2021 International Energy Conservation Code

Presented by Jack Daniels

IECC 2021

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Presentation Format

There have been significant changes from the previous 2018 Energy Code requirements to the 2021 Edition

- List Objectives
- Why is energy conservation required
- Review a few definitions
- Identify the application methods
  - ResCheck Program Do’s/Don’ts
- Identify the Systems used for energy compliance
- Identify the analysis compliance alternatives.

OBJECTIVES

- **Once completed participants should be able to:**

1. **Explain why energy conservation is required**
2. **Define some important terms associated with energy compliance**
3. **List the application methods identified within the code**
4. **Identify some of the pitfalls of ResCheck information**
5. **Locate the various code sections that address the systems that attribute to energy compliance requirements**
6. **List the different analysis compliance options.**

Why take steps towards Energy Compliance?

- Various Energy Conservation regulations, both at Federal and State levels, mandate energy conservation and usage to produce cost savings, use less energy as a whole and create some level of energy independence
- Various agencies created to develop energy efficient pathways in both residential and commercial structures. These agencies assisted in the development of the regulations and codes
- The energy code intent is to regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building. Study

You Should be Familiar with these Definitions

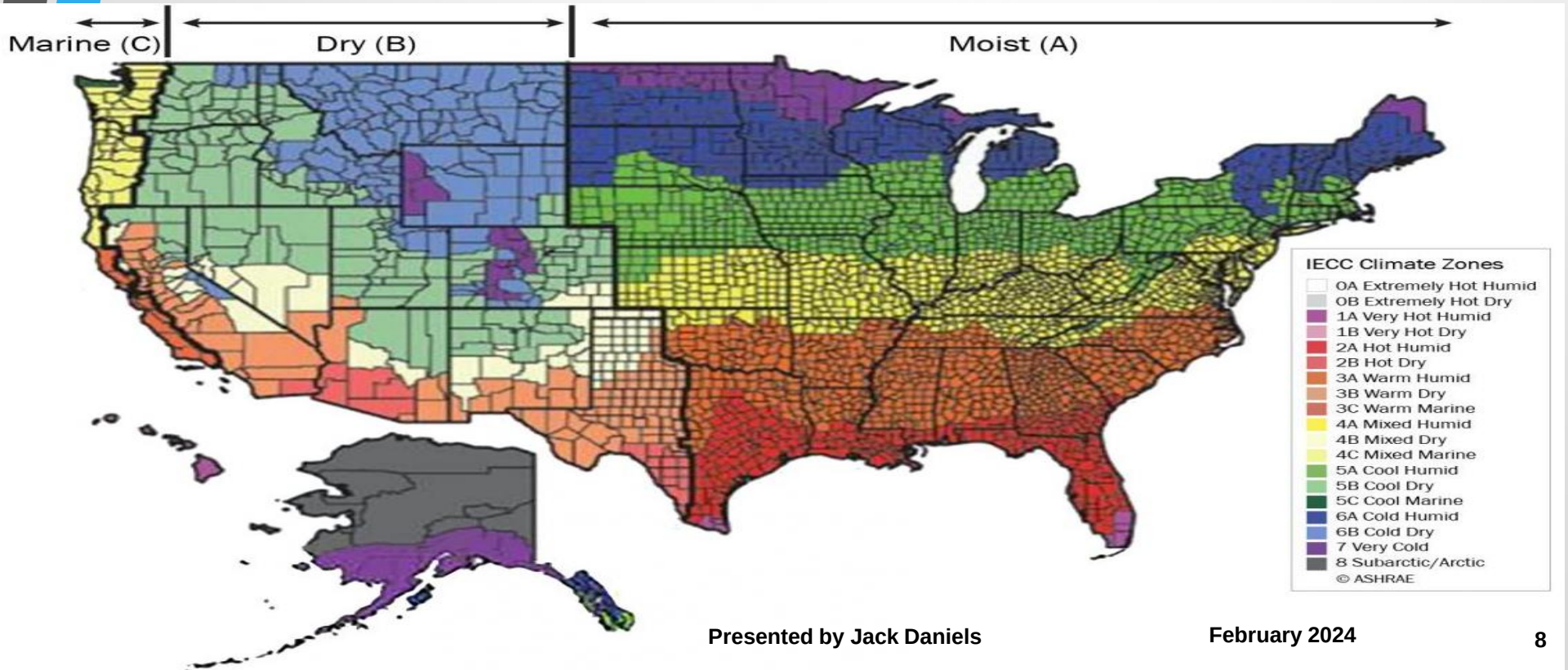
- **Building Thermal Envelope** – basement walls, exterior walls, floors, ceilings, roofs and any other building element assemblies that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space
- **U-factor** – a coefficient of the heat transmission rate through a window, door, or skylight related to time rate of heat flow per unit area and unit temperature
- **UA** – A measure of the amount of heat that would be transferred through a given surface or enclosure (such as a building envelope) with a one degree Fahrenheit temperature difference between the two sides. The UA is calculated by multiplying the U–Value by the area of the surface
- **Conditioned Space** – area, room or space that is enclosed within the building thermal envelope and that is directly heated or cooled or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditioned spaces, where they are separated from conditioned spaces by uninsulated walls, floors or ceilings, or where they contain uninsulated ducts, piping or other sources of heating or cooling
- **Air Barrier** – one or more materials joined together in a continuous manner to restrict or prevent the passage of air through the building thermal envelope and its assemblies.

Definitions that were added or changed

- **Cavity Insulation** – *insulating material between framing members* (commonly known as batt insulation)
- **Fenestration (Skylights)** – glass or glazing installed at a slope less than 60^{o} from horizontal, *including unit skylights, tubular daylighting devices, & glazing in solariums, sunrooms, roofs and sloped walls ("___" represents term definition found in chapter 2)*
- **Renewable Energy Resources** – *Energy obtained from solar, wind, waves, tides, landfill or biogas, biomass or extracted from hot fluid or steam heated within the earth*
- **Thermal Distribution Efficiency** – *resistance to changes in air heat as air is conveyed through a distance of air duct. This is a heat-loss calculation evaluating the difference in heat of air between air duct inlet and outlet expressed as a percentage*.

Climate Zones

- Definition – a geographical region based on climatic criteria as specified within the code
- Energy Code provides zone based on location and type of climate for that area
  - *Note is 2021 Zone "0" has been added (Extremely Hot Region)*
- 2021 IECC identifies the zone in table N1101.7
  - If not in table N1101.7 use section N1101.7.2 to determine zone.



Application Methods
N1101.13

- 2021 change*: Entire section modified*
  - *"Mandatory" indication removed*

1. Prescriptive Compliance: sections N1101 – 1104
   - Most changed section
2. Total Building Performance Option: section N1105
   - Uses Compliance Software
3. Energy Rating Index (ERI) Option: section N1106
   - Based on identified items and in accordance with RESNET/ICC 301
4. Tropical Climate Region Option: section N1107
   - Alternative method for residential buildings in tropical regions at elevation < 2400 feet above sea level
5. *Additional energy efficiency: section N1101.13.5* & ties to *new section N1108*
   - Specific methods if additional energy efficiency desired.

- What do you typically use; 1, 2, 3 ?

Compliance Certificate

- Permanent certificate required to be completed by builder or approved agency AND posted on a wall or space where furnace is located, a utility room or other approved location (electrical panel area?) inside building
- Certificate shall indicate
  - Predominant R values for areas of thermal envelope components
  - U factors of fenestration
    - 2021 added: *more than 1 value for any component of envelope the certificate shall indicate both the value covering the largest area and the weighted average (if available)*
    - Duct tightness and blower door test results
    - Types, sizes and efficiencies of HVAC & water heater type systems
    - 2021 added: *If there's any photovoltaic system; array capacity, inverter efficiency, panel tilt & orientation*
    - 2021 added: *Code Edition used for permit issued.*

    - Are you folks having certificate posted on your structures with the values known?

Building Thermal Envelope N1102

- 3 basic methods of providing compliance for the building thermal envelope
  1. Insulation & Fenestration Criteria (N1102.1.2)
     - Assembly U factor method
  2. R-value Alternative (N1102.1.3)
  3. Total UA Alternative (N1102.1.5).

- What method do you typically use?

Insulation and Fenestration Criteria IE: Assembly U factor *(N1102.1.2)*

- 2021 change: *added to section N1102.1.2; assemblies shall have a U factor rating equal to or less than that specified in table N1102.1.2 (which was relocated and modified).*

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

CLIMATE ZONE	FENESTRATION *U*-FACTOR[f]	SKYLIGHT *U*-FACTOR	GLAZED FENESTRATION SHGC[d, e]	CEILING *U*-FACTOR	WOOD FRAME WALL *U*-FACTOR	MASS WALL *U*-FACTOR[b]	FLOOR *U*-FACTOR	BASEMENT WALL *U*-FACTOR	CRAWL SPACE WALL *U*-FACTOR
0	0.50	0.75	0.25	0.035	0.084	0.197	0.064	0.360	0.477
1	0.50	0.75	0.25	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.25	0.026	0.084	0.165	0.064	0.360	0.477
3	0.30	0.55	0.25	0.026	0.060	0.098	0.047	0.091[c]	0.136
4 except Marine	0.30	0.55	0.40	0.024	0.045	0.098	0.047	0.059	0.065
5 and Marine 4	0.30	0.55	0.40	0.024	0.045	0.082	0.033	0.050	0.055
6	0.30	0.55	NR	0.024	0.045	0.060	0.033	0.050	0.055
7 and 8	0.30	0.55	NR	0.024	0.045	0.057	0.028	0.050	0.055

R value Alternative N1102.1.3

- Assemblies with an R value of insulation materials equal to or greater than table N1102.1.3 is another method
  - 2021 change: *Table values have changed for climate zones 2 to 8*
- R value Computation (N1102.1.4)
  - 2021: *Complete change to this section*
  - This section describes how the R value of the various assembly components is to be used to determine the assemblies total R value
    - Cavity versus Continuous R value
      - Multiple layers permitted; R value is the sum of layers
    - Components such as building framing or air films not to be added to insulation component R value

Let's take a look at Table N1102.1.3.

NJ IRC 2021 R Value Table

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

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
0	NR	0.75	0.25	30	13 or 0&10ci	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0&10ci	3/4	13	0	0	0
2	0.40	0.65	0.25	49	13 or 0&10ci	4/6	13	0	0	0
3	0.30	0.55	0.25	49	20 or 13&10ci[h] or 0&15ci[h]	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[h] or 13&10ci[h] or 0&20ci[h]	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[h] or 13&10ci[h] or 0&20ci[h]	13/17	30	15ci or 19 or 13&5ci	10ci, 4 ft	15ci or 19 or 13&5ci
6	0.30	0.55	NR	60	30 or 20&5ci[h] or 13&10ci[h] or 0&20ci[h]	15/20	30	15ci or 19 or 13&5ci	10ci, 4 ft	15ci or 19 or 13&5ci
7 and 8	0.30	0.55	NR	60	30 or 20&5ci[h] or 13&10ci[h] or 0&20ci[h]	19/21	38	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.

Total UA Alternative Method (Engineering?) N1102.1.5

- 2021 modification: Used in conjunction with Table N1102.1.2, *SHGC requirements of Table N1102.1.2 and the maximum U factors of section N1102.5*
  - FYI: Solar Heat Gain Coefficient (SHGC) is the fraction of solar radiation admitted through a window, door, or skylight
- Formula: Total UA is the sum of proposed assembly area * U factor of that assembly compared to the UA result of the U factor of Table N1102.1.2 * the same assembly area of proposed building
  - The proposed building total UA must be less than or equal to the comparison UA result determined using the tabular U factor values

UA calculation must be per method consistent with ASHRAE *Handbook of Fundamentals*.

Insulation Requirements N1102.2

- Ceilings: with & without attics
  - Refers to Table N1102.1.3 insulation values
  - With attics N1102.2.1
    - 2021 modification *add reduction for R-60*: Reduction allowed when full uncompressed height of insulation installed over 100% of ceiling extending over wall top plates at eaves
  - Without attics N1102.2.2
    - Reduction allowed to minimum of R-30 when interstitial space does not provide adequate space for full tabular R value insulation
      - Must extend over wall top plate and not be compressed
      - Maximum area permitted is lesser of either 500 sq ft or 20% to total insulated area
  - Eave Baffle Requirements N1102.2.3
    - 2021 modification *add requirements to assure proper insulation installation*.

Access Doors & Hatches

- 2021 modified almost entire section N1102.2.4
  - No change: Insulation required from conditioned to unconditioned space
  - *2 exceptions now indicated*
    - *Vertical access doors to unconditioned spaces where fenestration requirements of table N1102.1.3 are met for the specific zone*
    - *Pull down or stair access hatches in climate zones 0 – 4 do not have to comply BUT there are 4 items that must all be adhered to*
      - *U factor shall be 0.10 or less OR have R-10 or greater insulation*
      - *At least 75% of panel area shall have minimum R-13 or better*
      - *Net area of opening less than or equal to 13.5 sq ft*
      - *Hatch edge must be weatherstripped*
  - Insulation shall be protected from damage or compression and if loose fill shall have a retainer or dam installed to prevent spillage.

Floors & Basement Walls

- 2021 both sections modified
- *Floor cavity insulation required to comply with 1 of 3 choices* N1102.2.7
  - *Permanent contact with underside of subfloor to maintain R-value OR readily fill available cavity space*
  - *Contact with top side of sheathing separating cavity and unconditioned space but insulation must extend from bottom to top of all perimeter floor framing members AND framing members must be air sealed*
  - *Combination of cavity and continuous insulation can be installed such that cavity insulation is in contact with top of continuous insulation, insulation extends from bottom to top of floor framing and framing is air sealed. Required R value is combination of cavity and continuous insulation.*

Floors & Basement Walls

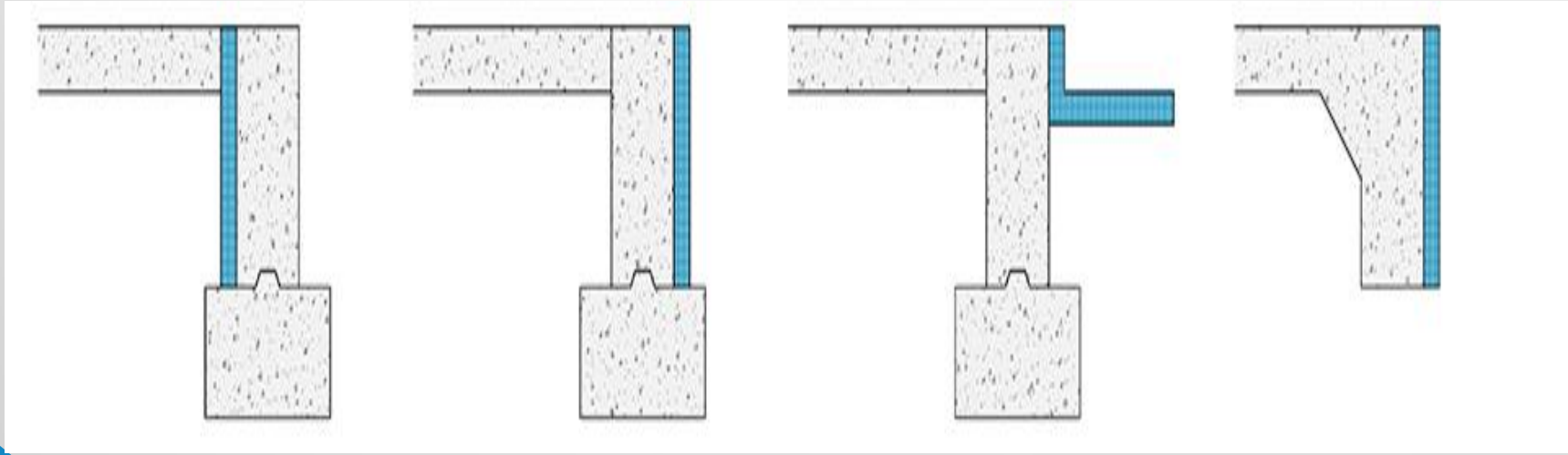
- <u>2021 both sections modified</u>
- *Basement wall insulation as per table N1102.1.3* N1102.2.8
  - *Exception added where ALL 6 items met*
    - *Floor above and underside of stair stringer is insulated*
    - *No exposed uninsulated duct, domestic hot water or hydronic heating surfaces*
    - *No HVAC supply or return diffusers serving basement area*
    - *Walls around stairway and adjacent to conditioned space are insulated*
    - *Door leading to basement from conditioned space are insulated and weatherstripped*
    - *Building thermal envelope separating basement from conditioned space complies with N1102.4*
  - *Basement wall insulation shall be installed from top of wall down at least 10 feet or to basement floor, whichever is less.*

Energy Code and Superior Walls

- Superior Wall type system have built in “insulation” factor that can be used within the energy compliance software evaluation
- Seek manufacturer R value information to determine that value

Slab on Grade Insulation N1102.2.9.1

- 2021 change
  - *Extend from top of slab down on outside or inside of foundation wall required distance per table N1102.1.3 by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the building (extending out from building must be protected by pavement or not less than 10” of soil).*



Crawl Space Walls N1102.2.10

- 2021 change adds exception
  - *Vented crawl space does not require walls to be insulated where the floor above the crawl space is insulated per table N1102.1.3 and section N1102.2.7.*

Air Leakage Components N1102.4.1.1

- 2021 changes within table N1102.4.1.1.

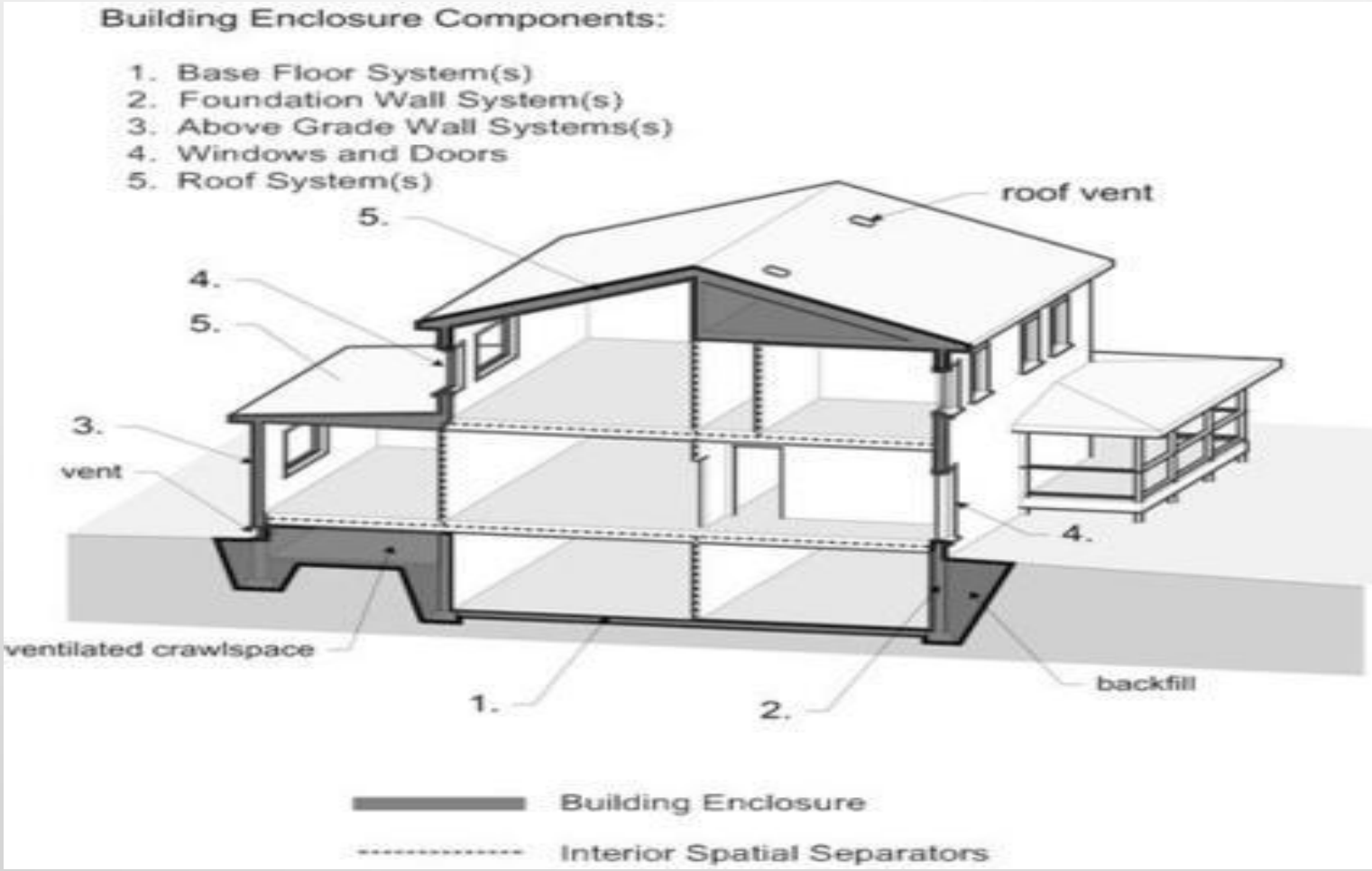


Table N1102.4.1.1

TABLE N1102.4.1.1 (R402.4.1.1)
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION[a]

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop-down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, *R*-value, of not less than R-3 per inch. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include an exterior air barrier.[b] The junctions of the rim board to the sill plate and the rim board and the subfloor shall be air sealed.	Rim joists shall be insulated so that the insulation maintains permanent contact with the exterior rim board.[b]
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extending from the bottom to the top of all perimeter floor framing members.
Basement, crawl space, and slab foundations	Exposed earth in unvented crawl spaces shall be covered with a Class 1 vapor retarder/air barrier in accordance with Section N1102.2.10. Penetrations through concrete foundation walls and slabs shall be air sealed. Class 1 vapor retarders shall not be used as an air barrier on below-grade walls and shall be installed in accordance with Section R702.7.	Crawl space insulation, where provided instead of floor insulation, shall be installed in accordance with Section N1102.2.10. Conditioned basement foundation wall insulation shall be installed in accordance with Section N1102.2.8.1. Slab-on-grade floor insulation shall be installed in accordance with Section N1102.2.10.
Shafts, penetrations	Duct and flue shafts and other similar penetrations to exterior or unconditioned space shall be sealed. Utility penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for expansion, contraction of materials and mechanical vibration.	Insulation shall be fitted tightly around utilities passing through shafts and penetrations in the building thermal envelope to maintain required *R*-value.
Narrow cavities	Narrow cavities of 1 inch or less that are not able to be insulated shall be air sealed.	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	Insulated portions of the garage separation assembly shall be installed in accordance with Sections N1101.10–N1101.12 and N1102.2.7.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air sealed in accordance with Section N1102.4.5.	Recessed light fixtures installed in the building thermal envelope shall be airtight and IC rated, and shall be buried or surrounded with insulation.
Plumbing, wiring or other obstructions	All holes created by wiring, plumbing or other obstructions in the air barrier assembly shall be air sealed.	Insulation shall be installed to fill the available space and surround wiring, plumbing, or other obstructions, unless the required *R*-value can be met by installing insulation and air barrier systems completely to the exterior side of the obstructions.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover	—

Air Leakage Testing

- 2021 Change: N1102.4.1.2
  - *Leakage rate changed from maximum of 3 air changes per hour (climate zones 3-8) to a maximum of 5 air changes per hour for all compliance paths*
  - NJ UCC Bulletin 22-1 provides guidance regarding testing
    - Commonly known as the “blower door test”
  - 2021 changes: some exceptions to note
    - *Heated attached and detached private garages tightness and insulation considered acceptable where air barrier and installation items are field verified (by 3rd party per code official)*
    - *Thermal isolation is required from other conditioned spaces.*

Mechanical Ventilation

- Don’t forget that mechanical ventilation is required as per section M1505.

M1505 Mechanical Ventilation

- 1505.4 Whole House Mechanical Ventilation System
  - Design: 1 or more supply or exhaust fans, or a combination of such
  - Local exhaust or supply fans are allowed to be used as part of the ventilation system
  - System controls are required that provide for manual override
- **Mechanical Ventilation Rate** *M1505.4.3*
  - Required to be delivered at a **continuous** rate
  - Per Table 1505.4.3(1) OR not less than equation 15-1
    - EQUATION 15-1: Ventilation Rate in CFM = .01 * total sq ft area of house + [7.5 * (# of bedrooms +1)]
  - Exceptions:
    - Ventilation Rate Credit – rate determined per Table 1505.4.3(1) OR the above equation shall be reduced by 30% as long as BOTH of the following are true
      - Ducted system supplies ventilation air into each bedroom and 1 or more of the following (living room, dining room, kitchen)
      - The whole house ventilation system is a balanced system.

Air Leakage Rates N1102.4.1.3

- 2021 Change: Leakage rate information relocated but values the same
  - *When complying with the prescriptive method (N1101.13.1) when testing as per N1102.4.1.2 (blower door test)*
    - *Climate zones 0 – 2 leakage rate maximum of 5 air changes per hour*
    - *Climate zones 3 – 8 leakage rate maximum of 3 air changes per hour.*

Systems N1103

- 2021 change and relocated: Ducts to be considered within conditioned space
  - *Ductwork in floor or exterior wall cavities N1103.3.2 condition 3 & 4 added*
    - *3. Floors over unconditioned space must have*
      - *Continuous air barrier*
      - *Insulation installed in accordance with N1102.2.7 (modified for 2021)*
      - *Minimum R 19 in cavity width separating duct from unconditioned space*
    - *4. Exterior Walls (Building Thermal Envelope)*
      - *Continuous air*
      - *Minimum R 10 in cavity separating duct from outside sheathing*
      - *Rest of cavity fully insulated to drywall.*

Remember the Ductwork Requirements

- Sealing of the ductwork joints and seams required to be compliant with M1601.4.1
- Insulated ductwork required when outside of building thermal envelope
- Building framing cavities cannot be used as ducts or plenums.

Duct Testing Requirements N1103.3.5

- In NJ again refer to UCC Bulletin 22-1 (likely works elsewhere too)
- 2 Methods: (2021 change: *testing required no matter what now – Duct Tightness*)
  - Rough In Test
  - Postconstruction Test
- 2021 Changes: Leakage Amounts N1103.3.6
  - At Rough in test: not greater than ***4.0*** CFM per 100 sq ft of conditioned floor space
    - If no air handler installed not greater than ***3.0*** CFM per 100 sq ft of conditioned floor space
  - Postconstruction test: not greater than ***4.0*** CFM per 100 sq ft of conditioned floor space
  - *If all ducts and air handler within building thermal envelope total leakage maximum of 8.0 CFM per 100 sq ft of conditioned floor space*.

Whole House Mechanical Ventilation Efficacy
N1103.6.2

- 2021 change: entire section changes including most of table
- *Fans for these systems shall have efficacy per table N1103.6.2*
- *Fan airflow & efficacy shall be reported on product listing or on the label*
- *Testing of these systems is now required per N1103.6.3 and a report submitted*.

Table N1103.6.2

TABLE N1103.6.2 (R403.6.2) WHOLE-DWELLING MECHANICAL VENTILATION SYSTEM FAN EFFICACY[a]

	FAN LOCATION	AIRFLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)
	HRV, ERV or balanced	Any	1.2 cfm/watt
	In-line supply or exhaust fan	Any	3.8 cfm/watt
	Other exhaust fan	< 90	2.8 cfm/watt
	Other exhaust fan	≥ 90	3.5 cfm/watt
	Air-handler that is integrated to tested and listed HVAC equipment	Any	1.2 cfm/watt

· SI: 1 cubic foot per minute = 28.3 L/min.

a. Design outdoor airflow rate/watts of fan used.

Electrical & Lighting Systems N1104

- 2021 Change: *All permanent lighting fixtures, except kitchen appliance lighting shall contain high efficacy lighting*
- Permanent interior lighting shall have dimmer or occupancy sensors N1104.2
  - 2021 change*: Exceptions: bathrooms, hallways, exterior lighting, safety/security*
- 2021 change*: Exterior Lighting Controls N1104.3*
  - *Permanent lighting greater than 30 watts shall have the following*
    - *Manual control switch that permits automatic shut off actions*
    - *Automatic daylight shutoff when lighting needs met*
    - *Controls that override automatic shut off not permitted unless deactivates within 24 hours.*

Total Building Performance
N1105

- This section is based on a proposed performance based design analysis
- 2021 change: Name of section modified from 2018 entitled Simulated Performance Alterative (Performance)
- 2021 change: N1105.2 Entire section changed in name (Performance based compliance) and content
  - *Compliance based on all 3 required criteria*
    - *Sections identified in Table N1105.2* (no change to table itself)
    - *Building thermal envelope must be greater than or equal to efficiency levels & SHGC in table R402.1.1 or R402.1.3 of* ***2009 IECC***
    - *Annual energy cost less than or equal to standard reference design. Energy prices must be taken from approved source (Dept of Energy).*

Standard Reference Design Definition

- N1101.6
  - A version of the proposed design that meets the minimum requirements of this code and is used to determine the maximum annual energy use requirement for compliance based on total building performance.

Using ResCheck Program

- Old adage: garbage in – garbage out holds true with this
- The values entered need to be verified as accurate for the area indicated, the type of insulation and the R value
- Building components are already part of the value for the specific building component
  - Adding R values for wood framing, air barrier, sheetrock is incorrect since the program automatically accounts for these components
- Cavity versus continuous insulation columns need to be indicated properly
  - If using cavity (batt) insulation along with an exterior insulated sheathing, both the cavity AND the continuous columns would have values in them
  - If closed cell insulation used than the associated R value indicated needs to be verified based on manufacturer specs.

REScheck Software Version 4.7.2

Compliance Certificate

Project Addition & Alteration

Energy Code: **2015 IECC**
Location:
Construction Type: **Single-family**
Project Type: **Addition**
Climate Zone: **5 (5894 HDD)**
Permit Date:
Permit Number:

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Site Revised

Construction Site: Owner/Agent: Designer/Contractor:

Compliance: Passes using UA trade-off

Compliance: **10.2% Better Than Code** Maximum UA: **187** Your UA: **168**

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.

NOTE: Slab-on-grade tradeoffs are no longer considered in the UA or performance compliance path in REScheck. Each slab-on-grade assembly in the specified climate zone must meet the minimum energy code insulation R-value and depth requirements.

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Prop. U-Factor	Req. U-Factor	Prop. UA	Req. UA
Floor 1: Slab-On-Grade:Unheated Insulation depth: 2.0'	209		10.0	0.767	0.033	0	0
Basement walls (west-north-east): Solid Concrete or Masonry:Interior Insulation	518	0.0	15.0	0.056	0.065	24	28
Window 1 west: Wood Frame:Double Pane with Low-E	13			0.300	0.320	4	4
(2) sliding glass patio doors - north: Glass	68			0.300	0.320	20	22
1st fl walls (west-north-east): Wood Frame, 16" o.c.	544	0.0	15.0	0.051	0.060	21	25
1st fl windows (west-north-east + laundry south): Wood Frame:Double Pane with Low-E	75			0.300	0.320	23	24
slidng glass door north: Glass	34			0.300	0.320	10	11
solid wood door east: Solid	21			0.200	0.320	4	7
1st floor overhang north: All-Wood Joist/Truss:Over Outside Air	68	0.0	30.0	0.029	0.033	2	2
1st floor ceiling (east) over kitchen +& laundry: Flat Ceiling or Scissor Truss	253	0.0	30.0	0.031	0.026	8	7
2nd fl ceiling (new attic) addition: Flat Ceiling or Scissor Truss	478	0.0	38.0	0.025	0.026	12	12
2nd fl walls (west-north-east): Wood Frame, 16" o.c.	502	0.0	15.0	0.051	0.060	23	27
2nd fl windows: Wood Frame:Double Pane with Low-E	57			0.300	0.320	17	18

Project Title: Addition & Alteration Report date: 11/03/23

Notice that the entire R-value is in the “continuous” column

- Notice the “floor” row has an R-30 cavity value included
- Which “floor” is this to be installed? Basement ceiling, 1st level ceiling or both?

Energy Code: 2021 IECC
Location: [redacted], New Jersey
Construction Type: Single-family
Project Type: New Construction
Conditioned Floor Area: 5,339 ft2
Glazing Area 14%
Climate Zone: 4 (5227 HDD)
Permit Date:
Permit Number:

Construction Site: [redacted]

Owner/Agent: residence [redacted]

Designer/Contractor: [redacted]

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Compliance: Passes using UA trade-off

Compliance: 0.9% Better Than Code | Maximum UA:672 | Your UA:666 | Maximum 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.

Slab-on-grade tradeoffs are no longer considered in the UA or performance compliance path in REScheck. Each slab-on-grade assembly in the specified climate zone must meet the minimum energy code insulation R-value and depth requirements.

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Prop. U-Factor	Req. U-Factor	Prop. UA	R
Ceiling: Flat Ceiling or Scissor Truss	2,992	38.0	0.0	0.030	0.024	90	
Wall: Wood Frame, 16" o.c.	2,340	19.0	0.0	0.060	0.045	117	
Door: Glass Door (over 50% glazing) SHGC: 0.40	238			0.270	0.300	64	
Window: Wood Frame SHGC: 0.40	144			0.270	0.300	39	
Wall 1: Wood Frame, 16" o.c.	2,070	19.0	0.0	0.060	0.045	109	
Window 1: Wood Frame SHGC: 0.40	252			0.270	0.300	68	
Floor: All-Wood Joist/Truss	621	30.0	0.0	0.033	0.047	20	
Floor 1: All-Wood Joist/Truss	2,178	30.0	0.0	0.033	0.047	72	
Basement Wall: Solid Concrete or Masonry Wall height: 9.0' Depth below grade: 8.0' Insulation depth: 8.5'	1,853	17.5	0.0	0.047	0.059	87	

Additional Efficiency Package(s)

Required: 1 Proposed: 1

Description	Credits
Efficient HVAC Performance	1.0

Documentation Required N1105.3

- 2021 change: Compliance report generated by compliance software submitted at time of permit application AND *upon completion of building to confirm condition of building prior to CO being issued*
- 2021 change: *5 of the 6 report items needed at time of permit application have been modified* N1105.3.2.1
- 2021 change: 5 of the 7 r*eport items needed at time of CO have been modified.* N1105.3.2.2.

Energy Rating Index Compliance Alternative N1106

- The Energy Rating Index (ERI) compares the energy performance to a baseline rather than the energy cost. The ERI requires the design to be a specified percentage better than the baseline. The baseline for the ERI is the code whereas the simulated performance method uses a current baseline
- 2021 change: new equation
  - $UA_{proposed\ design} = 1.15 * UA_{prescriptive\ reference\ design}$
  - UA: A measure of the amount of heat that would be transferred through a given surface or enclosure (such as a building envelope) with a one degree Fahrenheit temperature difference between the two sides. The UA is calculated by multiplying the U–Value by the area of the surface (or surfaces).

Compliance Report Requirements N1106.7.2

- 2021 change: ERI Compliance report generated by compliance software submitted at time of permit application AND *upon completion of building to confirm condition of building prior to CO being issued*
- 2021 change: *All 7 report items needed at time of permit application modified*
- 2021 change: *All 6 report items needed at time of CO modified*
- 2021 change*: Renewable energy certificate is needed.*

Additional Efficiency Package Options N1108

- Provides for addressing additional requirements for all compliance paths to achieve added energy efficiency if desired.
- Broken down into enhanced components
  - Enhanced envelope performance
  - 2021 change: *HVAC equipment with better efficiency than needed*
  - 2021 change: *Reduced water heater energy use*
  - 2021 change: *Better duct thermal distribution system*
  - Improved air sealing & efficient ventilation system.

Conclusion

- Your time spent attending these learning opportunities and making this industry better through education and knowledge of the code requirements is appreciated!
- Thank you for your devotion to your industry and the homes that you all are a part of
- I hope you have gained some information from today even if it was a review.