



WMU Facility Life Cycle Design Guidelines

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A. DESIGN GOALS

1. Minimize building life cycle costs, direct and indirect, relating to energy use, maintenance, waste disposal and occupant health and productivity.
2. Minimize environmental impacts throughout the building life cycle, including product manufacturing, construction, use/occupancy, and demolition or renovation/reuse.
3. Optimize indoor environmental quality.

B. DESIGN PROCESS

1. The US Green Building Council LEED Rating System- New Construction- Version 4.1 is to be used as a performance standard and guideline on all new building and renovation projects. All Prerequisites and the highest number of credits should be achieved that are feasible, within project scope, program and budget. Official LEED Certification at a minimum of Silver level is to be obtained on all major projects.
2. Consider energy strategies to reduce global warming impacts. See WMU Climate Action Plan, adopted 4/12/12.
3. Evaluate life cycle costs of design alternatives to reduce costs of major building systems. Use energy simulation/modeling software on major projects. Life cycle cost saving strategies used should have maximum payback period of 5-15 years (not greater than 80% of the useful lifespan), to be evaluated on a case by case basis.
4. The Project Design Team is to determine design strategies appropriate for project program, site and budget. The LEED Checklist is to be submitted with project reviews to document sustainable strategies implemented, for all projects over \$250,000. Final checklist will be published on the WMU Office for Sustainability website.
5. Consider use of new "cutting edge" sustainable technologies where appropriate, for project testing on a small scale.
6. Architectural/Engineering consultants are to include the above services in the *Agreement for Professional Services*.



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C. DESIGN GUIDELINES

Location & Transportation

1. Site Selection: As indicated in the WMU Master Plan, avoid development of buildings and parking in flood plain and wetland areas.
2. Development Density & Community: Encourage moderate density development to preserve open space and enhance pedestrian & bicycle use of campus. Locate new facilities in proximity to other related services.
3. Alternative Transportation: Provide site facilities to encourage pedestrian, bicycle and bus transport, where feasible. Promote carpooling and use of fuel efficient and alternative fuel vehicles.

Sustainable Sites

1. Erosion & Sedimentation Control: Employ techniques such as silt fencing, sediment traps/filters, topsoil stockpiling and slope stabilization to minimize erosion of soil during construction. At a minimum, comply with Michigan NPDES Construction Storm Water Program: Rule 2190 of Part 31 of Act 451 and EPA Construction General Permit 2012.
2. Minimize Site Disturbance: Consider the impact of project on the surrounding ecosystem. Investigate methods to minimize impacts on natural habitats and watersheds.
3. Habitat and Open Space: Create or preserve vegetative open space within the project site, as feasible. Where feasible, use vegetation that is native to the bioregion to support ecological systems.
4. Stormwater Management: Limit off site storm water runoff and employ methods to increase on-site infiltration. Project design is to maintain no net increase in discharge to storm system for projects of an acre or larger. See WMU Campus Stormwater Management Guideline 2013.
5. Heat Island Effect: Use light colored site and roof surfaces, or provide shading on site where feasible, to minimize solar heat absorption.
6. Light Pollution Reduction: Minimize site lighting levels and off-site light spillover/ glare, while providing for adequate levels for security and wayfinding.

Water Efficiency

1. Water Use Reduction: Use strategies to reduce water consumption, including low flow plumbing fixtures and mechanical equipment. Consider methods for water reuse and recycling.
2. Water Efficient Landscaping: Use drought resistant plant materials and low flow irrigation techniques, where feasible. Consider use of native plant species and non-irrigated landscaping design.



3. Consider reuse and filtration of stormwater and graywater in building to reduce the need for detention system.

Energy & Atmosphere

1. Building Systems Commissioning: Key mechanical and electrical systems are to go thru a Commissioning process, which includes the following:
 - Inspection and testing for functional performance in accordance with project objectives and University guidelines.
 - Testing to verify no cross connections between storm and sanitary sewers.
 - Documentation of criteria, inspections/testing and acceptance
 - Training of WMU operations and maintenance staff

All projects shall implement a Commissioning plan, with the scope to be determined by the project team. Consider inclusion of Building Envelope Commissioning and Monitoring-Based Commissioning, if appropriate for the project.

2. Integrate Buildings with the Site: Consider local climate and site influences on building energy use. Use “free” energy sources where feasible, such as solar energy, daylight, exterior temperature variations and winds.
3. Optimize Energy Performance: Select building envelope, mechanical and electrical systems for improved energy efficiency. The goal for all major projects is to exceed ASHRAE 90.1- 2013 by 30%. All projects are to comply with the International Energy Code as a minimum. Typical strategies & technologies:
 - Building Envelope
 - Control and utilization of solar heat gain
 - Daylighting of interior spaces
 - High performance windows/glazing
 - Optimized insulation values
 - Reduced air infiltration
 - Mechanical Systems
 - High efficiency equipment
 - Direct Digital Control System (DDC) for HVAC
 - Occupancy sensors/CO2 monitoring
 - Heat recovery systems
 - Economizer cycle cooling
 - Zoning of HVAC system based on building orientations & loads
 - Variable speed drives on motors and fans
 - Time of day scheduling
 - Separate controls for individual spaces, where feasible
 - Geothermal energy systems.
 - Chilled beam systems.
 - Other Demand Control Ventilation



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- Electrical Systems
 - High efficiency lighting fixtures (no incandescent)
 - Occupancy sensors (and switches)
 - Daylight sensors
 - Separate ambient and task lighting
 - Lighting dimmers
 - Equipment Used by Occupants
 - Consider Energy Star rated equipment (eg. Office, Lab, Kitchen, Vending)
4. CFC/HCFC/Halon Reduction: Avoid use of these products in HVAC refrigerants and fire suppression systems. No use of CFC's or HCFC's in new facilities. Develop a phase out and conversion plan for existing facilities.
 5. Renewable Energy: Consider strategies to utilize renewable energy sources, including grant funding opportunities. Investigate cost effectiveness of photovoltaic and solar thermal energy systems. On major new building projects, the goal is to obtain at least one LEED renewable energy credit for on-site systems and provide space and infrastructure for future renewable energy systems.
 6. Measurement & Verification: Develop a plan for measurement and verification of energy saving design goal implementation, in conjunction with the Commissioning Plan.

Materials & Resources

1. Recycling Facilities: Plan for convenient areas in buildings for sorting and & storage of recyclable items by the building occupants. Provide containers for occupant collection of recyclable items:
 - Front entry bins to improve access for custodial
 - Include trash, paper, glass/plastic/metal containers together
 - Add 4th bin for future compost collection (or other material)
 - Signs posted vertical above openings
2. Building Reuse: Where appropriate, consider reuse of existing building elements such as structural system, building envelope, interior walls, finishes and furniture.
3. Construction Waste Management: Contractors are to develop a plan for sorting, storing & recycling of waste materials on projects. "Waste Spec" is to be used as a specification for this work. All projects shall implement a Construction Waste Management Plan, with the scope to be determined by the project team. A minimum of 50% of construction waste is to be salvaged, recycled or otherwise diverted from landfill or incineration. Submit final recycling data to WMU Office for Sustainability.
4. Recycled Content Materials: Use materials with post-consumer or post-industrial recycled content where feasible. Common products with recycled content include structural steel, aluminum windows, gypsum board, acoustical ceiling tiles, rubber floor tiles, carpeting, toilet partitions and furniture.



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5. **Durable & Flexible Materials:** Utilize components and systems which are durable and easy to maintain. Where feasible, use materials which provide flexibility to allow future changes and modifications.
6. **Local Materials:** Use products produced regionally where possible. See WMU General Requirements for use of Michigan products.
7. **Renewable Materials:** Consider use of products that are comprised of raw materials that are in abundant supply or come from renewable sources. When feasible, obtain wood products from Forest Stewardship Council certified suppliers.
8. **Materials containing PCB's, lead and asbestos are prohibited.** Mercury containing products are prohibited, unless no alternatives are available. Use of Mercury containing products requires full disclosure in product submittals. Consider the pollution and health impacts of product manufacturing and chemical ingredients and reduce these impacts as feasible.

Indoor Environmental Quality

1. **Minimum Indoor Air Quality Performance:** Comply with ASHRAE 62.1-2010 and State Mechanical Code.
2. **Tobacco Smoke Control:** Smoking is prohibited anywhere on WMU campuses, including during construction. <https://wmich.edu/policies/tobacco-free>
3. **Ventilation Requirements:** Optimize the amount of fresh air provided to building spaces. Connect occupancy sensors and carbon dioxide monitors to HVAC systems, where feasible.
4. **Construction Air Quality Management:** Protect ductwork and equipment from contamination during construction. At a minimum:
 - During construction, comply with SMACNA IAQ Guideline for Occupied Buildings Under Construction, 2008, Chapter 3.
 - Protect stored on-site or installed absorptive materials from moisture damage.
 - If air handlers are used during construction, filtration media with a MERV value of 8 are to be used at each return grille, per ASHRAE 52.2- 2007.
 - Replace all filtration media immediately prior to occupancy.
 - Conduct a 2 week building flush-out with new filtration media with 100% outside air after construction ends and prior to occupancy. After flush out, replace filtration media.or
 - Conduct a baseline indoor air quality testing procedure to demonstrate that concentration of air contaminants are below specified levels. Meet the testing requirements listed in LEED IEQ Credit 4.
5. **Low Emitting Materials:** Utilize materials which have low levels of volatile organic compound off-gassing for interior construction:
 - Adhesives & sealants: VOC content less than limits of South Coast Air Quality Management District Rule No. 1168 and Green Seal Standard 36.



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- Paints & coatings: VOC emissions that do not exceed Green Seal's Standard GS-11 & GC-03 and South Coast Air Quality Management District Rule No. 1113.
- Carpet: Comply with CRI Green Label Plus Testing program.
- Carpet cushion: Comply with CRI Green Label Testing program.
- Composite panels: No added urea formaldehyde resins.

6. Indoor Chemical Source Control: Consider methods to control and reduce dirt and moisture accumulation in flooring at entryways. Provide local exhaust ventilation at spaces in which hazardous chemicals will be present.

7. Design for Human Health & Occupant Controls: Consider environmental needs of people in terms of daylight, ventilation, exterior views and thermal/acoustic/visual comfort for interior spaces. Where feasible, provide controls for occupants to adjust these conditions. A direct line of sight to exterior vision glazing from 90% of all regularly occupied spaces is a long term goal.

D. EDUCATION

1. Consider signage to explain sustainable design features (LEED Innovation Credit).
2. Consider implementation of Energy Dashboards for analysis and public reporting of building performance. Dashboard platforms should be standardized across campus.

E. REFERENCES

General

- US Green Building Council LEED Green Building Rating System New Construction Version 4.1, www.usgbc.org
- WMU Climate Action Plan, adopted 4/12/12
http://wmich.edu/sites/default/files/attachments/1028-cap_0.pdf

Site Work

- EPA Construction General Permit 2012
- Michigan NPDES Construction Storm Water Program: Rule 2190 of Part 31 of Act 451
- ANSI/ASHRAE/IESNA Standard 90.1-2013, Section 9
- WMU Campus Stormwater Management Guideline 2013
http://www.fm.wmich.edu/ap/sq/guidelines/Admin_Guidelines_DG31-1.Storm%20Water%20Mgmt%20Policy-Signed_current.pdf
- WMU Campus Master Plan 2000
<http://www.wmich.edu/facilities/planning/masterplan>
- WMU Landscape Services Master Plan
<http://www.wmich.edu/sites/default/files/attachments/u301/2014/LS%20MasterPlanNEW.pdf>



Water Conservation

- The Energy Policy Act (EPAct) 1992, 2005
- Michigan Plumbing Code 2012

Energy Use

- ANSI/ASHRAE/IESNA Standard 90.1-2016 Energy Standard for Buildings except Low Rise Residential Buildings
- US DOE/EPA Energy Star Guidelines
- EPA Clean Air Act, Title VI, Section 608- Compliance with the Refrigerant Recycling Rule
- International Performance Measurement & Verification Protocol, Volume III EVO30000.1-2006
- WMU Energy Reduction Strategic Plan, 2014
<http://www.wmich.edu/facilities/engineering/strategic-plan>
- WMU Energy Star Purchasing Policy
<http://wmich.edu/sites/default/files/attachments/u338/2016/Energy%20Star.pdf>

Building Materials

- EPA Comprehensive Guide for Procurement of Products Containing Recovered Materials; Recovered Materials Advisory Notice III; Final rule (1/19/00) 40 CFR Part 247
- Triangle J Council of Governments, "Waste Spec"- Model Specification for Construction Waste Reduction.
- Forest Stewardship Council Principles and Criteria

Indoor Environmental Quality

- ASHRAE 62.1- 2016: Ventilation for Acceptable Indoor Air Quality
- Sheet Metal & Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, Chapter 3, November 2007
- EPA Compendium of Methods for Determination of Air Pollutants in Indoor Air
- South Coast Air Quality Management District Rule No. 1168, Amended 1/7/05
- Green Seal Standard 36 (GS-36), 10/19/2000
- Green Seal Paints and Coatings Requirements- Paints (GS-11), GC-03
- South Coast Air Quality Management District Rule No. 1113
- Carpet and Rug Institute Green Label Indoor Air Quality Test Program



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- ASHRAE Standard 55- 2017

END OF APPENDIX