

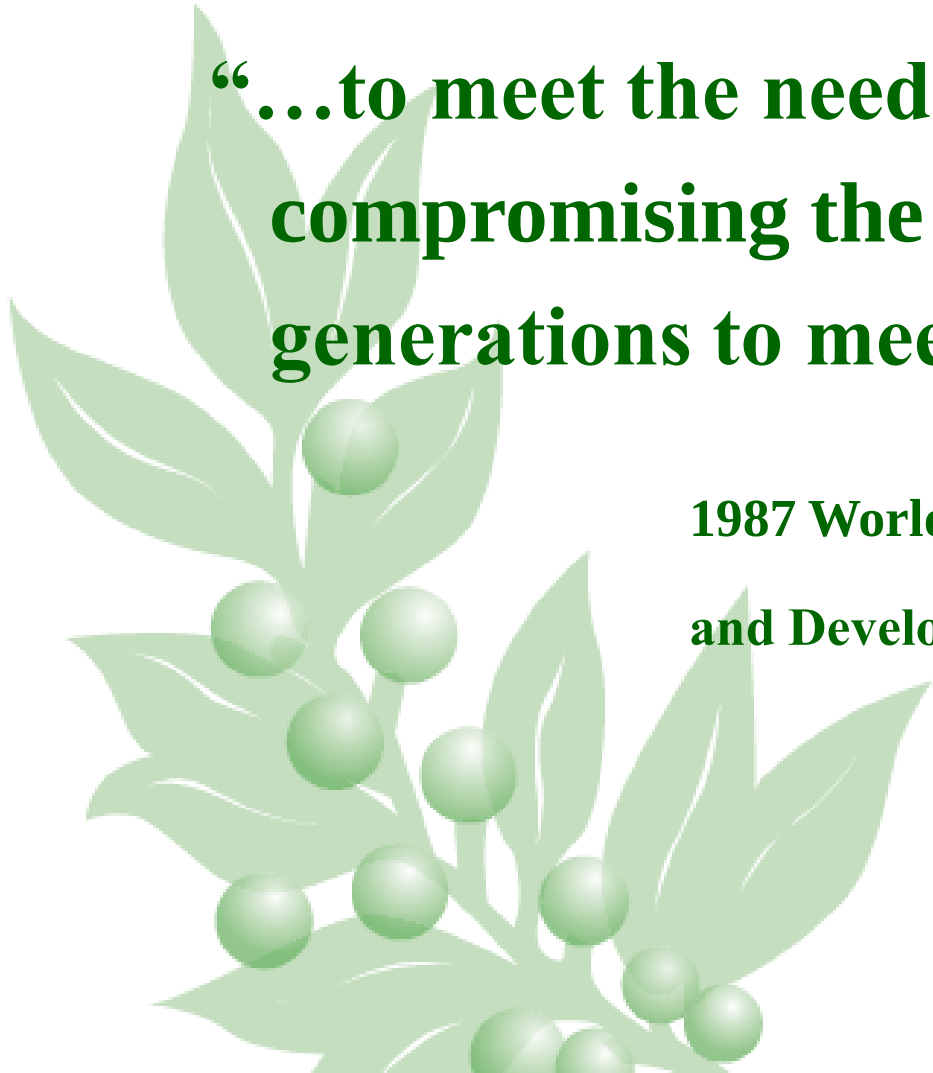
Leadership in Energy and Environmental Design (LEED®) for New Construction



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

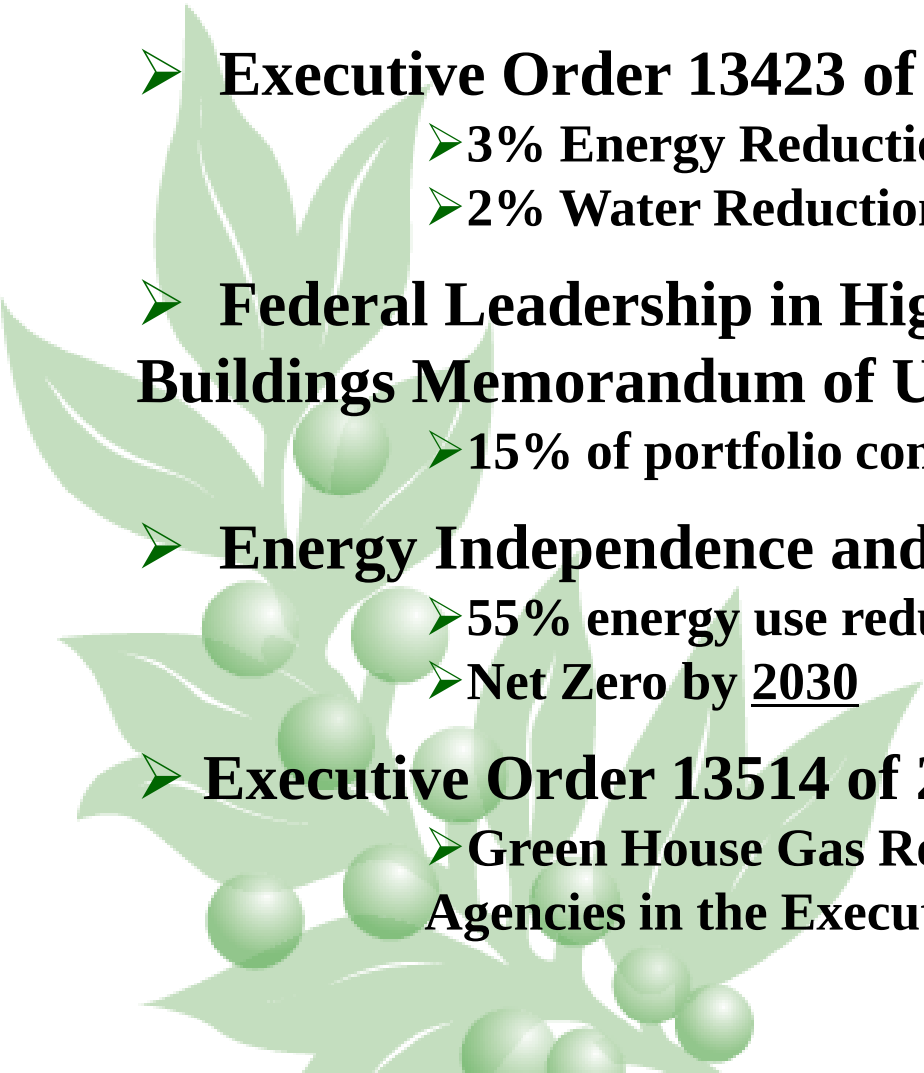
- **39%** of total U.S. primary energy use (43% for HVAC in households)
- **68%** of electricity consumption
- **38%** of total U.S. greenhouse gas emissions
- **160 million tons** of construction and demolition waste in the U.S. (approx. 2.8 lbs/person/day)—nearly 26% percent of non-industrial waste 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 Initiatives

- 
- **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 2030
 - **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**

❖ United Kingdom, Russia

❖ **LEED®**

❖ United States, India,
Argentina, Brazil,
Canada,

❖ **Green Globes**

❖ Canada, United States

❖ **Green Star**

❖ Australia, New Zealand,
❖ South Africa

❖ **CASBEE**

❖ Japan

❖ **Living Building Challenge**

❖ United States, Canada

❖ **DGNB**

❖ Germany

❖ **SICES**

❖ Mexico

❖ **EEWH**

❖ 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

Recommended	Alternate	Optional	N/A		Possible Points	
6	2	0	6	Sustainable Sites	14	
Y				Prereq 1		
1				Credit 1		
1				Credit 2		
		1		Credit 3		
1				Credit 4.1		
1				Credit 4.2		
1				Credit 4.3		
	1			Credit 4.4		
		1		Credit 5.1		
1				Credit 5.2		
		1		Credit 6.1		
		1		Credit 6.2		
1				Credit 7.1		
		1		Credit 7.2		
		1		Credit 8		

Recommended	Alternate	Optional	N/A		Possible Points	
3	0	0	2	Water Efficiency	5	
1				Credit 1.1		
		1		Credit 1.2		
		1		Credit 2		
1				Credit 3.1		
1				Credit 3.2		

Recommended	Alternate	Optional	N/A		Possible Points	
4	0	0	13	Energy & Atmosphere	17	
Y				Prereq 1		
Y				Prereq 2		
Y				Prereq 3		
2				Credit 1		
		2				
		2				
		2				
		2				
		2				
		1		Credit 2		
		1				
		1				
1				Credit 3		
1				Credit 4		
		1		Credit 5		
		1		Credit 6		

Recommended	Alternate	Optional	N/A		Possible Points	
1	3	0	9	Materials & Resources	13	
Y				Prereq 1		
		1		Credit 1.1		
		1		Credit 1.2		
		1		Credit 1.3		
	1			Credit 2.1		
		1		Credit 2.2		
		1		Credit 3.1		
		1		Credit 3.2		
	1			Credit 4.1		
		1		Credit 4.2		
	1			Credit 5.1		
		1		Credit 5.2		
		1		Credit 6		
1				Credit 7		

Recommended	Alternate	Optional	N/A		Possible Points	
11	0	1	3	Indoor Environmental Quality	15	
Y				Prereq 1		
Y				Prereq 2		
1				Credit 1		
		1		Credit 2		
1				Credit 3.1		
1				Credit 3.2		
1				Credit 4.1		
1				Credit 4.2		
1				Credit 4.3		
1				Credit 4.4		
1				Credit 5		
1				Credit 6.1		
	1			Credit 6.2		
1				Credit 7.1		
1				Credit 7.2		
		1		Credit 8.1		
		1		Credit 8.2		

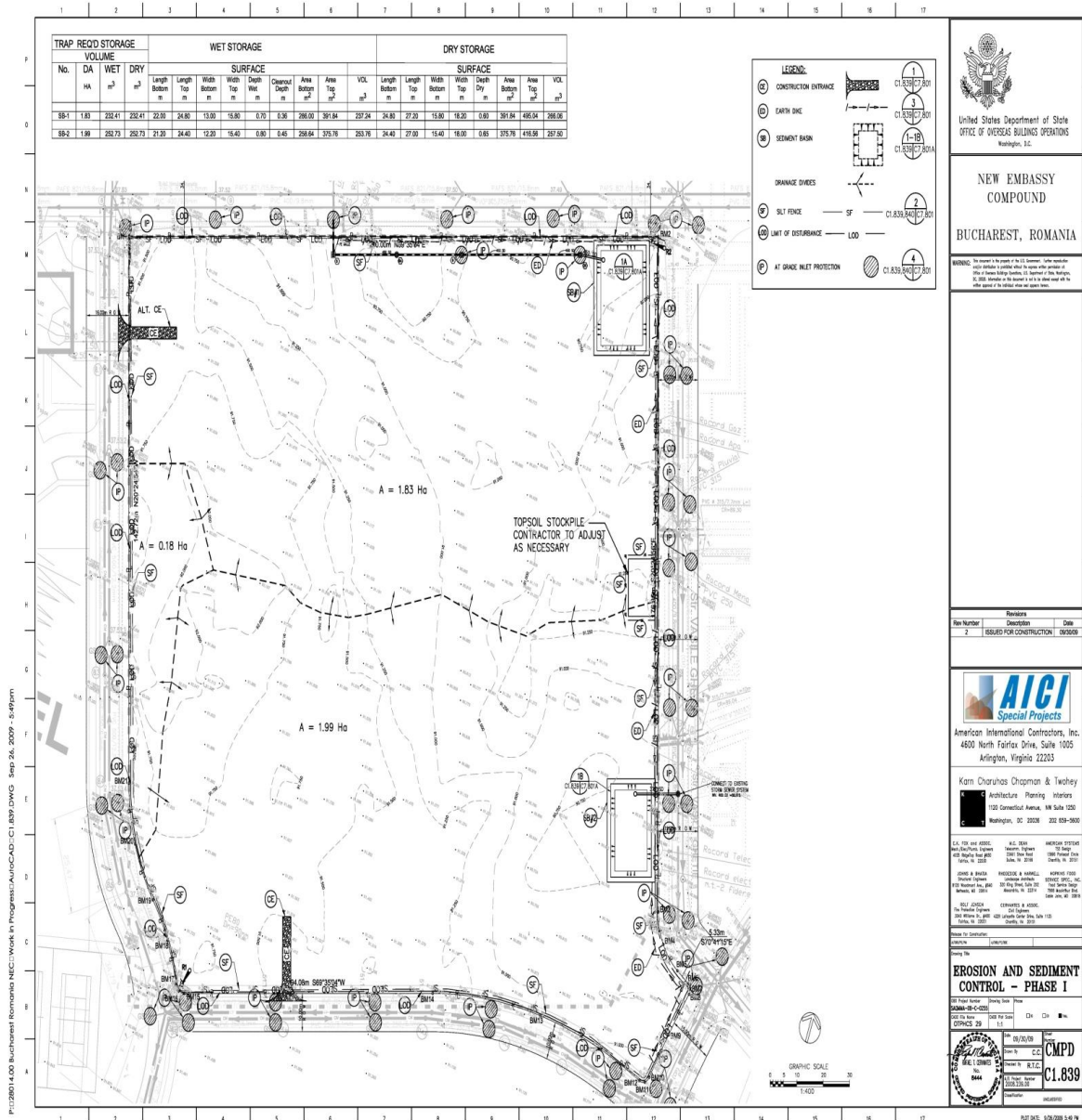
Recommended	Alternate	Optional	N/A		Possible Points	
4	1			Innovation & Design Process	5	
1				Credit 1.1		
1				Credit 1.2		
1				Credit 1.3		
	1			Credit 1.4		
1				Credit 2		

29	6	1	33	Total Project Score		
				Total Points	69	

LEED® Sustainable Sites

➤ SSp1 - Construction Activity Pollution Prevention

➤ Strategies:
Silt fencing,
inlet protection
and
sedimentation
basins



LEED® Sustainable Sites

➤ SS1 – Site Selection

➤ Strategies: Select a site that does not encompass, or is not directly adjacent to, wetlands, prime farm land, land 5 feet above the 100-year 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 worship, retail, etc.



LEED® Sustainable Sites

➤ SS4.1 – Public Transportation Access

➤ Strategies: 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

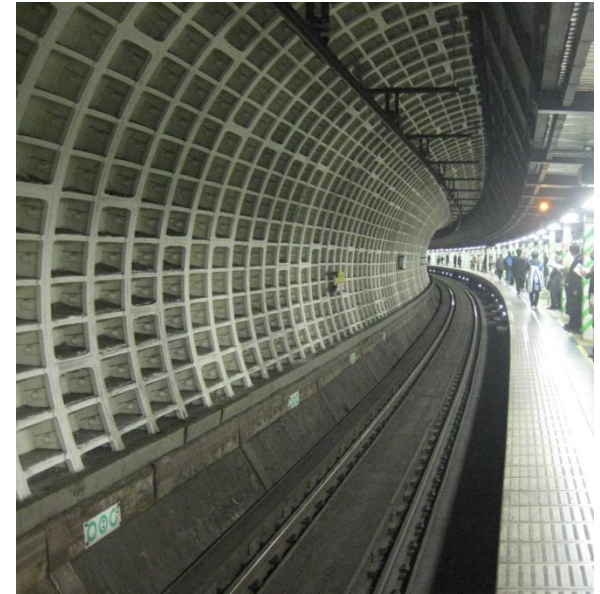
➤ Strategies: Provide secure bicycle racks with 200 meters of the entrance, provide shower and changing room on the compound

➤ SS4.3 – Low Emitting and Fuel Efficient Vehicles

➤ Strategies: Provide priority parking for low emitting or fuel efficient vehicles

➤ SS4.4 – Parking Capacity

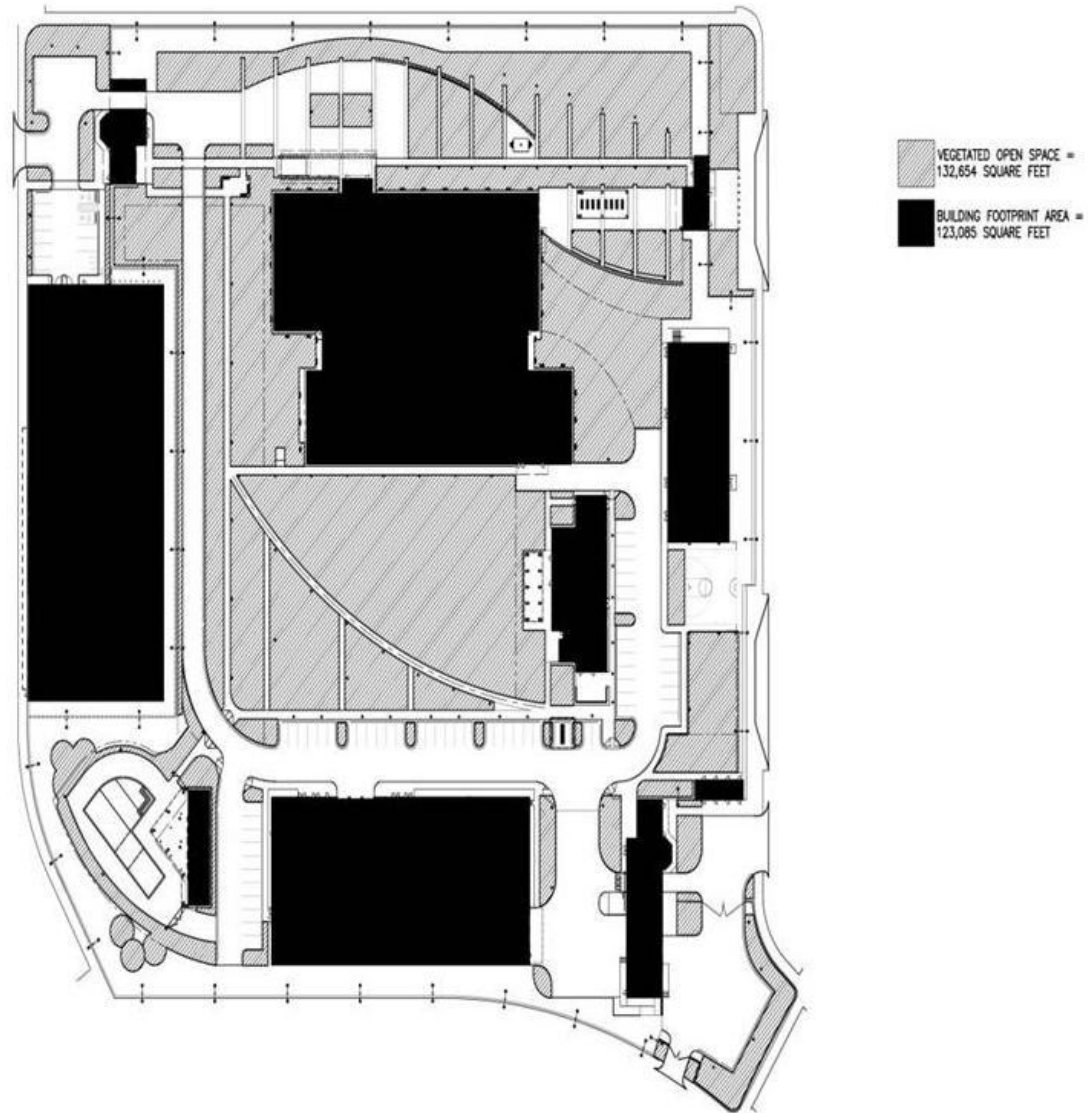
➤ Strategies: Do not exceed the local zoning requirement, or the SRP requirements if there are no local zoning requirement



LEED® Sustainable Sites

➤ SS5.2 – Maximize Open Space

➤ Strategies:
Provide open green space exceeding local zoning by 25%, or equal to 20% of the site, or equal to the building footprint.



LEED® Water Efficiency

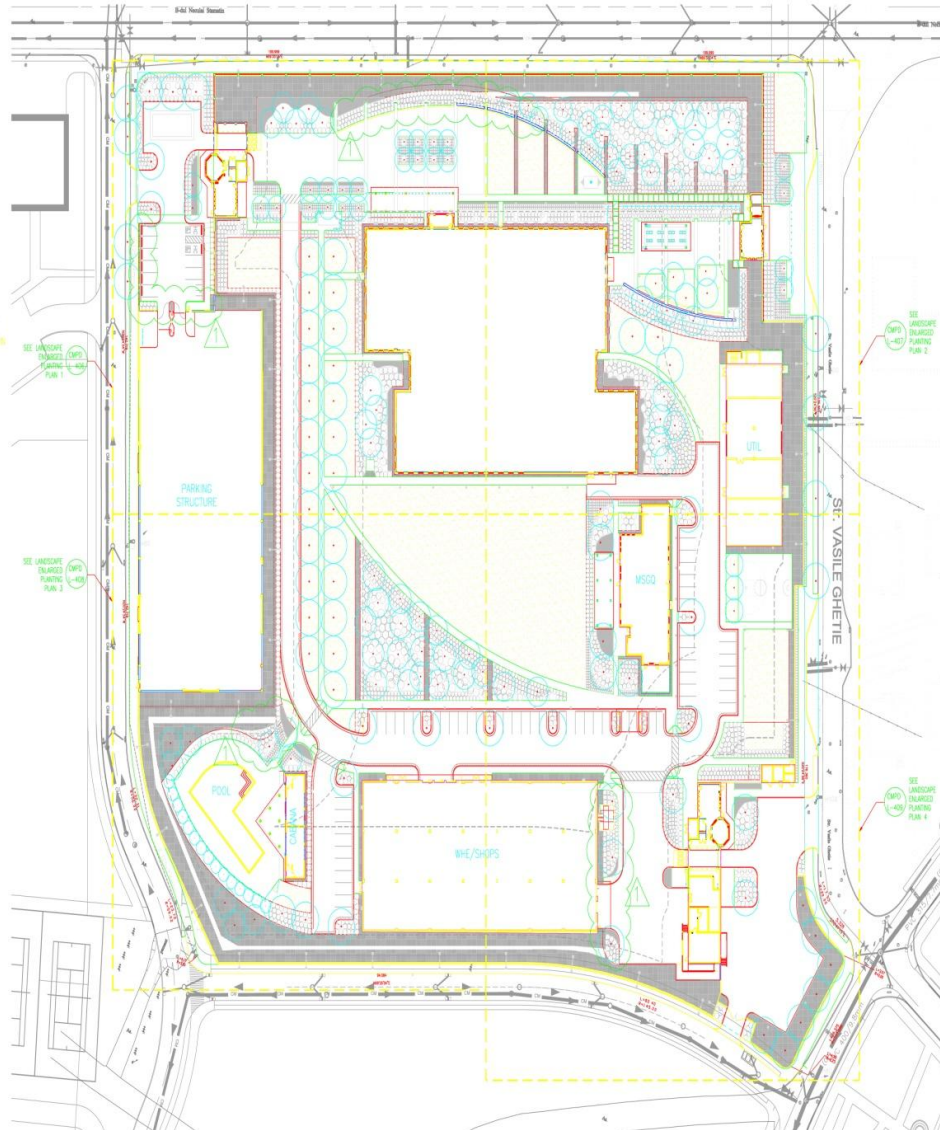
➤ WE1 – Irrigation Efficiency

➤ Strategies:

Design with a native plant selection, and drought tolerant plants, and in-ground drip irrigation systems

➤ 53% reduction in irrigation consumption



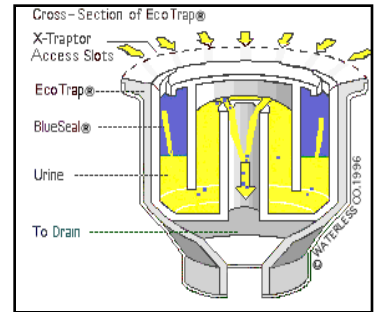


LEED® Water Efficiency

➤ WE3 – Plumbing Fixture Efficiency

➤ Strategies: 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

➤ EA1 – Energy Efficiency

Lighting System

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

Lighting control system utilizes sensors 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

➤ EA1 – Energy Efficiency

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 sensors 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.

LEED® Energy + Atmosphere

➤ EA3 – Enhanced Commissioning

➤ Strategies:

- (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.



LEED® Materials + Resources

- **MRp1 - Storage & Collection of Recyclables:** Prerequisite requires an on-going 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.

LEED® Materials + Resources

➤ MR 4 - Recycled Content:

➤ Strategies: 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.

➤ MR5 – Regional Materials:

➤ Strategies: Use materials extracted, processed, and manufactured within 800 Kilometers (500 miles)

➤ Typical Materials: Concrete and local stone for cladding



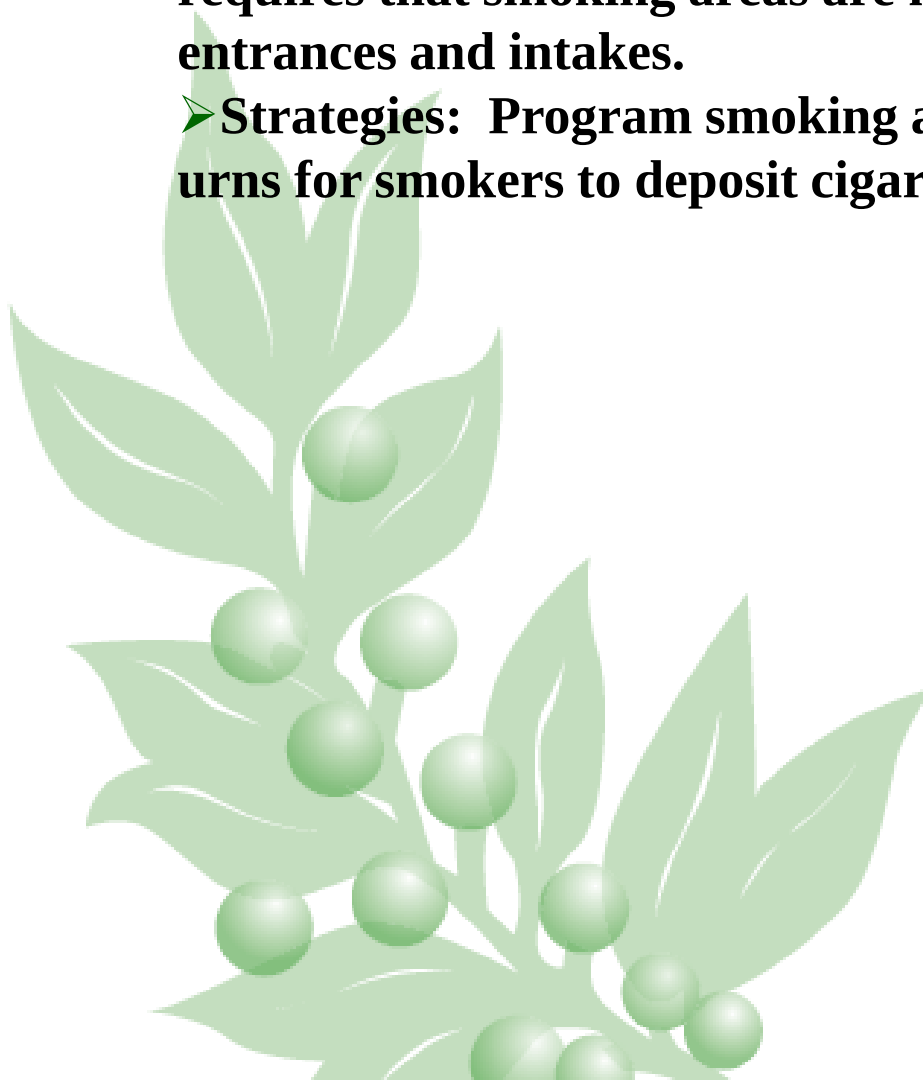
LEED® Indoor Environmental Quality

➤ 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.



NO SMOKING



LEED® Indoor Environmental Quality

- **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.**



LEED® Indoor Environmental Quality

- **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
- **EQ5 - Pollutant Source Control:** 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



LEED® Indoor Environmental Quality

- **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

LEED® Indoor Environmental Quality

➤ EQ6.1 – Controllability of Systems: Lighting

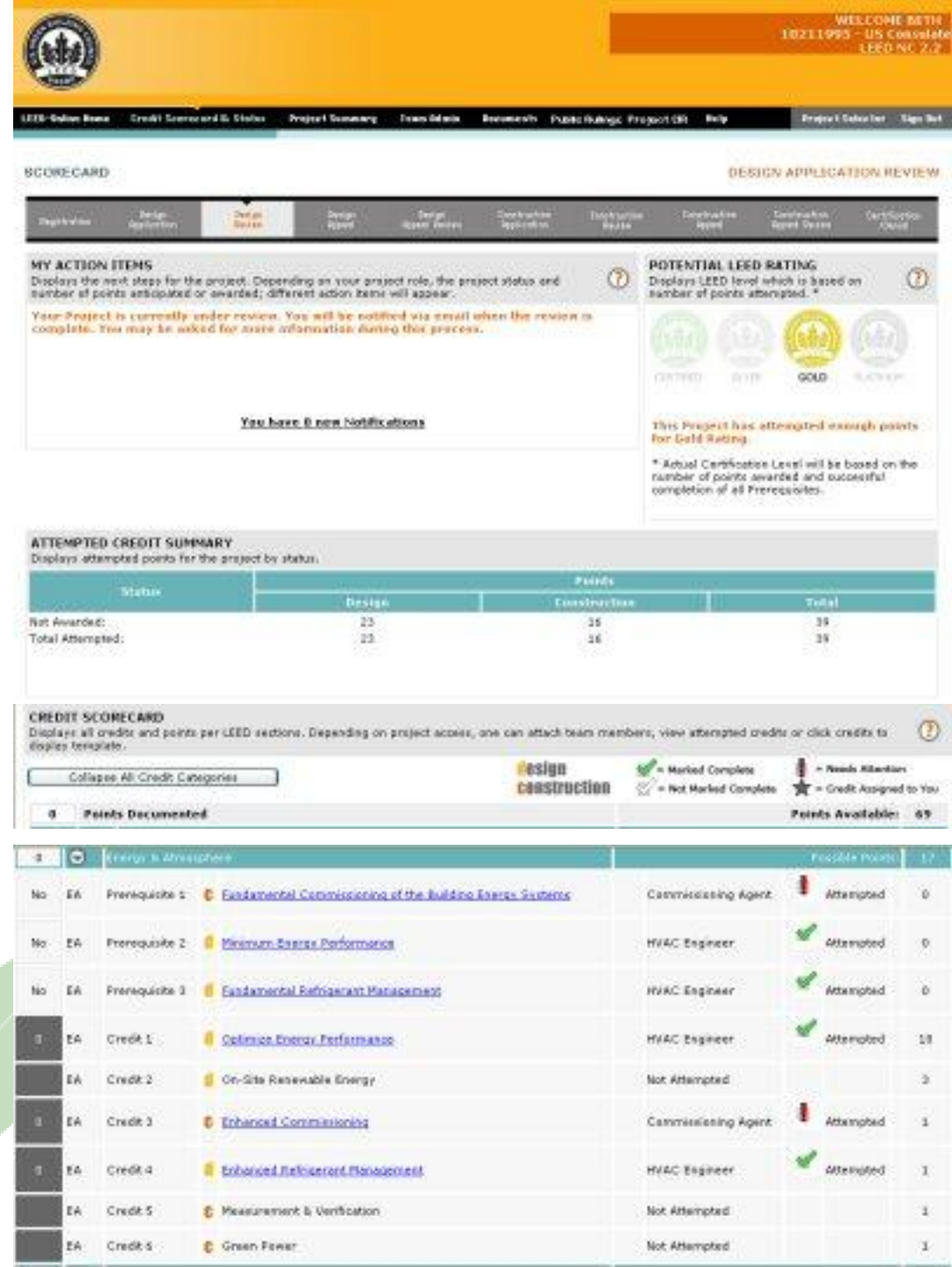
➤ Strategies: Occupancy sensors for common spaces, individual task lighting.



LED task lights

LEED® Online

➤ Project teams input all LEED documentation into templates in LEED Online



The image displays the LEED Online web application interface. At the top, there is a navigation bar with links for 'LEED Online Home', 'Credit Sources & Status', 'Project Summary', 'Team Details', 'Documents', 'Public Ratings', 'Project CRI', 'Help', 'Project Selection', and 'Sign Out'. The main content area is titled 'SCORECARD' and 'DESIGN APPLICATION REVIEW'. It shows the project's current status as 'Design Review' and provides a 'MY ACTION ITEMS' section with a message: 'Your Project is currently under review. You will be notified via email when the review is complete. You may be asked for more information during this process.' The 'POTENTIAL LEED RATING' section shows a 'GOLD' rating with a message: 'This Project has attempted enough points for Gold Rating.' Below this is the 'ATTEMPTED CREDIT SUMMARY' table, which shows the project has attempted 23 points out of a total of 39. The 'CREDIT SCORECARD' section shows a list of credits and prerequisites, with a total of 69 points available. The table includes columns for 'Credit', 'Status', 'Points', 'Possible Points', and 'Points Available'.

Status	Design	Construction	Total
Not Awarded:	23	16	39
Total Attempted:	23	16	39

Credit	Status	Points	Possible Points	Points Available
EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems	Attempted	0	0	0
EA Prerequisite 2: Minimum Energy Performance	Attempted	0	0	0
EA Prerequisite 3: Fundamental Refrigerant Management	Attempted	0	0	0
EA Credit 1: Optimize Energy Performance	Attempted	18	18	18
EA Credit 2: On-Site Renewable Energy	Not Attempted	0	0	0
EA Credit 3: Enhanced Commissioning	Attempted	1	1	1
EA Credit 4: Enhanced Refrigerant Management	Attempted	1	1	1
EA Credit 5: Measurement & Verification	Not Attempted	0	0	0
EA Credit 6: Green Power	Not Attempted	0	0	0

Other Green Resources: OBO GreenGuide

<http://www.state.gov/documents/organization/128748.pdf>

GreenGuide for Embassy & Consulate Operations



SITE

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.



WATER

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.



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.



MATERIAL

The gecko can support his entire body with one toe. Biomimicry scientists are studying the microscopic hairs (setae) gecko's toes as a model for developing the first dry, self-cleaning adhesive.



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 to an even 78 °F.



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."

Patrick E. Kennedy
Under Secretary of Management
Department of State



Questions?

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