DOHA GREEN TRAINING WORKSHOP

10th December 2009

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DOHA GREEN TRAINING WORKSHOP

Integrated Strategy for Water Use Reduction
Water Efficiency

10th December 2009

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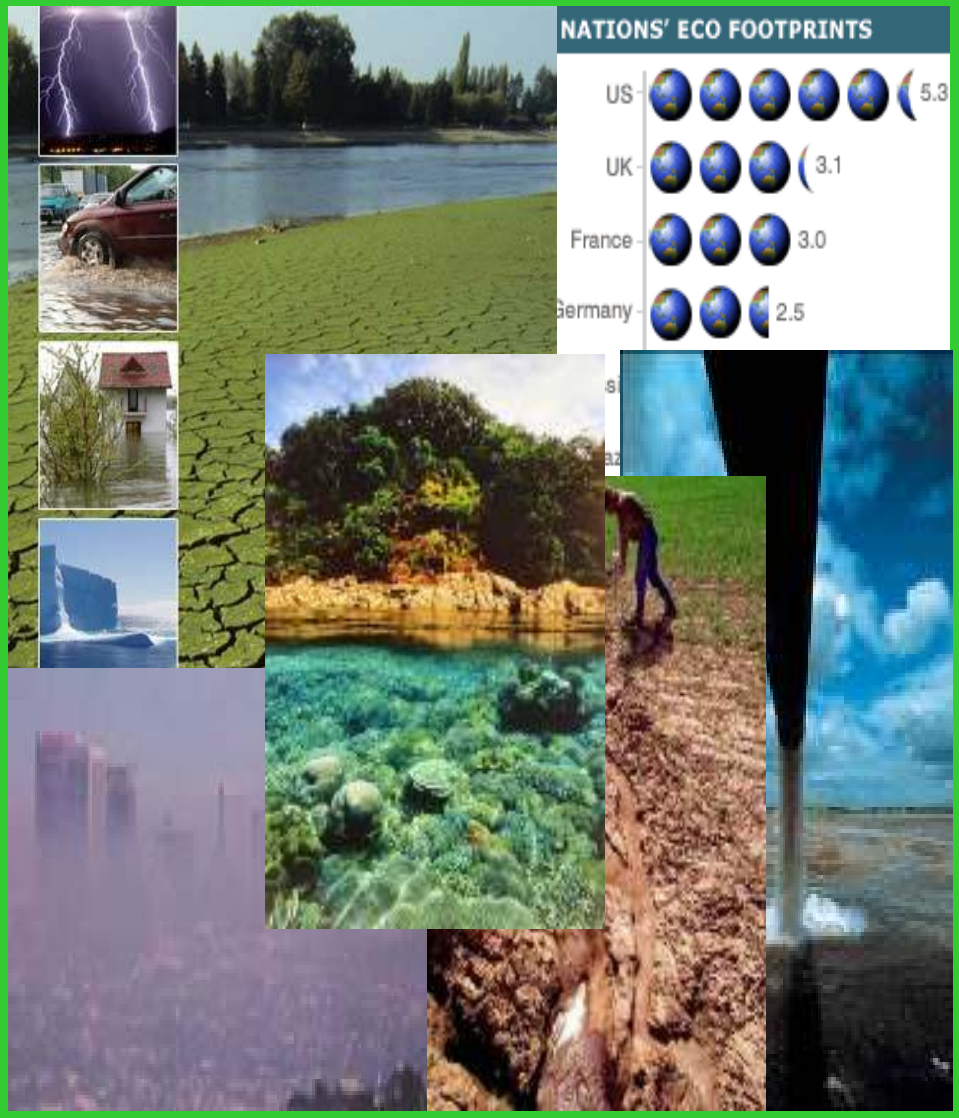
KEY ENVIRONMENTAL CHALLENGES

- Anomalous Climate Change
- Natural Resource Depletion
- Atmospheric Pollution and Acid Rain
- Contamination of Freshwater Resources
- Soil Erosion and Degradation
- Loss of Biodiversity



WORLDWIDE, BUILDINGS ACCOUNT FOR:

20%
~~17%~~
of fresh water consumption

25 %
of wood harvest

40%
~~33%~~
of CO_2 emissions

40%
~~30-40%~~
of energy use

30%
~~40-50%~~
of raw materials used

LEED™

LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

Leadership Energy Environmental Design

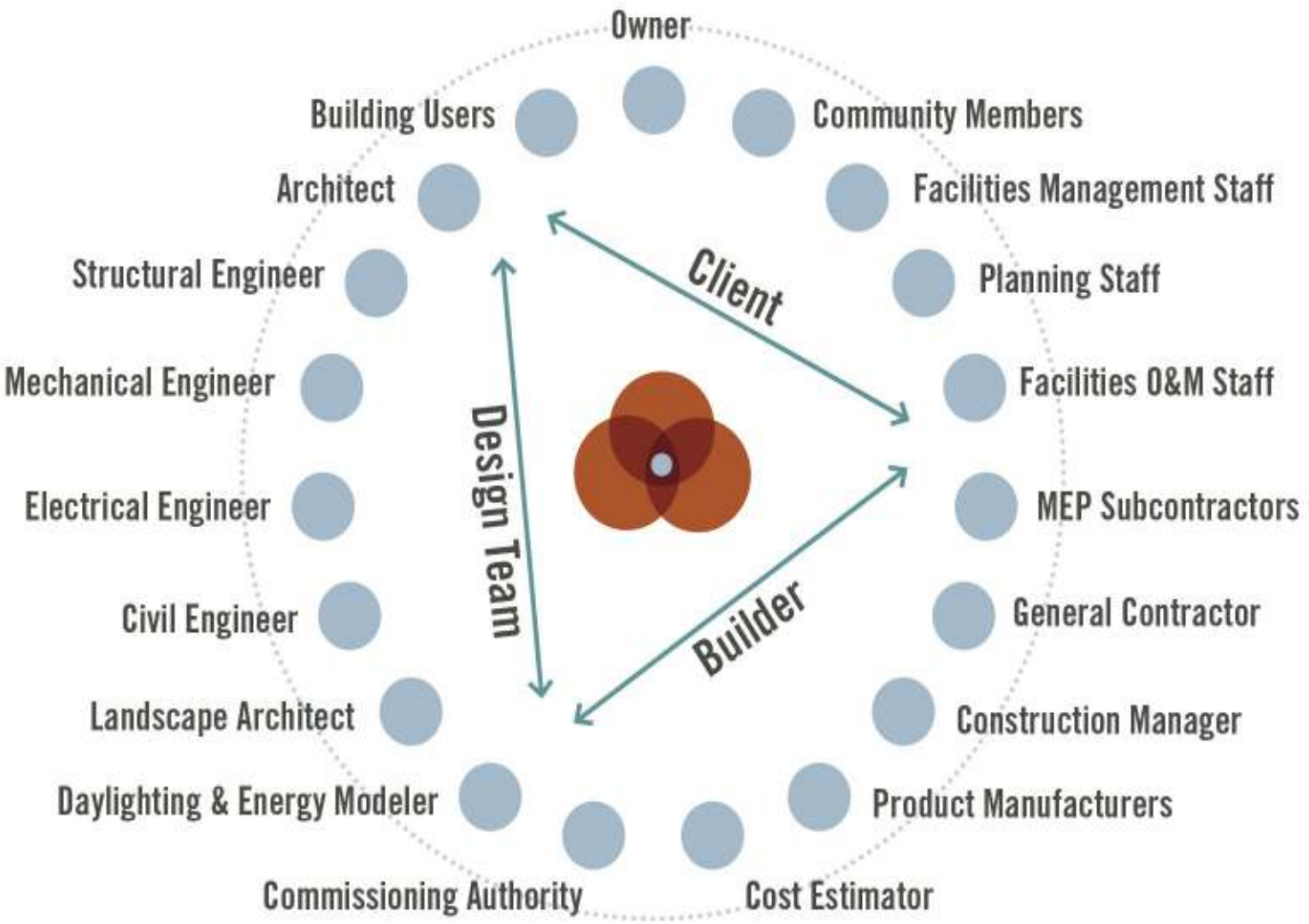
USGBC
EDUCATION

V3

Leadership in Energy and Environmental Design

A voluntary system for certifying high-performance, sustainable buildings and neighborhoods

INTEGRATIVE APPROACH: KEY STAKEHOLDERS



Adapted from graphic by Bill Reed

CREDIT CATEGORY SYNERGIES & INTEGRATIVE DESIGN

Sustainable Sites

Innovation in Design

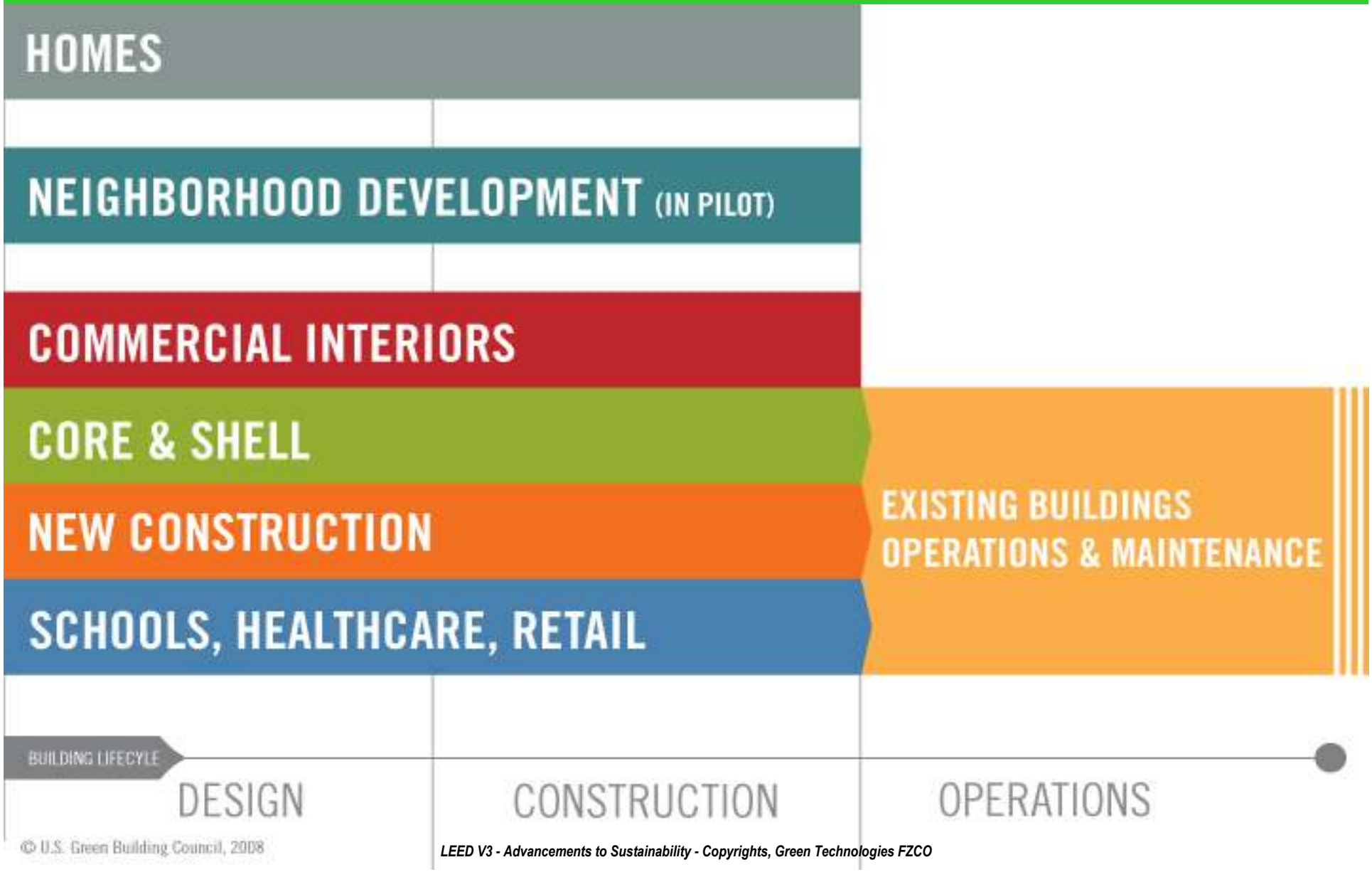
Water Efficiency

Indoor Environmental Quality

Energy & Atmosphere

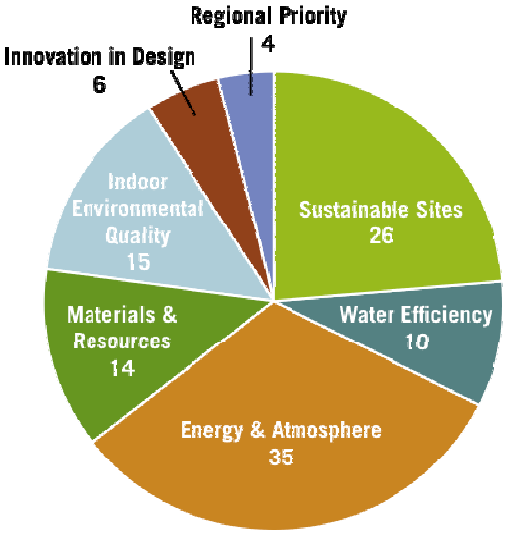
Materials & Resources

LEED ADDRESSES...

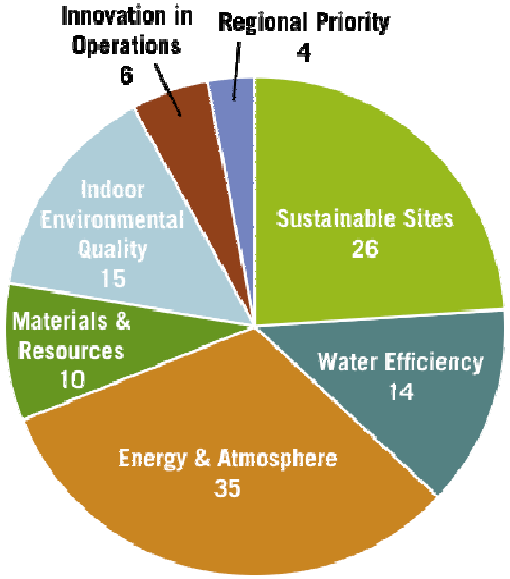


POINT DISTRIBUTIONS

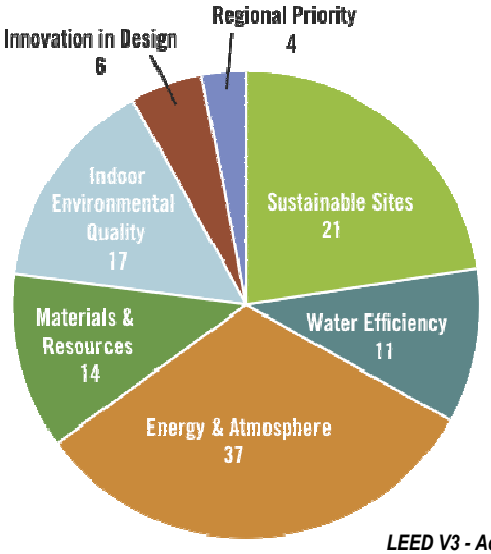
New Construction



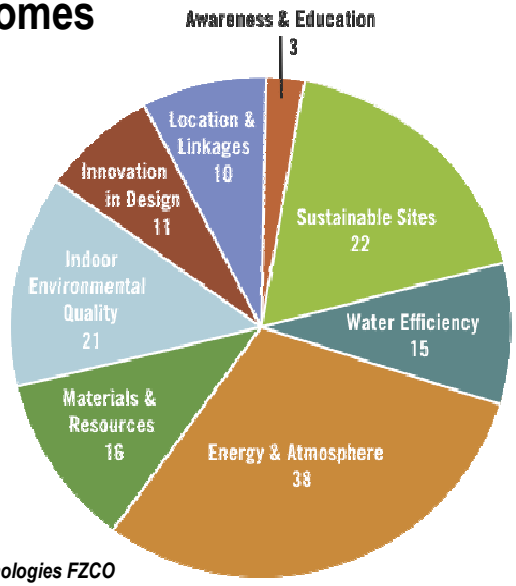
Existing Buildings: Operations & Maintenance



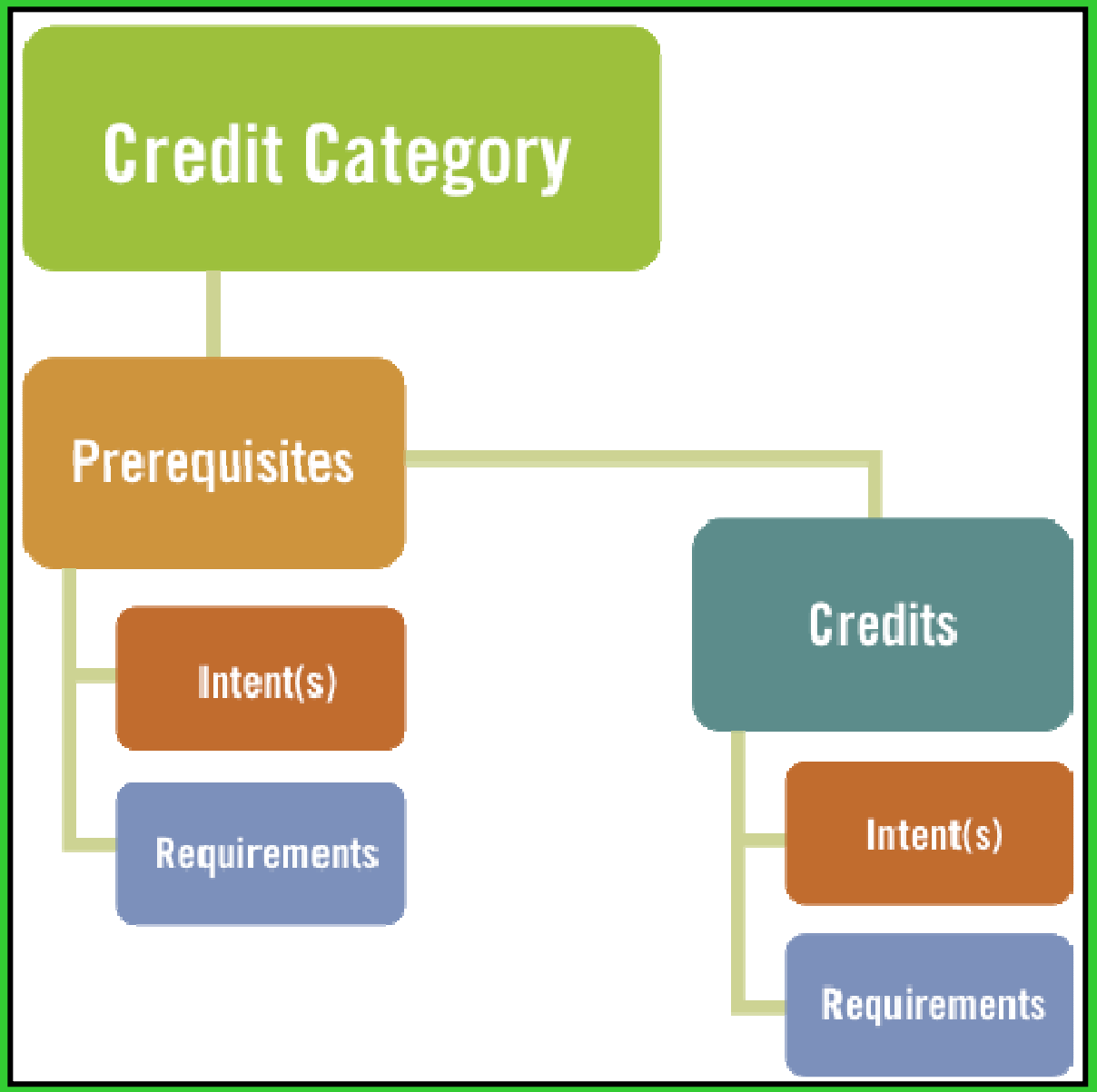
Commercial Interiors



Homes



RATING SYSTEM STRUCTURE



CERTIFICATION TOOL: LEED SCORECARD

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

FOUR CERTIFICATION LEVELS

40-49 **50-59** **60-79** **80+**

Points

LEED ONLINE V3 - HIGHLIGHTS

- Faster, smarter, better user experience.
- Scalable and more robust.
- Improved design and more intuitive user interface.
- Greater help capabilities.
- Better communication between project teams and certifying bodies.
- Upgrades that respond to the changes in the LEED 2009 Rating Systems.
- More functionality.
- Improved reliability.

CERTIFICATION TOOL: LEED ONLINE

LEED® ONLINE

My Projects | My Archives | Register New Project | Project Transfer

Project Registration

Project Registration

Welcome

1 Eligibility — 2 Rating System Selection — 3 Rating System Results — 4 Project Information — 5 Review — 6 Payment — 7 Confirmation

Welcome to LEED Online Project Registration.

The Registration questionnaire will begin the registration process.

Click on the Next button to continue with the registration process.

Back | Next | Cancel

CERTIFICATION TOOL: LETTER TEMPLATES

LEED-NC
LEED FOR NEW CONSTRUCTION

LEED-NC 2.2 Submittal Template
SS Credit 2: Development Density & Community Connectivity

design

(Responsible Individual) (Company Name)

I, _____, from _____

verify that the information provided below is accurate, to the best of my knowledge.

CREDIT COMPLIANCE

Please complete the project information listed below:

Project Site Area (sf) _____

Gross Building Area (sf) _____

Please select the appropriate compliance path option:

○ **Option 1:** Development Density

○ **Option 2:** Community Connectivity

OPTION 1: DEVELOPMENT DENSITY

Please ensure that the density radius and surrounding properties are clearly designated on the project's uploaded site vicinity plan.

Supporting Documentation

The site vicinity plan has been uploaded. The drawing includes a scale, density radius, and identifies all the neighborhood property locations within and intersected by the density boundary.

Sheet Description Log

Please include sheet name, sheet number and file name for each uploaded, referenced drawing (e.g. A-101, Site Plan, siteplan.pdf)

CERTIFICATION PROCESS: COMMERCIAL

Start

- Assessment of value
- Evaluation/documentation of condition treatment recommendations
- Set goals
- Determine preliminary LEED score
- Register project
- Identify partners
- Apply for incentives
- Determine green building practices
- Begin documentation process

Design

- Assemble design phase documentation
- Submit documentation
- USGBC design phase review
- "Anticipated" or "Denied"

Construction

- Assemble documentation
- Submit documentation
- USGBC construction phase review
- "Achieved" or "Denied"

Certification

CERTIFICATION TOOLS

- Rating systems
- Reference guides
- LEED-Online
- Credit Interpretation Rulings (CIRs)
- www.usgbc.org
- Case studies

CREDIT CATEGORY SYNERGIES & INTEGRATIVE DESIGN

Sustainable Sites

Innovation in Design

Water Efficiency

Indoor Environmental Quality

Energy & Atmosphere

Materials & Resources

WATER EFFICIENCY

- Goals
  - Reduce the quantity of water needed for the building
  - Reduce municipal water supply and treatment burden
  - Eliminate the use of Potable Water for landscape irrigation
  - Eliminate the use for Potable Water for Process

Ramboda Falls, Sri Lanka

WATER EFFICIENCY PREREQUISITES AND CREDITS

PREREQUISITE / CREDIT NUMBER	PREREQUISITE / CREDIT TITLE	AVAILABLE POINTS
WEp1	Water Use Reduction	Required
WEc1	Water Efficient Landscaping	2 – 4
WEc2	Innovative Waster Water Technologies	2
WEc3	Water Use Reduction	2 - 4
WEc4	Process Water Use Reduction	Applicable Only to LEED Schools

GREEN BUILDING DESIGN & CONSTRUCTION RATING SYSTEM

CATEGORY	AVAILABLE POINTS			ENVIRONMENTAL WEIGHTING
	NC	CS	Schools NC	
Sustainable Sites	26	28	24	~24%
Water Efficiency	10	10	11	~10%
Energy & Atmosphere	35	37	33	~32%
Materials & Resources	14	13	13	~13%
Indoor Environmental Quality	15	12	19	~14%
Innovation in Design	6	6	6	~6%
Regional Priority	4	4	4	~4%
Total	110	110	110	

WATER EFFICIENCY

1 Prerequisite

- Water Use Reduction

10 Possible Credit Points for LEED NC and LEED CS, 11 Possible Points for LEED Schools

- Water Efficient Landscaping
- Innovative Wastewater Technologies
- Water Use Reduction
- Process Water Use Reduction (LEED Schools only)

Modern Living Machine

WATER EFFICIENCY PREREQUISITE 1

Intent:

Increase water efficiency. Reduce burden on municipal water supply and wastewater systems.

Requirement:

Use 20% less water than calculated baseline. Calculation does not include irrigation and is based on the following;

Commercial Fixtures, Fittings, and Appliances	Current Baseline
Commercial toilets	1.6 gallons per flush (gpf)* Except blow-out fixtures: 3.5 (gpf)
Commercial urinals	1.0 (gpf)
Commercial lavatory (restroom) faucets	2.2 gallons per minute (gpm) at 60 pounds per square inch (psi), private applications only (hotel or motel guest rooms, hospital patient rooms) 0.5 (gpm) at 60 (psi)** all others except private applications 0.25 gallons per cycle for metering faucets
Commercial prerinse spray valves (for food service applications)	Flow rate ≤ 1.6 (gpm) (no pressure specified; no performance requirement)

Residential Fixtures, Fittings, and Appliances	Current Baseline
Residential toilets	1.6 (gpf)***
Residential lavatory (bathroom) faucets	2.2 (gpm) at 60 psi
Residential kitchen faucet	
Residential showerheads	2.5 (gpm) at 80 (psi) per shower stall****

* EPAct 1992 standard for toilets applies to both commercial and residential models.

** In addition to EPAct requirements, the American Society of Mechanical Engineers standard for public lavatory faucets is 0.5 gpm at 60 psi (ASME A112.18.1-2005). This maximum has been incorporated into the national Uniform Plumbing Code and the International Plumbing Code.

*** EPAct 1992 standard for toilets applies to both commercial and residential models.

**** Residential shower compartment (stall) in dwelling units: The total allowable flow rate from all flowing showerheads at any given time, including rain systems, waterfalls, bodysprays, bodyspas and jets, must be limited to the allowable showerhead flow rate as specified above (2.5 gpm) per shower compartment, where the floor area of the shower compartment is less than 2,500 square inches. For each increment of 2,500 square inches of floor area thereafter or part thereof, an additional showerhead with total allowable flow rate from all flowing devices equal to or less than the allowable flow rate as specified above must be allowed. Exception: Showers that emit recirculated nonpotable water originating from within the shower compartment while operating are allowed to exceed the maximum as long as the total potable water flow does not exceed the flow rate as specified above.

WATER EFFICIENCY PREREQUISITE 1

Benefits and Issues to Consider:

- Reduces water withdrawal from natural water bodies
- Protects the natural water cycle
- Reduces capital investment required for water supply and wastewater treatment infrastructure.
- Reduces chemical input, energy usage and greenhouse gas emissions associated with the treatment and distribution of water.
- Reduces end use energy and energy related pollution associated with water heating.
- Reduces operating costs.

Referenced Standards:

- Energy Policy Act (EPAct) of 1992 (and as amended)
- Energy Policy Act (EPAct) of 2005
- Uniform Plumbing Code (UPC) 2006
- International Plumbing Code 2006

WATER EFFICIENCY PREREQUISITE 1

Implementation Strategies:

- Flow restrictors and / or reduced flow aerators
- Automatic faucet sensors and metering controls
- Low consumption flush fixtures
- Non water fixtures
- Rainwater harvesting
- Special use pot fillers
- High efficiency faucets
- Foot pedal operated faucets

Table 1. UPC and IPC Standards for Plumbing Fixture Water Use

Fixture	UPC and IPC Standards	EPA WaterSense Standards
Water closets (gallons per flush, gpf)	1.60	1.28
Urinals (gpf)	1.00	0.5[a]
Showerheads (gallons per minute, gpm*)	2.50	1.5–2.0[b]
Public lavatory faucets and aerators (gpm**)	0.5	
Private lavatory faucets and aerators (gpm**)	2.2	1.5
Public metering lavatory faucets (gallons per metering cycle)	0.25	
Kitchen and janitor sink faucets	2.20	
Metering faucets (gallons per cycle)	0.25	

*When measured at a flowing water pressure of 80 pounds per square inch (psi).

**When measured at a flowing water pressure of 60 pounds per square inch (psi).

[a] On May 22, 2008, EPA issued a notification of intent to develop a specification for high-efficiency urinals. WaterSense anticipates establishing a maximum allowable flush volume of 0.5 gpf.

[b] On August 30, 2007, EPA issued a notification of intent to develop a specification for showerheads. WaterSense anticipates establishing a single maximum flow rate between 1.5 gpm and 2.0 gmp.

WATER EFFICIENCY CREDIT 1

Intent:

Limit or eliminate potable or natural surface / subsurface water on or near site, for landscape irrigation.

Requirement:

Option 1 (2 points) – Reduce by 50% from a calculated midsummer baseline case. Reduction to be attributed to a combination of;

- Plant species, density and microclimate factor
- Irrigation efficiency
- Use of captured rainwater
- Use of recycled wastewater
- Use of water treated and conveyed by a public agency specifically for non potable uses

Option 2 (4 points) – No potable water use or irrigation by meeting Option 1 **AND**,

Path 1 – Use only captured rainwater, recycled wastewater, recycled grey water or water treated and conveyed by a public agency specifically for non potable uses **OR**

Path 2 – Install landscaping that does not require permanent irrigation. Temporary irrigation is allowed if only for 1 year.

WATER EFFICIENCY CREDIT 1

Benefits and Issues to Consider:

- Improved landscaping reduces or eliminates irrigation needs.
- Native / adaptive plants fosters self sustaining landscape.
- Native / adaptive plants attract wildlife integrating the building with surroundings.
- Native / adaptive plants minimize water quality degradation through less fertilizer and pesticides.
- Water efficient landscaping conserves potable water resources.
- Climate sensitive landscaping avoids escalating water costs for irrigation.

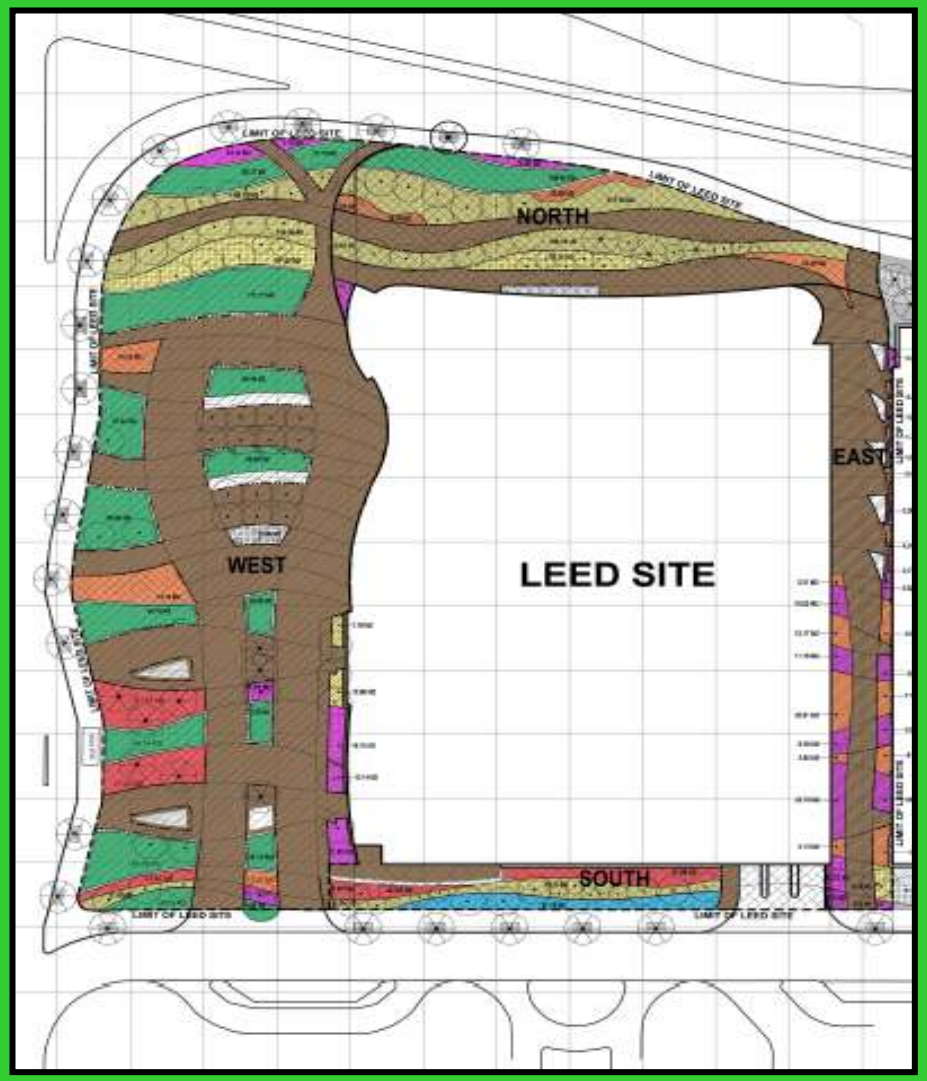
Implementation Strategies:

- Climate tolerant plants
- Contour the land to make use of rainwater runoff
- Minimize turf grass area
- Mulching
- Composting
- Increase shade canopy
- Avoid monocultures
- Drip, micromist, subsurface irrigation systems
- Smart irrigation controllers – moisture / rain sensors
- Rainwater harvesting
- Recovered wastewater usage

WATER EFFICIENCY CREDIT 1

Rainwater Harvesting System - Example

LEED AREAS WITH LANDSCAPING



LEED SITE - LANDSCAPE AREA CALCULATIONS

PLANT TYPE	NORTH	SOUTH	EAST	WEST	TOTAL
1. PALMS [6M DIA]	3	-NIL-	-NIL-	6	9
2. PALMS [3M DIA]	-NIL-	-NIL-	-NIL-	3	3
PALMS TOTAL AREA					228.00M²
3. TREES [5M DIA]	14	6	1	44	65
4. TREES [4M DIA]	10	11	-NIL-	2	23
TREES TOTAL AREA					45.00M²
5. SHRUBS	82.78M²	-NIL-	108.45M²	121.69M²	312.90M²
5A. SHRUBS (MIXED PLANTING)	-NIL-	98.9M²	-NIL-	177.56M²	276.50M²
6. GROUND COVERS	24.95M²	-NIL-	128.84M²	103.62M²	257.40M²
6A. GROUND COVERS (MIXED PLANTING)	497.03M²	97.76M²	13.48M²	324.96M²	933.20M²
7. TURF GRASS	109.40M²	-NIL-	-NIL-	786.88M²	895.30M²
7A. TURF GRASS (MIXED PLANTING)		87.79M²			87.80M²
8. PAVING AREA	511.45M²	93.33M²	693.90M²	2315.45M²	3640.90M²
TOTAL SITE AREA					6877M²

SCHEDULE OF PLANTING MATERIALS

CODE	QTY	BOTANICAL NAME (COMMON NAME)	SPACING	SIZE (HEIGHT / POT SIZE)
		PALMS		
PC	3	PHOENIX CANARIENSIS (CANARY ISLAND DATE PALM)	AS SHOWN	3 M HT CLEAR BROWN TRUNK
PD	9	PHOENIX DACTYLIFERA (DATE PALM)	AS SHOWN	6 M HT CLEAR BROWN TRUNK
		LARGE / MEDIUM TREE		
AI	1	AZIDIRACHTA INDICA (NEEM TREE)	AS SHOWN	MIN 2.00M HT, CALIPER @ 75 MM DIA AT BREAST HEIGHT [DBH]
BP	8	BRACHYCHITON POPULNEUS (BOTTLE TREE)	AS SHOWN	
BH	5	BAUHINIA PURPUREA (PURPLE ORCHID TREE)	AS SHOWN	
CV	4	CALLISTEMON VIMINALIS (WEEPING BOTTLEBRUSH)	AS SHOWN	
CF	13	CASSIA FISTULA (GOLDEN SHOWER)	AS SHOWN	
EF	3	EUCALYPTUS FICIFOLIA (RED - FLOWERING GUM)	AS SHOWN	
PO	11	PLUMERIA OBTUSA (WHITE FRANGIPANI)	AS SHOWN	
TA	3	TABEBUIA ARGENTEA (YELLOW TABEBUIA)	AS SHOWN	
EF 'AM'	322	EUONYMUS FORTUNEI 'AUREO-MARGINATA' (VARIGATED EUONYMUS)	0.50 m.o.c.	15 cm diameter
		CLIMBERS		
AL	11	ANTIGONON LEPTOPUS, PINK (PINK CORAL VINE)	AS SHOWN	15 cm diameter
IP	13	IPOMEA PALMATA (RAILWAY CREEPERS)	AS SHOWN	15 cm diameter
PV	13	PYROSTEGIA VENUSTA (FLAME VINE)	AS SHOWN	15 cm diameter
		GROUNDCOVERS		
AS 1	3,142	AERVA SANGUINOLENTA (BLOODLEAF)	0.25 m.o.c.	20 cm diameter
GRS 1	375	GAZANNIA RIGENS 'SUNBURST' (YELLOW CREEPING GAZANNIA)	0.15 m.o.c.	9 cm diameter
GRS 2	37,779	GAZANNIA RIGENS 'SUNGLOW' (ORANGE CREEPING GAZANNIA)	0.15 m.o.c.	9 cm diameter
LM	149	LANTANA MONTEVIDENSIS (PURPLE TRAILING LANTANA)	0.30 m.o.c.	15 cm diameter
MP	4,675	MALEPHORA CROCEA (ICE PLANT)	0.10 m.o.c.	9 cm diameter
AS 2	1,102	ATRIPLEX SEMIBACCATA (ATRIPLEX)	0.30 m.o.c.	12 cm diameter
CRP	605	CATHARANTHUS ROSEUS, PURPLE (MADAGASCAR PURPLE PERWINKLE)	0.30 m.o.c.	9 cm diameter
CRW	642	CATHARANTHUS ROSEUS, WHITE (MADAGASCAR WHITE PERWINKLE)	0.30 m.o.c.	9 cm diameter

CALCULATION EXAMPLE WEc1

WE Credit 1: Water Efficient Landscaping

Evapotranspiration Table

ETo	[in]
July	12.10

Project in Kuwait City – WEc1

Design Case Table

Landscape Type	Area [SF]	Species Factor [Ks]		Density Factor [Kd]		Microclimate Factor [Kmc]		K_L	ET_L	IE		TPWA [gal]
Trees	2,937	High	0.9	Low	0.5	High	1.4	0.6	7.62	Drip	0.900	24,876
Shrubs	3,366	Avg	0.5	Low	0.5	High	1.3	0.3	3.93	Drip	0.900	14,708
Groundcovers	2,770	High	0.7	Low	0.5	High	1.2	0.4	5.08	Drip	0.900	15,641
Mixed Planting	13,958	High	0.9	Low	0.6	High	1.4	0.8	9.15	Drip	0.900	141,869
Turfgrass	9,632	High	0.8	Low	0.6	High	1.2	0.6	6.97	Drip	0.900	74,590

Total	32,663	Subtotal [gal]	271,685
		July Greywater Harvest [gal]	271,685
		DESIGN CASE **Net GPWA** [gal]	**0**

Landscape Type	Area [SF]	Species Factor [Ks]		Density Factor [Kd]		Microclimate Factor [Kmc]		K_L	ET_L	IE		TPWA [gal]
Trees	2,937	High	0.9	Low	0.5	High	1.4	0.6	7.62	Sprinkler	0.625	35,822
Shrubs	3,366	Avg	0.5	Avg	1	High	1.3	0.7	7.87	Sprinkler	0.625	42,358
Groundcovers	2,770	Avg	0.5	Avg	1	High	1.2	0.6	7.26	Sprinkler	0.625	32,176
Mixed Planting	13,013	High	0.9	Avg	1.1	High	1.4	1.4	16.8	Sprinkler	0.625	349,177
Turfgrass	10,577	Avg	0.7	Avg	1	High	1.2	0.8	10.2	Sprinkler	0.625	172,007

Total	32,663	**Net GPWA** [gal]	**631,541**
Irrigation Potable Water Use Reduction			**100%**

Savings on Total Water Applied = 57%

Narrative, Design Case

Species used are adapted to arid conditions of Kuwait. Most trees and palms are part of mixed planting, with a few isolated ones at the west side of the project. Likewise, most shrubs and groundcover planting are part of mixed planting, except for isolated cases on the sheltered east side of the project bounded by the parking building. Mixed planting are further categorized into north, south, east and west because of the microclimate factors expected to impact on evapotranspiration (ETo). Refer to attached PDF sheet illustrating planting design.

Refer to WEc1 Template

WATER EFFICIENCY CREDIT 2

Intent:

Reduce wastewater generation and potable water demand. Increase local aquifer recharge.

Requirement:

Option 1 – Reduce potable water use for sewage conveyance by 50% by,

- Use of water conserving fixtures OR
- Use of non potable water

Option 2 – Treat to tertiary standards and infiltrate or reuse on site, 50% of the wastewater generated.

WATER EFFICIENCY CREDIT 2

Benefits and Issues to Consider:

- Reduction of potable water for sewage conveyance reduces total water withdrawal from natural water bodies.
- Reduction of sewage volume reduces public infrastructure, chemical inputs, energy use and emissions at municipal water treatment plants.
- Wastes are converted into resources such as treated water for potable and non potable use and nutrients that improve soil conditions.
- Grey water recycling saves costs of procuring municipal water.
- Rainwater harvesting reduces municipal water demand and the need for storm water management systems.
- Water treatment through natural or constructed wetlands adds value through site enhancement.

Referenced Standards:

- Energy Policy Act (EPAct) of 1992 (and as amended)
- Energy Policy Act (EPAct) of 2005
- Uniform Plumbing Code (UPC) 2006
- International Plumbing Code 2006

WATER EFFICIENCY CREDIT 2

Calculations are based on;

- Annual generation of black water volumes from flush fixtures
- Fixture and fitting water consumption rate
- Estimated use by occupants

Occupancy types include;

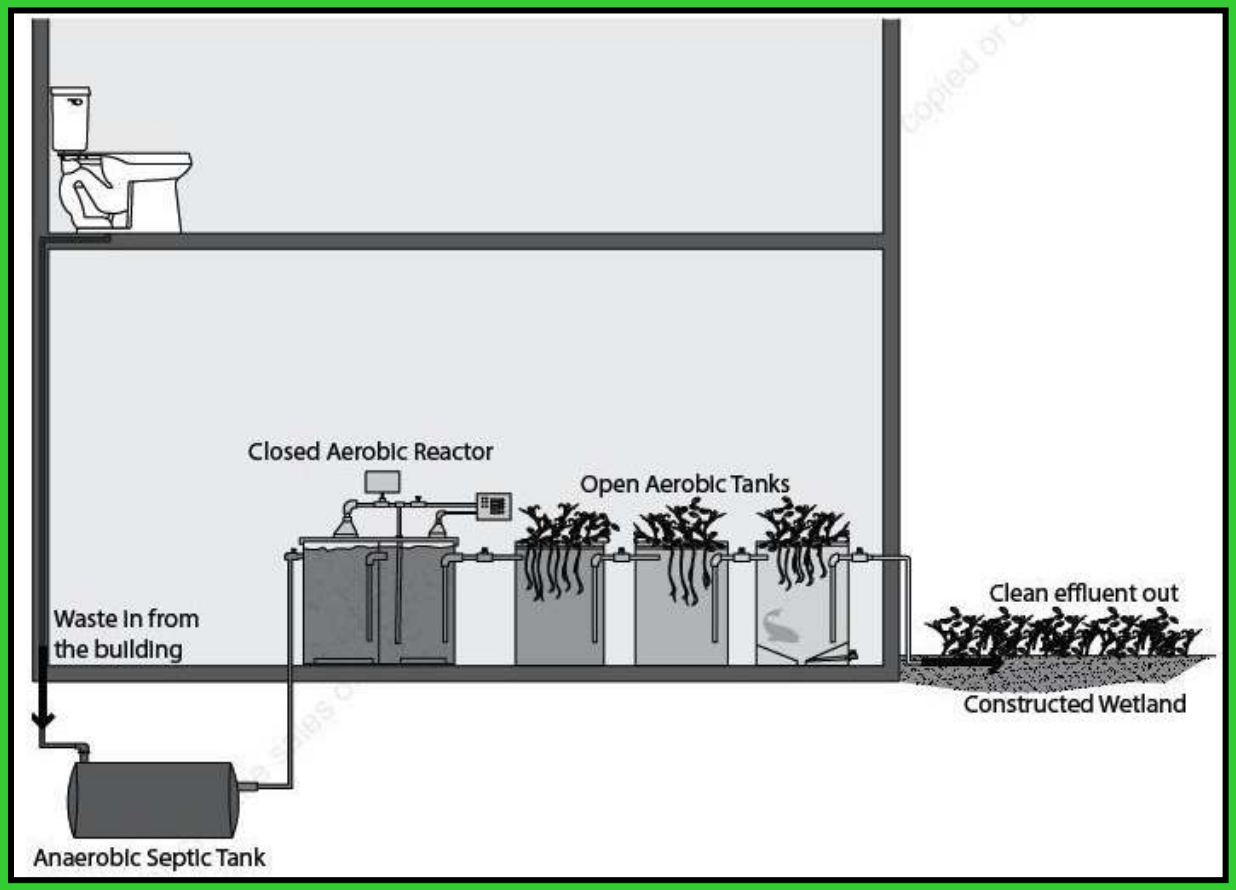
- Full Time Equivalent (FTE) occupants
- Transient occupants
- Residents

Table 4. Sample Blackwater-Generating Fixtures and Fittings and Water Consumption

Flush fixture	Flow rate (gpf)
Conventional water closet	1.6
High-efficiency toilet (HET), single-flush gravity	1.28
HET, single-flush pressure assist	1.0
HET, dual flush (full-flush)	1.6
HET, dual flush (low-flush)	1.1
HET, foam flush	0.05
Non-water toilet	0.0
Conventional urinal	1.0
High-efficiency urinal (HEU)	0.5
Nonwater urinal	0.0

WATER EFFICIENCY CREDIT 2

On-site Biological Treatment of Wastewater - Example



Exemplary Performance:

- EITHER by 100% reduction of potable water for sewage conveyance OR
- By 100% onsite treatment and infiltration or reuse of generated waste water.

GUIDELINES TO ACHIEVE - TARGET 50% LESS

- Water Efficient Landscaping – No Potable Water Use
- Grey Water Treatment
- Storm Water Recovery
- Ultra Low Flow Fixtures
- 50% reduction of Potable Water for Sewage Conveyance
- No Potable Water for Process
- Condensate recovery

SUSTAINABLE WATER CONSUMPTION STRATEGIES

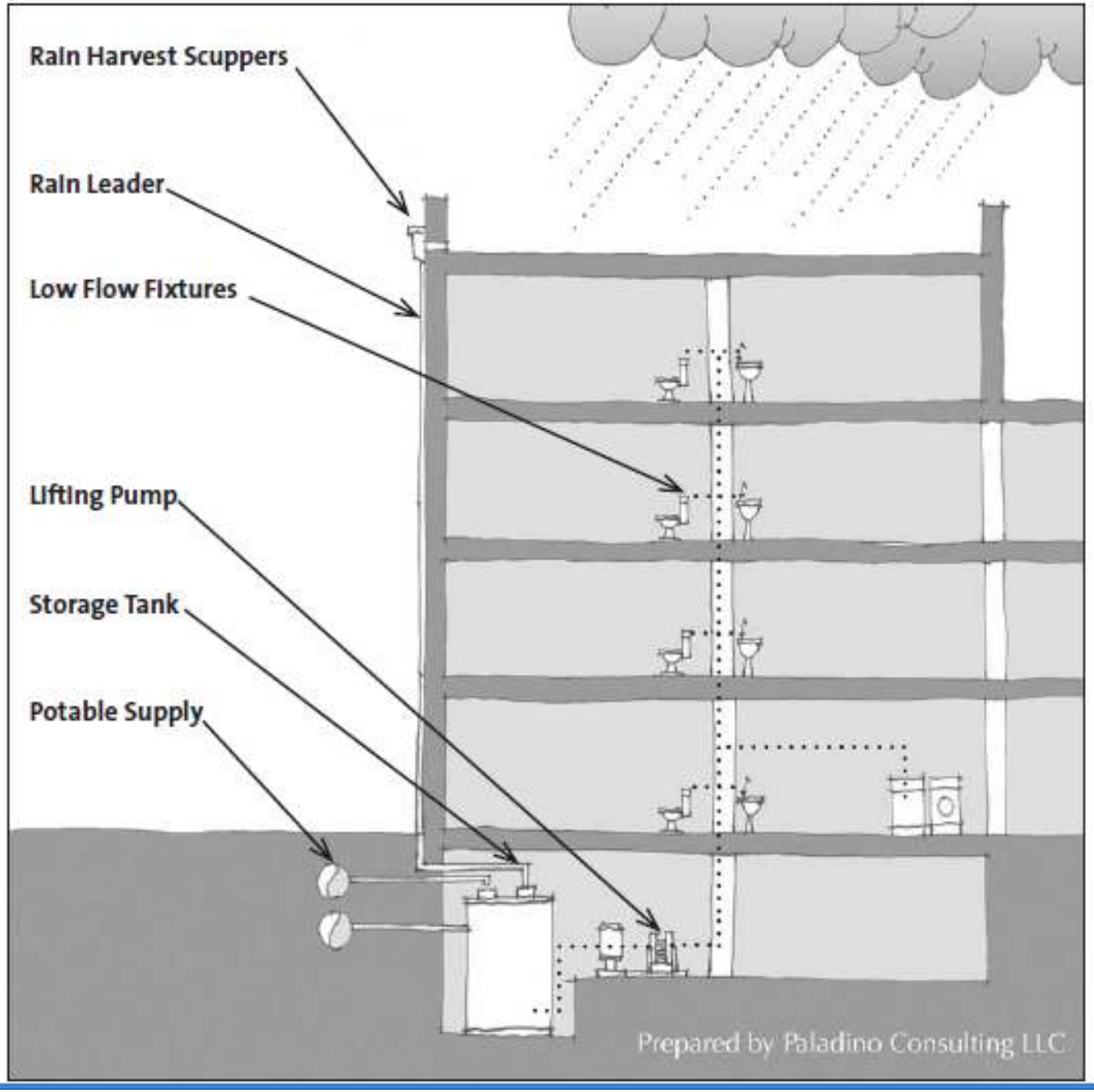
- Potable Water Reduction through High Efficiency Plumbing Fixtures

	Baseline	Design
▪ Low Flow Urinals	1gpf	0.1gpf
▪ Dual Flush Toilets	1.6gpf	1.5gpf / 1.1gpf
▪ Ultra Low Flow Lavatory Faucets	2.2gpm	0.8gpm
▪ Low Flow Showers	2.5gpm	1.5gpm
▪ Low Flow Kitchen Faucets	2.2gpm	2.2gpm
▪ Low Flow Janitor Sink Faucets	2.2gpm	2.2gpm

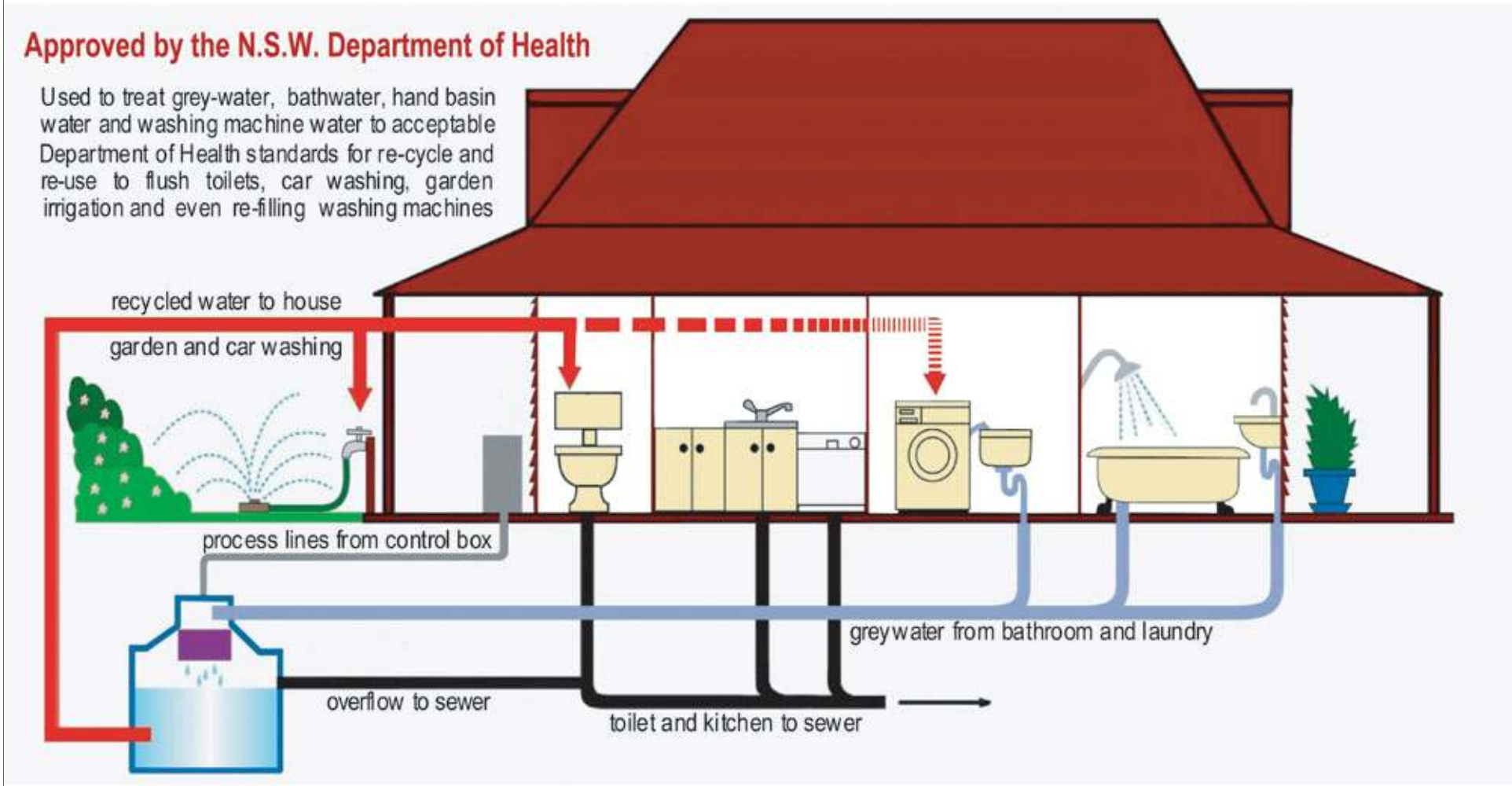
TERTIARY TREATMENT

- Tertiary Treatment is the highest form of wastewater treatment that includes the removal of nutrients, organic and solid material, along with biological or chemical polishing (generally to effluent limits of 10 mg/L BOD and 10 mg/L TSS).

An illustration of a Rain Harvesting System



GREYWATER TREATMENT



Baseline Case

Fixture Type	Daily Uses	Flowrate [GPF]	Occupants	Sewage Generation [gal]
Water Closet (Male)	1	1.6	150	240
Water Closet (Female)	3	1.6	150	720
Urinal (Male)	2	1.0	150	300
Urinal (Female)	0	1.0	150	0
			Total Daily Volume [gal]	**1,260**
			Annual Work Days	260
			TOTAL ANNUAL VOLUME [gal]	**327,600**

Design Case

Fixture Type	Daily Uses	Flowrate [GPF]	Occupants	Sewage Generation [gal]
Low-Flow Water Closet (Male)	0	1.1	150	0
Low-Flow Water Closet (Female)	3	1.1	150	495
Composting Toilet (Male)	1	0.0	150	0
Composting Toilet (Female)	0	0.0	150	0
Waterless Urinal (Male)	2	0.0	150	0
Waterless Urinal (Female)	0	0.0	150	0
			Total Daily Volume [gal]	**495**
			Annual Work Days	260
			Annual Volume [gal]	128,700
			Rainwater or Graywater Volume [gal]	(36,000)
			TOTAL ANNUAL VOLUME [gal]	**92,700**

Potable Water Savings = 71.7%

Refer to WEc2 Template

WATER EFFICIENCY CREDIT 3

Intent:

Further increase water efficiency. Reduce burden on municipal water supply and wastewater systems.

Requirement:

Use 30% (2 points), 35% (3 points), 40% (4 points) less water than calculated baseline. Calculation does not include irrigation and is based on the following;

Commercial Fixtures, Fittings, and Appliances	Current Baseline
Commercial toilets	1.6 gallons per flush (gpf)* Except blow-out fixtures: 3.5 (gpf)
Commercial urinals	1.0 (gpf)
Commercial lavatory (restroom) faucets	2.2 gallons per minute (gpm) at 60 pounds per square inch (psi), private applications only (hotel or motel guest rooms, hospital patient rooms) 0.5 (gpm) at 60 (psi)** all others except private applications 0.25 gallons per cycle for metering faucets
Commercial prerinse spray valves (for food service applications)	Flow rate ≤ 1.6 (gpm) (no pressure specified; no performance requirement)

Residential Fixtures, Fittings, and Appliances	Current Baseline
Residential toilets	1.6 (gpf)***
Residential lavatory (bathroom) faucets	2.2 (gpm) at 60 psi
Residential kitchen faucet	
Residential showerheads	2.5 (gpm) at 80 (psi) per shower stall****

* EPAct 1992 standard for toilets applies to both commercial and residential models.

** In addition to EPAct requirements, the American Society of Mechanical Engineers standard for public lavatory faucets is 0.5 gpm at 60 psi (ASME A112.18.1-2005). This maximum has been incorporated into the national Uniform Plumbing Code and the International Plumbing Code.

*** EPAct 1992 standard for toilets applies to both commercial and residential models.

**** Residential shower compartment (stall) in dwelling units: The total allowable flow rate from all flowing showerheads at any given time, including rain systems, waterfalls, bodysprays, bodyspas and jets, must be limited to the allowable showerhead flow rate as specified above (2.5 gpm) per shower compartment, where the floor area of the shower compartment is less than 2,500 square inches. For each increment of 2,500 square inches of floor area thereafter or part thereof, an additional showerhead with total allowable flow rate from all flowing devices equal to or less than the allowable flow rate as specified above must be allowed. Exception: Showers that emit recirculated nonpotable water originating from within the shower compartment while operating are allowed to exceed the maximum as long as the total potable water flow does not exceed the flow rate as specified above.

WATER EFFICIENCY CREDIT 3

Benefits and Issues to Consider:

- Reduces water withdrawal from natural water bodies
- Protects the natural water cycle
- Reduces capital investment required for water supply and wastewater treatment infrastructure.
- Reduces chemical input, energy usage and greenhouse gas emissions associated with the treatment and distribution of water.
- Reduces end use energy and energy related pollution associated with water heating.
- Reduces operating costs.

Referenced Standards:

- Energy Policy Act (EPAct) of 1992 (and as amended)
- Energy Policy Act (EPAct) of 2005
- Uniform Plumbing Code (UPC) 2006
- International Plumbing Code 2006

WATER EFFICIENCY CREDIT 3

Implementation Strategies:

- Flow restrictors and / or reduced flow aerators
- Automatic faucet sensors and metering controls
- Low consumption flush fixtures
- Non water fixtures
- Rainwater harvesting
- Special use pot fillers
- High efficiency faucets
- Foot pedal operated faucets

Table 1. UPC and IPC Standards for Plumbing Fixture Water Use

Fixture	UPC and IPC Standards	EPA WaterSense Standards
Water closets (gallons per flush, gpf)	1.60	1.28
Urinals (gpf)	1.00	0.5[a]
Showerheads (gallons per minute, gpm*)	2.50	1.5–2.0[b]
Public lavatory faucets and aerators (gpm**)	0.5	
Private lavatory faucets and aerators (gpm**)	2.2	1.5
Public metering lavatory faucets (gallons per metering cycle)	0.25	
Kitchen and janitor sink faucets	2.20	
Metering faucets (gallons per cycle)	0.25	

*When measured at a flowing water pressure of 80 pounds per square inch (psi).

**When measured at a flowing water pressure of 60 pounds per square inch (psi).

[a] On May 22, 2008, EPA issued a notification of intent to develop a specification for high-efficiency urinals. WaterSense anticipates establishing a maximum allowable flush volume of 0.5 gpf.

[b] On August 30, 2007, EPA issued a notification of intent to develop a specification for showerheads. WaterSense anticipates establishing a single maximum flow rate between 1.5 gpm and 2.0 gmp.

GUIDELINES TO ACHIEVE - TARGET 50% LESS

- Water Efficient Landscaping – No Potable Water Use
- Grey Water Treatment
- Storm Water Recovery
- Ultra Low Flow Fixtures
- 50% reduction of Potable Water for Sewage Conveyance
- No Potable Water for Process
- Condensate recovery

SUSTAINABLE WATER CONSUMPTION STRATEGIES

- Potable Water Reduction through High Efficiency Plumbing Fixtures

	Baseline	Design
▪ Low Flow Urinals	1gpf	0.1gpf
▪ Dual Flush Toilets	1.6gpf	1.5gpf / 1.1gpf
▪ Ultra Low Flow Lavatory Faucets	2.2gpm	0.8gpm
▪ Low Flow Showers	2.5gpm	1.5gpm
▪ Low Flow Kitchen Faucets	2.2gpm	2.2gpm
▪ Low Flow Janitor Sink Faucets	2.2gpm	2.2gpm

WATER EFFICIENT FIXTURES

Europlus E Infrared-Electronic basin mixer 1/2"without mixing device

battery supply
6V lithium-battery, type CR-P2
CE approved
multistage battery status display
safety shutdown circuit
solenoid valve
flow limiter 6 l/min
flexible connection hose
dirt strainers
non-return valve
type of protection IP 59K
noise classification 1 in accordance with DIN4109 incl. certificate
GROHE StarLight® Chrome finish

Colour chrome
Ref. no. 36208 000

WATER LESS URINALS

FALCON WATERFREE TECHNOLOGIES

WATERFREE URINAL
VITREOUS CHINA
MOD #U1PS001

U1-P

FEATURES

- Touch free operation
- Mechanical free design
- Waterless performance
- ADA compliant; 25.5" full size urinal
- Available in white and colors

BENEFITS

- No water or sewer costs
- No costly valve repairs
- No Flooding
- Hassle Free maintenance
- Odor free, clean environment
- Minimal area and easier cleaning
- Improved hygiene and safety

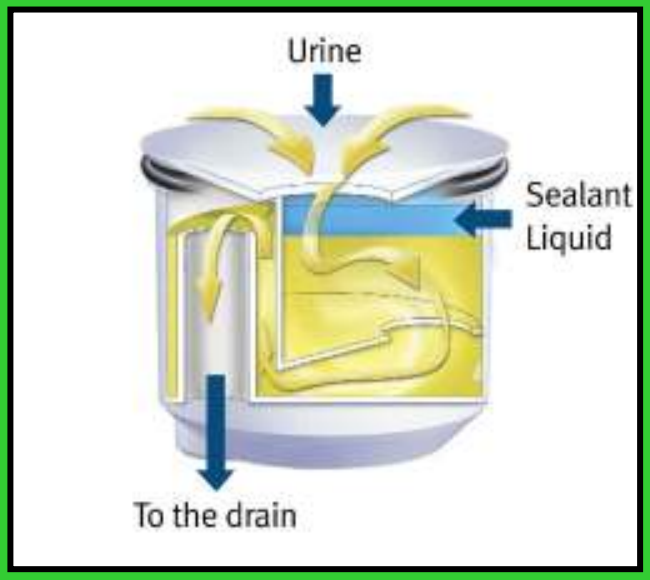
COMPLIANCE CERTIFICATIONS: Meets the ANSI/ASME A112.19.2/B45.1998 and A112.19.3/asme MFS.73 for Vitreous China Fixtures. In compliance with IAPMO IGC 161-2008.

Falcon Waterfree urinals each save approximately 40,000 gallons per year, resulting in dramatically reduced water and sewer costs. Purchasing and installing Falcon Waterfree urinals is also much less expensive because flush valves, and the associated piping, are not required. Accordingly, maintenance costs associated with these valves are eliminated.

The Falcon Waterfree urinal incorporates smooth, non-porous surfaces, while eliminating corners and hard to clean areas. Flooding, corroding water and sanitation problems, associated with flush valves, are no longer an issue.

Falcon Waterfree Technologies LLC
10900 Wilshire Boulevard, 15th Floor
Los Angeles, CA 90024
United States of America

Telephone 310.209.7258
Facsimile 310.209.7268
Email: info@falconwaterfree.com
Website www.falconwaterfree.com



WATER EFFICIENT FIXTURES

Z5758 "The Retrofit Pint" 0.125 gpf Ultra Low Consumption Urinal System

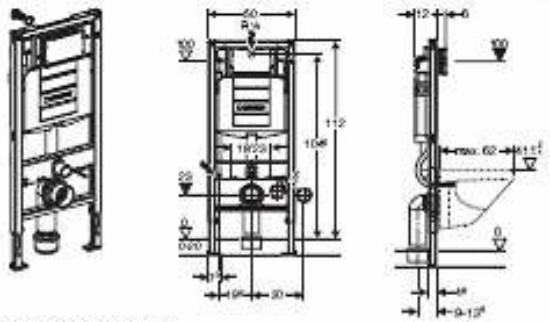
Z5758 Series – "The Retrofit Pint"

- Zurn One ultra low consumption urinal system designed for optimal performance between Zurn fixture and Zurn flush valve to save water while exceeding industry performance standards.
- 1/8 gpf [0.5 Lpf]
- Over 85% water savings over standard 1.0 gpf [4.0 Lpf] system
- Pressure compensating internal flow regulator
- Oversized footprint to make retrofit easy
- Vitreous china
- High efficiency washout flushing action
- 3/4" top spud
- 2" I.P.S. outlet flange and rubber gasket with integral trap
- 14" extended rim height for handicap compliance when installed at proper height
- Shipping Weight: 72 lbs.

WATER EFFICIENT

Duofix mounting elements for wall-hung WC

Duofix element with UP320, front actuation — new



Application Purpose

- For installation in front of a solid or drywall
- For installation in dry-wall or PreWall construction covered with panels (gypsum or wood)
- For installation in room-height preWall or partition wall
- For a floor construction of 0 - 20 cm
- For wall-hung WC with fastening distance 18 cm or 23 cm
- For installation in front of - or inside a solid wall

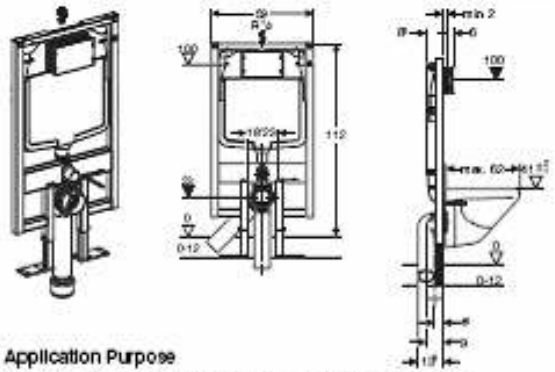
Characteristics

- Element height 112 cm
- Water supply connection at centre back or at the top
- Dual-flush with Sigma50, Sigma20, Samba, Twist or Bolero actuator plate
- Single flush with Sigma10 actuator plate
- Stop-and-go flush with Rumba, Mambo or Tango actuator plate
- Adjustable flushing volume
- Concealed cistern for tool-free mounting and repair work
- Tool-free fastening for outlet bend, sound-absorbing, adjustable in depth with 6 positions, adjustable range 45 mm
- Self-locking feet for tool-free alignment of the element
- Galvanized leg supports, adjustable from 0 - 20 cm, with detent mark
- Concealed cistern fully insulated against condensation
- Self-supporting
- Powder-coated, colour Geberit blue
- Rotating foot plate

Product Details

Factory setting	6 and 3 l
Flush range small	3 - 4 l
Flush range large	6/7.5 l
Interruptible flush-stop	6/7.5 l

Duofix Special element with UP700, front actuation, thickness 8cm — new



Application Purpose

- For wall-hung WC with fastening distance 18 cm or 23 cm
- For a floor construction of 0 - 12 cm
- For installation in front of a solid or drywall
- For installation in dry-wall or PreWall construction covered with panels (gypsum or wood)
- For installation in room-height preWall or partition wall
- For installation in front of - or inside a solid wall

Characteristics

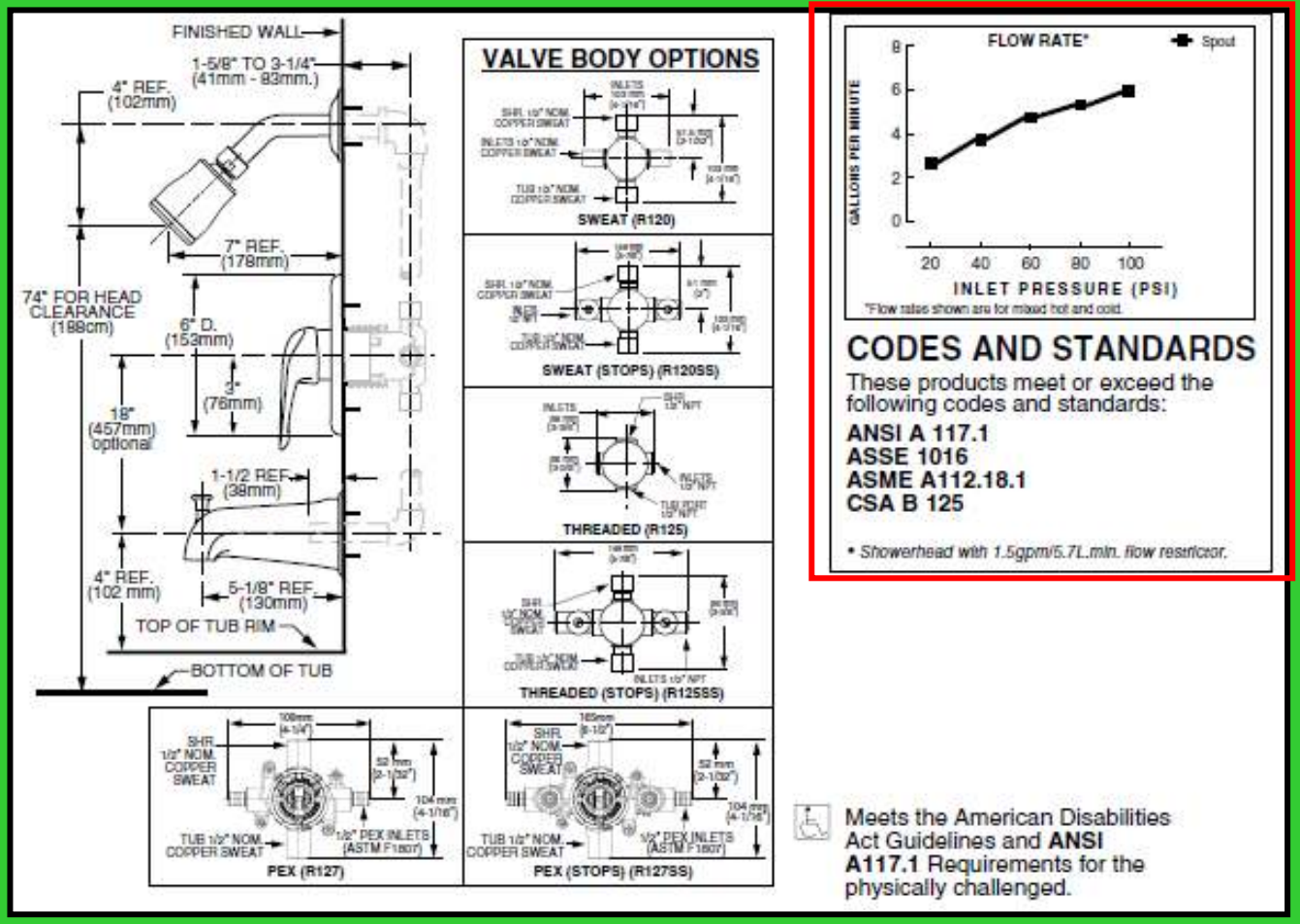
- Self-supporting
- Element height 112 cm
- M12 fastening for ceramic appliances, fastening distance 18 cm or 23 cm
- Concealed cistern fully insulated against condensation
- Installation depth 8 cm
- Water supply connection at the top
- Stop-and-go flush with actuator plate Rumba, Mambo or Tango
- Single flush with Sigma10 actuator plate
- Dual-flush with Sigma50, Sigma20, Samba, Twist or Bolero actuator plate
- Adjustable flushing volume
- Fastening for outlet bend adjustable in depth and sound-absorbing
- Powder-coated, colour Geberit blue
- Feet galvanized, adjustable 0-12 cm
- Self-locking feet for tool-free alignment of the element

Product Details

Factory setting	6 and 3 l
Flush volume small	3 l
Flush range large	6/9 l
Interruptible flush-stop	6/9 l

WATER EFFICIENT FIXTURES

T675.508 Bath/Shower Trim Shown



Fixture	Energy Policy Act of 1992 Flow Requirement
Water Closets [gpf]	1.6
Urinals [gpf]	1.0
Showerheads [gpm]*	2.5
Faucets [gpm]*	2.5
Replacement Aerators [gpm]*	2.5
Metering Faucets [gal/cy]	0.25

**At flowing water pressure of 80 pounds per square inch (psi)*

EXAMPLE FLUSH AND FLOW FIXTURES AND BASELINE FLOW RATES

Flush Fixture	Flowrate [GPF]
Conventional Water Closet	1.6
Low-Flow Water Closet	1.1
Dual-Flush Water Closet (Full-Flush)	1.6
Dual-Flush Water Closet (Low-Flush)	0.8
Composting Toilet	0.0
Conventional Urinal	1.0
Low-Flow Urinal	0.5
Non-Water Urinal	0.0

Flow Fixture	Flowrate [GPM]
Conventional Lavatory	2.5
Low-Flow Lavatory	1.8
Ultra Low-Flow Lavatory	0.5
Kitchen Sink	2.5
Low-Flow Kitchen Sink	1.8
Shower	2.5
Low-Flow Shower	1.8

STANDARD FIXTURE USES BY OCCUPANCY TYPE

Fixture Types	FTE	Student/ Visitor	Retail Customer	Resident
	Uses/Day			
Water Closet				
female	3	0.5	0.2	5
male	1	0.1	0.1	5
Urinal				
female	0	0	0	n/a
male	2	0.4	0.1	n/a
Lavatory Faucet (duration 15 sec; 12 sec with autocontrol)	3	0.5	0.2	5
Shower (duration 300 sec)	0.1	0	0	1
Kitchen Sink, non-residential (duration 15 sec)	1	0	0	n/a
Kitchen Sink, residential (duration 60 sec)	n/a	n/a	n/a	4

Table 4: Sample Design Case Water Use Calculation

Flush Fixture	Daily Uses	Flowrate [GPF]	Duration [flush]	Occupants	Water Use [gal]
Ultra Low-Flow Water Closet (Male)	0	0.8	1	150	0
Ultra Low-Flow Water Closet (Female)	3	0.8	1	150	360
Composting Toilet (Male)	1	0.0	1	150	0
Composting Toilet (Female)	0	0.0	1	150	0
Waterless Urinal (Male)	2	0.0	1	150	0
Waterless Urinal (Female)	0	0.0	1	150	0

Flow Fixture	Daily Uses	Flowrate [GPM]	Duration [sec]	Occupants [gal]	Water Use [gal]
Conventional Lavatory	3	2.5	12	300	450
Kitchen Sink	1	2.5	12	300	150
Shower	0.1	2.5	300	300	375
				Total Daily Volume [gal]	**1335**
				Annual Work Days	260
				Annual Volume [gal]	347,100
				Rainwater or Graywater Volume [gal]	(36,000)
				TOTAL ANNUAL VOLUME [gal]	**311,100**

Table 5: Baseline Case

Flush Fixture	Daily Uses	Flowrate [GPF]	Duration [flush]	Auto Controls N/A	Occupants	Water Use [gal]
Conventional Water Closet (Male)	1	1.6	1		150	240
Conventional Water Closet (Female)	3	1.6	1		150	720
Conventional Urinal (Male)	2	1.0	1		150	300
Conventional Urinal (Female)	0	0.0	1		150	0

Flow Fixture	Daily Uses	Flowrate [GPM]	Duration [sec]	Occupants [gal]	Water Use [gal]	
Conventional Lavatory	3	2.5	15		300	563
Kitchen Sink	1	2.5	15		300	188
Shower	0.1	2.5	300		300	375
					Total Daily Volume [gal]	**2,386**
					Annual Work Days	260
					TOTAL ANNUAL VOLUME [gal]	**620,360**

Potable Water Savings = 49.8%

DESIGN CASE

SN	AREA SERVED	Fixture Type	Occupancy (Person)				Flowrate (GPF)	Percent of Occupants	Duration	Daily Uses per person		Water Use (Gallons)		
			Breakdown (50% Male & 50% Female)	FTE-Retail	Retail Customer	Total Occupants				FTE Occupants	Retail Customers	FTE Occupants	Retail Customers	TOTAL
1	Common Mall Areas	FLUSH FIXTURE					gpf		Flush					
	Male/Female/Disabled Toilets & Janitor's Room	Dual Flush Water Closet - Full Flush (Female)	50%	2,407	8,000	10,407	1.6	33%	1.0	3.0	0.2	3,813.44	844.80	4,658.24
		Dual Flush Water Closet - Low Flush (Female)					0.8	67%	1.0	3.0	0.2	3,871.22	857.60	4,728.82
		Dual Flush Water Closet - Full Flush (Male)	50%				1.6	100%	1.0	1.0	0.1	3,851.96	1,280.00	5,131.96
		Waterless Urinal (Male)					0.0	100%	0.0	2.0	0.1	0.00	0.00	0.00
	DAILY TOTAL WATER VOLUME USAGE (Gal)											11,536.62	2,982.40	14,519.02
	Annual Work Days													365
	ANNUAL FLUSH FIXTURE WATER USAGE (Gal/Year)													5,299,441.58
		FLOW FIXTURE					gpm		Sec					
		Low-Flow Lavatory Faucet(Female)	50%	2,407	8,000	10,407	1.6	100%	12.0	3.0	0.2	2,289.80	507.27	2,797.07
		Low-Flow Lavatory Faucet(Male)	50%				1.6	100%	12.0	3.0	0.2	2,289.80	507.27	2,797.07
		Low-Flow Shower (Female)	50%	2,407	8,000	10,407	1.50	100%	300.0	0.1	0.0	1,805.61	0.00	1,805.61
		Low-Flow Shower (Male)	50%				1.50	100%	300.0	0.1	0.0	1,805.61	0.00	1,805.61
		Low-Flow Janitor Sink Faucet	100%	4,815	16,000	20,815	2.2	100%	15.0	0.1	0.0	263.96	0.00	263.96
	DAILY TOTAL WATER VOLUME USAGE (Gal)											8,454.78	1,014.53	9,469.31
	Annual Work Days													365
	ANNUAL FLOW FIXTURE WATER USAGE (Gal/Year)													3,456,299.79
		TOTAL OCCUPANTS		4,815	16,000	20,815								
	TOTAL ANNUAL FLUSH & FLOW FIXTURE WATER USAGE (Gallons/year)													8,755,741.37
	GRAYWATER VOLUME RE-USE (Gallons)													0.00
	TOTAL ANNUAL DESIGN CASE WATER VOLUME CONSUMPTION (Gallons)													8,755,741.37

BASELINE CASE

SN	AREA SERVED	Fixture Type	Occupancy (Person)				Flowrate (GPF)	Percent of Occupants	Duration	Daily Uses per person		Water Use (Gallons)		
			Breakdown (50% Male & 50% Female)	FTE-Retail	Retail Customer	Total Occupants				FTE Occupants	Retail Customers	FTE Occupants	Retail Customers	TOTAL
1	Common Mall Areas	FLUSH FIXTURE					gpf		Flush					
	Male/Female/Disabled Toilets & Janitor's Room	Conventional Water Closet (Female)	50%	2,407	8,000	10,407	1.6	100%	1.0	3.0	0.2	11,555.88	2,560.00	14,115.88
		Conventional Water Closet (Male)	50%				1.6	100%	1.0	1.0	0.1	3,851.96	1,280.00	5,131.96
		Conventional Urinal (Male)					1.0	100%	1.0	2.0	0.1	4,814.95	800.00	5,614.95
	DAILY TOTAL WATER VOLUME USAGE (Gal)											20,222.79	4,640.00	24,862.79
	Annual Work Days													365
	ANNUAL FLUSH FIXTURE WATER USAGE (Gal/Year)													9,074,916.96
		FLOW FIXTURE					gpm		Sec					
		Conventional Lavatory Faucet(Female)	50%	2,407	8,000	10,407	2.2	100%	15.0	3.0	0.2	3,972.33	880.00	4,852.33
		Conventional Lavatory Faucet(Male)	50%				2.2	100%	15.0	3.0	0.2	3,972.33	880.00	4,852.33
		Conventional Shower(Female)	50%	2,407	8,000	10,407	2.5	100%	300.0	0.1	0.0	3,009.34	0.00	3,009.34
		Conventional Shower(Female)	50%				2.5	100%	300.0	0.1	0.0	3,009.34	0.00	3,009.34
		Janitor Sink Faucet	100%	4,815	16,000	20,815	2.5	100%	15.0	0.1	0.0	300.93	0.00	300.93
	DAILY TOTAL WATER VOLUME USAGE (Gal)											14,264.29	1,760.00	16,024.29
	Annual Work Days													365
	ANNUAL FLOW FIXTURE WATER USAGE (Gal/Year)													5,848,864.64
		TOTAL OCCUPANTS		4,815	16,000	20,815								
	TOTAL ANNUAL FLUSH & FLOW FIXTURE WATER USAGE (Gallons/year)													14,923,781.60
	TOTAL ANNUAL BASELINE CASE WATER VOLUME CONSUMPTION (Gallons)													14,923,781.60

Potable Water Savings – 41.3%

Refer to WEc3 Template

USGBC
EDUCATION

V3

GREEN BUILDING DESIGN & CONSTRUCTION RATING SYSTEM

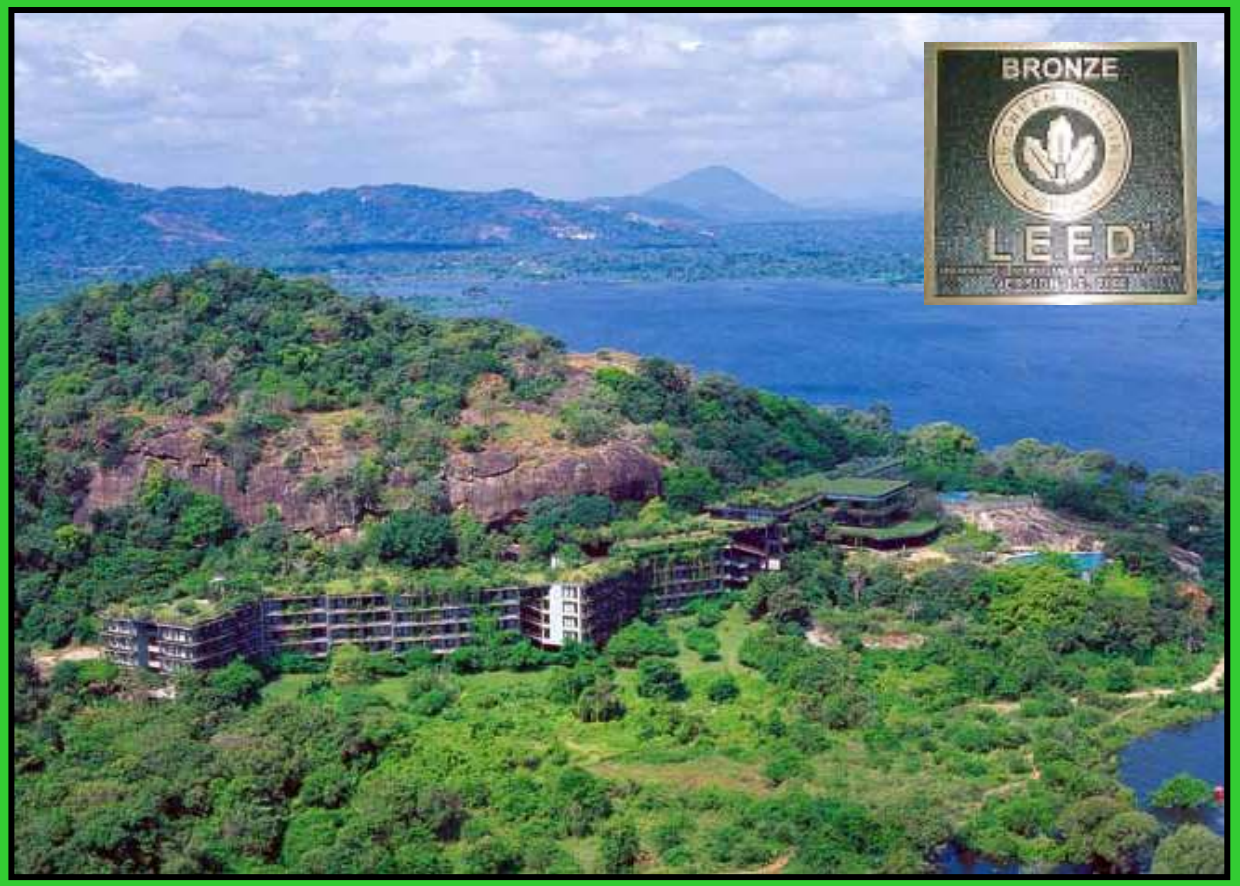
CATEGORY	AVAILABLE POINTS			ENVIRONMENTAL WEIGHTING
	NC	CS	Schools NC	
Sustainable Sites	26	28	24	~24%
Water Efficiency	10	10	11	~10%
Energy & Atmosphere	35	37	33	~32%
Materials & Resources	14	13	13	~13%
Indoor Environmental Quality	15	12	19	~14%
Innovation in Design	6	6	6	~6%
Regional Priority	4	4	4	~4%
Total	110	110	110	

WATER EFFICIENCY PREREQUISITES AND CREDITS

PREREQUISITE / CREDIT NUMBER	PREREQUISITE / CREDIT TITLE	AVAILABLE POINTS
WEp1	Water Use Reduction	Required
WEc1	Water Efficient Landscaping	2 – 4
WEc2	Innovative Waster Water Technologies	2
WEc3	Water Use Reduction	2 - 4
WEc4	Process Water Use Reduction	Applicable Only to LEED Schools

THE KANDALAMA HOTEL,
Dambulla – LEED Bronze; 2000

The First LEED Green Building outside USA & the First LEED Green Hotel in the World



SABAH AL AHMAD INTERNATIONAL FINANCIAL CENTRE, Kuwait – Pre-Certified LEED Gold; 2008

Pre-Certified

Sustainable Sites	13
Water Efficiency	4
Energy & Atmosphere	5
Materials & Resources	2
Indoor Environmental Quality	10
Innovation & Design Process	5
TOTAL POINTS	39

DUBAI TRADE CENTRE DISTRICT PHASE 1 - OFFICES

Pre-Certified LEED Gold; 2008

Pre-Certified

Sustainable Sites	10
Water Efficiency	5
Energy & Atmosphere	6
Materials & Resources	4
Indoor Environmental Quality	9
Innovation & Design Process	5
TOTAL POINTS	**39**

Dubai Maritime City
UAE – LEED for Retail Sustainability Guidelines

MALL OF THE EMIRATES (LEED EBOM), Dubai – Pursuing LEED Gold

Sustainable Sites	8
Water Efficiency	6
Energy & Atmosphere	11
Materials & Resources	7
Indoor Environmental Quality	12
Innovation & Design Process	5
TOTAL POINTS	49

TECOM MANAGEMENT OFFICE INTERIORS, DUBAI – LEED Platinum; 2009

The First LEED Platinum Commercial Interiors in the Middle East

DOHA GREEN TRAINING WORKSHOP

Integrated Strategy for Water Use Reduction
Water Efficiency

10th December 2009

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