

# Tropical Zone Buildings



Buildings in the Tropical Zone typically have no conditioning (heat or cooling) or partial conditioning; consequently, they are inherently greener and more energy efficient. Without heat or air conditioning, many mainland U.S. green building practices are irrelevant to the building's performance. Further, the prevalence of masonry construction makes some green practices extraneous.

The 2015 NGBS and 2020 NGBS Consensus Committees specifically sought to include a pragmatic certification path for Tropical Zone buildings to ensure these buildings could earn NGBS Green certification. Both the 2015 NGBS and the 2020 NGBS versions include an alternative compliance path for buildings in the Tropical Climate Zone that diverges from how buildings in other climates demonstrate compliance. The intent is to recognize the relative energy efficiency for buildings compliant with the provisions of the IECC Section R401.2.1 (Tropical Zone). See **2020 NGBS 701.1.4 Alternative Bronze and Silver level compliance** excerpted below, and additionally, see **2020 NGBS 701.1.6 Alternative Gold level compliance for Tropical Zone** (not reproduced here).

**701.1.4 Alternative Bronze and Silver level compliance.** As an alternative, any building that qualifies as an ENERGY STAR Version 3.0 Certified Home or ENERGY STAR Multifamily High-Rise Version 1.0 Rev. 03 building or demonstrates compliance with the ICC IECC or IRC Chapter 11 achieves the Bronze level for Chapter 7. As an alternative, any building that qualifies as an ENERGY STAR Version 3.1 Certified Home or ENERGY STAR Multifamily High-Rise Version 1.0 Rev. 03 (with the baseline at ASHRAE 90.1-2010) building achieves the Silver level for Chapter 7. ***As an alternative in the Tropical Climate Zone, any building that meets all the requirements in ICC IECC Section R401.2.1 (Tropical Zone) achieves the Silver level for Chapter 7.*** The buildings achieving compliance under § 701.1.4 are not eligible for achieving a rating level above Silver. [emphasis added]

Despite the 2015 NGBS and 2020 NGBS alternative energy compliance criteria for buildings in the Tropical Zone, there remain a few NGBS practices that are incompatible with customary Tropical building construction. Further, when applied in the Tropical Zone, these practices do not improve the building's efficiency, sustainability, or overall performance. As a result, NGBS Green certification allows for buildings in the Tropical Zone to qualify for waivers when certain conditions are met (see below).

- **NGBS 701.4.3.2 Air-sealing** – Building types, such as poured concrete and CMU walls, are extremely airtight and therefore air-sealing testing provides little value to the building's sustainability; instead, Verifier must review detailed architectural drawings illustrating roof-to-wall intersection to confirm proper sealing technique – these drawings are subject to NGBS Green audit for QA so keep them as part of your verification records. [This determination offers consistency with other practices in the

NGBS. Within the Prescriptive Path, the mandatory practices for building thermal envelope compliance are not required for the Tropical Climate Zone.]

- **NGBS 703.1.1.2 Prescriptive R-value and Fenestration Requirements** – Unconditioned buildings are designed to have open windows; therefore, windows do not serve as an energy efficiency measure. Windows in the Tropical Climate Zone are exempt from NGBS fenestration requirements but must meet the IECC fenestration requirements. See IECC requirements below and 2015 NGBS and 2020 NGBS 703.1.1 UA Compliance. This exemption carries over to 2015 NGBS and 2020 NGBS 703.2.5 Fenestration.
- **701.1.4 Alternative Bronze and Silver level compliance AND 701.1.6 Alternative Gold Compliance for Tropical Zones** – Tropical Zone elevation requirement *waived* for unconditioned homes/buildings; the elevation limit is designed to recognize buildings at higher elevations may install heating equipment and therefore should comply with conventional energy efficient requirements, however, buildings without heating installed should still be able to use the Tropical Zone compliance requirements – Note that NGBS Green certified buildings that use the elevation waiver will have this deviation in compliance noted on the certificate.
- **NGBS 902.1.1(1) Spot Ventilation** – *Not waived* even though spot ventilation is uncommon in the Tropical Zone in unconditioned buildings; bathroom exhaust fans that vent to the outside *required* (no waiver allowed), even if the bathroom has operable fenestration (this practice mitigates excess indoor moisture).
- **NGBS 902.3 Radon reduction measures** for Zone 1 *waived* in Puerto Rico and US Virgin Islands until EPA develops radon zone maps.
- **2020 NGBS 902.3.2 Radon testing requirement** – *waived* in Puerto Rico and US Virgin Islands until EPA develops radon zone maps.
- **2020 NGBS 1202.13 Roof overhang requirement** – *waived* if roof overhangs are not part of the building design; if roof overhangs are planned other than above the door, the building must meet the practice.
- **2020 NGBS 1203.11.1.2 Building Envelope** – Tropical Climate Zone exception extended to 1203.11.1.2.
- **2020 NGBS 1203.6 Air Sealing & Insulation** -- exemption provided for majority unconditioned buildings.
- **2020 NGBS 1205.11** -- waiver available for building without heating systems
- **2020 NGBS 11.700** -- only 15 points (lowered from 30-point threshold) are needed by Tropical Buildings to meet the prescriptive energy efficiency requirements. This action reflects the limited options available to unconditioned buildings.

# Homes and Buildings in the Tropical Zone



The National Green Building Standard ICC/ASHRAE-700 (NGBS) is the only green building rating system specifically designed for homes and apartments approved by the American National Standards Institute (ANSI), as an American National Standard. The NGBS provides a blueprint for architects, builders, and developers for the design and construction of residentially used buildings.

Home Innovation Research Labs serves as NGBS certification agency, providing certification of compliance nationwide. The NGBS Green certification is an above-code, voluntary program and is recognized by the U.S. Department of Housing and Urban Development, Fannie Mae, Freddie Mac, and government agencies at all levels. Buildings can attain one of four performance levels — Bronze, Silver, Gold, or Emerald, and single-family homes also have a Certified performance level option. The NGBS has specific compliance provisions buildings in the Tropical Zone.

## 2015 NGBS Compliance for Tropical Zone Homes/Buildings

- 2015 IECC is baseline (local code modifications not recognized)
- Covers single-family homes, multifamily buildings, or residential portion of mixed-use buildings
- Buildings that comply with minimum requirements of 2015 ICC IECC Section R401.2.1 (Tropical Zone) achieve Silver level for NGBS Chapter 7 (but no higher)
- Meets HUD requirements for CDBG disaster recovery funding

## 2020 NGBS Compliance for Tropical Zone Homes/Buildings

- 2018 IECC is baseline (local code modifications not allowed – see below for 2018 IECC requirements)
- Covers single-family homes, multifamily buildings, the residential portion of mixed-use buildings, or the entire building when the residential portion is >50% of the gross floor area
- Buildings that comply with the minimum requirements of 2018 ICC IECC Section R401.2.1 (Tropical Zone) achieve Silver level for Chapter 7 (but no higher)
- Buildings that comply with 2020 NGBS 701.1.6 Alternative Gold level compliance for Tropical Zone achieve the Gold level for NGBS Chapter 7 (but no higher)
- **NEW** Simplified Chapter 12 Certified Path for SF or townhomes
- More renovation flexibility for existing buildings with Prescriptive Path for energy and water efficiency
- Resilient design and construction earns points toward certification (New Construction and Renovation paths only, not Certified Path)
- All certification paths meet HUD requirements for CDBG disaster recovery funding

## 2018 IECC R401.2.1 Tropical Zone Requirements<sup>1</sup>

**R401.2.1 Tropical Zone.** Residential buildings in the Tropical Zone at elevations less than 2,400 feet (731.5 m) above sea level shall be deemed to be in compliance with this chapter provided that the following conditions are met:

1. Not more than one-half of the occupied space is air conditioned.
2. The occupied space is not heated.
3. Solar, wind or other renewable energy source supplies not less than 80 percent of the energy for service water heating.
4. Glazing in conditioned spaces has a solar heat gain coefficient of less than or equal to 0.40, or has an overhang with a projection factor equal to or greater than 0.30.
5. Permanently installed lighting is in accordance with Section R404.
6. The exterior roof surface complies with one of the options in Table C402.3 or the roof or ceiling has insulation with an R-value of R-15 or greater. Where attics are present, attics above the insulation are vented and attics below the insulation are unvented.
7. Roof surfaces have a slope of not less than one-fourth unit vertical in 12 units horizontal.<sup>2</sup> The finished roof does not have water accumulation areas.
8. Operable fenestration provides a ventilation area of not less than 14% of the floor area in each room. Alternatively, equivalent ventilation is provided by a ventilation fan.
9. Bedrooms with exterior walls facing two different directions have operable fenestration on exterior *walls* facing two directions.
10. Interior doors to bedrooms are capable of being secured in the open position.
11. A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest space that is not used as a bedroom.

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<sup>1</sup> 2018 IECC Tropical Zone Requirements are excerpted to facilitate compliance for buildings seeking NGBS Green certification.

<sup>2</sup> NOTE: The 2018 IECC has a math error, a slope of not less than one-fourth unit vertical in 12 units horizontal does not equal 21% so we have amended this requirement to not include the percentage.

	<b>2018 IECC R401.2.1 Tropical zone Compliance Requirements</b>	<b>REQUIRED DOCUMENTATION</b>	<b>VERIFICATION INSTRUCTIONS</b>
<b>1</b>	Not more than one-half of the occupied space is air conditioned.	Manufacturer's literature stating compliance with the practice	Documentation review and inspection
<b>2</b>	The occupied space is not heated.	Manufacturer's literature stating compliance with the practice	Documentation review and inspection
<b>3</b>	Solar, wind or other renewable energy source supplies not less than 80 percent of the energy for service water heating.	Manufacturer's literature or installer certification for equipment that is installed and showing number of watts (or equivalent) produced by installed system	Inspection that system is installed
<b>4</b>	Glazing in conditioned spaces has a solar heat gain coefficient of less than or equal to 0.40, or has an overhang with a projection factor equal to or greater than 0.30.	Window label or other documentation showing glazing. Plans and specs showing overhang details	Inspection and documentation review that practices have been met
<b>5</b>	Not less than 90 percent of the permanently installed lighting fixtures shall contain only high-efficacy lamps.	Manufacturer's literature or labels	Inspection and counting total number of fixtures and number of compliant fixtures.
<b>6</b>	Fuel gas lighting systems shall not have continuously burning pilot lights.	Manufacturer's literature or labels	Documentation review and Inspection that installed lighting systems comply
<b>7</b>	The exterior roof surface complies with one of the options in Table C402.3 or the roof or ceiling has insulation with an R-value of R-15 or greater. Where attics are present, attics above the insulation are vented and attics below the insulation are unvented.	Manufacturer's literature or specification showing solar reflectance, thermal emittance, or insulation values.	Inspection and documentation review that practices have been met
<b>8</b>	Roof surfaces have a slope of not less than one-fourth unit vertical in 12 units horizontal. The finished roof does not have water accumulation areas.	Manufacturer's plans and submittals showing roof details along with slope calculation.	Observation that roof meets criteria
<b>9</b>	Operable fenestration provides a ventilation area of not less than 14% of the floor area in each room. Alternatively, equivalent ventilation is provided by a ventilation fan.	Building plans and calculations for ratio of fenestration area to floor area or equivalent ventilation system.	Documentation review and inspection
<b>10</b>	Bedrooms with exterior walls facing two different directions have operable fenestration on exterior <i>walls</i> facing two directions.	Building plans and specifications	Documentation review and inspection that practice have been met
<b>11</b>	Interior doors to bedrooms are capable of being secured in the open position.	Manufacturer's literature stating compliance with the practice	Inspection that practice is met
<b>12</b>	A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest space that is not used as a bedroom.	Manufacturer's plans and specification for equipment that is installed	Inspection that ceiling fans are installed

## NGBS Green Energy Modeling Guidance for Partially-Conditioned and Unconditioned Buildings

For Tropical Zone buildings seeking NGBS Green certification, the following energy efficiency pathways can be used for NGBS Chapter 7 compliance.

**701.1.4 Alternative Bronze.** For this path, compliance with IECC 2018 must be demonstrated by either using a REScheck or COMcheck. See below for guidance on how to model partially conditioned or unconditioned buildings.

**701.1.4 Alternative Silver.** For this path, a building must comply with the 2018 IECC R401.2.1 Tropical Zone. See above excerpt. No energy analysis documentation necessary; but Desktop Audit may require documentation that building is compliant with 2018 IECC R401.2.1.

**701.1.6 Alternative Gold** level compliance for tropical zones. For this path, a one-or two-family dwelling can achieve Gold if they meet the requirements above for Silver, plus meet the eight additional NGBS requirements. No energy analysis documentation necessary.

**702 Performance Path:** For the performance path, compliance must be demonstrated using an energy model, and the following should be incorporated when performing an energy model for low energy buildings.

**Low-energy buildings.** The following low energy buildings, or portions thereof separated from the remainder of the building by *building thermal envelope* assemblies, shall be exempt from the *building thermal envelope* requirements.

1. Those with a peak design rate of energy usage less than 3.4 Btu/h • ft<sup>2</sup> (10.7 W/m<sup>2</sup>) or 1.0 watt per square foot (10.7 W/m<sup>2</sup>) of floor area for space conditioning purposes.
2. Those that do not contain *conditioned space*. \*\*

**\*\*EXCERPTED FROM THE 2018 IECC R402.1 AND CORRESPONDING C402.1.1**

**Modeling Guidance:** Modeling low energy buildings can be tricky. Most of the modeling software require that a heating or cooling system be installed. One can employ the following strategies when modeling low energy building:

- 1) Set the cooling set point very high, and the heating set point very low, so it does not turn the AC or Heater on in the model.
- 2) Model the building to be heated and cooled and then subtract all related heating and cooling cost from the modeled results.

For partially conditioned buildings, if possible, create two models, one for conditioned and one for unconditioned and use strategy 1 and 2 directly above for the unconditioned space. If using this approach, please submit both reports to Home Innovation with the final verification packet.

**703 Prescriptive Path.** This path is available to buildings in the Tropical Zone, and there is logic and exemptions incorporated in the NGBS Green Scoring Tools to accommodate such buildings. No energy analysis documentation necessary; but Desktop Audit may require documentation that building is compliant with 703 practices for which the building was awarded points.

## Tropical Zone NGBS Green Verification Process & Guidance

- Homes or multifamily buildings must be registered using the normal process
- If a home in the Tropical Zone does not have drywall and/or fiberglass insulation, Home Innovation will *waive* the rough inspection notification and the rough inspection with following requirements:
  - Building construction must not have drywall or batt insulation
  - Verifier must secure builder consent via email or other written form to forego rough inspection before construction starts; save this documentation for you records
  - Verifier must work with builder to ensure Chapter 5 Lot Design practices that are typically inspected at the rough stage *during construction* are verified so that the Verifier has complete confidence regarding compliance – the construction progress reports compiled for the HUD financing requirements are acceptable as documentation
- Virtual inspections are allowed for Tropical Zone projects meeting the above qualifications. Verifiers do not need to notify Home Innovation of virtual inspection or seek approval, as described within the emergency-use Virtual Inspection Protocol.
- Chapter 5 practices, such as *Natural Resource Protection*, and other practices typically verified at the rough stage can be verified by the NGBS Green Remote Verification Protocol in conjunction with a builder/developer sediment control and resource protect plan
- To streamline the process, single-family homes will be invoiced for the certification fee immediately after registration if Home Innovation has a completed Client Agreement on file
- Verifiers can help streamline the process by ensuring new clients complete the agreement in a timely fashion – [email Lynda](#) who can send an agreement to any new clients
- For multifamily buildings which will likely have drywall, Verifiers should submit a rough inspection notification as normal and the certification fee invoice will be sent after we receive the rough notification – if you have a building that does not have drywall, [email Lynda](#)

## 2020 NGBS SF and MF New Construction Scoring Tools

- Text field for “Project Elevation (ft. above sea level)” has been added to the Overview tabs. This field is mandatory when a Tropical zone address has been entered.
- When a value equal to or above 2400 is entered in that field, the following warning text will be shown under 701.1.4 and 701.1.6 on the Ch 7 and Verification Report tabs: *“Certificate will indicate a deviation due to project elevation.”*

## Tropical Zone NGBS Green Mandatory Practice Verification Guidance

See attached.

# 2015 NGBS MANDATORY ITEMS FOR CONSTRUCTION IN TROPICAL ZONE

*This document is not intended to serve as a substitute for the 2015 NGBS, but rather as a quick guide to the mandatory items required for compliance and any waivers/interpretations for the Tropical Zone generally, and Puerto Rico specifically.*

## GREEN BUILDING PRACTICES

### CHAPTER 5: LOT DESIGN, PREPARATION, AND DEVELOPMENT

No mandatory practices

### CHAPTER 6 RESOURCE EFFICIENCY

#### 602 ENHANCED DURABILITY AND REDUCED MAINTENANCE

**601.1 Conditioned floor area.** Finished floor area of a dwelling unit is limited. Finished floor area is calculated in accordance with ANSI Z765 for single family and ANSI/BOMA Z65.4 for multifamily buildings. Only the finished floor area for stories above grade plane is included in the calculation.

(6) greater than 4,000 square feet (372 m<sup>2</sup>)

**(For every 100 square feet (9.29 m<sup>2</sup>) over 4,000 square feet (372 m<sup>2</sup>), one point is to be added to rating level points shown in Table 303, Category 7 for each rating level.)**

*Calculate from architectural plans and drawings.*

#### 602.1 Moisture management – building envelope

**602.1.1.1 A capillary break** and vapor retarder are installed at concrete slabs in accordance with ICC IRC Sections R506.2.2 and R506.2.3 or ICC IBC Sections 1907 and 1805.4.1.

*Verify by plans/specifications AND scope of work(s) detailing how mandatory requirement has been met. Photo(s) with a geotag showing installation.*

**602.1.3.1** Where required by the ICC IRC or IBC for habitable and usable spaces below grade, **exterior drain tile** is installed.

*N/A if no habitable and usable spaces below grade.*

**602.1.4.1** Vapor retarder in unconditioned vented crawlspace is in accordance with the following, as applicable. Joints of vapor retarder overlap a minimum of 6 inches (152 mm) and are taped.

(2) Walls. Dampproof walls are provided below finished grade.

*N/A if no habitable and usable spaces below grade.*

**602.1.4.2** Crawlspace that is built as a conditioned area is sealed to prevent outside air infiltration and provided with conditioned air at a rate not less than 0.02 cfm (.009 L/s) per square foot of horizontal area and one of the following is implemented:

(2) 6-mil polyethylene sheeting, or other Class I vapor retarder installed in accordance with Section 408.3 or Section 506 of the International Residential Code.

*N/A if no crawlspace*

**602.1.7.1** Moisture control measures are in accordance with the following:

(2) Insulation in cavities is dry in accordance with manufacturer's instructions when enclosed (e.g., with drywall).

*N/A if no insulation and drywall*



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**602.1.8 Water-resistive barrier.** Where required by the ICC, IRC, or IBC, a water-resistive barrier and/or drainage plane system is installed behind exterior veneer and/or siding.

*Verify compliance from architectural drawings and photo(s) with a geotag showing installation.*

**602.1.9 Flashing.** Flashing is provided as follows to minimize water entry into wall and roof assemblies and to direct water to exterior surfaces or exterior water-resistive barriers for drainage. Flashing details are provided in the construction documents and are in accordance with the fenestration manufacturer's instructions, the flashing manufacturer's instructions, or as detailed by a registered design professional.

- (1) Flashing is installed at all of the following locations, as applicable:
  - (a) around exterior fenestrations, skylights, and doors
  - (b) at roof valleys
  - (c) at all building-to-deck, -balcony, -porch, and -stair intersections
  - (d) at roof-to-wall intersections, at roof-to-chimney intersections, at wall-to-chimney intersections, and at parapets
  - (e) at ends of and under masonry, wood, or metal copings and sills
  - (f) above projecting wood trim
  - (g) at built-in roof gutters, and
  - (h) drip edge is installed at eave and rake edges.

*Air sealing or flashing is required if there are seams, joints or gaps between building components and needs to be verified by review of architectural plan and geotagged photo(s) if these seams, joints or gaps will be covered and cannot be verified at final.*

**602.1.11 Tile backing materials.** Tile backing materials installed under tiled surfaces in wet areas are in accordance with ASTM C1178, C1278, C1288, or C1325.

*Verify with manufacturer's literature/specification/labeling showing ASTM compliance. Plans/specifications and scope of work showing installation.*

**602.1.14 Architectural features.** Architectural features that increase the potential for water intrusion are avoided:

- (1) All horizontal ledgers are sloped away to provide gravity drainage as appropriate for the application.

*Verify by inspection at final.*

**602.4.1** Finished grade at all sides of a building is sloped to provide a minimum of 6 inches (150 mm) of fall within 10 feet (3048 mm) of the edge of the building. Where lot lines, walls, slopes, or other physical barriers prohibit 6 inches (152 mm) of fall within 10 feet (3048 mm), the final grade is sloped away from the edge of the building at a minimum slope of 2 percent.

*Verify by inspection at final proper grade slope.*

## SECTION 7: ENERGY EFFICIENCY

### 701 MINIMUM ENERGY EFFICIENCY REQUIREMENTS

#### 701.4 Mandatory practices

**701.4.1.1 HVAC system sizing.** Space heating and cooling system is sized according to heating and cooling loads calculated using ACCA Manual J, or equivalent. Equipment is selected using ACCA Manual S or equivalent.

*N/A if no HVAC system installed. Otherwise verify Manual J & Manual S reports are for the building being verified and that the square footage and specifications used in the report are consistent with the building being verified. Verify HVAC equipment sizes installed for this specific building comply with the analysis recommendation. Report must be done by a qualified professional – see NGBS Green policy regarding who is qualified.*

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**701.4.1.2 Radiant and hydronic space heating.** Where installed as a primary heat source in the building, radiant or hydronic space heating system is designed, installed, and documented, using industry-approved guidelines and standards (e.g., ACCA Manual J, AHRI I=B=R, ACCA 5 QI-2010, or an accredited design professional's and manufacturer's recommendations).

*N/A if no space heating. Otherwise verify by documentation review. The statement must be done by a qualified professional and be specific to the building being verified. When there is not a radiant or hydronic system as primary heat indicate that via the appropriate dropdown menu choice.*

**701.4.2.1 Duct air sealing.** Ducts are air sealed. All duct sealing materials are in conformance with UL 181A or UL 181B specifications and are installed in accordance with manufacturer's instructions.

*N/A if no ducts. Indicate **No Ducts** on verification report if there is no ductwork. Otherwise verify that approved duct sealing methods have been used. All field assembled seams and joints should be sealed. This must be inspected by Verifier at rough if ductwork cannot be verified at final.*

**701.4.2.2 Ducts and Plenums.** Building framing cavities are not used as ducts or plenums.

*Verify by observation no building cavities have been used as SUPPLY ducts. This must be inspected by Verifier either on-site or remotely. If remotely inspected, statement from mechanical engineer or contractor that no building cavities other than the mechanical closet is used as a duct or plenum.*

**701.4.2.3 Duct system sizing.** Duct system is sized and designed in accordance with ACCA Manual D or equivalent.

*N/A when no ducts. Otherwise verify Manual D reports are for the building being verified and that the square footage and specifications used in the report are consistent with the building being verified. Report must be done by a qualified professional. Verify duct system was installed consistent you the Manual D design.*

**701.4.3.1 Building Thermal Envelope Air Sealing.** The building thermal envelope is durably sealed to limit infiltration. The sealing methods between dissimilar materials allow for differential expansion and contraction. The following are caulked, gasketed, weather-stripped or otherwise sealed with an air barrier material, suitable film, or solid material:

- (a) All joints, seams and penetrations.
- (b) Site-built windows, doors, and skylights.
- (c) Openings between window and door assemblies and their respective jambs and framing.
- (d) Utility penetrations.
- (e) Dropped ceilings or chases adjacent to the thermal envelope.
- (f) Knee walls.
- (g) Walls and ceilings separating a garage from conditioned spaces.
- (h) Behind tubs and showers on exterior walls.
- (i) Common walls between dwelling units.
- (j) Attic access openings.
- (k) Rim joist junction.
- (l) Other sources of infiltration.

*Air sealing or flashing is required when the building is conditioned if there are seams, joints or gaps between building components and needs to be verified by review of architectural plan and geotagged photo(s) if these seams, joints or gaps will be covered and cannot be verified at final. Some building types, such as poured concrete and CMU walls, do not face issues with air-tightness, and therefore verification can be waived – however, the Verifier must obtain detailed architectural drawings regarding the roof-to-wall intersection for their review and approval for NGBS compliance – these drawings will be subject to NGBS Green audit. Air-tightness verification when necessary for other construction types can be handled remotely.*

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**701.4.3.2 Air sealing and insulation.** Grade II and III insulation installation is not permitted. Building envelope air tightness and insulation installation is verified to be in accordance with Section 701.4.3.2(1) and 701.4.3.2(2).

- (1) **Testing.** Building envelope tightness is tested. Testing is conducted in accordance with ASTM E-779 using a blower door at a test pressure of 1.04 psf (50 Pa). Testing is conducted after rough-in and after installation of penetrations of the building envelope, including penetrations for utilities, plumbing, electrical, ventilation, and combustion appliances. Testing is conducted under the following conditions:
- Exterior windows and doors, fireplace and stove doors are closed, but not sealed;
  - Dampers are closed, but not sealed, including exhaust, intake, make-up air, backdraft and flue dampers;
  - Interior doors are open;
  - Exterior openings for continuous ventilation systems and heat recovery ventilators are closed and sealed;
  - Heating and cooling systems are turned off;
  - HVAC duct terminations are not sealed; and
  - Supply and return registers are not sealed.

*N/A if building not conditioned. Otherwise verify at final.*

**Multifamily Building Note:** *Testing by dwelling units, groups of dwelling units, or the building as a whole is acceptable.*

- (2) **Visual inspection.** The air barrier and insulation items listed in [Table 701.4.3.2\(2\)](#) are field verified by visual inspection. *(Table not provided here; please see 2015 NGBS)*

*N/A if no cavity insulation is installed. Otherwise verify before covering.*

**701.4.3.2.1** Grade I insulation installations are in accordance with the following:

- Grading applies to field-installed insulation products.
- Grading applies to ceilings, walls, floors, band joists, rim joists, conditioned attics basements and crawlspaces, except as specifically noted.
- Inspection is conducted before insulation is covered.
- Air-permeable insulation is enclosed on all six sides and is in substantial contact with the sheathing material on one or more sides (interior or exterior) of the cavity. Air permeable insulation in ceilings is not required to be enclosed when the insulation is installed in substantial contact with the surfaces it is intended to insulate.
- Cavity insulation uniformly fills each cavity side-to-side and top-to-bottom, without substantial gaps or voids around obstructions (such as blocking or bridging).
- Cavity insulation compression or incomplete fill amounts to 2 percent or less, presuming the compressed or incomplete areas are a minimum of 70 percent of the intended fill thickness; occasional small gaps are acceptable.
- Exterior rigid insulation has substantial contact with the structural framing members or sheathing materials and is tightly fitted at joints.
- Cavity insulation is split, installed, and/or fitted tightly around wiring and other services.
- Exterior sheathing is not visible from the interior through gaps in the cavity insulation.
- Faced batt insulation is permitted to have side-stapled tabs, provided the tabs are stapled neatly with no buckling, and provided the batt is compressed only at the edges of each cavity, to the depth of the tab itself.
- Where properly installed, ICFs, SIPs, and other wall systems that provide integral insulation are deemed in compliance with the Grade 1 insulation installation requirements.

*N/A when no insulation is installed behind drywall. Otherwise visual inspection must demonstrate that it is Grade 1 as defined above. Other Grade I definitions should NOT be used. Inspection can be done vis remote protocol. Sampling is NOT permitted for on-site or remote inspections unless the Verifier is Accredited as a Master. Projects must comply with Table 701.4.3.2(2) insulation installation requirements that specifically defines what is considered a Grade I insulation installation – not any other organization, technical resource, or grading rubric. Multifamily buildings following 701.4.3.3 Multifamily Air Leakage Alternative must be in conformance with Table 701.4.3.2(2) for insulation installation even if they are not testing for air leakage.*

## GREEN BUILDING PRACTICES

**701.4.3.3 Multifamily air leakage alternative.** Multifamily buildings four or more stories in height and in compliance with IECC section C402.5 (Air leakage-thermal envelope) are deemed to comply with Sections 701.4.3.1 and 701.4.3.2.

*N/A for unconditioned buildings or unconditioned spaces within building with partial conditioning.*

**701.4.3.4 Fenestration air leakage.** Windows, skylights and sliding glass doors have an air infiltration rate of no more than 0.3 cfm per square foot (1.5 L/s/m<sup>2</sup>), and swinging doors no more than 0.5 cfm per square foot (2.6 L/s/m<sup>2</sup>), when tested in accordance with NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited, independent laboratory and listed and labeled. This practice does not apply to site-built windows, skylights, and doors.

*Verify by manufacturer's label or literature. N/A for unconditioned buildings or unconditioned spaces within building with partial conditioning.*

**701.4.3.5 Recessed lighting.** Recessed luminaires installed in the building thermal envelope are sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires are IC-rated and labeled as meeting ASTM E283 when tested at 1.57 psf (75 Pa) pressure differential with no more than 2.0 cfm (0.944 L/s) of air movement from the conditioned space to the ceiling cavity. All recessed luminaires are sealed with a gasket or caulk between the housing and the interior of the wall or ceiling covering.

*Verify by documentation review. When no recessed lights penetrate the thermal envelop indicate so in the verification report. This practice can be verified at final.*

**701.4.4 High-efficacy lighting.** Lighting efficacy in dwelling units is in accordance with one of the following:

- (1) A minimum of 75 percent of the total hard-wired lighting fixtures or the bulbs in those fixtures qualify as high efficacy or equivalent
- (2) Lighting power density, measured in watts/square foot, is 1.1 or less.

*Verify by inspection at final.*

**701.4.5 Boiler supply piping.** Boiler supply piping in unconditioned space is insulated.

*N/A when no boiler.*

## 703 PRESCRIPTIVE PATH

### 703.1 Mandatory practices

**703.1.1 UA Compliance.** The building thermal envelope is in compliance with Section 703.1.1.1 or 703.1.1.2.

**Exception:** Section 703.1.1 is not required for Tropical Climate Zone.

**703.1.1.1 Maximum UA.** For IECC residential, the total building UA is less than or equal to the total maximum UA as computed by 2015 IECC Section R402.1.5. For IECC commercial, the total UA is less than or equal to the sum of the UA for 2015 IECC Tables C402.1.4 and C402.4, including the U-factor times the area and C-factor or F-factor times the perimeter. The total UA proposed and baseline calculations are documented. REScheck or COMcheck is deemed to provide UA calculation documentation.

**703.1.1.2 Prescriptive R-values and fenestration requirements.** The building thermal envelope is in accordance with the insulation and fenestration requirements of 2015 IECC Table R402.1.1 or Tables C402.1.3 and C402.4. The SHGC is in accordance with the 2015 IECC requirements.

**703.1.2 Building Envelope Leakage.** The building thermal envelope is in accordance with 2015 IECC R402.4.1.2 or C402.5 as applicable.

**Exception:** Section 703.1.2 is not required for Tropical Climate Zone.

*Not required for Tropical Zone.*

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**703.1.3 Duct Testing.** The duct system is in accordance with 2015 IECC R403.3.2 through R403.3.5 as applicable.

*N/A when no ducts. If duct work is installed, then sampling per NGBS Green Protocol allowed. Testing must be conducted by qualified professional. Where a “qualified professional” is required the work must be provided by a licensed or trained person with expertise in the referenced field and who provides that service professionally, such as a HERS Rater or qualified mechanical contractor.*

**703.2.5.1** NFRC-certified (or equivalent) U-factor and SHGC of windows, exterior doors, skylights, and tubular daylighting devices (TDDs) on an area-weighted average basis do not exceed the values in Table 703.2.5.1. Area weighted averages are calculated separately for the categories of 1) windows and exterior doors and 2) skylights and tubular daylighting devices (TDDs). Decorative fenestration elements with a combined total maximum area of 15 square feet (1.39 m<sup>2</sup>) or 10 percent of the total glazing area, whichever is less, are not required to comply with this practice.

## SECTION 8: WATER EFFICIENCY

### 801 INDOOR AND OUTDOOR WATER USE

**801.5 Water closets and urinals.** Water closets and urinals are in accordance with the following:

*[Points awarded for 801.5(2) or 801.5(3), not both.]*

(1) Gold and emerald levels: All water closets and urinals are in accordance with Section 801.5.

*Manufacturer’s specifications or literature. Verify at final.*

**801.6.3** Where an irrigation system is installed, an irrigation plan and implementation are executed by a qualified professional certified by a WaterSense labeled program or equivalent program as approved by Adopting Entity.

*Waived for lack of qualified Water Sense professionals and per 2020 NGBS revision that made this voluntary for points, not mandatory.*

## SECTION 9: INDOOR ENVIRONMENTAL QUALITY

### 901 POLLUTANT SOURCE CONTROL

**901.1.4** Gas-fired fireplaces and direct heating equipment is listed and is installed in accordance with the NFPA 54, ICC IFGC, or the applicable local gas appliance installation code. Gas-fired fireplaces within dwelling units and direct heating equipment are vented to the outdoors.

*N/A when no fireplaces*

**901.3 Garages.** Garages are in accordance with the following:

- (1) Attached garage
  - (a) Doors installed in the common wall between the attached garage and conditioned space are tightly sealed and gasketed.
  - (b) A continuous air barrier is provided separating the garage space from the conditioned living spaces.

*N/A for homes without conditioned space. If garage abuts a conditioned space (such as a bedroom with air conditioning) this practice must be met.*

**901.4 Wood materials.** A minimum of 85 percent of material within a product group (i.e., wood structural panels, countertops, composite trim/doors, custom woodwork, and/or component closet shelving) is manufactured in accordance with the following:

- (1) Structural plywood used for floor, wall, and/or roof sheathing is compliant with DOC PS 1 and/or DOC PS 2. OSB used for floor, wall, and/or roof sheathing is compliant with DOC PS 2. The panels are made with moisture-resistant adhesives. The trademark indicates these adhesives as follows: Exposure 1 or Exterior for plywood, and Exposure 1 for OSB.

*Applicable only for any wood products. Verify that marking on the products show compliance with the appropriate criteria. Approve points for each product group when at least 85% of the product for the group meets the requirement. Product groups available for these practices include countertops, trim, woodwork, and shelving.*

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**901.12 Carbon monoxide (CO) alarms.** A carbon monoxide (CO) alarm is provided in accordance with the IRC Section R315.

*N/A when no combustion equipment in the home/building. If garage abuts a conditioned space (such as a bedroom with air conditioning) this practice must be met.*

### 902 POLLUTANT CONTROL

**902.1.1** Spot ventilation is in accordance with the following:

- (1) Bathrooms are vented to the outdoors. The minimum ventilation rate is 50 cfm (23.6 L/s) for intermittent operation or 20 cfm (9.4 L/s) for continuous operation in bathrooms.

*[Points are awarded only if a window complying with IRC Section R303.3 is provided in addition to mechanical ventilation.]*

*This is **MANDATORY** even if there is an operable window in the bathroom – verify at final.*

- (2) Clothes dryers (except listed and labeled condensing ductless dryers) are vented to the outdoors.

*Verify at final.*

### 902.2 Building ventilation systems

**902.2.1** One of the following whole building ventilation systems is implemented and is in accordance with the specifications of Appendix B and an explanation of the operation and importance of the ventilation system is included in either 1001.1 or 1002.2.

*[\* Mandatory where the maximum air infiltration rate is less than 5.0 ACH50]*

- (1) exhaust or supply fan(s) ready for continuous operation and with appropriately labeled controls
- (2) balanced exhaust and supply fans with supply intakes located in accordance with the manufacturer's guidelines so as to not introduce polluted air back into the building
- (3) heat-recovery ventilator
- (4) energy-recovery ventilator

*If no air-tightness testing and the max air infiltration rate is unknown, this practice is N/A.*

**902.3 Radon control.** Radon control measures are in accordance with ICC IRC Appendix F. Zones as defined in Figure 9(1).

- (1) Buildings located in Zone 1
  - (a) a passive radon system is installed
  - (b) an active radon system is installed

*EPA has not mapped Radon Zones for PR. As a result, this practice is waived. When EPA completes the mapping process this will become **MANDATORY** for Zone 1.*

**902.6 Living space contaminants.** The living space is sealed in accordance with Section 701.4.3.1 to prevent unwanted contaminants.

## GREEN BUILDING PRACTICES

### SECTION 10: OPERATION, MAINTENANCE, AND BUILDING OWNER EDUCATION

#### 1001 HOMEOWNER'S MANUAL AND TRAINING GUIDELINES FOR ONE- AND TWO-FAMILY DWELLINGS

**1001.0 Intent.** Information on the building's use, maintenance, and green components is provided.

**1001.1 Homeowner's manual.** A homeowner's manual is provided and stored in a permanent location in the dwelling that includes the following, as available and applicable. *[Points awarded per two items. Points awarded for non-mandatory items.]*

- (1) A National Green Building Standard certificate with a web link and completion document.
- (2) List of green building features (can include the national green building checklist).
- (3) Product manufacturer's manuals or product data sheet for installed major equipment, fixtures, and appliances. If product data sheet is in the building owners' manual, manufacturer's manual may be attached to the appliance in lieu of inclusion in the building owners' manual.

*Verifier should review homeowner's manual that addresses the required 3 items and any of the listed additional optional items. A placeholder for the green certificate in the manual is acceptable for (1); the builder should insert the certificate when it is received from Home Innovation. A digital owner's manual is acceptable.*

**1001.2 Training of initial homeowners.** Initial homeowners are familiarized with the role of occupants in achieving green goals. Training is provided to the responsible party(ies) regarding equipment operation and maintenance, control systems, and occupant actions that will improve the environmental performance of the building. These include:

- (1) HVAC filters.
- (2) Thermostat operation and programming.
- (3) Lighting controls.
- (4) Appliances operation.
- (5) Water heater settings and hot water use.
- (6) Fan controls.
- (7) Recycling and composting practices.

*Builder's documented procedures & standard practices explaining the occupant training process. Examples of training materials and written confirmation from similar projects that training has been done.*

#### 1002 CONSTRUCTION, OPERATION, AND MAINTENANCE MANUALS AND TRAINING FOR MULTIFAMILY BUILDINGS

**1002.0 Intent.** Manuals are provided to the responsible parties (owner, management, tenant, and/or maintenance team) regarding the construction, operation, and maintenance of the building. Paper or digital format manuals are to include information regarding those aspects of the building's construction, maintenance, and operation that are within the area of responsibilities of the respective recipient. One or more responsible parties are to receive a copy of all documentation for archival purposes.

**1002.1 Building construction manual.** A building construction manual, including five or more of the *listed items (see 2015 NGBS)*, is compiled and distributed in accordance with Section 1002.0. *[Points awarded per two items. Points awarded for non-mandatory items.]*

- (1) A narrative detailing the importance of constructing a green building, including a list of green building attributes included in the building. This narrative is included in all responsible parties' manuals.
- (2) A local green building program certificate as well as a copy of the *National Green Building Standard™*, as adopted by the Adopting Entity, and the individual measures achieved by the building.
- (3) Warranty, operation, and maintenance instructions for all equipment, fixtures, appliances, and finishes.

*Verifier must review building construction manual that addresses 3 mandatory items (certificate placeholder is fine) plus at least 2 of the listed additional optional items. Verify expected process to deliver manual(s) to the responsible party.*

## GREEN BUILDING PRACTICES

**1002.2 Operations manual.** Operations manuals are created and distributed to the responsible parties in accordance with Section 1002.0. Between all of the operation manuals, five or more of the *listed items (see 2015 NGBS)* are included. *[Points awarded per two items. Points awarded for non-mandatory items.]*

- (1) A narrative detailing the importance of operating and living in a green building. This narrative is included in all responsible parties' manuals.
- (2) A list of practices to conserve water and energy (e.g., turning off lights when not in use, switching the rotation of ceiling fans in changing seasons, purchasing ENERGY STAR appliances and electronics).

*Review the operations manual that includes both mandatory items and at least 2 from the list of optional items.*

**1002.3 Maintenance manual.** Maintenance manuals are created and distributed to the responsible parties in accordance with Section 1002.0. Between all of the maintenance manuals, five or more of *listed items (see 2015 NGBS)* are included. *[Points awarded per two items. Points awarded for non-mandatory items.]*

- (1) A narrative detailing the importance of maintaining a green building. This narrative is included in all responsible parties' manuals.

*Review the maintenance manual that addresses the mandatory item and at least 4 of the optional items.*

**1002.4 Training of building owners.** Building owners are familiarized with the role of occupants in achieving green goals. On-site training is provided to the responsible party(ies) regarding equipment operation and maintenance, control systems, and occupant actions that will improve the environmental performance of the building. These include:

- (1) HVAC filters
- (2) thermostat operation and programming
- (3) lighting controls
- (4) appliances operation
- (5) water heater settings and hot water use
- (6) fan controls
- (7) recycling and composting practices

*Builder's documented procedures & standard practices explaining the occupant training process. Examples of training materials and written confirmation from similar projects that training has actually been done.*