Sustainable Design Requirements 01 81 13

Description:

The purpose of the section is to highlight the current applicable UMD Design Standards related to the incorporation of sustainable criteria for the design of new and renovation construction projects.

Related Sections:

- 01 61 13 Building Commissioning
- 01 81 00 Facility Performance Requirements
- 01 81 16 Environmental Health and Safety in Facility Design
- 01 86 26 Energy and Energy Analysis
- 07 33 63 Vegetated Roof Coverings
- 22 00 00 Plumbing
- 22 09 00 Meters, Water Flow and Energy (BTU)
- 23 00 04 HVAC Energy Efficiency
- 23 00 05 Mechanical Design Standards
- 26 50 00 Lighting
- 31 25 00 Stormwater Management and Sediment and Erosion Control
- 32 01 90 Tree and Shrub Preservation Protection
- 32 33 13 Site Bicycle Racks
- 32 39 00 Site Standards
- 32 80 00 Irrigation Systems
- 33 71 33 Utility Metering

Effective Date:

January 1, 2020

Applicable Standards:

- ASHRAE 90.1
- International Energy Conservation Code (IECC)
- USGBC LEED for New Construction
- International Green Construction Code (IgCC)

The following Campus and State initiatives serve as the framework for the University's sustainable design practices:

- The Facilities Master Plan was adopted in 2002 and the Environmental Stewardship Guidelines were adopted in 2005.
- May, 2007 – President Mote, University of Maryland, signed the American College and University Presidents Climate Commitment (later renamed "Carbon Commitment") which pledges to take significant steps to reduce greenhouse gas emissions from campus operations and move toward the goal of climate neutrality (zero net greenhouse gas emissions).
- October, 2007 – The UMD Facilities Council agreed that new buildings and full building renovations at College Park be constructed with the goal of being eligible for LEED certification at the Silver level as prescribed by the U.S. Green Building Council.
- April, 2008 – Governor Martin O'Malley signed into Maryland Law, the High Performance Buildings Act. It requires specified buildings (to include higher education buildings) constructed or renovated with state funds, to be high performance buildings.
- May, 2008 – President Mote adopted the new University Strategic Plan. The Plan states that the University should become a model for environmental stewardship and sustainability "holding new construction and renovation to stringent LEED standards".
- August, 2009 – The Campus Climate Action Plan is endorsed by the University President and Senate and

becomes part of the University's strategic direction. The Climate Action Plan is a 40-year strategic plan for how the campus will become carbon neutral by 2050.

- April 2014 – UMD President Loh outlines new Energy Initiatives including a Carbon Neutral New Development Initiative, which requires all new construction, renovations, building occupancy changes, and major program changes achieve net-zero greenhouse gas emissions by employing the strategies of Energy Efficient Design, Energy Use Intensity Tracking, and Carbon Footprint Neutralization with the purchase of renewable energy and carbon-offsets.
- May 2014 – The University Sustainability Council issued the Sustainable Water Use and Watershed Report. The Report includes 13 recommendations for pursuing strategies that manage short and long-term risk and promote resiliency as it relates to our water supply; demonstrate best current practices in the management of water, wastewater and stormwater; train and educate the next generation of policy makers/engineers/scientists and general citizenry who will be responsible for managing the watershed and Chesapeake Bay; and build strong coalitions with the local and regional community in support of watershed restoration.

General Requirements:

Each project should strive for excellence in sustainable design within the constraints of the project program and budget. Each project shall incorporate, to the maximum extent possible, sustainable design features consistent with these sustainable design standards.

For projects required to follow the State High Performance Building Program, refer to the Maryland Green Building Council website for additional requirements beyond those outlined in this document.
https://dgs.maryland.gov/Pages/GreenBuilding/index.aspx

Unless otherwise directed, all projects that are required to be LEED certified shall be registered and certified using the University of Maryland's U.S. Green Building Council membership. The University's Project Manager will facilitate this effort.

Deliverables:

- Designers must provide a written narrative that addresses the design team's plan to execute all items required in the Sustainable Design Standards.
- If certification is required, the written narrative should also include a plan to acquire environmental certification (i.e. LEED, Green Globes, Sustainable Sites, International Green Construction Code, etc.) and which credits are deemed to be achievable. Items which are not achievable and/or applicable should be noted as such. The narrative is required to be updated and submitted with each design document submission.
- The design team (upon completion of construction documents) shall provide a list of the sustainable design features.
- Unless otherwise directed by UMD PM, provide a 1 year and 2 year post-occupancy energy use/carbon emissions analysis.

  All design review sessions necessary to incorporate designated sustainable requirements are be incorporated into the total project design schedule as to not impact the approved project schedule.

Sustainable Design Standards:

- **Programming and Design**
  - Project Planning and Design: The design shall manifest the University commitment to sustainability to the greatest extent possible. Sustainability shall be addressed comprehensively as an integral aspect of the design philosophy and in all aspects of building design. All required design team members should be included early in the design process and be involved throughout.
  - Building Size and Footprint: As programmed, minimize the overall building size (square footage and footprint) while meeting the building program requirements. Encourage efficient use of space while reducing overall resource consumption, including embodied energy, operational energy, and building materials.
  - Design for Future Use: Design interior spaces that are flexible and allow for changes in use. Use standard furniture wherever possible. Minimize use of custom millwork, custom building systems (door frames, doors, interior windows, etc.) to maximize reuse in the future.
  - Programming and Space Planning: Within Program requirements, group spaces or activities with similar energy requirements and times of use to allow for zoning efficiency of mechanical energy systems in order to optimize operational efficiency.
  - Service Areas: If applicable, service areas shall support efficient operations, program, and building management for sustainability initiatives such as recycling, composting, water capture, vehicle access, etc.
  - User Involvement: Survey building occupants/users (students and faculty/staff) for sustainable design, maintenance and operations suggestions. Incorporate recommendations in the design as practicable.
  - Life Cycle Cost Analysis (LCCA) and Life Cycle Costing (LCC):
    - Provide LCC data and analysis for all sustainable design features which may have a higher upfront cost, but will pay back the investment over time (Return on Investment (ROI)).
    - Ensure ROI calculations include 'synergistic' effects on cost. I.e. change in lighting fixtures or increased insulation may allow for reduced HVAC load and reduced need for carbon offsets.
    - Renewable energy certificate (REC) and carbon offset rates shall be included in all life cycle cost analyses using prices and escalation rates available at https://go.umd.edu/CNND

- **Site Planning and Development**
  - Building Siting: As programmed, optimize building placement and configuration for energy performance. Place, orient, and configure the building on the site to optimize daylighting, reduce heat island effects, minimize non- permeable surfaces, optimize stormwater management, and maximize alternative transportation options.
  - Stormwater Management: At a minimum, manage rainfall onsite and size the management system to meet Maryland Department of the Environment regulations. Look for opportunities to treat additional stormwater from other campus areas, paying special attention to problem areas such as parking lots. Consider ESD strategies as part of the stormwater management design strategy. Prioritize ESD strategies to 1) protect and utilize existing site features, 2) reduce impervious cover to be managed, 3) manage remaining stormwater, and 4) consider operations and maintenance in design.
  - Existing Landscape: As programmed, protect significant natural and historic landscaping and incorporate those elements into the new landscape design.
  - Paved Surfaces: As programmed, utilize permeable surfaces to reduce stormwater run-off and/or reflective surfaces to reduce urban heat island effects.
  - Bicycle parking: As programmed, Provide ample bike rack spaces to accommodate both staff and student use of the building.

  - Habitat: Protect or restore natural habitat areas wherever feasible. As programmed, design and construct building and site with consideration to reduce or prevent bird mortality due to bird strikes on large

expanses of window glazing. Utilize dense canopy trees in line with the mission of the campus Arboretum and Botanical Garden and the UMD Tree Management Plan. Invasive species, as designated, by the MD Department of Natural Resources shall not be selected for planting.

- Soil Protection and Restoration: Create and implement a plan to protect and restore topsoil on the project site, if applicable. Plan should include topsoil protection, soil reuse, soil preparation, and restoration of soils disturbed during construction and not to be covered by buildings, structures, or hardscapes. Wherever possible, soil should be reused on site or elsewhere on the campus.
- Landscape Maintenance: Reduce maintenance and potential problems caused by landscape debris. Specify plants appropriately for their purpose and location. Avoid overplanting. Consider mature landscape growth potential to insure appropriate integration with lighting and other site systems.
- Light Pollution Reduction: Design exterior lighting to minimize backlighting, uplighting, and glare. BUG ratings for exterior fixtures shall be appropriate for campus lighting zone designation. Lighting controls, including motion sensors, photo sensors, time clocks, etc. shall be installed per state energy code requirements. Consideration should be given to ensure light trespass from the building interior is minimized appropriately.

- **Energy Use and Conservation**
  - Energy Efficient Design: All new construction and renovation projects will adhere to the current adopted state energy code through a combination of design, equipment selection, and/or on site renewable energy. All efforts shall be made to exceed the requirements. This flexibility will allow each project to best design for its unique requirements or site location. All construction documents shall be submitted to the FM Director of Engineering and Energy to validate that this requirement is met for each project.
  - Energy Use Intensity Tracking: All new construction and renovation projects will exceed annual Energy Use Intensity (kBTU/GSF) of similar facilities on the University of Maryland campus (e.g. laboratories, residence halls, classroom buildings, dining halls, etc.) and achieve net-zero greenhouse gas emissions for heating, cooling, and powering the facility. Additional costs for renewable electricity and carbon offsets shall be included in life cycle cost analyses and factored into equipment selection. A compliance statement shall be submitted to the Department of Engineering and Energy with proposed designed EUI as compared to similar buildings or occupancies. Facilities Management will confirm the design EUI during the commissioning process and continuously monitor and take corrective action as needed to ensure that the buildings continue to operate as designed. All new construction and major renovations must have a continuous commissioning program.
  - Energy Commissioning and Monitoring [see Section 01 61 13 Building Commissioning]: As programmed, provide building energy commissioning beginning in schematic design to establish energy goals, and ending with a post-occupancy energy analysis. Provide permanent energy metering on all buildings for monitoring each type of energy use, utilizing the campus' monitoring standards for water, lighting, electrical, gas, etc. Provide the capability to monitor and analyze post- occupancy performance in comparison to energy analysis predictions. Submit comparative analysis for review. Provide a 1 year and 2 year post-occupancy energy/carbon use analysis. Use smart meters for all spaces or groups of spaces to monitor energy use and educate users of their effect on energy consumption.
  - Energy modeling: [See Section 01.86.26 Energy and Energy Analysis]: As programmed, energy simulation modeling of the whole facility under design shall be conducted. The energy modeling shall begin no later than the Concept Design phase and continue through Design Development and Construction Document phases as required to benefit early design decisions. The energy model will:
    - Enable an integrated design process by estimating the impact of siting, orientation, and architectural and building shell design on building mechanical and electrical system loads and equipment sizing and selection.
    - Provide a tool to simulate energy performance of mechanical and electrical system design alternatives, for input to cost/benefit and value engineering analyses. Renewable energy certificate

(REC) and carbon offset rates shall be included in all life cycle cost analyses using prices and escalation rates available at https://go.umd.edu/CNND
    - Demonstrate compliance with state energy code requirements and UMD Energy Performance Goals.
    - Be used to document energy use for sustainability certifications, if applicable.
- Climate-Responsive and Passive Systems Design: Design buildings in a climate responsive manner to reduce energy demand, maximize passive heating and cooling, and minimize mechanical HVAC requirements by considering building form, orientation, articulated shading, natural ventilation, glazing, demand response control, daylighting, building envelope, interior thermal mass, blinds, controls, geothermal energy, etc.
- Window glazing: Select glazing size and materials appropriate for the orientation of the windows. Consider the use of multi-glazed units with thermal breaks in window frames at all exterior glazing. Minimize window to wall ratios while achieving programmatic goals.
- Window shading: Exterior windows shall be shaded appropriately for the window orientation. Consider cleaning and maintenance of windows and shading devices in the design.
- On-site Renewable Energy Generation: Investigate and propose all viable options for renewable energy generation and provide ROI analysis to inform design decisions. As programmed, ensure that the building and roof are solar ready for possible future installations.
- Mechanical Systems: Coordinate systems and controls with other building systems to optimize building operation and reduce energy consumption on a life-cycle basis.
- Energy Efficiency Incentives and Funding: If applicable, provide necessary analyses and documentation to capture utility incentives or other funding opportunities to facilitate implementation of energy efficiency measures.

- **Water**
    - Plumbing Fixture: Employ strategies that, in aggregate use 35% less water than the water use baseline calculated for the building based on minimum applicable plumbing code requirements (not including irrigation).
    - Landscaping: Reduce demand on all systems by utilizing appropriately sited native landscaping materials wherever feasible.
    - Irrigation: As applicable, emitters for tree and landscape irrigation shall be designed to be easily modifiable to move the system farther out over time encouraging root spread reducing the amount of water used as plants become established. Reduce potable water use for irrigation by at least 50% using landscape design and an efficient irrigation system.
    - Water Capture: Consider providing a site location for collection opportunities for water capture and reuse. Consider opportunities for rainwater harvesting and condensate collection.
    - Plumbing Fixtures: All plumbing fixtures shall be certified for low water use and WaterSense labeled, if available.
    - Mechanical Systems: As programmed, specify water-efficient HVAC systems.
    - Purple Pipe System: Consider maximizing gray/rain water use for landscape irrigation and other purposes as campus standards and local regulations allow. Consider installation of purple pipe infrastructure for future expansion of water reuse practices.
    - Monitoring and Metering: If applicable, provide whole building water metering and monitoring. Ensure that data collection will be compatible with campus standards. Provide separate metering for landscape irrigation and building use. Provide recommendations for additional metering for separate water uses as appropriate in order to identify and correct abnormal water use.

- **Construction and Finish Materials**
    - Preferred Environmental Attributes: Preference should be given for materials and products with the

following properties: Reused and Repurposed Materials, Recycled Content Materials, Local/Regional Materials, Rapidly Renewable Materials, and/or Bio-based Materials (as defined in Section 505.2.4 of the International Green Construction Code).

- Surface Reflectance: Specify materials that will minimize the lighting fixture load wherever possible. Ensure actual reflectance of proposed surface finishes is included in lighting calculations.
- EPDs and HPDs: Materials and products which have Environmental Product Declarations and/or Health Product Declarations certifying that persistent bioaccumulative and toxic chemicals or persistent organic pollutants are not contained or created during extraction and manufacture are preferred.
- Seek opportunities to use salvaged materials in the design and construction of new buildings. Similarly, when renovating an existing building, deconstruct and reuse or divert from landfill as much of the material as possible to other uses.
- Construction Waste: Minimize or eliminate construction waste. Reduce, reuse and/or recycle waste materials to minimize disposal to a landfill. At least 75% of construction waste shall be recycled or otherwise diverted from the waste stream**.** Similarly, at least 75% of land-clearing debris and excavated soil shall be reused on site or otherwise diverted from a typical landfill.
- Maintenance: Specify low maintenance materials. Identify opportunities to use materials that do not require additional finishing (i.e. paints and stains). Material and building maintenance and special cleaning procedures shall be reviewed by Facilities Management for integration into the sustainable cleaning program standards.

- **Indoor Environmental Quality**
  - Indoor Air Quality [See 01 81 06 Environmental Health and Safety in Facilities Design, Prohibited Building Materials.]: Careful selection of all materials shall be employed to minimize toxic elements in the building. Eliminate or minimize the use of volatile organic compounds and formaldehyde for interior finishes, cabinetry, furnishings and other interior applications.
  - Natural Daylight: Utilize natural daylight and views to enhance building occupant comfort. Provide adequate operable shading where necessary to reduce heat and glare.
  - Occupant Control of Lighting and Thermal Comfort: Provide opportunities for reasonable individual control of lighting and thermal comfort, including lighting, heating, cooling, shading, and natural ventilation within the parameters established by Facilities Management.
  - Connection to Outdoors: Where feasible, provide opportunities for occupant connection to the outdoor environment with living walls, water features, etc.

- **Operation & Maintenance**
  - Building "Owner's User Manual": Provide a Building Owner's User manual (in digital format) informing building occupants how to operate and maintain building and site to optimize building system and design. This manual should include such items as user lighting and temperature controls, plumbing fixtures (i.e. dual flush toilets), automatic shading devices, etc., that occupants control.
  - Operation and Maintenance Education: As programmed, conduct building owner/user/FM workshop prior to occupancy to review the "Building Owner's User Manual" and direct building users on how to optimize the building systems and design.
  - Post-Occupancy Evaluation: As programmed, post-occupancy evaluations will be performed by the Sustainability Consultant at the end of the first year of occupancy. The evaluation shall include performance satisfaction assessments of building comfort, HVAC systems operations and controls, water and energy use, lighting, etc.

- **Building Education**
  - Resource Usage Information Display: As programmed, provide smart meters to educate and influence

user behavior with the goal of reducing energy and water consumption. Information may be provided via on site display monitor or a publicly accessible website.

- Interpretation: Propose innovative ways to educate users about sustainable building design through the use of signage, displays, and other appropriate communication device to explain design strategies, techniques, technologies, etc.
- Research: Propose opportunities to facilitate ongoing research and teaching by UMD faculty.