



**US Army Corps  
of Engineers®**

# ENGINEERING AND CONSTRUCTION BULLETIN

**No.** 2016-29

**Issuing Office:** CECW-CE

**Issued:** 13 Dec 16

**Expires:** 13 Dec 18

**SUBJECT:** Lessons Learned from LEED v4 Pilot Projects

**CATEGORY:** For Information

## 1. References:

- a. Engineering and Construction Bulletin (ECB) 2014-19, [Leadership in Energy and Environmental Design \(LEED\), Version 4 \(V4\)](#), R1 12 Feb 2015
- b. Memorandum, ASA (IE&E), [Sustainable Design and Development Policy Update](#), 16 Dec 13
- c. US Green Building Council (USGBC) memorandum, 11 Apr 2014
- d. USGBC DoD Gender Ratio Exemption, 2 Apr 2014

2. **Purpose.** This ECB is to aid in the transition to version 4 of the LEED certification program (LEED v4) which will apply to all projects registered after 1 November 2016 as previously indicated in ECB 2014-19 (Reference 1.a.) All new construction vertical projects and comprehensive building renovations meeting the Minimum Program Requirements (MPRs) must be formally third-party certified at the LEED Silver level in accordance with Army policy (reference 1.b.) Lessons learned from advanced LEED v4 Pilot Projects were gathered and are presented below. When pursuing LEED compliance, note that military-specific exceptions to the LEED data-sharing requirements and mandated gender ratios are still in effect and are documented in References 1.c and 1.d.

3. **Meeting Mandatory Provisions.** Most sections of the LEED v4 program include specific prerequisites that are required for certification as minimum standards. These items must be achieved. The prerequisites for each section are listed below and described in terms of *Applicability*, *Familiarity*, and *Commentary*. *Applicability* indicates whether or not points can be documented once on a Campus-wide basis and applied to multiple projects within that boundary indicated by “Campus”, on a “Group” basis requiring documentation only once for a group of buildings, or at the “Building” level indicating that documentation for each individual building is required. *Familiarity* indicates whether a requirement is a new requirement in LEED v4, or it is similar or the same as familiar requirements of the prior 2009 version of the LEED program. *Commentary* discusses experiences, best practices, and lessons learned to date from the pilot projects and other sources to provide insight to project teams who have yet to pursue project certification under LEED v4.

- a. Sustainable Sites (SS)

- (1) Construction Activity Pollution Prevention

(a) Applicability: Campus or Group

(b) Familiarity: The “Campus” compliance path is new in LEED v4

(c) Commentary: In a campus approach each contractor may provide a plan for their individual sites to manage contracts.

**b. Water Efficiency (WE)**

**(1) Outdoor Water Use Reduction**

(a) Applicability: Campus or Group

(b) Familiarity: New in LEED v4

(c) Commentary: Easily met by not providing permanent irrigation.

**(2) Indoor Water Use Reduction**

(a) Applicability: Building

(b) Familiarity: Similar to LEED 2009 WE prerequisite 1

(c) Commentary: May be achieved by either a prescriptive path or performance based on usage. Need to provide cut sheets for fixtures and water equipment as opposed to a schedule. Make sure specifications require Water Sense labels as they are required for Federal project whenever available. Coordinate with Installations to develop and provide non-potable water lines (‘purple pipe’) infrastructure.

**(3) Building-Level Water Metering**

(a) Applicability: Building

(b) Familiarity: New to LEED v4

(c) Commentary: Coordinate with Installation regarding connection to any central monitoring systems, present or future.

**c. Energy & Atmosphere (EA)**

**(1) Fundamental Commissioning and Verification**

(a) Applicability: Campus

(b) Familiarity: Similar to LEEDv2009 requirements, but expanded

(c) Commentary: LEEDv4 adds electrical, plumbing, building envelope, and O&M turnover requirements.

(2) Minimum Energy Performance

(a) Applicability: Building

(b) Familiarity: Similar to, but more stringent than LEEDv2009? EA point 2

(c) Commentary: Likely achieved through Option 1. Note that differing Federal and Army policy update timelines may result in a different version of ASHRAE 90.1 than required by LEED resulting in a requirement for the designer to do two models. Arch/Elec/Mech should use the template from beginning and during design. LEED's interpretation of ASHRAE 90.1 table G3.1.1.3, and the paragraphs that reference it, is that you should have a minimum number of systems in the baseline model, but buildings with high exhaust loads, may then have the potential for conflicts and other issues. Teams should review the Process Workload spreadsheet in this credit documentation early during design process. Pilot project teams recommend using the prescriptive path.

(3) Building Level Energy Metering

(a) Applicability: Building

(b) Familiarity: New in LEED v4

(c) Commentary: The Army Sustainable Design Directive policy requires meeting ASHRAE 189.1 metering, including sub-metering. Coordinate with Installation regarding connection to any central monitoring systems, present or future.

(4) Fundamental Refrigerant Management

(a) Applicability: Campus

(b) Familiarity: Same as LEEDv2009 EA prerequisite 3

(c) Commentary: Be sure to include for any applicable fire suppression equipment in the documentation.

d. Materials & Resources (MR)

(1) Storage and Collection of Recyclables

(a) Applicability: Campus or Group

(b) Familiarity: Similar to LEEDv2009 MR prerequisite 1, with two additional recycling streams added.

(c) Commentary: In addition to traditional recyclable material collection, incorporate and document e-waste and battery disposal programs available on Installation. Also include mercury disposal if the facility has mercury containing waste; e.g. uses fluorescent/CFL light fixtures. Collection and disposal of mercury should be in the installation's waste disposal plans and project teams will need to document the installation's plan for collection and disposal since

these materials are considered hazardous waste if broken. (Tip: use LED/non-mercury based lighting technologies for all new projects in lieu of fluorescent if possible.)

(2) Construction and Demolition Waste Management Planning

(a) Applicability: Campus or Group

(b) Familiarity: New in LEED v4

(c) Commentary: Create plan and identify recycling streams and percentages recycled. Note that per UFGS 01 74 19 and UFC 1-200-02, the current Army minimum Construction and Demolition waste diversion requirement is 60% and exceeds the LEED requirement. Tip: Concrete demolition waste can be economically crushed and used as granular base material on-site, depending on project scope. Also, suppliers of large quantity materials can be coordinated with to use less packaging or recyclable packaging alternatives for delivery.

e. Indoor Environmental Quality (IEQ)

(1) Minimum Indoor Air Quality Performance

(a) Applicability: Building

(b) Familiarity: Similar to LEEDv2009 IEQ prerequisite 1

(c) Commentary: Team should provide a breakdown of floor area, area provided should be within 10% of gross floor area. Used outside air calculator in design process; use to verify 62.1 force model. USGBC has changed their calculations spreadsheet, which differs from ASHRAE. Pilot projects are achieving this prerequisite through Option 1 compliance.

(2) Environmental Tobacco Smoke Control

(a) Applicability: Campus or Group

(b) Familiarity: Similar to IEQ prerequisite 2

(c) Commentary: With proper signage, Army policy meets the minimum requirements for this prerequisite.

**4. Point-by-Point Guidance.** Guidance applicable to each section of the LEED v4 program and the required criteria for compliance is provided below, followed by an overview of each credit category to assist project teams in deciding which points to pursue in order to achieve the required level of certification. The commentary is divided into the following topical areas: *Applicability*, *Familiarity*, *Achievability*, *Economy*, and *Commentary*. As above, *Applicability* indicates whether or not points can be documented once on a Campus-wide basis and applied to multiple projects within that boundary, on a group basis requiring documentation only once for a group of buildings, or at the building level indicating that documentation for each individual building is required. *Familiarity* indicates whether a requirement is a new requirement in LEED v4, or is it is similar or the same as familiar requirements of the prior 2009 version of the LEED program. *Achievability* predicts the likelihood that a typical project will be able to achieve points

under this credit in terms of High, Medium, or Low probability. This rating is qualitatively based on the experiences of the LEED v4 pilot projects and are for general information only. Project teams need to use their own discernment in determining credits applicable to individual projects. *Economy* indicates how credits are consistent with existing project requirements and policies, and therefore achievable without significant additional effort. *Commentary* discusses experiences, best practices, and lessons learned to date from the pilot projects and other sources to provide insight to project teams attempting points under these credits.

a. Integrative Process.

(1) Integrative Process.

(a) Applicability: Group

(b) Familiarity: Consistent with USACE standard practices and UFC 1-200-02.

(c) Achievability: High

(d) Economy: No significant additional effort is required to comply.

(e) Commentary: See the LEED v4 Reference Guide for more information. There are no comments on this section from the pilot projects.

b. Location and Transportation.

(1) LEED for Neighborhood Development Location

(a) Applicability: Campus or Group

(b) Familiarity: New in LEED v4

(c) Achievability: Binary High or Low, depending upon the prior completion of a LEED Neighborhood certification.

(d) Economy: Aligns with UFC, exceeds ASHRAE 189.1

(e) Commentary: Project has to be located in a previously certified LEED Neighborhood.

(2) Sensitive Land Protection

(a) Applicability: Group

(b) Familiarity: Similar to LEEDV2009 SSc1 Site Selection

(c) Achievability: High

(d) Economy: No significant impact with LEED v4.

(e) Commentary: Note that the definition of Prime Farm Land varies across agencies; e.g. USDA, USGBC.

(3) High Priority Site

(a) Applicability: Campus or Group

(b) Familiarity: Similar to LEEDv2009 SSc3 Brownfield development

(c) Achievability: Binary high or low based on existing site conditions

(d) Economy: No significant impact with LEED v4.

(e) Commentary: No further comments

(4) Surrounding Density and Diverse Uses

(a) Applicability: Group

(b) Familiarity: Similar to SSc2 Development Density and Community Connectivity

(c) Achievability: Medium

(d) Economy: No significant impact with LEED v4.

(e) Commentary: Typical Installations provide many of the required services in a defined area which may enhance achievement of this credit during planning efforts for project site selection.

(5) Access to Quality Transit

(a) Applicability: Group

(b) Familiarity: Similar to LEEDv2009 SSc4.1

(c) Achievability: Low

(d) Economy: No significant additional work effort required.

(e) Commentary: A troop transit system does not qualify because it is not available to general population.

(6) Bicycle Facilities

(a) Applicability: Campus or Group

(b) Familiarity: Similar to but more stringent than LEEDv2009 SSc4.2

(c) Achievability: Medium/Low depending on site surroundings

(d) Economy: If pursued, projects must provide storage, changing areas, showers.

(e) Commentary: New requirements have been implemented to ensure usability of bike infrastructure; i.e. site must now be accessible by low speed-limit roads (25mph or less) or dedicated bike paths to comply. Requirements for long term storage may be more complicated. Recommend coordination with Installations to document roadways with compliant speed zones for use in documented credit compliance.

(7) Reduced Parking Footprint

(a) Applicability: Campus or Group

(b) Familiarity: Similar to LEEDv2009 SSc4.4

(c) Achievability: Medium

(d) Economy: No significant impact.

(e) Commentary: Buildings with no parking do not qualify automatically. Existing parking has to meet the requirements.

(8) Green Vehicles

(a) Applicability: Campus or Group

(b) Familiarity: Similar to LEEDv2009 SSc4.3

(c) Achievability: Low

(d) Economy: If not present, refueling/charging infrastructure may be a complex issue and incur additional cost.

(e) Commentary: Future Army Policy will need to include charging stations available to POV users on Army facilities; new infrastructure will need to be identified on DD1391s

c. Sustainable Sites (SS)

(1) Site Assessment

(a) Applicability: Campus or Group

(b) Familiarity: New in LEED v4

(c) Achievability: High

(d) Economy: No significant project impact

(e) Commentary: Documentation and analysis either required by UFCs, Army Sustainable Design and Development Policy, or general best practice for Integrated Design strategies to include in project Design Analysis.

(2) Site Development, Protect or Restore Habitat

(a) Applicability: Campus or Group

(b) Familiarity: Similar to LEEDv2009 SSc5.1 – setback requirement removed

(c) Achievability: Low

(d) Economy: Varies

(e) Commentary: Significant pre-project effort; needs to be identified during DD1391/planning process.

(3) Open Spaces

(a) Applicability: Campus or Group

(b) Familiarity: Similar to LEEDv2009 SSc5.2 - unified requirements

(c) Achievability: Varies by site

(d) Economy: Minor project impact

(e) Commentary: Consider planting maintenance and water use.

(4) Rainwater Management

(a) Applicability: Campus or Group

(b) Familiarity: Similar to LEEDv2009 SSc6.1 & 6.2

(c) Achievability: Medium

(d) Economy: No Significant Impact.

(e) Commentary: Low Impact Development UFC 3-210-10 requirements consistent with credit requirements.

(5) Heat Island Reduction

(a) Applicability: Campus or Group

(b) Familiarity: Similar to LEEDv2009 SSc7.1 & 7.2

(c) Achievability: High



(d) Economy: No significant impact

(e) Commentary: None.

(6) Light Pollution Reduction

(a) Applicability: Campus or Group

(b) Familiarity: Similar to but more stringent than LEEDv2009 SSc8, may be easier to comply.

(c) Achievability: High

(d) Economy: No significant cost impact for backlight-uplight-glare (BUG) rated fixtures.

(e) Commentary: Now more achievable because now specifying BUG (Back, Uplight, and Glare) rating system can demonstrate compliance. LEED and light boundaries must be defined.

d. Water Efficiency (WE)

(1) Outdoor Water Use Reduction

(a) Applicability: Campus or Group

(b) Familiarity: Similar to LEEDv2009 WEc1

(c) Achievability: High

(d) Economy: No impact.

(e) Commentary: Achieve by not providing permanent irrigation with potable water.

(2) Indoor Water Use Reduction

(a) Applicability: Building

(b) Familiarity: Similar to LEEDv2009 WEc3 with substantial changes

(c) Achievability: High

(d) Economy: Minimal impact

(e) Commentary: Investigate condensate collection requirement from ASHRAE 189.1-2014. ASHRAE 189.1 threshold for dual flush is lowered so older style dual flush toilets do not meet minimum.

(3) Cooling Tower Water Use

(a) Applicability: Campus or Group

(b) Familiarity: New to LEED v4; roughly related to WEc2

(c) Achievability: Varies

(d) Economy: Minor effort. Some design alternatives need consideration.

(e) Commentary: Source water quality influences attainability.

(4) Water Metering

(a) Applicability: Building

(b) Familiarity: New in LEED v4

(c) Achievability: High

(d) Economy: Minor cost impact for sub-metering systems

(e) Commentary: Coordinate overall metering strategy and integration with Installation meter reading operations.

e. Energy & Atmosphere (EA)

(1) Enhanced Commissioning

(a) Applicability: Building

(b) Familiarity: Similar to LEEDv2009 EAc3

(c) Achievability: Medium

(d) Economy: Minor cost impact

(e) Commentary: Option 1 requires CxA development of an ongoing commissioning plan and a commitment to an ongoing commissioning plan which the owner will maintain. Need to confirm Option 2 matches USACE Total building Cx. Envelope specific guidance. Guide specification may need to be updated.

(2) Optimize Energy Performance

(a) Applicability: Group

(b) Familiarity: Similar to, but much more stringent than EAp2

(c) Achievability: High

(d) Economy: Consistent with Army SDD Policy and UFC 1-200-02 standard, and Federal mandates.

(e) Commentary: Maximize energy savings in keeping with mandates and policies to earn more points.

(3) Advanced Energy Metering

(a) Applicability: Building

(b) Familiarity: New in LEED v4

(c) Achievability: Varies

(d) Economy: May be different than standard practice, requiring additional effort.

(e) Commentary: Documentation requires manufacturers cut sheets. Coordinate b/w Mechanical & Electrical

(4) Demand Response

(a) Applicability: Group

(b) Familiarity: New in LEED v4

(c) Achievability: Varies by location

(d) Economy: No significant additional effort.

(e) Commentary: Designer completed credit not contractor. Installations may not have a demand response program. An Army policy would have to be developed for this to be implemented consistently.

(5) Renewable Energy Production

(a) Applicability: Group

(b) Familiarity: Similar to LEEDv2009 EAc4

(c) Achievability: Depends on location

(d) Economy: Significant impact.

(e) Commentary: This credit may now be met for multiple buildings by one consolidated system on the installation, which is consistent with Army Renewable Energy strategies. System should be identified on DD1391.

(6) Enhanced Refrigerant Management

(a) Applicability: Campus, for Option 1

(b) Familiarity: Similar to LEEDv2009 EAc5

- (c) Achievability: Low
- (d) Economy: undetermined
- (e) Commentary: Equipment may not be available to meet the requirements of this credit.

(7) Green Power and Carbon Offsets

- (a) Applicability: Group
- (b) Familiarity: Similar to, but more stringent than LEEDv2009 EAc6
- (c) Achievability: Low (against current policy)
- (d) Economy: Prohibited
- (e) Commentary: Cannot obligate funding for green power, especially not as part of project funds.

f. Materials & Resources (MR)

(1) Building Life, Cycle Impact Reduction

- (a) Applicability: Group (Option 2 or 3)
- (b) Familiarity: Combines LEEDv2009 MRc1.1, MRc1.2, and MRc3, with significant changes.

(c) Achievability: Low

(d) Economy: Low

(e) Commentary: A high bar to achieve; requires re-use of structural elements.

(2) Product Disclosure & Optimization, Environmental Product Declarations

- (a) Applicability: Group
- (b) Familiarity: Combines LEEDv2009 MRc3, MRc4, and MRc5 with significant changes.

(c) Achievability: High

(d) Economy: Low construction management impact

(e) Commentary: Contract can require the contractor to achieve two points. Education by USACE to contractor from the beginning is important. Achievement of this credit is

dependent on subcontractors providing documentation. There is an industry hesitation to provide required data that may be proprietary.

(3) Product Disclosure and Optimization, Sourcing of Raw Materials

(a) Applicability: Group

(b) Familiarity: Combines LEEDv2009 MRc6 and MRc7 with significant changes.

(c) Achievability: High

(d) Economy: Low construction management impact

(e) Commentary: Contract can require the contractor to achieve two points. For all three Building Product Disclosure Credits: Architects and Interior Designers need to consult the credit template when writing specifications so that they are asking for the correct products. It is also beneficial to fill out the template to verify the points required in the contract are feasible based on the design.

(4) Product Disclosure and Optimization, Material Ingredients

(a) Applicability: Group

(b) Familiarity: New to LEED v4

(c) Achievability: High

(d) Economy: Low construction management impact

(e) Commentary: Contract can require the contractor to achieve two points.

(5) Construction and Demolition Waste Management

(a) Applicability: Group

(b) Familiarity: Similar to LEEDv2009 MRc2

(c) Achievability: High

(d) Economy: Normal/Low construction management impact

(e) Commentary: Note that there may be a template calculator issue: Credit requires 5 stream sources. The spreadsheet template calculator adds all products under each stream source making the total in the hundreds, instead of up to 5. Be sure to require contractor to meet Army SDD Policy (60%) in UFGS 01 74 19 which guarantees using one of Option 1 paths.

g. Indoor Environmental Quality (IEQ)

(1) Enhanced Indoor Air Quality Strategies

- (a) Applicability: per building
- (b) Familiarity: Combines LEEDv2009 IEQc1, IEQc2, & IEQc5
- (c) Achievability: Medium
- (d) Economy: See below

(e) Commentary: Pilots pursuing Option 2. Requires a CFD model/TRACER Gas. To meet UFC, pilot project teams suggest designers increase the outside air value to handle the latent load and get the LEED point. Submit control drawings, highlight air flow monitoring and alarm sequence.

(2) Low-Emitting Materials

- (a) Applicability: Group
- (b) Familiarity: Combines LEEDv2009 IEQc4.1, 4.2, 4.3 & 4.4
- (c) Achievability: High
- (d) Economy: Low project impact

(e) Commentary: A pilot project Contractor is using software, Green Badger, to scan materials and gather information.

(3) Construction Indoor Air Quality Management Plan

- (a) Applicability: Group
- (b) Familiarity: Same as LEEDv2009 IEQc3.1
- (c) Achievability: High
- (d) Economy: Consistent with ASHRAE 189.1 requirements

(e) Commentary: Contract should require contractor to achieve one point. Project engineer will need to enforce ASHRAE 189.1 Indoor Air Quality during construction management. Includes restriction of HVAC equipment operations during construction.

(4) Indoor Air Quality Assessment

- (a) Applicability: Building
- (b) Familiarity: Similar to LEEDv2009 IEQc3.2, but now includes furnishings
- (c) Achievability: Medium
- (d) Economy: To be determined

(e) Commentary: Pilot project Contractor chose Option 2. Increased ventilation rate must be included in contract so contractor is aware of requirement. Credit requires furniture to be in place for testing. FF&E to be included.

(5) Thermal Comfort

(a) Applicability: per building

(b) Familiarity: Similar to LEEDv2009 IEQc7.1

(c) Achievability: High

(d) Economy: Additional HVAC Zones required which can increase cost.

(e) Commentary: Current HVAC UFC conflicts with the Sustainability UFC.

(6) Interior Lighting

(a) Applicability: Group

(b) Familiarity: Similar to LEEDv2009 IEQc6.1

(c) Achievability: High

(d) Economy: Consistent with practice

(e) Commentary: Educate the design team about Option 2 up-front for finish reflectance requirements. Verify lighting quality requirements are in specs and submittals.

(7) Daylight

(a) Applicability: Group

(b) Familiarity: Similar to LEEDv2009 IEQc8.1

(c) Achievability: Varies

(d) Economy: Requires minor additional design effort

(e) Commentary: Recommend using simulation software to incorporate with standard designs. Analysis and re-design will be difficult otherwise.

(8) Quality Views

(a) Applicability: per building

(b) Familiarity: Similar to LEEDv2009 IEQc8.2

(c) Achievability: Medium/Low

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(d) Economy: Minor design effort

(e) Commentary: Difficult to incorporate without modifying standard designs with certain security requirements.

(9) Acoustic Performance

(a) Applicability: Building

(b) Familiarity: New in LEED v4

(c) Achievability: Low

(d) Economy: Effort generally not worth point

(e) Commentary: Requires an acoustic field survey with a sound level meter. Calculations required of mechanical engineers is beyond typical scope. ASHRAE 189.1 focuses on STC ratings between spaces, which addresses the intent of this point.

5. **Elective Points and Resources.** Additional points will need to be achieved in the Innovation and Design Process and Regional Priority sections. These points vary in their nature and are not rigidly defined.

6. **Update.** The LEED v4 Implementation Guide issued with ECB 2014-19 (reference 1.a) is planned to be updated again and re-released as necessary as the pilot projects develop.

7. **Point of Contact.** HQUSACE point of contact for this ECB is Eric Mucklow, CECW-CE, (202) 761-0522 or [eric.mucklow@usace.army.mil](mailto:eric.mucklow@usace.army.mil).

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