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# A Comparative Overview of the ICC/ASHRAE 700 2015 National Green Building Standard & LEED v4 BD+C: New Construction

This document is intended to provide a comparative overview of the features, elements and key factors of two sustainability and green building rating systems: ICC/ASHRAE 700 2015 National Green Building Standard (NGBS), and the Leadership in Energy and Environmental Design Version 4 – New Construction (LEED NC). It discusses the similarities and differences of the two rating systems,

# NGBS & LEED NC Scopes

# **Building Types**

The standard was designed specifically for residential construction, development and renovation, while LEED NC is intended for use by both commercial office buildings and multifamily high rise residential buildings having eight stories or more. While commercial and multifamily buildings may share construction types and methods, the occupancy and use of the building is essential to its sustainability and overall functionality. The sole focus on design, construction and operation of residential buildings allows NGBS to be uniquely suited to residential occupancy.

# Project Types Eligible for NGBS Certification

Single family homes (new construction and remodels) Low rise multifamily High rise multifamily Residential areas of mixed use buildings Land developments (*not covered in this report*) Renovations of existing homes and multifamily buildings (*not covered in this report*) Renovations of functional areas (*not covered in this report*)

# Project Types Eligible for LEED NC Certification

High rise multifamily residential (9 stories or more) Major renovations of existing commercial and multifamily high rise Buildings that do not primarily serve K 12 educational, retail, data centers, warehouses and distribution centers, hospitality, or healthcare uses

# Categories of Green Practices

NGBS and LEED both have practices in five similar categories:

Water Efficiency Energy Efficiency Location and Site Development Material and Resource Efficiency Indoor Environmental Quality

The Standard has an additional category for "Building Operation, Maintenance, and Building Owner Education", emphasizing the importance of the end users' and occupants' education of and interaction with the building and building systems 1751/[[16]/115229950TD.0006Tc[cat)3.

for one additional points. This

# CertificationLevels

# ICC/ASHRAZ00 2015NGBSCertification Levels

Under the NGBS single family homes and multifamily buildings can attain one of four potential certification levels: Bronze, Silver, Gold, or Emerald. This is achieved by earning a minimum number of points at each certification level, as can be seen in Table 2 below. There are a total of 1,100 points available within the rating system. In addition to earned points, every building certified under the Standard must comply with all of the relevant mandatory provisions.

The Standardwasspecifically designeds othat a project team must take a balanced and multifaceted approach to green building. Therefore, the Standard equires that a project achievea minimum number of points in each green practice category to be certified, as well as earn a minimum number of additional points from any category it chooses. This prevents project teams from obtaining all of its points by focusing on a handful of categories and ignoring other categories due to difficulty. This requirement ensures that the NGBS s a rigorous green rating system in respect to achieving certification.

A building'shighestrating dependsupon the lowest thresholdmet by any of the six categories For example, if a project missed the threshold for Emeraldin one category by a singlepoint, it will still only achieve Goldcertification even if it reached the required number of points for Emerald certification in all other categories.

Furthermore, for dwellingunits greater than 4,000squarefeet, the number of total points required to receive certification levels increases by one point for every additional 100 squarefeet. This makes it more challenging for larger dwellings to receive the same certification as smaller dwellings to account for the larger environmental impact of larger dwelling spaces.

GroonBracticeCotogorian		Number of Mandatory	Minimum PointsRequiredPer RatingLevel <sup>(1)(2)</sup>			
Gre	chir racillocoalegones	Practices	BRONZ	SILVER	GOLD	EMERAL
1.	Lot Design, Preparation and Development	0	50	64	93	121
2.	ResourceEfficiency	11	43	59	89	119
3.	EnergyEfficiency	13	30	45	60	70
4.	WaterEfficiency	2	25	39	67	

# Table:2 NGBSThresholdPoint Ratingsfor Certification

PeforentalesailablePoints

611

LEED NC Certification Levels

# **Example Project Comparisons**

In the sections below, four example projects are provided to demonstrate the various pathways of achieving certification through the two rating systems. Two of the example projects have met the requirements to successfully achieve LEED NC Silver, and the other two have achieved NGBS Silver. In all four cases, Silver Certification is the second highest rating a project can achieve, above the basic level of "certified" in the case of LEED and "bronze" in the case of the NGBS.

# Project A - NGBS Silver

Table 4 below provides an example of a project achieving NGBS Silver certification by achieving all of the points required within each category at the Silver level, as well as the total additional points required from any category of the team's choice. The mean achieved only the minimum points required, but did so in all categories and therefore are awarded Silver. Figure 1 shows the percentage of points achieved in each category compared to the total points achieved.

Table 4: Example 'Project A' Achieving NGBS 2015 Silver

### Project 'B' - 'LEED 'Silver'

While a minimum number of total points are required for each certification tier, LEED NC does not require minimum point thresholds to be achieved in each green building category. Project teams can obtain certification by achieving points in any of the nine available categories, as observed in Table 5 below. The project team earned LEED NC Silver Certification without earning points within the Energy & Atmosphere category. In this example, the project team deemed the already above code mandatory requirements of the category sufficient to the needs of the project. These mandatory practices will be reviewed in greater detail in later sections of the report.

Gree	n Building Categories	Points <sup>:</sup> Achieved	Points Required for Silver
1.	Integrative Process	1	N/A
2.	Location & Transportation	16	N/A
3.	Sustainable Sites	8	N/A
4.	Water Efficiency	9	N/A
5.	Energy & Atmosphere	0	N/A
6.	Materials & Resources	4	N/A
7.	Indoor Environmental Quality	6	N/A
8.	Regional Priority	2	N/A
9.	Innovation	4	N/A
	Total Points	50	50

Table 5: Example 'Project B' Achieving LEED NC Silver Certification



Figure 2: Distribution of Points Achieved for Example 'Project B' —

### Project C - NGBS Silver

In Example 'Project C' below, the project team earned enough total points within the NGBS required for Gold Certification, as well as earned more than enough minimum points in each category except for one, Water Efficiency. Even though the project exceeded the minimum number of points required in multiple sections, the fact that the project did not meet the 67 points in Water Efficiency required for Gold means the entire project can only achieve Silver Certification.

Greei	n Building Categories	Points <sup>:</sup> Achieved	Points Required for Gold
1.	Lot Design, Preparation, and Development	95	93
2.	Resource Efficiency	91	89
3.	Energy Efficiency	62	60
4.	Water Efficiency	66	67
5.	Indoor Environmental Quality	69	69
6.	Operation, Maintenance, and Building Owner Education	11	11
7.	Additional Points from Any Category	103	100
	Total Points :	497	489

### Table 6: Example 'Project D' Achieving NGBS Silver Certification

Figure 3: Distribution of Points Achieved for Example 'Project C'

# Project 'D' – 'LEED 'Silver'

In Example 'Project D' below, the project

# The Certification Process

# ICC/ASHRAE 700 2015 NGBS

Conformance with the NGBS is verified through construction documents, plans, specifications, inspection reports, and other data that demonstrates conformance with the points being pursued. All NGBS project teams must include a NGBS Green Verifier, who serves as an independent, in field representatives of the NGBS Green certification system. Verifiers work with project teams to perform the rough and final construction inspections described below. To achieve certification, these inspection reports, along with relevant information regarding pursued practices, are provided to Home Innovation Labs for technical review and verification.

Every project is subject to two independent, mandatory, third party verification inspections. The accredited Verifier is responsible for the visual inspection of every green building practice in the building. The verifier must perform a rough inspection before the drywall is installed in order to observe the wall cavities in every apartment, and a final inspection of every apartment once the project is complete. The required verification imbues a high level of rigor, continuity, and quality assurance to the system and to the projects that are certified.

### Home Innovation Research Labs

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Home Innovation Research Labs is a 53 year old, internationally recognized, accredited product testing and certification laboratory located in Upper Marlboro, Maryland. Their work is solely focused the reh

on the project team. The project team will need to hire a Commissioning Agent to complete commissioning practices described in later sections of this report.

In order to achieve certification, all relevant plans and information regarding pursued green practices are provided to the Green Business Certification Inc. (GBCI) for a third party technical review and verification. No visual inspections by the GBCI or independent third party are required for achieving LEED NC certification. Project teams can opt to have a single review, called a "Combined Design and Construction" review completed on their provided information. The GBCI will review all information at the same time, from design through construction. Alternatively, projects may opt to have "Split" reviews, wherein the GBCI will review the design practices and construction practices separately. Thto Derererererepr4(fro)7.2(m

# Legislative and Regulatory Inclusion

Both LEED and NGBS have been considered on par or more stringent than other green building rating systems for residential projects within a number of federal systems. The following systems and municipalities recognize both LEED and the NGBS:

HUD &



# **Green Practice Categories**

This section will provide an overview of the green practice categories featured in both LEED NC and the NGBS, including mandatory practices, minimum point requirements, and green practices featured within the category.

Location and Site Development

# ICC/ASHRAE 700 2015 NGBS Lot Design, Preparation and Development

The "Lot Design, Preparation, and Development" green practice category pertains to key site related green aspects, such as stormwater management, heat island reduction, high priority sites (brownfields, infills, etc.), green vehicles, and access to public transportation and bicycle facilities.

This category is more process oriented than the other NGBS categories, since environmentally sensitive strategies differ depending on locale, topography, climate, and other regional factors. Regardless, the Standard requires a minimum number of points from this category to be earned in order to receive any level of certification. See the chart below for the required number of points for this category.

### Mandatory Practices:

NGBS does not have any mandatory practices in this category.

# Minimum Point Requirements:

Table 8: Lot Design, Preparation, and Development Minimum Point Requirements

Green Building Categories

Minimum Points Required

# Minimum Point Requirements:

LEED does not require projects to obtain a minimum number of points per category.

# Analysis<sup>-</sup>

Green practices in the "Lot Design, Preparation, and Development" category of NGBS are similar to the "Location and Transportation" and "Sustainable Sites" categories of LEED NC. Both rating systems include many similar practices in these categories. One notable exception is the LEED practice "Light Pollution Reduction." NGBS 2015 does offer points for outdoor lighting techniques that take into consideration local wildlife.

LEED also requires a Construction Activity Pollution Plan to be implemented to comply with the Sustainable Sites category, regardless of project size or area of disturbance (See Figure 5 below). NGBS awards points for activities in accordance with a Storm Water Pollution Prevention Plan or other applicable construction plan. However, it does not require a plan to be made unless also required by the local jurisdiction based on area of project disturbance.

In these categories, NGBS has fewer mandatory practices but more overall available practices than LEED. To receive any NGBS certification, a minimum number of points must be obtained in the category. NGBS was designed to apply to a wide range of residential sites, from the rural single family home, to a neo traditional neighborhood townhouse, to the higm2240TD. The townhouse, to the higm2240TD. The townhouse is the higm2240TD



		ICC/ASHRAE 700-2015 NGBS	Points Possible		LEEDv4-NC	Points Possible
	505.6 / 706.8	Electric Vehicle Charging Stations Plug-in electric vehicle charging capability (Level 2) is provided for 1% or more of parking stalls. Sta are equipped with either Level 2 charging AC grounded outlets or Level 2 charging stations.	4	& Transportation	Green Vehicles Designate 5% of all parking spaces used by the project as preferred parking for green vehicl -AND- Install electrical vehicle supply equipment (EVSE) in 2% of all parking spaces used by the pr -OR- Install liquid or gas alternative fuel fueling facilities or a battery switching station capable of refueling a number of vehicles per day equal to at least 2% of all parking spaces.	a o 1
on and Development	505.1	Driveways and Parking Reduction Impervious areas are minimized by one or more of the following: ! Off-street parking and driveways are shared (5 pts) ! For multifamily, parking does not exceed local minimums (5 pts) ! Structured parking is use or reduce footprint by 25% (4 pts), 50% (5 pts), or greater than 75% (6 ! Water permeable surfacing is used to reduce impervious driving and parking surfaces by 10% (1 25% (2 pts), and greater than 75% (3 pts)	16	Location	Reduced Parking Footprint Do not exceed the minimum local code requirements for parking capacity. -AND- Provide parking capacity that is a 20-40% below the base ratios recommended by the Parkin Consultants Council, depending on if the "Surrounding Density and Diverse Uses" credit or "Access to Quality Transit" is achieved.	1
Lot Design, Preparatic	504.3	Soil Erosion and Soil Implementation         Soil disturbance and erosion is minimized by using one or more of the following practices in accord with the SWPPP:         ! Sediment/erosion controls installed per SWPPP (5 pts)         ! Limits of clearing/grading staked out (5 pts)         ! No disturbance" zones created to protect veg. and sensitive areas (5 pts)         ! Topsoil stockpiled and stabilized for later use (5 pts)         ! Distribute weight of equipment to reduce soil compaction (4 pts)         ! Disturbed areas to be left unworked for 21 days are stabilized with 14 days (3 pts)         ! Soil is improved with organic amendments and mulch         ! Utilities are installed by alternative means, such as tunneling (5 pts)	38	Sustainable Sites	Construction Activity Pollution Prevention Create and implement an erosion and sedimentation control plan for all construction activitie conforming with the 2012 U.S. Environmental Protection Agency (EPA) Construction Genera Permit (CGP) or local more-stringent equivalent, regardless of size.	Mandatory
	503.1	On-site Existing Natural Resources ! A natural resource inventory is completed under the direction of a qualified professional (5 pts) ! A plan is implemented to conserve the elements identified by the natural resource inventory (6 pt	11		Site Assessment Complete and document a site survey or assessment that includes all items listed in LEED, including but not limited to topography, flood hazard areas, wetlands, solar exposure primary vegetation types, tree mapping, soils delineation, prime farmland, transportation infrastructur proximity or vulnerable populations, and adjacent physical activity opportunities.	1

		Points Possible		LEEDv4-NC	Points Possible
503.6	Wildlife Habitat           At least two of the following practices must be selected to earn this credit:           Plants and garden are selected that encourage wildlife, such as bird and butterfly gardens (3 pts)           Include a certified "backyard wildlife" program (3 pts)           The lot is designed in regard to wildlife corridors, fish and game parks, and preserved areas (3 pt           Utdoor lighting techniques are utilized with regard to wildlife (3 pts)           Tree and Venetation Preservation	12	-		
	Trees and vegetation are preserved by one ore more of the following: Fencing is installed to protect trees and other vegetation (3 pts) Trenching, significant changes of grade, and soil compaction in "tree save" areas are avoided (5   Damage to existing trees and vegetation is mitigated during construction (4 pts) Landscape Plan	12			
504.2	A landscaping plan is developed with one ore more of the following: ! A plan is implemented that protects, restores, or enhances natural vegetation for 12% (1 pt), 25% pts), 50% (3 pts), or 100% (4 pts) of the lot. ! Only non-invasive native or regionally appropriate plants selected to promote biodiversity. (7 pts) ! To improve pollinator habitat, 10% or more of planted area are non-invasive flowering and nectar producing plants. (3 pts)	14			
505.5	Community Gardens A portion of the site is established as a community garden, available to all occupants, to provide for food production.	3			
503.4	Complete one or more of the following: Implement a plan to maintain the natural site hydrology by preserving important permeable soils, natural drainage ways, and other water features. (7 pts) Design stormwater management system so that post-construction runoff rate, volume, and durative do not exceed pre-development (natural, stable) conditions. (10 pts) Use LID and Green Infrastructure to manage the 80th percentile (5 pts), 90th percentile, (8 pts), c percentile (10 pts) storm event. Permeable materials are used for less than 25% (5 pts), 25-50% (8 pts), or greater than 50% (10 surfaces.	37		Rainwater Management       Option 1.Use on-site LID and green infrastructure to manage rainfall from the 95th percentile pts) or 98th percentile (3 pts) storm event. If Zero lot line project in urban areas, only 85th percentile storm event required.         -OR-       Option 2Manage on site the annual increase in runoff volume from the natural land cover	

### Other NGBS 2015 Credits

### Other LEEDv4-NC Credits

		Points Possible		LEEDv4-NC	Points Possible
501.2(3	Walkability and Pedestrian Access Design walkways, street crossings, and entrances to promote pedestrian activity and are connect to existing sidewalks or areas of development.	5	Integrative Process	Integrative Process Perform a preliminary Òsimple boxÔ energy modeling analysis and water budget analysis be the completion of schematic design that explores how to reduce energy and water use in the building. Document how the analyses informed building and site design decisions in the projectŌs OP BOD.	1
503.1	Natural Resources (cont'd) Listed items are protected under direction of qualified professional. (4 pts) Listed items are protection provided to on-site supervisor. (4 pts) Tree pruning conducted by certified arborist. (3 pts) Vegetation maintenance in accordance with TCIA A300. (4 pts) Vortection plan of adjacent common areas implemented. (5 pts)	20	Sustainable Sites	Light Pollution Reduction Meet uplight and light trespass requirements, using either the backlight-uplight-glare (BUG) method or calculation method provided within LEED.	1
503.2					

### Materials & Resource Efficiency

# ICC/ASHRAE 700 2015 NGBS Resource Efficiency

The "Resource Efficiency" green practice category is focused on minimizing the environmental impact of buildings by incorporating environmentally efficient building systems and materials, and reducing waste generated both during construction and after occupation of the home. This includes products and systems with enhanced durability and reduced maintenance, as well as reused, recycled, regional, or salvaged materials.

### Mandatory Practices:

For dwelling units greater than 4,000 ft<sup>2</sup>, the number of overall project points required for certification shall be increased by 1 point for every additional 100 ft<sup>2</sup>.

A capillary break and vapor retarder must be installed at concrete slabs in accordance with ICC IRC or IBC codes referenced in the Standard.

Where required, exterior drain tile installed.

Crawlspaces:

- o Damp proof wall are provided below grade
- o 6 mil PE sheeting or Class I Vapor retarded installed Insulation in cavities is dry

Where required, water resistive barrier or drainage plane system installed behind exterior veneer/siding.

Flashing installed at all locations listed in Figure 6.

Tile backing materials installed under tiled surfaces in wet areas. Where required, an ice barrier is installed at roof eaves of pitched roofs.

All horizontal ledgers are sloped away to provide gravity drainage. Finished grades at all sides of a building provide a min of 6" of all within 10' of the building for proper drainage.

Minimum Point Requirements:

Croop Puilding Catagorias	Minimum Points Required					
Green building categories	BRONZE	SILVER	GOLD	EMERALD		
Resource Efficiency	43	59	89	119		

Table 9: Resource Efficiency Minimum Point Requirements

### LEED NC Materials & Resources

The "Material & Resources" category of LEED NC focuses on the environmental performance of products and materials pertaining to green building, as well as diverting

material waste from landfills and incineration facilities. Practices in this category include building life cycle

		Points Possible	LEEDv4-NC	Points Possible
	Recycling and Composting			
607.1				

		ICC/ASHRAE 700-2015 NGBS	Points Possible		LEEDv4-NC	Points Possible
Manufacturer's Environmental Management System Concepts           Product manufacturer's operations and business practices include environmental           611.1         management system concepts, and the production facility is registered to ISO 14001.           point is awarded for every 1% of materials from ISO 14001 facilities based on total         10           construction cost.         Use at least 20 of	Building Product Disclosure and Optimization - Sourcing of Raw Materials Option 1. raw material source and extraction reporting Use at least 20 different permanently installed products from at least five different manufactu					
	606.2	Wood-based Products At least two major and/or minor components are made of certified wood or wood-based products, including Forest Stewardship Council (FSC) or Sustainable Forestry Initiative Program (SFI), among others.			that have publicly released a report from their raw material suppliers. (1 pt) -AND/OR- <u>Option 2. Leadership extraction pr</u> actices Use products that meet the LEED responsible extraction criteria for at least 25%, by cost, of	2
	606.3	Manufacturing Energy Materials manufactured using a minimum of 33% of manufacturing process energy fron renewable or combustible waste sources, or renewable energy credits. Two points are awarded per material.	6		value of permanently installed building products. (1 pt) <u>Note</u> -Products sourced (extracted, manufactured, purchased) within 100 miles of the project are valued at 200% of their base contributing cost.	
	609.1	Regional Materials See "Regional Materials" above	See Above			
esource Efficiency	610.1.2	Product and/or Building Assembly Life Cycle Assessment (LCA) Select products and/or building assemblies that have completed a LCA using the follow environmental impact measures: - Primary energy use - Global warming potential - Acidification potential - Eutrophication potential - Ozone depletion potential - Smog potential	10	lerials & Resources	Building Product Disclosure and Optimization - Materials Ingredients <u>Option 1. Material ingredient rep</u> orting Use at least 20 different permanently installed products from at least five different manufactu that use programs to demonstrate the chemical inventory of the product to at least 1000 ppm such as GreenScreen v1 2 or Crafte to Crafte v2 Basic Level among others (1 pt)	
Res	608.1	Resource-Efficient Materials Products containing fewer materials are used to achieve the same end-use requiremen conventional products, including but not limited to lighter, thinner brick, engineered woc or engineered steel products, roof or floor trusses. (3 pts per material)	9	Ma Na	-AND/OR- <u>Option 2. Material ingredient optimi</u> zation Use products that document their material ingredient optimization for at least 25%, by cost, o	
	601.2	Material Usage Structural systems are designed or construction techniques are implemented that reduc and optimize material usage, including choosing minimum structural member sizes in accordance with advanced framing techniques, selecting higher-grade or higher-streng materials and reducing sizes accordingly, and using performance-based structural desi optimize lateral force-resisting systems.	9		the total value of permanently installed products in the projects, such as GreenScreen v1.2 o Cradle to Cradle certification, among others (1 pt) -AND/OR- <u>Option 3. Product Manufacturer Supply Chain Opt</u> imization Use building products for at least 25%, by cost, of the total value of permanently installed products in the project that meet the criteria set out in LEED, including being sources from perventions with 2 depty using the criteria set out in LEED.	2
	603.2	Salvaged Materials Reclaimed and/or salvaged materials and component are used. One point is awarded every 1% of salvaged materials based on total construction cost	9		robust safety, health, hazard, and risk programs.	
-	604.1	Recycled Content Building materials with recycled content are used for two minor and/or two major components of the building. Point are based on the percentage of recycled content, wit minimum of 25%.	9		<u>Note</u> :Products sourced (extracted, manufactured, purchased) within 100 miles of the project are valued at 200% of their base contributing cost.	
	609.1	Regional Materials See "Regional Materials" above	See Above			



Other NGBS 2015 Resource Efficiency Credits

	ICC/ASHRAE 700-2015 NGBS				
	601.1	Conditioned Floor Area         Total finished floor area of a dwelling unit is limited to the following areas:         ! 700 sqft:       14 points         ! 1,000 sqft:       12 points         ! 1,500 sqft:       9 points         ! 12,500 sqft:       9 points         ! 12,500 sqft:       3 points         ! 12,500 sqft:       4 points         ! 14,000 sqft:       5 points         ! 14,000 sqft:       6 points         ! 14,000 sqft       5 points         ! 14,000 sqft       5 points         ! 14,000 sqft       5 points         ! 14,000 sqft	14 (Mandatory if over 4,000 sqft)		
Resource Efficiency	601.3	Building Dimensions and Layouts Building dimensions and layouts are designed to reduce material cuts and waste. This practice is used for a minimum of 80 percent of the following areas: 1 floor area (3 pts) 1 wall area (3 pts) 1 roof area (3 pts) 1 cladding or siding area (3 pts) 1 penetrations or trim area (1 pt)	13		
	601.4	Framing and Structural Plans Detailed framing or structural plans, material quantity lists and on-site cut lists for framir structural materials, and sheathing materials are provided.	4		
	601.5	Prefabricated Components Precut or preassembled components, or panelized or precast assemblies are utilized fo minimum of 90 percent for the following system or building: 1 floor system (4 pts) 1 wall system (4 pts) 1 roof system (4 pts) 1 modular construction for the entire building located above grade (13 pts) 1 manufactured home construction for the entire building located above grade (13 pts)	13		
	601.6	Stacked Stories Stories above grade are stacked, with support floors at least 1/2 the size of ground floo 7-foor ceiling. First stacked floor is worth 4 points, with 2 points for each additional floor points max.	8		
	601.7	Prefinished Materials Prefinished building materials or assemblies, such as trim, walls, floors, ceilings, and fenestrations, have no additional site-applied finishing material are installed.	12		
	601.8	Foundations The foundation system minimizes soil disturbance, excavation quantities, and material usage.	3		
	601.9	Above-Grade Wall Systems Above-grade wall systems provide the structural and thermal characteristics of mass w and are used for at least 75% of the gross exterior wall area of the building.	4		
	602.1.1	Capillary Breaks Mandatory: 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 a 1805.4.1. A capillary break between the footing and the foundation wall is provided to prevent moisture migration into foundation wall. (3 pts)	Mandatory + 3 Points		

Other NGBS 2015 Resource Efficiency Credits (cont'd)

Points Possible

4

602.1.2	Foundation Waterproofing Enhanced foundation waterproofing is installed using one or both of the following: ! rubberized coating ! drainage mat
602.1.3	Foundation Drainage I Mandatory:

Other NGBS 2015 Resource Efficiency Credits (cont'd)

		Points Possible
	Water-Resistive Barrier	
602.1.8	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. Flashing	Mandatory
	! Mandatory: 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	Mandatory
602.1.9	(h) drip edge is installed at eave and rake edges.	+
	! All window and door head and jamb flashing is either self-adhered flashing complying	
	with AAMA 711-13 or liquid applied flashing complying with AAMA 714-15 and installed	
	accordance with fenestration or flashing manufacturerOs installation instructions. (2 pts)	
	Pan flashing is installed at sills of all exterior windows and doors. (3 pts)	
	Seamless, preformed kickout flashing or prefabricated metal with soldered seams is provided at all roof-to-wall intersections. (3 pts)	
	! A rainscreen wall design is used for exterior wall assemblies. (4 pts)	
	! Through-wall flashing is installed at transitions between wall cladding materials or wa construction types. (2 pts)	
	! Flashing is installed at expansion joints in stucco walls. (2 pts)	

Energy Efficiency

# ICC/ASHRAE 700 2015 NGBS - Energy Efficiency

This green practice category of the NGBS is focused on design and construction practices that help increase the energy efficiency of a project while encouraging the use of renewable energies. There are multiple paths for a project to comply with this category, providing builders and project teams the flexibility to choose the best means of demonstrating an increased energy efficiency based on their local conditions and market. Regardless of the path selected, this category requires multiple mandatory practices to be implemented within the project to ensure a solid base of energy efficiency regardless of project type and location.

Table 10 below showfigeeCate detsigners of the construction of the

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One of the available compliance pathways from Table 10 above must be selected.

All installation of insulation must meet Grade 1 standards.

Building envelope tightness must be tested in accordance with ASTM E 779 using a blower door at 1.05 psf (50 Pa).

Building thermal envelope must be durably sealed to limit infiltration. All openings, penetrations, joints, seams, connections, common walls, and other sources of infiltration are caulked, gasketed, weather stripped, or otherwise

# LEED NC – Energy Efficiency

The "Energy Efficiency" category of LEED NC is also focused on design and construction practices that help increase the energy efficiency of a project while encouraging the use of renewable energies. To comply with this category, projects have the option of performing an energy model (Performance Path), using ANSI/ASHRAE/IESNA Standard 90.1–2010, Appendix G, with errata as the baseline building performance, or selecting the Prescriptive Path, using either the ASHRAE 50% Advanced Energy Design Guide or Advanced Buildings Core Performance Guide.

Beyond completing an energy model to verify building performance or completing required prescriptive practices, LEEDv4 NC also requires all buildings seeking certification to undergo fundamental commissioning and verification. This entails a Commissioning Agent verifying the development of the Basis of Design and Owner's Project Requirements, as well as completing standard commissioning tasks listed within the credit description. This helps ensure the design, construction and eventual operation of a project meets the owner's project requirements for energy, water, indoor environmental quality and durability.

# Mandatory Practices:

Select one of the following compliance paths:

- Performance Path: Demonstrate an improvement of 5% for new construction, 3% for major renovations, or 2% for core and shell projects in the proposed building performance rating compared with the baseline building performance rating per ANSI/ASHRAE/IESNA Standard 90.1–2010, Appendix G, with errata
- Comply with the mandatory and prescriptive provisions of ANSI/ASHRAE/IESNA Standard 90.1–2010, with errata, as well as the HVAC and service water heating requirements in Chapter 4, Design Strategies and Recommendations by Climate Zone, for the appropriate ASHRAE 50% Advanced Energy Design Guide and climate zone
- Comply with the mandatory and prescriptive provisions of ANSI/ASHRAE/IESNA Standard 90.1 2010, with errata, as well as Section 1: Design Process Strategies, Section 2: Core Performance Requirements, and the following three strategies from Section 3: Enhanced P r a P a t h : t h e 5 T J / T. 2 2 4 D . 0 0 1 5 T c (

energy consumption data and electrical demand data for a 5 year period.

Do not use or phase out existing chlorofluorocarbon (CFC) based refrigerants in new heating, ventilating, air conditioning, and refrigeration (HVAC&R) systems.

Minimum Point Requirements:

LEED does not require projects to obtain a minimum number of points per category.

# Analysis<sup>-</sup>

As observed in Figure 8 below, a number of energy efficiency practices are similar in the two green building rating systems. There are three LEEDv4 NC practices that do not have a similar NGBS practice available for comparison: Advanced Energy Metering, Fundamental Refrigerant Management, and Enhanced Refrigerant Management. Fundamental Refrigerant Management requires projects to not use or phase out existing chlorofluorocarbon (CFC) based refrigerants in new heating, ventilating, air conditioning, and refrigeration (HVAC&R) systems. CFCs have been phased out of production under the Montreal Protocol, which became effective in 1989. As such, the consensus committee of NGBS 2015 did not include this as a green practice category, as it is already required nationally.

LEED NC requires

Figure7b: TablesC.1and C.2from "National Costeffectiveness f ANSI/ASHRAE/ISS and ard 90.1 r 2013"

Based on the data provided by these research papers, the following graphic demonstrates the relative comparison of the various editions of the IECC and ASHRAE 90.1.

Figure 7c: Relative Comparison of Energy Efficiency for ASHRAE 90.1 and IECC Standards

# Reference for Figure 7c<sup>-</sup>

Hart, Athalye, Rosenberg, Loper, Halverson, & Richman. (2015). *National Cost effectiveness of ANSI/ASHRAE/IES Standard 90.1 2013*. Richland: Pacific Northwest National Laboratory.

Hedrick, R., Brook, M., Geiszler, E., Ashuckian, D., & Oglesby, R. (2013). *Emery Efficiency Comparison: California's Building Energy Efficiency Standards and ASHRAE/IESNA Standard 90.1 2010.* State of California Energy Commission.

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Points Possible	

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		ICC/ASHRAE 700-2015 NGBS	Points Possible		LEEDv4-NC	Points Possible
	701.1.1 & 702	Performance Path (IECC 2015) Demonstrate an improvement of 1% or more in the proposed building performance rating compared with the baseline building performance rating. Calculate the baseline building performance according to ICC IECC 2015.	30+	$\neg$	Ontimize Energy Performance	
	701.1.2 & 703	Prescriptive Path (ICC/ASHRAE 700-2015 & ICC IECC 2015) Comply with all mandatory requirements, as well as earn more than 30 points, within Section 7 of the ICC/ASHRAE 700-2015.	30+	-\\	Option 1: Whole-building Energy Simulation (18 pts) Demonstrate an improvement of 6% or more for new construction, 4% or more for major renovations, or 3% or more for core and shell projects in the proposed building performance rating compared with the baseline building performance rating. Calculate the baseline buildin performance according to ANSI/ASHRAE/IESNA Standard 90.1Đ2010, Appendix G, with erre	18
	701.1.3	EPA HERS Index Target Path The building must complete the EPA HERS Index Target Procedure with the final value less th HERS Index Target. Points are awarded per percent less than EnergyStar HERS Index Target,	30+	$\rightarrow$	-OR- Option 2: Prescriptive Path: ASHRAE Advanced Energy Design Guide (6 pts) Implement and document compliance with the applicable recommendations and standards in	
iergy Efficiency	701.1.4	ENERGY STAR Version 3.0 Certified Home A project that qualifies as an ENERGY STAR Version 3.0 Certified Home or ENERGY STAR N High Rise Version 1.0 Rev 03 can satisfy the Energy Efficiency categocarbanly achieve Bronze Certification. A project that qualifies as an ENERGY STAR Version 3.1 Certified Home or ENERGY STAR N High Rise Version 1.0 Rev 03 (with the baseline as AHSRAE 90.1-2010) can satisfy the Energ Efficiency category, buttan only achieve Silver Certification.	N/A	ergy Efficiency	Chapter 4, Design Strategies and Recommendations by Climate Zone, for the appropriate AS 50% Advanced Energy Design Guide and climate zone. <u>Note:</u> To be eligible for Option 2, projects must use Option 2 in "Minimum Energy Performanc	
Er	705.7 (2)	Energy Consumption Control Install a whole-building energy-monitoring device or system.	1	ш. —	Building-Level Energy Metering Install building-level energy meters, or submeters that can be aggregated to provide building- level data representing total building energy consumption. Commit to sharing with USGBC th resulting energy consumption data and electrical demand data for a 5-year period.	Mandatory
	706.9	Automatic Demand Response An automatic demand response system is installed that curtails energy usage upon a signal fro the utility or energy service provider.	1		Demand Response Case 1Participate in an existing demand response (DR) program (2 pts) -OR- -OR- Case 2Provide infrastructure to take advantage of future demand response programs or dynamic, real-time pricing programs. (1 pt)	2
	706.5	On-site Renewable Energy System An on-site renewable energy production system is installed. Two points are awarded based on produced, divided by the number of dwelling units.	2+		Renewable Energy Production Use renewable energy systems to offset building energy costs. Calculate the percentage of renewable energy produced (by cost) compared to total building annual energy cost.	3
	706.2	Renewable Energy Service Plan A renewable energy service plan is provided: - Builder's local administrative office has renewable energy service and also selects renewable energy service plan for interim electric service for project until occupant occupied (1 pt) - The homeowner selects a renewable energy service provider with minimum two-year commitment for 1-49% (1 pt) or 50%+ (2 pts) of projected energy use.	3		Green Power & Carbon Offsets Engage in a contract for qualified resources that have come online since January 1, 2005, for minimum of five years, to be delivered at least annually. The contract must specify the provis of at least 50% (1 pt) or 100% (2 pts) of the projectÖs energy from green power, carbon offse renewable energy certificates (RECs).	2

### Other NGBS 2015 Energy Efficiency Credits (cont'd)

	ICC/ASHRAE 700-2015 NGBS (Cont'd)						
		Return Ducts/Transfer Grilles					
	705.4	Return ducts or transfer grilles installed in every room with a door (except bathrooms, kitchens	2				
		closets, pantries, and laundry rooms)					
	705.6.3	Insulating Hot Water Pipes	1				
	100.0.0	Piping involved in hot water is insulated with a minimum thermal resistance of R-3					
	705.6.4	Potable Hot Water Demand Re-circulation System	2				
	703.0.4	A Potable Hot Water Demand Re-circulation System is installed	2				
	705.7	Submetering System					
		In a multifamily building, an advanced submetering system is installed to monitor energy	1				
cy		consumption for each unit. Information is available to occupants monthly.					
ien	706.3	Smart Appliances and Systems					
ffic		Smart appliances and systems are installed for at least three of the following: refrigerator, free	2				
Ϋ́Ε		dishwasher, clothes dryer, clothes washer, HAVC System, Service Hot Water Heating System					
erg	700.4	Pumps					
Ē		! Electronically controlled variable-speed pumps are installed.	<i>c</i>				
	706.4	! Sump pumps with electrically commutated motors or permanent split capacitor motors are	5				
		installed.					
	700.0	Parking Garage Efficiency	0				
	706.6	Structured Parking Garages are designed to require no mechanical ventilation for fresh air	2				
	706.7	Grid-Interactive Thermal Storage System					
		A grid-interactive electric thermal storage system is installed for water and/or space heating an	2				
		cooling					
	700.0	Electrical Vehicle Charging Station	0				
	706.8	A Level 2 or 3 electric vehicle charging station is installed on the building site.	2				

Equip cooling towers and evaporative condensers with makeup water meters, conductivity controllers and overflow alarms, efficient drift eliminators that reduce drift to maximum of 0.002% of recirculated water volume for counterflow towers and 0.005% of recirculated water flow for cross flow towers.

### Minimum Point Requirements:

LEED does not require projects to obtain a minimum number of points per category.

### Analysis<sup>-</sup>

Both LEED and the NGBS tackle indoor and outdoor water conservation. Indoors, LEED sets baseline flush and flow rates for fixtures, and then requires projects to reduce overall indoor consumption by 20% from those baselines by using low flow fixtures. Points are available for increased reductions or use of alternative water sources such as rainwater, leading r e c

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		Points Possible
801.1	Indoor Hot Water Usage See details above.	See above
801.2	Water-Conserving Appliances See details above.	See above
801.3	Showerheads See details above.	See above
801.4	Lavatory Faucets See details above.	See above
801.5	Water Closets and Urinals See details above.	See above
801.7.2	Rainwater Collection and Distribution See details above.	See above
802.1(1)	Reclaimed , Gray , or Recycled Water (Domestic) Water closet flushed by reclaimed, gray, or recycled water (5 pts each, 20 max) Irrigation Systems	20
801.6	Sprinkler nozzles have a max precipitation rate of 1.2 in/hr, tested by a third-pa laboratory. (6 pts)     Drip irrigation is installed in landscapes beds, turf, and zone specs show plant t and water need for each emitter. (13 pts max)     Mandatory: Irrigation plans must be executed by a qualified professional certific by WaterSense labeled program.     Either no irrigation (& corresponding landscape plan), irrigation. controller with rain sensor/soil moisture sensor installed, or irrigation. controller labeled by WaterSense installed. (15 pts max)     Irrigation zones use pressure regulation. (3 pts)	Mandatory + 26 pts

# LEED-NC Points Possible Outdoor Water Use Reduction Points

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### Other NGBS 2015 Water Efficiency Credits

			Points Possible
	801.8	$\frac{Sediment\ Filters}{Water\ filter\ installed\ to\ reduce\ sediment\ and\ protecting\ plumbing\ for\ entire\ buildir\ or\ dwelling\ unit(s)\ (1\ pt)$	1
	802.2	Reclaimed Water, Graywater, or Rainwater Pre-Piping These systems are rough-plumbed into building for future use (3 pts per system)	9
ency		Automatic Shutoff Water Device	
Efficie	802.3	One of the following installed: excess water flow automatic shutoff or leak detective system with automatic shutoff (2 pts)	2
Water E	802.4	Engineered Biological System or Intensive Bioremediation System One of these systems are installed and treated water is used on-site. (20 pts) Recirculating Humidifier	20
	802.5	Where humidifier required, a recirculating humidifier is used in lieu of flow through the (1 nt)	1
	802.6	Advanced Wastewater Treatment System Advanced wastewater (aerobic) treatment system installed and treated water use on-site. (20 pts)	20

### Other LEED Water Efficiency Credits

Water Efficiency

LEED-NC	Possible
Cooling Tower Water Use	
Conduct a one-time potable water analysis of cooling towers and evaporative condensers, in o	
to optimize cooling tower cycles. Limit cooling tower cycles to avoid exceeding maximum value	
any of following parameters.	
Ca (as CaCO3): 1000 ppm	
Total alkalinity: 1000 ppm	

### Indoor Environmental Quality

### ICC/ASHRAE 700 2015 NGBS – Indoor Environmental Quality

The "Indoor Environmental Quality" practice category is focused on providing clean air and a higher quality environment inside the home. This encompasses a multitude of interior components from floor to ceiling, including how fireplaces are installed and which types of paint are used. Ventilation is primary focus, with a number of mandatory ventilation requirement and points being available for strategies such as cross ventilation and MERV 14 filters.

### Mandatory Practices:

Bathrooms are vented to the outdoors. Clothes dryers (except listed and labeled condensing ductless dryers) are vented to the outdoors. Carbon Monoxide alarms are provided in accordance with the IRC Section R315. Gas fired fireplaces and direct heating equipment w4/TT14 h313/27720 applic ec(abij/15) 2j/Tfl.b2940

# LEED NC – Indoor Environmental Quality

The "Indoor Environmental Quality" practice

# Analysis<sup>•</sup>

Both systems have multiple mandatory and optional practices related to whole building, spot and combustion ventilation. LEED requires compliance with AHSRAE 62.1 2010, and sets several mandates for mechanically and naturally ventilated spaces, such as providing airflow measurement devices. Specifically for residential projects, LEED sets out the indoor air

# Figure 10: Indoor Environmental Quality Practices

	Points Possible		LEEDv4-NC	Points Possible
Non-Smoking Areas Multifamily projects only: 901.14 ! All interior common areas of a multifamily building are non-smoking, with signa pt) ! Exterior smoking areas of a multifamily building are located at least 25 feet from entries, outdoor air intakes, and operable windows (1 pt)	<sup>9</sup> 2	Environmental Tobacco Smoke Control		

# Figure 10: Indoor Environmental Quality Practices

	ICC/ASHRAE 700-2015 NGBS	Points Possible
901. ≩ 901.	Wood Materials           85% or more of material in a wood product group (wood structural panels, compos trim and doors, custom woodwork, etc.) meets the following:           1 Mandatory: Structural plywood (floors, walls, roof sheathing) is compliant DOC F and/or DOC PS 2. OSB meets DOC PS 2.           4 Particleboard and MDF is labeled CPA A208.1 and CPA A208.2. (2 pts)           1 Hardwood plywood meets HPVA HP-1. (2 pts)           2 Particleboard, MDF, or hardwood plywood meets CPA 4. (3 pts)           1 Composite Wood Air Toxic Contaminant Measure Standard. (4 pts)           1 No emitting products used. (4 pts) Cabinets           85% or more installed cabinets are:           5 Made of solid wood or non-formaldehyde emitting materials (5 pts)	Mandatory + 10 Points 5
901.	I Made of solid wood or non-tormaldenyae emitting materials (5 pts) I Composite wood meeting CARB Composite Wood Air Toxic Contaminant Measu Standard (3 pts) <u>Floor Materials</u> Materials have emission levels in accordance with CDPH/EHLB Standard Methd v The following prefinished hard surfacing comply if no coatings or surface applicatic are applied: Ceramic tile, mieral-based flooring, clay masonry flooring, concrete	5
901.	Mall Coverings     Wall Coverings     S5% of more wall coverings are in accordance with CDPH/EHLB Standard Methd v     Interior Architectural Coatings     S5% or more of architectural coatings meet one of the following:	4
901.	<ul> <li>9 ! Low VOC, no VOC, or GreenSeal GS-11. (6 pts) -OR- ! Emission levels in accordance with CDPH/EHLB Standard Method v1.1 (8pts) <u>Interior Adhesives and Sealants</u> 85% or more of interior adhesives and sealants meet one of the following:</li> </ul>	8
901.1	0 ! Emission are in accordance with CDPH/EHLB Standard Method v1.1 (8pts) ! GreenSeal GS-36 (5 pts) ! SCAQMD Rule 1168 (5 pts) Insulation	8
901.1	1 85% or more of wall, ceiling, and floor insulation materials are in accordance with emission levels of CDPH/EHLB Standard Method v1.1	4

Figure 10: Indoor Environmental Quality Practices



# ICC/ASHRAE 700 2015 NGBS - Operation, Maintenance, and Building Owner Education

The "Operation, Maintenance, and Building Owner Education" practice category is focused on providing information on the building's use, maintenance, and green components to all necessary parties. This includes mandatory operation and maintenance manual(s) and first hand training of

# Minimum Point Requirements:

Not applicable to this section.

# Analysis<sup>-</sup>

As stated above, LEED NC does not have a designated Operation, Maintenance, and Building Owner Education category. However, under the Energy Efficiency category, the commissioning agent is required to prepare a current facilities requirements and operations and maintenance plan.

NGBS requires a home owner manual for single family homes, or a series of operation and maintenance manuals for multifamily homes, to be provided to responsible parties. These manuals include mandatory information, such as appliance data sheets and lists of green features, but are also required to include a few additional practices from a provided list. Examples include information on opportunities to purchase renewable energy from local utilities, information on local and on site recycling and hazardous waste disposal programs and waste handling and disposal procedures, organic pest control, fertilizers, de icers, and cleaning products.

Onsite training of responsible parties is mandatory in NGBS, and must include at minimum the operation and maintenance and occupant actions for all of the following: HVAC filters, thermostat operation and programming, lighting controls, appliance operation, water heater settings and hot water use, fan controls, recycling and composting practices. This level of first hand training of building owners or managers is not required by LEED NC.

NGBS also awards points for providing public education about the green features of the project, such as construction signs demonstrating how the project is designed and built in accordance with the National Green Building Standard.

Providing a verification system plan also earns points within the NGBS. The verification system 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, and comparing it to annualized consumption at least every four years.

# Figure 11: Operation, Maintenance, and Building Owner Education Practices

Points Possible

Mandatory:

Building Construction Manual

! !

# Figure 11: Operation, Maintenance, and Building Owner Education Practices

Points Possible

Training of Single-Family Homeowners

# Figure 11: Operation, Maintenance, and Building Owner Education Practices

	ICC/ASHRAE 700-2015 NGBS	Points Possible
	Public Education	
	1	
	1	2
/ Efficiency	1	
Energy	Verification System_	
		4
	!	
	!	

# Conclusion

In review, both LEED NC and the National Green Building Standard are effective systems for the integration green building strategies buildings. LEED NC is primary focused on office, commercial, and high rise residential buildings, while the NGBS is solely focused on residential buildings spanning from single family to high rise and includes remodeling. The NGBS is not applicable to commercial and office buildings.

Both LEED NC and the NGBS require mandatory practices to be completed, and then offer a catalog of optional practices for a project to earn points. Both systems require a project to meet a minimum number of total points to earn tiered levels of certification. The NGBS is unique in that it also requires projects to earn a minimum number of points within each green building practice category as well. While it does not require a project to earn minimum points in each category, LEED NC has a greater percentage of mandatory prerequisites when compared to total available practices.

Both LEED and the NGBS focus on five main subject areas of sustainability within the residential industry: Water Efficiency, Energy Efficiency, Location and Site Development, Material and Resource Efficiency, and Indoor Environmental Quality. The NGBS added an additional category for Operation, Maintenance, and Building Owner Education, recognizing the importance of building owner and manager education to the long term sustainability of the project. Both systems encourage innovative strategies as well as understand impacts to design and construction based on region.

Within each green practice category, both rating systems contain a number of similar or identical design and construction practices, as well as several unique practices. In total, the NGBS has a greater number of individual practices which a project team can select from in order to earn points. While LEED NC has fewer options, the requirements for earning points are generally more multifaceted and stringent. This means a project completing an option with LEED NC could be equivalent to a project completing multiple NGBS options. Alternatively, with the NGBS, the team has more flexibility to choose applicable practices given their situation in lieu of the more all or nothing approach to LEED, finding multiple paths to earn the required number of points.

While LEED NC requires commissioning of building systems, the NGBS is unique that it requires third party on site verification of proper instaTc@00nTD@003¥j/TT21Tf35.00551.224TD(requires)Tjlat8TD

homes.

Per the Project Directory on the USGBC website, there are over 12,000 projects certified under the LEED NC program. There is no public data available about how many are specifically multifamily high rise projects.