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BULLETIN 19-2

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Subject: Energy Subcode Compliance
Reference: N.J.A.C. 5:23-2.15(f)1vi, 2.18(b) and 3.18

The Uniform Construction Code requires applicants to show compliance with the Energy Subcode as part of the permit application process for a newly-constructed building or an addition. Buildings undergoing a repair, renovation, alteration, reconstruction or change of use must only meet the requirements provided for at N.J.A.C. 5:23-6, the Rehabilitation Subcode.

Note: "Low-energy" buildings, or portions thereof (thermal separation required), do not have to meet the Thermal Envelope portion of the Energy Subcode. This includes buildings:

- 1. Those with a peak design rate of energy usage less than 3.4 Btu/h* ft^2 or 1.0 watt/ ft^2 of floor area for space conditioning purposes; or*
- 2. Those that do not contain conditioned space.*

Compliance methods vary dependent on climate zone and building type. The Energy Subcode separates the State into two climates zones as follows:

Zone 4A – Atlantic, Burlington, Camden, Cape May, Cumberland, Essex, Gloucester, Hudson, Middlesex, Monmouth, Ocean, Salem and Union counties;

Zone 5A – Bergen, Hunterdon, Mercer, Morris, Passaic, Somerset, Sussex and Warren counties.

The Energy Subcode divides buildings into two categories: low-rise residential and commercial, which includes all buildings that are not low-rise residential.

PERMIT APPLICATION/PLAN REVIEW

The following is a description of the alternatives for documenting energy subcode compliance at the time of permit application.

Low-rise residential buildings are defined as one- and two-family dwellings or multiple-family buildings three stories or less in height. Compliance must be in accordance with the Energy Subcode and the residential portion of the International Energy Conservation Code (IECC-R), which parallels Chapter 11 of the International Residential Code (IRC-N). For purposes of this bulletin, IECC-R references will be made. Compliance for low-rise residential buildings, may be demonstrated in one of four ways:

1. COMPLIANCE WITH CALCULATIONS: This has been the traditional way that compliance with energy codes has been shown. It involves calculating the “U” value (thermal transmittance) of the various building components (walls, floors, roofs, etc.) and showing that they are less than the code-specified maximum for the components. Guidance on how to perform the calculations can be found in the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) Handbook of Fundamentals.

2. COMPLIANCE WITH RESCHECK SOFTWARE: The software program performs the calculations based on input about the shape and size of the building, the type of insulation and windows and the type of equipment that the applicant proposes to use. The software is available as a free download from the website: <http://www.energycodes.gov>. The IECC-R version of the software should be used and can be selected under “Code” in the menu bar at top. The software simply requires the input of the areas of the various components, the R-value of insulation, and the U value of windows and doors. Based on Section R402.1.5, entitled “Total UA alternative,” the software automatically gives trade-offs. A compliance report is generated by the software program, which is to be submitted with the permit application. It must meet or exceed the IECC-R (“passes” by zero percent or better) based on the applicable climate zone location specified for each municipality.

Note: REScheck is the software most commonly used to demonstrate compliance with the energy subcode. However, the US Department of Energy does list other building energy software tools that can be used in lieu of REScheck as long as the tool chosen determines compliance with the provisions of the IECC-R, specifically the building envelope and HVAC requirements. These tools can be found at <http://www.buildingenergysoftwaretools.com>.

3. COMPLIANCE WITH CLEAN ENERGY PROGRAM FOR RESIDENTIAL NEW CONSTRUCTION (FORMERLY NJ ENERGystar HOMES): This program is sponsored by the New Jersey Board of Public Utilities through its Clean Energy Program (see <http://www.njcleanenergy.com/residential>). The program provides incentives and technical assistance for projects that exceed the Energy Subcode. A letter of enrollment (typically the “builder’s acknowledgment” letter) from the NJ Clean Energy Program “market manager” should be submitted with the permit application if the applicant is choosing this compliance option. Inspections for this program are handled by Home Energy Rating company, except that Section R403, entitled “Systems,” of the IECC-R must be verified by the local construction office. Upon application for a new home’s Certificate of Occupancy, the program’s verification summary (i.e. passing final inspection report) should be submitted.

4. COMPLIANCE WITH PRESCRIPTIVE PACKAGE: Previous adoptions of the energy subcode allowed for the use of a prescriptive package based on climate zone location and window-to-wall ratios. Following are the applicable portions of Table R402.1.2 of the IECC-R that can be applied as a prescriptive package. The applicant need only identify that he/she is using the prescriptive package and then show the corresponding details on the plans. If a proposed building has U factors (a measure of the windows’ efficiency) that are equal to or lower than the values found on the appropriate line in the chart, and R-values that are equal to or higher than those listed in the chart, the building complies.

INSULATION & FENESTRATION REQUIREMENTS BY COMPONENT ^a										
Climate Zone	Fenestration U-Factor ^b	Skylight U-Factor ^b	Glazed Fenestration SHGC ^b	Ceiling R-Value	Wood Frame Wall R-Value	Mass Wall R-Value ⁱ	Floor R-Value	Basement Wall R-Value ^c	Slab R-Value ^d & Depth	Crawl Space Wall R-Value ^c
4A	0.32	0.55	0.40	49	20 or 13+5 ^h	8/13	19	10/13	10, 2 ft	10/13
5A	0.30	0.55	NR	49	20 or 13+5 ^h	13/17	30 ^g	15/19	10, 2 ft	15/19
a. R-values are minimums. U-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the installed R-value of the insulation shall not be 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.										
c. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulated sheathing on the interior or exterior of the home. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.										
d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge R-value for slabs. The slab edge insulation for heated slabs shall not be required to extend below the slab.										
g. Alternatively, insulation sufficient to fill the framing cavity providing not less than an R-value of R-19.										
h. The first value is cavity insulation, the second value is continuous insulation. Therefore, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.										
i. Mass walls shall be in accordance with Section R402.2.5. The second R-value applies when more than half the of insulation is on the interior of the mass wall.										

Note: Table R402.1.2 applies to typical wood-framed construction; equivalent U-factors may be found in Table R402.1.4. Steel-frame equivalent R-values may be found in Table R402.2.6.

Regardless of the compliance method chosen, the documentation must be signed and sealed by a design professional, except that in Class 3 buildings, as described at N.J.A.C. 5:23-4.3A(d), the documentation may be signed and sealed by the HVACR contractor, and in the case of a single-family detached dwelling where the homeowner resides or intends to reside in the dwelling, the homeowner may sign the energy code compliance documentation.

Commercial buildings are defined as all buildings other than low-rise residential buildings. Compliance must be in accordance with the Energy Subcode and ASHRAE Standard 90.1; do not use the commercial portion of the International Energy Conservation Code (IECC-C) as it is deleted per N.J.A.C. 5:23-3.18. Compliance for commercial buildings may be demonstrated in one of two ways:

1. COMPLIANCE WITH CALCULATIONS: This is very much like the calculations for low-rise residential buildings mentioned above. However, the applicant must also provide information on the type of lighting installed and its usage. *Tip: For building thermal envelope, use Tables 5.5-4 and 5.5-5, as applicable, for a starting point in your calculations.*

2. COMPLIANCE WITH COMCHECK SOFTWARE: This is very much like the REScheck software mentioned above. However, the applicant must also include the type of lighting installed and its usage. The COMCHECK software is available as a free download from the website: <http://www.energycodes.gov>. The ASHRAE Standard 90.1 version of the software should be used and can be selected under "Code" in the menu bar at top. A compliance report is generated by the software program, which is to be submitted with

the permit application. It must meet or exceed the ASHRAE (“passes” by zero percent or better) based on the applicable climate zone location. *Tip: For building thermal envelope, use Tables 5.5-4 and 5.5-5, as applicable, for a starting point in your calculations.*

Note: COMcheck is the software most commonly used to demonstrate compliance with the energy subcode. However, the US Department of Energy does list other building energy software tools that can be used in lieu of COMcheck as long as the tool chosen determines compliance with the provisions of the ASHRAE Standard 90.1, specifically the building envelope, lighting, HVAC, and service water heating requirements. These tools can be found at <http://www.buildingenergysoftwaretools.com>.

Regardless of the compliance method chosen, the documentation must be signed and sealed by a design professional, except that in Class 3 buildings, as described at N.J.A.C. 5:23-4.3A(d), the documentation may be signed and sealed by the HVACR contractor.

INSPECTION

Work done in **low-rise residential buildings** is inspected to verify:

- (1) The insulation specified on the plans is the insulation installed,
- (2) The sealing (air tightness) of the building thermal envelope (this may be done through either a visual inspection or a blower door test), and
- (3) Duct tightness through an air leakage test.

A further explanation of these inspection responsibilities follows:

Insulation — N.J.A.C. 5:23-2.18(b)1iv(1)(C) requires inspectors to verify that the insulation levels installed match the ones: (a) used in the calculations, (b) found in the REScheck printout, or (c) shown in the Prescriptive Package table. The one exception to inspector verification of the insulation levels is a home enrolled in the NJ Clean Energy Program where compliance is verified by a third party. In all cases, other Energy Subcode requirements, such as piping and ductwork insulation, still apply. With specific regard to ductwork (Section R403.3.1), supply and return ducts in attics are to be insulated to a minimum of R-8 where 3 inches in diameter and greater and R-6 where less than 3 inches in diameter. Supply and return ducts in other portions of the building are to be insulated to a minimum of R-6 where 3 inches in diameter or greater and R-4.2 where less than 3 inches in diameter. The exception to the ductwork insulation requirement is when the duct is located completely inside the building thermal envelope.

Sealing — Specific air leakage sealing requirements within the IECC-R are as follows:

- Building Thermal Envelope tightness — The permit holder has two options for verifying building thermal envelope tightness: (1) testing per Section R402.4.1.2, or (2) visual inspection per Section R402.4.1.1. Because inspectors are already looking at the type of insulation installed, the visual inspection (option #2) will have already been partially completed; the remaining inspection issues for envelope tightness relate to the air barrier. If the permit holder chooses testing, the documentation showing the results of the blower door test will become part of the permit file. If the permit holder chooses a visual inspection, the code official will field-verify that the building thermal envelope tightness complies with Table R402.4.1.1. The air barrier inspection may be performed by a person other than

the local code official, but that person must be independent of the installer and approved by the code official. The IECC-R establishes no credentials for persons performing these inspections. In all cases where the inspection option is used to document compliance, UCC-F392, the Air Barrier and Insulation checklist must be completed. Once completed, checklists documenting visual inspection(s) as described below, are retained in the file.

- UCC inspector(s) – One checklist documenting both insulation and air barrier requirements have been met is filed.
- UCC inspector(s) and independent inspector(s) – In this case, there may be two checklists filed, one for the insulation completed by the UCC inspector(s), and one for the air barrier completed by the independent inspector(s).
- UCC inspector(s) and blower door test – Here, one checklist for insulation completed by the UCC inspector(s) is filed, and documentation of a passing blower door test is appended to the checklist.
- Duct tightness — Duct tightness must be verified by way of a leakage test unless the air handler and all ducts are located within conditioned space. The permit holder may verify duct tightness through testing either at post-construction or during rough-in; the timing of this test is the permit holder's choice. The benefit to a post-construction test is that the qualifications for passing are less stringent than a rough-in test. The benefit to a rough-in test is that the ductwork should be much more accessible to fix if it does not pass. The requirements for passing can be found at Section R403.3.3 and R403.3.4. Again, a copy of the test results will become part of the permit file. The IECC-R establishes no credentials for persons performing this test.
 - Note that Section R403.3.5 does not permit the usage of framing cavities (e.g. stud wall cavities, space between solid floor joists) to be used as ducts or plenums for supply or return air.

Certificate — As per Section R401.3 of the IECC-R, a permanent certificate is to be posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate (attached hereto) is to be completed by the builder or registered design professional and is to list the applicable, predominant building thermal envelope properties along with the type and efficiencies of heating, cooling and service water heating equipment installed. In lieu of the certificate provided, a certificate from REScheck or NJ Clean Energy Program is acceptable.

NJ IECC/2018 Energy Efficiency Certificate for Low-rise Residential Dwellings*		
Address:		Permit #:
<i>Insulation Rating</i> <small>(batt, spray, blown, continuous, other)</small>		<i>R-value</i>
Ceiling/Roof		
Above Grade Wall: framed__ ; mass__		
Floor: over unconditioned space__ ; slab__		
Crawlspace Wall		
Foundation/Basement Wall		
Ductwork (unconditioned spaces)		
<i>Fenestration Rating</i>		<i>U-factor</i> <i>SHGC</i>
Window		
Skylight		
Door		
<i>Heating & Cooling Equipment</i>	<i>Type</i> <small>(Oil, Gas, Electric, other)</small>	<i>Efficiency</i> <small>(AFUE, EER/SEER, HSPF, other)</small>
Furnace		
Heatpump		
Boiler		
Cooling System		
Water Heater		
Other		
<i>Renewables (type of system)</i>		
<i>Other Energy Efficiency Equipment</i>		
<i>Builder or Design Professional Certification</i>		
Name:		Date:
Registration/License Number:		
<i>Comments</i>		
<small>* This is a generic certificate and some items listed above may not be applicable to this specific design when initially constructed; please leave those items blank.</small>		

The inspection of work done in **commercial buildings** has not changed. The inspection includes, but is not limited to, verifying that:

- (1) The insulation specified on the plans is the insulation installed,
- (2) The lighting fixtures and associated controls specified on the plans are installed, and
- (3) The mechanical systems, associated controls and associated insulation specified on the plans are installed.

AIR BARRIER AND INSULATION CHECKLIST

In the checklist below, **AB** and **I** stand for the *air barrier* and *insulation* inspection components to be verified. The local code official will always verify the **I** components. In the case where the local code official is not verifying the **AB** components, they may be verified by a person independent of the insulation installer, or by the use of a blower door test.

If the permit holder has elected use of a blower door test, documentation of test results verifying air leakage less than 3 air changes per hour when tested per RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 w.g. (50 Pa) shall be submitted with this checklist. A passing test demonstrates that the **AB** components are verified.

COMPONENT	CRITERIA	Y, N, OR N/A	COMMENTS	INITIALS	DATE
Floors (including above-garage and cantilevered floors)					
General	I	Insulation is installed to maintain permanent contact with underside of subfloor decking.			
	AB	Air barrier is installed at any exposed edge of insulation.			
Rim joists	AB	Rim joists include an air barrier.			
	I	Rim joists are insulated.			
Walls					
General	I	Corners and headers are insulated.			
	AB	Junction of foundation and sill plate is sealed.			
Crawl space walls	I	Insulation is permanently attached to walls.			
	I	Exposed earth in unvented crawl spaces is covered with Class I vapor retarder with overlapping joints taped.			
Windows and doors	AB	Space between window/door jambs and framing is sealed.			
Garage separation	AB	Air sealing is provided between the garage and conditioned spaces.			
Plumbing and wiring	I	Insulation is placed between outside and pipes. Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.			
Shower/tub on exterior wall	I	Showers and tubs on exterior walls have insulation.			
	AB	Showers and tubs on exterior walls have an air barrier separating them from the exterior wall.			
Electrical/phone box on exterior walls	AB	Air barrier extends behind boxes or air sealed-type boxes are installed.			
Ceiling/Attic					
Skylights	AB	Space between skylight framing is sealed.			

PERMIT # _____

LOT: _____ BLOCK: _____

COMPONENT		CRITERIA	Y, N, OR N/A	COMMENTS	INITIALS	DATE
Ceiling/Attic		<i>(continued)</i>				
General	AB	Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed.				
	AB	Attic access (except unvented attic), knee wall door, or drop down stair is sealed.				
Recessed lighting	I	Recessed light fixtures penetrating the thermal envelope are air tight, IC-rated, and sealed to drywall.				
Other/All						
Air barrier and thermal barrier	I	Exterior thermal envelope insulation for framed assemblies is installed in substantial contact and continuous alignment with building envelope air barrier.				
	AB	Breaks or joints in the air barrier are filled or repaired.				
	I	Air-permeable insulation is not used as a sealing material.				
	AB	Air-permeable insulation is inside of an air barrier.				
Shafts, penetrations	AB	Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.				
Narrow cavities	I	Batts in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.				
HVAC register boots	AB	HVAC register boots that penetrate building envelope are sealed to subfloor or wall/ceiling covering.				

CODE OFFICIAL: _____	SIGNATURE: _____	DATE: _____
CODE OFFICIAL: _____	SIGNATURE: _____	DATE: _____
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