APPLYING THE VALUE METHODOLOGY TO LEED CHARRETTES

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Biography

Benson Kwong is an independent consultant providing services in value engineering, energy analysis, sustainability design, and life cycle cost analysis. He holds master degrees in mechanical and electrical engineering, as well as in business administration. As the president of enVErgie consulting, LLC, Benson Kwong provides consulting services to facility owners, designers, and contractors, to help achieve projects that are energy efficient, sustainable, and economical.

Abstract

The value methodology (VM) is an excellent tool to use for facilitating a charrette for the Leadership in Energy & Environmental Design (LEED). LEED is a family of sustainability rating systems for building construction and/or operation. A LEED charrette is typically held at the early design phase with the design team and the owner, to confirm project sustainability goals and to select the sustainability design features for the project. The VM tools, including function analysis, brainstorming, evaluation, development, and life cycle cost analysis, can be very effectively used in this setting. The presentation will describe a LEED charrette that was facilitated using VM and share lessons learnt.

1.0 INTRODUCTION

As many building projects are emphasizing on sustainability, Leadership in Energy and Environment Design (LEED) becomes a popular benchmarking tool for projects. LEED is a sustainability rating system for building construction and/or operation. For a new construction or major renovation project, a LEED charrette is typically held at the early design phase with the design team and the owner, to confirm project sustainability goals and to select the sustainability design features for the project.

The value methodology (VM) is an excellent tool to use for facilitating a LEED charrette. The typical eight-phase value management process is very applicable:

- Preparation
- Information
- Analysis
- Creation
- Evaluation
- Development
- Presentation
- Implementation

This paper will walk through a LEED charrette that uses VM.

2.1 PREPARATION

A LEED charrette should be scheduled near the very start of the project design phase. This would provide the opportunities to consider all sustainable design features without the constraint of a given design.

The success of a charrette depends first on identifying the appropriate group of participants. A LEED charrette should involve all stakeholders for the project. These would include:

- Project owner's representatives
- Building operation and maintenance staff
- Building occupants' representatives
- Design team
- Construction manager
- Commissioning agent

The design team should include, at the minimum:

- Architect
- Interior designer
- Civil engineer
- Mechanical engineer
- Electrical engineer
- Plumbing engineer
- Landscape architect
- Cost estimator

Other design disciplines may be added, depending on project scope. These include consultants in fire protection, kitchen design, roofing, façade…etc.

The length of the LEED charrette may vary. A minimum of one day is needed to fully introduce the sustainability concept to all the stakeholders. Two days provides a more ideal duration, allowing for brainstorming and evaluation of sustainable design elements. The design team would need additional time to develop and estimate the costs of the selected concepts.

2.2 INFORMATION

The information phase serves as an introduction in the LEED charrette. It introduces the following to the participants:

- What is the design baseline.
- What is LEED

The LEED charrette is ideally scheduled at the very beginning of the design phase. However, a baseline design is helpful to convey the project requirements to all stakeholders. This baseline design may consist of a conceptual sketch, and/or a list of project requirement.

Since many of the stakeholders, especially the occupant representatives, may not know what LEED represents, and others would benefits of a refresher of the ever changing LEED rating system, a LEED overview should be provided. The intent and requirements of each LEED pre-requisite or credit is introduced, followed by a brief discussion on the project specific requirements to attain the pre-requisite or credit. This exercise begins to shape the LEED roadmap. Table 1 – Project Specific LEED Evaluation is a sample summary of this exercise.

A LEED project boundary may need to be determined in order to determine the feasibility of some of the LEED credits. The issues that would be involved include:

- Real estate ownership and lease issues
- Whether other buildings sharing the site would be certified for LEED.
- Inclusion of amenities such as parking, landscape features, and recreation facilities.

SUSTAINABLE SITES		
	Name	**Project Specific Requirements**
Prereq 1	Construction Activity Pollution Prevention	
Credit 1	Site Selection	Site meets criteria
Credit 2	Development Density & Community Connectivity	Option 2 - Community Connectivity
Credit 3	Brownfield Redevelopment	Site does not meet criteria
Credit 4.1	Alternative Transportation, Public Transportation Access	Option 2 - Bus stop proximity
Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	Requires addition of bike racks for visitors
Credit 4.3	Alternative Transportation, Low-Emitting & Fuel-Efficient Vehicles	Any of the 4 options can be implemented as additional feature
Credit 4.4	Alternative Transportation, Parking Capacity	Case 1, Option 3 - Provide no new parking
Credit 5.1	Site Development, Protect or Restore Habitat	Case 2. Green roof enables meeting of this requirement
Credit 5.2	Site Development, Maximize Open Space	Case 1 or case 3. Green roof enables meeting of this requirement
Credit 6.1	Stormwater Design, Quantity Control	Case 2 - May require storage tanks to meet this requirement
Credit 6.2	Stormwater Design, Quality Control	Will require additional BMPs to meet this requirement
Credit 7.1	Heat Island Effect, Non-Roof	Option 2 - Place a minimum of 50% of parking space under cover
Credit 7.2	Heat Island Effect, Roof	Option 2 - Install a vegetated roof that covers at least 50% of the roof.
Credit 8	Light Pollution Reduction	Need to evaluate and replace existing site lighting

Table 1 - Sample project specific LEED evaluation

2.3 ANALYSIS

One unique feature of VM, the Function Analysis, can be very helpful in the LEED charrette. Function analysis helps in the understanding of sustainable design and specifically how the LEED credits contribute to sustainability. A sample list of sustainable design functions are provided in Table 2.

Reduce Input • Conserve Water • Conserve or use Renewable Electricity • Conserve Fuel • Conserve or Reuse Building Material • Reduce Maintenance Supplies • Reduce Transportation Requirements
Reduce Harmful Output • Reduce Carbon Dioxide / Greenhouse Gas Emission • Reduce Ozone Depletion Gas Emission • Reduce Heat Emission • Control Light Emission • Reduce Sewage • Reduce Trash • Reduce Stormwater and/ or Improve Quality
Positive Human Environment • Improve Air Quality • Provide Visual Connections • Ensure Comfort • Enable Control
Positive Impact on Environment • Maintain Bio-Diversity • Cleanup Contamination

TABLE 2 – Sample Sustainable Design Functions

This list provides a framework to evaluate the contribution of each sustainable design features by its contribution to sustainability. It broadens the analysis from simply achieving the LEED points to optimizing sustainability. LEED is a rigid set of rules, which in some cases may not take into account all the site and project specific conditions. A basic understanding of the fundamentals behind LEED is helpful to ensure that LEED is not followed legalistically, but that the higher order goals of sustainability may be pursued.

2.4 CREATION

The Creative Phase consists of a brainstorming session, when charrette participants are invited to generate a long list of sustainable design features, regardless of feasibility, and free of criticism from

other participants. Many of these ideas, though not by themselves practical, spark additional ideas that may be feasible for the project.

The categories in LEED help to provide a framework of organization for the brainstormed ideas:

- Sustainable Site
- Energy & Environment
- Water Efficiency
- Material & Resources
- Indoor Environmental Quality
- Innovation

Since the charrette participants consist of both professionals (i.e. design team) and non-professionals (e.g., occupants), it is important that neither party dominate the discussion. While the professionals' ideas are typically more realistic, the ideas from the non-professionals would reflect more the desires of the users and could help reveal the needs of the project. In VM speaks, the professionals will typically contribute more towards the "how"s and the lower order functions and the non-professionals the "why"s and the higher order functions. It is important to maintain a good balance to optimize the results of the brainstorming session.

2.5 EVALUATION

During the Judgment Phase, participants identify ideas for further development. The evaluation criteria used to select the ideas are:

- Ideas that are not already included in the baseline design
- Ideas that would potentially improve sustainability
- Ideas that may result in additional LEED credits

In a short LEED charrette, it may not be feasible to perform an in-depth evaluation of each idea during the charrette. Rather, ideas that meet the above criteria would be further analyzed by the design team and included in the report.

CREATIVE PHASE		EVALUATION PHASE
NO.	**CREATIVE IDEA**	**COMMENTS**
SS	**SUSTAINABLE SITES**	
SS-1	Capture rainwater	Will be considered
SS-2	Minimize uplight	Will be considered

SS-3	Achieve light pollution reduction while maintaining security	See SS-2
SS-4	Modify existing exterior light	Will be considered
SS-5	Provide bike racks for visitors	Will be considered
SS-6	Guide visitors to use public transit	Will be considered
SS-7	Reroute shuttle to drop off in front of Building	Not in scope
SS-8	Telecommuting policy	Not in scope
SS-9	Alternative work schedule	Not in scope
SS-10	Provide electric plug-in for cars	Will be considered
SS-11	Treat storm water to LEED standard	Will be considered

Table 3 – Sample Sustainable Design Ideas and Evaluation

2.6 DEVELOPMENT

The detailed development of each item includes a brief description of the concept and how it differs from the baseline (original) design, a list of advantages and disadvantages of the proposed concept as well as a discussion and/or justification for the concept. Many of the development will include sketches to illustrate the sustainability design concepts.

Some of the ideas developed would only include a brief discussion of why they are not feasible for the project. Others would deserve more complete evaluation, including rough order of magnitude (ROM) cost benefit analysis with life cycle cost evaluation.

A LEED analysis is also included to evaluate if the sustainable design element would contribute to additional LEED credits. Some sustainable design elements would earn one or more LEED credits. Other would only contribute to a credit with combination of other sustainable design elements. For example, if an energy conservation design element reduces the energy use by 1%, it would contribute to half of a LEED point since the energy performance LEED credit award one LEED point for every 2% incremental usage reduction. A 1% reduction has a 50% chance of providing an additional LEED credit.

These evaluations form the foundation of the proposed paths to varying levels of LEED certification. Table 4 is a sample LEED Analysis for the project that has a baseline design that meets the Silver LEED certification level. The LEED analysis identifies feasible paths to higher certification levels.

Table 5 is a Summary that identifies each feasible sustainable design elements studied in the LEED charrette, its potential LEED credit contribution, the ROM cost estimate, its role in the paths to various levels of LEED certification, and the payback period.

Credit	Name	Certification Level			Contributing Sustainable Idea(s)
		Silver	Gold	Platinum	
SUSTAINABLE SITES		**18**	**23**	**25**	
Prereq 1	Construction Activity Pollution Prevention	Y	Y	Y	
Credit 1	Site Selection	1	1	1	
Credit 2	Development Density & Community Connectivity	5	5	5	
Credit 3	Brownfield Redevelopment	-	-	-	
Credit 4.1	Alternative Transportation, Public Transportation Access	6	6	6	
Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	-	1	1	SS-5 Bike Racks for Visitors
Credit 4.3	Alternative Transportation, Low-Emitting & Fuel-Efficient Vehicles	-	3	3	SS-10 Promote Use of Low-Emitting & Fuel Efficient Vehicles
Credit 4.4	Alternative Transportation, Parking Capacity	2	2	2	
Credit 5.1	Site Development, Protect or Restore Habitat	1	1	1	
Credit 5.2	Site Development, Maximize Open Space	1	1	1	
Credit 6.1	Stormwater Design, Quantity Control	-	1	1	SS-1 Capture Rainwater for Irrigation
Credit 6.2	Stormwater Design, Quality Control	-	-	1	SS-11 Treat Stormwater to LEED Standards
Credit 7.1	Heat Island Effect, Non-Roof	1	1	1	
Credit 7.2	Heat Island Effect, Roof	1	1	1	
Credit 8	Light Pollution Reduction	-	-	1	SS-2 Achieve Light Pollution Reduction

Table 4 – Sample LEED Analysis

No.	Idea	Feasible?	Related LEED credits	Possible LEED credits	Initial Constr. Cost	LEED Gold	LEED Platinum	Payback Period
SS	**SUSTAINABLE SITES**							
SS-1	Capture rainwater for irrigation	Y	SSc6.1	1	$90,000	X	X	> 20 yrs
SS-2	Achieve light pollution reduction	Y	SSc8	1	$0.00	-	X	NMP
SS-4	Modify existing exterior light pole	Y	EAc1	<< 1	$20,000	-	-	> 20 yrs
SS-5	Bike Racks for visitors	Y	SS4.2	1	$6,000	X	X	NMP
SS-6	Develop comprehensive transportation management plan	Y	IDc1	1	$0.00	-	X	NMP
SS-10	Promote use of low-emitting and fuel-efficient vehicles	Y	SSc4.3	3	$4,000	X	X	NMP
SS-11	Treat stormwater to LEED standard	Y	SSc6.2	1	$260,000	-	X	NMP

Table 5 - Sample Summary of Sustainable Design Elements

NMP – No Monetary Payback

2.7 PRESENTATION

After the design team develops the report, it is presented to the project manager and other stakeholders. The presentation includes the following:

What are the feasible sustainable design elements?

What are the payback periods or present value for each sustainable design elements?

What does it cost to reach a certain LEED level?

The report and the presentation provide the basis for the project manager to opt for additional sustainable design features. It will inform the project on the cost and benefits of each design features and help to map a course of action that would result in greater sustainability and higher level of LEED recognition.

2.8 IMPLEMENTATION

The LEED charrette provides a tool for the design team to communicate to the owner the sustainability features that can be included in the design to allow the owner to evaluate whether

to incorporate them. The owner can then either instruct the designer to continue with the base line design as originally commissioned, or incorporate additional sustainable design features to aim for a higher LEED certification level.

3.0 CONCLUSION

This report illustrated how VM can be applied to the LEED charrette process. The main similarities between the sustainable design and VM processes are:

1. Goal oriented – Whereas VM study aims to optimize value to the project, the LEED charrette focuses on optimizing on the value of sustainability.
2. Interdisciplinary – Both VM and LEED charrette works best with an interdisciplinary group that fuses the traditional separation of design disciplines to get experts of multiple disciplines working together in the same room.
3. Cost constraint – Both VM and LEED charrette, as with any design process, have to work with cost constraints. It is therefore helpful to involve the cost estimators in the process to identify the initial and life cycle cost associated with each proposed design element.

There are also some major differences between the VM and the LEED charrettes:

1. Sustainable design tends to be more proactive and would be most beneficial towards the very beginning of the design process, before the conceptual design. Whereas VM is more reactive and would best follow a formal design submission, such as conceptual design or design development phases.
2. VM works best in most cases with an independent team to provide a second look. LEED charrette, since it happens at the beginning of the design process, works best with the design team. The facilitator of the LEED charrette would likely be the LEED coordinator for the project. An outside facilitator may also be used.
3. The LEED charrette is a unique opportunity to educate the project stakeholders, including owners, occupants, design team) about sustainability. The VE process typically does not have this educational function.