Overview of USGBC/LEED

USGBC promotes design, construction, and operation of bldgs that are environmentally responsible, profitable & healthy places to live/work
Benefits of green design: reduce negative environmental impact, reverse trend of unsustainable construction practices, reduce operating costs, enhance marketability, increase occupant productivity, create sustainable community, maximize return on investment, align w/company mission
Non-profit, volunteer organization started in 1993 with members from all aspects of the bldg industry
Overriding goal is to **transform the marketplace**

LEED Green Building Rating System is a tool for defining a "green" building
Consensus based documents- require 2 public review drafts and a balloted draft for approval
Whole bldg perspective-- voluntary & market-driven-- based on accepted energy/environmental principles and emergent technologies
Different types of rating systems for different types of buildings:

- LEED-NC New Construction & Major Renovations (for bldg owners & design teams for new building projects)
- LEED-EB Existing Buildings (for bldg owners/service providers to address O&M issues)
- LEED-CI Commercial Interiors (for tenant improvements)
- LEED-CS Core & Shell (for buildings with no tenant improvements)
- LEED-H Houses (single family residences-- probably available end of 2005)
- LEED-ND Neighborhood Developments (large campuses, new towns-- under development)

The most certified projects are in California, followed by Pennsylvania & Washington
The most registered projects are Multi-Use, followed by Commercial Offices & Higher Education-- 54% of all LEED projects are private-sector
LEED Process: 1) register w/USGBC 2) prepare documentation 3) request any CIRs 4) assemble documentation 5) submit to USGBC 6) respond to audits 7) final approval

LEED-NC Rating System

5 categories: Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality + Innovation
7 prerequisites: ALL prerequisites must be earned in order to earn any credits
CIRs: Credit Interpretation Requests- chance to appeal to USGBC for an interpretation of something not specifically covered by LEED
Letter Templates: Excel spreadsheet designed to organize/streamline submissions and keep track of progress
Some are declarations that req'ts have been met, others are checklists w/ backup documentation, others are calculations
A selection of credits will be audited- will require submission of additional information
Have to earn 26 of 69 possible points for certification: Certified= 26-32; Silver= 33-38; Gold= 39-51; Platinum= 52+
Benefits of certification: 3rd party validation of achievement; qualification for state/local gov't incentives; marketing exposure

Sustainable Sites

1 prerequisite, 8 credits = 14 possible points

SS Prerequisite 1	Erosion & Sediment Control	Erosion & sediment control plan Prevent: loss of soil- runoff & wind erosion, stockpile topsoil for later use sedimentation- sewers or streams air pollution- dust & particulates *US EPA 832/R-92-005 (Sept 1992)- Storm Water Mgmt for Const Activities, Ch 3* describes 2 types of measures for sedimentation/erosion control: 1) stabilization- prevents erosion 2) structural control- retains sediment
SS Credit 1	Site Selection	Do not develop: Prime farmland *US Dept of Ag Code of Fed Regs, Title 7, Vol 6, Pt 400-699* Elevs lower than 5' above elev of 100- yr flood *FEMA* Habitat for any species on endangered/threatened list W/in 100' of water/wetlands *US Code of Fed Regs 40 CFR, Pts 230-233 & 22* Public parkland (unless > or = value land accepted in trade)
SS Credit 2	Development Density	Utilize sites w/ min development density of 60,000 sf/acre (2 st downtown)
SS Credit 3	Brownfield Redevelopment	Remediate documented contaminated site *ASTM E1903-97 Phase II Env Site Assessment* ***OR*** Remediate brownfield (as determined by local, state, or fed agency)
SS Credit 4.1	Alternative Transportation: Public Transportation Access	Locate w/in 1/2 mi of rail, light rail or subway station ***OR*** Locate w/in 1/4 mi of 2 bus lines (can be 1 stop served by 2 different lines)
SS Credit 4.2	Alternative Transportation: Bicycle Storage/Changing Rms	C&I: Bicycle storage for 5% or more of occs. + showers (1:8 bicyclists) ***OR*** R: Covered storage for 15% or more of occs. (no showers req'd)
SS Credit 4.3	Alternative Transportation: Alternative Fuel Vehicles	Alternative fuel vehicles (hybrids OK) for 3% bldg occs. + preferred parking ***OR*** Refueling station for 3% total on-site vehicle parking capacity
SS Credit 4.4	Alternative Transportation: Parking Capacity	Meet but not exceed local zoning for parking + carpool parking for 5% bldg occs. ***OR*** Rehab: add no new parking + carpool parking for 5% bldg occs. *If no local zoning: 25% less than National Transportation Ass'n recommendations or an average of neighboring municipalities' req'ts*

SS Credit 5.1	Reduced Site Disturbance: Protect or Restore Open Space	Greenfields: limit site disturbance: 40' beyond bldg perimeter 5' beyond roadway curbs, walkways & utility trenches 25' beyond constructed areas w/pervious surfaces ***OR*** Previously developed: Restore min. 50% of site area by replacing pervious surfaces w/ native/adapted vegetation
SS Credit 5.2	Reduced Site Disturbance: Development Footprint	Local zoning: Reduce development footprint to exceed zoning open space req't by 25% ***OR*** No zoning: Designate open space adjacent to bldg = to bldg footprint for life of bldg
SS Credit 6.1	Stormwater Management: Rate & Quantity	Existing imperviousness < or = to 50%: stormwater mgmt plan that prevents post-development 1.5yr/24hr peak discharge rate from exceeding pre-development 1.5yr/24hr peak discharge rate ***OR*** Existing imperviousness > 50%: stormwater mgmt plan that reduces rate & quantity by 25%
SS Credit 6.2	Stormwater Management: Treatment	Stormwater treatment system to remove 80% TSS and 40% TP BMPs in *US EPA Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Jan 1993 (EPA 840-B-92-002)* or local, whichever most stringent mgmt practices that can be incorporated to remove pollutants from stormwater volumes: includes infiltration basins, trenches, porous pavement, permeable surfaces, vegetated filter strips, grassed swales, filtration basins, constructed wetlands, detention ponds
SS Credit 7.1	Heat Island Effect: Non-Roof	Shade w/in 5 yrs &/or light-colored-high-albedo (>0.3) materials &/or open grid pavement for at least 30% of non-roof impervious surfaces ***OR*** Min. 50% parking spaces underground/ covered by structured parking ***OR*** Open-grid pavement system (<50% impervious) for min. of 50% of parking lot area
SS Credit 7.2	Heat Island Effect: Roof	*Energy Star* compliant & high emissivity roofing (at least 0.9 per ASTM 408) for min. 75% of roof surface *ASTM E408-71* : measures total normal emittance of surfaces; non-destructive; for large surfaces *Energy Star* roof criteria: Low-slope (< or = 2:12) initial 0.65, 3-yr 0.50 Steep-slope (> 2:12) initial 0.25, 3-yr 0.15 ***OR*** "Green" roof for at least 50% of roof area ***OR*** Combination if they collectively cover 75% of roof area *If there are PV panels or mech equip on roof, that area is excluded from equation*

SS Credit 8	Light Pollution Reduction	Meet or provide light levels/uniformity ratios in *IESNA Recommended Practice Manual: Lighting for Exterior Environments (RP-33-99):* > 1000 lumens - shielded > 3500 lumens - Full Cutoff Max. candela value of interior lighting falls w/in bldg Max. candela value of exterior lighting falls w/in property Any luminaire w/in 2.5x mounting height from property line shall have shielding such that no light crosses the property boundary *4 IESNA light levels:* *E1: Intrinsically Dark (0.1 fc)* *E2: Low Ambient Brightness (0.1 fc)* *E3: Medium Ambient Brightness (0.2 fc)* *E4: High Ambient Brightness (0.6 fc)*

Water Efficiency

No prerequisites, 3 credits = 5 possible points

Energy Policy Act of 1992: Requires low-flow toilets (1.6 GPF), urinals (1.0 GPF), shower heads (2.5 GPM), faucets (2.5 GPF), replacement aerators (2.5 gpm) & metering faucets (0.25 gal/CY)-- Saves US 6.5 billion gallons per day

WE Credit 1.1	Water Efficient Landscaping: Reduce by 50%	High efficiency irrigation technology ***OR*** Reduce potable water use for irrigation by 50% (captured rainwater/recycled site water)
WE Credit 1.2	Water Efficient Landscaping: No Potable Use/Irrigation	Eliminate all potable water use for irrigation ***OR*** No permanent landscape irrigation systems
WE Credit 2	Innovative Wastewater Technologies	Reduce use of potable water for sewage conveyance by min 50% ***OR*** Treat 100% of wastewater to tertiary standards
WE Credit 3.1	Water Use Reduction: 20%	Use 20% less water in design bldg vs. baseline bldg
WE Credit 3.2	Water Use Reduction: 30%	Use 30% less water in design bldg vs. baseline bldg

Energy & Atmosphere

3 prerequisites, 6 credits = 17 possible points

EA Prerequisite 1 Fundamental Building Systems Commissioning

Implement commissioning procedures:
- Engage commissioning team (individuals not involved in design/const mgmt)
- Review design intent & basis of design documentation
- Incorporate commissioning req'ts into CDs
- Develop/utilize commissioning plan
- Verify installation, functional performace, training & O&M documentation
- Complete commissioning report

75% of bldgs do not perform as designed; 20% are missing components-- CxAs are bridge btwn designers & contractors

EA Prerequisite 2 Minimum Energy Performance

Comply with *ASHRAE/IESNA Standard 90.1-1999* (w/out amendments) or local energy code, whichever is more stringent

EA Prerequisite 3 CFC Reduction in HVAC&R Equipment

No CFCs in new systems; where reusing systems, complete comprehensive phase-out conversion

EA Credit 1 (1-10 points) Optimize Energy Performance

Reduce design energy cost vs. energy cost budget per *ASHRAE/IESNA Standard 90.1-1999* (w/o amendments) as demonstrated through Energy Cost Budget Method in Sec 11
- For 1 pt- new bldgs 15% savings; existing bldgs 5% savings
- For each 5% increase in savings you get another point

Strategies: reduce demand, harvest free energy, increase efficiency

EA Credit 2.1 Renewable Energy: 5%

Supply 5% of bldg's total energy use w/ on-site renewable energy systems

EA Credit 2.2 Renewable Energy: 10%

Supply 10% of bldg's total energy use w/ on-site renewable energy systems

EA Credit 2.3 Renewable Energy: 20%

Supply 20% of bldg's total energy use w/ on-site renewable energy systems

*Renewable energy sources include wind power, photovoltaics, biomass, etc. Ground source heat pumps and solar hot water heaters are **not** included.*

EA Credit 3 Additional Commissioning

Above & beyond Prerequisite 1, CxA performs following tasks: (* not designer)
- Review design prior to CDs*
- Review CDs near completion and prior to issuing for construction*
- Review contractor submittals for commissioned systems*
- Provide owner single manual w/ info for re-commissioning bldg systems
- Contract to review bldg operation w/ O&M staff, including resolving outstanding issues w/in 1 yr after construction completion date

EA Credit 4	Ozone Protection	No HCFCs or Halons (supports early compliance w/ *Montreal Protocol*)
EA Credit 5	Measurement & Verification	Install continuous metering equipment for: Lighting systems and controls — Constant & variable motor loads Variable frequency drive (VFD) operation — Chiller efficiency @ variable loads (kW/ton) Cooling load — Air & water economizer/heat rec. cycles Air dist. static pressures/vent. air vols. — Boiler efficiencies Bldg-related process energy systs/equip — Indoor water risers & outdoor irrigation Develop M&V plan that complies w/ Option B, C or D of *2001 International Performance Measurement & Verification Protocol (IPMVP) Vol 1: Concepts & Options for Determining Energy & Water Savings* (A is not valid) *Essentially extends commissioning into life of bldg*
EA Credit 6	Green Power	At least 50% of bldg's electricity supplied from renewable resources through min. 2 year contract w/ *Green-e* provider *Green-e* certification req'ts: 1) qualified sources of renewable energy content — 2) new renewable energy content 3) emissions criteria for non-renewable portion — 4) no nuclear power *Green power "tags" can be purchased where access is not available*

Materials & Resources

1 prerequisite, 7 credits = 13 possible points

The most environmentally benign material is the one that you don't use

MR Prerequisite 1	Storage & Collection of Recyclables	Provide separation/collection/storage area for recyclables: Includes glass, paper, plastics, corrugated cardboard, metals
MR Credit 1.1	Building Reuse: Maintain 75% Structure/Shell	Maintain at least 75% of existing bldg structure & shell
MR Credit 1.2	Building Reuse: Maintain 100% Structure/Shell	Maintain 100% of existing bldg structure & shell
MR Credit 1.3	Building Reuse: Maintain 100% Structure/Shell & 50% Non-Structure/Shell	Maintain 100% of existing bldg structure & shell and at least 50% of non-shell components
	In all of the Building Reuse credits it is assumed that window assemblies and non-structural roofing material will be replaced because new assemblies would be more energy efficient	
MR Credit 2.1	Construction Waste Management: Divert 50% from Landfill	Waste management plan- recycle/salvage at least 50% of waste
MR Credit 2.2	Construction Waste Management: Divert 75% from Landfill	Waste management plan- recycle/salvage at least 75% of waste

MR Credit 3.1	Resource Reuse: 5%	Use salvaged/refurbished/reused materials for at least 5% of bldg materials
MR Credit 3.2	Resource Reuse: 10%	Use salvaged/refurbished/reused materials for at least 10% of bldg materials
MR Credit 4.1	Recycled Content: 5% (p-c + 1/2 p-i)	Use materials w/ recycled content such that sum of post-consumer recycled content + 1/2 post-industrial content constitutes at least 5% of total value of materials in project
MR Credit 4.2	Recycled Content: 10% (p-c + 1/2 p-i)	Use materials w/ recycled content such that sum of post-consumer recycled content + 1/2 post-industrial content constitutes at least 10% of total value of materials in project

P-C is weighted more heavily to increase demand for p-c goods in the marketplace
Industrial processes that use their own waste product as a component in new product is ***not*** *recycled content*

MR Credit 5.1	Regional Materials: 20% mfr	Minimum of 20% of bldg materials manufactured w/in radius of 500 miles *Distance based on final point of manufacture*
MR Credit 5.2	Regional Materials: 50% extract	Of materials in MR Credit 5.1, use minimum of 50% of bldg materials extracted/harvested/ recovered w/in radius of 500 miles *easy places to start: gravel, concrete, landscaping, masonry, etc.*
MR Credit 6	Rapidly Renewable Materials	Use rapidly renewable materials for 5% of total value of all bldg materials/products *rapidly renewable = harvested w/in 10 yr cycle or less (ex. cork, bamboo, linoleum)*
MR Credit 7	Certified Wood	50% of wood products certified by *Forest Stewardship Council's Principles & Criteria*

Indoor Environmental Quality

2 prerequisites, 8 credits = 15 possible points

EQ Prerequisite 1	Minimum IAQ Performance	Comply w/ *ASHRAE 62-1999, Ventilation for Acceptable Indoor Air Quality* w/Addenda using the Ventilation Rate Procedure *ASHRAE 62-1999* : specifies min. ventilation rates & IAQ levels to prevent uptake of contaminants, filter particulates, and minimize opportunity for organism growth
EQ Prerequisite 2	Environmental Tobacco Smoke (ETS) Control	No smoking in bldg + locate outdoor smoking areas away from entry/operable windows ***OR*** Smoking room directly exhausted to outdoors , deck-to-deck partitions, and negative pressure of at least 7 PA. Performance verified w/ tracer gas testing methods per *ASHRAE Standard 129-1997* (testing req'd in CDs and results req'd Cx plan/other report)
EQ Credit 1	Carbon Dioxide (CO_2) Monitoring	Permanent CO_2 monitoring system that provides feedback on performance in a form that affords operational adjustments. CO_2 differentials in *ASHRAE 62-2001* , Appendix D.

EQ Credit 2	Ventilation Effectiveness	Mechanically ventilated: Ventilation system w/ air change effectiveness (Eac) > or = to 0.9 as determined by *ASHRAE 129-1997* or *ASHRAE 2001 Fundamentals Ch 32, Space Air Diffusion* ***OR*** Naturally ventilated: Distribution & laminar flow pattern that involves not less than 90% of room/zone area in the direction of air flow for at least 95% of hours of occupancy
EQ Credit 3.1	Construction IAQ Mgmt Plan: During Construction	IAQ Management Plan for construction/pre-occupancy: During construction meet or exceed *SMACNA IAQ Guideline for Occupied Bldgs Under Construction, 1995, Ch 3* Protect absorptive materials from moisture damage If AHUs are used during construction, use MERV 8 filters @ ea return air grill Replace all filtration media prior to occupancy w/ MERV 13 filters
EQ Credit 3.2	Construction IAQ Mgmt Plan: Before Occupancy	IAQ Management Plan for pre-occupancy: After construction/prior to occupancy complete min 2-wk bldg flush-out w/ new MERV 13 filtration media @ 100% outside air. After flush-out replace all filtration media w/ new MERV 13 (except filters solely processing outside air) ***OR*** Conduct baseline IAQ testing procedure consistent w/ *US EPA Protocol for Environmental Req't's, Baseline IAQ and Materials, for the Research Triangle Park Campus, Sec 01445*
EQ Credit 4.1	Low-Emitting Materials: Adhesives & Sealants	VOC of all adhesives & sealants < limits of *South Coast Air Quality Mgmt District Rule 1168* All sealants used as fillers to meet or exceed req'ts of *Bay Area Air Quality Mgmt District Regulation 8, Rule 51* Sealants: Architectural/Roadway = 250 g/L Roofing = 450 g/L PVC Welding = 480 g/L Other = 420 g/L Sealant Primer: Architectural (non-porous) = 250 g/L Architectural (porous) = 775 g/L Other = 750 g/L
EQ Credit 4.2	Low-Emitting Materials: Paints & Coatings	VOC of all paints & coatings < *Green Seal Standard GS-11* req'ts Flat< 50 g/L Non-flat< 150 g/L
EQ Credit 4.3	Low-Emitting Materials: Carpet	VOC of carpet systems to meet or exceed *Carpet & Rug Institute's Green Label Indoor Air Quality Program*
EQ Credit 4.4	Low-Emitting Materials: Composite Wood	No added urea-formaldehyde resins *Check OSB, MDF, plywood, parallams, SC WD doors*

EQ Credit 5	Indoor Chemical & Pollutant Source Control	Provide: Permanent entryway systems to capture dirt, etc. (walk-off mats) At chemical use areas, deck-to-deck partitions and separate outside exhaust @ rate of at least 0.50 ft^3/min and negative pressure of at least 7 PA Drains plumbed for disposal of liquid waste in chemical use areas *Chemical use areas include janitor closets, copy rooms, etc.*
EQ Credit 6.1	Controllability of Systems: Perimeter Spaces	Avg of 1 operable window and 1 lighting control zone per 200 sf for all regularly occupied areas w/in 15' of perimeter wall *Lighting controls: switch, dimmer, sensor*
EQ Credit 6.2	Controllability of Systems: Non-Perimeter Spaces	Controls for individual airflow, temperature, and lighting for at least 50% of occupants in non-perimeter, regularly occupied areas
EQ Credit 7.1	Thermal Comfort: Compliance w/ ASHRAE 55-1992	Mechanically ventilated: Comply w/ *ASHRAE 55-1992* , Addenda 1995, for thermal comfort standards (Winter 68-74, 71 optimum; Summer 73-79, 76 optimum) ***OR*** Naturally ventilated: Use adaptive comfort temperature boundaries per *Collaborative for High Performance Schools Best Practices Manual Appendix C* (basically says that people in naturally ventilated buildings will tolerate a wider temperature range beyond ASHRAE stds)
EQ Credit 7.2	Thermal Comfort: Permanent Monitoring System	Install permanent temperature/humidity monitoring system that allows operators control over thermal comfort performance and de/humidification systems in bldg
EQ Credit 8.1	Daylight & Views: Daylight 75% of Spaces	Minimum Daylight Factor of 2% in 75% of all spaces occupied for critical visual tasks *achieving this credit acc'd to the calc's does not necessarily mean you have achieved successful daylighting-- must be modeled to determine that*
EQ Credit 8.1	Daylight & Views Views for 90% of spaces	Direct line of sight to vision (transparent and 2'-6" A.F.F. to 7"-6" A.F.F.) glazing for bldg occupants in 90% of all regularly occupied spaces

Innovation & Design Process

No prerequisites, 2 credits = 5 possible points

ID Credit 1 (1-4 points)	Innovation in Design	Rewards exceptional performance in an area covered by LEED or innovative performance in an area not covered by LEED Exceptional performance must show measurable, verifiable, and documentable benefits Substantial effort must be applied to innovation credits
ID Credit 2	LEED Accredited Professional	One principal member of project team has successfully completed LEED AP exam People are *accredited* , buildings are *certified*