



Sustainability Base

A Living Testbed for NASA Technologies



*Sustainability Base is simultaneously a workplace, a showcase for NASA technology and a living prototype for future buildings.
Image credit: NASA/Ames Eric James*

The Facility

Sustainability Base at NASA Ames Research Center, Moffett Field, Calif., is one of the greenest buildings in the federal government.

Sustainability Base is designed to be “native to place,” which means it incorporates design elements of its surroundings into the new design. This 50,000 square-foot, lunar-shaped building is oriented to take advantage of the sun’s arc and the prevailing winds from San Francisco Bay. It is capable of anticipating and reacting to changes in sunlight, temperature, wind, and occupancy and will be able to optimize its performance automatically, in real time, in response to internal and external changes. It is simultaneously a workplace, a showcase for NASA technology and a living prototype for future buildings. It is NASA’s latest mission on Earth.

LEED Platinum Certified

The building is Leadership in Energy and Environmental Design (LEED) platinum certified, signifying the U.S. Green Building Council’s highest level of achievement in design and construction for sustainability.

Architecture

Sustainability Base is supported by an “exoskeleton” --- structural supports on the outside of the building that allow an unobstructed flow of air and daylight.

The building’s narrow width (54-feet) allows daylight to reach desks in the middle of each floor, and operable windows can be opened for natural ventilation. The windows also are automated to flush the building with cool air at night.

Electrical power required for the building is more than offset by on-site photovoltaic solar panels and solid oxide fuel cell technology from a Bloom Energy Box, an example of repurposed NASA space technology. The site also features 106 geothermal wells supporting a ground-source heat pump system.

Part of the goal of Sustainability Base is to reduce potable (drinkable) water consumption by 90 percent, compared to conventionally constructed buildings of equivalent size. A water recovery system, derived from one that was originally designed for the International Space Station, filters water used to flush toilets and urinals. All irrigation water is reclaimed water.

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One green feature of the building is its windows, which are automated to open at night and allow fresh, cool air to enter the building.
Image credit: NASA/Ames Eric James

Landscaping

The landscaping around the building also contributes to Sustainability Base's efficiency. It includes California native plants and non-invasive, draught-tolerant species. The grass is a special hybrid hydroseed mix that requires no mowing and little maintenance. The site also has bioswales, "pathways" of small stones that naturally filter silt and pollution.

The site's irrigation water will be recycled groundwater obtained from another site on the Ames campus.

Additionally, light-colored materials absorb and re-emit minimal heat, thereby minimizing the "heat-island" effect.

Human Factors

Studies have shown that humans are happier and more productive when their environment is more connected to the natural world. This concept, biophilia, is one of the core principles around which Sustainability Base was designed.

The building and its site are designed not only for planetary well-being, but also for human physical and emotional health. The elements for human well-being include plentiful fresh air, daylight, outdoor workspaces, views of nature, natural shading, nontoxic building materials and a variety of greenery.

The landscaping around the building contributes to its efficiency.
Image Credit: NASA/Ames Dominic Hart

Embedded NASA Technologies

- Solid oxide fuel cell technology, originally developed for a NASA Mars project, from Bloom Energy, Inc., which re-developed the technology for Earth applications.
- A water recovery system was derived from one originally designed for the International Space Station.
- Advanced intelligent control technology, derived from software originally developed for aerospace applications, can increase energy efficiency.
- Computational fluid dynamic tools, used to simulate, quantify and understand the ways fluid flows in a given environment, simulate air flows inside and outside the building to help minimize energy demands.
- Inductive Monitoring System (IMS), originally developed at Ames, is used to monitor systems on the International Space Station. For example, IMS monitors the control moment gyros, which regulate the attitude of the station. Sustainability Base will use IMS to learn about and monitor its performance.
- Hybrid Diagnostic Engine (HyDE), originally developed at Ames, is a model-based reasoning engine designed to detect and isolate faults in complex systems. In the new building, HyDE will be used to monitor the geothermal systems.

NASA Partners

William McDonough + Partners, San Francisco, Calif., designed the building; AECOM, Inc., Los Angeles, Calif., implemented the building design; and Swinerton Builders, Inc., Santa Clara, Calif., constructed the building.

For more information about Sustainability Base, visit:

<http://www.nasa.gov/externalflash/sustainability-base>



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