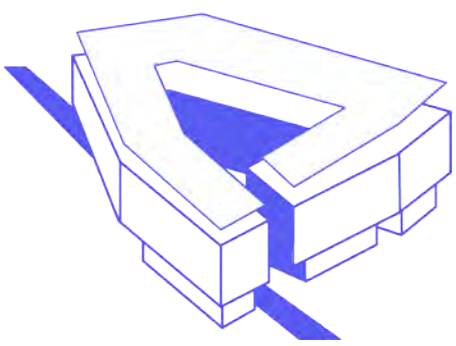
ARIZONA STATE UNIVERSITY WALTON CENTER FOR PLANETARY HEALTH

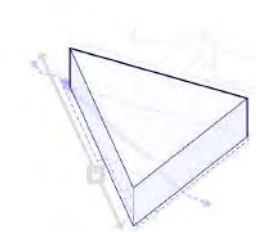
ROB AND MELANI WALTON CENTER FOR PLANETARY HEALTH



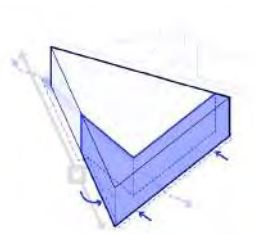
SUSTAINABILITY AND REGENERATIVE DESIGN CASE STUDY

Location	Tempe, Arizona, USA
Completion	2022
Client	Arizona State University (ASU)
Certifications	LEED Platinum achieved
Project Partner/Leads	William Horgan/ David Burke, Eric Johnson

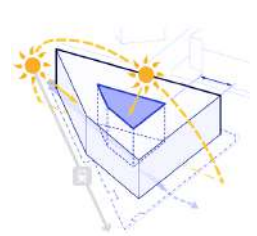
Project team	Grimshaw, Architekton, McCarthy Building Companies, Buro Happold, Jensen Hughes, Sherwood, Thornton Tomasetti, Ten Eyck, Sextant Group, River Levett Bucknall, Research Facilities Design



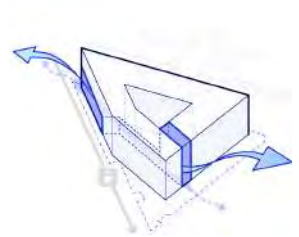
1. Allowable building massing



2. Offset from street and rail



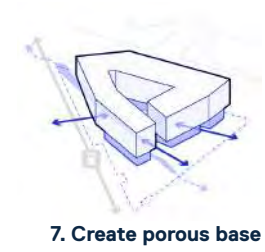
3. Carve courtyard for daylight



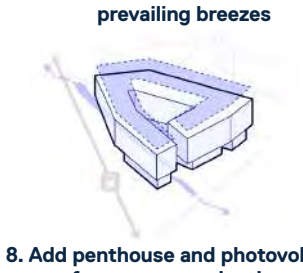
4. Straddle canal and embrace prevailing breezes

5. Respond to urban sightline

6. Lift mass to shade plaza below



7. Create porous base



8. Add penthouse and photovoltaics for energy production

The Arizona State University Walton Center for Planetary Health (WCPH) is a 281,000 square foot research facility that houses interdisciplinary, leading-edge research, including work on the sustainability of food, water, and energy. The building includes public outreach and exhibit spaces as well as a 389-seat presentation hall. It is home to a number of institutes including the Global Futures Institute, the Julie Ann Wrigley Global Institute of Sustainability, the Walton Sustainability Solutions Service, the Institute of Human Origins and the university's Global Institute of Sustainability and Innovation. The Walton Center also has research labs for biological sciences, engineering, life sciences and sustainability including space for computing, cyber-security, engineering design and fabrication, and robotics.

The Walton Center for Planetary Health is a building of the desert, not a building in the desert. The Grimshaw team, appointed in 2017, responded to University President Michael Crow's challenge to create a living room for the university, a place that is a nexus for all the institution's research, that emphasized the nexus of food, water, and energy on the site and in the new building. The main challenges included the site's complexity and stringent sustainability goals, particularly in energy conservation.

A geode

The conceptual form of the building is modeled after a geode. The exterior is hard and protective, while in the interior courtyard an abundance of light highlights its transparency and glazed openings. The interior is also a riparian area, with water flowing through and cool green-blue walls inspired by the Grand Canyon's Havasu Falls.

The skin

The building is clad in a shell of glass fiber reinforced concrete panels which absorb and store little heat thus reducing demands on mechanical cooling. The panels are based on biomimicry of the saguaro, an iconic regional cactus species, and its relationship to the sun. The cactuses shield themselves from solar exposure with patterned deep-pleated skin. South-, east- and west-facing windows are heavily shaded by the angled concrete panels, while the north-facing windows are barely covered.

As you walk around the building, some of the panels are much more open than others. On the south facade, the aperatures remain small to cut down as much of the solar gain on the facades as possible. The skin has been lifted at each opening to provide a hood, or visor, so that the sun is blocked from one direction, but provides views out in another direction obliquely. This considered variation provides a skin that's responsive to the solar angle.

Shade

There's a nexus between history, shade, and the building's height. In winter, solar radiation is embraced for passive solar warming while in summer solar radiation is blocked to keep the courtyard cool similar to the orientation and form of cliff dwellings of southwestern ancestral Puebloans. Lifting the building to protect the historic irrigation canal also engages the canal, not only to irrigate plants, but also to cool the microclimate under the building in order to support comfortable gathering.

↑ GFRC Biomimicry of the Saguaro's performative skin

Key Sustainability Facts

PROJECT SITE
Brownfield

TRANSECT ZONE / CLIMATE ZONE
Campus / General urban zone / Climate zone 2

ECOREGION
Sonoran Desert

OPERATIONAL ENERGY/CARBON
> The design optimized the building envelope and integrated efficient mechanical systems to achieve a predicted energy use intensity (EUI) of 104 kBtu/sf/year. This EUI falls 26.9% below an ASHRAE baseline building and 10% below a typical laboratory building.
> ASU partnered with local utility APS to build the Red Rocks solar array, a 68GWh array located offsite. ASU will purchase 95% of the array's energy each year, which will supply 30% of the WCPH's annual energy usage.
> The roof of the WCPH is PV ready.
> There is no on-site combustion for building services. There may be some limited combustion in the restaurant kitchen and in certain laboratory spaces.
> Note the project is directly adjacent to light rail and buses reducing the carbon footprint of the residents. The project received a waiver from the zoning requirement for parking, thereby discouraging individual automobile use/ownership.

HEALTH & WELLBEING
> Three exterior egress stairs provide a social space for interaction and discourse between various research groups.
> Courtyard microclimate adjacent to canal gives thermally comfortable shaded seating areas for interaction and contemplation.
> Native Vegetation in courtyard creates oxygen and sequesters carbon contributing to clean air quality.
> GFRC self-shading façade increases comfort in offices & laboratories by reducing glare and solar thermal gain.
> Scientific Community is strengthened by including multiple research entities within one building and providing a central lecture hall for academic and research based presentations.
> IWBI Well Certification is being pursued by ASU post-occupancy.

EMBODIED CARBON
> Reduction of Global Warming Potential or CO2e from an equivalent new building in the region: 26%
> Reductions in embodied carbon focused on the following:
  - 78% of the construction waste was diverted from landfills.
  - 20% of the total building materials content, by value, has been manufactured using recycled materials.
  - 24% of the total building materials value includes materials and products that have been manufactured and extracted within 500 miles of the project site.
  - 40% carbon reduction from concrete achieved by reducing the volume 1,300 cu yd through use of the void form system in the south wing and 40% replacement of cement with fly ash in the floors.
> Additionally, most of the facade was prefabricated off-site. This reduced material waste associated with on-site construction. It also reduced the amount on energy used for installation on site.

WATER
> Use of native and adapted plant species on site has reduced landscape water needs by 77%.
> Water needs are met entirely with alternative water sources – specifically canal water from the Salt River Project, rainwater, and condensate from the building's rooftop mechanical systems – instead of using city-supplied potable water.
> Capacity to capture 100% of rainfall and direct it to landscape and aquifer recharge.

Alignment with UN Sustainable Development Goals

SDG 13 CLIMATE ACTION
The project's prioritizations of operational energy efficiency and energy decarbonization with off-site PV as well as embodied carbon reduction with low carbon construction materials and systems presents national and global leadership.

SDG 3 GOOD HEALTH AND WELL-BEING
The project's design for occupant health and wellbeing through daylight, comfort, views – including biophilic elements, materials, as well as health of workers along the building materials supply chain by prioritizing materials with Health Product Declarations (HPDs) presents regional and national leadership.

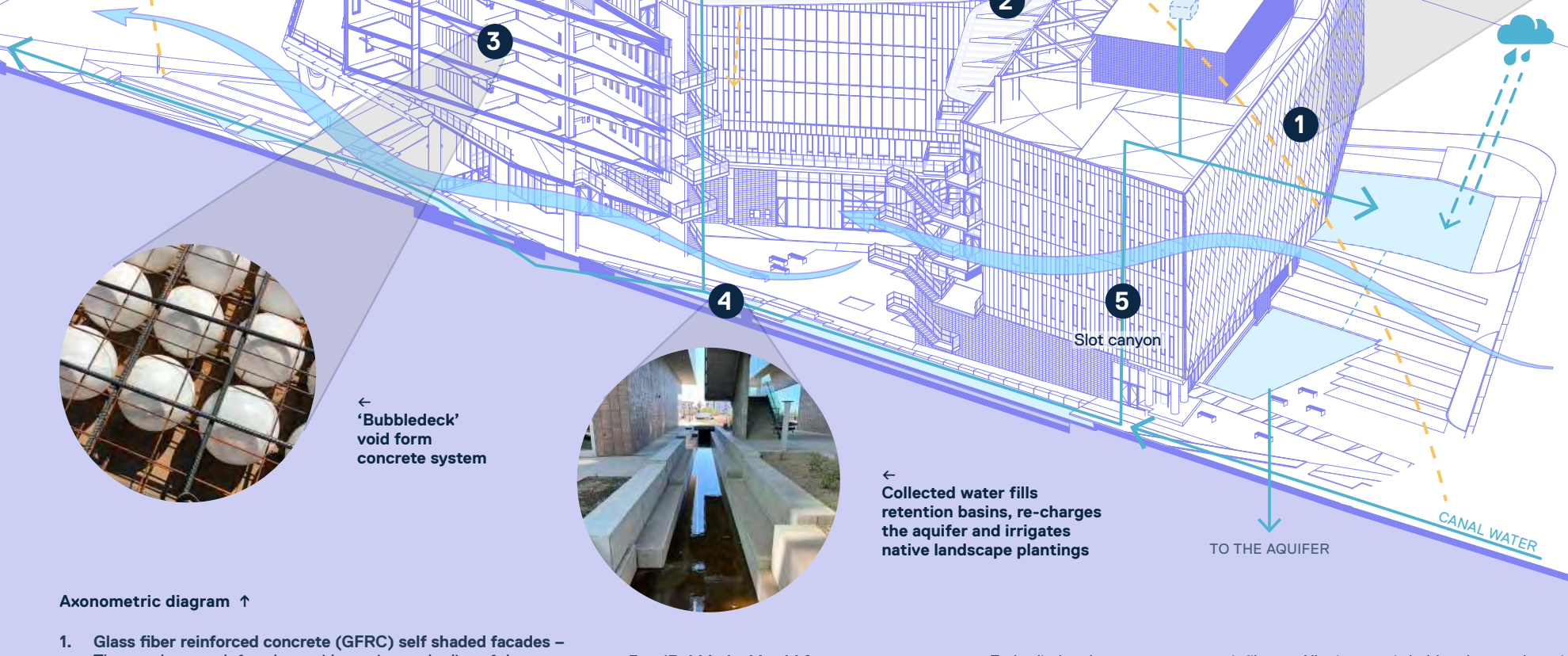
SDG 15 LIFE ON LAND
The project's landscape design, as a celebratory place of ecology supporting Sonoran Desert bio-diversity synergistically with water conservation as well as human comfort, presents regional and national leadership.

↑ The super structure of the building is designed to support a future photovoltaic array covering the entire site area (artist's rendering)

← Prefabricated structural steel shade canopy that is part of a continous shade network

→ Courtyard expanded aluminum shade canopy, active design egress stairs and panelized facade system

→ Glass fiber reinforced concrete self shaded facades



← 'Bubbledeck' void form concrete system

← Collected water fills retention basins, re-charges the aquifer and irrigates native landscape plantings

Axonometric diagram ↑

1. **Glass fiber reinforced concrete (GFRC) self shaded facades –** The panels on each facade provide maximum shading of the windows while still allowing for quality interior daylighting and views. The envelope is comprised of glass fiber reinforced concrete (GFRC), which is a lower-density material and thus allows for less 'banking' of solar thermal energy. The GFRC, combined with an optimized window-to-wall ratio, results in a building envelope with less external conduction gain and less solar heat gain that still provides a strong visual connection to the outdoors.

2. **Courtyard expanded aluminum shade canopy, active design egress stairs and panelized facade system –** The panelized courtyard facade provides a tight envelope which is shop fabricated to achieve a high level of thermal performance. Exterior egress stairs provide opportunities for exercise, social interaction and potential collaboration between researchers. The option to use the stairs to ascend through the courtyard provides opportunity for staff, researchers, and students to have an active and healthy experience while circulating through the space.

3. **'Bubbledeck' void form concrete system –** Embodied carbon was a selection criterion for structure, facade, as well as interior materials and assemblies. An innovative void-form concrete (not before used in the American Southwest) was utilized in the floor slabs to reduce the volume of concrete and embodied carbon used on the project. The bubble deck (void form) relied on recycled plastic spheres that allowed for less concrete to be used. Additionally, the team used concrete made with 40% fly ash, which replaced the cement – the most carbon-intensive component of concrete.

4. **Collected water fills retention basins, re-charges the aquifer and irrigates native landscape plantings –** Using expansive native and adapted plantings in combination with a series of stormwater retention, hardscape surfaces are graded to redirect surface water flows into planting areas to allow water to naturally infiltrate to the aquifer. Building runoff and mechanical system condensate are also directed toward stormwater detention basins that naturally infiltrate. All rainwater is held and treated on site. Water from the canal is used to irrigate the landscape plantings in lieu of the municipal potable water supply.

5. **Slot canyon –** The 'slot canyon' exterior entry sequence enables prevailing winds to enter the courtyard and continue along the canal water to provide thermal comfort and evaporative cooling along the canal.

6. **Prefabricated structural steel shade canopy that is part of a continous shade network –** The design of the University Avenue pedestrian bridge shade canopy provides continuity with the ASU campus shade network through public spaces and circulation zones. Outdoor passive shading strategies implemented on the bridge, within the WCPH courtyard, and across the ASU campus reduce the need for active cooling and misting systems which require additional energy consumption.