

LEED AP STUDY GUIDE - MATTHEW MATSON 9/8/09

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CATEGORY	LEED CREDIT	#	REQUIREMENT	BUILDING CODE/FORMULAS
Sustainable Sites PR	Construction Activity Pollution Prevention	Construction	Erosion/Sedimentation Plan - Submit - Confirmation of compliance path, copies of drawings to verify erosion and sedimentation measures are implemented & Narrative to describe measures	2003 EPA Constr. General Permit or LOCAL if
Sustainable Sites #1	Site Selection	Design	No development under 5' elevation of 100 yr floodplain, prime farmland, public parkland, endangered species, within 100 ft of wetlands, within 50 ft of water**	**Clean Water Act /FEMA/ Dept. of Agriculture
Sustainable Sites #2	Development Density/Comm. Connectivity	Design 2	Prev. developed AND 60,000 sq/acre including area of project being built OR Previously Developed AND , within 1/2 mile of residential zoning with a density of 10 unit/acre AND within 1/2 mile of 10 basic services that have PED Access	Density Radius = 3' sq root of (property in acres * 43,560)
Sustainable Sites #3	Brownfield Redevelopment	Design	Develop site documented as contaminated OR designated as a Brownfield SOLUTIONS INCLUDE - Hauling, Pump and Treat, Bioreactors and In-Situ Applications OR Innovative Solar Detoxification.	ASTM E9103 Phase II Env. Site Asses. / or Local Voluntary Cleanup Program
Sustainable Sites #4.1	Alt. Transportation: Public Transportation	Design 2 E Alt Plan	Locate project within 1/2 mile of commuter rail OR 1/4 mile of bus stop w/ 2 lines	
Sustainable Sites #4.2	Alt. Transportation: Bike Storage	Design 3	Commercial: Bike storage for 5% of occupants PEAK within 200 yards, showers for .5% FTE. Residential: Covered storage for 15% of occupants FTE Covered. MIXED = storage for 15% of FTE & racks for 5% of non residential users & 0.5% changing rooms of non residential FTE	FTE = Occupant hours/8. Bldg Users = FTE + avg transient users per day ZEV (Zero Emission Vehicle) or Green Score 40 ACEEE
Sustainable Sites #4.3	Alt. Transportation: Low E Vehicles	Design 3	Provide low E vehicles to 3% FTE & preferred parking OR preferred parking for low E 5% OR install fueling stations for 3%	
Sustainable Sites #4.4	Alt. Transportation: Parking Capacity	Design 4	Non Residential = Don't exceed local zoning parking requirements & preferred parking for carpools 5% OR For projects that provide less than 5% FTE provide Van/Carpool parking for 5%. Residential - Don't exceed local zoning & support carpool programs. OR No new Parking. Greenfield = Limit disturbance to 40 ft from bldg., 10 ft from hardscape, 15 ft from curbs/trenches, 25 ft from permeable areas OR Previously Developed = protect/restore 50% site (excl. bldg.) with native vegetation. On Previously Developed sites Earning SS Credit 2 Vegetated Roof can be used for 20% of building site INCLUDING FOOTPRINT!	
Sustainable Sites #5.1	Site Development: Protect/Restore Habitat	Construction E 75%		Count wetlands 1:4 & Vegetated Roof in Urban Areas & Pedestrian Oriented Hardscape NO Zoning In military = Double Building Footprint
Sustainable Sites #5.2	Site Development: Max Open Space	Design 3 E Dbl. Zoning	Reduce building footprint or provide vegetated space to exceed zoning requirements by 25% OR No Zoning provide vegetated open space equal to the footprint OR Zoning Exists but no requirement provide open space equal to 20% of the projects site. Wetlands count if vegetated with slope 1:4	
Sustainable Sites #6.1	Stormwater Design: Quantity	Design 3	Where imperviousness <50%: Do not exceed current discharge rate OR implement a stream channel protection plan where Imperviousness >50%: Reduce runoff by 25% from the 2 year, 24 Hour Design Storm	
Sustainable Sites #6.2	Stormwater Design: Quality	Design	Implement a stormwater management plan that treats stormwater runoff for 90% of the AVG annual rainfall with BMP's that Remove 80% of post development total suspended solids (TSS)	
Sustainable Sites #7.1	Heat Island Effect: Non-roof Degrees Raise Temp. 10	Construction 2 E 100%	Provide Shade (within 5 years), Paving material with an SRI of 29 or an Open Grid paving system for 50% of hardscape OR put 50% of parking under cover with SRI of 29+ 75% of Steep Slope SRI 29+ (steep sloped >2:12) or Low Sloped SRI 78 OR 50% vegetated roof OR mix of high albedo & vegetated roof**	ASTM E-1980 for SRI **Area SRI Roof/.75 + Area Vegetated/.5 > Total Roof Area
Sustainable Sites #7.2	Heat Island Effect: Roof	Design 2 E 100%		
Sustainable Sites #8	Light Pollution Reduction	Design 3	Interior: Maximum candela shall intersect opaque surface and not illuminate through windows OR all non-emergency lighting shall turn off automatically during non business hours with Emergency Override & Exterior: Don't exceed 80% light power density and 50% for facades/landscape	IESNA RP-33 for Lighting Zones 1-4 Exterior Interior Building Lighting info use Photometric Data
		TOTAL	14	
Water Efficiency #1.1	Water Efficient Landscaping: Reduce 50%	Design	Reduce potable water consumption for irrigation by 50% from mid-summer baseline Methods - Plant species factor, Irrigation efficiency, use of captured rain water, use of recycled wastewater, use of water treated by a public agency for non potable use.	IPC and UPC Gray water Definition - Showers, bathroom wash basin, water from clothes washer & laundry tubs. Household water less kitchen and dishwasher
Water Efficiency #1.2	Water Efficient Landscaping: No Potable	Design 2	No potable water use for irrigation Use only Captured Rainwater, Recycled Wastewater, Recycled Gray water or water treated by a public agency for non potable uses OR Install landscaping that does not require permanent irrigation. Submit - 1. Project baseline 2. Design Case total Water Applied 3. Total Non	Landscape Coefficient(KL) indicates evapotranspiration - Species factor, Density factor, Microclimate Factor, & Irrigation
Water Efficiency #2	Innovative Wastewater Technologies	Design E 100%	Reduce potable water use for building sewage conveyance by 50% through the use of water conserving fixtures (water closets, Urinals) or non potable water (captured rainwater, recycled gray water & onsite municipally treated wastewater. OR treat 50% of wastewater onsite to tertiary standards. Must be infiltrated or used onsite. Submittal - Drawings of on-site treatment facilities 2. Calculated Occupants 3. Calc Baseline water 4. Design case water usage for sewage conveyance. 5. Narrative 6. Non Potable conveyance if App. 7. Quantity of treated if App.	
Water Efficiency #3.1	Water Use Reduction: 20%	Design E40%	Use 20% less water than baseline (Building only) H2O closets, urinals, lav faucets, showers and kitchen sinks Fixtures Comparison - Water closet 1.6 vs. 1.1 vs.8 Urinal - 1 vs. .5 LAVs = 2.5 vs. 1.8 vs. .5 Gray Water shall not include Kitchen Sinks or Dishwashers	Energy Policy Act of 1992
Water Efficiency #3.2	Water Use Reduction: 30%	Design E 40%	Use 30% less water than baseline (Building only) H2O closets, urinals, lav faucets, showers and kitchen sinks	Energy Policy Act of 1992
		TOTAL	5	

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Energy & Atmos. PR1	Fundamental Commissioning	Construction	Following Activities shall be completed by design team: 1. Designate CxA that... has experience in 2 projects, is independent of projects design and construction management, (may be employee of firm or owner)... 2. Owner documents OPR , Design team develops BOD, CxA reviews docs 3. Incorporate commissioning requirements into construction docs 4. Develop and implement commissioning plan 5. Verify installation performance 6. Complete a summary	HVAC&R (mechanical & passive) and associated controls, lighting & day lighting, Domestic hot water systems, Renewable Energy Systems
Energy & Atmos. PR2	Min. Energy Performance	Design	Design Building envelope, HVAC, Lighting Requirements, Service Water Heating Requirements and other equipment requirements to maximize energy performance.	ASHRAE/IESNA 90.1-2004 mandatory Provisions (without amendments) & ASHRAE/IESNA 90.1 - 2004 Section 11 (without Amendments) prescriptive Requirements OR Local Codes
Energy & Atmos. PR3	Fundamental Refrigerant Mgmt	Design	New HVAC equipment has No CFC's & Phase out plan within 5 years for and equipment that contains CFC's ALTERNATE PATH - For Central chilled water systems.... Have 3rd party show that the replacement economic payback is greater than 10 years. Reduce leakage to 5% per EPA Clean Air Act Rule 608 and reduce total leakage to 30 % of total charge.	Possible EPA Clean Air Act Rule 608
Energy & Atmos. #1	Optimize Energy Performance	Design 3	Whole Building = 1 pt for every 3.5% over 10.5% or 3.5% (exist) ASHRAE Standard 90.1 - 2004 Appendix G Prescriptive office space <20,000 sf and comply with climate zone ASHRAE Adv. Energy Design Guide Small Office 2004 (4 pts) Prescriptive- 1pt =Advanced Buildings Benchmark Version 1.1	Whole Building Energy Simulation
Energy & Atmos. #2	On-Site Renewable Energy	Design	Renewable % of annual energy costs: 2.5% = 1 pt add 1 pt for every + 5 Ineligible Systems - Architectural Features, Passive Solar Features, Day lighting Strategies, Geo exchange systems (Ground Source Heat Pumps) & Green E power Eligible Systems - Photo Voltaic, Solar Thermal systems, Bio-Fuel Based Electrical Systems, Geothermal Electric Systems, Low Impact Hydro, Wave and Tidal Power systems.	ASHRAE/IESNA 90.1-2004 OR Dep of Energy - Commercial Buildings Energy Consumption OR Commercial Buildings Energy Survey
Energy & Atmos. #3	Enhanced Commissioning	Construction	In addition to Fundamental Commissioning: 1. Designate CxA before construction Docs phase. CxA may not be involved in design or construction, may not be employee or contracted through GC (may be employee of Owner or contracted through Design Firm) 2. CxA must conduct at least one design review of OPR, BOD and design Doc prior to Mid-construction 3. CxA shall review contractor submittals concurrent to A/E reviews submit to owner 4. Develop systems manual of staff 5. Verify requirements for training personnel are completed 6. CxA must review building operation within 10 months from Substantial Completion, including resolution plan for commissioning issues.	CxA minimum. 1. Review OPR and BOD prior to mid construction and back check review comments in design submission 2. Review contractor submittals concurrent to A/E 3. Review building operation within 10 months of substantial completion.
Energy & Atmos. #4	Enhanced Refrigerant Mgmt	Design 2	No refrigerants OR Select Equipment that 1. Has Minimal Leakage 2. Long service Life 3. Efficient Charge AND do not install Fire protection systems with CFC's, Halons or HCFC's	estimates that Refrigerant Equipment has a 15 year life cycle
Energy & Atmos. #5	Measurement and Verification	Construction	Develop and Implement a Measure and Verification Plan consistent with IPMVP Phase III Concepts and Options for Determining Energy savings. Plan shall cover a period of no less than 1 year post construction OCCUPANCY. Option B - (ECM) Isolation addresses M&V at the system level suitable for smaller buildings. Option D - (whole building simulation, energy savings) - Compares actual building costs with predicted computer model to get Energy Conservation Models	Commences at Occupancy & Stabilization and Ends after 1 year PROVIDES ACCOUNTABILITY OVER TIME
Energy & Atmos. #6	Green Power	Construction E Dbl.	Purchase Green power based on AHRAE 90.1 Electricity consumption OR use the DOE's Commercial Building Energy Consumption for estimated use OR buy REC's TRC and Green tags that come 2 years of at least 35% of energy.	Meet Green E technical requirements in (CRS) Center of Resource Solutions
		TOTAL 17		
Mat. & Resource PR	Storage/Collection of Recyclables	Design	Provide area dedicated to recycling for building occupants and designate on plans... plastics, metals, paper, cardboard & glass. No Specific Size but should have Signage, Protection from Elements & Security for High \$ Items	
Mat. & Resource #1.1	Building Reuse: 75% structure	Construction	Reuse 75% of building structure including Structural Floor, Roof Deck, Exterior Skin & Framing	Not App. If addition is 2 x existing building SF
Mat. & Resource #1.2	Building Reuse: 95% structure	Construction	Reuse 95% of building structure including Structural Floor, Roof Deck, Exterior Skin & Framing	Not App. If addition is 2 x existing building SF
Mat. & Resource #1.3	Building Reuse: 50% non-structure	Construction	Reuse 50% of Non Structural elements including - Interior Walls, Doors, Floor Coverings and Ceiling Systems.	Not App. If addition is 2 x existing building SF
Mat. & Resource #2.1	Construction Waste Mgmt: 50%	Construction	Divert 50% of non-hazardous waste from landfill (by weight or volume) Submittal - Complete Table that includes - Type of waste, Location of Recycler, quantity of waste diverted in tons or cubic yards	
Mat. & Resource #2.2	Construction Waste Mgmt: 75%	Construction E 95%	Divert 75% of non-hazardous waste from landfill (by weight or volume) Submittal - Complete Table that includes - Type of waste, Location of Recycler, quantity of waste diverted in tons or cubic yards	
Mat. & Resource #3.1	Materials Reuse: 5%	Construction	Reuse 5% existing building materials (cannot get credit if taken in MR 1.1 or 1.2) Such as Beams, Posts, Flooring, Paneling, Doors and Frames, Cabinetry & Furniture, Brick & Decorative Items	45% of bldg \$ is material per LEED Based on Hard Costs for CSI Master Format 1995 Divisions 2-10 ONLY NO MEP'S OR Elevators BASED ON \$\$\$
Mat. & Resource #3.2	Materials Reuse: 10%	Construction E 15%	Reuse 10% existing building materials (cannot get credit if taken in MR 1.1 or 1.2) Such as Beams, Posts, Flooring, Paneling, Doors and Frames, Cabinetry & Furniture, Brick & Decorative Items	45% of bldg \$ is material per LEED Based on Hard Costs for CSI Master Format 1995 Divisions 2-10 ONLY NO MEP'S OR ELEV BASED ON \$\$\$
Mat. & Resource #4.1	Recycled Content: 10%	Construction	10% of building cost must be post consumer (20% pre-consumer)	25% assumed pre for steel
Mat. & Resource #4.2	Recycled Content: 20%	Construction E 30%	20% of building cost must be post consumer (40% pre-consumer)	ISO 14021 Environ. Labels & Declarations
Mat. & Resource #5.1	Regional Materials: 10%	Construction	Extracted, processed, and manufactured within 500 miles for 10% of total bldg cost	
Mat. & Resource #5.2	Regional Materials: 20%	Construction E 40%	Extracted, processed, and manufactured within 500 miles for 20% of total bldg cost	

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Mat. & Resource #6	Rapidly Renewable Material	Construction E 5%	2.5% of total bldg cost must be completed in material renewable in 10 yr cycle	Includes - bamboo, wool, cotton insulation, agrifiber, wheat board, strawboard & cork.
Mat. & Resource #7	Certified Wood	Construction E 95%	50% of wood products on job must be FSC Certified** Based on Cost. No salvaged or reclaimed wood	Temp use for bracing Counts All other must be permanently installed... Include COC #
TOTAL		13		
Environ. Quality PR1	Min. IAQ Performance	Design	Mechanically Vented - Meet AHHRAE Standard 62.1 - 2004 Naturally Vented - ASHRAE - 62.1 - 2004, Section 5.1 Mixed - ASHRAE 62.1 - 2004 Chapter 6	ASHRAE 62.1-2004 & ASHRAE 62.1 2004 Sec. 5.1 & ASHRAE 62.1 2004 Ch. 6
Environ. Quality PR2	Environ. Tobacco Smoke Control	Design 3	No smoking in bldg. locate smoking 25 ft from bldg. OR designate and vent smoking areas 25 ft from building with operable windows that vent directly outdoors with ridiculous worst case testing ... OR Residential prohibit smoking in common areas, ext smoking at least 25 ft away, seal chases less than 1.25 of leakage	ANSI/ASTM - E779-03 Standard test method for determining Air Leakage Rate by Fan Pressurization.
Environ. Quality #1	Outdoor Air Delivery Monitoring	Design	Mechanically Vented - Install monitoring equipment between 3 -6 ft in Densely Occupied spaces (greater than 25 people per 1000 SF) that generate alarms when conditions vary by 10%... Non Dense spaces need outdoor Airflow monitoring equipment + or - 15% of ASHRAE 62.1 - 2004. Naturally Vented - Equipment bet. 3-6 multi spaces if passive stacked.	
Environ. Quality #2	Increased Ventilation	Design 2	Mechanically Vented - Ventilation of occupied spaces exceed ASHRAE 62.1 - 2004 by 30% Naturally Vented - Meet Carbon Trust "Good Practice Guide 237" and use flow diagram in CIBSE Applications Manual 10: 2005 OR create a macroscopic model to ensure effective natural airflow for 90% of occupied Meet SMACNA IAQ Guidelines for bldgs under constr., 1995, Ch. 3. , protective absorptive and porous materials, replace filters on air handlers per ASHRAE 52.5-1999 , replace air filtration prior to occupancy, seal HVAC on return Ducts	ASHRAE 62.1 - 2004 & The Carbon Trust Good Practice Guide 237 & Chartered Institution of Building Services Engineers Sheet Metal and Air Conditioning National Contractors Association (SMACNA) Guidelines under Construction, 1995, Chapter
Environ. Quality #3.1	Construction IAQ Mgmt Plan: Construction	Construction	Flush out with 14,000 cfm prior to occupancy OR 3,500 cfm during occupancy 60 /60 '3 Hrs prior to people coming in until 14,000 CuFt OR conduct IAQ testing per EPA Prevent: Formaldehyde, Particulates Volatile Organic Compounds, 4-phenylcyclohexene MERV 8	US EPA: Methods for Determination of Air Pollutants in Indoor Air
Environ. Quality #3.2	Construction IAQ Mgmt Plan: Before Occupancy	Construction 2	Adhesives/sealants/primers meet (SCAQMD) Rule # 1168..... Aerosol Adhesives = Green Seal GS-36 Oct 19 2000 Common Products to Evaluate - Flooring Adhesives, fire stopping sealants, caulking, duct sealants, plumbing adhesives and cove base adhesive.	SCAQMD # 1168 & Green Seal GS-36 Oct 19 2000
Environ. Quality #4.1	Low Emitting Mat.: Adhesives & Sealants	Construction	Paints - Green Seal Standard GS-11 Flat = 50 gr vs. Non-Flats = 150 g/L..... Anti corrosive & rust paints - Green Seal Standard GC-03 Anti Corrosive Paints, 2nd Edition, Jan 1997 250 g/L.....Floor Coatings - SCAQMD Rule 1113 Jan 1 2004 = Wood: Varnish 350 g/L, Lacquer 550 g/L Waterproofing Sealers = 250 g/L	Green Seal Standard GS-11 & Green Seal GC-03 & SCAQMD Rule 1113 Architectural Coating Rule January 1, 2004
Environ. Quality #4.2	Low Emitting Mat.: Paints & Coatings	Construction	Carpet must meet Carpet & Rug Institute Green Label Plus ,... Carpet cushion only Green Label.. Carpet adhesive must meet EQ 4.1 w/ VOC limit of 50g/l Measured in Micrograms per square meter per Hr	Carpet & Rug Institute Green Label & "Plus"
Environ. Quality #4.3	Low Emitting Mat.: Carpet Systems	Construction	Wood & Agrifiber products shall have NO urea-formaldehyde resins. Ex: particleboard, MDF, plywood, wheat board, Strawboard, panel substrates & Door Cores.	No Furniture and Equipment Agrifiber made from Sugar Cane
Environ. Quality #4.4	Low Emitting Mat.: Composite Wood & Agrifiber	Construction	Employ permanent grated, grille or slotted entryway systems 6 ft to capture particulate. Roll mats are only acceptable when cleaned WEEKLY by a contracted agency. & in areas with Hazardous gases including Garages, Housekeeping areas, Laundry areas & Printing rooms provide self closing doors and proper negative pressure . Filters w/ MERV 13 before occupancy.	ASHRAE 52.2 - 1999 - Method of Testing Air Cleaning Devices
Environ. Quality #5	Indoor Chemical & Pollutant Source Control	Design	Provide Individ. Lighting control for 90% of occupants & controllability for shared multi occupant spaces conference rooms, areas of congregation & Subdivided areas as with a moveable wall such as in a conventional hall . Glare Control If using Day lighting. Wiring does not need to be permanent.	Repositionable Lights Welcome
Environ. Quality #6.1	Controllability of Systems: Lighting	Design	Individ Comfort Controls for 50% occupants & ALL multi occupant spaces. Operable windows for areas 20 ft inside and 10 ft to either side... Must meet ASHRAE 62.1 - 2004, 5.1 Natural Ventilation.	**ASHRAE 62.1-2004 paragraph 5.1 Natural Ventilation & ASHRAE 55 - 2004
Environ. Quality #6.2	Controllability of Systems: Thermal Comfort	Design	Design HVAC systems and Building Envelope to meet ASHRAE 55 - 2004 & demonstrate design compliance using Section 6.1.1 Evaluate Air Temp, Radiant Temp, Air Speed and Relative Humidity. Submittal - 1. Data for seasonal temp 2. Narrative describing conditions and compliance with standard.	ASHRAE 55 -2004
Environ. Quality #7.1	Thermal Comfort: Design	Design	Survey to occupants 6-18 months after occupancy to see if they are satisfied with thermal conditions based on environmental factors such as TEMPERATURE, THERMAL RADIATION, HUMIDITY, & AIR SPEED . If 20% or more are dissatisfied corrective actions must be taken.	ASHRAE 55 - 2004 Owner/Engineer
Environ. Quality #7.2	Thermal Comfort: Verification	Design	Glazing factor of 2% in 75% of regularly occupied areas OR Demonstrate through a Computer Daylight Simulation Model, that 25 foot candles' have been achieved under clear sky conditions, at 12:00 noon on the Equinox. At 30" above the floor. OR Daylight Measurement of 25 foot candles. In all cases, Provide daylight redirection/ Glare control devices to avoid high contrast situations that could impede visual tasks.	Glazing Factor = window area, window geometry, Visible Light Transmittance, Height of window
Environ. Quality #8.1	Daylight & Views: Daylight 75% of spaces	Design 3 E 95%+	Achieve direct line of sight to the outdoor environment via Glazing between 2'-6" and 7'-6" for building occupants in 90% of all occupied spaces. Line of sight may be drawn through interior glazing. Entire SF of Private offices can be counted if 75% of area has a direct line of sight to perimeter vision glazing. But not multi occupant spaces. Submittal: Template Calc. spreadsheet to demonstrate views 2. Project Drawings with line of sight 3. Narrative of areas excluded from compliance.	
Environ. Quality #8.2	Daylight & Views: Views for 90% of spaces	Design E No prescribed		
TOTAL		15		
Innovation & Design #1.1	Innovation in Design	Construction or Design	Exemplary performance or innovative performance not addressed by LEED-NC	

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Innovation & Design #1.2	Innovation in Design	Construction or Design	SAME AS ABOVE	
Innovation & Design #1.3	Innovation in Design	Construction or Design	SAME AS ABOVE	
Innovation & Design #1.4	Innovation in Design	Construction or Design	SAME AS ABOVE	
Innovation & Design #2	LEED AP	Construction	Submittal - Name, Company Name, Description of Project Roles, Copy of LEED AP certificate.	
TOTAL		5		

MAXIMUM POINTS POSSIBLE

69

Emissivity

Reflectance

Pre Consumer - Material Diverted from waste stream during the manufacturing process. Excluded is Reutilization of Rework, Regrind OR Scrap because it can be reclaimed within the same generating process.

Post Consumer 0 Waste material generated by households, industrial or commercial end users, which can no longer be used for its intended purpose.

Visible Light Transmittance - Ratio of total transmitted light to total incident light

Non-Regularly Occupied Areas - Corridors, Hallways, Lobbies, Break Rooms, Copy Rooms, Storage Rooms, Kitchens, Restrooms & Stairwells

Glazing Factor Variables - Floor Area, Window Area, Window Geometry, Visible Transmittance & Window Height

Vision Glazing - 2'-6" - 7'-6"

Innovation & Design - (4 Pts.) - Intent, Proposed Requirement Compliance, Proposed Submittals, Design Approach