Leadership in Energy and Environmental Design (LEED[®]) for New Construction





Defining Sustainability

"...to meet the needs of the present without compromising the ability of future generations to meet their needs."

1987 World Commission on Environment

and Development's "Bruntland Report"

Overseas Buildings Operations Mission

"Our diplomatic missions require safe, secure, functional, well-maintained, and sustainable platforms for operations."

Environmental Impact of Buildings

- ➤ 39% of total U.S. primary energy use (43% for HVAC in households)
- ≻ 68% of electricity consumption
- > 38% of total U.S. greenhouse gas emissions
- 160 million tons of construction and demolition waste in the U.S. (approx. 2.8 lbs/person/day)—nearly 26% percent of nonindustrial waste generation in the U.S.
- > 12% of potable water in the U.S., or 15 trillion gallons/yr
- > 40% (3 billion tons annually) of raw materials use globally
- > 25% of virgin wood

Federal Buildings' Impact on Environment

➤The federal government owns approximately 445,000 buildings with total floor space over 280 Million SM (3B gsf), in addition to leasing 57,000 buildings comprising 374M gsf of floor space. These federal buildings account for 37% of the government's total energy use.



U.S. Federal Green Building Inititives

Energy Policy Act of 2005 ≻7.5% Renewable Energy Executive Order 13423 of 2007 **≻**3% Energy Reduction Annually (30% by 2020) >2% Water Reduction Annually (16% by 2020) Federal Leadership in High Performance and Sustainable **Buildings Memorandum of Understanding (MOU) of 2006** >15% of portfolio compliant by 2015 Energy Independence and Security Act of 2007 >55% energy use reduction in new construction by 2010>Net Zero by <u>2030</u> Executive Order 13514 of 2009 **Green House Gas Reporting for Federal Agencies in the Executive Branch of government**

Green Building Rating Systems

>Examples of Green Building Rating Systems:

BREEAM CASBEE ***United Kingdom, Russia **Japan *LEED® Living Building Challenge *****United States, India, *****United States, Canada Argentina, Brazil, Canada, ***DGNB ***Germany **Green Globes Canada**, United States *****SICES *****Mexico *****Green Star *Australia, New Zealand, ***EEWH** *South Africa Taiwan

Leadership in Energy and Environmental Design

LEED[®] was Developed by the U.S. Green Building Council (USGBC) in 1993
Goals of LEED include:

>Promote integrated design

>Define a standard of measurement for "green"

- Prevent "greenwash" (false or exaggerated claims)
- >Stimulate green competition

➢ Raise consumer awareness

Levels of Certifications:
Certified, Silver, Gold, and Platinum

Family of rating systems for different project types:
 LEED for New Construction

>The World Green Building Council was formed in 2002 by 8 national level green building councils



LEED[®] for New Construction 2 LEED[®] Certified Embassies 2 anticipated LEED[®] Certified Embassies



NEC Sofia, Bulgaria earned 7 Prereqs & 26 Points:

- 37% Better than ASHRAE
- Brownfield
- Redevelopment
- Ozone Protection
- No Chemical Water Treatment
- Enhanced Indoor Air Quality
- Tree Preservation
- Building as Educational Tool

NEC Panama City earned 7 Prereqs & 26 Points:

- 35% Better than ASHRAE
- Ozone Protection
- Water Efficient Landscaping
- Regional Materials
- Low-Emitting Materials
- Enhanced Indoor Air Quality
- Building as Educational Tool

NCC Johannesburg attempted 7 Prereqs & 29 Points:

- •22% Better than ASHRAE•31% Building Water Use better than baseline
- Ozone Protection
- Regional Materials
- Low-Emitting Materials
- Enhanced Indoor Air Quality

NEC Brazzaville *attempted* 7 Prereqs & 37 Points:

- •32% Better than ASHRAE
- •31% Building Water Use better than baseline
- •Water Efficient
- Landscaping
- •87% of Construction Waste Diverted from Landfills
- •Regional Materials
- Enhanced Indoor Air Quality

New Embassy Compound - Bucharest, Romania



NEC Bucharest LEED® Scorecard

LEED Scorecard

New Office Building, Bucharest, Romania

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29 6 1 33 Total Project Score

><u>SSp1 - Construction</u> **Activity Pollution Prevention** ><u>Strategies:</u> Silt fencing, inlet protection and sedimentation basins



►<u>SS1 – Site Selection</u>

><u>Strategies:</u> Select a site that does not encompass, or is not directly adjacent to, wetlands, prime farm land, land 5 feet above the 100year flood plane, a body of water covered by The Clean Water Act, previously public parkland

SS2 – Community Connectivity and Development Density

Strategies: Locate the project near existing infrastructure including high density housing, and commercial resources such as restaurants, banks, places of warship, retail, etc.



SS4.1 – Public Transportation Access

➤<u>Strategies:</u> Locate the project site within .5 mile of a rail stations or .25 miles of 2 or more bus lines

SS4.2 – Bicycle Racks and Changing Rooms
Strategies: Provide secure bicycle racks with 200 meters of the entrance, provide shower and changing room on the compound

><u>SS4.3 – Low Emitting and Fuel Efficient</u> <u>Vehicles</u>

><u>Strategies:</u> Provide priority parking for low emitting or fuel efficient vehicles

SS4.4 – Parking Capacity

><u>Strategies:</u> Do not exceed the local zoning requirement, or the SRP requirements if there are no local zoning requirement









VEGETATED OPEN SPACE = 132,654 SQUARE FEET

UILDING FOOTPRINT AREA = 23.085 SQUARE FEET

LEED[®] Water Efficiency

►<u>WE1 – Irrigation</u> <u>Efficiency</u>

Strategies: Design with a native plant selection, and drought tolerant plants, and inground drip irrigation systems

>53% reduction in irrigation consumption



RAPHC SCALE 8 16 24

LEED® Water Efficiency



LEED® Water Efficiency

<u>WE3 – Plumbing Fixture Efficiency</u>
 <u>Strategies:</u> Specify low-flow or waterless fixtures for toilets, urinals, sinks, and showers fitted with aerators or flow restrictors

>Total water saving is 46%





LEED[®] Energy + Atmosphere

►<u>EA1 – Energy Efficiency</u>

Lighting System

It was designed using pendant mounted fixtures. With this design 20% less energy is being consumed.

Lighting control system utilizes censors for an additional 10% reduction in lighting power.

Chilled Water System

High Efficiency air cooled chillers with VFDs were designed. The system utilizes a variable primary pumping and two way control valves that offers significant energy reductions.

Heat Recovery Chiller

A heat recovery chiller to generate hot water for the building has been designed with great energy savings against traditional systems.

LEED[®] Energy + Atmosphere

►<u>EA1 – Energy Efficiency</u>

Building Orientation

The building was designed where the long axis faces North which yields lower cooling requirements.

Demand Control Ventilation

The building utilizes DCV to reduce the amount of outside air required. CO2 censors communicate with the Building Automation System to adjust the amount of outside air.

Gas Fired Boilers

The back up boilers to the heat recovery chiller are full condensing gas fired which are very efficient at low hot water temperatures used for this system.

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EA3 – Enhanced Commissioning

≻<u>Strategies:</u>

- (1) Designate an independent Commissioning Authority (CxA)
 to oversee commissioning process
- (2) CxA shall conduct a commissioning design review of the Owners Project Requirements (OPR) and Basis of Design (BOD)
- (3) CxA shall review contractor's submittals of commissioned systems
- (4) Develop a systems manual
- (5) Verify training of operating personnel
- (6) Involve the CxA within 10 months after substantial completion with O&M staff and occupants.



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MRp1 - Storage & Collection of Recyclables: Prerequisite requires an ongoing recycling program for common office items such as paper, corrugated cardboard, plastics, and metals.



MR2 - Construction Waste Management:

>Strategies: Divert construction waste that that would otherwise end up in a landfill by identifying recycling haulers, local partners that will accept the construction waste, or making charitable donations. Record by volume or weight.

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►<u>MR 4 - Recycled Content</u>:

><u>Strategies:</u> Incorporate post consumer and pre-consumer content examples include such common building materials as steel, acoustic ceiling tile, gypsum board, aluminum, copper, carpet, and ceramic tile.

><u>MR5 – Regional Materials</u>:

 <u>Strategies:</u> Use materials extracted, processed, and manufactured within 800 Kilometers (500 miles)
 Typical Materials: Concrete and local stone for cladding



EQp2 – Environmental Tobacco Smoke

>All Federal building prohibit smoking indoors. Additionally, LEED requires that smoking areas are not within 8.3 meters of building entrances and intakes.

>Strategies: Program smoking areas around the site, and provides ash urns for smokers to deposit cigarette waste.



EQ3.1 - Air Quality During Construction: SMACNA IAQ Guidelines
Strategies: seal all ducts with plastic, protecting absorptive materials from moisture damage and scheduling delivery to occur AFTER any off-gassing has occurred, providing temporary filtration media minimum of MERV 8 in return air grilles, and replacing all filters immediately prior to occupancy.



EQ3.2 - Building Flush out and/or Air Quality Testing: eliminate toxins accumulated during the construction process

Strategies: provide a 14,000 cu. ft. per sq. ft. (~72 hours) flush out period while maintaining temperature of at least 60 degrees and no higher than 60% humidity

➢<u>EQ5 - Pollutant Source Control</u>: eliminate or control pollutant sources from entering the building

> Strategies: entry mats, MERV 13 filtration media, slab-to-slab partitions, negative air pressure, and exhaust in areas with high concentrations of hazardous materials such as janitorial closets and high volume copy rooms



>Low VOC-emitting materials inside the building envelope: limit toxins for improved occupant health

> Strategies: include low- or no-VOCs in the following materials:

EQ4.1 -Adhesives and sealants

EQ 4.2 - Paints and coatings, including wood finishes

EQ4.3 - Flooring, including carpets, carpet

cushions, and hard surface flooring

 EQ4.4 - Composite Wood & Agrifiber, including urea-formaldehyde-free composite wood products such as plywood, medium density fiberboard (MDF), particleboard, strawboard, or door cores
 Furniture, almost all Knoll furniture is GreenGuard Certified, which ensures low

VOC content



Low-VOC Paints and Coatings



Urea-formaldehyde-free Composite Wood

EQ6.1 – Controllability of Systems: Lighting

➢<u>Strategies:</u> Occupancy sensors for common spaces, individual task lighting.







LEED[®] Online

Project teams input all
 LEED documentation into
 templates in LEED Online



Other Green Resources: OBO GreenGuide http://www.state.gov/documents/organization/128748.pdf



Under Secretary of Management Department of State

GreenGuide

Embassy & Consulate Operations



SITE

MATERIAL

The gecko can support his entire body

with one toe. Biomimicry scientists an

studying the microscopic hairs (setae)

the first dry, self-cleaning adhesive

Natural wetland systems have often been described as the "earth's kidneys because they filter pollutants from water that flows through on its way to receiving lakes, streams and oceans. Because these systems can improve water quality, engineers and scientists construct systems that replicate the functions of natural wetlands.



The Saguaro is the ultimate water harvester-sucking up as much water as possible when it rains. The trunk and arms are pleated like an accordion and can expand or contract with the amount of water taken in. Saguaro roots extend to a diameter of 100 feet (for a 50-foot-high Saguaro) at a depth of only inches. Tiny hairs absorb even concentrated drizzle or mist.



INDOOR ENVIRONMENT

Termites have designed their structure to perfectly balance the raging heat of the day and the bitter cold of the night naturally ventilating their environment gecko's toes as a model for developing to an even 78 *F.



ENERGY

The potential of solar power in the Southwest United States is comparable in scale to the hydropower resource of the Northwest. A desert area 10 miles by 15 miles could provide 20,000 megawatts of power, while the electricity needs of the entire United States could theoretically be met by a photovoltaic array within an area 100 miles on a side.



TRANSPORTATION

Ruby-Throated Hummingbirds fly ~27 miles per hour on their 18.5 hour migration flight across the Gulf of Mexico without refueling.

That is fuel efficiency worth mimicking.

"I encourage our missions to use this timely and valuable guide to address energy and sustainability challenges at our facilities overseas, in response to federal mandates and in support of greater environmental stewardship. Regular adherence to the guidance provided here will allow Overseas Buildings Operations to participate in and forward the Department of State's platform of eco-diplomacy.

Pattick F Kennedy

Questions?

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