



THE UNIVERSITY OF ARIZONA

Sustainability & Climate Action Plan

Create a Dedicated Sustainable Design & Construction Standard

SUSTAINABILITY COMMITMENT(S) THIS INITIATIVE SUPPORTS

- 1 - Decarbonization
- 2 - Water Reduction
- 3 - Waste Reduction
- 4 - Transportation Mode Shift
- **5 - Energy Efficiency**
- 6 - Sustainable Sourcing

INITIATIVE ALIGNMENT WITH THE CHARGE

- **Eliminate Emissions:** A set of Green Buildings Guidelines would minimize emissions during construction of new buildings and building operations.
- **Build Community:** With planning, design, and construction professionals working together to achieve shared goals as determined in these Green Buildings Guidelines, a sense of community can be strengthened.
- **Be Actionable:** A baseline building guide already exists in the Design and Specification Standards used by the Planning, Design & Construction department, this initiative aims to create a guidebook similar to this that emphasizes the importance of green building.
- **Inspire Adaptive Management:** Sustainable Design & Construction Standards should be adaptable to each development scenario to allow for consistency of work across development departments and private consultants.
- **Demonstrate Leadership:** Developing a set of Sustainable Design & Construction Standards will allow the university to emphasize the importance of sustainability in the built environment and only accept new development if it meets certain sustainability requirements.

INITIATIVE DETAILS

Initiative Summary

This initiative proposes to develop a comprehensive Sustainable Design & Construction Standard for all University of Arizona construction projects, complementing existing Design & Specification Standards (DSS) to ensure sustainability design goals are met. This set of Sustainable Design & Construction Standards should encompass all aspects of sustainable buildings and serve as a new set of green building requirements for all new construction and renovation projects. These requirements will focus on energy efficiency, water conservation, transportation mode shift, green infrastructure, equity considerations, and other elements of sustainable design. Actionable items include:

- Develop enhanced performance standards that align with the requirements of the Decarbonization Sub-Plan and that support other Sustainability Commitments.
- Define new criteria for what types of projects need to follow these guidelines to capture projects that fall below the current \$10M threshold for requiring LEED certification.
- Utilize life-cycle cost modeling to ensure that design choices are balancing site level project requirements with long-term system wide decarbonization and performance goals.
- Implement project management models that prioritize increased collaboration and systems integrations during the design phase to maximize project outcomes while reducing construction time and costs.

Proposed Initiative & Background

The University of Arizona must create a set of Sustainable Design & Construction Standards that can be applied to all new builds and major renovations of varying sizes and budgets. These requirements should also include guidelines for applying the standards to University of Arizona properties around the state. Currently, the University of Arizona uses a set of Design & Specification Standards (DSS) to ensure that all builds on campus meet a set of predetermined requirements. The University of Arizona's Design & Specification Standards (DSS) contains information on the procedures, materials, and design parameters that the University of Arizona feels are appropriate to ensure a high degree of sustainability, quality, and long-term serviceability of our facility-related projects. Currently, there is one page dedicated to Sustainability in the document. The DSS may be found here: <https://www.pdc.arizona.edu/dss>. The DSS is managed and updated by University Facility Services.

The sustainable building certification program Leadership in Energy and Environmental Design (LEED) is commonly used in development practices across the United States, including at the University of Arizona. The DSS requires that all major capital projects (new construction and renovations) over \$10M on campus must receive a LEED Silver certification or higher. The proposed Sustainable Design & Construction Standard may have similar elements to the sustainable building requirements to achieve LEED certification but must be tailored to the unique needs of the University of Arizona and this Sustainability & Climate Action Plan. In past projects, the LEED certification system has been criticized for creating room for "point-grabbing," or merely implementing some sustainable design elements over others because they allow projects to earn more points and higher ratings than other elements. These sustainable building certification programs are still very helpful, and a requirement to achieve LEED Silver certification should remain for all campus projects. Sustainable Design & Construction Standards that are specific to the University of Arizona must be developed and enforced to encourage sustainable building for the environmental, social, and economic benefits provided, rather than a higher certification. This will ensure that all sustainable building recommendations are fully considered before being disregarded as unimpactful for a project.

As previously mentioned, the LEED Silver requirement only applies to major capital projects over \$10M, leaving millions of dollars' worth of projects under \$10M that do not need to meet the required sustainability standards. The new Sustainable and Design Construction Standards should adopt a new

tiered requirements model that will ensure that different levels of sustainability requirements are met for different project types and budget amounts. All capital and infrastructure projects that have a budget of \$500,000 or more should be subject to some level of sustainability requirements.

This initiative proposes accompanying Sustainable Design & Construction Standards to be developed to address issues in energy efficiency, water consumption, accommodations for alternative modes of transportation, improvements to bike infrastructure, and the use of green infrastructure in all projects concerning the built environment.

Topic-specific guidelines should include:

- Energy Efficiency
 - Requiring higher levels of building energy efficiency standards will be required to reduce overall energy peak demand to offset the increases in energy use associated with the shift from natural gas to renewables, as described in the Decarbonization Subplan.
 - The technical team that prepared the Decarbonization Subplan recommended some of the following actions for improving building energy efficiency standards for new builds and major retrofits:
 - The university “should focus on expanding its Strategic Energy Management (SEM) program for projects that offer immediate or short-term operational cost avoidance. Common efficiency projects of this nature include LED lighting retrofits, control upgrades, HVAC efficiency projects, fan/pump/motor replacements, variable frequency drives, steam trap replacements, weatherization, air/water heat recovery, retro-commissioning, and metering/monitoring. The University has an SEM central operations support function that can be expanded to provide technical staff to support the Energy Conservation Program.”
 - Campus-wide ASHRAE Level 2 Energy Audits
 - Expansion of centralized building automation system (BAS) design and project support
 - Energy Management Information Systems (EMIS)5
 - Automated fault detection and diagnostic platforms
 - Project delivery services, including dedicated project staff and controls specialists supported by standard specifications, work order processes, and procurement services
 - Measurement and Verification services
 - Monitored Based Commissioning services for both retrofit and new construction projects.
 - “Energy efficiency projects will be prioritized in the Decarbonization Sub-Plan. Lighting projects will reduce peak electrical demands by approximately 0.5 to 1 watt/sq ft, freeing up electrical panel capacity. Upgrading and expanding building control systems will provide microprocessor controls and IT network infrastructure to analyze data, apply learning algorithms, and optimize building heating and cooling systems. Consolidating exhaust fans into larger fans with heat recovery coils will provide energy efficiency savings through pre-heating outside air and boost efficiency for heat recovery chillers. Finally, upgrading air

handling units with larger coils and energy-efficiency fans will save energy, reduce heat loss, and allow the systems to run at lower air temperatures for heat pumps.”

- The Decarbonization Subplan assumed that buildings across meet certain standards for improved performance:
 - 24% reduction in heating demand
 - 15% reduction in cooling demands
 - 10% reduction in residual electrical use.
- This new Sustainable Design & Construction Standard should incorporate energy-efficient and safe fume hood design for all new buildings and any major renovations in existing buildings. All purchases of new fume hoods must follow these sustainable design standards. This correlates with a research initiative that proposes to modernize laboratory fume hoods.
- Water
 - Require the use of multiple water sources in new builds, including potable and non-potable water. The idea of “treat to use” comes from the idea that we are currently using potable well water for many uses beyond drinking, bathing, and food production. The university should require that new construction utilize alternative water resources in applications that do not require potable water and instead provide water that is treated for its intended use.
 - A major example of this concept would be to require that all new construction and major retrofits be plumbed with “purple pipe” (reclaimed) water to be used for flushing toilets or urinals. Buildings could also be plumbed with grey water systems that collect water from lower contamination applications such as showers, sinks, AC condensate, and laundry wash machines to then use in toilets and urinals or even landscaping. The use of greywater in a system like this would align with the net zero water building concept, where water that is used onsite stays onsite.
 - New buildings and retrofits should require the use of multiple water sources, including potable and non-potable water. The idea of “treat to use” comes from the idea that we are currently using potable well water for many uses beyond drinking, bathing, and food production. Instead, the university should require that new construction utilize alternative water resources in applications that do not require potable water and instead provide water that is treated for its intended use.
- Transportation Mode Shift
 - Require that new building construction and major capital retrofits of buildings with a large percentage of office space or administrative space have internal building bike storage for building users.
 - Internal bike storage should be inside the building and not added as “bike cages” external to the building, as these cages are still prime targets for bike theft.
 - Internal bike storage areas should also include:
 - 24/7 CatCard access
 - Locker space for people’s belongings
 - Bike parking for large bikes such as cargo bikes
 - A self-repair station with basic tools and an air pump

- Fans that can be turned on with a timer for those who bike in the summer
 - Require all new dorms to have internal building bike storage for students who live in the dorms and pursue the creation of internal parking in existing dorms, where feasible.
 - All new buildings and major retrofits should include at least two showers for commuters to utilize.
 - Add self-repair stations outside of major hubs of bike parking areas around campus in addition to the handful of stations that already exist.
 - Bike lanes around campus must have consistent lane markings and signage.
 - Bike lanes and pedestrian lanes should be clearly marked, and where warranted, physical barriers should be installed to separate the two modes from each other.
 - Bike lanes should be in tree-shaded green infrastructure corridors wherever possible to shade riders and to extend the multiple benefits of green infrastructure.
 - Bike parking outdoors should be in well-lit areas in high-traffic areas and, where possible, these areas should be under 24/7 video surveillance.
 - Consider adjusting campus rules to allow bikes to be stored in personal offices, or within designated areas of an office if entryways and egress paths are not interrupted.
- Green Infrastructure
 - Reflect the most current thinking and practices on integrated design for multi-benefit green infrastructure landscapes, with customizations reflecting the unique University of Arizona setting and mission.
 - Stormwater drainage should be considered on each site and optimized to prevent flooding and promote stormwater capture for reuse.
 - Water harvesting should be thoroughly considered for all new builds to reduce the amount of potable water the building consumes for non-potable uses.
 - Irrigation should be programmed to take place outside of peak heat hours and should use only non-potable water sources.
 - Landscaping should consist of native or low water use plants to reduce potable water use for irrigation.
- Equity
 - Inspired by LEED Social Equity, University Facilities Services must create and implement a checklist as part of the Sustainable Design & Construction Standard reviewing the social responsibility of the projects ahead of any procedure including design, planning, remodeling, demolition, new construction, and post-occupancy. Additionally, PDC should initiate a review of the operations process evaluating the user experience through post-occupancy data to address positive and negative feedback, trends, and patterns. The process of using the checklist may be called self-assessment and based on the input, the projects will include a plan for meeting the highest expectation of social responsibility.
 - The social responsibility of our procedures may address users/populations within four ranges of proximity:
 - Site-specific: the place where the procedure is or will happen
 - Cluster: the place and immediate neighbor spaces
 - Campus: this range will assess the impact on the entire campus

- Off-campus: the neighbor community that surrounds a university project or facility.
- Design Process
 - The university should add a decarbonization lens when prioritizing capital expenditures to capture overlapping opportunities embedded in deferred maintenance and other capital renewal projects. Strategic decision-making should be supported with life-cycle modeling, a social cost of carbon perspective, and other long-range planning tools/techniques. Sustainability efforts are often the first to be “value engineered” out of a capital project when budgets are tight, while LEED “points chasing” leads to additional expenses with little impact on the project’s performance.
 - The university should require more stringent Life Cycle Cost Analysis processes during design phases to encapsulate the total long-term impacts of a building’s performance. This process can often help justify design choices that can be seen as “too expensive”, but in the long run can save on maintenance and operating costs.
 - Advanced energy modeling requirements should be applied to every major capital project and renovation to ensure that design choices correlate with modeled performance to meet the intended efficiency metrics of a project. This is already a standard requirement for the LEED certification process, but they are not often used once a project is completed to ensure the buildings are operating as intended and meeting the designed performance standards.
 - An Integrated Design Process should be utilized to ensure that sustainability goals are being addressed early in the process. This design model process allows the various design teams to meet early and often, and to discuss how changes in their designs will impact or benefit other areas of the project. This design process requires more upfront meeting time and planning for a project, but it can lead to an overall faster process as time and money is saved during the construction phase thanks to the advanced planning efforts.
- Other sections to consider in these Green Buildings Guidelines include energy use (possibly measured in Energy Use Intensity (EUI)), building adherence to recommended zero waste designs, sustainable heating and cooling sourcing, sustainable construction materials sourcing, etc.

The resulting Sustainable Design & Construction Standard should be updated every 5 years to reflect modernizing technology and emerging development practices to remain progressive and cutting-edge. To ensure the highest impact of this initiative, no construction project shall be exempt from this Sustainable Design & Construction Standard, whether on main campus or not.

Data Analyses to Support Initiative

In 2022, campus used 526,224,000 gallons of water, or 1,615 acre feet: 385,596,000 gallons of well water, 71,731,000 gallons of Tucson Water potable water, and 68,897,000 gallons of Tucson Water reclaimed water. 59% of that water was used for domestic use and irrigation, and the rest went to the cooling towers and other “unassigned” water sources. Cooling tower water use is discussed at further length in the other water-related initiatives. For this initiative, discussion will be focused on domestic water use and irrigation uses. Irrigation accounted for 13.8% of water use on campus, of which an

estimated 90% is already provided by Tucson Water reclaimed water, and the remaining is provided by well water. Irrigation water sources should transition to 100% non-potable sources and the make-up of irrigation water sources should include green infrastructure, stormwater, AC condensate, greywater, and active rainwater capture sources.

38.4% of 2022 campus water use could be categorized as domestic. This is potable water from dorms, classrooms, administrative buildings, labs, etc., excluding the cooling towers. Dorms could be an excellent candidate for greywater systems that harvest greywater to then go through light onsite treatment before being distributed for non-potable uses like toilets and urinals. The DSS should be updated to require certain water harvesting tactics for domestic water use, and account for external water uses that could support the implementation of a Green Infrastructure Master Plan (BE 7). Excess greywater and stormwater that is not used in buildings should be used in green spaces and public spaces near the building or be sent to nearby recharge facilities (drywells). Arizona state laws and local building codes currently allow for the use of treated reclaimed water from Tucson Water to be used in domestic non-potable applications.

The university should look for building recommendation guidance from sustainable building certification programs such as [LEED v4.1](#), the [Living Building Challenge v3.1](#), or the [Green Globes Certifications](#). A prime example of this building method is the [Kendeda Building at Georgia Tech](#), which achieved a Net Water Positive achievement through the Living Building Challenge.

Several of the applicable DSS sections have not been substantially updated in 15-20+ years, and while they represented the leading edge at the time of creation, they are now in need of updates to follow or exceed local and industry practices and standards. This Sustainable Design & Construction Standard should also represent current and cutting-edge practices.

Resource Requirements & Return on Investment

Resource Requirements

- Staffing to plan and implement the Guidelines
- Staff cost for maintaining biking infrastructure, irrigation networks, etc.
- Costs associated with higher quality building materials and building technology
- Potential costs for hiring third-party consultants, if necessary

Return on Investment

- This initiative would take time to create and enforce but ultimately would lead to savings for the university.
- Energy efficiency, low water use, and other sustainable design elements reduce operational costs for buildings and result in buildings that are increasingly economically sustainable.
- This would result in long-term savings and if executed well enough, possibly even net-positive buildings that would allow the university to sell energy or water back to the city.

Potential Funding Sources

- Each building could be eligible for a variety of state and federal funds that relate to water conservation, energy efficiency, etc.
- Costs could be reduced if buildings are retrofitted for net zero water use while they are being retrofitted as part of the Decarbonization Plan.
- Life and Work Connections should be engaged as a possible revenue source for supporting this programming. Multiple studies have been done that show how a healthier employee population can lead to reduced insurance costs. Promoting a healthier lifestyle through supporting bike commuting infrastructure could lead to cost savings on the insurance costs of the institution.

Accountable Division(s) & Department(s)

- University Facility Services
- Parking & Transportation Services
- Planning, Design & Construction

Partners & Collaborators

- Office of Sustainability
- All units/departments who are looking to renovate a building, or build a new one
- Tucson Water
- Pima County Wastewater Reclamation
- Housing & Residential Life
- Campus Recreation
- All departments looking to build or renovate space
- Life and Work Connections
- Building managers
- Risk Management Services
- Researchers and educators involved in using the campus as a living lab for research

Implementation

Length of Time to Implement

- Less than one year
- One to five years
- More than five years

Difficulty of Implementation

- Low
- Medium
- High

- Extremely High

Relative Timing

- **Begin within two years**
- Begin in three to five years
- Begin in six years or later

Metrics for Success

- Amount of funds spent on sustainability projects
- Water use
- Bike theft and police reports
- Annual Travel Demand Survey
- Greenhouse gas emissions reductions
- Numbers of existing and added bike facilities/amenities
- Total potable water consumption by building
- EUI at a building scale
- The effectiveness of recharge activities and water quality in buildings
- Number of projects using Equity self-assessment and scores from the assessment