Water Efficiency (WE)
GA02 Excerpt WE Overview. LEED BD+C RG v4 - Pgs. 257-258
GA08 Water Efficiency (WE) - Pgs. 52-66
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Energy and Atmosphere (EA)
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Water Efficiency (WE)
GA02 Excerpt WE Overview. LEED BD+C RG v4 - Pgs. 257-258

The Water Efficiency (WE) credit category addresses the reduction of:
1. Indoor Water Use
2. Outdoor Water Use
3. Process/Specialized Water Use
4. And Metering

potable water
water that meets or exceeds U.S. Environmental Protection Agency drinking water quality standards (or a local equivalent outside the U.S.) and is approved for human consumption by the state or local authorities having jurisdiction; it may be supplied from wells or municipal water systems

nonpotable water
water that does not meet drinking water standards

graywater
“untreated household waste water which has not come into contact with toilet waste. Graywater includes used water from bathtubs, showers, bathroom wash basins, and water from clothes-washers and laundry tubs. It must not include wastewater from kitchen sinks or dishwashers” (Uniform Plumbing Code, Appendix G, Gray Water Systems for Single-Family Dwellings); “wastewater discharged from lavatories, bathtubs, showers, clothes washers and laundry sinks” (International Plumbing Code, Appendix C, Gray Water Recycling Systems). Some states and local authorities allow kitchen sink wastewater to be included in graywater. Other differences can likely be found in state and local codes. Project teams should comply with the graywater definition established by the authority having jurisdiction in the project area.

process water
water that is used for industrial processes and building systems, such as cooling towers, boilers, and chillers. It can also refer to water used in operational processes, such as dishwashing, clothes washing, and ice making.

The conservation and creative reuse of water are important because only 3% of Earth's water is fresh water.

Sources of Potable Water
- Public water supply (municipal)
- Wells

Wastewater
- Piped to processing plant.
- Septic tanks

Importance of Metering
Energy required to treat water for drinking, transport it to and from a building, and treat it for disposal represents a significant amount of energy use not captured by a building's utility meter. (GHG Red Flag!)

In the U.S., buildings account for 13.6% of potable water use. (LCCG – 12%)

Designers and builders can construct green buildings that use significantly less water than conventional construction by incorporating native landscapes that eliminate the need for irrigation, installing water efficient fixtures, and reusing wastewater for nonpotable water needs.

The WE category comprises three major components: indoor water (used by fixtures, appliances, and processes, such as cooling), irrigation water, and water metering. Several kinds of documentation span these components, depending on the project's specific water-saving strategies.

Site Plans
Fixture Cutsheets
Alternative Water Sources
- Graywater reuse
- Rainwater harvesting
- Municipally supplied wastewater (purple pipe)

Note: Team cannot apply the same water to multiple credits unless the water source has sufficient volume to cover the demand of all the uses (e.g., irrigation plus toilet-flushing demand).

Occupancy Calculations
FTE
1. A LEED BD+C: New Construction project has 400 full-time (40 hrs/wk) and 200 part-time (10 hrs/wk) employees. How many Full Time Equivalent (FTE) must be included for indoor water efficiency calculations?
   A. 400
   B. 450
   C. 500
   D. 600

LCCG Section 4. Water Efficiency - pgs. 61-63

The operation of buildings, including landscaping, accounts for approximately 47 billion gallons per day—12% of total water use.

GUIDING QUESTIONS FOR A TEAM TO CONSIDER MAY INCLUDE THE FOLLOWING:

- How much rain falls on the site per year?
- How will water be used on site, and how can the amount be reduced?
- What are the sources of graywater, such as from sinks and showers, that could be collected and reused for nonpotable uses, such as irrigation?

Indoor Water Use

Indoor use encompasses water for urinals, toilets, showers, kitchen or break room sinks, and other applications typical of occupied buildings.

Indoor Water Use Reduction

Installing water-efficient fittings and fixtures
Use nonpotable water for flush functions
Installing submeters to track and log water use trends, check fixture performance, and identify problems.

Industrial Processes and Systems

Cooling Towers
Boilers
Chillers
Washing machines
Dishwashers

→ Substitute harvested rainwater and nonpotable water sources

Submeters

Report how much water is used by systems and fixtures.
Alerts building maintenance to leaks and other inefficiencies.

Water Efficiency Goals

- ❑ Infiltrate rainwater on site to recharge the local aquifer.
- ❑ Use water more efficiently.
- ❑ Reduce the buildings water demand from indoor water (used by fixtures, appliances, and processes, such as cooling), and irrigation water.
- ❑ Install building level water meter and sub meters to track consumption and identify issues.

Quick Fill-in

Prerequisite / Credit	Percentage Reduction Required	Additional Reductions/Points
Outdoor Water Use Reduction		Points: 1 _____ 2 _____
Indoor Water Use Reduction		Points: 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____ EP?

STRATEGIES FOR REDUCING INDOOR WATER USE:

- **INSTALL EFFICIENT PLUMBING FIXTURES.** Install new high-efficiency fixtures, including high-efficiency lavatories, kitchen sinks and showers, dual-flush toilets, waterless urinals, and composting toilets. High-efficiency fixtures use less water than specified by the Energy Policy Act (EPAct) of 1992. Select EPA WaterSense and ENERGY STAR products. In existing buildings, if porcelain replacement proves cost-prohibitive, install new flush valves or flow restrictors (e.g., aerators) to achieve water savings.
- **USE NONPOTABLE WATER.** If permitted by the jurisdiction, use captured rainwater, graywater, or municipally-provided reclaimed water for flush fixtures. Design and install plumbing systems that can use captured rainwater or graywater in flush fixtures. Graywater use is not an option in all municipalities, so it is important check regulations before planning to use this strategy.
- **INSTALL SUBMETERS.** Meter indoor water systems and monitor the data to track consumption trends, determine fixture performance, and pinpoint leaks.

STRATEGIES FOR REDUCING OUTDOOR WATER USE:

- **CHOOSE LOCALLY ADAPTED PLANTS.** Landscape with native and adapted plants that require less water. These plantings have the added benefit of providing habitat for native wildlife.
- **USE XERISCAPING.** These drought-tolerant plantings have extremely low water needs. Especially in arid regions, employ xeriscape principles when designing the site landscape.
- **SELECT EFFICIENT IRRIGATION TECHNOLOGIES.** Drip and bubbler systems and weather-based controllers can save water.
- **USE NONPOTABLE WATER.** Captured rainwater, graywater, or municipal reclaimed water is suitable for irrigation.
- **INSTALL SUBMETERS.** Meter the irrigation system to track water consumption and identify leaks.

GA08 Water Efficiency (WE) - Pgs. 52-66

Water Efficiency

Adaptation	NC	CS	S	R	DC	WDC	HOS	HC
Total	11	11	12	12	11	11	11	11
Outdoor Water Use Reduction	req	req	req	req	req	req	req	req
Indoor Water Use Reduction	req	req	req	req	req	req	req	req
Building-Level Water Metering	req	req	req	req	req	req	req	req
Outdoor Water Use Reduction	2	2	2	2	2	2	2	1
Indoor Water Use Reduction	6	6	7	7	6	6	6	7
Cooling Tower and Process Water Use	2	2	2	2	2	2	2	2
Water Metering	1	1	1	1	1	1	1	1

Energy and Atmosphere (EA)
GA02 Excerpt EA Overview. LEED BD+C RG v4 - Pgs. 323-324

EA Prerequisites (Required) and Credits Address:
Energy use reduction
Energy-efficient design strategies
Renewable energy sources

Nonrenewable Energy Sources
Oil
Coal
Natural Gas

Energy Efficient Green Buildings incorporate Designs that reduce overall energy needs.
- Building Orientation
- Glazing selection
- Choosing climate-appropropriate building materials
- Passive heating and cooling
- Natural ventilation
- High-efficiency HVAC systems w/smart controls
- Generating renewable energy on the project site
- Purchase green power

Commissioning Process
Critical to ensuring high-performance buildings.

Demand Response Programs
Increases grid efficiency.
Shift Load - Reduce electricity use during peak times.
Shed load – turn off equipment and lights!

LCCG Section 4. Energy and Atmosphere - pgs. 64-70

FOLLOWING AN INTEGRATIVE PROCESS HELPS IDENTIFY SYNERGISTIC STRATEGIES FOR THE FOLLOWING AREAS:

- Energy demand
- Energy efficiency
- Renewable energy
- Ongoing performance

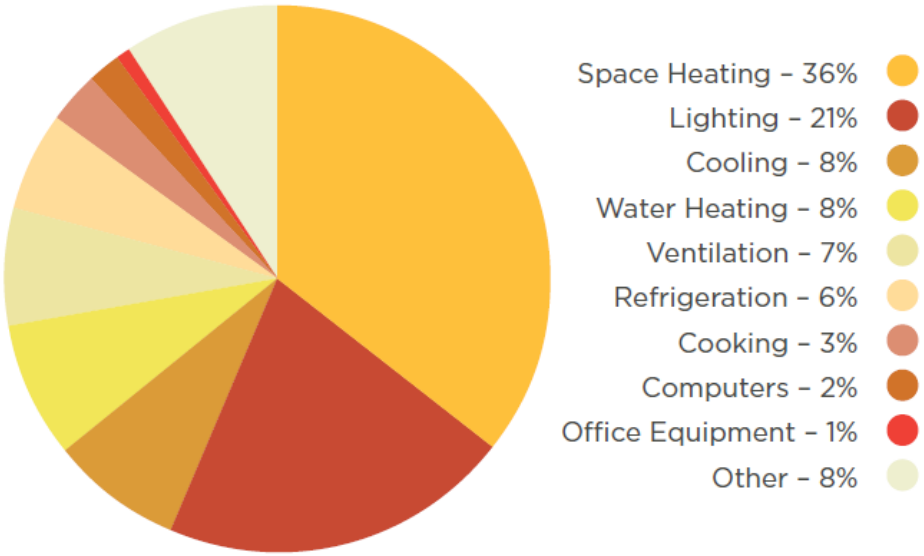
STRATEGIES FOR REDUCING ENERGY DEMAND IN DESIGN AND PLANNING:

- **ESTABLISH DESIGN AND ENERGY GOALS.** Set targets and establish performance indicators at the outset of a project and periodically verify their achievement.
- **SIZE THE BUILDING APPROPRIATELY.** A facility that is larger than necessary to serve its function creates costly and wasteful energy demand.
- **USE FREE ENERGY.** Orient the facility to benefit from natural ventilation, solar energy, and daylight.
- **INSULATE.** Design the building envelope to insulate efficiently against heating and cooling losses.

STRATEGIES FOR REDUCING ENERGY DEMAND IN OPERATIONS AND MAINTENANCE:

- **USE FREE ENERGY.** Use the facility's orientation and appropriate shades, windows, and vents to take advantage of natural ventilation, solar energy, and daylight.
- **MONITOR CONSUMPTION.** Use energy monitoring and feedback systems to encourage occupants to reduce energy demand.

Percentage of Total Consumption in Commercial Buildings by End Use



STRATEGIES FOR ACHIEVING ENERGY EFFICIENCY:

- **ADDRESS THE ENVELOPE.** Use the regionally-appropriate amount of insulation in the walls and roof and install high-performance glazing to minimize unwanted heat gain or loss. Make sure that the building is properly weatherized.
- **INSTALL HIGH-PERFORMANCE MECHANICAL SYSTEMS AND APPLIANCES.** Apply life-cycle assessment to the trade-offs between capital and operating costs, and evaluate investments in energy efficiency technologies. Appliances that meet or exceed ENERGY STAR requirements will reduce plug load demands.
- **USE HIGH-EFFICIENCY INFRASTRUCTURE.** Efficient street lighting and LED traffic signals will reduce energy demands from neighborhood infrastructure.
- **CAPTURE EFFICIENCIES OF SCALE.** Design district heating and cooling systems, in which multiple buildings are part of a single loop.
- **USE ENERGY SIMULATION.** Computer modeling can identify and prioritize energy efficiency opportunities.
- **MONITOR AND VERIFY PERFORMANCE.** Ensure that the building systems are functioning as designed and support the owner's project requirements through control systems, a building automation system, and commissioning and retrocommissioning.

STRATEGIES FOR MEETING ENERGY DEMAND WITH RENEWABLE ENERGY:

- **GENERATE RENEWABLE ENERGY.** Install photovoltaic cells, solar hot water heaters, or building-mounted wind turbines.
- **PURCHASE OFF-SITE RENEWABLE ENERGY OR CARBON OFFSETS.** Buy green power, renewable energy certificates, or carbon offsets to reduce the environmental impact of energy consumed on-site and promote renewable energy generation and the reduction in carbon dioxide emissions.

STRATEGIES FOR INCORPORATING ONGOING PERFORMANCE MEASUREMENT INTO A PROJECT:

- **ADHERE TO THE OWNER'S PROJECT REQUIREMENTS.** Prepare detailed owner's project requirements at the beginning of the design process and conduct commissioning throughout the life-cycle of the project to ensure that the building functions as designed.
- **PROVIDE STAFF TRAINING.** Knowledge and training empower facilities managers to maintain and improve the performance of buildings.
- **CONDUCT PREVENTIVE MAINTENANCE.** Develop a robust preventive maintenance program to keep the building in optimal condition.
- **CREATE INCENTIVES FOR OCCUPANTS AND TENANTS.** Involve building occupants in energy efficiency strategies. Promote the use of energy-efficient computers and equipment, bill tenants from submeter readings to encourage energy conservation, educate occupants about shutting down computers and turning out lights before they leave, and give them regular feedback on energy performance.

GA08 Energy and Atmosphere (EA) - Pgs. 67-90

Energy and Atmosphere (EA)

Adaptation	NC	CS	S	R	DC	WDC	HOS	HC
Total	33	33	31	33	33	33	33	33
Fundamental Commissioning and Verification	req	req	req	req	req	req	req	req
Minimum Energy Performance	req	req	req	req	req	req	req	req
Building-Level Energy Metering	req	req	req	req	req	req	req	req
Fundamental Refrigerant Management	req	req	req	req	req	req	req	req
Enhanced Commissioning	6	6	6	6	6	6	6	6
Optimize Energy Performance*	18	18	16	18	18	18	18	20
Advanced Energy Metering	1	1	1	1	1	1	1	1
Grid Harmonization	2	2	2	2	2	2	2	2
Renewable Energy	5	5	5	5	5	5	5	5
Enhanced Refrigerant Management	1	1	1	1	1	1	1	1