LEED 2009 for New Construction and Major Renovation
Project Scorecard

Project Name:
Project Address:

Yes	?	No			
			SUSTAINABLE SITES		**26 Points**
Y			Prereq 1	Construction Activity Pollution Prevention	Required
			Credit 1	Site Selection	1
			Credit 2	Development Density and Community Connectivity	5
			Credit 3	Brownfield Redevelopment	1
			Credit 4.1	Alternative Transportation - Public Transportation Access	6
			Credit 4.2	Alternative Transportation - Bicycle Storage and Changing Rooms	1
			Credit 4.3	Alternative Transportation - Low-Emitting and Fuel-Efficient Vehicles	3
			Credit 4.4	Alternative Transportation - Parking Capacity	2
			Credit 5.1	Site Development - Protect or Restore Habitat	1
			Credit 5.2	Site Development - Maximize Open Space	1
			Credit 6.1	Stormwater Design - Quantity Control	1
			Credit 6.2	Stormwater Design - Quality Control	1
			Credit 7.1	Heat Island Effect - Nonroof	1
			Credit 7.2	Heat Island Effect - Roof	1
			Credit 8	Light Pollution Reduction	1
Yes	?	No			
			WATER EFFICIENCY		**10 Points**
					4
Y			Prereq 1	Water Use Reduction	Required
			Credit 1	Water Efficient Landscaping	2 to 4
				Reduce by 50%	2
				No Potable Water Use or Irrigation	4
			Credit 2	Innovative Wastewater Technologies	2
			Credit 3	Water Use Reduction	2 to 4
				Reduce by 30%	2
				Reduce by 35%	3
				Reduce by 40%	4
			ENERGY & ATMOSPHERE		**35 Points**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Fundamental Refrigerant Management	Required
			Credit 1	Optimize Energy Performance	1 to 19
				Improve by 12% for New Buildings or 8% for Existing Building Renovations	1
				Improve by 14% for New Buildings or 10% for Existing Building Renovations	2
				Improve by 16% for New Buildings or 12% for Existing Building Renovations	3
				Improve by 18% for New Buildings or 14% for Existing Building Renovations	4
				Improve by 20% for New Buildings or 16% for Existing Building Renovations	5
				Improve by 22% for New Buildings or 18% for Existing Building Renovations	6
				Improve by 24% for New Buildings or 20% for Existing Building Renovations	7
				Improve by 26% for New Buildings or 22% for Existing Building Renovations	8
				Improve by 28% for New Buildings or 24% for Existing Building Renovations	9
				Improve by 30% for New Buildings or 26% for Existing Building Renovations	10
				Improve by 32% for New Buildings or 28% for Existing Building Renovations	11
				Improve by 34% for New Buildings or 30% for Existing Building Renovations	12
				Improve by 36% for New Buildings or 32% for Existing Building Renovations	13
				Improve by 38% for New Buildings or 34% for Existing Building Renovations	14
				Improve by 40% for New Buildings or 36% for Existing Building Renovations	15
				Improve by 42% for New Buildings or 38% for Existing Building Renovations	16
				Improve by 44% for New Buildings or 40% for Existing Building Renovations	17
				Improve by 46% for New Buildings or 42% for Existing Building Renovations	18
				Improve by 48%+ for New Buildings or 44%+ for Existing Building Renovations	19
			Credit 2	On-Site Renewable Energy	1 to 7
				1% Renewable Energy	1
				3% Renewable Energy	2
				5% Renewable Energy	3
				7% Renewable Energy	4
				9% Renewable Energy	5
				11% Renewable Energy	6
				13% Renewable Energy	7
			Credit 3	Enhanced Commissioning	2
			Credit 4	Enhanced Refrigerant Management	2
			Credit 5	Measurement and Verification	3
			Credit 6	Green Power	2

LEED 2009 for New Construction and Major Renovation
Project Scorecard

Project Name:
Project Address:

Yes	?	No			
Yes	?	No			
	2		**MATERIALS & RESOURCES**		14 Points
Y			Prereq 1	Storage and Collection of Recyclables	Required
			Credit 1.1	Building Reuse - Maintain Existing Walls, Floors and Roof	1 to 3
				Reuse 55%	1
				Reuse 75%	2
				Reuse 95%	3
			Credit 1.2	Building Reuse - Maintain Interior Nonstructural Elements	1
	2		Credit 2	Construction Waste Management	1 to 2
				50% Recycled or Salvaged	1
				75% Recycled or Salvaged	2
			Credit 3	Materials Reuse	1 to 2
				Reuse 5%	1
				Reuse 10%	2
			Credit 4	Recycled Content	1 to 2
				10% of Content	1
				20% of Content	2
			Credit 5	Regional Materials	1 to 2
				10% of Materials	1
				20% of Materials	2
			Credit 6	Rapidly Renewable Materials	1
			Credit 7	Certified Wood	1
Yes	?	No			
			INDOOR ENVIRONMENTAL QUALITY		15 Points
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required
			Credit 1	Outdoor Air Delivery Monitoring	1
			Credit 2	Increased Ventilation	1
			Credit 3.1	Construction Indoor Air Quality Management Plan - During Construction	1
			Credit 3.2	Construction Indoor Air Quality Management Plan - Before Occupancy	1
			Credit 4.1	Low-Emitting Materials - Adhesives and Sealants	1
			Credit 4.2	Low-Emitting Materials - Paints and Coatings	1
			Credit 4.3	Low-Emitting Materials - Flooring Systems	1
			Credit 4.4	Low-Emitting Materials - Composite Wood and Agrifiber Products	1
			Credit 5	Indoor Chemical and Pollutant Source Control	1
			Credit 6.1	Controllability of Systems - Lighting	1
			Credit 6.2	Controllability of Systems - Thermal Comfort	1
			Credit 7.1	Thermal Comfort - Design	1
			Credit 7.2	Thermal Comfort - Verification	1
			Credit 8.1	Daylight and Views - Daylight	1
			Credit 8.2	Daylight and Views - Views	1
Yes	?	No			
			INNOVATION IN DESIGN		6 Points
			Credit 1	Innovation in Design	1 to 5
				Innovation or Exemplary Performance	1
				Innovation or Exemplary Performance	1
				Innovation or Exemplary Performance	1
				Innovation	1
				Innovation	1
			Credit 2	LEED® Accredited Professional	1
Yes	?	No			
			REGIONAL PRIORITY		4 Points
			Credit 1	Regional Priority	1 to 4
				Regionally Defined Credit Achieved	1
				Regionally Defined Credit Achieved	1
				Regionally Defined Credit Achieved	1
				Regionally Defined Credit Achieved	1
Yes	?	No			
	2		**PROJECT TOTALS (Certification Estimates)**		110 Points

Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80+ points

Dr. Saum K. Nour
Paper presented for Swedish Chamber of Commerce, San Diego, Ca

Energy Savings, Sustainability, Leed

The discussion of energy savings has been rather an old discussion. Since 1973, the United States with State of California as leader underwent a major challenge in saving and controlling the energy consumption in variety of means and methods. State of California used Department of Energy models and adopted codes, regulations and bylaws. And by forming the California Energy Commission and adopting all guidelines under State Laws with enforcement capabilities, famously known as Title-24, the mechanism was set in place.

It was till the presence of the United States Green Building Council, that the energy savings was combines with environmental concerns and sustainability. These concerns have opened many doors and opportunities for the industries, and professional. One of the most difficult challenges for a new concept is implementation of the concept. The concept has to make practical sense that

- It is universal,
- It is understood,
- It is adoptable,
- It is adaptable,
- It is practical,
- It can be implemented,
- It is relatively economical,
- It is perpetual,
- It is standardized,
- It is constructible,
- It is enforceable,
- It is measurable.

- It is universal: As license Professional Engineer in nearly 30 States, many of current codes are not universal, since many states have not adopted the same codes, therefore the concept of the sustainability and energy savings must be universal.

- It is understood: Lack of education in the field even amongst the elite shows that concepts are not understood.

- It is adoptable: The concept of sustainability must be adoptable. A theoretical concept on paper, if it is not adopted for its benefit, then, it will not be used and will get adopted by the community.

- It is adaptable: If the concept is adopted, yet it cannot be adapted to the structure, plant, or to the building, then it will not be utilized.

- It is practical: If it is not practical and will not be accepted as a pragmatic exercise, and not practical, the engineering community will be the first to ignore the concept.

- It can be implemented: Greatest concept that cannot be implemented, then the concept will not be used.

- It is relatively economical: Financial component of any concept questions the functionality of the concept. An expensive concept never leaves its status.

- It is perpetual: A concept that decays with time will not be implemented and will be erased by engineer. Green roofs that may cause major leak in the future may be abandoned in near future, once the cost of maintenance is overshadows the original benefits.

- It is standardized: Lack of standards within the industry is depriving the industry from evaluating a concept from another. This is one of the elements that the industry must attack first to give confidence to the designer and the end-user of the products selected.

- It is constructible: The construction industry and the manufacturer's will always be the first to ask, if the concept can be constructible. Whether is quanitity of one to mass production, the question of material selection, difficulty in construction will haunt the concept.

- It is enforceable: As shown in State of California, all laws can be written, however, if it is not enforced, it will never bye used.

At this time, unfortunately all of the projects that are in the industry are either driven by government or large industry entities where many of the above concerns are not even addressed. There are no economical, practical studies that can evaluate one concept to another. There are no universal standards that can be distributed that the engineer feels a level of comfort for the design.

A serious look at these concerns will assist faster growth of the energy savings and sustainability in the industry.

Learning to LEED: Exam Preparation
Gloom & Doom Factoids

Why Design Green?

- Buildings in the U.S. consume more than *30% of our total energy and 60% of our electricity annually.*
- Buildings consume *5 billion gallons of potable water per day to flush toilets.*
- A typical North American commercial construction project generates *2.5 pounds of solid waste per square foot of floor space.*
- Studies of workers in green buildings reported *productivity gains of up to 16%.*
- About ¼ of the increase in carbon dioxide is due to the building sector, Energy efficiency may reduce this *by 50%.*

- Buildings consume *40%* of raw stone, gravel and sand, and *25% of virgin wood*.
- Building related sickness may cost between *$60 and 400 billion* per year.
- People spend *as much as 90%* of their time indoors.

"Commercial, institutional, and residential buildings account for approximately:

- 40% of global consumption of raw materials
- 30% of primary U.S. energy consumption
- 60% of U.S. electricity consumption
- 12% of U.S. potable water consumption, *including 5 billion gallons a day for flushing toilets*

- 136 million tons of construction and demolition debris - annually about 40% of the total U.S. solid waste stream of roughly 2.5 lbs. of solid waste per square foot of floor space for construction of a typical commercial building
- 35% of U.S. carbon dioxide emissions (a greenhouse gas)
- It's estimated that U.S. businesses lose 60 to 400 billion dollars annually as a result of building-related illnesses.

The average American spends 90% of their time indoors, so the potential for buildings to either adversely affect or positively support human health and productivity in the U.S. is therefore significant."

Factoids by LEED Category

Sustainable Sites

- Vehicles are responsible for approximately *20% of U.S. greenhouse gases* annually.

Water Efficiency

- *340 billion gallons* of fresh water are withdrawn per day from rivers, streams, and reservoirs to support residential, commercial, industrial, agricultural, and recreational activities.
- Almost *65%* of water taken is discharged back to bodies of water after use.
- Annual *water deficiency for the US is 3,700 billion gallons*.
- US industries today use *36% less water than in 1950* due to reuse and

Energy Policy Act of 1992 mandating water conserving plumbing.

- Water consumption rose *6 fold* in the last century – double the rate of population.

Energy & Atmosphere

- *Coal-fired electric utilities* produce almost *1/3* the total emission of nitrogen oxide by US citizens.
- Fundamental commissioning can increase building energy efficiency from *5-10%*.
- Buildings with M&V programs save *10 to 20%* the electricity of buildings without.
- "Lost Productivity" is equated with *20% of occupants complaining 30 minutes per month*.

- Occupancy sensors may save up to *60%* of light energy costs in a building.

Materials & Resources

- *4%* of US old growth forest remains.
- *20%* of the world's large ancient forests remain intact.
- *90%* of residential construction is wood.
- *40%* of the waste stream is due to construction and demolition.
- Recycling an aluminum can uses *5%* of the energy needed to create a new can out of virgin mined aluminum.

Indoor Environmental Quality

- A well-designed daylight building is estimated to reduce energy use by *50% to 80%*.

Scorecard Worksheet:

WIMSEE
LEED Certification:

To earn LEED certification, the applicant project must satisfy all prerequisites and a minimum number of points to attain the established LEED project medal ratings:

CERTIFIED 40-49
Silver 50-59
Gold 60-79
Platinum 80-100 +

10 Extra points on IO and Regional

Who is WIMSEE?

	Category	Pre-requisites	%	Points
W	Water Efficiency	0	9.1	10
I	Innovation in Design	0	5.5	6
M	Materials and Resources	1	11.8	13
S	Sustainable Sites	1	25.5	28
E	Indoor Environmental Quality	2	10.9	12
E	Energy and Atmosphere	3	33.6	37
	Regional 3.6%	**7**	**100**	**100+10**

Prerequisites include (ALL MUST BE MET):

1. **C**onstruction Activity Pollution Prevention
2. **F**undamental Commissioning of the Building Energy Systems
3. **M**inimum Energy Performance
4. **F**undamental Refrigerant Management
5. **S**torage & Collection of Recyclables
6. **M**inimum IAQ Performance
7. **E**nvironmental Tobacco Smoke (ETS) Control

Exam Key – Memorize WMSIE (pronounced "whimsy") & CFMFSME

. Sustainable Sites

As a prerequisite under Sustainable Sites, LEED requires an EPA-compliant erosion and sedimentation control plan. Credits are awarded for selecting a building site that protects or restores open space, is accessible to public transportation, manages stormwater, reduces “heat-island” effects and controls light pollution.

Sites typically are chosen before the architect and construction manager are selected, so many SS credits are gained or lost before the project team is assembled. Therefore, it may be beneficial for schools to bring in an architect, engineer or builder with LEED expertise to perform a feasibility study at the site-selection phase.

. Water Efficiency

LEED promotes water-use reduction through resourceful landscaping, wastewater technologies and high-efficiency plumbing design.

A simplified landscaping plan, with drought-tolerant native plants, reduced use of sod, and high-efficiency irrigation (e.g., drip hoses) can be an attractive, cost-effective design. However, many administrators, particularly in university settings, want lush landscaping to enhance the visual impact of a high-profile building. An effective, yet more costly, irrigation strategy is a rainwater or gray-water collection system, such as a cistern.

Water-use reductions of 20 percent or more can be achieved by installing high-efficiency plumbing fixtures, such as low-flow lavatory faucets and toilets, and waterless urinals. However, building owners must understand and comply with maintenance requirements. For those unsure about adopting these new technologies, flexibility can be incorporated into the plumbing design. Although it eliminates any cost savings from simplified plumbing requirements, supply piping can be installed in walls behind waterless urinals to enable change-out in the future if maintenance issues arise.

. Energy & Atmosphere

EA prerequisites include building commissioning, compliance with the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) 90.1-1999 energy performance standard, and chlorofluorocarbon (CFC) reduction in HVAC equipment.

Commissioning is used on many projects, especially laboratory and healthcare facilities with complex MEP systems. For smaller or more traditional facilities, it may be hard to justify the added cost of commissioning. Tailoring the scope of commissioning services to focus on critical systems, such as the air-handlers or the exterior building

envelope, is an effective way to maximize performance and value.

Those institutions that have central chiller plants with CFC-based refrigerants may find CFC reduction to be a more difficult prerequisite to achieve. Owners should evaluate their equipment in the earliest stages of planning to determine if remedial work is needed to satisfy this requirement.

EA credits are awarded for reducing energy consumption, and for using renewable or low-impact sources to provide part of the building's energy load. Energy use can be reduced 15 to 25 percent through “right-sized” air-handling systems, an efficient building envelope and glazing, and energy-saving features such as occupant sensors for lighting control.

Materials & Resources

Storage and collection of recyclables is required under the MR category. Credits in this category include building and resource reuse, construction waste management, and use of recycled or renewable materials, local and regional materials, and wood products certified by the Forest Stewardship Council (FSC).

Construction waste management means diverting construction debris from landfills. As tipping fees continue to rise, this practice actually can result in cost savings. Mulching trees or shrubs that have been cleared from the site, and reusing demolished asphalt or concrete as

road base can increase the percentage of waste diverted.

With the exception of certified wood products, which tend to cost more than their non-certified counterparts, materials satisfying the MR credits come with little or no additional cost. Structural steel, building insulation, ceiling tile and carpeting all contain high recycled content, and locally available materials can be found if project teams seek them out. As such, the challenge in achieving these credits is not merely finding suitable materials, but ensuring that adequate documentation is provided to substantiate them. This documentation process can be demanding and should begin as early as possible.

. Indoor Environmental Quality

LEED projects must meet the minimum indoor air quality (IAQ) performance standards of ASHRAE 62-1999, which has become a common design standard, and includes prohibiting or controlling smoking within the building. The IAQ category awards credits for building features such as carbon-dioxide monitoring, ventilation effectiveness, construction IAQ management, and use of low-emitting paints, adhesives, carpet and composite wood.

Carbon-dioxide monitoring requires that exterior sensors be installed in line with the air handlers and integrated into the building-control system. Ventilation effectiveness is

achieved via operable windows or alternative ventilation systems such as underfloor or high-velocity supplies. Schools should work with their MEP designers during project planning to evaluate design alternatives.

IAQ construction-management plans include protection of ductwork from contamination that might result from debris, dust and mold during construction, and proper housekeeping to minimize dispersal of airborne contaminants. These procedures generally do not add to the capital cost of a project, but do require proper construction sequencing and monitoring.

IAQ management before occupancy can be achieved with a two-week period of flushing the mechanical

system with 100 percent outside air, or through a baseline IAQ testing protocol. Flush-out is the more cost-effective approach provided time is allotted in the schedule and excess humidity from the outside air is not a concern. IAQ testing will add to a project's costs. These costs are based on the number of testing points within the building, and the quantity and placement of testing points is dependent on the size and program of the facility.

Low-emitting paints, adhesives and sealants are available at no additional cost; low-emitting composite wood products are more difficult to incorporate. Some products are available, but their long-term performance is somewhat unsubstantiated. Achieving these

credits requires the preparation of volatile organic compound (VOC) budgets for each material to document its IAQ performance.

. Innovation & Design Process

Finally, up to four credits are awarded for innovative design and construction features that go “above and beyond” the existing LEED requirements. An additional credit is awarded for including a LEED-accredited professional on the project team.

A common ID credit is the development of an Active Education Component, featuring signage, tours or a case study, to illustrate and inform visitors about sustainable features and benefits.

Delivering success

The most critical driver to LEED success is the spirit of collaboration that exists on the project team. Education institutions should evaluate their project-delivery approach to promote greater coordination and trust among the design and construction team. Traditional general contracting, characterized by lump-sum, single-prime bidding is not the optimal project-delivery method for LEED projects.

The construction-management (CM) approach, in which the builder is brought on board before the start of design, can be a more attractive model. This delivery method affords the benefit of the CM's expertise in budgeting, scheduling, value analysis,

and constructability reviews. It ensures that the design progresses within the established budget, and that potential dilemmas are identified and resolved before construction is underway. The benefits extend to the LEED process as well. Design and cost scenarios can be developed for a number of credits, which affords a school the option to “pick and choose” credits that provide the best value or performance.

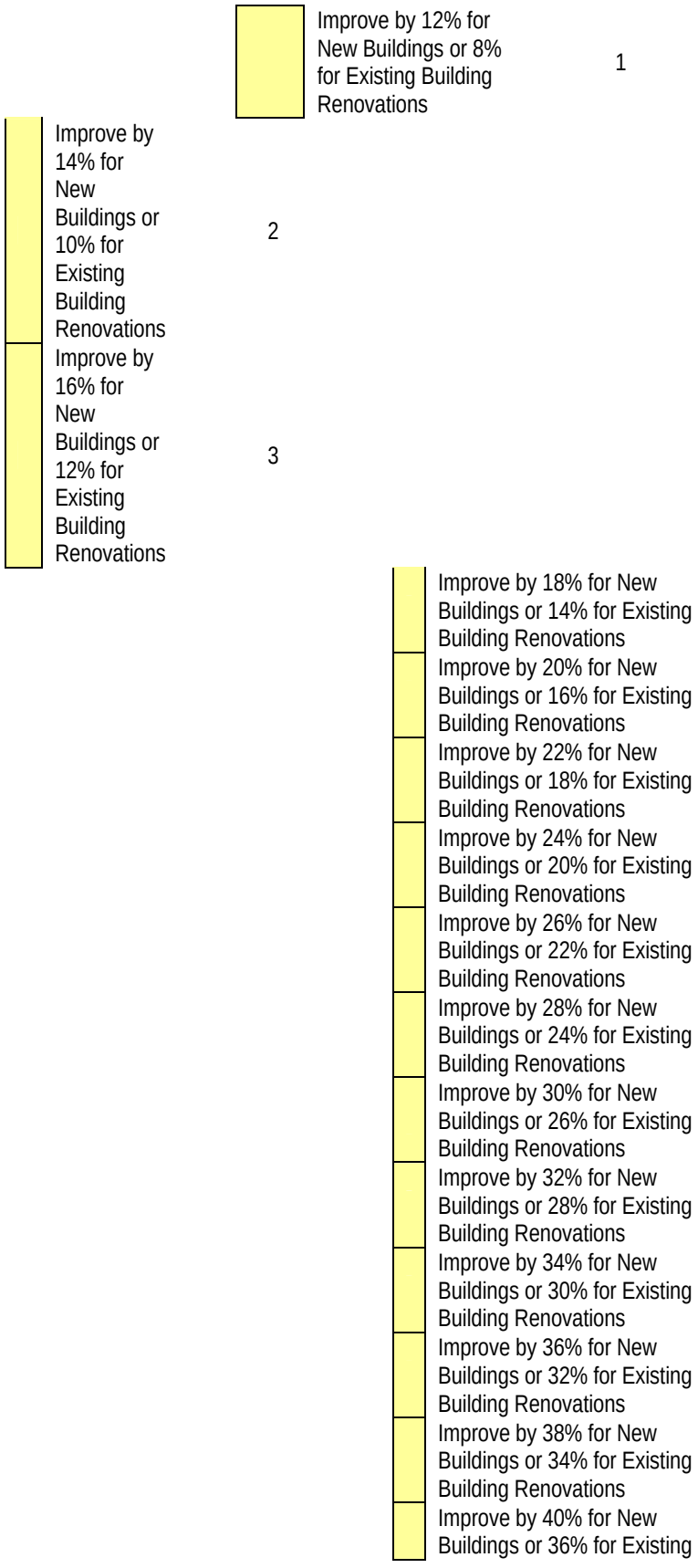
Finally, the role of the school itself in LEED certification should not be underestimated. Although the design and construction team provides technical advice, the school must communicate clearly the project objectives that drive the process and hold team members accountable.

Decision Makers Table & LEED Credit Responsible Parties							
Credit	*Decision Makers*			*Credit*	*Decision Makers*		
Sustainable Sites				**Materials & Resources**			
SS P1		Contractor	Civil Engineer	MR P1	Owner		Architect
SS 1	Owner			MR 1.1	Owner	Contractor	Architect
SS 2	Owner		LEED AP	MR 1.2	Owner	Contractor	Architect
SS 3	Owner			MR 1.3		Contractor	Architect
SS 4.1	Owner			MR 2.1		Contractor	
SS 4.2			LEED AP & Architect	MR 2.2		Contractor	
SS 4.3	Owner			MR 3.1		Contractor	Architect
SS 4.4	Owner		Civil Engineer	MR 3.2		Contractor	Architect
SS 5.1	Owner	Contractor	Civil Engineer	MR 4.1		Contractor	Architect
SS 5.2	Owner		Civil Engineer	MR 4.2		Contractor	Architect
SS 6.1			Civil Engineer	MR 5.1		Contractor	Architect
SS 6.2			Civil Engineer	MR 5.2		Contractor	Architect
SS 7.1		Contractor	LEED AP/Land/Arch/Civil	MR 6		Contractor	Architect
SS 7.2		Contractor	LEED AP	MR 7		Contractor	Architect
SS8			LEED & Lighting Dsgnr.	**Indoor Environmental Air Quality**			
Water Efficiency				EQ P1			Mechanical Engineer
WE 1.1			Landscape Architect	EQ P2	Owner		
WE 1.2	Owner		Landscape Architect	EQ 1			Mechanical Engineer
WE 2			Mechanical Engineer	EQ 2			Mechanical Engineer
WE 3.1			Mechanical Engineer	EQ 3.1		Contractor	
WE 3.2			Mechanical Engineer	EQ 3.2		Contractor	
Earth & Atmosphere				EQ 4.1		Contractor	Architect
EA P1	Owner	Contractor	Commissioning Auth.	EQ 4.2		Contractor	Architect
EA P2			Mechanical Engineer	EQ 4.3			Architect
EA P3	Owner		Mechanical Engineer	EQ 4.4		Contractor	Architect
EA 1			Mechanical Engineer	EQ 5			LEED AP
EA 2			Mechanical Engineer	EQ 6.1			Mechanical Engineer
EA 3	Owner	Contractor	Commissioning Auth.	EQ 6.2			Mechanical Engineer
EA 4			Mechanical Engineer	EQ 7.1			Mechanical Engineer
EA 5			Mech. Eng & Facility Eng.	EQ 7.2	Owner		Mechanical Engineer
EA 6	Owner			EQ 8.1			LEED AP & Architect
Look at each credit one by one and try and figure out why it makes sense that those are the responsible parties for that particular credit. You'll begin to notice some patterns for which trades work with which credits.				EQ 8.2			LEED AP & Architect
				Innovation in Design			
				ID 1.1-1.4	Owner	Contractor	
				ID 2	Owner	Contractor	LEED AP

Yes	?	No			
			SUSTAINABLE SITES		**26 Points**
Y			Prereq 1	Construction Activity Pollution Prevention	Required
			Credit 1	Site Selection	1
			Credit 2	Development Density and Community Connectivity	5
			Credit 3	Brownfield Redevelopment	1
			Credit 4.1	Alternative Transportation - Public Transportation Access	6
			Credit 4.2	Alternative Transportation - Bicycle Storage and Changing Rooms	1
			Credit 4.3	Alternative Transportation - Low-Emitting and Fuel-Efficient Vehicles	3
			Credit 4.4	Alternative Transportation - Parking Capacity	2
			Credit 5.1	Site Development - Protect or Restore Habitat	1
			Credit 5.2	Site Development - Maximize Open Space	1
			Credit 6.1	Stormwater Design - Quantity Control	1
			Credit 6.2	Stormwater Design - Quality Control	1
			Credit 7.1	Heat Island Effect - Nonroof	1
			Credit 7.2	Heat Island Effect - Roof	1
			Credit 8	Light Pollution Reduction	1

Yes	?	No			
			WATER EFFICIENCY		**10 Points**
					4
Y			Prereq 1	Water Use Reduction	Required
			Credit 1	Water Efficient Landscaping	2 to 4
				Reduce by 50%	2
				No Potable Water Use or Irrigation	4
			Credit 2	Innovative Wastewater Technologies	2
			Credit 3	Water Use Reduction	2 to 4
				Reduce by 30%	2
				Reduce by 35%	3
				Reduce by 40%	4

			ENERGY & ATMOSPHERE		**35 Points**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Fundamental Refrigerant Management	Required
			Credit 1	Optimize Energy Performance	1 to 19


Improve by 12% for New Buildings or 8% for Existing Building Renovations
1
Improve by 14% for New Buildings or 10% for Existing Building Renovations
2
Improve by 16% for New Buildings or 12% for Existing Building Renovations
3
Improve by 18% for New Buildings or 14% for Existing Building Renovations
Improve by 20% for New Buildings or 16% for Existing Building Renovations
Improve by 22% for New Buildings or 18% for Existing Building Renovations
Improve by 24% for New Buildings or 20% for Existing Building Renovations
Improve by 26% for New Buildings or 22% for Existing Building Renovations
Improve by 28% for New Buildings or 24% for Existing Building Renovations
Improve by 30% for New Buildings or 26% for Existing Building Renovations
Improve by 32% for New Buildings or 28% for Existing Building Renovations
Improve by 34% for New Buildings or 30% for Existing Building Renovations
Improve by 36% for New Buildings or 32% for Existing Building Renovations
Improve by 38% for New Buildings or 34% for Existing Building Renovations
Improve by 40% for New Buildings or 36% for Existing

Building Renovations
Improve by 42% for New Buildings or 38% for Existing Building Renovations
Improve by 44% for New Buildings or 40% for Existing Building Renovations
Improve by 46% for New Buildings or 42% for Existing Building Renovations
Improve by 48%+ for New Buildings or 44%+ for Existing Building Renovations

Credit 2 — On-Site Renewable Energy — 1 to 7

1% Renewable Energy
3% Renewable Energy
5% Renewable Energy
7% Renewable Energy
9% Renewable Energy
11% Renewable Energy
13% Renewable Energy

Credit 3 — Enhanced Commissioning
Credit 4 — Enhanced Refrigerant Management
Credit 5 — Measurement and Verification
Credit 6 — Green Power

Yes ? No

2 MATERIALS & RESOURCES

Y — Prereq 1 — Storage and Collection of Recyclables — Required

Credit 1.1 — Building Reuse - Maintain Existing Walls, Floors and Roof

Reuse 55%
Reuse 75%
Reuse 95%

Credit 1.2 — Building Reuse - Maintain Interior Nonstructural Elements

	2		Credit 2	Construction Waste Management	
					50% Recycled or Salvaged
					75% Recycled or Salvaged
			Credit 3	Materials Reuse	
					Reuse 5%
					Reuse 10%
			Credit 4	Recycled Content	
					10% of Content
					20% of Content
			Credit 5	Regional Materials	
					10% of Materials
					20% of Materials
			Credit 6	Rapidly Renewable Materials	
			Credit 7	Certified Wood	

Yes ? No

INDOOR ENVIRONMENTAL QUALITY

Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required
			Credit 1	Outdoor Air Delivery Monitoring	
			Credit 2	Increased Ventilation	
			Credit 3.1	Construction Indoor Air Quality Management Plan - During Construction	
			Credit 3.2	Construction Indoor Air Quality Management Plan - Before Occupancy	
			Credit 4.1	Low-Emitting Materials - Adhesives and Sealants	

			Credit 4.2	Low-Emitting Materials - Paints and Coatings
			Credit 4.3	Low-Emitting Materials - Flooring Systems
			Credit 4.4	Low-Emitting Materials - Composite Wood and Agrifiber Products
			Credit 5	Indoor Chemical and Pollutant Source Control
			Credit 6.1	Controllability of Systems - Lighting
			Credit 6.2	Controllability of Systems - Thermal Comfort
			Credit 7.1	Thermal Comfort - Design
			Credit 7.2	Thermal Comfort - Verification
			Credit 8.1	Daylight and Views - Daylight
			Credit 8.2	Daylight and Views - Views
Yes	?	No		
			INNOVATION IN DESIGN	
			Credit 1	Innovation in Design
				Innovation or Exemplary Performance
				Innovation or Exemplary Performance
				Innovation or Exemplary Performance
				Innovation
				Innovation
			Credit 2	LEED® Accredited Professional
Yes	?	No		
			REGIONAL PRIORITY	

			Credit 1

Regional Priority

	Regionally Defined Credit Achieved
	Regionally Defined Credit Achieved
	Regionally Defined Credit Achieved
	Regionally Defined Credit Achieved

Yes	?	No	
	2		PROJECT TOTALS (Certification Estimates)

Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80+ points

LEED AP Exemplary Performance / ID Credit Breakdown

There has been a lot of LEED ARE Forum talk about recent questions on the exam involving ID (Innovation in Design) thresholds. That being said, I hope this is a timely and useful post for you.

Here is a question I found from the Colorado Chapter LEED Study Guide:

Exceptional performance, also referred to as exemplary performance, under ID Credit 1, Innovation in Design, generally requires which one of the following?

***A.** that performance achieved is at least 100% better than that established by an existing LEED Credit, regardless of which credit it is.*

***B.** that performance achieved is either 25% better or the next incremental percentage threshold established by the existing LEED Credit that is being exceeded, whichever is greater.*

***C.** that performance achieved represents either a doubling or the next incremental percentage threshold established by the existing LEED Credit that is being exceeded.*

***D.** that performance achieved is at least 50% better than that established by an existing LEED Credit, regardless of which credit is being exceeded.*

***E.** that performance achieved is at least double that established by an existing LEED Credit, regardless of which credit is being exceeded.*

The answer is at the bottom of this post, in case you don't want the answer upfront. As promised in a previous post about ID Credits and exemplary performance , below is another helpful table that shows you which credits have an exemplary performance requirement. Again, most (the question above says *generally*) are achieved through a doubling or the next incremental percentage threshold, as you can see.

Exemplary Performance

Credit	Description		Requirement	
SSc2	Development Density & Community Connectivity	•	Project density >= 120,000 sf/acre 120,000	
		•	sf/acre within 2xdensity radius	
SSc4.1 - SSc4.4	Alternative Transportation	•	Institute a comprehensive transportation management plan that reduces personal automobile use	
SSc5.1	Site Selection, Protect or Restore Habitat	•	Restore or protect at least 75% of the site area on previously developed sites	
SSc5.2	Site Selection, Maximize Open Space	•	Double the open space provided on-site in accordance with the compliance path selected to achieve the point	

SSc7.1	Heat Island Effect, Non-Roof	•	100% of non-roof impervious surfaces have been constructed with high-albedo materials and/or open grid paving and/or will be shaded within five years	
		•	100% of on-site parking spaces are located under cover	
SSc7.2	Heat Island Effect, Roof	•	100% of the project roof area consists of a vegetated roof system	
WEc2	Innovative Wastewater Technologies	•	Zero use of potable water in sewage conveyance	
		•	100% on-site treatment and reuse/infiltration of wastewater	
WEc3	Water Use Reduction	•	Projected water savings of at least 40%	
		•	At least 10% water use savings in process and non-regulated water use	

EAc1	Optimize Energy Performance	•	An additional 3.5% improvement (45.5% for new buildings, 38.5% for existing buildings)	
EAc2	Renewable Energy	•	17.5% renewable energy	
EAc6	Green Power	•	At least 70% of the building's electricity each year for two years (double)	
		•	A contract of four years or longer in which 35% of more electricity is provided each year (double)	
MRc2	Construction Waste Management	•	Divert 95% or better of total waste from disposal	
MRc3	Materials Reuse	•	Value of salvaged or reused materials must be 15% or more of the total materials cost	
MRc4	Recycled Content	•	Value of recycled content should be 30% or more of the total materials cost	

MRc5	Regional Materials	•	Value of regional materials must be 40% or more of the total materials cost	
MRc6	Rapidly Renewable Materials	•	Value of rapidly renewable materials must be 5% or more of the total materials cost	
MRc7	Certified Wood	•	Value of FSC-certified wood must be 95% or more of the total wood building components	
EQc8.1	Daylight & Views, Daylight 75% of Spaces	•	95% daylighting based on the requirements by compliance path	
EQc8.2	Daylight & Views, Views for 90% of Spaces	•	No prescribed	

Credit	Exemplary Performance
SSc2	2x Density OR > 120,000sf/acre
SSc4.1-4.4	a) Transit Mgmt. Plan demonstrating quantifiable auto reduction OR b) 2x bus/rail lines & 200 trips per day
SSc5.1	75% Green
SSc5.2	case 1: exceed local by 50% case 2: 2x bldg. footprint case 3: 40% of site area open
SSc7.1	option 1: 100% shade option 2: 100% parking under
SSc7.2	100% Green Roof
WEc2	reduce or treat 100%
WEc3.1- 3.2	40% reduction
EAc1	New Building: 45.5% Existing Bldg: 38.5%
EAc2	17.5% on-site renewable
EAc6	case 1: purchase 70% or 4 yr. contract
MRc2.1-2.2	divert 95%
MRc3.1-3.2	reuse 15%
MRc4.1-4.2	recycle 30%
MRc5.1-5.2	regional 40%
MRc6	rapidly renewable 5%
MRc7	95% FSC wood
EQc8.1	95% daylighting
EQc8.2	case by case basis

Sustainable Sites		
SSp1	Construction Activity Pollution Prevention	Storm Water Management for Construction Activities, Chap. 3 (U.S.EPA 832R92005)
SSc1	Site Selection	U.S. Department of Agriculture Definition of Prime Agricultural Land (U.S. Code of Federal Regulations 7CFR657.5)
		Federal Emergency Management Agency (FEMA) 100-Year Flood Definition
		Endangered Species Lists (U.S. Fish & Wildlife Service List of Threatened & Endangered Species; National Marine Fisheries Service List of Endangered Marine Species)
		Definition of Wetlands in the U.S. Code of Federal Regulations (40 CFR, Parts 230-233, 22)
SSc3	Brownfield Redevelopment	ASTM E1903-97 Phase II Environmental Site Assessment
		EPA Brownfields Definition (EPA Sustainable Redevelopment of Brownfields Program)
SSc6.2	Stormwater Management: Quality Control	Guidance Specifying Management Measures for Sources of Non-Point Pollution in Coastal Waters, January 1993 (U.S.EPA 840B92002)
SSc7.2	Heat Island Effect: Roof	ASTM Standard E1980-01—Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
		ASTM E408-71(1996)e1—Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
		ASTM E903-96—Standard Test Method for Solar Absorbance, Reflectance, and Transmittance of Materials Using Integrating Spheres

		ASTM E1918-97—Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
		ASTM C1371-04—Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
		ASTM C1549-04—Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
SSc8	Light Pollution Reduction	ASHRAE/IESNA Standard 90.1-2004, Energy Standard for Buildings Except Low-Rise Residential – Lighting, Section 9 (without amendments)

Water Efficiency		
WEc3	Water Use Reduction	The Energy Policy Act (EPAct) of 1992

Materials & Resources		
MRc4	Recycled Content	International Standard ISO 14021—1999 – Environmental Labels and Declarations – Self-Declared Environmental Claims (Type II Environmental Labeling)
MRc7	Certified Wood	Forest Stewardship Council's Principles and Criteria

Energy & Atmosphere		
EAp2	Minimum Energy Performance	ASHRAE/IESNA 90.1-2004: Energy Standard for Buildings Except Low-Rise Residential

EAc1	Optimize Energy Performance	Option 1: ASHRAE/IESNA 90.1-2004: Energy Standard for Buildings Except Low-Rise Residential, and Informative Appendix G—Performance Rating Method
		Option 2: ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004
		Option 3: Advanced Buildings BenchmarkTMVersion 1.1
EAc2	On-Site Renewable Energy	ASHRAE/IESNA 90.1-2004: Energy Standard for Buildings Except Low-Rise Residential
EAc5	Measurement & Verification	International Performance Measurement & Verification Protocol (IPMVP) Volume III: Concepts and Options for Determining Energy Savings in New Construction, April 2003
EAc6	Green Power	Center for Resource Solutions' Green-e Product Certification Requirements

Indoor Environmental Quality		
EQp1	Minimum IAQ Performance	ASHRAE Standard 62.1-2004: Ventilation for Acceptable Indoor Air Quality
EQp2	Environmental Tobacco Smoke (ETS) Control	ANSI/ASTM-E779-03, Standard Test Method for Determining Air Leakage Rate By Fan Pressurization
		Residential Manual for Compliance with California's 2001 Energy Efficiency Standards (For Low Rise Residential Buildings), Chapter 4
EQc2	Increased Ventilation	ASHRAE Standard 62.1-2004: Ventilation for Acceptable Indoor Air Quality

		The Carbon Trust Good Practice Guide 237—Natural ventilation in non-domestic buildings—a guide for designers; developers and owners (1998)
		CIBSE Applications Manual 10: 2005, Natural ventilation in non-domestic buildings
EQc3.1	Construction IAQ Management Plan: During Construction	IAQ Guidelines for Occupied Buildings Under Construction, SMACNA
		ANSI/ASHRAE 52.2-1999: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
EQc3.2	Construction IAQ Management Plan: Before Occupancy	US EPA "Compendium of Methods for the Determination of Air Pollutants in Indoor Air"
EQc4.1	Low-Emitting Materials: Adhesives & Sealants	South Coast Rule #1168 October 3, 2003 Amendment by the South Coast Air Quality Management District
		Green Seal Standard GS-36 (commercial adhesives), Effective October 19, 2000
EQc4.2	Low-Emitting Materials: Paints & Coatings	South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings
		Green Seal Standard GC-03 (anti-corrosive and anti-rust paints)
		Green Seal Standard GS-11 (commercial flat and non-flat paints)
EQc4.3	Low-Emitting Materials: Carpet Systems	Carpet and Rug Institute Green Label Plus Testing Program

EQc5	Indoor Chemical & Pollutant Source Control	ANSI/ASHRAE 52.2-1999: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
EQc6.2	Controllability of Systems: Thermal Comfort	ASHRAE Standard 62.1-2004: Ventilation for Acceptable Indoor Air Quality
		ASHRAE Standard 55-2004: Thermal Comfort Conditions for Human Occupancy
EQc7	Thermal Comfort	ASHRAE Standard 55-2004, Thermal Comfort Conditions for Human Occupancy

Referenced Standards and Legislation:

ASHRAE 90.1-Building energy standard covering design, construction, operation and maintenance.

ASHRAE 52.2-Standardized method of testing building ventilation filters for removal efficiency by particle size.

ASHRAE 55-Standard describing thermal and humidity conditions for human occupancy of buildings

ASHRAE 62-Standard that defines minimum levels of ventilation performance for acceptable indoor air quality

ASHRAE 192-Standard for measuring air-change effectiveness

ASTM E408-Standard of inspection-meter test methods for normal emittance of surfaces

ASTM E903-Standard of integrated-sphered test method for solar absorptance, reflectance, and transmittance

CERCLA-Comprehensive Environmental Response, Compensation, and Liability Act

EPACT-U.S. Energy Policy Act of 1992

RCRA-Resource Conservation and Recovery Act

UBC-Uniform Building Code: the International Conference of Building Officials model building code

American Society of Heating, Refrigerating & Air Conditioning Engineers		
ASHRAE STANDARD	**KEYWORDS**	**RELATED CREDITS**
52.2 - 1999	Filters, MERV	EQ 3.1 EQ 5
55 - 2004	Thermal Comfort (Temperature, air speed humidity)	EQ 6.2 (multi-occupant spaces) EQ 7.1 EQ 7.2
62.1 - 2004	IAQ & Natural Ventilation	EQ P1 EQ 2 EQ 6.2
90.1 - 2004	Bldg. Energy Systems Performance Rating HVAC, Lighting & Envelope	SS 8 EA P2 EA 1 (Option 1) & EA 2 (Thanks BOB!)
Advance Energy Design Guide for Small Office Buildings - 2004	Prescriptive Compliance Path	EA 1 (Option 2)

Organizations and Agencies:

AIA-American Institute of Architects

ANSI-American National Standards Institute

ASHRAE-American Society of Heating, Refrigeration, and Air-conditioning Engineers, Inc.

ASTM-American Society for Testing Materials

AWEA-American Wind Energy Association

CEC-California Energy Commission

CFR-Code Federal Regulation

CIBSE-Chartered Institution of Building Services Engineers

CIWMB-California Integrated Waste Management Board

CRI-Carpet and Rug InstituteCRS-Center for Resource Solutions

DOE-U.S. Department of Energy

EIA-Energy Information Administration

EPA-U.S. Environmental Protection Agency

FEMA-U.S. Federal Emergency Management Agency

FSC-Forest Stewardship Council

GBCI-Green Building Certification Institute

IESNA-Illuminating Engineering Society of North America

IMEX-Industrial Material Exchange

ISO-International Organization for Standardization

NBI-New Building Institute

NFRC-National Fenestration Rating Council

OSWER-U.S. EPA Office of Solid Waste & Emergency Response

SBIC-Sustainable Building Industry Council

SCAQMD-South Coast Air Quality Management District

SMACNA-Sheet Metal and Air Conditioning National Contractors Association

USDA-United States Department of Agriculture

USGBC-United States Green Building Council

Abbreviated General Terminology:

A/C-Air Conditioning Unit

ACH-Air Change per Hour

AFV-Alternative-Fueled Vehicle: e.g., hybrid-electric, electric, natural-gas, bio-diesel, and fuel-cell

AHU-Air Handling Unit

BIPV-Building Integrated Photovoltaics: e.g., integrated roof, spandrels, glazing, or shading devices

BMP-Best Management Practice

BOD-Basis of Design

CBECS-Commercial Building Energy Consumption Survey

CFCs-Chlorofluorocarbons: ozone-depleting constituent of the most widely used

HVAC refrigerants

CFM-Cubic Feet per Minute

CFS-Cubic Feet per Second

CDVR-Corrected Design Ventilation Rate: design ventilation rate divided by the air-change effectiveness

DEC-Design Energy Cost

ECB-Energy Cost Budget: a method of demonstrating compliance with ASHRAE 90.1

ECMs-Energy Conservation Measures, as in those tracked in support of measurement and verification

EER-Energy Efficiency Rating

EMP-LEED Energy Modeling Protocol to assist in documenting efficiency measures not in ECBEMS-Energy Management System

ETS-Environmental Tobacco Smoke, includes that transported between spaces by ventilation systems

FTE-Full Time Equivalent

GPF-Gallons per Flush

GPM-Gallons per Minute

GS-Green Seal

GWP-Global Warming Potential: rating of a gaseous substance's contribution to greenhouse effects

HCFCs-Hydrochlorofluorocarbons: alternative refrigerant type that has reduced ozone-depleting effects

HFCs-Hydrofluorocarbons: alternative refrigerant with no ozone-depleting effect but some tradeoffs

HVAC-Heating, Ventilation, and Air-Conditioning

HVAC&R-Heating, Ventilation, Air Conditioning, and Refrigerants

IAQ-Indoor Air Quality with respect to human occupancy of a building

IEQ-Indoor Environmental Quality: encompasses

IAQ, thermal comfort, daylighting, views, etc.

IPLV-Integrated Part Load Value: chiller efficiency including part-load operation for a given duty cycle

LAV-Lavatory

LCA-Life-Cycle Assessment: a full accounting of a material's "cradle-to-grave" environmental impacts

LCC-Life-Cycle Cost

LCGWP-Life-Cycle Global Warming Potential

LCODP-Life-Cycle Ozone Depletion Potential

LEED-Leadership in Energy and Environmental Design

LPD-Lighting Power DensityLr-Refrigerant Leakage Rate

MEP-Mechanical, Electrical, and Plumbing

MERV-Minimum Efficiency Reporting Value: a measure of the effectiveness of air filtration media

Mr- End of Life Refrigerant

MSDS-Material Safety Data Sheet: provides essential information on composition, hazards, & precautions

NC-New Construction

NPDES-National Pollutant Discharge Elimination System

O&M-Operations and Management

ODP-Ozone Depleting Potential: rating of a gaseous substance's ability to destroy stratospheric ozone

OPR-Owner Project Requirements

OSA-Outside Air

PM-Particulate Manner

PMV-Predicted Mean Vote

PPM-Parts Per Million

RA-Return Air

Rc-Refrigerant Charge

REC-Renewable Energy Certificate

RH-elative Humidity

SA-Supply Air

SHGC-Solar Heat Gain Coefficient: the fraction of solar radiation admitted through a particular glazing

SRI-Solar Reflectance Index

TSS-Total Suspended Solids: particles too small or light to be removed from a liquid by gravity settling

TP-Total Phosphorous: phosphates, polyphosphates, and orthophosphates in stormwater

TVOC-Total Volatile Organic Compounds, see VOCs

VAV- Variable Air Volume: ventilation system configuration differentiated from Constant Air Volume

VOCs-Volatile Organic Compounds: potentially hazardous substances omitted as a gas from certain solids and liquids.

WC-Water Closet

ZEV-Zero Emissions Vehicle (minimum energy star rating of 40

LEED Certification Exam

Test Impressions

and Notes

General Comments

The specifications for each section of the LEED Professional Accreditation exam are organized to include a statement of intent and a list of various content areas. This structure provides the volunteer Subject Matter Experts with a framework to guide the development of exam items to assess whether a candidate is capable of performing specific tasks and services. The following outline provides a general description of exam content areas.

- The test is divided into 4 sections, each requiring it's own study strategy

Section 1

1. Knowledge of LEED-NC Credit Intents and Requirements

- **covers Green Building Design and Construction Industry Knowledge and contains 30 questions**

Section 2

Coordinate Project and Team

- **covers LEED Rating System Knowledge and contains 20 questions**

Section 3

Implement LEED-NC Process

- **covers LEED Resources and Processes and contains 20 questions**

Section 4

Verify, Participate In, and Perform Technical Analyses Required for LEED-NC Credits

- **covers Green Design Strategies and contains 30 questions**

MINIMUM MATERIALS/RESOURCES NEEDED:

www.LEEDeducation.com
USGBC website
LEED Reference Manual

MUST KNOW:

Basic understanding of the green building process
Credit Intents
Credit Requirements
Submittal Requirements
Standards

STUDY TIPS:

Attend a LEED one day seminar. You will not be able to pass the exam based on this information, but will help you gain a basic understanding of the LEED building process.

If possible join a study group. You will be less likely to fall behind on your studying if others are counting on you.

Develop a plan of attack. One strategy may be to divide material into 10+/- sections, covering one section a week.

Schedule exam date. Rescheduling is an option (48 hours notice) if not ready, but will force you set deadline

Create a spreadsheet with rows for each credit and columns for credit intent, requirements, submittals, etc.

Obtain a set of flash cards from www.LEEDeducation.com or one of the great websites on the internet

WEEK BEFORE TEST:

Take a Mock Exam such as the one found in the Colorado Study Guide

Your score should be a good indication on areas requiring more attention or if you are prepared to proceed in taking LEED AP Exam

If not ready comfortable, reschedule the test. Give yourself a realistic deadline to try again

DAY OF TEST:

Arrive early

Ask test administrator for scratch paper and pencil

During 10 minute tutorial, do a “memory dump” specifically noting LEED credits. This will be a valuable resource for your reference during the actual exam

Read each question thoroughly. Many questions will be misleading.

For questions with requiring multiple answers, immediately eliminate those which do not fit the parameters of the question. If you know your material, you should always be able to eliminate one or two answers.

IF UNSUCCESSFUL:

Note areas of strength and weakness, focusing your efforts on the areas that need the most improvement

Get in and take the exam as quickly as possible, ensuring that your previous efforts and information was not lost

- The system allows you to skip by questions and/or to mark questions you want to come back to later. You will be given a question to review ALL of your answers at the end, or can do so at any time by pressing the review answers button. Questions you have not answered will be marked with an "I' for incomplete. Questions you have marked will be flagged with a red flag to make it easier to find them. You can call up any question to review your answer and make any changes.

- **Studying the LEED Rating system document alone is not enough.** It will get the candidate through Section 4, and will help with Section 1, but further study is necessary to pass sections 1, 2, and 3.
- Most of the questions are pretty straightforward, though there a couple are nearly inscrutable. For an example of an inscrutable question, see the second sample question in Section 1 below.

- Many of the questions contained in USGBC-provided test preparation materials (e.g. the "official" USGBC study guide on the web site) appear nearly verbatim on the test. *Word to the wise: Study Any of These You've Got*

- It is common for questions to have all of the multiple choices be legitimate answers for LEED, but the right answer depends on knowledge of which does/does not apply to the particular credit involved (e.g. questions worded like the following:

  All of the following are Prerequisites within the LEED rating system except for:

  A. Erosion and Sedimentation Control
  B. Environmental Tobacco Smoke Control
  C. Increased Ventilation Effectiveness
  D. Minimum Energy Performance

Section 1 covers Green Building Design and Construction Industry Knowledge and contains 30 questions

Knowledge of LEED-NC Credit Intents and Requirements

- Test takers with significant experience in all aspects of green building/design who have studied the rating system document and the reference guide will fare all right.
- Success really requires a detailed study of the reference manual, paying particular attention to the introductory sections on green building design/construction and the introductions to each individual credit area (Introductory pages to SS, WE, EA, MR, and EQ). Many questions are drawn from these areas.

1.1 Apply LEED-NC definitions consistently across all credits.

1.2 Establish level of knowledge of LEED-NC credit intents requirements, submittals, technologies, and strategies for site credit category.

1.3 Establish level of knowledge of LEED-NC credit intents requirements, submittals, technologies, and strategies for water credit category.

1.4 Establish level of knowledge of LEED-NC credit intents requirements, submittals, technologies, and strategies for energy credit category.

1.5 Establish level of knowledge of LEED-NC credit intents requirements, submittals, technologies, and strategies for materials credit category.

1.6 Establish level of knowledge of LEED-NC credit intents requirements, submittals, technologies, and strategies for Indoor Environmental Quality (IEQ) credit category.

1.7 Describe format and process for achieving innovation in upgrades, operations and maintenance credits.

Sample Questions

Which of the following is the largest component to construction debris going to landfill?

A Asphalt B. Wood C. Metal D. Drywall

What building type generates the most solid waste per person?

A Hospitals B. Schools C. Offices D. Supermarkets

1. Which two of the following are considered sources of potable water in LEED? (Choose two.)

A. irrigation wells B. captured rain water

C. municipal water system

D. municipally supplied reclaimed waste water

2. A proposed 40,000 Sq. Ft. building with five equal floors is located within a university campus with no zoning requirements.

In order to achieve SS Credit 5.2, Site Development: Maximize Open Space the vegetated open space area adjacent to the building must be _____ Sq. Ft.

A. 2,500 B. 5,000 C. 7,500 D. 8,000

3. Increasing outdoor air ventilation rates by at least 30% above the minimum rates required by ASHRAE Standard 62.1-2004 will _____.

A. improve thermal comfort B. improve indoor air quality

C. assist with compliance with EA Prerequisite 2, Minimum Energy Performance

D. assist with compliance with EA Prerequisite 1, Fundamental Commissioning of the Building Energy Systems

Section 2 covers LEED Rating System Knowledge and contains 20 questions

Coordinate Project and Team

- Passing this section requires knowledge of the background and business case for LEED. A good resource to study would be USGBC's Introduction to LEED powerpoint presentation. Another good resource to study is the brochure "Making The Business Case For High Performance Green Buildings", both available on the USGBC web site.
- In addition to these, spend some time reviewing the LEED system background information on the www.usgbc.org web site.
- It's a good idea to know that it takes a minimum of 26 points under LEED 2.0 for a building to become certified. There could be derivations of this question in other versions of the test, so it might be good to memorize the certified (26), silver (33), gold (39), and platinum (52) point minimums, as well as the maximum number of points possible under LEED 2.0 (69)

2.1 Gather all project information and requirements to support the LEED-NC process.

2.2 Manage coordination of multiple job functions to achieve LEED-NC certification

2.3 Identify standards that support LEED-NC credits.

2.4 Identify opportunities for integrated design and credit synergies to support LEED-NC certification. Explore systems integration opportunities

2.5 Identify critical path elements and schedule to implement LEED process. Develop and implement green building strategies critical path

Sample Questions:

All of the following are benefits of sustainable design and construction except:

A. Increased Employee Productivity
B. Reduced Construction Costs
C. Improved Employee Health
D. Increased Property Value

What is the first step a project team with a question about a LEED credit is likely to take?

A. Call their designated LEED Project Manager at USGBC
B. Submit a credit interpretation request
C. Read the credit intent in the LEED Rating System
D. Consult the credit interpretation database on the LEED web site

Which of the following is not included in the format of a Credit in the LEED Rating System

A. Goals and objectives
B. Environmental Impact of existing practices
C. Summary of Referenced Standards
D. Criteria to satisfy the credit

1. A value engineering exercise has proposed that exterior horizontal louvers above south-facing windows will be deleted from the project. The change requires that various project team members review strategies and reconfirm calculations for several credits.
Which three credits would be affected by this decision? (Choose three.)
A. EA Credit 6, Green Power
B. SS Credit 7.1, Heat Island Effect: Non-Roof
C. EA Credit 1, Optimize Energy Performance
D. EQ Credit 1, Outdoor Air Delivery Monitoring
E. EQ Credit 8.1, Daylight and Views: Daylight 75% of Spaces

2. Which LEED-referenced standard includes a volatile organic compound (VOC) limit for waterproofing sealers?
A. Green Seal Standard GS-11, Paints
B. Green Seal Standard GC-03, Anti-Corrosive Paints
C. Bay Area Air Quality Management District Regulation 8, Rule 51
D. South Coast Air Quality Management District Rule 1113, Architectural Coatings

3. Which strategy will contribute to earning points for both EA Credit 1, Optimize Energy Performance and EA Credit 2, On-Site Renewable Energy?
A. utilize ground source heat pumps for heating and cooling
B. implement architectural passive solar and daylighting strategies
C. install active solar thermal energy systems that employ collection panels

D. purchase tradable renewable energy certificates

Section 3 covers LEED Resources and Processes and contains 20 questions

Implement LEED-NC Process

3.1 Select appropriate LEED product for project scope
3.2 Register project for LEED-NC certification on-line.
3.3 Demonstrate knowledge of CIR process and resources.
3.4 Manage LEED-NC documentation/certification process.
3.5 Manage and complete letter templates.
3.6 Draft and review innovation credits.

- Passing this section will be easier with a good knowledge of the resources that are listed in the various sections of the reference guide. For example, questions may ask about which of the 4 listed publications are good green design/construction resources to draw upon.
- Knowledge of resources and processes needs to also include an awareness of what some of the federal government documents, such as the Environmentally Preferable Procurement Guide, are available and what their intent is.
- This section is very heavily weighted toward the process of getting a project registered, and on the process of approval. The best place to study this is the USGBC web site. The candidate should understand:
  - How to register a project
  - What steps are involved in the entire certification process
  - What proper methods for resolving questions are, including the "how to" of each area.
    - Credit Intent
    - Reference Guide
    - Credit Interpretation Process
  - Who is (and is not) part of a project team and the project review (hint: there are no USGBC staff resources or project managers available for discussion of projects).

Sample Questions

What is the proper method for registering a project for LEED certification?

A. Download, complete, and mail the project registration form from the USGBC web site
B. Fax a copy of the project description and design intent to the LEED certification coordinator at the USGBC
C. Have the project architect submit AIA form 5931, request for consideration of project for LEED certification
D. Complete the online form available on the USGBC web site

What is the proper method for submitting a credit interpretation?

A. Complete the online credit interpretation request on the USGBC web site.
B. Schedule a conference call with the designated LEED Project Manager at USGBC
C. Download, complete, and mail the project registration form from the USGBC web site.
D. Send a letter or FAX toUSGBC requesting a credit interpretation request form.

1. A project involves the renovation of an existing commercial office building, which includes 4 of 10 stories and the core and shell. Project scope includes window replacement, HVAC equipment replacement, plumbing replacement and tenant fit-out of the owner occupied space.
Which rating system product(s) should be used for this project?
A. LEED-NC
B. LEED-EB and LEED-CI
C. LEED-CI and LEED-CS
D. LEED-CS and LEED-EB

2. A LEED-registered project has a complex issue, which makes it so the project does not comply with every aspect of a particular credit's requirements as written. Furthermore, that credit's submittal template does not address the issue within its own format.
What should the responsible party do?
A. contact USGBC review team directly to resolve the issue with appropriate documentation
B. provide a separate narrative explaining the complex issue and how the credit intent is met
C. complete the submittal template as though all aspects of the credit's requirements are met as written and submit for review
D. use the alternative compliance path option on the LEED submittal template and provide a narrative demonstrating compliance

3. Which two are true statements about the LEED certification process? (Choose two.)
A. No credits are awarded during a Design Phase Review.
B. Appeals may only be filed following a Construction Phase Review.
C. LEED certification may be awarded following a Design Phase Review.

D. Additional information must be submitted during the Construction Phase Review for any Design Phase attempted credits that have changed.

Section 4 covers Green Design Strategies and contains 30 questions

Verify, Participate In, and Perform Technical Analyses Required for LEED-NC Credits

4.1 Verify compliance of technical work products created by other team members.

4.2 Participate in and guide the development of technical analyses with design professionals.

4.3 Perform technical analyses to verify compliance with LEED-NC requirements

- Submittal Requirements form the basis of a number of questions.
- The referenced standard section does not contain ALL of the standards that questions refer to, a weakness of the 2.0 standard documents. There are some standards that are referenced in the text of individual sections, sometimes somewhat obliquely.
- To pass, the candidate has to know more than just the information contained in the LEED standard document itself. Much of the information is drawn from the detail contained in the **reference guide.**
- Knowledge of the additional resources listed in the Resources section of each credit will help in several questions.
- Know which ASHRAE standard is which.

- Know which items are prerequisites and which are credits. There are several questions that will ask you to differentiate.

Sample Questions

Which of the following is included in Total Cost when calculating Materials and Resources Credit 3 – Resource Reuse?

A. Electrical panels
B. Ductwork
C. Labor
D. Drywall

Which of the following has the most square feet of surface area?

A. Building shell
B. Interiors
C. Foundation
D. Floors

Which of the following applies to thermal comfort?

A. ASHRAE 90.1 1999
B. ASHRAE 62-1999
C. ASHRAE 129-1997
D. ASHRAE 55-1992

Which of the following applies to Energy and Atmosphere Prerequisite 1 – Minimum IAQ Performance?

A. ASHRAE 90.1 1999
B. ASHRAE 62-1999
C. ASHRAE 52.2-1999
D. ASHRAE 55-1992

What is the maximum number of Innovation in Design Credits that can be awarded to a project?

A. 2
B. 4
C. 6
D. 8

Which of the following is not included in the ways to earn Materials and Resources Credit 3.2 - Construction IAQ Management Plan?

A. Conduct a bake out of the building at high temperatures for two weeks to eliminate all VOC's
B. Conduct a minimum 2 week building flushout with 100% air
C. Conduct a minimum 2 week building flushout with new filtration media
D. Conduct a baseline indoor air quality testing procedure

1. For a 200-occupant, all-residential condominium, the architect's plan indicates the use of bicycle racks that hold 10 bicycles inside the parking structure.
What must the architect do to comply with SS Credit 4.2, Alternative Transportation: Bicycle Storage & Changing Rooms?

A. replace the bicycle racks with bicycle lockers
B. increase the number of bicycle racks to hold 30 bicycles
C. provide two shower/changing rooms in the parking structure, one for each gender
D. confirm that the bicycle storage location is within 200 yards of the building entrance

2. Which three should be included in the specifications to inform the contractors and subcontractors of the requirements for MR Credit 2, Construction Waste Management? (Choose three.)

A. quantity of waste leaving site
B. description of waste material
C. approximate amount of recycled material
D. requirement to identify haulers and recyclers
E. description of the requirements for a site logistics plan

3. A building is undergoing a major renovation and expansion. The addition is 1.5 times the square footage of the existing building.
To achieve MR Credit 1, Building Reuse, what existing surface area information must be available to document compliance with this credit? (Choose three.)

A. window assemblies

B. exterior skin and framing
C. landscaped area to be retained
D. structural floor and roof decking
E. mechanical, electrical, and plumbing equipment

Exam/Test/Exam

What to expect on Exam Day:

- 80 multiple-choice questions, many with two or three answer selection
- 2 hours in which to complete the exam.
- administered by computer.
- computer will not permit to answer more than required number of correct answers.
- Computer will "flag" any question any errors in process
- "mark" any question, this will not effect the question or exam in any other way.
- At the end you will be given a summary of all 80 questions, where you can see which questions are completed, which questions need to be completed, and any questions that are "marked"
- When you have completed the exam, you will see your results in about 10 seconds.inal score is converted to a 75 point scale from 125 to 200. to pass = 170.
- Expect questions very very very similar to page 6 of the Colorado Study Guide.
- questions were presented in a manner that is not *straightforward* and
- will require rereading the question to determine what it is they are asking for.
- many people consider the exam difficult because the questions are not straightforward
- Be on the look out for key words to help identify the intent of the question such as recent, previous, and proposed.
    - For example: To become eligible for LEED certification, what is needed? (choose 3)
      _ A LEED AP on staff
      _ A recycle area with storage bins
      _ Complying with ASHRAE 62.2
      _ A Soil Erosion Plan
      _ A Cx authority to review construction submittals
      _ Complying with ASHRAE 90.1
    - *The key is here is to identify the question is asking about the Prerequisite for LEED*

Things the exam tested on:

- Which credits are able to earn Exemplary Credit.

  - Sample Question:

    A project wants to earn an ID point and has the following strategies; 100% building reuse of walls, roof and windows, has 12% renewable energy from Photo Voltaic Solar Panels, 75% use of FSC wood in framing and trimming materials, and 50% water reduction from use of waterless urinals. Which ID credit is this project eligible for?

    _ MR 1 – Building reuse.
    _ WE 3 – Water use Reduction
    _ EA 2 - Renewable Energy
    _ MR 7 – Certified Wood

- Know the requirements for WE 1 - Water Efficiency Landscaping.
  _ Landscape Coefficient
  _ Species Factor
  _ Density Factor
  _ Microclimate Factor
- Know the submittal requirements for ID 2 – LEED AP:
  _ Name of LEED AP
  _ Name of LEED AP's company
  _ Copy of LEED AP certificate
  _ Brief description of LEED AP's project role
- Know the different standards referenced by the LEED NC reference guide and which credit they are associated with:
  _ ASHRAE 52 Testing
  _ ASHRAE 55 Thermal Comfort (associated with EQ 7 – Thermal Comfort)
  _ ASHRAE 62 Ventilation (associated with EQ category)
  _ ASHRAE 90.1 Energy Standards (associated with EA category)
  _ IESNA RP-33 (associated with outdoor lighting zones)
  _ South Coast Rule #1168 (associated with adhesive & sealants)
  _ ASTM (various): Solar Effects on Surfaces SSc7.2
  _ Energy Policy Act 1992 WEc3
  _ Green-e Center for Resource Solutions (CRS) qualification standard for what's acceptable source for green power EAc6
  _ Green Seal standards for low VOC adhesives (GS-36), paints (GS-11),
  _ Anti-corrosive paints (GS-03) EAc4
  _ Green Label standard for low-VOC carpet EAc4
  _ Green Spec sustainable specifications
  _ U.S. DOE CBECS survey database to determine baseline electricity use
  _ (CBECS) Commercial Buildings Energy Consumption Survey EAc6, EAc2
- Know the Requirement for SS 7 - Heat Island Effect Non-roof:
  - Provide any of the following for 50% of site hardscape
  _ Shade (within 5 years of occupancy)
  _ Paving materials with SRI of at least 29
  _ Open grid paving system (defined as pavement that is less than 50% imperviousness and contains vegetation in open cells.
- Understand MERV (minimum efficiency rating value – higher equals better) is associated with "during construction" and "post construction"
  _ MERV 8 is added to existing HVAC system "during construction"
  _ MERV 13 is added to existing HVAC system "post construction"
- Know the requirements for SS 4 – Alternative transportation

_ A few questions tested your knowledge of different strategies to achieve SS 4 point.

_ Know the criteria for a project to be considered a "major renovation"

_ Rule of thumb – Use LEED NC when your project involves elements of major HVAC renovations, significant envelope modifications, and major interior rehabilitation.
_ Knowledge of CIRs (Credit Interpretation Rulings)
_ Credits are not awarded through CIR process
_ LEED AP should review all existing CIRs to determine similar inquiries have already been made
_ CIRs are submitted through LEED online
_ Submitting drawings, cut sheets, or other attachments are not permitted
_ Submit both the CIR inquiry and Ruling as supporting documentation for the credit pursued.
_ LEED registration cost is base on:
Project size and USGBC membership

_ Understand pre-development discharge and post-development discharge
_ New site – Post discharge rate ≤ Pre discharge rate
_ Existing site - Post discharge rate ≤ 25% of Pre discharge rate
_ Project team can do the following after USGBC has denied a proposed credit
_ Accept or Appeal
_ Know the difference between pre-consumer and post-consumer contents.
_ Broken Glass from a window making factory is NOT pre-consumer if used to make more windows. Must be used for another application.
_ Understand that excavated soil and/or hazardous material removed from job site does not qualify for any calculations related to LEED credits.

- Know the volume of air required to flush out for EQ 3.2
  _ 14,000 Cu Ft of air per sq ft of floor area
- Furniture can be included if it is applied consistently to all calc's in MR3-7
- Know difference between green power vs. on-site renewable energy. Know what third-party certifies green power (green-e), and what's allowed to contribute to each. Hydropower does not count.
- Also know what qualifies for on-site renewable energy (mostly active, no passive)
- Know what is considered a renewable resource (wool, cotton, linoleum, cork, wheat-board)
- Know what time frames for commissioning and M&V
- Know what Ventilation is (natural, mechanical, outdoor air, etc)
- Construction IAQ management plan, know what General Contractor is responsible for (strategy & submittals)
- Know the certification process, know the design phase process for submittals & templates, know the construction phase process for submittals & templates.
- Know who is allowed to be Cx (commissioning authority)
- Know the definition of what type and size of building would be LEED-NC certified. (vs. existing, CI, etc.)
- Know and understand the strategies that can be implemented to obtain multiple points. (Vegetated roofs, white-roofs, etc.)
- Multiple questions regarding ID points, innovative / exceptional design requirements, this is where they get you if you don't know the percentages (and when to double vs. next increment)
- Know everything about WE (all intent, req.,submittals, strategies, & calcs), it's the only category that can be fully submitted in the design phase.

http://www.usgbc.org/chapters/cascadia/docs/pdf/LOLOverview.pdf

Disclaimer: questions may differ than what I had, this is just a brain dump of things I could remember and may not include everything you will encounter so the best strategy is to know all the material, everything. The test is very difficult and they pull information from everywhere and anywhere. The best resources in my opinion include studying the USGBC.org website and the LEED Reference Guide, only use the Rating System once you've read through the full guide. At the end I've listed some other resources

Notes: As of mid-September 2007, the required optimized energy performance credits are NOT reflected as prerequisites on the exam yet. The exam is 80 questions and you are given 2 hours to complete it, scored from 125-200 points, a 170 is minimum required to pass.

A couple questions on the prerequisites, each were worded differently (know what the sentence form of commissioning is).
The following are examples of the answers for which one's are prerequisites, etc.

(a) ASHRAE 90.1
(b) ASHRAE 62.1
(c) 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.
(d) Erosion and Sedimentation Control Plan

- Know that (c) is the same thing as Fundamental commissioning.
- Know which credits use some form of baseline and what those points or percentages above baseline are -- a minimum measurement for a standard (water use, energy model, energy use baseline, etc)
    - Baseline for WE 3.1 / WE 3.2 = 20-30% reduction in water use baseline from Energy Policy Act-1992
    - Baseline for EA pre 2 = (min. level of energy efficiency) that complies with Appendix G of ASHRAE 90.1
    - Baseline for EA 1 = use calc'd baseline from EA pre 2
    - Baseline for EA 6 = electricity use = annual electricity use calc. From EA 1 or use the DOE CBECS (also used in EA 2)

A couple questions regarding recycling, know pre-consumer vs. post-consumer, specifically what qualifies as pre-consumer recycled content (waste from manufacturing ONLY if reclaimed in same process, does not count if it's sold, etc..)

Know what materials are allowed for the recycling prerequisites
Know the difference between Building Reuse, Material Reuse, Salvaged Material, Regional Materials, and Recycled Content

- Be prepared to be given an example (story of a project) using all of the above and to apply the appropriate credits.

MR Construction waste management:

- know exactly what is accepted to be reused/recycled and what cannot (soil & land clearing debris cannot contribute).
- Know the process / strategies.

Building Reuse:

- know what counts as reuse and what doesn't. (what part of the building can be applied to which credit),
- know the exemptions (non-structural roof & windows, etc…)

For building reuse:

- know what qualifies and what doesn't towards the percentage
- Know what credits require to know FTE for calc's
- Know the volume of air required to flush out for EQ 3.2
- Know the four major ASHRAE standards (90.1, 62.1, 52.2, & 55) and what credits they are applied to
- Know strategy of SS8 (full cutoff luminaries, occupancy sensors to turn off light after hours, etc)

KNOW PERCENTAGES (know what the percentages are, very often they will try to confuse you with similar percentages or multiple percentages, like 2% glazing factor for 75% of space, direct line of sight for 90%, so the answer was 2%, 75%, 90%, other answers may have been 1%, 75%, 90% or 2%, 70%, 90%)

Furniture can be included if it is applied consistently to all calc's in MR3-7
Study the commissioning process, both the prerequisite and the credit.

- Know how they differ.
- Know the process and steps involved.
- Know the roles & responsibilities involved.
- Know what equipment is checked for efficiency.
- Know what bldg. maintenance engineers need to do (adjust for thermal comfort, adjust CO2) versus commissioning, versus measurement & verifying.
- Know about the process for certified wood, specifically the submittal and chain-of-custody.
- Know the differences between green-e, Green Seal, Green Label, and Green Spec
- Know difference between green power vs. on-site renewable energy.
- Know what third-party certifies green power (green-e), and what's allowed to contribute to each. Hydropower does not count. (only low-impact hydro).
- Also know what qualifies for on-site renewable energy (mostly active, no passive)
- Know what's a renewable resource (wool, cotton, linoleum, cork, wheatboard, etc.)
- Know what time frame to MV (when to start and when to verify, after 2-week flush to 1-yr)
- Know CIR, process involved and submittals involved.
- Know what ventilation is (natural, mechanical, outdoor air mixed with recycled air, etc)

Construction IAQ management plan,

- know what GC is responsible for (strategy & submittals) and know what MERV filters are for what credit EQ3.1 MERV 8 EQ3.2 MERV 13 EQ5 MERV 13 – indoor chemical & pollutant control

- Know the third-party standards for low-emitting materials and what falls into what category. You do not need to know specific VOC levels.

Couple questions on LEED AP role,

- what they should know, what needs to be submitted for ID2, etc.
- Know the difference in calculation method and strategies for EQ 8.1 versus 8.2 SS6 – A

Couple questions regarding innovative storm water

- SUBMITTALS & CALC's, know pre-development runoff & post-development runoff and
- know when to use it based on EXISTING imperviousness
- Know the certification process,
- know the design phase process for submittals & templates,
- know the construction phase

Process for submittals & templates.

- Know who is allowed to be Cx (commissioning authority)
- Know the definition of what type and size of building would be LEED-NC certified. (vs. existing, CI, etc.)
- The one calc I had asked for daily water use of an occupant for use in water reduction. You may not need to know the exact calculation, but numerous questions regarding what values were required to perform the calculations.

Asked straight forward questions about the requirements for the following credits:

SS4.2/4.3 SS5.1/5.2 SS7.1/7.2 EQ7.1/7.2 EQ8.1/8.2

Know the details of how one point differs from another point in the same credit (see credits in list above).

Know and understand the strategies that can be implemented to obtain multiple points. (Vegetated roofs, white-roofs, etc.)

Multiple questions regarding ID points, innovative / exceptional design requirements, this is where they get you if you don't:

- know the percentages (and when to double vs. next increment)
- Know everything about WE, I had 6-8 questions regarding WE, know that it's the only category that can be fully submitted in the design phase.
- Know purpose and when to use baseline and design energy model.
- Know what strategies impact design energy model (Vegetated Roof, Daylighting. etc)
- Know what requirements use – "for greenfiled sites" vs. "previously developed sites"

Referenced Standards:

ASHRAE 90.1: Energy Standards SSc8 EAp2 EAc1 EAc2
ASHRAE 52.2: Ventilation Filters EQc5
ASHRAE 55: Thermal & Humidity EQc3.1 EQc5
ASHRAE 62: Minimum Ventilation EQp1 EQc2 EQc6.2
ASHRAE 129: Air Exchange
ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004 EAc1

ASTM (various): Solar Effects on Surfaces SSc7.2

Energy Policy Act 1992 WEc3

Green-e Center for Resource Solutions (CRS) qualification standard for what's acceptable source for green power EAc6
Green Seal standards for low VOC adhesives (GS-36), paints (GS-11), Anti-corrosive paints (GS-03) EAc4
Green Label standard for low-VOC carpet EAc4
Green Spec sustainable specifications

U.S. DOE CBECS (CBECS) survey database to determine baseline electricity use Commercial Buildings Energy Consumption Survey EAc6, EAc2

FSC Forest Stewardship Council(provide principles & criteria for certified wood) MRc7

IPMVP International Performance Measurement &Verification Protocol EAc5

Online Resources:

USGBC http://www.usgbc.org
LEEDstudy.com http://www.leedstudy.com/
AREforums http://www.areforum.org/forums/forum12/
University of Florida http://www.cce.ufl.edu/LEED/
LEED education http://www.leededucation.com/
Flashcards
http://ppi2pass.com/ppi/PPIShop?pr=LDNCFL&ct=LEED
http://leedsource.com/

A great summary table for 2.2 credits, intents, requirements, strategies, submittals, phase, etc.
http://www.leededucation.com/LEED_2.2_Summary%5b1%5d.pdf

Test Specifications & Sample Questions:
https://www.usgbc.org/ShowFile.aspx?DocumentID=3178

Guidance on Innovation & Design (ID) Credits:
http://www.usgbc.org/Docs/LEEDdocs/IDcredit_guidance_final.pdf

Certification Process specific to **LEED**-NC:
http://www.usgbc.org/ShowFile.aspx?DocumentID=1108

LEED for New Construction:
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=220

LINK TO USGBC PROJECT CERTIFICATION PAGE:
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1497

LINK TO USGBC PROJECT CERTIFICATION REGISTRATION PAGE:
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=65

LINK TO USGBC LEED ONLINE SAMPLE CREDIT TEMPLATES (pay attention to fee structure):
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1447

LINK TO USGBC CIR & RULING PROCESS GUIDELINES (pay attention to fees): http://www.usgbc.org/ShowFile.aspx?DocumentID=1510

I attended a LEED-NC seminar a couple of weeks ago. If you are fortunate enough to attend one I would suggest taking the exam as quickly as you can after completing it. I have to say, it was MUCH better than I expected it to be and I think it is worth it if you are serious about becoming LEED accredited. Luckily, my firm covered the cost of the seminar and of my study materials. I know others aren't so fortunate. If you attend the seminar you can buy the hard-copy Reference Guide at a reduced price (still outrageously high, but reduced nonetheless). I believe that when you register for the seminar you get access to the online Reference Guide for a year. Unfortunately, you can't print it.

I primarily studied the Reference Guide and the supplemental booklet that I was given at the seminar. I looked over the Letter Templates just to be familiar with their format. I did not have the study guide or the flashcards that are often referenced on this board.

I felt I was well-prepared and knew the material pretty well, but I still felt that the exam was pretty difficult. In the past two years I have taken and passed all of the sections of the ARE and the NCIDQ exam so I consider myself to be a fairly experienced test taker: the difficulty of this exam is not so much the material, but the structure of the questions. Whereas on the ARE there is just one correct answer, (although it may be "A, C, and D") I would say that a good 75% of the LEED questions are in the "choose two" or "choose three" format. And there was always one answer that was definately right, one that was obviously wrong, and three that could go either way. Look at the sample questions in the test info that you download from USGBC. That is the way most of the questions are formatted. Some of them are written in a very confusing way so take your time when you are reading them.

There were more questions from the first section of the Reference Guide-- the process of application-- than I imagined there would be. On the bright side, my test had no calculations. However, you did need to know what data was required for completing calculations for certain credits. Also, know the Reference Standards well. There were many questions on these, particularly ASHRAE 90.1 (understandably, since that is a major points area and a pretty complex requirement

Yet Another Helpful LEED AP Chart - Know Your Roles (Decision Makers)

As my LEED AP exam day quickly approaches, I find myself fairly confident with all of the credits as I fill out the semi blank study guide. However, there is a lot more to the exam than just understanding the credits. Knowing the credit intentions and requirements is just 1/4 the battle. But thats ok! Hopefully I can shed some light on those other things you'll need to know within the next day or two.

To recap, there are 4 basic "sections" within the LEED AP Exam format that you'll be tested on:

1. Knowledge of LEED Credit Intents and Requirements
2. Coordinate Project and Team
3. Implement LEED Process
4. Verify, Participate in, and Perform Technical Analysis Required for LEED Credits

At the end of the test, you'll see how well you did in each category and then an overall score. By studying the reference book and your favorite study guides, you'll have a lot of information to help you answer questions from each of these sections. This being said, there are going to be quite a few questions dealing with "who does what", or how the certification process works, which isn't directly mentioned in the reference guide. Many of these answers are found online at the USGBC website - you just have to fish for them. Again, I'll do my best to post useful information from a variety of resources soon.

Below is a useful table of responsibilities and decision making for each credit in the LEED certification process. I really don't think you should spend too much time memorizing a table like this, rather - I think it would be useful to carefully go through it a few times. Read each credit number, associate it with the information you know about the credit and see who is responsible. After a while it should become almost "common sense" to you. For example, of course the contractor is the only trade responsible for MR 2.1 & 2.2 - Construction Waste Management because he/she is really the only one who will be on site to deal with the disposal and diversion waste during construction while collecting the receipts and tickets from the haulers.

It's Good to Know LEED AP Synergies

synergy (syn·er·gy)

1. *the interaction of two or more agents or forces so that their combined effect is greater than the sum of their individual effects.*
2. *cooperative interaction among groups, especially among the acquired subsidiaries or merged parts of a corporation, that creates an enhanced combined effect.*
3. *the name I would give to an energy drink I invent, but I'd replace the "y" with an "i" and serve it exclusively at high-end clubs for great-tasting jager-bombs.*

Synergies in LEED are very important and is an essential ingredient in designing successful green buildings. Plus, they may show up on the test in one form or another - so pay attention.

Understanding synergies in LEED means understanding how different design strategies are interconnected and may contribute to more than one LEED credit. Synergies aren't always good though, as some strageties can be great for one credit but terrible for another - at the same time. I'll outline some examples for you:

1. **Rainwater Collection**
   - Good Synergies
     1. collecting from roof runoff reduces quantity of stormwater to be managed
     2. saves fees associated with handling runoff volumes
     3. resource for landscape irrigation
     4. source of non-potable water for flushing toilets and urinals
     5. provides opportunity to displace potable water use for HVAC (water for cooling towers)
2. **Daylighting**
   - Good Synergies
     1. can reduce need for electric lighting
     2. capture savings in electricity
     3. capture savings from reduced cooling loads and downsizing cooling equipment
     4. can provide passive solar heating
     5. may permit elimination of perimeter heating
     6. an integrated design effort may include addressing operating costs for both electricity and natural gas, environmental impacts related to energy consumption, initial costs for heating and cooling, the quality of lighting and thermal comfort.
   - Bad Synergies
     1. in cold-climate, skin-load dominated buildings, great daylighting may mean poor insulation (roof, walls and glazing). This could raise overall heating loads for the building.

2. innapropiate fenestration (the placement of windows on a building's facade) can also lead to overheating of occupants near windows, glare problems, and higher cooling loads in the summer.

3. **Light Colored Pervious Paving**
   - Good Synergies
     1. reduces heat-island effects
     2. reduction of stormwater runoff
     3. treatment of stormwater runoff
     4. improved mid-summer microclimate thermal comfort
     5. reduction of cooling loads
     6. possible rainwater collection for irrigation and flushing
   - Bad Synergies
     1. if implemented innapropiately in a winter-dominated climate and/or with insufficient drainage, potential benefits may be reduced and may actually increase overall energy consumption and cause maintainance problems.
        - i.e. having to plow snow that would of melted on black asphalt
        - snow removal equipment may damage the paving
        - cracking and buckling of the paving due to bad drainage and build up of silt

4. **Use of Wheatboard**
   - Good Synergies
     1. Initially more expensive, but saves money due to it's durability compared to sheetrock.
        - saves costs on installation and maintainance
     2. The benefits associated with using a renewable agricultural byproduct
   - Bad Synergies
     1. if used with a finish or stain high up on walls, distribution of daylight may be severely constrained (because wheatboard is relatively dark)
        - here, it would absorb light rather than reflect it deeper into spaces.
        - this would result in a reduced displacement of electric lighting and greater energy consumption.
     2. because of the reduced thermal mass of wheatboard, in some cases this may lead to greater fluctuations in interior temperatures

5. **Vegetated Roofs *(every practice exam I've seen involved vegetated roofs in some fashion)***
   - Good Synergies
     1. reduction of roof rainwater runoff
     2. reduction of heat-island effects
     3. reduction of cooling loads by buffering roof membrane from sun exposure and through evapotranspiration.

    - this can reduce electric power demand and permit downsizing of cooling equipment and save costs
4. vegetation and soil also provide an added layer of insulation to prevent escape of winter heating energy from the building
5. aesthetic appeal
6. can communicate leadership in sustainability in the community
7. provide habitat for birds and other wildlife

The LEED Project Registration, CIR and Appeal Process - Lightning Round

Here is a "lighting round" of information regarding Project Registration, the Credit Interpretation Requests and Rulings (CIRs) and the Appeal Process in LEED. This information is as of January 2007. When updates occur, so will the information this page. Any of the information below could be asked on the Exam, so get familiar with it.

LEED Project Registration:

- First thing is to do is register ONLINE via USGBC website
- Registration fees are **$450** for members, **$600** for non-members
- Certification fee depends on LEED Rating System (NC, EB, CS, etc.) and building sq. ft. (let me reiterate - building square footage !)
    - paid in different stages (i.e. design and construction phase)
- *Certification* fees are waived if project receives Platinum LEED Certification
- You could submit in two phases (for design submittal and then again for construction) **OR** submit in one phase (design and construction submittals together)
- After design phase - USGBC will mark each credit as *credit anti cipated* or *credit denied* . They cannot actually reward credits after the design phase.
- After construction phase - this is when USGBC makes a ruling on each credit as *credit achieved* or *credit denied* .
- Registration provides access to Credit Templates online
    - 4 sections of Credit Templates:
        1. template status
        2. manage template
        3. required documents
        4. documentation status
- Registration during early phases of project design ensures maximum potential for achieving certification.
- Registration establishes point of contact with USGBC and provides access to essential information, software tools and communications.
- Registration also provides access to a database of existing Credit Interpretation Requests and Rulings
- A complete *LEED-Online* submittal must include the following:
    - overall project narrative including at least three project highlights
    - drawings and photos illustrating the project, including:
        1. site plan
        2. typical floor plan
        3. typical building section
        4. typical or primary elevation
        5. photo or rendering of the project

CIRs (Credit Interpretation Requests and Rulings):

- During the certification process, if it is unclear whether or not a strategy applies to a given credit, a CIR can be submitted and the ruling will determine the suitability of the approach.
- CIR rulings will never guarantee or award any credits - it just provides specific information regarding applicability.
- **IMPORTANT** - Before submitting a CIR, check the online resource for previous CIRs logged by other projects on relevant credits *first* . Only if a similar credit interpretation has not been logged or does not answer your inquiry sufficiently, then a new CIR via *LEED-Online* should be submitted.
- CIRs are **$220** for each one
- Each CIR should refer to only one LEED credit and one primary related strategy
- The inquiry should only include essential project strategy and background information and should be presented in the context of the credit intent. (600 max words?)
- Submissions of drawings, cut-sheets, or other attachments is NOT permitted.
- CIRs can be *viewed* by all USGBC members, non-members with registered projects, and workshop attendees.
- CIRs can only be *requested* by LEED Registered Project Team Members.

Appeals:

- If a project team feels that sufficient grounds exist to appeal a credit that has been denied in the Final LEED Review, it has the option to appeal.
- Appeals are **$500** *per credit*
- You have 25 days to appeal after Final LEED Review
- Appeal submittals are all done via *LEED-Online*
- Because review will be done by a different review team, appeals must include the following:
    - LEED registration information, including project contact, project type, project size, number of occupants, date of construction completion, etc.
    - An overall project narrative including at least three project highlights.
    - The LEED Project Checklist Scorecard indicating project prerequisites and credits and the total score for the project
    - Drawing and photos illustrating the project, including:
        1. site plan
        2. typical floor plan
        3. typical building section
        4. typical or primary elevation
        5. photo or rendering of project
    - complete list of all CIRs used
    - Original, re-submittal, and appeal submittal documentation for only those credits that are being appealed. Narratives for each to be included as well.

- The Registration process
- The CIR process
- Commissioning (EA P1 and EA P3)
- Synergies between Stormwater credits (SS 6.1 & SS 6.2) and Construction Activity Pollution (SS P1)
- Relations between Stormwater credits (SS 6.1 & SS 6.2), Site Development credits (SS 5.1 & SS 5.2) and Heat Island Effect (SS 7.1 & SS 7.2)
- Energy Performance Credits (EA P2 & EA 1) - very important
- Environmental Quality Construction Management credits (EQ 3.1 & EQ 3.2)
- Environmental Quality 4-series (EQ 4.1 , EQ 4.2 , EQ 4.3 & EQ 4.4)
- Water Efficiency Plumbing Fixture Calculations
- ASHRAE!
- Decision Makers for different credits
- The ID Credits and their thresholds
- Project Administrator Duties (I didn't know squat about this.) *UPDATE: Thanks to Binu for finding this link that may help with figuring out project admin duties

How About All About LEED Submittal Documentation

I've received a few questions lately asking why I don't add a section within each credit about what documents are needed to be submitted for credit compliance. My initial thought was that the submittal documentation could be easily determined based on the information provided in the credits.

I guess I was being biased because I do work in the industry and may understand how these types of things work more so than some other people. I did not take into account the many people who have no experience in the building/construction industry who do take the LEED exam. So, for everyone, I've created a helpful list for you below.

There may be a few questions on the exam about submittal documentation, so feel free to use the list below as you wish. I'll try to shorthand this as best as I can so you can still easily understand it. I won't go too far into detail (i.e. exact calaulations) because they won't ask you too much detail about documentation on the exam.

Note: a lot of the credits may require additional documentation for a description of any special circumstances that may be involved with meeting the requirements. For the purposes of this list, I have not included that below. It's just good to know that.

LEED for NC Submittal Documentation

Sustainable Sites

- SSp1: project drawings and description of ESCs, confirmation of NPDES (or local) compliance
- SSc1: confirmation not on prohibited land
- SSc2: project site & area (sq. ft)
    - option 1: drawing of project and adjacent buildings w/ density radius
    - option 2: drawing or aerial photo of 1/2 mi. radius w/ 10 basic services
- SSc3: descriptions of site contamination & fixes; confirmation that it's brownfield
- SSc4.1: drawing of site indicating rail & bus, list of nearby rail & bus with distances from site
- SSc4.2: project drawings w/ storage and shower locations, calculation numbers
- SSc4.3: project drawings, info about specific options
- SSc4.4: FTE and transit occupancy, confirm. of which option
    - (depending on option): site's parking capacity, number of carpool spaces, desc. about rideshare program
- SSc5.1: site area, building area, desc. of approach
    - greenfields: copy of site grading drawings & boundaries
    - previously dev: area of plant area, landscape plan & plant info
- SSc5.2: site area, building area, landscape site/plan highlighting open spaces
    - option 1: area of open space required vs. area of vegetated open space
    - option 2: area of veg. open space that is equal to bldg. footprint

  - option 3: area of veg. open space
- SSc6.1: runoff rate and quantity calculations, desc. of site cond. and measures taken
- SSc6.2: confirm. of compliance
  - non structural: list and desc. of each BMP + rainfall treated annually
  - structural: list and desc. of struct. controls + rainfall treated annually
- SSc7.1: site dwgs. with highlighted shade areas, pav materials & underground/covered parking, confirmation that roof materials meet requirements, calculation requirements + parking space info
- SSc7.2: roof plans w/ highlighted area of specific roof mats. or green roof area, SRI information
- SSc8: lighting dwgs (interior & ext.), max. candela information, light tresspass analysis, lighting power density tables, site zone classification, calculation requirements

Water Efficiency

- WEc1.1&1.2: calculation requirements
- WEc2: plumbing dwgs, # occupants, baseline water use info, design case water use info, fixture info, any treated water information, desc. of strategies
- WEc3.1&3.2: # occupants, fixture info, baseline water use info, design case for flow flush,desc. of strategies

Energy and Atmosphere

- EAp1: CxA name & company, confirm. 6 requirements, description + results of commissioning
- EAp2: confirm. ASHRAE 901.1-2004 compliance
- EAp3: confirm. no CFC use or phae out plan, desc. of phase out plan & refrig. quantities
- EAc1: confirm. compliance of option requirements
- EAc2: confirm. compliance of option requirements, desc. of renewable systems & calculations
- EAc3: CA name & company, comfirm task completion, results and training/implementation/review plan
- EAc4: finish letter template w/ all necessary items
- EAc5: comfirm. IPMVP option, M&V plan
- EAc6: name & contract term or REC number, total annual elec. consumption & purchases

Materials & Resources

- MRp1: confirm. recycle areas, confirm. materials to be recycled
- MRc1.1&1.2: area of existing, area of any additions, area of each existing struct/envelope element and area that is being reused
- MRc1.3: same as above except its info about interior nonstruct. elements

- MRc2.1&2.2: units (tons or cubic yds.), info (receipts from haulers) about waste diversion
- MRc3.1&3.2: method of determining materials cost & calculations, desc./vendor/cost of materials, desc. of strategy
- MRc4.1&4.2: method of det. mat. cost & calcs, desc/manu./cost/%/PREorPOST/ of materials
- MRc5.1&5.2: method of det. mat. cost & calcs, desc/manu/cost/% regional/distance from site
- MRc6: method of det. mat. cost & calcs, desc/manu/cost/% rapid renewable
- MRc7: info about product/name/vendor/cost/% wood/% FSC wood/FSC c.o.c. cert. #

Indoor Environmental Quality

- EQp1: desc. of ventiliation design, confirm. meets ASHRAE 62.1-2004, drawings of natural ventilated zones & operable windows
- EQp2: confirm. option chosen, drawings if applicable & testing results if applicable
- EQc1: confirm. option chosen, confirm compliances, desc. of monitoring systems, drawings w/ location & type of sensors & natural vent. components
- EQc2: confirm. option chosen, confirm meets ref. standard requirements, required calcs & drawings, desc. of design method & ventilation used if applicable
- EQc3.1: copy of IAQ plan, confirm air handling equipment installation method, photos highlighting each approach to IAQ plan, list of filtration media used & confirm it was replaced after
- EQc3.2: copy of IAQ plan highlighting pre-occupancy phase practices, confirm. of option used & compliance
- EQc4.1-4.4: list of each critical product used. Include name/manu/VOC/allowable VOC based on SCAQMD, source of VOC & compliant statement
- EAc5: confirm. required entryway systems installed, desc. & info on system installed, project drawings w/ locations, copies of mech. drawings, confirm. meets vent. & chem. requirements, confirm. filter requirements met
- EAc6.1&6.2: # of workstations w/ controls, list of multi-occ. spaces w/ controls, desc. of controls + strategy + location used
- EAc7.1: seasonal temp. data, desc. of method used + confirm. compliance w/ ASHRAE 55-2004
- EAc7.2: desc. of planned survey and a possible plan if survey shows dissatisfaction
- EAc8.1: areas and calcualtions for respective options. Project drawings with results of modeling simulations if applicable.
- EAc8.2: calculation requirements, completion of online template, total area of reg. occupied space and spaces w/ views, copies of line of sight drawings in plan and section

Innovation in Design

- IDc1.1-1.4:
    - ID credit title

  - desc. of credit intention
  - desc. of credit requirements
  - desc. of approach
  - any drawings that may need to be included
- IDc2:
  - LEED AP name
  - LEED AP company
  - Description of role
  - Copy of certificate

Implement LEED Process

*Summary:*This section is mostly all about how to manage a project from it's initial registration with the USGBC, through the CIR and documentation process, and all the way to the appeal process.

What to study:

- Read and re-read everything I wrote in the LEED Project Registration, CIR and Appeal Process post. I heard that it's pretty spot on.
- Get your hands on some letter templates. If you know anyone who is currently undergoing a LEED project, ask them how letter templates work. If not, you can visit this website from the Green Building Certification Institute.
- Find out, if you can, anything about the project administrator's duties. I still have yet to find any good information about this, so if you do come across something useful, PLEASE let us all know!

Sample Questions:

1. An application for LEED Certification must contain two of the following:
2. What are two responsibilities of the contractor that support LEED documentation?
3. Credit Interpretation Rulings provide which two of the following?

Verify, Participate in, and Perform Technical Analyses Required for LEED Credits

*Summary:*This section is tricky. The USGBC lists the "content areas" of this section to be:

- Verify compliance of technical work products created by other team members.
- Participate in and guide the development of technical analyses with design professionals.
- Perform technical analyses to verify compliance with LEED-NC requirements.

Generally, I've noticed that this seems to be the section that most people perform the worst in. I think this section is really a combination of all of the other sections with a primary focus on those credits and situations where there is verification and calculations involved. The questions can get pretty nit-picky, and for some, you'll only know the answers based on your construction and building experience, your knowledge from taking so many practice exams, and/or luck. That being said, a lot of the questions come from information that you should already know: the credit intents and calculations! It's just worded a little differently, so you may have to think about the questions a little harder.

What to Study:

- Again, memorize each of the credits and prerequisites. Feel free to use the credit summaries on the table of contents, along with the blank or semi-blank study guide to make sure you've got it down.

- Know which credits have calculations and make sure you know how to perform them. (Credits dealing with FTE or number of plumbing fixtures especially!)
- Practice tests and more practice tests!

Sample Questions:

1. The design team has elected to pursue strategies addressing 50% of the hardscape surfaces on the site to meet the requirement of SS Credit 7.1, Heat Island Effect: Non-Roof. Which three of the following should the LEED AP verify?
2. Which of the following best represents an appropiate level of overall illumination on an office work surface, including daylighting, ambient artificial lighting, and task lighting?
3. In an office building, the design includes a rainwater harvesting system that collects 20,000 gallons of water each year. This water is used for flushing toilets. Which of the following information is needed to calculate the reduction in potable water demand for building sewage conveyance for achieving WE Credit 2, Wastewater Technologies?

If some of these questions scare you, don't worry. Just stick with your gameplan, and follow the tactics that are described above. Don't get yourself down if you have failed once before. Agression or doubt can get in the way of all the hard work you've put into this. Get familiar with the types of questions you need help on, study, and you'll do great. I hope this breakdown has helped even just one of you.Best of luck!

The PDF is ATTACHED to this post below...

I don't think this gives too much stuff away, b/c I cannot verify if they rotate/randomize questions, but these were the areas they covered for me.

I passed w/ a 175

PLEASE LET ME KNOW IF THIS IS TOO SPECIFIC!
I want to abide by the rules and help others who are studying for the exam.

Disclaimer: questions may differ than what I had, this is just a brain dump of things I could remember and may not include everything you will encounter so the best strategy is to know all the material, everything. The test is very difficult and they pull information from everywhere and anywhere. The best resources in my opinion include studying the USGBC.org website and the LEED Reference Guide, only use the Rating System once you've read through the full guide. At the end I've listed some other resources

Notes: As of mid-September 2007, the required optimized energy performance credits are NOT reflected as prerequisites on the exam yet.]Be vary wary of studying v2.1 material as a significant number of things have changed in v.2.2 The exam is 80 questions and you are given 2 hours to complete it, scored from 125-200 points, a 170 is minimum required to pass. Good luck!

Know the prerequisites, each was worded differently (ex. know what the definition of commissioning is).

The following are examples of which one's are prerequisites, etc.

(a) ASHRAE 90.1
(b) ASHRAE 62.1
(c) 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.
(d) Erosion and Sedimentation Control Plan

example - (c) is the same thing as Fundamental commissioning.

Know which credits use some form of baseline and what those points or percentages above baseline are -- a minimum measurement for a standard (water use, energy model, energy use baseline, etc)

Baseline for WE 3.1 / WE 3.2 = 20-30% reduction in water use baseline from Energy Policy Act-1992
Baseline for EA pre 2 = (min. level of energy efficiency) that complies with Appendix G of ASHRAE 90.1
Baseline for EA 1 = use calc'd baseline from EA pre 2
Baseline for EA 6 = electricity use = annual electricity use calc. From EA 1 or use the DOE CBECS
(also used in EA 2)

Know about recycling, know pre-consumer vs. post-consumer, specifically what qualifies as pre-consumer recycled content (waste from manufacturing ONLY if reclaimed in same process, does not count if it's sold, etc..)

Know what materials are allowed for the recycling prereq.

Know the difference between Building Reuse, Material Reuse, Salvaged Material, Regional Materials, and Recycled Content -- Be prepared to be given an example (story of a project) using all of the above and to apply the appropriate credits.

MR Construction waste management, know exactly what is accepted to be reused/recycled and what cannot (soil & land clearing debris cannot contribute). Know the process / strategies.

Building Reuse, know what counts as reuse and what doesn't. (what part of the building can be applied to which credit), know the exemptions (non-structural roof & windows, etc…)

For building reuse, know what qualifies and what doesn't towards the percentage

Know what credits require to know FTE value for calc's

Know the volume of air required to flush out for EQ 3.2

Know the four major ASHRAE standards (90.1, 62.1, 52.2, & 55) and what credits they are applied to

KNOW PERCENTAGES (know what the percentages are, very often they

will try to confuse you with similar percentages or multiple percentages, like 2% glazing factor for 75% of space, direct line of sight for 90%)

Furniture can be included if it is applied consistently to all calc's in MR3-7

Study the commissioning process, both the prerequisite and the credit. Know how they differ. Know the process and steps involved. Know the roles & responsibilities involved. Know what equipment is checked for efficiency.

Know about the process for certified wood, specifically the submittal and chain-of-custody.

Know the differences between green-e, Green Seal, Green Label, and Green Spec

Know difference between green power vs. on-site renewable energy. Know what third-party certifies green power (green-e), and what's allowed to contribute to each. Hydropower does not count. (only low-impact hydro). Also know what qualifies for on-site renewable energy (mostly active, no passive)

Know what qualifies as a renewable resource.

Know what time frames for commissioning and M&V

Know the roles of people involved in some of the complex processes like commissioning, M&V, CO2 monitoring, thermal comfort, etc.

Know CIR, process involved and submittals involved.

Know the differences of ventilation.

Construction IAQ management plan, know what GC is responsible for (strategy & submittals)

Know what MERV filters are for what credit

Know the third-party standards for low-emitting materials and what falls into what category.

Know the LEED AP role, what they should know, what needs to be submitted for ID2, etc.

Know the innovative storm water (SS6) SUBMITTALS & CALC's, know pre-development runoff & post-development runoff and know when to use it based on EXISTING imperviousness

Know the certification process, know the design phase process for submittals & templates, know the construction phase process for submittals & templates.

Know who is allowed to be Cx (commissioning authority)

Know the definition of what type and size of building would be LEED-NC certified. (vs. existing, CI, etc.)

You may not need to know the exact calculation, but numerous questions regarding what values were required to perform the calculations.

Know the details of how one point differs from another point in the same credit.

Know and understand the strategies that can be implemented to obtain multiple points. (Vegetated roofs, white-roofs, etc.)

Multiple questions regarding ID points, innovative / exceptional design requirements, this is where they get you if you don't know the percentages (and when to double vs. next increment)

Know everything about WE (all intent,req.,submittals, strategies, & calcs), it's the only category that can be fully submitted in the design phase.

Know purpose and when to use baseline and design energy model.

Know what strategies impact design energy model (Vegetated Roof, Daylighting. etc)

Know what requirements use – "for greenfield sites" vs. "previously developed sites"

Referenced Standards:

ASHRAE 90.1: Energy Standards SSc8 EAp2 EAc1

EAc2

ASHRAE 52.2: Ventilation Filters EQc5
ASHRAE 55: Thermal & Humidity EQc3.1 EQc5
ASHRAE 62: Minimum Ventilation EQp1 EQc2 EQc6.2
ASHRAE 129: Air Exchange

ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004 EAc1

ASTM (various): Solar Effects on Surfaces SSc7.2

Energy Policy Act 1992 WEc3

Green-e Center for Resource Solutions (CRS) qualification standard for what's acceptable source for green power EAc6
Green Seal standards for low VOC adhesives (GS-36), paints (GS-11),
Anti-corrosive paints (GS-03) EAc4
Green Label standard for low-VOC carpet EAc4
Green Spec sustainable specifications

U.S. DOE CBECS survey database to determine baseline electricity use
(CBECS) Commercial Buildings Energy Consumption Survey EAc6, EAc2

FSC Forest Stewardship Council
(provide principles & criteria for certified wood) MRc7

IPMVP International Performance Measurement &Verification Protocol EAc5

Online Resources:

USGBC http://www.usgbc.org
LEEDstudy.com http://www.leedstudy.com/
AREforums http://www.areforum.org/forums/forum12/
University of Florida http://www.cce.ufl.edu/LEED/
LEED education http://www.leededucation.com/
Flashcards
http://ppi2pass.com/ppi/PPIShop?pr=LDNCFL&ct=LEED
http://leedsource.com/

A great summary table for 2.2 credits, intents, requirements, strategies, submittals, phase, etc.
http://www.leededucation.com/LEED_2.2_Summary%5b1%5d.pdf

DOWNLOAD ATTACHMENT BELOW for PDF version

Attachment: LEED-NC 2.2 notes 2007-09.pdf (Downloaded 1495 times)

Test Specifications & Sample Questions:
https://www.usgbc.org/ShowFile.aspx?DocumentID=3178

CIR Guidelines:
http://www.usgbc.org/ShowFile.aspx?DocumentID=1510

Guidance on Innovation & Design (ID) Credits:
http://www.usgbc.org/Docs/LEEDdocs/IDcredit_guidance_final.pdf

Certification & Documentation Process:
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1497

Certification Process specific to LEED-NC:
http://www.usgbc.org/ShowFile.aspx?DocumentID=1108

Registration Process:
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=65

LEED for New Construction:
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=220

Last edited on Tue Sep 25th, 2007 01:46 pm by prospero

Hello, everyone!

I am about 5 days away from taking my LEED AP exam and thought I'd try to create a consolidated list of study materials for the exam. There is a GREAT posting of study prep, materials, tips by "AWU72" in the "How to go about starting to study" STICKY at the top of this message board. I have copied and pasted his tips into this post for simplicities sake. The post is as follows (in italics), update all "v2.1" to "v2.2":

here's a suggested study methodology which i used for v2.1

first some prereqs:

- *get the reference guide*
- *get a copy of a suitable mock exam w/answers (i used the *** v2.1 mock exam w/answers)*
- *get access to the USGBC website*
- *schedule the exam. it doesn't cost anything to move it, if you do it more than 2 business days before your exam. (check that) scheduling the exam forces you to move on studying. also, prometric didn't charge me until after i took the exam, so there doesn't seem to be any "upfront" cost to doing this.*

now, on how to study:

1. *download the LEED-NC checklist-v2.1.xls from USGBC (excel format). you use this as a basis to make your own study/cheat sheet.*
2. *in excel add, 3 more columns with the headings*
    - *Requirements*
    - *Submittals*
    - *References*
3. *start filling these out. the act of looking them up and filling them out kinda forces you to go through the reference book step-by-step. filling out your cheat sheet also gives you a "goal" and sense of accomplishment. if you just try to read the book alone, it get's pretty dry and seems a bit overwhelming. (BONUS: when you're done with your sheet, it also gives you a quick reference to some of the major contents of the exam.)*
4. *review definitions at the end of the Reference guide. if you did step 3, you'll probably know most of them now.*
5. *go to USGBC website and review the following:*
    - *process to certify a building including steps to take, generally how fees are calced, review periods, and under what LEED? NC, CI, etc.*
    - *CIR process, how to do it...*

Test yourself:

- *do the mock exam and check your answers.*
- *review weak areas.*
- *move the exam date if you're freaking out...*

Take the exam. Good luck.

end of AWU72 post

When I registered for the exam through Prometric, there was a warning that there would be a $30 fee to reschedule the exam . . . Perhaps this policy was instituted AFTER AWU72 took the exam. There is also a deadline to reschedule the exam - you get "locked in" to your time slot at 2 business days prior to the scheduled exam date (in other words, you can't reschedule this close to your exam date). I do concur that there's nothing like a deadline to get you motivated to study! This test costs a lot of money, and I'd hate to have to spend another $250 to take the test again.

I read the LEED for Schools Reference Guide in its entirety before moving on to flashcards, then practice tests. The LEED exam seems to be about memorization, so I thought that a pass through the book, followed by a pass through ALL of my flashcards was important (to read/re-read the information).

Also before beginning the flash cards, I committed the credits to memory (and continue to re-write the credits breakdown/points available/exemplary credits/% required for points on a daily basis). I will write this down on the scratch paper available at the testing facility during the 15 minute tutorial PRIOR to the start of the exam (to use as a reference). This is similar to AWU72's recommendation to type in all of the requirements, submittals, etc. on the LEED NC2.2 checklist EXCEL file . . . writing vs. typing helps me remember things just a little bit better . . .

Our office has purchased the LEED study guide available through the CO chapter of USGBC. Unfortunately, it takes a few weeks to get these materials, so they won't be available in time for my exam. I can't give any input on this information, other than order it EARLY in your studying timeline!

As an alternate to the practice exams through the CO USGC chapter, our office purchased the online practice exams through http://www.leedtestprep.com/. There are 4 tests available for a 90 day window. I have already taken 2 of the practice tests, and am feeling more and more comfortable with the prospect of taking my "real" exam in 5 days. The practice exam has a review feature, which allows you to check where the content of the question was derived from (e.g.: SSc1 Requirements or WEc1.1 Submittals). I have used this information to

better focus my studies, to work on the areas that I consistently score poorly in.

Our office also purchased the flashcards through the http://www.leedtestprep.com/ website. There are a few minor errors on the cards, but they have also proved to be a good resource. I LOVE flashcards because they travel so well. I can pull these out and review them at numerous points during my day . . .

The flashcards that are available through http://www.leededucation.com website are also a good *FREE* resource, BUT there are several cards that have "coming soon" written on the back, so the set is incomplete. There are also many grammatical and typing errors on these . . . I'm a "Type A" personality, so I get frustrated by these (I feel the need to edit them). Most of the information is duplicated in the other set of flashcards that our office purchased, so I have not used these since downloading the "leedtestprep.com" cards.

Here are the links to the webpages recommended in the USGBC LEED AP Candidate Handbook. I had a hard time tracking these down at first - primarily because I can get pretty cross-eyed by the end of the day (just as I'm sitting down to begin my studies, right?!) . . .

LINK TO USGBC PROJECT CERTIFICATION PAGE:
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1497

LINK TO USGBC PROJECT CERTIFICATION REGISTRATION PAGE:
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=65

LINK TO USGBC LEED ONLINE SAMPLE CREDIT TEMPLATES (pay attention to fee structure):
http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1447

LINK TO USGBC CIR & RULING PROCESS GUIDELINES (pay attention to fees): http://www.usgbc.org/ShowFile.aspx?DocumentID=1510

USGBC LEED-New Construction v3

is a comprehensive Sustainable Building program for commercial projects covering the following design and process categories:

□□Sustainable Sites
□□Water Efficiency
□□Energy & Atmosphere
□□Materials & Resources
□□Indoor Environmental Quality
□□Innovation in Design
□□Regional Priority

Each category contains multiple credit point guidelines for a project team to consider during design, construction, and function of the building. The credit points are then compiled in order to achieve one of four levels of certification; Certified, Silver, Gold and Platinum.

Energy & Atmosphere

□□**EA Prerequisite 2 Minimum Energy Performance**

Design the building project in order to demonstrate a 10% improvement in the proposed building performance rating for the new buildings, or a 5% improvement for major renovations to existing buildings, compared with the baseline building performance. Calculate the baseline building performance rating according to Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2007.

□□**EA 1 Optimize Energy Performance**

Achieve increasing levels of energy performance above the baseline in the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use. Demonstrate a percentage improvement in the proposed building performance rating compared to the baseline as calculated according to Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2007.

□□**EA 2 On-site Renewable Energy**

Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental and economic impacts associated with fossil fuel energy use.

• EA 6 Green Power

Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.

Materials and Resources

□□**MR 2.1 Construction Waste Management**

Recycle and/or salvage at least 50% of non-hazardous construction and demolition debris.

□□**MR 2.2 Construction Waste Management**

Recycle and/or salvage at least 75% of non-hazardous construction and demolition debris.

□□**MR 4.1 Recycled Content**

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

• **MR 4.2 Recycled Content**

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

MR 5.1 Regional Materials

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.

MR 5.2 Regional Materials

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.

MR 7 Certified Wood (FSC)

Encourage environmentally responsible forest management. Use a minimum of 50% of wood-based materials and products, which are certified in accordance with the Forrest Stewardship Council's (FSC) Principals and Criteria, for wood building components.

USGBC LEED-New Construction v3

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Indoor Environmental Quality

EQ Prerequisite 1 Minimum IAQ Performance

Establish minimum indoor air quality (IAQ) performance to prevent the development of
indoor air quality problems in buildings, thus contributing to the comfort and well-being of the occupants. This can be accomplished through two methods: mechanically ventilated and naturally ventilated. Naturally ventilated buildings must comply with ASHRAE Standard 62.1-2007, paragraph 5.1.

EQ 2 Increased Ventilation

Provide additional outdoor air ventilation to improve indoor air quality for improved occupant comfort, well-being and productivity. This can be accomplished through two methods: mechanically ventilated and naturally ventilated. Naturally ventilated buildings must comply with the Carbon Trust Good Practice Guide 237 (1998).

EQ 4.1 Low-Emitting Materials: Adhesives & Sealants

Reduce the quantity of indoor air contaminates that are odorous, irritating and/or harmful to the comfort and well being of installers and occupants. This credit applies to site-applied adhesives and sealants.

EQ 4.2 Low-Emitting Materials: Paints and Coatings

Reduce the quantity of indoor air contaminates that are odorous, irritating and/or harmful to the comfort and well being of installers and occupants. This credit applies to site-applied paints and coatings.

EQ 4.4 Low-Emitting Materials: Composite Wood & Agrifiber Products
Reduce the quantity of indoor air contaminates that are odorous, irritating and/or harmful to the comfort and well being of installers and occupants. This credit applies to urea-formaldehyde to be absent from composite wood and agrifiber products.

EQ 6.1 Controllability of Systems: Lighting
Provide a high level of lighting system control by individual occupants or by specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants. Credit requires 90% (minimum) of occupants have lighting control.

EQ 6.2 Controllability of Systems: Thermal Comfort
Provide a high level of thermal comfort system control by individual occupants or by specific groups in multi-occupant spaces to promote the productivity, comfort and wellbeing of building occupants. Credit requires 50% (minimum) of occupants have thermal control. The areas of operable window must meet the requirements of ASHRAE Standard 62.1-2007 paragraph 5.1 Natural Ventilation.

EQ 7.1 Thermal Comfort: Design
Provide a comfortable thermal environment that supports the productivity and well being of building occupants.

EQ 8.1 Daylight & Views: Daylight 75% of Spaces
Provide the building occupants with a connection between indoor spaces and the outdoors through the introduction of daylight into 75% (minimum) of regularly occupied areas of the building.

EQ 8.2 Daylight & Views: Views for 90% of Spaces
Provide the building occupants with a connection between indoor spaces and the outdoors through the introduction of views into 90% (minimum) of the regularly occupied areas of the building.

- 12% of U.S. potable water consumption, *including 5 billion gallons a day for flushing toilets*

Water Efficiency

- *340 billion gallons* of fresh water are withdrawn per day from rivers, streams, and reservoirs to support residential, commercial, industrial, agricultural, and recreational activities.
- Almost *65%* of water taken is discharged back to bodies of water after use.
- Annual *water deficiency for the US is 3,700 billion gallons*.
- US industries today use *36% less water than in 1950* due to reuse and Energy Policy Act of 1992 mandating water conserving plumbing.

- Water consumption rose *6 fold* in the last century – double the rate of population.

Buildings consume *5 billion gallons of potable water per day to flush toilets.*

Water Efficiency

WE P 1 Water Use Reduction Required

Water Efficiency
WE C1.1- (2-NE) Water Efficient Landscaping: Reduce by 50%- Design

Standard: None

Intent or Credit

Limit or eliminate the use of potable water, or other natural surface or subsurface water resources available on or near the project site, for landscape irrigation

Requirements

Reduce potable water consumption for irrigation by 50% from a calculated mid-summer baseline case, and based on:

(1) plant species factor; (2) irrigation efficiency (3) use of captured rainwater (4) use of recycled wastewater (5) use of non-potable water treated and conveyed by a public agency (6) density factor (7) microclimate (8) landscape coefficient

Calculations: Estimate baseline water use***
Density Factor- No. of plants and total leaf at maturity
Microclimate- temperature/wind/humidity in area
Landscape Coefficient- Volume water lost via evapotransporation
******Landscape Coefficient= (species factor) x density factor x microclimate factor**
Evapotransporation Rate=
(ET in table) x (Landscape coefficient)

Strategy

- Analyze soil/ climate for native /adapted plants
- Use high-efficiency irrigation system (drip, micro-mister)
- Climate based controllers - Irrigation system using stormwater, graywater, or condensate water

- Site map with structures, sun/ wind exposure, - Shadow profiles of landscape areas
- Reduce heat island effect with shade trees
- Plan water use zones (high-mod-low)
- Plant turf areas only in functional or soil

Submittal Documentation

- Calculated Baseline Total Water Applied (TWA)

- Calculated design Case TWA
- Total non-potable Water supply for irrigation

- narrative

Water Efficiency

WE C1.2- (2)Water Efficient Landscaping: No Potable Water Use or No Irrigation-Design

Standard: None

Intent or Credit

Limit or eliminate the use of potable water, or other natural surface or sub- surface water resources available on or near the project site, for landscape irrigation

Requirements

Use only captured rainwater, recycled wastewater, recycled Gray water, or non-potable water treated by public agency OR

. Install landscaping that does not require permanent irrigation systems (xeriscaping). Temp irrigation for plant establishment allowed only within the first year.

Strategy

- Analyze soil/climate for native /adapted plants
- Use high-efficiency irrigation system (drip, micro mister)
- Climate based controllers -
Irrigation system using storm water, Gray water, or condensate water
- Site map with structures, sun/wind exposure,
-Shadow profiles of landscape areas

- Reduce heat island effect with shade trees
- Plan water use zones (high-mod-low)
- Plant turf areas only in functional or soil. perform soil and climate analysis to determine appropriate plant materials and design with natives or adaptives
-Where irrigation is required, use high efficiency equipment and or climate based controllers

Submittal Documentation

- Calculated Baseline Total Water Applied (TWA) - Calculated design Case TWA
- Total non-potable Water supply for irrigation
- narrative

. Baseline TWA= Area x (ET/IE) x 0.6233
Calculations: Estimate baseline water use***

Density Factor- number of plants and total leaf at maturity Microclimate- temperature, wind, and humidity in immediate area
Landscape Coefficient- Volume water lost via evapotransporation
Landscape Coefficient= species factor x density factor x microclimate factor
Evapotransporation Rate= ET in table x Landscape coefficient

Water Efficiency

WE C2- (2) Innovative Water Technology **(Sewage Conveyance)**- Design

Standard: None

Intent or Credit

Reduce generation of wastewater and potable water demand, while increasing the local aquifer recharge

Requirements

OPTION 1 - Reduce potable water use for bldg sewage conveyance by 50% thru water-conserving fixtures (waterless urinals) or non-potable Water (captured rainwater or greywater)

.

OPTION 2 - Treat 50% of wastewater on-site to tertiary standards. Treated water must be infiltrated or used on-site.

Strategy

- Specify high-efficiency fixtures and dry fixtures
- Reuse stormwater or graywater for sewerage conveyance
- Onsite wastewater treatment systems (packaged biological nutrient removal systems, constructed wetlands, high efficiency filtration systems

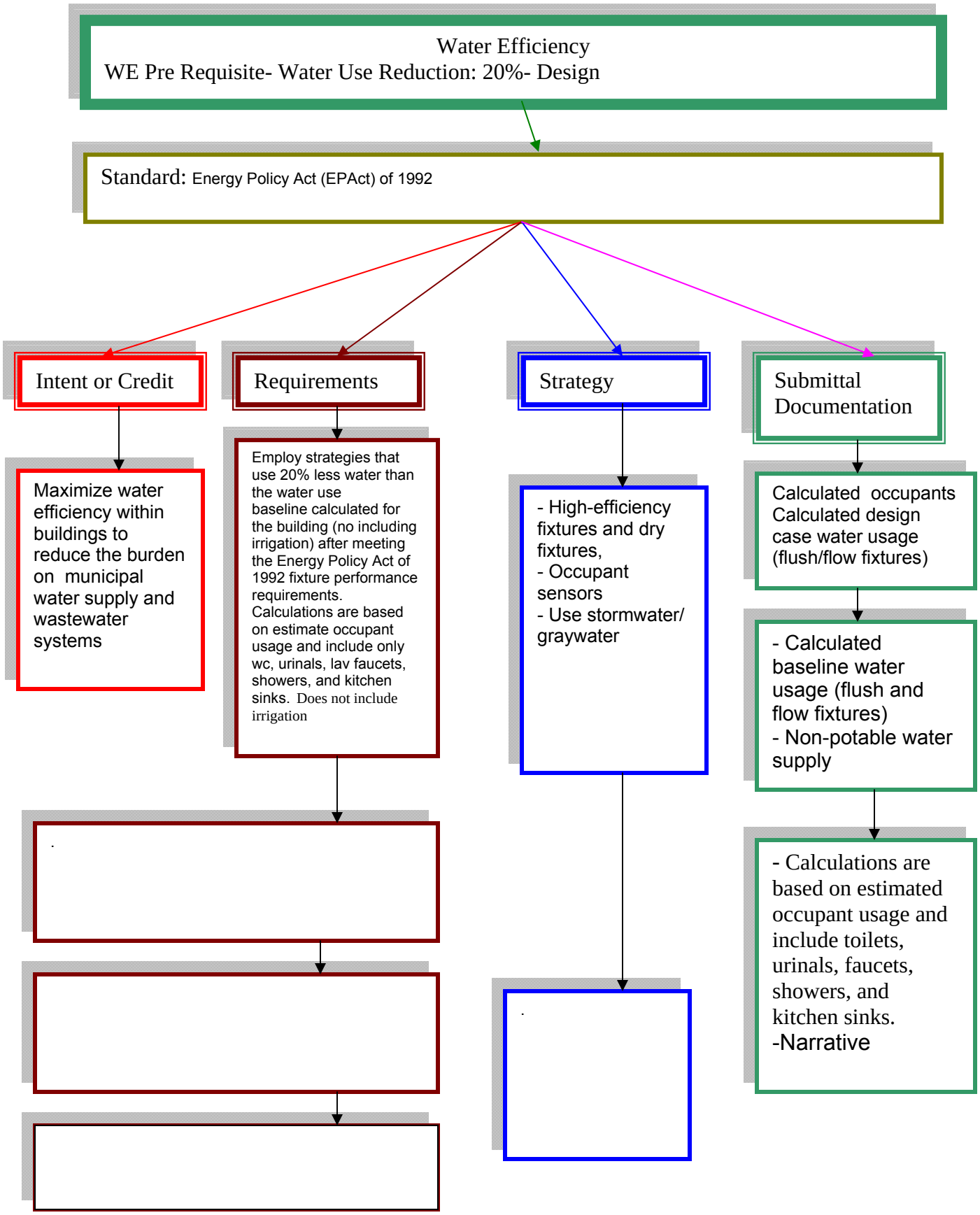
.Change 50% toilets to composting and water-less urinals and reduce use of potable water by 50%.
.Use high efficiency and dry fixtures such as composting toilet or waterless urinals to reduce wastewater volumes.
.Also use greywater or stormwater for sewer conveyance.
.Could use constructed wetlands or biological removal systems or filtration systems for on-site wastewater systems.

Submittal Documentation

- Plumbing drawings
- Calculated occupants FTEs on 8 hr.day/ transients (daily average)
-Calculate volume blackwater generation (male and female volumes)
-Multiply total daily sewage volume x number of work days= total annual sewage volume
-If using grey water or rainwater, subtract from sewage volumes
-Divide annual volume of wastewater saved by volume generated.
-Use Energy Policy Act 1992 fixture flow rate to create a baseline to show difference between your figures and this to see if a point is achieved.

. - Calculated baseline water usage for sewage conveyance
- Calculated design case water usage for sewage conveyance

- Non-potable water supply
- Annual qty of treated wastewater
-FTE's
- Narrative- plumbing drawings


Water Efficiency
WE Pre Requisite- Water Use Reduction: 20%- Design
Standard: Energy Policy Act (EPAct) of 1992
Intent or Credit
Requirements
Strategy
Submittal Documentation
Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems
Employ strategies that use 20% less water than the water use baseline calculated for the building (no including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements. Calculations are based on estimate occupant usage and include only wc, urinals, lav faucets, showers, and kitchen sinks. Does not include irrigation
- High-efficiency fixtures and dry fixtures,
- Occupant sensors
- Use stormwater/ graywater
Calculated occupants
Calculated design case water usage (flush/flow fixtures)
- Calculated baseline water usage (flush and flow fixtures)
- Non-potable water supply
- Calculations are based on estimated occupant usage and include toilets, urinals, faucets, showers, and kitchen sinks.
-Narrative

Water Efficiency
WE C3 - (2/30%, 3/35%, 4/40%)Water Use Reduction: 30%, 35%, 40%- Design

Standard: Energy Policy Act (EPAct) of 1992

Intent or Credit

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

Requirements

Employ strategies that use 30% less water than the water use baseline

. calculated for the building (no including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements.

Calculations are based on estimate occupant usage and include only WC, urinals, lavatory faucets, showers, and kitchen sinks.

Design case annual water use- total of annual volume of each fixture type and subtract use or greywater- use actual flow and flush rates

Strategy

-Calculate FTE's/Transients

-efficiency fixtures

- Occupant sensors

- Use stormwater/ graywater

Exemplary: I.O reduction or demonstrate 10% reduction from non-regulated fixtures, such as dishwashers. *Greywater not from kitchen sink or dishwater

Submittal Documentation

- Calculated occupants FTE's
- Calculated design case water usage (typical flush/ flow fixtures)

- Calculated baseline water usage (flush and flow fixtures)
-

- gallons of non-potable water supply available
- Narrative

Remember what you Design!

- It is universal,
- It is understood,
- It is adoptable,
- It is adaptable,
- It is practical,
- It can be implemented,
- It is relatively economical,
- It is perpetual,
- It is standardized,
- It is constructible,
- It is enforceable,

It is measurable

Bird Migrations

Penguins Legacy

Polar Bears

Whale Movements

Storage & Collection of Recyclables

MR

Construction Activity Pollution Prevention

SS

Environmental Tobacco Smoke (ETS) Control
Minimum IAQ Performance

EQ (IAQ)

Fundamental Commissioning of the Building Energy Systems
Minimum Energy Performance
Fundamental Refrigerant Management

EA

Sustainable Sites

As a prerequisite under Sustainable Sites, LEED requires an EPA-compliant erosion and sedimentation control plan. Credits are awarded for selecting a **building site** that protects or restores open space, is accessible to public transportation, manages stormwater, reduces "heat-island" effects and controls light pollution.

Sites typically are chosen before the architect and construction manager are selected, so many SS credits are gained or lost before the project team is assembled. Therefore, it may be beneficial for OWNERS to bring in an architect, engineer or builder with LEED expertise to perform a feasibility study at the site-selection phase.

Decision Makers Table & LEED Credit Responsible Parties							
Credit	*Decision Makers*			*Credit*	*Decision Makers*		
Sustainable Sites				**Materials & Resources**			
SS P1		Contractor	Civil Engineer	MR P1	Owner		Architect
SS 1	Owner			MR 1.1	Owner	Contractor	Architect
SS 2	Owner		LEED AP	MR 1.2	Owner	Contractor	Architect
SS 3	Owner			MR 1.3		Contractor	Architect
SS 4.1	Owner			MR 2.1		Contractor	
SS 4.2			LEED AP & Architect	MR 2.2		Contractor	
SS 4.3	Owner			MR 3.1		Contractor	Architect
SS 4.4	Owner		Civil Engineer	MR 3.2		Contractor	Architect
SS 5.1	Owner	Contractor	Civil Engineer	MR 4.1		Contractor	Architect
SS 5.2	Owner		Civil Engineer	MR 4.2		Contractor	Architect
SS 6.1			Civil Engineer	MR 5.1		Contractor	Architect
SS 6.2			Civil Engineer	MR 5.2		Contractor	Architect
SS 7.1		Contractor	LEED AP/Land/Arch/Civil	MR 6		Contractor	Architect
SS 7.2		Contractor	LEED AP	MR 7		Contractor	Architect
SS8			LEED & Lighting Dsgnr.	**Indoor Environmental Air Quality**			
Water Efficiency				EQ P1			Mechanical Engineer
WE 1.1			Landscape Architect	EQ P2	Owner		
WE 1.2	Owner		Landscape Architect	EQ 1			Mechanical Engineer
WE 2			Mechanical Engineer	EQ 2			Mechanical Engineer
WE 3.1			Mechanical Engineer	EQ 3.1		Contractor	
WE 3.2			Mechanical Engineer	EQ 3.2		Contractor	
Earth & Atmosphere				EQ 4.1		Contractor	Architect
EA P1	Owner	Contractor	Commissioning Auth.	EQ 4.2		Contractor	Architect
EA P2			Mechanical Engineer	EQ 4.3			Architect
EA P3	Owner		Mechanical Engineer	EQ 4.4		Contractor	Architect
EA 1			Mechanical Engineer	EQ 5			LEED AP
EA 2			Mechanical Engineer	EQ 6.1			Mechanical Engineer
EA 3	Owner	Contractor	Commissioning Auth.	EQ 6.2			Mechanical Engineer
EA 4			Mechanical Engineer	EQ 7.1			Mechanical Engineer
EA 5			Mech. Eng & Facility Eng.	EQ 7.2	Owner		Mechanical Engineer
EA 6	Owner			EQ 8.1			LEED AP & Architect
Look at each credit one by one and try and figure out why it makes sense that those are the responsible parties for that particular credit. You'll begin to notice some patterns for which trades work with which credits.				EQ 8.2			LEED AP & Architect
				Innovation in Design			
				ID 1.1-1.4	Owner	Contractor	
				ID 2	Owner	Contractor	LEED AP

Sustainable Sites

SS Prerequisite 1: Construction Activity Pollution Prevention

SS Credit 1: Site Selection

SS Credit 2: Development Density & Community Connectivity +

SS Credit 3: Brownfield Redevelopment

SS Credit 4.1: Alternative Transportation: Public Transportation Access +
SS Credit 4.2: Alternative Transportation: Bicycle Storage & Changing Rooms +
SS Credit 4.3: Alternative Transportation: Low Emitting & Fuel Efficient Vehicles +
SS Credit 4.4: Alternative Transportation: Parking Capacity +

SS Credit 5.1: Site Development: Protect or Restore Habitat
SS Credit 5.2: Site Development: Maximize Open Space

SS Credit 6.1: Stormwater Design: Quantity Control
SS Credit 6.2: Stormwater Design: Quality Control

SS Credit 7.1: Heat Island Effect: Non-Roof +
SS Credit 7.2: Heat Island Effect: Roof +

SS Credit 8: Light Pollution Reduction

Prereq 1	Construction Activity Pollution Prevention	Required
Credit 1	Site Selection	1
Credit 2	Development Density and Community Connectivity	5
Credit 3	Brownfield Redevelopment	1
Credit 4.1	Alternative Transportation - Public Transportation Access	6
Credit 4.2	Alternative Transportation - Bicycle Storage and Changing Rooms	1
Credit 4.3	Alternative Transportation - Low-Emitting and Fuel-Efficient Vehicles	3
Credit 4.4	Alternative Transportation - Parking Capacity	2
Credit 5.1	Site Development - Protect or Restore Habitat	1
Credit 5.2	Site Development - Maximize Open Space	1
Credit 6.1	Stormwater Design - Quantity Control	1
Credit 6.2	Stormwater Design - Quality Control	1
Credit 7.1	Heat Island Effect - Nonroof	1
Credit 7.2	Heat Island Effect - Roof	1
Credit 8	Light Pollution Reduction	1

Credit	Description		Requirement	
SSc2	Development Density & Community Connectivity	•	Project density >= 120,000 sf/acre 120,000	
		•	sf/acre within 2xdensity radius	
SSc4.1 - SSc4.4	Alternative Transportation	•	Institute a comprehensive transportation management plan that reduces personal automobile use	
SSc5.1	Site Selection, Protect or Restore Habitat	•	Restore or protect at least 75% of the site area on previously developed sites	
SSc5.2	Site Selection, Maximize Open Space	•	Double the open space provided on-site in accordance with the compliance path selected to achieve the point	

SSc7.1	Heat Island Effect, Non-Roof	•	100% of non-roof impervious surfaces have been constructed with high-albedo materials and/or open grid paving and/or will be shaded within five years	
		•	100% of on-site parking spaces are located under cover	
SSc7.2	Heat Island Effect, Roof	•	100% of the project roof area consists of a vegetated roof system	

LEED for NC Submittal Documentation

Sustainable Sites

- SSp1: project drawings and description of ESCs, confirmation of NPDES (or local) compliance
- SSc1: confirmation not on prohibited land
- SSc2: project site & area (sq. ft)
    - option 1: drawing of project and adjacent buildings w/ density radius
    - option 2: drawing or aerial photo of 1/2 mi. radius w/ 10 basic services
- SSc3: descriptions of site contamination & fixes; confirmation that it's brownfield
- SSc4.1: drawing of site indicating rail & bus, list of nearby rail & bus with distances from site
- SSc4.2: project drawings w/ storage and shower locations, calculation numbers
- SSc4.3: project drawings, info about specific options
- SSc4.4: FTE and transit occupancy, confirm. of which option
    - (depending on option): site's parking capacity, number of carpool spaces, desc. about rideshare program
- SSc5.1: site area, building area, desc. of approach
    - greenfields: copy of site grading drawings & boundaries
    - previously dev: area of plant area, landscape plan & plant info
- SSc5.2: site area, building area, landscape site/plan highlighting open spaces
    - option 1: area of open space required vs. area of vegetated open space
    - option 2: area of veg. open space that is equal to bldg. footprint
    - option 3: area of veg. open space
- SSc6.1: runoff rate and quantity calculations, desc. of site cond. and measures taken
- SSc6.2: confirm. of compliance
    - non structural: list and desc. of each BMP + rainfall treated annually
    - structural: list and desc. of struct. controls + rainfall treated annually
- SSc7.1: site dwgs. with highlighted shade areas, pav materials & underground/covered parking, confirmation that roof materials meet requirements, calculation requirements + parking space info
- SSc7.2: roof plans w/ highlighted area of specific roof mats. or green roof area, SRI information
- SSc8: lighting dwgs (interior & ext.), max. candela information, light tresspass analysis, lighting power density tables, site zone classification, calculation requirements

Sustainable Sites
SS P1- Construction Activity Pollution Presentation- Construction
(Contractor+Design Team)

Standard: 1 - 2003 EPA Construction General Permit
2 – NPDES (National pollution discharge)

Intent or Credit

Reduce pollution from construction sites by controlling soil erosion, waterway sedimentation, airborne dust generation

Requirements

Provide ESC (Erosion / Sedimentation Control Plan)
EPA CGP is available at: http://cfpub.epa.gov/npdes/stormwater/cgp.cfm.

1 - Prevent loss of soil

2 - Prevent sedimentation of storm sewer or streams

3 - Prevent air pollution from dust

Strategy

Sedimentation can be controlled by the following methods:

1 - Stabilization (seeding, mulching)
2 - Structural (silt fencing, earth diking, sediment trap, sediment basin)

Submittal Documentation

1 - Copies of the drawings to document erosion / Sedimentation control measures

2 - Confirmation showing compliance path - NPDES or local

3 - Narrative of ESC

SSP1 ECS 2003 EPA Construction General Permit

- Planting grass is only addresses prerequisite ECS
- Storm water management for construction activities standard for ECS
- Loss of soil, characteristics for erosion, sedimentation, & air pollution
- Submittal: NPDES compliance, drawings showing implementation
- Non-structural controls
  - Permanent seeding, soil-crete(does not exist), temporary seeding
  - Structural = silt fence, sediment trap, earth pike
- Two type of ESC, SSP1
    - Structural controls: berm, earthdike, silt, fences
    - Stabilization: seeding, mulching
- Permanent seeding = Stabilization of erosion & sedimentation
- Structural = Sediment Basin
  - SS6.2 (Treating Storm Water Runoff 90% of the ave. annual rainfall using BMP
  - SS5.1 Covering 50% of site w/ native vegetation

SS6.1 Smaller footprint

Sustainable Sites

SS C1- (1) Site Selection- Design (Owner)

Standard: 1- USDA (US Agricultural Dept) 2– FEMA 3- CFR (Code Federal of Regulation) 4- Clean Water ACT

Intent or Credit

Avoid development of Inappropriate sites and reduce the environmental impact from the location of a building on a site.

Requirements

AVOID selecting sites:
1 – Prime Farmland (USDA) United States Department of Agriculture in the United States Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5 (citation 7CFR657.5)

2 - Previously undeveloped land below 5 ft above 100 year flood (FEMA) [<5ft +floodplain]
3 - Within 100 feet of any wetlands as defined by United States Code of Federal Regulations 40 CFR, Parts 230-233 and Part 22, and isolated wetlands or areas of special concern identified by state or local rule, OR within setback distances from wetlands prescribed in state or local regulations, as defined by local or state rule or law, whichever is more stringent [100 gy wetland]

4 - Habitat for threatened/endangered species
5 - Within 50 ft of lake, sea, river and streams (Clean Water Act) [<50 ft of Waterbody]

6 - Land which prior to acquisition for the project was public parkland, unless land of equal or greater value as parkland is accepted in trade by the public landowner (USDA) (Park Authority projects are exempt)

Strategy

During site selection, give preference to sites

that do not include sensitive site elements and restrictive land types.

Submittal Documentation

1 - Confirmation does not meet prohibited criteria

2 - Special circumstances: provide narrative

Optional narrative.

- # SSC1 Site Selection (CFR)
  - Project team action: Explain any site characteristics & non-standard tactics to reach intent
  - If word is developed, site does not have to meet SSC1
    Farmland, Species, Wetland
  - Office near lake, prime tract of undeveloped real estate 40 ft. from lake. 1/8 from 3 bus stop.
    - Possible credits App. Does Not Apply
      - SS4.1 SSC1→50' From Lake
      - SS6.2 Storm MRC1.1→Building Reuse
      - WE2 Innov. (New Bldg.)
  - Best qualifies SSC1 previously (near) developed site
    Not: -3 ft. above 100 yr. flood plane
    -Land rare species habitat
    -10 acre park
    -6 acre farm
  - SSC Qualification: Not within 100' of wetland
    Not on prime park or farm
    Below 5' of 100 yr. storm/flood

Sustainable Sites

SS C2 (5)- Density Development and Community Connectivity- Design (Owner+Design Team)

Standard: None

Intent or Credit

Channel development to urban areas with existing infra-structure, protect green fields and preserve habitat and natural resources.

Requirements

OPTION 1 - DEVELOPMENT DENSITY

1 - Previously developed site AND
2 - Min density 60,000 sf/acre

Option 2 - COMMUNITY CONNECTIVITY
1 - Previously developed site AND
2 - Within 1/2 mile of residential avg density 10 units/acre AND 3 - 10 basic services within 1/2 mile radius with pedestrian access between the building and the services:

1) Bank; 2) Place of Worship; 3) Convenience; 4) Park 5) Grocery; 6) Day Care; 7) Cleaners; 8) Fire Station; 9) Beauty; 10) Hardware; 11) Laundry; 12) Library; 13) Medical/Dental; 14) Senior Care Facility; 15) Post Office; 16)Pharmacy; 17) Restaurant; 18) Community Center; 19) School; 20) Supermarket; 21) Theater; 22) Museum; 23) Fitness Center;.

Strategy

During site selection, give preference to urban sites with pedestrian access to variety of services.

For Campus Setting: Find The Density Radius= 3 times SQRT(project Site in sqft). 1 acre= 43560 sqft. **Identifu all buildings and parcel within Density radius.**

Example: 2 acres = 87,120 s.f. and it's square root is 295 x 3 = 885
This is the radius that you will use to determine the TOTAL building square footage within the circle with the 885 foot radius. Total these and then divide by the total acres within the circle to get the average density. **Example: Buildings within 885 ft. radius Parcels within 885 ft. radius**

Parcels and Building sizing within the Density Radius area

Building Sqft	**Project and Adjacent**
100,000 (project building)	**87,120 (project site)**
10,000 s.f.	30,000
15,000 s.f.	45,000
20,000 s.f.	60,000
12,000 s.f.	36,000
4,000 s.f.	4,000
159,000 s.f.	**262,120 s.f.**

To get the 885' radius circle area in acres, divide 262,120s.f./43,560=6.0 acres 159,000s.f/6.0=26,500 which is <60,000 so does not meet the credit requirements.

Submittal Documentation

OPTION 1 - DEVELOPMENT DENSITY
1 - Site vicinity plan with density boundary
2 - Project site and building area (sf)
3 - List of site and bldg areas within the radius

OPTION 2 - COMMUNITY CONNECTIVITY
1 - Site vicinity plan with 1/2 mile radius
2 - Project site and building area (sf)
3 - List of services

Optional narrative.

SSC2 Development density and Community Connectivity

- Gross building 300 Ksqft, project site 0.5 acre, total building area within density radius 900Ksqft, total site area within density radius 12 ac, undeveloped public area=200 k sqft
    - Development density
        - = Gross building 300K/Project site area 0.5 ac=600Ksqft /ac
    - Density Radius = 3 sqrt [project site area]=3*sqrt[0.5*43560ft sq]=441 ft
    - Surrounding Area, ac= Total site area within radius - undeveloped area
        - = 12ac – [200ksqft/43560 in ac] = 12- 4.49= 7.51 ac undeveloped
        - Surrounding Site development density, 441 ft radius=900k sqft/[7.51 ac]

Sustainable Sites
SS C3- (1) Brownfield Redevelopment- Design (Owner)

Standard: ASTM E1903-97 Phase II EPA Brownfield definition

Intent or Credit

Rehabilitate damaged sites where development is complicated by environmental contamination, reducing pressure on undeveloped land.

Requirements

Develop site documented as contaminated by

1 - Phase II or local Voluntary Cleanup Program OR ASTM E1903-97 Phase II Environmental Site Assessment or a local voluntary cleanup program).

2 - Defined as Brownfield by government agency

Strategy

During site selection, give preference to Brownfield sites. Identify tax incentives and property cost savings

Coordinate development plans with remediation plans.

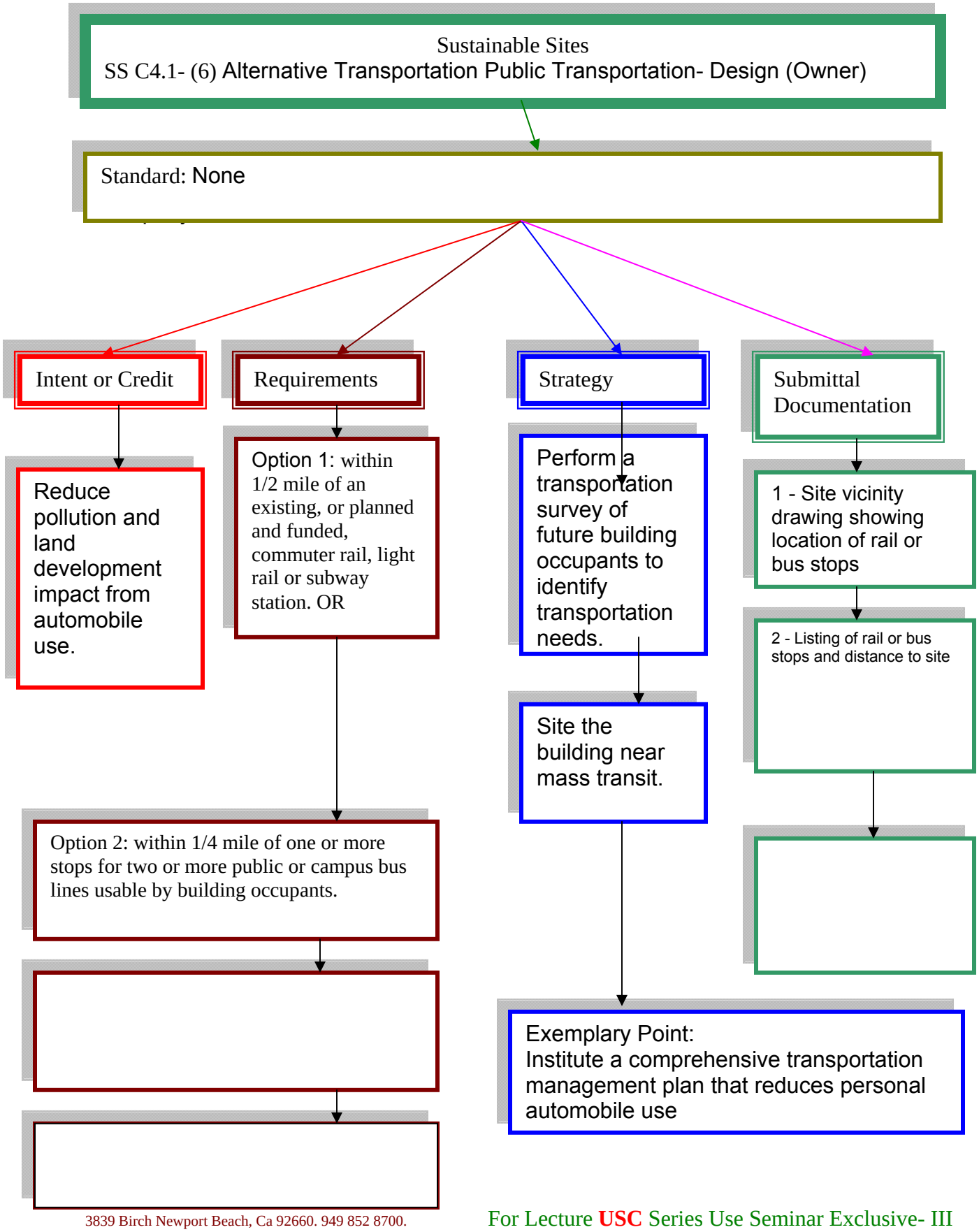
Submittal Documentation

1 - Provide confirmation site is Brownfield

2 - Narrative describing contamination and remediation

- SSC3 Brownfield ASTM Phase II Environmental EPA, or other agencies
  - EPA office local or state
  - Appropriate letters and documentation needed for supporting land
  - Lower property cost as advantage
  - Declaration of all remedial measures
  - Major risk of contamination and site affected
  - Civil Engineer Cannot mark property as Brownfield
  - Brownfield with certain legal exclusion and addition: Brownfield means real property, expansion, redevelopment or reuse of which may be complicated by presence of hazardous substance, pollutants or contaminants
  - State/local agencies and S/ME E1903-97 Phase II Environmental assessment

BMP= Methods determined to be most effective, practical, means of preventing or reducing pollution from non point resources


Sustainable Sites
SS C4.1- (6) Alternative Transportation Public Transportation- Design (Owner)
Standard: None
Intent or Credit
Requirements
Strategy
Submittal Documentation
Reduce pollution and land development impact from automobile use.
Option 1: within 1/2 mile of an existing, or planned and funded, commuter rail, light rail or subway station. OR
Perform a transportation survey of future building occupants to identify transportation needs.
Site the building near mass transit.
1 - Site vicinity drawing showing location of rail or bus stops
2 - Listing of rail or bus stops and distance to site
Option 2: within 1/4 mile of one or more stops for two or more public or campus bus lines usable by building occupants.
Exemplary Point:
Institute a comprehensive transportation management plan that reduces personal automobile use

Sustainable Sites
SS C4.2- (1+1EP) Alternative Transportation Bike Storage and Changing Rooms- Design (Design Team)

Standard: None

Intent or Credit

Reduce pollution and land development impact from automobile use.

Requirements

COMMERCIAL

1 - Bike racks for 5% of building users within 200 yard of entrance AND

2 - Shower/changing rooms for 0.5% of Full-Time Equivalent (FTE- peak rate) Occupants

RESIDENTIAL
1 - Covered storage for bikes for 15% of occupants

Strategy

Design the building with bike racks and shower/ changing rooms.

Exemplary Point:
Institute a comprehensive transportation management plan that reduces personal automobile use

Submittal Documentation

1 - Provide FTE occupancy and Transient Occupancy

2 - Provide drawings showing bike storage and showers

3 - Calculation of quantity of showers

Sustainable Sites

SS C4.3-(3) Alternative Transportation: Low Emitting and Fuel Efficient Vehicles- Design (Owner +Design Team)

Standard: California Air Resources Board Zero Emission Vehicles (ZEV) OR American Council for an Energy Efficient Economy (ACEEE) annual vehicle rating

Intent or Credit

Reduce pollution and land development impact from automobile use.

Requirements

OPTION 1: Provide low-emitting and fuel-efficient vehicles for 3% of Full-Time Equivalent (FTE) occupants AND provide preferred parking for these vehicles. OR

OPTION 2 Provide preferred parking for low-emitting and fuel-efficient vehicles for 5% of the total vehicle parking capacity of the site. OR

OPTION 3 Install alternative-fuel refueling stations for 3% of the total vehicle parking capacity of the site (liquid or gaseous fueling facilities must be separately ventilated or located outdoors).

Low-emitting and fuel-efficient vehicles are defined as vehicles that are either classified as Zero Emission Vehicles (ZEV) by the California Air Resources Board or have achieved a minimum green score of 40 on the American Council for an Energy Efficient Economy (ACEEE) annual vehicle rating guide.
"Preferred parking" refers to the parking spots that are closest to the main entrance of the project (exclusive of spaces designated for handicapped) or parking passes provided at a discounted price.

Strategy

Provide transportation amenities such as alternative fuel refueling stations. Consider sharing the costs and benefits of refueling stations with neighbors.

Provide transportation amenities such as alternative fuel refueling stations. Consider sharing the costs and benefits of refueling stations with neighbors.

Exemplary Point:
Institute a comprehensive transportation management plan that reduces personal automobile use

Submittal Documentation

1- Provide FTE occupancy and Transient Occupancy

2 - Provide drawings showing preferred parking spaces

3 - Confirm quantity / type FLE/FE car
4 - Confirm number preferred spots
5 - Confirm alternative fuel type

SSC4.1 Alternative Transportation-

- Public Transportation ½ mile with 2 commuter rail **or**
- ¼ mile with 1 or more bus lines
- Exemplary Point: 2 or more bus stops for 4 bus lines with 200 transit rides per day
- Submittal: Vicinity map with commuter rails or bus lines and may be drawings required
- Exemplary Performance: Demonstrate a quantifiable reduction in personal automobile use
- Distance is to building entrance is critical for the design

- # SSC4.2 Alternative Transportation- Bike Storage and Changing Rooms
  - Commercial Bicycle rack 5% of FTE (200 yard) and shower/changing room for 5% of FTE
  - Residinetial: 15% covered parking for residences
  - 180 FTE+40 part time+30 transients= Commercial
    - 180+40/2+ 0 for transients= 200 FTE
  - 660 office occupants:
    - 0.05*660= # of bicycle racks + shower
    - For residential: 660*0.15 = # of bicycles+ no publis shower
      ¼ mile with 1 or more bus lines
  - 100 full time plus 60 part time + 30 peak= 100+60/2+30 peak visitors ?=160
    - 160*0.05 = # of shower/bike rack
  - Residential 1000 ocupant with 50 storage covered racks:
    - needs (1000 * 0.15) -50 additional covered storage racks
  - If number of changing room+shower+shower+racks are for new building but can use the existing campus facilities if the
    - It meets the 5% of FTE + existing usage rule
    - It is maximum 200 yards to the door of the new building
  - 420 students, 20 FTE, 10 part ime staff office
    - (420+20+10/2)* 0.05= # of shower/bicycles
    - Residential: 15% covered parking for residences
  - Visitors do not need shower or change rooms

- # SSC4.3 Alternative Transportation- Low Emission and Fuel Efficient Vehicle
  - LE/EF 3% FTE+ Preferred Parking Or
    - 5% LE/Fe preferred parking capacity on site or
      - 3% fuel station of the parking capacity

  - 1000 FTE: gives 30 cars LE/EF or 50 preferred parking or 30 Fuel station
  - Fuel Efficient vehicles
  - Electric vehicle relatesd to alternate transportations
  - Mixed use: No difference, even if underground parking
  - Parking shall never exceed the local ordinance
  - Narrative: # of FTE+Car Pools+Preferred parking
  - Highlight drawings
  - Copy of local zone ordinance
  - All local parking guidelines are based on FTE's
  - Documentations:
    - Space allotted for options 1, 2, or 3
    - Project drawings to show locations of preferred
  - FTE= Full time + Part time /2 (50%)
  - Hybrid engine: uses gasoline engine which is used to drive generator and storage batteries, both of which drive the car through an electric motor
  - Fuel efficient vehicles: Minimum Green score of 40 or more: American Council for Energy Efficient Economy (ACEEE) Rating (FE cars)
  - Fuel efficient vehicles: Zero Emission Vehicles (ZEV): California Air Resource Board

FTE is used: WE2, WE3, SSC4.2, SS4.3, SS4.4

Sustainable Sites
SS C4.4- Alternative Transportation Parking Capacity (1) – Design
(Owner + Design Team)

Standard: None

Intent or Credit

Reduce pollution and land development impact from automobile use.

Requirements

OPTION 1 - NON-RESIDENTIAL
1 - Parking capacity no more than min zoning requirement AND
2 - Preferred parking for carpools for 5% of parking spaces

OPTION 2 - NON-RESIDENTIAL
1 - Provide parking for less than 5% FTE AND
2 - Preferred parking for carpools for 5% of parking spaces

OPTION 3 - RESIDENTIAL
1 - Parking capacity no more than min zoning requirement AND
2 - Provide infrastructure program for ride sharing

OPTION 4 – ALL 1 - No new parking
"Preferred parking" refers to the parking spots that are closest to the main entrance of the project (exclusive of spaces designated for handicapped) or parking passes provided at a discounted price.

Strategy

Minimize parking lot/garage size. Consider shared parking facilities with Adjacent buildings

Consider alternatives that will limit the use of single occupancy Vehicles.

Submittal Documentation

1 - Provide FTE , total parking capacity, confirm path of compliance: Option 1 - provide number of parking spaces per code and number of carpool spaces

Option 2 - provide number of carpool spaces

Option 3 - provide description of Ride sharing infrastructure programs

SSC4.4 Alternative Transportation- Parking Capacity

- 5% 5% 5%
- Commercial:
  - Option 1: PC no more than local Zoning
  - Preferred Parking for 5% of spaces
  - Or
  - Option 2: Less than 5% FTE Preferred Parking for carpool
- Residential
  - Option 3: PC no more than local zoning +Infrastructure for ride sharing
- Option 4
  - No Parking
- Factory with multi shift, with no local zoning, must use the worst case for calculations. Try both options – commercial. Use FTE.
- 3 Methods to reduce environmental impact of parking
  - No new parking on plans
  - Near bus lines/public transportation

Ride sharing arrangement

Sustainable Sites
SS C5.1- (1) Site Development Protect or Restore Habitat (1)- Design
(Owner + Design Team)

Standard: Design

Intent or Credit

Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.

Requirements

Limit site disturbance to 40' outside building perimeter, 10' beyond pavement, 15' roadways, and 25' permeable surfaces

OR Restore/protect **50%** site area with native/adaptive vegetation

Greenfield sites are those that are not previously developed or graded and remain in a natural state. Previously developed sites are those that previously contained buildings, roadways, parking lots, or were graded or altered by direct human activities.

Strategy

Perform site survey to identify site elements and adopt master plan for development of site. Site bldg to minimize disruption, stack bldg program, tuck-under parking, share facilities with Neighbors.

Plant native/ adapted plants.

Submittal Documentation

1 - Provide project site area, building footprint area, narrative of approach

2 - Greenfield sites: site drawing with Boundaries of disturbance

3 - Developed site: sf of site that is restored and landscape plan

Exemplary Point:
Restore or protect **75%** site area, not including building footprint and with natives or adaptive

SS5.1 Site Development- Reducing Site Disturbance- Protect and Restore Habit 50%, EP 75%

- Option 1:
  - 10’ from walkways, 15’ Main Street, 25’ permeable surface, 40’ ?
- Option 2: Restore and protect 50% of site SS6.2 may apply there if the plants are native and adapted
- 185,000 sqft site, foot print of building = 85,000 sqft
  - 50% -→ [185k-85k] *0.50 = 50 k restored 1 credit
  - 75% -→ [185k-85k] *0.75 = 75 k restored 2 credit (1+1EP)
- Rural school plan for a Greenfield site
  - SS5.1 Protect and Restore habitat One point
  - Prerequisite No point
- Site Selection: Site related issues
  - SS4.1 Alternative Transportation ACCESS
  - SSC3 Brownfield
  - SSC5.1 Reduced Site Disturbance Protect open space
- Shopping center: distance from parking area= 10 ft
- Strategy Acceptable:
  - Share facilities
  - Use tuck under the building
  - Clearly mark construction boundaries
  - Place building to minimize disruption of eco system
- Strategy Not Acceptable:
  - Use Pervious Paving
  - While grading use bio fertilizer
- Qualifications:
  - Previously graded site, 50% restored with native vegetation
  - 1000,000 sqft warehouse on previously developed site with 500,000 sqft covered with native plants (50 of site)
  - Military base of 500,000 sqft need 500K sqft of equal space vegetation
  - 100,000 sqft office space with requirement for open space = 100K*0.2= 20k open
- If site = 600,000 sqft, building foot print for exemplary points is:
  - Assume 200 K building:
  - 200k building * 2 times for EP= 400 K open space
  - 400k open space + 200 K footprint= 600 k is ok
- 80,000 sqft building, local zoning 15% of total size, 4 floors, 10,000 sqft footprint
  - Must exceed by 25% of local ordinance for SSC5.2

Jerkwater does not affect SSC5.2 however if affects WE 1.1, WE2, WE3, SSC5.1

Sustainable Sites
SS C5.2- (1) Site Development Maximize Open Space- Design
(Owner +Design Team)

Standard: None

Intent or Credit

Provide a high ratio of open space to development Foot print to promote biodiversity.

Requirements

OPTION 1 - Reduce the development footprint and/or provide 25% more open space than zoning requirement

OPTION 2 - For no zoning code, provide open space equal to development footprint

Option 3 - No zoning requirement, provide 20% open space of project site area

ALL OPTIONS: For urban projects that earn SS C2, vegetated roof areas can contribute to credit compliance and 2, pedestrian oriented hardscape areas can contribute to credit compliance. For such projects, a minimum of 25% of the open space counted must be vegetated. Wetlands or naturally designed ponds may count as open space if the side slope gradients average 1:4 (vertical: horizontal) or less and are vegetated.

Strategy

Perform site survey to identify site elements and adopt master plan for development of site. Site bldg to minimize disruption, stack bldg program, tuck-under parking, share facilities with Neighbors.

Plant native/adapted plants.

If double the Open Space requirements in this credit

Submittal Documentation

1 - Provide project site area, building footprint area, landscape drawings, narrative

2- sf of open space required by code and sf open space provided

Projects earning SSC2 (Urban) having green roofs can apply the vegetation roof surface to this calculation) and

- # SS5.2 Site Development- 50%, EP 75%
- Option1: Reduce hardscape or 25% more than zoning
- Option 2: No local zoning & landscaping required Vegetated space= building footprint
- Option 3: Local Zoning= No landscape zoning= 20% of the site= vegetated area
-
- No local architectural zoning requirement, 20% open space= one point
- Strategy to increase open space
  - Vegetated roof
  - Share facilities with neighboring office
  - Vegetated pond with minimum slope
  - Pedestrian hardscape
- If 100,000 sqft (exclude foot print)= 0.75*100,000= 75 k open space
- Site area calculations are required for
    - SSC5.2 Site development
    - SSC2 Development Density
- SS4.1 Alternative Transportation- Does not use site for Transportation Access
- MR 1.3 Does not value of site area
- SS6.1 Does not use site area for quality of storm water
- SS5.2 Footprint means one need 50k of vegetated area

Site area *0.20= 1000,000*0.20= 200,000 sqft green area +200,000 (EP) = 400K 2 points

Sustainable Sites

SS C6.1- (1) Stormwater Design Quantity Control- Design (Design Team)

Standard: None. Use Green Roof or Pervious Paving

Intent or Credit

Limit disruption of natural hydrology by reducing impervious cover, increasing on-site infiltration, and managing stormwater runoff

Requirements

OPTION 1 - EXISTING IMPERVIOUSNESS LESS THAN <50% Storm water: Then management plan reduce discharge rate less than 1-2 yr, 24hr design storms OR

Option 2 -**Implement stormwater management plan that protects the receiving stream** channels from erosion/quantity control measures. Infiltration trench is an example. OR

OPTION 3- If **existing impervious is >50%**, then implement stormwater management plan that says **post-development pollution discharge cannot be > pre-development peak load** for the one and two-year 24 hour storm.

Strategy

1 - smaller building footprint; 2 - Green roofs; 3 - pervious paving; 4 - Reuse stormwater- Land-scape irrigation, toilet flushing, custodial uses; 5 - bioswales, vegetated filter strips; 6- retention ponds 7- cluster development to reduce paved Surfaces

- Reuse stormwater volumes generated for non-potable uses such as landscape irrigation, toilet and urinal flushing and custodial uses. - Design site to maintain natural stormwater flows with infiltration -Vegetated roofs, cisterns, pervious paving, raingardens and other ways of reducing stormwater. -Reuse stormwater

Submittal Documentation

1 - provide pre-development site run-off rate; 2 - provide pre-development run-off quantity; 3 - provide post-dev site runoff rate

4 - provide post-dev runoff quantity OR narrative

Option 1 Determine the pre-dev. discharge rate and quantity for 1 and 2 year 24 hour storms. Determine post-dev. rates and show that post is less than/equal to pre-amount.
Option 1 b. Describe project site conditions, the measures taken and controls to prevent excessive stream velocities and erosion. Include pre- and post-calculations.
Option 2 Post-rate must be 25% < pre development

- # SS6.1 Stormwater

- Option1: is the land 75% impervious…> if yes Post development pollution =< predevelopment peak load
- Option 2: Storm water management that protects receiving stream channels from erosion/quantity control measures (i.e. infiltration trench)
- Option 3: if existing impervious is less than 50% …..> if yes, then reduce post runoff by 25% for 2 year 24 hour storm
- Building area: gross exterior dimension of building

Decreased permeability increases column of storm water on site

Sustainable Sites

SS C6.2- (1) Stormwater Design Quality Control- Design (Design Team)

Standard: Guidance Specifying Management Measures for Sources of Non- Point Pollution in Coastal Waters, January 1993 & protocol (e.g., Technology Acceptance Reciprocity Partnership [TARP], Washington State Department of Ecology)

Intent or Credit

Reduce or eliminate water pollution by reducing impervious cover, increasing on-site infiltration, eliminating sources of contaminants, and removing pollutants from stormwater runoff

Requirements

Stormwater management plan reduces impervious cover, promotes infiltration,

and captures and treats the stormwater runoff from 90% of the average annual rainfall using acceptable

Best Management Practices (BMPs)

BMPs must remove 80% of Total Suspended Solids (TSS)

Strategy

Non-structural: vegetated swales, disconnection of impervious areas, pervious pavement

Structural: cisterns, manhole treatment, ponds

Submittal Documentation

Non-structural Controls: Provide list of BMPS, description and percent annual rainfall treated

Structural controls: Provide list of structural controls, pollutant removal of each control, and % annual rainfall treated

In three distinct climates that influence the nature and amount of rainfall occurring on an annual basis. Humid watersheds are defined as those that receive at least 40 inches of rainfall each year, Semi-arid watersheds receive between 20 and 40 inches of rainfall per year, and Arid watersheds receive less than 20 inches of rainfall per year. For this credit, 90% of the average annual rainfall is equivalent to treating the runoff from:
(a) Humid Watersheds – 1 inch of rainfall;
(b) Semi-arid Watersheds – 0.75 inches of rainfall; and
(c) Arid Watersheds – 0.5 inches of rainfall.

. SS6.2 Stormwater

- Capture and treat 90% and reduce TSS by 80% and total phosphorous
- Existing has 25% imperviousness
  - Redevelopment discharge rate = 8000 gallons
  - 50% = 8000 gallons (2*@25%)= 16000 gallons or 8000 gallons added
- To reduce stormwater column and treatment
  - Reduce amount of impervious area
- Total Site Area:
  - SS2 Development Density
  - SS6.1 Stormwater Management: Quantity
  - SS5.2 Reduced Site Disturbance
- Civil Engineer to submit:
    - List of structural control
    - Description of pollutant Control
    - Percent of annual rainfall treated
    - Declaring and demonstrating stormwater management strategies resulting 25% decrease in rate in rate of runoff
- Greenfield site:
    - Rain garden
    - Disconnection of imperviousness
    - Rainwater cycling
- Stormwater SS6.1 assists
  - WE1.2 no irrigation landscape
  - Stormwater diverted to cisterns/storage tanks
  - Vegetated roof assist SS6.1
- If totally paved (>50%) & 10,000 gallons rain, now must be 25% less after completion
    - 10,000 (1-0.25) =7500 gallons after completion
- Vegetated Roof (Architect, Structural Engineer, Civil Engineer, Energy Consultant, General Contractor)
    - SSC7.1 Heat Island Effect: Roof
    - SSC6.1 Stormwater Design: Quantity Control
    - EAC1 Optimize Energy Performance
    - SSC5 Site development
- Non-Structural reduction of water pollution
    - Rain garden
    - Vegetated swales
    - Rainwater recycling
    - Disconnection of imperviousness

    - Vegetated roof
    -
- Submittals
    - Best BMP for functions
    - % of annual rate treated
- BMP's
    - Monitoring Data showing compliance
    - Follow State and local programs
    -
- Reducing storm water
    - Install biowales
    - Smaller footprints
    - Retention ponds
- Submittals:
    - Narrative describing project conditions: measure taken, controls installed
    - Pre and post runoffs and quantities
- Storm Water Management
    - Low impact strategies
    - Biowales
    - Porous pavement
    - Mimic natural hydrological conditions
    - Infiltration basin
    - Vegetated roof
    - Constructed wetlands
    - Calculations Demonstrating existing imperviousness is less than 50%
    - Vegetation type and slope of berms
    - Slope and runoff coefficient for pervious courtyard
- Heat Island reduction
    - Evapotraspiration
    - Increased Albedo
    - Increased imperviousness
    - Civil Engineer to submit:

List of structural control

Sustainable Sites
SS C7.1- (1)Heat Island Effect Non-Roof- Construction (Design Team + Contractor)

Standard: None. Emittance calculations per **ASTM** E 408-71 or ASTM C 1371-04

Intent or Credit

Reduce heat islands to minimize impact on microclimate and human and wildlife inhabitants

Requirements

OPTION 1: Provide a combination of the following for 50% of the site hardscape

1 - Shade (within 5 yrs)
2 - Paving materials with Solar Reflectance Index (SRI) of min 29
3 - Open grid pavement system

OPTION 2: Minimum 50% of parking spaces under cover with SRI of 29

Exemplary Point: **100%** non-roof surfaces high albedo and/or open grid, and/or shaded w/in 5 years **OR 100%** parking located under cover

Strategy

Use light colored paving, shade paved areas with landscaping, parking deck to minimize footprint

Submittal Documentation

Project site drawings, highlighting paving materials, landscape shading, covered parking, confirmation roof and parking has SRI of 29 and

OPTION 1: SRIs for each paving material and total areas of site hardscape, area of hardscape to be shaded, area of installed SRI materials, area of open grid pavement

OPTION 2: Total number of parking spaces provided on-site, total number of covered parking spaces

The Solar Reflectance Index (SRI) is a measure of the constructed surface's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. To calculate the SRI for a given material, obtain the reflectance value and emittance value for the material. SRI is calculated according to ASTM E 1980-01. Reflectance is measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C 1371..

SS7.1 Heat Island- Non roof

- Solar Reflectance Index : index of a roof material as a measurement to determine whether or not roofing material comply with SS credit 7.2 calculated by ASTM 80
- Standard White = 100, and Standards black – 0.0
- Options:
    - Option 1:
        - 50% site harscape: do not include the building
        - Shade within 5 years
        - Paving material with SRI >= 29
        - Open Grid paving, with 50% open
- Minimum 50% parking area space under cover with a roof top (SRI >= 29)
- Heat island effect can vary temperature by 10 degrees F
- Minimum 50 % parking space under cover with a roof top of SRI >=29
- Exemplary: 100% non-roof high albedo and/or open grid system green shaded within 5 years or 100% parking cover
- Exemplary point for SS&.1:
        - 50% underground or covered to 100% parking covered
        - Plant trees with full shade in 5 years
- Equations: Total qualifying area > 50% total hardscape areas
    - T= sum of total non roof hardscape
    - O= Hardscape with 50% open grid
    - R= Hardscape with SRI >=29
    - S= Summer Solstice mean @10 am, 12 noon, and 3 pm
    - Q= sum of open paving high SRI paving, and shaded area
    - Q= O+R+S >= T/2
    - Submittal package/calculations required
        - Total area of all hardscape with SRI >=29
        - Total Area of all non-roof hardscape on project site
        - Total effective shaded area of hardscape features shaded by trees and other landscape features
        - Total area of hardscape and surface with open grid paving system @least 50% of pervious site
        - Building ?
- Only Large shrubs account for heat island (not small or medium)
- LEED SSC7.1: Albedo of imperviousness or area or shading from site trees
- Consolidating building footprint and underground parking assts in
    - SS7.1 Heat Island – Non roof
    - SS6.1 Stormwater design: Quality control

- Decision makers: Least involved = mechanical engineer
- Storm water management relates to porous paving +SS7.1
- Complex with 500 parking. Select SS7.1 and pollution (option2):
    - Underground parking 500 * 0.50 = 250 underground parking
- Only 50% of parking to be covered with albedo over the parking deck
- Only 50% parking to be covered with SRI of 29
- Heat Island contributes:
    - Microclimate disturbances ,
    - sever weather,
    - High energy loads,
    - Not pollution?
- k
- Gravel: Most porous material
- Porous Material used in:
    - Island heat
    - Minimize impact of microclimate
    - Minimize the impact on humans and wildlife
    - No correlation to SS4: alternative transportation
- To meet SS7.1:
    - Need of High albedo impervious paving materials
    - Need for area of shading from suite trees
- Decision maker: Owner: involved mostly in everything
- All decision makers are: contractor, civil engineer, owner, mechanical engineer, electrical engineer, other consultants
- In LEED: individuals “pursue” credit
- Least Likely= Decision makers not to pursue point
- LEED AP understands importance of integrated design and consider interaction between perquisites, credits, and their respective criteria
- Building footprint reduction and addition of underground parking:
    - SS6.1 Stormwater quality control
    - Heat island effect SS7.1 (non-roof)
        - It is not correlated with parking capacity SS4.4 and EA3- enhanced commissioning
- Non roof: Cover parking deck with SRI >=29 more than 50% of the parking area
- Roof Low sloped covered with SRI >=78
- All Parking under the building SRI >= 78 makes it two credit SS7.1 and SS7.2
- Submittal templates
    - Emissivity= ability of a material to shed infra red radiation or heat
    - Visible transmittance= visible transmitted/visible light striking surface

- Planting small shrubs do not contribute with SSC7.1
- Commercial Park with 4 acre of hardscape:
  - 2 acres of open grid pavement
  - Paving material with SRI >= 29

Shade 2 acres of hardscape in 5 years

Sustainable Sites

SS C7.2- (1) Heat Island Effect Roof- Design (Design Team + Contractor)

Standard: ASTM Standard E1980-01 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surface.

Intent or Credit

Reduce heat islands to minimize impact on microclimate and human and wildlife inhabitants

Requirements

OPTION 1: Use roofing with SRI 78 (low slope) or SRI 29 (steep slope) for min 75% of roof surface

OPTION 2: Use vegetated roof for at least 50% of roof area

OPTION 3: Use combination of above
Install high albedo and vegetated roof surfaces that, in combination, meet the following criteria:
(Area of SRI Roof / 0.75) + (Area of vegetated roof / 0.5) >= Total Roof Area

Roof Type	Slope	SRI
Low-Sloped Roof	<=2:12	78
Steep-Sloped Roof	> 2:12	29

Strategy

High-albedo and vegetated roofs to reduce heat absorption. Cool Roof Rating Council website, www.coolroofs.org.

The Solar Reflectance Index (SRI) is a measure of the constructed surface's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. To calculate the SRI for a given material, obtain the reflectance value and emittance value for the material. SRI is calculated according to ASTM E 1980. Reflectance is measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C 1371.

Submittal Documentation

Roof drawings showing green roof systems AND OPTION 1 - total area of SRI compliant roofing , listing of roofing materials and

OPTION 2 - Total area of installed green roof system

OPTION 3 - Area of installed green roof systems, area of installed SRI roofing, list of installed materials and SRI values

Exemplary Point: 100% Green Roof

SS7.2 Heat Island- Roof

- 75% of roof (<2:12 low slope with SR>=78) or (>2:12 steep slope with SRI >=29)
- Or 50% Vegetated Roof or
- High albedo +green roof combination
- Combo formula: {area High albedo Roof/0.75]+{area Green roof/0.50]= total roof area
- Exemplary: 100& of roof= green. Exclude mechanical skylight, photovoltaic, etc.
- Reflective roofing material: same as SRI= Percent of roof is based on SRI
- Do not use vegetated area as reflective roof
- Non SRI roofs are not albedo
- Solar Reflectance: Reflected Solar Energy/Incident Solar energy
    - = Ability to reflect sunlight to incoming solar energy zero to one
    - = Higher solar reflectance= better control of heat gain
    - Solar reflectance include:
        - Visible light
        - Infra red heat
        - Ultra violet wavelength
        - = albedo= Product that reflects high amount of sunlight or “high” green of light reflectance
        - Not the same as emissivity, similar but not the same
        - Index : Standard White = 100, and Standards black – 0.0
- Vegetated Roof= Potential contribution to
    - SS6 Storm water management
    - SS7 Heat island effect
    - EQ4 Low Emitting materials
- Team members to design vegetated roof: Architect, Engineers: structural, civil, energy, and general contractor
- If project earns SSC2, development density and community connectivity. What additional credit can be achieved by vegetated roof
    - SS5.1 Site development open space
    - SS5.2 Site development protect habitat
    - SS7.2 Heat island effect- Roof
- Early design review to consolidated footprint of building and underground parking
    - SS7.1 Heat Island non-roof
    - SS6.1 Storm Water design – Quality control
- Living roof: landscape and exterior design to reduce heat island
- Office space with 65k sqft and roof 5K mechanical sqft and 10k skylight wants to meet 7.2:
    - Available roof area = 65-10 skylight-5mechanical = 50 k roof
    - 50/2 = 25 k for vegetated roof

    - 50*0.75 K for albedo SRI >=78
    - Combination 50 K sqft= Albedo roof/0.75 + Vegetated Roof/0.5
    - Exemplary credit: 50 ksqft vegetated roof
    - Exemaplary credit: 50 Ksqft very high albedo roof
- Strong participation of general contractor:
    - SS7.2 Heat Island Roof
    - SS5.1 Site development, project, restore habitat
    - SS7.1 Heat island- non roof
    - Not answers: “involved strongly: ss1 site selection; SSC3 Brownfield, SS6.1 Stormwater management
    -
- Low slope roof, 30 k sqft
    - Option 1: 0.75*30k= 22.5 k SRI >=78
    - Option 2: 30k*0.50= 15k Vegetated roof
    - Option 3: 12k/0.75 + 8k/0.50 ==== verify 30k combination
    - tins:

s

Sustainable Sites
SS C8- (1) Light Pollution Reduction- Design (Design Team)

Standard: ASHRAE/IESNA Standard 90.1- 2004

Intent or Credit

Minimize light trespass from the bldg/site, reduce sky-glow to increase night sky access, improve nighttime visibility thru glare reduction, and reduce impact on nocturnal environment

Requirements

INTERIOR LIGHTING: Each interior light candela output must not exit thru windows, must hit opaque surface OR Interior lighting shall be auto-matically controlled to turn off during no-business hours AND EXTERIOR LIGHTING: Meet ASHRAE/IESNA Std 901.1-2004, do not exceed 80% of lighting power densities for exterior areas, and 50% for bldg facades & landscape features

LZ1 - Dark (Park & rural settings): .01 fc at sight boundary and beyond LZ2 - Low (Residential): .10 fc at site boundary, .01 fc at 10' beyond boundary, 2% total initial designed fixture lumens are emitted at anlge of 90 deg from nadir

LZ3 - Medium (Commercial/Industrial, High-Density Rees): .20 fc at site boundary, .01 fc at 15', 5% emitted LZ4 - High (major city centers, entertainment districts): .60 fc at size boundary, .01 fc at 15', 10% emitted

LZ4 - High (major city centers, entertainment districts): .60 fc at size boundary, .01 fc at 15', 10% emitted

Strategy

- Minimize site lighting, Use computer modeling
- Full cutoff luinaires
- Low-refectance surfaces
- Low-angle spotlights
- Overlay photometric data on

plans/sections to confirm candela angle does not transmit thru to exterior
- Automatic sweep timers
- Occupancy sensors
- Programmed master lighting control panels
- Manual override for after-hours Use
- Employ lighting professional
- Minimize upward illumination from reflected surfaces

Submittal Documentation

- Project lighting drawings
- Confirmation that light does not pass thru windows OR

- Complete lighting power density tables
- confirm the site zone classification
- Complete site Lumen Calculation

Optional narrative.

Site Boundary

- SSC2 Development Density & Community Connectivity
- SSC8 Light Pollution Reduction
- SSC5 Site Development: Maximize Open Space
- SS4.1 Alternative Transportation: Public Transportation Access
- SSC3 Brown Field Redevelopment
-
- 3 credits SS in design phase:
  - SS4.1 Alternative Transportation- Public transportation –acee
  - SS6.2 Storm Water Quality
  - SS2 Dvelopment density and community connectivity
  -

.

.Remember, is it?

- It is universal,
- It is understood,
- It is adoptable,
- It is adaptable,
- It is practical,
- It can be implemented,
- It is relatively economical,
- It is perpetual,
- It is standardized,
- It is constructible,
- It is enforceable,

It is measurable

Energy & Atmosphere

- *Coal-fired electric utilities* produce almost *1/3* the total emission of nitrogen oxide by US citizens.
- Fundamental commissioning can increase building energy efficiency from *5-10%.*
- Buildings with M&V programs save *10 to 20%* the electricity of buildings without.
- "Lost Productivity" is equated with *20% of occupants complaining 30 minutes per month.*
- Occupancy sensors may save up to *60%* of light energy costs in a building.

- ## Energy & Atmosphere

EA prerequisites include building commissioning, compliance with the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) 90.1-1999 energy performance standard, and chlorofluorocarbon (CFC) reduction in HVAC equipment.

Commissioning is used on many projects, especially laboratory and healthcare facilities with complex MEP systems. For smaller or more traditional facilities, it may be hard to justify the added cost of commissioning. Tailoring the scope of commissioning services to focus on critical systems, such as the air-handlers or the exterior building envelope, is an effective way to maximize performance and value.

Those institutions that have central chiller plants with CFC-based refrigerants may find CFC reduction to be a more difficult prerequisite to achieve. Owners should evaluate their equipment in the earliest stages of planning to determine if remedial work is needed to satisfy this requirement.

EA credits are awarded for reducing energy consumption, and for using renewable or low-impact sources to provide part of the building's energy load. Energy use can be reduced 15 to 25 percent through “right-sized” air-handling systems, an efficient building envelope and glazing, and energy-saving features such as occupant sensors for lighting control.

EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems
EA Prerequisite 2: Minimum Energy Performance
EA Prerequisite 3: Fundamental Refrigerant Management

EA Credit 1: Optimize Energy Performance
EA Credit 2: On-Site Renewable Energy
EA Credit 3: Enhanced Commissioning
EA Credit 4: Enhanced Refrigerant Management
EA Credit 5: Measurement & Verification
EA Credit 6: Green Power

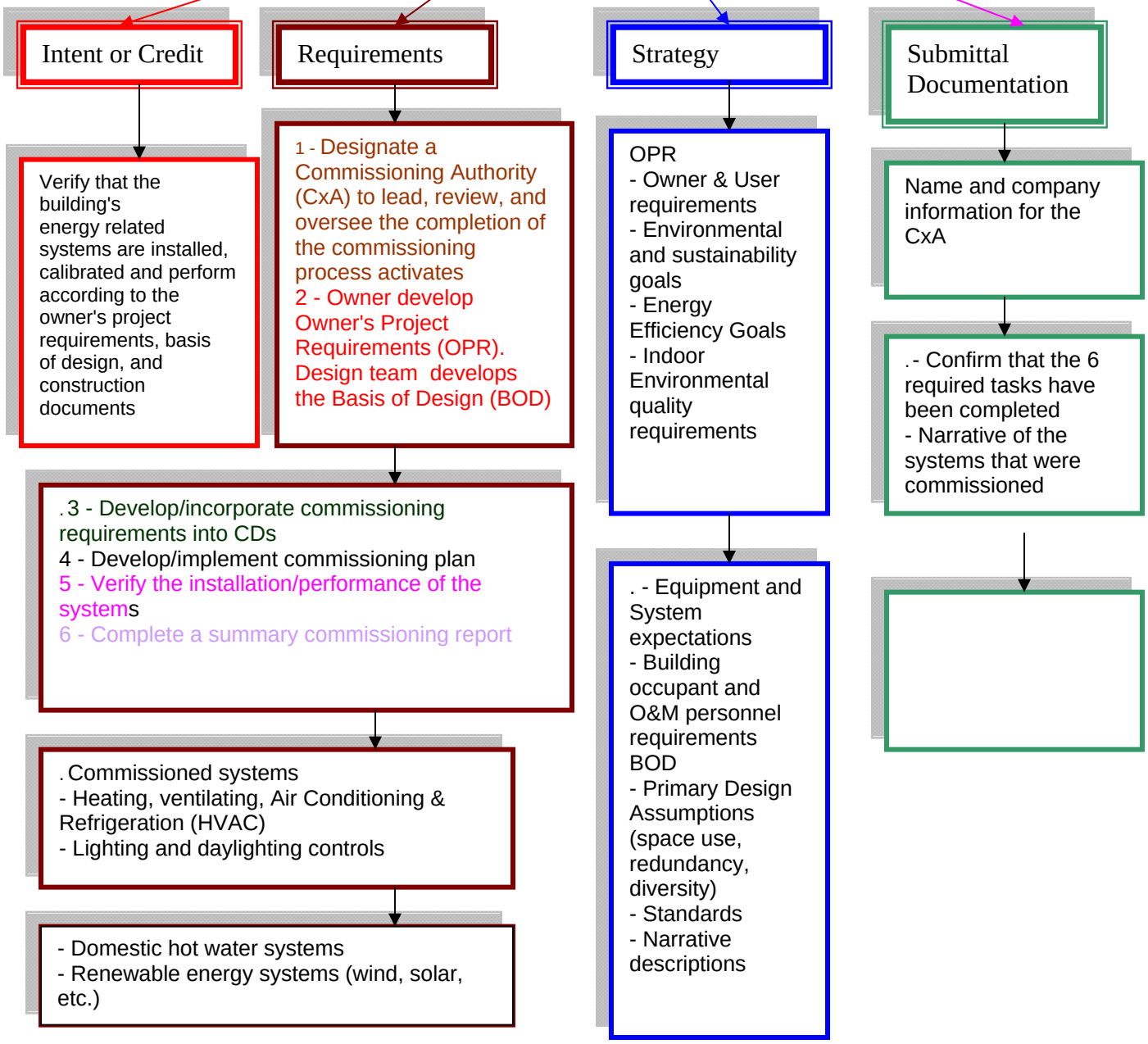
ENERGY & ATMOSPHERE 35

Prereq 1	Fundamental Commissioning of Building Energy Systems			Required
Prereq 2	Minimum Energy Performance			Required
Prereq 3	Fundamental Refrigerant Management			Required
Credit 1	Optimize Energy Performance			1 to 19
			Improve by 12% for New Buildings or 8% for Existing Building Renovations	1
			Improve by 14% for New Buildings or 10% for Existing Building Renovations	2
			Improve by 16% for New Buildings or 12% for Existing Building Renovations	3
			Improve by 18% for New Buildings or 14% for Existing Building Renovations	4
			Improve by 20% for New Buildings or 16% for Existing Building Renovations	5
			Improve by 22% for New Buildings or 18% for Existing Building Renovations	6
			Improve by 24% for New Buildings or 20% for Existing Building Renovations	7
			Improve by 26% for New Buildings or 22% for Existing Building Renovations	8
			Improve by 28% for New Buildings or 24% for Existing Building Renovations	9
			Improve by 30% for New Buildings or 26% for Existing Building Renovations	10
			Improve by 32% for New Buildings or 28% for Existing Building Renovations	11
			Improve by 34% for New Buildings or 30% for Existing Building Renovations	12
			Improve by 36% for New Buildings or 32% for Existing Building Renovations	13
			Improve by 38% for New Buildings or 34% for Existing Building Renovations	14
			Improve by 40% for New Buildings or 36% for Existing Building Renovations	15
			Improve by 42% for New Buildings or 38% for Existing Building Renovations	16
			Improve by 44% for New Buildings or 40% for Existing Building Renovations	17
			Improve by 46% for New Buildings or 42% for Existing Building Renovations	18
			Improve by 48%+ for New Buildings or 44%+ for Existing Building Renovations	19
Credit 2	On-Site Renewable Energy			1 to 7
			1% Renewable Energy	1
			3% Renewable Energy	2
			5% Renewable Energy	3
			7% Renewable Energy	4

		9% Renewable Energy	5
		11% Renewable Energy	6
		13% Renewable Energy	7
Credit 3	Enhanced Commissioning		2
Credit 4	Enhanced Refrigerant Management		2
Credit 5	Measurement and Verification		3
Credit 6	Green Power		2

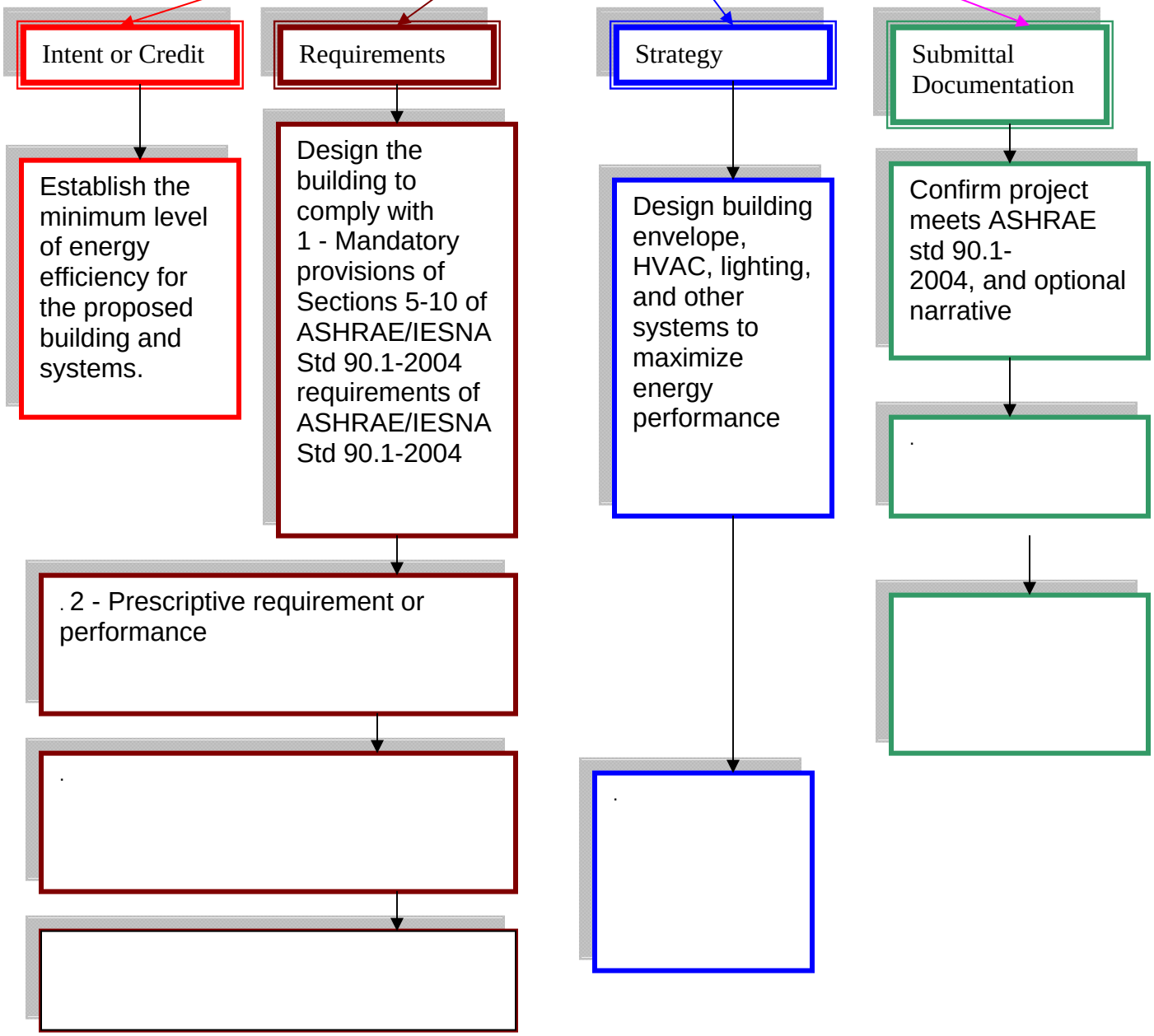
Energy and Atmosphere
EA P1- Fundamental Commissioning of the Building Energy – Construction
(Owner/Design team/Contractor)

Standard: None



Energy and Atmosphere
EA P2- Minimum Energy Performance – Design (Design Team)

Standard: None. **ASHRAE 90.1-2004, secs. 5-11**, min. reqs. for energy effic., except for low rise residential ***OR*** local code if stronger



EAP2

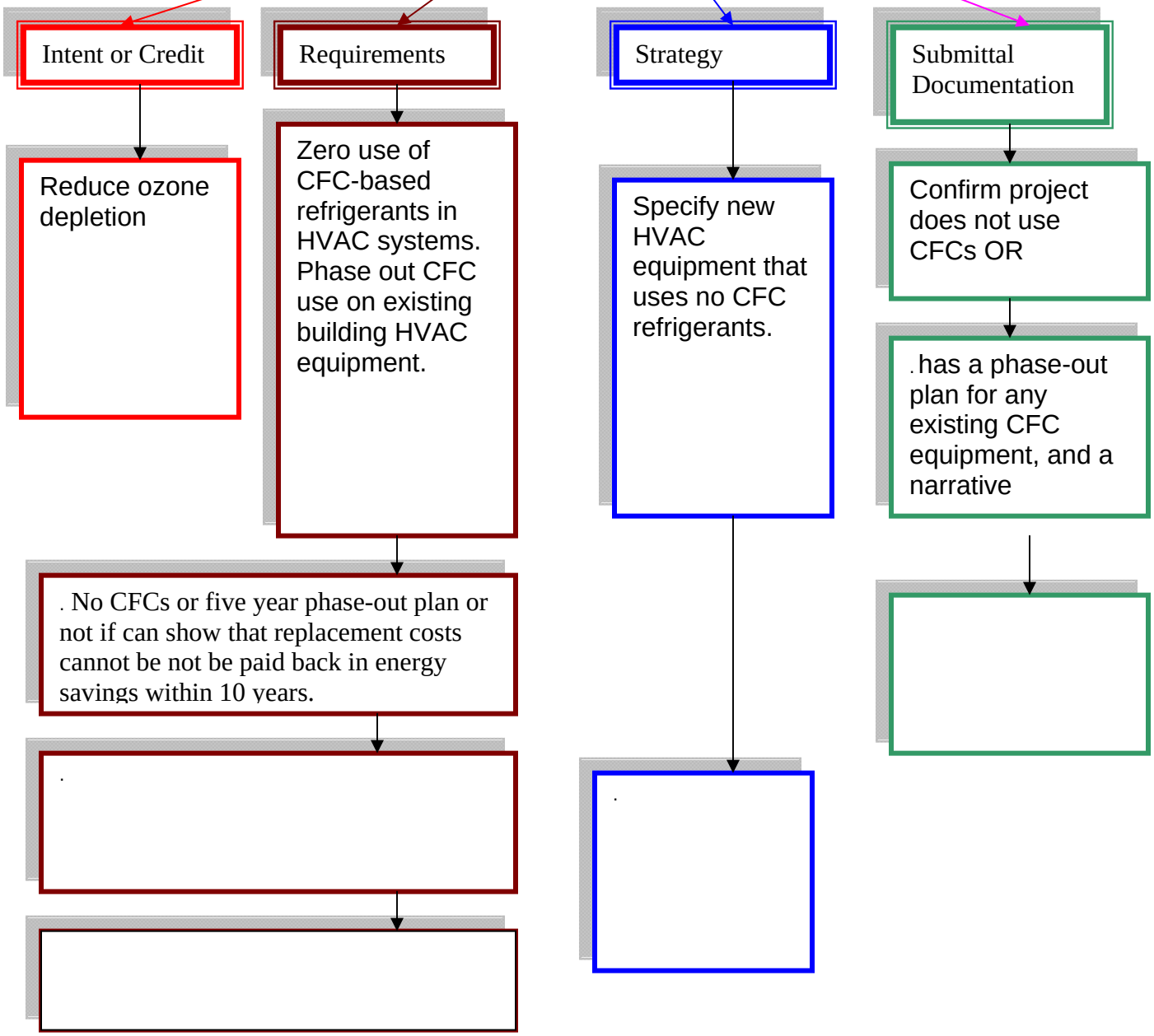
- ASHRAE 90.1/1999 or local code
  IESNA
    Mandatory provisions & prescriptive (or performance) requirements: building envelope, HVAC, water heating, power, lighting, permanently wired motors, or similar
- AC units energy efficiency = 10-40%
- Centrifugal chillers > efficient than screw, scroll, reciprocating
- Lender's will not benefit on "baseline"
- Efficiency of swimming pool hearing
  ASHRAE 90.1/2004
  Service water heating, lighting, heating, ventilating
    Not water efficiency
    Not reducing heat island
- Baseline applies to
  - Optimize energy performance options
  - No baseline:
    (a) Enhanced refrigeration
    (b) EQ 6.1 Controllability
    (c) Green power EA6
    (d) EQ credit 5 thermal comfort
- Photoelectric lighting sensors contribute towards:
  - EAC1 Optimize Energy Performance

Side note: prerequisites ASHRAE/ANSI 90.1/2004;62.1-2004
Others ASHRA 55-2004, 52.2-1999

Energy and Atmosphere

EA P3- Fundamental Refrigerant Management – Design (Design Team)

Standard: None **ASHRAE 90.1-2004,**



EAP3 Fundamental of Refrigeration

- CFC resolution based on Montréal treaty

(No CFC) Banned 1995
ODC = Ozone Depleting Compounds
CFC = Chlorofluorocarbons
HFC = lowest ozone depletion (ODP)

- If project team cannot change chilled water system as EAP3:
  - They must show: replacement economic payback greater than 10 yrs.
- If original building uses CFC:
  - You must take out in 5 yrs.
- Mechanical engineer & owner to make decision to EAP3
  - M.E. to select equipment
- CFC reduction in HVAC & R equipment applies
  (a) Base building A/C systems

Reuse of HVAC systems

Energy and Atmosphere

EA C1- (1 to 19) Optimize Energy Performance – Design (Design Team)

Standard: **Building Performance Rating Method in Appendix G of ASHRAE/IESNA Std 90.1-2004 (Option 1), ASHRAE Advance Energy Design Guide for Small Office Buildings 2004 (Ooption 2), Advanced Building Core Performance Program (Option 3)**

Intent or Credit

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

Requirements

OPTION 1 - WHOLE BLDG ENERGY SIMULATION – (1-19pts)- Min 1 pts demonstrate % improvement in the proposed building performance rating compared to the baseline performance rating per **Building Performance Rating Method in Appendix G of ASHRAE/ IESNA Std 90.1-2004**

OPTION 2 - Prescriptive Compliance Path (x pts) - For office building under 20,000 sf comply with the prescriptive measure of **ASHRAE Advance Energy Design Guide for Small Office Buildings 2004**. Identify climate zone bldg is located and comply with all recommendations.

OPTION 3 - **Prescriptive Compliance Path (x-x pt, min x-x pts needed) - Comply with the Basic Criteria and Prescriptive Measures of the Advanced Buildings Benchmark Version 1.1**. (<100k) Identify climate zone bldg is located and comply with all recommendations. (no good for health care, warehouse, laboratory)

if new or renovation. Starts at 10.5% savings and up by 3.5% for each point up to 42%

Strategy

. Design bldg envelope & systems to maximize energy performance. Use Computer simulation model for **Option 1.**
REDUCE DEMAND: Optimize building form & orientation, reduce internal loads thru shell & lighting improvements, & shift

HARVEST FREE ENERGY: Use daylight, ventilation cooling, solar heating & power, wind energy, service water heating & power generation.
INCREASE EFFICIENCY: More efficient envelope, lighting, & appropriately sized HVAC system.
RECOVER WASTE ENERGY: Exhaust air energy recover, graywater heat recovery, and cogeneration.

Submittal Documentation

Complete table and calculations in the submittal template.

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EAC1

- Option 1: 1-5 Points
- Whole building energy simulation
  ASHRAE/IESNA 90.1-2004, Appendix G, Building Performance Rating Method
- % of Improvement→Baseline ASHRAE
- Runs: 5 Energy Models
- Earn 1-10 Points depending on reduction from baseline
- Simulation: Energy Costs Savings

  $$\frac{\text{Project Annual Projected}}{\text{ASHRAE Baseline}} = \text{Ave. of 4 Directions}$$
- Baseline = Ave. of 4 Direction Model
- Option 2: 4 Points
- Prescriptive Compliance Path for Small Office < 20Kϕ
  Comply w/ Correct Climate Zone
  ASHRAE Advanced Energy Guide for Small Office 2004
- No Calculations or Analysis: Envelope, Lighting, HVAC & W.H.
- Option 3: 1 Point
- Building Benchmark V.1.1
  w/ Exception of Several Section & Correct Climate Zone

30 Criteria for Building No Calcs.

- For small office under 20k ϕ office building
  - Use ASHRAE Advanced Energy Guide A Addition Issue (?)
- To achieve 4 points, what is the first task?
  - Climate zone of building to be determined
- To find qualifying method for ASHRAE 90.1
  - Use performance rating method appendix "G"
- Photoelectric day light sensors
  - For lighting is for EAC1 optimize energy performance
- Common mistakes in calculating savings from performance rating method EAC1
  (a) Use energy consumption vs. cost
  (b) Not accounting for task lighting
  (c) Not supplying enough information for energy measures incorporations, the exceptional calculation methodology
  (d) Calculating non-tradable surfaces as tradable surfaces
- Non regulated energy systems are
  (a) Garage ventilation
  (b) Exterior lighting
  (c) Plug loads
- To achieve 5 points (180,000ϕ laboratory(
  - Use option 1 (not 2, 3, or 4)
    - Need baseline building HVAC per "the approach & implementation"
  - 5 points can be with option 3 (not for warehouse, laboratory , and/or heath care
- once optimize energy performance occurs:
  (a) use EA6 Green power

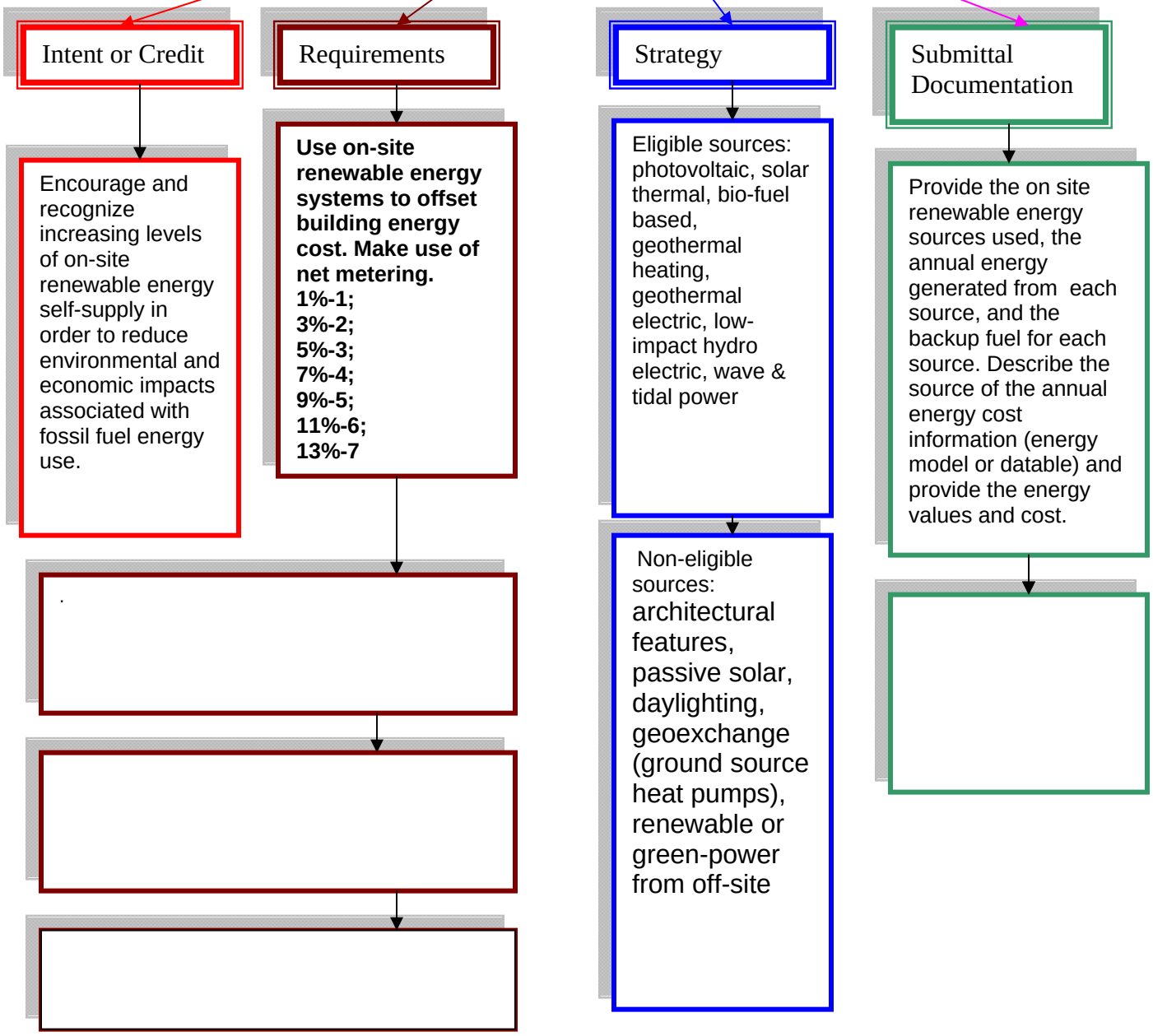
(b) EA2 renewable energy on site
Annual energy guide (consumption) not cost can be used as baseline for EA2 & EA6
EA2 needs $/kw hr/yr

- 22,000 apartment/condominium needs 4 points:
  - use building performance rating method
  - using whole building energy simulation
- if apt or condo cannot use office calcs, namely ASHRAE Advanced Energy Design Guide
- In pursuing multiple points: EAC1
  (a) Determine building baseline envelope properties from appendix B in ASHRAE 90.1-1999
  (b) Need (2) energy simulations (baseline & proposed) on building
- Energy star score is used to compare two buildings in Los Angeles
  - Score (example 45) is the Building Energy Performance Rating
- To increase each performance
  (a) Reduce demand by optimizing building orientation
  (b) Use ventilation cooling for space conditioning
- Newly registered projects need two optimizes energy performance points. It is mandatory except for LEED Home or LEED Neighborhood Dev.
- 2 story (7,000 ϕ office:
  - ASHRAE 90.1-2004
  - ASHRAE Advanced Energy Design Guide for small office buildings 2004 option 1 or option 2
- EAC1 is length rest technical analysis
- 26,000ϕ office to achieve 4 points by EAC1
  - option 1: building performance rating method of ASHRAE 90.1-2004 using whole building energy simulation or
    option 2: Advanced building core performance guide for buildings < 100,000ϕ (not for warehouse/health care/labs)
- installing occupancy sensors: EAC1, EQP1
  - occupancy sensors: to design to control air flow, thermostat
  - verify thermal comfort ASHRAE 5S-2004 w/ acceptable indoor air quality for EQP1 (62.1-2004)
    - indoor sensors control lights, thermostat, airflow
- EAC1 ASHRAE 90.1 -T24 like: exceptional calculations methods & LEED:
  (a) When energy consumption associated with a particular technology or integrated building systems design strategy cannot be appropriately represented by available hourly whole-building modeling tools but can be appropriately represented by a separate supporting calculation or software tool
  (b) When given the requirements of ASHRAE 90.1 a particular energy strategy is not eligible for contributions to EAC1, optimize energy performance but may qualify for earning a point under ED1 Innovation in Design
  - Mall tried to do energy performance. Other credits that conflict are:
    - ASHRAE 55 Thermal Comfort

"Comfort has higher priority

Energy and Atmosphere
EA C2- (1 to 7) On-Site Renewable Energy – Design (Design Team)

Standard: Department of Energy Commercial Building Energy Consumption Survey (CBECS)



EAC2 Onsite Renewable Energy 1%+2n = 1+1n (n=0-6)

Base Doe Commercial Building Energy Consumption Survey CBECS

- Credits are
  - Organic material as a fuel in a boiler
  - Photovoltaic/solar
  - Wind turbines
  - Bio-gas fueled generator (biomass)
  - Tidal systems (low impact-wave)
  - Geothermal – electric
  - Geothermal – heating
  - Low impact hydro
  - Bio-fuel (wood waste, agric. Crops, animal waste, landfill gas, manure…)
- Non-qualifying:
  - Bio-fuels excluded: pressure treated lumber, forestry biomass waste
  - passive solar & day lighting
  - geo exchange ground source heat pump
  - green power certificate
  - tradable renewable certificate
- renewable energy produced
  - normal building annual energy cost
- if each not performed:
  - EAC2 uses USDOE 2003 commercial sector average energy costs by state
- For costs
  - For consumption: CBECS
  - Not qualified for biomass
  - Preserved wood/ treated lumber contains CCA
  - Forestry biomass wastes (other than mill residue)

  - 40,000 sqft building with 10% green roof and 25% energy from renewable source. Project to reduce the green roof by 10,000 sqft and add 8000 sqft of photovoltaic. Affected credits are"
    - EPA 1 Fundamental of commissioning adding photovoltaic
    - SSC6.1 storm water hangs
    - Green roof and PV system still cover 100% of roof
    - Adding PV will not change T24 EAP1 and EAC1, energy efficiency
    - EAC6 does not qualify. Minimum of green power is 35% not 25%.

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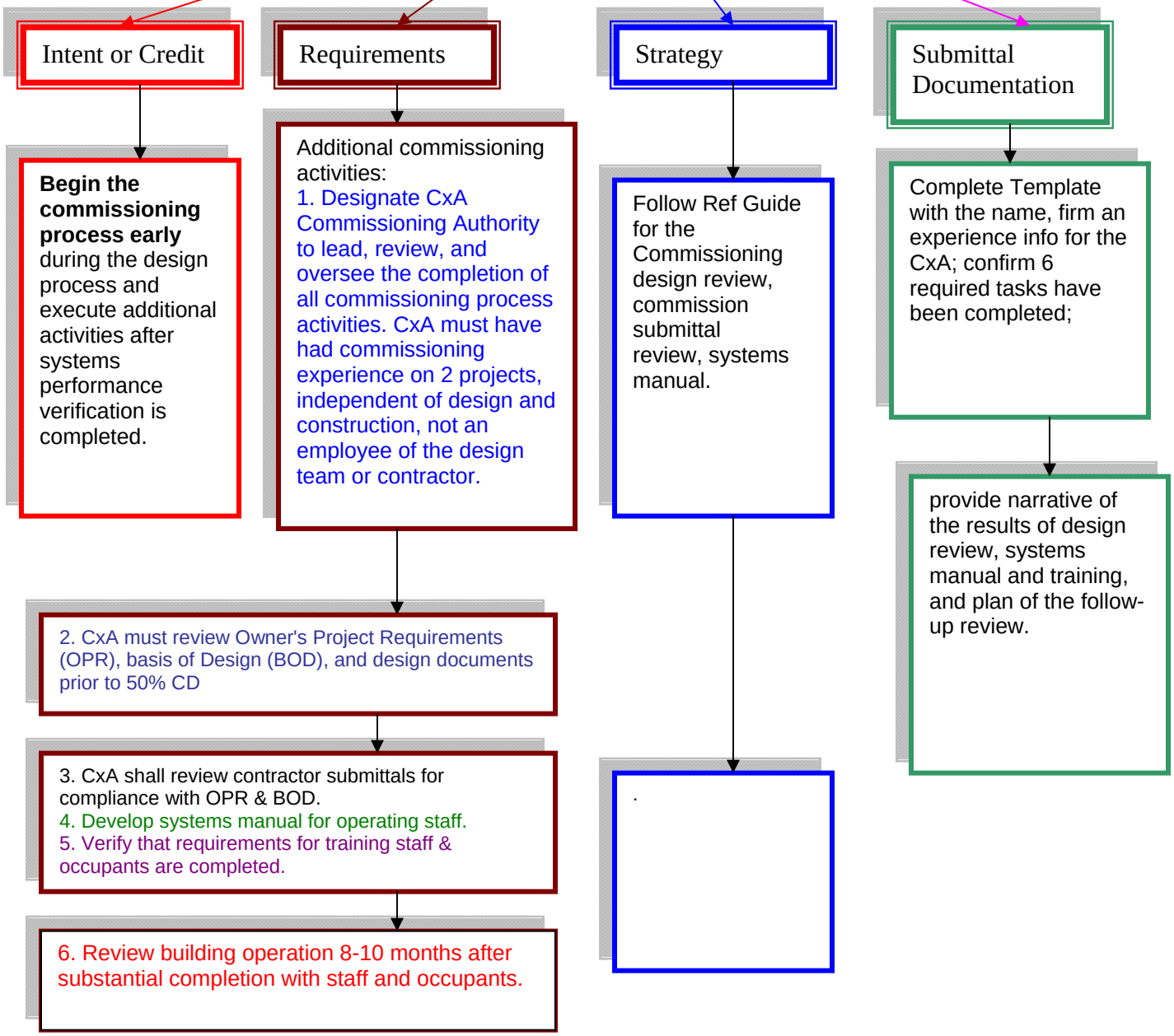
Energy and Atmosphere
EA C3- (2)Enhanced Refrigerant Management- Construction
(Owner/Design Team/Contractor)

Standard: None



		Responsibilities
Tasks	**EA1**	**EA1 and EAC3**
Designate Commissioning Authority	**Owner or Project Team**	**Owner or Project Team.**
Document Owners' project requirement (OPR)	**Owner**	**Owner**
Develop Basis of Design	**Design Team**	**Design Team**
Incorporate Commissioning requirements into the construction documents	**Project Team or CxA**	**Project Team or CxA**
Conduct commissioning design review prior to mid-construction documents	NA	**CxA**
Develop and Implement a Commmissionning plan	**Project Team or CxA**	**Project Team or CxA**
Review Contractor submittal s appplicable to systems being commissionined	NA	**CxA**
Verify the installation and performance o f commissioned systems	**CxA**	**CxA**
Developp systen manual for the commissioned systems	NA	**Project Team or CxA**
Verify that the requirement for training are completed	NA	**Project Team or CxA**
Complete a summary commissioning report	**CxA**	**CxA**
Review Building Operations within 10 minths afyer substantial completion	NA	**CxA**

- Who can be CxA agent for EAP1

Mechanical engineer's subcontractor responsible for energy modeling

> 50k Independent of design or construction team

< 50k Qualified staff member of owner,
An owner's consultant to project.
Or a qualified individual of the design
Or construction team that has more job than CxA

OPR: Details of functional requirements of project & expectations of how it will be used & operated
BOD: all info necessary to accomplish OPR's including weather date, interior environmental criteria, cost goals & references to applicable codes, standards, regulations, & guidelines
Commissioning specifications: Contract documents that details the commission requirements of construction contractors

- Commission plans: organization schedule & document requirement of commissioning

EAP1 Fundamental of Commissioning and EA C3 Commissioning

- USGBC encourages independent third parties hired directly by owner
- Negated roof, storm water quality does not have to be commissioned
- To be commissioned
  (a) HVAC
  (b) Lighting & day lighting controls
  (c) Domestic hot water systems
  (d) Renewable energy systems (wind, solar, etc.)
- >50,000 sqft = 65,000 ϕ, staff member of owner, or third party consultant
- Start commission early before CD phase, this is most beneficial to the owner
- Again:
  (a) Engage a commissioning party
  (b) Complete commissioning report
  (c) Develop & utilize a commissioning plan
- BOD: Basis of Design: An important component of commissioning & must include:
  i. Narrative description of systems
  ii. Standards including applicable codes, guidelines, etc.
  iii. Primary design assumptions (do not include # of AP's, arch drawings)
- Responsibility of commissioning authority:
  (a) Review results of system performance verifications
  (b) Direct commissioning team & processes
  (c) Coordinate commissioning testing
- Design team is in charge of developing Basis of Design
- Fundamental Commissioning needs:
  (a) Develop summary commissioning report
  (b) Develop a commissioning plan
  (c) Verify installation & performance of commissioned systems

- Developing system manual for commissioning system
  - Nobody. This task does not exist
- 18k ϕ retail center to hire commissioning authority
  - cannot be:
    (a) independent of work of design & construction
    (b) not an employee of contractor or construction manager holding construction contract
  - Can be
    (a) Employee or contractor of owner
    (b) Building experience on at least 3 other building projects
    (c) Contracted employee of design firm
- Additional commissioning EAC3
  (a) Review of design prior to construction document phase
  (b) Review of construction document near completion of construction document design PH
  (c) Review contractor submittal relative to systems being commissioned
- CxA commissioning authority is responsible for verifying installation & performance of commissioned systems EAP1, EAC3. Commissioning is in two levels: E P1, EAC3

- Others persons (other than CxA)
  (a) Verify requirement for training operating personnel & building occupant are complete
  (b) Develop a system manual that provides future operation staff information to operating systems
- CxA to do
  (a) Review contractor submittals applicable to systems being commissioned
  (b) Prior to construction phase, review all commissioning process activities
  (c) Review building operations within 10 months with O & M staff and occupants. Includes plans for resolution of issues.
  (d) Commissioning design review of the owner's project requirements basis of design & design documents
- Additional commissioning?
  (a) Develop a re-commissioning manual
  (b) Conduct a review prior to construction documents
  (c) Review contractor submittals relative to systems being commissioned
- EAP1, fundamental building system commissioning
  - Separation of design (construction management team and entity reviewing the requirements
- Additional commissioning authority
  - Review building operation within 10 months after substantial completion
  - Conduct design review prior to mid-construction documents
- Enhanced commissioning
  - Commissioning authority independent of the design team shall conduct a review of the design prior to construction documents (2 phase)
  - An independent commissioning authority shall conduct a review of the design
  - Independent commissioning authority shall review the contractor submittals relative to the systems being commissioned
- Except/not: an independent commissioning agent shall identify the commissioning team and its responsibilities
  - This is not a job for CxA
- Commissioning (fundamental building)
  - Not part of design team & not part of construction & supervision
- Submittals:
  - Owner-design team, contractor decisions
    - CxA name, firm, experience
    - Confirm 6 required task met
    - Results of commissioning designs & 6 requirements

Commissioning Plan

1) EAC3 Review contractor submittals
   Applicable to systems being commissioned
2) EAP1 & EAC3
   Verify installation & performance of commissioning systems

3) CxA or project team (EAC3)
   Develop systems manual
4) Verify training manuals (EAC3)
   CxA or project team
5) Complete summary commissioning report CxA
   (EAP1 & EAC3)
6) Review building operation within 10 months CxA
   EAC3

CxA can be hired by Owner

Who does what	Which credit	
Designate CxA	Owner or Project Team	EAP1 and EAC3
Document OPR	Owner	EAP1 and EAC3
Develop BOD	Designate Team	EAP1 and EAC1
Conduct Commissioning to review Prior to mid-construction review	Cxa (EA3)	

Incorporate Commissioning requirements into construction
CxA or Project Team EA1 EAC3
Develop and implement project team or CxA

1) At least one commissioning design review of OPR, BOD, and design documentation prior to Mid-construction docs phase and back check review comments for design
2) CxA to review contractor applicable submittals to system to system being commission with OPR and BOD- review to be same time as design team.
3) Develop system manual for future and staff
4) Training for personnel and building occupants
5) Assure CxA review building operations with staff occupants within 10 months of completion

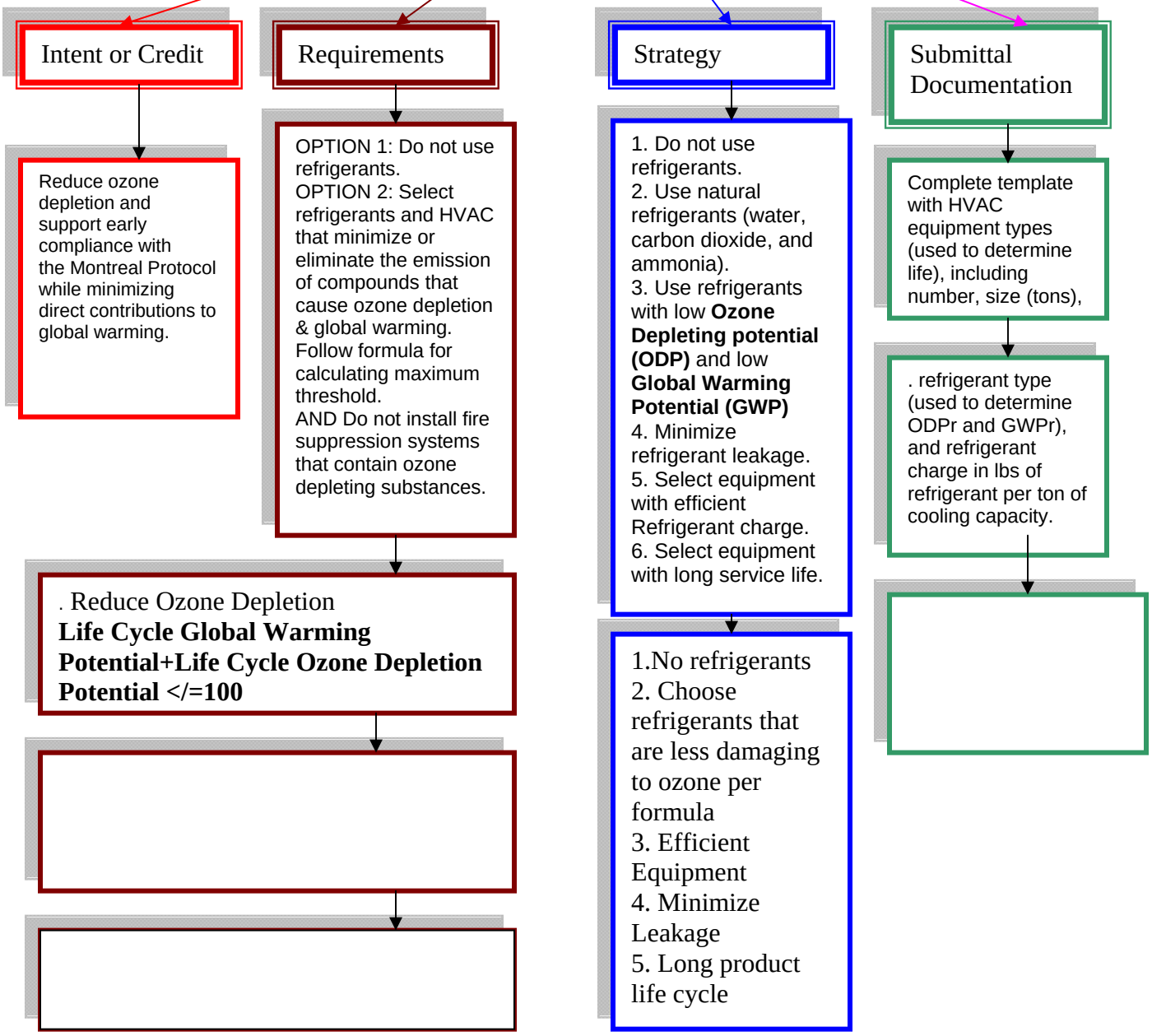
- Lead certification (prerequisites)
  - ASH 90.1-2004
  - Commissioning authority to verify performance of commissioning systems
  - EAP2 – must comply w/ ASHRAE 90.1-2004
  - ASHRAE 52.2 EQ 3.1 is not prerequisite
  - CxA does not design B.O.D. Basis of Design is done by design team
- Fundamental commissioning:
  1) To be effective, CxA not to hire individuals directly involved in project design/doc.
  2) CxA adds more total cost to smaller projects
  3) CxA is responsible for overseeing/testing primarily systems after installation
     U Valve: Minimum heat transfer characteristics cellulose insulation in lieu of fiberglass
     BTU's/lb: Measurement of energy
     OSHA: Only deals w/ construction workers, maintenance staff & subcontractors

Floor Air Distribution: better less stratification. Stratification @ 6'
SEER: Seasonal Energy Efficiency Heating and cooling "Right sizing" A/C units

- OPR: Owner's project requirement (by owner)
- BOD: Basis of Design (by design team)
- Independent CxA if project > 50k ϕ
- If < 50k ϕ, employee of design firm as long as not part of design team
- Owner shall document OPR
- CxA verify BOD & OPR for completeness
  - OPR: Detail functional requirement of project expectations of building's use operations & relation to system
    - Energy efficiency goals
    - Environmental or sustainability goals
    - IEQ requirements
    - Equipment system expectations
    - Building occupancy requirements
- Fundamental of CxA
  a) Engage commissioning authority
  b) Complete commissioning report
  c) Verify installation, functional performance, training & documentation
  - **EAC3 Enhanced commissioning (www. BCXa.org)**
- Commissioning agents: review list
  (a) Conduct one design review of owner's design requirement
  (b) Review of Basis of Design
  (c) Design Documents prior to mid-construction documents phase
  (d) Review building operations 10 months after substantial completion
- Not responsible for
  (a) Develop manual to illustrate optimal operation of commissioned systems
  Requirements for training personnel & building occupants

Energy and Atmosphere
EA C4- (2) Enhanced Refrigerant Management- Design (Design Team)

Standard: None. **Montreal Protocol**



EAC4

- Ozone depletion based on Montreal Protocol
  - No CFC refrigerants
  - Reduce ozone depletion

- Benefits
  - uses natural Refrigerants
  - Long Ser=vice life
  - Efficient refrigerant charge
  - Minimize refrigerant leakage.

- LCGWP + LOOPD * 10 **5 =< 100
- Life Cycle Global Warming Potential + Life Cycle Ozone Depletion
- Refrigeration Equipment(ASHRAE 2003 Application Handbook) estimated life is 15 years
- Points towards LEED Certification:
  - EAC4 "Not Using Refrigerants"
  - Prerequisites are not points
    - General Description
    - Or just names of prerequisite

- 300,000 sqft office uses gas cogeneration and uses no CFC or HCFC's plus many energy savings
  - Credits are:
    - EA4 Ozone protection (no CFC or HCFC)
    - EA1 Optimize Energy

- Small HVAC <0.05 lbs and are not part of the building
- Mechanical Engineer is responsible for
  - EQ1 Outdoor Air Delivery Monitoring
  - EQ2 Increased Ventilation effectiveness
  - EQ7 Thermal comfort
  - EQP1 Not a credit
  - EAC4 Enhanced Refrigeration Management

- To meet EAC4:
  - All fire separation system is free from Halon
  - Building does not contain cfc.
  - All building is free from HCFC

Energy and Atmosphere
EA C5- (3) Measurement & Verification.- Construction (Design Team).

Standard: None

Intent or Credit

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

Requirements

1. Develop/ implement a Measurement & Verification (M&V) Plan consistent with Option D: Calibrated Simulation (savings Estimation Method 2) or Option B Energy Conservation measure (ECM) Isolation as specified in the

. **International Performance Measurement & Verification Protocol (IPMVP) Vol. III**: Concepts and Options for Determining Energy Savings in New Construction April 2003.
Part B: Small simple buildings- ECM Isolation) or **Part D** (whole bldg level – calibration simulation with large no. energy conservation measures

2. The M&V period shall cover a period of no less than 1 year of post-construction occupancy.

Strategy

Use Option B for smaller/ simpler buildings by isolating the main energy systems. Use Option D for whole-building system for larger building with systems that are interactive.

.

Submittal Documentation

Confirm the IPMVP Option, upload a copy of the M&V Plan,

.
provide a narrative.

EAC5 MEASUREMENT AND VERIFICATION

- International Performance Measurement and Verification Protocol (IPMVP) V. III among 4 options (A,B,C and D) satisfy LEED
- Option B: Small Building (simple) ECM Isolation
- Option D: Whole Building Simulation with Large No. of Conversation
  - Addresses:
    - Lighting systems and controls
    - Chiller Efficiency at variable loads
    - Boiler Efficiency
    - Indoor Water riser and outdoor irrigation
    - Building related process energy systems and equipment

  - Whole building calibration (Part D) good for large building complex.
  - Part B, Energy Conservation Isolation for small building
  - Part D …….Key Word ….Calibration Simulation
  - Part B …… Key word …. ECM Isolation
  - Option B: Calculates hypothetical energy performance of the systems under post construction operating conditions
- Option B
  - Uses Measurement and verification at the system or
  - Energy Conservation Measure (ECM)
  - Level (rather than whole building level)
  - Best suited for small buildings and community centers
  - Option D: at whole building level
    - Simulation of whole baseline energy use under post-conservation operating conditions
  - Start: Occupancy and stabilization
  - End: One year after stabilization/optimized
  - Comparison of energy use versus baseline
  - EAS shows Energy accountability with Time
  - IPMVP.org is based on water savings and energy conservation:
    - Does not include storm water
    - Does not include daylight and factor lighting systems

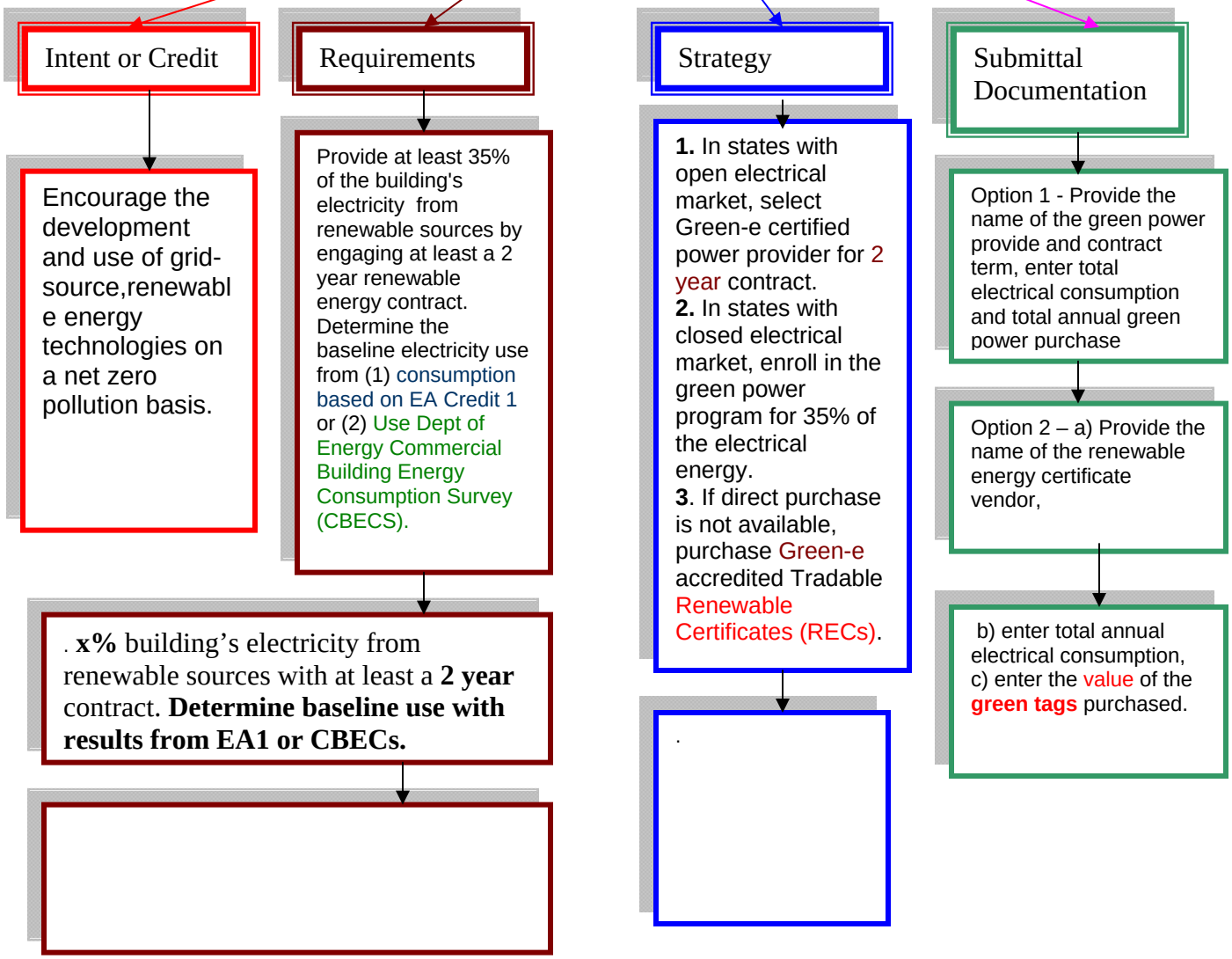
EAC6 GREEN POWER 35% 2 YRS: EP: 70% 2 YRS, 35% 4 YRS

- Need purchasing 35% of building energy
- Needs as green power (= renewable energy needs defined by Center for Resources Solutions)
- "Green-e" Certificate (not green label or green label plus or green seal…. EQ Low VOC)
- Onsite energy does not count
- EA6 to encourage development/use of renewable energy connected to utility grid
- 1000 sqft @ 2 kw/hr/sqft/year
    - 1000sqft (2kw/sqft/yr * 0.35 = 700 kw @4 year purchased EP
    - 1000sqft (2kw/sqft/yr * 0.70 = 1400 kw @2 year purchased EP
- Tradable Renewable Certificate:
    - Allows to buy non-green utility
    - As long as someone trades green to non-green
    - Emission criteria for non-renewable portion is not on documents
    - Need:
        - Building types
        - Square footage
        - Mean electrical intensity kwh/sqft year
- CBECS Data base provides Data for
    - EA C2 Om-Site renewable energy
    - EA C6 Green Power
    -
- EA6 Baseline for green power on site:
    - Energy use as determined by D.O.E.
    - Building Consumption Survey CBES)

..

Energy and Atmosphere
EA C6- (2) Green Power **Certificates.** Construction (Owner)

Standard: Eligible organizations Defined by **Center For Resource Solutions.**



Lecture series- II

Remember Project must have following components

- It is universal,
- It is understood,
- It is adoptable,
- It is adaptable,
- It is practical,
- It can be implemented,
- It is relatively economical,
- It is perpetual,
- It is standardized,
- It is constructible,
- It is enforceable,
- It is measurable.

MATERIALS & RESOURCES			14
Prereq 1	Storage and Collection of Recyclables		Required
Credit 1.1	Building Reuse - Maintain Existing Walls, Floors and Roof		1 to 3
		☐ Reuse 55%	1
		☐ Reuse 75%	2
		☐ Reuse 95%	3
Credit 1.2	Building Reuse - Maintain Interior Nonstructural Elements		1
Credit 2	Construction Waste Management		1 to 2
		☐ 50% Recycled or Salvaged	1
		☐ 75% Recycled or Salvaged	2
Credit 3	Materials Reuse		1 to 2
		☐ Reuse 5%	1
		☐ Reuse 10%	2
Credit 4	Recycled Content		1 to 2
		☐ 10% of Content	1
		☐ 20% of Content	2
Credit 5	Regional Materials		1 to 2
		☐ 10% of Materials	1
		☐ 20% of Materials	2
Credit 6	Rapidly Renewable Materials		1
Credit 7	Certified Wood		1

Decision Makers Table & LEED Credit Responsible Parties

Credit	*Decision Makers*		
Sustainable Sites			
SS P1		Contractor	Civil Engineer
SS 1	Owner		
SS 2	Owner		LEED AP
SS 3	Owner		
SS 4.1	Owner		
SS 4.2			LEED AP & Architect
SS 4.3	Owner		
SS 4.4	Owner		Civil Engineer
SS 5.1	Owner	Contractor	Civil Engineer
SS 5.2	Owner		Civil Engineer
SS 6.1			Civil Engineer
SS 6.2			Civil Engineer
SS 7.1		Contractor	LEED AP/Land/Arch/Civil
SS 7.2		Contractor	LEED AP
SS8			LEED & Lighting Dsgnr.
Water Efficiency			
WE 1.1			Landscape Architect
WE 1.2	Owner		Landscape Architect
WE 2			Mechanical Engineer
WE 3.1			Mechanical Engineer
WE 3.2			Mechanical Engineer
Earth & Atmosphere			
EA P1	Owner	Contractor	Commissioning Auth.
EA P2			Mechanical Engineer
EA P3	Owner		Mechanical Engineer
EA 1			Mechanical Engineer
EA 2			Mechanical Engineer
EA 3	Owner	Contractor	Commissioning Auth.
EA 4			Mechanical Engineer
EA 5			Mech. Eng & Facility Eng.
EA 6	Owner		

Look at each credit one by one and try and figure out why it makes sense that those are the responsible parties for that particular credit. You'll begin to notice some patterns for which trades work with which credits.

Credit	*Decision Makers*		
Materials & Resources			
MR P1	Owner		Architect
MR 1.1	Owner	Contractor	Architect
MR 1.2	Owner	Contractor	Architect
MR 1.3		Contractor	Architect
MR 2.1		Contractor	
MR 2.2		Contractor	
MR 3.1		Contractor	Architect
MR 3.2		Contractor	Architect
MR 4.1		Contractor	Architect
MR 4.2		Contractor	Architect
MR 5.1		Contractor	Architect
MR 5.2		Contractor	Architect
MR 6		Contractor	Architect
MR 7		Contractor	Architect
Indoor Environmental Air Quality			
EQ P1			Mechanical Engineer
EQ P2	Owner		
EQ 1			Mechanical Engineer
EQ 2			Mechanical Engineer
EQ 3.1		Contractor	
EQ 3.2		Contractor	
EQ 4.1		Contractor	Architect
EQ 4.2		Contractor	Architect
EQ 4.3			Architect
EQ 4.4		Contractor	Architect
EQ 5			LEED AP
EQ 6.1			Mechanical Engineer
EQ 6.2			Mechanical Engineer
EQ 7.1			Mechanical Engineer
EQ 7.2	Owner		Mechanical Engineer
EQ 8.1			LEED AP & Architect
EQ 8.2			LEED AP & Architect
Innovation in Design			
ID 1.1-1.4	Owner	Contractor	
ID 2	Owner	Contractor	LEED AP

Application & Fees

* In addition to regular review fee. For more information on the Expedited Review process, click here.
** The Existing Building Recertification Review fee is due when the customer submits the application for recertification review. Before submitting, please contact customer service (leedinfo@usgbc.org) to get a promotion code.

If your company is a USGBC member, your corporate ID must be added to your site account in order to receive member pricing. If you cannot locate your companyâ€™s corporate ID, contact us. If paying by check, please allow approximately 10 business days for processing.
Note: All fees are subject to change. Sorry, no refunds. There is, however, a rebate for all certification fees if Platinum Certification is earned. Click here to see more information on Platinum Certification Rebates.

Review Timelines

For design & construction rating systems (all rating systems except LEED for Existing Buildings), the project team administrator has two options for submission: the **Combined Design & Construction Review**, and the **Split Design & Construction Review**. The Combined Review is only available for projects that have reached substantial completion. The split review is available to projects that are ready to submit "Design" credits for review well ahead of substantial completion of the project. The timelines of these two review processes are outlined below.

Review will not commence until payment is fully processed. Please allow approximately 10 business days for check processing.

Note that LEED for Existing Buildings projects are only able to follow the combined review process.

NOTE: *The following review delay estimates are updated on a weekly basis. Please be assured that USGBC is working hard to maintain the integrity of the LEED certification process, and we are addressing the issues causing these delays.*

For LEED for New Construction (all versions) and LEED for Schools, project teams can expect delays of up to 4 weeks from the date of submittal for their project to begin the review process. The project team will be notified when their project enters review; due to increasing review volume, review results may be delayed by up to 6 weeks.

For LEED for Commercial Interiors, project teams can expect delays of up to 5 weeks from the date of submittal for their project to begin the review process. The project team will be notified when their project enters review; due to increasing review volume, review results may be delayed by up to 6 weeks.

For LEED for Existing Buildings (all versions), due to increasing review volume, review results may be delayed by up to 6 weeks.

For LEED for Core & Shell v2.0 full certification, project teams can expect delays of up to 4 weeks from the date of submittal for their project to begin the review process. The project team will be notified when their project enters review; due to increasing review volume, review results may be delayed by up to 6 weeks. **For LEED for Core & Shell v2.0 precertification,** project teams can expect delays of up to 3 weeks from the date of submittal for their project to begin the review process. The project team will be notified when their project enters review; due to increasing review volume, review results may be delayed by up to 6 weeks.

Combined Design & Construction Review* Existing Buildings Review (initial certification and recertification)		**Split Design & Construction Review**	
Review phase	Length	Review phase	Length
Preliminary review: The project team submits all attempted credits and prerequisites. USGBC returns them to the project team as "earned," "clarify," or "denied."**	25 business days *Expedited: 12 business days*	**Preliminary design-phase review:** Before substantial completion, the project team submits all attempted Design credits and prerequisites. USGBC returns them to the project team as "anticipated," "clarify," or "denied."**	25 business days *Expedited: 12 business days*
PROJECT TEAM Preliminary Review Response: Project team responds to any credits or prerequisites marked as "clarify" and resubmits to USGBC.	Up to 25 business days *Expedited: 10 business days*	**PROJECT TEAM Preliminary design-phase response:** Project team responds to any credits or prerequisites marked as "clarify" and resubmits to USGBC.	Up to 25 business days *Expedited: 10 business days*
Final review: USGBC reviews the resubmitted credits and returns a final review of all credits and prerequisites, which will either be marked "earned" or "denied."	15 business days *Expedited: 7 business days*	**Final design-phase review:** USGBC reviews the resubmitted credits and returns a final review of all Design credits and prerequisites, which will either be marked "anticipated" or "denied."	15 business days *Expedited: 7 business days*
PROJECT TEAM Accept or Appeal: The project team has 25 business days to choose to accept or appeal the results of the final review.	Up to 25 business days	**PROJECT TEAM Accept or Appeal:** The project team has 25 business days to choose to accept or appeal the results of the final design-phase review.	Up to 25 business days
Appeal: Denied credits or prerequisites may be resubmitted to USGBC for appeal. USGBC will return the appealed prerequisite(s) or credit(s) to the project team as "earned" or "denied."	25 business days *Expedited: 12 business days*	**Design-phase Appeal:** Denied design-phase credits or prerequisites may be resubmitted to USGBC for appeal. USGBC will return the appealed prerequisite(s) or credit(s) to the project team as anticipated or denied. Project teams may also appeal design-phase credits at the end of the construction-phase review.	25 business days *Expedited: 12 business days*

	Preliminary construction-phase review: After substantial completion, the project team submits all attempted Construction and/or NEW Design credits and prerequisites. USGBC returns them to the project team as "earned," "clarify," or "denied."**	25 business days *Expedited: 12 business days*
	PROJECT TEAM Preliminary construction-phase response: Project team responds to any credits or prerequisites marked as "clarify," and resubmits to USGBC.	Up to 25 business days *Expedited: 10 business days*
	Final construction-phase review: USGBC reviews the resubmitted credits and returns a final review of all credits.	15 business days *Expedited: 7 business days*
	PROJECT TEAM Accept or Appeal: The project team has 25 business days to choose to accept or appeal the results of the final review.	Up to 25 business days
	Construction-phase Appeal: Denied Construction OR Design credits or prerequisites may be appealed. USGBC will return the appealed prerequisite(s) or credit(s) to the project team as anticipated or denied.	25 business days *Expedited: 12 business days*

* The LEED for Core & Shell precertification process is considered a "combined" review.

** LEED for New Construction v2.1 and LEED for Commercial Interiors v2.0 projects may also receive credits marked as "audit." For more information, please consult the "audit documentation" sections of credits in the respective reference guides.

Expedited Review Process

Project teams may request expedited reviews for LEED for New Construction, LEED for Schools, LEED for Existing Buildings, LEED for Commercial Interiors, and LEED for Core and Shell projects. Expedited reviews are subject to a fee in addition to standard certification fees. USGBC reserves the right to deny any request for an expedited review.

NOTE: Due to volume, USGBC is currently NOT accepting any requests for expedited reviews?!

Teams may request an expedited review for:

- a complete LEED certification review
- a Design Review only
- a Construction Review only
- an Appeal Review

Project teams interested in requesting an expedited review should call the USGBC main office at 202-828-7422 and ask to speak with a member of the LEED certification team. You must submit -- and at the discretion of USGBC, USGBC must accept -- an expedited review request no less than 10 business days before the start of your projects scheduled review. You must then submit your certification fee, expedited fee, and application for LEED certification to USGBC within 10 days of their acceptance.

Certification Award

The official certification date of the project is the date USGBC receives notice of a project team's acceptance of the Final LEED Review. USGBC will then contact the project team regarding fulfillment details, including their certificate and LEED plaque.

Platinum Certification Rebates

Projects that are awarded LEED platinum certification will receive a rebate for all certification fees. The rebate applies to projects that certify using LEED for New Construction, LEED for Existing Buildings, LEED for Commercial Interiors, LEED for Core & Shell, or LEED for Schools. Projects that certify under future versions of LEED (excluding pilot projects and LEED for Homes projects) will also be eligible. Registration fees, appeal review fees, and any additional fees required to expedite LEED certification will not be refunded.

Materials & Resources

- 136 million tons of construction and demolition debris - annually about 40% of the total U.S. solid waste stream of roughly 2.5 lbs. of solid waste per square foot of floor space for construction of a typical commercial building

- Buildings consume *40%* of raw stone, gravel and sand, and *25% of virgin wood*.

- *4%* of US old growth forest remains.
- *20%* of the world's large ancient forests remain intact.
- *90%* of residential construction is wood.
- *40%* of the waste stream is due to construction and demolition.
- Recycling an aluminum can uses *5%* of the energy needed to create a new can out of virgin mined aluminum.

Materials & Resources 43

Prerequisite 1: Storage & Collection of Recyclables

1: Building Reuse….. BR$_{ian}$

2: Construction Waste Management *CW*

3: Materials Reuse……. MR

4: Recycled Content …..RC

5: Regional Materials ….RM

6: Rapidly Renewable Materials..RRM

7: Certified Wood…. CW

MATERIALS & RESOURCES

MR Prerequisite 1: Storage & Collection of Recyclables

MR Credit 1: Building Reuse – Surface Area

1.1: Maintain 55%, 75%, 95%
of Existing Walls, Floors & Roofs

1.2: Maintain Interior Non Structural Elements

MR Credit 2: Construction Waste Mgt – Weight/Volume

2.1: 50% Divert from Disposal

2.2: 75% Divert from Disposal +

MR Credit 3: Materials Reuse – Cost

3.1: 5% Reuse

3.2: 10% Reuse +

MR Credit 4: Recycled Content – Cost

4.1: 10% (Post & ½ Pre-Recycled Content)

4.2: 20% (Post & ½ Pre-Recycled Content) +

MR Credit 5: Regional Materials – Cost

5.1: 10% Extracted, Processed & Manufactured Regionally

5.2: 20% Extracted, Processed & Manufactured Regionally

MR Credit 6: Rapidly Renewable Materials – Cost

MR Credit 7: Certified Wood – Cost

If percentage is not enough for MR1 – go for MR2. Materials can count for both MR 3 (reused) and MR 5 (regional) if they meet both requirements
Materials that count for MR 3 cannot count for 1, 2, 4, 6 or 7.

Materials and Resources

MR P1- (0) Storage & Collection of Recyclables- Design (Owner & Design Team)

Standard: None

Intent or Credit

Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills. Reduce waste stream to landfills

Requirements

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.

Strategy

Coordinate the size and function of the recycling areas with the anticipated collection services for glass, plastic, office paper, newspaper, cardboard, and organic wastes to maximize the effectives of the dedicated areas..

. Consider employing cardboard balers, aluminum can crushers, recycling chutes, and collection bins at individual workstations.

.Consider can crushers and collection bins at individual workstations

.Calculate actual material costs for project including labor and equipment and apply a **45% factor- LEED allows for this to estimate materials costs**

.Note that materials used for MR C3.1 and 3.2 can be applied to other MR credits.

.Projects that use existing buildings, but do not meet MR c1 requirements (75% of existing structure), may apply reused portions towards MRc2 –construction waste management.

Submittal Documentation

Confirm recycling areas have been provide per requirements,

. confirm types of material/area that are recycled. narrative.

MR P1

- Very different wording used to describe Storage and collection of recyclables
- At minimum: paper (not different sorts of paper, just paper), corrugated cardboard, glass, plastics, metals
- Metal, plastic, glass (not ferrous, PVC, etc..)
- Aluminum??
- Location:
    - Protection from elements
    - Security for high value materials
    - Signage to prevent from contamination
    - Designed by architect
    - Easily accessible area
    - Serving the entire building
    - Dedicated for recycling

Materials and Resources
MR C1.1- (1-3) Building Reuse - Maintain 50,75, 95% of Existing Walls, Floors, & Roof-Construction (Owner & Design Team)

Standard: None

Intent or Credit

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste, and reduce environ-mental impacts of new buildings as they relate to materials manufacturing and transport. Reduce demand for resources

Requirements

Maintain at least xx (based on surface area) of existing building structure (including structural floor and roof decking) and envelope (exterior skin an framing, excluding window assemblies and non-structural roofing material).

Hazardous materials that are remediated can be excluded from calks.

Credit is N/A if adding an addition that is 2x size of existing building.

Keep at least **xx** of existing bldg. **structural** elements- **floor, roof decking, exterior skin & framing- excludes windows and non-structural roof.**

Strategy

Consider reuse of existing buildings. Remove elements that pose contamination risk and upgrade components that would improve energy and water efficiency such as windows, mechanical systems, and plumbing fixtures.

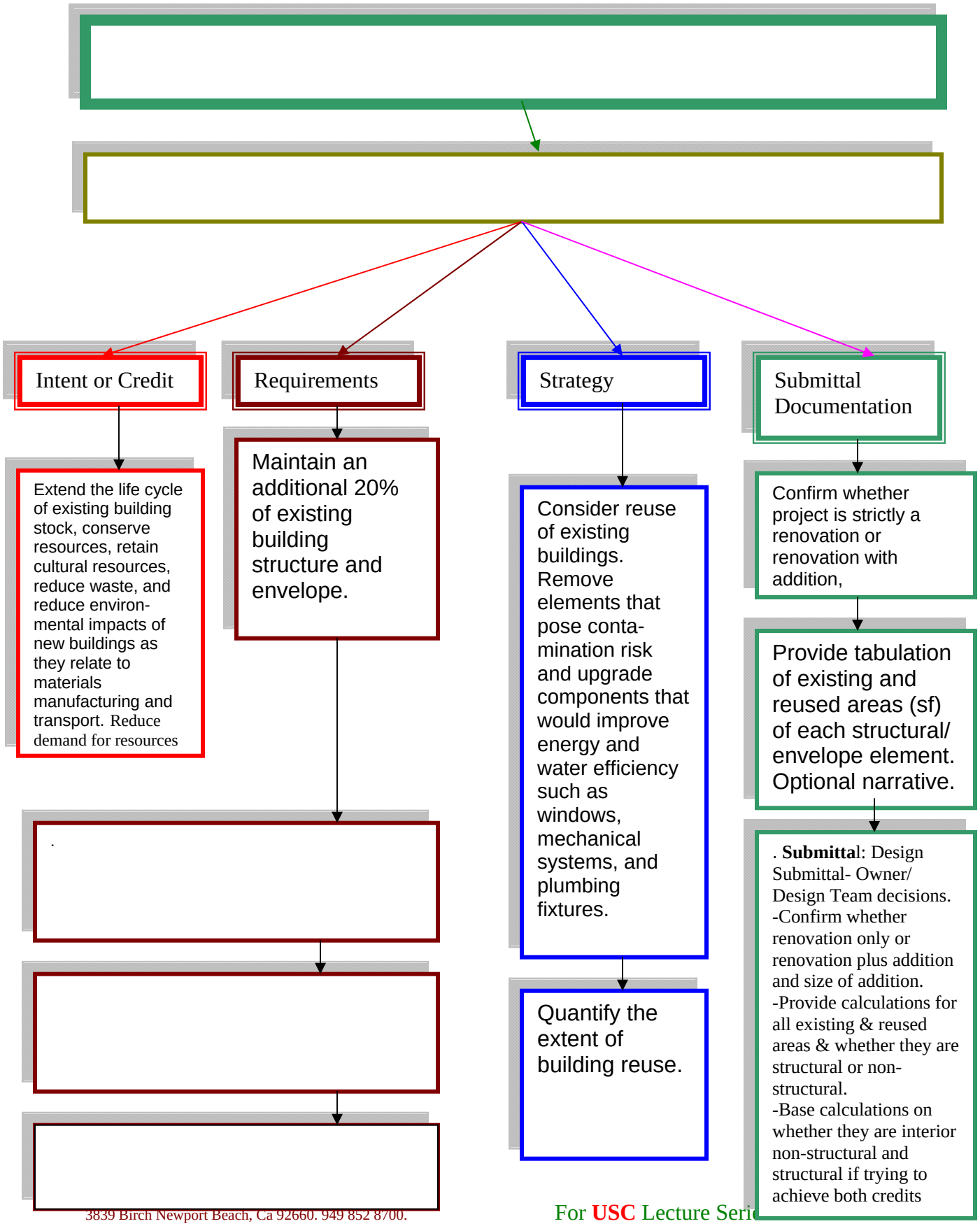
Quantify the extent of building reuse.

Submittal Documentation

Confirm whether project is strictly a renovation or renovation with addition,

Provide tabulation of existing and reused areas (sf) of each structural/ envelope element.

. **Submittal**: Design Submittal- Owner/ Design Team decisions.
-Confirm whether renovation only or renovation plus addition and size of addition.
-Provide calculations for all existing & reused areas & whether they are structural or non-structural.
-Base calculations on whether they are interior non-structural and structural if trying to achieve both credits.


Intent or Credit
Requirements
Strategy
Submittal Documentation
Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste, and reduce environ-mental impacts of new buildings as they relate to materials manufacturing and transport. Reduce demand for resources
Maintain an additional 20% of existing building structure and envelope.
.
Consider reuse of existing buildings. Remove elements that pose conta-mination risk and upgrade components that would improve energy and water efficiency such as windows, mechanical systems, and plumbing fixtures.
Quantify the extent of building reuse.
Confirm whether project is strictly a renovation or renovation with addition,
Provide tabulation of existing and reused areas (sf) of each structural/ envelope element. Optional narrative.
. **Submittal**: Design Submittal- Owner/ Design Team decisions.
-Confirm whether renovation only or renovation plus addition and size of addition.
-Provide calculations for all existing & reused areas & whether they are structural or non-structural.
-Base calculations on whether they are interior non-structural and structural if trying to achieve both credits

Materials and Resources
MR C1.2- (1) Building Reuse - Maintain xx of the interior Non-Structural Elements- Design (Owner & Design Team)

Standard: None

Intent or Credit

Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste, and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport. Reduce demand for resources

Requirements

Use existing interior non-structural elements (interior walls, doors, floor coverings and ceiling systems)

floor coverings and ceiling systems) in at least xx (by area) of the completed building (including additions).

Credit is N/A if adding an addition that is 2x size of existing building.

Interior non-structural elements such **non-structural: Walls, doors, floor coverings, and ceiling coverings**.

Strategy

Consider reuse of existing buildings. Remove elements that pose contamination risk and upgrade components that would improve energy and water efficiency such as windows, mechanical systems, and plumbing fixtures.

Quantify the extent of building reuse.

Submittal Documentation

Confirm whether project is renovation or renovation with addition.

Provide tabulation of total and reused areas (sf) of each non-structural interior element. Optional narrative.

. **Submittal**: Design Submittal- Owner/ Design Team decisions.
-Confirm whether renovation only or renovation plus addition and size of addition.
-Provide calculations for all existing & reused areas & whether they are structural or non-structural.
-Base calculations on whether they are interior non-structural and structural if trying to achieve both credits.

MR 1 Building Reuse (remember **BR** yan)

- Use of foundation of shell and structure of existing building
  - All brick and mortars crushed and reused as material
  - Some walls are removed and sent to recycling centers
  - Identification of volume of structural foundations, columns, and beams reused
  - Area of roof, exterior walls reused
  - Volume of roof, floor, and roof decks reused

- Building reuse credit:
  - Existing ceiling tiles (not panels, ductworks, labor, …)
  - Building reuse is based on area/volume not cost, FTE's, etc…
- Percent of existing walls, floors, roof maintained for MRC1.1= 0.75 or 75%
- Windows and doors (interiors) are excluded from building reuse calculations
- To 1M square feet office * 95% of existing walls, floors, and roofs= 950K sqft
- Building reuse does not have a baseline model
- Existing building information must be available MR1.2 structural only:
  - Window assemblies
  - Exterior skin and framing
  - Structural floor and roof decking
  - Major structural elements
  - Windows and exterior doors are needed to exclude from areas (interior doors are not included)
  - Ceiling tiles and lay-in tiles are structural 1.1 and 1.2.
- A warehouse being remodeled
  - New windows and non-structural roof needed
  - Used donated reclaimed flooring
  - What credits can be used
    - 1.1 Building Reuse
    - 1.2 Building Reuse
    - 1.3 Resource Reuse (donated flooring)
- A 40,000 sqft building renovation to use interior of building
  - If total non-structural is 30,000 sqft
  - 50% of 30,000 sqft needed to meet interior non-structural area reused credit
- 20,000 sqft building of reuse non-structural interior elements. Partial building addition of project is allowed if less than 2 times (2*20,000 sqft= 40,000 sqft).

- Building reuse technical analysis:
  - Structural elements, shell elements, in square feet
  - Square feet of reused/ total available square feet prior to demolition

Materials and Resources

MR C2.1- (1) Construction Waste Management - Divert 50% from Disposal- Construction (Contractor)

Standard: None

Intent or Credit

Divert construction and demolition debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

Divert debris from landfills

Requirements

Recycle and/or salvage at least 50% of non-hazardous construction and demolition. Develop and implement a construction waste management plan

that identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or commingled.

Calculations can be done by weight or volume but must be consistent throughout.

Divert **50%** waste from construction and demo- recycle or salvage. -Develop and implement **Construction Waste Mgt plan**

Strategy

Establish goals for diversion from disposal in landfills and incinerators. Designate an area for collection of recyclable materials and track recycling efforts. Identify haulers to handle the materials.

Obtain records (waste haul receipts, waste mgmt reports, spreadsheets, etc.) to confirm the diverted materials have been recycled or salvaged.

Based on weight or volume- soil and land clearing debris do not apply

Submittal Documentation

Complete construction waste calculation tables.

Information required includes: general description of each type of waste generated; location of receiving agent (recycler/landfill) for waste; quantity of waste diverted in tons or cubic yard.

Provide narrative including construction Waste Management Plan.

Materials and Resources
MR C2.2- (1+1Ex (90%)) Construction Waste Management - Divert 75% from Disposal
Construction (Contractor)

Standard: None

Intent or Credit

Divert construction and demolition debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.
Divert debris from landfills

Requirements

Recycle and/or salvage at least 75% of non-hazardous construction and demolition. Develop and implement a construction waste management plan

that identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or commingled.

Calculations can be done by weight or volume but must be consistent throughout.

Divert **50%** waste from construction and demo- recycle or salvage. -Develop and implement **Construction Waste Mgt plan**

Strategy

Establish goals for diversion from disposal in landfills and incinerators. Designate an area for collection of recyclable materials and track recycling efforts. Identify haulers to handle the materials.

Obtain records (waste haul receipts, waste mgmt reports, spreadsheets, etc.) to confirm the diverted materials have been recycled or salvaged.
Based on weight or volume- soil and land clearing debris do not apply

Submittal Documentation

Complete construction waste calculation tables.

Information required includes: general description of each type of waste generated; location of receiving agent (recycler/landfill) for waste; quantity of waste diverted in tons or cubic yard.

Provide narrative including construction Waste Management Plan.

o MR 2 Construction Waste Management (**CWM**)

- Materials donated will assist in construction waste management
- Contractor to sort waste credit to construction waste management
- Plastic, concrete, wallboards, insulation, will contribute to MR2
- Tree stumps, earth work, excavated soil, land work, debris, hazardous material do not meet MR2
- Diverted materials (i.e. concrete) contribute to MR2
- Submitted template:
  - General description of each type and category of waste
  - Location of receiving agent (recycling/refill)
  - Quantity of waste diverted (tons/cubic yard)
  - Do not include hazardous material
  - Fill dirt does not qualify

1.6 tons of steel and 6 cubic yard of wallboard cannot be the correct answered, since the units are not consistent

Materials and Resources
MR C3.1- (1) Material Reuse- 5% - Construction (Design Team & Contractor)

Standard: None. Use **actual costs or SI Master format Divs. 2-10 to determine material costs (total constr. Costs x .45)**

Intent or Credit

Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin

Requirements

Use salvaged, refurbished or reused materials such that.

the sum of these materials constitutes at least 10%, based on cost, of the total value of materials on the project (replacement value)

Exclude MEP, but furniture may be included if included consistently across MR credits 3-7.

Strategy

Identify opportunities to incorporate salvaged materials in building design.

Use salvaged materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick and decorative items.

Submittal Documentation

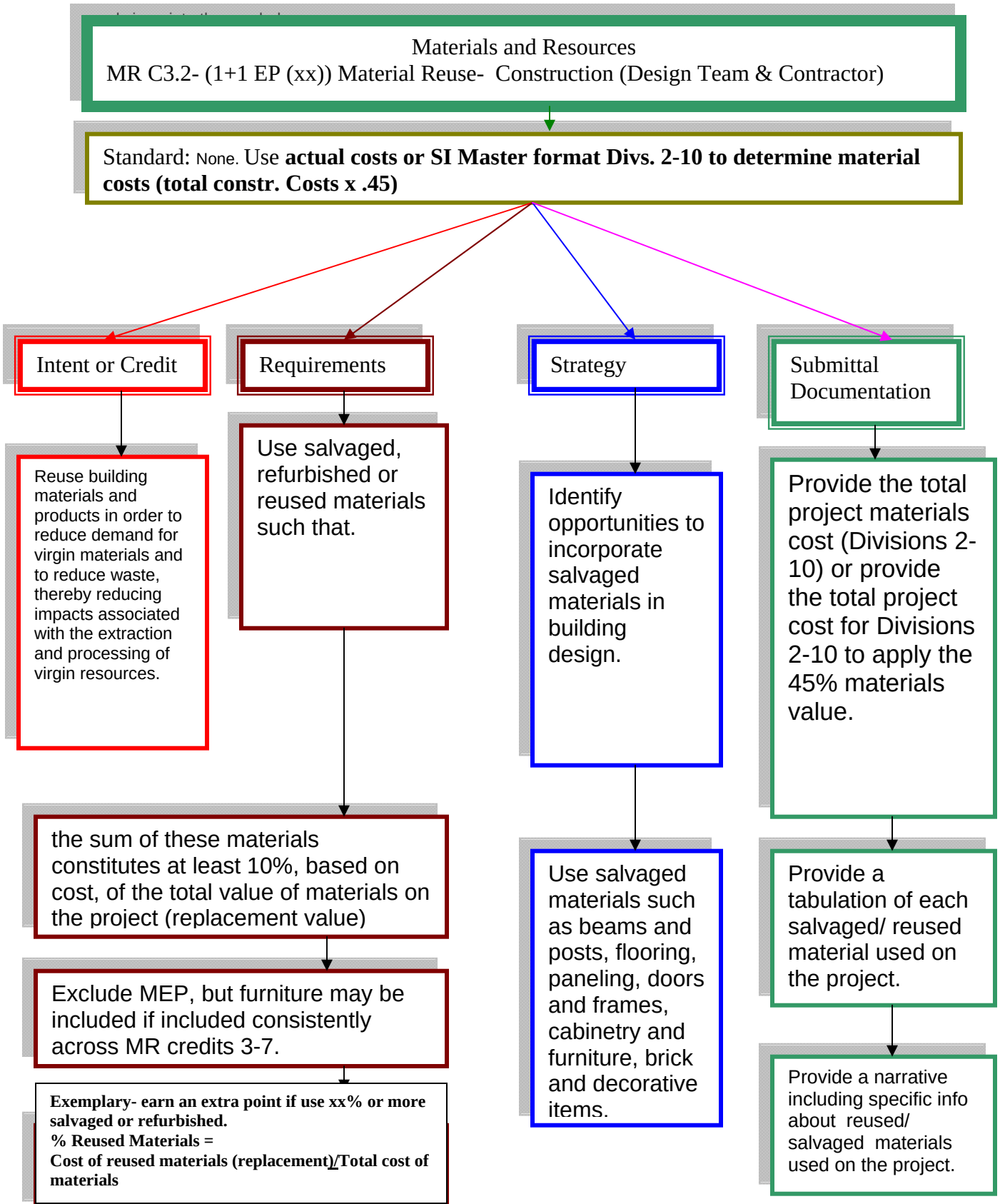
Provide the total project materials cost (Divisions 2-10) or provide the total project cost for Divisions 2-10 to apply the 45% materials value.

Provide a tabulation of each salvaged/ reused material used on the project.

Provide a narrative including specific info about reused/ salvaged materials used on the project.

MR 3 Material Reuse (remember **MR**.)

- MEP not included in MR3
- Furniture can be used from MR3 to MR7 furniture can be included if consistent
- Decorative components are considered as reuse
- Cost of on-site salvaged material is based on replacement value
- Bricks are reused resources
- Opportunities: Beams, posts, flooring, paneling, doors, frames, cabinets, furniture, bricks, architectural details
- If the existing building does not meet MRC1.1 building reuse, possible credits are:
  - 2.1 Construction Waste Management
  - 3.1 Material reuse
  - 3.2 Material Reuse
- Material reuse of 10M$ (cost of building construction)
  - 3.1 5% 0.05*10M$= 0.5M$
  - 3.2 10% 0.10*10M$= 1.0M$
  - EX 15% 0.15*10M$= 1.5M$
  - % reused material=
  - ++ Greater of the actual cost of the replacement value
  - cost of reused material (replacement)/total cost of material
- The material reuse can be reused as a different product: Fire door to counter top
- All factors are based on cost
- Salvaged wood flooring is material reuse
- No Salvaging: Wiring, copper, pipes, elevators, specialty items
- Bricks are ok
- Salvaged electrical panels may or may not be used?
- The material reuse and regional materials can be two points at all times
- Old doors contribute to
  - C2.1 Construction Waste Management
  - C5.1 Regional Materials
  - C3.1 Material Reuse
  - On Site doors and salvaged materials automatically qualify for MR5 regional materials
  - Material Reuse of doors to tables, sections, etc. can earn MR3
  - Building reuse credit:


Materials and Resources
MR C3.2- (1+1 EP (xx)) Material Reuse- Construction (Design Team & Contractor)
Standard: None. Use actual costs or SI Master format Divs. 2-10 to determine material costs (total constr. Costs x .45)
Intent or Credit
Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.
Requirements
Use salvaged, refurbished or reused materials such that.
the sum of these materials constitutes at least 10%, based on cost, of the total value of materials on the project (replacement value)
Exclude MEP, but furniture may be included if included consistently across MR credits 3-7.
Exemplary- earn an extra point if use xx% or more salvaged or refurbished.
% Reused Materials =
Cost of reused materials (replacement)/Total cost of materials
Strategy
Identify opportunities to incorporate salvaged materials in building design.
Use salvaged materials such as beams and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick and decorative items.
Submittal Documentation
Provide the total project materials cost (Divisions 2-10) or provide the total project cost for Divisions 2-10 to apply the 45% materials value.
Provide a tabulation of each salvaged/ reused material used on the project.
Provide a narrative including specific info about reused/ salvaged materials used on the project.

Materials and Resources
MR C4.1- (1) Recycled Content- 10% (post-consumer+1/2 pre-consumer)- Construction (Design team and Contractor)

Standard: ISO 14021 – Environmental Labels and Declarations = Self-Declared Environmental Claims (Type II Environmental Labeling) **ISO 14021, Environmental Labels and Declaration**

Intent or Credit

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

Requirements

Recycled content is determined by weight generally. The recycled fraction of the products is then multiplied by the total cost of the product to determine the recycled content. (10% based on cost).
Recycled Content Value = Material cost x (post-consumer % by weight + ½ pre-consumer content by weight)
Example- 10% of product by weight has recycled content, therefore .10 x cost of total product ($100) = $10.00 or recycled content value.
Use materials with recycled content such that the sum of postconsumer recycled content plus

1/2 of the pre-consumer content constitutes at least 10% (based on cost) of the total value of the materials in the project.

Exclude MEP, but furniture may be included if included consistently across MR credits 3-7.

Strategy

Establish project goal for recycled content materials and identify material suppliers that can achieve this goal.
-Recycled Content Determined by Weight
-Recycled Content Value=Weight x Cost

During construction, ensure that recycled content materials are installed.

Submittal Documentation

1 - Provide **total project materials cost** (or total project cost x **45% default** materials value).

Provide a table of each material including description of the material, the manufacture, the product cost, the pre-consumer and/or post-consumer recycled content %, and source of the data.

Optional narrative.
- Provide **tabulation** of each material including:
a) **Description** of the material
b) **Manufacturer** of the material
c) **Product cost**
d) Pre-consumer and/or postconsumer **recycled content %**
e) **Source** of the data

Materials and Resources
MR C4.2- (1+1EP(30%)) Recycled Content- 20% (post-consumer+1/2 pre-consumer)- Construction (Design team and Contractor)

Standard: ISO 14021 – Environmental Labels and Declarations = Self-Declared Environmental Claims (Type II Environmental Labeling)

Intent or Credit

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

Requirements

Use materials with recycled content such that the sum of postconsumer recycled content plus 1/2 of the pre-consumer content constitutes at least 20% (based on cost) of the total value of the materials in the project. Exclude MEP, but furniture may be included if included consistently across MR credits 3-7.

Exemplary : An additional point granted for achieving 30% recycled content.
Example: Floors with post-consumer content by weight of 5% and decking made of pre-consumer waste content by weight of 10% = 5%+ ½ of 10% = 10% total. The total value of the floors and decking is $12,000.10% of $12,000 = $1,200

Calculations: Provide recycled content of each item by weight plus value.

Strategy

Establish project goal for recycled content materials and identify material suppliers that can achieve this goal.
-Recycled Content Determined by Weight
-Recycled Content Value=Weight x Cost

During construction, ensure that recycled content materials are installed.

Submittal Documentation

Provide total project materials cost (or total project cost x 45% default materials value).

Provide a table of each material including description of the material, the manufacture, the product cost, the pre-consumer and/or post-consumer recycled content %, and source of the data.

Optional narrative.
- Provide **tabulation** of each material including:
a) **Description** of the material
b) **Manufacturer** of the material
c) **Product cost**
d) Pre-consumer and/or postconsumer r**ecycled content %**
e) **Source** of the data

MR 4 Recycling 10% ->20% ->EP 30% (RC)

- Standard: International organization for standardization document ISO 14021, Environmental Label Declaration
- Use CSI Master format 1995 Division 2-10 to determine material costs * 0.45
- Recycling philosophy: Value of recycling construction waste= Modest
  - = function of (regional markets, significant saving, hauling costs can be realized)
  - = Costs (avoid tipping)
  - = Improved packing capacity and efficiency of dumpsters thus reduced cost of hauling)
    - Key = Improved packing efficiency
- Use 45% of total cost (include labor and equipment)
  - MR3 Material Reuse
  - MR4 Recycled Material
  - MR5 Regional Material
  - Furnishing can be used if consistent MR3 to 7
- Example :
  - Post consumer by weight 5% floor
  - Pre-consumer waste by weight 10% decking
  - 5% post consumer + ½ (10% pre-consumer) = 10%
  - Floor + Decking = 10% of $12000 = $1,200.00
- Recycled content of Steel as recycled credit
  - Use 25% recycled content… if no information known, use 25% content of material
- Flooring, restroom partitions is recycled content, not EMP, appliance, plumbing,
- Only include permanent materials except furniture
- 10% of product by weight has recycled content
  - 0.10 (cost of $100 total) = 10$ of recycled content value
- Recycled content value = material cost
  - [Post Consumer %weight + ½ pre-consumer % weight]
- Content (Pre Consumer): Material diverted from waste stream during manufacturing process
- Post Industrial Content
  - Blue jean factory --→ fabric scrap --→ cotton insulation
  - Small mill --→ wood chip saw dust --→ composite board manufactured
  - Incinerator coal burning -→ fly ash -→ concrete
  - Tire Plant → Rubber → Carpet
  - Carpet and textile -> Waste Fiber -> carpet padding
  - Sawdust from sawmill -→ composite board
  - Lumber Mill Board -→ Pine bark mulch & nuggets → Landscaping
  - Textile manufacturing plant -→ waste fiber -→ carpet padding
  - Newspaper print overrun -> wood - > cabinets

MR 4

- Post Industrial not used as
  - Existing recycled cannot be used in materials again
  - Recycled pop bottles → carpet… Cannot use recycled material … No Leed
  - Carpets made from nylon scraps of a production
  - Steel beams created from metal reclaimed from manufacturing line
  - Metal studs contain known percentage of scraps and trimming collected and fed back into manufacturing process
  - Crushed bricks recovered from a building demolished to make way for the current project and used as drainage base for previous courtyard of new building
  - Extra drywall from a residential projects → drywall not post consumer
  - Wooden pallets used by a shopping company pallets are post consumer and shipping did not make them
  - Manufacturer of stud ---←--scraps and trimming ←- back to factory
  - Building demolished -→ Crushed brick --→ drainage base (this is not manufactured. Cannot use.
  - Brewery --- > Spent grain --- > Use as FEED.. No LEED for FOOD
  - Materials made from rework, regrind, or scrap generated to the other factors
  - Same process products rework, regrind, scraps generated, one process backing → process
  - WWW.ciwmb.ca.gov/rcp
  - Ca.integ.waste management board.
  - Scraps from reclaimed and used to make same items, not appliances.
- Heavy Steel Frames: High scrap material = Recycled material MR4
- Fly Ash = Recycled content, Innovative Design (not exemplary)
- ISO organization for Recycled Content
- Material: to evaluate recycling
- Documentation required
  - Summary of diversion rates from recycler for commingled recycling
  - Waste haul receipt for recycled material
  - Commingled is opposite of “on-site separation”
  - Crushed and reused concrete (if done on site) and masonry or asphalt
  - Bricks from demolition to buyers who sell or donate bricks for other construction site: construction waste management
  - Submittal templates require:

Quantity of diverted/Recycled Waste …. No approximation

Materials and Resources

MR C5.1- (1) Regional (within 500 miles) Materials - 10% Extracted, Processed & manufactured Regionally- Construction (Design Team and Contractor)

Standard: **CSI Master Format Div.2-10 (.45x total constr. Costs) if no actual value**
***salvaged goods can apply and point of pickup can be extraction location**

Intent or Credit

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

Use bldg materials/ products that have been extracted, harvested or recovered,

and manufactured within 500 miles of the site for minimum 10% (based on cost) of the total materials value.

If only a fraction of a product/material is extracted/ harvested/recover

and manufactured locally, then only that percentage by weight shall contribute to the regional value. Divisions 2-10 only.

Strategy

Run a preliminary calculation during Design to set appropriate target. Establish goal for locally sourced Materials, and identify materials and suppliers.

During construction, ensure that specified local materials are installed.

Submittal Documentation

Provide the project's total project cost for 45% default factor or total materials cost. Complete regional materials calculation table including manufacturer, total product cost, percentage of product by weight that meets both extraction

and manufacture criteria, distance from extractions/ harvest/recovery site and project site; distance between manufacturing location and project site. Optional narrative.

- Complete regional materials calculation **table** including
a) **Product name** for each tracked material
b) **Product cost**
c) **Percentage** of product by **weight** that meets both extraction and manufacture criteria
d) **Distance** from extractions /harvest / recovery site and project site
e) **Distance** between manufacturing location and project site.

Materials and Resources

MR C5.2- (1+1 EP (40%)) Regional (within 500 miles) Materials - 20% Extracted, Processed & manufactured Regionally - Construction (Design Team and Contractor)

Standard: **CSI Master Format Div.2-10 (.45x total constr. Costs) if no actual value**
***salvaged goods can apply and point of pickup can be extraction location**

Intent or Credit

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

Use bldg materials/ products that have been extracted, harvested or recovered,

and manufactured within 500 miles of the site for minimum 20% (based on cost) of the total materials value.

If only a fraction of a product/material is extracted/ harvested/recover

and manufactured locally, then only that percentage by weight shall contribute to the regional value. Divisions 2-10 only.

Strategy

Run a preliminary calculation during Design to set appropriate target. Establish goal for locally sourced Materials, and identify materials and suppliers.

During construction, ensure that specified local materials are installed.

Submittal Documentation

Provide the project's total project cost for 45% default factor or total materials cost. Complete regional materials calculation table including manufacturer, total product cost, percentage of product by weight that meets both extraction

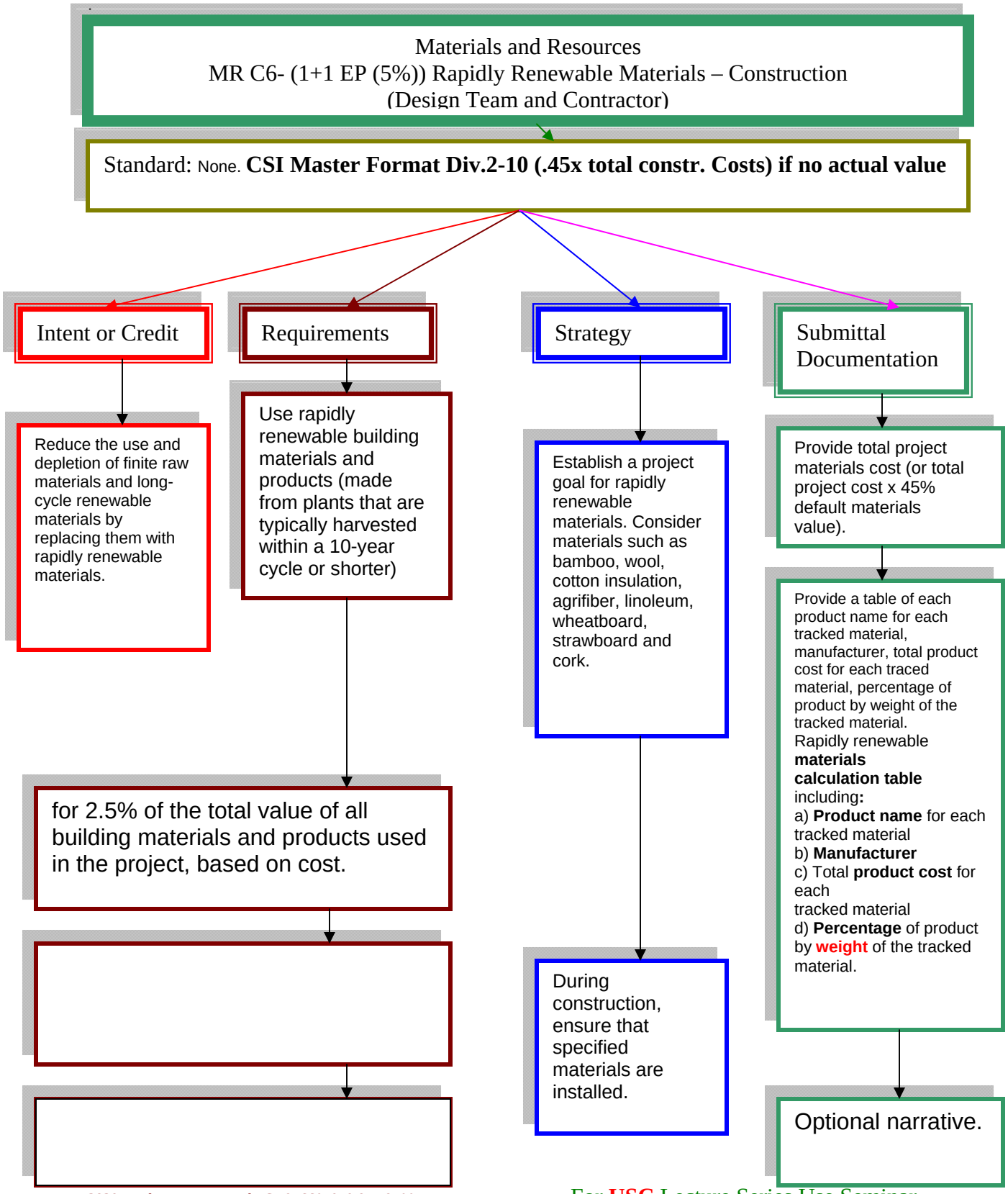
and manufacture criteria, distance from extractions/ harvest/recovery site and project site; distance between manufacturing location and project site. Optional narrative

- Complete regional materials calculation **table** including
a) **Product name** for each tracked material
b) **Product cost**
c) **Percentage** of product by **weight** that meets both extraction and manufacture criteria
d) **Distance** from extractions /harvest / recovery site and project site
e) **Distance** between manufacturing location and project site.

MR 5 Regional Material (remember **RM** **(Ronald McDonald.)**

- Refurbished doors offside MR5 regional and MR3 Reused
- Salvaged materials: cannot comply with MR3 with MR 1,2, 3, 6, or 7. (Only MR5)
- 20% manufactured, 50% extracted within 500 miles
- Place of manufacturing, extraction, …, 500 miles radius
- To calculate regional material
    - Material salvaged within 500 miles
    - Costs of materials extracted and manufactured within 500 miles
    - Total cost of materials
    - You cannot call it "purchased" within 500 mile since origin of material is not known
    - Innovative Design is 40%
        - $1,000,000.00 building: *0.45 = $450,000 Material cost
        - For ID, 0.40 * $450,000 = $180,000.00 Regional Material
        -

MEP not included in MR3

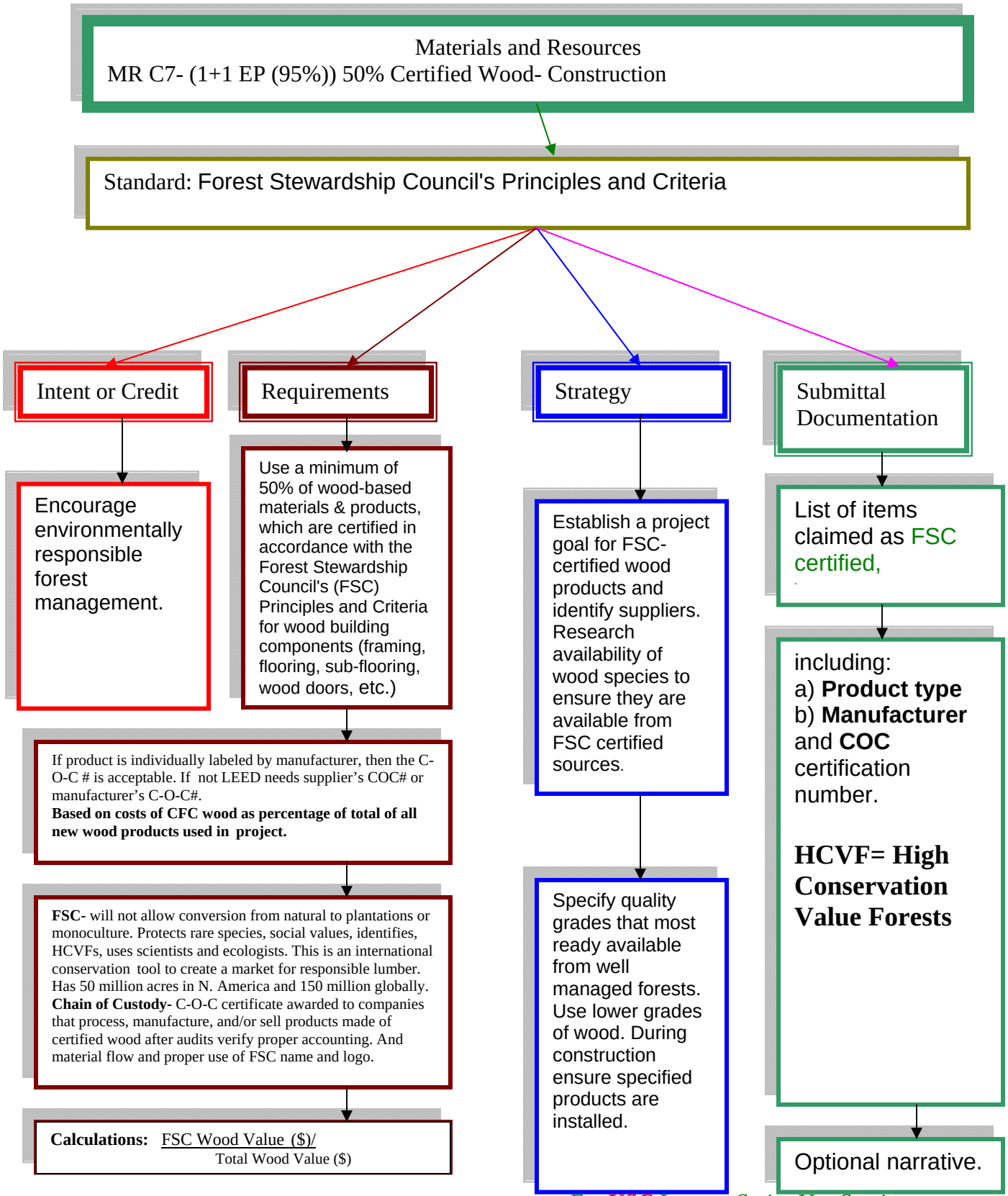

Materials and Resources
MR C6- (1+1 EP (5%)) Rapidly Renewable Materials – Construction
(Design Team and Contractor)
Standard: None. CSI Master Format Div.2-10 (.45x total constr. Costs) if no actual value
Intent or Credit
Requirements
Strategy
Submittal Documentation
Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.
Use rapidly renewable building materials and products (made from plants that are typically harvested within a 10-year cycle or shorter)
Establish a project goal for rapidly renewable materials. Consider materials such as bamboo, wool, cotton insulation, agrifiber, linoleum, wheatboard, strawboard and cork.
Provide total project materials cost (or total project cost x 45% default materials value).
Provide a table of each product name for each tracked material, manufacturer, total product cost for each traced material, percentage of product by weight of the tracked material.
Rapidly renewable materials calculation table including:
a) Product name for each tracked material
b) Manufacturer
c) Total product cost for each tracked material
d) Percentage of product by weight of the tracked material.
for 2.5% of the total value of all building materials and products used in the project, based on cost.
During construction, ensure that specified materials are installed.
Optional narrative.

.

MR 6 Rapidly Renewable Materials 2.5% EP 5%

- Rapidly Renewable Materials: Bamboo, wool, wool carpet, bamboo walls, wheat board grass, cotton, agri-fiber, linoleum, rosins, jute, wheat board, strawboard, cork, limestone, oil, sun flour, seed board
- Not rapidly renewable:
  - Pine Flooring, recycled flooring, light bulbs, granite counter top, brick, asphalt
  -
- 10 year life cycle
- MR6 is based on cost (cost of material and equipment and labor)
- 2M$ = cost of material, 2.5% = 50,000$
- $10M material cost
  - *2.5% = $250,000 MR6
  - *5% = $500,000 MR6 EP

At minimum


Materials and Resources
MR C7- (1+1 EP (95%)) 50% Certified Wood- Construction
Standard: Forest Stewardship Council's Principles and Criteria
Intent or Credit
Requirements
Strategy
Submittal Documentation
Encourage environmentally responsible forest management.
Use a minimum of 50% of wood-based materials & products, which are certified in accordance with the Forest Stewardship Council's (FSC) Principles and Criteria for wood building components (framing, flooring, sub-flooring, wood doors, etc.)
Establish a project goal for FSC-certified wood products and identify suppliers. Research availability of wood species to ensure they are available from FSC certified sources.
List of items claimed as FSC certified,
If product is individually labeled by manufacturer, then the C-O-C # is acceptable. If not LEED needs supplier's COC# or manufacturer's C-O-C#.
Based on costs of CFC wood as percentage of total of all new wood products used in project.
including:
a) Product type
b) Manufacturer and COC certification number.
HCVF= High Conservation Value Forests
FSC- will not allow conversion from natural to plantations or monoculture. Protects rare species, social values, identifies, HCVFs, uses scientists and ecologists. This is an international conservation tool to create a market for responsible lumber. Has 50 million acres in N. America and 150 million globally.
Chain of Custody- C-O-C certificate awarded to companies that process, manufacture, and/or sell products made of certified wood after audits verify proper accounting. And material flow and proper use of FSC name and logo.
Specify quality grades that most ready available from well managed forests. Use lower grades of wood. During construction ensure specified products are installed.
Calculations: FSC Wood Value ($)/ Total Wood Value ($)
Optional narrative.

MR 7 Certified Wood 50% ->95% EP

- Chain of Custody (COC) documents needed
- Qualification of MR7:
  - Weight of certified wood as fraction of all wood-based product
  - Value of all salvaged and refurbished wood products used on a project cannot be used
  - COC certificate number: Numbers for all certified wood products
  - Specification and submittal highlighting installed certified wood based materials
  - Spread sheet of all wood-based materials relevant calculations
  - Documentation showing 5% of wood based materials are certified Forest Stewardship Guidelines (Council)
  - 200K$ new wood and 10,000 $ reclaimed wood flooring
    - 0.50* 200,000 $= $100k Certified wood
    - Reclaimed wood does not account
    - Leed AP must verify:
      - Must only verify virgin wood
        - Rough Carpentry
        - Wood Doors and frames
      - Not used as MR7
        - Salvaged/refurbished wood

- Recycling wood fiber protein

Area

- MR 1 Building Reuse 1.1 (75%), 1.2(95%): Structural, 1.3(50% interior)

Volume or Weight

- MR 2 Construction Waste 2.1 (50%), 2.2 (75%), EP (95%)

Cost

- Material Resources
  - 3 Reuse 3.1 (5%), 3.2 (10%), EP (15%)….. 5% increment
  - 4 Recycled 4.1 (10%), 4.2 (20%), EP (30%) …10%
  - 5 Regional 5.1 (10%), 5.2 (20%), EP (40%) …10% & 20%
  - 6 Rapidly Renewed 2.5%, EP (5%) … 2.5%
  - 7 Certified Wood 50%, EP (95%)

MR General

- For cost, LEED NC 2.2: use 45% of total costs (including labor and equipment) to establish default total material cost
- Structural timber salvaged from demolition site: MR3 Reuse & MR% regional
- Natural Fiber Benefits: MR6: Rapidly Renewable, and EQ4.3 Low emitting materials EQc4.3, must comply with CRI for limiting voc
- 30,000 wood frames warehouse, 50,000 sqft new construction
  - Replace windows from next City maker
  - Reduces wood floors from local company
    1. Credits MR3Resource, MR5 Regional material. MR2 Construction Waste
- Analysis on selection of materials
  - Evaluations must consider
    1. First costs, including installation
    2. maintenance costs including maintenance efforts and material used
    3. Life expectancy and replacement cost

- Courtroom to be built with steel or concrete
  - Construction waste material C2 almost in all cases apply
  - Resource use C3 nearly all times sometimes with verbiage
  - Local and regional material C5 it almost is the answer with C3 at all times
  - Do Not Use Rapidly Renewed Material C6. Hint: Steel or concrete
  - Almost never ID point
  - No building reuse, since the construction is ground up
  -

Indoor Environmental Quality

EQ Prerequisite 1: Minimum IAQ Performance
EQ Prerequisite 2: Environmental Tobacco Smoke (ETS) Control

EQ Credit 1: Outdoor Air Delivery Monitoring

EQ Credit 2: Increased Ventilation

EQ Credit 3.1: Construction IAQ Management Plan: During Construction
EQ Credit 3.2: Construction IAQ Management Plan: Before Occupancy

EQ Credit 4.1: Low-Emitting Materials: Adhesives & Sealants
EQ Credit 4.2: Low-Emitting Materials: Paints & Coatings
EQ Credit 4.3: Low-Emitting Materials: Carpet Systems
EQ Credit 4.4: Low-Emitting Materials: Composite Wood & Agrifiber Products

EQ Credit 5: Indoor Chemical & Pollutant Source Control

EQ Credit 6.1: Controllability of Systems: Lighting
EQ Credit 6.2: Controllability of Systems: Thermal Comfort

EQ Credit 7.1: Thermal Comfort: Design
EQ Credit 7.2: Thermal Comfort: Verification

EQ Credit 8.1: Daylight & Views: Daylight 75% of Spaces
EQ Credit 8.2: Daylight & Views: Views for 90% of Spaces

A typical IAQ investigation involves the following steps:

1. **Determine who is affected, and when and where they are affected**
2. **Inventory potential sources of environmental agents that may be related to indoor environmental quality problems**
3. **Look for locations and sources of moisture intrusion or water damage**
4. **Investigate heating, ventilating and air conditioning (HVAC) system problems and air movement pathways.**

Indoor Environmental Quality

- A well-designed daylight building is estimated to reduce energy use by *50% to 80%*.

The average American spends 90% of their time indoors, so the potential for buildings to either adversely affect or positively support human health and productivity in the U.S. is therefore significant.

- It's estimated that U.S. businesses lose 60 to 400 billion dollars annually as a result of building-related illnesses.

. Indoor Environmental Quality

LEED projects must meet the minimum indoor air quality (IAQ) performance standards of ASHRAE 62-1999, which has become a common design standard, and includes prohibiting or controlling smoking within the building. The IAQ category awards credits for building features such as carbon-dioxide monitoring, ventilation effectiveness, construction IAQ management, and use of low-emitting paints, adhesives, carpet and composite wood.

Carbon-dioxide monitoring requires that exterior sensors be installed in line with the air

handlers and integrated into the building-control system. Ventilation effectiveness is achieved via operable windows or alternative ventilation systems such as underfloor or high-velocity supplies. Buildings should work with their **MEP designers** during project planning to evaluate design alternatives.

IAQ construction-management plans include protection of ductwork from contamination that might result from debris, dust and mold during construction, and proper house keeping to minimize dispersal of airborne contaminants. These procedures generally do not add to the

capital cost of a project, but do require proper construction sequencing and monitoring.

IAQ management before occupancy can be achieved with a two-week period of flushing the mechanical system with 100 percent outside air, or through a baseline IAQ testing protocol. Flush-out is the more cost-effective approach provided time is allotted in the schedule and excess humidity from the outside air is not a concern. IAQ testing will add to a project's costs. These costs are based on the number of testing points within the building, and the quantity and placement of testing points is

dependent on the size and program of the facility.

Low-emitting paints, adhesives and sealants are available at no additional cost; low-emitting composite wood products are more difficult to incorporate. Some products are available, but their long-term performance is somewhat unsubstantiated. Achieving these credits requires the preparation of volatile organic compound (VOC) budgets for each material to document its IAQ performance.

			Indoor Environmental Quality	15 Points
Y		Prereq 1	**Minimum IAQ Performance**	Required
Y		Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
		Credit 1	**Outdoor Air Delivery Monitoring**	1
		Credit 2	**Increased Ventilation**	1
		Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
		Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
		Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
		Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
		Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
		Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
		Credit 5	**Indoor Chemical & Pollutant Source Control**	1
		Credit 6.1	**Controllability of Systems**, Lighting	1
		Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
		Credit 7.1	**Thermal Comfort**, Design	1
		Credit 7.2	**Thermal Comfort**, Verification	1
		Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
		Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

EQc8.1	Daylight & Views, Daylight 75% of Spaces	•	95% daylighting based on the requirements by compliance path
EQc8.2	Daylight & Views, Views for 90% of Spaces	•	No prescribed

Submittals **Indoor Environmental Quality**

- EQp1: description of ventilation design, confirm. meets ASHRAE 62.1-2004, drawings of natural ventilated zones & operable windows
- EQp2: confirm. option chosen, drawings if applicable & testing results if applicable
- EQc1: confirm. option chosen, confirm compliances, description of monitoring systems, drawings w/ location & type of sensors & natural vent. components
- EQc2: confirm. option chosen, confirm meets ref. standard requirements, required calcs & drawings, description of design method & ventilation used if applicable
- EQc3.1: copy of IAQ plan, confirm air handling equipment installation method, photos highlighting each approach to IAQ plan, list of filtration media used & confirm it was replaced after
- EQc3.2: copy of IAQ plan highlighting pre-occupancy phase practices, confirm. of option used & compliance
- EQc4.1-4.4: list of each critical product used. Include name/manual/VOC/allowable VOC based on SCAQMD, source of VOC & compliant statement
- EAc5: confirm. required entryway systems installed, description & info on system installed, project drawings w/ locations, copies of mech. drawings, confirm. meets vent. & chem. requirements, confirm. filter requirements met
- EAc6.1&6.2: # of workstations w/ controls, list of multi-occ. spaces w/ controls, description of controls + strategy + location used
- EAc7.1: seasonal temp. data, description of method used + confirm. compliance w/ ASHRAE 55-2004
- EAc7.2: description of planned survey and a possible plan if survey shows dissatisfaction
- EAc8.1: areas and calculations for respective options. Project drawings with results of modeling simulations if applicable.
- EAc8.2: calculation requirements, completion of online template, total area of reg. occupied space and spaces w/ views, copies of line of sight drawings in plan and section

Indoor Environmental Quality
EQ P1- Minimum IAQ Performance- Design

Standard: **ASHRAE62.1-2004, Secs. 4-7**, Acceptable Indoor Air Quality

Intent or Credit

Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings,

thus contributing to the comfort and well-being of the occupants.

Requirements

Meet the minimum requirement of Sections 4 through 7 of ASHRAE 62.1-2004, Ventilation for Acceptable Indoor Air Quality.

Mechanical ventilation systems shall be designed using the Ventilation Rate Procedure or the applicable local code, whichever is more stringent.

Naturally ventilation of buildings shall comply with ASHRAE 62.1-2004 p 5.1:

. **(<u>window size>/4% net occupiable floor area</u>)**

Strategy

Design ventilation systems to meet/ exceed rates as per ASHRAE std for Active (Mechanical) Ventilation,

Passive (Natural) Ventilation, Mixed-mode Ventilation.

-Balance impacts of ventilation rates on energy use and IAQ to optimize for energy efficiency and health.
- 3 strategies for venting buildings-
oActive (mechanical): ASHRAE 62.1-2004, Sec. 6
oPassive (natural)- ASHRAE 62,1-2004 Section 5.1
oMixed-mode- AHRAE 62.1-2004 Section 6

Submittal Documentation

Design narrative describing the ventilation design

For mechanical ventilated bldg. confirm

For naturally ventilated bldg, confirm design meets window opening requirements per ASHRAE and provide drawings.

Indoor Environmental Quality

EQ P2- Environmental Tobacco Smoke (ETS) Control- Design

Standard: **ANSI/ASTM - E779-03**, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization

Intent or Credit

Minimize exposure of building occupants, indoor surfaces, and ventilation air distribution systems to Environmental Tobacco Smoke (ETS).

Requirements

OPTION 1: Prohibit smoking. Locate exterior smoking areas 25' from entries, outside air intakes, and operable windows.

OPTION 2: Prohibit smoking except in designated areas. Locate exterior smoking areas 25' from entries, O/A intakes, windows. Locate designated smoking rooms to effectively contain, capture and remove ETS from bldg. Smoking room to be direct exhausted to outdoors and enclosed with deck-to-deck partitions. Performance testing of differential air pressures required (5Pa Ave, Min. 1Pa).

OPTION 3 (residential only): Prohibit smoking from all common areas. Locate exterior smoking areas 25' from entries, O/A intakes, windows open to common areas. Minimize uncontrolled pathways for ETS transfer between units. All doors to units from common halls to be weather stripped.

Strategy

Prohibit smoking in the building.

Provide designated areas outside the building where ETS will not enter the building or vent system.

Post info on non-smoking policy. If interior smoking areas are design within the building, separate ventilation systems must be installed and their effectives must be tested.

Submittal Documentation

Confirm project has met appropriate project category: Non-Smoking Building; Building with Designated smoking Rooms; or residential Project. For interior smoking rooms or residential project, provide copies of drawings to document location of smoking rooms, designed area separations, and dedicated ventilation systems.
Optional narrative.

Design meets Ventilation Rate Procedure.

..

Indoor Environmental Quality
EQ C1- (1) Outdoor Air Delivery Monitoring- Design

Standard: **ASHRAE 62.1-2004, Min. Outdoor Air rate** -For mechanical Ventilation Spaces, **monitor CO2 levels in all densely occupied** areas with monitors 3-6 ft above floor

Intent or Credit

Provide capacity for ventilation system monitoring to help sustain occupant comfort and well-being. Ventilation -Bring Fresh Air In and monitor

Requirements

Install permanent monitoring systems that provide feedback on ventilation system performance to ensure that ventilation systems maintain design minimum ventilation requirements. Configure system to generate alarm when conditions vary by 10% of setpoint. For mechanically vented spaces, monitor carbon dioxide concentrations in densely occupied spaces - 25 people per 1000 sf. Non-densely occupied spaces, provide direct outdoor airflow measure devise to measure min outdoor airflow r ate to detect when system is 15% below the design rate.

a) Install permanent Monitoring systems and make sure minimum requirements are met; b) Alarm generated if varies by **10%** audible, auto to operations or both

For naturally vented spaces, monitor CO2 within all naturally vented spaces.

Strategy

Install CO2 and airflow measure equipment (Pitot tubes, Venturi meters and rotating vane anemometers) and feed the info to the HVAC system and BAS.

.. For mech. Vent. Spaces, **monitor CO2 levels in all densely occupied** areas with monitors 3-6 ft above floor - for non-densely pop. Areas provide direct outdoor airflow meas. **device per ASHRAE**
-For naturally vent. Areas monitor CO2, but can be shared for multiple spaces w/stacks

Submittal Documentation

Confirmation of the type of ventilation system and installed controls. Design narrative including ventilation design and CO2 monitoring system. Copies of applicable drawings.

design meets Ventilation Rate Procedure.

-Type of ventilation system and controls with description of ventilation and CO2 systems.
-Location of monitors
-Project drawings

Indoor Environmental Quality
EQ C2- Increase Ventilation- Design

Standard: ASHRAE 62.1-2004:Ventilation for Acceptable Indoor Air Quality
The Carbon Trust Good Practice Guide 2347: Natural Ventilation in non-domestic Buildings
CUBES Application Manual 10:2005: Natural Ventilation in non-domestic buildings

Intent or Credit

Provide additional outdoor air ventilation to improve indoor air quality for improved occupant comfort, well-being and productivity.

Requirements

MECHANICALLY VENTED SPACES: Increase breathing zone O/A vent rates to 30% above min rates req'd by ASHRAE Std 62.1-2004. NATURALLY VENTED SPACE: Design system to meet Carbon Trust Good Practice Guide 2347 [1998]. Determine that natural vent is effective for project by following the flow diagram process shown in Figure 1.18 of CUBES Applications Manual 10: 2005. Use diagrams/ calcs to show design meets CISBE OR use macroscopic, multi-zone, analytic model to predict that room-by room airflows will effectively naturally ventilate 90% of occupied spaces per ASHRAE 62.1-2204 Chapter 6.

..

Strategy

For mechanically ventilated spaces, use heat recovery to minimize the add'l energy consumption associated with higher ventilation rates. For naturally ventilated spaces, follow Carbon Trust Good Practice Guide 237: 1) Develop design reqmts, 2) Plan airflow paths, 3) Identify bldg uses & features that might require special attention, 4) Determine vent reqmts, 5) Estimate external driving pressures, 6) Select types of ventilation devices, 7) Size vent devices, 8) Analyze design. Use software (NIST's CONTAM).

Submittal Documentation

Mechanically Ventilated: confirm that breathing zone rates have been designed to exceed ASHRAE 62.1-2004 by 30% and provide design narrative. Naturally Ventilated: Confirm system has been design to meet Carbon Trust Good Practice Guide 237. Design narrative design method.

design meets Ventilation Rate Procedure.

..

Indoor Environmental Quality
EQ C3.1- Construction IAQ Management Plan- During Construction- Construction

Standard: IAQ Guidelines for Occupied Buildings Under Construction- SMACNA/ASHRAE 52.2-1999: Method of Testing General Ventilation Air Cleaning Devices by Removal Efficiency by Particle Size

Intent or Credit

Reduce indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and wellbeing of construction workers and building occupants.

Requirements

Develop and implement an Indoor Air Quality (IAQ) Management Plan for construction and pre-occupancy phase of the bldg as follows:

(1) During construction meet or exceed Control Measure of the SMACNA IAQ Guidelines for Occupied Buildings under Construction.

(2) Protect stored on-site or installed absorptive materials from moisture damage,

(3) Permanent AHU's during construction must have filters with Mini-mum Efficiency Reporting Value of 8 per AHSRAE 52.2-1999.

Strategy

Adapt IAQ plan to (1) protect HVAC system during construction - avoid using permanent AHU's during construction or use MERV 8 or better filters, (2) control pollutant sources - spec materials that have low VOC's, exhaust fumes (3) interrupt contamination pathways - depressurize work areas, provide temp barriers, (4) institute house keeping activities - protect porous surfaces, dust control, and

(5) schedule the installation of materials to avoid contamination of absorptive materials such as insulation, carpeting, ceiling tile and drywall. Select member of GC's team as IAQ mgr.

Submittal Documentation

Provide a copy of projects IAQ Plan. Confirm if permanently installed AHU's were used during construction. Provide photos of IAQ practices. List all filtration media. Optional narrative.

..

Indoor Environmental Quality
EQ C3.2- Construction IAQ Management Plan- Before Occupancy- Construction

Standard: US EPA:"Compendium of Methods for the Determination of Air Pollutants in Indoor Air

Intent or Credit

Reduce indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and wellbeing of construction workers and building occupants.

Requirements

Develop and implement Indoor Air Quality (IAQ) Management Plan for pre-occupancy phase as follows:

OPTION 1 - Flush-out: After construction but before occupancy, perform a flush-out by supplying a total air volume of 14,000 cf of O/A per sf of floor area while maintaining an internal temperature of 60 deg and relative humidity less than 60%.

OR If occupancy occurs prior to flush out, then delivery 3500 cu O/A per sf of floor area. Ventilate at .30 cfm/sf. Min 3 hours per date until 14,000 cf/sf of O/A is delivered.

OPTION 2 - Air Quality Testing: Conduct baseline IAQ testing after construction,

prior to occupancy using testing protocols per EPA Compendium of Methods for the Determination of Air Pollutants in Indoor Air. Demonstrate the contaminant maximum construction listed are not listed.

prior to occupancy using testing protocols per EPA Compendium of Methods for the Determination of Air Pollutants in Indoor Air. Demonstrate the contaminant maximum construction listed are not listed.

Strategy

Prior to occupancy, perform building flushout or test the air contaminant levels.

For flush-out, use temp supply/ exhaust systems at windows or remove temp filters from HVAC system and install MERV 13 filters. OR perform Air Quality testing.

During construction, use low VOC cleaning supplies, use vacuums with HEPA filters. If test sample exceeds levels, increase flush out rate of the space.

Submittal Documentation

Confirmation of approach (flush-out preoccupancy, flush-out with early occupancy, IAQ testing).

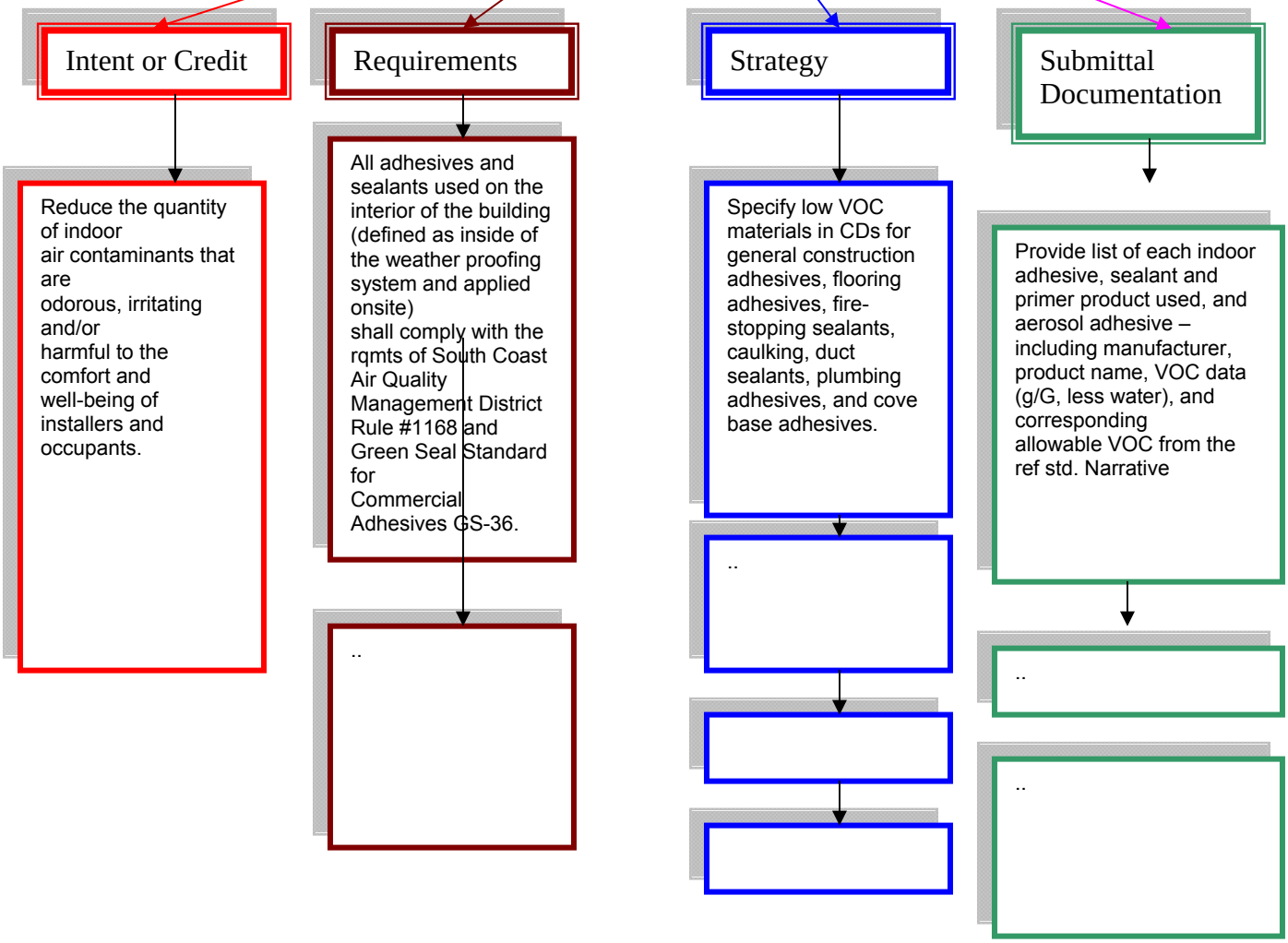
Copy of the testing report.

design meets Ventilation Rate Procedure.

Narrative.

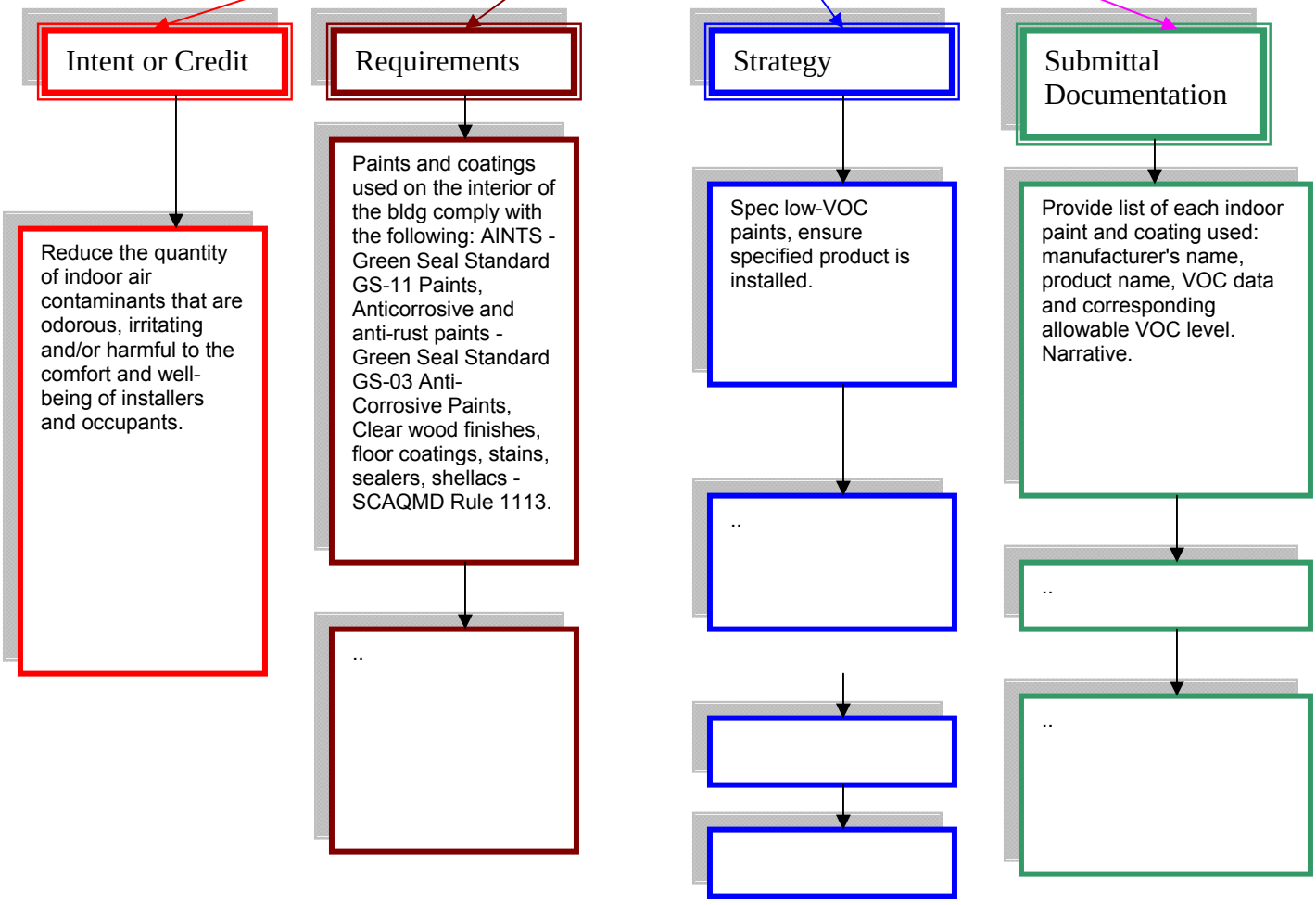
Indoor Environmental Quality
EQ C4.1- Low Emitting Materials- Adhesives and Sealants- Construction

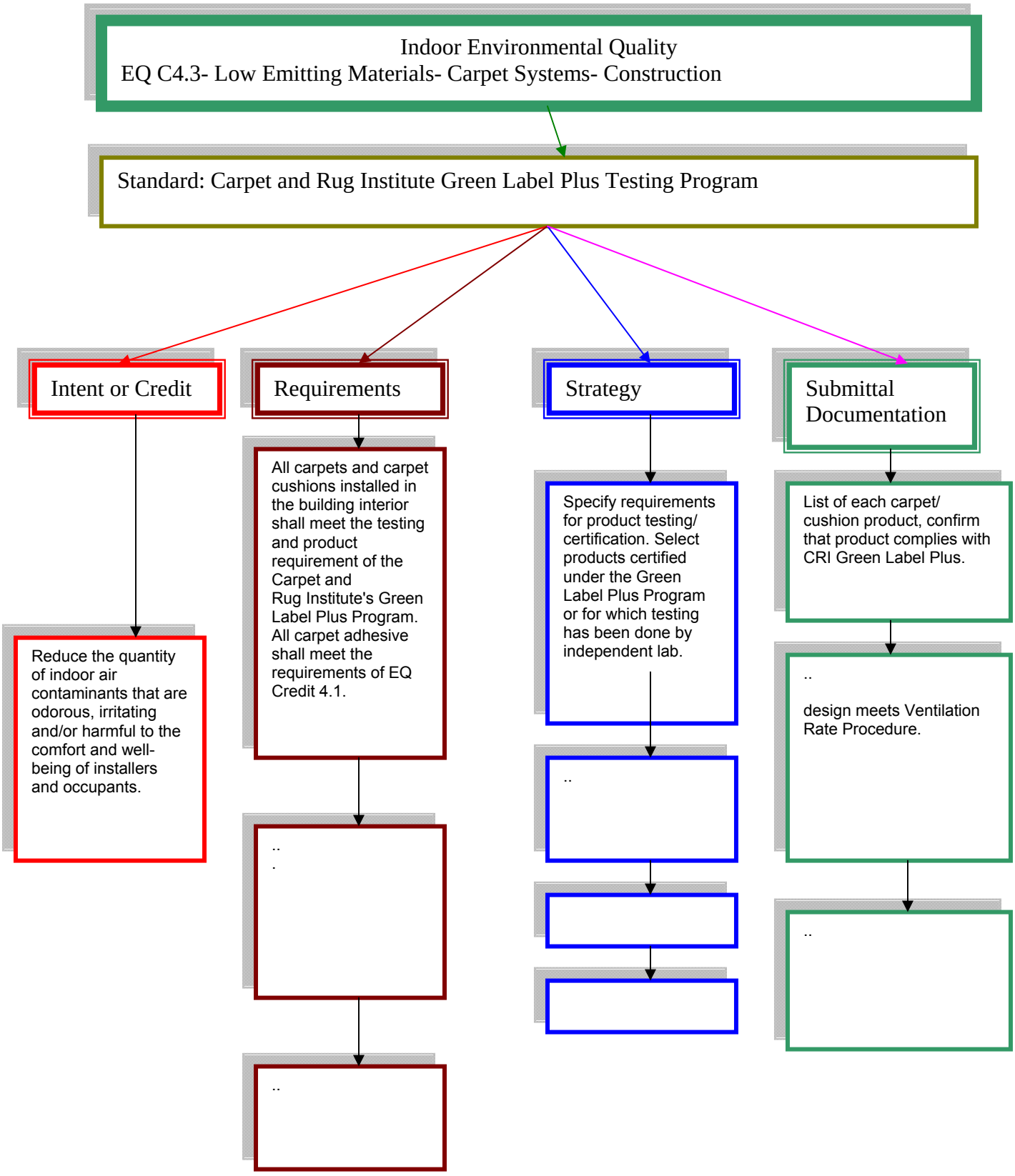
Standard: South Coast Rule #1168October 3
2003 Amendment by the South Coast Air Quality Management District
Green Seal Standard 36 (GS-36) effective October 19th, 2000

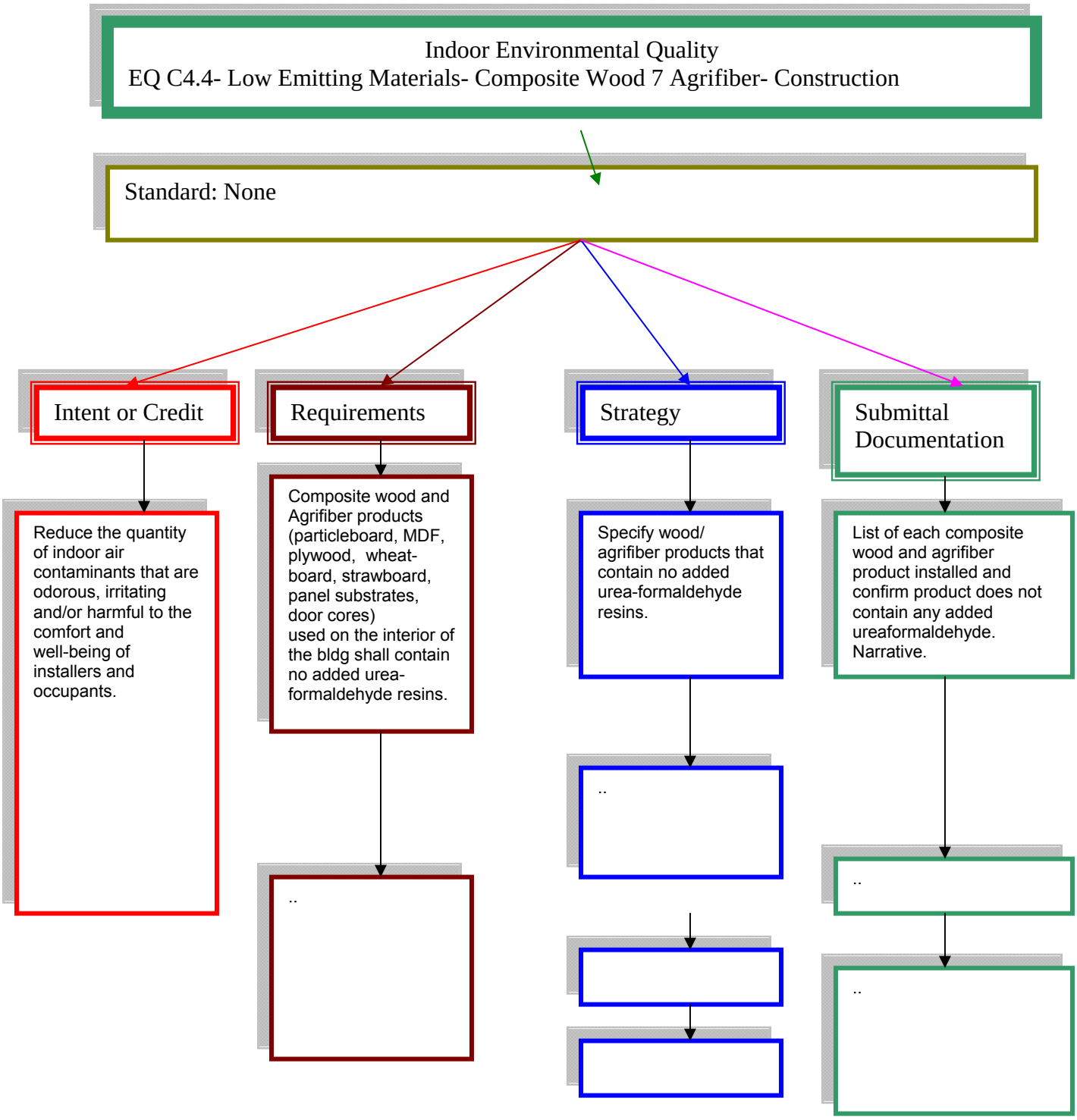


Indoor Environmental Quality
EQ C4.2- Low Emitting Materials- Paints and Coating- Construction

Standard: South Coast Rule #1168October 3
2003 Amendment by the South Coast Air Quality Management District
Green Seal Standard 36 (GS-36) effective October 19th, 2000




Indoor Environmental Quality
EQ C4.3- Low Emitting Materials- Carpet Systems- Construction
Standard: Carpet and Rug Institute Green Label Plus Testing Program
Intent or Credit
Requirements
Strategy
Submittal Documentation
Reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.
All carpets and carpet cushions installed in the building interior shall meet the testing and product requirement of the Carpet and Rug Institute's Green Label Plus Program. All carpet adhesive shall meet the requirements of EQ Credit 4.1.
..
..
Specify requirements for product testing/ certification. Select products certified under the Green Label Plus Program or for which testing has been done by independent lab.
..
List of each carpet/ cushion product, confirm that product complies with CRI Green Label Plus.
..
design meets Ventilation Rate Procedure.
..


Indoor Environmental Quality
EQ C4.4- Low Emitting Materials- Composite Wood 7 Agrifiber- Construction
Standard: None
Intent or Credit
Requirements
Strategy
Submittal Documentation
Reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.
Composite wood and Agrifiber products (particleboard, MDF, plywood, wheat-board, strawboard, panel substrates, door cores) used on the interior of the bldg shall contain no added urea-formaldehyde resins.
..
Specify wood/ agrifiber products that contain no added urea-formaldehyde resins.
..
List of each composite wood and agrifiber product installed and confirm product does not contain any added ureaformaldehyde. Narrative.
..
..

Indoor Environmental Quality

EQ C5- Indoor Chemical & Pollutant Source Control- Design

Standard: ANSI/ASHRAE 52.1-1999: Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size

Intent or Credit

Minimize exposure of building occupants to potentially hazardous particulates and chemical pollutants.

Requirements

Design to minimize and control pollutant entry into buildings and later cross-contamination of occupied areas:

.. - Permanent entryway system (grates/grilles) at least 6' long to capture dirt

- Where hazardous chemicals are stored (garages, House-keeping, copy rooms), exhaust each space to create negative pressure at .50 cfm/sf.

- Provide air filtration media of MERV 13 or better

Strategy

Design facility cleaning and maintenance areas with isolated exhaust systems for contaminants.

Maintain physical isolation from rest of the occupied areas. Install permanent entryway systems.

Install highlevel filtration systems in both return air and outside supply air.

Submittal Documentation

Confirmation that required entryway systems have been provided; list of entryway products installed; drawings to highlight location of entryways.

.. Chemical use areas have been design as separate rooms with dedicated exhaust and negative pressure, show mechanical drawings. design meets Ventilation Rate Procedure.

..
List of installed MERV 13 filter. Narrative.

Indoor Environmental Quality
EQ C6.1- (1) Controllability of Systems (90% of occupants)- Lighting- Design

Standard: None

Intent or Credit

Provide a high level of lighting system control by individual occupants

or by specific groups in multi-occupant spaces to promote the productivity, comfort and well being of bldg occupants.

Requirements

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

Provide lighting system controllability for all share 50% of multi-occupant spaces to enable lighting adjustment that meets group needs and preferences.

Task lighting per ASHRAE 90.1-2004, task lighting.

Strategy

Design bldg with occupant controls for lighting: lighting controls and task lighting.

Integrate systems controls into overall lighting design, providing ambient and task lighting while managing the energy use of the building.

Submittal Documentation

For individual work stations, provide list of total number of work stations and lighting controls.

For multi-occupant spaces, provide a list of spaces and description of the installed controls.

Narrative including data regarding the type and location of controls.

Indoor Environmental Quality
EQ C6.2- Controllability of Systems (50% of occupants)- Thermal Comfort- Design

Standard: ANSI/ASHRAE 62.1-2004: Ventilation for Acceptance Indoor Air Quality
ANSI/ASHRAE 55-2004: Thermal Environmental Conditions for Human Occupancy

Intent or Credit

Provide a high level of thermal comfort system control by individual occupants.

or by specific groups in multi-occupant spaces to promote the productivity, comfort, and well being of occupants

Requirements

Provide individual comfort controls for 50% minimum of the bldg 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' inside of and 10' to either side of the operable part of the window. The areas of operable window must meet the requirements of ASHRAE 62.1-2004, part 5.1 Natural Ventilation.

AND Provide comfort system controls for multi-occupant spaces to enable adjustments to suit group needs and preferences.

AND Provide comfort system controls for multi-occupant spaces to enable adjustments to suit group needs and preferences.

Conditions for thermal comfort are described in ASHRAE Std 55-2004 to include the primary factors of air temp, radiant temp, air speed and humidity.

Strategy

Design the bldg with comfort controls to allow adjustments for individuals and groups - including incorporating operable windows, individual thermos-tats, local diffusers at floor, desk or overhead levels, control of individual radiant panels, occupancy sensors, education of occupants and training of maintenance staff.

Operable windows can be used for areas that are 20 feet inside and 10 feet to either side of windows and windows meeting size requirements within ASHRAE 62.1-2004 (ventilation) area of window =4% floor area of space to be ventilated.

Submittal Documentation

Provide list of total number of individual workstations and thermal controls.

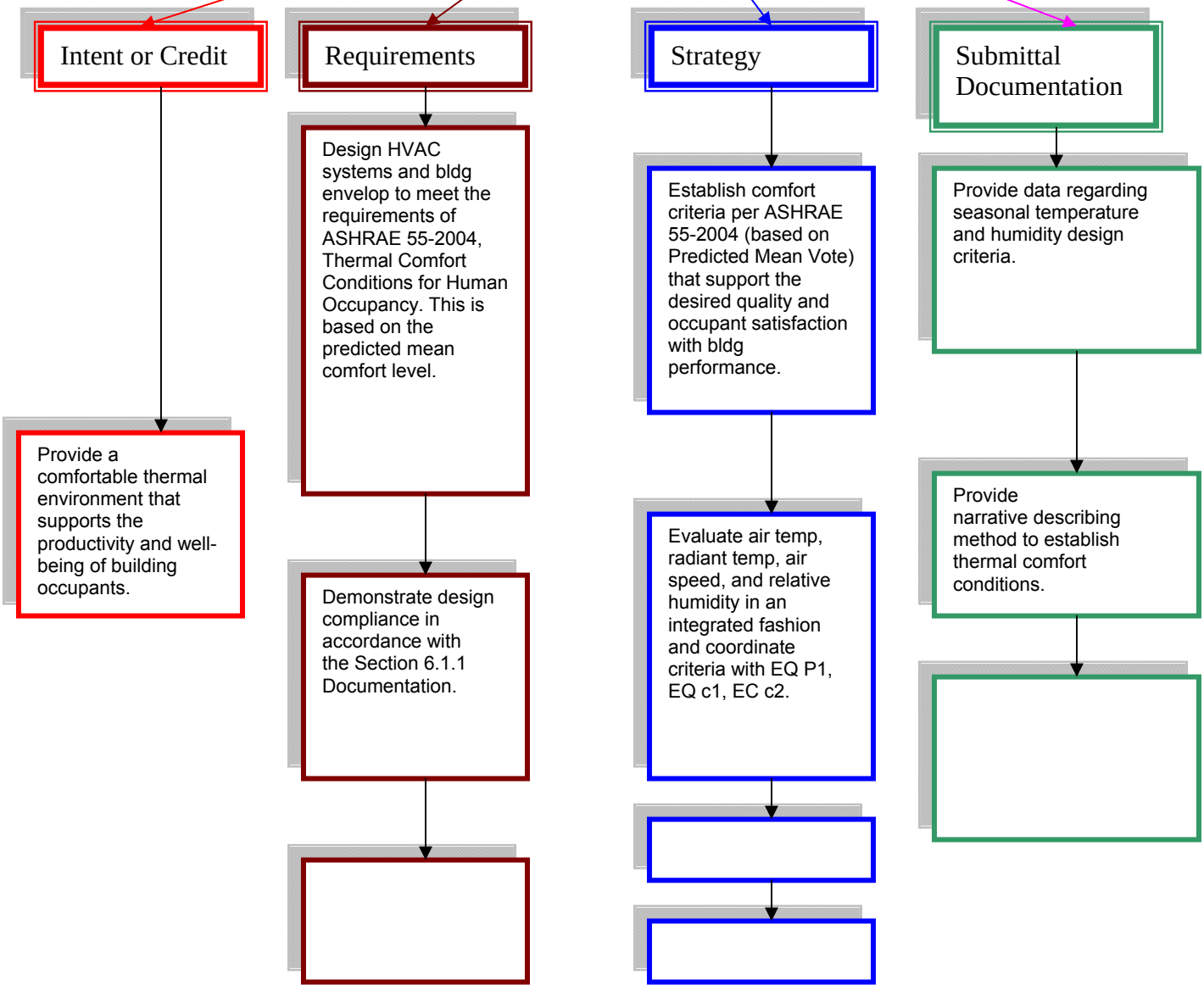
For shared space control, provide list of group spaces and thermal controls.

Narrative.
Total number of workstations and controls.

Description of multi-occupant spaces and controls

Indoor Environmental Quality
EQ C7.1- Thermal Comfort- Design

Standard: ASHRAE 55-2004: Thermal Environmental Conditions for Human Occupancy



Indoor Environmental Quality

EQ C7.2- Thermal Comfort- Verification- Design

L

Standard: ASHRAE 55-2004, Thermal Comfort Conditions for Human Occupancy

Intent or Credit

Provide for the assessment of building thermal comfort over time.

Requirements

Implement thermal comfort survey of bldg occupants within a period of 6-18 months after occupancy.

Survey to include anonymous responses about thermal comfort in the building including assessment of overall satisfaction of thermal performance.

Develop a plan for corrective action if the survey results indicate 20% of occupants are dissatisfied. This plan should include measurement of relevant environ-mental variables in problem areas in accordance with ASHRAE 55-2004.

Strategy

ASHRAE 55-2004 provides guidance for establishing thermal comfort criteria and the documentation and validation of bldg performance to the criteria.

Submittal Documentation

Narrative describing the survey planned

and provisions for plan for corrective action.

Evaluate: Air speed, Air temperature, Relative humidity, Radiant temperature, coordinate with EQp1, EQc1, EQc2

3 Basic approaches: Active, Passive, mixed modes

Indoor Environmental Quality
EQ C8.1- Daylighting & Views, Daylight 75% of Spaces - Design

Standard: None

Intent or Credit

Provide for the bldg occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the bldg.

Requirements

OPTION 1 - GLAZING FACTOR CALCULATION - Achieve a minimum glazing factor of 2% in a min of 75% of all regularly occupied areas for critical visual task.

If a private office building is in question and if 75% of floor area of room has direct line of sight, you can count the whole floor area, but if < 75%, cannot count it.

OPTION 2 - DAYLIGHT SIMLUTION MODEL - Demonstrate thru computer simulation that min daylight illumination level of 25 foot-candles has been achieved in a min of 75% of regularly occupied areas.

Must show 25 horizontal footcandles under clear sky conditions, at noon, on the equinox, and at 30" above the floors.

OPTION 3 - DAYLIGHT MEASUREMENT - Demonstrate thru records of indoor light measures that min daylight illumination level of 25 foot candles has been achieved in a min of 75% of regularly occupied areas.

All cases - only sf associated with portions of the room can be applied towards the 75% total area calc, and provide daylight redirection and/or glare control devices to avoid high-contrast situations.

Strategy

Design bldg to maximize interior day lighting, including bldg orientation, shallow floor plates, increased bldg perimeter, exterior and interior permanent shading devices, high performance glazing and automatic photocell-based controls

Predict daylight factors via manual calculations or model day-lighting strategies with physical or computer model to asses fc levels.

Submittal Documentation

Glazing Factor Calc Method - complete temp calc spreadsheet to demonstrate overall glazing factor

Computer Simulation - complete template calc to demonstrate min illumination levels and copies of drawings

Daylight Measurement Method - complete temp calc to demonstrate min illumination levels and copies of drawings

Indoor Environmental Quality
EQ C8.2- (1+1EP) Daylighting & Views, Daylight 90% of Spaces - Design

Standard: None

Intent or Credit

Provide for the bldg Occupants a connection between indoor spaces and the outdoors through the introduction of daylight

and views into the regularly occupied areas of the bldg. connection between indoors and out

Requirements

Achieve direct line of sight to the outdoor environment via vision glazing between 2'6" and 7'6" above finish floor for bldg occupants in 90% of all regularly occupied areas. Assume 42" seated heights: Option 1- Glazing Factor Calculation: Achieve a minimum glazing factor of 2% in at least 75% of regularly occupied spaces. If a private office building is in question and if 75% of floor area of room has direct line of sight, you can count the whole floor area, but if < 75%, cannot count it.

Option 2-Daylight Simulation Model : (1) Demonstrate through computer simulation that a minimum daylight illumination level of 25 footcandles has been achieved in at least 75% of areas (2) Must show 25 horizontal footcandles under clear sky conditions, at noon, on the equinox, and at 30" above the floors.
OR Option 3- Daylight Measurement: (1) Demonstrate through records of indoor light of 25 footcandles that a minimum daylight illumination level of 25 footcandles has been achieved in at least 75% of all regularly occupied spaces. Measurements must be taken at a 10' grid and shown on all floorplans. Only portions of rooms that meet this can qualify.
In all areas, provide daylight reduction and/or glazing control devices

Determine area with direct line of sight by totaling the regularly occupied sf that meets the following criteria: in plan view, the area is within sight lines drawing from perimeter vision glazing; in section view, a Direct sight line can be drawn from the area to perimeter vision glazing.

Strategy

Design the space to maximize day lighting and view opportunities.

Strategies to consider include lower partition heights, interior shading devices, interior glazing, and automatic photocell-based controls.

Maximum daylight in buildings achieved through orientation, shallow floor plates, increased building perimeter, exterior and interior permanent shading devices, high performance glazing, photo cell based controls, skylights, and tall windows.

Exemplary Point: Daylight 95% of Spaces

Submittal Documentation

Complete template calc, provide project drawings, narrative.