The cost of meeting these electric-ready requirements when the house is being built, walls are open, and the trades are already on-site, is marginal. In comparison, the cost of retrofitting a building for these requirements can be an order of magnitude higher and act as a barrier for the homeowner to choose electric appliances.

An electrification engineering study by Group 14 reports that the electrical modifications needed to install a HP heating system and a HPWH is \$2,100 as a retrofit compared to \$500 as an original install for a 3,000 sq ft single family home. The California Energy Commission cost study found that the retrofit cost to add electrical infrastructure for water heating, space heating, dryers and cooking appliances after construction is at least \$2,560 (likely higher), compared to the upfront cost of around \$1,010 to do it during construction. These studies indicate that it is about 3-4 times less expensive to do this work during construction. Not making new buildings electric-ready would leave homeowners exposed to potentially high retrofit costs in the future and will greatly inhibit customer choice.
3. If there is a cost increase, who will bear the costs? This can include government units, businesses, and individuals.
Construction contractors and developers will bear most of the costs. The substantial cost savings for reduced costs of future retrofits will benefit homeowners.
4. Are there any enforcement or compliance cost increases or decreases with the proposed code change? Please explain.
There will be a negligible impact in inspection and enforcement cost when code inspectors ensure this portion of the code is complied with.
5. Will the cost of complying with the proposed code change in the first year after the rule takes effect exceed \$25,000 for any one small business or small city ([Minn. Stat. § 14.127](#))? A small business is any business that has less than 50 full-time employees. A small city is any statutory or home rule charter city that has less than ten full-time employees. Please explain.
No. This will not impact businesses or cities. This is a residential code proposal.

Regulatory Analysis

1. What parties or segments of industry are affected by this proposed code change?
Electrical contractors will have slightly more work because of this proposal
2. Can you think of other means or methods to achieve the purpose of the proposed code change? What might someone opposed to this code change suggest instead? Please explain what the alternatives are and why your proposed change is the preferred method or means to achieve the desired result.
This is the only feasible option to cost effectively prepare homes for future electrification required to reach the state's climate action goals. The main argument will be around the upfront cost, which I have already addressed by showing that this will save thousands of dollars of future retrofit costs.
3. What are the probable costs or consequences of not adopting the code change, including those costs or consequences borne by identifiable categories of affected parties, such as separate classes of government units, businesses, or individuals?
If we continue to build with fossil fuels in new buildings without preparing for the future energy transition, we will simply not meet our climate goals, which is unthinkable.
4. Are you aware of any federal or state regulation or requirement related to this proposed code change? If so, please list the federal or state regulation or requirement and your assessment of any differences between the proposed code change and the federal regulation or requirement.

The Inflation Reduction Act currently has many incentives and tax credits for installing new clean energy technologies. By preparing for electric ready homes, consumers whose appliances break between now and 2031 will be able to easily take advantage of these tax credits. Ideally, future administrations will continue to extend these incentives and tax credits.

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