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Green Building Certification System Review

N Wang
KM Fowler
RS Sullivan

March 2012

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The following certification system owners responded to the request for additional information regarding their systems:

- Sarah Alexander, US Green Building Council
- Eden Brukman, Living Building Challenge
- Melissa Gallagher-Rogers, US Green Building Council
- Kevin Stover, The Green Building Initiative
- Vicki Worden, The Green Building Initiative

Certification system users were interviewed to gain additional insights into the use of various systems. Those interviewed include:

- Colonel Barton Barnhart (Air Force)
- Danielle Bogni (GSA)
- Jessica Higgins (GSA)
- Beth Kempton (State)
- Keith Molina (Army)
- Brad Nies (GSA)
- Joseph Parisi (GSA)
- Paula Shaw (Air Force)
- Julie Sobelman (State)

Executive Summary

Background

The General Services Administration's Office of Federal High-Performance Green Buildings (the Office) commissioned this study of green building certification systems in accordance with the Energy Independence and Security Act of 2007 (EISA).[1] Sections 433(a) and 436(h) of EISA require the Director of the Office to identify a green building certification system that the Director "*deems to be most likely to encourage a comprehensive and environmentally sound approach to certification of green buildings*." Federal agencies have been using green building certification systems since such systems were pilot tested in the late 1990s. Now that the Federal government has developed minimum sustainability requirements for its own buildings, it is important to evaluate how different systems perform in helping the government meet its green building objectives. This review of certification systems is designed to provide clarity on how current certification systems align with Federal sustainable design principles and high-performance operational requirements. The framework for analysis is a set of criteria drawn from EISA and Federal building performance requirements. EISA-cited criteria to be used in reviewing certification systems include:

- Robustness of the technical components of the certification system to address Federal high-performance design and operational requirements for Federal facilities
- Independence of auditors or assessors
- Availability of technically qualified auditors or assessors
- Documented verification method
- Transparency of certification systems' approach to collecting and addressing public comments
- Consensus-based standard for documenting a development and revision process
- System maturity
- Usability of the system
- National recognition within the building industry[2]

Most EISA criteria highlight similarities and differences among certification systems and the context of how they are used by the market. The "robustness" criterion as applied here includes a set of measures intended to assess how each system aligns with Federal performance requirements. Building performance is an important, current focus in the Federal sector, and this multi-part criterion compares the legal requirements applicable to Federal real estate portfolios against each certification system's technical components (such as energy, water, siting, etc.).

To meet Federal sustainable design and high-performance operations requirements, agencies need to focus on the existing Federal building stock. Quality, integrated design may make it easier for buildings to meet the Federal requirements, but in the end, there is a need for quality building operations professionals to achieve long term, high-performing buildings. The building occupants also need to be committed to contributing in a positive manner to optimize building operations.

[1] Public Law 110–140—DEC. 19, 2007. Energy Independence and Security Act of 2007. (EISA)
[2] Detailed information about the review criteria used in this evaluation is found in Appendix D.

Green building certification systems can be used to provide design and operations guidance, document progress toward a design or operational performance target, compare buildings using the certification systems structure, and document what design and operations outcomes and/or strategies are being used in the building. None of the systems discussed in this report ensures that a building will meet Federal sustainable design requirements (once certified), or that the building will perform optimally. Federal sector high-performance, sustainable design and operations requirements can be met without the use of a green building certification system. At the same time, certification systems have been identified as useful tools by users when they are documenting, tracking, and reporting a building's progress toward the Federal requirements.

The determination of which, if any, certification system to use depends on the user's goals. This report does not recommend a certification system or compare measured building performance to design intent, but rather is intended to organize certification system information based on the EISA Section 436(h) review criteria to enable a comparable evaluation of the systems. The review focuses on identifying measurable components of each criterion as well as qualitative information that further explains how each certification system relates to the criteria.

Methodology

The information compiled for this review was collected from November 15, 2010 to November 10, 2011 through literature reviews, requests for information from certification system owners, and interviews with certification system users.

Screening criteria were used to identify which systems met the minimum expectations of a green building certification system with respect to EISA criteria. The screening criteria are:

- Systems must employ whole building evaluation, addressing key sustainable design and operations metrics,
- Systems must be available in the U.S. market, and
- Systems must have third party certification.

Three certification systems passed the screening criteria: Green Building Initiative's Green Globes® (2010), U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) (2009), and the International Living Building Institute's Living Building Challenge™ (2011) (Table ES.1). Both the new construction and existing building systems for Green Globes and LEED, and the Living Building Challenge Building and Renovation typologies are reviewed.

Table ES.1 Summary of Green Building Certification Systems

Certification System	Owner	Whole-building sustainability	Building Types	Third-party Certification
Green Globes®	Green Building Initiative (GBI)	Green Globes is comprised of seven key areas: energy, indoor environment, site, water, resources, emissions, and project/ environmental management.	Green Globes certifies new buildings and significant renovation, existing buildings, building emergency management, building intelligence, and fit-up.	Green Globes Assessors provide third-party certification services.
LEED®	U.S. Green Building Council (USGBC)	LEED is comprised of five key areas: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.	LEED certifies new construction and major renovations, existing buildings, commercial building interiors, core and shell construction, schools, retail, healthcare, and homes.	The Green Building Certification Institute (GBCI) provides third-party certification services.
Living Building Challenge™	International Living Building Institute (ILBI)	Living Building Challenge is comprised of seven performance areas: site, water, energy, health, materials, equity and beauty.	Living Building Challenge certifies development at four scales: building, neighborhood, village/campus, and city.	A third-party auditor is responsible for performing document review and onsite verification.

Green Globes and LEED have separate certification systems focused on new construction and existing buildings.

- Green Globes NC (New Construction) and CIEB (Continual Improvement of Existing Buildings)
- LEED-NC (New Construction and Major Renovation) and EBO&M (Existing Buildings Operations and Maintenance)

Each of these systems is reviewed in this report. The Living Building Challenge has four typologies:

- Building
- Renovation
- Landscape or Infrastructure
- Neighborhood.

For this review, the Building typology is being used for the new construction comparison and the Renovation typology is being used for the existing building comparison.

Tables ES 2-5 illustrate how the certification systems align with the current set of Federal high-performance building requirements using the robustness criterion. There are 27 Federal requirements drawn from the Energy Policy Act, EISA, the High-Performance Sustainable Building Guiding Principles and Executive Order 13514. For each Federal requirement, the technical information available for each certification system was reviewed to determine if the Federal requirement would be fully or partially met.

- Full circles (green) mean that the Federal requirement would automatically be met if the building was certified because the system and Federal requirements fully align, and the system component is mandatory to achieve certification.
- Three-quarter circles (green) mean that the certification system has an option (e.g., point, credit, etc.) that meets the Federal requirement; if that option is included in the certification package, the Federal requirement would be met.

- A half circle (yellow) means the certification system includes an option related to but not directly aligned with the Federal requirement. If the user meets this option within the certification system, it is likely additional effort may be needed to meet the Federal requirement. The certification systems may have a lower standard, different baselines, different calculation methods, or different ways to document compliance with the Federal requirement.
- An empty circle means the Federal requirement is not an identified component within the certification system.

The difference between the three-quarter circle and full circle can be communicated by a waste and materials management example. The Federal requirement is for at least 50% of construction and demolition materials to be recycled. In Green Globes, if the building receives 4 of the 6 possible points, the Federal requirement will be met. In LEED, if at least 1 of the 2 possible credits is achieved, the Federal requirement will be met. The half circle symbol can be illustrated by using a daylighting example. The Federal requirement is to achieve a minimum daylight factor of 2 percent in 75 percent of all space occupied for critical visual tasks.[3] All three systems address daylighting, but in different ways, which is why they received a half circle. In Green Globes points are available for designing primary spaces to receive indirect minimum daylight illumination levels of 25 footcandles. In LEED a point is available for designing regularly occupied spaces achieve daylight illuminance levels of a minimum of 25 footcandles and a maximum of 500 footcandles. The Living Building Challenge requires that every occupiable space provides access to daylight.

The robustness criterion includes a set of measures intended to assess how each system aligns with Federal performance requirements. The robustness criterion for new construction includes 27 Federal requirements (source requirement documents in parentheses):

1. Integrated Design (Guiding Principles)
2. Commissioning (Guiding Principles, EISA)
3. Indoor Water (Guiding Principles, EPAct, EO 13423, EISA, EO 13514)
4. Process Water (Guiding Principles, EPAct)
5. Outdoor Water (Guiding Principles, EO 13423, EISA, EO 13514)
6. Storm Water (Guiding Principles, EISA, EO 13514)
7. Water-Efficient Products (Guiding Principles, EO 13514)
8. Energy Efficiency (Guiding Principles, EPAct, EO 13423, EISA)
9. On-Site Renewable Energy (Guiding Principles, Executive Order 13423, EISA)
10. Measurement and Verification (Guiding Principles, EPAct, EISA)
11. Benchmarking (Guiding Principles)
12. Recycled Content (Guiding Principles, Resource Conservation and Recovery Act, EO 13514)
13. Biobased Content (Guiding Principles, Farm Security and Rural Investment Act, EO 13514)
14. Environmentally Preferable Products (Guiding Principles, EO 13514)
15. Waste and Materials Management (Guiding Principles, EO 13514)
16. Ozone Depleting Compounds (Guiding Principles, Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990)
17. Low-Emitting Materials (Guiding Principles, EO 13514)

[3] Office of Management and Budget. December 2008. High-performance Sustainable Design Guidance. Initially developed by the Interagency Sustainability Working Group. URL: http://www.wbdg.org/pdfs/hpsb_guidance.pdf

18. Ventilation (Guiding Principles)
19. Thermal Comfort (Guiding Principles)
20. Daylighting (Guiding Principles)
21. Environmental Tobacco Smoke Control (Guiding Principles)
22. Protect Indoor Air Quality during Construction (Guiding Principles)
23. Moisture Control (Guiding Principles)
24. Acoustic (EISA)
25. Building System Controls (EISA)
26. Siting (EISA)
27. Greenhouse Gas (EISA)

Each certification system was mapped to the robustness criteria for new construction. Tables ES.2 and ES.3 reflect Federal requirements for new construction and major renovations. The following is a summary of that mapping.

Green Globes aligns at some level with more of the Federal requirements (25) than any other new construction system in this review:

- Green Globes has no points that are specifically required; thus, an examination of the points achieved on each individual project is required in order to determine which Federal requirements would be met by certification.

- Ten of the Federal requirements would be fully met through the Green Globes system if these points are selected by the user and achieved.

- Fifteen requirements may be met if points are achieved and additional efforts are made to conform to the Federal requirement.

- The Green Globes system does not include two of the Federal requirements (benchmarking and building system controls).

LEED aligns at some level with 20 Federal requirements:

- Four Federal requirements would be automatically met if certification is achieved because LEED has minimum requirements that must be met before any level of certification can be attained (called prerequisites). The prerequisites do not add to the total number of points needed to achieve certification.

- Seven of the Federal requirements would be fully met through the LEED system if these credits are selected by the user and achieved.

- Nine of the Federal requirements may be met if the credits are achieved and additional efforts are made to conform to the Federal requirements.

- The LEED system does not include seven of the Federal requirements (integrated design, process water, benchmarking, moisture control, acoustics, building system controls and greenhouse gas emissions).

The Living Building Challenge aligns at some level with 14 Federal requirements:

- The Living Building Challenge requires that buildings meet 100% of the system's design and operations strategies (many of which exceed Federal targets), so these twelve Federal requirements would be met automatically if certification is achieved.

- Three of the Federal requirements could be met if additional efforts are made to conform to Federal requirements.

- The Living Building Challenge system does not include thirteen of the Federal requirements (integrated design, commissioning, water efficient products, measurement and verification, benchmarking, recycled content, biobased content, thermal comfort, moisture control, indoor air quality protection during construction, acoustics, building system controls, and greenhouse gas).

In practice, the Green Globes and LEED certification systems are "tiered," meaning that they require a minimum number of points or credits to be achieved for a base level of certification, with higher levels of certification available based on accumulation of additional points or credits. Table ES.2 reflects how each system aligns with each of the 27 Federal requirements for new construction; it does not reflect how these points or credits may be accumulated to achieve different levels of certification.

Table ES.2: Robustness Criteria for New Building Construction

	GG NC	LEED NC	LBC NC
Robustness - Others			
Integrated Design	◑	○	○
Commissioning	◕	●	○
Robustness - Water			
Indoor Water	◕	●	●
Process Water	◑	○	●
Outdoor Water	◑	◕	●
Storm Water	◕	◕	●
Water-Efficient Products	◑	◑	○
Robustness - Energy			
Energy Efficiency	◑	◕	◑
On-Site Renewable Energy	◑	◑	◑
Measurement and Verification	◕	◕	○
Benchmarking	○	○	○
Robustness - Materials			
Recycled Content	◑	◑	○
Biobased Content	◑	◑	○
Environmentally Preferable Products	◑	◑	●
Waste and Materials Management	◕	◕	●
Ozone Depleting Compounds	◑	◑	●
Low-Emitting Material	◕	◕	●
Robustness - Indoor Environment			
Ventilation	◑	●	●
Thermal Comfort	◑	◑	○
Daylighting	◑	◑	◑
Environmental Tobacco Smoke Control	◑	●	●
Moisture Control	◕	○	○
Protect Indoor Air Quality during Construction	◑	◑	○
Robustness - Not in GP			
Acoustic (Not in GP)	◕	○	○
Building System Controls (Not in GP)	○	○	○
Siting (Not in GP)	◕	◕	●
Greenhouse Gas (Not in GP)	◕	○	○

Table ES.3 summarizes how each system aligns with Federal requirements, based on the total number of points or credits available.

Table ES.3: Summary of Robustness Criteria for New Building Construction

Certification System	Federal Requirement Met	Federal Requirement Met if Point Achieved	Federal Requirement Could be Met	Not Specifically Mentioned
Green Globes	0	10	15	2
LEED	4	7	9	7
Living Building Challenge	12	0	3	12

The robustness criterion for existing buildings includes 28 Federal requirements (source requirement documents in parentheses):

1. Integrated Assessment, Operation, and Management (Guiding Principles)
2. Commissioning (Guiding Principles, EISA)
3. Indoor Water (Guiding Principles, EPAct, EO 13423, EISA, EO 13514)
4. Outdoor Water (Guiding Principles, EO 13423, EISA, EO 13514)
5. Storm Water (Guiding Principles, EISA, EO 13514)
6. Process Water (Guiding Principles, EPAct)
7. Water-Efficient Products (Guiding Principles, EO 13514)
8. Energy Efficiency (Guiding Principles, EPAct, EO 13423, EISA)
9. On-Site Renewable Energy (Guiding Principles, Executive Order 13423, EISA)
10. Measurement and Verification (Guiding Principles, EPAct, EISA)
11. Benchmarking. (Guiding Principles)
12. Ventilation (Guiding Principles)
13. Thermal Comfort (Guiding Principles)
14. Moisture Control (Guiding Principles)
15. Integrated Pest Management (Guiding Principles)
16. Daylighting (Guiding Principles)
17. Low-Emitting Materials (Guiding Principles, EO 13514)
18. Protect Indoor Air Quality during Construction (Guiding Principles)
19. Environmental Tobacco Smoke Control (Guiding Principles)
20. Recycled Content (Guiding Principles, Resource Conservation and Recovery Act, EO 13514)
21. Biobased Content (Guiding Principles, Farm Security and Rural Investment Act, EO 13514)
22. Environmentally Preferable Products (Guiding Principles, EO 13514)
23. Waste and Materials Management (Guiding Principles, EO 13514)
24. Ozone Depleting Compounds (Guiding Principles, Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990)
25. Acoustic (EISA)
26. Building System Controls (EISA)
27. Siting (EISA)
28. Greenhouse Gas (EISA)

Each certification system was mapped to the robustness criteria for existing buildings. Tables ES.4 and ES.5 reflect Federal requirements for existing buildings. The following is a summary of that mapping.

Green Globes CIEB aligns at some level with 22 Federal requirements:

- Green Globes CIEB has no points that are specifically required, thus, an examination of the points achieved on each individual project is required in order to determine which Federal requirements would be met by certification.

- Eight of the requirements would be fully met through the Green Globes CIEB system if these points are selected by the user and achieved.

- Fourteen requirements may be met if points are achieved and additional efforts are made to conform to the Federal requirement.

- The Green Globes CIEB system does not include six of the Federal requirements (commissioning, recycled content, biobased content, low emitting materials, siting, and building system controls).

LEED EBO&M aligns at some level with more of the Federal requirements (27) than any other existing building system in this review:

- One of the Federal requirements would be automatically met if certification is achieved because LEED EBO&M has minimum requirements that must be met before any level of certification can be attained (called prerequisites).

- Sixteen of the requirements would be fully met through the LEED EBO&M system if these credits are selected by the user and achieved.

- Ten requirements may be met if points are achieved and additional efforts are made to conform to the Federal requirement.

- The LEED EBO&M system does not include one of the Federal requirements (greenhouse gas emissions).

The Living Building Challenge aligns at some level with seventeen Federal requirements:

- The Living Building Challenge requires that buildings meet 100% of the system's design and operations strategies (many of which exceed Federal targets), so these twelve Federal requirements would be met automatically if certification is achieved.

- Five of the Federal requirements may be met if additional efforts are made to conform to the Federal requirement.

- The Living Building Challenge system does not include eleven of the Federal requirements (commissioning, water use, stormwater, water efficient products, measurement and

verification, recycled content, biobased content, thermal comfort, integrated pest management, moisture control, acoustics and building system controls.)

Table ES.4 reflects how each system aligns with each of the 28 Federal requirements for existing buildings; it does not reflect how these points or credits may be accumulated to achieve different levels of certification. As noted above, in practice the Green Globes and LEED certification systems are "tiered," meaning that they require a minimum number of points or credits to be achieved for a base level of certification, with higher levels of certification available based on accumulation of additional points or credits.

Table ES.4: Robustness Criteria for Existing Buildings

	GG CIEB	LEED EB	LBC Ren
Robustness - Others			
Integrated Assessment, Operation and Management	◑	◑	◑
Commissioning	○	◑	○
Robustness - Water			
Indoor Water	◑	◕	●
Process Water	◑	◑	●
Outdoor Water	◑	◕	●
Measurement of Water Use	◑	◑	○
Stormwater	◕	◕	○
Water-Efficient Products	◑	◑	○
Robustness - Energy			
Energy Efficiency	◕	◕	◑
On-Site Renewable Energy	◕	◕	◑
Measurement and Verification	◑	◑	○
Benchmarking	◕	◕	●
Robustness - Materials			
Recycled Content	○	◕	○
Biobased Content	○	◕	○
Environmentally Preferable Products	◕	◕	●
Waste and Materials Management	◕	◕	●
Ozone Depleting Compounds	◑	◕	●
Robustness - Indoor Environment			
Ventilation	◑	●	●
Thermal Comfort	◕	◕	◑
Integrated Pest Management	◑	◑	○
Daylighting	◑	◑	◑
Environmental Tobacco Smoke Control	◑	◕	●
Moisture Control	◑	◕	○
Low-Emitting Material	○	◑	●
Robustness - Not in Guiding Principles			
Acoustic (Not in GP)	◕	◑	○
Building System Controls (Not in GP)	○	◕	○
Siting (Not in GP)	○	◕	●
Greenhouse Gas (Not in GP)	◑	○	●

Table ES.5 reflects the total number of points or credits available in each system; it does not reflect how these points or credits may be accumulated to achieve different levels of certification.

Table ES.5: Summary of Robustness Criteria for Existing Buildings

Certification System	Federal Requirement Met	Federal Requirement Met if Point Achieved	Federal Requirement Could be Met	Not Specifically Mentioned
Green Globes	0	8	14	6
LEED	1	16	10	1
Living Building Challenge	12	0	3	13

"Measured performance" is important to the Federal sector because outside of the sustainable design requirements many Federal reporting requirements are based on actual performance, such as the EISA requirement for federal agencies to reduce energy intensity by 3 percent per year, or 30 percent by FY 2015. Federal agencies have begun to measure the performance of sustainably designed buildings using an established protocol for building cost and performance.[4] For example, GSA's study of 22 buildings shows that on average "green" buildings use less energy, less water, cost less to operate, and have occupants that express general satisfaction scores higher than typical buildings, with additional studies underway using the same measurement protocol.

To document progress toward sustainable design and operations, measuring, calculating, or demonstrating evidence of intent are all legitimate mechanisms. Metered energy and water performance data are the most commonly sought forms of measured building performance data, however, quantities of recycled materials, waste generation, and indoor air quality measurements are also examples of measured performance. Calculated performance typically serves as a proxy for measured, using industry standards and assumptions to estimate or project how a building will perform. When measured data is limited, calculated performance provides useful, comparative values that can be used to support design and operational decisions. Evidence of intent documents frameworks that have the potential to facilitate impactful actions.

The Guiding Principles were reviewed for whether they required measured performance data (e.g., energy consumed), calculated values (e.g., energy models), or evidence of intent (e.g., energy policy). Tables ES.6 and ES.7 illustrate that the documentation required to meet the Guiding Principles is primarily evidence of intent for both new construction and existing buildings. The majority of the Guiding Principles can be documented using evidence of intent. The certification systems tend to require more measurement and calculation than is required by the Guiding Principles.

[4] Fowler KM, EM Rauch, AR Kora, JE Hathaway, AE Solana, and KL Spees. 2009. Whole Building Cost and Performance Measurement: Data Collection Protocol, Revision 2. PNNL-18325, Pacific Northwest National Laboratory, Richland, WA. http://www1.eere.energy.gov/femp/pdfs/datacollectionprotocol.pdf

Table ES.6: Measured, Calculation, and Evidence of Intent Assessment of Guiding Principles for New Construction

Guiding Principles				
New Construction and Major Renovations		GG	LEED	LBC
Site				
I	Reduce stormwater runoff	I	I	I
Water				
C	Indoor water use reduction	C	C	M
I	Installation of water meters is encouraged for indoor water use			
I	Consider use of harvested rainwater	C	C	M
C	Outdoor water use reduction	I	C	M
I	Installation of water meters is encouraged for outdoor water use			
I	Reduce process water when life cycle cost effective	C		
I	Specify WaterSense products	I	I	
I	Use certified irrigation system installers when available			
Energy				
C	Energy use reduction	C	C	M
I	Use EnergyStar or FEMP products when available			
C	Solar hot water system, when cost effective	C	C	M
I	Renewable energy	C	C	M
I	Install meters	I	I	M
M	Benchmark energy performance			
I	Commissioning	I	I	
Indoor Environment				
I	Meet ASHRAE 55	C	C	I
I	Meet ASHRAE 62.1	C	C	I
I	Moisture Control	I	I	I
C	Daylighting	C	C	
C	Lighting controls	C	C	
I	Specify low emitting materials		I	I
M	Indoor air quality and construction	M	M	
I	No smoking policy		I	I
Resources/Materials				
I	Specify recycled content materials	M	M	C
I	Specify biobased content materials	M	M	M
I	Specify environmentally preferable materials	M	M	I
I	Design-in recycling container space	I	I	M
C	Construction waste management	M	M	M
M	Eliminate use of ozone depleting substances	M	M	M

Table ES.7: Measured, Calculation, and Evidence of Intent Assessment of Guiding Principles for Existing Buildings

Guiding Principles Existing Buildings		GG	LEED	LBC
Site				
I	Reduce stormwater runoff	I	C	
Water				
M	Indoor water use reduction	M	M	M
I	Installation of water meters is encouraged	M	M	
C	Outdoor water use reduction (measured option exists)	I	C	M
I	Reduce process water when life cycle cost effective	I	C	
I	Specify WaterSense products	C	C	
I	Use certified irrigation system installers when available			
Energy				
M	Energy use reduction (options exist for a calculation method)	M	M	M
I	Use EnergyStar or FEMP products when available			
I	Renewable energy	M	C	M
I	Install meters	M	C	M
M	Benchmark energy performance	I	M	M
I	Commissioning/Re-Commissioning	M	I	
Indoor Environment				
I	Meet ASHRAE 55	I	C	I
I	Meet ASHRAE 62.1	I	C	I
I	Moisture Control	I	I	I
C	Daylighting	C	C	
M	Lighting controls	M	I	
I	Use/Specify low emitting materials		M	M
I	Integrated Pest Management	I	I	
I	Moisture Control	I	I	I
I	Prohibit smoking	I	I	I
Resources/Materials				
I	Specify recycled content materials		M	
I	Specify biobased content materials		M	I
I	Specify environmentally preferable materials	I	M	M
I	Provide recycling services	I	I	M
M	Eliminate use of ozone depleting substances	M	M	M

The EISA evaluation criteria included eight criteria in addition to the category of "robustness" of the technical elements of the certification systems. For many of these criteria the certification systems

perform similarly. Table ES.8 illustrates those criteria where differences were found among the certification systems. In this table:

- Full circles mean that the certification system meets the criterion developed for this report (i.e., essential elements of the criterion are required by the certification system).
- A half circle means the certification system may meet the criterion (metrics cannot be directly compared) or partially meets the criterion.
- An empty circle means that information was not found or is the criterion is not addressed within the certification system.

Information used to review the certification systems against these criteria was provided by the certification system owners and obtained through literature reviews. Detailed information of the mapping of each system against the review criteria can be found in Appendices E-G. Owners of each certification system were provided the opportunity to review and comment on the detailed mapping of review criteria. The system owners' responses are included in Appendices H-J.

Each of the certification systems has different approaches to guide design and operations teams toward high-performance green buildings. These variations in approach and philosophy drive many of the differences found among systems in the review criteria highlighted below. The Living Building Challenge is the system with the largest number of differences as it does not align with eight of the eleven criteria highlighted in Table ES.8. Philosophically, the International Living Building Institute does not employ a consensus-based process in the development of the Living Building Challenge system. The result is that several of the independence, transparency, and consensus related review criteria are not addressed within the certification system.

Other differences found among the systems include:

- Green Globes and Living Building Challenge use on-site auditors to augment the certification information received electronically, while LEED bases its certification solely on the information submitted electronically.

- LEED has an established piloting process that is implemented prior to a revision to the certification system being released.

- LEED requires that new construction projects submit measured energy and water performance to the USGBC for five years following certification.

- The Living Building Challenge is designed to incorporate the results of at least the first year of a building's operations prior to certification, which means this system has the greatest emphasis on measured performance.

Table ES.8 Review questions with different certification system responses

Review Question	Green Globes	LEED	Living Building Challenge
Independence: Is there a documented appeal process?	●	●	○
Verification: Do the assessors/auditors verify the information onsite?	●	○	●
Transparency: Are there methods to collect and address public comments?	●	●	○
Transparency: Are the changes documented and accessible by the public?	●	●	◐
Consensus: Was the certification system developed using a consensus-based approach?	●	●	○
Consensus: Are credits pilot tested before publication	◐	●	○
Consensus: Are there third-party reviewers/moderators of the process?	●	●	○
Maturity: Is there a requirement for post occupancy data collection once a building has been certified?	◐	●	●
Maturity: Is there a mechanism to transfer the certification of a new building to an existing building over time?	○	○	●
Maturity: What is the frequency of changes?	●	●	○
Usability: Does the certification system have performance-based criteria?	◐	◐	●

See Table 2-3 for a more complete description of these criteria

Each of the certification systems in this review has the stated goal of improving the design and operations of buildings so that they operate in a more sustainable manner although each system approaches this challenge differently. Each system addresses what the buildings industry has identified as the major aspects of green buildings (i.e., siting, energy, water, materials, and indoor environment). All of the systems have a set of on-line tools to assist users.

With the exception of the differences outlined above, the three systems align well with the EISA-defined review criteria. Green Globes for new construction and LEED for existing buildings align the most closely with 25 and 27 respectively out of 27 and 28. Green Globes and LEED have a points system offering multiple certification levels, where the Living Building Challenge is an "all-or-nothing" system. LEED and Living Building Challenge have specific minimum requirements that must be met for certification to be achieved; Green Globes has a minimum number of points within each area with flexibility as to how those points would be met. LEED is the dominant tool in the market, with thousands more users than the other two systems. However, all three systems are all generally recognized by building professionals.

Selecting a certification system requires the user to first understand their purpose for using a system. Innovation, market recognition, ease of use, assistance with meeting requirements, and a performance emphasis are some of the reasons a system might be selected. The Federal sustainable design and high-performance operations requirements steer agencies toward the use of green building certification tools to help buildings professionals meet their energy, water, materials, and indoor environmental quality requirements. As commercially-available tools, they have been useful in connecting the Federal sector with the current private sector standards.

Acronyms and Abbreviations

ANSI	American National Standards Institute
ASHRAE	American Society of Heating Refrigerating and Air Conditioning Engineers
CEO	Chief Executive Officer
CIEB	Continual Improvement of Existing Buildings
DOE	U.S. Department of Energy
EB	existing buildings
EBO&M	Existing Buildings Operations and Maintenance
EISA	Energy Independence and Security Act
EO	Executive Order
GBCI	Green Building Certification Institute
GBI	Green Building Initiative
GG	Green Globes
GSA	General Services Administration
ILBI	International Living Building Institute
LBC	Living Building Challenge
LEED	Leadership in Energy and Environmental Design
LEED-NC	LEED for New Construction and Major Renovation
LSC	LEED Steering Committee
NC	new construction
PNNL	Pacific Northwest National Laboratory
USGBC	U.S. Green Building Council

Contents

Tables

1.0 Introduction

The General Services Administration's Office of Federal High-performance Green Buildings (the Office) commissioned this study of green building certification systems in accordance with the Energy Independence and Security Act (EISA) of 2007. Sections 433(a) and 436(h) of EISA require the Director of the Office to identify a green building certification system that the Director "deems to be most likely to encourage a comprehensive and environmentally sound approach to certification of green buildings." This review of existing certification systems is designed to provide clarity on how current certification systems align with Federal sustainable design principles and high-performance operational requirements. Federal agencies are required to employ sustainable design principles and high-performance operational requirements within their facilities. Green building certification systems are one mechanism for documenting success in implementing these requirements.

The purpose of this report is to offer an objective summary of selected green building certification systems based on specific criteria. The review criteria were derived from EISA, the Guiding Principles for Federal Leadership in High-Performance Sustainable Buildings, other legal drivers of Federal green building, and the experience of Federal personnel who have used the certification systems. Publicly available information, both free and for purchase, was examined to document certification system information and to map each system to the review criteria. The certification system owners were offered an opportunity to provide additional information in response to the review criteria. Federal personnel who have had experience using green building certification systems were interviewed to offer anecdotal information about their use of the systems.

1.1 Defining Green Building Certification Systems

Over the past decade, there has been an enormous growth in building evaluation tools, programs, systems and standards focused on sustainable building and product development. Distinguishing and categorizing these numerous types of tools and systems has become more difficult as they have evolved into a myriad of forms. This study is focused strictly on green building certification systems, as distinct from to building evaluation tools and programs such as life cycle assessment, energy simulation, performance evaluation, indoor environmental quality assessments, and operation and maintenance optimization, which are frequently used within certification systems.

The Federal green building requirements and drivers that guided this review include:

- *Energy Independence and Security Act of 2007 (42 USC Part 152) (EISA)*
- *Energy Policy Act of 2005 (Public Law 109-58) (EPAct)*
- *Strengthening Federal Environmental, Energy, and Transportation Management* (Executive Order 13423, 2007, codified by 111th Congress, HR1105 §748)
- *Federal Leadership in Environmental, Energy, and Economic Performance* (Executive Order 13514, 2009)
- *Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding* (signed by 21 Federal agencies in January 2006) and *Guidance* (approved by Office of Management and Budget December 2008)

1.1.1 Energy Independence and Security Act

The Energy Independence and Security Act of 2007 (EISA) was signed into law on December 19, 2007. EISA aims "*to reduce our Nation's dependency on foreign oil by investing in clean, renewable, and alternative energy resources, promoting new emerging energy technologies, developing greater efficiency…*"

EISA directs that sustainable design principles be applied to Federal design and construction projects for new buildings and buildings undergoing major renovations (see Appendix A for relevant EISA text). EISA also establishes the General Services Administration's role in evaluating green building certification systems and making recommendations for other Federal agencies. EISA sections 433(a) and 436(h) require the Director of the Office of Federal High-performance Green Buildings to identify a green building certification system that the Director *"deems to be most likely to encourage a comprehensive and environmentally sound approach to ratification of green buildings."* In accordance with EISA section 433, this recommendation is provided to the Secretary of Energy who, in consultation with GSA and the Department of Defense, identifies a certification system and certification level for the Federal sector. EISA requires that GSA re-evaluate certification systems every five years.

This report was developed to provide an objective, independent review of certification systems to inform the Director's recommendation as part of the first five-year evaluation. The first review was performed in 2006, focused around certification systems for new construction and major renovation.[1] Tracking the evolution of green building certification systems in the market, this report reviews certification systems for existing buildings in addition to those for new construction and major renovations.

EISA sections 433 and 436 establish the minimum basis for the Director's recommendation and the Secretary's determination of a green building certification system deemed to be most likely to encourage a comprehensive and environmentally-sound approach as follows:

> *"(B) the ability and availability of assessors and auditors to independently verify the criteria and measurement of metrics at the scale necessary to implement this subtitle;*
>
> *(C) the ability of the applicable standard-setting organization to collect and reflect public comment;*
>
> *(D) the ability of the standard to be developed and revised through a consensus-based process;*
>
> *(E) an evaluation of the robustness of the criteria for a high-performance green building, which shall give credit for promoting—*
>
> > *(i) efficient and sustainable use of water, energy, and other natural resources;*
> >
> > *(ii) use of renewable energy sources;*

[1] Fowler, KM and EM Rauch. 2006. Sustainable Building Rating Systems Summary. PNNL-15858. Pacific Northwest National Laboratory, Richland, Washington.

(iii) improved indoor environmental quality through enhanced indoor air quality, thermal comfort, acoustics, day lighting, pollutant source control, and use of low-emission materials and building system controls;

(iv) reduced impacts from transportation through building location and site design that promote access by public transportation; and

(v) such other criteria as the Federal Director determines to be appropriate; and

(V) national recognition within the building industry."[2]

These EISA requirements were used to develop the review criteria and frame the comparison of certification systems in this report. Before and after passage of EISA, Executive Orders (EOs) 13423 and 13514 were issued to establish high-performance requirements for new and existing Federal facilities. These requirements include performance standards relating to energy use, greenhouse gas emissions, water use, waste reduction, materials use and employee commuting. Requirements in these EOs, as well as the Guiding Principles for High-Performance Sustainable Buildings, informed the development of additional criteria for this review.

1.1.2 Executive Orders 13423, 13514 and the Guiding Principles for Federal Leadership in High-Performance Sustainable Buildings

In 2006, 21 Federal agencies signed a Memorandum of Understanding which included the Guiding Principles for High-Performance and Sustainable Buildings. These Guiding Principles require minimum levels of performance for Federal facilities in five areas:

- Integrated design and operations,
- Energy performance,
- Water performance,
- Indoor environmental quality, and
- Materials impact.

Two Executive Orders, 13423 and 13514, have affirmed that the Guiding Principles are required for all new Federal facilities and 15% of the existing Federal buildings inventory. EO 13423 and 13514 also establish specific targets for agencies in building design, construction and operations in the areas of energy use, water use, greenhouse gas emissions, waste reduction, storm water management, and facility siting.

In 2008, guidance on how to implement the Guiding Principles for High Performance and Sustainable Buildings for new construction and existing buildings (see Appendix B for relevant Guiding Principles text) was approved by the Office of Management and Budget.[3] The Implementing Instruction for the Guiding Principles was updated to incorporate existing Federal requirements from the Executive Orders, EISA, and EPAct.

[2] Public Law 110–140—DEC. 19, 2007. EISA 2007 Section 433(h)(2)
[3] Office of Management and Budget. December 2008. High-performance Sustainable Design Guidance. Initially developed by the Interagency Sustainability Working Group. URL: http://www.wbdg.org/pdfs/hpsb_guidance.pdf

1.2 Federal Green Building Experience

The Federal government has been an early adopter of green building certification.[4] Since the previous study in 2006, numerous agencies have gained substantial experience in applying green building certification systems to Federal facilities. The 2009 American Recovery and Reinvestment Act provided an opportunity for Federal agencies to invest in their real estate portfolios, applying the sustainable design and high-performance operating principles to an even greater number of buildings. As of August 25, 2011, the certification system owners reported that 40 Federal buildings have been certified under the Green Building Initiative's Green Globes' system and 519 Federal buildings have been certified under the U.S. Green Building Council's Leadership in Energy and Environmental Design Rating System. As of August 15, 2011, there were no certified Federal buildings for the Living Building Challenge. However, two Federal projects have been registered by the National Park Service.

[4] Office of the Federal Environmental Executive. 2003. The Federal Commitment to Green Building: Experiences and Expectations. Washington, DC. URL: http://www.epa.gov/greenbuilding/pdf/2010_fed_gb_report.pdf

2.0 Study Approach

This review involved several stages: developing screening and review criteria; using the screening criteria to identify systems for detailed review; mapping selected certification systems to the review criteria using publicly available information; and gathering and mapping additional information from certification system owners and users to the review criteria.

2.1 Screening Approach

Literature reviews, internet searches, and the previous Pacific Northwest National Laboratory (PNNL) report on sustainable building rating systems[1] were used to identify currently marketed green building systems. Certification system documentation that was identified and publicly available during the time period of November 15, 2010 to November 10, 2011 was used for this review.

The screening criteria were selected to ensure that the certification systems reviewed in detail would address the EISA requirements. The screening criteria used are:

- **Relevance:** The certification system addresses buildings (rather than individual products) and multiple sustainable attributes identified in EISA, including energy, water, indoor environmental quality, etc.

- **Availability:** The certification system has been used or is currently available for use in the US commercial building market. The certification system is not limited to one climate zone or geographic region.

- **Third-party certification:** Validation of how the building addresses sustainability is performed by an independent auditor, per EISA's requirement for *"the ability and availability of assessors and auditors to independently verify the criteria and measurement of metrics."*

Table 2-1 provides a summary of the screening analysis. The full set of systems or tools screened can be found in Appendix C.

[1] Fowler, KM and EM Rauch. 2006. Sustainable Building Rating Systems Summary. PNNL-15858. Pacific Northwest National Laboratory, Richland, Washington.

Table 2-1 - Screening of Green Building Certification System

Legend	**√ (Meets the criterion)**	(Does NOT meet the criterion for the listed reason)	(No further evaluation because previous criterion not met.)

Certification System Name	**Relevance**	**Availability**	**Third-Party Certification**
BREEAM (Building Research Establishment's Environmental Assessment Method)	√	For the UK market	
CASBEE (Comprehensive Assessment System for Building Environmental Efficiency)	√	For the Japan market	
CEPAS (Comprehensive Environmental Performance Assessment Scheme)	√	For the Hong Kong market	
Energy Star Portfolio Manager	Building energy only		
EPLabel	Building energy only		
Estidama Pearl Rating System	√	For the Abu Dhabi market	
Green Globes™ US	√	√	√
HQE (High Environmental Quality)	√	For the France market	
LEED® (Leadership in Energy and Environmental Design)	√	√	√
Living Building Challenge	√	√	√
NABERS (National Australian Built Environment Rating System)	√	For the Australia market	
SB Tool	√	For the international market, but not adopted in the U.S. yet	
SPiRiT (Sustainable Project Rating Tool)	√	√	Self Compliance
Three Star System	√	For the China Market	

Table 2-2 summarizes the characteristics of the three green building certification systems that were determined to meet all of the screening criteria.

Table 2-2 - Summary of Green Globes, LEED, and Living Building Challenge

Certification System	Owner	Whole-building sustainability	Building Types	Third-party Certification
Green Globes®	Green Building Initiative (GBI)	Green Globes is comprised of seven key areas: energy, indoor environment, site, water, resources, emissions, and project/ environmental management.	Green Globes certifies new buildings and significant renovation, existing buildings, building emergency management, building intelligence, and fit-up.	Green Globes Assessors provide third-party certification services.
LEED®	U.S. Green Building Council (USGBC)	LEED is comprised of five key areas: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.	LEED certifies new construction and major renovations, existing buildings, commercial building interiors, core and shell construction, schools, retail, healthcare, and homes.	The Green Building Certification Institute (GBCI) provides third-party certification services.
Living Building Challenge™	International Living Building Institute (ILBI)	Living Building Challenge is comprised of seven performance areas: site, water, energy, health, materials, equity and beauty.	Living Building Challenge certifies development at four scales: building, neighborhood, village/campus, and city.	A third-party auditor is responsible for performing document review and onsite verification.

Green Globes and LEED have separate certification systems focused on new construction and existing buildings.

- Green Globes NC (New Construction) and CIEB (Continual Improvement of Existing Buildings)
- LEED-NC (New Construction and Major Renovation) and EBO&M (Existing Buildings Operations and Maintenance)

Each of these systems is reviewed in this report. The Living Building Challenge has four typologies:

- Building
- Renovation
- Landscape or Infrastructure
- Neighborhood.

For this review, the Building typology is being used for the new construction comparison and the Renovation typology is being used for the existing building comparison.

2.2 Review Approach

EISA section 436(h) and the Guiding Principles for High-Performance and Sustainable Buildings were used to develop the review criteria and frame the comparison of certification systems in this report (see Appendix A for relevant EISA text). Table 2-3 shows how the EISA and Guiding Principle requirements were translated into the review criteria.

Table 2-3 - Definitions of Review Criteria

Source (PUBLIC LAW 110–140—DEC. 19, 2007 121 STAT. 1613)	Criteria	Criteria Definition
(B) the ability and availability of assessors and auditors to independently verify the criteria and measurement of metrics at the scale necessary to implement this subtitle;	**Independence**	Assessors/auditors have no stake in whether a building receives certification.
	Availability	Assessors/auditors are available to evaluate a building.
	Verification	A documented standard verification method and process must be followed by assessors and auditors.
(C) the ability of the applicable standard-setting organization to collect and reflect public comment	**Transparency**	There is a documented approach for the review and consideration of public comments.
		Public comments are collected on a regular basis.
		Public comments are reflected in the certification systems.
		Development and updating process of the certification system is documented and publicly available.
(D) the ability of the standard to be developed and revised through a consensus-based process;	**Consensus-based**	The certification system contains the attributes of a voluntary consensus standards body defined in OMB Circular A-119: openness, balance of interest, due process, an appeal process, and consensus
(E) an evaluation of the robustness of the criteria for a high-performance green building, which shall give credit for promoting— (i) efficient and sustainable use of water, energy, and other natural resources;	**Robustness**	Certification system ensures the qualification of the certified building.
		Water criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
		Energy criteria meet Federal requirements including commissioning, at the minimum, and are a relevant part of the certification system.
		Material selection criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
		Siting criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
		Renewable energy criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
(ii) use of renewable energy sources;	**Robustness**	Indoor air quality criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
(iii) improved indoor environmental quality through enhanced indoor air quality, thermal comfort, acoustics, day lighting, pollutant source control, and use of low-emission materials and building system controls;	**Robustness**	Thermal comfort criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
		Acoustics criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
		Daylighting criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.

Source (PUBLIC LAW 110–140—DEC. 19, 2007 121 STAT. 1613)	Criteria	Criteria Definition
(iii) improved indoor environmental quality through enhanced indoor air quality, thermal comfort, acoustics, day lighting, pollutant source control, and use of low-emission materials and building system controls;	**Robustness**	Pollutant source control criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
		Low-emission material criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
		Building system controls criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
		Integrated design criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
(iv) reduced impacts from transportation through building location and site design that promote access by public transportation; and	**Robustness**	Siting criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
(v) such other criteria as the Federal Director determines to be appropriate; and	**System Maturity**	Certification system is effectively linked to latest tools and standards.
		Certification system has components to track building performance post-occupancy.
		The certification system is used as basis for development of other systems.
		The certification system has been consistently updated overtime.
	Usability	Cost of use is affordable.
		Technical knowledge needed to use the certification system is generally available in the design and construction industry.
		The certification system requires professional rigor and judgment rather than leading user to prescriptive solutions.
		The certification system organization provides product support.
		The certification system is well-defined, easily communicated, and clearly understood among multiple parties.
(F) national recognition within the building industry	**National Recognition**	The certification system is recognized academically.
		The certification system is recognized within the buildings' industry (including real estate and construction industry).
		The certification system is recognized within the Federal sector.

The certification systems were mapped to these review criteria. Detailed documentation on how each system mapped to the criteria can be found in the Appendices E-G.

3.0 Certification System Overview

Three certification systems were reviewed in detail: Green Globes for new construction and existing buildings (2010),[1,2] LEED for new construction and existing buildings (2009),[3,4] and the Living Building Challenge including the building and renovations typologies (2011).[5,6]

Green Globes is a voluntary certification system intended for commercial buildings. Available since 2004, Green Globes covers project management, site, water use, energy use, indoor environmental quality and resource, building materials and solid waste. (http://www.thegbi.org)

LEED is a voluntary certification system intended for commercial buildings. Available since 1998, LEED covers siting, water use, energy and atmosphere, materials and resources, indoor environment, and innovation. (http://www.usgbc.org)

Living Building Challenge is a voluntary system intended for commercial buildings. Initiated in 2008, it is comprised of seven performance areas: Site, Water, Energy, Health, Materials, Equity and Beauty. These are subdivided into a total of twenty Imperatives. (https://ilbi.org/lbc)

The following summary of the certification systems includes information on the applicable building types, the development and certification processes, online support, governance, financial aspects, research, and outreach.

Green Globes®

Green Globes® US was adapted from Green Globes Canada in 2004 when the Green Building Initiative purchased the rights to the system in the Unites States. The Green Building Initiative received accreditation as a standards developer by ANSI in 2005 and the Green Building Assessment Protocol for

[1] Green Building Initiative. 2010. Green Building Assessment Protocol for Commercial Buildings. ANSI/GBI 01-2010. Green Building Initiative, Portland, Oregon.
[2] Green Building Initiative. 2011. Green Globes CIEB Criteria. Green Building Initiative, Portland, Oregon.
[3] U.S. Green Building Council. 2009. LEED Reference Guide for Green Building Design and Construction. ISBN: 978-1-932444-14-8. U.S. Green Building Council, Washington, DC.
[4] U.S. Green Building Council. 2009. LEED Reference Guide for Green Building Operations and Maintenance. ISBN: 978-1-932444-16-2. U.S. Green Building Council, Washington, DC.
[5] International Living Building Institute. 2010. Living Building Challenge 2.0. International Living Building Institute, Seattle, Washington.
[6] International Living Building Institute. 2010. Documentation Requirements Living Building Challenge 2.0. International Living Building Institute, Seattle, Washington.

Commercial Buildings (new construction and major renovations) derived from Green Globes® became an official ANSI standard in 2010.[7]

Projects that are third-party verified and have achieved over 35% of the points can earn a rating of 1 to 4 Green Globes. Green Globes' major categories include:

- Project Management (integrated design, environmental purchasing, commissioning, emergency response plan)
- Site (site development area, reduce ecological impacts, enhancement of watershed features, site ecology improvement)
- Energy (energy consumption, energy demand minimization, "right sized" energy-efficient systems, renewable sources of energy, energy-efficient transportation)
- Water (flow and flush fixtures, water-conserving features, reduce off-site treatment of water)
- Indoor Environment (effective ventilation systems, source control of indoor pollutants, lighting design and integration of lighting systems, thermal comfort, acoustic comfort)
- Resource, Building Materials and Solid Waste (materials with low environmental impact, minimized consumption and depletion of material resources, re-use of existing structures, building durability, adaptability and disassembly, and reduction, re-use and recycling of waste)

Building types: Currently, Green Globes applies to the design and construction of new buildings, existing buildings, and existing health care facilities.[8]

Technical development and update process: Technical development is based on the ANSI process which includes a committee of users, producers, interested parties and non-government organizations. ANSI requires that the committee be balanced and conduct a technical review that is both open and transparent.[9]

Certification/Verification Process: Green Globes describes the process as follows: "Building projects that have completed the Green Globes assessments and scored a minimum threshold of 35% of the 1,000 available points are then eligible to schedule a thorough third-party review of documentation and an on-site walk through that will then lead to a formal Green Globes rating/certification. Buildings that successfully complete a third-party assessment are assigned a Green Globes rating of one to four Green Globes."[10] Green Globes has prescriptive and performance based paths for achieving some points.

Green Globes uses an online questionnaire, which, once completed, generates a report that provides a rating, a list of achievements, and list of recommendations. Third-party verification is provided by a

[7] Green Building Initiative. "Green Building Initiative Establishes American National Standard for Commercial Green Building." Accessed: May 25, 2011. URL: http://www.thegbi.org/news/news/2010/news_201001_Green_Building_Initiative_ANSI_Commercial_Building.asp
[8] Green Building Initiative. "Green Globes Overview." Accessed: April 29, 2012. URL: http://www.thegbi.org/green-globes/
[9] Green Building Initiative "History of the Green Globes System." Accessed: April 29, 2012. URL: http://www.thegbi.org/products/green-globes/history.shtml
[10] Green Building Initiative. "Green Globes® Rating/Certification." Accessed: May 25, 2011. URL: http://www.thegbi.org/green-globes/ratings-and-certifications.asp

Green Building Initiative-approved and Green Globes trained regional verifier. There are over 170 certified Green Globes Professionals[11] and over 175 certified projects.[12]

Governance: GBI is a 501(c)(3) non-profit organization. GBI has 53 Members and Supporters and 9 Industry Affiliates.[13] In addition, GBI has over 10,000 "Friends of GBI," formerly known as Associate Members who receive the quarterly newsletter and other information from GBI.[14] There is a Board of Directors, Executive Director, executive staff, and Industry Advisory Board. Decisions of the Industry Advisory Board are non-binding.[15]

Financial support: Income sources include membership dues and in-kind contributions, revenue from educational materials and workshops, verification fees and professional certification fees. In addition, GBI also receives grants from various organizations to fund specific projects and efforts.

Research: GBI has an online resource library with several white papers, links to organizations/resources, and links to sustainability organizations.[16]

Outreach: GBI has over 170 Green Globes Professionals. Education and training is provided through web seminars, best practice videos and online customer training.[17]

LEED®

LEED® (Leadership in Energy and Environmental Design) was developed and piloted in the U.S. in 1998 as a consensus-based building rating system based on the use of existing building technology. USGBC received accreditation as a standards developer by ANSI in 2006.

The LEED Reference Guide presents information on how to achieve credits within the following major categories:

- Sustainable Sites (construction related pollution prevention, site development impacts, transportation alternatives, stormwater management, heat island effect, and light pollution)
- Water Efficiency (landscaping water use reduction, indoor water use reduction, and wastewater strategies)
- Energy and Atmosphere (commissioning, whole building energy performance optimization, refrigerant management, renewable energy use, and measurement and verification)
- Materials and Resources (recycling collection locations, building reuse, construction waste management, and the purchase of regionally manufactured materials, materials with recycled

[11] Green Building Initiative. "Green Globes Personnel Certifications Search." Accessed: May 25, 2011. URL: http://www.thegbi.org/green-globes/personnel-certifications/certified-personnel-listing/index.pl
[12] Green Building Initiative. Green Globes Certified Buildings. Accessed: August 25, 2011. URL: http://www.thegbi.org/assets/case_study/Green-Globes-NC-Certified-Buildings.pdf
[13] Green Building Initiative. "Join the GBI Today." Accessed: May 25, 2011. URL: http://www.thegbi.org/join/
[14] Green Building Initiative "Friends of the GBI." Accessed: May 25, 2011. URL: http://www.thegbi.org/about-gbi/who-we-are/friends-and-associates-of-gbi.asp
[15] Green Building Initiative. "About the Green Building Initiative." Accessed: May 25, 2011. URL: http://www.thegbi.org/about-gbi/, GBI Bylaws, 2006
[16] Green Building Initiative. "Green Resource Library." Accessed: May 25, 2011. URL: http://www.thegbi.org/green-resource-library/
[17] Green Building Initiative. "Training." Accessed: May 25, 2011. URL: http://www.thegbi.org/training/

content, rapidly renewable materials, salvaged materials, and sustainably forested wood products)

- Indoor Environmental Quality (environmental tobacco smoke control, outdoor air delivery monitoring, increased ventilation, construction indoor air quality, low emitting materials use, source control, and controllability of thermal and lighting systems)
- Innovation and Design Process (LEED® accredited professional, and innovative strategies for sustainable design)

Building types: Within LEED, there are multiple rating systems based on building type or the building life cycle. In the United States, these include New Construction and Major Renovations (NC), Existing Buildings: Operations & Maintenance (EBO&M), Commercial Interiors, Core & Shell, Schools, Retail, Healthcare (pilot), Homes, and Neighborhood Development.

Technical development and update process: The steps followed for the development of USGBC rating system products include technical development by committee, pilot testing, public comment period, approval by council membership, and then release for public use. For the existing LEED rating systems, minor updates can occur no more than once a year, while major updates occur on a three year cycle to match building code cycle development, and will follow a defined process including two public comment periods. In addition, LEED interpretations provide official, precedent-setting rulings from USGBC based on formal project team inquiries.[18]

Certification process: The rating systems consist of individual credits with assigned point values within general categories. Within each category, credits known as "prerequisites" are mandatory. Most of the rating systems also have geographically based Regional Priority credits which allow region-specific technical and environmental issues to be addressed rather than using a "one size fits all" approach. LEED points are awarded on a 100-point scale with an additional 10 bonus credits available.[19] Project credit interpretation rulings provide technical guidance on issues not covered by the rating systems.[20] LEED has prescriptive and performance based paths for achieving some credits.

With the exception of LEED for Homes, LEED certification is supported by LEED Online which allows building specific information to be uploaded by credit in a series of automated templates. A project is first registered in the LEED Online system. Once documentation of the quantifiable sustainable design measures is provided to the Green Building Certification Institute through LEED Online for third-party verification, the project proceeds through the certification process. Third-party certification is mandatory in order to be termed a LEED building.

There are currently over 10,000 LEED certified projects. There are over 30,000 registered projects.

Other tools include a searchable database for LEED Interpretation rulings, an interactive map showing the Regional Priority credits, a searchable database of LEED Certified and Registered projects, and credit checklists by rating system.

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[18] US Green Building Council. "TSAC: HCFC Task Group." Accessed: May 24, 2011. URL: http://www.usgbc.org/DisplayPage.aspx?CategoryID+19

[19] US Green Building Council. "How to achieve certification." Accessed: May 24, 2011. URL: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1991

[20] US Green Building Council. "Certification Tools." Accessed: May 24, 2011. URL: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=75 Accessed: May 24, 2011

Governance: USGBC is a 501c3 non-profit organization. Over 16,000 companies and organizations comprise the membership of USGBC. Individuals cannot be members. There is a Board of Directors, CEO, and executive staff.[21] There are three strategic committees and various Board committees. Individuals from member companies and organizations are appointed to committees and short term, task-focused working groups.[22]

Financial support: Income sources include membership dues, revenue from educational materials and workshops, and registration fees associated with various conferences and seminars including the annual conference, Greenbuild. USGBC also receives a portion of the revenues from certification fees and professional accreditation programs administered by Green Building Certification Institute (GBCI). In addition, USGBC receives grant funds from various agencies to fund specific projects and efforts.

Research: USGBC has a research program and resources available online including: research publications, a Green Building Information Gateway, a Knowledge Exchange, and a Green Building Research Fund to provide grants for external research projects. In addition, there is an internal research program.[23]

Outreach: USGBC has 79 local affiliates known as Chapters and more than 160,000 LEED® Professional Credential holders.[24] Education and training is provided through various types of educational materials, courses including a full LEED curriculum, and conferences and seminars.[25]

Living Building Challenge™

The Living Building Challenge™ is a certification program for buildings that have been occupied for a minimum of one year. It generally has stricter technical requirements than other green building certification systems. Living Building Challenge was developed and piloted in the U.S. in 2006 by the Cascadia Green Building Council, a Chapter/Affiliate of USGBC. The International Living Building Institute (ILBI) was formed in 2009 to administer the Living Building Challenge.[26] With this standard, ILBI aims to encourage dialogue on the evolution of the building industry and engender support for the first pilot projects, until more Living Buildings emerge. Two rules govern the standard:

- All elements of the Living Building Challenge are required for a building to be certified. Some of the requirements have temporary exceptions to acknowledge current market limitations. These are listed in the footnotes of each section. Exceptions will be modified or removed as the market changes.

[21] US Green Building Council "About USGBC." Accessed: May 24, 2011. URL: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=124
[22] US Green Building Council "About Committees." Accessed: May 24, 2011. URL: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1742
[23] US Green Building Council "About Research Program." Accessed: May 24, 2011. URL: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1718
[24] US Green Building Council "About USGBC." Accessed: May 24, 2011. URL: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=124
[25] US Green Building Council "Education." Accessed: May 24, 2011. URL: http://www.usgbc.org/DisplayPage.aspx?CategoryID=127
[26] International Living Building Institute "FAQ." Accessed: May 25, 2011. URL: https://ilbi.org/about/faq

- Living Building designation is based on measured, rather than modeled or anticipated, performance. Therefore, buildings must be operational for at least twelve consecutive months prior to evaluation.

To earn full program certification (Living status), projects must meet all assigned Imperatives and have proven performance through at least twelve consecutive months of operation. The seven performance areas are referred to as "Petals" and are subdivided into a total of twenty Imperatives as shown in the table below.

A project may also earn partial program certification (Petal Recognition) by satisfying the requirements of a minimum of three categories, of which at least one must be Water, Energy or Materials.

Table 3-1 - Living Building Challenge Imperatives

Petals	Imperatives
Site	Limits to growth
	Urban Agriculture
	Habitat exchange
	Car free living
Water	Net zero water
	Ecological water flow
Energy	Net zero energy
Health	Civilized environment
	Healthy air
	Biophilia
Materials	Red list
	Embodied carbon footprint
	Responsible industry
	Appropriate sourcing
	Conservation + reuse
Equity	Human scale + humane places
	Democracy + social justice
	Rights to nature
Beauty	Beauty + spirit
	Inspiration + education

Building types: The Living Building Challenge is for any building that has been occupied for a minimum of one year.

Technical development and update process: New releases are provided periodically. ILBI sponsors multiple options for feedback on the system: The "Dialogue" supports requests for clarification and feedback, the "Pow Wow" is an informal supplement to the Dialogue, and the "Brain Trust" is an opportunity to share design strategies, tools, etc.[27]

Certification process: The Living Building Challenge has twenty Imperatives organized into seven Petals. The system can be applied to four "Typologies" including renovation, landscape or infrastructure, building, and neighborhood. The building typology is for new or existing roofed and walled structures

[27] International Living Building Institute. 2010. Living Building Challenge 2.0. Seattle, Washington.

created for permanent use. The renovation typology is for projects that do not include a substantial portion of a complete building reconstruction.

As described by the Living Building Challenge, "Renovation projects have 13 Imperatives, Landscape + Infrastructure projects have 16 Imperatives, and Building and Neighborhood projects have 20 Imperatives. For a project to be certified as "Living", all Imperatives assigned to a Typology must be met. The International Living Building Institute also offers partial program certification – 'Petal Recognition' – to projects that satisfy the requirements in three categories of the Living Building Challenge, when at least one is Water, Energy or Materials."[28]

The first step toward Living Building Challenge certification is registration. To register a project you must be a community member. Only registered projects are eligible for direct feedback from the ILBI. Certification is supported on-line and involves review of documentation regarding compliance with the Imperatives and verification of claims during an onsite audit by ILBI certified auditors.[29, 30] There are currently five certified projects. There are over 70 registered projects.[31]

Governance: ILBI is a 501c3 non-profit organization with over 150 funding sponsors.[32] There is a Board of Directors, CEO, and executive staff.[33]

Financial support: Income sources include membership dues, sponsors, and the annual conference. ILBI also receives revenues from registration and certification fees.

Research: ILBI provides online reports and a Building Materials Questionnaire that provides an online questionnaire connecting users with manufacturers and product representatives to learn about a product's attributes.[34]

Outreach: ILBI offers workshops, consultations in terms of charrette facilitation and design development guidance, and educational materials. There is an annual conference and quarterly magazine.[35] ILBI has a training network of volunteers in two categories: Advocates and Ambassadors.[36] Membership is achieved by joining the Living Building Community.[37]

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[28] International Living Building Institute. 2009. Living Building Challenge 2.0 Introduction. (Presentation). Seattle, Washington.
[29] International Living Building Institute. 2010. Living Building Challenge 2.0. Seattle, Washington.
[30] International Living Building Institute. "Join the Living Building Community." Accessed: May 25, 2011. URL: https://secure.ilbi.org/community/registrationpage/
[31] International Living Building Institute. "FAQ." Accessed: May 25, 2011. URL: https://ilbi.org/about/faq
[32] International Living Building Institute. "We are grateful for the generosity of our major contributors. Thank you!." Accessed: May 25, 2011. URL: https://ilbi.org/about/sponsor
[33] International Living Building Institute. "Staff." Accessed: May 25, 2011. URL: https://ilbi.org/about/staff
[34] International Living Building Institute. "Reports." Accessed: May 25, 2011. URL: https://ilbi.org/education/reports
[35] International Living Building Institute. "Education + Resources." Accessed: May 25, 2011. URL: https://ilbi.org/education
[36] International Living Building Institute. "Ambassador Network." Accessed: May 25, 2011 (Community members only). URL: https://ilbi.org/education/ambassador-program
[37] International Living Building Institute. "Join the Living Building Community." Accessed: May 25, 2011. URL: https://secure.ilbi.org/community/registrationpage/

4.0 Certification System Review

Table 4-1 represents a summary list of the EISA review criteria that were used to compare the certification systems, with a detailed list of questions related to the criteria located in Appendix D. Information publicly available and available for purchase was reviewed for each certification system and mapped to each of the review criteria. This information was shared with the certification system owners and they had the opportunity to provide additional information regarding their systems. Appendices E, F, and G contain the compiled information from the publicly available sources and the certification system owners. The information in these tables is color coded and referenced to identify what was independently verifiable or "Owner" provided. The summary tables in this section were built from the information in the appendices, but to know the source of information the appendices must be referenced. Appendices H, I, and J capture the full responses received from each of the certification system owners.

Table 4-1 - Review Criteria

Criteria	Criteria Definition
Independence	Assessors/auditors have no stake in whether a building receives certification.
Availability	Assessors/auditors are available to evaluate a building.
Verification	A documented standard verification method and process must be followed by assessors and auditors.
Transparency	There is documented approach for the review and consideration of public comments.
	Public comments are collected on a regular basis.
	Public comments are reflected in the certification systems.
	Development and updating process of the certification system is documented and publicly available.
Consensus-based	The certification system contains the attributes of a voluntary consensus standards body defined in OMB Circular A-119: openness, balance of interest, due process, an appeal process, and consensus
System Maturity	Certification system is effectively linked to latest tools and standards.
	Certification system has components to track building performance post-occupancy.
	The certification system is used as basis for development of other systems.
	The certification system has been consistently updated overtime.
Usability	Cost of use is affordable.
	Technical knowledge needed to use the certification system is generally available in the design and construction industry.
	The certification system requires professional rigor and judgment rather than leading user to prescriptive solutions.
	The certification system organization provides product support.
	The certification system is well-defined, easily communicated, and clearly understood among multiple parties.
National Recognition	The certification system is recognized academically.
	The certification system is recognized within the buildings' industry (including real estate and construction industry).
	The certification system is recognized within the Federal sector.
Robustness	Certification system ensures the qualification of the certified building.
	Water criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
	Energy criteria meet Federal requirements including commissioning, at the minimum, and are a relevant part of the certification system.
	Material selection criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
	Siting criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
	Renewable energy criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.

Criteria	Criteria Definition
	Indoor air quality criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
	Thermal comfort criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
	Acoustics criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
	Daylighting criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
	Pollutant source control criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
	Low-emission material criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
	Building system controls criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
	Integrated design criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.
	Siting criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.

An “apples-to-apples” comparison of the certification systems is challenging because the development basis is different for each system. Green Globes uses a questionnaire-driven approach to guide the users through the design. LEED uses building codes and standards, and a minimum program requirements approach as its base. The Living Building Challenge uses a philosophy-based approach pushing for advanced building design and operations.

In the following sections a summary of the mapping of the certification systems to the review criteria is provided for each criterion. As mentioned above, Appendices E through J offer additional details for how each system mapped to each criterion.

Following is a key to symbols in Tables 4-2 through 4-9.

●	Solid circle	Meets the criterion
◑	Half circle	Partially meets the criterion, or may meet the criterion but the metrics cannot be compared directly
○	Open circle	Does not meet the criterion or information was not found

4.1 Independence

Although each of the certification systems has a different approach for the independent assessment, all have a documented system in place. Green Globes and Living Building Challenge include a site visit with a review of documentation, where LEED involves only a review of submitted documentation.

Table 4-2 - Independence Criteria

Review Question	Green Globes	LEED	Living Building Challenge
Is an assessor/auditor independently assigned/selected?	● (Yes)	● (Yes)	● (Yes)
How is an assessor or auditor assigned/selected to evaluate a project?	Assessors are selected based on their experience in different assessment areas.	Projects are assigned from a pool of qualified assessors based on their availability and expertise.	Auditors are selected first by expertise, then by location.
Is there a documented appeal process?	● (Yes)	● (Yes)	○ (No)[1]
What is the documented appeal process?	The project team can file a written complaint within 30 days after the date of notification of any action.	The project team can file an appeal within 25 business days of the applicable action.	After initiation there are three written instances for providing supplemental/clarifying data.
Is there an independent review and verification process?	● (Yes)	● (Yes)	● (Yes)
What is the method for evaluation?	The evaluation process includes document review and on-site walk through.	The review process is conducted with LEED Online and occurs in two phases.	The evaluation process includes document review, site visit, and a quality control review.

4.2 Availability

Each of the certification systems evaluates buildings for certification in a different way, but they all address the criteria.

Table 4-3 - Availability Criteria

Review Question	Green Globes	LEED	Living Building Challenge
What is the average length of time for a building evaluation from submission to certification?	● (3 months)	● (3-4 months)	● (1-3 months)
Is there a documented feedback/comment resolution process?	● (Yes)	● (Yes)	● (Yes)
What is the documented feedback and/or comment resolution process?	The reviewer provides a preliminary report, score, and rating to the project team which becomes final if accepted by project team.	The reviewer provides detailed feedback to the project team. Project teams are able to contact GBCI technical staff with additional questions.	There are three written instances for supplemental/clarifying data and one verbal opportunity during the site visit.
Is there a projected evaluation schedule provided online?	● (Yes)	● (Yes)	● (Yes)
How long does it take for a project to receive evaluation feedback at various stages of assessment?	5 weeks of lead time Stage 1 assessment (document review): 3 weeks Stage 2 assessment (site visit): 4-5 weeks	Preliminary review: 25 business days/15 business days for expedited reviews Opportunity for project to respond to request for clarifications: 25 business days	Feedback is provided during the evaluation. The evaluation includes: Institute 'completion check': up to 2 weeks Auditor content review: up

[1] According to the certification system owner the appeal process was published on-line, but it could not be located on the system's website.

Review Question	Green Globes	LEED	Living Building Challenge
		Final review: 15 business days/7 business days for expedited reviews	to 4 weeks Auditor single-day site visit: up to 2 weeks Auditor completes written report: up to 2 weeks Institute quality control review of the report: up to 2 weeks
Does the user get feedback in time?	●	●	●
What is the average time an auditor/assessor spends on each project?	8-32 hours of work	40 hours (range 30-120+ hours)	40-80 hours
How many assessors/auditors are typically involved with a project evaluation? Do larger buildings have more than one assessor? Expertise?	One assessor is assigned to each project unless the project has specific needs.	Typically 3 assessors are assigned per project.	One assessor is assigned for each project.

4.3 Verification

As a measure of quality control, a certifier can be ANSI-accredited, which is intended to provide some additional assurance of objectivity on the part of the certifier. Both GBI and USGBC are ANSI-accredited organizations; ILBI is not. The most obvious operational difference among all the systems is in the area of verification (which is focused on validation of the information provided during the certification process): Green Globes and Living Building Challenge use on-site auditors to augment the certification information received electronically, while LEED bases its certification solely on the information submitted electronically.

Table 4-4 - Verification Criteria

Review Question	Green Globes	LEED	Living Building Challenge
What is the process assessors/auditors use to evaluate a project?	Review process for Green Globes includes document review and on-site walk through.	Review process for LEED can involve a one or two phase review of on-line documentation.	Review process for Living Building Challenge includes review of written documentation, site visit and quality control review.
Do the assessors/auditors verify the information onsite?	●	○	●
	(Yes)	(No)	(Yes)
Are the criteria used by assessors/auditors documented?	●	●	●
	(Yes)	(Yes)	(Yes)
What are the evaluation criteria assessors/auditors use when evaluating a project?	For new construction, the Green Building Assessment Protocol specifies evaluation criteria.	Project documentation for compliance with the published system requirements (credits & prerequisites), published Addenda & LEED Interpretations and other USGBC guidance documents.	The documentation requirements provide a verification method and guidelines.
What tools are used to evaluate the technical information provided by a project?	The Pre-Assessment and Assessment Checklist.	LEED Online assessment tool. LEED online tool.	The auditor is provided guidelines/checklists and a report template with prompts for each Imperative.

Review Question	Green Globes	LEED	Living Building Challenge
Are evaluation needs outside the expertise of the auditor/assessor addressed?	● (Yes)	● (Yes)	● (Yes)
What is the process when evaluation needs are outside an auditor/assessor's expertise?	A senior assessor or member of the technical committee may help address special evaluation needs.	USGBC and its technical committee structure may be used to address unique or complex evaluation needs.	Programmatic assistance may be provided by Institute staff to clarify the intent of an Imperative. Content assistance may be provided by the associated Petal Committee to clarify the project's applied solution.

4.4 Transparency

The only noticeable difference among the systems relative to the transparency criteria was with the Living Building Challenge, which only allows its community members access to some feedback information.

Table 4-5 - Transparency Criteria

Review Question	Green Globes	LEED	Living Building Challenge
Are there methods to collect and address public comments?	● (Yes)	● (Yes)	○ (Living Building Challenge subscribers community only)
What methods are used to collect and address public comments?	Comments are collected through periodic public comment forums.	Revised certification systems are open for public comment for at least 45 days.	Comments are collected online through the Dialogue Forum and the Feedback Form.
How frequently are public comments collected?	During the development of the ANSI/GBI Standard[2]	Annually for minor updates and every three years for major revisions	Comments are incorporated whenever they are reviewed and approved
Are public comments incorporated into the revision process?	● (Yes)	● (Yes)	● (Yes)
How are public comments incorporated into the certification system revision process?	Public comments and committee responses are posted at GBI's website.	Comments are evaluated through a formal process and posted, with responses, on USGBC's website.	The Living Building Challenge, the Dialogue activity and completed Feedback Forms are reviewed and comments integrated as appropriate.
Are the changes documented and accessible by the public?	● (Yes)	● (Yes)	○ (Living Building Challenge subscribers community only)
Where are certification system changes documented?	Meeting minutes of the Consensus Body are posted on GBI's website.	Summary of changes and committee meeting minutes are posted on USGBC's website.	Changes can be viewed online by members through the Dialogue Forum.

[2] No information provided from certification system owner regarding update schedule.

4.5 Consensus

The primary differences noted between the systems among the consensus criteria are:

- Green Globes is an ANSI standard
- LEED pilots revisions before releasing new versions, while Green Globes releases a new version and relies on the first buildings to use the new version as pilots. Living Building Challenge does not have a published pilot process
- Living Building Challenge does not align with the criterion's definition of a consensus-based development process. Owner feedback from the Living Building Challenge expressed that transparency is the goal of its certification system and that a consensus-based approach can be "disingenuous."

Table 4-6 - Consensus Criteria

Review Question	Green Globes	LEED	Living Building Challenge
Who has been involved in the development, funding, and management of the certification system - Government, Private Industry, Non-Governmental Organizations, and others?	GBI is governed by a group of stakeholders representing construction companies, industry, architectural firms, and academic institutions.	USGBC is organized around volunteer committees. The committee members come from various types of organizations.	Living Building Challenge was developed and is managed by the International Living Building Institute.
What has been the role and commitment in the development, funding, and management of the certification system by Government, Private Industry, Non-Governmental Organizations, and others?	GBI is responsible for development, management, and funding. GBI was accredited as a Standards Developing Organization (SDO) by the American National Standards Institute (ANSI) in September of 2005. Green Globes is an ANSI standard as of 2010.	Multiple LEED committees play different roles in development and management. USGBC was accredited as ANSI Standards Developer in 2006.	The Institute is responsible for management, development, and funding. Government Agencies and Private Organizations have participated in certification system development.
Was the certification system developed using a consensus-based approach?	●	●	○
	Yes	Yes	No, expert opinion
How are points allocated?	No information was found on how points were weighted.	The allocation of points is split between direct human benefit and direct environmental benefit. The types of impacts are quantified and the resulting allocation of points among credits is called credit weighting.	Living Building Challenge does not use a point-based system.
Are credits or points pilot tested before publication	◑	●	○
	(Pilot projects launched after certification system published.)	(Yes)	No
How are credits or points tested?	GBI is undertaking a limited pilot assessment and certification program.	LEED Pilot Credit Library is used to test proposed or revised LEED credits.	Living Building Challenge does not use a point-based system.
How are different opinions managed?	Differing opinions are managed by the technical committee and in accordance with the GBI Procedures for the	Any party may appeal to the USGBC Executive Committee of the Board and within 30 calendar days of the action.	Use the online Dialogue activity and completed Feedback Forms to manage and document opinion discussion.

Review Question	Green Globes	LEED	Living Building Challenge
	Development and Maintenance of Green Building Standards (GBI-PRO 2005-5)		
Is there a written procedure for managing different opinions?	●	●	●
	(Yes)	(Yes)	(Yes)
Are there third-party reviewers/moderators of the process?	●	●	○
	(Yes)	((Yes)	(No)

4.6 Usability

The publicly available information and certification system owner's responses to questions regarding the cost of certification and availability of services are summarized in Table 4-7. Generally speaking the cost of certification is similar for each of the systems and each system describes a set of technical assistance tools for users.

Table 4-7 - Usability Criteria

Review Question	Green Globes	LEED	Living Building Challenge
What are the direct costs of using the certification system, including materials, registration, and certification fees?	Certification fee: $2,500-22,000 Assessor Travel Expenses: $1,500 Additional analysis fees: $1,000-3,500 Software subscription: $500-2,000	Registration fee: $1200-1500 Certification fee: $1,500-27,500 Reference Guide: $195	Registration fee: $250-1,000 Certification fee: $1,500-25,000 Subscription fee: $125-3,500
What is the availability and responsiveness of direct requests for assistance, availability of training, and usability of information available on the website, through case studies, documented inquiries, and frequently asked questions.	GBI offers several resources for customers including: an online system, which allows customers to keep up-to-date entries, as well as provides instant feedback. There is an FAQ page, case studies, a virtual tour of the software, and a "contact us" page on the website. GBI provides live web seminar events on specific topics and personnel certification.	USGBC develops tools to support the LEED rating system, including reference guides, LEED Online, and workshops and educational courses. These supporting tools are regularly updated to reflect the changes made during LEED development cycles. The various market sectors that use LEED have individual resource pages.	Living Building Challenge offers case studies on the website, educational programs and resources, including public and in-house workshops, technical assistance, and the ability to request a speaker. Users can access the Contact webpage for assistance with specific questions. The Dialogue is a primary way for project teams to receive direct programmatic guidance from Institute staff.

To gain a certification system user perspective, nine Federal green building professionals were interviewed, representing five Federal agencies. Other Federal green building professionals were contacted but were not available for an interview during the interview timeframe. Collectively, these professionals had experience with all of the certification systems included in this review, with most of their experience being with LEED products. The user experience level ranged from six months to 14 years using green building design and certification systems. User comments were highly variable from

person to person and should not be assumed to represent the full experiences of the green building certification system market. User perceptions and anecdotal comments are interesting, but not based on the certification systems records, and are treated as experiential commentary in this report.

The more experience users had, the more the certification systems were described as tools that can be used to support the development of high performing buildings, rather than the mechanism that is directly responsible for green building design and operations. The systems were referred to as 'checklists of things to do to gain recognition,' which in itself has value, but is not necessary to meet the Federal requirements.

Overall, the users stated that the use of certification systems helped the agencies meet the Federal green building requirements, while recognizing that none of the certification systems are directly aligned with all of the current requirements. More than one person expressed an interest in having a certified building being automatically recognized as meeting the Guiding Principles to minimize the additional tracking and documentation needed to complete both. Users also noted that design and construction contractors have a better understanding of certification systems than of the current Federal requirements.

A general benefit identified by the users was how certification systems help "push" users toward integrated design because of the need to collaborate with others to meet the system requirements. A general barrier was the documentation that is required for certification systems. Related to the documentation barrier was the user comment that certification was not necessary because key design elements are already required for federal agencies. In contrast, other users stated that they believed full certification was needed to confirm that green building design features and operations actions were actually incorporated into the building. Users also noted that a certification system label was not a guarantee of building performance. Several users expressed that familiarity with a certification system makes it easier to use.

Users with Green Globes experience stated that the documentation was not time intensive, and the format was not rigid. Users commented that it was "user-friendly" because of the lower level of detail needed for certification. Multiple users commented that they preferred the Green Globes customer service model, as it provided direct interaction with GBI staff who were responsive to questions. The on-site review of the building was mentioned as an effective certification mechanism. One user commented that the cost to certify used to be less expensive, which seemed more commensurate with the rigor. For this user, the change in certification cost structure from individual building to the cost per square foot model increased the cost for certification and decreased their interest in the system. Another user commented they thought the link to the Guiding Principles "was not close enough."

Users with LEED experience stated that the guidance documents, on-line tools, on-line collaboration pages, USGBC webpage, GBCI webpage, credit interpretations, and the case studies were helpful design tools and useful for facilitating certification. One user commented they had experienced poor, non-responsive customer service, where others stated that they had received quick, highly-responsive customer service. Several users commented that customer service had significantly improved over the last two years with GBCI in charge. The volume program and the requirement to document certified buildings' performance were highlighted by users as potentially useful tools in the future. The detail and inflexibility of the certification documentation was identified as a barrier because it can result in an agency duplicating effort to report on Federal requirements. One user stated that the documentation can take time away from improving the quality of the building design and operations and that the expertise

needed to use the certification system is greater than the benefit of certification. One user commented that they thought LEED was more stringent than the Federal requirements.

Users with Living Building Challenge experience identified its strengths as having fewer documentation requirements and an emphasis on performance that was lacking in the other certification systems. Additionally, the case studies provided on the website were useful for providing design ideas for other buildings trying to accomplish sustainable design. However, users also stated that the minimum requirements for meeting the Living Building Challenge are 'not easy' and that the system is not yet recognized as mainstream.

Although it was recognized by the certification system users that the systems alone do not meet the Federal requirements, they stated that the psychology of certification systems provide motivation to design and operate high-performance, sustainably designed buildings.

4.7 National Recognition

LEED has been in the market longer that the other systems (LEED was launched in 1999, Green Globes in 2006, and Living Building Challenge in 2006). LEED features the most certified buildings and the greatest number of locales requiring its use. However, each of these systems are known and in use in the green building market.

Table 4-8 - National Recognition Criteria

Review Question	Green Globes	LEED	Living Building Challenge
Is the certification system included in the curriculum of the top 20 architectural schools?[3]	● (Yes) GBI allowed professors to develop green building curriculum using Green Globes in architecture classes and encouraged student collaboration projects previously with Clemson, Cal Poly, Poloma, Stanford, Cooper Union, Arizona State University, University of Arkansas and University of Florida.	● (Yes) LEED is included in the sustainable courses in Cornell, Syracuse, University of Texas, and University of Oregon.	● (Yes) Living Building Challenge is being used in the curriculum at K-12 institutions as well as in college courses at the undergraduate and graduate levels.
How many students are involved? (Attending conferences or training, becoming assessors or green building professionals, etc.)	GBI participates in an annual EPA higher education building competition.	Approximately 1250 students attend the annual USGBC Greenbuild conference. USGBC has a network of 70 student groups representing 1600 students. From May 2009-August 2011, over 1400 students became LEED professionals	60 student subscribers. 11 student groups entered the Living City Design Competition. 80 students participated in 2010 conference.

[3] American Institute of Architects. 2011. "AIA's top undergraduate and graduate architecture schools." Accessed: July 6, 2011. URL: http://archrecord.construction.com/features/0911BestArchSchools/0911BestArchSchools-2.asp

Review Question	Green Globes	LEED	Living Building Challenge
Is the certification system recognized within the building industry?	●	●	●
What is the adoption rate at the State level?	23 states	35 states	0 state
What is the adoption rate at the County level?	15 counties	58 counties	1 county
What is the adoption rate at the City level?	3 cities	384 cities	0 city (referred by cities, but no adoption)
How many buildings have signed up to participate in the certification system?	2,671	31,696	87
How many buildings have been awarded certification?	176	10,000	4
How many professionals are involved?	173	162,456	Thousands of building industry professionals are involved.
How many institutional/group members?	9 affiliates, 13 associate members	More than 5,000	More than 150 sponsors and recognized by 2 professional associations
Is the certification system recognized within the Federal sector?	●	●	●
How many Federal agencies have identified the system as guidance or a requirement?	9	14	3
How many Federal buildings have been certified?	40	519	0
Does the system address the building types which account for a majority of Federal space?	Yes	Yes	Yes

4.8 System Maturity

There are three differences among the certification systems with regard to the system maturity criteria.

- All three certification systems have at least an option, if not a requirement, for submitting energy performance criteria, but Green Globes does not require it for the prescriptive path option.
- Neither Green Globes nor LEED have a requirement for transferring new construction certifications into existing building certifications.
- Neither Green Globes nor Living Building Challenge identified an established development cycle.

Table 4-9 - System Maturity Criteria

Review Question	Green Globes	LEED	Living Building Challenge
How do the tools and standards within the certification system compare to current versions of standards and latest industry tools?	Efforts were made throughout the process to ensure that the standards were compatible wherever possible.	As LEED evolves it adopts the latest versions of codes and standards. Due to several standards being included in the	Living Building Challenge requirements are more advanced than the current standards.

Review Question	Green Globes	LEED	Living Building Challenge
		LEED guides, a change to one of the standards will not spur an immediate revision to LEED.	
How frequently are the certification systems and referenced standards and tools updated?	Every 5 years.	Update occurred in 2000, 2002, 2005, and 2009.	Updates occurred in 2006, 2008, and 2009.
Does the certification system allow for the evaluation of an existing building?	●	●	●
	(Yes) Green Globes CIEB evaluates existing buildings.	(Yes) LEED EB evaluates existing buildings.	(Yes) Living Building Challenge can be used for both new construction and existing buildings.
Is there a requirement for post occupancy data collection once a building has been certified?[4]	◑	●	●
	Green Globes NC Energy performance path requires post occupancy data through Energy Star. The prescriptive path does not require post occupancy data.	LEED 2009 requires projects to commit to supplying all available whole-project energy and water usage data for a period of at least 5 years post-certification.	Living Building Challenge certification is based on measured post occupancy performance.
Is there a mechanism to transfer the certification of a new building to an existing building over time?	○	○	●
	(No)	(No)	There is no separate certificate for new construction and existing building; no transfers required.
How many other systems refer to the certification system or the certification organization as its basis for development or comparison?	None	10	6
When was the certification system developed, first used, first available for public use, and when was most recent revision completed?	The first US version was developed in 2006 and launched in 2010. It is the most current version.	The first version was developed and launched in 1998. The most current version was completed in 2009.	The first version was developed in 2005 and launched in 2006. The most current version was completed in 2009.
What is the frequency of changes?	○	●	○
	(No development cycle was identified.)	(Every 3 years)	(No development cycle was identified.)

4.9 Robustness

The "robustness" criterion contains a set of measures intended to assess how each system aligns with Federal performance requirements.[5, 6, 7, 8] Building performance is an important current focus in the Federal sector, and this multi-part criterion compares the legal requirements applicable to the Federal real

[4] Post occupancy data collection expectations in the Federal sector involve metrics beyond energy.
[5] Office of Management and Budget. December 2008. High-performance Sustainable Design Guidance. Developed by the Interagency Sustainability Working Group. URL: http://www.wbdg.org/pdfs/hpsb_guidance.pdf
[6] Public Law 110–140—DEC. 19, 2007. Energy Independence and Security Act of 2007. (EISA)
[7] Executive Order 13423—Strengthening Federal Environmental, Energy, and Transportation Management, January 26, 2007, Federal Register Vol. 72, No. 17, pages 3919-3923.
[8] Executive Order 13514—Federal Leadership in Environmental, Energy, and Economic Performance, October 8, 2009, Federal Register Vol. 74, No. 194, pages 52117-52127.

estate portfolio against each certification system's technical components (such as energy, water, siting, etc.). Table 4-11 and 4-12 (new construction) and Tables 4-14 and 4-15 (existing buildings) illustrate how the systems align to the robustness measures. Following is a key to symbols used in the robustness criterion.

- Full circles (green) mean that the Federal requirement would automatically be met if the building was certified because the system and Federal requirements fully align, and the system component is mandatory to achieve certification.
- Three-quarter circles (green) mean that the certification system has an option (e.g., point, credit, etc.) that meets the Federal requirement; if that option is included in the certification package, the Federal requirement would be met.
- A half circle (yellow) means the certification system includes an option related to but not directly aligned with the Federal requirement. The certification systems may have a lower standard, different baselines, different calculation methods, or different ways to document compliance with the Federal requirement.
- An empty circle means the Federal requirement is not an identified component within the certification system.

The difference between the three-quarter circle and full circle can be communicated by a waste and materials management example. The Federal requirement is for at least 50% of construction and demolition materials to be recycled. In Green Globes, if the building receives 4 of the 6 possible points, the Federal requirement will be met. In LEED, if at least 1 of the 2 possible credits is achieved, the Federal requirement will be met. The half circle symbol can be illustrated by using a daylighting example. The Federal requirement is to achieve a minimum daylight factor of 2 percent in 75 percent of all space occupied for critical visual tasks. All three systems address daylighting, but in different ways, which is why they received a half circle. In Green Globes points are available for designing primary spaces to receive indirect minimum daylight illumination levels of 25 footcandles. In LEED a point is available for designing regularly occupied spaces achieve daylight illuminance levels of a minimum of 25 footcandles and a maximum of 500 footcandles. In Living Building Challenge it requires that every occupiable space provides access to daylight.

In addition to the certification systems having a different basis of development, they also have different strategies for achieving similar goals. In some cases within a certification there will be multiple paths or approaches for achieving a goal. To manage the quantity of options in this review, generally speaking the first option was selected. An example of the different options is energy use for new construction. Green Globes and LEED have performance and prescriptive path options, where Living Building Challenge requires measured energy use data for 12 months. Summaries of the performance and prescriptive paths for Green Globes and LEED illustrate the complexity involved in a side-by-side comparison of the systems (Table 4-10). The first path or option for both compares the projected energy use to a baseline, where the prescriptive approaches require specific actions to be taken.

Table 4-10 – Summary of Green Globes and LEED Energy Point Paths/Options

Point Comparison			
Green Globes	8.1 Performance Path A (300/1000 points) 50% reduction in carbon dioxide equivalent emissions compared to the baseline. Baseline energy use is calculated using Energy Star Target Finder score of 50.	8.2 Prescriptive Path B (250/1000 points) User chooses from list of specific design options to achieve points.	
LEED	Option 1 Whole Building Energy Simulation (19/110 points) Percent reduction in modeled energy use compared to the baseline. Baseline energy use is simulated according to Appendix G of ASHRAE 90.1-2007.	Option 2 Prescriptive Compliance Path: ASHRAE Advanced Energy Design Guide (1/110 points) Compliance with all applicable criteria in Guide is required.	Option 3 Prescriptive Compliance Path: Advanced Buildings Core Performance Guide (3/110 points) Compliance with all applicable criteria in Guide is required.

Although none of the certification systems are identical to the Federal requirements, users have expressed that systems offer a useful framework for tracking and/or documenting progress toward meeting the requirements. If an agency identifies a certification system as an alternative to meeting the Guiding Principles and Office of Management and Budget approves that alternative, the certification system documentation is/becomes sufficient evidence for meeting the Guiding Principles (as is the case with the Department of Energy).[9] If that equivalent does not exist for an agency, then specific documentation to demonstrate the building met the Guiding Principles may need to be prepared in addition to certification system documentation.

The certification systems include elements that are not identified in the Guiding Principles. For example, Green Globes has points that address clean diesel practices, bird collisions, and asbestos management. LEED has credits that address light pollution, priorities that vary by geographic region, and purchasing of sustainable food. Living Building Challenge has a materials "red list" (prohibiting use of specific materials) and requires the building address beauty and inspiration.

New Construction and Major Renovation

The robustness criterion includes a set of measures intended to assess how each system aligns with Federal performance requirements. The robustness criterion for new construction includes 27 Federal requirements (source requirement documents in parentheses):

1. Integrated Design (Guiding Principles)
2. Commissioning (Guiding Principles, EISA)
3. Indoor Water (Guiding Principles, EPAct, EO 13423, EISA, EO 13514)
4. Process Water (Guiding Principles, EPAct)
5. Outdoor Water (Guiding Principles, EO 13423, EISA, EO 13514)

[9] U.S. Department of Energy. 2010. Strategic Sustainability Performance Plan: Discovering Sustainable Solutions to Power and Secure America's Future. U.S. Department of Energy, Washington, DC. URL: http://energy.gov/downloads/2010-doe-strategic-sustainability-performance-plan-report-white-house-council

6. Storm Water (Guiding Principles, EISA, EO 13514)
7. Water-Efficient Products (Guiding Principles, EO 13514)
8. Energy Efficiency (Guiding Principles, EPAct, EO 13423, EISA)
9. On-Site Renewable Energy (Guiding Principles, Executive Order 13423, EISA)
10. Measurement and Verification (Guiding Principles, EPAct, EISA)
11. Benchmarking (Guiding Principles)
12. Recycled Content (Guiding Principles, Resource Conservation and Recovery Act, EO 13514)
13. Biobased Content (Guiding Principles, Farm Security and Rural Investment Act, EO 13514)
14. Environmentally Preferable Products (Guiding Principles, EO 13514)
15. Waste and Materials Management (Guiding Principles, EO 13514)
16. Ozone Depleting Compounds (Guiding Principles, Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990)
17. Low-Emitting Materials (Guiding Principles, EO 13514)
18. Ventilation (Guiding Principles)
19. Thermal Comfort (Guiding Principles)
20. Daylighting (Guiding Principles)
21. Environmental Tobacco Smoke Control (Guiding Principles)
22. Protect Indoor Air Quality during Construction (Guiding Principles)
23. Moisture Control (Guiding Principles)
24. Acoustic (EISA)
25. Building System Controls (EISA)
26. Siting (EISA)
27. Greenhouse Gas (EISA)

Each certification system was mapped to the robustness criteria for new construction. Table 4-11 and Table 4-12 reflect Federal requirements for new construction and major renovations. The following is a summary of that mapping.

Green Globes aligns at some level with more of the Federal requirements (25) than any other new construction system in this review:

- Green Globes has no points that are specifically required; thus, an examination of the points achieved on each individual project is required in order to determine which Federal requirements would be met by certification.

- Ten of the Federal requirements would be fully met through the Green Globes system if these points are selected by the user and achieved.

- Fifteen requirements may be met if points are achieved and documentation is adapted to conform to the Federal requirement.

- The Green Globes system does not include two of the Federal requirements (benchmarking and building system controls).

LEED aligns at some level with 20 Federal requirements:

- Four Federal requirements would be automatically met if certification is achieved because LEED has minimum requirements that must be met before any level of certification can be attained, called prerequisites. The prerequisites do not add to the total number of points needed to achieve certification.

- Seven of the Federal requirements would be fully met through the LEED system if these credits are selected by the user and achieved.

- Nine of the Federal requirements may be met if the credits are achieved and documentation is conformed to match the Federal requirements.

- The LEED system does not include seven of the Federal requirements (integrated design, process water, benchmarking, moisture control, acoustics, building system controls and greenhouse gas emissions).

The Living Building Challenge aligns at some level with 14 Federal requirements:

- The Living Building Challenge requires that buildings meet 100% of the system's design and operations strategies (many of which exceed Federal targets), so these twelve Federal requirements would be met automatically if certification is achieved.

- Three of the Federal requirements could be met if documentation or tracking is changed to conform to Federal requirements.

- The Living Building Challenge system does not include thirteen of the Federal requirements (integrated design, commissioning, water efficient products, measurement and verification, benchmarking, recycled content, biobased content, thermal comfort, moisture control, indoor air quality protection during construction, acoustics, building system controls, and greenhouse gas).

Table 4-11 summarizes how each system aligns with Federal requirements, based on the total number of points or credits available; it does not reflect how these points or credits may be accumulated to achieve different levels of certification. The Green Globes and LEED certification systems are "tiered," meaning that they require a minimum number of points or credits to be achieved for a base level of certification, with higher levels of certification available based on accumulation of additional points or credits. Table 4-12 reflects how each system aligns with each of the 27 Federal requirements.

Table 4-11 - Summary of Robustness Criteria for New Building Construction

Certification System	Federal Requirement Met	Federal Requirement Met if Point Achieved	Federal Requirement Could be Met	Not Specifically Mentioned
Green Globes	0	10	15	2
LEED	4	7	9	7
Living Building Challenge	12	0	3	12

Table 4-12 reflects how each system aligns with each of the 27 Federal requirements for new construction.

Table 4-12 - Robustness Criteria for New Building Construction

	GG NC	LEED NC	LBC NC
Robustness - Others			
Integrated Design	◑	○	○
Commissioning	◕	●	○
Robustness - Water			
Indoor Water	◕	●	●
Process Water	◑	○	●
Outdoor Water	◑	◕	●
Storm Water	◕	◕	●
Water-Efficient Products	◑	◑	○
Robustness - Energy			
Energy Efficiency	◑	◕	◑
On-Site Renewable Energy	◑	◑	◑
Measurement and Verification	◕	◕	○
Benchmarking	○	○	○
Robustness - Materials			
Recycled Content	◑	◑	○
Biobased Content	◑	◑	○
Environmentally Preferable Products	◑	◑	●
Waste and Materials Management	◕	◕	●
Ozone Depleting Compounds	◑	◑	●
Low-Emitting Material	◕	◕	●
Robustness - Indoor Environment			
Ventilation	◑	●	●
Thermal Comfort	◑	◑	○
Daylighting	◑	◑	◑
Environmental Tobacco Smoke Control	◑	●	●
Moisture Control	◕	○	○
Protect Indoor Air Quality during Construction	◑	◑	○
Robustness - Not in GP			
Acoustic (Not in GP)	◕	○	○
Building System Controls (Not in GP)	○	○	○
Siting (Not in GP)	◕	◕	●
Greenhouse Gas (Not in GP)	◕	○	○

Table 4-13 is in response to the review question: *What percentage of the certification system is represented by this metric?* Note that the Living Building Challenge is not included in this table because it is not a point-based system.

Table 4-13 - Percentage Represented for NC

Certification System Components	Green Globes		LEED New Construction	
	Minimum Percentage	Maximum Percentage	Prerequisites	Maximum Percentage
Siting	6%	12%	2	24%
Energy	7%	30%	3	41%
Water	4%	13%	1	9%
Materials	4%	15%	1	13%
Indoor Environment	5%	16%	3	14%
Emissions	0.4%	5%	n/a	0%
Management	3%	10%	n/a	0%
Other	n/a	n/a	n/a	9%

Existing Building

The robustness criterion for existing buildings includes 28 Federal requirements (source requirement documents in parentheses):

1. Integrated Assessment, Operation, and Management (Guiding Principles)
2. Commissioning (Guiding Principles, EISA)
3. Indoor Water (Guiding Principles, EPAct, EO 13423, EISA, EO 13514)
4. Outdoor Water (Guiding Principles, EO 13423, EISA, EO 13514)
5. Storm Water (Guiding Principles, EISA, EO 13514)
6. Process Water (Guiding Principles, EPAct)
7. Water-Efficient Products (Guiding Principles, EO 13514)
8. Energy Efficiency (Guiding Principles, EPAct, EO 13423, EISA)
9. On-Site Renewable Energy (Guiding Principles, Executive Order 13423, EISA)
10. Measurement and Verification (Guiding Principles, EPAct, EISA)
11. Benchmarking. (Guiding Principles)
12. Ventilation (Guiding Principles)
13. Thermal Comfort (Guiding Principles)
14. Moisture Control (Guiding Principles)
15. Integrated Pest Management (Guiding Principles)
16. Daylighting (Guiding Principles)
17. Low-Emitting Materials (Guiding Principles, EO 13514)
18. Protect Indoor Air Quality during Construction (Guiding Principles)
19. Environmental Tobacco Smoke Control (Guiding Principles)
20. Recycled Content (Guiding Principles, Resource Conservation and Recovery Act, EO 13514)
21. Biobased Content (Guiding Principles, Farm Security and Rural Investment Act, EO 13514)
22. Environmentally Preferable Products (Guiding Principles, EO 13514)
23. Waste and Materials Management (Guiding Principles, EO 13514)
24. Ozone Depleting Compounds (Guiding Principles, Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990)
25. Acoustic (EISA)
26. Building System Controls (EISA)

27. Siting (EISA)
28. Greenhouse Gas (EISA)

Each certification system was mapped to the robustness criteria for existing buildings. Table 4-14 and Table 4-15 reflect Federal requirements for existing buildings. The following is a summary of that mapping.

Green Globes CIEB aligns at some level with 22 Federal requirements:

- Green Globes CIEB has not points that are specifically required, thus, an examination of the points achieved on each individual project is required in order to determine which Federal requirements would be met by certification.
- Eight of the requirements would be fully met through the Green Globes CIEB system if these points are selected by the user and achieved.
- Fourteen requirements may be met if points are achieved and documentation is adapted to conform to the Federal requirement.
- The Green Globes CIEB system does not include six of the Federal requirements (commissioning, recycled content, biobased content, low emitting materials, siting, and building system controls).

LEED EBO&M aligns at some level with more of the Federal requirements (27) than any other existing building system in this review:

- One of the Federal requirements would be automatically met if certification is achieved because LEED EBO&M has minimum requirements that must be met before any level of certification can be attained, called prerequisites.
- Sixteen of the requirements would be fully met through the LEED EBO&M system if these credits are selected by the user and achieved.
- Ten requirements may be met if points are achieved and documentation is adapted to conform to the Federal requirement.
- The LEED EBO&M system does not include one of the Federal requirements (greenhouse gas emissions).

The Living Building Challenge aligns at some level with seventeen Federal requirements:

- The Living Building Challenge requires that buildings meet 100% of the system's design and operations strategies (many of which exceed Federal targets), so these twelve Federal requirements would be met automatically if certification is achieved.
- Five of the Federal requirements may be met if documentation or tracking is adapted to conform to the Federal requirement.

- The Living Building Challenge system does not include eleven of the Federal requirements (commissioning, water use, stormwater, water efficient products, measurement and verification, recycled content, biobased content, thermal comfort, integrated pest management, moisture control, acoustics and building system controls.)

Table 4-14 summarizes how each system aligns with Federal requirements, based on the total number of points or credits available; it does not reflect how these points or credits may be accumulated to achieve different levels of certification. As noted above, in practice the Green Globes and LEED certification systems are "tiered," meaning that they require a minimum number of points or credits to be achieved for a base level of certification, with higher levels of certification available based on accumulation of additional points or credits.

Table 4-14 - Summary of Robustness Criteria for Existing Buildings

Certification System	Federal Requirement Met	Federal Requirement Met if Point Achieved	Federal Requirement Could be Met	Not Specifically Mentioned
Green Globes	0	8	14	6
LEED	1	16	10	1
Living Building Challenge	12	0	3	13

Table 4-15 reflects how each system aligns with each of the 28 Federal requirements for existing buildings.

Table 4-15 - Robustness Criteria for Existing Buildings

	GG CIEB	LEED EB	LBC Ren
Robustness - Others			
Integrated Assessment, Operation and Management	◑	◑	◑
Commissioning	○	◑	○
Robustness - Water			
Indoor Water	◑	◕	●
Process Water	◑	◑	●
Outdoor Water	◑	◕	●
Measurement of Water Use	◑	◑	○
Stormwater	◕	◕	○
Water-Efficient Products	◑	◑	○
Robustness - Energy			
Energy Efficiency	◕	◕	◑
On-Site Renewable Energy	◕	◕	◑
Measurement and Verification	◑	◑	○
Benchmarking	◕	◕	●
Robustness - Materials			
Recycled Content	○	◕	○
Biobased Content	○	◕	○
Environmentally Preferable Products	◕	◕	●
Waste and Materials Management	◕	◕	●
Ozone Depleting Compounds	◑	◕	●
Robustness - Indoor Environment			
Ventilation	◑	●	●
Thermal Comfort	◕	◕	◑
Integrated Pest Management	◑	◑	○
Daylighting	◑	◑	◑
Environmental Tobacco Smoke Control	◑	◕	●
Moisture Control	◑	◕	○
Low-Emitting Material	○	◑	●
Robustness - Not in Guiding Principles			
Acoustic (Not in GP)	◕	◑	○
Building System Controls (Not in GP)	○	◕	○
Siting (Not in GP)	○	◕	●
Greenhouse Gas (Not in GP)	◑	○	●

Table 4-16 is in response to the review question: *What percentage of the certification system is represented by this metric?* Note that the Living Building Challenge is not included in this table because it is not a point-based system.

Table 4-16 - Percentage Represented for Existing Buildings

Certification System Components	Green Globes CIEB	LEED EBO&M	
	Maximum Percentage	Pre-requisites	Maximum Percentage
Siting	n/a	n/a	24%
Energy	35%	3	32%
Water	8%	1	13%
Materials	11%	2	9%
Indoor Environment	19%	3	14%
Emissions	18%	n/a	n/a
Management	10%	n/a	n/a
Other	n/a	n/a	9%

"Measured performance" is important to the Federal sector because outside of the sustainable design requirements many Federal reporting requirements are based on actual performance, such as the EISA requirement for federal agencies to reduce energy intensity by 3 percent per year, or 30 percent by FY 2015. Federal agencies have begun to measure the performance of sustainably designed buildings using an established protocol for building cost and performance.[10] For example, GSA's study of 22 buildings shows that on average "green" buildings use less energy, less water, cost less to operate, and have occupants that express general satisfaction scores higher than typical buildings, with additional studies underway using the same measurement protocol.[11] Performance measurement averages are useful as a portfolio metric but when investigating the performance of individual buildings it is important to note that there is high variability in performance.[12]

To document progress toward sustainable design and operations, measuring, calculating, or demonstrating evidence of intent are all legitimate mechanisms, however it is generally perceived that measured performance is preferred and something the Federal sector is already doing.[13] Metered energy and water performance data are the most commonly sought forms of measured building performance data, however, quantities of recycled materials, waste generation, and indoor air quality measurements are also examples of measured performance. Calculated performance typically serves as a proxy for measured, using industry standards and assumptions to estimate or project how a building will perform. When measured data is limited, calculated performance provides useful, comparative values that can be used to support design and operational decisions. Evidence of intent is a useful proxy for documenting frameworks that facilitate potentially impactful actions. For example, having an Environmental Management System is a positive indicator that building operations will address commonly identified operational impacts of the building and its occupants.

The Guiding Principles were reviewed for whether they required measured performance data (e.g., energy consumed), calculated values (e.g., energy models), or evidence of intent (e.g., energy policy). Table 4-17 and Table 4-18 illustrate that the documentation required to meet the Guiding Principles is

[10] Fowler KM, EM Rauch, AR Kora, JE Hathaway, AE Solana, and KL Spees. 2009. Whole Building Cost and Performance Measurement: Data Collection Protocol, Revision 2. PNNL-18325, Pacific Northwest National Laboratory, Richland, WA. http://www1.eere.energy.gov/femp/pdfs/datacollectionprotocol.pdf

[11] Fowler KM, EM Rauch, JW Henderson, and AR Kora. 2010. Re-Assessing Green Building Performance: A Post Occupancy Evaluation of 22 GSA Buildings. PNNL-19369, Pacific Northwest National Laboratory, Richland, WA.

[12] Turner, C, and M Frankel. 2008. Energy Performance of LEED for New Construction Buildings. New Buildings Institute, White Swan, WA.

[13] U.S. Government Accountability Office. 2011. Green Building: Federal Initiatives for the Nonfederal Sector Could Benefit from More Interagency Collaboration. GAO-12-79. Government Accountability Office, Washington, DC.

primarily evidence of intent for both new construction and existing buildings. The majority of the Guiding Principles can be documented using evidence of intent. The certification systems tend to require more measurement and calculation than is required by the Guiding Principles. Appendix K contains a preliminary mapping of whether each certification system element uses measurement, calculation or evidence of intent to document compliance.[14]

[14] This mapping has not been reviewed by certification system owners.

Table 4-17 - Measured, Calculation, and Evidence of Intent Assessment of Guiding Principles for New Construction

Guiding Principles New Construction and Major Renovations		GG	LEED	LBC
Site				
I	Reduce stormwater runoff	I	I	I
Water				
C	Indoor water use reduction	C	C	M
I	Installation of water meters is encouraged for indoor water use			
I	Consider use of harvested rainwater	C	C	M
C	Outdoor water use reduction	I	C	M
I	Installation of water meters is encouraged for outdoor water use			
I	Reduce process water when life cycle cost effective	C		
I	Specify WaterSense products	I	I	
I	Use certified irrigation system installers when available			
Energy				
C	Energy use reduction	C	C	M
I	Use EnergyStar or FEMP products when available			
C	Solar hot water system, when cost effective	C	C	M
I	Renewable energy	C	C	M
I	Install meters	I	I	M
M	Benchmark energy performance			
I	Commissioning	I	I	
Indoor Environment				
I	Meet ASHRAE 55	C	C	I
I	Meet ASHRAE 62.1	C	C	I
I	Moisture Control	I	I	I
C	Daylighting	C	C	
C	Lighting controls	C	C	
I	Specify low emitting materials		I	I
M	Indoor air quality and construction	M	M	
I	No smoking policy		I	I
Resources/Materials				
I	Specify recycled content materials	M	M	C
I	Specify biobased content materials	M	M	M
I	Specify environmentally preferable materials	M	M	I
I	Design-in recycling container space	I	I	M
C	Construction waste management	M	M	M
M	Eliminate use of ozone depleting substances	M	M	M

Table 4-18 - Measured, Calculation, and Evidence of Intent Assessment of Guiding Principles for Existing Buildings

Guiding Principles Existing Buildings		GG	LEED	LBC
Site				
I	Reduce stormwater runoff	I	C	
Water				
M	Indoor water use reduction	M	M	M
I	Installation of water meters is encouraged	M	M	
C	Outdoor water use reduction (measured option exists)	I	C	M
I	Reduce process water when life cycle cost effective	I	C	
I	Specify WaterSense products	C	C	
I	Use certified irrigation system installers when available			
Energy				
M	Energy use reduction (options exist for a calculation method)	M	M	M
I	Use EnergyStar or FEMP products when available			
I	Renewable energy	M	C	M
I	Install meters	M	C	M
M	Benchmark energy performance	I	M	M
I	Commissioning/Re-Commissioning	M	I	
Indoor Environment				
I	Meet ASHRAE 55	I	C	I
I	Meet ASHRAE 62.1	I	C	I
I	Moisture Control	I	I	I
C	Daylighting	C	C	
M	Lighting controls	M	I	
I	Use/Specify low emitting materials		M	M
I	Integrated Pest Management	I	I	
I	Moisture Control	I	I	I
I	Prohibit smoking	I	I	I
Resources/Materials				
I	Specify recycled content materials		M	
I	Specify biobased content materials		M	I
I	Specify environmentally preferable materials	I	M	M
I	Provide recycling services	I	I	M
M	Eliminate use of ozone depleting substances	M	M	M

5.0 Summary

The goal of the Federal requirements for sustainable design and construction and high-performance operations is to decrease resource use, reduce operating costs and increase organization's effectiveness. Studies have demonstrated that, on average, sustainably designed and operated buildings use less energy and water, have lower maintenance costs, and have higher levels of occupant satisfaction than comparable buildings.[1,2] Green building certification systems offer a framework for teams to identify high-performance opportunities and to document and track design and operational performance. Certification by any third-party system does not guarantee that a building will achieve continued optimum performance. Every building is unique and there is high variability in performance when examining individual buildings. The experience of the design, construction, and operations teams play a significant role in the ability of a building to meet its performance goals.

Each of the certification systems in this review has the stated goal of improving the design and operations of buildings so that they operate in a more sustainable manner. Each system approaches this challenge differently. Each addresses what the buildings industry has identified as the major aspects of green buildings (i.e., siting, energy, water, materials, indoor environment). All of the systems offer a set of on-line tools to assist the users.

Although none of the certification systems are identical to the Federal requirements, users have expressed that systems offer a useful framework for tracking and/or documenting progress toward meeting the requirements. If an agency chooses to use a certification system, then specific documentation to demonstrate the building met the Guiding Principles may need to be prepared in addition to certification system documentation.

The systems align well with the EISA-defined review criteria, with Green Globes for new construction and LEED for existing buildings aligning most closely (25 and 27 respectively out of 27 and 28). Green Globes and LEED have a points system offering multiple certification levels, whereas the Living Building Challenge is an "all-or-nothing" system. The Living Building Challenge certification system is designed to incorporate the results of at least the first year of a building's operations into the certification, which means this system has the greatest emphasis on measured performance. Green Globes and Living Building Challenge feature on-site verification of the user submitted documentation, whereas LEED uses on-line documentation alone. LEED and Living Building Challenge have specific minimum requirements that must be met for certification to be achieved, whereas Green Globes defines a minimum number of points within each area with flexibility as to how those points would be met. LEED is the dominant tool in the market, with thousands more users than the other two systems, however, they are all generally recognized by building professionals.

An "apples-to-apples" comparison of the certification systems is challenging because the development basis is different for each system. Green Globes uses a questionnaire-driven approach to guide the users through the design. LEED uses building codes and standards, and a minimum program requirements approach as its base. The Living Building Challenge uses a philosophy-based approach

[1] Fowler KM, EM Rauch, JW Henderson, and AR Kora. 2010. Re-Assessing Green Building Performance: A Post Occupancy Evaluation of 22 GSA Buildings. PNNL-19369, Pacific Northwest National Laboratory, Richland, WA.
[2] Fowler KM. 2011. "Assessing Federal Green Building Performance." Interagency Sustainability Working Group, Washington DC on January 11, 2011. PNNL-SA-77169.

pushing for advanced building design and operations. Additionally, the certification systems have different strategies for achieving similar goals. In some cases there are multiple paths or approaches for achieving a goal within a certification. An example of the different options is energy use for new construction. Green Globes and LEED have performance and prescriptive path options, where Living Building Challenge requires 12 months of measured energy use data.

Selecting a certification system requires users to clearly understand their purpose for using a system. Innovation, market recognition, ease of use, assistance with meeting requirements, and a performance emphasis are some of the reasons a system might be selected. The Federal sustainable design and high-performance operations requirements steer agencies toward the use of green building certification tools to help buildings professionals meet these energy, water, materials, waste, recycling and indoor environmental quality requirements. As commercially available tools they have been useful in connecting the Federal sector with the current private sector standards.

The certification systems also include elements that fall outside those identified by EISA or the Guiding Principles. For example, Green Globes has points that address clean diesel practices, bird collisions, and asbestos management. LEED has credits that address light pollution, priorities that vary by geographic region, and purchasing of sustainable food. Living Building Challenge has a materials "red list" (prohibiting use of some materials) and requires the building address beauty and inspiration.

To meet Federal sustainable design and high-performance operations requirements, agencies need to focus on the existing Federal building stock. Quality, integrated design may make it easier for buildings to meet the Federal requirements, but in the end, there is a need for quality building operations professionals to achieve long term, high-performing buildings. The building occupants also need to be committed to contributing in a positive manner to optimize building operations.[3]

[3] National Academy of Sciences. 2011. Achieving High-Performance Federal Facilities: Strategies and Approaches for Transformational Change: A Workshop Report. ISBN-13: 978-0-309-21168-0 and ISBN-10: 0-309-21168-9. The National Academy Press, Washington, DC.

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Green Building Certification System Review – Appendices

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March 2012

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Appendix A: EISA Sections 433 & 436

Energy Independence and Security Act of 2007, December 13, 2007

SEC. 433. FEDERAL BUILDING ENERGY EFFICIENCY PERFORMANCE STANDARDS.

(a) STANDARDS.—Section 305(a)(3) of the Energy Conservation and Production Act (42 U.S.C. 6834(a)(3)) is amended by adding at the end the following new subparagraph:

(D) Not later than 1 year after the date of enactment of the Energy Independence and Security Act of 2007, the Secretary shall establish, by rule, revised Federal building energy efficiency performance standards that require that: (i) For new Federal buildings and Federal buildings undergoing major renovations, with respect to which the Administrator of General Services is required to transmit a prospectus to Congress under section 3307 of title 40, United States Code, in the case of public buildings (as defined in section 3301 of title 40, United States Code), or of at least $2,500,000 in costs adjusted annually for inflation for other buildings:

(I) The buildings shall be designed so that the fossil fuel-generated energy consumption of the buildings is reduced, as compared with such energy consumption by a similar building in fiscal year 2003 (as measured by Commercial Buildings Energy Consumption Survey or Residential Energy Consumption Survey data from the Energy Information Agency), by the percentage specified in the following table:

Fiscal Year	Percentage Reduction
2010	55
2015	65
2020	80
2025	90
2030	100.

(II) Upon petition by an agency subject to this subparagraph, the Secretary may adjust the applicable numeric requirement under subclause (I) downward with respect to a specific building, if the head of the agency designing the building certifies in writing that meeting such requirement would be technically impracticable in light of the agency's specified functional needs for that building and the Secretary concurs with the agency's conclusion. This subclause shall not apply to the General Services Administration.

(III) Sustainable design principles shall be applied to the siting, design, and construction of such buildings. Not later than 90 days after the date of enactment of the Energy Independence and Security Act of 2007, the Secretary, after reviewing the findings of the Federal Director under section 436(h) of that Act, in consultation with the Administrator of General Services, and in consultation with the Secretary of Defense for considerations relating to those facilities under the custody and control of the Department of Defense, shall identify a certification system and level for green buildings that the

Secretary determines to be the most likely to encourage a comprehensive and environmentally-sound approach to certification of green buildings. The identification of the certification system and level shall be based on a review of the Federal Director's findings under section 436(h) of the Energy Independence and Security Act of 2007 and the criteria specified in clause (iii), shall identify the highest level the Secretary determines is appropriate above the minimum level required for certification under the system selected, and shall achieve results at least comparable to the system used by and highest level referenced by the General Services Administration as of the date of enactment of the Energy Independence and Security Act of 2007. Within 90 days of the completion of each study required by clause (iv), the Secretary, in consultation with the Administrator of General Services, and in consultation with the Secretary of Defense for considerations relating to those facilities under the custody and control of the Department of Defense, shall review and update the certification system and level, taking into account the conclusions of such study.

(ii) In establishing criteria for identifying major renovations that are subject to the requirements of this subparagraph, the Secretary shall take into account the scope, degree, and types of renovations that are likely to provide significant opportunities for substantial improvements in energy efficiency.

(iii) In identifying the green building certification system and level, the Secretary shall take into consideration—

(I) the ability and availability of assessors and auditors to independently verify the criteria and measurement of metrics at the scale necessary to implement this subparagraph;

(II) the ability of the applicable certification organization to collect and reflect public comment;

(III) the ability of the standard to be developed and revised through a consensus-based process;

(IV) an evaluation of the robustness of the criteria for a high-performance green building, which shall give credit for promoting—

(aa) efficient and sustainable use of water, energy, and other natural resources;

(bb) use of renewable energy sources;

(cc) improved indoor environmental quality through enhanced indoor air quality, thermal comfort, acoustics, day lighting, pollutant source control, and use of low-emission materials and building system controls; and

(dd) such other criteria as the Secretary determines to be appropriate; and

(V) national recognition within the building industry.

(iv) At least once every five years, and in accordance with section 436 of the Energy Independence and Security Act of 2007, the Administrator of General Services shall conduct a study to evaluate and compare available third-party green building certification systems and levels, taking into account the criteria listed in clause (iii).

(v) The Secretary may by rule allow Federal agencies to develop internal certification processes, using certified professionals, in lieu of certification by the certification entity identified under clause

(i)(III). The Secretary shall include in any such rule guidelines to ensure that the certification process results in buildings meeting the applicable certification system and level identified under clause (i)(III). An agency employing an internal certification process must continue to obtain external certification by the certification entity identified under clause (i)(III) for at least 5 percent of the total number of buildings certified annually by the agency.

(vi) With respect to privatized military housing, the Secretary of Defense, after consultation with the Secretary may, through rulemaking, develop alternative criteria to those established by subclauses (I) and (III) of clause (i) that achieve an equivalent result in terms of energy savings, sustainable design, and green building performance.

(vii) In addition to any use of water conservation technologies otherwise required by this section, water conservation technologies shall be applied to the extent that the technologies are life-cycle cost-effective.

(b) DEFINITIONS.—Section 303(6) of the Energy Conservation and Production Act (42 U.S.C. 6832(6)) is amended by striking ''which is not legally subject to State or local building codes or similar requirements.'' and inserting ''Such term shall include buildings built for the purpose of being leased by a Federal agency, and privatized military housing.''

(c) REVISION OF FEDERAL ACQUISITION REGULATION.—Not later than 2 years after the date of the enactment of this Act, the Federal Acquisition Regulation shall be revised to require Federal officers and employees to comply with this section and the amendments made by this section in the acquisition, construction, or major renovation of any facility. The members of the Federal Acquisition Regulatory Council (established under section 25 of the Office of Federal Procurement Policy Act (41 U.S.C. 421)) shall consult with the Federal Director and the Commercial Director before promulgating regulations to carry out this subsection.

(d) GUIDANCE.—Not later than 90 days after the date of promulgation of the revised regulations under subsection (c), the Administrator for Federal Procurement Policy shall issue guidance to all Federal procurement executives providing direction and instructions to renegotiate the design of proposed facilities and major renovations for existing facilities to incorporate improvements that are consistent with this section.

SEC. 436. HIGH-PERFORMANCE GREEN FEDERAL BUILDINGS

(a) ESTABLISHMENT OF OFFICE.—Not later than 60 days after the date of enactment of this Act, the Administrator shall establish within the General Services Administration an Office of Federal High-Performance Green Buildings, and appoint an individual to serve as Federal Director in, a position in the career-reserved Senior Executive service, to—

(1) establish and manage the Office of Federal High-Performance Green Buildings; and

(2) carry out other duties as required under this subtitle.

(b) COMPENSATION.—The compensation of the Federal Director shall not exceed the maximum rate of basic pay for the Senior Executive Service under section 5382 of title 5, United States Code, including any applicable locality based comparability payment that may be authorized under section 5304(h)(2)(C) of that title.

(c) DUTIES.—The Federal Director shall—

(1) coordinate the activities of the Office of Federal High-Performance Green Buildings with the activities of the Office of Commercial High-Performance Green Buildings, and the Secretary, in accordance with section 305(a)(3)(D) of the Energy Conservation and Production Act (42 U.S.C. 6834(a)(3)(D));

(2) ensure full coordination of high-performance green building information and activities within the General Services Administration and all relevant agencies, including, at a minimum—

(A) the Environmental Protection Agency;

(B) the Office of the Federal Environmental Executive;

(C) the Office of Federal Procurement Policy;

(D) the Department of Energy;

(E) the Department of Health and Human Services;

(F) the Department of Defense;

(G) the Department of Transportation;

(H) the National Institute of Standards and Technology; and

(I) the Office of Science and Technology Policy;

(3) establish a senior-level Federal Green Building Advisory Committee under section 474, which shall provide advice and recommendations in accordance with that section and subsection (d);

(4) identify and every 5 years reassess improved or higher rating standards recommended by the Advisory Committee;

(5) ensure full coordination, dissemination of information regarding, and promotion of the results of research and development information relating to Federal high-performance green building initiatives;

(6) identify and develop Federal high-performance green building standards for all types of Federal facilities, consistent with the requirements of this subtitle and section 305(a)(3)(D) of the Energy Conservation and Production Act (42 U.S.C. 6834(a)(3)(D));

(7) establish green practices that can be used throughout the life of a Federal facility;

(8) review and analyze current Federal budget practices and life-cycle costing issues, and make recommendations to Congress, in accordance with subsection (d); and

(9) identify opportunities to demonstrate innovative and emerging green building technologies and concepts.

(d) ADDITIONAL DUTIES.—The Federal Director, in consultation with the Commercial Director and the Advisory Committee, and consistent with the requirements of section 305(a)(3)(D) of the Energy Conservation and Production Act (42 U.S.C. 6834(a)(3)(D)) shall—

(1) identify, review, and analyze current budget and contracting practices that affect achievement of high-performance green buildings, including the identification of barriers to high-performance green building life-cycle costing and budgetary issues;

(2) develop guidance and conduct training sessions with budget specialists and contracting personnel from Federal agencies and budget examiners to apply life-cycle cost criteria to actual projects;

(3) identify tools to aid life-cycle cost decisionmaking; and

(4) explore the feasibility of incorporating the benefits of high-performance green buildings, such as security benefits, into a cost-budget analysis to aid in life-cycle costing for budget and decisionmaking processes.

(e) INCENTIVES.—Within 90 days after the date of enactment of this Act, the Federal Director shall identify incentives to encourage the expedited use of high-performance green buildings and related technology in the operations of the Federal Government, in accordance with the requirements of section 305(a)(3)(D) of the Energy Conservation and Production Act (42 U.S.C. 6834(a)(3)(D)), including through—

(1) the provision of recognition awards; and

(2) the maximum feasible retention of financial savings in the annual budgets of Federal agencies for use in reinvesting in future high-performance green building initiatives.

(f) REPORT.—Not later than 2 years after the date of enactment of this Act, and biennially thereafter, the Federal Director, in consultation with the Secretary, shall submit to Congress a report that—

(1) describes the status of compliance with this subtitle, the requirements of section 305(a)(3)(D) of the Energy Conservation and Production Act (42 U.S.C. 6834(a)(3)(D)), and other Federal high-performance green building initiatives in effect as of the date of the report, including—

(A) the extent to which the programs are being carried out in accordance with this subtitle and the requirements of section 305(a)(3)(D) of that Act; and

(B) the status of funding requests and appropriations for those programs;

(2) identifies within the planning, budgeting, and construction process all types of Federal facility procedures that may affect the certification of new and existing Federal facilities as high-performance green buildings under the provisions of section 305(a)(3)(D) of that Act and the criteria established in subsection (h);

(3) identifies inconsistencies, as reported to the Advisory Committee, in Federal law with respect to product acquisition guidelines and high-performance product guidelines;

(4) recommends language for uniform standards for use by Federal agencies in environmentally responsible acquisition;

(5) in coordination with the Office of Management and Budget, reviews the budget process for capital programs with respect to alternatives for—

(A) restructuring of budgets to require the use of complete energy and environmental cost accounting;

(B) using operations expenditures in budget-related decisions while simultaneously incorporating productivity and health measures (as those measures can be quantified by the Office of Federal High-Performance Green Buildings, with the assistance of universities and national laboratories);

(C) streamlining measures for permitting Federal agencies to retain all identified savings accrued as a result of the use of life-cycle costing for future high-performance green building initiatives; and

(D) identifying short-term and long-term cost savings that accrue from high-performance green buildings, including those relating to health and productivity;

(6) identifies green, self-sustaining technologies to address the operational needs of Federal facilities in times of national security emergencies, natural disasters, or other dire emergencies;

(7) summarizes and highlights development, at the State and local level, of high-performance green building initiatives, including executive orders, policies, or laws adopted promoting high-performance green building (including the status of implementation of those initiatives); and

(8) includes, for the 2-year period covered by the report, recommendations to address each of the matters, and a plan for implementation of each recommendation, described in paragraphs (1) through (7).

(g) IMPLEMENTATION.—The Office of Federal High-Performance Green Buildings shall carry out each plan for implementation of recommendations under subsection (f)(8).

(h) IDENTIFICATION OF CERTIFICATION SYSTEM.—

(1) IN GENERAL.—For the purpose of this section, not later than 60 days after the date of enactment of this Act, the Federal Director shall identify and shall provide to the Secretary pursuant to section 305(a)(3)(D) of the Energy Conservation and Production Act (42 U.S.C. 6834(a)(3)(D)), a certification system that the Director determines to be the most likely to encourage a comprehensive and environmentally-sound approach to certification of green buildings.

(2) BASIS.—The system identified under paragraph (1) shall be based on—

(A) a study completed every 5 years and provided to the Secretary pursuant to section 305(a)(3)(D) of that Act, which shall be carried out by the Federal Director to compare and evaluate standards;

(B) the ability and availability of assessors and auditors to independently verify the criteria and measurement of metrics at the scale necessary to implement this subtitle;

(C) the ability of the applicable standard setting organization to collect and reflect public comment;

(D) the ability of the standard to be developed and revised through a consensus-based process;

(E) an evaluation of the robustness of the criteria for a high performance green building, which shall give credit for promoting—

(i) efficient and sustainable use of water, energy, and other natural resources;

(ii) use of renewable energy sources;

(iii) improved indoor environmental quality through enhanced indoor air quality, thermal comfort, acoustics, day lighting, pollutant source control, and use of low-emission materials and building system controls;

(iv) reduced impacts from transportation through building location and site design that promote access by public transportation; and

(v) such other criteria as the Federal Director determines to be appropriate; and

(F) national recognition within the building industry.

Appendix B: High Performance Sustainable Building Guiding Principles

HIGH PERFORMANCE and SUSTAINABLE BUILDINGS GUIDANCE
Final (12/1/08)

PURPOSE

The Interagency Sustainability Working Group (ISWG), as a subcommittee of the Steering Committee established by Executive Order (E.O.) 13423, initiated development of the following guidance to assist agencies in meeting the high performance and sustainable buildings goals of E.O. 13423, section 2(f).[1]

E.O. 13423, sec. 2(f) states "In implementing the policy set forth in section 1 of this order, the head of each agency shall: ensure that (i) new construction and major renovations of agency buildings comply with the *Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings* set forth in the *Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding* (2006)[2], and (ii) 15percent of the existing Federal capital asset building inventory of the agency as of the end of fiscal year 2015 incorporates the sustainable practices in the *Guiding Principles*."

This guidance accomplishes the following: (1) Updates the *Guiding Principles for Sustainable New Construction and Major Renovations,* (2) establishes a separate *Guiding Principles for Sustainable Existing Buildings,* 3) clarifies reporting guidelines for entering information on Sustainability Data Element #25 in the Federal Real Property Profile (FRPP) database, and (4) explains how to calculate the percentage of buildings/square footage that are compliant with the *Guiding Principles*.

Legislation enacted subsequent to the issuance of E.O. 13423 was considered in drafting both sets of *Guiding Principles* described herein. This guidance shall be reviewed every two years, at a minimum, for potential revisions to keep pace with evolving sustainable building practices and new regulations and/or legislation.

For a set of answers to frequently asked questions (FAQs) on this guidance, please visit: <www.wbdg.org/references/sustainable_eo.php>. These FAQs are based on comments received during the development of this guidance, and will be updated as necessary.

[1] Additional Federal guidance on the sustainability aspects of Executive Order 13423 can be found at: http://www1.eere.energy.gov/femp/controlledaccess/sustainable_E.O.13423.html
Additional Technical Guidance on requirements and strategies for meeting the *Guiding Principles* is available at www.wbdg.org/sustainableE.O .. [2] In 2006, the Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding outlined *Guiding Principles* for Federal Leadership in High Performance and Sustainable Buildings. http://www.wbdg.org/pdfs/sustainable_mou.pdf

REPORTING REQUIREMENTS

To ensure accuracy and consistency in reporting across agencies and to leverage existing resources dedicated to agency real property management, data on compliance with E.O. 13423, sec. 2(f), is to be reported to the Federal Real Property Profile (FRPP) database managed by the Federal Real Property Council (FRPC).[3] All Executive agencies are already required to report annual inventory and performance data at the individual asset level on all real property assets: including land, buildings, and structures.

As part of the Fiscal Year 2008 reporting, the FRPC, in consultation with ISWG, established a "sustainability" data element to be reported on all building assets (optional for land assets and structures) to capture agency progress toward meeting the Executive Order goal in section 2(f). The guidance issued by the FRPC reads as follows:

Sustainability Data Element (#25)	**Required Information**
Sustainability	Reflects whether or not an asset meets the sustainability goals set forth in Section 2 (f) of Executive Order 13423. Options are: Yes (1) – asset has been assessed and meets guidelines set forth in Section 2 (f) of Executive Order 13423 No (2) – asset has been assessed and does not meet guidelines set forth in Section 2 (f) of Executive Order 13423 Not yet evaluated (3) – asset has not yet been evaluated on whether or not it meets guidelines set forth in Section 2 (f) of Executive Order 13423 Not applicable (4) – guidelines set forth in Section 2 (f) of Executive Order 13423 do not apply to the asset

The FRPC issued the Fiscal Year 2008 reporting instructions on June 23, 2008.[4] All agency data is to be reported to the FRPP database no later than December 15th of each year. Reporting of all inventory and performance data is to be coordinated with the agency's Senior Real Property Officer. The reporting of data for the "sustainability" data element is **optional** for FY 2008 and **required** for FY 2009 and beyond.

[3] The Federal Real Property Council was established under EO 13327, Federal Real Property Asset Managed, issued February 4, 2004.

[4] The FRPC annual guidance and FRPP reporting instructions can be found at: http://www.whitehouse.gov/omb/financial/fia_asset.html

In order to select "Yes (1)" for a sustainable building, an agency must verify that it meets the sustainability requirements for new, existing, or leased buildings as defined in this document.

The "Not applicable (4)" option is only appropriate for structures and land assets. Information on the "sustainability" data element is required on all buildings reported to the FRPP.

CRITERIA FOR DETERMINING COMPLIANCE WITH THE GUIDING PRINCIPLES BASED UPON TYPE OF BUILDING

New construction and major renovations can be considered compliant with the Guiding Principles and reported 'Yes (1)' under the sustainability data element when either Option New Construction 1 (NC-1) or Option NC-2 is met:

OPTION NC-1 An agency can demonstrate that a building is compliant with each of the five *Guiding Principles for Sustainable New Construction and Major Renovations* (provided in this document), or

OPTION NC-2 A documented commitment to third-party certification was made (e.g., registering a project) for projects with a design contract that was awarded prior to October 1, 2008 **AND** the building has been third-party certified to meet the requirements of a multi-attribute green building standard or rating system developed by an ANSI-accredited organization.

Existing buildings can be considered compliant with the Guiding Principles and reported 'Yes (1)' under the sustainability data element when either Option Existing Buildings 1 (EB-1) or Option EB-2 is met:

OPTION EB-1 An agency can demonstrate that a building is compliant with each of the five *Guiding Principles for Sustainable Existing Buildings* (provided in this document), or

OPTION EB-2 A documented commitment to third-party existing building certification was made (e.g., registering a project) prior to October 1, 2008 **AND** the building is third-party certified to meet the requirements of a multi-attribute green building standard or rating system developed by an ANSI-accredited organization.

Agency-leased buildings can be considered compliant with the Guiding Principles and reported 'Yes (1)' under the sustainability data element when Option Leases 1 (L-1) or Option L-2 is met:

OPTION L-1 An agency can demonstrate that a building is compliant with the appropriate set of *Guiding Principles*, or

OPTION L-2 At any point, the building has been third-party certified to meet the requirements of a multi-attribute green building standard or rating system developed by an ANSI-accredited organization.

SUSTAINABLE BUILDING IMPLEMENTATION PLANS

Progress and status regarding compliance with E.O. 13423, sec. 2(f) shall be documented in the agency's Sustainable Building Implementation Plan (SBIP).

- Agencies should include a discussion of the independent validation and verification (IV&V) process established to ensure compliance with the *Guiding Principles* and accuracy of the data reported to the FRPP.
- If the previous version of the *Guiding Principles* (dated 1/24/06) was used to assess a building, document which version is applicable in the agency's SBIP.
- For sustainable buildings leased by another Federal entity (e.g., General Services Administration) on an agency's behalf, information and characterization of the buildings, or spaces within, may be identified in the annual SBIP of the agency occupying the building, even though it is not included in that Agency's FRPP submission.
- Agencies should describe the strategies (including disposition) and key milestones for evaluating buildings reported to the FRPP as "Not yet evaluated (3)".
- It is recognized that agency-owned and leased facilities have different challenges in meeting the *Guiding Principles*. Therefore, agencies are encouraged to separately analyze its agency-owned and leased buildings portfolio in the SBIP.
- Along with the total number of buildings and total square footage, agencies shall report their capital asset threshold[5], and the percentage of buildings and square footage above and below the threshold.

CALCULATION OF PERCENTAGE OF EACH AGENCY'S BUILDING INVENTORY THAT COMPLIES WITH THE GUIDING PRINCIPLES

The percentage of each agency's building inventory meeting the Criteria for Compliance with the *Guiding Principles* shall be calculated in two ways: (1) by square footage of buildings and (2) by number of buildings. All buildings, including those below the agency's capital asset threshold, must be reported in the FRPP.

The equations to calculate the percentage (%) of buildings meeting the *Guiding Principles* based on the entries in the Sustainability Data Element are as follows:

By Square Feet Sustainability % = [(square feet of buildings reporting "Yes (1)") / (square feet of buildings reporting "Yes (1)," "No (2)," and "Not yet evaluated (3)")] x 100

By Number of Buildings Sustainability % = [(number of buildings reporting "Yes (1)") / (number of buildings reporting "Yes (1)," "No (2)," and "Not yet evaluated (3)")] x 100

NOTE: The total square footage of buildings reporting "Yes (1)," "No (2)," and "Not yet evaluated (3)" should be equal to the square footage of all buildings on which an agency reports in their FRPP submission.

[5] OMB Circular A-11 Part 7 Supplemental & EO 13227 define what constitutes the capital asset building inventory.

GUIDING PRINCIPLES FOR SUSTAINABLE NEW CONSTRUCTION AND MAJOR RENOVATIONS

I. Employ Integrated Design Principles

Integrated Design. Use a collaborative, integrated planning and design process that

- Initiates and maintains an integrated project team as described on the Whole Building Design Guide <http://www.wbdg.org/design/engage_process.php> in all stages of a project's planning and delivery
- Integrates the use of OMB's A-11, Section 7, Exhibit 300: *Capital Asset Plan and Business Case Summary*
- Establishes performance goals for siting, energy, water, materials, and indoor environmental quality along with other comprehensive design goals and ensures incorporation of these goals throughout the design and lifecycle of the building
- Considers all stages of the building's lifecycle, including deconstruction.

Commissioning. Employ commissioning practices tailored to the size and complexity of the building and its system components in order to verify performance of building components and systems and help ensure that design requirements are met. This should include an experienced commissioning provider, inclusion of commissioning requirements in construction documents, a commissioning plan, verification of the installation and performance of systems to be commissioned, and a commissioning report.

II. Optimize Energy Performance

Energy Efficiency. Establish a whole building performance target that takes into account the intended use, occupancy, operations, plug loads, other energy demands, and design to earn the ENERGY STAR® targets for new construction and major renovation where applicable. For new construction, reduce the energy use by 30 percent compared to the baseline building performance rating per the American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., (ASHRAE)/Illuminating Engineering Society of North America (IESNA) Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential. For major renovations, reduce the energy use by 20 percent below pre-renovations 2003 baseline. Laboratory spaces may use the Labs21 Laboratory Modeling Guidelines. Use ENERGY STAR® and FEMP-designated Energy Efficient Products, where available.

On-Site Renewable Energy. Per the Energy Independence and Security Act (EISA) Section 523, meet at least 30% of the hot water demand through the installation of solar hot water heaters, when lifecycle cost effective.

Per Executive Order 13423, implement renewable energy generation projects on agency property for agency use, when lifecycle cost effective.

Measurement and Verification. Per the Energy Policy Act of 2005 (EPAct) Section 103, install building level electricity meters in new major construction and renovation projects to track and continuously optimize performance. Per EISA Section 434, include equivalent meters for natural gas and steam, where natural gas

and steam are used.

Benchmarking. Compare actual performance data from the first year of operation with the energy design target, preferably by using ENERGY STAR® Portfolio Manager for building and space types covered by ENERGY STAR®. Verify that the building performance meets or exceeds the design target, or that actual energy use is within 10% of the design energy budget for all other building types. For other building and space types, use an equivalent benchmarking tool such as the Labs21 benchmarking tool for laboratory buildings.

III. Protect and Conserve Water

Indoor Water. Employ strategies that in aggregate use a minimum of 20 percent less potable water than the indoor water use baseline calculated for the building, after meeting the EPAct 1992, Uniform Plumbing Codes 2006, and the International Plumbing Codes 2006 fixture performance requirements. The installation of water meters is encouraged to allow for the management of water use during occupancy. The use of harvested rainwater, treated wastewater, and air conditioner condensate should also be considered and used where feasible for nonpotable use and potable use where allowed.

Outdoor Water. Use water efficient landscape and irrigation strategies, such as water reuse, recycling, and the use of harvested rainwater, to reduce outdoor potable water consumption by a minimum of 50 percent over that consumed by conventional means (plant species and plant densities). The installation of water meters for locations with significant outdoor water use is encouraged.

Employ design and construction strategies that reduce storm water runoff and discharges of polluted water offsite. Per EISA Section 438, to the maximum extent technically feasible, maintain or restore the predevelopment hydrology of the site with regard to temperature, rate, volume, and duration of flow using site planning, design, construction, and maintenance strategies.

Process Water. Per the Energy Policy Act of 2005 Section 109, when potable water is used to improve a building's energy efficiency, deploy lifecycle cost effective water conservation measures.

Water-Efficient Products. Specify EPA's WaterSense-labeled products or other water conserving products, where available. Choose irrigation contractors who are certified through a WaterSense labeled program.

IV. Enhance Indoor Environmental Quality

Ventilation and Thermal Comfort. Meet ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy, including continuous humidity control within established ranges per climate zone, and ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality.

Moisture Control. Establish and implement a moisture control strategy for controlling moisture flows and condensation to prevent building damage, minimize mold contamination, and reduce health risks related to moisture.

Daylighting. Achieve a minimum daylight factor of 2 percent (excluding all direct sunlight penetration) in 75

percent of all space occupied for critical visual tasks. Provide automatic dimming controls or accessible manual lighting controls, and appropriate glare control.

Low-Emitting Materials. Specify materials and products with low pollutant emissions, including composite wood products, adhesives, sealants, interior paints and finishes, carpet systems, and furnishings.

Protect Indoor Air Quality during Construction. Follow the recommended approach of the Sheet Metal and Air Conditioning Contractor's National Association Indoor Air Quality Guidelines for Occupied Buildings under Construction, 2007. After construction and prior to occupancy, conduct a minimum 72-hour flush-out with maximum outdoor air consistent with achieving relative humidity no greater than 60 percent. After occupancy, continue flush-out as necessary to minimize exposure to contaminants from new building materials.

Environmental Tobacco Smoke Control. Implement a policy and post signage indicating that smoking is prohibited within the building and within 25 feet of all building entrances, operable windows, and building ventilation intakes during building occupancy.

V. Reduce Environmental Impact of Materials

Recycled Content. Per Section 6002 of the Resource Conservation and Recovery Act (RCRA), for EPA-designated products, specify products meeting or exceeding EPA's recycled content recommendations. For other products, specify materials with recycled content when practicable. If EPA-designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of or use in the building. EPA's recycled content product designations and recycled content recommendations are available on EPA's Comprehensive Procurement Guideline web site at <www.epa.gov/cpg>.

Biobased Content. Per Section 9002 of the Farm Security and Rural Investment Act (FSRIA), for USDA-designated products, specify products with the highest content level per USDA's biobased content recommendations. For other products, specify biobased products made from rapidly renewable resources and certified sustainable wood products. If these designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of or use in the building. USDA's biobased product designations and biobased content recommendations are available on USDA's BioPreferred web site at <www.usda.gov/biopreferred>.

Environmentally Preferable Products. Use products that have a lesser or reduced effect on human health and the environment over their lifecycle when compared with competing products or services that serve the same purpose. A number of standards and ecolabels are available in the marketplace to assist specifiers in making environmentally preferable decisions. For recommendations, consult the Federal Green Construction Guide for Specifiers at <www.wbdg.org/design/greenspec.php>.

Waste and Materials Management. Incorporate adequate space, equipment, and transport accommodations for recycling in the building design. During a project's planning stage, identify local recycling and salvage operations that could process site-related construction and demolition materials. During construction, recycle or salvage at least 50 percent of the non-hazardous construction, demolition and land clearing materials, excluding soil, where markets or onsite recycling opportunities exist. Provide salvage, reuse and recycling services for waste generated from major renovations, where markets or onsite recycling opportunities exist.

Ozone Depleting Compounds. Eliminate the use of ozone depleting compounds during and after construction where alternative environmentally preferable products are available, consistent with either the Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990, or equivalent overall air quality benefits that take into account lifecycle impacts.

GUIDING PRINCIPLES FOR SUSTAINABLE EXISTING BUILDINGS

I. Employ Integrated Assessment, Operation, and Management Principles

Integrated Assessment, Operation, and Management. Use an integrated team to develop and implement policy regarding sustainable operations and maintenance.

- Incorporate sustainable operations and maintenance practices within the appropriate Environmental Management System (EMS)
- Assess existing condition and operational procedures of the building and major building systems and identify areas for improvement
- Establish operational performance goals for energy, water, material use and recycling, and indoor environmental quality, and ensure incorporation of these goals throughout the remaining lifecycle of the building
- Incorporate a building management plan to ensure that operating decisions and tenant education are carried out with regard to integrated, sustainable building operations and maintenance
- Augment building operations and maintenance as needed using occupant feedback on work space satisfaction.

Commissioning. Employ recommissioning, tailored to the size and complexity of the building and its system components, in order to optimize and verify performance of fundamental building systems. Commissioning must be performed by an experienced commissioning provider. When building commissioning has been performed, the commissioning report, summary of actions taken, and schedule for recommissioning must be documented. In addition, meet the requirements of EISA 2007, Section 432 and associated FEMP guidance.

Building recommissioning must have been performed within four years prior to reporting a building as meeting the *Guiding Principles*.

II. Optimize Energy Performance

Energy Efficiency. Three options can be used to measure energy efficiency performance:

- Option 1: Receive an ENERGY STAR® rating of 75 or higher or an equivalent Labs21 Benchmarking Tool score for laboratory buildings,
- Option 2: Reduce measured building energy use by 20% compared to building energy use in 2003 or a year thereafter with quality energy use data, or
- Option 3: Reduce energy use by 20% compared to the ASHRAE 90.1-2007 baseline building design if design information is available.

Use ENERGY STAR® and FEMP-designated Energy Efficient Products, where available.

On-Site Renewable Energy. Per Executive Order 13423, implement renewable energy generation projects on agency property for agency use, when lifecycle cost effective.

Measurement and Verification. Per the Energy Policy Act of 2005 (EPAct2005) Section 103, install building

level electricity meters to track and continuously optimize performance. Per the Energy Independence and Security Act (EISA) 2007, the utility meters must also include natural gas and steam, where natural gas and steam are used.

Benchmarking. Compare annual performance data with previous years' performance data, preferably by entering annual performance data into the ENERGY STAR® Portfolio Manager. For building and space types not available in ENERGY STAR®, use an equivalent benchmarking tool such as the Labs21 benchmarking tool for laboratory buildings.

III. Protect and Conserve Water

Indoor Water. Two options can be used to measure indoor potable water use performance:

- Option 1: Reduce potable water use by 20% compared to a water baseline calculated for the building. The water baseline, for buildings with plumbing fixtures installed in 1994 or later, is 120% of the Uniform Plumbing Codes 2006 or the International Plumbing Codes 2006 fixture performance requirements. The water baseline for plumbing fixtures older than 1994 is 160% of the Uniform Plumbing Codes 2006 or the International Plumbing Codes 2006 fixture performance requirements, or
- Option 2: Reduce building measured potable water use by 20% compared to building water use in 2003 or a year thereafter with quality water data.

Outdoor Water. Three options can be used to measure outdoor potable water use performance:

- Option 1: Reduce potable irrigation water use by 50% compared to conventional methods, or
- Option 2: Reduce building related potable irrigation water use by 50% compared to measured irrigation water use in 2003 or a year thereafter with quality water data, or
- Option 3: Use no potable irrigation water.

Measurement of Water Use. The installation of water meters for building sites with significant indoor and outdoor water use is encouraged. If only one meter is installed, reduce potable water use (indoor and outdoor combined) by at least 20% compared to building water use in 2003 or a year thereafter with quality water data.

Employ strategies that reduce storm water runoff and discharges of polluted water offsite. Per EISA Section 438, where redevelopment affects site hydrology, use site planning, design, construction, and maintenance strategies to maintain hydrologic conditions during development, or to restore hydrologic conditions following development, to the maximum extent that is technically feasible.

Process Water. Per EPAct 2005 Section 109, when potable water is used to improve a building's energy efficiency, deploy lifecycle cost effective water conservation measures.

Water-Efficient Products. Where available, use EPA's WaterSense-labeled products or other water conserving products. Choose irrigation contractors who are certified through a WaterSense-labeled program.

IV. Enhance Indoor Environmental Quality

Ventilation and Thermal Comfort. Meet ASHRAE Standard 55-2004 Thermal Environmental Conditions for Human Occupancy and ASHRAE Standard 62.1-2007: Ventilation for Acceptable Indoor Air Quality.

Moisture Control. Provide policy and illustrate the use of an appropriate moisture control strategy to prevent building damage, minimize mold contamination, and reduce health risks related to moisture. For façade renovations, Dew Point analysis and a plan for cleanup or infiltration of moisture into building materials are required.

Daylighting and Lighting Controls. Automated lighting controls (occupancy/vacancy sensors with manual-off capability) are provided for appropriate spaces including restrooms, conference and meeting rooms, employee lunch and break rooms, training classrooms, and offices. Two options can be used to meet additional daylighting and lighting controls performance expectations:

> Option 1: Achieve a minimum daylight factor of 2 percent (excluding all direct sunlight penetration) in 50 percent of all space occupied for critical visual tasks, or
> Option 2: Provide occupant controlled lighting, allowing adjustments to suit individual task needs, for 50% of regularly occupied spaces.

Low-Emitting Materials. Use low emitting materials for building modifications, maintenance, and cleaning. In particular, specify the following materials and products to have low pollutant emissions: composite wood products, adhesives, sealants, interior paints and finishes, solvents, carpet systems, janitorial supplies, and furnishings.

Integrated Pest Management. Use integrated pest management techniques as appropriate to minimize pesticide usage. Use EPA-registered pesticides only when needed.

Environmental Tobacco Smoke Control. Prohibit smoking within the building and within 25 feet of all building entrances, operable windows, and building ventilation intakes.

V. Reduce Environmental Impact of Materials

Recycled Content. Per section 6002 of RCRA, for EPA-designated products, use products meeting or exceeding EPA's recycled content recommendations for building modifications, maintenance, and cleaning. For other products, use materials with recycled content such that the sum of postconsumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost or weight) of the total value of the materials in the project. If EPA-designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of or use in the building. EPA's recycled content product designations and recycled content recommendations are available on EPA's Comprehensive Procurement Guideline web site at <www.epa.gov/cpg>.

Biobased Content. Per section 9002 of FSRIA, for USDA-designated products, use products with the highest content level per USDA's biobased content recommendations. For other products, use biobased products made from rapidly renewable resources and certified sustainable wood products. If these designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them should be included in all solicitations relevant to construction, operation, maintenance of or use in the building. USDA's biobased product designations and biobased content recommendations are available on USDA's BioPreferred web site at <www.usda.gov/biopreferred>.

Environmentally Preferable Products. Use products that have a lesser or reduced effect on human health and the environment over their lifecycle when compared with competing products or services that serve the same purpose. A number of standards and ecolabels are available in the marketplace to assist specifiers in making environmentally preferable decisions. For recommendations, consult the Federal Green Construction Guide for Specifiers at <www.wbdg.org/design/greenspec.php>.

Waste and Materials Management. Provide reuse and recycling services for building occupants, where markets or on-site recycling exist. Provide salvage, reuse and recycling services for waste generated from building operations, maintenance, repair and minor renovations, and discarded furnishings, equipment and property. This could include such things as beverage containers and paper from building occupants, batteries, toner cartridges, outdated computers from an equipment update, and construction materials from a minor renovation.

Ozone Depleting Compounds. Eliminate the use of ozone depleting compounds where alternative environmentally preferable products are available, consistent with either the Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990, or equivalent overall air quality benefits that take into account lifecycle impacts.

Appendix C: List of Pre-screened Certification Systems

Legend	√ (Meet the criterion)	(NOT meet the criterion for the listed reason)	(No further evaluation because the previous criterion is not met.)

Name	Relevance	Availability	Certification
Green Building Advisor	Product		
Energy Star (Products)	Product		
EPLabel	Building/Energy		
BSEA 1.0 (Finland)	Information Not Found		
NEN 2916: 2004 nl (Dutch code for the determination of the energy performance of non-residential buildings)	Building/Energy		
SIMBAD (Finland)	Building/Energy		
EDIP (Environmental Design of Industrial Products, Denmark)	Product		
Environmental Classification of Properties (Finland)	Building/Energy		
Papoose (Finland)	Information Not Found		
Envest	Building/LCA		
EcoEffect (Sweden)	Building/LCA		
ISO 14001	Building/Management		
Dutch MRPI (Environmental Relevant Product Information, Netherlands)	Building/LCA		
Climate Protection Manual for Cities	Building/GHG		
City of Santa Monica Green Building & Construction Guidelines	Building	Santa Monica, CA	

Name	Relevance	Availability	Certification
ECDG – Japan	Building	Japan	
Green Building Program (Austin, TX)	Building	Austin, TX	
National Packages Sustainable Building (Netherlands)	Building	Netherlands	
NYC High Performance Building Guidelines	Building	NYC	
Seattle Sustainable Building Action Plan and Built Smart (Seattle, WA)	Building	Seattle, WA	
Tokyo Metro Green Building Program	Building	Japan	
Environmental Profiles of construction materials, components and buildings (UK)	Building/LCA		
Quest	Building/Management		
BM Bau Building Passport (Germany)	Product		
The Movement for Innovation (M4i)	Building/Construction		
EcoProP	Building/Management		
Costing Reference Model	Building/Residential		
Super E House Program (Canada)	Building/Residential		
AccuRate (Australia)	Building/Residential		
Alameda County (CA)	Building/Waste		
BASIX Building Sustainability Index (Australia)	Building/Residential		
BERS (Australia)	Building/Residential		
Build a Better Clark (Clark County Washington HBA)	Building/Residential		
Build A Better Kitsap Home Builder Program (Kitsap, WA HBA)	Building/Residential		

Name	Relevance	Availability	Certification
National Association of Home Buildings (NAHB) Green Guidelines	Building/Residential		
Built Green Alberta (Canada)	Building/Residential		
Built GreenTM (MBA of King and Snohomish Counties, WA)	Building/Residential		
Built GreenTM Colorado (HBA of Metro Denver)	Building/Residential		
Chula Vista (CA) GreenStar Building Incentive Program	Building/Residential		
City of Boulder Green Points (CO)	Building	Boulder, CO	
City of Frisco (TX) Green Building Program	Building	Frisco, TX	
"Green" Hotels Association (US)	Building/Lodging		
Coalition for Environmentally Responsible Economies (CERES) Green Hotel Initiative (US)	Building/Lodging		
Green Globe 21 (US)	Building/Lodging		
Green Leaf Eco-Rating Program (Canada)	Building/Lodging		
Green Rating Program (Africa)	Building/Lodging		
Green Seal Certification (US)	Product		
HVS International ECOTEL Certification	Building/Lodging		
Sustainable Ecotourism Rating (Costa Rica)	Building/Lodging		
Vermont Green Hotels in the Green Mountain State	Building/Lodging		
Green Rating Initiative (Ethiopia)	Product		
Green Rating of Indian Industry	Product		
Sustainable Project Appraisal Routine (SPEAR)	Product		

Name	Relevance	Availability	Certification
Global Reporting Initiative	Product		
BEAT 2000 (Denmark)	Building/LCA		
BRI LCA (Japan)	Building/LCA		
EcoIndicator (Netherlands)	Building/LCA		
EcoInstall (Netherlands)	Building/LCA		
EcoPro (Germany)	Building/LCA		
EcoQuantum (Netherlands)	Building/LCA		
LCA-House (Finland)	Building/LCA		
LCAiT (Sweden)	Building/LCA		
Legoe (Germany)	Building/LCA		
OGIP (Switzerland)	Building/LCA		
REGENERS (Finland)	Building/LCA		
TAKE-LCA (Finland)	Building/LCA		
TEAM (Finland)	Building/LCA		
Athena Model (Canada)	Building/LCA		
BEES (US)	Building/LCA		
GaBi 4	Building/LCA		
KCL-ECO	Building/LCA		
LISA (LCA in Sustainable Architecture)	Building	Australia	
Umberto	Building/LCA		
Solution Spaces (Canada)	Building/LCA		
Equer (France)	Building/LCA		
MMG (Netherlands)	Information Not Found		

Name	Relevance	Availability	Certification
SIA 493 (Switzerland)	Information Not Found		
County of Santa Barbara Innovative Building Review Program (CA)	Building/Residential		
Earth Advantage Home (US)	Building/Residential		
Earth Advantage Program (Portland General Electric)	Building/Residential		
EarthCraft House (Greater Atlanta, GA HBA)	Building/Residential		
EarthCraft House (US)	Building/Residential		
EcoHomes (UK)	Building/Residential		
EnerGuide Houses Program (Canada)	Building/Residential		
Energy Rated Homes of Colorado	Building/Residential		
Evergreen Building Guide (Issaquah, WA)	Building/Residential		
FirstRate (Australia)	Building/Residential		
G/Rated (Portland, OR)	Building	Portland, OR	
Green Built Home (Wisconsin Environmental Initiative)	Building/Residential		
Green Built Program (HBA of Greater Grand Rapids, MI)	Building/Residential		
Green Home Designation (Florida Green Building Coalition)	Building/Residential		
Hawaii BuiltGreen	Building/Residential		
Health House Advantage Certification (US)	Building/Residential		
HERS (US)	Building/Residential		
Home Builders Association of Greater Kansas City (MO)	Building/Residential		

Name	Relevance	Availability	Certification
HomeRun (Canada)	Building/Residential		
Hudson Valley HBA Green Building Program (NY)	Building/Residential		
Multifamily Green Building Guidelines (Alameda County, CA)	Building/Residential		
NatHERS (Australia)	Building/Residential		
New Mexico Building America Partner Program (HBA of Central New Mexico)	Building/Residential		
Novoclimat (Quebec, Canada)	Building/Residential		
R-2000 (Canada)	Building/Residential		
Schenectady HBA Green Building Program (NY)	Building/Residential		
SeaGreen (Seattle)	Building/Residential		
Southern Arizona Green Building Alliance	Information Not Found		
Super Good Cents and Natural Choice Homes	Building/Residential		
The BREEAM Green Leaf for Multi-Residential Buildings (Canada)	Information Not Found		
The Green Builder Program (NM)	Building/Residential		
Vermont Built Greener	Building/Residential		
Western North Carolina Green Building Council	Building/Residential		
BREEAM (Building Research Establishment's Environmental Assessment Method)	Building	UK	
BREEAM Canada	Building	Canada (Obsolete)	
BREEAM Green Leaf	Building	Canada (Obsolete)	
Calabasas LEED	Information Not Found		

Name	Relevance	Availability	Certification
CASBEE (Comprehensive Assessment System for Building Environmental Efficiency)	Building	Japan	
CEPAS (Comprehensive Environmental Performance Assessment Scheme)	Building	Hong Kong	
EkoProfile (Norway)	Building	Norway	
ESCALE	Information Not Found		
GBTool	Building	Obsolete	
GEM (Global Environmental Method) For Existing Buildings (Green Globes) – UK	Building	UK	
GOBAS (Green Olympic Building Assessment System)	Building	China (Obsolete)	
Green Building Rating System – Korea	Information Not Found		
Green Globes Canada	Building	Canada	
Green Globes™ US	Building	U.S. National	Third party
Green Leaf Eco-Rating Program	Building/Lodging		
Green Star rating tool (Australia)	Building	Australia	
HK BEAM (Hong Kong Building Environmental Assessment Method)	Building	Hong Kong	
HQE (High Environmental Quality)	Building	France	
iDP (Integrated Design Process)	Information Not Found		
Labs21	Building/Laboratory		
LEED® (Leadership in Energy and Environmental Design)	Building	U.S. National	Third party
LEED Canada	Building	Canada	
LEED India	Building	India	

Name	Relevance	Availability	Certification
LEED Mexico	Building	Mexico	
LEED Italia	Building	Italy	
NABERS (National Australian Built Environment Rating System)	Building	Australia	
PromisE	Information Not Found		
Protocol ITACA	Building	Italy	
SBAT (Sustainable Buildings Assessment Tool)	Building	South Africa	
Scottsdale's Green Building Program	Building	Scottsdale, AZ	
SPiRiT (Sustainable Project Rating Tool)	Building	U.S. National	Self Compliance
TERI Green Rating for Integrated Habitat Assessment	Building	India	
TQ Building Assessment System (Total Quality Building Assessment System)	Building	Germany	
Green Star® (Alaska)	Corporate		
ecospecifier	Product		
Water Sense	Product		
SPI Green Firm Certification	Corporate		
Living Building Challenge	Building	U.S. National	Third party
SB Tool	Building	International	Third party
Estidama Pearl Rating System	Building	Abu Dhabi	
Three Star System	Building	China	
Energy Start Portfolio Manager	Building/Energy		
U.S. EnergyGuide Label	Product		

Name	Relevance	Availability	Certification
Guiding Principles for High Performance and Sustainable Buildings	Building	U.S. National	Self Compliance
10 CFR 433 -- Energy Efficiency Standards for the Design and Construction of New Federal Commercial and Multi-Family High-Rise Residential Buildings	Building	U.S. National	Self Compliance
Minnesota Sustainable Building Guidelines*	Building	Minnesota	
California Green Building Standards Code	Building	California	
ASHRAE 189.1 Standard for the Design of High-Performance, Green Buildings	Building	U.S. National	AHJ Review
National Green Building Certification (based on the ICC 700 National Green Building Standard™)	Building/Residential		
International Green Construction Code (IGCC)	Building	U.S. National	AHJ Review
Earth Advantage Commercial Program	Building	Not Launched	
ASHRAE Building Energy Quotient Program	Building/Energy		
STARS (Sustainability Tracking, Assessment & Rating System)	Building/Higher Education		
GGHC Green Guide for Health Care	Building/Health Care		
The Sustainable Sites Initiative: Guidelines and Performance Benchmarks 2009	Landscape		
EcoLogo (Canada)	Product		
Passive House	Building/Residential		

Appendix D: Review Criteria

Source	Criteria	Criteria Definition	Review Questions
(PUBLIC LAW 110–140—DEC. 19, 2007 121 STAT. 1618-1619)			
(B) the ability and availability of assessors and auditors to independently verify the criteria and measurement of metrics at the scale necessary to implement this subtitle;	**Independence**	Assessors/auditors have no stake in whether a building receives certification.	Is an assessor/auditor independently assigned/selected?
			How is an assessor or auditor assigned/selected to evaluate a project?
			Is there a documented appeal process?
			What is the documented appeal process?
			Is there an independent review and verification process?
			What is the method for evaluation?
	Availability	Assessors/auditors are available to evaluate a building.	What is the average length of time for a building evaluation from submission to certification?
			Is there a documented feedback/comment resolution process?
			What is the documented feedback and/or comment resolution process?
			Is there a projected evaluation schedule provided online?
			How long does it take for a project to receive evaluation feedback at various stages of assessment?
			Does the user get feed back in time?
			What is the average time an auditor/assessor spends on each project?
			How many assessors/auditors are typically involved with a project evaluation? Do larger building have more than one assessor? Expertise?
	Verification	A documented standard verification method and process must be followed by assessors and auditors.	What is the process assessors/auditors use to evaluate a project?
			Do the assessors/auditors verify the information onsite?
			Are the criteria used by assessors/auditors documented?
			What are the evaluation criteria assessors/auditors use when evaluating a project?
			What tools are used to evaluate the technical information provided by a project?
			Are evaluation needs outside the expertise of the auditor/assessor addressed?
			What is the process when evaluation needs are outside an auditor/assessor's expertise?
(C) the ability of the applicable standard-setting organization to collect and reflect public comment;	**Transparency**	Documented approach for the review and consideration of public comments.	Are there methods to collect and address public comments?
			What methods are used to collect and address public comments?
		Public comments are collected on a regular base.	How frequently are public comments collected?
		Public comments are reflected in the certification systems.	Are public comments incorporated into the revision process?
			How are public comments incorporated into the certification system revision process?

		Development and updating process of the certification system is documented and publicly available.		Are the changes documented and accessible by the public?
				Where are certification system changes documented?
(D) the ability of the standard to be developed and revised through a consensus-based process;	**Consensus-based**	The certification system contains the attributes of a voluntary consensus standards body defined in OMB Circular A-119: openness, balance of interest, due process, an appeal process, and consensus		Who has been involved in the development, funding, and management of the certification system - Government, Private Industry, Non-Governmental Organizations, and others?
				What has been the role and commitment in the development, funding, and management of the certification system by Government, Private Industry, Non-Governmental Organizations, and others?
				Was the certification system developed using a consensus-based approach?
				How are points allocated?
				Are credits pilot tested before publication
				How are credits tested?
				How are different opinions managed?
				Is there a written procedure for managing different opinions?
				Are there third-party reviewers/moderators of the process?
(E) an evaluation of the robustness of the criteria for a high-performance green building, which shall give credit for promoting— (i) efficient and sustainable use of water, energy, and other natural resources;	**Robustness**	Water criteria meet Federal requirements, at the minimum, and are a relevant part of the certification	Indoor Water	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Process Water	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Outdoor Water	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Stormwater	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Water-Efficient Products	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
		Energy criteria meet Federal requirements, at the minimum, and are a relevant part of the certification	Energy Efficiency	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Measurement and Verification	Does the metric help a building meet a current Federal requirement?
				What standards or tools are required for the metric?
			Benchmarking	Does the metric help a building meet a current Federal requirement?
				What standards or tools are required for the metric?
			Greenhouse Gas	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?

		Material selection criteria meet Federal requirements, at the minimum, and are a relevant part of the	Recycled Content	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Biobased Content	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Environmentally Preferable Products	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Waste and Materials Management	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Ozone Depleting Compounds	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
(ii) use of renewable energy sources;	**Robustness**	Renewable energy criteria meet Federal requirements, at the minimum, and are a relevant part of the		Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What percentage of the certification system is represented by this metric?
(iii) improved indoor environmental quality through enhanced indoor air quality, thermal comfort, acoustics, day lighting, pollutant source control, and use of low-emission materials and building system controls;	**Robustness**	Indoor air quality (ventilation) criteria meet Federal requirements, at the minimum, and are a relevant part		Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
		Thermal comfort criteria meet Federal requirements, at the minimum, and are a relevant part of the certification		Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
		Acoustics criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.		Does the metric help a building meet a current Federal requirement?
		Daylighting criteria meet Federal requirements, at the minimum, and are a relevant part of the certification		Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
		Pollutant source control criteria meet Federal requirements, at the minimum, and are a relevant part	Environmental Tobacco Smoke Control	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Moisture Control	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Protect Indoor Air Quality during	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
		Low-emission material criteria meet Federal		Does the metric help a building meet a current Federal requirement?

		requirements, at the minimum, and are a relevant part of the certification system.		What is the baseline or point of comparison?
				What standards or tools are required for the metric?
		Building system controls criteria meet Federal requirements, at the minimum, and are a relevant part	Building System Controls	Does the metric help a building meet a current Federal requirement?
			Commissioning	Does the metric help a building meet a current Federal requirement?
				What standards or tools are required for the metric?
		Integrated design criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.		Does the metric help a building meet a current Federal requirement?
(iv) reduced impacts from transportation through building location and site design that promote access by public transportation; and	**Robustness**	Siting criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.		Does the metric help a building meet a current Federal requirement?
(v) such other criteria as the Federal Director determines to be appropriate; and	**System Maturity**	Certification system is effectively linked to latest tools and standards.		How do the tools and standards within the certification system compare to current versions of standards and latest industry tools?
				How frequently are the certification systems and referenced standards and tools updated?
		Certification system has components to track building performance post-occupancy.		Does the certification system allow for the evaluation of an existing building?
				Is there a requirement for post occupancy data collection once a building has been certified?
				Is there a mechanism to transfer the certification of a new building to an existing building over time?
		The certification system is used as basis for development of other systems.		How many other systems refer to the certification system or the certification organization as its basis for development or comparison?
		The certification system has been consistently updated overtime.		When was the certification system developed, first used, first available for public use, and when was most recent revision completed?
				What is the frequency of changes?
	Usability	Cost of use is affordable.		What are the direct costs of using the certification system, including materials, registration, and certification fees?
		The certification system organization provides product support.		What is the availability and responsiveness of direct requests for assistance, availability of training, and usability of information available on the website, through case studies, documented inquiries, and frequently asked questions.
(V) national recognition within the building industry	**National Recognition**	The certification system is recognized academically.		Is the certification system included in the curriculum of the top 10 architectural schools?
				How many students are involved? (Attending conferences or training, becoming assessors or green building professionals, etc.)
		The certification system is recognized within the buildings' industry (including real estate and construction industry).		Is the certification system recognized in the building industry?
				What is the adoption rate at the State level?
				What is the adoption rate at the County level?
				What is the adoption rate at the City level?
				How many buildings have signed up to participate in the certification system?
				How many buildings have been awarded certification?
				How many professionals (by category) are involved?
				How many institutional/group members?

				How many professional associations have recognized the certification system?
		The certification system is recognized within the federal sector.		How many Federal agencies have identified the system as guidance or a requirement?
				How many Federal buildings have been certified?
				Does the system address the majority of Federal building inventory (building types)?

NOTE: The following robustness review questions are for existing buildings.

(E) an evaluation of the robustness of the criteria for a high-performance green building, which shall give credit for promoting— (i) efficient and sustainable use of water, energy, and other natural resources;	**Robustness**	Water criteria meet Federal requirements, at the minimum, and are a relevant part of the certification	Indoor Water	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Process Water	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Outdoor Water	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Measurement of Water Use	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Storm Water	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Water-Efficient Products	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
		Energy criteria meet Federal requirements, at the minimum, and are a relevant part of the certification	Energy Efficiency	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Measurement and Verification	Does the metric help a building meet a current Federal requirement?
				What standards or tools are required for the metric?
			Benchmarking	Does the metric help a building meet a current Federal requirement?
				What standards or tools are required for the metric?
			Greenhouse Gas	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
		Material selection criteria meet Federal requirements, at the minimum, and are a relevant part of the	Recycled Content	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?

			Biobased Content	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Environmentally Preferable Products	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Waste and Materials Management	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Ozone Depleting Compounds	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
(ii) use of renewable energy sources;	**Robustness**	Renewable energy criteria meet Federal requirements, at the minimum, and are a relevant part of the		Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What percentage of the certification system is represented by this metric?
(iii) improved indoor environmental quality through enhanced indoor air quality, thermal comfort, acoustics, day lighting, pollutant source control, and use of low-emission materials and building system controls;	**Robustness**	Indoor air quality (ventilation) criteria meet Federal requirements, at the minimum, and are a relevant part		Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
		Thermal comfort criteria meet Federal requirements, at the minimum, and are a relevant part of the certification		Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
		Acoustics criteria meet Federal requirements, at the minimum, and are a relevant part of the certification system.		Does the metric help a building meet a current Federal requirement?
		Daylighting criteria meet Federal requirements, at the minimum, and are a relevant part of the certification		Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
		Pollutant source control criteria meet Federal requirements, at the minimum, and are a relevant part	Integrated Pest Management	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Environmental Tobacco Smoke Control	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
			Moisture Control	Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
		Low-emission material criteria meet Federal requirements, at the minimum, and are a relevant part		Does the metric help a building meet a current Federal requirement?
				What is the baseline or point of comparison?
				What standards or tools are required for the metric?
		Building system controls criteria meet Federal requirements, at the minimum, and are a relevant part	Building System Controls	Does the metric help a building meet a current Federal requirement?

		of the certification system.	Commissioning	Does the metric help a building meet a current Federal requirement?
				What standards or tools are required for the metric?
		Integrated design criteria meet Federal requirements, at the minimum, and are a relevant part of the		Does the metric help a building meet a current Federal requirement?
				What standards or tools are required for the metric?

Appendix E: Certification System Mapping to Review Criteria

(all criteria, except “Robustness”)

Independence

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Review Questions	Summary	Green Globes	Source	Date Retrieved	Summary	LEED	Source	Date Retrieved	Summary	Living Building Challenge	Source	Date Retrieved
Is an assessor/auditor independently assigned/selected?	**Yes**				Yes				Yes			
How is an assessor or auditor assigned/selected to evaluate a project?	Assessors are selected based on their experience in different assessment areas. Assessors must sign a business agreement with GBI and follow the conflict of interest guidelines.	Third-party assessors are selected based on qualification (experience in design, engineering, energy analysis/management, commissioning, construction, and/or facility management). Once an assessors is assigned, contact information for an assessor is then given to the owner by GBI. A Green Globe Assessors cannot provide other services relating to Green Globes, except for the third party assessments. Assessors must sign a business agreement with GBI and adhere to conflict of interest guidelines and disclosure requirements.	http://www.thegbi.org/commercial/about-green-globes/faq.asp Conflict of interest guidelines for assessors can be found at http://www.thegbi.org/commercial/about-green-globes/faq.asp Conflict of interest guidelines are not available at provided address.	07/28/11 08/25/2011	Projects are randomly assigned through an unbiased pool of qualified assessors (Note: USGBC uses the term "reviewers") based on their availability and expertise. Under certain unique circumstances (e.g. buildings on the same campus) project teams can request that the same assessor be assigned to the related projects (subject to capacity). Each assessor must confirm the absence of any conflict of interest prior to accepting any project application for review.	Green Building Certification Institute (GBCI), established in 2008 is a separately incorporated entity and is responsible for project registration and certification. GBCI administers the LEED certification program, performing third-party technical reviews and verification of registered projects to determine if they have met the standards set forth by the LEED rating system. Dedicated technical experts ensure building certification meets the highest levels of quality and integrity. Projects are randomly assigned through our unbiased pool of highly qualified reviewers based on their availability and expertise. Under certain unique circumstances (e.g. buildings on the same campus) project teams can request that the same reviewer be assigned to the related projects (subject to capacity). Each reviewer must confirm the absence of any conflict of interest prior to accepting any project application for review.	GBCI Website - http://www.gbci.org/org-nav/about-gbci/about-gbci.aspx Owner	8/25/2011	Auditors are selected first by expertise, then by location. Auditors must sign a conflict of interest form and they are not introduced to the project team until the site visit is scheduled.	Auditors are selected first by expertise, then by location. As demand grows, additional auditors will be trained in diverse geographical locations. The intent is for the auditor to have an applied knowledge of the climate and culture of the place, allowing for a simplified assessment process. Prior to taking an assignment, the auditor must sign a 'conflict of interest' form, documenting that they have no personal or professional connection to the project and will not benefit from the outcome of the certification ruling. The auditor is not introduced to the project/representative project team member until the site visit is scheduled to maximize the potential for an unbiased review.	Owner	8/14/2011
Is there a documented appeal process?	Yes	Complete appeal policies and procedures can be found in section 6.0 Appeals of The GBI Procedures for the Development and Maintenance of Green Building Standards (GBI-PRO 2005-5).	http://www.thegbi.org/commercial/about-green-globes/faq.asp The Green Building Initiative (GBI) Procedures for the Development and Maintenance of Green Building Standards (GBI-PRO 2005-5). www.thegbi.org/commercial/standards/GBIProceduresFebruary2008.pdf	8/25/2011	Yes			8/25/2011	The documented appeal process is not published yet.	There is a documented appeal process, included in the certification flow diagram created for online viewing May 27, 2011. See https://ilbi.org/lbc/certification-process for a simplified account. Details for each step in the flow diagram will be published in the upcoming Process book of the Petal Series – a collection of printed companion guides to provide the necessary generalized support information, strategies, rationale, case studies, and context for every Petal and Imperative. This resource will complement the "Dialogue", the online forum where the most up-to-date information is maintained.	Owner https://ilbi.org/lbc/certification-process	8/14/2011

Independence

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Review Questions	Summary	Green Globes	Source	Date Retrieved	Summary	LEED	Source	Date Retrieved	Summary	Living Building Challenge	Source	Date Retrieved
What is the documented appeal process?	A project team (Note: GBI uses the term "A customer") can file a written complaint within 30 days after the date of notification of any action. The Secretariat will respond within 30 days after the receipt of the compliant. An appeal panel may be appointed to conduct a hearing. Further appeal may be made directly to ANSI.	A customer may file an appeal with the Green Building Initiative regarding specific discrepancies previously identified and discussed with the Green Globes Assessor but not resolved to the customer's satisfaction. A one-time appeal fee must be paid prior to Green Building Initiative evaluating the merits of the appeal. 6.0 Appeal 6.1 Complaint – Persons who have been or may be affected by any Committee action or inaction shall have the right to appeal such action or inaction. The appellant shall file a written complaint with the Secretariat within 30 days after the date of notification of any action, or at any time with respect to inaction. The complaint shall state the nature of the objection, the procedures or the sections of the Standards that are at issue, the action or inaction at issue, and the specific remedial action(s) that would satisfy the appellant's concerns. 6.2 Response – Within 30 days after the receipt of the complaint, the Secretariat shall respond in writing to the appellant, specifically addressing each allegation in the complaint to the extent possible. The Secretariat shall attempt to resolve, informally, the complaint of the appellant. 6.3 Appeals Panel and Hearing – If the Secretariat is unable to informally resolve the complaint, it shall appoint an appeals panel to hold a hearing on a date agreeable to all participants, with at least 15 working days notice. The appeals panel shall consist of three individuals who have not been directly involved in the dispute and who will not be materially affected by any decision made in the dispute. At least two members of the panel shall be acceptable to the appellant and at least two shall be acceptable to the Secretariat. 6.4 Conduct of the Hearing – The appellant has the responsibility of demonstrating improper procedural action or inaction, the adverse effects therefrom, and the efficacy of the requested remedial action. The Secretariat has the responsibility to demonstrate that the Committee took all actions in question in compliance with these procedures.	http://www.thegbi.org/commercial/about-green-globes/faq.asp Rating Discrepancy Resolution and Appeal Guidelines http://www.thegbi.org/assets/pdfs/Green-Globes-Rating-Appeal-Guidelines.pdf	7/28/2011	The project team can file a first level appeal to GBCI prior to formal acceptance of and within 25 business days of the applicable action. The appeals are usually submitted through LEED Online. GBCI representatives not previously involved in evaluating the relevant requirement for the Project will review the appeal documentation. GBCI endeavors to deliver a decision on the appeal within 25 business days from the initial filing of the appeal. Within 25 business days after receiving notice from GBCI as to the determination of the first level appeal, a project team may initiate a final level appeal. The Appeals Board will make a final decision. Expedited appeals are available.	First Level Appeal: The project team may initiate an first level appeal to GBCI prior to formal acceptance of and within twenty-five (25) business days of the applicable action or determination by GBCI. (Formal acceptance of a GBCI determination occurs within LEED Online) All appeals must be provided to GBCI via the same platform through which the project application was submitted for review (usually LEED Online). The project team must remit the appeal fee as well as submit the following information to establish the basis for the appeal: 1) supplemental documentation supporting such MPR, prerequisite and/or credit; as well as 2) an explanation addressing the issues in the technical advice provided with the denial of the MPR, prerequisite and/or credit. GBCI will acknowledge filing of the appeal to the project team. GBCI representatives not previously involved in evaluating the relevant requirement for the Project will review the appeal documentation and explanation provided by the project team. GBCI endeavors to deliver a decision on the appeal within twenty-five (25) business days from the initial filing of the appeal. GBCI's appeal decision shall include identification of the technical basis underlying such decision. Final Level Appeal: A project team may initiate a final level appeal in order to challenge a denied prerequisite, credit, or first level appeal decision. Final level appeals are restricted to appeals in which the project team disagrees with the denial of a prerequisite, credit, or first level appeal decision, and wishes to argue the validity of the ruling without providing additional clarifications, documentation, or alternative compliance paths. The project team must submit the final level appeal, using LEED Online, within twenty-five (25) business days after receiving notice from GBCI as to the determination of the first level appeal. Whenever a final level appeal is lodged, the GBCI Chair in consultation with the GBCI President shall appoint three persons to serve on the Appeals Board, each of whom shall be qualified by virtue of training and experience to have the appropriate technical knowledge in the relevant LEED Rating System. The Appeals Board shall make a final determination on all determinations pertaining to MPRs, credits and/or prerequisites. No member of the Appeals Board may (a) review any matter in which his or her impartiality might reasonably be questioned or (b) review any matter which presents an actual or apparent conflict of interest relating to the project.	LEED Certification Policy Manual - https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf	7/8/2011 8/25/2011	After initiation there are three written instances for providing supplemental/clarifying data, and one verbal opportunity during the site visit.	Project teams can rectify any deficiencies in the submissions and re-apply for missing petals and a new audit. Previously accepted petals are not re-audited unless desired. The details of repeal process are not described in the User's Guide. Once a team has initiated the certification process, there are three written instances when they can provide supplemental/clarifying data, and one verbal opportunity during the site visit: 1. Institute staff perform a "completeness check" to ensure that sufficient data have been submitted and may request additional written information from the project team. 2. During the written documentation review (prior to the site visit), the auditor performs a technical content review of the data and may request written clarification about information provided by the project team. 3. During the site visit, the auditor may ask questions and the representative project team member may provide clarifying explanations. Any otherwise undocumented relevant information learned during the site visit is included in the auditor's written report. 4. Once the team is informed of the official results and receives a simplified copy of the auditor's written report, they have one opportunity to appeal. The appeal review is based on supplemental written documentation only – there will not be a second site visit.	The Living Building Challenge User's Guide V1.2 Owner	7/8/2011 8/14/11

Independence

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Review Questions	Summary	Green Globes	Source	Date Retrieved	Summary	LEED	Source	Date Retrieved	Summary	Living Building Challenge	Source	Date Retrieved
		6.5 Decision – The appeals panel shall render its decision in writing within 30 days of the hearing, based upon a preponderance of the evidence, stating its findings of fact and conclusions, with reasons therefore and citing the evidence. The Secretariat shall notify the appellant and the Committee of the decision of the appeals panel, which shall be binding and final on all concerned. 6.6 Further appeal – Further appeal may be made directly to ANSI, but only if the above process has been followed to its conclusion. If the appellant gives notice to GBI that such a further appeal to ANSI is intended, all relevant materials, including the decision made by the appeals panel set forth above, shall be submitted to ANSI by GBI.				GBCI shall notify the project team of the names of those persons serving on the Appeals Board, and the project team shall notify GBCI within ten (10) business days of receipt of such names if the project team questions the impartiality of any member of the Appeals Board. The Chair of GBCI shall determine whether to disqualify any member from serving on the Appeals Board. In the event of disqualification, the Chair of GBCI will designate another individual to serve as an interim member. The GBCI Chair in consultation with the GBCI President shall designate the Chair of the Appeals Board. All final level appeals must be submitted in writing and sent to GBCI by traceable email, mail or delivery service. The appeal must specify a valid basis for the appeal, but may not offer documentation other than that previously proffered to GBCI. GBCI may file a written response to the appeal request. Written briefings may be submitted by the project team and by GBCI within twenty-five (25) business days following submission of the appeal request. The Appeals Board will endeavor to meet within sixty (60) calendar days. It shall render a decision, including a brief description of its reasons, based on the record below and written briefs (if any) without an oral hearing. GBCI will endeavor to (but does not guarantee) deliver the decision on the appeal within ten (10) business days of the meeting of the Appeals Board. Decisions of the Appeals Board shall be by majority vote. The decisions of the Appeals Board shall be final.					
Is there an independent review and verification process?	Assessors must sign a business agreement with GBI and follow the conflict of interest guidelines.		http://www.thegbi.org		The review and verification are administered by GBCI, a separately incorporated entity.	Green Building Certification Institute (GBCI), established in 2008 is a separately incorporated entity and is responsible for project registration and certification. GBCI administers the LEED certification program, performing third-party technical reviews and verification of registered projects to determine if they have met the standards set forth by the LEED rating system.	GBCI Website - http://www.gbci.org/org-nav/about-gbci/about-gbci.aspx	9/6/2011	Auditors must sign a conflict of interest form and they are not introduced to the project team until the site visit is scheduled.	Prior to taking an assignment, the auditor must sign a 'conflict of interest' form, documenting that they have no personal or professional connection to the project and will not benefit from the outcome of the certification ruling. The auditor is not introduced to the project/representative project team member until the site visit is scheduled to maximize the potential for an unbiased review.	Owner	8/14/2011
What is the method for evaluation?	The evaluation process includes document review and on-site walk through.	The method for building evaluation includes two stages: paperwork (construction documents, analysis documents, management policies, facility records, support materials, online questionnaire with points confirmed by the third-party assessor), and an on-site walk through. The third party assessment process is different for existing buildings and new construction. Green Globes-CIEB assessment includes an extensive documentation review and an on-site visit with a walk through and interview of facility manager and chief engineer. The New Construction assessment includes two stages of assessment. Stage I is a review of construction documents, working drawings, landscape designs, energy analysis, LCA documentation, commissioning reports, etc. Stage II includes an onsite walk through, review of additional documentation, and interview of key team members.	http://www.thegbi.org/commercial/about-green-globes/faq.asp	7/28/2011	The LEED certification program is a documentation-based verification program. The review process for LEED is conducted in LEED Online and occurs in two phases. In both the preliminary and (optional) final review, all the documentation submitted with the application is reviewed for completeness and compliance with the appropriate LEED rating system.	The review process for LEED occurs in two phases. In both the preliminary and (optional) final review, all the documentation submitted with the application is reviewed for completeness and compliance with the appropriate LEED rating system. Each reviewed prerequisite and credit is designated as anticipated, pending, or denied in the preliminary review and as awarded or denied in the final review. Each designation is accompanied by technical advice as deemed appropriate by the review team. All project information forms are designated as approved or not approved, and are accompanied by technical advice as deemed appropriate by the review team. The LEED certification program is a documentation-based verification program. Each LEED rating system and version thereof consists of unique documentation requirements to complete a LEED certification application. Within the LEED certification application, a series of required documents, attestations, data, or other information must be indicated in order to demonstrate the satisfaction of each MPR, prerequisite, and attempted credit. Specific documentation requirements vary across the different rating systems; though, usually consist of forms, calculations, narratives, maps, drawings, specifications, and other related media (collectively, "documentation").	http://www.gbci.org/main-nav/building-certification/certification-guide/leed-for-existing-buildings-operations-and-maint/application-review/certification-review.aspx http://www.gbci.org/main-nav/building-certification/certification-guide/LEED-for-New-Construction/Application-review/split-review.aspx LEED Certification Policy Manual: https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_D	7/7/2011 8/25/2011	The evaluation process includes document review and site visit performed by a single auditor and quality control review performed by the institute.	A project team is required to submit documentation and an independent, third-party technical group will be engaged to review the submittal. Multiple reviewers may review the project and documentation. Once all written documents meet the review requirements, a Living Building Inspector will visit the project site. The audit process will take 2-8 hours. Once the audit is satisfied, the project will receive the certificate. (User's Guide 1.2) Imperatives are evaluated based on written documentation and/or site visit. See https://ilbi.org/lbc/certification-process for a simplified account of the certification process. The project team is required to submit documentation and a single independent, third-party auditor will be engaged to review the submittal. - Team submits written documentation - Institute performs a 'completion check' of Team's documentation - Auditor performs a content review - Auditor performs a single-day site visit and compiles findings into written report - Institute performs quality control review of the report (to ensure that all elements for each relevant Imperative have been assessed – essentially a 'completeness check' of Auditor's work) - Institute notifies Team of certification results and the team is provided a simplified copy of the report. (User's Guide 2.0)	The Living Building Challenge User's Guide V1.2 Owner https://ilbi.org/lbc/certification-process	7/8/2011 8/14/11

Availability

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Q #		Review Questions	Summary	Green Globes	Source	Date Retrieved	Summary	LEED	Source	Date Retrieved	Summary	Living Building Challenge	Source	Date Retrieved
A1	b	**What is the average length of time for a building evaluation from submission to certification?**	3 months	In general, a building can be Green Globes certified from start to finish in about 3 months. Once users have completed the online evaluation and ordered/paid for a third party assessment, they should plan for at least 5 weeks lead time and allow a 1-2 week scheduling window of dates before the third party on-site assessment can be performed. For New Construction, the Stage 1 assessment will take approximately 1 week for review of the construction documents and an additional 2 weeks to generate the assessment report. The NC State 2 as well as the Continual Improvement of Existing Buildings assessment will generally take 1/2 days for the on-site visit followed by 3 weeks for generating the assessment report.	http://www.thegbi.org/faq.asp	7/7/2011	3-4 months	Altogether, the process can take 3-4 months: 25 business days for the initial review followed by 25 business days for the project team to prepare their clarifications, followed by 15 business days for the final review. In instances where an appeal is necessary, this adds an additional 25 business days from when the appeal documentation is submitted for review. Subject to capacity, GBCI is able to provide an expedited review process for a higher fee, and this reduces the review time by approximately 50%.	LEED Certification Policy Manual - https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf	8/25/2011	1-3 months	4-12 weeks, depending on the complexity of the project and the availability of the representative team member to schedule the site visit.	Owner	8/14/2011
	a	**Is there a documented feedback/comment resolution process?**	Yes				Yes				Yes			
A2	b	**What is the documented feedback and/or comment resolution process?**	The reviewer provides a preliminary report, score, and rating to the project team (called "client" by GBI). The preliminary report becomes final if the project team accept the evaluation results.	Generally, the client receives a preliminary report, score, and rating. If the preliminary report, score and rating are accepted and no appeals are anticipated, the report and rating will become final within two weeks after issuance of the report. If there are disputed items, the client must notify GBI within two weeks from when the report was received. Supporting information must be provided to GBI. If an update to the report is deemed necessary by the assessor, he/she will amend the report, score, and rating and final report will be forwarded within 4 weeks. If it is not deemed warranted, the client notifies GBI of an ongoing dispute and pays a one-time appeal fee. Appeals are reviewed by GBI staff and/or Green Globes auditing assessors and are generally granted or denied within 4 weeks. If the appeal was caused by GBI or assessor error, the appeal fee is rebated.	http://www.thegbi.org/assets/pdfs/Green-Globes-Rating-Appeal-Guidelines.pdf	8/25/2011	The reviewer provides detailed feedback to the project team. Project teams are able to contact GBCI technical staff, via the Contact Us Form on the GBCI website, should they have any follow-up questions	The LEED certification process includes a preliminary and a final review. The reviewer provides detailed feedback to the project team during the preliminary review and guidance on the outstanding submittal information that is required before credit/prerequisite compliance can be confirmed. In addition, all project teams are able to contact GBCI technical staff, via the Contact Us Form on the GBCI website, should they have any follow-up questions about their preliminary review comments or other questions about the technical requirements of LEED. GBCI staff are available for conference calls with project teams should they need to discuss complex or unique situations where the project team may be facing challenges evaluating whether their project with comply with the LEED rating system requirements.	LEED Certification Policy Manual - https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf	8/25/2011	There are three written instances for supplemental/clarifying data, and one verbal opportunity during the site visit.	Once a team has initiated the certification process, there are three written instances when they can provide supplemental/clarifying data, and one verbal opportunity during the site visit. All data must be provided in writing to the Institute: 1. Institute staff perform a “completeness check” to ensure that sufficient data have been submitted and may request additional written information from the project team. 2. During the written documentation review (prior to the site visit), the auditor performs a technical content review of the data and may request written clarification about information provided by the project team. 3. During the site visit, the auditor may ask questions and the representative project team member may provide clarifying explanations. Any otherwise undocumented relevant information learned during the site visit is included in the auditor’s written report. 4. Once the team is informed of the official results and receives a simplified copy of the auditor’s written report, they have one opportunity to appeal. The appeal review is based on supplemental written documentation only that is provided by the project team – there will not be a second site visit. The Institute is in the process of building an on-line Project Portal, to be complete in 2011, where all written documentation is uploaded and Dialogue activity is tracked. Once complete, teams will have access to the Project Portal from the time of registration and for the duration of the project.	Owner	08/14/2011
A3	a	**Is there a projected evaluation schedule provided online?**	Yes				Yes				Yes			

A4	b	**How long does it take for a project to receive evaluation feedback at various stages of assessment?**	5 weeks of lead time Stage 1 assessment (document review): 3 weeks Stage 2 assessment (site visit): 4-5 weeks	In general, a building can be Green Globes certified from start to finish in about 3 months. Once users have completed the online evaluation and ordered/paid for a third party assessment, they should plan for at least 5 weeks lead time and allow a 1-2 week scheduling window of dates before the third party on-site assessment can be performed. For New Construction, the Stage 1 assessment will take approximately 1 week for review of the construction documents and an additional 2 weeks to generate the assessment report. The NC State 2 as well as the Continual Improvement of Existing Buildings assessment will generally take 1/2 days for the on-site visit followed by 3 weeks for generating the assessment report. Generally, the client receives a preliminary report, score, and rating. If the preliminary report, score and rating are accepted and no appeals are anticipated, the report and rating will become final within two weeks after issuance of the report. If there are disputed items, the client must notify GBI within two weeks from when the report was received. Supporting information must be provided to GBI. If an update to the report is deemed necessary by the assessor, he/she will amend the report, score, and rating and final report will be forwarded within 4 weeks. If it is not deemed warranted, the client notifies GBI of an ongoing dispute and pays a one-time appeal fee. Appeals are reviewed by GBI staff and/or Green Globes auditing assessors and are generally granted or denied within 4 weeks. If the appeal was caused by GBI or assessor error, the appeal fee is rebated.	http://www.thegbi.org/faq.asp http://www.thegbi.org/assets/pdfs/Green-Globes-Rating-Appeal-Guidelines.pdf	8/25/2011	Preliminary review: 25 business days/15 business days for expedited reviews Opportunity for project to respond to request for clarifications: 25 business days Final review: 15 business days/7 business days for expedited reviews	Preliminary review (25 business days) (15 business days for expedited reviews) Opportunity for project to respond to request for clarifications (25 business days) Final review (15 business days) (7 business days for expedited reviews) Altogether, the process can take 3-4 months: 25 business days for the initial review followed by 25 business days for the project team to prepare their clarifications, followed by 15 business days for the final review. In instances where an appeal is necessary, this adds an additional 25 business days from when the appeal documentation is submitted for review. Subject to capacity, GBCI is able to provide an expedited review process for a higher fee, and this reduces the review time by approximately 50%.	https://www.usgbc.org/FAQConsolidation/FAQ_Detail.aspx?Id=Q501400000009vbmAAA LEED Certification Policy Manual - https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf	7/8/2011 08/25/2011	Feed back is provided real time related to the evaluation schedule. Institute 'completion check': up to 2 weeks Auditor content review: up to 4 weeks Auditor single-day site visit: up to 2 weeks Auditor completes written report: up to 2 weeks Institute quality control review of the report: up to 2 weeks	The evaluation schedule is published in the certification flow diagram. See https://ilbi.org/lbc/certification-process for a simplified account. [Refer to the Appendix for a soft copy.] - Institute 'completion check': up to 2 weeks - Auditor content review: up to 4 weeks - Auditor single-day site visit: up to 2 weeks - Auditor completes written report: up to 2 weeks - Institute quality control review of the report: up to 2 weeks If additional information is required from the project team during the certification process [i.e. instances summarized in Comment 6 – A2], the schedule may be delayed. The team has up to 2 weeks to reply to requests made as a result of the Institute's completeness check; up to 2 weeks to reply to requests made as a result of the auditor's content review; and up to 4 weeks to provide all necessary data required for an appeal. The team must file an intent to appeal the certification results within 2 weeks of notification. The project team receives feedback in real time related to the evaluation schedule. The upcoming Project Portal will include an administrative area with a calendar that provides an up-to-date account of the position of the project in the certification process and anticipated timeline/end date for each phase.	Owner	8/14/2011
	a	**Does the user get feed back in time?**													
A5	b	**What is the average time an auditor/assessor spends on each project?**	8-32 hours of work	8-32 hours	http://www.thegbi.org/about-gbi/career/Green-Globes-Assessor-GBI-Contractor.pdf	8/25/2011	40 hours (range 30-120+ hrs)	This depends largely on the size and complexity or innovative strategies presented by a project. On average, LEED technical reviewers will spend approximately 40 hours (range 30-120+ hrs) reviewing submitted documentation, spread over the preliminary and final review. Time spent to assess Appeal documentation for compliance would be additional.	Owner	8/25/2011	40-80 hours	The onsite audit process will take between 2-8 hours depending upon the size and complexity of the building and the number of petals being pursued. The Auditor may be connected to a single project for up to 8 weeks. Actual dedicated hours during this time likely range from 40-80, depending on the project's complexity, whether additional clarification is necessary, and availability of representative team member. (Hours noted include technical content review; site visit scheduling, walk through and associated travel; and composing report.)	The Living Building Challenge User's Guide V1.2 Owner	7/8/2011 8/14/2011
A6	c	**How many assessors/auditors are typically involved with a project evaluation? Do larger building have more than one assessor? Expertise?**	One assessor is assigned to each project unless the project has specific needs.	Typically, only one assessor is involved. However, if a specialized energy audit is required or an appeal is filed, one additional assessor/auditor will be utilized.	http://www.thegbi.org/about-gbi/career/Green-Globes-Assessor-GBI-Contractor.pdf http://www.thegbi.org/assets/pdfs/Green-Globes-Rating-Appeal-Guidelines.pdf	8/25/2011	Assessors (called "reviewers" by GBCI) are assigned to each project.	In general, three LEED reviewers are assigned to each project: a generalist reviewer, HVAC/energy reviewer and a QC reviewer.	Owner	8/25/2011	One assessor is assigned for each project.	One auditor is assigned per project. One Institute staff member will perform the completeness check for the initial submittal and the auditor's written report.	Owner	8/14/2011

Verification

Black is the information collected by the PNNL team. Blue is the verified information provided by owners. Orange is the unverified information provided by owners.

Q #		Review Questions	Summary	Green Globes	Source	Date Retrieved	Summary	LEED	Source	Date Retrieved	Summary	Living Building Challenge	Source	Date Retrieved
V1	b	**What is the process assessors/auditors use to evaluate a project?**	Review process for GG include document review and on-site walk through.	The method for building evaluation includes two stages: paperwork (construction documents, analysis documents, management policies, facility records, support materials, online questionnaire with points confirmed by the third-party assessor) and an on-site walk through. Building projects that have completed either the NC or CIEB assessments, and scored a minimum threshold of 35% of the 1,000 available points, are then eligible to schedule a thorough third-party review of documentation and an on-site walk-through that will then lead to a formal Green Globes rating/certification. The third party assessment process is different for existing buildings and new construction. Green Globes-CIEB assessment includes an extensive documentation review and an on-site visit with a walk through and interview of facility manager and chief engineer. The New Construction assessment includes two stages of assessment. Stage I is a review of construction documents, working drawings, landscape designs, energy analysis, LCA documentation, commissioning reports, etc. Stage II includes an onsite walk through, review of additional documentation, and interview of key team members. Green Globes-CIEB includes an extensive documentation review and an on-site visit with walk through and interview of facility manager and chief engineer.	http://www.thegbi.org/commercial/about-green-globes/faq.asp	7/28/2011	The LEED review process has the option for two phases, preliminary and final review.	The review process for LEED occurs in two phases. In both the preliminary and (optional) final review, all the documentation submitted with the application is reviewed for completeness and compliance with the appropriate LEED rating system. Each reviewed prerequisite and credit is designated as anticipated, pending, or denied in the preliminary review and as awarded or denied in the final review. Each designation is accompanied by technical advice as deemed appropriate by the review team. All project information forms are designated as approved or not approved, and are accompanied by technical advice as deemed appropriate by the review team.	http://www.gbci.org/main-nav/building-certification/certification-guide/leed-for-existing-buildings-operations-and-maint/application-review/certification-review.aspx	7/7/2011	Review process for LBC includes review of written documentation, site visit and quality control review.	A project team is required to submit documentation and an independent, third-party technical group will be engaged to review the submittal. Multiple reviewers may review the project and documentation. Once all written documents meet the review requirements, a Living Building Inspector will visit the project site. The audit proves will take 2-8 hours. Once the audit is satisfied, the project will receive the certificate. Once the team submits written documentation and the Institute performs a completeness check, the auditor receives access to project data. The site visit is scheduled and the auditor reviews the written documentation. If applicable, the auditor maintains a list of clarifications, which are submitted to the team in one exchange. The auditor reviews any data submitted as a result of the clarification request prior to traveling to the project site. The auditor may add items to the site review checklist template, as necessary, based on the content review. (The documentation requirements for each Imperative indicate whether assessment is based on written documentation, site visit or a combination of both.) The auditor performs a site visit, then completes the written report summarizing findings about each Imperative, and submits the report to the Institute.	The Living Building Challenge User's Guide V1.2 Owner	7/8/11 08/14/11
V2	a	**Do the assessors/auditors verify the information onsite?**	Yes	Yes. GBI assessors make a site visit to walk through the building, review additional documentation, and interview relevant staff. Evaluation criteria are detailed within the rating systems and third-party assessors use relevant documentation provided by the client to assess the accuracy of client compliance/adherence.	http://www.thegbi.org/commercial/aboutgreen-globes/faq.asp	7/28/11 08/25/11	No	For LEED certification, the review team does NOT verify the information onsite.	LEED Certification Policy Manual - https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf	08/25/11	The information is verified during the site visit or through document review.	Yes. There are three ways that an imperative is verified: 1. Verified at site visit, documentation used as reference; 2. Partially-Verified at site visit as well as documentation review; 3. Not Verified at site visit – verified solely through documentation. The Petal Series (documentation requirements) provides information on the verification method for each petal.	The Living Building Challenge User's Guide V1.2	7/8/11 08/14/11
	a	**Are the criteria used by assessors/auditors documented?**	Yes				Yes				Yes			

V3	b	**What are the evaluation criteria assessors/auditors use when evaluating a project?**	For new construction, the Green Building Assessment Protocol specifies evaluation criteria.	Documentation requirements used in evaluations vary depending on the rating system being used. The New Construction assessment includes two stages of assessment. Stage I is a review of construction documents, working drawings, landscape designs, energy analysis, LCA documentation, commissioning reports, etc. Stage II includes an onsite walk through, review of additional documentation, and interview of key team members. Green Globes CIEB includes an extensive documentation review and an on-site visit with walk through and interview of facility manager and chief engineer.	http://www.thegbi.org/commercial/aboutgreen-globes/faq.asp Detailed information on documentation typically requested as part of a third-party assessment is listed in the documents called "Pre-3rd Party Assessment Checklist." Green Globes NC http://www.thegbi.org/assets/pdfs/Green-Globes-NC-Pre-3rdParty-Assessment-Checklist-031809.pdf	8/25/2011	Project documentation for compliance with the published, balloted LEED rating system requirements, Minimum Program Requirements, and individual credit/prerequisite requirements, LEED Online Forms, published Addenda & LEED Interpretations and other LEED guidance documents published by USGB.	LEED reviewers assess project documentation for compliance with the published, balloted LEED rating system requirements, Minimum Program Requirements, and individual credit/prerequisite requirements, LEED Online Forms, published Addenda & LEED Interpretations and other LEED guidance documents published by USGBC (e.g. District and Campus Thermal Energy Treatment)	LEED Certification Policy Manual - https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf	8/25/2011	Documentation Requirements provides verification method and guidelines.	Evaluation criteria are summarized in "Documentation Requirements". [Most recent update to Documentation Requirements was December 03, 2010 and is posted within the online Living Building Community (a subscription is required): https://ilbi.org/action/community/users-guide. Documentation requirements will also be present with assigned form fields in the online Project Portal.] In summary, each project team is expected to share the following: - 'For Construction' Drawing Set - A site plan with the project area clearly noted - Project Manual (specifications) - At least ten photographs or digital color 3D renderings - Additional information specific to each Imperative (in most cases)	https://ilbi.org/action/community/users-guide. Owner	8/25/2011

V4 b	**What tools are used to evaluate the technical information provided by a project?**	Information was not found on how the tool would be used by assessors. The Pre-Assessment and Assessment Checklist is for the project team.	Documentation requirements used in evaluations vary depending on the rating system being used. The New Construction assessment includes two stages of assessment. Stage I is a review of construction documents, working drawings, landscape designs, energy analysis, LCA documentation, commissioning reports, etc. Stage II includes an onsite walk through, review of additional documentation, and interview of key team members. Green Globes CIEB includes an extensive documentation review and an on-site visit with walk through and interview of facility manager and chief engineer.	http://www.thegbi.org/commercial/aboutgreen-globes/faq.asp Detailed information on documentation typically requested as part of a third-party assessment is listed in the documents called "Pre-3rd Party Assessment Checklist." Green Globes NC http://www.thegbi.org/assets/pdfs/Green-Globes-NC-Pre-3rdParty-Assessment-Checklist-031809.pdf	8/25/2011	LEED Online assessment tool.	LEED project reviews are performed using the LEED Online assessment tool. Information was not found on how the tool would be used by assessors. Note: LEED-Online is used by project teams with registered projects to manage the LEED certification process.	LEED Certification Policy Manual - https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf	8/25/2011	The auditor is provided guidelines/checklists and a report template with prompts for each Imperative.	The auditor is provided guidelines/checklists to aid in the content review and site visit portion of a project evaluation. To maximize the potential for a thorough review, the Institute also provides a report template with prompts for each Imperative.	Owner	8/14/2011
a	**Are evaluation needs outside the expertise of the auditor/assessor addressed?**	Yes				Yes				Yes			

V5	b	**What is the process when evaluation needs are outside an auditor/assessor's expertise?**	A senior assessor or member of the technical committee may help address special evaluation needs.	Such a scenario is unlikely because assessors are recruited and selected for a project based on their experience and area of expertise. However, if evaluation needs are outside an assessor's expertise, GBI may contract the assistance of a senior assessor or member of the technical committee.	http://www.thegbi.org/about-gbi/career/Green-Globes-Assessor-GBI-Contractor.pdf Owner	8/25/2011	Standard developer (USGBC) and its technical committee structure may be used to address unique or complex evaluation needs.	GBCI employs highly qualified, professionally licensed, technical staff who have a wide breadth of experience. In instances where a particularly unique or complex project presents evaluation needs outside an assessors expertise, GBCI may pose technical questions to the standard developer (USGBC) and its robust technical committee structure.	Owner	8/25/2011	There are two possible pathways: - Programmatic assistance is provided by Institute staff to clarify the intent of an Imperative. - Content assistance is provided by the associated Petal Committee to clarify the project's applied solution.	Every effort is made to pair a project with an auditor that has broad and deep direct experience applying the technical requirements of the Living Building Challenge to its Typology (e.g. renovation, landscape, infrastructure, building, or neighborhood) and within its Living Transect (e.g. Natural Habitat Preserve, Rural Agriculture Zone, Village or Campus Zone, General Urban Zone, Urban Center Zone, or Urban Core Zone). There are two possible pathways for dealing with an issue that is outside the auditor's expertise: - Programmatic assistance is provided by Institute staff to clarify the intent of an Imperative. - Content assistance is provided by the associated Petal Committee to clarify the project's applied solution. Petal Committees are comprised of national and/or international experts within a given field that share a strong philosophical alignment with the goals of the Living Building Challenge. Positions on a Petal Committee are voluntary and individuals serve at the discretion of the Institute for as long as they are able to provide expert guidance to the certification system and remain free of any significant conflicts of interest. For example, Petal Committee advisors may not be working on an active Living Building Challenge project while sitting on a Petal Committee, nor work for a building product manufacturer or a trade association. There is a minimum of five seats on each Petal Committee, one of which must be held by senior Institute staff to ensure continuity. Committees must be odd in number and may have as many as nine seats.	Owner	8/14/2011

Transparency

Black is the information collected by the PNNL team. Blue is the verified information provided by owners. Orange is the unverified information provided by owners.

Q #		Review Questions	Summary	Green Globes	Source	Date Retrieved	Summary	LEED	Source	Date Retrieved	Summary	Living Building Challenge	Source	Date Retrieved
	a	**Are there methods to collect and address public comments?**	Yes				Yes				Yes, but only those who subscribe for the LBC community can have access to the Forum and feedback form			
T1	b	**What methods are used to collect and address public comments?**	Comments were collected through public comment forums.	GBI became an ANSI accredited Standards Developing Organization (or SDO) in 2005, breaking new ground for the industry by also becoming the first green building organization to commit to taking a commercial building rating system (Green Globes™) through an ANSI consensus process. The assessment protocol—or rating system—contained within GBI's proposed standard will be available to the public for use during the design, construction, operations, and maintenance of commercial buildings. In addition, it will also be the basis of the next version of the Green Globes™ online tools. GBI's standard was developed by a technical committee—or consensus body—formed in 2006 which follows GBI's ANSI-approved procedures for developing consensus documents and involves a balanced committee of users, producers, and interested parties with required public comment periods and full committee ballot voting. The committee is comprised of 30 individuals, balanced equally between users (10), generally interested parties (10), and producers (10). It is supported by technical experts from across the country through working subcommittees. Additionally, the public plays an important role in developing ANSI standards by participating in periodic public comment forums. Many hundreds of individuals and organizations lent their expertise to the development of ANSI/GBI 01-2010: Green Building Assessment Protocol for Commercial Buildings before it was finalized.	http://www.thegbi.org/commercial/standards/	8/25/2011	After changes are reviewed by USGBC the new rating systems/revisions are opened for public review and comment, for at least 45 days, via online form displayed on the USGBC website or the Pilot Credit Library process	LEED is developed through a process in which proposed new rating systems or significant revisions to existing ones are reviewed by USGBC, the Technical Advisory Group, USGBC's Board of Directors, and finally, the LEED Steering Committee. Once these reviews are completed, the new rating systems or revisions are opened for public review and comment. In accordance with USGBC policies, the first comment period is open to the public for at least 45 days. After the comment period closes, comments are incorporated into the draft, an outline of the changes are posted, and a second public comment period is held, during which the public can comment on any changes made since the first comment period. The final draft is delivered to USGBC members for balloting. Web-based comments will be accepted within a 45 day public comment period through an online form displayed on the USGBC website. The comment form will require respondents to reference specific paragraphs or sections of the draft and will include provisions for submitting substantive and procedural comments Only comments submitted through either the public comment forum or the Pilot Credit Library process will be accepted. Hard copy letters, faxes, email comments, etc. will not be responded to.	**LEED Public Comment** http://www.usgbc.org/ledd/leedrafts/ratingsystemversions.aspx **Foundations of LEED (July 17, 2009) VII. Appendix 2: Balloting** http://www.usgbc.org/ShowFile.aspx?DocumentID=6103	3/24/11	Comments are collected online through the Dialogue Forum and the Feedback Form.	Comments are officially collected in one of two ways: - The Dialogue: an online forum where project teams are encouraged to ask clarifications about the intent of the Imperative – generally or specific to their project, and share information that may influence the evolution of an Imperative or Petal. The individual who posted the entry is noted, and there is a visual indicator that demarcates any post that has been officially adopted into the Living Building Challenge. - The Feedback Form: an online form that individuals may use to share ideas or suggestions for the evolution of a particular Imperative, Petal, or Living Building Challenge generally.	**Dialogue** https://ilbi.org/action/community/dialogue **Feedback Form** https://ilbi.org/action/community/feedback-form	8/14/2011
T2	c	**How frequently are public comments collected?**	During the development of the ANSI/GBI Standard	Public comments were collected during the development of the ANSI/GBI 01-2010: Green Building Assessment Protocol for Commercial Buildings. For the current ANSI approved version of the Standard, public comments were solicited and reviewed by the technical committee on multiple occasions. These comments are available on the "Development Archive" page of the GBI website at www.thegbi.org/commercial/standards.	http://www.thegbi.org/commercial/about-green-globes/faq.asp http://www.thegbi.org/commercial/standards	7/28/11 08/25/11	When substantive changes to LEED are made	Public comments are collected when substantive changes to LEED including the addition, deletion, or substantive revision of prerequisites, credits or credit point values are made.	**Foundations of LEED (July 17, 2009) VII. Appendix 2: Balloting** http://www.usgbc.org/ShowFile.aspx?DocumentID=6103	3/24/11	In real time	Comments are collected in real time.	Owner	8/14/2011
	a	**Are public comments incorporated into the revision process?**	Yes				Yes				Yes			

T3	b	**How are public comments incorporated into the certification system revision process?**	Public comments and committee responses are posted at GBI's website.	GBI became an ANSI accredited Standards Developing Organization (SDO) in 2005, breaking new ground for the industry by also becoming the first green building organization to commit to taking a commercial building rating system (Green Globes™) through an ANSI consensus process. The assessment protocol—or rating system—contained within GBI's proposed standard will be available to the public for use during the design, construction, operations, and maintenance of commercial buildings. In addition, it will also be the basis of the next version of the Green Globes™ online tools. GBI's Standard was developed by a technical committee—or consensus body—formed in 2006 which follows GBI's ANSI-approved procedures for developing consensus documents and involves a balanced committee of users, producers, and interested parties with required public comment periods and full committee ballot voting. The committee is comprised of 30 individuals, balanced equally between users (10), generally interested parties (10), and producers (10). It is supported by technical experts from across the country through working subcommittees. Additionally, the public plays an important role in developing ANSI standards by participating in periodic public comment forums. Many hundreds of individuals and organizations lent their expertise to the development of ANSI/GBI 01-2010: Green Building Assessment Protocol for Commercial Buildings before it was finalized.	http://www.thegbi.org/commercial/about-green-globes/faq.asp http://www.thegbi.org/commercial/standards/	7/28/11 08/25/11	Comments submitted through either the public comment forum or the Pilot Credit Library process are accepted. Consideration will be given to expressed objections made by commenters and evaluation will be done as to whether to make revisions to the credits based on the comments. The comments received will be posted on the USGBC website along with a response to each comment and all changes to the draft as approved by LSC.	Web-based comments will be accepted within a 45 day public comment period through an online form displayed on the USGBC website. The comment form will require respondents to reference specific paragraphs or sections of the draft and will include provisions for submitting substantive and procedural comments. Project team feedback gathered during the course of testing of credits and prerequisites in the Pilot Credit Library is considered, by its nature, to be equal to a comment submitted via the online USGBC website form. Comments that are outside of the scope of the proposed changes in the draft will not be considered. Only comments submitted through either the public comment forum or the Pilot Credit Library process will be accepted. Hard copy letters, faxes, email comments, etc. will not be responded to. Comments will be collated and reviewed. Consideration will be given to expressed objections made by commenters and evaluation will be done as to whether to make revisions to the credits based on the comments. The comments received, without commenter name or organization will be posted on the USGBC website along with a response to each comment and all changes to the draft as approved by LSC.	**Foundations of LEED (July 17, 2009) VII. Appendix 2: Balloting** http://www.usgbc.org/ShowFile.aspx?DocumentID=6103	3/24/11	As part of the process for updating the Living Building Challenge, the Dialogue activity and completed Feedback Forms are reviewed and comments integrated as appropriate after additional research is completed.	As part of the process for updating the Living Building Challenge, the Dialogue activity and completed Feedback Forms are reviewed. These comments are then integrated into the certification system by Institute staff as appropriate after additional research is completed. Depending on the complexity and potential impact of a comment, the associated Petal Committee may be involved. - Step One – Registered Team Posting Someone who has subscribed to the Community may at any time post to the Dialogue seeking clarification as to how their particular project may meet a given Imperative. The project team may simply be seeking confirmation that their proposal is in alignment with the intent of the Imperative, or they may be proposing a temporary exception due to some unique characteristic of their project. Either way, all project team communication is done in full view of all other registered projects so that transparency and equitability is achieved. - Step Two – Query Identification The Institute staff then review the Dialogue post and determine the best course of action. Postings typically fall into one of the following categories: A) Simple clarifications that have been previously addressed B) Simple clarifications that have not yet been addressed C) Substantive clarification/idea that needs deliberation at the 'exception' level D) Substantive clarification/idea that needs deliberation at the Imperative level - Step Three – Addressing the Query Postings that fall into category A) are simply and quickly answered: Institute staff post a response to the Dialogue that refers the project team to a previous ruling. This posting is made visible to all Community subscribers so transparency and equitability is achieved. Postings that fall into category B) are also simply and quickly answered: Institute staff endeavor to respond to	Owner	8/14/2011
	a	**Are the changes documented and accessible by the public?**	Yes				**Yes**				Yes, but only those who subscribe for the LBC community can have access to the Dialogue Forum.			
T4	b	**Where are certification system changes documented?**	Meeting minutes of the Consensus Body are posted on GBI's website.	Certification system changes are documented and can be accessed by the public on the GBI website. This standard, officially named ANSI/GBI 01-2010: Green Building Assessment Protocol for Commercial Buildings, was derived from the Green Globes environmental design and assessment rating system for New Construction and was formally approved on March 24, 2010. The standard was developed following ANSI's highly regarded consensus-based guidelines, which are among the world's most respected for the development of consensus standards and ensure a balanced, transparent and inclusive process. A variety of stakeholders including sustainability experts, architects, engineers, ENGO's, and industry groups participated in its development. For those interested in learning more about the development of the ANSI/GBI Standard, including information on the procedures, technical committee members, subcommittees, public comments, and meeting minutes, please" contact info@thegbi.org or review the "ANSI/GBI 01-2010 Development Archive" page on the GBI website.	http://www.thegbi.org/commercial/standards http://www.thegbi.org/green-globes/ansi-gbi-standard.asp	8/25/2011	Summary of changes and committee meeting minutes are posted on USGBC's website. News for seeking public comments is posted on USGBC's website. The comments received, without commenter name or organization will be posted on the USGBC website along with a response to each comment and all changes to the draft as approved by LSC.	LEED Steering Committee, Subcommittees, and Technical Advisory Groups' meeting minutes are available for public download.	**Summary of Changes** http://www.usgbc.org/DisplayPage.aspx?CMSPageID=2521 **LEED Steering Committee Minutes** http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1637 **LEED Technical Advisory Groups Minutes** http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1637 **LEED Technical Committee Minutes** http://www.usgbc.org/DisplayPage.aspx?CMSPageID=2185	3/24/11	Changes can be viewed online through the Dialogue Forum .	Major certification system changes are noted in the current version of the Living Building Challenge. Changes stemming from project team comments are viewable in the Dialogue.	Dialogue https://ilbi.org/action/community/dialogue	8/14/2011

Consensus

Black is the information collected by the PNNL team. Blue is the verified information provided by owners. Orange is the unverified information provided by owners.

Q #		Review Questions	Summary	Green Globes	Source	Date Retrieved	Summary	LEED	Source	Date Retrieved	Summary	Living Building Challenge	Source	Date Retrieved
C1	b	**Who has been involved in the development, funding, and management of the certification system - Government, Private Industry, Non-Governmental Organizations, and others?**	GBI is governed by a group of stakeholders representing construction companies, industry, architectural firms, and academic institutions.	The Green Building Initiative was initially intended to present green building practices modeled after the NAHB green programs to local home builder associations. In 2004, while negotiating a partnership with NAHB, GBI agreed to introduce a Canadian assessment and rating tool into the U.S market. GBI is supported by a core group of industries, including organizations like Wood Promotion Network, financial services, wholesalers, retailers, appliance manufacturers and other building material providers. GBI continues to find new support from other organizations and companies with similar interests. GBI is governed by a group of stakeholders representing construction companies, industry, architectural firms, and academic institutions.	Origin & Non-Profit Status http://www.thegbi.org/about-gbi/	7/28/2011	USGBC is organized around volunteered committees. The committee members come from various types of organizations.	USGBC is organized around three strategic committees: the LEED Steering Committee, the Education Steering Committee and the Chapter Steering Committee. These steering committees ensure there is volunteer involvement in the development of LEED. Volunteer opportunities are posted on USGBC's website.	**About Committees** http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1742 **Volunteer Opportunity** https://www.usgbc.org/myUSGBC/Nomination/VolunteerOpportunityList.aspx **USGBC National Committee Structure** http://www.usgbc.org/ShowFile.aspx?Docu	3/25/2011	LBC was developed and managed by the Living Building Institute.	The Institute, a 501c3 non-profit organization, is responsible for the development and management of the certification system. Individuals representing government agencies, private industry, non-governmental organizations, and others have submitted comments that have helped to shape the evolution of the program. To-date, Living Building Challenge has been funded primarily by foundation grants, and augmented by project registration fees, Community subscriptions, and educational offerings on related topics.	Owner	8/14/2011
								LEED Committees have primary responsibility for the development, implementation and revisions of LEED®. The LEED committee structure includes committees and Technical Advisory Groups (TAGs) which focus on the project implementation process, market responsiveness, and technical rigor of LEED. LEED committees and subcommittees must adhere to the policies and procedures set forth by the Board of Directors in the USGBC Policies and Procedures for Committees and Working Groups. --The LEED Steering Committee (LSC) is a standing committee of the USGBC Board of Directors, consistent with Article XI of the USGBC Bylaws. The work of the Committee is governed by this Charter, as approved by the USGBC Board. The LSC may establish subcommittees and workgroups to focus on specific LEED content areas. --Subcommittees are 'standing committees' of the LSC or of an established subcommittee that perform subject-based work. These subcommittees may propose working groups to work on specific credits, prerequisites, or issues within the LEED rating system as part of LEED Continuous Improvement. Subcommittees shall address the technical, market, and implementation issues of LEED. --Working Groups are groups that come together for the completion of a specific task with a clearly defined scope to be accomplished in a set period of time. Working groups are established by the LSC or a subcommittee and must adhere to all parameters set by the LSC.	**Foundations of LEED (July 17, 2009)** http://www.usgbc.org/ShowFile.aspx?DocumentID=6103 **USGBC Policies and Procedures for Committees and Working Groups (Amended on Nov 8, 2009)** http://www.usgbc.org/ShowFile.aspx?DocumentID=1905 **USGBC Bylaws** http://www.usgbc.org/ShowFile.aspx?DocumentID=4875 **LEED Committees** http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1750	3/25/2011				
C2	b	**What has been the role and commitment in the development, funding, and management of the certification system by Government, Private Industry, Non-Governmental Organizations, and others?**	Green Building Initiative is responsible for development, management, and funding. The Green Building Initiative was accredited as a Standards Developing Organization (SDO) by the American National Standards Institute (ANSI) in September of 2005.	The original Green Globes System (BREEAM) was brought to Canada in 1996 in cooperation with ECD Energy and Environment. In 2005, the Green Building Initiative became the first green building organization to be accredited as a standards developer by the American National Standards Institute.	http://www.thegbi.org/commercial/about-green-globes/ http://www.thegbi.org/commercial/standards/ansi-faq.asp	7/28/11 10/10/11	Multiple LEED committees play different roles in development and management. USGBC was accredited as ANSI Standards Developer in 2006.	The LEED Implementation Advisory Committee is a committee of the LSC charged with assessing and recommending solutions to the LSC for review and approval. Its purpose is to advise on the scope, content and rigor of technical resources and tools supporting LEED programs, with the goal of maintaining LEED's integrity while also providing an effective, predictable and satisfying LEED customer engagement.	**LEED Implementation Advisory Committee** http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1785 **Announcement: USGBC Accredited as ANSI Standards Developer** http://www.usgbc.org/News/PressReleaseDetails.aspx?ID	3/25/11	The Institute is responsible for management, development, and funding. The Government Agencies and Private Organizations participate in rating system development.	Government Agencies and Private Industry have participated in research efforts to substantiate the principles of the Living Building Challenge; and have offered suggestions for the evolution of the certification system via the online Dialogue. Parties other than the Institute do not oversee management, development or funding strategies.	Owner	8/14/2011

							The LEED Market Advisory Committee is a committee of the LSC charged with advising staff and LSC on market-related issues. Its purpose is to advise on market transformation aspects of LEED in collaboration with USGBC staff, to ensure that LEED maintains leadership and continues to respond to the markets. The committee will apply its market experience and expertise to ensure that all LEED systems are feasible and flexible and represent leadership in the market.	**LEED Market Advisory Committee** http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1787	3/25/11				
							The LEED Technical Committee is a committee of the LSC charged with assessing and recommending solutions to the LSC for review and approval. Its purpose is to optimize LEED's technical effectiveness and scientific validity across LEED credit categories. The Committee works to enhance the natural environment and human well-being.	**LEED Technical Committee** http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1792	3/25/11				
							Administrative-Management Committee is a committee of the LSC charged with assisting the full LSC in handling of administrative tasks, process-related decisions, and approvals of selected appointments. The work of this committee is governed by the USGBC Policies and Procedures for Committees and this Charge, as approved by the LEED Steering Committee (LSC).	**Administrative-Management Committee** http://www.usgbc.org/DisplayPage.aspx?CMSPageID=2211	3/25/11				
							The Technical Advisory Groups (TAGs) are charged with providing a consistent source of technical advice to LEED committees and working groups with respect to credit and prerequisite improvement and supporting tool development; the TAGs ensure that the integrity of LEED is grounded on technical and scientific considerations of the highest quality. These committees also work on credit and prerequisite development based on their specific areas of expertise. The Technical Advisory Groups are structured to include commercial, residential and neighborhood development expertise for specific technical issues within the LEED rating systems: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Location & Planning.	**LEED Technical Advisory Groups** http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1795#ss	3/25/11				
							The LEED Rating System Committees have primary responsibility for the development and implementation of LEED credits for a specific building type or market sector. Once a pilot program has been completed and the rating system has been approved by USGBC membership, the committee is disbanded.	**LEED Rating System Committees** http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1786	3/25/11				

C3	a	**Was the certification system developed using a consensus-based approach?**	Consensus-based approach	In 2005, GBI was accredited as a standards developer by the American National Standards Institute (ANSI). The GBI ANSI technical committee was formed in early 2006 and follows GBI's ANSI-approved procedures for developing consensus documents. The committee involves an equal balance of users, producers, and interested parties in required public comment periods and full committee ballot voting and is supported by technical experts from across the country through working subcommittees. Additionally, many hundreds of individuals and organizations lent their expertise to the development of ANSI/GBI 01-2010: Green Building Assessment Protocol for Commercial Buildings before it was finalized. The official Green Globes ANSI standard was published in 2010, and Green Globes NC meets the ANSI consensus standard.	http://www.thegbi.org/commercial/standards/	8/25/2011	Consensus-based approach	Notice will be provided to USGBC members that a consensus body is being formed. Employees of USGBC member organizations in good standing will be allowed to sign up to become part of the consensus body for a period of 30 days preceding the ballot period. The consensus body will be reviewed to ensure it is balanced; no single interest category (producer, user, general interest as defined by the Board of Directors) shall make up a majority of the consensus body. If necessary, the LSC shall appoint voters from and among USGBC member organizations which have not already elected to become part of the consensus body so as to balance the consensus body. Upon approval by the LEED Steering Committee the proposed draft will be submitted to the consensus body for an online vote which shall remain open for 30 days. The ballot shall utilize proportional voting, by which an employee of a USGBC member organization in good standing who has signed up for the consensus body and has a site-user account on the USGBC website linked to the member organization may cast a proportional share of the vote for that member organization. Each USGBC member organization is allowed one vote. All negative votes without reason or with reason not related to the draft shall count toward quorum but shall not be factored into the numerical requirements for consensus. All comments submitted with ballots will be reviewed by the LSC. A ballot is approved by the consensus body if: a. A majority (more than 50%) of the members of the consensus body casts a vote, including abstentions; and b. A minimum of two-thirds of votes cast are affirmative votes; and c. A majority of votes cast by members of the consensus body in each interest category (producer, user, general interest) are affirmative votes.	**Foundations of LEED (July 17, 2009) VII. Appendix 2: Balloting** http://www.usgbc.org/ShowFile.aspx?DocumentID=6103	3/24/11	Expert opinion approach	The certification system was created using an expert opinion approach and has developed with input from the Living Building Community. Because transparency is fundamental to achieving the goals of the Living Building Challenge, the Institute avoids the notion of a 'consensus-based approach' -- Ironically, in the end, consensus decision-making still entrusts someone or some group with the final say. While there is a veil of transparency present, ultimately it is not achieved, which makes the consensus process disingenuous.	Owner	8/14/2011
C4	b	**How are points allocated?**	No documentation was found regarding the mechanism being used for weighting of each area.	In accordance with the Standard, buildings will be comprehensively and thoroughly evaluated across multiple assessment areas that are relevant to sustainability and environmental impact. The seven areas of assessment for the ANSI/GBI Standard include Energy, Indoor Environment, Resources/Materials, Water, Site, Project Management, and Emissions. The total points available for each assessment area are as follows: • Energy 300 • Indoor Environment 160 • Resources/Materials 145 • Water 130 • Site 120 • Project Management 100 • Emissions 45	http://www.thegbi.org/assets/pdfs/ANSI-GBI-Assessment-Areas-Point-Allocation-Achievement-Levels.pdf	8/25/2011	The allocation of points is split between direct human benefit and direct environmental benefit. The types of impacts are quantified and the resulting allocation of points among credits is called credit weighting.	In LEED, the allocation of points is split between direct human benefit and direct environmental benefit. These benefits are based on the potential effect of each credit with respect to a set of impact categories. Examples of these categories include global warming, greenhouse gas emissions, fossil fuel use, toxins and carcinogens, air and water pollutants, and indoor quality. The types of impacts are quantified and the resulting allocation of points among credits is referred to as credit weighting. Credits that most directly address the prioritized impacts are given the greatest weight. Credit weights also reflect a decision by LEED to recognize the market implications of point allocation. The credit weightings process will be reevaluated for each new version to incorporate changes in values ascribed to different building and neighborhood impacts and types, based on both market reality and evolving scientific knowledge related to development.	**Foundations of LEED (July 17, 2009)** http://www.usgbc.org/ShowFile.aspx?DocumentID=6103	3/24/11	Living Building Challenge does not use a point-based system.	Living Building Challenge does not have a points-based system. There are performance-based metrics assigned to each of the 20 Imperatives within the certification system. There are two types of certification: Projects earn "Living" status when all Imperatives assigned to its Typology are met, and earn "Petal Recognition" when projects satisfy the requirements in three or more categories, and at least one is Water, Energy or Materials. In addition, projects that earn Petal Recognition must comply with Imperative 01 (no development on greenfields, on/adjacent to sensitive ecosystems, prime farmland, or within the 100-yr floodplain) and Imperative 20 (inspiration + education). The Institute also offers a specialized version of Petal Recognition called Zero Energy Building Certification. This process certifies projects that meet or exceed net-zero energy and are operationally carbon neutral.	http://zeb.livingbuildingchallenge.org	8/14/2011
	a	**Are credits pilot tested before publication**	GBI is undertaking a limited pilot assessment and certification program.				Yes					No			
C5	b	**How are credits tested?**	GBI is undertaking a limited pilot assessment and certification program.	GBI is undertaking a limited pilot assessment and certification program. "To accommodate the various needs of different clients in the pilot program, GBI provides options for clients to pursue just self-evaluation, design/documentation review by a skilled 3rd party assessor, or the complete 3rd party assessment and certification process; however, those projects seeking certification to the standard must complete all of the steps in the process. As part of the evolution and improvement of the building assessment and certification process, GBI has included post-certification performance evaluation (at no additional cost) for those buildings that are certified to the ANSI/GBI 01-2010 standard."	http://www.thegbi.org/green-globes/ansi-gbi-standard.asp	7/28/2011	LEED Pilot Credit Library is used to test proposed or revised LEED credits.	The LEED Pilot Credit Library is a rating system development tool established to encourage testing of proposed and revised LEED prerequisite credit language, alternative compliance paths, and new and innovative green building technologies and concepts. The LSC, with recommendations from the Pilot Credit Library Working Group, will determine which proposed prerequisites and credits, including versions of future LEED credits, must be pilot tested, and shall approve final language before proposed credits or prerequisites are placed in the Pilot Credit Library.	**Foundations of LEED (July 17, 2009)** http://www.usgbc.org/ShowFile.aspx?DocumentID=6103	3/24/11		Each Imperative is created by identifying the ideal 'end game' for its area of influence and then stepping back to recognize the limits of our collective knowledge and current market realities; Thresholds for performance are established in part by looking to successful built examples. In this way, decisions are steered by restorative principles instead of code-minimum solutions. These also serve as ever-present reminders of the objectives we are working to achieve. Because Living Building Challenge is performance-based, "the specific methodology used to meet the expectations of the Living Building Challenge is relegated to the genius of the design teams, who are expected to make informed decisions appropriate to the project and bioregion." [See page 5 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf] Therefore, there are myriad options for teams to explore and implement to be successful.	Owner	8/14/2011

C6 b	**How are different opinions managed?**	Differing opinions are managed by the technical committee and in accordance with the GBI Procedures for the Development and Maintenance of Green Building Standards (GBI-PRO 2005-5)	Differing opinions are managed by the technical committee and in accordance with the GBI Procedures for the Development and Maintenance of Green Building Standards (GBI-PRO 2005-5). When addressing Public Review Comments without objections "The Standards Committee shall be made aware of all public review comments." Public Review Comments Containing Objections - "shall be referred to the Standards Committee Chair or the Subcommittee responsible for the part of the standard in question to attempt resolution. The Committee may request the Secretariat to obtain further information from the commentator or attempt to correspond with the commenter directly and reach resolution. Each unresolved objection and attempts at resolution shall be referred to the Standards Committee. If substantial changes to the standard are required then the changes are subject to letter ballot, and a new public review period. If changes are not made to the standard, then the response to the negative comment is subject to approval by vote of the Standards Committee and the commenter is informed in writing of the response. In addition, the commenter shall be informed of the appeals process (section 6.0)."	http://www.thegbi.org/commercial/standards/GBIProceduresFebruary2008.pdf	8/25/2011	Any party may appeal to the USGBC Executive Committee of the Board and within 30 calendar days of the action.	"Any party with a direct and material interest, who may be adversely affected by actions or inactions inconsistent with the USGBC procedures with regard to the development, approval, revision, reaffirmation, or withdrawal of a LEED Green Building Rating System, may appeal to the USGBC Executive Committee of the Board. Only appeals of a procedural nature shall be considered by the Executive Committee of the Board. Such appeals shall not be based on the merits of substantive comments regarding the technical content of the rating system. The appellant has the burden of proof of showing that proper procedures were not followed. All appeals must be initiated within 30 calendar days of the action or at any time with respect to an inaction alleged to be inconsistent with these procedures. Requests for appeal must be in writing and shall state the nature of the objection(s) with supporting evidence and proposed remedial actions."	**Foundations of LEED (July 17, 2009) IX. Appendix 4: Appeals** http://www.usgbc.org/ShowFile.aspx?DocumentID=6103	3/24/11	The online Dialogue activity and completed Feedback Forms are used to manage and document opinion discussion.	When there are differing opinions, the Petal Committees are brought into the conversation and provide expertise and recommendations. The process uses the online Dialogue activity and completed Feedback Forms.	Owner	8/14/2011
C7 a	**Is there a written procedure for managing different opinions?**	Yes	The GBI Procedures for the Development and Maintenance of Green Building Standards (GBI-PRO 2005-5) contain procedures for managing differing opinions. Specifically, sections 4.10 and 4.11 address Public Comments, and section 6.0 provides details of the appeals process.	http://www.thegbi.org/commercial/standards/GBIProceduresFebruary2008.pdf	8/25/2011	Yes	"As promptly as possible and no later than 30 calendar days after receipt of the written request for appeal, the Executive Committee shall respond in writing to the appellant, acknowledging the appeal, and identifying any actions which will be undertaken to resolve the appeal. If the appellant is not satisfied with the Executive Committee's attempt to resolve the appeal without a hearing, the appellant may request a hearing within 15 business days of receiving the written response."	**Foundations of LEED (July 17, 2009) IX. Appendix 4: Appeals** http://www.usgbc.org/ShowFile.aspx?DocumentID=6103	3/24/11	Yes	This information is included in a document about how the Living Building Challenge is changed that was published within the Community in March 2010. The contents are being integrated into the upcoming Process book of the Petal Series.	Owner	8/14/2011
C8 a	**Are there third-party reviewers/moderators of the process?**	If the Secretariat cannot resolve the complaint, an independent appeal panel is appointed to conduct hearing.	The GBI Procedures for the Development and Maintenance of Green Building Standards (GBI-PRO 2005-5) outline in section 6.0 Appeals the requirements to ensure there are third-party reviewers of the process when appropriate. Specifically, "If the Secretariat is unable to informally resolve the complaint, it shall appoint an appeals panel to hold a hearing on a date agreeable to all participants, with at least 15 working days' notice. The appeals panel shall consist of three individuals who have not been directly involved in the dispute and who will not be materially affected by any decision made in the dispute. At least two members of the panel shall be acceptable to the appellant and at least two shall be acceptable to the Secretariat."	http://www.thegbi.org/commercial/standards/GBIProceduresFebruary2008.pdf	8/25/2011	Independent technical experts perform the review.	USGBC conducts a Zone of Reasonableness Review prior to any item going to member ballot. For each rating system, independent technical experts who understand the content, but were not involved in developing content, perform a review to make sure that LEED is reasonable from a technical perspective. The results are presented to the LEED Steering Committee for review and determining how to address any issues brought about by the review.	Owner	8/25/2011	No	Petal Committees are comprised of national and/or international experts within a given field that share a strong philosophical alignment with the goals of the Living Building Challenge. Positions on a Petal Committee are voluntary and individuals serve at the discretion of the Institute for as long as they are able to provide expert guidance to the certification system and remain free of any significant conflicts of interest. For example, Petal Committee advisors may not be working on an active Living Building Challenge project while sitting on a Petal Committee, nor work for a building product manufacturer or a trade association.	Owner	8/14/2011

Maturity

Black is the information collected by the PNNL team. Blue is the verified information provided by owners. Orange is the unverified information provided by owners.

Q #		Review Questions	Summary	Green Globes	Source	Date Retrieved	Summary	LEED	Source	Date Retrieved	Summary	Living Building Challenge	Source	Date Retrieved
M1	b	**How do the tools and standards within the certification system compare to current versions of standards and latest industry tools?**	Efforts were made during the development process to ensure that the standards were compatible wherever possible.	ANSI/GBI 01-2010 was developed with representatives of ASHRAE, AIA, and ICC participating in the process. Many of the individuals selected to participate on GBI's consensus body also participated in the development of ASHRAE 189.1 and IGCC. Efforts were made throughout the process to ensure that the standards were compatible wherever possible. ANSI/GBI-01-2010 is complementary to ASHRAE 189.1, which provides a minimum performance standard versus ANSI/GBI-01-2010, which incentivizes higher levels of performance. ASHRAE also deserves credit for their work to develop a minimum performance standard for high performance buildings through an ANSI process. Whereas GBI's standard is a rating system incentivizing users toward multiple higher levels of performance, the ASHRAE standard was written in mandatory language for adoption into building codes.	http://www.thegbi.org/commercial/standards/technical-committee.asp http://www.thegbi.org/commercial/standards/ http://www.thegbi.org/assets/pdfs/House_Testimony_5.14.08.pdf ANSI/GBI 01-2010 Green Building Assessment Protocol for Commercial Buildings, April 1, 2010 Owner	08/25/11	LEED adopts the recent versions of codes and standards as part of its scheduled updates.	In general, as LEED evolves it adopts the latest versions of codes and standards, often requiring a percent improvement beyond the stated code or standard, when that can be quantified. Due to several standards being included in the LEED guides, a change to one of the standards will not spur an immediate revision to LEED.	Owner	8/25/2011	Tools and standards used for LBC look beyond the current standards.	The tools and standards within the certification system are advanced compared to current standards and latest industry tools. Living Building Challenge and its support tools function on several levels to assist project teams and others in the industry (e.g. manufacturers, regulatory officials). Fundamentally, there is a shifted mindset when using in a performance-based system as opposed to a prescriptive system. As such, Living Building Challenge is designed to function as a philosophy, advocacy platform, and certification program.	https://ilbi.org/about/handouts Owner	8/14/2011
M2	b	**How frequently are the certification systems and referenced standards and tools updated?**	Every 5 years	The GBI has committed to continually refining the system to ensure that it reflects changing opinions and ongoing advances in research and technology, and, in so doing, to involve multiple stakeholders in an open and transparent process. "Standards Maintenance – All standards shall be reaffirmed, revised, or withdrawn within 5 years from the original standard approval date, and every five years thereafter."	ANSI/GBI 01-2010 Development Archive http://www.thegbi.org/commercial/standards/ http://www.thegbi.org/commercial/about-green-globes/ http://www.thegbi.org/commercial/standards/GBIProceduresFebruary2008.pdf	7/8/11 08/25/11	Updates occurred in 2000, 2002, 2005, and 2009.	Due to several standards being included in the LEED guides, a change to one of the standards will not spur an immediate revision to LEED. Instead, LEED is updated at regular intervals and at the time of revision, all referenced standards are updated to the most appropriated version as necessary. Currently LEED 2009 references ANSI/ASHRAE/IESNA Standard 90.1-2007. **Update Process:** LEED is updated through continuous improvement, which involves a regular development cycle for revisions to the rating system and a Pilot Credit Library where proposed credits are tested and evaluated before they can be considered for incorporation into the LEED consensus process for approval by USGBC membership. There are three basic types of LEED development: 1. Implementation and Maintenance of Current Version includes the improvement of LEED through the correction and clarification of credit language. It also includes fixing more substantive inaccuracies and omissions which require a more rigorous review and approval process. 2. Adaptations to the existing version include the ability for both specific space types and international projects to be addressed through the creation of credit adaptations. This allows new paths to be introduced in existing credits to meet the needs of projects that would otherwise be unable to utilize the requirements in LEED. 3. Next Version is the comprehensive improvement phase of LEED development through a periodic evaluation and revision process. This phase includes multiple avenues for stakeholder input and final approval by USGBC membership. The ideas generated during the development of next version LEED credits are often pilot	**Foundations of LEED (July 17, 2009)** http://www.usgbc.org/ShowFile.aspx?DocumentID=6103	7/28/2011	Updates occurred in 2006, 2008, and 2009.	There have been two notable updates since the certification system was officially launched in November 2006: version 1.3 in August 2008, and version 2.0 in November 2009. The updates in version 1.3 primarily served to provide additional information about the system, whereas the release of version 2.0 included structural modifications. Tools are continually created and are updated as necessary to maximize the ability to support project teams. Project teams are also encouraged to share with others the tools that they create on the Brain Trust, an online area in the Living Building Community where subscribers (students, professionals and Institute staff) post and reference strategies, tools and research to further our collective knowledge base.	https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf Owner	8/14/2011
M3	a	**Does the certification system allow for the evaluation of an existing building?**	Yes. Green Globes CIEB evaluates existing buildings.				Yes, LEED EB evaluates existing buildings.				Living Building Challenge can be used for both new construction and existing buildings.			
M4	a	**Is there a requirement for post occupancy data collection once a building has been certified?**	GG NC Energy performance path requires post occupancy data through Energy Star. The prescriptive path does not require post occupancy data.	Green Globes CIEB requires 12 months of energy and water data. "A Meter Data Management System was installed to electronically store water meter and sub-meter data and create user reports showing calculated hourly, daily, monthly and annual water consumption for each meter or submeter." Green Globes uses performance criteria to evaluate the energy consumption of a building. Green Globes compares against data generated by the EPA's Energy Star tools; specifically these are better performing buildings in the Energy Star database.	ANSI/GBI 01-2010 Green Building Assessment Protocol for Commercial Buildings, April 1, 2010. http://www.thegbi.org/commercial/about-green-globes/faq.asp	7/8/11 08/25/11	LEED 2009 requires projects to commit to supplying all available whole-project energy and water usage data for a period of at least 5 years post-certification.	LEED EB refers to Energy Star, which requires 12 months of energy data. Meters must measure potable water use, but gray or reclaimed water use may also be measures to meet the requirements of this credit (WE Credit 1). Metering must be continuous and data logged to allow for an analysis of time trends. The project must compile monthly and annual summaries of results for each subsystem metered. However, this is an optional set of points unlike the energy performance which is linked to a prerequisite. Minimum Program Requirement #6 requires projects to commit to supplying all available whole-project energy and water usage data for a period of at least 5 years post-certification. The MPRs, introduced with LEED 2009, require projects to meet certain criteria to be eligible for LEED certification.	LEED 2009 New Construction and Major Renovations Rating System http://www.usgbc.org/DisplayPage.aspx?CMSPageID=220 The MPRs: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=2102	7/28/2011 08/25/11	Yes - Living Building Challenge certification is based on measured energy and water use.	Living Building Challenge certification is based on actual performance. Therefore, projects must be operational for at least twelve consecutive months prior to evaluation. Verification of claims via an onsite audit takes place after a project is fully completed and operational for at least twelve consecutive months.	LIVING BUILDING CHALLENGE 2.0	7/7/11

M5	**a**	**Is there a mechanism to transfer the certification of a new building to an existing building over time?**	No	GBI recognizes the New Construction and Existing Building evaluations as separate tools. The New Construction is an assessment and certification of the building as it pertains to design and construction. The CIEB is an assessment of the building for operations and management of the building. Accordingly, the certifications are different. Green Globes is designed to offer opportunities for improvement throughout the continuum of the building. After a building achieves certification under NC, GBI encourages building owners to certify buildings under CIEB after 14-18 months following occupation of the building. Recertification every three years is also encouraged. Certification criteria for each system are complimentary in that they reinforce the measuring, meeting, and exceeding of performance goals.	Owner	8/25/2011	No	LEED EB awards points to buildings that have been certified LEED NC under SS Credit 1: LEED Design and Construction. The building will still need to fulfill the remainder of the LEED EB certification process to become certified LEED EB.	LEED 2009 New Construction and Major Renovations Rating System http://www.usgbc.org/DisplayPage.aspx?CMSPageID=220	7/28/2011	There is no separate certification for new construction and existing building.	Living Building Challenge certifies a building based on measured performance over at least 12 months. There is no separate certification for new construction and existing building.	LIVING BUILDING CHALLENGE 2.0	7/7/11
M6	**b**	**How many other systems refer to the certification system or the certification organization as its basis for development or comparison?**	None	Green Globes Certification is recognized as a tool to help clients achieve insurance discounts through at least four major insurance providers: Travelers, AON, Fireman's Fund Insurance Company, and Liberty Mutual. "The financial sector has also implemented financial incentives for certifying to Green Globes. Fireman's Fund was the first to offer a discount tied to green building certification. In 2006, Fireman's Fund began offering 5% premium discounts on various products tied to Green Globes™ certification. Liberty Mutual, AON and Travelers Insurance also offer products tied to Green Globes and building rating system certifications." Green Globes is recognized in public law in more than 22 states: Arkansas, Connecticut, Delaware, Florida, Hawaii, Illinois, Kentucky, Missouri, Massachusetts, Minnesota, Nevada, New Jersey New Mexico , New York , North Carolina, Oklahoma, Oregon, Pennsylvania, Rhode Island , South Carolina , South Dakota , Tennessee, Virginia, Wisconsin	http://www.thegbi.org/green-globes/green-globes-private-sector-recognition.asp http://www.thegbi.org/commercial/about-green-globes/faq.asp http://www.thegbi.org/green-globes/green-globes-state-acceptance-map.asp	8/25/2011	10	The following 10 rating systems are developed based on LEED: Calabasas LEED Comprehensive Environmental Performance Assessment Scheme (CEPAS) Green Olympic Building Assessment System (GOBAS) Green Building Rating System - Korea Green Star Australia LEED Canada LEED Italia LEED Mexico The State of Minnesota Sustainable Building Guidelines (MSBG) Sustainable Project Rating Tool (SPiRiT)	Fowler, KM & Rauch, EM, 2006. Sustainable Building Rating Systems Summary, PNNL Owner	8/25/2011	6	Several new and overseas systems and organizations' guiding documents have been informed by the Living Building Challenge, such as: Eco-District Initiative (a regional framework championed by the Portland Sustainability Institute for the City of Portland); Estidama Pearl (a regional rating system for Abu Dhabi run by the Abu Dhabi Urban Planning Council); LENSES (a national academic framework championed by the Institute for the Built Environment at Colorado State University); International Ecocity Standard (an international rating system championed by Ecocity Builders, Inc.); and the update to Standard 5281 (the national green building code for the State of Israel published by the Standards Institution of Israel). There are also several new or expanded credits/prerequisites in the most recent version of LEED® (LEED 2012, now open for public comment) that were influenced by the Living Building Challenge. The Institute was informed of this influence by members of LEED technical committees.	Owner	8/14/2011
M7	**b**	**When was the certification system developed, first used, first available for public use, and when was most recent revision completed?**	In 2004 GBI acquired rights to distribute Green Globes in US. US Green Globes version 1 (for new construction) was introduced in 2006 and approved as an ANSI standard in 2010.	The Green Globes Canada was based on Building Research Establishment's Environmental Assessment Method (BREEAM), which was brought to Canada in 1996 in cooperation with ECD Energy and Environment. That year, the Canadian Standards Association published BREEAM Canada for Existing Buildings. In 2004, Green Globes for Existing Buildings was adopted by the Building Owners and Managers Association of Canada (BOMA) under the name Go Green Comprehensive (a.k.a. Go Green Plus) and the Green Building Initiative acquired the rights to distribute Green Globes in the United States. In 2005, GBI became the first green building organization to be accredited as a standards developer by the American National Standards Institute (ANSI) and began the process of establishing Green Globes as an official ANSI standard. The GBI ANSI technical committee was formed in early 2006 and Green Globes Rating System v.1 was introduced in the United States. GBI formed a consensus body that delivered the industry's first commercial building rating system to become an ANSI Standard. This standard, ANSI/GBI 01-2010: Green Building Assessment Protocol for Commercial Buildings, was derived from the Green Globes environmental design and assessment rating system for new construction and was approved on March 24, 2010. The standard was developed following ANSI's consensus based guidelines. A variety of stakeholders including sustainability experts, architects, engineers, ENGO's, and industry groups participated in its development.	http://www.thegbi.org/commercial/about-green-globes/ http://www.thegbi.org/commercial/standards http://www.thegbi.org/green-globes/ansi-gbi-standard.asp	7/7/11 08/25/11	The first version for new construction was developed and launched in 1998. The most current version was completed in 2009.	The first LEED Pilot Project Program, also referred to as LEED Version 1.0, was launched at the USGBC Membership Summit in August 1998. After extensive modifications, LEED Green Building Rating System Version 2.0 was released in March 2000, with LEED Version 2.1 following in 2002 and LEED Version 2.2v following in 2005. The most recent version is LEED v3, which was launched on April 27, 2009. The revision cycle is similar for the existing buildings system.	**Foundations of LEED (July 17, 2009)** http://www.usgbc.org/ShowFile.aspx?DocumentID=6103	7/28/2011	The first version was developed in 2005 and launched in 2006. The most current version was completed in 2009.	The idea for the Living Building first emerged in the mid-1990s during the creation of the NIST-funded EpiCenter project in Bozeman, Montana. The goal of this project, led by Bob Berkebile and Kath Williams was to produce the most advanced sustainable design project in the world. Jason F. McLennan guided the research and technology efforts on the project, and began developing the requirements for what is now known as 'Living Building'. In 2005, McLennan began to turn the conceptual idea of a 'living' building into a codified standard that became the Living Building Challenge version 1.0. He presented this standard to Cascadia in August 2006, and three months later, the Challenge was launched. The latest version of the Living Building Challenge (version 2.0) was introduced in November 2009.	https://ilbi.org/stuff/brief_history https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf	7/7/11

M8 **b**	**What is the frequency of changes?**	Every 5 years	The rights to distribute the Green Globes system in the US were acquired by GBI in 2004. Green Globes was adapted from a Canadian protocol of the same name, which evolved through an iterative process from BREEAM Canada. The GBI continues to refine the system using its ANSI-approved procedures. There have been two major changes to the Green Globes system since its introduction into the United States. One was developing the ANSI-GBI 01-2010 standard and the other was introducing a Green Globes-CIEB version for health care. Over 170 Veterans Affairs hospitals and long term care facilities have completed online surveys with the new tool, enabling portfolio-wide comparison and ranking of individual building environmental performance.	http://www.thegbi.org/commercial/about-green-globes/ http://www.thegbi.org/commercial/standards http://www.thegbi.org/news/news/2011/news_201106_Green-Globes-Healthcare-Building.shtml http://www.thegbi.org/commercial/healthcare/ http://www.thegbi.org/commercial/healthcare/green-building-certification.shtml	7/8/11 08/25/11	Every 3 years	LEED has evolved since its original inception in 1998 to more accurately represent and incorporate emerging green building technologies. LEED NCv1.0 was a pilot version. These projects helped inform the USGBC of the requirements for such a rating system, and this knowledge was incorporated into LEED NCv2.0. LEED NCv2.2 was released in 2005, and v3 in 2009. The system is changed slightly each revision. In the 2005 version had a total of 69 pints possible, the current 2009 version has a total of 100 points possible. The LEED rating system is on a predictable 3 year development cycle. The next version of LEED, LEED 2012 is now open for second public comment.	Major Changes from LEED - NC v2.2 to LEED 2009 NC (February 12 2010) http://www.usgbc.org/ShowFile.aspx?DocumentID=6103 http://www.usgbc.org/DisplayPage.aspx?CMSPageID=2360 Owner	7/28/11 08/25/11	No development cycle was identified.	Living Building Challenge has been updated twice. V1.0 was released in November 2006. V1.3 was released in August 2009. V2.0 was released in November 2009.	https://ilbi.org/lbc/v1-3	7/8/2011

Usability

Black is the information collected by the PNNL team. Blue is the verified information provided by owners. Orange is the unverified information provided by owners.

Review Questions	Summary	Green Globes	Source	Date Retrieved	Summary	LEED	Source	Date Retrieved	Summary	Living Building Challenge	Source	Date Retrieved
What are the direct costs of using the certification system, including materials, registration, and certification fees?	Certification fee: $2,500-22,500 Assessor travel expenses: $1,500 Potential additional analysis fees: $1,000-3,500 per analysis type Software subscription: $500-2,000 Appeals: $1,000/time Expedite fee: $2,500	Certification fee * NC: $3,000 - $22,500 (depending on building size) * CIEB: $2,500 - $10,000 (depending on building size) * Expedited Fee: $2,500 Assessor Travel Expenses: $1,500 (or actual expenses+20% overhead) Multiple Space Types/Complexity: $1,000 - $3,500 Custom Energy Analysis: $1,000 - $3,500 Appeals: $1,000/time Software subscriptions: * NC: $500/building * CIEB: $1000/building * CIEB Healthcare: $2000/building	http://www.thegbi.org/assets/pdfs/Green-Globes-Price-List-Building-Certifications.pdf	7/28/11	Registration fee: $1,200-1,500 Certification fee: $1,500-27,500 Reference Guide: $195 Appeals $500/credit Expedite fee: $10,000	Registration fee * $900/$1,200 (Member/Non-Member) * LEED for Neighborhood Development Project: $1,500 Certification fee * NC: $2,250 - $27,500 (depending on building size) * EB: $1,500 - $20,000 (depending on building size) * Expedited Fee: $10,000 Appeals: $500/credit Reference Guide: $160/$195 (Member/Non-Member)	**Registration fee** http://www.gbci.org/certification/resources/project-registration-fees.aspx **Certification fee** http://www.gbci.org/main-nav/building-certification/resources/fees/current.aspx **Publications** http://www.usgbc.org/Store/PublicationsList_New.aspx?CMSPageID=1518	07/06/11	Registration fee: $250-1,000 Certification fee: $1,500-25,000 Subscription fee: $45-3,500	Project registration fees were increased on August 1, 2011 after increased functionality was introduced to the Living Building Community. At least one person per team must maintain a current account in the Living Building Community from registration to certification. An individual subscription costs $125/yr; there are volume discounts for company, institution or agency subscription, which allows for unlimited number of individual accounts within a single office location and range in cost from $300-$3500/yr. A discounted rate is extended to Students and Elders, with a subscription fee of $45/yr. Project Registration Fees are: $250 – Renovation $500 – Landscape, Infrastructure, Building $1000 – Neighborhood Project Certification Fees are paid prior to audit and are tiered based on project size, ranging from $1500 to $25,000.	https://secure.ilbi.org/community/registration page https://ilbi.org/lbc/register-a-project	8/14/11
What is the availability and responsiveness of direct requests for assistance, availability of training, and usability of information available on the website, through case studies, documented inquiries, and frequently asked questions.	GBI offers several resources for customers including: an online system, which allows customers to keep up-to-date entries, as well as provides instant feedback. There is an FAQ page, case studies, a virtual tour of the software, and a "contact us" page on the website. GBI provides live web seminar events on specific topics and personnel certification.	GBI offers several resources for customers including an online system, which allows customers to keep up-to-date entries and provides user feedback. The online system walks users through a series of questions regarding the building. "Tool Tips" offer additional information associated with the questions. There is an FAQ page, case studies, and a virtual tour of the software. A "contact us" feature is offered for additional questions. GBI provides live web seminar events on specific topics that enable industry professionals to learn about Green Globes, pose questions to GBI staff and technical experts, and to collaborate on ways to enhance the sustainability of new or existing buildings. GBI also offers personnel certification for those interested in pursuing a Green Globes Professional (GGP) designation, for which nine-hours of fee-based training are available. There are GGPs registered in 30 states (incl. DC) and two provinces (QC, MB).There are 32 states (incl. DC) that have achieved certified buildings. 59% of states (incl. DC) have GGPs 62% of states (incl. DC) have certified buildings	http://www.greenglobes.com/about-faq.asp http://www.greenglobes.com/casestudies.asp http://www.greenglobes.com/contact.asp http://www.thegbi.org/live-webseminars/ http://www.thegbi.org/green-globes/personnel-certifications/ http://www.thegbi.org/assets/pdfs/Green-Globes-Personnel-Certifications-Professional-Training-Overview.pdf http://www.thegbi.org/green-globes/personnel-certifications/certified-	7/28/11 08/25/11	USGBC develops and maintains tools to support the LEED rating system, including reference guides, LEED Online, and workshops and educational courses. These supporting tools are regularly updated to reflect the improvements made to LEED through the development cycle. The various market sectors that use LEED have individual resource pages to assist those market sectors with their use of the LEED rating system as well as the general LEED resources.	USGBC develops and maintains tools to support the LEED rating system, including reference guides, LEED Online, and workshops and educational courses. These supporting tools are regularly updated to reflect the improvements made to LEED through the development cycle. --The LEED Reference Guides include detailed information on the process for achieving LEED certification, detailed credit and prerequisite information, resources, and standards for the LEED rating systems. For each credit or prerequisite, the guide provides: intent, requirements, point values, environmental and economic issues, related credits, summary of reference standards, credit implementation discussion, timeline and team recommendations, calculation methods and formulas, documentation guidance, examples, operations and maintenance considerations, regional variations, resources, and definitions. --LEED Online is the primary resource for managing the LEED documentation process. Through LEED Online, project teams can manage project details, complete documentation requirements for LEED credits and prerequisites, upload supporting files, submit applications for review, receive reviewer feedback, and ultimately earn LEED certification. --USGBC offers workshops and educational programs to educate members and project teams about LEED. --LEED Resources webpage provides information on green building research, project profiles, case studies, presentations, and other resources. The various market sectors that use LEED have individual resource pages to assist those market sectors with their use of the LEED rating system as well as the general LEED resources.	**Foundations of LEED (July 17, 2009)** http://www.usgbc.org/ShowFile.aspx?DocumentID=6103 **LEED Resources webpage** http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1602 www.usgbc.org/government	3/24/11 08/25/11	LBC offers several effective resources for project groups. Case studies are available on the website. Educational programs and resources, including public and in-house workshops, technical assistance, and the ability to request a speaker are available. Users can access the Contact webpage for assistance with specific questions. The Dialogue is a primary way for project teams to receive direct programmatic guidance from Institute staff. Individuals may post questions to the Dialogue at any time.	The Living Building Challenge website offers case studies (free of charge) and a Contact page for assistance on specific questions. LBC also offers educational programs and resources, including public and in-house workshops, technical assistance, and the ability to request a speaker. Workshop options include a "kick-off" workshop, where projects groups can outline strategic goals. Another workshop option can help to improve a project's potential to comply with the LBC requirements. The Dialogue is a primary way for project teams to receive direct programmatic guidance from Institute staff. Individuals may post questions to the Dialogue at any time.	https://ilbi.org/lbc/casestudies https://ilbi.org/education/workshops-consultation/tech-assist https://ilbi.org/about/contact	7/7/11

Recognition

Black is the information collected by the PNNL team. Blue is the verified information provided by owners. Orange is the unverified information provided by owners.

Q#		Review Questions	Summary	Green Globes	Source	Date Retrieved	Summary	LEED	Source	Date Retrieved	Summary	Living Building Challenge	Source	Date Retrieved
N1	b	**Is the certification system included in the curriculum of the top 10 architectural schools?**	Curriculum in at least one of the AIA top architecture schools have coursework that identify the Green Globes certification system.	GBI allowed professors to develop green building curriculum using Green Globes in architecture classes and encouraged student collaboration projects previously with Clemson, Cal Poly, Poloma, Stanford, Cooper Union, Arizona State University, University of Arkansas and University of Florida.	Owner http://www.thegbi.org/news/news/archive_2007/news-040207-arkansas.asp http://www.thegbi.org/news/news/archive_2006/news_110106_yearreview.asp http://www.thegbi.org/news/gbi-insight/2007_04_27/ See Chapter 3: Green Building Assessment; Chapter 6-8; and Appendix E http://books.google.com/books?hl=en&lr=&id=xPpB4bntJLAC&oi=fn	8/25/2011	Curriculum in at least 4 of the AIA top architecture schools have coursework that identify the LEED certification system.	Examing the curriculum of the top ten AIA graduate and undergraduate universities uncovered that LEED is included in courses at Cornell, Syracuse, University of Texas, and University of Oregon.	http://aap.cornell.edu/arch/programs/upload/spring2011_elective_packet2.pdf http://www.ecs.syr.edu/faculty/johnson/CQIForms/CIE_331_CQI_2009.pdf http://www.caee.utexas.edu/prof/novoselac/Classes/ARE383/SyllabusARE383_Fall2010.pdf http://architecture.uoregon.edu/sites/architecture.uoregon.edu/files/downloads/ARCH4%3A510-Craig%20Davis.pdf	7/6/2011	Curriculum in at least 7 of the AIA top architecture schools have coursework that identify the Living Building Challenge certification system.	Living Building Challenge is being used in the curriculum at K-12 institutions as well as in college courses at the undergraduate and graduate levels. Though most frequently used in the school of architecture, it has also been taught in other focus areas such as: real estate, business, interior design, construction management, engineering (mechanical, electrical, plumbing), Of the top US Architecture Schools, the following are known to have lectures and/or course curriculum based on the Living Building Challenge (listed in no particular order): - Kansas State University - University of California at Berkeley - Carnegie Mellon University - University of Southern California - University of Oregon - University of Texas at Austin - Washington University in St Louis - Syracuse University - University of Pennsylvania - Harvard - University of Minnesota - Southern California Institute of Architecture - University of California, Los Angeles	Owner	8/14/2011

N2	**b**	**How many students are involved? (Attending conferences or training, becoming assessors or green building professionals, etc.)**	GBI participates in an annual EPA higher education building competition.	GBI participated in the EPA P3 events held in Washington, DC, where higher education students competed for recognition in sustainability projects. Buildings was one of the categories, and GBI sponsored a $ 1000 special award for the highest rated project specifically related to commercial buildings (for 3 years). Green Globes is also incorporated into Dr. Charles J. Kibert's (Univ. of FL), well-regarded book, "Sustainable Construction: Green Building Design and Delivery," Second Edition, copyright 2008, edited by John Wiley & Sons. Green Globes is incorporated into American Society for Civil Engineer's premier book on sustainability: "Sustainability Guidelines for the Structural Engineer," Edited by Dirk Kestner, PE, Jennifer Goupil, PE, and Emily Lorenz, PE.	Owner http://www.thegbi.org/news/news/archive_2007/news-040207-arkansas.asp http://www.thegbi.org/news/news/archive_2006/news_110106_yearreview.asp http://www.thegbi.org/news/gbi-insight/2007_04_27/ See Chapter 3: Green Building Assessment; Chapter 6-8; and Appendix E http://books.google.com/books?hl=en&lr=&id=xPpB4bntJLAC&oi=fn	8/25/2011	Approximately 1250 students attend the USGBC Greenbuild. USGBC has a network of 70 student groups representing 1600 students. From May 2009-August 2011, over 1400 students became LEED professionals.	Every year, USGBC's Greenbuild conference coordinates 800 student volunteers who are able to attend the conference in exchange for working part of the week supporting the event. An additional 450 students pay a student rate to attend the conference. Additionally, USGBC currently has a network of 70 USGBC Students groups representing 1600 students as of August 2011. There are 60 trained, mid-career professionals who are committed to building the program locally, which will be ramping up through the fall of 2011 and into 2012. Each student group has a faculty advisor as well. From May 2009-August 2011, over 1400 students became LEED professionals (LEED AP with specialty or LEED Green Associate).	Owner	8/25/2011	60 student subscribers. 11 student groups entered the Living City Design Competition. 80 students participated in 2010 conference.	The Institute is aware of curriculum based on the Living Building Challenge in more than 100 colleges and universities. - To supplement their studies, more than 60 students have subscribed to the Living Building Community on an individual level, and 3 professors have subscribed for a group account for one or more classes. - Out of 81 total entries, 11 student groups entered the Living City Design Competition www.ilbi.org/lcdc and one student team was recognized among the winners: https://ilbi.org/lcdc-winners. - Each year, the Institute offers reduced rates for students and recent graduates to attend the Living Future unConference, an annual event with approximately 800 attendees. In 2011, students attended the conference in Vancouver, BC; in 2010, approximately 80 students attended the conference in Seattle, WA. In 2012, the conference will be held in Portland, OR. - The volunteer facilitator option in the Ambassador Network originally was created with a student focus, and dozens of students have received training in the Living Building Challenge, group leadership dynamics and methods for fostering an inclusive environment.	Owner	8/14/2011
N3	**a**	**Is the certification system recognized in the building industry?**	Yes				Yes				Yes			
N3	**b**	**What is the adoption rate at the State level?**	23 states	Recognized in public law in 23 states AK, CO, DE, FL, HI, IL, KY, MI, MA, MN, NV, NJ, NW, NY, NC, OK, PA, RI, SC, SD, TN, VA, WI Also, the Council of State Government recognized Green Globes in its Resolution on Energy Efficiency Measures in Buildings (Nov. 2006)	**Green Globes, A Nationally Recognized Alternative to LEED** http://www.thegbi.org/green-resource-library/pdf/GBI_LEED_Flyer.pdf http://www.thegbi.org/news/gbi-insight/2011_07/commercial.shtml http://www.dnr.state.md.us/ed/CSGresfinal.pdf	7/28/2011 08/25/2011	35 states	35 state governments (Latest as of: 09/24/10) AL, AK, AZ, AR, CA, CO, CT, DE, DC, FL, GA, HI, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, PR, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI, WY	Public Policies Adopting or Referencing LEED http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1852#AL	3/28/11	0 states	State of Oregon Legislature passed House Bill 2080, which legalizes graywater and rainwater use in residential and commercial buildings throughout the state. Living Building Challenge and Institute staff were instrumental to this Bill's development and adoption. State of Oregon Department of Environmental Quality refers to Living Building Challenge as a standard and resource for Life Cycle Approaches to Prioritizing Methods of Preventing Waste from the Residential Construction. State of California refers to the Living Building Challenge as a potential national partner in its 2010-2012 Energy Efficiency Strategic Plan. Several departments within the State of California refer to Living Building Challenge as a resource that "does take a very different approach through (Imperatives) rather than "trade offs" found in most existing green rating systems." New Hampshire Department of Environmental Services refers to Living Building Challenge as a resource and innovative program for its "Innovative Land Development Technical Assistance and Coordinated Permitting Initiative" State of Washington Department of Ecology refers to Living Building Challenge as a certification program and resource for residential and commercial	Owner	8/14/2011

N4	b	**What is the adoption rate at the County level?**	15 counties	It is difficult to track all activities at county and city levels. The following is a representative sample demonstrating Green Globes acceptance at county levels. -Carroll County, Maryland tax credits for two Green Globes -Mecklenburg County, NC rebates for Green Globes -Alchua County, allows choice of Green Globes -Summit Count, CO uses Green Globes -County of El Paso uses Green Globes -Volousia County, FL fast-track permitting program allows use of Green Globes for third-party certification -Charlotte County references Green Globes in its green building code -Montgomery County, Maryland pursuing Green Globes equivalency to meet green building requirements -Desoto County, California uses Green Globes -Chatam County, NC recognizes Green Globes -Fairfax County, VA uses Green Globes -Bucks County, PA uses Green Globes -Ulster County, NY recognizes Green Globes -Sarasota County, FL recognizes Green Globes -Counties in Hawaii required to recognize Green Globes	Carroll County, Maryland tax credits for two Green Globes http://webcache.googleusercontent.com/search?q=cache:iUPd0aDPOdUJ:www.dsireusa.org/incentives/incentive.cfm%3FIncentive_Code%3DMD65F%26re%3D1%26ee%3D1+county+%22green+globes%22&cd=1&hl=en&ct=clnk&gl=us&source=www.google.com Mecklenburg County, NC rebates for Green Globes http://www.doe.gov/sa	8/25/2011	58 counties	58 counties (Latest as of: 09/24/10)	Public Policies Adopting or Referencing LEED http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1852#AL	3/28/11	1 counties	Clark County and City of Vancouver, WA created the Sustainable Communities Pilot Program: departs from code requirements that may discourage or prevent Living Building Challenge Imperatives	Owner	8/14/2011

N5	b	**What is the adoption rate at the City level?**	3 cities	Chamblee, GA recognizes Green Globes in its ordinance. Sustainable Cities Institute recognizes Green Globes to help achieve sustainability goals. City of Austin, TX references Green Globes "Using sustainability/green building rating tools specifically developed for Austin, along with the LEED and Green Globes national rating tools, Green Building's staff assist design teams in establishing green building or sustainability goals for the construction of a building, review plans and specifications, make recommendations for improvements, and rate the final product on its impact to the environment and community."	ordinance: https://www.usgbc.org/ShowFile.aspx?DocumentID=4081 Sustainable Cities Institute: http://www.sustainablecitiesinstitute.org/view/page.basic/class/feature.class/Lesson_Green_Globes_System City of Austin: http://webcache.googleusercontent.com/search?q=cache:DVa2BigoHkMJ:www.c40cities.org/bestpractices/buildings/austin_standards.jsp+city+of+austin+green+globes&cd=1&hl=en	8/25/2011	384 cities	384 cities/towns (Latest as of: 09/24/10)	Public Policies Adopting or Referencing LEED http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1852#AL	3/28/11	0 cities	Living Building Challenge is referenced by dozens of Cities directly as a certification system, or indirectly by posting findings from the Institute's various research reports as resources for their constituents. Several instances of regulatory reform cite the Living Building Challenge. The following is a list of focused efforts in the Pacific Northwest; Living Building Challenge project teams all over the world are presenting viable alternatives to existing codes in order to create Living Buildings, Sites and Communities (The Institute is collecting these examples of reform in the documentation provided by project teams for certification and will publicize this information on the program website). - Bainbridge Island, WA. Ordinance 2009–06: offers flexible development + density incentives for housing projects - Seattle, WA. Living Building Pilot: additional flexibility + gives special assistance for Living Building Challenge projects - Seattle, WA. Priority Green (formerly Green Q): provides expedited appointments + individual assistance for permit review, public recognition for effort - Clark County and City of Vancouver, WA. Sustainable Communities Pilot Program: departs from code requirements that may discourage or prevent Living Building Challenge Imperatives - Portland, OR. Green Building Policy (proposed): rebates up to $17.30/ft2 for projects pursuing Living Building Challenge - Eugene, OR. Guide 2 Green: grants prioritized plan reviews and inspections, one-day permits and reduced system development charges The Institute has provided consulting or served as an advisor to more than 20 cities to inform their sustainability goals. There are active Living Building Challenge Collaborative in 11 cities, and training is in-progress	https://ilbi.org/education/regreform Owner	8/14/2011
N6	b	**How many buildings have signed up to participate in the certification system?**	2,671	1647 NC 1024 CIEB Information from internal sources not publicly available.	Owner	8/25/2011	31,696	26,169 registered buildings (Latest as of: 1/21/2011, Numbers do not include LEED for HOMES or LEED for Neighborhood Development projects) 31,696 projects registered for LEED certification as of August 4, 2011.	http://www.usgbc.org/ShowFile.aspx?DocumentID=7744 Owner	3/28/11 08/25/11	87	There are currently 87 active registered projects, and the Institute is aware of an additional 30+ that have not yet formally registered. There are also approximately 20 registered projects not included in the count above that have been archived due to undefined hold or discontinuation, mostly due to shifted economic influences in 2008 and 2009.	Owner	8/14/2011
N7	b	**How many buildings have been awarded certification?**	176	94 CIEB Certified Building Projects and 82 NC Certified Building Projects (as of 8/25/11) See the following included documents: GG Certified Buildings NC 8/25/11 and GG Certified Buildings CIEB 8/25/11. Website updated quarterly.	Website updated quarterly at http://www.thegbi.org/assets/case_study/Green-Globes-NC-Certified-Buildings.pdf http://www.thegbi.org/assets/case_study/Green-Globes-CEIB-Certified-Buildings.pdf	8/25/11	10,000	7,137 certified buildings (Latest as of: 1/21/2011, Numbers do not include LEED for HOMES or LEED for Neighborhood Development projects) 10, 000 projects are LEED certified as of August 25, 2011.	http://www.usgbc.org/ShowFile.aspx?DocumentID=7744 Owner	3/28/11 08/25/11	4	4 certified buildings	https://ilbi.org/lbc/case studies	7/6/11

N8	b	**How many professionals (by category) are involved?**	173	There are 173 certified Green Globes Professionals.	http://www.thegbi.org/greenglobes/personnel-certifications/certifiedpersonnel-listing/index.pl	08/25/11	162,456	Appraisal (30); **Architecture (46394)**; Assistant Project Manager (217); Brokerage (70); **Builder (4572); Building Engineer (2191)**; Building Owner (341); Building Products (809); **Civil Engineering (6709)**; Cleaning Product Supply (54); Code Official (198); **Commissioning (1353); Construction Management (14846); Consulting (9693);** Custodial/Maintenance (92); Design Build (782); **Developer (1788)**; Director (172); Educator (575); **Electrical Engineering (3569); Environmental (1214)**; Estimating Department (376); **Facility Management (1733);** Finance (127); Furniture Sales (335); **General Contracting (7188);** Healthcare and Education (161); Human Resources (19); **Interior Design (9483); Landscape Architecture (3534)**; Legal (1124); Lighting Engineers (138); Manufacturing (1452); Marketing (1205); **Mechanical Engineering (9966);** Non-Profit (652); Other (3894); **Planner (2787);** Plumbing Engineer (616); Press (39); Project Leader (209); Project Management (11315); **Property Management (1233); Real Estate (1960)**; Research (364); Retail (149); Service Branch Manager (47); Specifications Writer (273); **Structural Engineer (2661); Student (1809);** Subcontractor (1854); Urban Design Consulting (84); TOTAL (162,456)	https://ssl27.cyzap.net/gbcicertonline/onlinedirectory/	07/06/11	Thousands of building industry professionals are involved.	Thousands of building industry professionals are involved with the Living Building Challenge (both nationally and internationally) such as designers, engineers, contractors, product manufacturers, developers, sustainability consultants, regulatory officials, etc. Individuals have participated as members of project teams, volunteer Ambassadors, or attendees to conferences and/or workshops offered by the Institute.	Owner	8/14/2011
N9	b	**How many institutional/group members?**	9 affiliates, 13 associate members	Affiliates with MOUs include: American Council for Energy-Efficient Economy ASHRAE Association of Facilities Engineers Association of Energy Engineers BOMA EPA Energy Star (GBI is an Energy Star Partner) AIA National Association of Home Builders Energy Solutions Center GBI association members include: Alliance to Save Energy American Gas Association American Chemistry Council American Wood Council Plastic Pipe & Fittings Association Resilient Floor Coverings Institute Carpet & Rug Institute SMACNA Chemical Fabrics and Films Association Steel Recycling Institute The Vinyl Institute Irrigation Association International Association of Plumbing and Mechanical Officials Major Insurance Carriers providing discounts for Green Globes Certified Buildings are: AON Fireman's Fund Traveler's Liberty Mutual	ASHRAE: http://www.thegbi.org/news/news/2009/news_200902_ASHRAE.asp Energy Solutions Center: http://www.thegbi.org/news/news/2011/news_201107_GBI-Energy-Solutions-Center-green-building-assessment-tools-to-gas-companies.shtml http://www.thegbi.org/about-gbi/who-we-are/members-and-supporters.asp http://www.thegbi.org/join/industryAffiliates.asp	8/25/2011	More than 5,000 members	The online member directory does not provide an overall counts. Leaving all search fields blank returns the first 5000 members.	http://www.usgbc.org/myUSGBC/Members/MembersDirectory.aspx	07/06/11	More than 150 sponsors	Living Building Challenge does not have a membership model. It has sponsors and a paid membership community. There are at least 150 sponsors.	Owner https://ilbi.org/about/sponsor	8/14/2011 11/9/11

N10 b	**How many professional associations have recognized the certification system?**	9 affiliates, 13 associate members	Affiliates with MOUs include: American Council for Energy-Efficient Economy ASHRAE Association of Facilities Engineers Association of Energy Engineers BOMA EPA Energy Star (GBI is an Energy Star Partner) AIA National Association of Home Builders Energy Solutions Center GBI association members include: Alliance to Save Energy American Gas Association American Chemistry Council American Wood Council Plastic Pipe & Fittings Association Resilient Floor Coverings Institute Carpet & Rug Institute SMACNA Chemical Fabrics and Films Association Steel Recycling Institute The Vinyl Institute Irrigation Association International Association of Plumbing and Mechanical Officials Major Insurance Carriers providing discounts for Green Globes Certified Buildings are: AON Fireman's Fund Traveler's Liberty Mutual	ASHRAE: http://www.thegbi.org/news/news/2009/news_200902_ASHRAE.asp Energy Solutions Center: http://www.thegbi.org/news/news/2011/news_201107_GBI-Energy-Solutions-Center-green-building-assessment-tools-to-gas-companies.shtml http://www.thegbi.org/about-gbi/who-we-are/members-and-supporters.asp http://www.thegbi.org/join/industryAffiliates.asp	7/28/11 08/25/11	Information not found.				2	Among other, smaller associations, two of the most relevant organizations to green building both have recognized and supported the Living Building Challenge: - American Institute of Architects, Living Building Challenge was the reference standard for the AIA Committee on Design "Ideas Competition" in 2009 and 2010 - The US Green Building Council has publicly endorsed the Living Building Challenge	http://www.aia.org/advocacy/local/AIAS076929?dvid=&recspec=AIAS076929 Owner	8/14/2011

N11	a	**How many Federal agencies have identified the system as guidance or a requirement?**	9	Department of Veterans Affairs – 21 certified with commitment for online, green building self-evaluations of 173 hospital facilities using Green Globes CIEB Army Corps of Engineers – accepts Green Globes as alternative for some projects. Department of Education – recognizes Green Globes for use at the state level by schools that receive their funding General Service Administration regional offices - 5 buildings as of 8/25/11 Dept. of State – 9 buildings as of 8/25/11 U.S. Forest Service – recognizes Green Globes for new structures 10,000 sq. ft. or more --Department of Health and Human Services (new buildings with at least $3 million of Federal funds to earn LEED certification, Green Globes certification, or certification by another nationally recognized green building standard) -- Department of Interior (new construction with gross construction costs greater than $2,000,000 achieve LEED Certified or one Green Globe)	Department of Veterans Affairs: http://www.va.gov/GREENROUTINE/pressreleases/news20101112vanguard.asp http://www.marketwire.com/press-release/veterans-administration-awards-contract-green-building-initiative-green-globesr-online-1392507.htm Department of Education: http://www2.ed.gov/policy/gen/leg/recovery/guidance/impactaid.pdf Dept. of	8/25/2011 3/24/11	14	(Latest as of: 09/24/10) --Department of Agriculture & Forest Service (new construction to earn LEED Silver) --Department of Energy (new buildings of $5M or greater to earn LEED Gold) --Department of Health and Human Services (new buildings with at least $3 million of Federal funds to earn LEED certification, Green Globes certification, or certification by another nationally recognized green building standard) -- Department of Interior (new construction with gross construction costs greater than $2,000,000 achieve LEED Certified or one Green Globe) --Environmental Protection Agency (new construction to achieve LEED Gold certification, with a minimum requirement of LEED Silver certification) --General Services Administration (earn LEED Certified, with a target of LEED Silver) --National Aeronautics and Space Administration (to meet LEED Silver certification, and strive for LEED Gold) --Smithsonian Institution (all new buildings and renovation work to aim for a minimum of LEED certification) --U. S. Army (new construction to achieve LEED Silver certification) --U.S. Navy (all applicable projects to be registered with USGBC for LEED certification AND achieve a minimum LEED Silver-level rating) Guidance only: --Department of State --Department of Veterans Affairs --U. S. Air Force	Public Policies Adopting or Referencing LEED http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1852#AL	7/6/11	3	EPA, Region 9, Green Building: Green Building and Energy Codes, Office of Brownfields and Land Revitalization General Services Administration, Strategic Sustainability Performance Plan National Parks Service National Institute of Building Sciences, Whole Building Design Guide	http://www.wbdg.org/resources/livingbuildings.php http://www.epa.gov/region9/greenbuilding/building-codes.html http://www.gsa.gov/portal/content/186749 Owner	8/14/2011
N12	b	**How many Federal buildings have been certified?**	40 Federal buildings	40 federal buildings have been certified (as of 8/25/11) 38 CIEB, 2 NC	Owner	7/28/11	519 Federal buildings	519 federal buildings are certified under LEED and 3,809 federal projects are registered and pursuing certification.	www.usgbc.org/government	08/25/11	Zero Federal buildings	There are no certified Federal buildings, but there are two Federal projects that have been registered by the National Parks Service.	Owner	8/14/2011
N13	a	**Does the system address the majority of Federal building inventory (building types)?**	Yes	New Construction and Existing Buildings. Building types include offices, multi-family, health care, schools, universities, labs, industrials, retail, etc.	http://www.thegbi.org/assets/pdfs/GBI_Project_Single_Building_Summary_Sheet.pdf campuses: http://www.thegbi.org/assets/pdfs/GBI_Campus_and_Portfolio_Summary_Sheet.pdf	7/28/2011	Yes	Core & Shell, New Construction, Schools, Existing Buildings: Operations & Maintenance, Neighborhood Development, Retail, Healthcare, Homes, and Commercial Interiors.	**Foundations of LEED (July 17, 2009)** http://www.usgbc.org/ShowFile.aspx?DocumentID=6103	3/24/11	Yes	Neighborhood, Building, Landscape+Infrastructure, Renovation	https://ilbi.org/lbc/v2-0	7/6/11

Appendix F: Certification System Mapping to Robustness for New Construction Review Criteria

The review criteria and review questions listed in Appendix D were applied equally across all three certification systems. In the Robustness criterion, the key question that was answered for each was: Does the metric help a building meet a current Federal requirement? Additional questions regarding the baseline or point of comparison and the standards or tools used to achieve the metric were used when appropriate. The certification system owners had an opportunity to respond to these criteria and their responses can be found in Appendices H through J.

Robustness

	Review Questions	Guiding Principles NC	Green Globes NC	LEED NC	Living Building Challenge
Integrated Design	**Integrated Design**				
	Does the metric help a building meet a current Federal requirement?	Integrated Design. Use a collaborative, integrated planning and design process that • Initiates and maintains an integrated project team as described on the Whole Building Design Guide <http://www.wbdg.org/design/engage_process.php> in all stages of a project's planning and delivery • Integrates the use of OMB's A-11, Section 7, Exhibit 300: Capital Asset Plan and Business Case Summary • Establishes performance goals for siting, energy, water, materials, and indoor environmental quality along with other comprehensive design goals and ensures incorporation of these goals throughout the design and lifecycle of the building • Considers all stages of the building lifecycle, including deconstruction.	Green Globes NC refers to the Whole Systems Integrated Process Guide. If the points are achieved, life cycle impacts as specified in the Resources/Materials section must be met. Relevant sections: 6.1.1 GDDC (Green Design and Delivery Coordination) Pre-Design Green Design Meetings (4 points) 6.1.2 GDDC Performance Goals (10 points) 6.1.3 GDDC Progress Meetings for Design (6 points) 6.4 Environmental Management - Post Construction (14 points) 10.1.1 Assemblies--Performance Path (33 points) 10.2.1 Furnishing, Finishes, and Fit-outs--Life Cycle Assessment (4 points) 10.6.1 Building Life Service Plan	Integrated Design is not addressed in LEED NC. While LEED NC does not specifically mention that an integrated planning and design process is required, integrated design is encouraged. The USGBC website states that "the most successful LEED project teams report an integrated design process." (USGBC LEED Frequently Asked Questions - see References for website) The LEED for Healthcare rating system is a supplement to the Green Building Design and Construction rating systems and has a prerequisite for integrated project planning and design The LEED for Healthcare rating system also offers a credit for integrated project planning and design in the innovations in design section of the rating system.	The LBC refers to an integrated dsign approach being required to meet the technical standard. "The Living Building Challenge does not dwell on basic best practice issues so it can instead focus on fewer, high level needs. It is assumed that to achieve this progressive standard, typical best practices are being met. The implementation of this standard requires leading-edge technical knowledge, an integrated design approach, and design and construction teams well versed in advanced practices related to 'green building'." (Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf) The Institute offers an optional service to project teams that includes the facilitation of a 1-, 2- or 3-day charrette, or kick-off meeting. The Living Building Challenge establishes performance goals for site, water, energy, indoor environmental quality (health), materials, social equity and beauty – because certification is performance-based, these goals must be incorporated throughout the design and lifecycle of the building.
	Does the certification system help users achieve cost saving through integrated design?	n/a	Cost saving through integrated design is not mentioned. Integrated Design and Delivery inherently encompasses cost savings since the process involves all key project personnel from the planning stage forward, allowing sustainable design opportunities to be implemented and integrated as the design evolves, versus the more expensive approach of 'cobbling together' the different design elements (disciplines) late in the design process.	The USGBC website states that "The most successful LEED project teams report an integrated design process, with LEED in mind from the project's inception." No requirement, credit, or method for integrated design. (http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1819)	The Institute helps users achieve cost savings through integrated design.
Commissioning	**Commissioning**				
	Does the metric help a building meet a current Federal requirement?	Employ commissioning practices tailored to the size and complexity of the building and its system components in order to verify performance of building components and systems and help ensure that design requirements are met. This should include an experienced commissioning provider, inclusion of commissioning requirements in construction documents, a commissioning plan, verification of the installation and performance of systems to be commissioned, and a commissioning report.	ASHRAE is required. ASHRAE meets the intent of the Guidelines. ASHRAE and ASHRAE/NIBS Guideline 0-05 – Commissioning – are cited throughout Section 6.3 Whole Building Commissioning, such that the entire criteria is based on the ASHRAE standard for commissioning. 6.3 Whole Building Commissioning	LEED NC meets the intent of the Guidelines. EA Prerequisite 1: Fundamental Commissioning of Building Energy Systems	The Living Building Challenge does not directly address commissioning. Living Building Challenge cites Commissioning as a key strategy for success in achieving the requirements for Imperative 07: Net Zero Energy, though as a rule, the Institute avoids prescriptive paths to certification. The Institute explicitly notes that a "copy of commissioning reports or other design or construction documents identifying corrections and/or improvements made to the system(s) or envelope throughout the 12-month occupancy period" may be included with the project team's documentation.
	What standards or tools are required for the metric?	n/a	ASHRAE and ASHRAE/NIBS Guideline 0-05	n/a	n/a

Water

Review Questions	Guiding Principles NC	Green Globes NC	LEED NC	Living Building Challenge
Indoor Water				
Does the metric help a building meet a current Federal requirement?	Employ strategies that in aggregate use a minimum of 20 percent less potable water than the indoor water use baseline calculated for the building, after meeting the EPAct 1992, Uniform Plumbing Codes 2006, and the International Plumbing Codes 2006 fixture performance requirements. The installation of water meters is encouraged to allow for the management of water use during occupancy. The use of harvested rainwater, treated wastewater, and air conditioner condensate should also be considered and used where feasible for no potable use and potable use where allowed.	If the Green Globes NC points for water reduction and metering are achieved the GP are met. 9.2.1 Plumbing Fixtures and Fittings, Appliances and Equipment 9.8.1 Special Water Features 9.10.1 Alternate Sources of Water	LEED meets the intent of the GP for water reduction and alternative technologies. No mention in LEED NC of water consumption measurement. WE Prerequisite 1: Water Use Reduction WE Credit 2: Innovative Wastewater Technologies WE Credit 3: Water Use Reduction	If the LBC challenge is accomplished, no outside potable water is used and the GP are exceeded. This Imperative may be attempted using the Scale Jumping design overlay, which endorses the implementation of solutions beyond the building scale that maximize ecological benefit while maintaining self-sufficiency at the city block, neighborhood, or community scale. There is an exception for water that must be from potable sources due to local health regulations, including sinks, faucets and showers but excluding irrigation, toilet flushing, janitorial uses and equipment uses. However, due diligence to comply with this Imperative must be demonstrated by filing an appeal(s) with the appropriate agency (or agencies). An exception is made for an initial water purchase to get cisterns topped off. A Living Building Challenge project only buys water once. 05 Net Zero Water
What is the baseline or point of comparison?	EPAct 1992 and 2005, UPC/IPC 2006	EPAct 1992 and 2005	EPAct 1992 and 2005, UPC/IPC 2006	n/a
What is the range of requirements to achieve the metric?	20%	Water Use Reduction 25%-40% (6-24 pts)	Waste Water Reduction 50% (2 pts) Water Use Reduction 30%, 35%, 40% (2-4 pts)	n/a
What standards or tools are required for the metric?	EPAct 1992 and 2005, UPC/IPC 2006	GBI Water Consumption Calculator, V1.3	EPAct 1992 and 2005, UPC/IPC 2006	n/a
Process Water				
Does the metric help a building meet a current Federal requirement?	Per the Energy Policy Act of 2005 Section 109, when potable water is used to improve a building's energy efficiency, deploy lifecycle cost effective water conservation measures.	6.1.2 GDDC Performance Goals: Water efficiency, conservation and performance would necessarily include life cycle cost measures for process water. 9.3.1 Cooling Towers 9.4.1 Boilers and Water Heaters 9.5.1 Commercial Food Service Equipment 9.6.1 Medical/Dental and Laboratory Equipment 9.10 Alternate Sources of Water	LEED NC has no process water requirement. The LEED for Healthcare rating system Water Efficiency prerequisite 1 requires that projects employ strategies that, in aggregate, use 20% less process water than the process water use baseline calculated for equipment performance requirements listed in the credit.	If the LBC challenge is accomplished, no outside potable water is used and the GP is exceeded. This Imperative may be attempted using the Scale Jumping design overlay, which endorses the implementation of solutions beyond the building scale that maximize ecological benefit while maintaining self-sufficiency at the city block, neighborhood, or community scale. There is an exception for water that must be from potable sources due to local health regulations, including sinks, faucets and showers but excluding irrigation, toilet flushing, janitorial uses and equipment uses. However, due diligence to comply with this Imperative must be demonstrated by filing an appeal(s) with the appropriate agency (or agencies). An exception is made for an initial water purchase to get cisterns topped off. A Living Building Challenge project only buys water once. **05 Net Zero Water**
Outdoor Water				
Does the metric help a building meet a current Federal requirement?	Use water efficient landscape and irrigation strategies, such as water reuse, recycling, and the use of harvested rainwater, to reduce outdoor potable water consumption by a minimum of 50 percent over that consumed by conventional means (plant species and plant densities). The installation of water meters for locations with significant outdoor water use is encouraged.	For Green Globes NC, exterior water use is measured using the percentage of the exterior vegetated space instead of calculating a baseline for outdoor water consumption and reducing accordingly. 7.4.1.2 No irrigated exterior vegetated space corresponds with GP criteria - Option 3. 7.4.1 Landscape and Irrigation	If LEED NC points are achieved the GP will be met. WE Credit 1: Water Efficient Landscaping	If the LBC challenge is accomplished, no outside potable water is used and the GP is exceeded. 05 Net Zero Water Imperative 06: Ecological Water Flow This Imperative may be attempted using the Scale Jumping design overlay, which endorses the implementation of solutions beyond the building scale that maximize ecological benefit while maintaining self-sufficiency at the city block, neighborhood, or community scale. There is an exception for water that must be from potable sources due to local health regulations, including sinks, faucets and showers but excluding irrigation, toilet flushing, janitorial uses and equipment uses. However, due diligence to comply with this Imperative must be demonstrated by filing an appeal(s) with the appropriate agency (or agencies). An exception is made for an initial water purchase to get cisterns topped off. A Living Building Challenge project only buys water once.
What is the baseline or point of comparison?	water use by convetional means	Exterior vegetated space	Midsummer baseline case	n/a
What is the range of requirements to achieve the metric?	50%	25%-100% space not irrigated	50% (2 pt), 100% (4 pts)	n/a

What standards or tools are required for the metric?	n/a	Irrigation Association's "Turf and Landscape Irrigation Best Management Practices 2005", section 2,3.	n/a	n/a
Storm Water				
Does the metric help a building meet a current Federal requirement?	Employ design and construction strategies that reduce storm water runoff and discharge polluted water offsite. Per EISA Section 438, to the maximum extent technically feasible, maintain or restore the predevelopment hydrology of the site with regard to temperature, rate, volume, and duration of flow using site planning, design, construction, and maintenance strategies.	If the Green Globes NC points are achieved, the GP will be met. 7.3.1 Storm Water Management	If the LEED NC points are achieved, the GP will be met. SS Credit 6.1: Stormwater Design - Quantity Control SS Credit 6.2: Stormwater Design - Quality Control	If the LBC challenge is accomplished, no storm water is discharged and the GP is exceeded. Imperative 01: Limits to Growth (partial) 06 Ecological Water Flow Municipal storm sewer solutions do not qualify as acceptable onsite storm water management practices. For Building projects that have a F.A.R. equal to or greater than 1.5 in Transects L5 or L6, a conditional exception may apply, which allows some water to leave the site at a reduced rate and depends on site and soil conditions and the surrounding development context. Greater flexibility is given to projects with higher densities.
What is the baseline or point of comparison?	n/a	Total storm water runoff 24-hour storm Roof square footage	1- and 2-year 24-hour design storm Predevelopment peak discharge rate and quantity Average annual rainfall	n/a
What is the range of requirements to achieve the metric?	n/a	1% -100% roof space	25% storm run-off 90% stomrwater from average annual rainfall	n/a
What standards or tools are required for the metric?	EISA Section 438	Percolation test	n/a	n/a
Water-Efficient Products				
Does the metric help a building meet a current Federal requirement?	Specify EPA's WaterSense-labeled products or other water conserving products, where available. Choose irrigation contractors who are certified through a WaterSense labeled program.	If the Green Globes NC points are achieved the GP will be met, except there is no mention of certified irrigation contractors. 7.4.1.8 Landscaping 7.4.1.9 Irrigation	LEED NC meets the intent of the GP for WaterSense but does not mention certified irrigation contractors. WE Prerequisite 1: Water Use Reduction	LBC does not specify water-efficient products requirements. The Institute avoids prescriptive paths to certification, and as such does not provide a list of products to use. However, the performance-based requirements of Imperative 05: Net Zero Water necessitate that project teams strictly evaluate products based on their water conservation potential.
What standards or tools are required for the metric?	EPA WaterSense	Irrigation Association's "Turf and Landscape Irrigation Best Management Practices 2005", section 2,3 EPA's WaterSense Program	n/a	n/a

Energy

Review Questions	Guiding Principles NC	Green Globes NC	LEED NC	Living Building Challenge
Energy Efficiency				
Does the metric help a building meet a current Federal requirement?	Establish a whole building performance target that takes into account the intended use, occupancy, operations, plug loads, other energy demands, and design to earn the ENERGY STAR® targets for new construction and major renovation where applicable. For new construction, reduce the energy use by 30 percent compared to the baseline building performance rating per the ANSI/ASHRAE/IESNA Standard 90.1-2007. For major renovations, reduce the energy use by 20 percent below pre-renovations 2003 baseline.	ASHRAE 91 – 2007 is specified first, implying that the local code applies if more stringent. In Path A, the EUI of the baseline building is determined using ENERGY STAR Target Finder (50% better than the Energy Performance Rating score of 50) instead of ASHRAE 90.1-2007. Requirement of 50% reduction in CO2 emissions may or may not equal 30% in energy reduction as required by the Guidelines. Path B is a prescriptive option with no performance requirements compared to ASHRAE 2004. Path B references ASHRAE 90.1-2007 of IECC 2009. 8. Energy 8.1 Building CO2e Emissions -- Path A 8.2 Demand -- Path A 8.4 - 8.9 Prescriptive Design Option -- Path B 8.4 Building Opaque Envelope 8.5 Day lighting 8.6 HVAC Systems and Controls 8.7 Lighting Systems and Controls 8.8 Elevator and Conveyance Systems 8.9 Renewable Energy	For new buildings, LEED NC prerequisite ensures a 10% reduction; Guidelines require 30% reduction. For renovations, LEED NC prerequisite ensures a 5% reduction and the baseline is ASHRAE 90.1-2007; Guidelines require 20% reduction from pre-renovations 2003 baseline. LEED give more points to better energy performance. EA Overview. The design of new facilities must be based on the designated mandatory and prescriptive requirements in ASHRAE 90.1-2007 or USGBC-approved code, whichever is more stringent. EA Prerequisite 2: Minimum Energy Performance EA Prerequisite 2: Minimum Energy Performance EA Credit 1: Optimize Energy Performance	LBC requires Net Zero but does not have specific energy use requirement. 07 Net Zero Energy Living Building Challenge frames energy efficiency in the context of the carrying capacity of the site, and as such, requires that the project performs within this parameter. When the Scale Jumping overlay is used by project teams to achieve Net Zero Energy, they are required to demonstrate that a project's demand does not exceed the proportional amount of energy available. The Institute emphasizes the primary strategy of optimizing energy efficiencies prior to installing renewable energy systems. This Imperative may be attempted using the Scale Jumping design overlay, which endorses the implementation of solutions beyond the building scale that maximize ecological benefit while maintaining self-sufficiency at the city block, neighborhood, or community scale. This must include all electricity, heating and cooling requirements. Back-up generators are excluded. System may be grid-tied or off the grid. Renewable energy is defined as passive solar, photovoltaics, solar thermal, wind turbines, water-powered microturbines, direct geothermal or fuel cells powered by hydrogen generated from renewably powered electrolysis – nuclear energy is not an acceptable option. No combustion of any kind is allowed.
What is the baseline or point of comparison?	ASHRAE 90.1-2007; Energy use in 2003	Energy Star Target Finder score of 50	ASHRAE 90.1-2007	n/a
What is the range of requirements to achieve the metric?	30%; 20%	50%-100% (150 - 250 pts)	12%-48% for New Buildings (1-19 pts) 8%-44% for Existing Building Renovations (1-19 pts)	n/a
What standards or tools are required for the metric?	ASHRAE 90.1-2007	ASHRAE 90.1-2007 or 2009 IECC	ASHRAE 90.1-2007 Appendix G (ASHRAE AEDG or NBI ABCP)	n/a
On-Site Renewable Energy				
Does the metric help a building meet a current Federal requirement?	Per the Energy Independence and Security Act (EISA) Section 523, meet at least 30% of the hot water demand through the installation of solar hot water heaters, when lifecycle cost effective.	8.9.2 On-Site Renewable Energy includes on-site thermal, which could include solar hot water. Optional points are awarded for on-site renewable energy, calculated in use, and green power and RECs. 8.9 Renewable Energy -- Path B 8.9.1 Off-Site Renewable Energy 8.9.2 On-Site Renewable Energy	Solar hot water is not specified in LEED NC. Optional points are awarded for on-site renewable energy, calculated in cost, and green power. EA Credit 2: On-site Renewable Energy EA Credit 6: Green Power	To meet the requirements of the Living Building Challenge, 100% of all water heating systems must be powered with renewable energy systems. 07 Net Zero Energy This Imperative may be attempted using the Scale Jumping design overlay, which endorses the implementation of solutions beyond the building scale that maximize ecological benefit while maintaining self-sufficiency at the city block, neighborhood, or community scale. This must include all electricity, heating and cooling requirements. Back-up generators are excluded. System may be grid-tied or off the grid. Renewable energy is defined as passive solar, photovoltaics, solar thermal, wind turbines, water-powered microturbines, direct geothermal or fuel cells powered by hydrogen generated from renewably powered electrolysis – nuclear energy is not an acceptable option. No combustion of any kind is allowed.
What is the baseline or point of comparison?	total hot water demand	Total thermal and electrical consumption	Annual energy cost	n/a
What is the range of requirements to achieve the metric?	30%	On-Site Renewable 1%-25% (50 pts) Off-Site Renewable 1%-100% (50 pts)	On-Site Renewable 1%-13% (1-7 pts) Green Power 35% (2 pts)	n/a

Energy

Is on-site generation and purchases of green power treated differently?	Green power is not mentioned.	Yes - for every 1% of onsite consumption 2 points are assigned. For offsite 2% of consumptions earns 1 point.	Yes	Yes - purchase of green power not allowed to meet the LBC.
Measurement and Verification				
Does the metric help a building meet a current Federal requirement?	Per the Energy Policy Act of 2005 (EPAct) Section 103, install building level electricity meters in new major construction and renovation projects to track and continuously optimize performance. Per EISA Section 434, include equivalent meters for natural gas and steam, where natural gas and steam are used.	If Green Globes points are achieved, GP will be met. 8.3 Measurement and Verification -- Path A	If LEED NC points are achieved, GP will be met. EA Credit 5: Measurement and Verification	Measurement and verification is fundamental to the documentation for the Energy and Water Petal requirements in the Living Building Challenge. - Imperative 05: Net Zero Water - Monthly readings throughout the 12-month occupancy period from meter(s) or other onsite tracking systems that clearly record the amount of water received by the project from every source (including cisterns). - Imperative 07: Net Zero Energy - Monthly readings throughout the 12 month occupancy period from meter(s), other onsite tracking systems or web-link to online mechanism that clearly records energy produced and consumed.
What standards or tools are required for the metric?	EPAct 2005 Section 103; EISA Section 434	IPMVP Volume III (2003), Option D	IPMVP Volume III (2003), Option B or D	n/a
Benchmarking				
Does the metric help a building meet a current Federal requirement?	Compare actual performance data from the first year of operation with the energy design target, preferably by using ENERGY STAR® Portfolio Manager for building and space types covered by ENERGY STAR®. Verify that the building performance meets or exceeds the design target, or that actual energy use is within 10% of the design energy budget for all other building types. For other building and space types, use an equivalent benchmarking tool such as the Labs21 benchmarking tool for laboratory buildings.	The GBI ANSI Standard benchmarks against actual regional energy performance by building type by using the Target Finder Energy Star program. One of Target Finder's features is a tool that predicts future energy performance based on a benchmarking methodology.	LEED NC does not address Benchmarking.	Benchmarking is part of the documentation process for the Energy and Water Petal requirements in the Living Building Challenge. Project teams are required to provide the simulated/design water and energy demand, as well as list any/all tools used for the calculations. This information is then compared to the actual performance data provided, and published in the public Case Studies online.
What standards or tools are required for the metric?	ENERGY STAR	n/a	n/a	n/a

Materials

Review Questions	Guiding Principles NC	Green Globes NC	LEED NC	Living Building Challenge
Recycled Content				
Does the metric help a building meet a current Federal requirement?	Per Section 6002 of the Resource Conservation and Recovery Act (RCRA), for EPA-designated products, specify products meeting or exceeding EPA's recycled content recommendations. For other products, specify materials with recycled content when practicable. If EPA-designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of or use in the building. EPA's recycled content product designations and recycled content recommendations are available on EPA's Comprehensive Procurement Guideline web site at <www.epa.gov/cpg>.	GP uses the EPA's guideline, which is specific to the different types of construction materials. So it is difficult to compare with GG NC. 10.1 Assemblies 10.2 Furnishing, Finishes and Fit-outs 10.3 Other Material Properties 10.4 Reuse of Existing Structures 10.5 Reduction, Re-use and Recycling of Waste	GP uses the EPA's guideline, which is specific to the different types of construction materials. So it is difficult to compare with LEED NC. MR Credit 4: Recycled Content	LBC does not address recycled content of purchased goods.
What is the baseline or point of comparison?	n/a	Total cost or weight of project materials (assemblies, furnishings, finishes. fit-outs, facade, structured systems, non-structured elements)	Total value of materials on the project	n/a
What is the range of requirements to achieve the metric?	n/a	1% - 20%+ of building materials for assemblies 1% - 17%+ furnishings, finishes. fit-outs 1% - 9%+ of building materials for salvaged 10% - 75%+ building façade 10% - 95%+ structural systems 10% - 95% non-structural elements	10%, 20%+	n/a
What standards or tools are required for the metric?	EPA's Comprehensive Procurement Guideline	n/a	n/a	n/a
Biobased Content				
Does the metric help a building meet a current Federal requirement?	Per Section 9002 of the Farm Security and Rural Investment Act (FSRIA), for USDA-designated products, specify products with the highest content level per USDA's biobased content recommendations. For other products, specify biobased products made from rapidly renewable resources and certified sustainable wood products. If these designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of or use in the building. USDA's biobased product designations and biobased content recommendations are available on USDA's BioPreferred web site at <www.usda.gov/biopreferred>.	GP uses the USDA's guideline, which is specific to the different types of construction materials. GBI ANSI Standard references USDA bio-based guideline. 10.1 Assemblies 10.2 Furnishing, Finishes and Fit-outs 10.3 Other Material Properties	GP uses the USDA's guideline, which is specific to the different types of construction materials. So it is difficult to compare with LEED NC. MR Credit 6: Rapidly Renewable Materials MR Credit 7: Certified Wood	If the LBC challenge is accomplished the Guidelines will be met. 13 Responsible Industry
What is the baseline or point of comparison?	n/a	Total cost or weight of project materials (assemblies, furnishings, finishes. fit-outs, facade, structured systems, non-structured elements)	Total value of materials and products based on cost Total wood-based material based on cost	n/a
What is the range of requirements to achieve the metric?	n/a	1% - 20%+ of building materials for assemblies 1% - 16%+ furnishings, finishes. fit-outs 1% - 60%+ of wood-based building materials	Rapidly renewable = 2.5% Certified wood = 50%	n/a
What standards or tools are required for the metric?	USDA's Bio Preferred website	n/a	n/a	n/a
Environmentally Preferable Products				

Resources

Does the metric help a building meet a current Federal requirement?	Use products that have a lesser or reduced effect on human health and the environment over their lifecycle when compared with competing products or services that serve the same purpose. A number of standards and ecolabels are available in the marketplace to assist specifies in making environmentally preferable decisions. For recommendations, consult the Federal Green Construction Guide for Specifies at <www.wbdg.org/design/greenspec.php>.	Green Globes NC does not specifically call out EPP products but does have points for using regional materials. 10.1 Assemblies 10.2 Furnishing, Finishes and Fit-outs	LEED NC does not specifically call out EPP products but does have points for using regional materials. MR Credit 7: Regional Materials	The Living Building Challenge envisions a future where all materials in the built environment are replenishable and have no negative impact on human and ecosystem health. Imperative 09: Healthy Air Imperative 10: Biophilia Imperative 11: Red List Imperative 13: Responsible Industry Imperative 14: Appropriate Sourcing Imperative 15: Conservation + Reuse
What is the baseline or point of comparison?	n/a	Total cost or weight of project materials (assemblies, furnishings, finishes, fit-outs)	Total value of materials on the project	n/a
What is the range of requirements to achieve the metric?	n/a	1% - 20%	10%, 20%	n/a
What standards or tools are required for the metric?	Federal Green Construction Guide for Specifies	n/a	n/a	US EPA Design for the Environment (DfE) is referenced as a resource for understanding thresholds for disclosure of ingredients for Imperative 11:Red List.
Waste and Materials Management				
Does the metric help a building meet a current Federal requirement?	Incorporate adequate space, equipment, and transport accommodations for recycling in the building design. During a project's planning stage, identify local recycling and salvage operations that could process site-related construction and demolition materials. During construction, recycle or salvage at least 50 percent of the non-hazardous construction, demolition and land clearing materials, excluding soil, where markets or onsite recycling opportunities exist. Provide salvage, reuse and recycling services for waste generated from major renovations, where markets or onsite recycling opportunities exist.	If the Green Globes NC points are achieved for operational waste and re-use that portion of the GPs are met. If at least 4 Green Globes NC points are achieved on the demolition and construction waste criteria the GP will be met. 10.5 Reduction, Re-use and Recycling of Waste 10.5.1 Demolition and Construction Waste 10.5.3 Operational Waste	If LEED NC points are achieved the GP will be met. MR Prerequisite 1: Storage and Collection of Recyclables MR Credit 2: Construction Waste Management MR Credit 3: Materials Reuse	If the LBC challenge is accomplished the GP will be met. 15 Conservation + Reuse
What is the baseline or point of comparison?	Total non-hazardous construction, demolition and land clearing materials	Total weight of demolition and construction waste	Non hazardous C&D debris total Total value of materials on the project	Total weight of wasted material
What is the range of requirements to achieve the metric?	n/a	25% - 75%+	C&D = 50%, 75% Re-use = 5%, 10%	n/a
Ozone Depleting Compounds				
Does the metric help a building meet a current Federal requirement?	Eliminate the use of ozone depleting compounds during and after construction where alternative environmentally preferable products are available, consistent with either the Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990, or equivalent overall air quality benefits that take into account lifecycle impacts.	Refrigerants with zero or near-zero ozone-depletion potential are specified, which could allow use of HCFC instead of CFCs. According to the EPA, "HCFCs have ozone depletion potentials (ODPs) ranging from 0.01 to 0.1. Production of HCFCs with the highest ODPs are being phased out first, followed by other HCFCs." If the intent of the GPs is to replace all CFCs and HCFCs with HFCs or other refrigerant substitutes, then the Green Globes point does not meet this criteria. 11.2.1 Ozone-Depleting Potential	LEED NC requires zero use of CFC based refrigerants but does not specify other ozone depleting substances. EA Prerequisite 3: Fundamental Refrigerant Management	If the LBC challenge is accomplished the GP will be met. 11 Red List
What is the baseline or point of comparison?	n/a	ODP of refrigerant GWP of refrigerant	n/a	n/a
What is the range of requirements to achieve the metric?	n/a	≤.035 - ≤.005 ODP ≤1500 - ≤300 GWP	n/a	n/a
What standards or tools are required for the metric?	Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990	n/a	n/a	n/a
Low-Emitting Material				
Does the metric help a building meet a current Federal requirement?	Low-Emitting Materials. Specify materials and products with low pollutant emissions, including composite wood products, adhesives, sealants, interior paints and finishes, carpet systems, and furnishings.	If the Green Globes NC points are achieved, the GP will be met. 12.2.1 Volatile Organic Compounds	If the LEED NC points are achieved, relevant standards (e.g., South Coast Air Quality Management District (SCAQMD), Green Seal Standards) that define emissions limits must be complied with and the intent of the GP is met. IEQ Credit 4.1-4.5: Low-emitting Materials	If the LBC challenge is accomplished the GP will be met. Imperative 09: Healthy Air 11 Red List

Other Natural

ssion Material

low-emi

What is the baseline or point of comparison?	n/a	Weight or quantity the listed materials	n/a	n/a
What is the range of requirements to achieve the metric?	n/a	0% - 100%	n/a	n/a

Indoor Environment

	Review Questions	Guiding Principles NC	Green Globes NC	LEED NC	Living Building Challenge
Ventilation	**Ventilation**				
	Does the metric help a building meet a current Federal requirement?	Meet ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy, including continuous humidity control within established ranges per climate zone, and ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality.	Green Globes NC does not specify that if the local code is used, it must be more stringent than the ASHRAE standard. If points are achieved using local code, the GP may or may not be achieved. Since local codes and standards are listed last, the intent implied is that ventilation requirements defer to them only if more stringent than the national codes and standards. 12.1.1 Ventilation Air Quantity 12.1.2 Air Exchange 12.1.3 Ventilation Intakes and Exhausts 12.1.4 CO2 Sensing and Ventilation Control Equipment 12.1.5 Air Handing Equipment	LEED has the same requirements as GP. IEQ Prerequisite 1: Minimum Indoor Air Quality Performance	If the LBC challenge is accomplished the GP will be met. 09 Healthy Air
	What standards or tools are required for the metric?	ASHRAE Standard 62.1-2007	ASHRAE Standard 62.1-07 ICC 2009 International Mechanical Code IAPMO 2009 Uniform Mechanical Code Local codes or standards	ASHRAE Standard 62.1-2007	ASHRAE Standard 62
Thermal Comfort	**Thermal Comfort**				
	Does the metric help a building meet a current Federal requirement?	Meet ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy, including continuous humidity control within established ranges per climate zone, and ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality.	Green Globes NC does not specify that if the local code is used, it must be more stringent than the ASHRAE standard. If points are achieved using local code, the Guidelines may or may not be achieved. Since local codes and standards are listed last, the intent implied is that thermal comfort requirements defer to them only if more stringent than the national codes and standards. 12.5.2 Thermal Comfort Design	If points are achieved, GP will be met. IEQ Credit 6.2: Controllability of Systems - Thermal Comfort	The LBC challenge does not specifically call out the thermal comfort requirements of AHRAE 55-04. Living Building Challenge includes requirements for compliance with ASHRAE 62 and required testing throughout the project for temperature and relative humidity. Imperative 08: Civilized Environment
	What is the baseline or point of comparison?	n/a	n/a	Number of building occupants	n/a
	What is the range of requirements to achieve the metric?	n/a	n/a	50%	n/a
	What standards or tools are required for the metric?	ASHRAE Standard 55-2004	ANSI/ASHRAE Standard 55-04 Local codes or standards	ASHRAE Standard 55-2004	n/a
Daylighting	**Daylighting**				
	Does the metric help a building meet a current Federal requirement?	Achieve a minimum daylight factor of 2% in 75% of all space occupied for critical visual tasks.	Daylighting is addressed in two areas: Energy (Prescriptive Path) and Indoor Environment. The daylighting specifications use opening size and indoor lighting levels and ASHRAE Advanced Engineering Design Guides are referenced. Primary occupied spaces are designed to receive indirect minimum daylight illumination levels of 25 fc. 8.5.1 Daylighting 12.4.1 Daylighting 12.4.2 Lighting Design	The daylighting specifications use opening size and indoor lighting levels, which are not comparable to the Guidelines daylighting factor metrics. IEQ Credit 8.1: Daylight and Views - Daylight IEQ Credit 6.1: Controllability of Systems - Lighting	If the LBC challenge is accomplished the GPs will be met. 08 Civilized Environment
	What is the baseline or point of comparison?	All space occupied for critical visual tasks	Net building area Primary occupied space	Regularly occupied areas	n/a
	What is the range of requirements to achieve the metric?	75%	10% - 50%+ net building area 10% - 60%+ occupied area	75% (1 pt)	n/a
	Environmental Tobacco				

Pollution Source Control	**Does the metric help a building meet a current Federal requirement?**	Implement a policy and post signage indicating that smoking is prohibited within the building and within 25 feet of all building entrances, operable windows, and building ventilation intakes during building occupancy.	Smoking is not prohibited in Green Globes NC and there is no distance requirement, but smoking areas are considered specialized activity areas. The GP is not met. Smoking is primarily a building management issue and is most appropriately addressed in an Existing Buildings (CIEB) program. 12.2.8 Ventilation and Physical Isolation for Specialized Activities	LEED NC requirements meet the GP. IEQ Prerequisite 2: Environmental Tobacco Smoke (ETS) Control	If the LBC challenge is accomplished the GP will be met. 09 Healthy Air
	Moisture Control				
	Does the metric help a building meet a current Federal requirement?	Establish and implement a moisture control strategy for controlling moisture flows and condensation to prevent building damage, minimize mold contamination, and reduce health risks related to moisture.	If the Green Globes NC points are achieved the GP will be met. 10.9 Vapor Retarders 12.2.2 Leakage, Condensation and Humidity 12.2.7 Humidification and Dehumidification Systems	LEED NC does not specify moisture control requirements, except during construction. IEQ Credit 3.1: Construction Indoor Air Quality Management Plan - During Construction	The LBC challenge does not specify specific moisture control strategies beyond ventilation. 09 Healthy Air
	Protect Indoor Air Quality during Construction				
	Does the metric help a building meet a current Federal requirement?	Follow the recommended approach of the Sheet Metal and Air Conditioning Contractor's National Association Indoor Air Quality Guidelines for Occupied Buildings under Construction, 2007. After construction and prior to occupancy, conduct a minimum 72-hour flush-out with maximum outdoor air consistent with achieving relative humidity no greater than 60 percent. After occupancy, continue flush-out as necessary to minimize exposure to contaminants from new building materials.	Green Globes NC does address SMACNA and does have flush out requirements with a time frame longer than the GP, however it does not specify the humidity level; therefore the GP is only partially met. 6.2.1 Environmental Management 6.2.4 Indoor Air Quality	If the LEED NC points are achieved, the minimum volumetric flush-out requirements OR maximum contaminant concentrations must be met, however there is no specific call out of a length of time that the flush out must occur. Therefore, the GP is only partially met. IEQ Credit 3.1: Construction Indoor Air Quality Management Plan - During Construction IEQ Credit 3.2: Construction Indoor Air Quality Management Plan - Before Occupancy	The LBC challenge does not specify flush out or the SMACNA IAG Criteria. Living Building Challenge reduces the potential for exposure and by requiring that project teams focus on specifying products that do not compromise human and ecological health. 09 Healthy Air Imperative 11: Red List
	What standards or tools are required for the metric?	n/a	Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines For Occupied Buildings Under Construction	Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines For Occupied Buildings Under Construction	n/a

Not in Guiding Principles

	Review Questions	Guiding Principles NC	Green Globes (NC)	LEED (NC)	Living Building Challenge
Acoustic	**Acoustic (Not in GP)**				
	Does the metric help a building meet a current Federal requirement?	No requirements in the GP.	12.6.1 Acoustic Comfort (22 points) 12.6.1 Acoustic Comfort Design (12 points) 12.6.2 Mechanical, Plumbing and Electrical Systems (12 points)	—	—
BAS	**Building System Controls (Not in GP)**				
	Does the metric help a building meet a current Federal requirement?	No requirements in the GP.	n/a	n/a	n/a
Siting	**Siting (Not in GP)**				
	Does the metric help a building meet a current Federal requirement?	No requirements in the GP.	7.1 Site Development	SS Credit 1: Site Selection SS Credit 2: Development Density and Community Connectivity SS Credit 3: Brownfield Redevelopment SS Credit 4.1: Alternative Transportation - Public Transportation Access SS Credit 5.1: Site Development - Protect or Restore Habitat	01 Limits to Growth 02 Urban Agriculture 03 Habitat Exchange 04 Car Free Living Imperative 16: Human Scale and Humane Places Imperative 17: Democracy + Social Justice Imperative 18: Rights to Nature
Greenhouse Gas	**Greenhouse Gas (Not in GP)**				
	Does the metric help a building meet a current Federal requirement?	No requirements in the GP.	In Path A of Energy, Green Globes requires 50%-100 reduction in CO2 emissions. 8. Energy 8.1 Building CO2e Emissions -- Path A 11.1 Heating Equipment 11.2 Cooling Equipment	LEED NC does not address Greenhouse Gases directly.	Living Building Challenge requires that project teams calculate the project's total embodied carbon footprint (tCO2e), and purchase Certified Emission Reduction credits or Verified Emission Reduction credits from qualifying renewable energy projects. Imperative 12: Embodies Carbon Footprint
	What is the baseline or point of comparison?		Energy Performance Rating (Target Finder) score of 50.	n/a	n/a

Appendix G: Certification System Mapping to Robustness for Existing Buildings Review Criteria

Robustness

Management Principles

Review Questions	Guiding Principles (EB)	Green Globes (CIEB)	LEED (EB)	Living Building Challenge (Renovation)
Integrated Assessment, Operation and Management				
Does the metric help a building meet a current Federal requirement?	Integrated Assessment, Operation, and Management. Use an integrated team to develop and implement policy regarding sustainable operations and maintenance. • Incorporate sustainable operations and maintenance practices within the appropriate Environmental Management System (EMS) • Assess existing condition and operational procedures of the building and major building systems and identify areas for improvement • Establish operational performance goals for energy, water, material use and recycling, and indoor environmental quality, and ensure incorporation of these goals throughout the remaining lifecycle of the building • Incorporate a building management plan to ensure that operating decisions and tenant education are carried out with regard to integrated, sustainable building operations and maintenance • Augment building operations and maintenance as needed using occupant feedback on work space satisfaction.	The use of an integrated team to implement the elements specified in the GP is not specifically addressed in GG CIEB, but it is implied with EMS documentation. 6.1 Environmental Management System (EMS) Documentation 6.2 Environmental Purchasing 6.3 Emergency Response 6.4 Tenant Awareness	The use of an integrated team to implement the elements specified in the GP is not addressed in LEED EB. The elements are discussed as separate units as documented in other Robustness categories. SS Credit 3: Integrated Pest Management, Erosion Control and Landscape Management Plan IE Q Credit 2.1: Occupant Comfort—Occupant Survey	The use of an integrated team to implement the elements specified in the LBC is not specifically addressed. "The Living Building Challenge does not dwell on basic best practice issues so it can instead focus on fewer, high level needs. It is assumed that to achieve this progressive standard, typical best practices are being met. The implementation of this standard requires leading-edge technical knowledge, an integrated design approach, and design and construction teams well versed in advanced practices related to 'green building'." Project teams tend to include a more diverse range of practitioners, drawing expertise from less conventional areas of influence and allowing for a deeply integrated design process. [To view a testimonial from a project team about integrated design in the Living Building Challenge, see this video: Integrative Design: Phipps – A Case Study, created without Institute involvement. This topic is also discussed on the Dialogue, as in this excerpted response to a project team's query about the use of certain structural materials: "There are certainly trade-offs for most material decisions and the early stages of a project are ideal to investigate available structural materials that do not contain Red List materials or have the potential to compromise Responsible Industry. Ideally, an integrated design
Commissioning				
Does the metric help a building meet a current Federal requirement?	Employ recommissioning, tailored to the size and complexity of the building and its system components, in order to optimize and verify performance of fundamental building systems. Commissioning must be performed by an experienced commissioning provider. When building commissioning has been performed, the commissioning report, summary of actions taken, and schedule for recommissioning must be documented. In addition, meet the requirements of EISA 2007, Section 432 and associated FEMP guidance. Building recommissioning must have been performed within four years prior to reporting a building as meeting the Guiding Principles.	Commissioning is not addressed in Green Globs CIEB.	LEED EB does not require an experienced commissioning provider be used. In addition, there is no specified re-commissioning time frames. EA Credit 2.1: Existing Building Commissioning—Investigation and Analysis EA Credit 2.2: Existing Building Commissioning—Implementation EA Credit 2.3: Existing Building Commissioning—Ongoing Commissioning	The LBC does not address commissioning. Living Building Challenge cites Commissioning as a key strategy for success in achieving the requirements for Imperative 07: Net Zero Energy, though as a rule, the Institute avoids prescriptive paths to certification. The Institute explicitly notes that a "copy of commissioning reports or other design or construction documents identifying corrections and/or improvements made to the system(s) or envelope throughout the 12-month occupancy period" may be included with the project team's documentation.
What standards or tools are required for the metric?	EISA 2007 Section 432	n/a	n/a	n/a

Water

Review Questions	Guiding Principles (EB)	Green Globes (CIEB)	LEED (EB)	Living Building Challenge (Renovation)
Indoor Water				
Does the metric help a building meet a current Federal requirement?	Two options can be used to measure indoor potable water use performance: • Option 1: Reduce potable water use by 20% compared to a water baseline calculated for the building. The water baseline, for buildings with plumbing fixtures installed in 1994 or later, is 120% of the Uniform Plumbing Codes 2006 or the International Plumbing Codes 2006 fixture performance requirements. The water baseline for plumbing fixtures older than 1994 is 160% of the Uniform Plumbing Codes 2006 or the International Plumbing Codes 2006 fixture performance requirements, or • Option 2: Reduce building measured potable water use by 20% compared to building water use in 2003 or a year thereafter with quality water data.	For office buildings, GG CIEB uses utility bills to evaluate water performance. For other than office buildings, the client may utilize the GBI Water Calculator, which sets up baseline consumption for the building and then allows for benchmarking based on percent over baseline. 2.1 Water Consumption 2.3 Water Management	Meeting the LEED EB pre-requisite and achieving 5 points in WE Credit 2 would exceed the GP. WE Prerequisite 1: Minimum Indoor Plumbing Fixture and Fitting Efficiency WE Credit 2: Additional Indoor Plumbing Fixture and Fitting Efficiency	If the LBC challenge is accomplished, no outside potable water is used and the GP is exceeded. 05 Net Zero Water
What is the baseline or point of comparison?	120% or 160% of UPC/IPC 2006; 100% of water use in 2003	GBI Water Calculator sets up a baseline requires accurate inventory of water consuming equipment. Use actual water consumption data from 12 consecutive months for benchmarking and determining percent water efficiency.	100% of 2006 UPC/IPC	n/a
What is the range of requirements to achieve the metric?	20%	unknown	10% - 30%	n/a
What standards or tools are required for the metric?	Uniform Plumbing Code (UPC) or International Plumbing Code (IPC)	GBI Water Calculator	Uniform Plumbing Code (UPC) or International Plumbing Code (IPC)	n/a
Process Water				
Does the metric help a building meet a current Federal requirement?	Per EPAct 2005 Section 109, when potable water is used to improve a building's energy efficiency, deploy lifecycle cost effective water conservation measures.	GG credit for NOT having once through cooling. 2.2 Water Conserving Features	GP does not have quantitative requirement. WE Credits 4.1–4.2: Cooling Tower Water Management WE Credit 4.1: Chemical Management WE Credit 4.2: Nonpotable Water Source Use	If the LBC challenge is accomplished, no outside potable water is used and the GP is exceeded. 05 Net Zero Water
What is the baseline or point of comparison?	n/a	n/a	Total makeup water use	n/a
What is the range of requirements to achieve the metric?	n/a	n/a	50%	n/a
What standards or tools are required for the metric?	EPAct 2005 Section 109	n/a	n/a	n/a
Outdoor Water				
Does the metric help a building meet a current Federal requirement?	Three options can be used to measure outdoor potable water use performance: • Option 1: Reduce potable irrigation water use by 50% compared to conventional methods, or • Option 2: Reduce building related potable irrigation water use by 50% compared to measured irrigation water use in 2003 or a year thereafter with quality water data, or • Option 3: Use no potable irrigation water.	GG CIEB does not require 50% reduction. 2.2 Water Conserving Features	If the minimum points are achieved the GP will be met. WE Credit 3: Water Efficient Landscaping	If the LBC challenge is accomplished, no outside potable water is used and the GP are exceeded. 05 Net Zero Water
What is the baseline or point of comparison?	Conventional water use or measured use in 2003	n/a	Mid-summer baseline irrigation water use	n/a
What is the range of requirements to achieve the metric?	50%	n/a	50%-100%	n/a
What standards or tools are required for the metric?	n/a	n/a	LEED Reference Guide for Green Building Operations & Maintenance, 2009 edition	n/a
Measurement of Water Use				
Does the metric help a building meet a current Federal requirement?	The installation of water meters for building sites with significant indoor and outdoor water use is encouraged. If only one meter is installed, reduce potable water use (indoor and outdoor combined) by at least 20% compared to building water use in 2003 or a year thereafter with quality water data.	GG CIEB requires the water management but there is no associated water reduction requirements based on the measured water use. Water consumption is quantitative based on 12 consecutive months of consumption. Office category based on BOMA histogram. GBI Water Calculator utilized on other occupancy types per above. 2.1 Water Consumption 2.3 Water Management	LEED EB requires the measurement of total potable water use but there is no associated water reduction requirements based on the measured water use. WE Credit 1: Water Performance Measurement	LBC does not specify water use measurement requirements.

What is the baseline or point of comparison?	water use in 2003	n/a	n/a	n/a
What is the range of requirements to achieve the metric?	20%	n/a	n/a	n/a
Stormwater				
Does the metric help a building meet a current Federal requirement?	Employ strategies that reduce storm water runoff and discharges of polluted water offsite. Per EISA Section 438, where redevelopment affects site hydrology, use site planning, design, construction, and maintenance strategies to maintain hydrologic conditions during development, or to restore hydrologic conditions following development, to the maximum extent that is technically feasible.	If the points are achieved the GP will be met. 4.5 Waste Water Effluents	If the points are achieved the GP will be met. SS Credit 3: Integrated Pest Management, Erosion Control and Landscape Management Plan SS Credit 6: Stormwater Quantity Control	LBC Renovation does not have storm water requirement.
What is the baseline or point of comparison?	n/a	n/a	Average weather year and 2-year, 24-hour design storm	n/a
What is the range of requirements to achieve the metric?	n/a	n/a	15% precipitation	n/a
What standards or tools are required for the metric?	EISA Section 438	n/a	n/a	n/a
Water-Efficient Products				
Does the metric help a building meet a current Federal requirement?	Where available, use EPA's WaterSense-labeled products or other water conserving products. Choose irrigation contractors who are certified through a WaterSense-labeled program.	The GP are partially met. Although water conserving products are specified there is no mention of certified contractors. 2.2 Water Conserving Features	As part of fulfilling water prerequisite, water conserving indoor plumbing fixtures will be required. Although WaterSense-labeled products are not explicitly called out, equivalent fixtures will be necessary to meet the necessary water reductions. However, there is no mention of certified contractors. WE Prerequisite 1: Minimum Indoor Plumbing Fixture and Fitting Efficiency WE Credit 2: Additional Indoor Plumbing Fixture and Fitting Efficiency	LBC does not specify water-efficient products requirements. The Institute avoids prescriptive paths to certification, and as such does not provide a list of products to use. However, the performance-based requirements of Imperative 05: New Zero Water necessitate that project teams strictly evaluate products based on their water conservation potential. EPA's WaterSense listings are noted as a resource for project teams in the Dialogue, and in the Water book of the Petal Series (currently in pre-published draft form).
What is the baseline or point of comparison?	n/a	n/a	Calculated baseline in WE Prerequisite 1: Minimum Indoor Plumbing Fixture and Fitting Efficiency	n/a
What is the range of requirements to achieve the metric?	n/a	n/a	10% - 30%	n/a
What standards or tools are required for the metric?	EPA's WaterSense	n/a	Uniform Plumbing Code (UPC) or International Plumbing Code (IPC)	n/a

Energy

Review Questions	Guiding Principles (EB)	Green Globes (CIEB)	LEED (EB)	Living Building Challenge (Renovation)
Energy Efficiency				
Does the metric help a building meet a current Federal requirement?	Three options can be used to measure energy efficiency performance: • Option 1: Receive an ENERGY STAR® rating of 75 or higher or an equivalent Labs21 Benchmarking Tool score for laboratory buildings, • Option 2: Reduce measured building energy use by 20% compared to building energy use in 2003 or a year thereafter with quality energy use data, or • Option 3: Reduce energy use by 20% compared to the ASHRAE 90.1-2007 baseline building design if design information is available. Use ENERGY STAR® and FEMP-designated Energy Efficient Products, where available.	The Energy Performance Criteria in Green Globes is performance based. Credit is directly derived from ENERGY STAR benchmarking protocol and uses the credit earning threshold of 75 percentile, the same threshold that ENERGY STAR uses to award an ENERGY STAR label. 1.1 Energy Performance 1.2 Lighting 1.3 Boilers 1.4 Controls 1.5 Hot Water 1.6 Other Energy Efficiency Features	LEED requires a minimum ENERGY STAR score of 69, which is less stringent than GP. LEED gives more points for better performance. EA Prerequisite 2: Minimum Energy Efficiency Performance EA Credit 1: Optimize Energy Efficiency Performance	LBC requires Net Zero but does not have specific energy use requirement. Living Building Challenge frames energy efficiency in the context of the carrying capacity of the site, and as such, requires that the project performs within this parameter. When the Scale Jumping overlay is used by project teams to achieve Net Zero Energy, they are required to demonstrate that a project's demand does not exceed the proportional amount of energy available. The Institute emphasizes the primary strategy of optimizing energy efficiencies prior to installing renewable energy systems. 07 Net Zero Energy
What is the baseline or point of comparison?	ENERGY STAR; energy use in 2003; ASHRAE 90.1-2007	ENERGY STAR	ENERGY STAR	n/a
What is the range of requirements to achieve the metric?	Score of 75 or 20% reduction	80 points spread over ENERGY STAR scores of 75 – 100 percentile	69-95%	n/a
What standards or tools are required for the metric?	ENERGY STAR; ASHRAE 90.1-2007	ENERGY STAR Portfolio Manager	EnergyStar Portfolio Manager	n/a
On-Site Renewable Energy				
Does the metric help a building meet a current Federal requirement?	Per Executive Order 13423, implement renewable energy generation projects on agency property for agency use, when lifecycle cost effective.	If the GG CIEB points are achieved the GP will be met. 1.7 Green Energy	If the LEED EB points are achieved the GP will be met. EA Credit 4: On-site and Off-site Renewable Energy	To achieve Net Zero, onsite renewable is necessary. 07 Net Zero Energy
What is the baseline or point of comparison?	n/a	Building total energy use	Buildings total energy use	n/a
What is the range of requirements to achieve the metric?	n/a	>0% to >10%	3%-12% renewables 25%-100% certificates	n/a
Is on-site generation and purchases of green power treated differently?	Green power is not mentioned.	No - equal points are awarded for offsite generated electricity.	Yes	Yes - purchase of green power not allowed to meet the LBC.
Measurement and Verification				
Does the metric help a building meet a current Federal requirement?	Per the Energy Policy Act of 2005 (EPAct2005) Section 103, install building level electricity meters to track and continuously optimize performance. Per the Energy Independence and Security Act (EISA) 2007, the utility meters must also include natural gas and steam, where natural gas and steam are used.	Although energy monitoring is included in Green Globes EB it does not specifically address actual metering, nor does it include all utilities. 1.1 Energy Performance 1.11 Energy Management, Monitoring, and Targeting 1.14 Sub-metering Energy Use cannot be monitored without metering. Therefore, metering is necessarily implied in section 1.11 Energy Management, Monitoring and Targeting. There is also sub-metering in section 1.14 Sub-metering.	LEED EB meets the GP for energy meters. EA Prerequisite 2: Minimum Energy Efficiency Performance EA Credit 1: Optimize Energy Efficiency Performance	Measurement and verification is fundamental to the documentation for the Energy and Water Petal requirements in the Living Building Challenge.
What standards or tools are required for the metric?	EPAct 2005; EISA 2007	n/a	n/a	n/a
Benchmarking				

Does the metric help a building meet a current Federal requirement?	Compare annual performance data with previous years' performance data, preferably by entering annual performance data into the ENERGY STAR® Portfolio Manager. For building and space types not available in ENERGY STAR®, use an equivalent benchmarking tool such as the Labs21 benchmarking tool for laboratory buildings.	GG CIEB uses ENERGY STAR as benchmark.	LEED EB uses ENERGY STAR as benchmark. If LEED EB energy efficiency pre-requisite 2, case 1, is met the GP will be met.	LBC does not use ENERGY STAR, but the net zero target exceeds ENERGY STAR requirement. Benchmarking is part of the documentation process for the Energy and Water Petal requirements in the Living Building Challenge. Project teams are required to provide the simulated/design water and energy demand, as well as list any/all tools used for the calculations. This information is then compared to the actual performance data provided, and published in the public Case Studies online.
What standards or tools are required for the metric?	ENERGY STAR; Labs21	ENERGY STAR Portfolio Manger	ENERGY STAR Portfolio Manger	Annual generation = Annual use

Materials

Environmental Impact of Materials

Review Questions	Guiding Principles (EB)	Green Globes (CIEB)	LEED (EB)	Living Building Challenge (Renovation)
Recycled Content				
Does the metric help a building meet a current Federal requirement?	Per section 6002 of RCRA, for EPA-designated products, use products meeting or exceeding EPA's recycled content recommendations for building modifications, maintenance, and cleaning. For other products, use materials with recycled content such that the sum of postconsumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost or weight) of the total value of the materials in the project. If EPA-designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction, operation, maintenance of or use in the building. EPA's recycled content product designations and recycled content recommendations are available on EPA's Comprehensive Procurement Guideline web site at <www.epa.gov/cpg>.	Green Globes EB does not specifically address recycled content of purchased goods.	If the LEED EB points are achieved the Guidelines will be met. MR Credit 1: Sustainable Purchasing—Ongoing Consumables MR Credits 2.1: Sustainable Purchasing MR Credit 2.2: Furniture MR Credit 3: Sustainable Purchasing—Facility Alterations and Additions IEQ Credit 3.3: Green Cleaning—Purchase of Sustainable Cleaning Products and Materials	LBC does not address recycled content of purchased goods.
What is the baseline or point of comparison?	Total value of material	n/a	Total annual purchase in each category	n/a
What is the range of requirements to achieve the metric?	10%	n/a	On going consumables = 60% Durable goods = 40% Alterations = 50% Cleaning = 30%	n/a
What standards or tools are required for the metric?	EPA's Comprehensive Procurement Guideline	n/a	Environmental Protection Agency (EPA) Comprehensive Procurement Guidelines for Janitorial Paper and Plastic Trash Can Liners, Green Seal GS-09, Green Seal GS-01, Environmental Choice CCD-082, Environmental Choice CCD-086.	n/a
Biobased Content				
Does the metric help a building meet a current Federal requirement?	Per section 9002 of FSRIA, for USDA-designated products, use products with the highest content level per USDA's biobased content recommendations. For other products, use biobased products made from rapidly renewable resources and certified sustainable wood products. If these designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them should be included in all solicitations relevant to construction, operation, maintenance of or use in the building. USDA's biobased product designations and biobased content recommendations are available on USDA's BioPreferred web site at <www.usda.gov/biopreferred>.	Green Globes EB does not specifically address bio-based content of purchased goods.	If the LEED EB points are achieved the GP will be met. MR Credit 1: Sustainable Purchasing—Ongoing Consumables MR Credit 2.2: Furniture MR Credit 3: Sustainable Purchasing—Facility Alterations and Additions IEQ Credit 3.3: Green Cleaning—Purchase of Sustainable Cleaning Products and Materials	LBC does not specify bio-based material requirements. 13 Responsible Industry
What is the baseline or point of comparison?	n/a	n/a	Total annual purchase in each category	n/a
What is the range of requirements to achieve the metric?	n/a	n/a	On going consumables = 60% Durable goods = 40% Alterations = 50% Cleaning = 30%	n/a
What standards or tools are required for the metric?	USDA's BioPreferred web site	n/a	Environmental Protection Agency (EPA) Comprehensive Procurement Guidelines for Janitorial Paper and Plastic Trash Can Liners, Green Seal GS-09, Green Seal GS-01, Environmental Choice CCD-082, Environmental Choice CCD-086.	n/a
Environmentally Preferable Products				

Reduce Ei

Does the metric help a building meet a current Federal requirement?	Use products that have a lesser or reduced effect on human health and the environment over their lifecycle when compared with competing products or services that serve the same purpose. A number of standards and ecolabels are available in the marketplace to assist specifiers in making environmentally preferable decisions. For recommendations, consult the Federal Green Construction Guide for Specifiers at <www.wbdg.org/design/greenspec.php>.	If the GG CIEB points are achieved the Guidelines will be met. 5.6 Control of Pollutants at Source 6.2 Environmental Purchasing	If the LEED EB points are achieved the GP will be met. MR Prerequisite 1: Sustainable Purchasing Policy MR Credit 1: Sustainable Purchasing—Ongoing Consumables MR Credits 2.1–2.2: Sustainable Purchasing MR Credit 3: Sustainable Purchasing—Facility Alterations and Additions MR Credit 4: Sustainable Purchasing—Reduced Mercury in Lamps MR Credit 5: Sustainable Purchasing—Food IEQ Credit 3.4: Green Cleaning—Sustainable Cleaning Equipment	If the LBC challenge is accomplished the GP will be met. Imperative 11: Red List Imperative 13: Responsible Industry Imperative 14: Appropriate Sourcing Imperative 15: Conservation + Reuse
What standards or tools are required for the metric?	Federal Green Construction Guide	n/a	n/a	US EPA Design for the Environment (DfE) is referenced as a resource for understanding thresholds for disclosure of ingredients for Imperative 11:Red List.
Waste and Materials Management				
Does the metric help a building meet a current Federal requirement?	Provide reuse and recycling services for building occupants, where markets or on-site recycling exist. Provide salvage, reuse and recycling services for waste generated from building operations, maintenance, repair and minor renovations, and discarded furnishings, equipment and property. This could include such things as beverage containers and paper from building occupants, batteries, toner cartridges, outdated computers from an equipment update, and construction materials from a minor renovation.	If the Green Globes EB points are achieved the GP will be met. 3.1 Facilities for Storing and Handling Recyclable Materials 3.2 Waste Reduction Workplan	If the LEED EB points are achieved the GP will be met. MR Credit 7: Solid Waste Management—Ongoing Consumables MR Credit 8: Solid Waste Management—Durable Goods MR Credit 9: Solid Waste Management—Facility Alterations and Additions	If the LBC challenge is accomplished the Guidelines will be met. 15 Conservation + Reuse
What is the baseline or point of comparison?	n/a	Current waste stream	Ongoing waste stream in each area	Total weight of waste material
What is the range of requirements to achieve the metric?	n/a	85% diversion	50% consumables by weight or volume 75% durable goods by weight, volume or replacement value 70% alterations by volume	n/a
Ozone Depleting Compounds				
Does the metric help a building meet a current Federal requirement?	Eliminate the use of ozone depleting compounds where alternative environmentally preferable products are available, consistent with either the Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990, or equivalent overall air quality benefits that take into account lifecycle impacts.	A phase out plan is the only practical path to zero use of refrigerants. The first criteria in this section, 4.2 Refrigerants allows for an N/A if no ODP refrigerants are used and credit for non-ODP refrigerants. In both cases, the rating system avoids penalizing the user. Therefore, GG does award credit to zero ODP refrigerant use. 4.2 Refrigerants 4.3 Management of Ozone Depleting Refrigerants	If the LEED EB points are achieved the GP will be met. EA Prerequisite 3: Fundamental Refrigerant Management EA Credit 5: Enhanced Refrigerant Management	If the LBC challenge is accomplished the Guidelines will be met. 11 Red List
What standards or tools are required for the metric?	Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990	n/a	LEED Reference Guide for Green Building Operations & Maintenance	n/a

Indoor Environment

Review Questions	Guiding Principles (EB)	Green Globes (CIEB)	LEED (EB)	Living Building Challenge (Renovation)
Ventilation				
Does the metric help a building meet a current Federal requirement?	Meet ASHRAE Standard 55-2004 Thermal Environmental Conditions for Human Occupancy and ASHRAE Standard 62.1-2007: Ventilation for Acceptable Indoor Air Quality.	GG CIEB has ventilation requirements, however, meeting ASHRAE 55 2004 standard is not specifically requirement. 5.1 Ventilation System 5.2 Filtration System 5.4 Cooling Towers 5.5 Parking and Receiving	Minimum indoor air quality performance is required by LEED EB. GP is met. IEQ Prerequisite 1: Minimum Indoor Air Quality Performance	LBC meets the GP requirement. 09 Healthy Air
What standards or tools are required for the metric?	ASHRAE Standard 62.1–2007	ASHRAE Standard 55-2004	ASHRAE Standard 62.1–2007	ASHRAE Standard 62
Thermal Comfort				
Does the metric help a building meet a current Federal requirement?	Meet ASHRAE Standard 55-2004 Thermal Environmental Conditions for Human Occupancy and ASHRAE Standard 62.1-2007: Ventilation for Acceptable Indoor Air Quality.	If the GG CIEB points are achieved the GP will be met. 5.7 IAQ Management	If the LEED EB points are achieved the GP will be met. IEQ Credit 1.3: Indoor Air Quality Best Management Practices - Increased Ventilation IEQ Credit 2.1: Occupant Comfort—Occupant Survey IEQ Credit 2.3: Occupant Comfort—Thermal Comfort Monitoring	LBC does not specify meeting ASHRAE 55-2004. Living Building Challenge includes requirements for compliance with ASHRAE 62 and required testing throughout the project for temperature and relative humidity. 09 Healthy Air
What standards or tools are required for the metric?	ASHRAE Standard 55-2004	ASHRAE Standard 55-2004	ASHRAE Standard 55-2004	n/a
Integrated Pest Management				
Does the metric help a building meet a current Federal requirement?	Use integrated pest management techniques as appropriate to minimize pesticide usage. Use EPA-registered pesticides only when needed.	GG CIEB does include points for integrated pest management but does not specify EPA-registered pesticides. 4.13 Pesticides	LEED EB does include points for integrated pest management but does not specify EPA-registered pesticides. IEQ Credit 3.6: Green Cleaning—Indoor Integrated Pest Management	LBC does not have specific requirements for pest management and pesticides selections.
Daylighting				
Does the metric help a building meet a current Federal requirement?	Automated lighting controls (occupancy/vacancy sensors with manual-off capability) are provided for appropriate spaces including restrooms, conference and meeting rooms, employee lunch and break rooms, training classrooms, and offices. Two options can be used to meet additional daylighting and lighting controls performance expectations: • Option 1: Achieve a minimum daylight factor of 2 percent (excluding all direct sunlight penetration) in 50 percent of all space occupied for critical visual tasks, or • Option 2: Provide occupant controlled lighting, allowing adjustments to suit individual task needs, for 50% of regularly occupied spaces.	GP uses daylight factor and it cannot be directly compared to GG daylighting calculations. 5.8 Lighting Features 5.9 Lighting Management	GP uses daylight factor and it cannot be directly compared to LEED daylighting calculations. IEQ Credit 2.4: Daylight and Views IEQ Credit 2.2: Controllability of Systems—Lighting	LBC does not have quantitative daylighting requirements. 08 Civilized Environment
What is the baseline or point of comparison?	All space occupied for critical visual task	Typical working area	Regularly occupied spaces/work stations	n/a
What is the range of requirements to achieve the metric?	50%	80.00%	50%	n/a
Environmental Tobacco				
Does the metric help a building meet a current Federal requirement?	Prohibit smoking within the building and within 25 feet of all building entrances, operable windows, and building ventilation intakes.	Green Globes EB does not specifically prohibit smoking within the building so the GP is only partially met. 5.6 Control of Pollutants at Source	If the LEED EB Option 1 is chosen then the GP is met. IEQ Prerequisite 2: Environmental Tobacco Smoke (ETS) Control	If the LBC challenge is accomplished the Guidelines will be met. 09 Healthy Air
Moisture Control				

Does the metric help a building meet a current Federal requirement?	Provide policy and illustrate the use of an appropriate moisture control strategy to prevent building damage, minimize mold contamination, and reduce health risks related to moisture. For façade renovations, Dew Point analysis and a plan for cleanup or infiltration of moisture into building materials are required.	Green Globes EB only partially meets the Guidelines - no discussion of formal moisture control program is included. 5.6 Control of Pollution at Source 5.7 IAQ Management	If the points are achieved the intent of the requirement will be met. IEQ Credit 1.5: Indoor Air Quality Best Management Practices—Indoor Air Quality	LBC does not have specific requirement for moisture control. 09 Healthy Air
Low-Emitting Material				
Does the metric help a building meet a current Federal requirement?	Use low emitting materials for building modifications, maintenance, and cleaning. In particular, specify the following materials and products to have low pollutant emissions: composite wood products, adhesives, sealants, interior paints and finishes, solvents, carpet systems, janitorial supplies, and furnishings.	Green Globes EB does not address low-emitting materials.	The LEED points only partially meet the intent of the Guidelines. Furnishings and solvent are not specifically mentioned in LEED as requiring low emission options. MR Credit 3: Sustainable Purchasing—Facility Alterations and Additions IEQ Credit 3.3: Green Cleaning—Purchase of Sustainable Cleaning Products and Materials	If the LBC challenge is accomplished the Guidelines will be met. Imperative 09: Healthy Air
What standards or tools are required for the metric?	n/a	n/a	South Coast Air Quality Management District (SCAQMD) Rule #1168, Bay Area Air Quality Management District Regulation 8, Rule 51, Green Seal's Standard GS-11, FloorScore, CRI Green Label Plus Carpet Testing Program.	US EPA Design for the Environment (DfE) is referenced as a resource for understanding thresholds for disclosure of ingredients for Imperative 11:Red List.

Not in Guiding Principles

	Review Questions	Guiding Principles (NC)	Green Globes (EB)	LEED (EB)	Living Building Challenge (Renovation)
Acoustic	**Acoustic (Not in GP)**				
	Does the metric help a building meet a current Federal requirement?	No requirements in the GP.	5.10 Noise	IE Q Credit 2.1: Occupant Comfort—Occupant Survey	___
BAS	**Building System Controls (Not in GP)**				
	Does the metric help a building meet a current Federal requirement?	No requirements in the GP.	___	EA Credit 3.1: Performance Measurement—Building Automation System	___
Siting	**Siting (Not in GP)**				
	Does the metric help a building meet a current Federal requirement?	No requirements in the GP.	___	SS Credit 4: Alternative Commuting Transportation	01 Limits to Growth 04 Car Free Living Imperative 16: Human Scale and Humane Places Imperative 17: Democracy + Social Justice
Greenhouse Gas	**Greenhouse Gas (Not in GP)**				
	Does the metric help a building meet a current Federal requirement?	No requirements in the GP.	4.1 Boiler Emissions	LEED does not address Greenhouse Gas.	Living Building Challenge requires that project teams calculate the project's total embodied carbon footprint (tCO2e), and purchase Certified Emission Reduction credits or Verified Emission Reduction credits from qualifying renewable energy projects. Imperative 12: Embodies Carbon Footprint

Appendix H: Certification System Owner Input – Green Globes

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
1	a	Independence	Vicki Worden & Kevin Stover	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	I1	Third-party assessors are selected based on qualification (experience in design, engineering, energy analysis/management, commissioning, construction, and/or facility management). ~~There is no information on how assessors are chosen for individual projects.~~ Once an assessor is assigned, contact information for an assessor is then given to the owner by GBI. Conflict of interest guidelines for assessors can be found at http://www.thegbi.org/commercial/about-green-globes/faq.asp
2	a	Independence	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	I2	A customer may file an appeal with the Green Building Initiative regarding specific discrepancies previously identified and discussed with the Green Globes Assessor but not resolved to the customer's satisfaction. A one-time appeal fee must be paid prior to Green Building Initiative evaluating the merits of the appeal. Complete appeal policies and procedures can be found in section 6.0 Appeals of *The GBI Procedures for the Development and Maintenance of Green Building Standards (GBI-PRO 2005-5).* http://www.thegbi.org/commercial/about-green-globes/faq.asp
3	a	Independence	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	I3	*Misspelled word should be "customer" not "costumer" or "costomer" (appears incorrectly twice).*
4	a	Independence	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	I4	*Delete the following sentence as it is repetitive:* ~~Green Globes CIEB includes an extensive documentation review and an onsite visit with walk through and interview of facility manager and chief engineer.~~
5	b	Availability	VS & KS	Vicki@thegbi.org	8/25/11	A1	*Misspelled word should be "Stage 2" not "state".*

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
				Kevin@thegbi.org			
6	b	Availability	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	A2	Generally, the client receives a preliminary report, score, and rating. If the preliminary report, score and rating are accepted and no appeals are anticipated, the report and rating will become final within two weeks after issuance of the report. If there are disputed items, the client must notify GBI within two weeks from when the report was received. Supporting information must be provided to GBI. If an update to the report is deemed necessary by the assessor, he/she will amend the report, score, and rating and final report will be forwarded within 4 weeks. If it is not deemed warranted, the client notifies GBI of an ongoing dispute and pays a one-time appeal fee. Appeals are reviewed by GBI staff and/or Green Globes auditing assessors and are generally granted or denied within 4 weeks. If the appeal was caused by GBI or assessor error, the appeal fee is rebated. http://www.thegbi.org/assets/pdfs/Green-Globes-Rating-Appeal-Guidelines.pdf
7	b	Availability	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	A3	Yes http://www.thegbi.org/faq.asp http://www.thegbi.org/assets/pdfs/Green-Globes-Rating-Appeal-Guidelines.pdf
8	b	Availability	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	A4	See A1 and A2 http://www.thegbi.org/faq.asp http://www.thegbi.org/assets/pdfs/Green-Globes-Rating-Appeal-

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
							Guidelines.pdf
9	b	Availability	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	A5	8-32 hours of work http://www.thegbi.org/about-gbi/career/Green-Globes-Assessor-GBI-Contractor.pdf
10	b	Availability	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	A6	Typically, only one assessor is involved. However, if a specialized energy audit is required or an appeal is filed, one additional assessor/auditor will be utilized. http://www.thegbi.org/about-gbi/career/Green-Globes-Assessor-GBI-Contractor.pdf http://www.thegbi.org/assets/pdfs/Green-Globes-Rating-Appeal-Guidelines.pdf
11	c	Verification	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	V2	Evaluation criteria are detailed within the rating systems and third-party assessors use relevant documentation provided by the client to assess the accuracy of client compliance/adherence. http://www.thegbi.org/commercial/aboutgreen-globes/faq.asp
12	c	Verification	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	V3	Documentation requirements used in evaluations vary depending on the rating system being used. The New Construction assessment includes two stages of assessment. Stage I is a review of construction documents, working drawings, landscape designs, energy analysis, LCA documentation, commissioning reports, etc. Stage II includes an onsite walk through, review of additional documentation, and interview of key team members. Green Globes CIEB includes an extensive documentation review and an on-site visit with walk through and interview of facility manager and chief

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							engineer. http://www.thegbi.org/commercial/aboutgreen-globes/faq.asp Detailed information on documentation typically requested as part of a third-party assessment is listed in the documents called "Pre-3rd Party Assessment Checklist." Green Globes NC http://www.thegbi.org/assets/pdfs/Green-Globes-NC-Pre-3rdParty-Assessment-Checklist-031809.pdf see also Suggested Documentation incorporated into ANSI/GBI 01-2010 Green Globes CIEB http://www.thegbi.org/assets/pdfs/Green-Globes-CIEB-Pre-3rdParty-Assessment-Checklist-031809.pdf
13	c	Verification	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	V4	See V3
14	c	Verification	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	V5	Such a scenario is unlikely because assessors are recruited and selected for a project based on their experience and area of expertise. However, if evaluation needs are outside an assessor's expertise, GBI may contract the assistance of a senior assessor or member of the technical committee.

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							http://www.thegbi.org/about-gbi/career/Green-Globes-Assessor-GBI-Contractor.pdf
15	d	Transparency	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	T1	~~GBI follows ANSI standard, but does not provide detailed information on how to collect public comments.~~ ~~"GBI also sought and received accreditation in 2005 as a standards developer by the American National Standards Institute (ANSI), and has begun the process to establish Green Globes as an official ANSI standard. The GBI ANSI-approved process is consensus-based and involves a balanced committee of users, producers, and interested parties with required public comment periods and full committee ballot voting." This committee is conducting its review of the GBI Proposed American National Standard 01-200XP: "Green Building Assessment Protocol for Commercial Buildings" through an open and transparent process. The final standard will be has been incorporated into the next version of the Green Globes for New Construction tools."~~ GBI became an ANSI accredited Standards Developing Organization (or SDO) in 2005, breaking new ground for the industry by also becoming the first green building organization to commit to taking a commercial building rating system (Green Globes™) through an ANSI consensus process. The assessment protocol—or rating system—contained within GBI's proposed standard will be available to the public for use during the design, construction, operations, and maintenance of commercial buildings. In addition, it will also be the basis of the next version of the Green Globes™ online tools. GBI's standard was developed by a technical committee—or consensus body—formed in 2006 which follows GBI's ANSI-approved procedures for developing consensus documents and involves a balanced committee of users, producers, and interested parties with required public comment periods and full committee

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							ballot voting. The committee is comprised of 30 individuals, balanced equally between users (10), generally interested parties (10), and producers (10). It is supported by technical experts from across the country through working subcommittees. Additionally, the public plays an important role in developing ANSI standards by participating in periodic public comment forums. Many hundreds of individuals and organizations lent their expertise to the development of *ANSI/GBI 01-2010: Green Building Assessment Protocol for Commercial Buildings* before it was finalized. http://www.thegbi.org/commercial/standards/
16	d	Transparency	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	T2	Public comments were collected during the development of the ~~GBI Proposed American National Standard 01-200XP: "Green Building Assessment Protocol for Commercial Buildings~~ ANSI/GBI 01-2010: Green Building Assessment Protocol for Commercial Buildings. For the current ANSI-approved version of the Standard, public comments were solicited and reviewed by the technical committee on multiple occasions. These comments are available on the "Development Archive" page of the GBI website at www.thegbi.org/commercial/standards. http://www.thegbi.org/commercial/standards
17	d	Transparency	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	T3	~~GBI follows ANSI standard, but does not provide detailed information on how to incorporate public comments.~~ ~~"GBI also sought and received accreditation in 2005 as a standards developer by the American National Standards Institute (ANSI), and has begun the process to establish Green Globes as an official ANSI standard. The GBI ANSI-approved process is consensus-based and involves a balanced committee of users, producers, and interested parties with required public comment periods and full committee ballot voting. This committee is conducting its review of~~

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							~~the GBI Proposed American National Standard 01-200XP: "Green Building Assessment Protocol for Commercial Buildings" through an open and transparent process. The final standard will be incorporated into the next version of the Green Globes for New Construction tools."~~ GBI became an ANSI accredited Standards Developing Organization (SDO) in 2005, breaking new ground for the industry by also becoming the first green building organization to commit to taking a commercial building rating system (Green Globes™) through an ANSI consensus process. The assessment protocol—or rating system—contained within GBI's proposed standard will be available to the public for use during the design, construction, operations, and maintenance of commercial buildings. In addition, it will also be the basis of the next version of the Green Globes™ online tools. GBI's Standard was developed by a technical committee—or consensus body—formed in 2006 which follows GBI's ANSI-approved procedures for developing consensus documents and involves a balanced committee of users, producers, and interested parties with required public comment periods and full committee ballot voting. The committee is comprised of 30 individuals, balanced equally between users (10), generally interested parties (10), and producers (10). It is supported by technical experts from across the country through working subcommittees. Additionally, the public plays an important role in developing ANSI standards by participating in periodic public comment forums. Many hundreds of individuals and organizations lent their expertise to the development of *ANSI/GBI 01-2010: Green Building Assessment Protocol for Commercial Buildings* before it was finalized. http://www.thegbi.org/commercial/standards/
18	d	Transparency	VS & KS	Vicki@thegbi.org	8/25/11	T4	Certification system changes are documented and can be accessed by the public on the GBI website. The following is an excerpt from

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				Kevin@thegbi.org			www.thegbi.org/green-globes/ansi-gbi-standard.asp. This standard, officially named *ANSI/GBI 01-2010: Green Building Assessment Protocol for Commercial Buildings,* was derived from the Green Globes environmental design and assessment rating system for New Construction and was formally approved on March 24, 2010. The standard was developed following ANSI's highly regarded consensus-based guidelines, which are among the world's most respected for the development of consensus standards and ensure a balanced, transparent and inclusive process. A variety of stakeholders including sustainability experts, architects, engineers, ENGO's, and industry groups participated in its development. For those interested in learning more about the development of the ANSI/GBI Standard, including information on the procedures, technical committee members, subcommittees, public comments, and meeting minutes, please" contact info@thegbi.org or review the "ANSI/GBI 01-2010 Development Archive" page on the GBI website. http://www.thegbi.org/commercial/standards and http://www.thegbi.org/green-globes/ansi-gbi-standard.asp

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19	e	Consensus-based	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	C3	In 2005, GBI was accredited as a standards developer by the American National Standards Institute (ANSI). The GBI ANSI technical committee was formed in early 2006 and follows GBI's ANSI-approved procedures for developing consensus documents. The committee involves an equal balance of users, producers, and interested parties in required public comment periods and full committee ballot voting and is supported by technical experts from across the country through working subcommittees. Additionally, many hundreds of individuals and organizations lent their expertise to the development of *ANSI/GBI 01-2010: Green Building Assessment Protocol for Commercial Buildings* before it was finalized. ~~and t~~The official Green Globes ANSI standard was published in 2010, and Green Globes NC meets the ANSI consensus standard. http://www.thegbi.org/commercial/standards/
20	e	Consensus-based	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	C4	In accordance with the Standard, buildings will be comprehensively and thoroughly evaluated across multiple assessment areas that are relevant to sustainability and environmental impact. The seven areas of assessment for the ANSI/GBI Standard include Energy, Indoor Environment, Resources/Materials, Water, Site, Project Management, and Emissions. The total points available for each assessment area are as follows: • Energy 300 • Indoor Environment 160 • Resources/Materials 145 • Water 130 • Site 120 • Project Management 100 • Emissions 45 http://www.thegbi.org/assets/pdfs/ANSI-GBI-Assessment-Areas-Point-Allocation-Achievement-Levels.pdf

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21	e	Consensus-based	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	C6	Differing opinions are managed by the technical committee and in accordance with the *GBI Procedures for the Development and Maintenance of Green Building Standards* (GBI-PRO 2005-5). When addressing Public Review Comments without objections "The Standards Committee shall be made aware of all public review comments." Public Review Comments Containing Objections - "shall be referred to the Standards Committee Chair or the Subcommittee responsible for the part of the standard in question to attempt resolution. The Committee may request the Secretariat to obtain further information from the commentator or attempt to correspond with the commenter directly and reach resolution. Each unresolved objection and attempts at resolution shall be referred to the Standards Committee. If substantial changes to the standard are required then the changes are subject to letter ballot, and a new public review period. If changes are not made to the standard, then the response to the negative comment is subject to approval by vote of the Standards Committee and the commenter is informed in writing of the response. In addition, the commenter shall be informed of the appeals process (section 6.0)." http://www.thegbi.org/commercial/standards/GBIProceduresFebruary2008.pdf
22	e	Consensus-based	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	C7	*The GBI Procedures for the Development and Maintenance of Green Building Standards (GBI-PRO 2005-5)* contain procedures for managing differing opinions. Specifically, sections 4.10 and 4.11 address Public Comments, and section 6.0 provides details of the appeals process. http://www.thegbi.org/commercial/standards/GBIProceduresFebruary2008.pdf

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23	e	Consensus-based	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	C8	*The GBI Procedures for the Development and Maintenance of Green Building Standards (GBI-PRO 2005-5)* outline in section 6.0 Appeals the requirements to ensure there are third-party reviewers of the process when appropriate. Specifically, "If the Secretariat is unable to informally resolve the complaint, it shall appoint an appeals panel to hold a hearing on a date agreeable to all participants, with at least 15 working days' notice. The appeals panel shall consist of three individuals who have not been directly involved in the dispute and who will not be materially affected by any decision made in the dispute. At least two members of the panel shall be acceptable to the appellant and at least two shall be acceptable to the Secretariat." http://www.thegbi.org/commercial/standards/GBIProceduresFebruary2008.pdf
24	f	System Maturity	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	M1	ANSI/GBI 01-2010 was developed with representatives of ASHRAE, AIA, and ICC participating in the process. Many of the individuals selected to participate on GBI's consensus body also participated in the development of ASHRAE 189.1 and IGCC. Efforts were made throughout the process to ensure that the standards were compatible wherever possible. ANSI/GBI-01-2010 is complementary to ASHRAE 189.1, which provides a minimum performance standard versus ANSI/GBI-01-2010, which incentivizes higher levels of performance. http://www.thegbi.org/commercial/standards/technical-committee.asp http://www.thegbi.org/commercial/standards/ "ASHRAE also deserves credit for their work to develop a minimum performance standard for high performance buildings through an ANSI process. Whereas GBI's standard is a rating system incentivizing users toward multiple higher levels of performance, the

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							ASHRAE standard was written in mandatory language for adoption into building codes." http://www.thegbi.org/assets/pdfs/House_Testimony_5.14.08.pdf ANSI/GBI 01-2010 Green Building Assessment Protocol for Commercial Buildings, April 1, 2010
25	f	System Maturity	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	M2	The GBI has committed to continually refining the system to ensure that it reflects changing opinions and ongoing advances in research and technology, and, in so doing, to involve multiple stakeholders in an open and transparent process. http://www.thegbi.org/commercial/about-green-globes/ **"Standards Maintenance** – All standards shall be reaffirmed, revised, or withdrawn within 5 years from the original standard approval date, and every five years thereafter." http://www.thegbi.org/commercial/standards/GBIProceduresFebruary2008.pdf ~~NEED INFORMATION - ONLY FOUND THE BELOW~~ ~~"GBI's standard is being developed by a technical committee—or consensus body formed in 2006 which follows GBI's ANSI-approved procedures for developing consensus documents. The committee is comprised of 30 individuals, balanced equally between users (10),~~

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							~~generally interested parties (10), and producers (10). It is supported by technical experts from across the country through working subcommittees. Additionally, the public plays an important role in developing ANSI standards by participating in periodic public comment periods. Many hundreds of individuals and organizations will have lent their expertise to the development of GBI 01-200XP: Green Building Assessment Protocol for Commercial Buildings before it is finalized."~~
26	f	System Maturity	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	M3	*Misspelled the acronym. Should be CIEB (not CEIB).*
27	f	System Maturity	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	M4	Green Globes CIEB requires 12 ~~mothes~~ months of energy and water data. "A Meter Data Management System was installed to electronically store water meter and sub-meter data and create user reports showing calculated hourly, daily, monthly and annual water consumption for each meter or submeter." Green Globes uses performance criteria to evaluate the energy consumption of a building. Green Globes compares against data generated by the EPA's Energy Star tools; specifically these are better performing buildings in the Energy Star database. http://www.thegbi.org/commercial/about-green-globes/faq.asp
28	f	System Maturity	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	M5	GBI recognizes the New Construction and Existing Building evaluations as separate tools.

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							The New Construction is an assessment and certification of the building as it pertains to design and construction. The CIEB is an assessment of the building for operations and management of the building. Accordingly, the certifications are different. Green Globes is designed to offer opportunities for improvement throughout the continuum of the building. After a building achieves certification under NC, GBI encourages building owners to certify buildings under CIEB after 14-18 months following occupation of the building. Recertification every three years is also encouraged. Certification criteria for each system are complimentary in that they reinforce the measuring, meeting, and exceeding of performance goals.
29	f	System Maturity	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	M6	~~None~~ Green Globes Certification is recognized as a tool to help clients achieve insurance discounts through at least four major insurance providers: Travelers, AON, Fireman's Fund Insurance Company, and Liberty Mutual. "The financial sector has also implemented financial incentives for certifying to Green Globes. Fireman's Fund was the first to offer a discount tied to green building certification. In 2006, Fireman's Fund began offering 5% premium discounts on various products tied to Green Globes™ certification. Liberty Mutual, AON and Travelers Insurance also offer products tied to Green Globes and building rating system certifications." http://www.thegbi.org/green-globes/green-globes-private-sector-

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							recognition.asp http://www.thegbi.org/commercial/about-green-globes/faq.asp Green Globes is recognized in public law in more than 22 states: Arkansas, Connecticut, Delaware, Florida, Hawaii, Illinois, Kentucky, Missouri, Massachusetts, Minnesota, Nevada, New Jersey New Mexico , New York , North Carolina, Oklahoma, Oregon, Pennsylvania, Rhode Island , South Carolina , South Dakota , Tennessee, Virginia, Wisconsin http://www.thegbi.org/green-globes/green-globes-state-acceptance-map.asp
30	f	System Maturity	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	M7	The current GG system was based on the Building Research Establishment's Environmental Assessment Method (BREEAM), which was brought to Canada in 1996 in cooperation with ECD Energy and Environment. That year, the Canadian Standards Association published BREEAM Canada for Existing Buildings. In 2004, after several years of development, Green Globes for Existing Buildings was adopted by the Building Owners and Managers Association of Canada (BOMA) under the name Go Green Comprehensive (a.k.a. Go Green Plus). The same year, the Green Building Initiative acquired the rights to distribute Green Globes in the United States. To that end, in 2005, GBI became the first green building organization to be accredited as a standards developer by the American National Standards Institute (ANSI) and began the process of establishing Green Globes as an official ANSI standard. The GBI ANSI technical committee was formed in early 2006. Also in 2006, the latest version of the Green Globes Rating System v.1 was introduced in the United States. GBI went on to form a consensus body and delivered the industry's

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							first commercial building rating system to become an ANSI Standard. This standard, officially named *ANSI/GBI 01-2010:* ***Green Building Assessment Protocol for Commercial Buildings*** was derived from the Green Globes environmental design and assessment rating system for New Construction and was formally approved on March 24, 2010. The standard was developed following ANSI's highly regarded consensus-based guidelines, which are among the world's most respected for the development of consensus standards and ensure a balanced, transparent and inclusive process. A variety of stakeholders including sustainability experts, architects, engineers, ENGO's, and industry groups participated in its development. http://www.thegbi.org/commercial/about-green-globes/ http://www.thegbi.org/commercial/standards http://www.thegbi.org/green-globes/ansi-gbi-standard.asp
31	f	System Maturity	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	M8	There have been two major changes to the Green Globes system since its introduction into the United States. One was developing the ANSI-GBI 01-2010 standard and the other was introducing a Green Globes-CIEB version for health care. Over 170 Veterans Affairs hospitals and long term care facilities have completed online surveys with the new tool, enabling portfolio-wide comparison and ranking of individual building environmental performance. http://www.thegbi.org/commercial/standards http://www.thegbi.org/news/news/2011/news_201106_Green-Globes-Healthcare-Building.shtml http://www.thegbi.org/commercial/healthcare/ http://www.thegbi.org/commercial/healthcare/green-building-certification.shtml

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32	g	Usability	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	U1	*CIEB is misspelled (not EBCI).*
33	g	Usability	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	U2	There is significant anecdotal evidence demonstrating that Green Globes' "soft" labor costs are significantly less than with LEED. The Renschler Company (Wisconsin) has significant experience with both systems and publishes its approximate prices for LEED as $60,000 minimum and Green Globes as $8,000 maximum. Other quotes that appear in the testimonial section indicate that GBI clients save money on documentation preparation because GBI assessors are highly qualified architects and engineers that review actual paperwork that is already part of the design/operation process. Lastly, the VHA has documented that they saved more than $100,000 by not hiring an outside consultant to prepare existing building assessments for one of their campuses. (See testimonials) GBI states that Green Globes documentation costs are ¼ that of LEED and that certification costs are 1/3 of LEED certification costs. http://www.thegbi.org/green-globes/green-globes-leed-green-building-certification.shtml See also U8 Rick Hart testimonial ($100,000 saved). See included document *Green Building Certification Programs Comparison*
34	g	Usability	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	U3	Green Globes NC encourages integrated design and incentivizes use of leading edge sustainability techniques, energy modeling (for reduction of CO_2e), and minimization of occupant exposure to indoor environmental issues. Trained and licensed professionals are essential to proper design outcomes. Green Globes-NC incorporates Life Cycle Assessment and provides customized tools

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							to facilitate design team understanding of environmental attributes of building materials. Green Globes CIEB is written for use by facility managers and engineers. The strength of both systems if reflected in the statements below. The strength of the Green Globes® system is that it is written in a clear and concise manner that allows beginners as well as experienced practitioners to be fully engaged in using the system in minutes. While there is no substitute for having highly qualified and appropriately licensed team members, the Green Globes system is questionnaire-driven. Users are walked through a logical sequence of questions that guide their steps, as well as providing tips for integrating important elements of sustainability. Answers consist of a combination of yes/no, multiple choice, data insertion, or non-applicable. Questionnaires become more detailed as the process progresses. Once the appropriate questionnaire is complete, the system automatically generates a report written in lay terms with suggestions for improvement and helpful links for supplementary information. Users can increase their comfort level with the Green Globes tool by participating in online training available on GBI's website. In-person training can be arranged for a separate fee. On-line live demonstrations will be conducted in Webex throughout the year. Even though there are similarities regarding what constitutes the best energy and environmental practices among the major green building rating systems—such as Green Globes, BREEAM, LEED, and the GBC tool— the Green Globes system does have a number of distinct attributes. In addition to being easy to use and affordable, Green Globes encourages designers and building operators to

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							consider the elements of sustainability early in the evaluation process. Green Globes tools generate a written report that can promote interaction between team members and owners. Among other attributes, it: • Encourages the use of the EPA's Energy Star tools for developing building energy benchmarks. (EPA's Energy Star program provides the most consistent source for building energy performance benchmarks because it's based on actual performance data.) • Introduces users to the idea of incorporating LCA into the decision making process for resource and material selection. • Gives points for using an integrated design process and environmental management systems, addressing acoustical comfort, minimizing opportunities for pest intrusion, and reducing emissions and effluents. Because it's online and interactive, the Green Globes system provides a convenient method to input, edit, and securely store building assessment data. Complex paper applications and forms are eliminated with the online assessment. Building data entered and submitted online directly updates the scoring and reports so that users have immediate feedback regarding the performance of their building and expected rating. The final certification and rating process is also expedited by enabling the third party assessors to quickly view building data and update ratings based on the on-site assessment results. http://www.thegbi.org/commercial/about-green-globes/faq.asp
35	g	Usability	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	U4	See V3
36	g	Usability	VS & KS	Vicki@thegbi.org	8/25/11	U5	CIEB: Energy, Outdoor Water

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				Kevin@thegbi.org			ANSI/GBI 01-2010 has performance paths for several of the 7 assessment areas and is the only commercial building rating system to include performance criteria for LCA construction materials. Life Cycle Assessment (LCA) inherently incorporates a performance approach in evaluating construction materials. Other criteria with a performance based path are Energy Performance and Water Performance . The Green Globes CIEB tool has performance based criteria for Energy Performance (Energy Star), Water Performance, and Waste Management (Diversion Rate) See robustness analysis.
37	g	Usability	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	U6	~~Green Globes~~ GBI offers several resources for customers. First, they offer an online system, which allows customers to keep up-to-date entries as well as provides instant feedback. Users are walked through a series of questions regarding the building and are assisted by "Tool Tips" that provide additional information about questions containing detailed technical language. They offer an FAQ page as well as case studies and a virtual tour of the software. If customers have further questions, they can visit the "contact us" page on the website. ~~Green Globes~~ GBI provides live web seminar events on specific topics that enable industry professionals to learn about Green Globes, pose questions to GBI staff and technical experts, and to collaborate on ways to enhance the sustainability of new or existing buildings. GBI also offers personnel certification for those interested in

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							pursuing a Green Globes Professional designation, for which nine-hours of fee-based training are available. There are GGPs registered in 30 states (incl. DC) and two provinces (QC, MB).There are 32 states (incl. DC) that have achieved certified buildings. 59% of states (incl. DC) have GGPs 62% of states (incl. DC) have certified buildings http://www.thegbi.org/green-globes/personnel-certifications/ http://www.thegbi.org/assets/pdfs/Green-Globes-Personnel-Certifications-Professional-Training-Overview.pdf http://www.thegbi.org/green-globes/personnel-certifications/certified-personnel-listing/index.pl
38	g	Usability	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	U7	The NC module is designed to be used in an integrated design process with all relevant licensed professionals and expertise that would be expected to achieve high performance green buildings. The CIEB module is designed to be used by facility managers and engineers without the need for consultants. In both cases, the online tool facilitates ease of use with built in "Tool Tips" and other supplementary information available. GBI also employs customer service and technical support professionals. http://www.thegbi.org/about-gbi/who-we-are/staff.asp Each project pursuing certification is assigned one Green Globes Assessor who provides personal interaction during the certification process. There are Green Globes Professionals registered in 30 states (incl. DC) and two provinces (QC, MB).There are 32 states

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							(incl. DC) that have achieved certified buildings. 59% of states (incl. DC) have GGPs 62% of states (incl. DC) have certified buildings http://www.thegbi.org/green-globes/personnel-certifications/ http://www.thegbi.org/assets/pdfs/Green-Globes-Personnel-Certifications-Professional-Training-Overview.pdf http://www.thegbi.org/green-globes/personnel-certifications/certified-personnel-listing/index.pl http://www.thegbi.org/green-globes/
39	g	Usability	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	U8	"I am a big proponent of Green Globes, even though I was what some might call a 'LEED snob'. I helped the Veterans Health Administration assess and certify 4 campuses—about 150 buildings—using Green Globes-CIEB. The beauty of the Green Globes system is that as Energy Manager, I could use the system to pull together and put in place policy, teams and experts already at hand. Each person learns as they progress through the assessment because Green Globes provides instant feedback, preliminary ratings, and justification for each question it asks. At first, one of our networks felt as if they would need to hire a consultant for an additional $100,000 to complete the CIEB assessments on their campus. Instead, we worked together using VHA staff and completed the process ourselves. Everyone is so used to LEED they assume that it is going to be complex and time consuming. However, Green Globes achieves the same results without the complication. Additionally, the value-added of the learning process while completing the online assessment is a bonus. In the federal government, we have the policies and programs already in place for the most part. Green Globes just give you the vehicle for bringing it all together and showing you how it all can be used to operate and improve the green attributes of any building." (2011) Rick Hart CEM

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							Former Energy Manager, North Texas Health Care System Veterans Health Administration Current Director of Energy Services Advanced Safety and Energy, Inc. Dallas Regional Office 214 927-4655 *"The Green Globes Environmental Assessment for New Buildings enabled the Lane Dermatology and Dermatologic Surgery project in Columbus, GA to achieve the owner's goal of documenting the sustainable design features of their building. The assessment process was straightforward and the Green Globes reviewer was very professional and knowledgeable". We would definitely recommend that owners consider the Green Globes Building Assessment and Rating System for their projects".* *Steven D. Barthlow, AIA* *Lyman Davidson Dooley, Inc.* *Ph: 770.850.8494* *BarthlowS@lddi-atl.com* *lddi-architects.com*

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							The U. S. Department of State has utilized several international certifying organizations for energy efficiency and environmental sustainability to assess the design, construction and operation of its real estate portfolio (~8.5Mft² in the U.S.). We have found the Green Building Initiative's (GBI) Green Globes process for continual improvement for existing buildings (CIEB) to be a logical, technical rigorous approach to benchmarking one's portfolio. The on-site inspection/verification process is a distinct advantage since it field-validates the submitter's claims made during the application process. The Department has found GBI staff to be knowledgeable and responsive and plans to continue using GBI in evaluating its sustainability efforts. Harry Mahar US Department of State "We prepared a lecture that we present to various AIA and yes, USGBC groups that compares and contrasts to the two systems. By developing this seminar and devoting quite a bit of study to the details, I have concluded that Green Globes will become the predominant rating system. It is only a matter of time and market exposure. The advantages: lower cost, speed of certification, lack of prerequisites, lack of owner-paid specialty consultants, known outcomes, collaborative relationship with the assessor, a web site that is not arduous, and an approach that rewards any and all sustainable features as opposed to a policy that favors certain sustainable features to the exclusion of others." Michael O'Brien, PE

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							Sr. Engineer, Energy Ace, Inc. Atlanta, GA Excerpt from Vail Daily, March 21, 2006: *Carly Wier, director of the Recycling Project and its umbrella organization, the High Country Conservation Center, said the initial plan for its new facility near the Keystone landfill was to get it LEED certified. But as the county cropped the budget, that was one of the first things on the chopping block.* *That's when they found out about Green Globes.* *"We looked at it, and it's definitely more user-friendly and not as cost-prohibitive as LEED," Weir said.* *In addition to the ease of use and lower price, Weir said another advantage of Green Globes over LEED is the ability to exclude parameters that aren't relevant to the project. In LEED, for example, there might be a consideration for an efficient cooling system - not something a commercial building in the mountains is likely to have. And those are points you can't get in LEED or make up in another area.* *Auden Schendler, the environmental manager for Aspen Skiing Corporation who's had a fair amount of experience with LEED, said the difference makes Green Globes appealing.* *"I think they're worth competition to LEED," he said. "With LEED, you get a credit based on the number of points you have, whereas with Green Globes it's a percentage."* http://webcache.googleusercontent.com/search?q=cache:Nr8qAoj3O5AJ:

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							www.vaildaily.com/article/20060321/NEWS/103210031+county+%22Green+Globes%22&cd=51&hl=en&ct=clnk&gl=us&source=www.google.com Excerpt from Philadelphia Business Journal Aug 20, 2007: *The researchers praised Green Globes' online assessments as being cheaper and more efficient and providing more immediate feedback not available from primarily paper-based systems.* *Green Globes also eliminates additional documentation requirements for the architect. "Green Globes doesn't require a new paper trail," Bink said. "You can use the papers you normally use as architects, which are voluminous. Why add another layer of paperwork documentation to the process?"* *http://docs.google.com/viewer?a=v&q=cache:VcRy9m2KjpYJ:www.stand.org/Document.Doc%3Fid%3D1056+county+%22Green+Globes%22&hl=en&gl=us&pid=bl&srcid=ADGEESjWtXE2wPO3PtHFKk1vJ7MdD_MkpymSDx-fXoi4WPbO69t7-Z1ut5VVgR2Zk1bVAHPCffXenH-LT_ni3iESvUP4NtayM8rcO8ia3wEL1ZW-sHCKsbShgrRF136EKFzd6tNCEf_g&sig=AHIEtbSKzb9D6r8DVI9vtxix28J_Pw2aKQ* "CSHQA Architecture has had the opportunity to use the GBI Green Globes rating system and found it to be streamlined, user friendly and cost effective. It is our opinion that the Green Globes system does a great job of rewarding building owners for responsible design and practices. We have and will continue to recommend the GBI Green Globes process to our clients."

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							Tim Sievers, Architecture CSHQA a design collaboration Whole Foods Architect Rocky Mountain Region "I've been impressed with the system's ability to provide both education and on-site third-party assessment. It's a flexible yet comprehensive tool that encourages users to learn more about green while working toward specific performance goals." Eric Truelove, P.E. Director, Sustainable Design, Renschler, Inc., Wisconsin *We have become the first supermarket company to be certified under the Green Building Initiative's Green Globes program, which is an alternative to LEED. We will be building all new stores to meet either LEED or Green Globes certification, and we also are pursuing Green Globes certification for existing stores.* Whole Foods interview with EarthTechling *When Whole Foods & Green Tech Collide* "We are particularly proud that the State Department has earned the first Green Globes designation for a building in Washington D.C. It is the fourth State Department facility to achieve Green Globes certification which we believe is helping us to accelerate our pace in improving our existing buildings and achieving the Secretary's Greening Diplomacy Initiative." Assistant Secretary Rodriguez

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							U.S. State Department http://www.thegbi.org/news/news/2010/news_201011_US-State-Department-Building-Green-Globes.asp Excerpt from "Federal Agency Adopts Green Globes Certification" article from GreenBuildingLawUpdate.com: *In describing the U.S. Department of Veterans Affairs' Green Globes buildings, Rob Watson, the Father of LEED, argued that Green Globes was continuing to "penetrate its mid-market target."* http://www.greenbuildinglawupdate.com/2010/03/articles/codes-and-regulations/federal-agency-adopts-green-globes-certification/ "What is wonderful about Green Globes? Through the completion of over 20 VA Hospital assessments, I have had the pleasure of seeing "ah-ha" moments for creative VA staff when a recommendation from the program allows them to successfully continue on their sustainable journey. Green Globes allows for the necessary benchmarking, but more importantly supports continual sustainable processes, ideas, and outreach. I work with Energy Managers and GEMS Coordinators from the VA Hospital System, and the comments I often hear include, *Green Globes is so facility friendly*; *The electronic survey provides immediate feedback*; *Green Globes provides a framework to advance our sustainable goals*; and *The Green Globes process relies on the people who work here every day, who know our buildings and process; which builds sustainable commitment within our organization*." Jane M. Rohde, AIA, FIIDA, ACHA, AAHID JSR Associates, Inc.
40	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org	8/25/11	N1	GBI allowed professors to develop green building curriculum using Green Globes in architecture classes and encouraged student

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				Kevin@thegbi.org			collaboration projects previously with Clemson, Cal Poly, Poloma, Stanford, Cooper Union, Arizona State University, University of Arkansas and University of Florida. GBI also participated in the EPA P3 events held in Washington, DC, where higher education students competed for recognition in sustainability projects. Buildings was one of the categories, and GBI sponsored a $ 1000 special award for the highest rated project specifically related to commercial buildings (for 3 years). http://www.thegbi.org/news/news/archive_2007/news-040207-arkansas.asp http://www.thegbi.org/news/news/archive_2006/news_110106_yearreview.asp http://www.thegbi.org/news/gbi-insight/2007_04_27/ Green Globes is also incorporated into Dr. Charles J. Kibert's (Univ. of FL), well-regarded book, "Sustainable Construction: Green Building Design and Delivery," Second Edition, copyright 2008, edited by John Wiley & Sons. See Chapter 3: Green Building Assessment; Chapter 6-8; and Appendix E http://books.google.com/books?hl=en&lr=&id=xPpB4bntJLAC&oi=fnd&pg=PR13&dq=kibert+sustainable+construction&ots=mwaDOgWx9e&sig=-b_OBvQxmYSeC2uMXyr9QdE0_Ic#v=onepage&q&f=false

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							Green Globes is incorporated into American Society for Civil Engineer's premier book on sustainability: "Sustainability Guidelines for the Structural Engineer," Edited by Dirk Kestner, PE, Jennifer Goupil, PE, and Emily Lorenz, PE. See p. 23 etc. http://cms.asce.org/Books-and-Journals/Books---Personify/Committee-Reports-(PCR)/Sustainability-Guidelines-for-the-Structural-Engineer/
41	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	N2	See N1
42	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	N3	Recognized in ~~legislation~~ public law in 23 states AK, CO, DE, FL, HI, IL, KY, MI, MA, MN, NV, NJ, NY, NC, OK, OR, PA, RI, SC, SD, TN, VA, WI http://www.thegbi.org/news/gbi-insight/2011_07/commercial.shtml Also, the Council of State Government recognized Green Globes in its Resolution on Energy Efficiency Measures in Buildings (Nov. 2006) http://www.dnr.state.md.us/ed/CSGresfinal.pdf
43	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org	8/25/11	N4	It is difficult to track all activities at county and city levels. The following is a representative sample demonstrating Green Globes

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				Kevin@thegbi.org			acceptance at county levels. Carroll County, Maryland tax credits for two Green Globes http://webcache.googleusercontent.com/search?q=cache:iUPd0aDPOdUJ:www.dsireusa.org/incentives/incentive.cfm%3FIncentive_Code%3DMD65F%26re%3D1%26ee%3D1+county+%22green+globes%22&cd=1&hl=en&ct=clnk&gl=us&source=www.google.com Mecklenburg County, NC rebates for Green Globes http://www.doe.gov/savings/mecklenburg-county-green-permit-rebate-program Alchua County, allows choice of Green Globes http://meetingdocs.alachuacounty.us/documents/bocc/agendas/2011-1-11/fa56d784-9ea4-4e24-9f56-7b49bf782e6b.pdf Summit Count, CO uses Green Globes http://www.buildinggreentv.com/739 County of El Paso uses Green Globes http://www.wrightdalbin.com/projects/Government/Annex.html Volousia County, FL fast-track permitting program allows use of

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							Green Globes for third-party certification http://webcache.googleusercontent.com/search?q=cache:nWeXH4qS99cJ:energy.gov/savings/volusia-county-green-building-program+county+%22green+globes%22&cd=7&hl=en&ct=clnk&gl=us&source=www.google.com Charlotte County references Green Globes in its green building code http://charlottecountyfl.com/BCS/GreenBuilding/pdfs/GrnBldOrd.pdf Montgomery County, Maryland pursuing Green Globes equivalency to meet green building requirements http://webcache.googleusercontent.com/search?q=cache:zWB7OpErmxMJ:www.stuartkaplow.com/library3.cfm%3Farticle_id%3D150+county+%22green+globes%22&cd=24&hl=en&ct=clnk&gl=us&source=www.google.com Desoto County, California uses Green Globes http://webcache.googleusercontent.com/search?q=cache:qQMFCPxtsNwJ:www.commercialappeal.com/news/2011/jul/19/county-switches-trash-collection/%3Fprint%3D1+county+%22green+globes%22&cd=37&hl=en&ct=clnk&gl=us&source=www.google.com Chatam County, NC recognizes Green Globes http://www.chathamjournal.com/weekly/news/government/green-

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							building-task-force-70618.shtml Fairfax County, VA uses Green Globes http://webcache.googleusercontent.com/search?q=cache:qp5zuCcjfwEJ:www.eco-structure.com/homeless-housing/give-me-shelter.aspx+county+%22Green+Globes%22&cd=43&hl=en&ct=clnk&gl=us&source=www.google.com Bucks County, PA uses Green Globes http://docs.google.com/viewer?a=v&q=cache:VcRy9m2KjpYJ:www.stand.org/Document.Doc%3Fid%3D1056+county+%22Green+Globes%22&hl=en&gl=us&pid=bl&srcid=ADGEESjWtXE2wPO3PtHFKk1vJ7MdD_MkpymSDx-fXoi4WPbO69t7-Z1ut5VVgR2Zk1bVAHPCffXenH-LT_ni3iESvUP4NtayM8rcO8ia3wEL1ZW-sHCKsbShgrRF136EKFzd6tNCEf_g&sig=AHIEtbSKzb9D6r8DVl9vtxix28J_Pw2aKQ Ulster County, NY recognizes Green Globes http://www.co.ulster.ny.us/downloads/UC%20Energy%20Policy.pdf Sarasota County, FL recognizes Green Globes http://www.scgov.net/environmentalservices/SolidWaste/Commercial/CDEconomicBenefits.asp

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							Counties in Hawaii required to recognize Green Globes http://www.doe.gov/savings/priority-permit-processing-green-buildings
44	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	N5	Chamblee, GA recognizes Green Globes in its ordinance https://www.usgbc.org/ShowFile.aspx?DocumentID=4081 Sustainable Cities Institute recognizes Green Globes to help achieve sustainability goals http://www.sustainablecitiesinstitute.org/view/page.basic/class/feature.class/Lesson_Green_Globes_System City of Austin, TX references Green Globes "Using sustainability/green building rating tools specifically developed for Austin, along with the LEED and Green Globes national rating tools, Green Building's staff assist design teams in establishing green building or sustainability goals for the construction of a building, review plans and specifications, make recommendations for improvements, and rate the final product on its impact to the environment and community." http://webcache.googleusercontent.com/search?q=cache:DVa2BigoHkMJ:www.c40cities.org/bestpractices/buildings/austin_standards.jsp+city+of+austin+green+globes&cd=1&hl=en&ct=clnk&gl=us&source=www.google.com
45	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	N6	1647 NC 1024 CIEB Information from internal sources not publicly available.

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46	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	N7	~~156 certified buildings (Lastest as of: 05/24/2010)~~ ~~74 NC Certified Building Projects, 92 CIEB Certified Building Projects~~ 94 CIEB Certified Building Projects and 82 NC Certified Building Projects (as of 8/25/11) See the following included documents: *GG Certified Buildings NC 8/25/11* and *GG Certified Buildings CIEB 8/25/11*. Website updated quarterly at http://www.thegbi.org/assets/case_study/Green-Globes-NC-Certified-Buildings.pdf and http://www.thegbi.org/assets/case_study/Green-Globes-CEIB-Certified-Buildings.pdf
47	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	N8	~~167 Green Globes Professionals (online directory does not provide area of practice). http://www.thegbi.org/greenglobes/~~ There are 173 certified Green Globes Professionals. http://www.thegbi.org/greenglobes/personnel-certifications/certifiedpersonnel-listing/index.pl
48	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	N9	Affiliates with MOUs include: American Council for Energy-Efficient Economy ASHRAE (http://www.thegbi.org/news/news/2009/news_200902_ASHRAE.as

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							p) Association of Facilities Engineers Association of Energy Engineers BOMA EPA Energy Star (GBI is an Energy Star Partner) AIA National Association of Home Builders Energy Solutions Center (http://www.thegbi.org/news/news/2011/news_201107_GBI-Energy-Solutions-Center-green-building-assessment-tools-to-gas-companies.shtml) GBI association members include: Alliance to Save Energy American Gas Association American Chemistry Council American Wood Council Plastic Pipe & Fittings Association Resilient Floor Coverings Institute Carpet & Rug Institute SMACNA

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							Chemical Fabrics and Films Association Steel Recycling Institute The Vinyl Institute Irrigation Association International Association of Plumbing and Mechanical Officials Major Insurance Carriers providing discounts for Green Globes Certified Buildings are: AON Fireman's Fund Traveler's Liberty Mutual http://www.thegbi.org/about-gbi/who-we-are/members-and-supporters.asp http://www.thegbi.org/join/industryAffiliates.asp http://www.thegbi.org/green-globes/green-globes-private-sector-recognition.asp
49	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	N10	~~Recognized by four commercial insurance companies.~~ Same as N9

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50	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	N11	~~None~~ **DHHS –** accepts Green Globes Department of Health and Human Services new buildings with at least $3 million of Federal funds to earn LEED certification, Green Globes certification, or certification by another nationally recognized green building standard. NIH in building in MD is Green Globes Certified. **Dept. of Interior** – accepts Green Globes Department of Interior new construction with gross construction costs greater than $2,000,000 achieve LEED Certified or one Green Globe **Army Corps of Engineers** – accepts Green Globes as alternative for some projects. Projects not falling within the scope of the LEED program will be designed and built to incorporate the maximum LEED components or equivalent sustainable design features available as allowed by project scope. If such a project is of a significant size or has high visibility or public interest, the use of alternative standards and certification systems available to the project is encouraged, such as Green Globes or Host Nation programs. See included document *ECB 2011-1 Army Corps - High Performance Energy and Sustainability Policy* **Department of Veterans Affairs** – uses Green Globes VA is greening its buildings, both new and existing, with the goal of reaching a 15% sustainable inventory by 2015. Currently, 25 facilities have received independent, third-party certification as

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							green—four through the Leadership in Energy and Environmental Design program and 21 through the Green Globes program. http://www.va.gov/GREENROUTINE/pressreleases/news20101112vanguard.asp GBI, a nonprofit organization dedicated to the acceleration of sustainable building practices, was recently awarded a contract with the U.S. Department of Veterans Affairs to provide online, green building self-evaluations for 173 hospital facilities using Green Globes® Continual Improvement of Existing Buildings environmental rating and assessment tool. As part of the contract, GBI will provide training for VA facilities management personnel who will be performing the web-enabled assessments. This recent award follows a 2009 pilot project by the VA in which 21 hospitals across the US were assessed and certified using the Green Globes system. http://www.marketwire.com/press-release/veterans-administration-awards-contract-green-building-initiative-green-globesr-online-1392507.htm **General Service Administration regional offices** - use Green Globes 5 buildings as of 8/25/11 – see GBI list of certified federal buildings **Department of Education** – recognizes Green Globes for use at the state level by schools that receive their funding http://www2.ed.gov/policy/gen/leg/recovery/guidance/impactaid.pdf

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							Dept. of State – uses Green Globes 9 buildings as of 8/25/11 http://www.marketwire.com/press-release/us-state-department-building-achieves-dcs-first-green-globes-rating-sustainability-1354785.htm **U.S. Forest Service –** recognizes Green Globes for new structures 10,000 sq. ft. or more http://www.usda.gov/wps/portal/usda/!ut/p/c5/04_SB8K8xLLM9MSSzPy8xBz9CP0os_gAC9-wMJ8QY0MDpxBDA09nXw9DFxcXQ-cAA_1wkA5kFaGuQBXeASbmnu4uBgbe5hB5AxzA0UDfzyM_N1W_IDs7zdFRUREAZXAypA!!/dl3/d3/L2dJQSEvUUt3QS9ZQnZ3LzZfUDhNVlZMVDMxMEJUMTBJQ01IMURERDFDUDA!/?contentidonly=true&contentid=2011%2F03%2F0143.xml see additional included documents: *DoD Sustainable Buildings Policy Oct 2010 Memo* *ECB 2011-01 NAVFAC - Navy Shore Energy Building Standard* *Military Construction - Appropriation Bill 2012*
51	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	N12	~~2 federal agencies or departments (Latest as of: 09/24/10)~~ ~~Department of Health and Human Services (new buildings with at least $3 million of Federal funds to earn LEED certification, Green Globes certification, or certification by another nationally recognized green building standard)~~ ~~Department of Interior (new construction with gross construction costs greater than $2,000,000 achieve LEED Certified or one Green~~

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							~~Globe)~~ Same as N11
52	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	N13	~~16 federal building has been certified.~~ ~~- Department of State (SA-1 Columbia Plaza, D.C.)~~ ~~- Department of Veterans Affairs (15 Veterans Affairs Medical Centers in 10 states)~~ 40 federal buildings have been certified (as of 8/25/11) 38 CIEB, 2 NC See the following included document: *GG Certified Buildings 8/25/11*
53	h	Nat'l Recognition	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	N14	~~New Construction and Existing Buildings~~ Yes See project summary sheet http://www.thegbi.org/assets/pdfs/GBI_Project_Single_Building_Summary_Sheet.pdf GBI also allows for campuses http://www.thegbi.org/assets/pdfs/GBI_Campus_and_Portfolio_Summar

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							y_Sheet.pdf
54	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC136	**10.6.1 Building Life Service Plan** 10.6.1.1 The underlying premise of the building life service plan is design & planning the whole building life cycle.
55	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC137	Integrated Design and Delivery inherently encompasses cost savings since the process involves all key project personnel from the planning stage forward, allowing sustainable design opportunities to be implemented and integrated as the design evolves, versus the more expensive approach of 'cobbling together' the different design elements (disciplines) late in the design process.
56	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC138	~~If the Green Globes NC pre-commissioning points are achieved, documentation in accordance with~~ ASHRAE is required. ASHRAE meets the intent of the Guidelines. ASHRAE and ASHRAE/NIBS Guideline 0-05 – Commissioning – are cited throughout Section 6.3 Whole Building Commissioning, such that the entire criteria is based on the ASHRAE standard for commissioning.
57	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC140	ASHRAE and ASHRAE/NIBS Guideline 05-5

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58	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC3	If the ~~Green Globes~~ GBI ANSI Standard points for water reduction and metering are achieved the GP are met. ~~Water reuse is not mentioned in Green Globes NC~~. 9.8.1.1 Special water features filter and re-circulate water for *reuse* within the system. 9.10.1 Alternate Sources of Water: Includes reuse of water, including gray water.
59	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC7	~~Green Globes~~ GBI Water Consumption Calculator, V1.3
60	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC8	0.4% - 4.4% Total Maximum Water points – GBI ANSI Standard: 13% of Certification System
61	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC9	~~Green Globes NC does not specify life-cycle cost effective measures for process water.~~ 6.1.2 *GDDC* Performance Goals: Water efficiency, conservation and performance would necessarily include life cycle cost measures for process water.
62	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC10	**9.4.1 Boilers and Water Heaters (n/a-3 points)** 9.4.1.1 Boilers and/or water heaters were installed with the following features: Boilers and water heating systems of 50 bhp and above were installed with a boiler feed makeup meter

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							Boiler systems with over 50 bhp were installed with condensate return systems Boilers were fitted with conductivity controllers Steam boilers were installed with conductivity meters **9.5.1 Commercial Food Service Equipment (n/a-12 points)** 9.5.1.1 Once-through water-cooled equipment was not installed (n/a or 3 points) 9.5.1.2 Water-fed garbage disposals were not installed (n/a or 2 points) 9.5.1.3 Installed ice machines met Energy Star requirements (n/a or 2 points) 9.5.1.4 Installed combination overs used no more than 15 L or 38 L (4 or 10 gal.) of water per hour (n/a-2 points) 9.5.1.5 Pre-rinse spray valves met or exceeded the requirements of the US Energy Policy Act of 2005 (and subsequent revisions and additions up to 2005) (n/a or 1 point) 9.5.1.6 All boilerless/connectionless food steamers use no more than 7.5 liters (2.0 gallons) per hour (n/a or 1 point) 9.5.1.7 Installed dishwashers met Energy Star requirements at a minimum (n/a/ or 1 point) **9.6.1 Medical/Dental and Laboratory Equipment (n/a-11 points)** 9.6.1.1 Steam sterilizers were equipped with: • Mechanical vacuum equipment (n/a or 2 points)

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							• Water tempering devices that allow water to flow when the discharge of condensate or hot water from the sterilizer exceeds 60˚C (140˚F) (n/a or 2 points) 9.6.1.2 Laboratory or medical equipment used non-potable water for once through cooling (3 points) 9.6.1.5 Installed wet scrubbers were equipped with water recirculation systems (n/a or 1 point)
63	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC 15	7.4.1.2 No irrigated exterior vegetated space corresponds with GP criteria - Option 3
64	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC21	If the ~~Green Globes NC~~ GBI ANSI Standard points are achieved, the GP will be met.
65	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC33	~~Green Globes NC does not specify the stringency requirements of the local code used; it is unknown if the code must be at least as stringent as ASHRAE 90.1-2007.~~ ASHRAE 91 – 2007 is specified first, implying that the local code applies if more stringent.
66	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC39	~~Solar hot water is not specified in Green Gloves NC.~~ **8.9.2 On-Site Renewable Energy** includes on-site thermal, which would include solar hot water.
67	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC49	~~Green Globes NC does not address Benchmarking.~~ The GBI ANSI Standard benchmarks against actual regional energy performance by building type by using the Target Finder Energy Star program. One of Target Finder's features is a tool that predicts future energy performance based on a benchmarking methodology. Green Globes CIEB (Existing Buildings) incorporates actual building energy performance at least one year after occupancy. GBI promotes the new and existing green building rating tools as a continuum.

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
68	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC59	GP uses USDA's guideline, which is specific to the different types of construction materials. ~~So it is hard to compare with GC NC.~~ GBI ANSI Standard references USDA bio-based guideline.
69	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC89	~~Green Globes NC does not specify that if the local code is used, it must be more stringent than the ASHRAE standard. If points are achieved using local code, the GP may or may not be achieved.~~ Since local codes and standards are listed last, the intent implied is that ventilation requirements defer to them only if more stringent than the national codes and standards.
70	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC95	~~Green Globes NC does not specify that if the local code is used, it must be more stringent than the ASHRAE standard. If points are achieved using local code, the GP may or may not be achieved.~~ Since local codes and standards are listed last, the intent implied is that thermal comfort requirements defer to them only if more stringent than the national codes and standards.
71	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC101	Daylighting is addressed in two areas: Energy (Prescriptive Path) and Indoor Environment. The daylighting specifications use opening size and indoor light levels, ~~which are not comparable to the Guidelines daylighting factor metrics.~~ and ASHRAE Advanced Engineering Design Guides are referenced.
72	i	Robustness (NC)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	RNC106	~~Smoking is not prohibited in Green Globes NC and there is no distance requirement, but smoking areas are considered specialized activity areas. The GP is not met.~~ Smoking is primarily a building management issue and is most appropriately addressed in an Existing Buildings (CIEB) program.

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
73	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB133	~~The use of an integrated team to implement the elements specified in the GP is not addressed in GC CIEB. The elements are discussed as separate units as documented in other Robustness categories.~~ Environmental Management System (EMS) is a major topical heading in GG CIEB. A comprehensive fully functioning EMS encompasses the integrated team approach.
74	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB3	~~GG CIEB uses utility bills to evaluate water performance. This is different from the calculation method used in GP.~~ For other than office buildings, the client may utilize the GBI Water Calculator, which sets up baseline consumption for the building and then allows for benchmarking based on percent over baseline.
75	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB5	~~Existing Buildings Green Building Initiative~~ GBI Water Calculator (see above)
76	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB6	~~Unknown~~ Setting up a baseline requires accurate inventory of water consuming equipment. Use actual water consumption data from 12 consecutive months for benchmarking and determining percent water efficiency.
77	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB7	~~Existing Buildings Green Building Initiative~~ GBI Water Calculator
78	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB10:	Evidence of Intent GG credit for NOT having once through cooling.

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
79	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB22	~~Performance~~ Water consumption is quantitative based on 12 consecutive months of consumption. Office category based on BOMA histogram. GBI Water Calculator utilized on other occupancy types per above. **2.3 Water Management** Is there a written policy intended to minimize water use and encourage water conservation? Is water consumption being monitored? Has a water audit been done within the last three years? Are there water-reduction targets? Are there regular procedures for checking and fixing leaks?
80	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB39	~~GG CIEB energy requirement is prescriptive.~~ The Energy Performance Criteria in Green Globes is performance based. Credit is directly derived from Energy Star benchmarking protocol and uses the credit earning threshold of 75 percentile, the same threshold that Energy Star uses to award an Energy star label.
81	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB41	~~Existing Buildings Green Building Initiative~~ Energy Star approach is used for Energy Performance
82	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB42	~~n/a~~ 80 points spread over Energy Star scores of 75 – 100 percentile

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
83	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB43	~~Existing Buildings Green Building Initiative~~ Energy Star Portfolio Manager protocol
84	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB61	~~n/a~~ Energy Use cannot be monitored without metering. Therefore, metering is necessarily implied in section **1.11 Energy Management, Monitoring and Targeting**. There is also sub-metering in section **1.14 Sub-metering**.
85	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB83	~~Green Globes EB does not fully meet the intent of the Guidelines. Although it calls for a phase out plan it does not specifically call for zero use.~~ A phase out plan is the only practical path to zero use of refrigerants. The first criteria in this section, **4.2 Refrigerants** allows for an N/A if no ODP refrigerants are used and credit for non-ODP refrigerants. In both cases, the rating system avoids penalizing the user. Therefore, GG does award credit to zero ODP refrigerant use.
86	i	Robustness (EB)	VS & KS	Vicki@thegbi.org Kevin@thegbi.org	8/25/11	REB89	~~There is no specific mention of the ASHRAE requirements in GG CIEB.~~ Under IAQ Management: 5.7 ("Are the following being monitored continuously: Temperature? Humidity?"), the associated ToolTip states "the building should conform to ASHRAE 55-2004 for thermal comfort."

Appendix I: Certification System Owner Input – LEED

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
1	A	Independence	Sarah Alexander	salexander@gbci.org	8/25/11	I1	**New Comment:** Green Building Certification Institute (GBCI), established in 2008 is a separately incorporated entity and is responsible for project registration and certification. GBCI administers the LEED certification program, performing third-party technical reviews and verification of registered projects to determine if they have met the standards set forth by the LEED rating system. Dedicated technical experts ensure building certification meets the highest levels of quality and integrity. Projects are randomly assigned through our unbiased pool of highly qualified reviewers based on their availability and expertise. Under certain unique circumstances (e.g. buildings on the same campus) project teams can request that the same reviewer be assigned to the related projects (subject to capacity). Each reviewer must confirm the absence of any conflict of interest prior to accepting any project application for review. **Source:** GBCI Website - http://www.gbci.org/org-nav/about-gbci/about-gbci.aspx
2	A	Independence	Sarah Alexander	salexander@gbci.org	8/25/11	I3	**New Comment:** The project team may initiate an appeal to GBCI prior to formal acceptance of and within twenty-five (25) business days of the applicable action or determination by GBCI. (Formal acceptance of a GBCI determination occurs within LEED Online) All appeals must be provided to GBCI via the same platform through which the project application was

							submitted for review (usually LEED Online). The project team must remit the appeal fee as well as submit the following information to establish the basis for the appeal: 1) supplemental documentation supporting such MPR, prerequisite and/or credit; as well as 2) an explanation addressing the issues in the technical advice provided with the denial of the MPR, prerequisite and/or credit. GBCI will acknowledge filing of the appeal to the project team. GBCI representatives not previously involved in evaluating the relevant requirement for the Project will review the appeal documentation and explanation provided by the project team. GBCI endeavors to deliver a decision on the appeal within twenty-five (25) business days from the initial filing of the appeal. GBCI's appeal decision shall include identification of the technical basis underlying such decision. **Source:** LEED Certification Policy Manual - https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf
3	A	Independence	Sarah Alexander	salexander@gbci.org	8/25/11	I4	**New Comment:** The LEED certification program is a documentation-based verification program. Each LEED rating system and version thereof consists of unique documentation requirements to complete a LEED certification application. Within the LEED certification application, a series of required documents, attestations, data, or other information must be indicated in order to demonstrate the satisfaction of each MPR, prerequisite, and attempted credit. Specific documentation requirements vary across the different rating systems; though, usually consist of forms, calculations, narratives, maps, drawings, specifications, and other related media (collectively, "documentation").The review process for LEED is conducted in LEED Online and occurs in two phases.

							In both the preliminary and (optional) final review, all the documentation submitted with the application is reviewed for completeness and compliance with the appropriate LEED rating system. Each reviewed Project Information Form, prerequisite and credit is designated as anticipated, pending, or denied in the preliminary review and as awarded or denied in the final review. Each designation is accompanied by technical advice as deemed appropriate by the review team. Add'l Source: LEED Certification Policy Manual
4	B	Availability	Sarah Alexander	salexander@gbci.org	8/25/11	A1	**New Comment:** Altogether, the process can take 3-4 months: 25 business days for the initial review followed by 25 business days for the project team to prepare their clarifications, followed by 15 business days for the final review. In instances where an appeal is necessary, this adds an additional 25 business days from when the appeal documentation is submitted for review. Subject to capacity, GBCI is able to provide an expedited review process for a higher fee, and this reduces the review time by approximately 50%. **New Source:** LEED Certification Policy Manual - https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf
5	B	Availability	Sarah Alexander	salexander@gbci.org	8/25/11	A2	**New Comment:** The LEED certification process includes a preliminary and a final review. The reviewer provides detailed feedback to the project team during the preliminary review and guidance on the outstanding submittal information that is required before credit/prerequisite compliance can be

							confirmed. In addition, all project teams are able to contact GBCI technical staff, via the Contact Us Form on the GBCI website, should they have any follow-up questions about their preliminary review comments or other questions about the technical requirements of LEED. GBCI staff are available for conference calls with project teams should they need to discuss complex or unique situations where the project team may be facing challenges evaluating whether their project with comply with the LEED rating system requirements. **New Source:** LEED Certification Policy Manual - https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf
6	B	Availability	Sarah Alexander	salexander@gbci.org	8/25/11	A3	**New Comment:** Yes.
7	B	Availability	Sarah Alexander	salexander@gbci.org	8/25/11	A4	**New Source:** LEED Certification Policy Manual - https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf
8	B	Availability	Sarah Alexander	salexander@gbci.org	8/25/11	A5	**New Comment:** This depends largely on the size and complexity or innovative strategies presented by a project. On average, LEED technical reviewers will spend approximately 40 hours (range 30-120+ hrs) reviewing submitted documentation, spread over the preliminary and final review. Time spent to assess Appeal documentation for compliance would be additional. **New Source:**

9	B	Availability	Sarah Alexander	salexander@gbci.org	8/25/11	A6	**New Comment:** In general, three LEED reviewers are assigned to each project: a generalist reviewer, HVAC/energy reviewer and a QC reviewer. **New Source:**
10	C	Verification	Sarah Alexander	salexander@gbci.org	8/25/11	V1	The review process for LEED is conducted in LEED Online and occurs in two phases. In both the preliminary and (optional) final review, all the documentation submitted with the application is reviewed for completeness and compliance with the appropriate LEED rating system. Each reviewed Project Information Form, prerequisite and credit is designated as anticipated, pending, or denied in the preliminary review and as awarded or denied in the final review. Each designation is accompanied by technical advice as deemed appropriate by the review team.
11	C	Verification	Sarah Alexander	salexander@gbci.org	8/25/11	V2	**New Source:** LEED Certification Policy Manual - https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf
12	C	Verification	Sarah Alexander	salexander@gbci.org	8/25/11	V3	**New Comment:** LEED reviewers assess project documentation for compliance with the published, balloted LEED rating system requirements, Minimum Program Requirements, and individual credit/prerequisite requirements, LEED Online Forms, published Addenda & LEED Interpretations and other LEED guidance documents published by USGBC (e.g. District and Campus Thermal Energy Treatment) **New Source:** LEED Certification Policy Manual -

							https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf
13	C	Verification	Sarah Alexander	salexander@gbci.org	8/25/11	V4	**New Comment:** LEED project reviews are performed using the LEED Online assessment tool. **New Source:** LEED Certification Policy Manual - https://www.leedonline.com/irj/go/km/docs/documents/usgbc/leed/config/terms/Legal_Documents_Download/rating_system_doc_june_20_2011/June2011_Cert_Policy_Manual.pdf
14	C	Verification	Sarah Alexander	salexander@gbci.org	8/25/11	V5	**New Comment:** GBCI employs highly qualified, professionally licensed, technical staff who have a wide breadth of experience. In instances where a particularly unique or complex project presents evaluation needs outside an assessors expertise, GBCI may pose technical questions to the standard developer (USGBC) and its robust technical committee structure. **New Source:**
15	F	Maturity	Melissa Gallagher-Rogers	mgrogers@usgbc.org	8/25/3011	M1	In general, as LEED evolves it adopts the latest versions of codes and standards, often requiring a percent improvement beyond the stated code or standard, when that can be quantified.
16	f	Maturity	Melissa Gallagher-	mgrogers@usgbc.org	8/23/2011	M4	Minimum Program Requirement #6 requires projects to commit to supplying all available whole-project energy and water usage data for a period of at least 5 years post-

			Rogers				certification. The MPRs (http://www.usgbc.org/DisplayPage.aspx?CMSPageID=2102), introduced with LEED 2009, require projects to meet certain criteria to be eligible for LEED certification.
17	F	Maturity	Melissa Gallagher-Rogers	mgrogers@usgbc.org	8/23/2011	M6	In addition to the rating systems listed in your report please add LEED Italia. There is not a LEED Mexico to our knowledge.
18	F	Maturity	Melissa Gallagher-Rogers	mgrogers@usgbc.org	8/23/2011	M8	The LEED rating system is on a predictable 3 year development cycle. The next version of LEED, LEED 2012 is now open for second public comment. http://www.usgbc.org/DisplayPage.aspx?CMSPageID=2360
19	G	Usability	Melissa Gallagher-Rogers	mgrogers@usgbc.org	8/23/2011	U6	The various market sectors that use LEED have individual resource pages to assist those market sectors with their use of the LEED rating system as well as the general LEED resources. The government page is available at www.usgbc.org/government.
20	I	Robustness	Melissa Gallagher-Rogers	mgrogers@usgbc.org	8/23/2011	RNC135	The LEED for Healthcare rating system is a supplement to the Green Building Design and Construction rating systems and has a prerequisite for integrated project planning and design The LEED for Healthcare rating system also offers a credit for integrated project planning and design in the innovations in design section of the rating system.
21	I	Robustness	Melissa Gallagher-Rogers	mgrogers@usgbc.org	8/25/2011	RNC9	The LEED for Healthcare rating system Water Efficiency prerequisite 1 requires that projects employ strategies that, in aggregate, use 20% less process water than the process water use baseline calculated for equipment performance requirements listed in the credit.
22	E	Consensus Based	Melissa Gallagher-	mgrogers@usgbc.org	8/25/2011	C8	USGBC conducts a Zone of Reasonableness Review prior to any item going to member ballot. For each rating system,

			Rogers				independent technical experts who understand the content, but were not involved in developing content, perform a review to make sure that LEED is reasonable from a technical perspective. The results are presented to the LEED Steering Committee for review and determining how to address any issues brought about by the review.
23	H	Recognition	Melissa Gallagher-Rogers	mgrogers@usgbc.org	8/25/11	N2	Every year, USGBC's Greenbuild conference coordinates 800 student volunteers who are able to attend the conference in exchange for working part of the week supporting the event. An additional 450 students pay a student rate to attend the conference. Additionally, USGBC currently has a network of 70 USGBC Students groups representing 1600 students as of August 2011. There are 60 trained, mid-career professionals who are committed to building the program locally, which will be ramping up through the fall of 2011 and into 2012. Each student group has a faculty advisor as well. From May 2009-August 2011, over 1400 students became LEED professionals (LEED AP with specialty or LEED Green Associate).
24	H	Recognition	Melissa Gallagher-	mgrogers@usgbc.org	8/25/11	N13	519 federal buildings are certified under LEED and 3,809 federal projects are registered and pursuing certification.

			Rogers				Please see www.usgbc.org/government for more information.
25	H	Recognition	Melissa Gallagher-Rogers	mgrogers@usgbc.org	8/25/11	N6	31,696 projects registered for LEED certification as of August 4, 2011.
26	H	Recognition	Melissa Gallagher-Rogers	mgrogers@usgbc.org	8/25/11	N7	10, 000 projects are LEED certified as of August 25, 2011.

Appendix J: Certification System Owner Input – Living Building Challenge

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
1	a	Independency	Eden Brukman	eden.brukman @ living-future.org	08/14/11	I1	Auditors are selected first by expertise, then by location. As demand grows, additional auditors will be trained in diverse geographical locations. The intent is for the auditor to have an applied knowledge of the climate and culture of the place, allowing for a simplified assessment process. Prior to taking an assignment, the auditor must sign a 'conflict of interest' form, documenting that they have no personal or professional connection to the project and will not benefit from the outcome of the certification ruling. The auditor is not introduced to the project/representative project team member until the site visit is scheduled to maximize the potential for an unbiased review.
2	a	Independency	Eden Brukman	eden.brukman @ living-future.org	08/14/11	I2	There is a documented appeal process, included in the certification flow diagram created for online viewing May 27, 2011. See https://ilbi.org/lbc/certification-process for a simplified account. [Refer to the Appendix for a soft copy.] Details for each step in the flow diagram will be published in the upcoming Process book of the Petal Series – a collection of printed companion guides to provide the necessary generalized support information, strategies, rationale, case studies, and context for every Petal and Imperative. This resource will complement the "Dialogue", the online forum where the most up-to-date information is maintained.

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
3	a	Independency	Eden Brukman	eden.brukman @ living-future.org	08/14/11	I3	Once a team has initiated the certification process, there are three written instances when they can provide supplemental/clarifying data, and one verbal opportunity during the site visit: 1. Institute staff perform a "completeness check" to ensure that sufficient data have been submitted and may request additional written information from the project team. 2. During the written documentation review (prior to the site visit), the auditor performs a technical content review of the data and may request written nclarification about information provided by the project team. 3. During the site visit, the auditor may ask questions and the representative project team member may provide clarifying explanations. Any otherwise undocumented relevant information learned during the site visit is included in the auditor's written report. 4. Once the team is informed of the official results and receives a simplified copy of the auditor's written report, they have one opportunity to appeal. The appeal review is based on supplemental written documentation only – there will not be a second site visit.
4	a	Independency	Eden Brukman	eden.brukman @ living-future.org	08/14/11	I4	Imperatives are evaluated based on written documentation and/or site visit. See https://ilbi.org/lbc/certification-process for a simplified account of the certification process. [Refer to the Appendix for a soft copy.] The project team is required to submit documentation and a single independent, third-party auditor will be engaged to review the submittal. - Team submits written documentation

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
							- Institute performs a 'completion check' of Team's documentation - Auditor performs a content review - Auditor performs a single-day site visit and compiles findings into written report - Institute performs quality control review of the report (to ensure that all elements for each relevant Imperative have been assessed – essentially a 'completeness check' of Auditor's work) - Institute notifies Team of certification results and the team is provided a simplified copy of the report.
5	b	Availability	Eden Brukman	eden.brukman @ living-future.org	08/14/11	A1	4-12 weeks, depending on the complexity of the project and the availability of the representative team member to schedule the site visit.
6	b	Availability	Eden Brukman	eden.brukman @ living-future.org	08/14/11	A2	[See also Comment 3 - I3] Once a team has initiated the certification process, there are three written instances when they can provide supplemental/clarifying data, and one verbal opportunity during the site visit. All data must be provided in writing to the Institute: 1. Institute staff perform a "completeness check" to ensure that sufficient data have been submitted and may request additional written information from the project team. 2. During the written documentation review (prior to the site visit), the auditor performs a technical content review of the data and may request written clarification about information provided by the project team. 3. During the site visit, the auditor may ask questions and the representative project team member may provide clarifying explanations. Any otherwise undocumented relevant information learned during the site visit is included in the auditor's written report.

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
							4. Once the team is informed of the official results and receives a simplified copy of the auditor's written report, they have one opportunity to appeal. The appeal review is based on supplemental written documentation only that is provided by the project team – there will not be a second site visit. The Institute is in the process of building an on-line Project Portal, to be complete in 2011, where all written documentation is uploaded and Dialogue activity is tracked. Once complete, teams will have access to the Project Portal from the time of registration and for the duration of the project.
7	b	Availability	Eden Brukman	eden.brukman @ living-future.org	08/14/11	A3	The evaluation schedule is published in the certification flow diagram. See https://ilbi.org/lbc/certification-process for a simplified account. [Refer to the Appendix for a soft copy.] - Institute 'completion check': up to 2 weeks - Auditor content review: up to 4 weeks - Auditor single-day site visit: up to 2 weeks - Auditor completes written report: up to 2 weeks - Institute quality control review of the report: up to 2 weeks If additional information is required from the project team during the certification process [i.e. instances summarized in Comment 6 – A2], the schedule may be delayed. The team has up to 2 weeks to reply to requests made as a result of the Institute's completeness check; up to 2 weeks to reply to requests made as a result of the auditor's content review; and up to 4 weeks to provide all necessary data required for an appeal. The team must file an intent to appeal the certification results within 2 weeks of notification.
8	b	Availability	Eden Brukman	eden.brukman @ living-	08/14/11	A4	The project team receives feedback in real time related to the evaluation schedule. The upcoming Project Portal will include an administrative area with a calendar that provides an up-to-date

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
				future.org			account of the position of the project in the certification process and anticipated timeline/end date for each phase.
9	b	Availability	Eden Brukman	eden.brukman @ living-future.org	08/14/11	A5	The Auditor may be connected to a single project for up to 8 weeks. Actual dedicated hours during this time likely range from 40-80, depending on the project's complexity, whether additional clarification is necessary, and availability of representative team member. (Hours noted include technical content review; site visit scheduling, walk through and associated travel; and composing report.)
10	b	Availability	Eden Brukman	eden.brukman @ living-future.org	08/14/11	A6	One auditor is assigned per project. One Institute staff member will perform the completeness check for the initial submittal and the auditor's written report.
11	c	Verification	Eden Brukman	eden.brukman @ living-future.org	08/14/11	V1	Once the team submits written documentation and the Institute performs a completeness check, the auditor receives access to project data. The site visit is scheduled and the auditor reviews the written documentation. If applicable, the auditor maintains a list of clarifications, which are submitted to the team in one exchange. The auditor reviews any data submitted as a result of the clarification request prior to traveling to the project site. The auditor may add items to the site review checklist template, as necessary, based on the content review. (The documentation requirements for each Imperative indicate whether assessment is based on written documentation, site visit or a combination of both.) The auditor performs a site visit, then completes the written report summarizing findings about each Imperative, and submits the report to the Institute.

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
12	c	Verification	Eden Brukman	eden.brukman @ living-future.org	08/14/11	V2	*Replace "prerequisite" with "Imperative", "audit" with "site visit", and "User's Guide" with "Petal Series" or "Documentation Requirements".*
13	c	Verification	Eden Brukman	eden.brukman @ living-future.org	08/16/11	V3	Evaluation criteria are summarized in "Documentation Requirements". [Most recent update to Documentation Requirements was December 03, 2010 and is posted within the online Living Building Community (a subscription is required): https://ilbi.org/action/community/users-guide. Refer to the Appendix for a soft copy. Documentation requirements will also be present with assigned form fields in the online Project Portal.] In summary, each project team is expected to share the following: - 'For Construction' Drawing Set - A site plan with the project area clearly noted - Project Manual (specifications) - At least ten photographs or digital color 3D renderings - Additional information specific to each Imperative (in most cases)
14	c	Verification	Eden Brukman	eden.brukman @ living-future.org	08/16/11	V4	The auditor is provided guidelines/checklists to aid in the content review and site visit portion of a project evaluation. To maximize the potential for a thorough review, the Institute also provides a report template with prompts for each Imperative.
15	c	Verification	Eden Brukman	eden.brukman @ living-future.org	08/16/11	V5	Every effort is made to pair a project with an auditor that has broad and deep direct experience applying the technical requirements of the Living Building Challenge to its Typology (e.g. renovation, landscape, infrastructure, building, or neighborhood) and within its Living Transect (e.g. Natural Habitat Preserve, Rural Agriculture Zone, Village or Campus Zone,

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
							General Urban Zone, Urban Center Zone, or Urban Core Zone). There are two possible pathways for dealing with an issue that is outside the auditor's expertise: - Programmatic assistance is provided by Institute staff to clarify the intent of an Imperative. - Content assistance is provided by the associated Petal Committee to clarify the project's applied solution. Petal Committees are comprised of national and/or international experts within a given field that share a strong philosophical alignment with the goals of the Living Building Challenge. Positions on a Petal Committee are voluntary and individuals serve at the discretion of the Institute for as long as they are able to provide expert guidance to the certification system and remain free of any significant conflicts of interest. For example, Petal Committee advisors may not be working on an active Living Building Challenge project while sitting on a Petal Committee, nor work for a building product manufacturer or a trade association. There is a minimum of five seats on each Petal Committee, one of which must be held by senior Institute staff to ensure continuity. Committees must be odd in number and may have as many as nine seats.
16	d	Transparency	Eden Brukman	eden.brukman @ living-future.org	08/16/11	T1	Comments are officially collected in one of two ways: - The Dialogue: an online forum where project teams are encouraged to ask clarifications about the intent of the Imperative – generally or specific to their project, and share information that may influence the evolution of an Imperative or Petal. The individual who posted the entry is noted, and there is a visual indicator that demarcates any

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							post that has been officially adopted into the Living Building Challenge. [Refer to the Appendix for an annotated screenshot of the Dialogue.] - The Feedback Form: an online form that individuals may use to share ideas or suggestions for the evolution of a particular Imperative, Petal, or Living Building Challenge generally.
17	d	Transparency	Eden Brukman	eden.brukman @ living-future.org	08/16/11	T2	Comments are collected in real time.
18	d	Transparency	Eden Brukman	eden.brukman @ living-future.org	08/16/11	T3	As part of the process for updating the Living Building Challenge, the Dialogue activity and completed Feedback Forms are reviewed. [See Comment 16 – T1 for explanation of Dialogue and Feedback Form] These comments are then integrated into the certification system by Institute staff as appropriate after additional research is completed. Depending on the complexity and potential impact of a comment, the associated Petal Committee may be involved. [See Comment 15 – V5 for explanation of Petal Committee] - Step One – Registered Team Posting Someone who has subscribed to the Community may at any time post to the Dialogue seeking clarification as to how their particular project may meet a given Imperative. The project team may simply be seeking confirmation that their proposal is in alignment with the intent of the Imperative, or they may be proposing a temporary exception due to some unique characteristic of their project. Either way, all project team communication is done in full view of all other registered projects so that transparency and equitability is achieved. - Step Two – Query Identification

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							The Institute staff then review the Dialogue post and determine the best course of action. Postings typically fall into one of the following categories: A) Simple clarifications that have been previously addressed B) Simple clarifications that have not yet been addressed C) Substantive clarification/idea that needs deliberation at the 'exception' level D) Substantive clarification/idea that needs deliberation at the Imperative level - Step Three – Addressing the Query Postings that fall into category A) are simply and quickly answered: Institute staff post a response to the Dialogue that refers the project team to a previous ruling. This posting is made visible to all Community subscribers so transparency and equitability is achieved. Postings that fall into category B) are also simply and quickly answered: Institute staff endeavor to respond to these inquiries within two weeks and post a response to the Dialogue. This forms the basis for a new 'ruling', which should be a simple clarification based on the current version of the standard. When enough of these have been logged, a updated version of the standard will be released (e.g., 2.1, 2.2, 2.3, etc.). It is important to emphasize that no ruling will ever apply to just one project and no 'backroom' deals are permitted. All new exceptions – even if initiated by a specific project – must then apply to all projects that find themselves in that similar situation, and the rulings are always posted so that there is a transparent record. Postings that fall into category C) have two possible pathways. i) If it is a substantive 'exception-level' change well within the logic and philosophy of the standard, Institute staff

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							will meet as a group and reach a shared decision, and consult with the respective Petal Committee on an as-needed basis (Petal Committees are explained in the next section). ii) If it is a substantive 'exception-level' change that challenges the logic and philosophy of the standard, Institute staff will most likely bring the query to the Petal Committee for larger deliberation, although final decision rests with Institute staff. Postings that fall into category D) are always brought to the Petal Committee for review. The final decision may take a greater length of time to be posted to the Community, depending on the specifics of the query or proposal.
19	d	Transparency	Eden Brukman	eden.brukman @ living-future.org	08/16/11	T4	Major certification system changes are noted in the current version of the Living Building Challenge. Changes stemming from project team comments are viewable in the Dialogue. [Refer to the Appendix for an annotated screenshot of the Dialogue.]
20	e	Consensus	Eden Brukman	eden.brukman @ living-future.org	08/16/11	C1	*Replace paragraph in its entirety, which appears to reference the background to the Living Building Challenge Financial Study rather than the certification system itself.* The Institute, a 501c3 non-profit organization, is responsible for the development and management of the certification system. Individuals representing government agencies, private industry, non-governmental organizations, and others have submitted comments that have helped to shape the evolution of the program. To-date, Living Building Challenge has been funded primarily by foundation grants, and augmented by project registration fees, Community subscriptions, and educational offerings on related topics.

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21	e	Consensus	Eden Brukman	eden.brukman @ living-future.org	08/16/11	C2	*Replace paragraph in its entirety.* Government Agencies and Private Industry have participated in research efforts to substantiate the principles of the Living Building Challenge; and have offered suggestions for the evolution of the certification system via the online Dialogue. Parties other than the Institute do not oversee management, development or funding strategies.
22	e	Consensus	Eden Brukman	eden.brukman @ living-future.org	08/16/11	C3	The certification system was created using an expert opinion approach and has developed with input from the Living Building Community. Because transparency is fundamental to achieving the goals of the Living Building Challenge, the Institute avoids the notion of a 'consensus-based approach' -- Ironically, in the end, consensus decision-making still entrusts someone or some group with the final say. While there is a veil of transparency present, ultimately it is not achieved, which makes the consensus process disingenuous.
23	e	Consensus	Eden Brukman	eden.brukman @ living-future.org	08/16/11	C4	Living Building Challenge does not have a points-based system. There are performance-based metrics assigned to each of the 20 Imperatives within the certification system. There are two types of certification: Projects earn "Living" status when all Imperatives assigned to its Typology are met, and earn "Petal Recognition" when projects satisfy the requirements in three or more categories, and at least one is Water, Energy or Materials. In addition, projects that earn Petal Recognition must comply with Imperative 01 (no development on greenfields,

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							on/adjacent to sensitive ecosystems, prime farmland, or within the 100-yr floodplain) and Imperative 20 (inspiration + education). The Institute also offers a specialized version of Petal Recognition called Zero Energy Building Certification. This process certifies projects that meet or exceed net-zero energy and are operationally carbon neutral. [A promotional flyer and postcard for Petal Recognition and Zero Energy Building Certification is available online: https://ilbi.org/about/handouts. Refer to the Appendix for a soft copy of each. Refer to http://zeb.livingbuildingchallenge.org for more information about Zero Energy Building Certification.]
24	e	Consensus	Eden Brukman	eden.brukman @ living-future.org	08/16/11	C5	*Replace paragraph in its entirety, which appears to reference a municipal ordinance that offers support to Living Building Challenge project teams rather than the certification system itself.* Each Imperative is created by identifying the ideal 'end game' for its area of influence and then stepping back to recognize the limits of our collective knowledge and current market realities; Thresholds for performance are established in part by looking to successful built examples. In this way, decisions are steered by restorative principles instead of code-minimum solutions. These also serve as ever-present reminders of the objectives we are working to achieve. Because Living Building Challenge is performance-based, "the specific methodology used to meet the expectations of the Living Building Challenge is relegated to the genius of the design teams, who are expected to make informed decisions appropriate to the

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							project and bioregion." [See page 5 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf] Therefore, there are myriad options for teams to explore and implement to be successful.
25	e	Consensus	Eden Brukman	eden.brukman @ living-future.org	08/16/11	C6	When there are differing opinions, the Petal Committees are brought into the conversation and provide expertise and recommendations. [See Comment 18 – T3 for details of the process]
26	e	Consensus	Eden Brukman	eden.brukman @ living-future.org	08/16/11	C7	Yes. This information is included in a document about how the Living Building Challenge is changed that was published within the Community in March 2010. The contents are being integrated into the upcoming Process book of the Petal Series.
27	e	Consensus	Eden Brukman	eden.brukman @ living-future.org	08/16/11	C8	Petal Committees are comprised of national and/or international experts within a given field that share a strong philosophical alignment with the goals of the Living Building Challenge. Positions on a Petal Committee are voluntary and individuals serve at the discretion of the Institute for as long as they are able to provide expert guidance to the certification system and remain free of any significant conflicts of interest. For example, Petal Committee advisors may not be working on an active Living Building Challenge project while sitting on a Petal Committee, nor work for a building product manufacturer or a trade association.
28	f	Maturity	Eden Brukman	eden.brukman @ living-future.org	08/17/11	M1	The tools and standards within the certification system are advanced compared to current standards and latest industry tools. Living Building Challenge and its support tools function on several levels to assist project teams and others in the industry

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							(e.g. manufacturers, regulatory officials). Fundamentally, there is a shifted mindset when using in a performance-based system as opposed to a prescriptive system. As such, Living Building Challenge is designed to function as a philosophy, advocacy platform, and certification program. [Promotional "summary sheets" that introduce the concepts for these levels of engagement are available online: https://ilbi.org/about/handouts. Refer to the Appendix for a soft copy]
29	f	Maturity	Eden Brukman	eden.brukman @ living-future.org	08/17/11	M2	There have been two notable updates since the certification system was officially launched in November 2006: version 1.3 in August 2008, and version 2.0 in November 2009. The updates in version 1.3 primarily served to provide additional information about the system, whereas the release of version 2.0 included structural modifications. Tools are continually created and are updated as necessary to maximize the ability to support project teams. Project teams are also encouraged to share with others the tools that they create on the Brain Trust, an online area in the Living Building Community where subscribers (students, professionals and Institute staff) post and reference strategies, tools and research to further our collective knowledge base. [See page 44 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf]
30	f	Maturity	Eden Brukman	eden.brukman @ living-future.org	08/17/11	M6	Several new and overseas systems and organizations' guiding documents have been informed by the Living Building Challenge, such as: Eco-District Initiative (a regional framework championed by the Portland Sustainability Institute for the City of Portland); Estidama Pearl (a regional rating system for Abu Dhabi run by the

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							Abu Dhabi Urban Planning Council); LENSES (a national academic framework championed by the Institute for the Built Environment at Colorado State University); International Ecocity Standard (an international rating system championed by Ecocity Builders, Inc.); and the update to Standard 5281 (the national green building code for the State of Israel published by the Standards Institution of Israel). There are also several new or expanded credits/prerequisites in the most recent version of LEED® (LEED 2012, now open for public comment) that were influenced by the Living Building Challenge. The Institute was informed of this influence by members of LEED technical committees.
31	f	Maturity	Eden Brukman	eden.brukman @ living-future.org	08/17/11	M7	*Replace April 2010 with November 2009 – the "version" dated April 28, 2010 only corrected nominal items such as spelling errors.*
32	f	Maturity	Eden Brukman	eden.brukman @ living-future.org	08/17/11	M8	[See Comment 29 – M2] *Add* The updates in version 1.3 primarily served to provide additional information about the system, whereas the release of version 2.0 included structural modifications.
33	g	Usability	Eden Brukman	eden.brukman @ living-future.org	08/17/11	U1	*Project registration fees were increased on August 1, 2011 after increased functionality was introduced to the Living Building Community* At least one person per team must maintain a current account in the Living Building Community throughout a project's span from registration to certification. An individual subscription costs $125/yr; there are volume discounts for company, institution or agency subscription, which allows for unlimited number of

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							individual accounts within a single office location and range in cost from $300-$3500/yr. A discounted rate is extended to Students and Elders, with a subscription fee of $45/yr. Project Registration Fees are: $250 – Renovation $500 – Landscape, Infrastructure, Building $1000 – Neighborhood Project Certification Fees are paid prior to audit and are tiered based on project size, ranging from $1500 to $25,000. [See Subscription Fees: https://secure.ilbi.org/community/registrationpage and Registration/Certification Fees: https://ilbi.org/lbc/register-a-project]
34	g	Usability	Eden Brukman	eden.brukman @ living-future.org	08/17/11	U2	Project Registration forms are simple and may take 10-20 minutes to complete. [Refer to Appendix for a screenshot of the online form with all questions listed.] Documentation for project certification is intended to be compiled as the team progresses through the process, and related labor costs are unknown at this time. A portion of the information requested is based on project performance and/or site visit and does not require additional paperwork. “The Institute has an ongoing goal to reduce the amount of documentation needed to demonstrate compliance with the Living Building Challenge Imperatives. Over time, items may be deleted or slightly modified to reflect this effort. Teams

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							may elect to submit information using the most current guidelines at the time of project registration or any subsequent releases." [See page 2 of the Documentation Requirements. Refer to the Appendix for a soft copy.]
35	g	Usability	Eden Brukman	eden.brukman @ living-future.org	08/17/11	U3	The tools are user-friendly and straightforward. Because Living Building Challenge is performance-based, there is a lot of flexibility written into the program and myriad options for teams to explore and implement to be successful. "The specific methodology used to meet the expectations of the Living Building Challenge is relegated to the genius of the design teams, who are expected to make informed decisions appropriate to the project and bioregion." [See page 5 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf] "The Living Building Challenge does not dwell on basic best practice issues so it can instead focus on fewer, high level needs. It is assumed that to achieve this progressive standard, typical best practices are being met. The implementation of this standard requires leading-edge technical knowledge, an integrated design approach, and design and construction teams well versed in advanced practices related to 'green building'." [See page 10 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf]
36	g	Usability	Eden Brukman	eden.brukman @ living-future.org	08/18/11	U4	Imperatives are evaluated based on written documentation and/or site visit. See https://ilbi.org/lbc/certification-process for a simplified

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							account of the certification process. [Refer to the Appendix for a soft copy.] Teams are encouraged to collect written documentation in real time; it is officially reviewed for certification at one time after at least twelve consecutive months of operation. Because decisions made early in the design process have an outsized influence on a project's success, the Institute offers an optional service to review and comment on a project's Design Development drawing set and draft Project Manual. Noted observations parallel the requirements of the 20 Imperatives of the Living Building Challenge and highlight areas that may be in conflict with the intent of the program. As such, this Review Guidance includes observations about in-progress design documents that are intended to improve a project's potential to comply with the Living Building Challenge requirements. It can also be a useful reference when preparing subsequent documents for construction. However, the Review Guidance does not constitute a ruling for certification nor is not a guarantee that an Imperative or Petal has been fulfilled. [Refer to the Appendix for a promotional flyer introducing some of the optional technical assistance services available to project teams.]
37	g	Usability	Eden Brukman	eden.brukman @ living-future.org	08/17/11	U5	Because the Living Building Challenge requires twelve consecutive months of operation before it can be certified, it relies on actual performance data for the certification process. This should also minimize the need for the team to generate additional documentation uniquely applicable to the Living Building Challenge.

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							Performance metrics include: - Site: photographic documentation of agricultural areas showing use patterns throughout the year - Water: actual onsite collection methods (e.g. well, rainwater, other) and reuse methods (e.g. infiltration, irrigation/landscaping, non-potable use, potable use, other) - Water: completed water use table listing total actual water use, volume of potable water supplied by Utility (if applicable), volume of water harvested onsite. - Energy: completed energy use table listing total actual energy generated, actual energy used for heating, cooling, lighting, fans/pumps, plug loads/equipment, vertical transportation, domestic hot water, other. - Health: for building and renovation projects - results from pre- and post-occupancy air quality tests listing amounts of respirable suspended particulates (RSP), total volatile organic compounds (TVOC), carbon dioxide, temperative and relative humidity. - Health: as part of the site visit, the auditor may take daylight measurements. The team is encouraged to take into account the acceptable range for daylight factors based on the function of the space. - Materials: completed Materials Conservation Management Plan that explains how the project optimizes materials in each of the following phases: - Design Phase, including the consideration of appropriate durability in product specification - Construction Phase, including product optimization and collection of wasted materials - Operation Phase, including a collection plan for consumables and durables - End of Life Phase, including a plan for Adaptable Reuse and Deconstruction.

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38	g	Usability	Eden Brukman	eden.brukman @ living-future.org	08/17/11	U6	*Add* The Dialogue is a primary way for project teams to receive direct programmatic guidance from Institute staff. Individuals may post questions to the Dialogue at any time. [Also refer to the Appendix for a promotional flyer introducing some of the optional technical assistance services available to project teams.]
39	g	Usability	Eden Brukman	eden.brukman @ living-future.org	08/17/11	U7	Private industry now advertises design and consulting services specifically related to Living Building Challenge. Project teams tend to include a more diverse range of practitioners, drawing expertise from less conventional areas of influence and allowing for a deeply integrated design process. To increase the availability of technical knowledge throughout private industry, the Institute created the Brain Trust. [See comment 29 – M2 for additional information about the Brain Trust] The Institute also created the Ambassador Network to amplify the potential for information sharing that is particular to place. Specifically, the Institute trains and provides ongoing support to volunteer presenters and facilitators of Living Building Challenge Collaboratives who bring the restorative principles represented in the certification system to others in their communities. - Collaboratives are community-based, in-person groups of Living Building Challenge enthusiasts that provide an opportunity for individuals to come together for informal learning experiences and to advance community transformation. Collaborative participants' activities support creation of the local conditions that allow for development

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							of Living Buildings, Sites and Neighborhoods. Collaborative events are held at least quarterly and up to monthly throughout the year, and are typically organized as meetings that address topics relevant to Living Building Challenge and foster an opportunity for dialogue. - Volunteer facilitators support the development of the local Collaborative over time by inspiring new participants, cultivating leadership among current members and by organizing and hosting regular Collaborative events. They provide a local connection for those interested in getting more involved with the movement, and maintain regular communication between the Institute and the Collaborative by participating in regular check-in and update calls with staff, and by logging all Collaborative events. - Volunteer presenters commit to a year of service as a volunteer presenter, during which time they deliver at least six introductory, informal presentations to peers, local organizations, institutions, companies and community groups. [Refer to the Living Building Challenge website for more information about the Ambassador Network: https://ilbi.org/action/network]
40	g	Usability	Eden Brukman	eden.brukman @ living-future.org	08/17/11	U8	Users of the certification system tend to describe it as straightforward, easy to understand, and inspiring. They also note that the Imperatives are advanced and require anon-traditional approach to design and construction. When asked, one project owner said this about his early experience with the Living Building Challenge: "You start to question everything. And you can't go back once you realize this is the way you should do things." [Refer to the Appendix for other testimonials from a diverse group of certification system enthusiasts. This is the back

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							page of Taking Root, a promotional pamphlet that is updated regularly and documents where Living Building Challenge has influenced people, projects and practices throughout the world. A soft copy is available online: https://ilbi.org/about/handouts.]
41	h	Recognition	Eden Brukman	eden.brukman @ living-future.org	08/17/11	N1	Living Building Challenge is being used in the curriculum at K-12 institutions as well as in college courses at the undergraduate and graduate levels. Though most frequently used in the school of architecture, it has also been taught in other focus areas such as: real estate, business, interior design, construction management, engineering (mechanical, electrical, plumbing), Of the top US Architecture Schools, the following are known to have lectures and/or course curriculum based on the Living Building Challenge (listed in no particular order): - Kansas State University - University of California at Berkeley - Carnegie Mellon University - University of Southern California - University of Oregon - University of Texas at Austin - Washington University in St Louis - Syracuse University - University of Pennsylvania - Harvard - University of Minnesota - Southern California Institute of Architecture - University of California, Los Angeles
42	h	Recognition	Eden Brukman	eden.brukman @ living-	08/17/11	N2	- The Institute is aware of curriculum based on the Living Building Challenge in more than 100 colleges and universities. - To supplement their studies, more than 60 students have

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				future.org			subscribed to the Living Building Community on an individual level, and 3 professors have subscribed for a group account for one or more classes. - Out of 81 total entries, 11 student groups entered the Living City Design Competition www.ilbi.org/lcdc and one student team was recognized among the winners: https://ilbi.org/lcdc-winners. - Each year, the Institute offers reduced rates for students and recent graduates to attend the Living Future unConference, an annual event with approximately 800 attendees. In 2011, students attended the conference in Vancouver, BC; in 2010, approximately 80 students attended the conference in Seattle, WA. In 2012, the conference will be held in Portland, OR. - The volunteer facilitator option in the Ambassador Network originally was created with a student focus, and dozens of students have received training in the Living Building Challenge, group leadership dynamics and methods for fostering an inclusive environment. [See comment 39 – U7]
43	h	Recognition	Eden Brukman	eden.brukman @ living-future.org	08/20/11	N3	- State of Oregon Legislature passed House Bill 2080, which legalizes graywater and rainwater use in residential and commercial buildings throughout the state. Living Building Challenge and Institute staff were instrumental to this Bill's development and adoption. - State of Oregon Department of Environmental Quality refers to Living Building Challenge as a standard and resource for Life Cycle Approaches to Prioritizing Methods of Preventing Waste from the Residential Construction. - State of California refers to the Living Building Challenge as a potential national partner in its 2010-2012 Energy Efficiency Strategic Plan. Several departments within the State of California refer to Living Building Challenge as a resource that "does take a very different approach through (Imperatives) rather than "trade offs" found in most existing

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							green rating systems." - New Hampshire Department of Environmental Services refers to Living Building Challenge as a resource and innovative program for its "Innovative Land Development Technical Assistance and Coordinated Permitting Initiative" - State of Washington Department of Ecology refers to Living Building Challenge as a certification program and resource for residential and commercial construction.
44	h	Recognition	Eden Brukman	eden.brukman @ living-future.org	08/20/11	N4	- Clark County and City of Vancouver, WA created the Sustainable Communities Pilot Program: departs from code requirements that may discourage or prevent Living Building Challenge Imperatives
45	h	Recognition	Eden Brukman	eden.brukman @ living-future.org	08/20/11	N5	Living Building Challenge is referenced by dozens of Cities directly as a certification system, or indirectly by posting findings from the Institute's various research reports as resources for their constituents. Several instances of regulatory reform cite the Living Building Challenge (Links to details about each as online: https://ilbi.org/education/regreform). The following is a list of focused efforts in the Pacific Northwest; Living Building Challenge project teams all over the world are presenting viable alternatives to existing codes in order to create Living Buildings, Sites and Communities (The Institute is collecting these examples of reform in the documentation provided by project teams for certification and will publicize this information on the program website). - Bainbridge Island, WA. Ordinance 2009–06: offers flexible development + density incentives for housing projects - Seattle, WA. Living Building Pilot: additional flexibility + gives special assistance for Living Building Challenge

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							projects □ - Seattle, WA. Priority Green (formerly Green Q): provides expedited appointments + individual assistance for permit review, public recognition for effort □ - Clark County and City of Vancouver, WA. Sustainable Communities Pilot Program: departs from code requirements that may discourage or prevent Living Building Challenge Imperatives - Portland, OR. Green Building Policy (proposed): rebates up to $17.30/ft^2 for projects pursuing Living Building Challenge □ - Eugene, OR. Guide 2 Green: grants prioritized plan reviews and inspections, one-day permits and reduced system development charges The Institute has provided consulting or served as an advisor to more than 20 cities to inform their sustainability goals. There are active Living Building Challenge Collaboratives [See Comment 39 – U7] in 11 cities, and training is in-progress for the initiation of 10 Collaboratives in other areas.
46	h	Recognition	Eden Brukman	eden.brukman @ living-future.org	08/20/11	N6	There are currently 87 active registered projects, and the Institute is aware of an additional 30+ that have not yet formally registered. There are also approximately 20 registered projects not included in the count above that have been archived due to undefined hold or discontinuation, mostly due to shifted economic influences in 2008 and 2009.
47	h	Recognition	Eden Brukman	eden.brukman @ living-future.org	08/20/11	N8	Thousands of building industry professionals are involved with the Living Building Challenge (both nationally and internationally) such as designers, engineers, contractors, product manufacturers, developers, sustainability consultants, regulatory officials, etc.

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							Individuals have participated as members of project teams, volunteer Ambassadors [See Comment 39 – U7], or attendees to conferences and/or workshops offered by the Institute.
48	h	Recognition	Eden Brukman	eden.brukman @ living-future.org	08/20/11	N9	Living Building Challenge does not have a membership model.
49	h	Recognition	Eden Brukman	eden.brukman @ living-future.org	08/20/11	N10	Among other, smaller associations, two of the most relevant organizations to green building both have recognized and supported the Living Building Challenge: - American Institute of Architects (http://www.aia.org/advocacy/local/AIAS076929?dvid=&recspec=AIAS076929) Living Building Challenge was the reference standard for the AIA Committee on Design "Ideas Competition" in 2009 and 2010 - The US Green Building Council has publicly endorsed the Living Building Challenge
50	h	Recognition	Eden Brukman	eden.brukman @ living-future.org	08/20/11	N11	*Replace text* - National Institute of Building Sciences, Whole Building Design Guide: http://www.wbdg.org/resources/livingbuildings.php - EPA - Region 9, Green Building: Green Building and Energy Codes http://www.epa.gov/region9/greenbuilding/building-codes.html - Office of Brownfields and Land Revitalization - General Services Administration, Strategic Sustainability Performance Plan: http://www.gsa.gov/portal/content/186749

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							- National Parks Service
51	h	Recognition	Eden Brukman	eden.brukman @ living-future.org	08/15/11	N13	*Replace text* There are no certified Federal buildings, but there are two Federal projects that have been registered by the National Parks Service.
52	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/15/11	RNC1	None.
53	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/15/11	RNC2	None.
54	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC4	*Add* This Imperative may be attempted using the Scale Jumping design overlay, which endorses the implementation of solutions beyond the building scale that maximize ecological benefit while maintaining self-sufficiency at the city block, neighborhood, or community scale. There is an exception for water that must be from potable sources due to local health regulations, including sinks, faucets and showers but excluding irrigation, toilet flushing, janitorial uses and equipment uses. However, due diligence to comply with this Imperative must be demonstrated by filing an appeal(s) with the appropriate agency (or agencies). An exception is made for an initial water purchase to get cisterns topped off. A Living Building Challenge project only buys water

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							once. [See Footnotes 28-30 on page 20 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf
55	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC10	*Add* This Imperative may be attempted using the Scale Jumping design overlay, which endorses the implementation of solutions beyond the building scale that maximize ecological benefit while maintaining self-sufficiency at the city block, neighborhood, or community scale. There is an exception for water that must be from potable sources due to local health regulations, including sinks, faucets and showers but excluding irrigation, toilet flushing, janitorial uses and equipment uses. However, due diligence to comply with this Imperative must be demonstrated by filing an appeal(s) with the appropriate agency (or agencies). An exception is made for an initial water purchase to get cisterns topped off. A Living Building Challenge project only buys water once. [See Footnotes 28-30 on page 20 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf
56	i	Robustness	Eden Brukman	eden.brukman @ living-	08/19/11	RNC16	*Add* This Imperative may be attempted using the Scale Jumping design

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				future.org			overlay, which endorses the implementation of solutions beyond the building scale that maximize ecological benefit while maintaining self-sufficiency at the city block, neighborhood, or community scale. There is an exception for water that must be from potable sources due to local health regulations, including sinks, faucets and showers but excluding irrigation, toilet flushing, janitorial uses and equipment uses. However, due diligence to comply with this Imperative must be demonstrated by filing an appeal(s) with the appropriate agency (or agencies). An exception is made for an initial water purchase to get cisterns topped off. A Living Building Challenge project only buys water once. [See Footnotes 28-30 on page 20 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf] Imperative 06: Ecological Water Flow One hundred percent of storm water and building water discharge must be managed onsite to feed the project's internal water demands or released onto adjacent sites for management through acceptable natural time-scale surface flow, groundwater recharge, agricultural use or adjacent building needs. Municipal storm sewer solutions do not qualify as acceptable

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
							onsite storm water management practices. For Building projects that have a F.A.R. equal to or greater than 1.5 in Transects L5 or L6, a conditional exception may apply, which allows some water to leave the site at a reduced rate and depends on site and soil conditions and the surrounding development context. Greater flexibility is given to projects with higher densities. [See page 21 (including Footnote 31) of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf] Imperative 01: Limits to Growth (*partial)* On-site landscape may only include native and/or naturalized species planted in such a way that emulates density and biodiversity of indigenous ecosystems and supports succession. [See page 15 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf]
57	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC22	*Add* Municipal storm sewer solutions do not qualify as acceptable onsite storm water management practices. For Building projects that have a F.A.R. equal to or greater than 1.5 in Transects L5 or L6, a conditional exception may apply, which allows some water to leave the site at a reduced rate and depends on site and soil conditions and the surrounding

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
							development context. Greater flexibility is given to projects with higher densities. [See page 21 (including Footnote 31) of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf] Imperative 01: Limits to Growth (*partial)* On-site landscape may only include native and/or naturalized species planted in such a way that emulates density and biodiversity of indigenous ecosystems and supports succession. [See page 15 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf]
58	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC27	The Institute avoids prescriptive paths to certification, and as such does not provide a list of products to use. However, the performance-based requirements of Imperative 05: New Zero Water necessitate that project teams strictly evaluate products based on their water conservation potential.
59	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC28	EPA's WaterSense listings are noted as a resource for project teams in the Dialogue, and in the Water book of the Petal Series (currently in pre-published draft form).
60	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC33	*Add* Living Building Challenge frames energy efficiency in the context of the carrying capacity of the site, and as such, requires that the

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							project performs within this parameter. When the Scale Jumping overlay is used by project teams to achieve Net Zero Energy, they are required to demonstrate that a project's demand does not exceed the proportional amount of energy available. The Institute emphasizes the primary strategy of optimizing energy efficiencies prior to installing renewable energy systems. The Case Studies for certified projects indicate the following metrics: - Hawaii Preparatory Academy Energy Lab: 3.23 kWh/sq ft (https://ilbi.org/lbc/casestudies/HPAenergylab/energy) - Omega Center for Sustainable Living: 28.3 kWh/sq ft (https://ilbi.org/lbc/casestudies/omega/energy) - Tyson Living Learning Center: 33.1 kWh/sq ft (https://ilbi.org/lbc/casestudies/tllc/energy)
61	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC34	*Add* This Imperative may be attempted using the Scale Jumping design overlay, which endorses the implementation of solutions beyond the building scale that maximize ecological benefit while maintaining self-sufficiency at the city block, neighborhood, or community scale. This must include all electricity, heating and cooling requirements. Back-up generators are excluded. System may be grid-tied or off the grid. Renewable energy is defined as passive solar, photovoltaics, solar thermal, wind turbines, water-powered microturbines, direct geothermal or fuel cells powered by hydrogen generated from renewably powered electrolysis – nuclear energy is not an

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							acceptable option. No combustion of any kind is allowed. [See Footnotes 32-34 on page 23 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf]
62	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC39	*Replace Text* To meet the requirements of the Living Building Challenge, 100% of all water heating systems must be powered with renewable energy systems.
63	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC40	*Add* This Imperative may be attempted using the Scale Jumping design overlay, which endorses the implementation of solutions beyond the building scale that maximize ecological benefit while maintaining self-sufficiency at the city block, neighborhood, or community scale. This must include all electricity, heating and cooling requirements. Back-up generators are excluded. System may be grid-tied or off the grid. Renewable energy is defined as passive solar, photovoltaics, solar thermal, wind turbines, water-powered microturbines, direct geothermal or fuel cells powered by hydrogen generated from renewably powered electrolysis – nuclear energy is not an acceptable option. No combustion of any kind is allowed. [See Footnotes 32-34 on page 23 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-

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							0.pdf]
64	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC45	*Replace Text* Measurement and verification is fundamental to the documentation for the Energy and Water Petal requirements in the Living Building Challenge. - Imperative 05: Net Zero Water - Monthly readings throughout the 12-month occupancy period from meter(s) or other onsite tracking systems that clearly record the amount of water received by the project from every source (including cisterns). - Imperative 07: Net Zero Energy - Monthly readings throughout the 12-month occupancy period from meter(s), other onsite tracking systems or web-link to online mechanism that clearly records energy produced and consumed. [Refer to the Appendix for a soft copy of the Documentation Requirements.]
65	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC46	Performance. Metering is required to track the following: - Water: actual onsite collection methods (e.g. well, rainwater, other) and reuse methods (e.g. infiltration, irrigation/landscaping, non-potable use, potable use, other) - Water: completed water use table listing total actual water use, volume of potable water supplied by Utility (if applicable), volume of water harvested onsite. - Energy: completed energy use table listing total actual energy generated, actual energy used for heating, cooling, lighting, fans/pumps, plug loads/equipment, vertical

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							transportation, domestic hot water, other.
66	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC49	*Replace Text* Benchmarking is part of the documentation process for the Energy and Water Petal requirements in the Living Building Challenge. Project teams are required to provide the simulated/design water and energy demand, as well as list any/all tools used for the calculations. This information is then compared to the actual performance data provided, and published in the public Case Studies online. [Refer to the Appendix for a soft copy of the Documentation Requirements.]
67	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC65	*Delete "However, there is no specific requirements."* *[See Comment 68 – RNC66 for list of specific requirements.]*
68	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC66	- Imperative 09: Healthy Air (*excerpt*) - "Conduct air quality testing at pre-occupancy and after nine months of occupancy to measure levels of Respirable Suspended Particulates (RSP) and Total Volatile Organic Compounds (TVOC)." - Imperative 10: Biophilia - "The project must be designed to include elements that nurture the innate human attraction to natural systems and processes. Each of the six established Biophilic Design Elements39 must be represented for every 2,000 m2 of the project: Environmental features; Natural shapes and forms; Natural patterns and processes; Light and space; Place-based relationships; Evolved human-nature relationships." - Imperative 11: Red List - "The project cannot contain any of the following Red List materials or chemicals: Asbestos;

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							Cadmium; Chlorinated Polyethylene and Chlorosulfonated Polyethlene; Chlorofluorocarbons (CFCs); Chloroprene (Neoprene); Formaldehyde (added); Halogenated Flame Retardants; Hydrochlorofluorocarbons (HCFCs); Lead (added); Mercury; Petrochemical Fertilizers and Pesticides; Phthalates; Polyvinyl Chloride (PVC); Wood treatments containing Creosote, Arsenic or Pentachlorophenol. There are temporary exceptions for numerous Red List items due to current limitations in the materials economy. Refer to the Living Building Community Dialogue for complete and up-to-date listings." - Imperative 13: Responsible Industry - "The project must advocate for the creation and adoption of third-party certified standards for sustainable resource extraction and fair labor practices. Applicable raw materials include stone and rock, metal, and timber. For timber, all wood must be certified by the Forest Stewardship Council (FSC), from salvaged sources, or from the intentional harvest of timber onsite for the purpose of clearing the area for construction." - Imperative 14: Appropriate Sourcing - The project must incorporate place-based solutions and contribute to the expansion of regional economy rooted in sustainable practices, products and services. Source locations for materials and services must adhere to listed restrictions. [See pages 32-33 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf] - Imperative 15: Conservation + Reuse (*excerpted*)- "All projects teams must strive to reduce or eliminate the production of waste during design, construction, operation, and end of life in order to conserve natural resources. Project teams must create a material conservation management plan that explains how the project optimizes materials in each of the following phases: Design Phase, including the consideration of appropriate durability in product

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							specification; Construction Phase, including product optimization and collection of wasted materials…"
69	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC69	*Delete (The Pharos Project is not required and does not function as a protocol)* US EPA Design for the Environment (DfE) is referenced as a resource for understanding thresholds for disclosure of ingredients for Imperative 11:Red List.
70	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC72	Design and Performance
71	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC84	Design and Performance *Add* Imperative 09: Healthy Air (*excerpt*) - "Conduct air quality testing at pre-occupancy and after nine months of occupancy to measure levels of Respirable Suspended Particulates (RSP) and Total Volatile Organic Compounds (TVOC)."
73	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC90	Design and Performance *Add* Imperative 09: Healthy Air (*excerpt*) - "Ventilation rates must be designed to comply with ASHRAE 62 and equipment must be installed to monitor levels of carbon dioxide (CO_2), temperature and humidity. Conduct air quality testing at pre-occupancy and after nine months of occupancy to measure levels of Respirable Suspended Particulates (RSP) and Total Volatile Organic

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
							Compounds (TVOC)." Testing reports must include the following for each location: - Test location (Name of Room or Area) - RSP (ug/m^3 or ug/ft^3) - TVOC (ug/m^3 or ug/ft^3) - (CO_2) (ppm) - Temperature (ºF or ºC) - Relative Humidity (%)
74	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC95	Living Building Challenge includes requirements for compliance with ASHRAE 62 and required testing throughout the project for temperature and relative humidity.
79	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC96	Design and Performance Imperative 08: Civilized Environment: Every occupiable space must have operable windows that provide access to fresh air and daylight. As part of the site visit, the auditor may take daylight measurements. The team is encouraged to take into account the acceptable range for daylight factors based on the function of the space. Imperative 09: Healthy Air (*excerpt*) - "Ventilation rates must be designed to comply with ASHRAE 62 and equipment must be installed to monitor levels of carbon dioxide (CO_2), temperature and humidity. Conduct air quality testing at pre-occupancy and after nine months of occupancy to measure levels of Respirable Suspended Particulates (RSP) and Total Volatile Organic Compounds (TVOC)." Testing reports must include the following for each location:

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
							- Test location (Name of Room or Area) - RSP (ug/m^3 or ug/ft^3) - TVOC (ug/m^3 or ug/ft^3) - (CO_2) (ppm) - Temperature (ºF or ºC) - Relative Humidity (%)
80	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC102	Design and Performance *Add* As part of the site visit, the auditor may take daylight measurements. The team is encouraged to take into account the acceptable range for daylight factors based on the function of the space.
81	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC107	Design and Performance As part of the site visit, the auditor will observe smoking patterns of occupants and project visitors, as well as any related printed/posted instructions.
82	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC118	Living Building Challenge reduces the potential for exposure and by requiring that project teams focus on specifying products that do not compromise human and ecological health.
83	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC119	Design and Performance *Add* Imperative 11: Red List - “The project cannot contain any of the following Red List materials or chemicals: Asbestos; Cadmium; Chlorinated Polyethylene and Chlorosulfonated Polyethlene; Chlorofluorocarbons (CFCs); Chloroprene (Neoprene);

Comment #	Section #	Section	Reviewer	Contact Information	Date	Question ID	Comments
							Formaldehyde (added); Halogenated Flame Retardants; Hydrochlorofluorocarbons (HCFCs); Lead (added); Mercury; Petrochemical Fertilizers and Pesticides; Phthalates; Polyvinyl Chloride (PVC); Wood treatments containing Creosote, Arsenic or Pentachlorophenol. Imperative 09: Healthy Air (*excerpt*) – "Conduct air quality testing at pre-occupancy and after nine months of occupancy to measure levels of Respirable Suspended Particulates (RSP) and Total Volatile Organic Compounds (TVOC)." Testing reports must include the following for each location: - Test location (Name of Room or Area) - RSP (ug/m^3 or ug/ft^3) - TVOC (ug/m^3 or ug/ft^3) - (CO_2) (ppm) - Temperature (ºF or ºC) - Relative Humidity (%)
84	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC133	Design and Performance *Replace "Care" with "Car" so that the text reads "04 Car Free Living"* *Add* - Imperative 16: Human Scale and Humane Places The project must be designed to create human-scaled rather than automobile-scaled places, so that the experience brings out the best in humanity and promotes culture and interaction. In context of the character of each Transect, there are specific maximum (and sometimes minimum) requirements for paved areas, street and block design,

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							building scale and signage that contribute to livable places. [Refer to the Appendix for a soft copy of detailed guidelines.] - Imperative 17: Democracy + Social Justice All primary transportation, roads and non-building infrastructure that are considered externally focused must be equally accessible to all members of the public regardless of background, age and socioeconomic class including the homeless, with reasonable steps taken to ensure that all people can benefit from the project's creation. (There is an exception for instances wherein such access would seriously threaten the security of the public directly or indirectly.) For all projects types located in Transect L3-L6, street furniture (such as benches) must be provided for and accessible to all members of society. For the Neighborhood typology, a minimum of fifteen percent of housing units must meet an affordable housing standard. Provisions must be in place for these units to remain affordable through time. Access for those with physical disabilities must be safeguarded through designs meeting the Americans with Disabilities Act (ADA). - Imperative 18: Rights to Nature The project may not block access to, nor diminish the quality of, fresh air, sunlight and natural waterways for any member of society or adjacent developments. Fresh Air: The project must be designed to protect adjacent properties from any noxious emissions that would compromise its ability to use natural ventilation. All operational emissions must be free of Red List chemicals, persistent bioaccumulative toxicants, and known or suspect carcinogenic, mutagenic and reprotoxic chemicals. Sunlight: The project may not block sunlight to adjacent building façades and rooftops such that they are shaded above the maximum height allotted per the listed

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							restrictions. [See page 39 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf] Natural Waterways (such as ocean shoreline, rivers, lakes, wetlands, ponds, and creeks): The project may not restrict access82 to the edge of any natural waterway, except where such access can be proven to be a hazard to public safety or would severely compromise the function of the development. No project may assume ownership of water contained in these bodies or compromise the quality or quantity that flows downstream. If a project's boundary is more than sixty meters long parallel to the edge of the waterway, the project must incorporate and maintain an access path to the waterway from the most convenient public right-of-way. The pathway must be at least three meters wide and allow entry to both pedestrians and bicyclists.
85	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC135	*Replace text* "The Living Building Challenge does not dwell on basic best practice issues so it can instead focus on fewer, high level needs. It is assumed that to achieve this progressive standard, typical best practices are being met. The implementation of this standard requires leading-edge technical knowledge, an integrated design approach, and design and construction teams well versed in advanced practices related to 'green building'." [See page 10 of the standard – Living Building Challenge 2.0 https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf] Project teams tend to include a more diverse range of practitioners, drawing expertise from less conventional areas of influence and allowing for a deeply integrated design process. [To view a testimonial from a project team about integrated design in the

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							Living Building Challenge, see this video: Integrative Design: Phipps – A Case Study, created without Institute involvement. http://www.youtube.com/phippsconservatory#p/u/5/rETpS0uq7_E] This topic is also discussed on the Dialogue, as in this excerpted response to a project team's query about the use of certain structural materials: "*There are certainly trade-offs for most material decisions and the early stages of a project are ideal to investigate available structural materials that do not contain Red List materials or have the potential to compromise Responsible Industry. Ideally, an integrated design process would make room for the manufacturer at the table.* *We encourage project teams to consider all available options to satisfy a system's functional requirements. This suggests a possible departure from current conventional details and assemblies, once again bringing focus to the fundamental question of the performance-based needs that the system is expected to fulfill. Any individual product's role may shift (or be eliminated) when evaluating design through this lens.*"
86	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC136	The Institute offers an optional service to project teams that includes the facilitation of a 1-, 2- or 3-day charrette, or kick-off meeting. This process requires an integrated process by having a broad cross-section of stakeholders present to define fundamental, strategic goals. The charrette should take place at the beginning of a project when the potential to explore is at its fullest. The one-day meeting format focuses on fostering an interactive dialogue that

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							allows participants to consider each area of impact. The two- or three-day format allows time for a deeper examination of promising ideas. The Institute designs the agenda, facilitates the session, and provides a follow-up summary. [Refer to the Appendix for a soft copy of a promotional flyer introducing some of the optional technical assistance services available to project teams.] The Living Building Challenge establishes performance goals for site, water, energy, indoor environmental quality (health), materials, social equity and beauty – because certification is performance-based, these goals must be incorporated throughout the design and lifecycle of the building.
87	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC137	The Institute helps users achieve cost savings through integrated design. A few examples include: - Charette facilitation [See Comment 86 – RNC136] - Education. e.g., The 6-hr "Understanding the Living Building Challenge" workshop (offered publicly, on-line for asynchronous learning, or privately as in-house sessions) includes discussion about the hard costs of various project types and design strategies, and demonstrates the benefits of a holistic and integrated approach. [Refer to the Appendix for a soft copy of sample slides "Tunneling Through Costs" from this workshop] - Research (publicly available). The Institute has completed three reports that address costs in the context of achieving advanced performance-based goals in site, water, energy, health, materials, equity and beauty. [Soft copies are available online: https://ilbi.org/education/reports] - Living Building Financial Study. April 2009 - Code and Regulatory Barriers to the Living Building

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							Challenge for Sustainable, Affordable, Residential Development (SARD), Part 3: Cost Benefit Summary. June 2009 - Quantifying the Value of Building Reuse. August 2011
88	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/19/11	RNC138	Living Building Challenge cites Commissioning as a key strategy for success in achieving the requirements for Imperative 07: Net Zero Energy, though as a rule, the Institute avoids prescriptive paths to certification. The Institute explicitly notes that a "copy of commissioning reports or other design or construction documents identifying corrections and/or improvements made to the system(s) or envelope throughout the 12-month occupancy period" may be included with the project team's documentation.
89	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC142	Living Building Challenge requires that project teams calculate the project's total embodied carbon footprint (tCO_2e), and purchase Certified Emission Reduction credits or Verified Emission Reduction credits from qualifying renewable energy projects.
90	i	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	RNC143	Evidence of Intent Imperative 12: Embodies Carbon Footprint The project must account for the total footprint of embodied carbon (tCO_2e) from its construction and projected replacement parts through a one-time carbon offset tied to the project boundary. Superstructure and interior components of floors, walls and ceilings are included in the calculation of projected replacement parts based on a 100-year life expectancy of the building. The amount of carbon offsets required may be reduced by 50 percent for renovations of existing buildings. [See page 30 of the standard – Living Building Challenge 2.0

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							https://ilbi.org/lbc/Standard-Documents/LBC2-0.pdf] Project teams must document the following characteristics about the carbon offsets that are purchased: - Renewable energy projects that ensure real, verifiable, permanent carbon reductions. - Green-e certified (3rd party verification) - Proven Additionality - Forecasted performance - Unique Recipients - Transparency / Education to buyers - Social co-benefits - Minimal environmental impacts Documentation must include the following: - Project embodied carbon footprint TCO_2e (with calculations) - Name of Carbon Offset project - Location of Carbon Offset project (City, State/Province, Country) - Name of Carbon Offset provider - Carbon Offset provider's website
91	j	Robustness	Eden Brukman	eden.brukman @ living-future.org	08/20/11	REB1-REB145	***Please refer to Comments 53 – 92 (RNC1-RNC143) for suggested modifications to the information currently listed in the parallel questions relating to the Robustness of the certification system as it applies to Existing Buildings (REB).***

Appendix K: Certification System Mapping to Measured, Calculated, and Evidence of Intent

Note: The numbers in the left-hand column of each certification system reflect the numbering system used by the certification systems.

NEW CONSTRUCTION

Calculated
Measured
Evidence of Intent

Green Globes			LEED			Living Building Challenge	
NC			NC			Building	
Site			Sustainable Site			Site	
7.1 Site Development	33		PR	**Construction Activity Pollution Prevention**		1	**Limits to growth**
7.1.1 Urban Infill, Urban Sprawl and Public Transportation				Create and implement an erosion and sedimentation control plan			Projects may only be built on greyfields, brownfields, or previously developed sites
7.1.1.1 Within a commercial zone	3						
7.1.1.2 Close to public transportation	4						
7.1.1.3 Bicycle facilities	1~3						
7.1.1.4 Previously developed site	3						
7.1.2 Greenfields, Brownfields and Floodplains							
7.1.2.1 Remediated brownfield or superfund site	15						
7.1.2.2 Greenfields	3						
7.1.2.3 100-year flood plain	2						
7.2 Ecological Impacts	25		1	**Site Selection**	1	2	**Urban Agriculture**
7.2.1 Site Disturbance and Erosion						SJ	All projects Must integrate opportunities for agriculture.
7.2.1.1 Soil control strategies during construction	1~5						
7.2.1.2 Tree preservation	2						
7.2.1.3 Construction activities management	2						
7.2.2 Heat Island Effect							
7.2.2.1 Increase vegetated space by 10%	2						
7.2.2.2 Vegetated roof or roofing surface SRI requirements	2~6						
7.2.2.3 Paved surfaces SRI requirements	2						
7.2.2.4 Trees shading	3						
7.2.2.5 Wall surface SRI requirements	1						
7.2.3 Bird Collisions	1~2						
7.3 Watershed Features	27		2	**Development Density and Community Connect**	5	3	**Habitat Exchange**
7.3.1 Storm Water Management						SJ	For each hectare of development, an equal amount of land (min. 0.4 hectare) Must be set-aside in perpetuity as part of a habitat exchange.
7.3.1.1 Storm water runoff	10						
7.3.1.2 Site boundaries	8						
7.3.1.3 Vegetated roof	1~9						
7.4 Site Ecology	28		3	**Brownfield Redevelopment**	1	4	**Car Free Living**
7.4.1 Landscape and Irrigation							The proposed development may not lower the density of the existing site or the catchment area of the Transect
7.4.1.1-7 25%-100% of exterior vegated spaces	7~28						
7.4.1.8 Landscaping							
7.4.8.1.1 Landscape and Irrigation plan	2						
7.4.8.1.2 Plan palette measures	8						
7.4.8.1.3 Soil requirements	1						
7.4.8.1.4 Organic Mulch	1						
7.4.8.1.5 Group plants	2						
7.4.8.1.6 Native plants	3						
7.4.8.1.7 Pervious materials	1						
7.4.1.9 Irrigation							
7.4.1.9.1 No irrigation	1~10						
7.4.1.9.2 Irrigation system	1~3						
7.4.1.9.3 Swing joints or flex pipes	1						

Green Globes			LEED			Living Building Challenge	
7.4.1.9.4	Irrigation control technology	1					
7.4.1.9.5	Best practice	5					
7.5	**Exterior Light Pollution**	7	**4.1**	**Alternative Transportation—Public Transporta**	6		
7.5.1	**Exterior Light Pollution**						
7.5.1.1	**Light fixture photometric and output**	3					
7.5.1.2	**Lamp output and Cutoff**	2					
7.5.1.3	**Light fixture location**	2					
	Total Points	**120**					
	Possible n/a	**52**	**4.2**	**Alternative Transportation—Bicycle Storage ar**	1		
	Minimum requirement	**24%**	**4.3**	**Alternative Transportation—Low-Emitting and**	3		
			4.4	**Alternative Transportation—Parking Capacity**	2		
			5.1	**Site Development—Protect or Restore Habitat**	1		
			5.2	**Site Development—Maximize Open Space**	1		
			6.1	**Stormwater Design—Quantity Control**	1		
			6.2	**Stormwater Design—Quality Control**	1		
			7.1	**Heat Island Effect—Non-roof**	1		
			7.2	**Heat Island Effect—Roof**	1		
			8	**Light Pollution Reduction**	1		
Water			**Water Efficiency**			**Water**	
9.1	**Points Calculation Methodology for the Water Assessment Area**		**PR**	**Water Use Reduction—20% Reduction**		**5**	**Net Zero Water**
						SJ	**100% of occupants' water use Must come from captured precipitation or closed loop water systems that account for downstream ecosystem impacts and that are appropriately purified without the use of chemicals.** Exception: For water that Must be from potable sources due to local health regulations, including sinks, faucets and showers but excluding irrigation, toilet flushing, janitorial uses and equipment uses.
9.2	**Plumbing Fixtures and Fittings, Appliances and Equipment**	46	**1**	**Water Efficient Landscaping**	2~4	**6**	**Ecological Water Flow**
9.2.1	**Plumbing Fixtures and Fittings, Appliance and Equipment**			**Reduce by 50% or No Potable Water Use or Irrigation**		**SJ**	**100% of storm water and building water discharge Must be managed onsite to feed the project's internal water demands or released onto adjacent sites for management through acceptable natural time-scale surface flow, groundwater recharge, agricultural use or adjacent building needs.** For Building projects that have a F.A.R. equal to or greater than 1.5 in Transects L5 or L6, a conditional exception may apply, which allows some water to leave the site at a reduced rate and depends on site and soil conditions and the surrounding development context. Greater flexibility is given to projects with higher densities.
9.2.1.1	Met or surpassed Energy Policy Act of 1992 by a min. of 25%	6~24					
9.2.1.2	Fixture and fittings in compliance with EPA WaterSense Program	18					
9.2.1.3	EnergyStar labeled residential clothes washers and dish washers	2~4					
9.3	**Cooling Towers**	18	**2**	**Innovative Wastewater Technologies**	2		
9.3.1	**Cooling Towers Cooling tower water quality**						
9.3.1.1	Cooling tower water quality	4~6					
9.3.1.2	Cooling tower water treatment program (controllers and	6					
9.3.1.3	% of sensible (dry) cooling	1~4					
9.3.1.4	Drift Eliminators efficiency	2					
9.4	**Boilers and Water Heaters**	3	**3**	**Water Use Reduction**	2~4		
9.4.1	**Meters and controllers**			**Reduce by 30%, 35%, 40%**			

Green Globes			LEED		Living Building Challenge	
9.4.1.1	Boilers and water heater features	3				
9.5	**Commercial Food Service Operations**	12				
9.5.1	**Commercial Food Service Equipment**					
9.5.1.1	No one-through water-cooled equipment	3				
9.5.1.2	No water-fed garbage disposals	2				
9.5.1.3	Energy Star Ice machines	2				
9.5.1.4	Combination ovens maximum hourly water use	1~2				
9.5.1.5	Pre-rinse spray valves met EPA 2005	1				
9.5.1.6	Boilerless/connectionless food steamers maximum	1				
9.5.1.7	Energy Star dish washer	1				
9.6	**Medical/Dental and Laboratory Facilities**	11				
9.6.1	**Medical/Dental and Laboratory Equipment**					
9.6.1.1	Steam sterilizer	2~4				
9.6.1.2	Non-potable water for once through cooling	3				
9.6.1.3	Install dry vacuum systems	2				
9.6.1.4	Digital imaging technology or film processors with water	1				
9.6.1.5	Wet scrubbers with water recirculation systems	1				
9.7	**Commercial/Institutional Laundry Operations**	10				
9.7.1	**Commercial/Institutional On-Premise Laundry Equipment**					
9.7.1.1	Water factor for clothes washers	1~10				
9.8	**Special Water Features**	4				
9.8.1	**Special Water Features (e.g. swimming pools, spas, ornamental fountains, water playscapes)**					
9.8.1.1	Reuse within the system	1				
9.8.1.2	Meters for potable water makeup lines	1				
9.8.1.3	Alternate sources of water for makeup water	2				
9.9	**Water Treatment**	5				
9.9.1	**Water Treatment**					
9.9.1.1	Equip filtration systems with pressure drop gauges	2				
9.9.1.2	Reverse osmosis systems performance	2				
9.9.1.3	Equip water softeners with recharge controls	1				
9.10	**Alternate Sources of Water**	15				
9.10.1	**Alternate Sources of water**					
9.10.1.1	Minimum 15% non-potable water applications	2~15				
9.11	**Metering**	6				
9.11.1	**Meter Data Management System**	4				
9.11.2	**Makeup Meters (for chilled or hot water loops)**	2				
	Total Points	**130**				
	Possible n/a	**62**				
	Minimum requirement	**26%**				

Energy			Energy and Atmosphere		Energy	
8.1	**Building CO_2e Emissions -- Path A**	250	PR	**Fundamental Commissioning of Building**	7	**Net Zero Energy**
8.1.1	**Percent Reduction in CO2e Emissions (min. 50%)**	150~250			SJ	**100% of the project's energy needs must be supplied by on-site renewable energy on a net annual basis.**
8.2	**Demand -- Path A**	40	PR	**Minimum Energy Performance**		
8.2.1	**Passive Demand Reduction**					
8.2.1.1	Thermal mass in wall construction (building envelope)	4				
8.2.1.2	Thermal mass in wall construction (interior partitions)	4				
8.2.1.3	Thermal mass in floor construction	4				
8.2.2	**Thermal Energy Storage System (% of offsetting of peak demand)**	4~12				
8.2.3	**Power Demand Reduction**	8				

Green Globes			LEED			Living Building Challenge
8.2.4	Demand Capable Energy Management System (% reduction)	8				
8.3	Measurement and Verification -- Path A	10	PR	Fundamental Refrigerant Management		
8.3.1	Measurement and Verification Protocol					
8.3.1.1	Energy Metering Reporting Plan in the O&M Manual	8				
8.3.1.2	M&V program in accordance with EVO's IPMVP	2				
8.4	Building Opaque Envelope -- Path B (Prescript	42	1	Optimize Energy Performance	1~19	
8.4.1	Thermal Resistance and Transmittance (min. R value)	12		Option 1: Improve by 12%-48% for New Buildings or 8%-44% for Existing Building Renovations		
8.4.2	Orientation (window to wall ratio)	1~6		Option 2: Prescriptive Compliance Path: ASHRAE Advanced Energy Design Guides	1	
8.4.3	Fenestration Systems			Option 3: Prescriptive Compliance Path: Advanced BuildingsTM Core Performance Guide	1~3	
8.4.3.1	U-factors of the fenestration system	12		*Note: Options 2 & 3 are not represented graphically because they offer limited points*		
8.4.3.2	SHGC of the fenestration system	12				
8.5	Daylighting -- Path B	15	2	On-Site Renewable Energy	1~7	
8.5.1	Daylighting			1-13% renewable energy		
8.5.1.1	Min. 10% daylighted area	1~8				
8.5.1.2	Minimum effective aperture for vertical fenestration	4				
8.5.1.3	2-6% of the roof area installed with skylights	3				
8.6	HVAC Systems and Controls -- Path B	84	3	Enhanced Commissioning	2	
8.6.1	Cooling Equipment					
8.6.1.1	Base Efficiency	5				
8.6.1.2	Incremental efficiency improvement	1~10				
8.6.2	Cooling Towers					
8.6.2.1	Reduce fan energy consumption measures	3				
8.6.2.2	Install waterside economizer system	3				
8.6.3	Heat Pumps (efficiency)	5~12				
8.6.4	Heating Equipment (efficiency)	1~12				
8.6.5	Condensate Recovery (% of condensate return)	1~3				
8.6.6	Steam Traps	2				
8.6.7	Domestic Hot Water Heater	2				
8.6.8	(% of)Variable Speed Control of Pumps	1~5				
8.6.9	Minimizing Reheat and Re-cool	1~8				
8.6.10	Air Economizers					
8.6.10.1	Use outdoor air for cooling in place of mechanical cooling	1				
8.6.10.2	Controls to shut outdoor air and exhaust air dampers	1				
8.6.10.3	Low leakage dampers for air handling systems	1				
8.6.11	Fans and Duckwork					
8.6.11.1	Max. pressure drop and noise criteria	1				
8.6.11.2	Flexible duct work requirements	1				
8.6.11.3	Overall leak rate < 5%	1				
8.6.11.4	Meet NEMA's Premium Energy Efficiency Motor Program	1				
8.6.11.5	Variable speed fans or energy management control system	2				
8.6.12	Demand Control Ventilation					
8.6.12.1	Use occupancy and/or CO2 sensors to control ventilation	5				
8.6.12.2	Ventilating heat recovery	5				
8.7	Lighting Systems and Controls -- Path B	38	4	Enhanced Refrigerant Management	2	
8.7.1	Total Lighting Power Density	13				
8.7.2	Interior Automatic Light Shutoff Controls	3				
8.7.3	Light Reduction Controls	7				
8.7.4	Controls for Daylighted Zones	2~6				

Green Globes			LEED			Living Building Challenge	
8.7.5	Exterior Lighting Controls	2~3					
8.7.6	Exterior Luminaires						
8.7.6.1	Lamp efficacy and Cutoff	4					
8.7.6.2	Pulse-start, metal halide for all exterior lighting	2					
8.8	**Elevator and Conveyance Systems -- Path B**	5	**5**	**Measurement and Verification**	3		
8.8.1	Elevators and Escalators						
8.8.1.1	Regenerative braking elevators	3					
8.8.1.2	Capability to slow down or stop when no traffic	2					
8.9	**Renewable Energy -- Path B**	50	**6**	**Green Power**	2		
8.9.1	Off-site Renewable Energy	1~50					
8.9.2	On-site Renewable Energy	1~50					
	Total Points (Path A)	**300**					
	Possible n/a (Path A)	**24**					
	Minimum requirement (Path A)	**50%**					
	Total Points (Path B)	**228**					
	Possible n/a (Path B)	**107**					
	Minimum requirement (Path B)	**33%**					
Indoor Environment			**Indoor Environmental Quality**			**Health**	
12.1	**Ventilation Systems**	39	**PR**	**Minimum Indoor Air Quality Performance**		**8**	**Civilized Environment**
12.1.1	Ventilation Air Quantity	10					Every occupiable space Must have operable windows that provide access to fresh air and daylight.
12.1.2	Air Exchange	10					
12.1.3	Ventilation Intakes and Exhausts	8					
12.1.4	CO2 Sensing and Ventilation Control Equipment	6					
12.1.5	Air Handling Equipment	5					
12.2	**Source Control of Indoor Pollutants**	34	**PR**	**Environmental Tobacco Smoke (ETS) Control**		**9**	**Healthy Air**
12.2.1	Volatile Organic Compounds	10					• Entryways Must have an external dirt track-in system and an internal dirt track-in system contained within a separate entry space.
12.2.2	Leakage, Condensation and Humidity	5					• All kitchens, bathrooms, copy rooms, janitorial closets and chemical storage spaces Must be separately ventilated and exhaust directly to outside air.
12.2.3	Access for HVAC Maintenance	4					• Ventilation rates Must be designed to comply with ASHRAE 62 and equipment Must be installed to monitor levels of carbon dioxide (CO2), temperature and humidity.
12.2.4	Carbon Monoxide Monitoring	3					• Smoking Must be prohibited within the project boundary.
12.2.5	Wet Cooling Tower	4					
12.2.6	Domestic Hot Water Systems	2					
12.2.7	Humidification and Dehumidification Systems	4					
12.2.8	Ventilation and Physical Isolation for Specialized Activities	2					
12.3	**Source Control**	6	**1**	**Outdoor Air Delivery Monitoring**	1	**10**	**Biophilia**
12.3.1	Pest and Contamination Control						Each of the six established Biophilic Design Elements39 Must be represented for every 2,000 m2 of the project:
12.3.1.1	Integrated pest management strategies	2					• Environmental features
12.3.1.2	Provide a sealed storage area for food/kitchen solid waste and recycling	2					• Natural shapes and forms
12.3.2	Radon Entry and Control	2					• Natural patterns and processes
12.4	**Lighting Design and Integration of Lighting Sy**	39	**2**	**Increased Ventilation**	1		• Light and space
12.4.1	Daylighting						• Place-based relationships
12.4.1.1	Min 10% of primary occupied spaces receive minim 25 fc daylight	3~11					• Evolved human-nature relationships
12.4.1.2	Min 10% of task areas have views to the outside	3~9					

Green Globes			LEED			Living Building Challenge	
12.4.1.3	Shading devices for southern, western, and eastern exposures	6					
12.4.2	**Lighting Design**						
12.4.2.1	Lighting levels in compliance with IESNA Lighting Handbook	7					
12.4.2.2	Reduce glare on VDT--Wall luminance (3:1 task to far surround luminance ratio)	2~6					
12.5	**Thermal Comfort**	20	**3.1**	**Construction IAQ Management Plan—During C**	1		
12.5.1	**Thermal Comfort Zones**	10					
12.5.2	**Thermal Comfort Design**	10					
12.6	**Acoustic Comfort**	22	**3.2**	**Construction IAQ Management Plan—Before C**	1		
12.6.1	**Acoustic Comfort Design**						
12.6.1.1	Acoustic design strategies for specific interior sound control performance targets	4					
12.6.1.2	Minimum Sound Transmission Class ratings of floor/celling assemblies, walls and doors between acoustically separated areas and adjacent spaces	2					
12.6.1.3	Impact Insulation Class of all floor-celling assemblies rating	2					
12.6.1.4	Reverberation Time in quiet areas and all other areas where speech intelligibility is important	2					
12.6.2	**Mechanical, Plumbing and Electrical Systems**						
12.6.2.1	Reduce background sound level performance associated with mechanical systems	4					
12.6.2.2	Minimize air-borne noise from the HVAC system	2					
12.6.2.3	Minimize structure-borne noise from the HVAC system	2					
12.6.2.4	Mitigate noise from the plumbing system	2					
12.6.2.5	Minimize noise from the electrical system	2					
	Total Points	**160**	**4.1**	**Low-Emitting Materials—Adhesives and Sealar**	1		
	Possible n/a	**32**	**4.2**	**Low-Emitting Materials—Paints and Coatings**	1		
	Minimum requirement	**32%**	**4.3**	**Low-Emitting Materials—Flooring Systems**	1		
			4.4	**Low-Emitting Materials—Composite Wood and**	1		
			5	**Indoor Chemical and Pollutant Source Control**	1		
			6.1	**Controllability of Systems—Lighting**	1		
			6.2	**Controllability of Systems—Thermal Comfort**	1		
			7.1	**Thermal Comfort—Design**	1		
			7.2	**Thermal Comfort—Verification**	1		
			8.1	**Daylight and Views—Daylight**	1		
			8.2	**Daylight and Views—Views**	1		

Resources/Materials			Materials and Resources			Material	
10.1	**Assemblies (Structural and Envelope)**	33/25	**PR**	**Storage and Collection of Recyclables**		**11**	**Red List**
10.1.1	**Assemblies--Path A**	1~33					**The project cannot contain any of the Red List materials or chemicals.** Exception: There are temporary exceptions for numerous Red List items due to Current limitations in the materials economy.
10.1.2	**Material Content Assemblies--Path B**						
10.1.2.1	Recycled content materials accounted for min 1% of building materials	1~8					
10.1.2.2	Bio-based products accounted for min 1% of building materials	1~7					
10.1.3	**Transportation of Harvested, Reclaimed Salvaged, or Extracted Materials--Path B**	1~5					
10.1.4	**Transportation of Processed or Manufactured Materials--Path B**	1~5					
10.2	**Furnishings, Finishes and Fit-outs**	17	**1.1**	**Building Reuse—Maintain Existing Walls, Floo**	1~3	**12**	**Embodied Carbon Footprint**

Green Globes			LEED			Living Building Challenge	
10.2.1	Furnishings, Finishes and Fit-outs--Life Cycle Assessment	1~4		Reuse 55%, 75%, 95%		SJ	The project Must account for the total footprint of embodied carbon (tCO2e) from its construction and projected replacement parts through a one-time carbon offset tied to the project boundary.
10.2.2	Material Content--Furnishing, Finishes and Fit-outs						
10.2.2.1	Recycled content materials accounted for min 1% of Furnishings, Finishes and Fit-outs	1~5					
10.2.2.2	Bio-based products accounted for min 1% of Furnishings, Finishes and Fit-outs	1~4					
10.2.3	Transportation of Harvested, Reclaimed Salvaged, or Extracted Materials	1~2					
10.2.4	Transportation of Processed or Manufactured Materials	1~2					
10.3	Other Material Properties	12	1.2	Building Reuse—Maintain 50% of Interior Non-	1	13	Responsible Industry
10.3.1	Off-Site Salvaged Materials	1~6					The project Must advocate for the creation and adoption of third-party certified standards for sustainable resource extraction and fair labor practices.
10.3.2	Certification of Wood-Based Products	1~6					
10.4	Reuse of Existing Structures	18	2	Construction Waste Management	1~2	14	Appropriate Sourcing
10.4.1	Reuse of Building Façade	1~6		50%, 75% recycled or salvaged			The project Must incorporate place-based solutions and contribute to the expansion of a regional economy rooted in sustainable practices, products and services. Source locations for materials and services Must adhere to the restrictions (500 km-20,004 km varied in type of materials and services).
10.4.2	Reuse of Structural Systems	1~6					
10.4.3	Reuse of Non-Structural Elements	1~6					
10.5	Reduction, Re-use and Recycling of Waste	9	3	Materials Reuse	1~2	15	Conservation + Reuse
10.5.1	Demolition and Construction Waste	1~6		Reuse 5%, 10%			• Project teams Must create a material conservation management • During construction, teams Must divert wasted material from landfills to the following levels (80%--100% varied in types)
10.5.2	Reuse of Existing Materials for Site Development and Landscaping	1					
10.5.3	Operational Waste	2					• There Must be dedicated infrastructure for the collection of recyclables and compostable food scraps.
10.6	Resource Conservation through Design	14	4	Recycled Content	1~2		
10.6.1	Building Service Life Plan	7		10%, 20% of content			Exception: There is a temporary exception for meeting this level of diversion in jurisdictions where Municipalities do not have systems in place to collect all listed construction materials or recyclables.
10.6.2	Materials and Raw Materials	2					
10.6.3	Multi-Functional Assemblies						
10.6.3.1	Architect or design professional to provide letter documentation describing how the building design uses assemblies that perform Multiple functions.	2					
10.6.3.2	The building design plans facilitated demounting or disassembling reusable materials without substantial damage to the materials or there surroundings.	3					
10.7	Building Envelope	30	5	Regional Materials	1~2		
10.7.1	Roofing Membrane Assemblies and Systems	5		10%, 20% of materials			
10.7.2	Flashings	5					
10.7.3	Roof and Wall Openings	5					
10.7.4	Foundation Systems						
10.7.4.1	Vapor retarders	2					
10.7.4.2	Damp roofing	2					
10.7.5	Below Grade Wall Slabs and Above Grade Horizontal Assemblies	4					

Green Globes			LEED			Living Building Challenge	
10.7.6	Exterior Wall Cladding Systems	5					
10.7.7	Rainscreen Wall Cladding	2					
10.8	**Air Barrier**	6	**6**	**Rapidly Renewable Materials**	1		
10.8.1	Continuous Air Barrier						
10.8.1.1	A continuous air barrier was in stalled	3					
10.8.1.2	Compliance of the continuous air barrier for the opaque building envelope	3					
10.9	**Vapor Retarders**	6	**7**	**Certified Wood**	1		
10.9.1	Vapor Retarders						
10.9.1.1	The interior side of framed walls	3					
10.9.1.2	Crawl space walls	3					
	Total Points (Path A)	**145**					
	Total Points (Path B)	**137**					
	Minimum requirement (Path B)	**29%**					
Emissions							
11.1	**Heating Equipment**	18					
11.1.1	District Heating--Path A	18					
11.1.2	Ultra Low NOx/Low CO Boilers and Furnaces--Path B	10					
11.1.3	Low NOx/Low CO Boilers and Furnaces--Path B	8					
11.2	**Cooling Equipment**	21					
11.2.1	Ozone-Depleting Potential (ODP)	1~7					
11.2.2	Globe Warming Potential (GWP)	1~7					
11.2.3	Leak Detection	7					
11.3	**Storage of Janitorial Supplies**	6					
11.3.1	Storage of Janitorial Supplies	6					
	Total Points	**45**					
	Possible n/a	**24**					
	Minimum requirement	**9%**					
Project Management			**Innovation and Design Process**			**Equity**	
6.1	**Coordination and Benchmarking**	28	**1**	**Innovation in Design**	1~5	**16**	**Human Scale + Human Places**
6.1.1	GDDC Performance Goals	4					Specific maximum (and sometimes minim) requirements for paved areas, street and block design, building scale and signage that contribute to livable places.
6.1.2	GDDC Progress Meetings for Design	10					
6.1.3	GDDC Pre-design Green Design Meetings	2~6					
6.1.4	GDDC Progress Meetings for Construction	2~8					
6.2	**Environmental Management during**	16	**2**	**LEED Accredited Professional**	1	**17**	**Democracy + Social Justice**
6.2.1	Environmental Management	4					• All primary transportation, roads and non-building infrastructure that are considered externally focused Must be equally accessible to all members of the public regardless of background, age and socioeconomic class including the homeless.
6.2.2	Clean Diesel Practices	1					• The ADA shall be considered the minim design compliance path.
6.2.3	Building Materials and Building Envelope	1~2					
6.2.4	Indoor Environmental Quality						
6.2.4.1	Air flush or IAQ test after construction	4					
6.2.4.2	Air and dust contaminants control strategies	1~5					
6.3	**Whole Building Commissioning**	42				**18**	**Rights to Nature**

Green Globes			LEED			Living Building Challenge	
6.3.1	Pre-commissioning	3				The project may not block access to, nor diminish the quality of, fresh air, sunlight and natural waterways for any member of society or adjacent developments.	
6.3.2	Whole Building Commissioning						
6.3.2.1	Envelope	5					
6.3.2.2	HVAC&R	5					
6.3.2.3	Structural system	4					
6.3.2.4	Fire protection	4					
6.3.2.5	Plumbing system	3					
6.3.2.6	Electrical system	3					
6.3.2.7	Lighting system	3					
6.3.2.8	Interior, elevating and conveying, communication systems	2~6					
6.3.2.9	Noise isolation	2					
6.3.2.10	Building system specifications	2					
6.3.2.11	Training	2					
6.4	Environmental Management -- Post -	14					
6.4.1	Operation and Maintenance Manuals	1~14					
	Total Points	**100**					
	Possible n/a	**2**					
	Minimum requirement	**50%**					

Regional Priority			Beauty	
1	Regional Priority	4	19	Beauty + Spirit The project Must contain design features intended solely for human delight and the celebration of culture, spirit and place appropriate to its function.
			20	Inspiration + Education Educational materials about the performance and operation of the project Must be provided to the public to share successful solutions and to motivate others to make change. Non-sensitive areas of Building Must be open to the public at least one day per year to facilitate direct contact with the Living Building Challenge.

EXISTING BUILDINGS

Calculated
Measured
Evidence of Intent

Green Globes	LEED	Living Building Challenge
CIEB	EBOM	Renovation

Sustainable Site

LEED EBOM

1	**LEED Certified Design and Construction**	4
2	**Building Exterior and Hardscape Management Plan**	1
3	**Integrated Pest Management, Erosion Control, and Landscape Management Plan**	1
4	**Alternative Commuting Transportation** Baseline assumes all regular occupants commute alone in conventional automobiles. Demonstrate 10%-35% reduction in commuting trips	3~15
5	**Site Development—Protect or Restore Open** Native or adapted vegetation covering 25% of the total site (excluding building) or 5% of the site (including building). Every 2SF off-site can be counted as 1SF onsite.	1
6	**Stormwater Quantity Control** stormwater management of 15% of the precipitation	1
7.1	**Heat Island Reduction—Nonroof** 50% of the site hardscape under cover, or with high SRI (≥29) or pervious material (≥50%)	1
7.2	**Heat Island Reduction—Roof** 75% of roof with high SRI (≥29) material, 50% vegetated roof, or combination	1
8	**Light Pollution Reduction** Interior lighting auto off during after-hours periods. Shield exterior lighting	1
	Total Points	**26**

Living Building Challenge Renovation

1	**Limits to growth** Projects may only be built on greyfields, brownfields, or previously developed sites
3	**Habitat Exchange** SJ For each hectare of development, an equal amount of land (min. 0.4 hectare) must be set-aside in perpetuity as part of a habitat exchange.

Water

Green Globes CIEB

2.1	**Water Consumption of 12 months**	30
2.2	**Water Conserving Features**	32
	Low flow fixtures and controls (based on code)	17
	Other features	2
	Irrigation	5
	Nonpotable water	6

LEED EBOM Water Efficiency

PR	**Minimum Indoor Plumbing Fixture and Fitting Efficiency** Meet plumbing code UPC or IPC 2006 (baseline) Adjusted baseline: --after 1993, 120% baseline --before 1993, 160% baseline	
1	**Water Performance Measurement** Whole building metering or submetering	1~2

Living Building Challenge Renovation

5	**Net Zero Water** SJ 100% of occupants' water use must come from captured precipitation or closed loop water systems that account for downstream ecosystem impacts and that are appropriately purified without the use of chemicals. Exception: For water that must be from potable sources

Calculated
Measured
Evidence of Intent

Green Globes			LEED			Living Building Challenge
CIEB			**EBOM**			**Renovation**
	Water-cooled units	2				
2.3	**Water Management**	18	**2**	**Additional Indoor Plumbing Fixture and Fitting Efficiency**	1~5	
	Written policy	3		10%-30% reduction in water use from baseline		
	Monitor consumption	4				
	Water audit	4				
	Reduction target	4				
	Regular checking	3				
			3	**Water Efficient Landscaping**	1~5	
				50%-100% potable water reduction for irrigation		
			4.1	**Cooling Tower Water Management—Chemical Management**	1	
	Total Points	**80**	**4.2**	**Cooling Tower Water Management—Nonpotable Water Source**	1	
	Possible n/a	**11**		Use makeup water that consists of ≥50% nonpotable water		
	Minimum requirement	unknown		**Total Points**	**14**	
Energy			**Energy and Atmosphere**			**Energy**
1.1	**Energy Consumption of 12 months**	80	**PR**	**Energy Efficiency Best Management Practices—Planning, Documentation, and Opportunity Assessment**		**7** **Net Zero Energy**
						SJ 100% of the project's energy needs must be supplied by on-site renewable energy on a net annual basis.
1.2	**Lighting**	25	**PR**	**Minimum Energy Efficiency Performance**		
				Achieve ENERGY STAR rating of at least 69 or 19% better than the average for typical buildings of similar type		
	High-efficiency lighting fixtures	15				
	Lighting controls	3				
	Percentage of high efficiency lighting	7				
1.3	**Boilers**	16	**PR**	**Fundamental Refrigerant Management**		
	Percentage of high-efficiency boilers	12		Zerouse of CFC-based refrigerants		
	Automatic vent damper	4				
1.4	**Controls**	14	**1**	**Optimize Energy Efficiency Performance**	1~18	
				Achieve ENERGY STAR rating of 71-95 or 21%-45% better than the average for typical buildings of similar type		
	Temperature setback	6				
	BAS installation	8				
1.5	**Hot Water**	12	**2.1**	**Existing Building Commissioning—Investigation and Analysis**	2	
		4		Conduct commissioning or ASHRAE level II energy audit		
	High-efficiency water heater					
	Hot water saving devices	4				
	Hot water temperature	4				
1.6	**Other Energy Efficiency Features**	16	**2.2**	**Existing Building Commissioning—Implementation**	2	
		unk		Implement no- or low-cost operational improvements, create retrofit/upgrade plan, and provide training		
	Percentage of high-efficiency chillers					
	Variable speed drives	unk				

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	Combined heat and power plants	unk				
	Energy recovery ventilation	unk				
	Energy-saving systems or measures	unk				
1.7	**Green Energy**	12	2.3	**Existing Building Commissioning—Ongoing Commissioning**	2	
				Implement an ongoing commissioning program and complete at least half of the scope of work in the first commissioning cycle		
	Purchase green electricity	5				
	On-site energy sources	5				
	Percentage of renewable energy	2				
1.8	**Envelope**	35	3.1	**Performance Measurement—Building Automation System**	1	
	Assess performance and condition of the building envelope	4		Have in place a BAS and a preventive maintenance program		
	Energy-efficient windows and doors	5				
	Shading	3				
	Air-sealed	11				
	Envelope insulation	12				
1.9	**Energy Policy**	5	3.2	**Performance Measurement—System Level**	1~2	
				Develop a breakdown of energy use and employing metering covering at least 40% or 80% of the total expected annual energy consumption		
1.10	**Energy Audit**	2	4	**On-site and Off-site Renewable Energy**	1~6	
	Energy audit within the past 3 years	2		Implement 3%-12% of on-site renewable energy or 25%-100% of off-site renewable energy certificates		
1.11	**Energy Management, Monitoring and Targeting**	16	5	**Enhanced Refrigerant Management**	1	
				Do not use refrigerants or minimize or eliminate the emission of compounds that contribute to ozone depletion and climate change		
	Energy management plan	2				
	Energy use monitor	3				
	Energy usage targets and movement	7				
	Analyze and reduce peak demand	4				
1.12	**Energy Training**	5	6	**Emissions Reduction Reporting**	1	
				Track, record, and report emissions reductions		
1.13	**Financial Resources**	5				
1.14	**Sub-metering**	10		**Total Points**	**35**	
	Percentage of tenants' sub-metering	7				
	Sub-metering of major energy uses	3				
1.15	**Operating Manual**	15				
1.16	**Maintenance Schedule**	22				
	Check mechanical systems and controls	15				
	Preventive maintenance program	7				
1.17	**Public Transportation**	45				
	Access to public transport within 0.3 miles	25				
	Service at least every 15 minutes during rush hour	20				

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Green Globes			LEED			Living Building Challenge	
CIEB			EBOM			Renovation	
1.18	Cycling Facilities	10					
1.19	Other Measures	5					
	Total Points	350					
	Possible n/a	36					
	Minimum requirement	?					
Indoor Environment			Indoor Environmental Quality			Health	
5.1	Ventilation System	24	PR	Minimum Indoor Air Quality Performance		8	Civilized Environment
				Meet ASHRAE 62.1-2007 or supply at least 10 cfm of outdoor air per person under all normal operating conditions			Every occupiable space must have operable windows that provide access to fresh air and daylight.
	Location of air intakes	6					
	Regular check of air intakes\	2					
	free-standing water	3					
	Signs of corrosion, loose materials in the AHU	2					
	Measured CO2 levels less than 850 ppm	6					
	Permanent CO2 monitoring	3					
	Occupants' control of ventilation rates	2					
5.2	Filtration System	11	PR	Environmental Tobacco Smoke (ETS) Control		9	Healthy Air
							• Entryways must have an external dirt track-in system and an internal dirt track-in system contained within a separate entry space.
	Able to remove particles from incoming air	4					
	Manometers	3					
	Easy access	2					
	fit snugly within supports	2					
5.3	Humidification System	15	PR	Green Cleaning Policy			
	Type and maintenance	15					• All kitchens, bathrooms, copy rooms, janitorial closets and chemical storage spaces must be separately ventilated and exhaust directly to outside air.
5.4	Cooling Towers	15	1.1	Indoor Air Quality Best Management Practices—Indoor Air Quality Management Program	1		
				Develop and implement on an ongoing basis an IAQ management program based on the EPA I-BEAM			• Ventilation rates must be designed to comply with ASHRAE 62 and equipment must be installed to monitor levels of carbon dioxide (CO2), temperature and humidity.
	location	5					
	Drift eliminators	5					
	Maintenance program	5					
5.5	Parking and Receiving	10	1.2	Indoor Air Quality Best Management Practices—Outdoor Air Delivery Monitoring	1		
				Installed permanent, continuous monitoring systems to ensure minimum outdoor airflow			• Smoking must be prohibited within the project boundary.
	Mechanical ventilation	3					
	Prevent intake from the loading/parking area	4					
	Carbon monoxide monitoring	3					
5.6	Control of Pollutants at Source	43	1.3	Indoor Air Quality Best Management Practices—Increased Ventilation	1		
				Increase outdoor ventilation rates by at least 30% above ASHRAE 62.1-2007 or provide natural ventilation			
	Complaints	7					
	Effective local exhaust for special rooms	3					

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Green Globes			LEED			Living Building Challenge
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	Documented measures to control pollutants at source	3				
	Environmentally preferable cleaning materials	5				
	Smoking not permitted	15				
	An IAQ checklist for project team discussions	10				
5.7	**IAQ Management**	25	1.4	**Indoor Air Quality Best Management Practices—Reduce Particulates in Air Distribution** Have in place filtration media with a MERV of 13 or greater	1	
	Address tenants/occupant concerns	4				
	IAQ audit in the past year	5				
	Procedures for maintaining good IAQ	8				
	Training	4				
	Monitoring temperature and humidity	4				
5.8	**Lighting Features**	25	1.5	**Indoor Air Quality Best Management Practices—Indoor Air Quality Management for Facility Alterations and Additions** Develop and implement and IAQ management plan	1	
	High frequency ballasts	5				
	Controllable blinds	5				
	Lighting levels meet IES guidelines for office	5				
	Individual control of task lighting	5				
	Floor plan allows 80% of a typical work area to have access to daylighting or 40% of workstations within 22ft from the windows	5				
	Good lighting control	0				
5.9	**Lighting Management**	7	2.1	**Occupant Comfort—Occupant Survey** Implement an occupant comfort survey among at least 30% of the occupants	1	
	Planned schedule of cleaning	4				
	Group-relamping program	3				
5.10	**Noise**	10	2.2	**Controllability of Systems—Lighting** Provide lighting controls to at least 50% of occupants	1	
	Open office areas acoustic condition	5				
	Sufficient acoustic privacy	5				
			2.3	**Occupant Comfort—Thermal Comfort Monitoring** Have a permanent monitoring system to ensure indoor comfort meet ASHRAE 5502994	1	
	Total Points	185	2.4	**Daylight and Views** 50% or more of all regularly occupied spaces achieve 25 fc daylight	1	
	Possible n/a					
	Minimum requirement		3.1	**Green Cleaning—High Performance Cleaning Program** Have in place a high-performance cleaning program	1	
			3.2	**Green Cleaning—Custodial Effectiveness Assessment**	1	

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Green Globes			LEED			Living Building Challenge	
CIEB			EBOM			Renovation	
				Conduct an audit accordance with APPA Leadership in Educational Facilities and score 3 or less			
			3.3	**Green Cleaning—Purchase of Sustainable Cleaning Products and Materials**	1		
				30% of the total annual purchases of cleaning products (by cost) meet the sustainability criteria			
			3.4	**Green Cleaning—Sustainable Cleaning Equipment**	1		
				Implement a program for the use of janitorial equipment that reduces building contaminants and minimizes environmental impact			
			3.5	**Green Cleaning—Indoor Chemical and Pollutant Source Control**	1		
				Employ permanent entryway systems			
			3.6	**Green Cleaning—Indoor Integrated Pest Management**	1		
				Implement an indoor IPM plan			
				Total Points	**15**		
Resources			Materials and Resources			Material	
3.1	**Facilities for Storing and Handing Recyclable Materials**	25	PR	**Sustainable Purchasing Policy**		11	**Red List**
	Separate storage/handling facilities for recycling	10					**The project cannot contain any of the Red List materials or chemicals.**
	Collection points for sorting	10					Exception: There are temporary exceptions for numerous Red List items due to current limitations in the materials economy.
	Composting program	5					
3.2	**Waste Reduction Workplan**	30	PR	**Solid Waste Management Policy**		12	**Embodied Carbon Footprint**
							The project must account for the total footprint of embodied carbon (tCO2e) from its construction and projected replacement parts through a one-time carbon offset tied to the project boundary.
	Waste audit in the last three years	5					
	Regular monitoring of waste	5					The amount of carbon offsets required may be reduced by 50 percent for renovations.
	Diversion rate	10					
	Waste-reduction targets and management policy	10					
3.3	**Site Pollution**	50	1	**Sustainable Purchasing—Ongoing Consumables**	1	13	**Responsible Industry**
	Free of contamination based on document or assessment	50		Sustainable purchases of at least 60% of total purchases by cost			**The project must advocate for the creation and adoption of third-party certified standards for sustainable resource extraction and fair labor practices.**
3.4	**Site Enhancement**	5	2.1	**Sustainable Purchasing—Electric-Powered Equipment**	1	14	**Appropriate Sourcing**

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Green Globes

CIEB

Site has been enhanced 5

Total Points 110

Possible n/a 5

Minimum requirement ?

Emissions, Effluents, and Pollution Controls

4.1 Boiler Emissions 30

Percentage of boilers with low Nox emission rate 23

Cleaning records 7

4.2 Refrigerants 25

Type of refrigerant 10

Automatic refrigerant leak detectors 10

System capable of pumping down all the refrigerant into a suitable container 5

4.3 Management of Ozone Depleting Refrigerants 10

4.4 Halons 10

4.5 Waste Water Effluents 20

4.6 Asbestos 15

4.7 Radon 5

4.8 PCBs 5

4.9 Storage Tanks 20

4.10 Drinking Water (lead and bacteria) 2

LEED

EBOM

Sustainable purchases of at least 40% of total purchases of electric-powered equipment by cost

2.2 Sustainable Purchasing—Furniture 1

Sustainable purchases of at least 40% of total purchases of furniture by cost

3 Sustainable Purchasing—Facility Alterations and Additions 1

Sustainable purchases of at least 50% of total purchases by cost

4 Sustainable Purchasing—Reduced Mercury in Lamps 1

Develop a lighting purchasing plan and at least 90% of purchased lamps comply with the target

5 Sustainable Purchasing—Food 1

Sustainable purchases of at least 25% of total combined food and beverage purchases by cost

6 Solid Waste Management—Waste Stream Audit 1

Conduct a waste stream audit and establish a baseline

7 Solid Waste Management—Ongoing Consuma 1

Reuse, recycle, or compost 50% of the ongoing consumables waste stream by weight or volume

8 Solid Waste Management—Durable Goods 1

Reuse or recycle 75% of the durable goods waste stream by weight, volume or replacement value

9 Solid Waste Management—Facility Alterations and Additions 1

Divert at least 70% of waste by volume

Total Points 10

Living Building Challenge

Renovation

The project must incorporate place-based solutions and contribute to the expansion of a regional economy rooted in sustainable practices, products and services. Source locations for materials and services must adhere to the restrictions (500 km-20,004 km varied in type of materials and services).

15 Conservation + Reuse

- Project teams must create a material conservation management.
- During construction, teams must divert wasted material from landfills to the following levels (80%--100% varied in types)
- There must be dedicated infrastructure for the collection of recyclables and compostable food scraps.

Exception: There is a temporary exception for meeting this level of diversion in jurisdictions where municipalities do not have systems in place to collect all listed construction materials or recyclables.

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Green Globes			LEED			Living Building Challenge	
CIEB			EBOM			Renovation	
4.11	HCS Program	10					
4.12	Health & Safety Management of Hazardous Products	18					
4.13	Pesticides	5					
	Total Points	175					
	Possible n/a	93					
	Minimum requirement	?					
	Environmental Management Systems			Innovation in Operation			Equity
6.1	Environmental Management Systems (EMS) Documentation	30	1	Innovation in Operations	1~4	19	Beauty + Spirit
							The project must contain design features intended solely for human delight and the celebration of culture, spirit and place appropriate to its function.
	Environmental policy	10					
	Goals and targets	10					
	Action plans	10					
6.2	Environmental Purchasing	25	2	LEED Accredited Professional	1	20	Inspiration + Education
							Educational materials about the performance and operation of the project must be provided to the public to share successful solutions and to motivate others to make change. Non-sensitive areas of Building must be open to the public at least one day per year to facilitate direct contact with the Living Building Challenge.
	Environmental-purchasing plan	6					
	A list of preferred products	7					
	Requirement for energy saving equipment	6					
	Hazardous products staff	6					
6.3	Emergency Response	20	3	Documenting Sustainable Building Cost .	1		
				Document overall building operating costs for the previous 5 years			
6.4	Tenant Awareness	25		Total Points	6		
				Regional Priority			
	Total Points	100	1	Regional Priority	4		
	Possible n/a	55					
	Minimum requirement	?		Total Points	4		