01 81 13 Sustainable Design Requirements – ASHRAE 90.1&189.1 & LEED clarifications

Delete the following body of text in current section 01 81 13 in its entirety (deletions are shown struck through).

01 81 13 Sustainable Design Requirements

.01 Owner General Requirements and Design Intent

~~A. Design Intent: Apply integrated, holistic, sustainable design principles to achieve a high-performance facility that effectively balances environmental responsibility, resource efficiency, occupant comfort and well-being for new and renovated building projects. The sustainable design principles shall:~~

~~1. Reduce environmental impact and the ecology of the site by considering building orientation, natural solar shading, incorporating renewable resource use and other innovative environmental impact reduction designs.~~

~~2. Ensure resource conservation when considering the use of land, water, materials & building in the most efficient & effective manner through the use of pre-used construction materials, use of construction materials made from recycled materials, the minimizing construction waste, measures for efficient water use and other cost effective resource conservation designs and activities.~~

~~3. Ensure the health & well-being of the building occupants & visitors through the use of low VOC materials (paint, cleaners etc.), efficient thermal envelope and integrated HVAC design to ensure thermal comfort, with fresh air to maintain indoor air quality and other indoor environmental enhancing designs.~~

~~4. Optimize energy efficiency through integrated systems building design, including but not limited to using the following:~~

~~a. High performance facility shell (thermal envelope) per 01 83 00 Facility Shell Performance Requirements~~

~~b. Passive heating/cooling~~

~~c. Higher efficiency equipment than minimum required by building code~~

~~d. Selecting equipment with adequate steps of capacity and achieving high part load system performance matched to building varying load profile~~

~~e. Energy reduction control strategies~~

~~f. Energy recovery~~

~~g. Maximizing the use of natural day lighting~~

~~h. Energy efficient electric lighting and automatic controls~~

~~i. On site renewable energy sources~~

~~j. Other innovative, cost-effective, energy conservation designs.~~

B. Advanced Energy Performance Target: All facilities shall achieve a minimum of at least 30% energy savings over the latest version of the ASHRAE 90.1 standard. Documentation of compliance shall be by complying with either:
   1. Prescriptive Methods of High Performance Building Design Guides and Standards developed to achieve that target, or
   2. Performance Rating Method as prescribed in ASHRAE 90.1 utilizing a computer-based, whole building, hourly-basis, annual energy simulation.

C. High-Performance Design Standard: All building projects shall comply with the latest version of ASHRAE Standard 189.1 Standard for the Design of High-Performance Green Buildings.
   1. This shall apply to:
      a. New buildings and their systems
      b. New additions and renewals of buildings and their systems
      c. New systems and equipment in existing buildings, including Level 1, 2 and 3 Alterations, as defined in the International Existing Building Code, Chapter 4.
   2. Any exceptions shall require approval by the OPP Project Manager, and exceptions by the OPP Project Manager shall require approval by one of the Associate Vice Presidents.

.02 LEED Certification Requirements

A. All new and renewed facilities shall be Leadership in Energy and Environmental Design (LEED) certified.

B. LEED Certification shall follow the current version of the "PSU Policy based on LEED for New Construction and Major Renovations" .

Replace with following new text.

A. General: All building projects shall be designed and constructed using best practices in an integrated, holistic, balanced way to achieve high-performance facilities that are safe, productive, comfortable, pleasant, and conserve resources such as energy, water and raw materials; and minimize or prevent environmental degradation over their useful life.

B. In order to achieve the general intent above, the following primary sustainable design and construction concepts shall be diligently and intelligently applied within the scope of each project.

   1. Optimize Site Potential

   2. Enhance Indoor Environmental Quality (IEQ)

   3. Optimize Energy Efficiency

   4. Optimize Water Use Efficiency

5. Minimize the Building's Impact on the Atmosphere, Materials and Resources

6. Optimize Construction and Operations Plans to verify quality control and maintain ongoing high-performance operation.

C. Decision-making throughout the project shall be on the basis of achieving the lowest total cost of ownership for the life cycle of the project.

.02 Owner's High-Performance Requirements

A. General: Apply advanced, best practice design guidelines and standards, along with creative innovation and judgment to obtain the optimum performance for each project. The Building Code establishes only MINIMUM requirements. Therefore it shall NOT to be used as the basis of defining OPTIMAL design and construction.

B. **High-Performance Building Design Standards:** Building projects shall comply with *ASHRAE Standard 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings, 2010 version* AND as superseded by more stringent requirements of *ASHRAE Standard 189.1 Standard for the Design of High-Performance Green Buildings, 2011 version*. The Mandatory and Prescriptive requirements shall form the minimum basis of design. Higher performance options wherever they can achieve lowest total cost of ownership are encouraged.

1. This shall apply to:
    a. New buildings and their systems
    b. New additions and their systems
    c. Renewals of buildings and their systems
    d. New systems and equipment in renovations of existing buildings, including Level 1, 2 and 3 Alterations, as defined in the International Existing Building Code, Chapter 4.

2. *OPP Exceptions*: The following Exceptions to the energy standards cited above are presently recommended by OPP Engineering Services. These or other requirements embedded within the standards above that could result in a HIGHER total cost of ownership for the life cycle of a given project shall be reviewed with OPP Project Management and Engineering Services.

    a. ASHRAE 90.1-2010

        1) **8.4.2 Automatic Receptacle Control:** The requirement for controlled receptacles lags behind technology by a code cycle or two. Old office equipment, computers, etc. were

wasteful prior to ENERGY STAR requirements for standby operation. Most occupants will be annoyed by electric receptacles turning off automatically, whether on a time schedule or via sensors, and install plug strips on uncontrolled outlets to avoid them. Engineering Services doubts that the additional cost of these measures (including a sensor or scheduled control device, relay, and 2x wiring) will ever pay back in actual energy savings. Limited use is supported if there are locations that make sense. Perhaps dedicated outlets for coffee makers, vending machines, and similar loads could be on a scheduled control device.

b. ASHRAE 189.1-2011

1) **7.3.3 Energy Consumption Management:** Electrical **subsystem metering** in accordance with **Table 7.3.3.1B**

a) Historically the incremental costs to accomplish this, including associated staffing commitment, has been considered to be unjustifiable with respect to the effective, realized benefit. Accountability of building energy consumption is valuable and can be accomplished in other ways that are more manageable and cost-effective. Review cost-effective metering/monitoring options with OPP Engineering Services where they can and should be applied to most strategically monitor performance of major energy uses.

b) Note: Variable Frequency Drives have consumption metering functions and thus shall be set up to perform this intent for such HVAC motor loads.

2) **7.4.1 On-Site Renewable Energy Systems:** Historically this has been difficult to cost-effectively justify at University Park. However, it is recognized that energy costs and project specific conditions will vary. Therefore, perform Life Cycle Cost Analysis on marginal cases to verify it can be applied in a practical and cost-effective manner to achieve the lowest total cost of ownership.

3) **7.4.3.6 Exhaust Air Energy Recovery**: Use Table 7.4.3.6 as a prescriptive guide, but perform Life Cycle Cost Analysis on marginal cases to verify it can be applied in a practical and cost-effective manner to achieve the lowest total cost of ownership. For instance, trying to implement it into existing

facilities with various space or infrastructure constraints might make it unreasonably cost prohibitive.

3. Submit formal requests for other exceptions to the OPP Project Manager. The OPP Project Manager shall review and obtain approval by the Director of Energy and Engineering and one of the Associate Vice Presidents.

C. **Building Envelope Energy Component:** The Architect / Lead Design Professional shall be held contractually responsible to optimize the thermal performance of the building envelope, evaluated as its own energy component.

1. The building envelope energy component budget shall be limited to that which would be achieved by using the Building Envelope requirements in the Mandatory Provisions and Prescriptive Option with values as superseded in ASHRAE 189.1. Refer to ASHRAE 90.1, Section 5 and ASHRAE 189.1, Section 7.

    a. If the Building Envelope Trade-Off Option is used, then the proposed building envelope performance factor shall be less than or equal to the budget envelope performance factor (as defined above).

    b. In other words, it is prohibited to apply the trade-off concept in a way that would require additional HVAC and Electrical system capacity and/or any combination of the remaining energy components to be reduced to make up the difference of a proposed design that exceeds the allowable building envelope energy budget.

2. Design Phase Compliance Documentation: Submit a *Building Envelope Energy Compliance Report* signed and sealed by the lead Design Professional certifying the Building Envelope Energy Component complies with the performance requirements of this standard. Submit for Owner Review prior to any official design approvals by the University, including final design approval by the Board of Trustees. Sample Building Envelope Compliance Forms are available in ASHRAE 90.1, User's Manual, Compliance Forms, Section 5 – Envelope.

.03 LEED Certification Requirements

A. All new and renewed facilities shall be Leadership in Energy and Environmental Design (LEED) certified.

B. LEED Certification shall follow the current version of the "PSU LEED Policy".

Special Note: This document is currently under revision due to the migration to LEED V4. Any questions on credit migration from LEED V3 to LEED V4

should be directed to the OPP project manager until this revision is completed.

END of revision

Update Commentary:

Section was updated primarily for the following reasons:

1) *To remove miscellaneous general design intent language that is now covered in in more specific detail of the cited combination of High Performance Building Design Standards.*
2) *To clarify the specific versions of high-performance energy standards of ASHRAE 90.1 and 189.1 presently adopted by OPP.*
3) *To remove the language in the "Advanced Energy Performance Target" that has become outdated due to incremental advances in the cited Energy Performance standards. For Projects that are not LEED, complying with the cited High-Performance Building Design Standards will achieve the intent. For LEED projects, any such "Energy Performance Target" for the credit to "Optimize Energy Performance" shall be as defined in the PSU LEED policy.*
4) *To emphasize the Building Envelope Energy Component requirements and associated compliance documentation.*
5) *To revise the correct title and hyperlink to the "PSU LEED Policy" document and to provide interim direction during migration period between LEED versions.*