Energy Sub-Workgroup

November 14, 2025

10:00 AM

Location: 4224 Cox Rd, Glen Allen, VA 23060 - **Virginia Housing Center**

AGENDA

1) Welcome

2) Introductions

3) Discussion

- Code Change Proposals:
  - REC-R402.1.2-24
  - REC-R402.1.2(1)-24
  - REC-R402.1.2(2)-24
  - REC-R402.1.2(4)-24
  - REC-R402.1.3-24
  - REC-R402.4.1.2-24
  - REC-R402.4.1.2(1)-24
  - REC-R403.14-24
  - REC-R404.1-24
  - REC-R404.2-24
  - REC-R404.5-24
  - REC-R405.2-24
  - REC-R405.2(1)-24
  - REC-R408.2.9-24
  - EC-C402.1.6(1)-24
  - EC-C403.7.4.1-24
  - EC-C405.15-24
  - EC-C405.17(1)-24
  - EC-C409-24
  - EC-1301-24
  - EB805.2.1.1-24

4) Next Steps

REC-R402.1.2-24

VRC: TABLE N1102.1.2 (R402.1.2), TABLE N1102.1.3 (R402.1.3); IRC: TABLE N1102.1.3 (R402.1.3)

Proponents: DeAnthony Pierce, City of Roanoke, representing Virginia Building & Code Officials Association (deanthony.pierce@roanokeva.gov)

2021 Virginia Residential Code

Revise as follows:

TABLE N1102.1.2 (R402.1.2) MAXIMUM ASSEMBLY *U*-FACTORS[a] AND FENESTRATION REQUIREMENTS
Portions of table not shown remain unchanged.

CLIMATE ZONE	FRAME WALL *U*-FACTOR
3	~~0.079~~ 0.060
4 except Marine	~~0.079~~ 0.060
5 and Marine 4	~~0.079~~ 0.060

For SI: 1 foot = 304.8 mm.

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zones 0 and 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.

c. In Warm Humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.

d. The SHGC column applies to all glazed fenestration.

   Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

e. There are no SHGC requirements in the Marine Zone.

f. A maximum U-factor of 0.32 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

   1. Above 4,000 feet in elevation above sea level, or

   2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

TABLE N1102.1.3 (R402.1.3) INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]
Portions of table not shown remain unchanged.

CLIMATE ZONE	WOOD FRAME WALL *R*-VALUE[g]
3	~~15 or 13+1~~[g] 20 or 13&5ci or 15&2.9ci[g]
4 except Marine	~~15 or 13+1~~[g] 20 or 13&5ci or 15&2.9ci[g]
5 and Marine 4	~~15 or 13+1~~[g] 20 or 13&5ci or 15&2.9ci[g]

For SI: 1 foot = 304.8 mm.

NR = Not Required.

ci = continuous insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

   Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. “5ci or 13” means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. “10ci or 13” means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. “15ci or 19 or 13&5ci” means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs. as indicated in the table. The slab-edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation shall not be required in Warm Humid locations as defined by Figure N1101.7 and Table N1101.7.

g. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, “13&5” means R-13 cavity insulation plus R-5 continuous insulation.

h. Mass walls shall be in accordance with Section N1102.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

i. A maximum *U*-factor of 0.32 shall apply in Climate Zones 3 through 8 to vertical fenestration products installed in buildings located either:

   1. Above 4,000 feet in elevation, or

   2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

2024 International Residential Code

Revise as follows:

TABLE N1102.1.3 (R402.1.3) INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

Portions of table not shown remain unchanged.

For SI: 1 foot = 304.8 mm.NR = Not Required, ci = Continuous Insulation.

h. ~~"30 or 19+7.5ci or 20ci" means R-30 cavity insulation alone or R-19 cavity insulation with R-7.5 continuous insulation or R-20 continuous insulation alone.~~ "20 or 13+ 5ci or 15+2.9ci" means R-20 cavity insulation alone or R-13 cavity insulation with R-5 continuous insulation or R-15 cavity insulation with R-2.9 continuous insulation.

Reason Statement:

This proposal is meant to be a replace Virginia's Amended "R-15 or 13+1" wall insulation requirement, which has been in-place since the 2012 Code Cycle.

When the Amendment was adapted, it generally aligned with the requirements in the Model I-Codes. Since than, prescriptive insulation values have incrementally increased in the Model I-Codes, while Virginia's Wall insulation has remained the same.

This proposal will put Virginia's insulation requirements, roughly in-line with the 2018 Model I-Codes.

Cost Impact: The code change proposal will increase the cost

If adopted, this code change will increase the cost to builders who generally use 2x4 framing, and R-15 batt insulation, since it will require the use of either 2x6 framing, or added continuous insulation on the exterior.

The cost of framing would also increase since window framing around exterior window and door openings would have to be extended, to facilitate the continuous insulation, or if 2x6 studs are used.

2.9 continuous insulation with R-15 batt insulation was determined to be roughly equivalent to R-13 + 5 continuous. Through preliminary research, R-2.9 rigid board insulation was regularly available at retail chains such as Lowes and Home Depot. For this reason, R-15 with 2.9 continuous was added as an option for builders who prefer to build with 2x4 studs, and use R-15 insulation.

Attached Files

- **VBCOA 2024 Code Change Proposal_N1102 Tables.pdf**
  https://va.cdpaccess.com/proposal/1408/2011/files/download/946/

Proponents: VBCOA

2024 Virginia Residential Code

Revise as follows:

SECTION N1102 (R402)
BUILDING THERMAL ENVELOPE

…

TABLE N1102.1.2 (R402.1.2)
MAXIMUM ASSEMBLY *U*-FACTORS[a] AND FENESTRATION REQUIREMENTS

CLIMATE ZONE	3	4 EXCEPT MARINE	5 EXCEPT MARINE 4
CEILING *U*-FACTOR	0.030	0.026	0.026
WOOD-FRAMED WALL *U*-FACTOR	~~0.079~~ 0.060	~~0.079~~ 0.060	~~0.079~~ 0.060

…

TABLE N1102.1.3(R402.1.3)

INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	3	4 EXCEPT MARINE	5 EXCEPT MARINE 4
CEILING *R*-VALUE	38	49	49
WOOD-FRAMED WALL *R*-VALUE	~~15 or 13+1~~ 20 or 13&5ci or 15&2.9ci	~~15 or 13+1~~ 20 or 13&5ci or 15&2.9ci	~~15 or 13+1~~ 20 or 13&5ci or 15&2.9ci

Reason Statement:

This proposal is meant to be a replace Virginia's Amended "R-15 or 13+1" wall insulation requirement, which has been in-place since the 2012 Code Cycle.

When the Amendment was adapted, it generally aligned with the requirements in the Model I-Codes. Since than, prescriptive insulation values have incrementally increased in the Model I-Codes, while Virginia's Wall insulation has remained the same.

This proposal will put Virginia's insulation requirements, roughly in-line with the 2018 Model I-Codes.

Resiliency Impact Statement:

This proposal will increase the resiliency of new homes to withstand exterior temperature extremes, by increasing the overall Building Thermal Envelope of a home. The incremental increase in wall insulation can further assist a home with maintaining its internal temperature longer, when mechanical equipment becomes inoperable in events such as blackouts.

Cost Impact:

If adopted, this code change will increase the cost to builders who generally use 2x4 framing, and R-15 batt insulation, since it will require the use of either 2x6 framing, or added continuous insulation on the exterior.

The cost of framing would also increase since window framing around exterior window and door openings would have to be extended, to facilitate the continuous insulation, or if 2x6 studs are used.

2.9 continuous insulation with R-15 batt insulation was determined to be roughly equivalent to R-13 + 5 continuous. Through preliminary research, R-2.9 rigid board insulation was regularly available at retail chains such as Lowes and Home Depot. For this reason, R-15 with 2.9 continuous was added as an option for builders who prefer to build with 2x4 studs, and use R-15 insulation.

REC-R402.1.2(1)-24

IRC: TABLE N1102.1.2 (R402.1.2), TABLE N1102.1.3 (R402.1.3)

Proponents: Eric Lacey, representing Responsible Energy Codes Alliance (eric@reca-codes.com)

2024 International Residential Code

Revise as follows:

TABLE N1102.1.2 (R402.1.2) MAXIMUM ASSEMBLY *U*-FACTORS[a] AND FENESTRATION REQUIREMENTS

Portions of table not shown remain unchanged.

CLIMATE ZONE	3	4 EXCEPT MARINE	5 AND MARINE 4
CEILING *U*-FACTOR	~~0.030~~ 0.026	~~0.026~~ 0.024	~~0.026~~ 0.024

For SI: 1 foot = 304.8 mm.

a. Nonfenestration *U*-factors and *F* -factors shall be obtained from measurement, calculation, an approved source or Appendix NF where such appendix is adopted or approved.

b. Mass walls shall be in accordance with Section N1102.2.6. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zones 0 and 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.

c. In Warm Humid locations as defined by Figure N1101.7 and Table N1101.7, the *basement wall U*-factor shall not exceed 0.360.

d. A maximum *U*-factor of 0.30 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

   1. Above 4,000 feet in elevation above sea level, or

   2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

e. *F*-factors for slabs shall correspond to the *R*-values of Table N1102.1.3 and the installation conditions of Section N1102.2.10.1.

TABLE N1102.1.3 (R402.1.3) INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

Portions of table not shown remain unchanged.

CLIMATE ZONE	3	4 EXCEPT MARINE	5 AND MARINE 4
CEILING *R*-VALUE	~~38~~ 49	~~49~~ 60	~~49~~ 60

For SI: 1 foot = 304.8 mm.NR = Not Required, ci = Continuous Insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. "5ci or 13" means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

c. Slab insulation shall be installed in accordance with Section N1102.2.10.1.

d. Basement wall insulation shall not be required in Warm Humid locations as defined by Figure N1101.7 and Table N1101.7.

e. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, "13&5" means R-13 cavity insulation plus R-5 continuous insulation.

f. Mass walls shall be in accordance with Section N1102.2.6. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

g. A maximum *U*-factor of 0.30 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation.

2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

h. "30 or 19+7.5ci or 20ci" means R-30 cavity insulation alone or R-19 cavity insulation with R-7.5 continuous insulation or R-20 continuous insulation alone.

Reason Statement:

This proposal reverses an efficiency rollback incorporated into the 2024 *IECC* by restoring the ceiling insulation R-values to R-60 for Virginia's climate zones (which is the current requirement in the Uniform Construction Code). This requirement was rolled back in the 2024 *IECC* as part of a large compromise among *IECC*-Residential Development Committee Members referred to as the "omnibus." However, significant portions of the omnibus related to electrification and decarbonization were removed from the 2024 *IECC* by the ICC Board of Directors as a result of several appeals, leaving in place several material efficiency rollbacks. These rollbacks would not have been approved in the 2024 *IECC* but for the omnibus compromise, and we recommend that Virginia adopt prescriptive envelope requirements at least as efficient as the 2021 *IECC*. Ceiling insulation is one of the longest-lasting efficiency measures in a building and will provide comfort and energy savings for occupants in all seasons, as well as improved passive survivability in the event of natural disasters and long-term power outages.

Cost Impact: The code change proposal will not increase or decrease the cost

This proposal will maintain Virginia's current ceiling insulation prescriptive baseline, so there will be no increase in construction costs. However, if Virginia reduces ceiling insulation requirements (per the 2024 IECC), this would increase costs for homeowners over the 70-100 year useful life of the building.

REC-R402.1.2(2)-24

VRC: TABLE N1102.1.2 (R402.1.2), TABLE N1102.1.3 (R402.1.3); VCC: 1301.1.1.1

Proponents: Eric Lacey, representing Responsible Energy Codes Alliance (eric@reca-codes.com)

2021 Virginia Residential Code

Revise as follows:

TABLE N1102.1.2 (R402.1.2) MAXIMUM ASSEMBLY *U*-FACTORS[a] AND FENESTRATION REQUIREMENTS

Portions of table not shown remain unchanged.

CLIMATE ZONE	FENESTRATION *U*-FACTOR[f]	SKYLIGHT *U*-FACTOR	GLAZED FENESTRATION SHGC[d, e]	CEILING *U*-FACTOR	FRAME WALL *U*-FACTOR	MASS WALL *U*-FACTOR[b]	FLOOR *U*-FACTOR	BASEMENT WALL *U*-FACTOR	CRAWL SPACE WALL *U*-FACTOR
3	0.30	0.55	0.25	0.026	0.060 ~~0.079~~	0.098	0.047	0.091c	0.136
4 except Marine	0.30	0.55	0.40	0.024	0.045 ~~0.079~~	0.098	0.047	0.059	0.065
5 and Marine 4	0.30	0.55	0.40	0.024	0.045 ~~0.079~~	0.082	0.033	0.050	0.055

For SI: 1 foot = 304.8 mm.

a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.

b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zones 0 and 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.

c. In Warm Humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.

d. The SHGC column applies to all glazed fenestration.

   Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

e. There are no SHGC requirements in the Marine Zone.

f. A maximum U-factor of 0.32 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

   1. Above 4,000 feet in elevation above sea level, or

   2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

TABLE N1102.1.3 (R402.1.3) INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

Portions of table not shown remain unchanged.

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b, i]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE[g]	MASS WALL *R*-VALUE[h]	FLOOR *R*-VALUE	BASEMENT[c,g] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c,g] WALL *R*-VALUE
3	0.30	0.55	0.25	49	20 or 13&5ci or 0&15ci ~~15 or 13+1~~[g]	8/13	19	5ci or 13[f]	10ci, 2 ft	5ci or 13[f]
4 except Marine	0.30	0.55	0.40	60	30 or 20&5ci or 13&10ci or 0&20ci ~~15 or 13+1~~[g]	8/13	19	10ci or 13	10ci, 4 ft	10ci or 13
5 and Marine 4	0.30	0.55	0.40	60	30 or 20&5ci or 13&10ci or 0&20ci ~~15 or 13+1~~[g]	13/17	30	15ci or 19 or 13&5ci	10ci, 4 ft	15ci or 19 or 13&5ci

For SI: 1 foot = 304.8 mm.

NR = Not Required.

ci = continuous insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. "5ci or 13" means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs. as indicated in the table. The slab-edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation shall not be required in Warm Humid locations as defined by Figure N1101.7 and Table N1101.7.

g. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, "13&5" means R-13 cavity insulation plus R-5 continuous insulation.

h. Mass walls shall be in accordance with Section N1102.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

i. A maximum *U*-factor of 0.32 shall apply in Climate Zones 3 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation, or

2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

2021 Virginia Construction Code

Revise as follows:

1301.1.1.1 Changes to the *International Energy Conservation Code* (IECC). The following changes shall be made to the IECC :

~~14. Change the wood frame wall *R*-value categories for Climate Zones 3A, 4A and 5A in Table R402.1.3 to read:~~

		~~Wood Frame Wall *R*-Value~~
		~~15 or 13+1[h]~~

~~15. Change the frame wall *U*-factor categories for Climate Zones 3A, 4A and 5A in Table R402.1.2 to read:~~

~~Frame Wall *U*-Factor~~
~~0.079~~

Reason Statement:

This proposal will reduce energy costs for homeowners and improve comfort and passive survivability in new homes by adopting the wall insulation requirements as they appear in the 2021 and 2024 IECC. Virginia is now several cycles behind the model energy code in requirements that apply to wall insulation.

	IECC Wall Insulation R-Value (CZ4)	VA UCC Wall Insulation R-Value (CZ4)
2009	13	13
2012	20 or 13+5	15 or 13+1
2015	20 or 13+5	15 or 13+1
2018	20 or 13+5	15 or 13+1
2021	30 or 20+5 or 13+10 or 0+20	15 or 13+1
2024	30 or 20+5 or 13+10 or 0+20	

Virginia currently allows 75% higher wall U-factors (less stringent) than the 2021/24 IECC. That means Virginia homes allow 75% more heat transfer through the opaque walls than a home built to the 2021 or 2024 IECC. While we understand that initial construction costs are higher with increased insulation requirements, the long-term benefits in lower energy bills and increased comfort for the building owners/occupants are well-documented. Wall insulation is most cost-effectively installed at construction and is likely to remain unchanged over the useful life of the building. The homes constructed today will generate roughly 1200 utility bills (100 years x 12 months), and the amount of wall insulation will directly impact what the homeowner pays every month. It is critical to build new homes to reduce energy use wherever feasible, particularly in the systems and components that will last the longest. Because the IECC provides a wide range of compliance options -- prescriptive, Total UA, simulated performance, Energy Rating Index -- an increase in wall insulation requirements may not require a complete redesign of the proposed home, as long as the home achieves the same overall level of energy savings.

Cost Impact: The code change proposal will increase the cost

In its analysis for the efficiency improvements in the 2021 IECC, the U.S. Department of Energy estimated that the increased construction cost of an additional R-5 continuous insulation would be $0.98/ft2 wall area, or $374.96 for the multifamily prototype/$1,961.96 for the single-family prototype. This improvement was part of a 30-year life-cycle energy cost savings of $2,243 in climate zone 4, with an estimated payback period of 12.4 years. *See* U.S. Department of Energy, *National Cost-Effectiveness of the Residential Provisions of the 2021 IECC* (June 2021).

REC-R402.1.2(4)-24

VCC: 1301.1.1.1 (New)

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2021 Virginia Construction Code

Revise as follows:

1301.1.1.1 Changes to the IECC. The following changes shall be made to the IECC:. (Portions of code section not shown remain unchanged.)

~~15. Change the frame wall U-factor categories for Climate Zones 3A, 4A and 5A in Table R402.1.2 to read:~~

	~~Frame Wall U-Factor~~
	~~0.079~~

~~16. Change the wood frame wall R-Value categories for Climate Zones 3A, 4A, and 5A in Table R402.1.3 to read:~~

	~~Wood Frame Wall R-Value Wood Frame Wall R-Value~~
	~~15 or 13+1~~

Reason Statement:

The purpose of this proposal is to bring Virginia's standards for wall insulation into compliance with the 2024 IECC.

Virginia's residential building code has been behind the IECC's wall energy efficiency standards for over a decade -- since the 2012 IECC update. **Virginia is even farther behind today since it failed to strengthen code standards for wall insulation to adopt the 2021 IECC standards, which strengthened wall insulation standards beyond the IECC's 2012 level**, **and which remain in the 2024 IECC standards.**

Despite a decade of actual experience, IECC never weakened the wall insulation standards to levels below the 2012 IECC standards. Instead, as noted, the IECC strengthened the wall insulation standards in 2021.

Tightening wall insulation standards is important to residents —whether owners or tenants--, since it would help them save money, and experience greater comfort and a healthier home for decades after the dwelling is built.

Tightening prescriptive construction standards for wall insulation will help to

- **(a) reduce occupancy costs, including for heating and conditioning of air in the dwelling,**
- **(b) reduce exposure to mold that can build up in walls,**
- **(c) increase residents' comfort,**
- **(d) increase physical and economic resiliency to power outages, climate change and rising energy prices,**
- **(e) reduce gaps for pests to enter the dwelling,**
- **(f) reduce pressure on utilities to raise rates in order to build and operate more energy delivery capabilities, and**
- **(g) reduce the air pollution that drives climate impacts and other harms to Virginia's health, property and economy.**

Legal Standards. Remaining at 5.0 ACH level would leave Virginia's building code out of compliance with statutory standards. **Sections 36-99A and 36-99B of the Virginia Code** states that building codes are required to "protect the health, safety and welfare of the residents of the Commonwealth" and that adjustments to reduce construction costs must nevertheless be **"consistent with recognized standards of health, safety, energy efficiency and water efficiency."** VIRGINIA ACTS OF ASSEMBLY – 2021 SPECIAL SESSION I, CHAPTER 425, Section 1 (referred to herein as "**H2227")**, which was enacted in 2021, calls for adoption of energy efficiency standards that are "at least as stringent" as the latest IECC considering factors such as consumer costs "over time" and air pollution.

Cost and energy savings. Beginning with its review of the 2012 IECC, in which the 3.0 ACH standard was first adopted, the U.S. Department of Energy and the Pacific Northwest National Laboratories (collectively DOE) has found that residents would save money from full implementation of each IECC update from 2012-2024 even after considering incremental purchase and mortgage costs. Focusing on the three most significant IECC updates containing the 3.0 ACH standard, DOE found that, over 30 years, lifecycle savings (i.e., net of additional purchase and mortgage costs): **full implementation of the 2012 IECC** (which introduced the 3.0 ACH requirement for Virginia's climate zone) would save average Virginia residents **$5,836, if adopted**; **full implementation of the 2021 IECC** would save Virginia residents **$8,376, if adopted**; and **full implementation of the 2024 IECC** would save residents of Virginia's Climate Zone 4 **$3,790 and Zones 2 and 5 an average of $2,502 compared to 2021 IECC**. Savings would have been

achieved year in and year out, with rapid payback and lasting for decades. [2]

Collectively, Virginians would save billions of dollars in energy costs from full implementation of the IECC, greatly benefiting residents and Virginia's economy. In its July 2021 report on "Cost-Effectiveness of the 2021 IECC for Residential Buildings in Virginia" (PNNL-31627), PNNL found that aggregate energy cost savings for Virginia residents from adopting the full 2021 IECC would be $7,192,000 in the first year and $2,487,000,000 over 30 years. Virginia would achieve substantial pollution reductions and add jobs.

Significantly, even as it preserved the 2021 IECC's prescriptive wall insulation standards, the 2024 IECC offered 's builders greater flexibility to achieve total efficiency targets through Simulated Building Performance and ERI compliance paths. These performance-based paths permit builders to trade some efficiency measures for other efficiency measures, provided they meet the code's overall efficiency goals. Importantly, however, the 2024 IECC's compliance flexibility are expressly tied to the 2024 Prescriptive Path's standards for envelope efficiency, including wall insulation. **The added flexibility was not intended to permit builders to reduce efficiency from a state-weakened baseline below the 2024 IECC's prescriptive standards for walls or otherwise**. Such double-dipping would be anything but "consistent with" or "at least as stringent as" the 2024 IECC.

Pollution Reductions. DOE has also repeatedly found that full compliance with the IECC's updates will reduce energy use and air pollution, including greenhouse gas pollution, which is critical to Virginians' future. Energy use in buildings is one of the largest drivers of CO2 emissions in Virginia. By cutting energy usage, **full implementation of the IECC's efficiency standards without weakening amendments would reduce air pollution, including greenhouse gas pollution that is driving climate change**. DOE found that full implementation of the 2024 IECC alone would reduce carbon emissions by 6.5% compared to the 2021 IECC, and the 2021 IECC would reduce carbon emissions by 8.7% compared to the prior IECC. (Full implementation of just the 2021 IECC "**will reduce statewide CO2 emissions over 30 years by 28,420,000 metric tons,** equivalent to the annual CO2 emissions of 6,181,000 cars on the road (1 MMT CO2 = 217,480 cars driven/year).") Applying the social cost of carbon to the CO2 reductions recognizes huge economic savings from to Virginia and the U.S. [3]

Given the 50-100 lifespans of new buildings, the accumulation of more efficient buildings over years will have significant impacts on reducing future climate and other pollution. Conversely, permitting less efficient new building to be constructed under weaker building code standards will have the opposite effect: driving up pollution and climate driven harms to all Virginians.

Climate change is already harming Virginia, and the harms will get much worse if we do not sharply reduce GHG emissions (particularly CO2 and methane). Growing climate dangers include harms to communities, infrastructure, people, property and the economy from rising seas, worsening storms and more severe rainfall events. Growing dangers also include rising atmospheric and water temperatures that threaten worsening heat-related illnesses, limits on economic activity, agriculture, fisheries, and our natural heritage. The likelihood of mitigating and recovering from those harms declines the longer we delay maximizing energy efficiency and minimizing GHG pollution.

--[1] See IECC; https://basc.pnnl.gov/information/infiltration-meets-ach50-requirements ; http://passivehousebuildings.com/books/phc-2019/five-principles-of-passive-house-design-and-construction/ .

--[2] The U.S. Department of Energy and Pacific Northwest National Laboratories found that **full compliance with the 2012 IECC, including its stronger standards for wall insulation,** would save money even after considering purchase and mortgages costs and otherwise benefit residents compared to earlier standards. DOE/PNNL, National Energy Cost Savings for New Single and Multifamily Homes, A Comparison of the 2006, 2009, and 2012 Editions of the IECC, https://www.energycodes.gov/sites/default/files/documents/NationalResidentialCostEffectiveness.pdf Subsequently, DOE found that the 2021 IECC update, which strengthened wall insulation standards again, would reduce energy use and save money over the life of the dwelling, even after considering purchase and mortgage costs. DOE/PNNL, **Cost-Effectiveness of the 2021 IECC for Residential Buildings in Virginia** (July 2021). And, DOE/PNNL found that the 2024 IECC would save money for residents even after considering purchase and mortgage costs, **Energy Savings Analysis: 2024 IECC for Residential Buildings** (Dec. 2024); https://www.energycodes.gov/national-and-state-analysis. PNNL, **National Cost-Effectiveness of the Residential Provisions of the 2024 IECC** (January 2025). See also https://www.energycodes.gov/determinations

--[3] PNNL, Impacts of Model Building Energy Codes (Nov. 2023) (estimating climate and health benefits in excess of $40,000,000,000 2010-2040 from residential energy building code). See also Notes [1][2] and PNNL report cited above.

Cost Impact: The code change proposal will increase the cost

Increasing the amount of wall insulation will somewhat increase construction costs. However, many choices affect the incremental costs, and the flexibility afforded by the Simulated Performance and ERI paths will enable builders to reduce costs.

Moreover, as discussed in the Reason Statement, **repeated findings by DOE and PNNL have shown that there is a net reduction of costs to residents when the IECC is fully implemented: (a) the cost increases are more than offset by the resulting energy cost savings; (b) the cost savings will last for decades and be accompanied by other important benefits, including more comfortable and healthier dwellings and greater resiliency to power outages and energy cost increases**.

As found by DOE/PNNL (see notes in Reason Statement), residents will save money by keeping up with the IECC. Looking at the three IECC updates relevant to wall insulation, the savings are substantial.

Savings from Full Adoption of 2024, 2021 and 2012 IECC

National or Virginia Average	Life-cycle Cost Savings
Nat'l – Full 2024 IECC Savings CZ 4, 3 & 5	CZ4 -$3,790 CZ3 - $2,509 CZ5 - $2,496
VA - Full 2021 IECC Savings	$8,376
VA- Full 2012 IECC Savings	$5,836

Energy cost savings over time are critical to defining "affordability" of housing.

- By reducing residents' occupancy costs (including utilities) and making dwellings more resilient, the 2024 IECC's energy efficiency requirements will make housing more affordable for owner-occupants and tenants for decades, not just at a buyer's closing date.
- H2227 which requires a decision based on savings and other benefits over time compared to construction costs, not by just looking at construction costs.
- State and federal laws and policies define "affordability" in terms of occupancy costs, including mortgages, rents and utility costs.
- Insulation represents only a small component of total construction costs. Insulation represents 0.017 of the cost of construction, according to a published survey. *"How Much Does It Cost To Build A House In 2023?"* https://www.forbes.com/home-improvement/contractor/cost-to-build-a-house/ Yet, unlike other housing construction costs, energy efficiency saves money for residents during many years of occupancy, making housing more affordable.
- There are programs in Virginia to assist low-income residents with costs of downpayments, mortgages and rents and to subsidize builders' construction of low-income housing. *See* JLARC, *Report to the Governor and the General Assembly, Affordable Housing in Virginia 2021.*

REC-R402.1.3-24

IECC: TABLE R402.1.3, R402.2.3.1; IRC: TABLE N1102.1.3 (R402.1.3), N1102.2.3.1 (R402.2.3.1)

Proponents: Andrew Clark, representing Home Builders Association of Virginia (aclark@hbav.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

TABLE R402.1.3 INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	0	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7 AND 8
Vertical fenestration *U*-factor	0.50	0.50	0.40	0.30	0.30	0.28[g]	0.28[g]	0.27[g]
Skylight *U*-factor	0.60	0.60	0.60	0.53	0.53	0.50	0.50	0.50
Glazed vertical fenestration SHGC	0.25	0.25	0.25	0.25	0.40	NR	NR	NR
Skylight SHGC	0.28	0.28	0.28	0.28	0.40	NR	NR	NR
Ceiling *R*-value	30	30	38	38	49	49	49	49
Insulation entirely above roof deck	25ci	25ci	25ci	25ci	30ci	30ci	30ci	35ci
Wood-framed wall *R*-value[e]	13 or 0&10ci	13 or 0&10ci	13 or 0&10ci	20 or 13&5ci or 0&15ci	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci
Mass wall *R*-value[f]	3/4	3/4	4/6	8/13	8/13	13/17	15/20	19/21
Floor *R*-value[h]	13 or 7+5ci or 10ci	13 or 7+5ci or 10ci	13 or 7+5ci or 10ci	19 or 13+5ci or 15ci	19 or 13+5ci or 15ci	30 or 19+7.5ci or 20ci	30 or 19+7.5ci or 20ci	38 or 19+10ci or 25ci
Basement wall *R*-value[b, e]	0	0	0	5ci or 13[d]	10ci or 13	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci
Unheated slab *R*-value & depth[c]	0	0	0	10ci, 2 ft	10ci, ~~3~~ 2 ft	10ci, ~~3~~ 2 ft	10ci, 4 ft	10ci, 4 ft
Heated slab *R*-value & depth[c]	R-5ci edge and R-5 full slab	R-5ci edge and R-5 full slab	R-5ci edge and R-5 full slab	R-10ci, 2 ft and R-5 full slab	R-10ci, 3 ft and R-5 full slab	R-10ci, 3 ft and R-5 full slab	R-10ci, 4 ft and R-5 full slab	R-10ci, 4 ft and R-5 full slab
Crawl space wall *R*-value[b, e]	0	0	0	5ci or 13[d]	10ci or 13	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci

For SI: 1 foot = 304.8 mm.

NR = Not Required, ci = Continuous Insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. “5ci or 13” means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

c. Slab insulation shall be installed in accordance with Section R402.2.10.1.

d. Basement wall insulation is not required in Warm Humid locations as defined by Figure R301.1 and Table R301.1.

e. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, “13&5” means R-13 cavity insulation plus R-5 continuous insulation.

f. Mass walls shall be in accordance with Section R402.2.6. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

g. A maximum *U*-factor of 0.30 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

   1. Above 4,000 feet in elevation.

   2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.

h. "30 or 19+7.5ci or 20ci" means R-30 cavity insulation alone or R-19 cavity insulation with R-7.5 continuous insulation or R-20 continuous insulation alone.

R402.2.3.1 Roof truss framing separating conditioned and unconditioned space. Where wood vertical roof truss framing members are used to separate *conditioned space* and unconditioned space, they shall comply with Table R402.1.3 for wood-framed walls. Steel frame vertical roof truss framing members used to separate *conditioned space* and unconditioned space shall comply with Section R402.2.7.

Exception: Attic knee walls and roof truss framing that comply with all of the following:

1. The attic knee wall or roof truss framing assembly is provided with an air barrier and is insulated to not less than R-15 in Climate Zone 3 and not less than R-20 in Climate Zones 4-6.

2. The attic knee wall or roof truss framing assembly is not more than 5 feet in height.

3. One additional credit is achieved above the minimum number of credits required by Section R408.

2024 International Residential Code

Revise as follows:

TABLE N1102.1.3 (R402.1.3) INSULATION MINIMUM *R*-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	0	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7 AND 8
VERTICAL FENESTRATION *U*-FACTOR	0.50	0.50	0.40	0.30	0.30	0.28[g]	0.28[g]	0.27[g]
SKYLIGHT *U*-FACTOR	0.60	0.60	0.60	0.53	0.53	0.50	0.50	0.50
GLAZED VERTICAL FENESTRATION SHGC	0.25	0.25	0.25	0.25	0.40	NR	NR	NR
SKYLIGHT SHGC	0.28	0.28	0.28	0.28	0.40	NR	NR	NR
CEILING *R*-VALUE	30	30	38	38	49	49	49	49
INSULATION ENTIRELY ABOVE ROOF DECK	25ci	25ci	25ci	25ci	30ci	30ci	30ci	35ci
WOOD-FRAMED WALL *R*-VALUE[e, h]	13 or 0&10ci	13 or 0&10ci	13 or 0&10ci	20 or 13&5ci[h] or 0&15ci[h]	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci	30 or 20&5ci or 13&10ci or 0&20ci
MASS WALL *R*-VALUE[f]	3/4	3/4	4/6	8/13	8/13	13/17	15/20	19/21
FLOOR *R*-VALUE [h]	13 or 7+5ci or 10ci	13 or 7+5ci or 10ci	13 or 7+5ci or 10ci	19 or 13+5ci or 15ci	19 or 13+5ci or 15ci	30 or 19+7.5ci or 20ci	30 or 19+7.5ci or 20ci	38 or 19+10ci or 25ci
BASEMENT WALL *R*-VALUE [b, e]	0	0	0	5ci or 13[d]	10ci or 13	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci
UNHEATED SLAB *R*-VALUE & DEPTH[c]	0	0	0	10ci, 2 ft	10ci, ~~3~~ 2 ft	10ci, ~~3~~ 2 ft	10ci, 4 ft	10ci, 4 ft
HEATED SLAB *R*-VALUE & DEPTH[c]	R-5ci edge and R-5 full slab	R-5ci edge and R-5 full slab	R-5ci edge and R-5 full slab	R-10ci, 2 ft and R-5 full slab	R-10ci, 3 ft and R-5 full slab	R-10ci, 3 ft and R-5 full slab	R-10ci, 4 ft and R-5 full slab	R-10ci, 4 ft and R-5 full slab
CRAWL SPACE WALL *R*-VALUE [b, e]	0	0	0	5ci or 13[d]	10ci or 13	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci	15ci or 19 or 13&5ci

For SI: 1 foot = 304.8 mm.NR = Not Required, ci = Continuous Insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.

b. "5ci or 13" means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.

c. Slab insulation shall be installed in accordance with Section N1102.2.10.1.

d. Basement wall insulation shall not be required in Warm Humid locations as defined by Figure N1101.7 and Table N1101.7.

e. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, "13&5" means R-13 cavity insulation plus R-5 continuous insulation.

f. Mass walls shall be in accordance with Section N1102.2.6. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.

g. A maximum *U*-factor of 0.30 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation.

2. In windborne debris regions where protection of openings is required by Section R301.2.1.2.

h. "30 or 19+7.5ci or 20ci" means R-30 cavity insulation alone or R-19 cavity insulation with R-7.5 continuous insulation or R-20 continuous insulation alone.

N1102.2.3.1 (R402.2.3.1) Roof truss framing separating conditioned and unconditioned space. Where wood vertical roof truss framing members are used to separate *conditioned space* and unconditioned space, they shall comply with Table N1102.1.3 for wood-framed walls. Steel frame vertical roof truss framing members used to separate *conditioned space* and unconditioned space shall comply with Section N1102.2.7.

Exception: Attic knee walls and roof truss framing that comply with all of the following:

1. The attic knee wall or roof truss framing assembly is provided with an air barrier and is insulated to not less than R-15 in Climate Zone 3 and not less than R-20 in Climate Zones 4-6.

2. The attic knee wall or roof truss framing assembly is not more than 5 feet in height.

3. One additional credit is achieved above the minimum number of credits required by Section N1108.

Reason Statement:

This proposal adopts revisions made to Table N1102.1.3 (R402.1.3) during the 2024 ICC code development process but also provides an additional 1ft reduction in depth requirements for unheated slabs in Climate Zones 4 and 5.

Table Formatting Revisions: Table N1102.1.3 reorganizes its format to align with the IECC Commercial tables, flipping rows and columns so climate zones appear in headers and assembly types in rows.

Incorporation of SHGC and Roof Insulation Values: The maximum solar heat gain coefficients (SHGCs) for skylights are now included within Table N1102.1.3 rather than as a footnote. R-value requirements for insulation installed entirely above the roof deck and separate R-value and depth requirements for heated and unheated slabs are now incorporated.

Changes to Fenestration and Floor Insulation Requirements

- In Climate Zones 5 through 8, vertical fenestration U-factors have been decreased to reduce heat loss through windows and doors in these cooler climates.
- Skylight U-factors in all climate zones have also been decreased.
- For floors above unconditioned spaces, the table now provides additional prescriptive R-value options similar to the expanded wood-framed wall insulation options of the 2021 IRC. These include requirements for cavity insulation only, continuous insulation only, and a combination of cavity and continuous insulation.

Alignment with Section N1108 and Ceiling R-Value Adjustments: The 2024 IRC includes a reduction in efficiency of ceiling R-values, reverting back to the requirements of the 2018 IRC. This allows designers and builders to make energy saving decisions based on the specific project. Ceiling insulation in Table R402.1.3 was reduced from R-49 to R-38 in climate zones 2 and 3 and reduced from R-60 to R-49 in climate zones 4 through 8. The associated ceiling U-factors were adjusted for the same climate zones in Table R402.1.2. The new U-factor is 0.030 for climate zones 2 and 3 and 0.026 for climate zones 4 through 8.

Changes to Footnotes: Footnote H added to Table N1102.1.3 to clarify cavity and continuous insulation requirements for floors. Footnotes related to SHGC and slab requirements have been removed as the information is now located in the table.

Alternative to Continuous Insulation in Attic Knee Walls: This amendment adds an alternate insulation method for shorter attic knee walls up to 5 feet in height. Energy neutrality is maintained by requiring an additional credit in section R408 that offsets energy impact. This option can be used to optimize costs and reduce complexity at the site by allowing cavity only insulation.

Cost Impact: The code change proposal will decrease the cost

Based on costs in the 2021 IECC Residential Cost Effectiveness Analysis from Home Innovation Research Labs, this amendment can save almost $1.50 per square foot of knee wall area in Climate Zones 4-6.

REC-R402.4.1.2-24

VRC: N1102.4.1.2, N1102.4.1.3; VCC: 1301.1.1.1

Proponents: Eric Lacey, representing Responsible Energy Codes Alliance (eric@reca-codes.com)

2021 Virginia Residential Code

Delete without substitution:

N1102.4.1.2 (R402.4.1.2) Testing. The building or *dwelling unit* shall be tested and verified as having an air leakage rate not exceeding 5 air changes per hour. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E779, or ASTM E1827 and reported at a pressure of 0.2 inches w.g. (50 Pa). A written report of the results of the test shall be signed by the party conducting the test and provided to the building official. Testing shall be conducted by a Virginia licensed general contractor, a Virginia licensed HVAC contractor, a Virginia licensed home inspector, a Virginia registered design professional, a certified BPI Envelope Professional, a certified HERS rater, or a certified duct and envelope tightness rater. The party conducting the test shall have been trained on the equipment used to perform the test. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.

Note: Should additional sealing be required as a result of the test, consideration may be given to the issuance of temporary certificate of occupancy in accordance with Section 116.1.1.

During testing:

1. Exterior windows and doors and fireplace and stove doors shall be closed, but not sealed beyond the intended weather stripping 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, if installed at the time of the test, shall be open;
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
6. Supply and return registers, if installed at the time of the test, shall be fully open.

Exception: When testing individual *dwelling units*, an air leakage rate not exceeding 0.30 cubic feet per minute per square foot [0.008 $m^3/(s \times m^2)$] 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 water gauge (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 m^2) or smaller.

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

N1102.4.1.3 (R402.4.1.3) Leakage rate. When complying with Section N1101.2.1 (R401.2.1), the building or *dwelling unit* shall have an air leakage rate not exceeding 5 air changes per hour in Climate Zones 3 through 5, when tested in accordance with Section N1102.4.1.2 (R402.4.1.2).

2021 Virginia Construction Code

Revise as follows:

1301.1.1.1 Changes to the *International Energy Conservation Code* (IECC). The following changes shall be made to the IECC :

19. Change Section R402.4.1.2 of the IECC to read:

R402.4.1.2 Testing. The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). A written report of the results of the test shall be signed by the party conducting the test and provided to the building official. Testing shall be conducted by a Virginia licensed general contractor, a Virginia licensed HVAC contractor, a Virginia licensed home inspector, a Virginia *registered design professional*, a certified BPI Envelope Professional, a certified HERS rater, or a certified duct and envelope tightness rater. The party conducting the test shall have been trained on the equipment used to perform the test. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.

Note: Should additional sealing be required as a result of the test, consideration may be given to the issuance of a temporary certificate of occupancy in accordance with Section 116.1.1 .

During testing:

1. Exterior windows and doors and 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, if installed at the time of the test, shall be open.
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.
5. Heating and cooling systems, if installed at the time of the test, shall be turned off.
6. Supply and return registers, if installed at the time of the test, shall be fully open.

20. Change Section R402.4.1.3 of the IECC to read:

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 3 through 5, when tested in accordance with Section R402.4.1.2 .

Reason Statement:

This proposal would improve the efficiency and durability of residential buildings and help maintain healthier indoor air quality by incorporating the air leakage testing requirements of the 2024 IECC into Virginia's code. Since the 2012 edition, the IECC has required all new residential dwellings in Virginia's climate zones to be tested and to verify a maximum total envelope leakage of 3.0 ACH50. However, Virginia did not adopt a testing requirement until the 2018 edition of the VCC, and set the maximum leakage allowance at 5.0 ACH50. That requirement remained unchanged in the 2021 VCC update, even though the 2021 IECC adopted additional flexibility that allows code users several alternatives for meeting the air tightness requirements. We believe Virginia is ready to catch up with the IECC envelope air leakage requirements. A well-sealed, verified thermal envelope will provide energy savings and promote better indoor air quality over the 70- to 100-year useful life of the home.

This proposal intends to delete the VA-specific amendments in order to incorporate the 2024 IECC air leakage testing requirements as published. This would result in the following changes:

1. All new dwelling units would be required to be air leakage tested, but the maximum allowable leakage for prescriptive compliance would improve from 5.0 ACH50 to 3.0 ACH50 in all Virginia climate zones.

2. The performance path baseline (R405) would be set at 3.0 ACH50, but dwellings could test as high as 5.0 ACH50 as long as efficiency losses are accounted for in other efficiency improvements. This allows considerable flexibility for code users who still find it challenging to achieve 3.0 ACH50, while maintaining the same overall efficiency required by the code.

3. Multifamily dwelling units (of any size) and buildings with 1500 square feet or less of conditioned floor area have the option to be tested to 0.27 cfm/min/ft2 of testing unit enclosure area. This will help address the challenges of achieving low ACH in smaller dwellings.

Cost Impact: The code change proposal will increase the cost

It is possible that some additional time or materials will be required to achieve the lower air leakage number; however, we note that the largest cost is typically the cost of the blower door test itself, which is already required under the VA UCC.

REC-R402.4.1.2(1)-24

VCC: 1301.1.1.1

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2021 Virginia Construction Code

Revise as follows:

1301.1.1.1 Changes to the *International Energy Conservation Code* (IECC). (Portions of code section not shown remain unchanged.) The following changes shall be made to the IECC :

19. ~~Change Section R402.4.1.2 of the IECC to read:~~

    ~~**R402.4.1.2 Testing.** The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). A written report of the results of the test shall be signed by the party conducting the test and provided to the building official. Testing shall be conducted by a Virginia licensed general contractor, a Virginia licensed HVAC contractor, a Virginia licensed home inspector, a Virginia *registered design professional*, a certified BPI Envelope Professional, a certified HERS rater, or a certified duct and envelope tightness rater. The party conducting the test shall have been trained on the equipment used to perform the test. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.~~

    ~~**Note:** Should additional sealing be required as a result of the test, consideration may be given to the issuance of a temporary certificate of occupancy in accordance with Section 116.1.1 .~~

    ~~**During testing:**~~

    1. ~~Exterior windows and doors and 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, if installed at the time of the test, shall be open.~~
    4. ~~Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.~~
    5. ~~Heating and cooling systems, if installed at the time of the test, shall be turned off.~~
    6. ~~Supply and return registers, if installed at the time of the test, shall be fully open.~~

20. ~~Change Section R402.4.1.3 of the IECC to read:~~

    ~~**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 3 through 5, when tested in accordance with Section R402.4.1.2 .~~

Reason Statement:

The purpose of this proposal is to bring Virginia's standards for air leakage rates into compliance with the 2024 IECC.

Virginia needs to adopt the IECC's 3.0 ACH (or 3 ACH50) air leakage standard, which has been in the national code since the 2012 IECC update. There is no valid reason for Virginia to continue a prescriptive air leakage standard that dates back to 2009.

The 2024 IECC is the fifth consecutive IECC to set the prescriptive standard for Virginia's climate zones at a maximum of 3.0 ACH. The IECC would not have repeatedly prescribed a 3.0 ACH maximum if actual experience had demonstrated that compliance was either impractical or raised costs or burdens that outweighed the benefits. The IECC has had four cycles, since 2012, to raise the ACH from 3.0 to 5.0, but it has not done so.

Tightening building air sealing to 3.0 ACH is important to residents—both owners and tenants--, since it would help them save money, and experience greater comfort and a healthier home for decades after the dwelling is built. Virginia's 5.0 ACH standard allows 67% more air changes per hour than the IECC's 3.0 ACH standard.

Tightening prescriptive construction standards to 3.0 ACH will help to

(a) reduce occupancy costs, including for heating and conditioning of air in the dwelling,
(b) reduce exposure to mold that can build up in walls,
(c) increase residents' comfort,
(d) increase physical and economic resiliency to power outages, climate change and rising energy prices,
(e) reduce gaps for pests to enter the dwelling,
(f) reduce pressure on utilities to raise rates in order to build and operate more energy delivery capabilities, and
(g) reduce the air pollution that drives climate impacts and other harms to Virginia's health, property and economy.

It is noteworthy that, while the 2024 IECC retains the 3.0 ACH prescriptive standard, It also **offers builders some flexibility to trade efficiency measures, including to allow up to 4.0 ACH of air leakage, when implementing Simulated Building Performance and ERI implementation methods. However, the 2024 IECC's addition of trading flexibility is premised on full adoption of the IECC's prescriptive baseline code, including 3.0 ACH.**

Legal Standards. Remaining at 5.0 ACH level would leave Virginia's building code out of compliance with statutory standards. **Sections 36-99A and 36-99B of the Virginia Code make clear that building codes are required to "protect the health, safety and welfare of the residents of the Commonwealth" and that adjustments to reduce construction costs must nevertheless be "consistent with recognized standards of health, safety, energy efficiency and water efficiency."** **H2227**, which was enacted in 2021, calls for adoption of energy efficiency standards that are **"at least as stringent" as the latest IECC considering factors such as consumer costs "over time" and air pollution.** VIRGINIA ACTS OF ASSEMBLY – 2021 SPECIAL SESSION I, CHAPTER 425, Section 1 (referred to herein as "H2227"). Thus, like energy costs over time, pollution is a named factor to be considered in connection with building code efficiency standards.

Broad Consensus. There is a broad consensus among recognized standards that tighter sealing of walls protects the health, safety and welfare of residents, and some recognized programs have stricter standards, which is part of why the IECC has incorporated the 3.0 ACH prescriptive standard in five consecutive IECC cycles from 2012-2024.

> In its commentary on its 2024 ACH levels for new residential construction, the ICC explains the importance of its air leakage standards: "**Insulation alone is not enough to moderate indoor temperatures. Sealing the building envelope is critical to good thermal performance of the building.** Insulation is important because it traps pockets of air creating stagnant air resistant to temperature change, but the air barrier is needed to stop the movement of air from scrubbing away those pockets of air. **Regardless of the compliance option chosen in Section R401.2, air leakage limits apply, and all air leakage requirements of this section must be met**." Citing EPA, the IECC commentary states that air leakage "can account for 25 to 40 percent of the energy used for heating and cooling in a typical residence." (ICC, 2024 IECC Code and Commentary.)
>
> In EnergyStar: A complete Thermal Enclosure System (2017), EPA advised: "The energy savings from comprehensive air sealing can quickly add up when you consider all the places hot or cool air can enter or escape from your home. Having a well-sealed home also means better air quality because dirt, pollen, pests, and moisture can't get in as easily. In addition, good sealing practices help protect your home against mold and moisture damage that can be caused by condensation."
>
> Even the NAHB has advised builders of the importance of air sealing and strategies to go below 3.0 ACH. See NAHB, et al., "TechNote – Building Tightness Code Compliance & Air Sealing Overview", which (a) states "Air leakage in a building should be minimized;" (b) identifies benefits to residents including ""Heating & cooling energy savings; Reduced potential for moisture movement through the building thermal enclosure; Improved insulation effectiveness and reduced risk of ice dams; Reduced peak heating and cooling loads resulting in smaller HVAC equipment; Improved comfort (reduces drafts and noise); Improved indoor air quality (limits contaminants from garages, crawl spaces, attics, and adjacent units)" and (c) suggests a possible construction strategy with a goal of 2.5 ACH – stricter than the IECC.

The feasibility of meeting a 3.0 ACH standard is underscored by the IECC's repeated adoption of 3.0 ACH for Virginia's climate zones; by its adoption of a 2.5 ACH standard for Climate Zones north of Virginia's; by use of 3.0 in the EnergyStar program; by DOE's use of tighter standards in its net-zero ready program (2.5 ACH for CZ3-4 and 2.0 for CZ 5); and by the PassiveHouse standard of 0.6 ACH for its program.[1]

Cost and energy savings. Beginning with its review of the 2012 IECC, in which the 3.0 ACH standard was first adopted, the U.S. Department of Energy and the Pacific Northwest National Laboratories (collectively DOE) has found that residents would save money from full implementation of each IECC update from 2012-2024 even after considering incremental purchase and mortgage costs. Focusing on the three most significant IECC updates containing the 3.0 ACH standard, DOE found that, over 30 years, lifecycle savings (i.e., net of additional purchase and mortgage costs): **full implementation of the 2012 IECC** (which introduced the 3.0 ACH requirement for Virginia's climate zone) would have saved average Virginia residents **$5,836**; **full implementation of the 2021 IECC** would have save Virginia residents **$8,376**; and full implementation of the 2024 IECC would save Virginia residents of Virginia's Climate Zone 4 **$3,790 and Zones 2 and 5 an average of $2,502 compared to 2021 IECC**. Savings would have been achieved year in and year out, with rapid payback and lasting for decades. [2]

Collectively, Virginians would save billions of dollars in energy costs from full implementation of the IECC, greatly benefiting residents and Virginia's economy. In its July 2021 report on "Cost-Effectiveness of the 2021 IECC for Residential Buildings in Virginia" (PNNL-31627), PNNL found that aggregate energy cost savings for Virginia residents from adopting the full 2021 IECC would be $7,192,000 in the first year and $2,487,000,000 over 30 years. Virginia would achieve substantial pollution reductions and add jobs.

Pollution Reductions. DOE has also repeatedly found that full compliance with the IECC's updates will reduce energy use and air pollution, including greenhouse gas pollution, which is critical to Virginians' future. Energy use in buildings is one of the largest drivers of CO2 emissions in Virginia. By cutting energy usage, **full implementation of the IECC's efficiency standards without weakening amendments would reduce air pollution, including greenhouse gas pollution that is driving climate change**. DOE found that full implementation of the 2024 IECC alone would reduce carbon emissions by 6.5% compared to the 2021 IECC, and the 2021 IECC would reduce carbon emissions by 8.7% compared to the prior IECC. (Full implementation of just the 2021 IECC "**will reduce statewide CO2 emissions over 30 years by 28,420,000 metric tons,** equivalent to the annual CO2 emissions of 6,181,000 cars on the road (1 MMT CO2 = 217,480 cars driven/year).") Applying the social cost of carbon to the CO2 reductions recognizes huge economic savings from to Virginia and the U.S. [3]

The accumulation of more efficient buildings over years will have significant impacts on reducing future climate and other pollution. Conversely, allowing less efficient new building to be constructed under weaker building code standards will have the opposite effect: driving up pollution and climate driven harms to all Virginians.

Climate change is already harming Virginia, and the harms will get much worse if we do not sharply reduce GHG emissions (particularly CO2 and methane). Growing climate dangers include harms to communities, infrastructure, people, property and the economy from rising seas, worsening storms and more severe rainfall events. Growing dangers also include rising atmospheric and water temperatures that threaten worsening heat-related illnesses, limits on economic activity, agriculture, fisheries, and our natural heritage. The likelihood of mitigating and recovering from those harms declines the longer we delay maximizing energy efficiency and minimizing GHG pollution.

--[1] See IECC; https://basc.pnnl.gov/information/infiltration-meets-ach50-requirements ; http://passivehousebuildings.com/books/phc-2019/five-principles-of-passive-house-design-and-construction/ .

--[2] The U.S. Department of Energy found that full compliance with the 2012 IECC would save money and benefit residents compared to earlier standards. DOE/PNNL, National Energy Cost Savings for New Single and Multifamily Homes, A Comparison of the 2006, 2009, and 2012 Editions of the IECC, https://www.energycodes.gov/sites/default/files/documents/NationalResidentialCostEffectiveness.pdf DOE found that the 2024 and 2021 IECC updates would reduce energy use and save money over the life of the dwelling, even after considering mortgage costs. U.S. Department of Energy, **Energy Savings Analysis: 2024 IECC for Residential Buildings** (Dec. 2024); DOE/PNNL, **Cost-Effectiveness of the 2021 IECC for Residential Buildings in Virginia** (July 2021), https://www.energycodes.gov/national-and-state-analysis. Following promulgation of the 2012 IECC, DOE found that the 2012 IECC changes improved efficiency and were cost effective for occupants because they saved money year after year for decades, more than recouping the cost of construction. DOE/PNNL, **National Energy Cost Savings for New Single and Multifamily Homes, A Comparison of the 2006, 2009, and 2012 Editions of the IECC**, https://www.energycodes.gov/sites/default/files/documents/NationalResidentialCostEffectiveness.pdf See also https://www.energycodes.gov/determinations

--[3] PNNL, Impacts of Model Building Energy Codes (Nov. 2023) (estimating climate and health benefits in excess of $40,000,000,000 2010-2040 from residential energy building codes). See Notes [1][2] and PNNL report cited above.

Cost Impact: The code change proposal will increase the cost

Bringing Virginia in line with the IECC's 3.0 ACH air leakage standards may modestly increase the cost of construction, but those costs will be outweighed by reduced occupancy costs and improved health, comfort and resiliency for residents. The excess of benefits over costs is why the IECC has required 3.0 ACH for Virginia's Climate Zones for 5 consecutive updates: 2012-2024. (See Reason Statement, above.)

The costs of additional caulking, weather-stripping, gaskets, taping and other sealing measures are very limited, since workers will be on site, and the quantity of additional material is small. Planning, care and attention by builders during the framing, insulating and sealing processes is mainly what is needed to achieve the 3.0 ACH standard.

According to GreenBuildingAdvisor, "Once builders get their crews trained, 3 ACH50 should cost them the same as 5 or 7 ACH50." https://www.greenbuildingadvisor.com/article/how-much-air-leakage-in-your-home-is-too-much

Having had more than a decade to train their crews to seal gaps and to meet blower door tests, Virginia builders should be fully capable of meeting the 3.0 ACH prescriptive standard. In addition to the time since the IECC's 2012 adoption of 3.0 ACH, Virginia builders will have a year from the effective date of Virginia's 2024 update to adjust their construction practices to meet the long-recognized model standard.

Under the 2024 IECC, cost impacts can also mitigated by the 2024 IECC's permitting builders to go to 4.0 ACH with trading options for Simulated Performance and ERI compliance paths. However, that flexibility was premised upon full implementation of the IECC's prescriptive standards.

Achieving 3.0 ACH or better during initial construction is critical. Leaving buyers to retrofit after a house has been purchased would be very expensive since it would require the owner to reopen, close and refinish walls, replace windows and doors, etc. In addition to energy cost saving, comfort and health benefits from achieving 3.0 ACH, minimizing the need for future retrofits and repairs should be recognized as a cost benefit to residents.

REC-R403.14-24

IECC: R403.14 (N1103.14) (New)

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2024 International Energy Conservation Code [RE Project]

Add new text as follows:

R403.14 (N1103.14) Ceiling fans. R403.14 (N1103.14). A ceiling fan (with variable speeds and reversible direction) shall be installed in each bedroom.

Exception: such fans are not required in rooms with ceilings less than 8 feet high.

Reason Statement:

Ceiling fans save energy and energy costs, while improving comfort for residents. They are an inexpensive, well-established technology. While distributing air with a ceiling fan will can improve comfort in any occupied room, this proposal is limited to bedrooms, which are occupied for sustained periods every night.

The U.S. Department of Energy (https://www.energy.gov/energysaver/fans-cooling) states:

"Ceiling fans are the most effective type of circulating fan. They help improve comfort year-round by effectively circulating air throughout a room.

- **Summer Use:** Run ceiling fans counterclockwise to create a cooling breeze.
- **Winter Use:** Reverse the direction to clockwise and set to low speed to circulate warm air from the ceiling down to living spaces.
- **Energy Savings:** Using a ceiling fan allows you to raise the thermostat setting by about 4°F without reducing comfort. In moderate climates, ceiling fans can sometimes replace air conditioning altogether."

The potential energy and energy-cost savings are very large when residents have the ability to live comfortably with temperatures set up to 4°F higher during the summer air-conditioning season. The benefits from ceiling fans will grow as climate change extends and exacerbates the annual air-conditioning season. As noted by DOE, winter demand can be reduced as well as summer demand.

Reduced demands for electricity will also reduce the driver of utilities' capital and operating costs. That will reduce rates for all customers and reduce utilities' need for intrusive and harmful construction projects to build or modify generation, transmission, distribution. Those reductions will benefit all Virginians.

Cost Impact: The code change proposal will increase the cost

Installing ceiling fans will modestly increase costs of construction but it will save money and improve comfort for residents for many years. The ability to reduce air conditioning demands by up to 4.0 F degrees will provide large savings for occupants and for utilities.

Ceiling fan with variable speeds and reversible directions can be purchased at retail for under $60 on Amazon or under $66 at Lowes, and installation is no different from (and can even replace with a fan-and-light) installing a ceiling light. https://www.amazon.com/s?k=ceiling+fans+for+bedroom&crid=7S8YNULXX7R4&sprefix=ceiling+fans%2Caps%2C189&ref=nb_sb_ss_p13n-expert-pd-ops-ranker_10_12 ; https://www.lowes.com/pl/ceiling-fans/indoor/4294395604-2003401792

REC-R404.1-24

IRC: N1104.1 (R404.1); IECC: R404.1

Proponents: Andrew Clark, representing Home Builders Association of Virginia (aclark@hbav.com)

2024 International Residential Code

Revise as follows:

N1104.1 (R404.1) Lighting equipment. Not less than 90 percent of the ~~All~~ permanently installed luminaires shall be capable of operation with an efficacy of not less than 45 lumens per watt or shall contain lamps capable of operation with an efficacy of not less than 65 lumens per watt.

Exceptions:

1. Appliance lamps
2. Antimicrobial lighting used for the sole purpose of disinfecting
3. General service lamps complying with DOE 10 CFR, Part 430.32.
4. Luminaires with a rated electric input of not greater than 3.0 watts.

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R404.1 Lighting equipment. Not less than 90 percent of the ~~All~~ permanently installed luminaires shall be capable of operation with an efficacy of not less than 45 lumens per watt or shall contain lamps capable of operation with an efficacy of not less than 65 lumens per watt.

Exceptions:

1. Appliance lamps
2. Antimicrobial lighting used for the sole purpose of disinfecting.
3. General service lamps complying with DOE 10 CFR, Part 430.32.
4. Luminaires with a rated electric input of not greater than 3.0 watts.

Reason Statement: This proposal restores the 10% allowance from the 2018 Code permitting a limited number of lighting sources that do not meet the current definition of high-efficacy lighting sources. The allowance is restored to provide design flexibility.

Cost Impact: The code change proposal will not increase or decrease the cost

The proposed code change may result in a modest reduction in construction costs; however, its primary benefit is the increased design flexibility it provides.

REC-R404.2-24

IECC: SECTION 202, R404.2, R404.2.1, R404.2.2; IRC: SECTION 202, N1104.2 (R404.2), N1104.2.1 (R404.2.1), N1104.2.2 (R404.2.2)

Proponents: Andrew Clark, representing Home Builders Association of Virginia (aclark@hbav.com)

2024 International Energy Conservation Code [RE Project]

Delete without substitution:

~~**AUTOMATIC SHUTOFF CONTROL.** A device capable of automatically turning loads off without *manual* intervention. *Automatic shutoff controls* include devices such as, but not limited to, occupancy sensors, vacancy sensors, door switches, programmable time switches (i.e., timeclocks), or count-down timers.~~

~~**R404.2 Interior lighting controls.**. All permanently installed luminaires shall be controlled as required in Sections R404.2.1 and R404.2.2.~~

~~**Exception:** Lighting controls shall not be required for safety or security lighting.~~

~~**R404.2.1 Habitable spaces.** All permanently installed luminaires in habitable spaces shall be controlled with a *manual dimmer* or with an *automatic* shutoff control that automatically turns off lights within 20 minutes after all occupants have left the space and shall incorporate a *manual* control to allow occupants to turn the lights on or off.~~

~~**R404.2.2 Specific locations.** All permanently installed luminaires in garages, unfinished basements, laundry rooms and utility rooms shall be controlled by an *automatic* shutoff control that automatically turns off lights within 20 minutes after all occupants have left the space and shall incorporate a *manual* control to allow occupants to turn the lights on or off.~~

2024 International Residential Code

Delete without substitution:

~~**[RE] AUTOMATIC SHUTOFF CONTROL.** For the definition applicable in Chapter 11, see Section N1101.6.~~

~~**N1104.2 (R404.2) Interior lighting controls.** All permanently installed luminaires shall be controlled as required in Sections N1104.2.1 and N1104.2.2.~~

~~**Exception:** Lighting controls shall not be required for safety or security lighting.~~

~~**N1104.2.1 (R404.2.1) Habitable spaces.** All permanently installed luminaires in *habitable spaces* shall be controlled with a *manual dimmer* or with an *automatic shutoff control* that automatically turns off lights within 20 minutes after all occupants have left the space and shall incorporate a *manual* control to allow occupants to turn the lights on or off.~~

~~**N1104.2.2 (R404.2.2) Specific locations.** All permanently installed luminaires in garages, unfinished *basements*, laundry rooms and utility rooms shall be controlled by an *automatic shutoff control* that automatically turns off lights within 20 minutes after all occupants have left the space and shall incorporate a *manual* control to allow occupants to turn the lights on or off.~~

Reason Statement:

This proposal seeks to simplify the interior residential lighting provisions of the code by removing the 2021 requirements mandating interior lighting controls in the form of a “dimmer, an occupant sensor, or another control,” as well as the 2024 IRC/IECC provisions requiring dimmers or automatic shutoff controls for all permanently installed luminaires in habitable spaces and automatic shutoff controls with manual on/off options in garages, basements, laundry rooms, and utility rooms. Removing these provisions restores consumer choice and design flexibility, without jeapordizing energy savings from the expanded use of hig-efficacy lighting sources.Limited Energy

Savings:

Limited Energy Savings: A report by the Washington State University Energy Program found that energy savings from increased use of residential lighting controls are significantly lower than those achieved through the high-efficacy lighting sources already required under the Virginia Residential Code (N1104.1/R404.1). As high-efficacy lamps have become standard, the marginal benefit of additional control strategies continues to decline, providing little measurable improvement in overall residential energy performance. The report also cited U.S. Department of Energy analysis showing that properly controlled exterior residential lighting offers far greater savings potential than interior controls, reducing energy use by up to 36%. (Source: Washington State University Energy Program).

Uncertainty about compliant control types: The 2021 VRC requires all permanently installed lighting fixtures to be controlled by a dimmer or an occupant sensor control, yet also allows for the use of "another control" that is installed and built into the fixture. Without further clarification, this term can be interpreted to include a standard on/off switch, effectively negating the intended requirement.

Unclear Applicability: The 2021 VRC lists specific exceptions for certain areas—bathrooms, hallways, exterior fixtures, and safety or security lighting—but provides no clear guidance on other common spaces such as closets, laundry rooms, mudrooms, garages, pantries, and utility rooms. The revisions introduced in the 2024 IECC further build upon this lack of clarity, expanding control requirements without resolving how they apply to these common residential areas.

Cost Impact: The code change proposal will decrease the cost

Proposal will decrease construction costs

REC-R404.5-24

IECC: 404.5 (N1104.5) (New), 404.5.1 (N1104.5.1) (New), 404.5.2 (N1104.5.2) (New), 404.5.2.1 (N1104.5.2.1) (New), 404.5.2.2 (N1104.5.2.2) (New), 404.5.2.3 (N1104.5.2.3) (New), 404.5.2.4 (N1104.5.2.4) (New), 404.5.2.5 (N1104.5.2.5) (New)

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2024 International Energy Conservation Code [RE Project]

Add new text as follows:

404.5 (N1104.5) ELECTRIC VEHICLE POWER TRANSFER.

404.5.1 (N1104.5.1) Definitions.

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

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

ELECTRIC VEHICLE CAPABLE SPACE (EV CAPABLE SPACE). A designated automobile parking space that is provided with electrical infrastructure such as, but not limited to, raceways, cables, electrical capacity, a panelboard or other electrical distribution equipment space necessary for the future installation of an EVSE.

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

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). Equipment for plug-in power transfer, including ungrounded, grounded and equipment grounding conductors; electric vehicle connectors; attached plugs; any personal protection system; and all other fittings, devices, power outlets or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the electric vehicle.

ELECTRIC VEHICLE SUPPLY EQUIPMENT INSTALLED SPACE (EVSE SPACE). An automobile parking space that is provided with a dedicated EVSE connection.

404.5.2 (N1104.5.2) Electric vehicle power transfer infrastructure. New residential automobile parking spaces for residential buildings shall be provided with electric vehicle power transfer infrastructure in accordance with Sections R404.5.2.1 through R404.5.2.5.

404.5.2.1 (N1104.5.2.1) Quantity.

New one- and two-family dwellings and townhouses with a designated attached or detached garage or other on-site private parking provided adjacent to the dwelling unit shall be provided with one EV capable, EV ready or EVSE space per dwelling unit. R-2 occupancies or allocated parking for R-2 occupancies in mixed-use buildings shall be provided with an EV capable space, EV ready space or EVSE

space for 40 percent of the dwelling units or automobile parking spaces, whichever is less; provided that the required number of served spaces shall be reduced to the extent that shared charging facilities are planned and designed to serve vehicles owned by occupants of multiple dwelling units.

Exceptions:

1. Where the local electric distribution entity certifies in writing that it is not able to provide 100 percent of the necessary distribution capacity within 2 years after the estimated certificate of occupancy date, the required EV charging infrastructure shall be reduced based on the available existing electric distribution capacity.

2. Where substantiation is approved that meeting the requirements of Section R404.5.2.5 will alter the local utility infrastructure design requirements on the utility side of the meter so as to increase the utility side cost to the builder or developer by more than $450 per dwelling unit.

3. To the extent the number of EVSE charging spaces must be reduced to comply with applicable fire safety codes.

404.5.2.2 (N1104.5.2.2) EV Capable Spaces.
R404.5.2.2 (N1104.5.2.2)EV capable spaces.

Each EV capable space used to meet the requirements of Section R404.5.2.1 shall comply withall of the following:

1. A continuous raceway or cable assembly shall be installed between a suitable panelboard or other on-site electrical distribution equipment and an enclosure or outlet located within 6 feet (1828 mm) of the EV capable space.

2. The installed raceway or cable assembly shall be sized and rated to supply a minimum circuit capacity in accordance with Section R404.5.2.5.

3. The electrical distribution equipment to which the raceway or cable assembly connects shall have sufficient dedicated space and spare electrical capacity for a two-pole circuit breaker or set of fuses.

4. The electrical enclosure or outlet and the electrical distribution equipment directory shall be marked: “For future electric vehicle supply equipment (EVSE).”

404.5.2.3 (N1104.5.2.3) EV Ready Spaces.
Each branch circuit serving EV ready spaces shall comply withall of the following:

1. Termination at an outlet or enclosure, located within 6 feet (1828 mm) of each EV ready space it serves and marked “For electric vehicle supply equipment (EVSE).”

2. Service by an electrical distribution system and circuit capacity in accordance with Section R404.5.2.5.

3. Designation on the panelboard or other electrical distribution equipment directory as “For electric vehicle supply equipment (EVSE).”

404.5.2.4 (N1104.5.2.4) EVSE Spaces.
An installed EVSE with multiple output connections shall be permitted to serve multiple EVSE spaces. Each EVSE serving either a single

EVSE space or multiple EVSE spaces shall comply with the following:

1. Be served by an electrical distribution system in accordance with Section R404.5.2.5.

2. Have a nameplate charging capacity of not less than 6.2 kVA (or 30A at 208/240V) per EVSE space served. Where an EVSE serves three or more EVSE spaces and is controlled by an energy management system in accordance with Section R404.5.2.5, the nameplate charging capacity shall be not less than 2.1 kVA per EVSE space served.

3. Be located within 6 feet (1828 mm) of each EVSE space it serves.

4. Be installed in accordance with NFPA 70 and be listed and labeled in accordance with UL 2202 (Electric Vehicle (EV) Charging System Equipment—with revisions through February 2018) or UL 2594 (Standard for Electric Vehicle Supply Equipment Standard for Electric Vehicle Supply Equipment.)

404.5.2.5 (N1104.5.2.5) Electrical distribution system capacity.
The branch circuits and electrical distribution system serving each EV capable space, EV ready space and EVSE space used to comply with Section R404.5.2.1 shall comply with one of the following:

1. Sized for a calculated EV charging load of not less than 6.2 kVA per EVSE, EV ready or EV capable space. Where a circuit is shared or managed, it shall be in accordance with NFPA 70.

2. The capacity of the electrical distribution system and each branch circuit serving multiple EVSE spaces, EV ready spaces or EV capable spaces designed to be controlled by an energy management system in accordance with NFPA 70 shall be sized for a calculated EV charging load of not less than 2.1 kVA per space. Where an energy management system is used to control EV charging loads for the purposes of this section, it shall not be configured to turn off electrical power to EVSE or EV used to comply with Section R404.5.2.1.

Reason Statement:

The purpose of this proposal is to incorporate into Virginia's residential building code the substance of 2024 IECC's Appendix RE which spells out requirements to install electric vehicle charging infrastructure in connection with new residential construction. Appendix RE comes with the 2024 IECC, but activation of Appendix RE requires inserting language into the Virginia Construction Code for residential construction, which this proposal would do by adding a new Section R404.5 and N1104.5.

The terms of Appendix RE are modified by (a) allowing the number of served spaces for R2 occupancies to be reduced by use of shared charging spaces and (b) the number of charging spaces shall be reduced to the extent required by any restrictions imposed by fire safety regulations.

Adoption of this proposal would benefit residents of new buildings by facilitating convenient electric vehicle charging, which can readily be expanded as the need grows. Implementation would benefit residents and the public with cost savings, pollution reduction (including greenhouse gases, ozone and carbon monoxide) and more equitable access to EVs and EV charging for residents. It would avoid the much higher costs of having to retrofit parking areas and building electrical systems.

Under Section 405, builders would be able to choose among three levels of EV charging readiness: EV Capable Space (raceway and basic infrastructure for future installation of a branch circuit and charger); or EV Ready Space (basic infrastructure plus a branch circuit, outlet, junction box or receptacle); or EVSE Space (includes actual charging).

The optionality allows builders to minimize construction costs while still making easier and much less costly for the owner to add an EV charger in the future. As explained in the IECC Commentary, "EV capable spaces are the first step towards the preparation of future

electric vehicle charging infrastructure. The raceways, electrical capacity, and panelboard placed and sized accordingly will ease future installations and reduce future costs."

By agreement among members of the ICC's committee to develop the 2024 IECC, these EV charging requirements were to have been included in the main body of the 2024 IECC (as proposed here). It was shifted to an appendix on appeal but activating an appendix requires text in the code itself.

It would serve Virginians' near and long-term interest to require minimum levels of EV charging infrastructure in new construction. Given the savings to vehicle users and the pollution reduction benefits to the community, requiring installation of EV charging infrastructure is just as appropriate as it is for the building code to require lighting and other electric infrastructure for lighting and future equipment (HVAC, appliances, etc.), as well as safety measures like carbon monoxide alarms needed for houses with garages for traditional gas/diesel fired vehicles.

EVs have many economic and health benefits for vehicle users, and assuring installation of basic electric infrastructure to serve EVs as their usage grows will best serve Virginia and its residents. EVs are cheaper to use and maintain compared to vehicles with internal combustion engines (ICE).

At-home charging is important for EV owners. It accounts for approximately 80% EV charging today and is much more convenient than searching for public chargers. However, many EV owners and potential buyers do not have EV infrastructure at their dwellings or even the potential to install charging in the future. That is a barrier to EV adoption and the inherent benefits of EVs for residents.

Growing EV usage is very important to Virginia. As explained in the ICC commentary accompanying the 2024 IECC, "The U.S. transportation sector accounted for 29 percent of the nation's greenhouse gas (GHG) emissions in 2019." That is specifically due to the traditional predominance of vehicles with internal combustion engines (ICE). Greenhouse gases from charging and operating EVs are less than 30% of GHG emissions from fueling and operating ICE vehicles. https://theicct.org/why-evs-are-already-much-greener-than-combustion-engine-vehicles-jul25/ Emissions will go down further as the electric system adopts more to zero-carbon energy sources. EVs are also far more energy efficient than burning fuels in vehicle engines.

Reducing GHG emissions is a stated policy goal in Virginia law because climate change is a current and growing danger for Virginians. (See., e.g., § 45.2-1706.1. Commonwealth Clean Energy Policy. "A. The Commonwealth recognizes that effectively addressing climate change and enhancing resilience will advance the health, welfare, and safety of the residents of the Commonwealth. The Commonwealth further recognizes that addressing climate change requires reducing greenhouse gas emissions across the Commonwealth's economy sufficient to reach net-zero emission by 2045 in all sectors, including the electric power, transportation, industrial, agricultural, building, and infrastructure sectors….") Virginia faces growing threats, including more heat-illnesses, disruption of outdoor work, worsening storms, flooding, sea level rise, supply-chain disruption, damage to crops, trees and natural resources, arrival of diseases and pests, etc.

Bringing on EVs will also reduce other air pollutants that also threaten Virginian's health and welfare. ICE vehicles are a major source of ozone and other pollutants, including carbon monoxide risks in homes with garages.

Providing EV electric infrastructure as part of new construction is no different from the building code's requiring electrical infrastructure for HVAC and other appliances likely to be used in the future or from its requiring more efficient equipment in homes (heat pumps, high-efficiency appliances and lighting). (The infrastructure for future EV charging could be used for other purposes if a resident were to choose to do so.)

Facilitating adoption of EVs requires that drivers have access to convenient, cost-effective EV charging. That can most easily be provided as part of new construction. It is very costly and complicated to renovate EV charging infrastructure into existing buildings. In the absence of a raceway from the electric panel to the garage, retrofitting would require reopening and repairing walls, which is very expensive and disruptive. Expanding EV charging at home is important and cannot be replicated by the slow process of trying to grow a highway-based charging system. That is why so much charging occurs at home.

The importance of incorporating into new construction is particularly great in the case of buildings whose parking is governed by condominium or common-interest-area boards. The high costs of retrofitting is a particularly large and a common barrier in apartment buildings where residents' choices are restricted by the need for third-party approvals and possible financial interests.

Cost Impact: The code change proposal will increase the cost

The cost of installing infrastructure would depend on the builder's choice among the three levels of EV charging readiness, which are provided by this proposal. The costs would be minimal for an EV Capable Space and not much more for the EV Ready Space option if the panel box is in or near a garage or outdoor parking space and low regardless of the location. The costs could be under $100 per

garage. Upstream costs would also provide an exception to the requirements. Since electricity will be installed anyway (e.g. for garage or parking lighting at a minimum), it would not be difficult or costly to go the extra steps during building construction—far less than undertaking to install EV charging capabilities as a retrofit.

REC-R405.2-24

IRC: N1105.2 (R405.2), TABLE N1105.4.2(1) [R405.4.2(1)]

Proponents: Eric Lacey, representing Responsible Energy Codes Alliance (eric@reca-codes.com)

2024 International Residential Code

Revise as follows:

N1105.2 (R405.2) Simulated building performance compliance. Compliance based on *simulated building performance* requires that a *building* comply with the following:

1. The requirements of the sections indicated within Table N1105.2.

2. The proposed total *building thermal envelope* thermal conductance (TC) shall be less than or equal to the required total *building thermal envelope* TC using the prescriptive *U-factors* and *F-factors* from Table N1102.1.2 multiplied by 1.08 in *Climate Zones* 0, 1 and 2, and 1.15 in Climates Zones 3 through 8, in accordance with Equation 11-6 and Section N1102.1.5. The area-weighted maximum *fenestrationSHGC* permitted in Climate Zones 0 through 3 shall be 0.30.

$$\text{For Climate Zones 0–2: } TC_{Proposed\ design} \leq 1.08 \times TC_{Prescriptive\ reference\ design}$$
$$\text{For Climate Zones 3–8: } TC_{Proposed\ design} \leq 1.15 \times TC_{Prescriptive\ reference\ design}$$

Equation 11-6

3. For each *dwelling unit*~~with one or more fuel-burning *appliances* for space heating, water heating, or both, the annual *energy cost* of the *dwelling unit* shall be less than or equal to 80 percent of the annual *energy cost* of the *standard reference design*. For all other *dwelling units*,~~ the annual *energy cost* of the *proposed design* shall be less than or equal to 89 ~~85~~percent of the annual *energy cost* of the *standard reference design*. For each *dwelling unit* with greater than 5,000 square feet (465 m^2) of *living space* located above *grade plane*, the annual *energy cost* of the *dwelling unit* shall be reduced by an additional 5 percent of annual *energy cost* of the *standard reference design*. Energy prices shall be taken from an *approved source*, such as the US Energy Information Administration's State Energy Data System prices and expenditures reports. Code officials shall be permitted to require time-of-use pricing in *energy cost* calculations.

   Exceptions:

   1. The energy use based on source energy expressed in *Btu* or *Btu* per square foot of *conditioned floor area* shall be permitted to be substituted for the *energy cost*. The source energy multiplier for electricity shall be 2.51 . The source energy multipliers shall be 1.09 for natural gas, 1.15 for propane, 1.19 for *fuel oil*, and 1.30 for imported liquified natural gas.

   2. The energy use based on site energy expressed in *Btu* or *Btu* per square foot of *conditioned floor area* shall be permitted to be substituted for the *energy cost.*

TABLE N1105.4.2(1) [R405.4.2(1)] SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS
Portions of table not shown remain unchanged.

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Heating systems[d, e, j, k]	Fuel Type/Capacity: same as proposed design.	As proposed.
	Product class: same as proposed design.	As proposed.
	Efficiencies: For other than electric heating without a heat pump: same as proposed design. Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the *IECC* – Commercial Provisions.	As proposed.
	~~Heat pump: complying with 10 CFR §430.32~~	~~As proposed~~
	~~Fuel gas and liquid fuel furnaces: complying with 10 CFR §430.32~~	~~As proposed~~.
	~~Fuel gas and liquid fuel boilers: complying with 10 CFR §430.32~~	~~As proposed~~.
Cooling systems[d, f, k]	Fuel Type: electric Capacity: same as proposed design	As proposed.
	Efficiencies: ~~complying with 10 CFR §430.32~~ Same as proposed design.	As proposed.

<table>
<tr><th>BUILDING COMPONENT</th><th colspan="4">STANDARD REFERENCE DESIGN</th><th>PROPOSED DESIGN</th></tr>
<tr><td rowspan="8">Service water heating[d, g, k]</td><td colspan="4" rowspan="8">Use, in units of gal/day = 25.5 + (8.5 × N_{br})
where: N_{br} = number of bedrooms.</td><td>Use, in units of gal/day = 25.5 + (8.5 × N_{br}) × (1 − $HWDS$)
where:
N_{br} = number of bedrooms.
$HWDS$ = factor for the compactness of the hot water distribution system.
Compactness ratio[l] factor
1 story | 2 or more stories | HWDS
> 60% | > 30% | 0
> 30% to ≤ 60% | > 15% to ≤ 30% | 0.05
> 15% to ≤ 30% | > 7.5% to ≤ 15% | 0.10
< 15% | < 7.5% | 0.15</td></tr>
<tr><td>Fuel type: same as proposed design</td></tr>
<tr><td>Rated storage volume: same as proposed design</td></tr>
<tr><td>Draw pattern: same as proposed design</td></tr>
<tr><td>Efficiencies: ~~Uniform Energy Factor complying with 10 CFR §430.32~~ Same as proposed design.</td></tr>
<tr><td>Tank temperature: 120°F (48.9°C)</td></tr>
<tr><td rowspan="5">Thermal distribution systems</td><td colspan="4">Duct insulation: in accordance with Section N1103.3.3.</td><td>Duct insulation: as proposed.[m]</td></tr>
<tr><td colspan="4">Duct location: Same as proposed design.</td><td>Duct location: as proposed.[l]</td></tr>
<tr><td>~~Foundation type~~</td><td>~~Slab on grade~~</td><td>~~Unconditioned crawl space~~</td><td>~~Basement or conditioned crawl space~~</td><td>—</td></tr>
<tr><td>~~Duct location (supply and return)~~</td><td>~~One-story building: 100% in unconditioned attic~~
~~All other: 75% in unconditioned attic and 25% inside conditioned space~~</td><td>~~One-story building: 100% in unconditioned crawl space~~
~~All other: 75% in unconditioned crawl space and 25% inside conditioned space~~</td><td>~~75% inside conditioned space 25% unconditioned attic~~</td><td>Duct system leakage to outside: The measured total duct system leakage rate shall be entered into the software as the duct system leakage to outside rate.
Exceptions:
1. Where duct system leakage to outside is tested in accordance ANSI/RESNET/ICC 380 or ASTM E1554, the measured value shall be permitted to be entered.
2. Where total duct system leakage is measured without space conditioning equipment installed, the simulation value shall be 4 cfm per 100ft^2 of conditioned floor area.</td></tr>
<tr><td colspan="4">Duct system leakage to outside: for duct systems serving > 1,000 ft^2 of conditioned floor area, the duct leakage to outside rate shall be 4 cfm per 100 ft^2 of conditioned floor area.
For duct systems serving ≤ 1,000 ft^2 of conditioned floor area, the duct leakage to outside rate shall be 40 cfm.</td></tr>
<tr><td colspan="4">Distribution System Efficiency (DSE): for hydronic systems and ductless systems a thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies.</td><td>Distribution System Efficiency (DSE): f or hydronic systems and ductless systems, DSE shall be as specified in Table N1105.4.2(2).</td></tr>
</table>

For SI: 1 square foot = 0.93 m^2, 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m^2, 1 gallon (US) = 3.785 L, °C = (°F – 32)/1.8, 1 degree = 0.79 rad, 1 cubic foot per minute = 28.317 L/min.

a. Hourly calculations as specified in the ASHRAE Handbook of Fundamentals , or the equivalent, shall be used to determine the energy loads resulting from infiltration.

b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE Handbook of Fundamentals , page 26.24 and the “Whole-house Ventilation” provisions of 2001 ASHRAE Handbook of Fundamentals , page 26.19 for intermittent mechanical ventilation.

c. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.

d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.

e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.

f. For a proposed design without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.

g. For a proposed design with a nonstorage-type water heater,For a proposed design without a proposed water heater, the following assumptions shall be made for both the proposed design and standard reference design. For a proposed design with a heat pump water heater, the following assumptions shall be made for the standard reference design, except the fuel type shall be electric:

   Fuel Type: Same as the predominant heating fuel type

   Rated Storage Volume: 40 gallons

   Draw Pattern: Medium

   Efficiency: Uniform Energy Factor complying with 10 CFR §430.32

h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, the following formula shall be used to determine glazing area:

   $AF = A_S \times FA \times F$

   where:

   AF = Total glazing area.

   A_S = Standard reference design total glazing area.

   FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 × below-grade boundary wall area).

   F = (above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

   and where:

   - Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.
   - Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.
   - Below-grade boundary wall is any thermal boundary wall in soil contact.
   - Common wall area is the area of walls shared with an adjoining dwelling unit.

i. The factor for the compactness of the hot water distribution system is the ratio of the area of the rectangle that bounds the source of hot water and the fixtures that it serves (the “hot water rectangle”) divided by the floor area of the dwelling.

1. Sources of hot water include water heaters, or in multiple-family buildings with central water heating systems, circulation loops or electric heat traced pipes.

2. The hot water rectangle shall include the source of hot water and the points of termination of all hot water fixture supply piping.

3. The hot water rectangle shall be shown on the floor plans and the area shall be computed to the nearest square foot.

4. Where there is more than one water heater and each water heater serves different plumbing fixtures and appliances, it is permissible to establish a separate hot water rectangle for each hot water distribution system and add the area of these rectangles together to determine the compactness ratio.

5. The basement or attic shall be counted as a story when it contains the water heater.

6. Compliance shall be demonstrated by providing a drawing on the plans that shows the hot water distribution system rectangle(s), comparing the area of the rectangle(s) to the area of the dwelling and identifying the appropriate compactness ratio and *HWDS* factor.

j. For a proposed design with electric resistance heating, a split system heat pump complying with 10 CFR §430.32 (2021) shall be assumed modeled in the standard reference design.

k. For heating systems, cooling systems, or water heating systems not included in this table, the standard reference design shall be the same as proposed design.

l. Only sections of ductwork that are installed in accordance with Section N1103.3.4, Items 1 and 2 are assumed to be located completely inside conditioned space. All other sections of ductwork are not assumed to be located completely inside conditioned space.

m. Sections of ductwork installed in accordance with Section N1103.3.5.1 are assumed to have an effective duct insulation *R*-value of R-25.

Reason Statement:

The proposed changes above will reverse the largest efficiency rollbacks incorporated into the 2024 *IECC* and maintain Virginia's current performance path approach to efficiency trade-offs for heating, cooling, and water heating equipment. It will also eliminate an unnecessary new credit for duct location. The proposal will also incorporate a single efficiency improvement to buildings with all equipment types based on the U.S. Department of Energy's Determination that the 2024 IECC reduced annual energy costs by roughly 6.6% as compared to the 2021 IECC. We believe the combination of these changes will allow Virginia code users to continue to use the performance path essentially as they do today, avoiding the controversies that have accompanied the 2024 IECC revisions to this section.

All of these new trade-off credits were included in the 2024 *IECC* as part of a large compromise among *IECC*-R Development Committee Members referred to as the “omnibus.” However, significant portions of the omnibus related to electrification and decarbonization were removed from the 2024 *IECC* by the ICC Board of Directors as a result of several appeals, leaving in place several material efficiency rollbacks. These rollbacks would not have been approved in the 2024 *IECC* but for the omnibus compromise, and we recommend that Virginia eliminate these trade-off credits to be consistent with the 2021 *IECC* and the current VA Construction Code approach to equipment efficiency in the performance path.

Equipment trade-offs were correctly eliminated in the 2009 version of the *IECC* (and in Virginia's adoption of the 2009 IRC/IECC) and were consistently rejected in every *IECC* and Virginia code update cycle until the ICC Residential Committee-developed 2024 *IECC*. Nearly every state that adopts the *IECC* has eliminated these trade-offs as well. Equipment trade-offs reduce building efficiency because commonly installed cooling, heating, and water heating equipment typically exceeds the federal minimum efficiencies, but states are unable to set more reasonable efficiency requirements (or more reasonable assumptions in the standard reference design baseline) because of federal preemption. **The result is an unwarranted trade-off credit that allows buildings to be constructed 11-22% less efficient overall than if the trade-offs were not allowed**. *See* ICF International, *Review and Analysis of Equipment Trade-offs in Residential Energy Codes,* at ii (Sep. 23, 2013).

Although proponents of equipment trade-offs argue that they are “energy neutral,” the reality is that they are a short-term trade-off that will have long-term negative impacts on homeowners –who are often unaware that such trade-offs are taking place. For example, if a trade-off is permitted for water heater efficiency, an instantaneous natural gas water heater would allow the builder to reduce the efficiency of the rest of the home by an average of 9%. The remaining home will be 9% less efficient for its entire useful lifetime. As the water heater is replaced every 10-15 years, the envelope of that home will continue to underperform by 9%. By contrast, under the current Virginia Construction Code (and the 2021 *IECC*), no trade-off credit is awarded for the instantaneous water heater, which means the rest of the home will be built to meet the code. As the water heater is swapped out in future years, a home built to the current Virginia UCC-compliant home will outperform a home built using a water heater performance trade-off allowed by 9%.

Regarding duct location, the current Virginia Uniform Construction Code does not award performance path trade-off credit for ducts located inside conditioned space. In both the prescriptive path and the performance path, builders are neither penalized nor credited for the location of duct systems. Although it is generally good building practice to locate all ducts and air handlers inside conditioned space, many builders in Virginia already do this.

The 2024 *IECC* already provides another performance-based alternative that provides credit for equipment efficiency and duct location (the Energy Rating Index), as well as multiple credits for equipment and duct location in Table R408.2. Both of these compliance paths do not carry such a high risk of free ridership (and reduced overall efficiency) as the proposed performance path credits. The simulated performance path lacks several of the built-in protections of the ERI path, and thus cannot guarantee an equivalent level of performance. We strongly recommend eliminating these loopholes from the performance path and implementing provisions consistent with the Virginia Construction Code and the 2021 *IECC*.

Finally, this proposal replaces the two multipliers in Section N1105.2(3)/R405.2(3) with a single multiplier. Although we do not oppose setting a different multiplier based on whether a home uses fossil fuel-fired or electric appliances, for a starting place we recommend setting a multiplier that is consistent with the U.S. Department of Energy's Determination on energy cost savings associated with the prescriptive path of the 2024 IECC, and one that properly reflects the impact of equipment trade-offs (if any). In December of 2024, U.S. DOE found that homes built to the 2024 IECC prescriptive path will have 6.6% lower annual energy costs than homes built to the 2021 IECC, on average. *See* U.S. Department of Energy, *Notification of Determination*, 89 Fed. Reg. 106458 (Dec. 30, 2024). The current Virginia Construction Code already requires that the proposed home in Section R405 not exceed 95% of the annual energy costs of the standard reference design home. A 6.6% reduction in energy costs is roughly 89%, and that number is proposed above as a single multiplier. We note, however, that if efficiency trade-offs are allowed for heating, cooling, water heating equipment, or for duct location, there would need to be additional changes to the multiplier, and the result would likely be lower than the 80/85% in the published 2024 IECC. However, for purposes of this proposal, assuming the equipment trade-offs and duct location credit are deleted, we view 89% as a reasonable starting place that would maintain consistency across compliance paths.

Cost Impact: The code change proposal will increase the cost

This proposal improves the overall efficiency of the performance path by roughly 6.6%, which may increase costs depending on decisions made by code users. However, these changes, taken as a single package, would maintain consistency with improvements made in the prescriptive path.

REC-R405.2(1)-24

IECC: R405.2, R406.3

Proponents: Eric Lacey, representing Responsible Energy Codes Alliance (eric@reca-codes.com)

2024 International Energy Conservation Code [RE Project]

Revise as follows:

R405.2 Simulated building performance compliance.. Compliance based on *simulated building performance* requires that a *building* comply with the following:

1. The requirements of the sections indicated within Table R405.2.

2. The proposed total *building thermal envelope* thermal conductance (TC) shall be less than or equal to the required total building thermal envelope TC using the prescriptive *U*-factors and *F*-factors from Table R402.1.2 multiplied by 1.08 ~~in Climate Zones 0, 1 and 2, and 1.15 in Climate Zones 3 through 8,~~ in accordance with Equation 4-2 and Section R402.1.5. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

   Equation 4-2 ~~For Climate Zones 0–2:~~ $TC_{Proposed\ design} \leq 1.08 \times TC_{Prescriptive\ reference\ design}$

   ~~For Climate Zones 3–8: $TC_{Proposed\ design} \leq 1.15 \times TC_{Prescriptive\ reference\ design}$~~

3. For each *dwelling unit* with one or more fuel-burning appliances for space heating, water heating, or both, the annual *energy cost* of the *dwelling unit* shall be less than or equal to 80 percent of the annual *energy cost* of the *standard reference design*. For all other *dwelling units*, the annual *energy cost* of the proposed design shall be less than or equal to 85 percent of the annual *energy cost* of the *standard reference design*. For each dwelling unit with greater than 5,000 square feet (465 m^2) of *living space* located above grade plane, the annual *energy cost* of the *dwelling unit* shall be reduced by an additional 5 percent of annual *energy cost* of the *standard reference design*. Energy prices shall be taken from an *approved* source, such as the US Energy Information Administration's State Energy Data System prices and expenditures reports. Code officials shall be permitted to require time-of-use pricing in *energy cost* calculations.

   Exceptions:

   1. The energy use based on source energy expressed in Btu or Btu per square foot of *conditioned floor area* shall be permitted to be substituted for the *energy cost*. The source energy multiplier for electricity shall be 2.51. The source energy multipliers shall be 1.09 for natural gas, 1.15 for propane, 1.19 for fuel oil, and 1.30 for imported liquified natural gas.

   2. The energy use based on site energy expressed in Btu or Btu per square foot of conditioned floor area shall be permitted to be substituted for the energy cost.

R406.3 Building thermal envelope.. The proposed total *building thermal envelope* thermal conductance (TC) shall be less than or equal to the required total *building thermal envelope* TC using the prescriptive *U*-factors and *F*-factors from Table R402.1.2 multiplied by 1.08 ~~in Climate Zones 0, 1 and 2, and by 1.15 in Climates Zones 3 through 8,~~ in accordance with Equation 4-2 and Section R402.1.5. The area-weighted maximum fenestration SHGC permitted in Climate Zones 0 through 3 shall be 0.30.

Reason Statement:

The most cost-effective time to properly insulate homes is at construction, when an incremental investment in envelope efficiency will pay dividends over the 70-100 year useful life of the home. As such, the code should not allow unlimited trade-offs of envelope efficiency for

other measures.

This proposal updates the thermal envelope trade-off backstops to reflect Virginia's weaker wall insulation requirements. The IECC allows substantial trade-off flexibility in the performance path and Energy Rating Index (and in above-code programs), but these trade-offs are not unlimited. The 2024 IECC allows the thermal envelope to be (on average) 15% less efficient than the IECC prescriptive envelope requirements in Virginia's climate zones, as long as the efficiency losses are accounted for elsewhere.

In Virginia, the current wall insulation requirements allow even weaker envelope efficiency (because the baseline to which 15% is applied is already much lower). Based on a simple REScheck-Web analysis of a sample 2500 square-foot home, we found that on an envelope-only (Total UA) comparison, Virginia's residential thermal envelope currently under-performs the 2024 IECC envelope by about 20%. If the wall insulation is improved to R-20, REScheck shows that the envelope is still 7.6% worse than the 2024 IECC envelope. Compliance reports from REScheck are linked at the bottom of this proposal.

This proposal modifies the envelope backstop from a 15% maximum trade-off cap to an 8% cap, which means envelope efficiency can still be 8% worse than Virginia's code (with R-20 wall insulation requirements), and approximately 15% weaker than an unamended 2024 IECC. While we would prefer to see all new homes perform at the same level, irrespective of compliance path, this proposal limits the underperformance of homes built to Sections R405 and R406 to approximately the same level of performance allowed under the 2024 IECC. Again, this adjustment is based on a scenario where Virginia updates its wall insulation requirement to R-20; if that requirement remains at R-15, we recommend an even more stringent backstop.

Cost Impact: The code change proposal will not increase or decrease the cost

This proposal will neither increase nor decrease the cost of construction. This proposal does not require anything more than what is already required for code compliance. It just ensures that in any performance-based compliance path, the thermal envelope efficiency cannot be more than 8% worse than a home built to the prescriptive path of Virginia's 2024 IECC with an R-20 wall insulation requirement.

Attached Files

- **Sample VA Home - R15 Walls.pdf**
  https://va.cdpaccess.com/proposal/1511/2223/files/download/1000/
- **Sample VA Home - R20 Walls.pdf**
  https://va.cdpaccess.com/proposal/1511/2223/files/download/999/
- **Sample VA Home - Full 2024 IECC.pdf**
  https://va.cdpaccess.com/proposal/1511/2223/files/download/998/

Compliance Certificate

Project Information

Project Title:	**A Sample Project**
Energy Code:	2024 IECC
Location:	Glen Allen, Virginia
Construction Type:	Single Family
Project Type:	New Construction
Project Sub Type:	None
Orientation:	Bldg. faces 180 deg. from North
Conditioned Floor Area:	2500 ft2
Glazing Area:	14%
Climate Zone:	4a (4220 HDD)
Project No:	1629133
All Electric:	false
Is Renewable:	false
Has Battery:	false
Has Charger:	false
Has Heat Pump	false

Construction Site:

123 Main St.
Glen Allen , VA

Owner/Agent:

Designer/Contractor:

Project Notes:

Energy Credits

Description	Credits
R408.2.3(1)(a): Gas-fired storage water heaters (Option 1)	5.0
R408.2.2(2): High Performance Cooling (Option 1)	2.0
R408.2.2(4): High Performance Gas furnace (Option 1)	5.0

Required: 10 Proposed: 12

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Prop. U-Factor/ F-Factor	Req. U-Factor/ F-Factor	Prop. UA	Req. UA
my Ceiling: Flat Ceiling or Scissor Truss	2500	49.0	0.0	0.026	0.026	65	65
Floor: Slab-On-Grade (Unheated) Insulation depth: 3.00' Insulation position: Fully Insulated (uniform R-value across perimeter and under slab)	70		10.0	0.360	0.510	25	36
Wall 1: Wood Frame, 24" o.c. Orientation: Front	1200	15.0	0.0	0.074	0.045	67	41
Window: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39
Window 2: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39
Door 2: Solid Door (under 50% glazing) Orientation: Front	32			0.300	0.300	10	10
Wall 2: Wood Frame, 24" o.c. Orientation: Front	1200	15.0	0.0	0.074	0.045	77	47
Window 2 Copy: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39
Door 1 Copy: Solid Door (under 50% glazing) Orientation: Front	32			0.300	0.300	10	10
Wall 3: Wood Frame, 24" o.c. Orientation: Front	1200	15.0	0.0	0.074	0.045	79	48
Window 2 Copy: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39
Wall 4: Wood Frame, 24" o.c. Orientation: Front	1200	15.0	0.0	0.074	0.045	79	48
Window 2 Copy: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39

Compliance: Fails using UA trade-off

Compliance: 21.4% Worse Than Code	Max UA: 500	Your UA: 607	Max SHGC: 0.40	Your SHGC: 0.40

The % Better or Worse Than Code Index reflects how close to compliance the house is based on code trade-off rules. It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

Inspection Checklist

Energy Code: 2024 IECC

Requirements: 96% were addressed directly in the RES*check* software

Text in the "Comments/Assumptions" column is provided by the user in the REScheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Pre-Inspection/Plan Review

Section # & Req.ID	Pre-Inspection/Plan Review	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
105.1, 105.2 [PR1][1]	Construction drawings and documentation demonstrate energy code compliance for the building envelope. Thermal envelope and energy compliance path represented on construction documents.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
105.1, 105.2, 403.8 [PR3][1]	Construction drawings and documentation demonstrate energy code compliance for lighting and mechanical systems. Systems serving multiple dwelling units must demonstrate compliance with the IECC Commercial Provisions.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
302.1, 403.7 [PR2][1]	Heating and cooling equipment is sized per ACCA Manual S based on loads calculated per ACCA Manual J or other methods approved by the code official.	Heating: Btu/hr Cooling: Btu/hr	Heating: Btu/hr Cooling: Btu/hr	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Foundation Inspection

Section # & Req.ID	Foundation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
303.2, 402.2.10 [FO2][1]	Slab edge insulation installed per manufacturer's instructions.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.8 [FI91][2]	Systems serving multiple dwelling units comply with Sections C403 and C404 of the commercial code.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.9.1 [FI92][2]	Heating systems installed for outdoor heating are radiant systems controlled by occupancy sensing or timer switch.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.9.2, 403.9.3, 403.9.4 [FI92][2]	Snow and ice-melting system controls installed to shut off system when pavement temperature > 50F and no precipitation or automatic controls to shut off the system when outdoor temperature > 40F.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.1.2 [FO1][1]	Slab edge insulation R-value.	R-☐ Unheated ☐ Heated	R-☐ Unheated ☐ Heated	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*
402.1.2 [FO3][1]	Slab edge insulation depth/length.	☐ ft	☐ ft	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Framing / Rough-In Inspection

Section # & Req.ID	Framing / Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
303.1.3 [FR4][1]	U-factors of fenestration products are determined in accordance with the NFRC test procedure or taken from the default table.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.1.1 [FR23][1]	Air barrier and thermal barrier installed per manufacturer's instructions.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.3 [FR20][1]	Fenestration that is not site built is listed and labeled as meeting AAMA /WDMA/CSA 101/I.S.2/A440 or has infiltration rates per NFRC 400 that do not exceed code limits.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.4 [FR16][2]	IC-rated recessed lighting fixtures sealed at housing/interior finish and labeled to indicate ≤2.0 cfm leakage at 75 Pa.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.4 [FR17][2]	HVAC piping conveying fluids above 105 ºF or chilled fluids below 55 ºF are insulated to ≥R-3.	R-☐	R-☐	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6 [FR19][2]	Automatic or gravity dampers are installed on all outdoor air intakes and exhausts for mechanical ventilation systems.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6.1 [FR30][2]	Ventilation systems in climate zones 6, 7 & 8 shall utilize heat or energy recovery with balanced ventilation and a sensible recovery efficiency (SRE) >= 65% at 32 F.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.3 [FR12][1]	Supply and return ducts in attics insulated >= R-8 where duct is >= 3 inches in diameter and >= R-6 where < 3 inches.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Section # & Req.ID	Framing / Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
403.3.6 [FR13][1]	Ducts, air handlers and filter boxes are sealed with joints/seams compliant with International Mechanical Code or International Residential Code, as applicable.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.4.1 [FR24][1]	Protection of insulation on HVAC piping.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.2 [FR18][2]	Hot water pipes are insulated to ≥ 1 inch of insulation.	R-	R-	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.5 [FR29][2]	Air-sealed electrical and communication boxes installed in the thermal boundary of the envelope sealed to limit air leakage between conditioned and unconditioned spaces.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.1 [FR12][1]	Duct systems are design and sized in accordance with ACCA Manual D. Duct systems serving multiple dwelling units is sized in accordance with ASHRAE Handbook of Fundamentals, ACCA Manual D or an equivalent methodology.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.1, 402.4.4 [FR1][1]	Door U-factor.	U-	U-	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*
402.1, 402.4.1, 402.4.3, 402.6 [FR2][1]	Glazing U-factor (area-weighted average).	U-	U-	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Insulation Inspection

Section # & Req.ID	Insulation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
303.1 [IN13][2]	All installed insulation is labeled or the installed R-values provided.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
303.2 [IN4][1]	Wall insulation is installed per manufacturer's instructions.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.1, 402.2.6, 402.2.7 [IN3][1]	Wall insulation R-value. If this is a mass wall with at least ½ of the wall insulation on the wall exterior, the exterior insulation requirement applies (FR10).	R- ☐ Wood ☐ Mass ☐ Steel	R- ☐ Wood ☐ Mass ☐ Steel	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Final Inspection Provisions

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
303.1.1.1, 303.2 [FI2][1]	Ceiling insulation installed per manufacturer's instructions. Blown insulation marked every 300 ft².			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
303.3 [FI18][3]	Manufacturer manuals for mechanical and water heating systems have been provided.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.2 [FI26][2]	Hot water boilers have automatic outdoor setback control to lower boiler water temperature based on outdoor temperature, indoor temperature or water temperature sensing.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.6.1 [FI24][1]	Air handler leakage designated by manufacturer at <=2% of design air flow.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.7 [FI27][1]	Ducts are pressure tested in accordance with ANEI/RESNET/ICC 380 or ASTME1554 to determine air leakage with either: Rough-in test: Total leakage measured with a pressure differential of 0.1 inch w.g. across the system including the manufacturer's air handler enclosure if installed at time of test. Postconstruction test: Total leakage measured with a pressure differential of 0.1 inch w.g. across the entire system including the manufacturer's air handler enclosure.	☐ cfm/100 ft^2	☐ cfm/100 ft^2	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.8 [FI4][1]	Duct tightness test result of <=4 cfm/100 ft2 across the system or <=3 cfm/100 ft2 without air handler @ 25 Pa. Duct tightness <= 8 cfm/100 ft2 for ducts within thermal envelope. For rough-in tests, verification may need to occur during Framing Inspection.	☐ cfm/100 ft^2	☐ cfm/100 ft^2	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.1 [FI11][2]	Circulating service hot water systems have automatic or accessible manual controls.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.1.1.1 [FI32][2]	Demand recirculation water systems have automatic controls to start pump when hot water is requested.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
403.5.1.1 [FI28][2]	Heated water circulation systems have a circulation pump. The system return pipe is a dedicated return pipe or a cold water supply pipe. Gravity and thermos-syphon circulation systems are not present. Controls for circulating hot water system pumps start the pump with signal for hot water demand within the occupancy. Controls automatically turn off the pump when water is in circulation loop is at set-point temperature and no demand for hot water exists.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.1.2 [FI29][2]	Electric heat trace systems comply with IEEE 515.1 or UL 515. Controls automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.3 [FI31][2]	Drain water heat recovery units tested in accordance with CSA B55.1. Potable water-side pressure loss of drain water heat recovery units < 3 psi for individual units connected to one or two showers. Potable water-side pressure loss of drain water heat recovery units < 2 psi for individual units connected to three or more showers.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
401.3 [FI7][2]	Compliance certificate posted with building specifications, compliance path, R408 energy credits, results and solar ready zone if provided.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6.2 [FI25][2]	403.6.2: All mechanical ventilation system fans meet efficacy and air flow limits per Table R403.6.2.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6.3 [FI33][2]	Mechanical ventilation systems tested and verified to meet the minimum flow rates required by Section R403.6.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6.5 [FI34][2]	Intermittent exhaust for bathrooms/toilet rooms has automatic control, occupant sensor control, humidity control or contaminant control.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.1, 402.2.1, 402.2.2, 402.2.7 [FI1][1]	Ceiling insulation R-value.	R- ☐ Wood ☐ Steel	R- ☐ Wood ☐ Steel	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
403.13, 403.13.1 [FI35][3]	Gas fireplaces equipped with on-demand pilot, intermittent ignition or interrupted ignition. Fireplace efficiency > 50% in accordance with CSA P.4.1			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.1 [FI6][1]	100% of permanent fixtures have high efficacy lamps.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.1.2 [FI35][3]	Exterior lighting power is below the allowable wattage in Table R404.1.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.1.5 [FI23][3]	Fuel gas lighting systems have no continuous pilot light.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.2.1, 404.2.2 [FI36][3]	Permanent interior lighting shall be controlled with either a manual dimmer, occupancy sensor or auto shut off control based on occupancy built with manual override.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.3 [FI37][3]	Exterior lighting >= 30 watts shall have the following controls: manual on/off switch with automatic shut-off, automatic shut-off in daylight hours, and controls that override automatic shutoff that returns to automatic control within 24 hours.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.4 [FI36][3]	Where renewable energy generation equipment is installed, renewable energy credits (RECs) or energy attributable certificates (EACs) associated with the renewable energy used for compliance are provided to the code official.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.2.4 [FI22][2]	Vented attics with air permeable insulation include baffle adjacent to soffit and eave vents that extends over insulation.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
408.2.2.1(2) [FI46][1]	Air conditioner installed with efficiency >= 15.2 SEER2/12.0 EER2 for additional efficiency credit			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
408.2.2.1(4) [FI48][1]	Gas furnace installed with efficiency >= 97 AFUE for additional efficiency credit			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.2.5 [FI3][1]	Attic access hatch and door insulation ≥R-value of the adjacent assembly.	R-	R-	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
408.2.3(1)(a) [FI59][1]	Gas-fired storage water heater efficiency >= 0.81 UEF for additional efficiency credit			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.1.3 [FI17][1]	Blower door test @ 50 Pa. <=4.0 ACH50 in Climate Zones 1-2, <=3.0 ACH50 in Climate Zones 3-5 and <= 2.5 ACH50 in Climate Zones 6-8.	ACH 50 =	ACH 50 =	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.3 [FI43][2]	Radiant barriers are installed in accordance with ASTM C1743	R- ☐ Wood ☐ Steel	R- ☐ Wood ☐ Steel	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*
403.1.1 [FI9][2]	Programmable thermostats installed for control of primary heating and cooling systems and initially set by manufacturer to code specifications.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

2024 IECC Energy Efficiency Certificate

Insulation Rating	R-Value
Above-Grade Wall	15.00
Below-Grade Wall	0.00
Floor	10.00
Ceiling / Roof	49.00
Ductwork (unconditioned spaces):	____

Glass & Door Rating	U-Factor	SHGC
Window	0.30	0.40
Door	0.30	
Skylight	0.00	

Heating & Cooling Equipment	Efficiency
Heating System: _____	_____
Cooling System: _____	_____
Water Heater: _____	_____

Signature

Name: _____ **Date:** _____

Comments:

Compliance Certificate

Project Information

Project Title:	**A Sample Project**
Energy Code:	2024 IECC
Location:	Glen Allen, Virginia
Construction Type:	Single Family
Project Type:	New Construction
Project Sub Type:	None
Orientation:	Bldg. faces 180 deg. from North
Conditioned Floor Area:	2500 ft2
Glazing Area:	14%
Climate Zone:	4a (4220 HDD)
Project No:	1629133
All Electric:	false
Is Renewable:	false
Has Battery:	false
Has Charger:	false
Has Heat Pump	false

Construction Site:

123 Main St.
Glen Allen , VA

Owner/Agent:

Designer/Contractor:

Project Notes:

Energy Credits

Description	Credits
R408.2.2(4): High Performance Gas furnace (Option 1)	5.0
R408.2.2(2): High Performance Cooling (Option 1)	2.0
R408.2.3(1)(a): Gas-fired storage water heaters (Option 1)	5.0

Required: 10 Proposed: 12

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Prop. U-Factor/ F-Factor	Req. U-Factor/ F-Factor	Prop. UA	Req. UA
my Ceiling: Flat Ceiling or Scissor Truss	2500	49.0	0.0	0.026	0.026	65	65
Floor: Slab-On-Grade (Unheated) Insulation depth: 3.00' Insulation position: Fully Insulated (uniform R-value across perimeter and under slab)	70		10.0	0.360	0.510	25	36
Wall 1: Wood Frame, 24" o.c. Orientation: Front	1200	20.0	0.0	0.057	0.045	52	41
Window: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39
Window 2: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39
Door 2: Solid Door (under 50% glazing) Orientation: Front	32			0.300	0.300	10	10
Wall 2: Wood Frame, 24" o.c. Orientation: Front	1200	20.0	0.0	0.057	0.045	59	47
Window 2 Copy: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39
Door 1 Copy: Solid Door (under 50% glazing) Orientation: Front	32			0.300	0.300	10	10
Wall 3: Wood Frame, 24" o.c. Orientation: Front	1200	20.0	0.0	0.057	0.045	61	48
Window 2 Copy: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39
Wall 4: Wood Frame, 24" o.c. Orientation: Front	1200	20.0	0.0	0.057	0.045	61	48
Window 2 Copy: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39

Compliance: Fails using UA trade-off

Compliance: 7.6% Worse Than Code	Max UA: 500	Your UA: 538	Max SHGC: 0.40	Your SHGC: 0.40

The % Better or Worse Than Code Index reflects how close to compliance the house is based on code trade-off rules. It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

Inspection Checklist

Energy Code: 2024 IECC

Requirements: 96% were addressed directly in the RES*check* software

Text in the "Comments/Assumptions" column is provided by the user in the REScheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Pre-Inspection/Plan Review

Section # & Req.ID	Pre-Inspection/Plan Review	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
105.1, 105.2 [PR1][1]	Construction drawings and documentation demonstrate energy code compliance for the building envelope. Thermal envelope and energy compliance path represented on construction documents.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
105.1, 105.2, 403.8 [PR3][1]	Construction drawings and documentation demonstrate energy code compliance for lighting and mechanical systems. Systems serving multiple dwelling units must demonstrate compliance with the IECC Commercial Provisions.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
302.1, 403.7 [PR2][1]	Heating and cooling equipment is sized per ACCA Manual S based on loads calculated per ACCA Manual J or other methods approved by the code official.	Heating: Btu/hr Cooling: Btu/hr	Heating: Btu/hr Cooling: Btu/hr	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Foundation Inspection

Section # & Req.ID	Foundation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
303.2, 402.2.10 [FO2][1]	Slab edge insulation installed per manufacturer's instructions.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.8 [FI91][2]	Systems serving multiple dwelling units comply with Sections C403 and C404 of the commercial code.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.9.1 [FI92][2]	Heating systems installed for outdoor heating are radiant systems controlled by occupancy sensing or timer switch.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.9.2, 403.9.3, 403.9.4 [FI92][2]	Snow and ice-melting system controls installed to shut off system when pavement temperature > 50F and no precipitation or automatic controls to shut off the system when outdoor temperature > 40F.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.1.2 [FO1][1]	Slab edge insulation R-value.	R-☐ Unheated ☐ Heated	R-☐ Unheated ☐ Heated	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*
402.1.2 [FO3][1]	Slab edge insulation depth/length.	☐ ft	☐ ft	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Framing / Rough-In Inspection

Section # & Req.ID	Framing / Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
303.1.3 [FR4][1]	U-factors of fenestration products are determined in accordance with the NFRC test procedure or taken from the default table.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.1.1 [FR23][1]	Air barrier and thermal barrier installed per manufacturer's instructions.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.3 [FR20][1]	Fenestration that is not site built is listed and labeled as meeting AAMA /WDMA/CSA 101/I.S.2/A440 or has infiltration rates per NFRC 400 that do not exceed code limits.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.4 [FR16][2]	IC-rated recessed lighting fixtures sealed at housing/interior finish and labeled to indicate ≤2.0 cfm leakage at 75 Pa.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.4 [FR17][2]	HVAC piping conveying fluids above 105 ºF or chilled fluids below 55 ºF are insulated to ≥R-3.	R-☐	R-☐	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6 [FR19][2]	Automatic or gravity dampers are installed on all outdoor air intakes and exhausts for mechanical ventilation systems.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6.1 [FR30][2]	Ventilation systems in climate zones 6, 7 & 8 shall utilize heat or energy recovery with balanced ventilation and a sensible recovery efficiency (SRE) >= 65% at 32 F.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.3 [FR12][1]	Supply and return ducts in attics insulated >= R-8 where duct is >= 3 inches in diameter and >= R-6 where < 3 inches.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Section # & Req.ID	Framing / Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
403.3.6 [FR13][1]	Ducts, air handlers and filter boxes are sealed with joints/seams compliant with International Mechanical Code or International Residential Code, as applicable.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.4.1 [FR24][1]	Protection of insulation on HVAC piping.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.2 [FR18][2]	Hot water pipes are insulated to ≥ 1 inch of insulation.	R-☐	R-☐	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.5 [FR29][2]	Air-sealed electrical and communication boxes installed in the thermal boundary of the envelope sealed to limit air leakage between conditioned and unconditioned spaces.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.1 [FR12][1]	Duct systems are design and sized in accordance with ACCA Manual D. Duct systems serving multiple dwelling units is sized in accordance with ASHRAE Handbook of Fundamentals, ACCA Manual D or an equivalent methodology.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.1, 402.4.4 [FR1][1]	Door U-factor.	U-☐	U-☐	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*
402.1, 402.4.1, 402.4.3, 402.6 [FR2][1]	Glazing U-factor (area-weighted average).	U-☐	U-☐	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Insulation Inspection

Section # & Req.ID	Insulation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
303.1 [IN13][2]	All installed insulation is labeled or the installed R-values provided.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
303.2 [IN4][1]	Wall insulation is installed per manufacturer's instructions.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.1, 402.2.6, 402.2.7 [IN3][1]	Wall insulation R-value. If this is a mass wall with at least ½ of the wall insulation on the wall exterior, the exterior insulation requirement applies (FR10).	R- ☐ Wood ☐ Mass ☐ Steel	R- ☐ Wood ☐ Mass ☐ Steel	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Final Inspection Provisions

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
303.1.1.1, 303.2 [FI2][1]	Ceiling insulation installed per manufacturer's instructions. Blown insulation marked every 300 ft².			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
303.3 [FI18][3]	Manufacturer manuals for mechanical and water heating systems have been provided.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.2 [FI26][2]	Hot water boilers have automatic outdoor setback control to lower boiler water temperature based on outdoor temperature, indoor temperature or water temperature sensing.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.6.1 [FI24][1]	Air handler leakage designated by manufacturer at <=2% of design air flow.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.7 [FI27][1]	Ducts are pressure tested in accordance with ANEI/RESNET/ICC 380 or ASTME1554 to determine air leakage with either: Rough-in test: Total leakage measured with a pressure differential of 0.1 inch w.g. across the system including the manufacturer's air handler enclosure if installed at time of test. Postconstruction test: Total leakage measured with a pressure differential of 0.1 inch w.g. across the entire system including the manufacturer's air handler enclosure.	☐ cfm/100 ft^2	☐ cfm/100 ft^2	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.8 [FI4][1]	Duct tightness test result of <=4 cfm/100 ft2 across the system or <=3 cfm/100 ft2 without air handler @ 25 Pa. Duct tightness <= 8 cfm/100 ft2 for ducts within thermal envelope. For rough-in tests, verification may need to occur during Framing Inspection.	☐ cfm/100 ft^2	☐ cfm/100 ft^2	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.1 [FI11][2]	Circulating service hot water systems have automatic or accessible manual controls.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.1.1.1 [FI32][2]	Demand recirculation water systems have automatic controls to start pump when hot water is requested.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
403.5.1.1 [FI28][2]	Heated water circulation systems have a circulation pump. The system return pipe is a dedicated return pipe or a cold water supply pipe. Gravity and thermos-syphon circulation systems are not present. Controls for circulating hot water system pumps start the pump with signal for hot water demand within the occupancy. Controls automatically turn off the pump when water is in circulation loop is at set-point temperature and no demand for hot water exists.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.1.2 [FI29][2]	Electric heat trace systems comply with IEEE 515.1 or UL 515. Controls automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.3 [FI31][2]	Drain water heat recovery units tested in accordance with CSA B55.1. Potable water-side pressure loss of drain water heat recovery units < 3 psi for individual units connected to one or two showers. Potable water-side pressure loss of drain water heat recovery units < 2 psi for individual units connected to three or more showers.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
401.3 [FI7][2]	Compliance certificate posted with building specifications, compliance path, R408 energy credits, results and solar ready zone if provided.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6.2 [FI25][2]	403.6.2: All mechanical ventilation system fans meet efficacy and air flow limits per Table R403.6.2.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6.3 [FI33][2]	Mechanical ventilation systems tested and verified to meet the minimum flow rates required by Section R403.6.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6.5 [FI34][2]	Intermittent exhaust for bathrooms/toilet rooms has automatic control, occupant sensor control, humidity control or contaminant control.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.1, 402.2.1, 402.2.2, 402.2.7 [FI1][1]	Ceiling insulation R-value.	R- ☐ Wood ☐ Steel	R- ☐ Wood ☐ Steel	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
403.13, 403.13.1 [FI35][3]	Gas fireplaces equipped with on-demand pilot, intermittent ignition or interrupted ignition. Fireplace efficiency > 50% in accordance with CSA P.4.1			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.1 [FI6][1]	100% of permanent fixtures have high efficacy lamps.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.1.2 [FI35][3]	Exterior lighting power is below the allowable wattage in Table R404.1.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.1.5 [FI23][3]	Fuel gas lighting systems have no continuous pilot light.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.2.1, 404.2.2 [FI36][3]	Permanent interior lighting shall be controlled with either a manual dimmer, occupancy sensor or auto shut off control based on occupancy built with manual override.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.3 [FI37][3]	Exterior lighting >= 30 watts shall have the following controls: manual on/off switch with automatic shut-off, automatic shut-off in daylight hours, and controls that override automatic shutoff that returns to automatic control within 24 hours.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.4 [FI36][3]	Where renewable energy generation equipment is installed, renewable energy credits (RECs) or energy attributable certificates (EACs) associated with the renewable energy used for compliance are provided to the code official.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.2.4 [FI22][2]	Vented attics with air permeable insulation include baffle adjacent to soffit and eave vents that extends over insulation.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
408.2.2.1(2) [FI46][1]	Air conditioner installed with efficiency >= 15.2 SEER2/12.0 EER2 for additional efficiency credit			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
408.2.2.1(4) [FI48][1]	Gas furnace installed with efficiency >= 97 AFUE for additional efficiency credit			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.2.5 [FI3][1]	Attic access hatch and door insulation ≥R-value of the adjacent assembly.	R-	R-	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
408.2.3(1)(a) [FI59][1]	Gas-fired storage water heater efficiency >= 0.81 UEF for additional efficiency credit			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.1.3 [FI17][1]	Blower door test @ 50 Pa. <=4.0 ACH50 in Climate Zones 1-2, <=3.0 ACH50 in Climate Zones 3-5 and <= 2.5 ACH50 in Climate Zones 6-8.	ACH 50 =	ACH 50 =	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.3 [FI43][2]	Radiant barriers are installed in accordance with ASTM C1743	R- ☐ Wood ☐ Steel	R- ☐ Wood ☐ Steel	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*
403.1.1 [FI9][2]	Programmable thermostats installed for control of primary heating and cooling systems and initially set by manufacturer to code specifications.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

2024 IECC Energy Efficiency Certificate

Insulation Rating	R-Value
Above-Grade Wall	20.00
Below-Grade Wall	0.00
Floor	10.00
Ceiling / Roof	49.00
Ductwork (unconditioned spaces):	____

Glass & Door Rating	U-Factor	SHGC
Window	0.30	0.40
Door	0.30	
Skylight	0.00	

Heating & Cooling Equipment	Efficiency
Heating System: _____	_____
Cooling System: _____	_____
Water Heater: _____	_____

Signature

Name: _____ **Date:** _____

Comments:

Compliance Certificate

Project Information

Project Title:	**A Sample Project**
Energy Code:	2024 IECC
Location:	Glen Allen, Virginia
Construction Type:	Single Family
Project Type:	New Construction
Project Sub Type:	None
Orientation:	Bldg. faces 180 deg. from North
Conditioned Floor Area:	2500 ft2
Glazing Area:	14%
Climate Zone:	4a (4220 HDD)
Project No:	1629133
All Electric:	false
Is Renewable:	false
Has Battery:	false
Has Charger:	false
Has Heat Pump	false

Construction Site:

123 Main St.
Glen Allen , VA

Owner/Agent:

Designer/Contractor:

Project Notes:

Energy Credits

Description	Credits
R408.2.3(1)(a): Gas-fired storage water heaters (Option 1)	5.0
R408.2.2(2): High Performance Cooling (Option 1)	2.0
R408.2.2(4): High Performance Gas furnace (Option 1)	5.0

Required: 10 Proposed: 12

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Prop. U-Factor/ F-Factor	Req. U-Factor/ F-Factor	Prop. UA	Req. UA
my Ceiling: Flat Ceiling or Scissor Truss	2500	49.0	0.0	0.026	0.026	65	65
Floor: Slab-On-Grade (Unheated) Insulation depth: 3.00' Insulation position: Fully Insulated (uniform R-value across perimeter and under slab)	70		10.0	0.360	0.510	25	36
Wall 1: Wood Frame, 24" o.c. Orientation: Front	1200	30.0	0.0	0.047	0.045	43	41
Window: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39
Window 2: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39
Door 2: Solid Door (under 50% glazing) Orientation: Front	32			0.300	0.300	10	10
Wall 2: Wood Frame, 24" o.c. Orientation: Front	1200	30.0	0.0	0.047	0.045	49	47
Window 2 Copy: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39
Door 1 Copy: Solid Door (under 50% glazing) Orientation: Front	32			0.300	0.300	10	10
Wall 3: Wood Frame, 24" o.c. Orientation: Front	1200	30.0	0.0	0.047	0.045	50	48
Window 2 Copy: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39
Wall 4: Wood Frame, 24" o.c. Orientation: Front	1200	30.0	0.0	0.047	0.045	50	48
Window 2 Copy: Vinyl Frame SHGC: 0.4 Orientation: Front	130			0.300	0.300	39	39

Compliance: Passes using UA trade-off

Compliance: 0.6% Better Than Code	Max UA: 500	Your UA: 497	Max SHGC: 0.40	Your SHGC: 0.40

The % Better or Worse Than Code Index reflects how close to compliance the house is based on code trade-off rules. It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

Compliance Statement

The proposed building design described here is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the 2024 IECC requirements in RES*check*-Web and to comply with the mandatory requirements listed in the REScheck Inspection Checklist.

Name - Title	Signature	Date

Inspection Checklist

Energy Code: 2024 IECC

Requirements: 96% were addressed directly in the RES*check* software

Text in the "Comments/Assumptions" column is provided by the user in the REScheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Pre-Inspection/Plan Review

Section # & Req.ID	Pre-Inspection/Plan Review	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
105.1, 105.2 [PR1][1]	Construction drawings and documentation demonstrate energy code compliance for the building envelope. Thermal envelope and energy compliance path represented on construction documents.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
105.1, 105.2, 403.8 [PR3][1]	Construction drawings and documentation demonstrate energy code compliance for lighting and mechanical systems. Systems serving multiple dwelling units must demonstrate compliance with the IECC Commercial Provisions.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
302.1, 403.7 [PR2][1]	Heating and cooling equipment is sized per ACCA Manual S based on loads calculated per ACCA Manual J or other methods approved by the code official.	Heating: Btu/hr Cooling: Btu/hr	Heating: Btu/hr Cooling: Btu/hr	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Foundation Inspection

Section # & Req.ID	Foundation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
303.2, 402.2.10 [FO2][1]	Slab edge insulation installed per manufacturer's instructions.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.8 [FI91][2]	Systems serving multiple dwelling units comply with Sections C403 and C404 of the commercial code.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.9.1 [FI92][2]	Heating systems installed for outdoor heating are radiant systems controlled by occupancy sensing or timer switch.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.9.2, 403.9.3, 403.9.4 [FI92][2]	Snow and ice-melting system controls installed to shut off system when pavement temperature > 50F and no precipitation or automatic controls to shut off the system when outdoor temperature > 40F.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.1.2 [FO1][1]	Slab edge insulation R-value.	R-☐ Unheated ☐ Heated	R-☐ Unheated ☐ Heated	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*
402.1.2 [FO3][1]	Slab edge insulation depth/length.	☐ ft	☐ ft	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Framing / Rough-In Inspection

Section # & Req.ID	Framing / Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
303.1.3 [FR4][1]	U-factors of fenestration products are determined in accordance with the NFRC test procedure or taken from the default table.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.1.1 [FR23][1]	Air barrier and thermal barrier installed per manufacturer's instructions.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.3 [FR20][1]	Fenestration that is not site built is listed and labeled as meeting AAMA /WDMA/CSA 101/I.S.2/A440 or has infiltration rates per NFRC 400 that do not exceed code limits.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.4 [FR16][2]	IC-rated recessed lighting fixtures sealed at housing/interior finish and labeled to indicate ≤2.0 cfm leakage at 75 Pa.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.4 [FR17][2]	HVAC piping conveying fluids above 105 ºF or chilled fluids below 55 ºF are insulated to ≥R-3.	R-☐	R-☐	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6 [FR19][2]	Automatic or gravity dampers are installed on all outdoor air intakes and exhausts for mechanical ventilation systems.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6.1 [FR30][2]	Ventilation systems in climate zones 6, 7 & 8 shall utilize heat or energy recovery with balanced ventilation and a sensible recovery efficiency (SRE) >= 65% at 32 F.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.3 [FR12][1]	Supply and return ducts in attics insulated >= R-8 where duct is >= 3 inches in diameter and >= R-6 where < 3 inches.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Section # & Req.ID	Framing / Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
403.3.6 [FR13][1]	Ducts, air handlers and filter boxes are sealed with joints/seams compliant with International Mechanical Code or International Residential Code, as applicable.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.4.1 [FR24][1]	Protection of insulation on HVAC piping.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.2 [FR18][2]	Hot water pipes are insulated to ≥ 1 inch of insulation.	R-	R-	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.5 [FR29][2]	Air-sealed electrical and communication boxes installed in the thermal boundary of the envelope sealed to limit air leakage between conditioned and unconditioned spaces.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.1 [FR12][1]	Duct systems are design and sized in accordance with ACCA Manual D. Duct systems serving multiple dwelling units is sized in accordance with ASHRAE Handbook of Fundamentals, ACCA Manual D or an equivalent methodology.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.1, 402.4.4 [FR1][1]	Door U-factor.	U-	U-	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*
402.1, 402.4.1, 402.4.3, 402.6 [FR2][1]	Glazing U-factor (area-weighted average).	U-	U-	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Insulation Inspection

Section # & Req.ID	Insulation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
303.1 [IN13][2]	All installed insulation is labeled or the installed R-values provided.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
303.2 [IN4][1]	Wall insulation is installed per manufacturer's instructions.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.1, 402.2.6, 402.2.7 [IN3][1]	Wall insulation R-value. If this is a mass wall with at least ½ of the wall insulation on the wall exterior, the exterior insulation requirement applies (FR10).	R- ☐ Wood ☐ Mass ☐ Steel	R- ☐ Wood ☐ Mass ☐ Steel	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Final Inspection Provisions

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
303.1.1.1, 303.2 [FI2][1]	Ceiling insulation installed per manufacturer's instructions. Blown insulation marked every 300 ft².			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
303.3 [FI18][3]	Manufacturer manuals for mechanical and water heating systems have been provided.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.2 [FI26][2]	Hot water boilers have automatic outdoor setback control to lower boiler water temperature based on outdoor temperature, indoor temperature or water temperature sensing.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.6.1 [FI24][1]	Air handler leakage designated by manufacturer at <=2% of design air flow.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.7 [FI27][1]	Ducts are pressure tested in accordance with ANEI/RESNET/ICC 380 or ASTME1554 to determine air leakage with either: Rough-in test: Total leakage measured with a pressure differential of 0.1 inch w.g. across the system including the manufacturer's air handler enclosure if installed at time of test. Postconstruction test: Total leakage measured with a pressure differential of 0.1 inch w.g. across the entire system including the manufacturer's air handler enclosure.	☐ cfm/100 ft^2	☐ cfm/100 ft^2	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.3.8 [FI4][1]	Duct tightness test result of <=4 cfm/100 ft2 across the system or <=3 cfm/100 ft2 without air handler @ 25 Pa. Duct tightness <= 8 cfm/100 ft2 for ducts within thermal envelope. For rough-in tests, verification may need to occur during Framing Inspection.	☐ cfm/100 ft^2	☐ cfm/100 ft^2	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.1 [FI11][2]	Circulating service hot water systems have automatic or accessible manual controls.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.1.1.1 [FI32][2]	Demand recirculation water systems have automatic controls to start pump when hot water is requested.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
403.5.1.1 [FI28][2]	Heated water circulation systems have a circulation pump. The system return pipe is a dedicated return pipe or a cold water supply pipe. Gravity and thermos-syphon circulation systems are not present. Controls for circulating hot water system pumps start the pump with signal for hot water demand within the occupancy. Controls automatically turn off the pump when water is in circulation loop is at set-point temperature and no demand for hot water exists.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.1.2 [FI29][2]	Electric heat trace systems comply with IEEE 515.1 or UL 515. Controls automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.5.3 [FI31][2]	Drain water heat recovery units tested in accordance with CSA B55.1. Potable water-side pressure loss of drain water heat recovery units < 3 psi for individual units connected to one or two showers. Potable water-side pressure loss of drain water heat recovery units < 2 psi for individual units connected to three or more showers.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
401.3 [FI7][2]	Compliance certificate posted with building specifications, compliance path, R408 energy credits, results and solar ready zone if provided.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6.2 [FI25][2]	403.6.2: All mechanical ventilation system fans meet efficacy and air flow limits per Table R403.6.2.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6.3 [FI33][2]	Mechanical ventilation systems tested and verified to meet the minimum flow rates required by Section R403.6.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
403.6.5 [FI34][2]	Intermittent exhaust for bathrooms/toilet rooms has automatic control, occupant sensor control, humidity control or contaminant control.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.1, 402.2.1, 402.2.2, 402.2.7 [FI1][1]	Ceiling insulation R-value.	R- ☐ Wood ☐ Steel	R- ☐ Wood ☐ Steel	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
403.13, 403.13.1 [FI35][3]	Gas fireplaces equipped with on-demand pilot, intermittent ignition or interrupted ignition. Fireplace efficiency > 50% in accordance with CSA P.4.1			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.1 [FI6][1]	100% of permanent fixtures have high efficacy lamps.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.1.2 [FI35][3]	Exterior lighting power is below the allowable wattage in Table R404.1.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.1.5 [FI23][3]	Fuel gas lighting systems have no continuous pilot light.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.2.1, 404.2.2 [FI36][3]	Permanent interior lighting shall be controlled with either a manual dimmer, occupancy sensor or auto shut off control based on occupancy built with manual override.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.3 [FI37][3]	Exterior lighting >= 30 watts shall have the following controls: manual on/off switch with automatic shut-off, automatic shut-off in daylight hours, and controls that override automatic shutoff that returns to automatic control within 24 hours.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
404.4 [FI36][3]	Where renewable energy generation equipment is installed, renewable energy credits (RECs) or energy attributable certificates (EACs) associated with the renewable energy used for compliance are provided to the code official.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.2.4 [FI22][2]	Vented attics with air permeable insulation include baffle adjacent to soffit and eave vents that extends over insulation.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
408.2.2.1(2) [FI46][1]	Air conditioner installed with efficiency >= 15.2 SEER2/12.0 EER2 for additional efficiency credit			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Section # & Req.ID	Final Inspection Provisions	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
408.2.2.1(4) [FI48][1]	Gas furnace installed with efficiency >= 97 AFUE for additional efficiency credit			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.2.5 [FI3][1]	Attic access hatch and door insulation ≥R-value of the adjacent assembly.	R-	R-	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
408.2.3(1)(a) [FI59][1]	Gas-fired storage water heater efficiency >= 0.81 UEF for additional efficiency credit			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.5.1.3 [FI17][1]	Blower door test @ 50 Pa. <=4.0 ACH50 in Climate Zones 1-2, <=3.0 ACH50 in Climate Zones 3-5 and <= 2.5 ACH50 in Climate Zones 6-8.	ACH 50 =	ACH 50 =	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
402.3 [FI43][2]	Radiant barriers are installed in accordance with ASTM C1743	R- ☐ Wood ☐ Steel	R- ☐ Wood ☐ Steel	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Envelope Assemblies table for values*
403.1.1 [FI9][2]	Programmable thermostats installed for control of primary heating and cooling systems and initially set by manufacturer to code specifications.			☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

2024 IECC Energy Efficiency Certificate

Insulation Rating	R-Value
Above-Grade Wall	30.00
Below-Grade Wall	0.00
Floor	10.00
Ceiling / Roof	49.00
Ductwork (unconditioned spaces):	____

Glass & Door Rating	U-Factor	SHGC
Window	0.30	0.40
Door	0.30	
Skylight	0.00	

Heating & Cooling Equipment	Efficiency
Heating System: _____	_____
Cooling System: _____	_____
Water Heater: _____	_____

Signature

Name: _____ **Date:** _____

Comments:

REC-R408.2.9-24

IRC: N1108.2.9 (R408.2.9)

Proponents: Eric Lacey, representing Responsible Energy Codes Alliance (eric@reca-codes.com)

2024 International Residential Code

Delete without substitution:

~~**N1108.2.9 (R408.2.9) Opaque walls.** For *buildings* in Climate Zones 4 and 5, the maximum *U-factor* of 0.060 shall be permitted to be used for wood-framed walls for compliance with Table N1102.1.2 where complying with one or more of the following:~~

1. ~~Primary space heating is provided by a *heat pump* that meets one of the efficiencies in Section N1108.2.2.~~
2. ~~All installed *water heaters* are *heat pumps* that meet one of the efficiencies in Section N1108.2.3.~~
3. ~~In addition to the number of credits required by Section N1108.2, three additional credits are achieved.~~
4. ~~*Renewable energy resources* are installed to meet the requirements of Section N1108.2.7.~~

Reason Statement:

New Section R408.2.9 is an efficiency loophole incorporated into the 2024 *IECC* with potential long-term negative impacts. It allows a reduction in wall insulation where one of four conditions is met. There are several problems with this section:

1. None of the specific measures will provide efficiency for as long as the wall insulation being traded off. Measures 1 and 2 have significantly shorter useful lifetimes than wall insulation; measure 4 creates an efficiency trade-off for renewable energy, which is not allowed in either the prescriptive or performance paths of the *IECC*; and measure 3 allows a code user to select 3 more credits from Table R408.2, effectively creating a prescriptive envelope trade-off for 40+ measures that may or may not match the longevity or efficiency of wall insulation. No analysis was provided to justify this trade-off or to quantify whether these measures could save a comparable amount of energy as well-insulated walls.

2. Some advocates have been urging states to allow double-counting of these measures, effectively reducing envelope efficiency without any improvements elsewhere in the building. The charging language does not clarify whether measures 1, 2, and 4 are *in addition to* measures already used to comply with Section R408.2, or whether a code user may simply double-count these measures and reduce envelope efficiency. Neither the proponent's reason statement for this measure (REPI-33-21) nor any of the debate in the 2024 IECC development cycle addressed the possibility of double-counting, and it would seem to contradict language in measure 3 (which requires 3 credits "in addition to the number of credits required by Section R408.2"). Yet advocates at the state and national level have argued that code users should receive credit for these measures both to comply with Section R408.2 and to receive the benefits of an insulation reduction under R408.2.9.

This entire section is problematic, and will only to lead to reduced efficiency. The only reason it is included in the 2024 IECC is because it was part of a deal among IECC Residential Consensus Committee members where sustainability measures and efficiency rollbacks that failed to achieve the required number of votes were grouped into a large "omnibus" package. In response to several appeals, the ICC Board of Directors later reversed the portions of the omnibus related to sustainability, but left in place the efficiency rollbacks, making the 2024 IECC less stringent than the 2021 IECC in several places. Other states considering the 2024 IECC have either deleted this controversial section or are in the process of debating it. We strongly recommend deleting the entire section and maintaining the stringency of the IECC.

Cost Impact: The code change proposal will not increase or decrease the cost

This section is a problematic and confusing exception that was introduced in the 2024 IECC. Eliminating it does not change the base efficiency requirements of the code, so it will neither increase nor decrease costs for code users.

EC-C402.1.6(1)-24

VECC: C402.1.6, CD101.1

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2021 Virginia Energy Code

Revise as follows:

C402.1.6 Groups F, S, and U. Appendix CD may be used as an alternative to the *building thermal envelope* provisions of this code for buildings in Groups F, S, and ~~U.~~ U that are not designed or equipped to heat the interior to more than 60°F or to cool the interior other than by fans or natural ventilation.

CD101.1 General. These provisions shall be permitted as an alternative to *building thermal envelope* requirements for building areas containing uses that are classified as Group F, S or ~~U.~~ U that are not designed or equipped to be heated to a temperature above 60°F or to be cooled other than by fans or natural ventilation.

Reason Statement:
This proposal would narrow a broad, unsupported rollback of minimum envelope energy efficiency standards for commercial Categories F, S and U from complying with the IECC to a level comparable to the 2006 version of the IECC.

The modification would reasonably limit the use of Appendix CD to buildings that are not designed or equipped to heat their interiors above 60℉ or to cool them other than by fans or natural ventilation, which are the only situtations that might justifiably use the greatly weakened thermal efficiency standards in Appendix CD. This is an alternative to the proposal to delete EC-C402.1.6 and Appendix CD.

Restricting the scope of Appendix CD as proposed herein is responsive to the only substantive objection that was given in support of Appendix CD during the 2021 Cycle. The proponent of Appendix CD cited a proposed “warehouse project used for storage of materials with heat maintained at 60 degrees or less and no cooling” and, more generally, a subset of warehouses with low heating needs. In the proponent's words:

> “The current energy code requirements are over burdensome for Factory Group F, Storage Group S, and Utility and Miscellaneous Group U. These use groups do not traditionally use a lot of energy as they are not heated or cooled to normal heating and cooling temperatures and or they create their own heat, etc. The change would eliminate unneeded and extra cost to the building owner. Additional insulation, roofing materials, and wall panel materials are being required in excess for buildings that will not fully utilize them. Many storage facilities are vacant most of the time and a lot of manufacturing and utility buildings will have the drive through doors open during production.”

Nothing in the “reason statement” submitted in support of Appendix CD even plausibly attempted to justify reducing the thermal envelope requirements for the many types of buildings in Groups F, S and U which do heat their interiors above 60℉ or to cool them with mechanical air conditioning. Nor did it explain why the IECC’s concessions to buildings with little need for heating and cooling were insufficient. It said nothing whatsoever about energy and energy-cost savings from IECC implementation or about benefits to occupants or the public. Nor did it provide any evidence contradicting the many findings by the U.S. Department of Energy and the Pacific Northwest National Laboratories that each IECC (and ASHRAE) update since 2006 would save energy and money for building users, including warehouse users.

The broad rollback by Appendix CD was granted over strong objections and evidence from multiple participants in the 2021 Code Cycle, which positioned it as a non-consensus proposal. [The proposal was called Appendix CB when introduced. It also did not include some references to the “2004” ASHRAE, which the draft 2024 Base Document appears to have added.]

Modifying or eliminating the rollback is required because applicable law requires Virginia’s building code to be consistent with or at least as stringent as the IECC. Appendix CD moves the code backwards by more than 15 years overriding multiple IECC updates approved by the Board and by the IECC since 2006. Failing to eliminate or, at least, modify Section C406.1.2 and Appendix CD as proposed herein would waste energy, raise occupancy costs, potentially harm employees, increase air pollution, including climate pollution, and harm the “health, safety and welfare” of the residents of Virginia both now and for the decades these inefficient buildings are operated.

The 2021-Cycle record showed that (a) Appendix CD's decade-plus rollback for the 120+ types of buildings covered by the proposal was not supported by substantial evidence; (b) builders successfully implemented Board-approved IECC standards for 2009, 2012, 2015 and 2018, and ASHRAE standards for every update since 2006; (c) U.S. DOE had found that full implementation of the 2021 IECC standards and each update from 2009-2018 would save energy and money; (d) far from suffering under unreasonable burdens, the warehouse market was booming under the then-effective 2018 IECC; and (e) there were no findings or analysis by either the proponent or the Board to support approving the non-consensus proposal. Buildings included in Groups F, S and U include many that are heated or cooled like commercial buildings in other Groups. Buildings in F, S and U include ones involving food, active employees, and even data centers with staggering energy loads.

1. Virginia Law Requires Consistency with Model Building Codes

Section 36-99A requires implementation of building code standards that "protect the health, safety and welfare of the residents of the Commonwealth, and that minimize costs "consistent with" recognized national standards, which in Virginia means the IECC.

> The provisions of the Building Code and modifications thereof shall be such as to protect the health, safety and welfare of the residents of the Commonwealth, provided that buildings and structures should be permitted to be constructed, rehabilitated and maintained at the least possible cost consistent with recognized standards of health, safety, energy conservation and water conservation, including provisions necessary to prevent overcrowding, rodent or insect infestation, and garbage accumulation; and barrier-free provisions for the physically handicapped and aged.

As recognized by the 2021 NOPR, keeping the code up to date with "recognized standards of health, safety, energy conservation and water conservation" is critical. Construction costs should be reduced where possible, but only to the extent "consistent with" the IECC's "energy conservation" standards. Backtracking to weaker, out-of-date standards is not permissible. The modification proposed here would at least keep Virginia's code nearly consistent with the IECC for buildings in Groups F, S and U.

Pursuant to 2021 legislation, VIRGINIA ACTS OF ASSEMBLY – 2021 SPECIAL SESSION I, CHAPTER 425, Section 1 ("H2227"), the Board was directed to **"**consider adopting Building Code standards that are at least as stringent as those contained in the new version of the IECC." Factors to be considered are "the public health, safety, and welfare benefits of adopting standards that are at least as stringent as those contained in the IECC, including potential energy savings and air quality benefits over time compared to the cost of initial construction." Nothing in H2227 authorized approval of less stringent standards, particularly for large groups of buildings that are heated and cooled.

In 2022, at the request of certain builders, the GA adopted HB1289, which directed the Board "to consider during the next code development cycle, revising the Uniform Statewide Building Code…to provide an exemption from any requirements in the energy efficiency … for the following use and occupancy classifications pursuant to Chapter 3 of the 2018 Virginia Construction Code: (i) Section 306, Factory Group F; (ii) section 311, Storage Group S; and (iii) Section 312, Utility and Miscellaneous Group U.**"**

While HB1289 called for consideration of an exemption, it did not alter the statutory standards for building codes prescribed by 36-99A and H2227. Since the legislature did not change the applicable legal standards, its direction "to consider" is bound by the standards in 36-99A and H2227, which require adoption of code standards that protect the "health, safety and welfare" of Virginians, minimize costs "consistent with" national model codes, and be "at least as stringent" as the IECC. Nothing justifies the broad rollback made in the 2021 cycle.

2. No credible support was provided the rollback of code standards.

Since the 2006 IECC, the IECC adjusted and the Board repeatedly approved updated standards to recognize new industry developments and public needs. Nothing presented in the 2021 Cycle plausibly justified overturning all those decisions by the IECC and the Board. The proponent's supporting statement for the rollback proposed in the last cycle was very brief and conclusory. Neither the proponent nor any other participant provided any reasonable basis for rolling back conservation standards for any type of building. While Appendix CD would reduce some builders' construction costs, nothing demonstrated that the proposal would meet the relevant statutory standards of

serving Virginians' "health, safety and welfare" or minimizing costs "consistent with" energy conservation standards or achieving energy efficiency "at least as stringent" as the latest IECC.

In support of cutting back standards for dozens of types of buildings within the 3 broad categories Groups F, S and U, the proposal's Reason Statement and Cost Impact statement provided (a) two, sketchy examples of hypothetical buildings' compliance costs with no information about energy or energy cost savings; (b) a few generalized statements that some builders find compliance challenging and that some the affected buildings are "not heated or cooled to normal heating and cooling temperatures" or are "vacant" some of the time or might have "open doors" part of the time (which the IECC already addresses by exempting or reducing efficiency standards for buildings with such characteristics). Apart from the suggestion that some warehouses are not heated above 60°F or not heated or cooled at all, there are absolutely no details about the energy usage, efficiency, costs, efficiency-driven savings and characteristics of any 120+ types of buildings that are covered by the efficiency rollback.

Section 306 Factory Group F identifies over 50 types of factories; Section 311 Storage Group S lists over 60 types of storage facilities; and Section 312 Utility and Miscellaneous Group U identifies over a dozen categories. Some of the facilities store products (*e.g.*, food) that are temperature sensitive and require a great deal of energy (lessened only by energy efficiency) to achieve temperature goals. Other buildings involve manufacturing, greenhouses and other operations, which have still different energy and energy-efficiency profiles. Yet, apart scant information about two hypothetical warehouses, the proposal for the rollback provided no details or analysis of any other types of buildings or their energy footprints, available technologies, employee and customer needs, compliance costs, energy cost savings, pollution reductions or other factors relevant to the extreme, multi-group proposal.

The proposal provided no contextual information about its hypotheticals while omitting critical information. For example, it failed to disclose the huge volume of air to be heated and cooled in the two illustrations of warehouses: roughly 2.5 million cubic feet for the 100,000 Sf warehouse, and 144,000 cubic feet for the 7500 SF warehouse. Even minimal space heating or conditioning would require a large amount of energy to achieve a target of 60 degrees or more. Nor did the proponent address the huge, overall energy cost and use increases (waste) or pollution increases from rolling back established and new efficiency standards for multiple categories of buildings.
The proposal to return to 2006 standards also claimed harms that ignored the 2021 IECC's flexibility provisions which reduce requirements for unheated and low-conditioned buildings and permitted buildings to be subdivided into an exempt unheated portion and a separate heated portion if, for example, heating for an office or other work area is needed. It also ignored ASHRAE's flexibility for low energy buildings.

The proponent failed to compare the impact of its proposed standards to the many IECC standards it would override or to subsequent ASHRAE standards, which Appendix CD also undercuts.

Nor did the proponent provide data contradicting the many findings by DOE that each update would save energy and energy costs. The proponent's brief assertions about possible implementation being more difficult and possibly less attractive are too vague or irrelevant to support the extreme proposal. If the proposal was based on legitimate problems, they would have been raised in each cycle from 2009 through 2018.

The proposal did not address or explain how Virginia had successfully implemented the higher conservation standards embodied in IECC updates from 2009-2018 or explain why the 2021 standards are unreasonable.

In fact, the evidence presented showed that the warehouse business was booming in the years the 2018 IECC standards were in effect. See, for example:

- **"Need for speed: Developers race to build warehouses amid site shortage,"** https://www.virginiabusiness.com/article/need-for-speed/ (Dec. 31, 2021) ("Geoff Poston [of Hampton Roads] likens the current market for building, buying and leasing warehouses and distribution centers to the mid-1800s California Gold Rush: Everybody wants in." The problem is land, not demand or ability to construct.);
- **"Making it rain: Increased e-commerce fuels wave of distribution centers,"** https://www.virginiabusiness.com/article/making-it-rain/ (April 29, 2021) ("For Hanover County Economic Development Director Linwood Thomas, things couldn't get much better. 'It's really been a perfect storm,' Thomas says. That storm — the good type — is a deluge of distribution centers and warehouses that have opened recently or are currently in the pipeline for the county of about 108,000 residents, located about 20 miles north of Richmond.… Over the past two years or so, Hanover has added about 1.5 million square feet of new space and about 80% of that has been leased. 'Then, we've got another almost 4 million square feet proposed in the next 24 months. These are tangible products that will put us over 5.5 million

square feet of new space, which is huge,' says Thomas, noting that the new space will represent a nearly VASE% increase over the county's existing stock of 13.8 million square feet of industrial/warehouse space.");

- o **"Industrial boom: Virginia continues to see more warehouses and distribution centers**," https://www.virginiabusiness.com/article/industrial-boom/ (July 27, 2018)("While Hampton and Southwest Virginia area also benefiting, …. Richmond's industrial warehouse market is currently undergoing a "golden age" in the distribution sector, according to a recent report from CBRE.")

Other considerations that require deleting Appendix CD and Section 402.1.6 which operationalizes Appendix CD, thereby returning to full compliance with the latest IECC, include:

The IECC's code provisions are built upon the hard work, expertise and negotiations of hundreds of industry and efficiency experts, architects, engineers, trade associations, environmental experts, government bodies and public review processes. They consider technological developments, costs, benefits and practicality. Nothing in the IECC standards was arbitrarily arrived at. It makes accommodations are made for different types of buildings and usage patterns, including low-energy building, through different standards, exemptions and performance alternatives.

DOE/PNNL have consistently found that ASHRAE and IECC standards save money for building users through energy savings compared to initial construction costs. https://www.energycodes.gov/sites/default/files/2021-07/Cost-effectiveness_of_ASHRAE_Standard_90-1-2019-Virginia.pdf ; The U.S. Department of Energy (DOE) and its Pacific Northwest National Laboratory (PNNL), in 2022, completed their analysisof commercial provisions of the International Code Council's 2021 International Energy Conservation Code (IECC). As stated in PNNL's report, "the 2021 edition of the IECC results in site energy savings of 12.1% at the aggregate national level compared to the 2018 IECC edition. In addition, on a national weighted average basis, the 2021 IECC is 6.5% more efficient for site energy use than Standard 90.1-2019." The 2021 IECC also provides a nationally aggregated energy cost savings of 10.6% and greenhouse gas emissions savings of 10.2% as compared to the 2018 edition. See PNNL, 2024 IECC Interim Energy Savings Analysis and Progress Indicator for Commercial Buildings (PNNL-SA-178763). See also https://www.energycodes.gov/determinations for recent and past determinations. Many of the DOE commercial determinations address ASHRAE standards which have followed an upward trajectory for efficiency stringency similar to IECC.

The proponent's supporting statement did not consider cost impacts, over time, to building users or the impacts of rising energy costs, which are likely to occur as climate change drives up ambient temperatures.

The proponent provided no evidence on how the public, including building occupants, communities and residents of the Commonwealth – would be affected by exempting these three large categories of buildings from all energy conservation requirements. DOE has found, for example, that energy use reductions, under updated IECC standards, would reduce GHG emissions impacts and climate impacts. By reducing peak and off-peak energy demands, keeping up with the latest IECC would reduce pressure on utilities to raise rates charged to all customers to cover higher priced energy resources.

Despite short-term appeals to builders of reducing construction costs, continuing implementation of the rollback would increase the risk that the buildings would become obsolete more quickly as energy operating costs go up for occupants. Lower rents and vacancies could follow just as they have for older office buildings in many areas.

In sum, while C402.1.6. and Appendix CD should be deleted from Virginia's building code as proposed elsewhere, they should at least be limited to buildings that are not heated above 60°F or cooled other than by fans or natural ventilation Such a limiting amendment would be at least generally consistent the IECC's existing standards which limit the envelope requirements for buildings that have little or no heating and cooling. No substantive information has ever been presented to support rolling back envelope efficiency standards to the 2006 level for all of Groups F, S and U, most of which were not even discussed in the 2021 cycle.

Cost Impact: The code change proposal will increase the cost

This code change proposal will increase construction costs for some, but not all, new buildings in Groups F, S and U. However, it will reduce energy costs and pollution, saving money for most building users in Groups F, S and U and protecting Virginia residents health, safety and welfare consistent with the requirements of Virginia laws governing building codes.
The DOE and PNNL have repeatedly found that the IECC's (and ASHRAE's) higher efficiency standards from 2009-2021 would result in large savings of energy and money. The evolution of the IECC, since 2006, was justified justified by changes in technology, building techniques, energy savings and energy costs, all of which have been reviewed by the IECC, DOE, and PNNL.

As discussed in the Reason Statement, Virginia warehouse builders managed to successfully and profitably construct new structures

under Virginia's building code, which, prior to the 2021 cycle, had implemented all the IECC's updates after 2006. Building warehouses was a "booming" business under full compliance with IECC's commercial envelope standards, which had been adopted in full by the Board prior to the last cycle.

The scanty cost claims that were presented in support of the Section 402.1.6 and Appendix CD (then called Appendix CB) described two hypothetical warehouses (presumably in Group F) and focused on buildings that are not heated above 60 F or cooled. There was no information about (a) any of costs or benefits for the many other types of buildings covered by Appendix CD, (b) the energy and energy cost savings that would result from the higher efficiency standards in either the 2021 or 2018 IECC, (c) any justifications for the many other changes embedded in Appendix CD, (d) how the so-called complications of construction had been successfully and profitably complied with for well over a decade, (e) why ASHRAE standards should be rolled back, (f) impacts on climate and other forms of air pollution, or any other issue relevant to the rollback to 8 pages of 2006 standards. Weakening building code standards to help two isolated examples or buildings that do not heat above 60°F or cool with air conditioning would hurt future building users of the other 120+ types of buildings in Groups F, S and U, most of which have very different heating and cooling profiles, involving much greater energy use for heating and/or cooling. Once the standards are weakened, builders will be pressured to match efficiency reductions by competitors – a result that building codes are supposed to prevent. That is not consistent with either the public's health, safety and welfare or the IECC's energy conservation standards.

Virginia law requires that these provisions of the code be restored to those of the latest IECC at least for buildings that are designed and equipped for heating and cooling. At a minimum, C402.1.6 and Appendix CD should be limited to buildings that are not designed or equipped to be heated above 60F or cooled other than with fans or natural ventilation as proposed herein.

EC-C403.7.4.1-24

VECC: C403.7.4.1

Proponents: Joseph Willis, representing Prince William County (jwillis@pwcgov.org); Eric Mays, representing Prince William County (emays@pwcgov.org); Donna Rubino, Prince William County, representing Prince William County Building (drubino@pwcgov.org)

2021 Virginia Energy Code

Revise as follows:

C403.7.4.1 Nontransient dwelling units. Nontransient dwelling units shall be provided with outdoor air energy recovery ventilation systems with an *enthalpy recovery ratio* of not less than 50 percent at cooling design condition and not less than 60 percent at heating design condition.

Exceptions:

1. Nontransient dwelling units in Climate Zone 3C.
2. Nontransient dwelling units with not more than 500 square feet (46 m^2) of *conditioned floor area* in Climate Zones 0, 1, 2, 3, 4C and 5C.
3. *Enthalpy recovery ratio* requirements at heating design condition in Climate Zones 0, 1 and 2.
4. *Enthalpy recovery ratio* requirements at cooling design condition in Climate Zones 4, 5, 6, 7 and 8.
5. **Nontransient dwelling units where the ratio of required outdoor air to supply air is less than 10 percent.**

Reason Statement:

Individual HVAC systems for condos and apartments tend to range from 2-3 tons cooling capacity. The required ventilation air is typically 5% or less of the supply airflow. The mechanical code permits options to achieve this through inexpensive means (connect to the return air side of the air handler or mechanical exhaust).

Prior to the 2015 Mechanical Code, natural ventilation was permitted through operable windows. Since then, only mechanical ventilation is permitted for this application.

An enthalpy recovery ratio for an ERV of 50%, means that 50% of the energy difference between the outside air and the return air is recovered and used to precondition the supply air. I'm assuming that the enthalpy recovery ratio at cooling design will be less than 50% for these types of units, so I use Exception 4. (Is that what the exception means? It's not clear.)

Cost Impact: The code change proposal will decrease the cost

Requiring these systems to use individual energy recovery is an added expense (~$600 - $1000 per unit) that doesn't seem necessary at these low airflows. There are better options available when using energy recovery for outdoor air, such as large dedicated outdoor air units with energy recovery to provide fresh air to multiple units or corridors.

EC-C405.15-24

IECC: C405.15, C405.15.1, C405.15.2, TABLE C405.15.2, C405.15.2.1, C405.15.2.2, C405.15.3, C405.15.4

Proponents: Steven Shapiro, AOBA/VAMA, representing Apartment and Office Building Association/Virginia Apartment Management Association (stevenishapiro@outlook.com)

2024 International Energy Conservation Code [CE Project]

Delete without substitution:

C405.15 Renewable energy systems. *Buildings* in Climate Zones 0 through 7 shall comply with Sections C405.15.1 through C405.15.4.

C405.15.1 On-site renewable energy systems. *Buildings* shall be provided with on-site renewable electricity generation systems with a direct current (DC) nameplate power rating of not less than 0.75 watts per square foot (8.1 W/m^2) multiplied by the sum of the gross *conditioned floor area* of all floors, not to exceed the combined gross *conditioned floor area* of the three largest floors.

Exceptions: The following *buildings* or building sites shall comply with Section C405.15.2:

1. A *building site* located where an unshaded flat plate collector oriented toward the equator and tilted at an angle from horizontal equal to the latitude receives an annual daily average incident solar radiation less than 1.1 kBtu/ft^2 per day (3.5 kWh/m^2/day).
2. A *building* where more than 80 percent of the roof area is covered by any combination of permanent obstructions such as, but not limited to, mechanical equipment, vegetated space, access pathways or occupied roof terrace.
3. Any *building* where more than 50 percent of the roof area is shaded from direct-beam sunlight by natural objects or by structures that are not part of the *building* for more than 2,500 annual hours between 8:00 a.m. and 4:00 p.m.
4. A *building* with gross *conditioned floor area* less than 5,000 square feet (465 m^2).

C405.15.2 Off-site renewable energy. *Buildings* that qualify for one or more of the exceptions to Section C405.15.1 or do not meet the requirements of Section C405.15.1 with an on-site renewable energy system shall procure off-site renewable electrical energy, in accordance with Sections C405.15.2.1 and C405.15.2.2, that shall be not less than the total off-site renewable electrical energy determined in accordance with Equation 4-11.

$$TRE_{off} = (REN_{off} \times 0.75\ W/ft^2 \times FLRA - IRE_{on}) \times 15$$ **Equation 4-11**

where:

TRE_{off} = Total off-site renewable electrical energy in kilowatt-hours (kWh) to be procured in accordance with Table C405.15.2.
REN_{off} = Annual off-site renewable electrical energy from Table C405.15.2, in units of kilowatt-hours per watt of array capacity.
FLRA = The sum of the gross conditioned floor area of all floors not to exceed the combined floor area of the three largest floors.
IRE_{on} = Annual on-site renewable electrical energy generation of a new on-site renewable energy system, to be installed as part of the building project, whose rated capacity is less than the rated capacity required in Section C405.15.1.

TABLE C405.15.2 ANNUAL OFF-SITE RENEWABLE ENERGY REQUIREMENTS

CLIMATE ZONE	ANNUAL OFF-SITE RENEWABLE ELECTRICAL ENERGY (kWh/W)
1A, 2B, 3B, 3C, 4B and 5B	1.75
0A, 0B, 1B, 2A, 3A and 6B	1.55
4A, 4C, 5A, 5C, 6A and 7	1.35

C405.15.2.1 Off-site procurement. The building *owner,* as defined in the *International Building Code* , shall procure and be credited for the total amount of off-site renewable electrical energy, not less than required in accordance with Equation 4-11, with one or more of the following:

1. *Physical renewable energy power purchase agreement.*
2. *Financial renewable energy power purchase agreement.*
3. *Community renewable energy facility.*
4. Off-site renewable energy system owned by the building property *owner.*
5. *Renewable energy investment fund.*
6. *Green retail tariff.*

The generation source shall be located where the energy can be delivered to the *building site* by any of the following:

1. Direct connection to the off-site renewable energy facility.
2. The local utility or distribution entity.
3. An interconnected electrical network where energy delivery capacity between the generator and the *building site* is available.

C405.15.2.2 Off-site contract. The renewable energy shall be delivered or credited to the *building site* under an energy contract with a duration of not less than 10 years. The contract shall be structured to survive a partial or full transfer of ownership of the building property.

C405.15.3 Renewable energy certificate (REC) documentation. The property *owner* or owner's authorized agent shall demonstrate that where renewable energy certificates (RECs) or energy attribute certificates (EACs) are associated with on-site and off-site renewable energy production required by Sections C405.15.1 and C405.15.2, all of the following criteria for RECs and EACs shall be met:

1. The RECs and EACs are retained and retired by or on behalf of the property owner or tenant for a period of not less than 15 years or the duration of the contract in Section C405.15.2.2, whichever is less.
2. The RECs and EACs are created within a 12-month period of the use of the REC.
3. The RECs and EACs are from a generating asset placed in service not more than 5 years before the issuance of the certificate of occupancy.

C405.15.4 Renewable energy certificate purchase. A *building* that qualifies for one or more of the exceptions to Section C405.15.1, and where it can be demonstrated to the *code official* that the requirements of Section C405.15.2 cannot be met, the building owner shall contract the purchase of renewable electricity products before the certificate of occupancy is issued. The purchase of renewable electricity products shall comply with the Green-e Energy National Standard for renewable electricity products equivalent to five times the amount of total off-site renewable energy calculated in accordance with Equation 4-11.

Reason Statement:

Remove Section C 405.15, requiring buildings to install on-site renewable energy systems or procure off-site renewable energy equal to 15% of the building's energy use.

This standard established by this code change is infeasible.

Even for new construction, it can be difficult to carve out contiguous space for systems representing 8-10% of the building's energy use. Depending on the size and use of the building, 5% may be a more practical standard. (The 15% threshold may be completely infeasible for smaller building types.)

This can be significantly more challenging for renovations of existing buildings where the space was not planned to accommodate renewable energy systems.

Renewable energy systems compete for limited space with cooling towers, condensing units and other systems, not to mention green rooves and amenity spaces that tenants demand. Multifamily properties may have multiple individual HVAC units with which to contend for limited space.

This code change will increase construction costs and discourage renovations.

The rough cost of a solar energy system is approximately $3 per watt for systems between 50 and 250 kilowatts in size.

- This includes panels, wiring, batteries, and inverters.
- This does not include extremely expensive canopy systems which may be required to achieve higher percentages of building energy use or for buildings over 80 feet in height.
  - Many commercial buildings make use of ballast systems, which employ weights to secure equipment without the need to puncture the roof. Canopy and racking systems come with additional concerns for leaks developing over time as they require a great many roof punctures.
- New solar and canopy systems may additionally trigger very expensive structural upgrades to support the weight of the renewable energy systems.

Section C 405.15 allows for properties which cannot meet the 15% threshold to supplement onsite generation with renewable energy credits (RECs). On the open market, such credits can be secured for approximately $3-4 per MWh. Local credits are far more costly, at around $100-$200 per MWh.

The costs of construction are ultimately passed onto Virginia businesses and renters. The Commonwealth can ill afford to absorb these costs in our current economic climate.

- Commercial office properties across the Commonwealth currently face a vacancy rate of 13%, indicative of a struggling market sector. Urban centers like Arlington and Fairfax in Northern Virginia are facing vacancies in the range of 20-25%. Increasing the cost of commercial office construction will render Virginia less competitive with surrounding states.
- The spike in commercial vacancy rates since the COVID-19 pandemic has led many jurisdictions to pursue converting commercial office properties to multifamily residential use. By driving up the cost of construction, this code change will serve as an impediment to substantial building renovations and conversions.
- Virginia additionally faces a crisis of housing affordability attributable to the failure of the Commonwealth to keep place with housing demand. Driving up the cost of construction will hinder Virginia's efforts to attract new multifamily housing development.

This code change fails to consider the challenges associated with connectivity to the grid, outside of the property owner's control.

Properties installing renewable energy systems must navigate Dominion Virginia Power's net metering and permitting rules and requirements.

Example #1

This large warehouse retail space in Reston is one of the few commercial building types with ample roof space to accommodate renewable energy systems. In the illustration below, you can see that the vendor has depicted the installation of solar panels in almost

every available space. Yet, even with this extremely cluttered design, the building would still only be able to achieve 12% of its energy consumption from renewable energy. And this would be at a cost of roughly $1.5 million. Again, this does not factor in the probable necessity of canopy and racking systems and the associated structural work they would require. Additionally, the need to cluster panels in non-contiguous spaces to reach the maximum percentage of building energy consumption supported by renewable energy would require extensive string wiring back to a centralized inverter, creating an additional safety hazard.

Example #2

Member property example #2 is a 712-unit garden-style apartment community in Alexandria, consisting of seven 4-story buildings.

The property averages 4,029,169 kWh of annual consumption, requiring an offset of 604,375 kWh to meet the 15% standard. While the property boasts significant roof and green space to accommodate renewable energy systems, installation would likely require the removal of several trees. This could potentially run afoul of local tree preservation policies/efforts.

Meeting the 15% standard would require a DC system size of 510 kW. The vendor recommends installation of 850 600W solar panels. Applying the $3/watt standard cost, the total comes to approximately $1.5 million.

600W X 850 panels X $3 unit cost = $1,530,000

This property, originally constructed in 1964, operates as market-rate affordable housing, with rents well below market averages. Given its age, it is likely that the property will require substantial renovation in the next 10-15 years. Taking into account the below-market rent levels that such a property can command, the addition of $1.5 million in cost could very well scuttle reinvestment in the property, leading either to substandard housing or a loss of affordable housing stock coveted by the Commonwealth and its jurisdictions.

Example #3

Member property example #2 is an 18-story, 853,000 square foot commercial office tower in Reston.

The property averages 9,458,913 kWh of annual consumption, requiring an offset of 1,418,837 kWh to meet the 15% standard. As depicted above, there is very little usable space on the roof of the office tower itself. The adjoining parking structure could accommodate renewable energy systems with the use of canopy systems, adding approximately $1.50 per watt.

Meeting the 15% standard would require a DC system size of 1,183 kW. The vendor recommends installation of 1,970 600W solar panels. Applying the $3/watt standard cost, plus the additional $1.50 per watt standard for canopy systems, the total comes to approximately $5.3 million.

600W X 1,970 panels X $4.50 unit cost = $5,319,000

Cost Impact: The code change proposal will decrease the cost

The deletion of the requirements of section C405.15 will decrease the cost of construction in the general amounts shown in the reason statement by avoiding the costs of on-site renewable energy systems as well as the procurement of off-site credits.

EC-C405.17(1)-24

IECC: C405.17 (New), C405.17.1 (New), C405.17.2 (New), C405.17.2.1 (New), C405.17.2.2 (New), C405.17.2.3 (New), C405.17.2.4 (New), C405.17.2.5 (New), C405.17.2.5.1 (New), C405.17.2.5.2 (New), C405.17.2.5.3 (New), C405.17.2.5.3.1 (New), C405.17.2.5.3.2 (New), C405.17.2.6 (New)

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2024 International Energy Conservation Code [CE Project]

Add new text as follows:

C405.17 ELECTRIC VEHICLE POWER TRANSFER.

C405.17.1 Definitions.
AUTOMOBILE PARKING SPACE. A space within a building or private or public parking lot, exclusive of driveways, ramps, columns, office and work areas, for the parking of an automobile.

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

ELECTRIC VEHICLE CAPABLE SPACE (EV CAPABLE SPACE). A designated automobile parking space that is provided with electrical infrastructure such as, but not limited to, raceways, cables, electrical capacity, a panelboard or other electrical distribution equipment space necessary for the future installation of an EVSE.

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

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). Equipment for plug-in power transfer, including ungrounded, grounded and equipment grounding conductors; electric vehicle connectors; attached plugs; any personal protection system; and all other fittings, devices, power outlets or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the electric vehicle.

ELECTRIC VEHICLE SUPPLY EQUIPMENT INSTALLED SPACE (EVSE SPACE). An automobile parking space that is provided with a dedicated EVSE connection.

C405.17.2 Electric vehicle power transfer infrastructure. Parking facilities shall be provided with electric vehicle power transfer infrastructure in accordance with Sections C405.17.2.1 through C405.17.2.6 and all applicable fire safety regulations.

C405.17.2.1 Quantity. Except to the extent the number of potential chargers is limited by any applicable fire safety regulations, the number of required electric vehicle (EV) spaces, EV capable spaces and EV ready spaces shall be determined in accordance with this section and Table C405.17.2.1 based on the total number of automobile parking spaces and shall be rounded up to the nearest whole number. For R-2 buildings, the C405.17.2.1 requirements shall be based on the total number of dwelling units or the total number of automobile parking spaces, whichever is less.

1. Where more than one parking facility is provided on a building site, the number of required automobile parking spaces required to have EV power transfer infrastructure shall be calculated separately for each parking facility.

2. Where one shared parking facility serves multiple building occupancies, the required number of spaces shall be determined

proportionally based on the floor area of each building occupancy.

3. Installed electric vehicle supply equipment installed spaces (EVSE spaces) that exceed the minimum requirements of this section may be used to meet the minimum requirements for EV ready spaces and EV capable spaces.

4. Installed EV ready spaces that exceed the minimum requirements of this section may be used to meet the minimum requirements for EV capable spaces.

5. Where the number of EV ready spaces allocated for R-2 occupancies is equal to the number of dwelling units or to the number of automobile parking spaces allocated to R-2 occupancies, whichever is less, requirements for EVSE spaces for R-2 occupancies shall not apply.

6. Requirements for a Group S-2 parking garage shall be determined by the occupancies served by that parking garage. Where new automobile spaces do not serve specific occupancies, the values for Group S-2 parking garage in Table C405.17.2.1 shall be used

Exception: Parking facilities serving occupancies other than R2 with fewer than 10 automobile parking spaces.

TABLE C405.17.2.1—REQUIRED EV POWER TRANSFER INFRASTRUCTURE

OCCUPANCY	EVSE SPACES	EV READY SPACES	EV CAPABLE SPACES
Group A	3%	0%	10%
Group B	3%	0%	10%
Group E	3%	0%	10%
Group F	2%	0%	5%
Group H	1%	0%	0%
Group I	5%	0%	10%
Group M	5%	0%	10%
Group R-1	5%	5%	30%
Group R-2	5%	5%	30%
Groups R-3 and R-4	2%	0%	5%
Group S exclusive of parking garages	1%	0%	0%
Group S-2 parking garages	5%	0%	10%

C405.17.2.2 EV Capable Spaces. Each EV capable space used to meet the requirements of Section C405.17.2.1 shall comply with the following:

1. A continuous raceway or cable assembly shall be installed between an enclosure or outlet located within 3 feet (914 mm) of the EV capable space and electrical distribution equipment.

2. Installed raceway or cable assembly shall be sized and rated to supply a minimum circuit capacity in accordance with Section C405.17.2.5.

3. The electrical distribution equipment to which the raceway or cable assembly connects shall have dedicated overcurrent protection device space and electrical capacity to supply a calculated load in accordance with Section C405.17.2.5.

4. The enclosure or outlet and the electrical distribution equipment directory shall be marked: “For electric vehicle supply equipment (EVSE).”

C405.17.2.3 EV Ready Spaces. Each branch circuit serving EV ready spaces used to meet the requirements of Section C405.17.2.1 shall comply with the following:

1. Terminate at an outlet or enclosure located within 3 feet (914 mm) of each EV ready space it serves.

2. Have a minimum system and circuit capacity in accordance with Section C405.17.2.5.

3. The electrical distribution equipment directory shall designate the branch circuit as “For electric vehicle supply equipment (EVSE)”

and the outlet or enclosure shall be marked “For electric vehicle supply equipment (EVSE).”

C405.17.2.4 EVSE Spaces.
An installed EVSE with multiple output connections shall be permitted to serve multiple EVSE spaces. Each EVSE installed to meet the requirements of Section C405.17.2.1, serving either a single EVSE space or multiple EVSE spaces, shall comply with the following:

1. Have a minimum system and circuit capacity in accordance with Section C405.17.2.5.
2. Have a nameplate rating not less than 6.2 kW.
3. Be located within 3 feet (914 mm) of each EVSE space it serves.
4. Be installed in accordance with Section C405.17.2.6.

C405.17.2.5 System and circuit capacity. The system and circuit capacity shall comply with Sections C405.17. 2.5.1 and C405.17.2.5.2.

C405.17.2.5.1 System capacity. The electrical distribution equipment supplying the branch circuit(s) serving each EV capable space, EV ready space and EVSE space shall comply with one of the following:

1. Have a calculated load of 7.2 kVA or the nameplate rating of the equipment, whichever is larger, for each EV capable space, EV ready space and EVSE space.

2. Meets the requirements of Section C405.17.2.5.3.1.

C405.17.2.5.2 Circuit capacity.
The branch circuit serving each EV capable space, EV ready space and EVSE space shall comply with one of the following:

1. Have a rated capacity not less than 50 amperes or the nameplate rating of the equipment, whichever is larger.

2. Meets the requirements of Section C405.17.2.5.3.2.

C405.17.2.5.3 System and circuit capacity management. Where system and circuit capacity management is selected in Section C405.17.2.5.1 or C405.17.2.5.2, the installation shall comply with Sections C405.17. 2.5.3.1 and C405.17.2.5.3.2.

C405.17.2.5.3.1 System capacity management. The maximum equipment load on the electrical distribution equipment supplying the branch circuits(s) serving EV capable spaces, EV ready spaces and EVSE spaces controlled by an energy management system shall be the maximum load permitted by the energy management system, but not less than 3.3 kVA per space.

C405.17.2.5.3.2 Circuit capacity management.

Each branch circuit serving multiple EVSE spaces, EV ready spaces or EV capablespaces controlled by an energy management system shall comply with one of the following:

1. Have a minimum capacity of 25 amperes per space.

2. Have a minimum capacity of 20 amperes per space for R-2 occupancies where all automobile parking spaces are EV ready spaces or EVSE spaces.

C405.17.2.6 EVSE installation. EVSE shall be installed in accordance with NFPA 70 and shall be listed and labeled in accordance with UL 2202 (2009 with revisions through February 2018) or UL 2594 (2016). EVSE shall be accessible in accordance with Section 1107 of the International Building Code.

Reason Statement:

The purpose of this proposal is to incorporate into Virginia's commercial building code most of the substance of 2024 IECC's Appendix CG, with modifications (a) to substantially reduce the number of affected parking spaces and (b) to assure compliance with all applicable fire safety regulations. Specifically: (1) the percentage of parking spaces requiring EVSE or EV Capable spaces specified by Table C405.17.2.1 Required EV Power Infrastructure is reduced by two-thirds for most categories of occupancies; and (2) language is added to Sections C405.17.2 and C405.17.2.1 to confirm both (i) the primacy of compliance with fire safety regulations and (ii) the fact that such regulations may limit the potential number of spaces that may fitted with EV charging and thus the potential number of parking spaces subject to requirements for EV infrastructure.

While Appendix CG comes with the 2024 IECC, activation of Appendix CG requires inserting language into the Virginia Construction Code for residential construction, which this proposal would do by adding a new Section C405.17.

Adoption of this proposal would benefit occupants and users of new commercial building—whether owners, employees, customers, or visitors—by facilitating convenient electric vehicle charging, which can readily be expanded as the need grows. Implementation would benefit residents and the public with cost savings, pollution reduction (including greenhouse gases, ozone and carbon monoxide) and more equitable access to EVs and EV charging for residents. It would avoid the much higher costs of having to retrofit parking areas and building electrical systems.

Under the proposed Section C405.17, builders would have to provide basic levels of EV charging readiness: EV Capable Space (basic infrastructure for future installation of a branch circuit and charger); or EV Ready Space (basic infrastructure plus a branch circuit, outlet, junction box or receptacle); or EVSE Space (includes actual charging). The number of each type of EV space depends upon the type of building for which parking is provided. The numbers are tailored to reflect expected times for users to stay at a building and the fact that, while most EV charging now occurs at home, many people do not have access to EV charging where they live. Under the proposal, the greatest number of EV-related spaces are required in multifamily residential buildings, but lesser levels are required in other types of buildings. The three types of EV spaces are designed to minimize future EV charging installation costs, since retrofits are much more costly than incorporating EV infrastructure into initial construction.

By agreement among members of the ICC's committee to develop the 2024 IECC, these EV charging requirements were to have been included in the main body of the 2024 IECC (as proposed here). It was shifted to an appendix on appeal. Activating an appendix requires text in the code itself, which is the purpose of this proposal.

Virginians would benefit from a requiring minimum levels of EV charging infrastructure in new construction. EVs have many economic and health benefits for vehicle users. EVs are cheaper to use and maintain compared to vehicles with internal combustion engines (ICE). While most charging currently occurs at home, many EV owners and potential buyers do not have EV infrastructure at their dwellings or even the potential to install charging in the future. Locating at least a minimum number of chargers at places of work and business, will help to alleviate this barrier to EV adoption and afford residents of older buildings access to the benefits of EVs.

Growing EV usage is very important to Virginia for additional reasons. As explained in the ICC commentary accompanying the 2024 IECC, "The U.S. transportation sector accounted for 29 percent of the nation's greenhouse gas (GHG) emissions in 2019." That is specifically due to the traditional predominance of vehicles with internal combustion engines (ICE). Greenhouse gases from charging and operating EVs are less than 30% of GHG emissions from fueling and operating ICE vehicles. https://theicct.org/why-evs-are-already-much-greener-than-combustion-engine-vehicles-jul25/ EVs are also far more energy efficient than burning fuels in vehicle

engines.

Reducing GHG emissions is a stated policy goal in Virginia law because climate change is a current and growing danger for Virginians. (See., e.g., § 45.2-1706.1. Commonwealth Clean Energy Policy. “A. The Commonwealth recognizes that effectively addressing climate change and enhancing resilience will advance the health, welfare, and safety of the residents of the Commonwealth. The Commonwealth further recognizes that addressing climate change requires reducing greenhouse gas emissions across the Commonwealth's economy sufficient to reach net-zero emission by 2045 in all sectors, including the electric power, transportation, industrial, agricultural, building, and infrastructure sectors….”) Virginia faces growing threats, including more heat-illnesses, disruption of outdoor work, worsening storms, flooding, sea level rise, supply-chain disruption, damage to crops, trees and natural resources, arrival of diseases and pests, etc.

Bringing on EVs will also reduce other air pollutants that also threaten Virginian’s health and welfare. ICE vehicles are a major source of ozone and other pollutants, including carbon monoxide risks in homes with garages.

Providing EV electric infrastructure as part of new construction is no different from the building code’s requiring electrical infrastructure for HVAC, machinery and appliances likely to be used in the future or from the code’s requiring more efficient equipment and lighting in new buildings.

Facilitating adoption of EVs requires that drivers have access to convenient, cost-effective EV charging. That can most easily be provided as part of new construction. As recognized in the IECC commentary on Appendix CG, it is very costly and complicated to renovate EV charging infrastructure into existing buildings.

The importance of incorporating EV charging into new construction is particularly great in the case of buildings whose parking is governed by condominium or common-interest-area boards, which divergent interests can use high retrofit costs to block EV adoption by some occupants.

Cost Impact: The code change proposal will increase the cost

The cost of installing infrastructure would depend on which of the three types of EV infrastructure is involved. The costs would be lower for an EV Capable Space and not much more for the EV Ready Space option if the electrical room or panel is close to the chosen spaces. Since electricity will be installed anyway (e.g. for garage or parking lighting, fans etc.), it would not be difficult or very costly to go the extra steps during building construction when an electrician is on site.

Construction costs will be reduced over time since retrofitting garages is much more expensive than installing at the outset the basic infrastructure to expand chargers. This has been repeatedly documented by PNNL and others.

Occupant/drivers' costs will also be reduced. EVs are less costly to operate (maintenance and energy) than traditional internal combustion engines, but access to chargers is a problem that deters EV usage. The lack of home charging is a particular barrier, which can be offset by chargers in residential and non-residential locations. Access to overnight charging is particularly important in residences and for long-distance drivers (hotels, motels, and many workers).

Additional savings will result in the form of reduced air pollution and the corresponding health benefits to all members of the public. Fuel combustion in vehicles is one of the major sources of ozone, particulates, CO2, CO, SO2 and other pollutants, which harm health and, in some cases drive climate change. The costs and harms are growing and harming all Virginians.

EC-C409-24

VECC: R409 (New), C409 (New)

Proponents: William Abrahamson, representing Phius, Phius Alliance (wabrahamson@gparch.com)

2021 Virginia Energy Code

Add new text as follows:

R409 PASSIVE BUILDING COMPLIANCE OPTION. *R409.1 Phius standard compliance.* *Compliance based on the Phius CORE 2024 of Phius ZERO 2024 (or later) Standard will include performance calculations by Phius-approved software or the use of the Phius Prescriptive Path.*

R409.1.1 Phius documentation. *Prior to the issuance of a building permit, a Phius Design Certification letter must be provided to the code official:*

R409.1.2 Project certificate. Prior to the issuance of a certificate of occupancy, a Phius 2024 (or later) Final certificate must be provided to the code official.

C409 PASSIVE BUILDING COMPLIANCE OPTION. C409.1 Phius standard compliance. Compliance based on the Phius CORE 2024 of Phius ZERO 2024 (or later) Standard will include performance calculations by Phius-approved software or the use of the Phius Prescriptive Path.

C409.1.1 Phius documentation. Prior to the issuance of a building permit, a Phius Design Certification letter must be provided to the code official.

C409.1.2 Project certificate. Prior to the issuance of a certificate of occupancy, a Phius 2024 (or later) Final certificate must be provided to the code official.

Reason Statement:

Explicitly including Phius certification as an alternate compliance path allows builders and homeowners to provide high-performing, energy efficient homes governed by rigorous, consistently vetted standards and testing without redundant reporting or conflicting requirements for envelope, mechanical, or plumbing standards.

Buildings constructed to the Phius standard provide superior indoor air quality, resilience during power outages, and an extremely quiet, comfortable indoor environment. Project teams are increasingly adopting passive building principles and the Phius standard for single-family, multifamily, and commercial buildings to achieve Net Zero buildings, resulting in over 7,000 units certified, and totaling over 7.4 million square feet across North America. Project teams are increasingly adopting passive building principles and the Phius standard for single-family, multifamily, and commercial buildings to achieve Net Zero buildings, resulting in over 7,000 units certified, and totaling over 7.4 million square feet across North America.

Phius is a non-profit 501(c)(3) organization committed to making high-performance passive building the mainstream market standard. Phius trains and certifies professionals, maintains the Phius climate-specific passive building standard, certifies and quality assures passive buildings, and conducts research to advance high-performance building**.**

See attached materials for more info on the standard, benefits, and cost impacts.

Cost Impact: The code change proposal will not increase or decrease the cost

This proposal will not incur any additional costs that a construction team would not otherwise elect to incur for their project.

This proposal could reduce soft costs and management costs by reducing redundant compliance checks and has the potential to reduce material costs by allowing builders to right-size the insulation, fenestration, and mechanical equipment based on the detailed energy modeling required by Phius certification.

EC-1301-24

VCC: SECTION 1301, [E] 1301.1, [E] 1301.1.1, 1301.1.1.1

Proponents: William Penniman, representing Sierra Club Virginia Chapter (wpenniman@aol.com)

2021 Virginia Construction Code

SECTION 1301
GENERAL

[E] 1301.1 Scope. This chapter governs the design and construction of buildings for energy efficiency.

[E] 1301.1.1 Criteria. Buildings shall be designed and constructed in accordance with the *International Energy Conservation Code* .

Revise as follows:

1301.1.1.1 Changes to the *International Energy Conservation Code* (IECC). The following changes shall be made to the IECC :
-Proposal Note: While some content in items 1-5, 13-20, and 22-25 is not shown or may appear unstricken, these items are proposed to be deleted entirely. Other items in the list (6-12, 21, and 26-33) that are not shown remain unchanged.

1. ~~Add Section C402.1.6 to the IECC to read:~~

   ~~**C402.1.6 Groups F, S, and U.** Appendix CD may be used as an alternative to the *building thermal envelope* provisions of this code for Groups F, S, and U.~~

2. ~~Add an exception to the first paragraph of Section C403.7.7 of the IECC to read:~~

   ~~**Exception:** Where a grease duct serving a Type I hood is installed in accordance with Section 506.3 of the *International Mechanical Code*, motorized or gravity dampers shall not be installed.~~

3. ~~Add Section C403.2.2.1 to the IECC to read:~~

   ~~**C403.2.2.1 Dwelling unit mechanical ventilation.** Mechanical ventilation shall be provided for dwelling units in accordance with the *International Mechanical Code* .~~

4. ~~Delete Section C403.7.5 and Table C403.7.5 of the IECC.~~

5. ~~Delete Sections C404.5 through C404.5.2.1 of the IECC, including Tables.~~

13. ~~Add Appendix CD to the IECC to read:~~ (DELETE ENTIRE APPENDIX CD, INCLUDING ITEMS NOT SHOWN IN APPENDIX)

   ~~**APPENDIX CD**~~
   ~~**BUILDING ENVELOPE REQUIREMENTS**~~

   ~~**CD101 Scope**~~

   ~~**CD101.1 General.** These provisions shall be permitted as an alternative to building thermal envelope requirements for *building* areas containing uses that are classified as Group F, S or U.~~

   ~~**CD102 Building Envelope Requirements**~~

   ~~**CD102.1 Insulation and fenestration criteria.** The building thermal envelope shall meet the requirements of Tables CD102.2(1) and CD102.3 based on the climate zone specified in Chapter 3CE. Buildings with a vertical fenestration area or skylight area that exceeds that allowed in Table CD102.3 shall comply with the building envelope provisions of ASHRAE/IESNA 90.1.~~

CD102.2 Specific insulation requirements. Opaque assemblies shall comply with Table CD102.2(1) .

CD102.2.1 Roof assembly. The minimum thermal resistance (*R*-value) of the insulating material installed either between the roof framing or continuously on the roof assembly shall be as specified in Table CD102.2(1) , based on *construction* materials used in the roof assembly.

Exception: Continuously insulated roof assemblies where the thickness of insulation varies 1 inch (25.4 mm) or less and where the area weighted *U*-factor is equivalent to the same assembly with the *R*-value specified in Table CD102.2(1) .

Insulation installed on a suspended ceiling with removable ceiling tiles shall not be considered part of the minimum thermal resistance of the roof insulation.

CD102.2.2 Classification of walls. Walls associated with the building envelope shall be classified in accordance with Section CD102.2.2.1 or CD102.2.2.2.

TABLE CD102.2(1)OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE METHOD

TABLE CD102.2(2)METAL BUILDING ASSEMBLY DESCRIPTIONS

CD102.2.2.1 Above-grade walls. Above-grade walls are those walls covered by Section CD102.2.3 on the exterior of the *building* and completely above grade or walls that are more than 15 percent above grade.

CD102.2.2.2 Below-grade walls. Below-grade walls covered by Section CD102.2.4 are basement or first-story walls associated with the exterior of the *building* that are at least 85 percent below grade.

CD102.2.2.3 Above-grade walls. The minimum thermal resistance (*R*-value) of the insulating material(s) installed in the wall cavity between the framing members and continuously on the walls shall be as specified in Table CD102.2(1) , based on framing type and construction materials used in the wall assembly. The *R*-value of integral insulation installed in concrete masonry units (CMU) shall not be used in determining compliance with Table CD102.2(1) . "Mass walls" shall include walls weighing at least (1) 35 pounds per square foot (170 kg/m^2) of wall surface area or (2) 25 pounds per square foot (120 kg/m^2) of wall surface area if the material weight is not more than 120 pounds per cubic foot (1,900 kg\m^3).

CD102.2.4 Below-grade walls. The minimum thermal resistance (*R*-value) of the insulating material installed in, or continuously on, the below-grade walls shall be as specified in Table CD102.2(1) and shall extend to a depth of 10 feet (3048 mm) below the outside finish ground level, or to the level of the floor, whichever is less.

CD102.2.5 Floors over outdoor air or unconditioned space. The minimum thermal resistance (*R*-value) of the insulating material installed either between the floor framing or continuously on the floor assembly shall be as specified in Table CD102.2(1) , based on construction materials used in the floor assembly. "Mass floors" shall include floors weighing at least (1) 35 pounds per square foot (170 kg/m^2) of floor surface area or (2) 25 pounds per square foot (120 kg/m^2) of floor surface area if the material weight is not more than 12 pounds per cubic foot (1900 kg/m^3).

~~CD102.2.6 Slabs on grade.~~ ~~The minimum thermal resistance (*R*-value) of the insulation around the perimeter of unheated or heated slab-on-grade floors shall be as specified in Table CD102.2(1) . The insulation shall be placed on the outside of the foundation or on the inside of a foundation wall. The insulation shall extend downward from the top of the slab for a minimum distance as shown in the table or to the top of the footing, whichever is less, or downward to at least the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table.~~

~~CD102.2.7 Opaque doors.~~ ~~Opaque doors (doors having less than 50-percent glass area) shall meet the applicable requirements for doors a specified in Table CD102.2(1) and be considered as part of the gross area of above-grade walls that are part of the building envelope.~~

CD102.3 Fenestration. Fenestration shall comply with Table CD102.3 .

TABLE CD102.3BUILDING ENVELOPE REQUIREMENTS: FENESTRATION

CD102.3.1 Maximum area. The vertical fenestration area (not including opaque doors) shall not exceed the percentage of the gross wall area specified in Table CD102.3 . The skylight area shall not exceed the percentage of the gross roof area specified in Table CD102.3 .

CD102.3.2 Maximum U-factor and SHGC. For vertical fenestration, the maximum *U*-factor and solar heat gain coefficient (SHGC) shall be as specified in Table CD102.3 , based on the window projection factor. For skylights, the maximum *U*-factor and solar heat gain coefficient (SHGC) shall be as specified in Table CD102.3 The window projection factor shall be determined in accordance with Equation CD-1

PF=A/B

PF = A/B

where: **(Equation CD-1)**

PF = Projection factor (decimal).

A = Distance measured horizontally from the furthest continuous extremity of any overhang, eave, or permanently attached shading device to the vertical surface of the glazing.

B = Distance measured vertically from the bottom of the glazing to the underside of the overhang, eave, or permanently attached shading device.

Where different windows or glass doors have different PF values, they shall each be evaluated separately, or an area-weighted PF value shall be calculated and used for all windows and glass doors.

CD102.4 Air leakage.

CD102.4.1 Window and door assemblies. The air leakage of window and sliding or swinging door assemblies that are part of the building envelope shall be determined in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 , or NFRC 400 by an accredited, independent laboratory, and labeled and certified by the manufacturer and shall not exceed the values in Section 402.4.2 of the 2006 IECC.

Exception: Site-constructed windows and doors that are weatherstripped or sealed in accordance with Section CD102.4.3.

CD102.4.2 Curtain wall, storefront glazing and commercial entrance doors. Curtain wall, storefront glazing and commercial glazed swinging entrance doors and revolving doors shall be tested for air leakage at 1.57 pounds per square foot (psf) (75 Pa) in accordance with ASTM E283 . For curtain walls and storefront glazing, the maximum air leakage rate shall be 0.3 cubic foot per minute per square foot (cfm/ft^2) (5.5 $m^3/h \times m^2$) of fenestration area. For commercial glazed swinging entrance doors and revolving doors, the maximum air leakage shall be 1.00 cfm/ft2 (18.3 $m^3/h \times m^2$) of door area when tested in accordance with ASTM E283 .

CD102.4.3 Sealing of the building envelope. Openings and penetrations in the building envelope shall be sealed with caulking materials or closed with gasketing systems compatible with the construction materials and location. Joints and seams shall be sealed in the same manner or taped or covered with a moisture vapor-permeable wrapping material. Sealing materials spanning joints between construction materials shall allow for expansion and contraction of the construction materials.

CD102.4.4 Outdoor air intakes and exhaust openings. Stair and elevator shaft vents and other outdoor air intakes and exhaust openings integral to the building envelope shall be equipped with not less than a Class I motorized, leakage-rated damper with a maximum leakage rate of 4 cfm per square foot (6.8 L/s – C m^2) at 1.0 inch water gauge (w.g.) (1250 Pa) when tested in accordance with AMCA 500D.

Exception: Gravity (nonmotorized) dampers are permitted to be used in *buildings* less than three stories in height above grade.

CD102.4.5 Loading dock weather seals. Cargo doors and loading dock doors shall be equipped with weather seals to restrict infiltration when vehicles are parked in the doorway.

CD102.4.6 Vestibules. A door that separates conditioned space from the exterior shall be protected with an enclosed vestibule, with all doors opening into and out of the vestibule equipped with self-closing devices. Vestibules shall be designed so that in passing through the vestibule it is not necessary for the interior and exterior doors to open at the same time.

Exceptions:

1. *Buildings* in Climate Zones I and 2 as indicated in Figure C301.1 and Table C301.1 .
2. Doors not intended to be used as a *building* entrance door, such as doors to mechanical or electrical equipment rooms.
3. Doors opening directly from a sleeping unit or dwelling unit.
4. Doors that open directly from a space less than 3,000 square feet (298 m^2) in area.
5. Revolving doors.
6. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.

CD102.4.7 Recessed luminaires. When installed in the building envelope, recessed luminaires shall meet one of the following requirements:

1. Type IC rated, manufactured with no penetrations between the inside of the recessed fixture and ceiling cavity and sealed or gasketed to prevent air leakage into the unconditioned space.
2. Type IC or non-IC rated, installed inside a sealed box constructed from a minimum 0.5-inch-thick (12.7 mm) gypsum wallboard or constructed from a preformed polymeric vapor barrier, or other airtight assembly manufactured for this purpose, while maintaining required clearances of not less than 0.5 inch (12.7 mm) from combustible material and not less than 3 inches (76 mm) from insulation material.
3. Type IC rated, in accordance with ASTM E283 admitting no more than 2.0 cubic feet per minute (cfm) (0.944 L/s) of air movement from the conditioned space to the ceiling cavity. The luminaire shall be tested at 1.57 psf (75 Pa) pressure difference and shall be labeled.

CD102.5 Moisture control. All framed walls, floors and ceilings not ventilated to allow moisture to escape shall be provided with an approved vapor retarder having a permeance rating of 1 perm (5.7 × 10-11 kg/Pa· s · m^2) or less, when tested in accordance with the dessicant method using Procedure A of ASTM E96 . The vapor retarder shall be installed on the warm-in-winter side of the insulation.

Exceptions:

1. *Buildings* located in Climate Zones 1 through 3 as indicated in Figure C301.1 and Table C301.1.
2. In *construction* where moisture or its freezing will not damage the materials.
3. Where other approved means to avoid condensation in unventilated framed wall, floor, roof and ceiling cavities are provided.

14. Change the wood frame wall *R*-value categories for Climate Zones 3A, 4A and 5A in Table R402.1.3 to read:

		Wood Frame Wall *R*-Value
		15 or 13+1[h]

15. Change the frame wall *U*-factor categories for Climate Zones 3A, 4A and 5A in Table R402.1.2 to read:

Frame Wall *U*-Factor
0.079

16. Add an exception to Section R401.3 of the IECC to read:

Exception: Where approved, certificates for multifamily dwelling units shall be permitted to be located off-site at an identified location.

17. Change Section R402.2.4 of the IECC to read:

R402.2.4 Access hatches and doors. Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces) shall be weatherstripped and insulated in accordance with the following values:

1. Hinged vertical doors shall have a minimum overall R-5 insulation value.
2. Hatches and scuttle hole covers shall be insulated to a level equivalent to the insulation on the surrounding surfaces.
3. Pull down stairs shall have a minimum of 75 percent of the panel area having R-5 rigid insulation.

Access shall be provided to all equipment that prevents damaging or compressing the insulation. A wood-framed or equivalent baffle or retainer is required to be provided when loose fill insulation is installed, the purpose of which is to prevent the loose-fill insulation from spilling into the living space when the attic access is opened and to provide a permanent means of maintaining the installed R-value of the loose-fill insulation.

18. Change the title of the “Insulation Installation Criteria” category of Table R402.4.1.1 ; change the “Shower/tub on exterior wall” category of Table R402.4.1.1 , and add footnotes “c” and “d” to Table R402.4.1.1 to read: (PROPOSAL NOTE: Delete remainder of item #18, including changes to Tables)

19. Change Section R402.4.1.2 of the IECC to read:

R402.4.1.2 Testing. The *building* or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). A written report of the results of the test shall be signed by the party conducting the test and provided to the building official. Testing shall be conducted by a Virginia licensed general contractor, a Virginia licensed HVAC contractor, a Virginia licensed home inspector, a Virginia *registered design professional*, a certified BPI Envelope Professional, a certified HERS rater, or a certified duct and envelope tightness rater. The party conducting the test shall have been trained on the equipment used to perform the test. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.

Note: Should additional sealing be required as a result of the test, consideration may be given to the issuance of a temporary certificate of occupancy in accordance with Section 116.1.1 .

During testing:

1. Exterior windows and doors and 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, if installed at the time of the test, shall be open.
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.
5. Heating and cooling systems, if installed at the time of the test, shall be turned off.
6. Supply and return registers, if installed at the time of the test, shall be fully open.

20. Change Section R402.4.1.3 of the IECC to read:

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 3 through 5, when tested in accordance with Section R402.4.1.2 .

22. Change the last paragraph of Section R403.3.5 of the IECC to read:

A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. The licensed mechanical contractor installing the mechanical system shall be permitted to perform the duct testing. The contractor shall have been trained on the equipment used to perform the test.

23. Change Section R403.3.7 of the IECC to read:

R403.3.7 Building cavities. *Building* framing cavities used as ducts or plenums shall comply with VRC Section M1601.1.1 .

24. Change Section R403.7 of the IECC to read:

R403.7 Equipment and appliance sizing. Heating and cooling equipment and appliances shall be sized in accordance with ACCA Manual S or other approved sizing methodologies based on building loads calculated in accordance with ACCA Manual J or other approved heating and cooling calculation methodologies.

Exception: Heating and cooling equipment and appliance sizing shall not be limited to the capacities determined in accordance with Manual S or other approved sizing methodologies where any of the following conditions apply:

1. The specified equipment or appliance utilizes multi-stage technology or variable refrigerant flow technology and the loads calculated in accordance with the approved heating and cooling methodology fall within the range of the manufacturer's published capacities for that equipment or appliance.
2. The specified equipment or appliance manufacturer's published capacities cannot satisfy both the total and sensible heat gains calculated in accordance with the approved heating and cooling methodology and the next larger standard size unit is specified.
3. The specified equipment or appliance is the lowest capacity unit available from the specified manufacturer.

25. Change Section R406.3.2 to read:

Section N1106.3.2 (R406.3.2) Onsite renewables are included. When onsite renewable energy is included for compliance using the Energy Rating Index (ERI) analysis per Section N1106.4 (R406.4), the building thermal envelope shall be greater than or equal to levels of energy efficiency and solar heat gain coefficient in Table N1102.1.2 (R402.1.2), with a ceiling U-factor of 0.026 and a frame wall U-factor of 0.060, or Table N1102.1.3 (R402.1.3), with a ceiling R-value of 49 and a wood frame wall R-value of 20 or 13+5.

Reason Statement:

The purpose of this proposal is to make Virginia's energy efficiency standards for new construction "at least as stringent as" the latest IECC for new commercial and residential construction. It would remove past weakening amendments to the IECC for new construction. (Efficiency standards for construction involving existing buildings are left for separate consideration.)

Virginia's residential building code has been behind the IECC's energy efficiency standards for over a decade -- since the 2012 IECC update. Virginia is even farther behind today since it failed to strengthen code standards for key building efficiency measures in the cycles that have followed. To make matters worse, in the 2021 cycle, it rolled back standards to 2006 levels for several broad categories of commercial buildings (F,S & U) which appear may include some data centers – the largest users of electricity in the state which threaten to upend rates for all Virginians. That rollback was not supported by any substantial evidence concerning the many types of buildings; nor has there been any substantial evidence for any of the other weakening amendments that would be eliminated by this proposal. Each weakening amendment is allowed to roll forward cycle after cycle, despite the IECC being reaffirmed or made even more stringent.

The IECC has repeatedly tightened energy efficiency standards over the past 20 years. Apart from a relaxation of ceiling insulation standards for some zones between the 2021 and 2024 cycles, the IECC has resisted pleas to weaken efficiency standards. Evidence of practical experience and new technologies has supported the IECC's continued enhancement of efficiency standards.

On the other hand, in the 2024 cycle the IECC introduced new levels of design and equipment flexibility to give builders a greater variety of ways to meet the overall levels of efficiency required. The increase in energy efficiency options while still improving overall efficiency strongly undercuts arguments to retain past weakening amendments. Indeed, retaining those outdated amendments would undercut the overall efficiency targets set by the IECC as weaker prescriptive standards would undermine Simulated Performance and ERI energy savings targets.

Improving energy efficiency in new buildings is important to occupants and users —whether owners or tenants or employees or producers of goods or services --, since it would help them save money and energy, increase indoor comfort, make for healthier buildings, and improve workplaces for decades. Greater energy efficiency will also serve the public by reducing pressure on utilities to raise rates in order to build and operate more energy delivery capabilities, and by reduce the air pollution that drives climate impacts and other harms to Virginia's health, property and economy.

Importantly, the U.S. Department of Energy and the Pacific Northwest National Laboratories have analyzed energy efficiency standards for residential and commercial building codes for more than 20 years. They have consistently found that full adoption of the IECC and ASHRAE updates so far this century will save energy and money. They have also found that, by reducing building energy usage, these model code updates will reduce pollution, including climate pollution.

Adoption of this proposal is vital to properly implementing Virginia law. Sections 36-99A and 36-99B of the Virginia Code states that building codes are required to "protect the health, safety and welfare of the residents of the Commonwealth" and that adjustments to reduce construction costs must nevertheless be "consistent with recognized standards of health, safety, energy efficiency and water efficiency." VIRGINIA ACTS OF ASSEMBLY – 2021 SPECIAL SESSION I, CHAPTER 425, Section 1 (referred to herein as "H2227"), which was enacted in 2021, calls for adoption of energy efficiency standards that are "at least as stringent" as the latest IECC considering factors such as consumer costs "over time" and air pollution. The accumulated evidence from DOE and PNNL leave no doubt that weakening amendments should be removed from the energy efficiency standards applicable to new residential and commercial construction.

This proposal attempts to delete only standards that are not "at least as stringent" as the latest IECC. If any of the proposed deletions are beneficial and "at least as stringent" as the latest IECC, we would discuss amending this proposal.

Cost Impact: The code change proposal will increase the cost

Fully implementing the latest IECC will add to construction costs. However, as DOE and PNNL have shown, building owners, residents and users will save money and energy for decades after the buildings are constructed. Thus, the net costs will be reduced.

Further, as discussed in the Reason section, Virginia law states that construction costs should be minimized "consistent with" the latest

model codes and that cost considerations must reflect the cost savings over time, not just initial costs. Further, building codes must be designed to serve the public's health, safety and welfare, including the benefits from reducing air pollution.

EB805.2.1.1-24

VEBC: 805.2.1.1

Proponents: Allison Cook, Arlington. Virginia, representing VBCOA VEBC Committee (acook1@arlingtonva.us)

2021 Virginia Existing Building Code

Revise as follows:

805.2.1.1 Building envelope. New *building* envelope assemblies that are part of the addition shall comply with Sections R402.1, R402.2, R402.3.1 through R402.3.5, and R402.4 of the VECC.

~~Exception:~~ Exceptions:

1. The building envelope of the addition shall be permitted to comply through a Total UA analysis, as determined in Section R402.1.5 of the VECC, where the *existing building* and the addition, and any alterations that are part of the project, is less than or equal to the Total UA generated for the *existing building*.

2. Building envelope of the addition tightness shall be considered acceptable when the items listed in Table N1102.5.1.1 (R402.5.1.1) of the VRC, applicable to the method of construction, are field verified with visual inspection(s). Where required by the building official, an approved party, independent from the installer, shall inspect the air barrier.

Reason Statement: Existing buildings are unlikely to be able to pass a blower door test due to the nature of the changing standards increasing building envelope tightness. This helps housing affordability because it does not requirement potentially costly retrofit requirements to the existing building to meet the blower door test for an addition. The language for visual inspections come from the 2015 VRC with sections updated to the 2024 IRC.

Cost Impact: The code change proposal will decrease the cost

This code change allows for a visual inspection of the addition to ensure compliance with the energy code requirements while not requiring costly retrofits to the existing building that would be needed to pass a blower door test.