

BUILDING COMMISSIONING COMPARISON: NGBS Green vs. LEED Requirements



COMMISSIONING OVERVIEW

Building commissioning is a quality-focused process designed to ensure the delivery of a new or existing building project. The process focuses on verifying and documenting that the key building systems are planned, designed, installed, tested, operated, and maintained to meet the owner's expectations.

For green certification of new buildings, post-construction commissioning of energy systems is typically required. However, a commissioning process may be focused on other building systems, including electrical systems, plumbing, and telecommunications. Commissioning can occur following construction of a new building or be conducted for existing buildings at regular intervals to ensure proper operation.¹

Local jurisdictions value commissioning as they have an interest in ensuring buildings meet local requirements. When green building certifications, such as NGBS Green (based on the ICC-700 National Green Building Standard) or Leadership in Energy and Environmental Design (LEED), are incentivized or required, the jurisdiction must ensure that buildings meet the requirements and performance levels of those programs.

NGBS GREEN VS. LEED COMMISSIONING REQUIREMENTS

It has come to the attention of Home Innovation Research Labs that some local agency staff incorrectly believe the NGBS does not include building commissioning requirements; they subsequently conclude the NGBS is a less useful tool for demonstrating that buildings meet their local energy efficiency or climate goals. This misunderstanding likely arises for two reasons: (1) the NGBS does not use the term "commissioning;" and (2) NGBS Green on-site verification and testing requirements may not be apparent to local jurisdiction decision makers. While the NGBS does not use the term "commissioning," many of the practices in the *Energy Efficiency and Operation, Maintenance, and Building Owner Education* practice areas meet the same intent as the LEED Building Commissioning and Enhanced Commissioning requirements. Most of these practices within the NGBS are mandatory and required for all projects seeking certification.

NGBS Green certification compliance criteria and verification requirements are not written into the NGBS standard. As an ANSI-approved standard, the NGBS only includes compliance criteria. In its role as an Adopting Entity,

Home Innovation Research Labs develops verification requirements separately; those are included in the *Verifier's Resource Guide (VRG)*, which is accessible to all accredited NGBS Green Verifiers.²

The NGBS requirement exceed those of LEED certification in the several areas:

- The NGBS requires on-site verification and maintenance/operations activities for all green building practices, not just those related to HVAC systems. As a result, the NGBS practices that address Enhanced Commissioning requirements are broader in scope than the LEED requirements.
- The NGBS Enhanced Commissioning practices address a longer timeframe than the requirements of the LEED Enhanced Commissioning credit. The LEED credit includes an option for building operations to be reviewed for a minimum of 10 months after project completion. The NGBS includes an optional practice that specifies two years of energy and water use verification post-occupancy.
- For LEED, commissioning is conducted by a "Commissioning Agent," who may be an employee of the owner company, independent consultant, or employee of the project's design or construction firm. For NGBS Green, verification must be conducted by an accredited NGBS Green Verifier. Home Innovation's NGBS Green Verifier Agreement and program policies strictly require independent third-party review to ensure no conflict of interest. Home Innovation does not allow a member of an owner company or anyone from the design or construction firms to perform on-site verification for a project on which they are providing design, construction, or other services.

This document identifies NGBS requirements that are comparable to LEED (both -H and -NC) Building Commissioning and Enhanced Commissioning requirements.

1. ASHRAE. *The Strategic Guide to Commissioning*. 2014. Accessed from: https://www.ashrae.org/File%20Library/Technical%20Resources/Bookstore/ENGLISH-ASHRAE_BPA-Brochure_FNL_6-24-14.pdf.

2. Visit the NGBS Green *Builder's Resource Guide* for verification information, including a description of the VRG. www.homeinnovation.com/BRG.

FUNDAMENTAL COMMISSIONING

The 2015 NGBS includes practices comparable to LEED-H and LEED-NC v4 fundamental commissioning requirements, but goes further in the areas of operations and maintenance, and professional accreditation.

Commissioning Practices: LEED for Homes & NGBS	
LEED for Homes and Midrise v4	2015 NGBS
<p>Commissioning is only required for mid-rise projects.</p> <p>Two options for compliance:</p> <p>OPTION 1 – Commissioning using ENERGY STAR Protocols Meet the ENERGY STAR Qualified Multifamily Highrise Buildings Testing & Verification (T&V) Protocols.</p> <p>OPTION 2 – Commissioning Using Prescriptive Path Meet the following:</p> <ol style="list-style-type: none"> 1. Reduced Heating and Cooling Distribution System Losses for in-unit HVAC — limit duct air leakage and test for compliance. 2. Fundamental Commissioning of Central HVAC Systems — meet the performance testing and ongoing maintenance requirements related to central commercial heating, cooling, water heating, and ventilation. Requirements include: <ul style="list-style-type: none"> • Development of a system test procedure • Verification of system test execution • Logging of issues and benefits throughout commissioning process • Documentation of all findings and recommendations throughout the process • Development of an operations and maintenance plan for efficient building operations 3. Construction Document Specifications include air sealing, air barrier, and compartmentalization details in construction and bid documents. 4. LEED for Homes Multifamily Midrise Thermal Enclosure Inspections Checklist — have a third-party qualified rater verify each item on the checklist, which is based on the ENERGY STAR for Homes version 3 (Rev. 02) thermal enclosure rater checklist, sections 2, 3, and 5. 	<p>701.1.4 Alternative Bronze and Silver Compliance projects seeking NGBS certification can meet the Energy Efficiency requirements by achieving ENERGY STAR certification.</p> <p><i>If a project is chosen to comply via this path, it would need to comply with all ENERGY STAR requirements, including those related to Testing and Verification. This practice meets the same intent as LEED’s Commissioning using ENERGY STAR Protocols.</i></p> <p>703.1.3 Duct Testing (Mandatory for projects complying via Prescriptive Path) — duct system is in accordance with 2015 IECC R403.3.2 through R403.3.5. The code provisions mandate duct leakage testing.</p> <p>703.4.4 Duct Testing (1-5 points) — the entire HVAC duct system, including air handlers and register boots, is tested by a third party for total leakage at a pressure differential of 0.1 inches w.g. (25 Pa) and maximum air leakage is equal to or less than 6 percent of the system design flow rate or 4 cubic feet per minute per 100 square feet of conditioned floor area.</p> <p><i>703.1.3 and 703.4.4 are comparable to LEED’s “Reduced Heating and Cooling Distribution System Losses for In-unit HVAC” requirement.</i></p> <p>705.6 Installation and Performance Verification (3 points) — third-party on-site inspection is conducted to verify compliance of ducts, building envelope, insulation, and windows/skylights/doors. All projects seeking NGBS Green certification automatically meet this practice, as Home Innovation requires on-site verification of all building features.</p> <p>1002.2 Operations Manual (Mandatory) — operations manuals are created and distributed to the responsible parties. Key elements: narrative detailing importance of operating and living in a green building; list of practices to conserve energy and water; information on methods of maintaining relative humidity; information on the building’s lighting and the importance of high-efficiency lighting options; and information on the operation of the building’s fresh air ventilation system.</p>

2015 NGBS (Continued)

1002.3 Maintenance Manual (Mandatory) —

maintenance manuals are created and distributed to the responsible parties. Key elements: maintenance checklists; list of local service providers; procedure for rental tenant occupancy turnover; and green cleaning plan.

705.6, 1002.2, and 1002.3 meet the same intent as LEED's "Fundamental Commissioning and Central HVAC Systems" requirement. However, the NGBS practices are more comprehensive than the LEED requirement, as they address other building systems beyond just HVAC.

701.4.3.2 Air Sealing and Insulation (Mandatory) —

building envelope tightness is tested; all air barrier and insulation items are visually inspected.

The NGBS includes rigorous mandatory requirements related to air sealing, air barrier, and compartmentalization. The items to be verified under 701.4.3.2 are the same items as those identified in LEED's "LEED for Homes Multifamily Midrise Thermal Enclosure Inspections Checklist." 701.4.3.2 meets the intent of LEED's "Construction Document Specifications" and "LEED for Homes Multifamily Midrise Thermal Enclosure Inspections Checklist."

While the NGBS specifies construction and verification requirements, it does not include requirements specifically related to construction and bid documents.

Commissioning Practices: LEED New Construction and NGBS

LEED-NC v4

Commissioning is included as an Energy & Atmosphere (EA) Prerequisite.

There are three components, all mandatory:

1. **Commissioning Process Scope** — complete commissioning process activities for mechanical, electrical, plumbing, and renewable energy systems and assemblies in accordance with the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Guideline 0-2205 and ASHRAE 1.1-2007 for HVAC&R Systems. Requirements include:
 - Development of owner’s project requirements
 - Development of basis of design
 - Review of construction documents and project design
 - Development and implementation of a commissioning plan
 - Incorporation of commissioning requirements into construction documents
 - Development of checklists
 - Development of a system test procedure
 - Verification of system test execution
 - Logging of issues and benefits throughout commissioning process
 - Preparation of a commissioning process report
 - Documentation of all findings and recommendations and direct reporting to owner
2. **Commissioning Authority** — commissioning authority must have experience on at least two building projects with similar scope; experience must extend from early design phase through at least 10 months of occupancy. Commissioning authority may be employee of owner, independent consultant, or a disinterested employee of the design or construction firm.
3. **Current Facilities Requirements and Operations and Maintenance Plan** — prepare and maintain current facilities requirements and operations and maintenance plan.

2015 NGBS

In its role as Adopting Entity, Home Innovation specifies verification and testing requirements for certification. Home Innovation requires all NGBS practices, including those related to building systems and renewable energy, must undergo on-site verification and/or testing by an NGBS Green Verifier. Verification notes are captured in the project’s NGBS Green Scoring Tool, which is submitted to Home Innovation for review.

By its nature, the NGBS and Home Innovation’s verification requirements provide equivalent benefit as LEED’s “Commissioning Process Scope” requirement.

Home Innovation’s NGBS Green Verifier Agreement and program policies ensure no conflict of interest; for that reason, they are significantly more stringent than LEED’s “Commissioning Authority” requirement. NGBS Green Verifiers must be independent and third-party representatives. Home Innovation does not allow members of the owner company or anyone from the design or construction firms to perform on-site verification for projects to which they are providing design and construction services.

1002.2 Operations Manual (Mandatory) — operations manuals are created and distributed to the responsible parties. Key elements: narrative detailing importance of operating and living in a green building; list of practices to conserve energy and water; information on methods of maintaining relative humidity; information on the building’s lighting and the importance of high-efficiency lighting options; and information on the operation of the building’s fresh air ventilation system.

1002.3 Maintenance Manual (Mandatory) — maintenance manuals are created and distributed to the responsible parties. Key elements: maintenance checklists; list of local service providers; procedure for rental tenant occupancy turnover; and green cleaning plan.

1002.2 and 1002.3 meet the same intent as LEED’s “Current Facilities Requirements and Operations and Maintenance Plan.” The NGBS also requires the development of a construction manual (1002.1) and delivery of training for building managers (1002.4). The combination of these practices means that NGBS goes further than LEED in the area of operations and maintenance.

ENHANCED COMMISSIONING

The 2015 NGBS version includes comparable practices as LEED-NC v4 enhanced commissioning requirements but are broader in scope and specify a longer timeframe for post-construction monitoring.

Note: LEED for Homes and Midrise does not include a section on Enhanced Commissioning.

Enhanced Commissioning Practices: LEED New Construction and NGBS	
LEED-NC v4	2015 NGBS
<p>Enhanced Commissioning is an optional EA credit for 2-6 points.</p> <p>Commissioning Authority — commissioning authority must have experience on at least two building projects with similar scope; experience must extend from early design phase through at least 10 months of occupancy. Commissioning authority may be employee of owner, independent consultant, or a disinterested subcontractor of the design team.</p> <p>OPTION 1, Path 1: Enhanced Commissioning (3 points) — complete commissioning process activities of mechanical, electrical, plumbing, and renewable energy systems and assemblies in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1--2007 for HVAC&R systems as they related to energy, water, indoor environmental quality, and durability.</p> <ul style="list-style-type: none"> • Review contractor submittals • Verify inclusion of systems manual requirements in construction documents • Verify inclusion of operator and occupant training requirements in construction documents • Verify system manual updates and delivery • Verify operator and occupant training delivery and effectiveness • Verify seasonal testing • Review building operations 10 months after substantial completion • Develop an ongoing commissioning plan <p>OPTION 1, Path 2: Enhanced and Monitoring-Based Commissioning (4 points) — Develop monitoring-based procedures and identify points to be measured and evaluated to assess performance of energy-and water-consuming systems. Include the procedures and measurement points in the commissioning plan. Address the following:</p> <ul style="list-style-type: none"> • Roles and responsibilities • Measurement requirements (meters, points, metering systems, data access) 	<p>For NGBS Green Certification, on-site verification is performed by independent third-party NGBS Green Verifiers. Verification is performed for all green building practices; documentation review is not accepted.</p> <p><i>Home Innovation’s NGBS Green Verifier Agreement and program policies ensure no conflict of interest; for that reason, they are significantly more stringent than LEED’s “Commissioning Authority” requirement. NGBS Green Verifiers must be Independent and third-party representatives. Home Innovation does not allow members of the owner company or anyone from the design or construction firms to perform on-site verification for projects to which they are providing design and construction services.</i></p> <p>705.5.1 HVAC Design and Installation (1 point) — HVAC contractor and service technician are certified by a nationally or regionally recognized program.</p> <p>705.5.2 HVAC Design and Installation (3 points) —performance of heating and/or cooling systems is verified by the HVAC contractor.</p> <p>705.6.1 Installation and Performance Verification (3 points) — third-party on-site inspection is conducted to verify ducts, air-sealing, insulation, window and door flashing, caulking, and sealing.</p> <p>705.6.2.1 Air Leaking Validation of Building or Dwelling Units (8 points available where testing is not required by 2015 IECC) — visual inspection and air leakage testing are performed.</p> <p>705.6.2.2 (5 points) — HVAC airflows are tested by a third party.</p> <p>705.6.2.3 HVAC Duct Leakage Testing (8 points available where testing is not required by IECC) — duct leakage testing is conducted by a third party.</p> <p>706.5 On-Site Renewable Energy System (2 points per kW, divided by number of dwelling units) — on-site renewable energy system(s) is installed and verified on-site.</p>

LEED-NC v4 (Continued)

- Points to be tracked, with frequency and duration for trend monitoring
- Limits of acceptable values for tracked points and metered values (where appropriate, predictive algorithms may be used to compare ideal values with actual values)
- Elements used to evaluate performance, including conflict between systems, out-of-sequence operation of systems components, and energy and water usage profiles
- Action plan for identifying and correcting operational errors and deficiencies
- Training to prevent errors
- Planning for repairs needed to maintain performance
- Frequency of analyses in the first year of occupancy (at least quarterly)

Update the systems manual with any modifications or new settings, and give the reason for any modifications from the original design.

OPTION 2: Envelope Commissioning (2 points) — Fulfill the requirements in EA Prerequisite Fundamental Commissioning and Verification as they apply to the building's thermal envelope in addition to mechanical and electrical systems and assemblies.

Complete the following commissioning process activities for the building's thermal envelope in accordance with ASHRAE Guideline 0-2005 and the National Institute of Building Sciences (NIBS) Guideline 3-2012, Exterior Enclosure Technical Requirements for the Commissioning Process, as they relate to energy, water, indoor environmental quality, and durability.

Commissioning authority must complete the following:

- Review contractor submittals
- Verify inclusion of systems manual requirements in construction documents
- Verify inclusion of operator and occupant training requirements in construction documents
- Verify systems manual updates and delivery
- Verify operator and occupant training delivery and effectiveness
- Verify seasonal testing
- Review building operations 10 months after substantial completion
- Develop an on-going commissioning plan

2015 NGBS (Continued)

For these practices (and all other NGBS practices pursued by the design team), third-party verification is required by an NGBS Green Verifier. Except for 705.6.1 (which requires on-site inspection), verification of these practices involve documentation review to ensure the credentials of those involved and that the appropriate testing was conducted. These energy efficiency practices meet the intent of LEED's "Option 1, Path 1 Enhanced Commissioning."

1002.1 Building Construction Manual (Mandatory) — a building construction manual is compiled and distributed.

1002.2 Operations Manual (Mandatory) — Operation manuals are created and distributed to the responsible parties.

1002.3 Maintenance Manual (Mandatory) — maintenance manuals are created and distributed to the responsible parties.

During verification, an NGBS Green Verifier would review manuals to ensure that all mandatory items and selected additional items are included. The verifier would also verify the expected process to deliver the manuals to the responsible parties.

1002.4 Training of Multifamily Building Owners (Mandatory) — on-site training is provided to the responsible party(ies) regarding equipment operation and maintenance, control systems, and occupant actions that will provide the environmental performance of the building.

During verification, an NGBS Green Verifier would need to review of the builder's documented procedures and standard practices that explain the occupant training process.

These operations and maintenance practices meet the intent of LEED's "Option 1, Path 2 Enhanced and Monitoring-Based Commissioning."

1004.1 Post-occupancy performance assessment — A verification system is provided in the building owner's manual that provides methods for demonstrating continued energy and water savings that are determined from the building's initial year of occupancy of water and energy consumption as compared to annualized consumption at least every four years. Two options:

2015 NGBS (Continued)

(1) Verification plan is developed to monitor post-occupancy energy and water use and is provided in the building owner's manual.

(2) Verification system is installed in the building to monitor post-occupancy energy and water use.

During verification, the NGBS Green Verifier would either: (1) review the building owner's manual to ensure that it includes an appropriate verification method; or (2) verify by inspection that the system is installed.

All NGBS practices, including those related to mechanical and electrical systems, water, indoor environmental quality, and durability are subject to onsite inspection and/or documentation review by an NGBS Green Verifier. Appropriate documentation about building systems, maintenance, and ongoing verification for these components is included within the construction, maintenance, and operations manuals, as well as the building owner training.

NGBS 1004.1 is similar in nature to LEED's "Option 2 Envelope Commissioning." The LEED requirement specifies ongoing commissioning for a minimum of 10 months following construction. The NGBS practice awards points for two years of post-occupancy energy and water monitoring.

The NGBS specifies that post-occupancy verification method and plan is captured within the building owners' manual, not the commissioning plan or systems manual. This distinction, however, has limited impact on the overall performance of the building. Regardless of the specific document, the verification method and plan are being documented and communicated to the appropriate party(ies).