Introduction
“Green” buildings, sustainable architecture, and environmentally responsible design — we have all heard these terms. But what do these terms mean to you — that this project is entertaining radical ideas at higher costs? Not any more. The term “green” design is now used to describe what is becoming either a standard or a priority for building owners. It is more mainstream, with an estimated $12 billion in efficient and lower impact building products and services in 2007, and an estimated $60 billion by 2010.

The paradigm of how to construct a project and be part of the community has shifted. Many of today’s design standards incorporate significant participation in environmentally sensitive building practices; therefore, the incremental up-front costs of these practices adds only minor to no additional cost, and in some cases are less. For those with higher up-front costs, the life cycle costs justify the increased amount spent with increased energy efficiency, reduced waste, and improved indoor air quality.

There are several organizations currently providing a mechanism for certifying a “green” building. Energy STAR®, Green Globes, and the U.S. Green Building Council (USGBC) LEED® program are some of those available. The LEED® program is currently the most predominant in the U.S., and this article will go into detail on one particular standard, LEED® for New Construction and Major Renovations (LEED®-NC).

What is the USGBC?
The USGBC is a non-profit organization consisting of more than 15,000 members, including community leaders and various building industry resources. A goal of the USGBC is for environmentally sensitive buildings to be available to all within a generation. To achieve this, the USGBC has developed the LEED® program and a portfolio of standards.

What is LEED®?
The USGBC defines LEED® as follows: “The Leadership in Energy and Environmental Design (LEED®) Green Building Rating System™ encourages and accelerates global adoption of so-called “green” building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria.”

“LEED® is a third-party certification program and the nationally accepted benchmark for the design, construction and operation of high performance buildings. LEED® gives building owners and operators the tools they need to have an immediate and measurable impact on their buildings’ performance. LEED® promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality.”

“The LEED® Green Building Rating System™ is a voluntary consensus-based national rating system for developing high performance buildings, that addresses all building types including new construction, commercial interiors, core and shell, operations and maintenance, homes, neighborhoods, and specific applications such as retail, multiple buildings/campuses, schools, healthcare, laboratories and lodging.”

Lighting and electrical distribution products can potentially contribute up to 22 points within the LEED®-NC rating system. An overview matrix is provided within this document.

To assist with your understanding of the credits within LEED®-NC, this article provides an overview on this particular standard. In addition, GE C&I has developed a web-based service called the Environmental Information Center.
This site is provided by GE and contains information on the latest information on environmental choices and impacts within our industry (including both lighting and electrical products). It is a web-based, one-stop shop for customer education and information, such as:

- Environmental Trends
- Ecomagination™
- USGBC’s LEED® Certification
- Picogram Value Product Lookup
- White Papers, MSDS Sheets
- EPAct (Energy Policy Act) Information
- Energy & Environmental Calculators

Available in the USBGC LEED® Certification section:

- Explanation tutorial
- Types of certification programs
- Picogram calculator
- GE products and the points they can earn towards certification

Want some help with the calculational legwork that needs to be done? Take a look at some of the calculators available:

- Cost of Light
- Energy & Environmental Impact Estimator
- Picogram per Lumen Hour Calculator
- Motors Calculator
- Drives Calculator
Rating Systems and Points
The USGBC has a multitude of rating systems, or standards, to choose from based on your type of project. For a full description, visit the USGBC’s web site (provided in the References section). Below is a snapshot of what is currently available and/or in pilot.

The LEED® program provides a system in which a project earns points in multiple areas of sustainability. The USGBC states: “It promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: Energy Efficiency, Sustainable Site Development, Water Savings, Materials and Resources Selection, Indoor Environmental Quality.”

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**USGBC Portfolio of Rating Systems**

<table>
<thead>
<tr>
<th>Rating System</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Construction</td>
<td></td>
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<tr>
<td>Existing Buildings: Operations &amp; Maintenance</td>
<td></td>
</tr>
<tr>
<td>Core &amp; Shell</td>
<td></td>
</tr>
<tr>
<td>Commercial Interiors</td>
<td></td>
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<tr>
<td>Neighborhood Development</td>
<td></td>
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<tr>
<td>Home</td>
<td></td>
</tr>
<tr>
<td>Schools</td>
<td></td>
</tr>
<tr>
<td>Retail</td>
<td></td>
</tr>
<tr>
<td>Healthcare</td>
<td></td>
</tr>
</tbody>
</table>

**Certification Levels (LEED-NC example):**

- Certified: 26-32 Points
- Silver: 33-38 Points
- Gold: 39-51 Points
- Platinum: 52-69 Points

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**LEED®-NC (New Construction & Major Renovations)**
This paper will focus on the NC 2.2 standard. Additional standards will be addressed in future articles.

Per USGBC, a project qualifies under the LEED®-NC standard if it is a commercial or institutional project, including office buildings, high-rise residential buildings (4 or more stories), government buildings, recreational facilities, manufacturing plants and laboratories.

General Overview of Credits & Applicability of Lighting and Electrical Distribution Equipment

**Site Selection** *(SS)* 1 point
Lighting and power information may be provided to support credits that deal with parking lighting and signage, power receptacles for electric cars, and irrigation. However, the energy calculation will fall under EA Prerequisite 2 and EA Credit 1. The only applicable credit within SS would be SS Credit 8: Lighting Pollution Reduction. This credit is lighting design focused on energy consumption, as well as lighting controllability.

**Water Efficiency** *(WE)* 1-2 points
Lighting and power information may be provided to support credits that deal with power for toilet fixtures and irrigation. However, as in Site Selection, the energy calculation will fall under EA Prerequisite 2 and EA Credit 1. The only applicable credit within WE would be WE Credit 3: Water Use Reduction. This credit involves metering to determine usage.

**Energy And Atmosphere** *(EA)* 1-12 points
These credits are the most intensive as far as applicable lighting and electrical distribution products.

In EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems, the commissioning process requires specialized training on the more complex systems such as lighting controls, generators, ATS, paralleling switchgear, and power monitoring systems. In addition to the prerequisite, there is an additional opportunity to earn a point in EA Credit 3: Enhanced Commissioning.

Where the most points can be earned is in regards to energy efficiency. EA Prerequisite 2: Minimum Energy Performance, requires compliance with the lighting and power requirements of ASHRAE 90.1 or similar local codes. In addition to this prerequisite, there is an opportunity to achieve up to 10 more points by designing energy efficient systems. EA Credit 1: Optimize Energy Performance, begins with a minimum of 10.5% increase in efficiency over AHRAE 90.1 and goes up to 42% more efficiency. This may affect significantly the building electrical service size.

The last area within EA for potential points is EA Credit 5: Measurement and Verification. This credit requires evaluating the energy efficiency by a comparison of the actual to baseline or design performance of the building for one year after occupancy. To do this will require meters and monitors to gather the necessary data.

**Materials And Resources** *(MR)* -0- points
Frequently asked questions in regards to lighting and electrical distribution products have to do with the recycled content, including packaging, and the regional manufacturing of these products. The Reference Guide is quite explicit that: “Mechanical, electrical and plumbing components and specialty items such as elevators shall not be included in this calculation.” However, the intention of the MR credits is for the proper recycling and reuse of materials to reduce the environmental impact of a building and site. The Reference Guide states: “Provide an easily accessible area that serves the entire building and is dedicated to the collection and storage of non-hazardous materials for recycling, including (at a minimum) paper, corrugated cardboard, glass, plastics and metals”

**Indoor Environmental Quality** *(EQ)* 1-2 points
Power may be provided to support credits that deal with interfacing with mechanical components. However, the energy calculation will fall under EA Prerequisite 2 and EA Credit 1. EQ Credit 6.1: Controllability of Systems – Lighting, provides an opportunity to earn a point. In this credit, occupants have the ability to control lighting levels. EQ Credit 8.1: Daylight and Views, Daylight 75% of Spaces also utilizes lighting controls, specific to daylight harvesting.

**Innovation And Design Process** *(ID)* 1-5 points
ID Credit 1: Innovations in Design allows up to 4 points. This credit provides for exemplary performance of an existing credit or for a category not specifically addressed. ID Credit 2: LEED® Accredited Professional allows a point for one principal participant of the project team being a LEED® AP.
## Lighting & Electrical Distribution Products Applicability

### New Construction Rating System

<table>
<thead>
<tr>
<th>Sustainable Sites (SS)</th>
<th>Available GE Product Points</th>
<th>GE Products to Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS Credit 8: Light Pollution Reduction</td>
<td>1</td>
<td>Full Cut Off Luminaires GE Lighting Systems</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Water Efficiency (WE)</th>
<th>Available GE Product Points</th>
<th>GE Products to Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>WE Credit 3.1: Water Use Reduction: 20% Reduction</td>
<td>1</td>
<td>Submetering Modular Metering</td>
</tr>
<tr>
<td>WE Credit 3.2: Water Use Reduction: 30% Reduction</td>
<td>1</td>
<td>Submetering Modular Metering</td>
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</tbody>
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<thead>
<tr>
<th>Energy &amp; Atmosphere (EA)</th>
<th>Available GE Product Points</th>
<th>GE Products to Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems</td>
<td>Required</td>
<td>Submetering Modular Metering</td>
</tr>
<tr>
<td>EA Prerequisite 2: Minimum Energy Performance Required</td>
<td>Required</td>
<td>Lighting Products GE Lighting Systems</td>
</tr>
<tr>
<td>EA Prerequisite 3: Fundamental Refrigerant Management</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>EA Credit 1: Optimize Energy Performance</td>
<td>1 to 12*</td>
<td>Lighting Products Electrical Distribution Products</td>
</tr>
<tr>
<td>EA Credit 3: Enhanced Commissioning</td>
<td>1</td>
<td>Submetering Modular Metering</td>
</tr>
<tr>
<td>EA Credit 5: Measurement &amp; Verification</td>
<td>1</td>
<td>Submetering Modular Metering</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Materials &amp; Resources (MR)</th>
<th>Available GE Product Points</th>
<th>GE Products to Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR Prerequisite 1: Storage and Collection of Recyclables</td>
<td>Required</td>
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<table>
<thead>
<tr>
<th>Indoor Environmental Quality (EQ)</th>
<th>Available GE Product Points</th>
<th>GE Products to Use</th>
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</thead>
<tbody>
<tr>
<td>EQ Prerequisite 1: Minimum IAQ Performance</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>EQ Prerequisite 2: Environmental Tobacco Smoke (ETS) Control</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>EQ Credit 6.1: Controllability of Systems: Lighting</td>
<td>1</td>
<td>Controls</td>
</tr>
<tr>
<td>EQ Credit 6.2: Controllability of Systems: Thermal Comfort</td>
<td>1</td>
<td>Controls</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Innovation &amp; Design Process</th>
<th>Available GE Product Points</th>
<th>GE Products to Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>D Credit 1-1.4: Innovation in Design</td>
<td>1 to 4</td>
<td>Lighting Products Electrical Distribution Products</td>
</tr>
<tr>
<td>D Credit 2: LEED® Accredited Professional</td>
<td>1</td>
<td>GE has LEED® Accredited Professionals on staff. Contact us for details.</td>
</tr>
</tbody>
</table>

### Available Project Points by using GE L&E Products

- **Up to 22**

* LEED® for New Construction projects registered after June 26th, 2007, are required to achieve at least two (2) points under EA1.
LEED®-NC Standard V.2.2 Credit Descriptions

The following section describes in general detail the credits in which lighting and electrical distribution equipment may be applicable. For the MR credits regarding recycled content and regional materials, lighting and electrical distribution equipment DO NOT apply. This is discussed further.

LEED® online submittal templates are to be completed by the designated design or construction team member of the project team. A representative of a manufacturer may provide submittal information, such as cut-sheets or MSDS information, but does not fill out the LEED® online submittal templates, as this is the responsibility of the LEED® project team.

The rest of this article is directed towards the actual language of applicable standards and is referenced directly from the USGBC’s New Construction and Major Renovation V.2.2 Reference Guide.
SS Credit 8: Light Pollution Reduction (1 point)

Intent:
Minimize light trespass from the building and site, reduce sky-glow to increase night sky access, improve
nighttime visibility through glare reductions, and reduce development impact on nocturnal environments.

Requirements:
FOR INTERNAL LIGHTING:
The angle of maximum candela from each interior luminaire as located in the building shall intersect opaque
building interior surfaces and not exit out through the windows, or all non-emergency interior lighting shall be
automatically controlled to turn off during non-business hours. Provide manual override capability for after
hours use. Controls may be automatic sweep timers, occupancy sensors or programmed master lighting
control panels.

AND

FOR EXTERNAL LIGHTING:
Only light areas as required for safety and comfort. Do not exceed 80% of the lighting power densities for
exterior areas and 50% for building facades and landscape features as defined in ASHRAE/IESNA Standard
90.1-2004, Exterior Lighting Section, without amendments, AND

All projects shall be classified under one of the following zones, as defined in IESNA RP-33, and shall follow all of
the requirements for that specific zone:

LZ1 — Dark (Park and Rural Settings) Design exterior lighting so that all site and building mounted luminaires
produce a maximum initial illuminance value no greater than 0.01 horizontal and vertical footcandles at the
site boundary and beyond. Document that 0% of the total initial designed fixture lumens are emitted at an
angle of 90 degrees or higher from nadir (straight down).

LZ2 — Low (Residential areas) Design exterior lighting so that all site and building mounted luminaires produce
a maximum initial illuminance value no greater than 0.10 horizontal and vertical footcandles at the site
boundary and no greater than 0.01 horizontal footcandles 10 feet beyond the site boundary. Document that no
more than 2% of the total initial designed fixture lumens are emitted at an angle of 90 degrees or higher from
nadir (straight down). For site boundaries that abut public rights-of-way, light trespass requirements may be
met relative to the curb line instead of the site boundary.

LZ3 — Medium (Commercial/Industrial, High-Density Residences) Design exterior lighting so that all site and
building mounted luminaires produce a maximum initial illuminance value no greater than 0.20 horizontal and
vertical footcandles at the site boundary and no greater than 0.01 horizontal footcandles 15 feet beyond the site.
Document that no more than 5% of the total initial designed fixture lumens are emitted at an angle of 90
degrees or higher from nadir (straight down). For site boundaries that abut public rights-of-way, light trespass
requirements may be met relative to the curb line instead of the site boundary.

LZ4 — High (Major City Centers, Entertainment Districts) Design exterior lighting so that all site and building
mounted luminaires produce a maximum initial illuminance value no greater than 0.60 horizontal and vertical
footcandles at the site boundary and no greater than 0.01 horizontal footcandles 15 feet beyond the site.
Document that no more than 10% of the total initial designed site lumens are emitted at an angle of 90
degrees or higher from nadir (straight down). For site boundaries that abut public rights-of-way, light trespass
requirements may be met relative to the curb line instead of the site boundary.

Referenced Standards:
(Section 9), www.ashrae.org, (800) 527-4723.
Intent:
Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

Requirements:
Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements. Calculations are based on estimated occupant usage and shall include only the following fixtures (as applicable to the building): water closets, urinals, lavatory faucets, showers and kitchen sinks.
WE Credit 3.1: Water Use Reduction: 30% Reduction

Intent
Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

Requirements
Employ strategies that in aggregate use 30% less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements. Calculations are based on estimated occupant usage and shall include only the following fixtures (as applicable to the building): water closets, urinals, lavatory faucets, showers and kitchen sinks.
EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems

Intent:
Verify that the building's energy related systems are installed, calibrated and perform according to the owner's project requirements, basis of design, and construction documents.

Benefits of Commissioning:
Benefits of commissioning include reduced energy use, lower operating costs, reduced contractor callbacks, better building documentation, improved occupant productivity, and verification that the systems perform in accordance with the owner's project requirements.

Requirements:
The following commissioning process activities shall be completed by the commissioning team, in accordance with the LEED® -NC 2.2 Reference Guide:

1) Designate an individual as the Commissioning Authority (CxA) to lead, review and oversee the completion of the commissioning process activities.
   a) The CxA shall have documented commissioning authority experience in at least two building projects.
   b) The individual serving as the CxA shall be independent of the project’s design and construction management, though they may be employees of the firms providing those services. The CxA may be a qualified employee or consultant of the Owner.
   c) The CxA shall report results, findings and recommendations directly to the Owner.
   d) For projects smaller than 50,000 gross square feet, the CxA may include qualified persons on the design or construction teams who have the required experience.

2) The Owner shall document the Owner’s Project Requirements (OPR). The design team shall develop the Basis of Design (BOD). The CxA shall review these documents for clarity and completeness. The Owner and design team shall be responsible for updates to their respective documents.

3) Develop and incorporate commissioning requirements into the construction documents.

4) Develop and implement a commissioning plan.

5) Verify the installation and performance of the systems to be commissioned.

6) Complete a summary commissioning report.

Commissioning process activities shall be completed for the following energy-related systems, at a minimum:
   o Heating, ventilating, air conditioning, and refrigeration (HVAC&R) systems (mechanical and passive) and associated controls
   o Lighting and daylighting controls
   o Domestic hot water systems
   o Renewable energy systems (wind, solar etc.)
**EA Prerequisite 2: Minimum Energy Performance**

**Intent:**
Establish the minimum level of energy efficiency for the proposed building and systems.

**Requirements:**
Design the building project to comply with both:

- the mandatory provisions of ASHRAE/IESNA Standard 90.1-2004 (without amendments) including sections 5.4, 6.4, 7.4, 8.4, 9.4 and 10.4; and
- the prescriptive requirements (sections 5.5, 6.5, 7.5 and 9.5) or the performance requirements (section 11) of ASHRAE/IESNA Standard 90.1-2004 (without amendments)
EA Credit 1: Optimize Energy Performance (1-10 Points)

**Intent:**
Achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.

**Requirements:**

**OPTION 1 - WHOLE BUILDING ENERGY SIMULATION (1-10 points)**

Demonstrate a percentage improvement in the proposed building performance rating compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004 (without amendments) by a whole building project simulation using the *Building Performance Rating Method in Appendix G* of the Standard. The minimum energy cost savings percentage for each point threshold is as follows:

<table>
<thead>
<tr>
<th>New Buildings</th>
<th>Existing Building</th>
<th>Renovations Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.5%</td>
<td>3.5%</td>
<td>1</td>
</tr>
<tr>
<td>14%</td>
<td>7%</td>
<td>2</td>
</tr>
<tr>
<td>17.5%</td>
<td>10.5%</td>
<td>3</td>
</tr>
<tr>
<td>21%</td>
<td>14%</td>
<td>4</td>
</tr>
<tr>
<td>24.5%</td>
<td>17.5%</td>
<td>5</td>
</tr>
<tr>
<td>28%</td>
<td>21%</td>
<td>6</td>
</tr>
<tr>
<td>31.5%</td>
<td>24.5%</td>
<td>7</td>
</tr>
<tr>
<td>35%</td>
<td>28%</td>
<td>8</td>
</tr>
<tr>
<td>38.5%</td>
<td>31.5%</td>
<td>9</td>
</tr>
<tr>
<td>42%</td>
<td>35%</td>
<td>10</td>
</tr>
</tbody>
</table>

Appendix G of Standard 90.1-2004 requires that the energy analysis done for the Building Performance Rating Method include ALL of the energy costs within and associated with the building project. To achieve points using this credit, the proposed design—

- must comply with the mandatory provisions (Sections 5.4, 6.4, 7.4, 8.4, 9.4 and 10.4) in Standard 90.1-2004 (without amendments);
- must include all the energy costs within and associated with the building project; and
- must be compared against a baseline building that complies with Appendix G to Standard 90.1-2004 (without amendments). The default process energy cost is 25% of the total energy cost for the baseline building. For buildings where the process energy cost is less than 25% of the baseline building energy cost, the LEED® submittal must include supporting documentation substantiating that process energy inputs are appropriate.

For the purpose of this analysis, process energy is considered to include, but is not limited to, office and general miscellaneous equipment, computers, elevators and escalators, kitchen cooking and refrigeration, laundry washing and drying, lighting exempt from the lighting power allowance (e.g. lighting integral to medical equipment) and other (e.g. waterfall pumps). Regulated (nonprocess) energy includes lighting (such as for the interior, parking garage, surface parking, façade, or building grounds, except as noted above), HVAC (such as for space heating, space cooling, fans, pumps, toilet exhaust, parking garage ventilation, kitchen hood exhaust, etc.), and service water heating for domestic or space heating purposes.

For EA Credit 1, process loads shall be identical for both the baseline building performance rating and for the proposed building performance rating. However, project teams may follow the Exceptional Calculation Method (ASHRAE 90.1-2004 G2.5) to document measures that reduce process loads. Documentation of process load energy savings shall include a list of the assumptions made for both the base and proposed design, and theoretical or empirical information supporting these assumptions.
- OR -

**OPTION 2 - PRESCRIPTIVE COMPLIANCE PATH (4 points)**

Comply with the prescriptive measures of the *ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004*. The following restrictions apply:

- Buildings must be **under 20,000** square feet
- Buildings must be office occupancy
- Project teams must fully comply with all applicable criteria as established in the Advanced Energy Design Guide for the climate zone in which the building is located

- OR -

**OPTION 3 - PRESCRIPTIVE COMPLIANCE PATH (1 point)**

Comply with the Basic Criteria and Prescriptive Measures of the *Advanced Buildings Benchmark™ Version 1.1* with the exception of the following sections: 1.7 Monitoring and Trend-logging, 1.11 Indoor Air Quality, and 1.14 Networked Computer Monitor Control. The following restrictions apply:

- Project teams must fully comply with all applicable criteria as established in Advanced Buildings Benchmark for the climate zone in which the building is located.
EA Credit 3: Enhanced Commissioning

Intent:
Begin the commissioning process early during the design process and execute additional activities after systems performance verification is completed.

Requirements:
Implement, or have a contract in place to implement, the following additional commissioning process activities in addition to the requirements of EA Prerequisite 1 and in accordance with the LEED® -NC 2.2 Reference Guide:

1) Prior to the start of the construction documents phase, designate an independent Commissioning Authority (CxA) to lead, review, and oversee the completion of all commissioning process activities. The CxA shall, at a minimum, perform Tasks 2, 3 and 6. Other team members may perform Tasks 4 and 5.
   a) The CxA shall have documented commissioning authority experience in at least two building projects.
   b) The individual serving as the CxA shall be—
      i) independent of the work of design and construction;
      ii) not an employee of the design firm, though they may be contracted through them;
      iii) not an employee of, or contracted through, a contractor or construction manager holding construction contracts; and
      iv) (can be) a qualified employee or consultant of the Owner.
   c) The CxA shall report results, findings and recommendations directly to the Owner.
   d) This requirement has no deviation for project size.
2) The CxA shall conduct, at a minimum, one commissioning design review of the Owner's Project Requirements (OPR), Basis of Design (BOD), and design documents prior to mid-construction documents phase and back-check the review comments in the subsequent design submission.
3) The CxA shall review contractor submittals applicable to systems being commissioned for compliance with the OPR and BOD. This review shall be concurrent with A/E reviews and submitted to the design team and the Owner.
4) Develop a systems manual that provides future operating staff the information needed to understand and optimally operate the commissioned systems.
5) Verify that the requirements for training operating personnel and building occupants are completed.
6) Assure the involvement by the CxA in reviewing building operation within 10 months after substantial completion with O&M staff and occupants. Include a plan for resolution of outstanding commissioning-related issues.
**EA Credit 5: Measurement & Verification**

**Intent:**
Provide for the ongoing accountability of building energy consumption over time.

**Requirements:**
- The M&V period shall cover a period of no less than one year of post-construction occupancy.
EQ Credit 6.1: Controllability of Systems: Lighting (1 point)

**Intent:**
Provide a high level of lighting system control by individual occupants or by specific groups in multi-occupant spaces (i.e. classrooms or conference areas) to promote the productivity, comfort and well-being of building occupants.

**Requirements:**

- Provide individual lighting controls for 90% (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences.

AND

- Provide lighting system controllability for all shared multi-occupant spaces to enable lighting adjustment that meets group needs and preferences.
EQ Credit 6.2: Controllability of Systems: Thermal Comfort

Intent:
Provide a high level of thermal comfort system control by individual occupants or by specific groups in multi-occupant spaces (i.e. classrooms or conference areas) to promote the productivity, comfort and well-being of building occupants.

Requirements:
- Provide individual comfort controls for 50% (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences. Operable windows can be used in lieu of comfort controls for occupants of areas that are 20 feet inside of and 10 feet to either side of the operable part of the window. The areas of operable window must meet the requirements of ASHRAE 62.1-2004 paragraph 5.1 Natural Ventilation.
- Conditions for thermal comfort are described in ASHRAE Standard 55-2004 to include the primary factors of air temperature, radiant temperature, air speed and humidity. Comfort system control for the purposes of this credit is defined as the provision of control over at least one of these primary factors in the occupant's local environment.
ID Credit 1-1.4: Innovation in Design

Intent:
To provide design teams and projects the opportunity to be awarded points for exceptional performance above the requirements set by the LEED®-NC Green Building Rating System and/or innovative performance in Green Building categories not specifically addressed by the LEED®-NC Green Building Rating System.

Requirements:
- Credit 1.1 (1 point) In writing, identify the intent of the proposed innovation credit, the proposed requirement for compliance, the proposed submittals to demonstrate compliance, and the design approach (strategies) that might be used to meet the requirements.
- Credit 1.2 (1 point) Same as Credit 1.1
- Credit 1.3 (1 point) Same as Credit 1.1
- Credit 1.4 (1 point) Same as Credit 1.1

ID Credit 2: LEED® Accredited Professional

Intent:
To support and encourage the design integration required by a LEED®-NC green building project and to streamline the application and certification process.

Requirements:
At least one principal participant of the project team shall be a LEED® Accredited Professional.
Standards that **DO NOT APPLY** -

### MR Credit 4.1 & 4.2: Recycled Content (2 points)

**Intent:**
Increase demand for building materials that incorporate recycled content materials, thereby reducing impacts from extraction and processing of virgin materials.

**Requirements:**
"Mechanical, electrical and plumbing components and specialty items such as elevators shall not be included in this calculation."

The Reference Guide for v2.2 goes on to state: "Mechanical, electrical and plumbing components, along with appliances and equipment cannot be included in this credit. These are excluded because, when compared with structural and finish materials, mechanical and electrical equipment tends to have a high dollar value relative to the amount of material it contains. That high dollar value would skew the results of the calculation, reducing the incentive to use recycled-content in high-mass materials."

### MR Credit 5.1 & 5.2: Regional Materials (2 points)

**Intent:**
Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.

**Requirements:**
"Mechanical, electrical and plumbing components and specialty items such as elevators and equipment shall not be included in this calculation."

The Reference Guide for v2.2 goes on to state: "Mechanical, electrical and plumbing components, along with appliances and equipment cannot be included in this credit for reasons of fairness and simplification: limited manufacturing locations, skewed results due to relatively high cost compared to the actual mass of materials in the product, and the complexity of some systems is not conducive to gathering the data needed for LEED® credits (the exclusion also applies to credits 3 and 4)."
References:

U.S. Green Building Council:  [www.usgbc.org](http://www.usgbc.org)


*LEED®’s Influence on the Electrical Design and Contractor* [www.sustainablefacility.com](http://www.sustainablefacility.com), Timothy Koch, PE, LEED® AP, February 6, 2008

*Building Green on a Budget* [www.buildinggreen.com](http://www.buildinggreen.com), Alex Wilson, May 1, 1999