



NASA Ames Sustainability Base



Innovative Design,
Resource Efficient Operation, and
Entrepreneurial Partnerships:
A Silicon Valley Model



Sustainability Base



Awards

- 2012 LEED Platinum Certification (U.S. Green Building Council)
- 2011 “Leadership in Innovation Award” (Center on Environmental Innovation and Leadership)
- 2011 White House “Lean Green and Mean” GreenGov Award
- 2011 Engineering News Record California “Best Green Building Award”
- 2010 “Real Property Innovation Award” (Government Services Agency)
- 2010 “Green Project of the Year” Structures Award (San Jose Business Journal)

awards





Sustainability Base



background

- NASA Ames 2005-2025 Master Plan 'Renewal by Replacement' Project
- William McDonough + Partners: Design Architect
- AECOM: Architect of Record, Building Engineering, Landscape, Interior Design
- Swinerton Builders: General Contractor





Sustainability Base



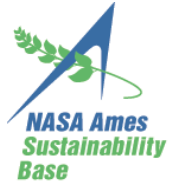
background

- 50,000 sq. ft. high-performance office building
- ~220 occupants
- LEED Platinum certified





Sustainability Base



objectives

- Natural lighting outdoor views and
- Fresh air
- Safe, healthy materials
- Operable windows and floor vents
- Workplace flexibility





Sustainability Base



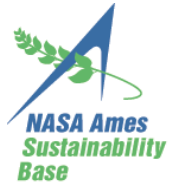
objectives

- Reduce impact on environment
- Minimize energy use
- Minimize potable water use
- Create an evolving sustainability research testbed
- Apply NASA + Partner technologies to improve performance





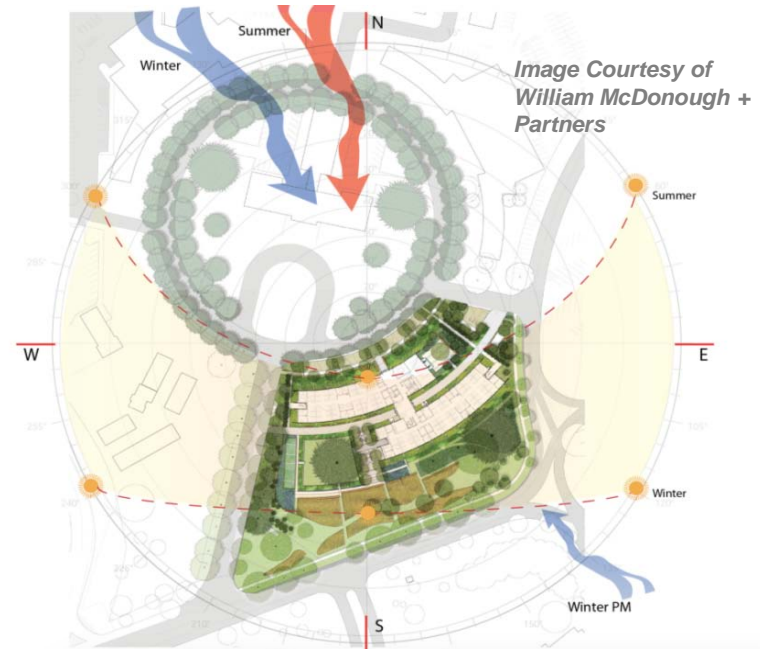
Sustainability Base



architecture

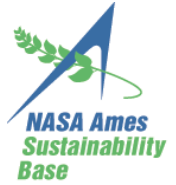
“Native to Place”

- Building orientation & geometry (passive solar) maximizes daylighting and takes advantage of local wind patterns
- Exoskeleton reflects Ames’ wind tunnel structures and allows for large, column-free interior spaces
- Native, drought tolerant plants





Sustainability Base



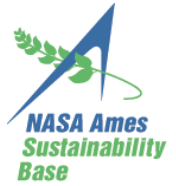
landscape

- Intelligent design with drought tolerant and native plants
- 100% irrigation needs supplied by treated/remediated groundwater
- Bioswales control and filter run-off
- Fast-growing vines augment glare protection, provide shading, and create natural views
- Outdoor workspaces and meeting areas with wireless communications





Sustainability Base



architecture

Designed for Daylighting

- Narrow building footprint, large windows allow natural lighting to penetrate into interior
- Skylights on 2nd floor, higher first floor ceiling height allows more natural light
- High performance window glazing
- Exterior and interior shades reduce solar heat gain





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Reuse Emphasized

- Lobby areas reuse oak flooring from 14 foot transonic wind tunnel
- Adds warmth to space and provides connection to Ames' storied history
- "Infinitely recyclable" carpeting tiles
- No volatile organic compounds (VOC) outgassing



materials



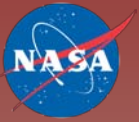
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furnishings

- Low workstation height allows daylight to penetrate
- “Green” certifications on all furnishings
 - ✓ No volatile organic compounds (VOC) outgassing
- Ergonomic, height adjustable work surfaces for all occupants
- Highly adjustable task chairs with lumbar support





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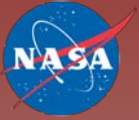


Ground Source Heat Pump System

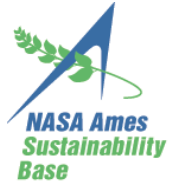
- 106 well bores provide 58 F conditioned water year round
- Energy efficient heat exchangers heat water for wall mounted radiators or cool water for ceiling radiant cooling panels
- Floor radiant heating and cooling in foyer



mechanical



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SunPower™ Photovoltaic Panels

- 432 panels in 24 strings of 9 modules on each wing (North and South)
- Generates 30% of annual building energy demand
- Conversion efficiency of 19%
- Acquired through Utility Energy Services Contract



electrical

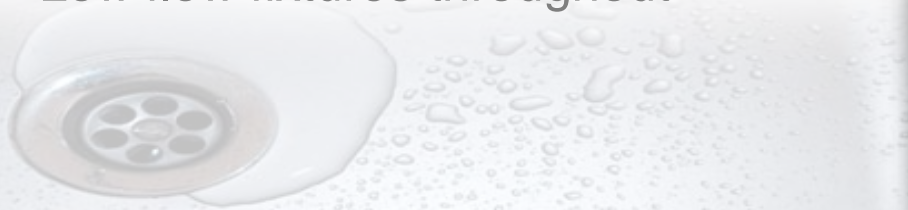


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plumbing

- Dual piping systems reduce water and sewer use
 - ✓ Separate drain piping from sinks and showers segregates grey water for treatment and re-use
 - ✓ NASA water recycling system developed for space habitats treats grey water
 - ✓ Treated water supplied to flush toilets and urinals
- Solar collectors on roof provide hot water to sinks and showers
- Low flow fixtures throughout





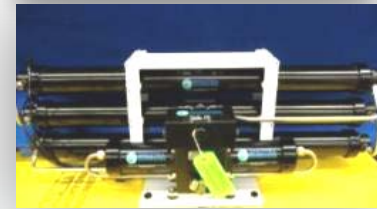
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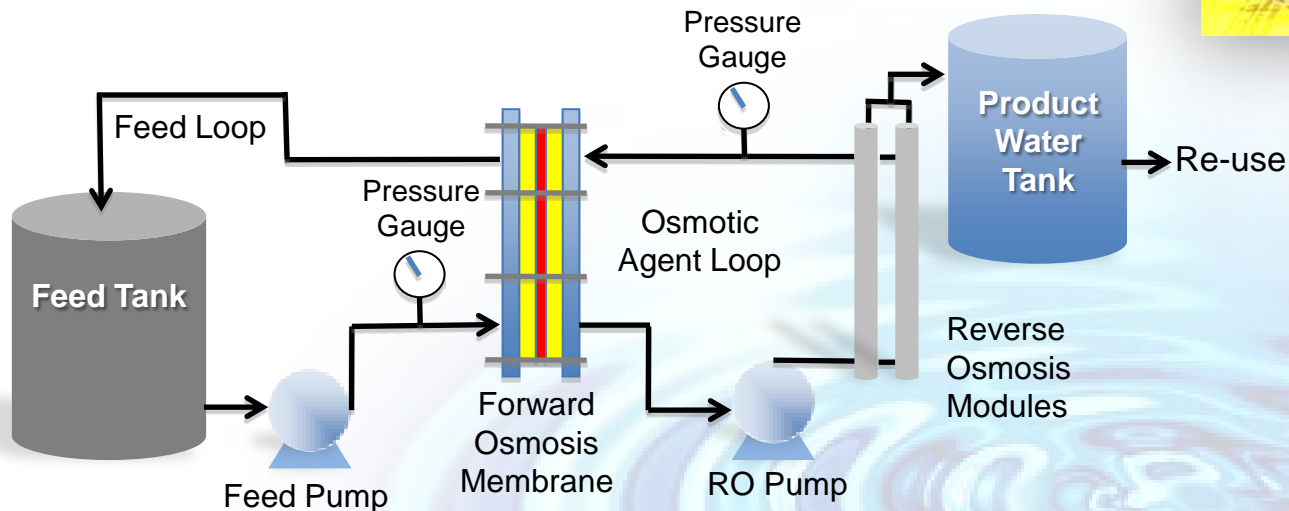
Grey Water Recycling System

- Reduce potable water requirements
- Provide a testbed for long duration water recycling technology applicable to space habitats
- Determine operating costs, cleaning requirements, and membrane life of Forward Osmosis process

Reverse Osmosis System (top)
Forward Osmosis System (bottom)

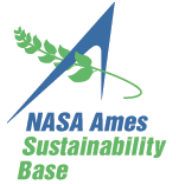


Water Recycling System





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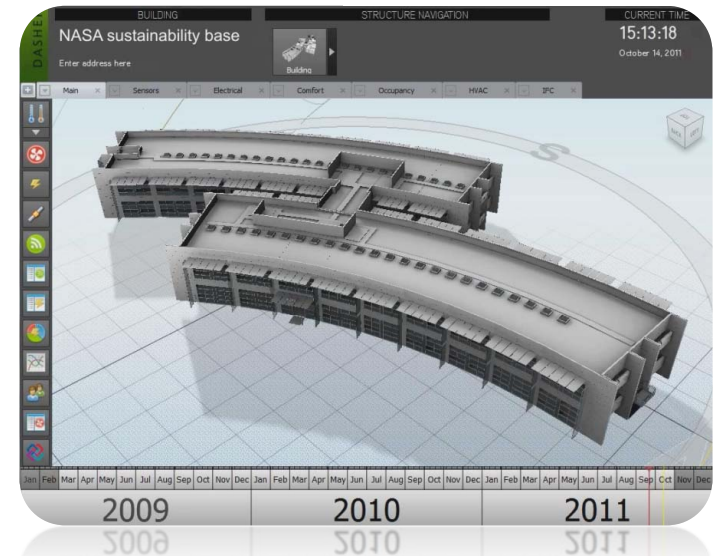


Autodesk, Inc.

Linking Ames expertise with Sustainability Base as a high performance building and testbed with Autodesk, an industry leader in 3D design.

- Interactive Building Information Model
 - ✓ Visualize architectural, mechanical, plumbing, power, controls and interior design
 - ✓ Monitor real-time and historic use patterns
 - ✓ Interact with knowledge-based filters to advise facilities operations, maintenance, upgrades

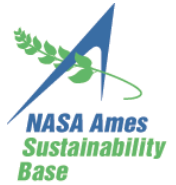
Autodesk®



partnerships



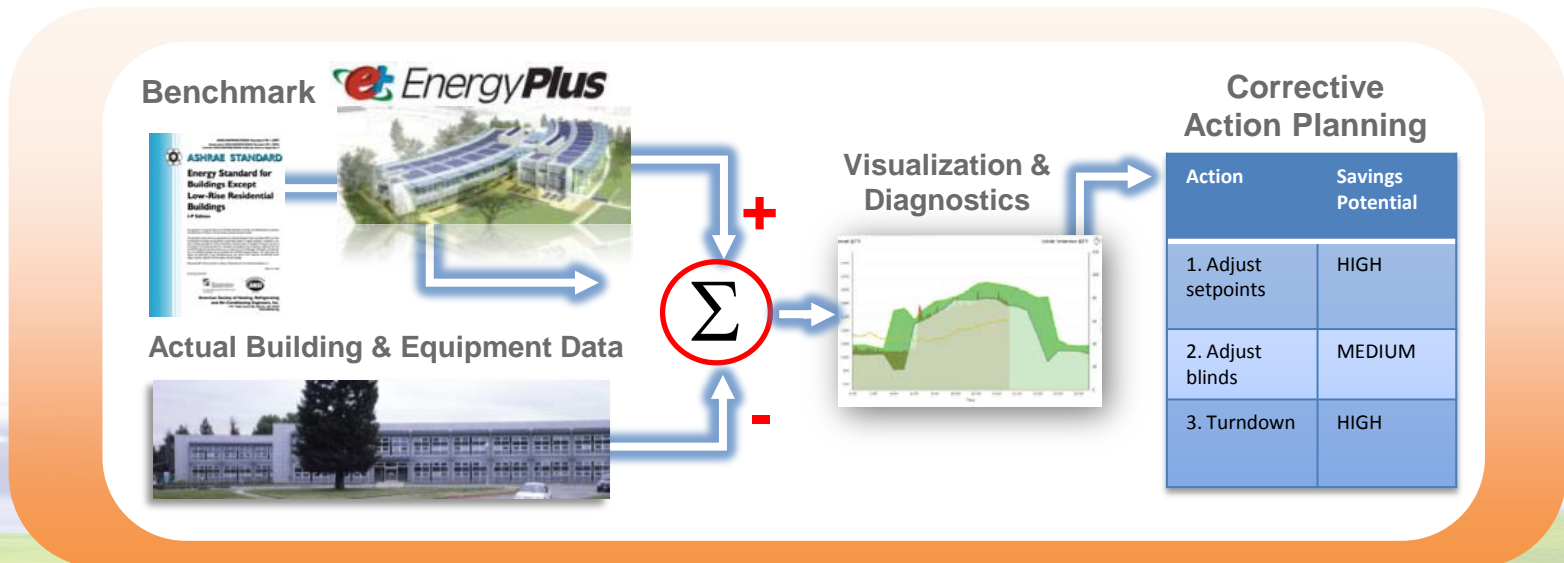
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Leveraging Ames expertise in diagnostics with advanced building energy simulation capabilities of LBNL

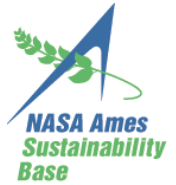
- Develop Sustainability Base energy simulation model (EnergyPlus)
- Run model in parallel with real-time building performance monitoring
- Inform corrective actions from deviations in model to maintain energy efficiency

partnerships





Sustainability Base



partnerships

Enmetric Systems

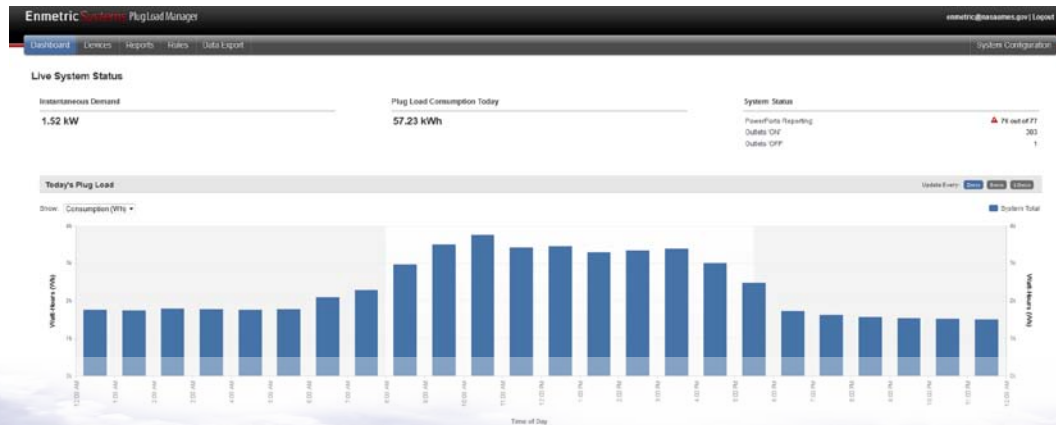
- Electrical plug loads are the fastest growing segment of commercial energy demand
- Enmetric plug load management system allows turning off loads when not being used, eliminating wasted electricity
- Occupants will be able to view and control personal energy usage



Power Port



Bridge





Questions