



01352 Sustainable Design Requirements

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Change History

Date	Description of Change	Pages / Sections Modified	Change Approver Initials
3/11/11	Modified 4 th bullet point to indicate all projects shall incorporate metered building energy consumption and diagnostic tools to evaluate system operations.	68 – Section 01352, #4a (Special Requirements), LEED NC	GC
3/11/11	Added 6 th bullet point to indicate all projects shall incorporate metered project area energy consumption and diagnostic tools to evaluate system operations.	70 – Section 01352, #4a (Special Requirements), LEED CI	GC
5/12/11	Added “Small Scope Sustainability Checklist” section (#3).	77 – Section 01352 (Small Scope Projects)	GC
9/6/11	Modified formatting of the following spreadsheet: “Small Scope Projects Product List”	76 – Section 01352 (Small Scope Projects)	GC
9/09/11	Modified two spreadsheets: “Sustainable Design Matrix” and “Small Scope Sustainability Checklist”	75 – Section 01352 (Limited Scope Projects, #5) 77 – Section 01352 (Small Scope Projects, #3)	GC
2/1/12	Modified entire section, modified Life Cycle Cost spreadsheet link, and added new link of “Yale Weightings of Desirable Sustainable Attributes”	71 – Section 01352, #7 (Life Cycle Cost and Life Cycle Assessment)	GC
2/1/12	Modified entire section	72 – Section 01352, #8 (Sustainability Workshops)	GC
3/28/12	Added items 5 and 6 – Salvageable Building Components and Salvageable Furniture and Equipment	76 – Section 01352	GC
3/28/12	Added items 3 and 4 – Salvageable Building Components and Salvageable Furniture and Equipment	78 – Section 01352	GC
3/28/12	Sustainable Products Lists and instructions replaced with 2012 versions	77 – Section 01352, D	GC
12/4/12	Added links to Life Cycle Cost calculators for Central/Medical and West Campuses.	71 – Section 01352, #7 (Life Cycle Cost and Life Cycle Assessment)	GC
12/4/12	Added link to Yale weightings of desired sustainable attributes	71 – Section 01352, #7 (Life Cycle Cost)	GC
6/7/13	Added “Archive Sustainability Documents” as part of Comprehensive Scope Projects	73 – Section 01352, #10	GC
6/7/13	Added “Archive Sustainability Documents” as part of Limited Scope Projects	77 – Section 01352, #10	GC
6/7/13	Added “Archive Sustainability Documents” as part of Small Scope Projects	79 – Section 01352, #6	GC
1/21/14	Added reference to “Yale University, A Framework for Campus Planning, Sustainability Supplement”	68 – Section 01352, Summary 78 – Section 01352, Sustainable Design Matrix 80 – Section 01352, Small Scope Sustainability Checklist	GC
1/21/14	Added LEED NC credit requirements – Storm Water Design, Quality Control and Water Efficient Landscaping	69 – Section 01352, Special Requirements	GC

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NOTE: This document contains hyperlinks that may work best if PDF is downloaded and viewed with a PDF viewer.



A. Summary

Sustainable design seeks a balance between the environment, economics, occupant comfort and human health considerations. Sustainably-designed buildings aim to lessen their impact on our environment by using energy and environmental resources efficiently while providing for the present and future needs of Yale University. Yale University is committed to the incorporation of sustainable design practices in the design of construction of all size projects on campus. This section describes the goals, strategy and procedures for providing and meeting sustainable design requirements for projects designated by Yale Facilities as **Comprehensive, Limited or Small Scope** projects. Note: Each project regardless of scope classification shall follow the required reference document “[Yale University, A Framework for Campus Planning, Sustainability Supplement](#)”.

B. Comprehensive Scope Projects

1. System Design and Performance Requirements

- a. Yale University has adopted the Leadership in Energy and Environmental Design (LEED-NC or LEED-CI) rating system, administered by the US Green Building Council (USGBC) as the method to help achieve a commitment to sustainable design.
- b. All comprehensive new construction and renovation project designs must meet LEED “Gold” status or higher. Registration with USGBC may occur at any time in the design process, but must be transitioned to the version in effect at the end of the CD phase.
- c. Yale University has outlined several “points,” listed under **Special Requirements**, below as mandatory areas of compliance.

2. Submittals

Submit the LEED checklist in the pre-design phase, DD phase and 50% CD phase with those points proposed for project inclusion. Score all designs at each design phase for Yale University’s information.

3. Materials & Product Standards



Designers shall provide product and materials specifications that preferentially select resource, energy saving and health building materials and design features.

4. Special Requirements

All sustainable design alternatives shall be presented to the University for their consideration with analyses as described herein. Designers are encouraged to reduce the energy loads, apply the most efficient systems, and look for synergies wherein all systems, building construction and components will work together to produce overall functionality and environmental performance.

a. Special Requirements

- (1) Required Credits (Note: This currently references credits in LEED-NC v3 and LEED-CI v3. These references will be updated as new versions are published and adopted by Yale).

The following LEED NC and LEED CI points are required credits:

(a) Sustainable Sites

LEED NC: Must incorporate SS Credit 6.1, Storm Water Management. (LEED CI: Not Applicable)

LEED NC: Must incorporate SS Credit 6.2, Storm Water Design – Quality Control (LEED CI: Not Applicable)

(b) Water Efficiency

LEED NC: Must incorporate WE Credit 1: Water Efficient Landscaping.

(c) Energy and Atmosphere

LEED NC: Must incorporate EA Credit 1, Optimize Energy Performance, using detailed energy modeling.

- Lab building or other building with 100% OA requirements: 12 pts (34% new, 30% existing)
- All other building types: 7pts (24% new, 20% existing)
- Must incorporate EA Credit 3, Enhanced Commissioning.



- Although EA Credit 5 Measurement & Verification is not required, all projects shall incorporate metered building energy consumption and diagnostic tools to evaluate system operations. Yale Utilities & Engineering shall indicate criteria for Measurement & Verification for each project.

LEED CI:

- Must incorporate EA Credit 1.1 Lighting Power (3 pts). Reduce installed lighting power density to 25% below ANSI/ASHRAE/IESNA Standard 90.1-2007 as a minimum.
- Must incorporate EA Credit 1.2 Lighting Controls (2 pts). Provide daylight controls for regularly occupied day lit spaces within 15 feet of windows and under skylights. Install daylight controls for at least 50% of the connected lighting load –or- install occupancy sensors for at least 75% of the connected lighting load.
- Must incorporate EA c1.3 Option 1 Appropriate Zoning/Controls (5 pts) and EA c1.3 Option 2 Performance Modeling (5 pts). For Option 1, zone each solar exposure and interior spaces separately, and provide active controls capable of sensing space use and modulating the HVAC systems in response to space demands of private offices and special occupancies. For Option 2, demonstrate that HVAC system performance criteria used for tenant space are 15% better than a system that is in minimum compliance with ANSI/ASHRAE/IESNA Standard 90.1-2007 using a whole building energy simulation. Note: Chilled water and steam shall be held cost neutral in energy simulations in accordance with the “Required Treatment of District Thermal Energy in LEED NC v2.2.”



In the case where a project does not have dedicated base building infrastructure, must incorporate EAc1.3 Option 1 Appropriate Zoning/Controls (5 pts) and EAc1.3 Option 1 Equipment Efficiency (5 pts). Zone each solar exposure and interior spaces separately, and provide active controls capable of sensing space use and modulating the HVAC systems in response to space demands of private offices and special occupancies, and also demonstrate that HVAC systems comply with the efficiency requirements outlined in the Advanced Buildings Core Performance Guide Sections, 1.4, 2.9, and 3.10 as applicable to project scope.

- Must incorporate EA Credit 1.4 (4 pts) Equipment & Appliances 90% (by rated power) of ENERGY STAR eligible equipment and appliances shall be qualified by EPA's ENERGY STAR program.
- Must incorporate EA Credit 2 Enhanced Commissioning (5 pts).
- Although EA Credit 3 Measurement & Verification is not required, all projects shall incorporate metered project area energy consumption and diagnostic tools to evaluate system operations. Yale Utilities & Engineering shall specify criteria for Measurement & Verification for each project.

(d) **Materials and Resources**

LEED-NC and LEED-CI

- Must incorporate MR Credit 2, Construction Waste Management; divert a minimum 90% of construction waste from landfills.

5. **Salvageable Building Components**

Design Consultant, with review by Facilities Project Manager and Planning Office to identify salvageable building components and determine their reuse by Yale or qualified salvage vendor.



6. Salvageable Furniture and Equipment

Facilities Project Manager and TR&S to evaluate existing furniture and equipment for potential storage and re-use on other projects

7. Life-Cycle Cost and Life Cycle Assessment

- a. Life Cycle Cost (LCC) evaluates the total lifetime cost of alternative building systems or construction options. Instead of focusing on the first cost, it incorporates the potential savings in energy and water, as well as ongoing costs of maintenance and service. It also recognizes that future dollars are not equivalent to present dollars, and converts future cash flows to present value for comparison.
 - (1) For all major sustainable design alternatives that have quantifiable economic impact over time (e.g. reduced cost for maintenance, energy or water use). Use Yale Life Cycle Cost calculator (found [here](#) for Central and Medical campuses, and [here](#) for West Campus). The spreadsheet incorporates:
 - (a) A GHG analysis that enumerates emission reducing measures with quantified MTCO₂ avoidance and cost, and
 - (b) An analysis that calculates total life-cycle costs, including design, construction, capital, operational, commissioning costs.
- b. Life Cycle Assessment (LCA) is a method of evaluating sustainable attributes and environmental impacts of construction materials over the lifetime of the building. Published LCA reports should be referenced for alternative products, assemblies and systems to assist in selections. Sustainable attributes of specific interest to Yale should be emphasized in these selections, and the referenced LCAs submitted to Yale. Yale weightings of desired sustainable attributes can be found [here](#).



8. Sustainability Workshops

- a. Eco- Charrette occurs in the first weeks after a project's kick off meeting with update meetings every phase thereafter, incorporating full team participation including:
 - (1) Yale representatives from multiple groups including Planning and/or Project Management, Utilities & Engineering, Facilities Operations, Office of Sustainability, Waste Management/Recycling, Custodial, Buildings and Grounds Maintenance
 - (2) Consultants including the Architect, Sustainability Engineer, MEP Engineer, Civil Engineer, Geotechnical Engineer, Landscape Architect, Structural Engineer, Lighting Consultants, Waste Management Consultant, Cost Estimator, Construction Manager

- b. Topics to include but not limited to:
 - (1) A Framework for Campus Planning, Sustainability Supplement: Project team shall review [“A Framework for Campus Planning, Sustainability Supplement”](#) and consider all applicable recommendations for integration into proposed project.
 - (2) Life Cycle Cost (LCC) and Life Cycle Assessment (LCA): for each of the topics addressed, determine a preliminary list of design alternatives that might require Life Cycle Cost and /or a Life Cycle Assessment.
 - (3) Site (utilities, building massing, landscape, hydrology)
 - (4) Water (opportunities for reuse, water conserving landscape design, storm water runoff mitigation using green and/or grey infrastructure)
 - (5) Energy (interaction with central plant, building facades, building systems, LEED performance requirements)
 - (6) Materials (opportunities for reuse of existing materials for building and landscape, demolition waste management)



- (7) Indoor Environment (daylight views, operable windows, environmentally preferable materials, HVAC systems options)

9. Sustainability Resource Group

The Sustainability Resource Group (SRG) will serve as an advisory body for Comprehensive Scope Projects providing input and guidance as needed on projects' sustainable design attributes. Project team (or Yale Planner) will meet with the Sustainability Resource Group after the first Eco Charrette to present proposed sustainable design strategies including the team's response to the recommendations in "[A Framework for Campus Planning, Sustainability Supplement](#)". The integration of recommendations into each project will be tracked on the Sustainability Supplement Recommendations Checklist, which can be found [here](#). The checklist is a tool to assess the depth and range of sustainable attributes that are being integrated into each project.

10. Archive Sustainability Documents

After LEED certification has been awarded, provide a compilation of all LEED documentation that was submitted to USGBC on-line plus all supporting analyses in the form of a bookmarked PDF file. Provide the following:

- a. LEED Submittal File: The full LEED documentation that was submitted to the USGBC for the project.
- b. LEED Final Report: The final report from USGBC that states each credit and describes what was earned and the final rating achieved with commentary from the USGBC reviewer regarding the design team responses.
- c. Energy Modeling Reports: Energy Modeling Reports that were prepared to analyze energy strategies for the project.
- d. Additional Supplements: Additional information, reports, studies etc. that provide insight into why decisions were made.



C. Limited Scope Projects

No LEED certification is required but the following sustainable attributes are required if the category is applicable. In addition, and depending on the type of project, life cycle costing must be used for comparative analysis for all measures. (Note: This currently references credits in LEED-NC v3 and LEED-CI v3. These references will be updated as new versions are adopted by Yale.)

1. Energy and Atmosphere

Optimize energy performance (e.g. –and not limited to- use of occupancy sensors, light fixture and lamp selections, controllability systems, HVAC system zoned and controlled for low energy consumption, use of energy star equipment, day lighting, thermal comfort, building insulation and reduced heat island effect roofing, etc.)

a. Lighting:

- (1) LEED CI EA Credit 1.1: Optimize Energy Performance, Lighting, reduce lighting power density to 25% below the standard)
- (2) LEED CI EA Credit 1.2: Optimize Energy Performance; lighting controls

b. HVAC:

- (1) LEED CI EA Credit 1.3: Optimize Energy Performance, HVAC
- (2) LEED CI EA Credit 2: Enhanced Commissioning (only if totally replacing HVAC system)
- (3) LEED NC EA Credit 4, Enhanced Refrigerant Management, if replacing or installing a chiller
- (4) Include Metering to enable monitoring of systems performance (where possible connecting to existing DDC)

c. Plug Load:

- (1) LEED CI EA Credit 1.4: Optimize Energy Performance, Equipment and Appliances (use energy star rated appliance)



d. Building Envelope:

- (1) LEED NC SS Credit 7.2 Heat Island Effect: Roof

2. Materials and Resources

Specify high recycled content, low emitting materials, high content of rapidly renewable materials, use of regional materials (e.g. when specifying carpet, floor tiles, ceiling tiles, casework etc.).

a. Material Specifications:

- (1) LEED CI MR Credit 4: Recycled content, 10%
- (2) LEED CI MR Credit 5: Regional Materials, 20% Manufactured Regionally
- (3) LEED CI MR Credit 6: Rapidly Renewable Materials
- (4) LEED CI MR Credit 7: Certified Wood
- (5) LEED CI IEQ Credit 4.1: Low Emitting Materials, Adhesives & Sealants
- (6) LEED CI IEQ Credit 4.2: Low Emitting Materials, Paints and Coatings
- (7) LEED CI IEQ Credit 4.3 Low Emitting Materials, Flooring Systems
- (8) LEED CI IEQ Credit 4.4 Low Emitting Materials, Composite Wood and Agrifiber Products
- (9) LEED CI MR Prerequisite 1: Storage and Collection of Recyclables

3. Water Use Reduction

Use e.g. dual flush toilets, water saver faucets, low flow lavatories, and where applicable reduce storm water runoff, reduce heat islands, and limit potable water irrigation.

a. Plumbing Fixtures:

- (1) LEED CI WE Credit 1 Water Use Reduction, 30%

b. Landscape and Storm Water:

- (1) LEED NC SS Credit 6.1 Storm Water Design Quantity Control



- (2) LEED NC SS Credit 6.2 Storm Water Design Quality Control
- (3) LEED NC SS Credit 7.1 Heat Island Effect, Non Roof
- (4) LEED NC WE Credit 1 Water Efficient Landscaping, Reduce by 50%

4. Construction Methods

The following construction methods must be followed where applicable:

- a. Construction and Demolition Debris:
 - (1) LEED CI MR Credit 2: Divert 75% of construction waste from landfill
- b. Salvageable Building Components:
 - (1) Design Consultant, with review by Facilities Project Manager and Planning Office to identify salvageable building components and determine their reuse by Yale or qualified salvage vendor.
- c. Salvageable Furniture and Equipment:
 - (1) Facilities Project Manager and TR&S to evaluate existing Furniture and Equipment for potential storage and reuse on other projects.
- d. Air Quality:
 - (1) LEED CI IEQ Credit 3.1 Construction IAQ Management Plan, during Construction
 - (2) LEED CI IEQ Credit 3.2 Construction IAQ Management Plan, before Occupancy
- e. Construction Activity Pollution Prevention
 - (1) LEED NC SS Prerequisite 1: Construction Activity Pollution Prevention

5. Salvageable Building Components

Design Consultant, with review by Facilities Project Manager and Planning Office to identify salvageable building components and determine their reuse by Yale or qualified salvage vendor.



6. Salvageable Furniture and Equipment

Facilities Project Manager and TR&S to evaluate existing furniture and equipment for potential storage and re-use on other projects.

7. Sustainable Design Matrix

Sustainable goals will be considered throughout the design process and will be tracked on the Sustainable Design Matrix (a modified LEED scorecard) which can be found [here](#). The matrix is the means to measure the level of compliance with the Limited Scope Project Standard. If a project is out of compliance, an explanation is required in the Remarks column of the Matrix with attachments submitted as backup as needed. The Design Team will submit the Sustainable Design Matrix at the mid-point of Schematic Design and at the end of all design phases, to the Yale Project Manager for review and signoff. Sustainable Design Matrix shall reflect the applicable recommendations considered by the Design Team from “[A Framework for Campus Planning, Sustainability Supplement](#)”.

8. Sustainability Resource Group

The Sustainability Resource Group (SRG) will serve as an advisory body for Limited Scope Projects. The SRG will provide input and guidance as needed on projects’ sustainable design attributes. The Project Manager will use the Sustainable Design Matrix to communicate the sustainable features of the project to the SRG at the intervals noted above. The SRG will respond with comments, questions or suggestions. The SRG may also request a meeting with the project team for clarification.

9. Verification

Constructor is required to sign project Sustainability Matrix attesting that the provisions in the matrix have been provided as per the Contract Documents.

10. Archive Sustainability Documents

After project is complete, submit a copy of the updated and final Sustainable Design Matrix which was used throughout the design and construction process to track sustainable attributes of the project, (see C. 7 above).



D. Small Scope Projects

No LEED certification is required. Sustainable products and construction methods must be followed as per the Yale Sustainable Products List and the Construction Methods listed below. Substitutions may be made if approved by Yale Project Manager with products or methods that achieve the same or greater sustainable attributes. The Sustainable Products List with instructions on how to use it can be found [here](#). A simple listing of products for easy reference can be found [here](#).

1. Yale Sustainable Products List

The Yale Sustainable Products List provides information on approved products typically used on small scope projects. The Yale Sustainable Products List will be updated regularly.

2. Construction Methods

The following construction methods must be followed where applicable:

- a. Construction and Demolition Debris:
 - (1) LEED CI MR Credit 2: Divert 75% of construction waste from landfill
- b. Salvageable Building Components, Furniture and Equipment:
 - (1) Per project requirements if needed, similar to requirements for Limited Scope Projects
- c. Air Quality
 - (1) LEED CI IEQ Credit 3.1 Construction IAQ Management Plan during Construction
 - (2) LEED CI IEQ Credit 3.2 Construction IAQ Management Plan, before Occupancy
- d. Construction Activity Pollution Prevention:
 - (1) LEED NC SS Prerequisite 1: Construction Activity Pollution Prevention



3. Salvageable Building Components

Design Consultant, with review by Facilities Project Manager and Planning Office to identify salvageable building components and determine their reuse by Yale or qualified salvage vendor.

4. Salvageable Furniture and Equipment

Facilities Project Manager and TR&S to evaluate existing furniture and equipment for potential storage and re-use on other projects

5. Small Scope Sustainability Checklist

Sustainable design and construction goals will be considered throughout the design process and be tracked on the Small Scope Sustainability Checklist which can be found [here](#). Design Team shall submit the Checklist to the Yale Project Manager at the end of the CD Phase indicating the products, systems and material specified that contribute to a sustainable project outcome. The Construction Manger shall submit the Checklist at construction completion with close out documents verifying the installation of specified products, systems and materials and use of required construction methods. The Sustainability Checklist shall reflect the applicable recommendations considered by the Design Team from “[A Framework for Campus Planning, Sustainability Supplement](#)”. As needed and indicated by Directors, Project Managers and Planners will review the Small Scope Sustainability Checklist with the Sustainability Resource Group for input and guidance.

6. Archive Sustainability Documents

After project is complete, submit a copy of the updated and final Small Scope Sustainability Check List which was used throughout the design and construction process to track sustainable attributes of the project, (see D. 5 above).

End of Section