

A23.4

Design Standards for Energy Efficiency

NOTE: Significant revisions or additions to the previous standards are highlighted in italics.

GENERAL

Designers shall verify that all applicable portions of these standards are incorporated into the project's design, drawings, specifications and final construction. Requests for variances from these standards shall be submitted in writing to the FPD Project Manager, using the KU Standards Variance Request Form found in [Appendix A1.1](#), for review and written approval or rejection as indicated on the form.

*Acknowledging the difficulty in meeting these standards in renovation or replacement projects, **Small Capital Projects** shall require that any large pieces of equipment such as air handling units, rooftop units, cooling towers, etc. exceed the current version of ASHRAE 90.1. Any complete replacement system, such as lighting in an office suite, shall also be compliant.*

DESIGN STANDARDS

Programming Phase

State a definitive and measurable energy performance target to exceed ASHRAE 90.1-2016 by 30% for new construction and major renovations and 10-15% for other projects where energy savings can be achieved, and budget 2% in additional project costs. Building programs should clearly state the connection to central steam and the connection to the central Chiller Building for chilled water or the development of district cooling systems where possible to serve multiple buildings in North and Central Districts, and the connection to central steam and chilled water in the research area of West District. At the program phase the desire to have water-cooled vs. air-cooled air conditioning systems should be stated, even if year-around cooling is necessary, as well as the desire to install heat-recovery systems.

Schematic Design

The design team is assembled and should include the owner, project manager, an architect with environmentally responsible design, HVAC engineer, plumbing engineer, lighting designer, structural engineer, the commissioning agent, an energy analyst, the building operator and building occupants. This team should discuss the energy performance target, high-performance system strategies and technologies, and energy-related design concepts that include, building siting, orientation, building form, building envelope, arrangement of spaces, shading, fenestrations, use of natural lighting and other design features that impact energy use during an Energy Performance Charrette. A computer model of the design should be created and used in all subsequent design phases to document expected energy performance of design alternatives. It is important that the holistic design reflect a balance of energy efficient measures between the building envelope and the MEP components. The

design direction should not result in a disproportionate burden of efficiency being placed on the MEP components.

Design Development

Develop comprehensive high-performance system strategies, model options for optimizing the building envelope and systems, including wall and roof insulation, natural shading to reduce the cooling load, low-e glass, daylighting and shading analysis to reduce electrical lighting and cooling requirements, high efficiency lighting, and other options such as those listed in the ASHRAE GreenGuide. Begin developing a commissioning plan and have the commissioning agent assess the constructability of the design options and evaluate if the design meets the owner's objectives. Model the design to determine if it meets the energy performance target of 30% over the ASHRAE 90.1-2016 standard, and at the end of the Design Development Phase the Design Team must submit the ASHRAE 90.1 Compliance Report, computer modeling, and the peak loads as well as total annual energy consumption. Begin developing an effective operation and maintenance program, which may include required training, operational procedures, maintenance and ongoing monitoring beyond the initial 18 months.

Construction Documents

Review the documents to ensure that all energy-related strategies are included as modeled and approved in the ASHRAE 90.1 Compliance Report. Ensure that metering of all utilities is included in the construction documents to measure energy use. If "value engineering" is necessary to get a project within budget or other cost reductions are considered to award a construction contract they shall be evaluated based on a Life-Cycle Comparative Study (LCCS) to quantify the impact to energy and long-term operating costs, and reviewed by the Provost Office prior to being incorporated into the Construction Documents. Complete the development of an effective operation and maintenance program.

Construction and Commissioning

At the pre-construction meeting, emphasize to the contractor and sub-contractors the goal to construct a high-performance building meeting a specific energy performance target. Ensure material submittals meet the energy performance targets. Document any design changes and use the computer model to ensure that performance targets will still be met, and provide as-built documents. Provide commissioning to ensure that the building functions as intended and meets energy performance and operational goals. Commissioning should also include the required system and equipment training and the development of an effective operational and maintenance program.

Measurement and Verification

Document actual energy use over an 18 month period following occupancy and compare the actual energy use to the anticipated energy consumption. Follow-up with the design team, contractors and occupants to make necessary adjustments to meet the performance target. Initiate ongoing performance monitoring, beyond the initial 18 months, for the life of the equipment/systems.

Operation and Maintenance

At the conclusion of the construction phase and commissioning, maintenance staff should be trained to achieve a complete understanding of the design parameters and operating sequences, and receive the necessary training of all systems and components to ensure that they are properly operated and maintained achieve peak performance through the life of the building. The maintenance and operational procedures should also be reviewed again after the first year of occupancy to ensure that all systems are being operated and maintained at peak efficiency.

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