Pomona College

Millikan Science Building

Center for the Built Environment
Livable Buildings Award 2018

Photo by: Jim Simmons Photography

MILLIKAN SCIENCE BUILDING
PROJECT NARRATIVE

The Millikan Science Building, at the heart of the Pomona College campus in Claremont California, was originally constructed in 1958 to house the Math and Physics Departments. While the building embodied the formal and inflexible teaching style of the day, it was programmatically and physically out of date for its current use as the home of the Physics and Astronomy Departments.

Informed by a collaborative process with building stakeholders, including faculty, students, and staff; the resultant design renovates a portion of the existing building while providing a new wing that supports the needs of the current tenants and looks to the future of higher education. This inclusive process allowed the vision and aspirations of the departments to be realized collectively and independently, and resulted in a rich weave of spaces to support student learning. The goals of this project were to ultimately create a new building that, while meeting ambitious sustainability and user comfort goals, also:

- Accommodated the school's 21st century teaching aspirations with active learning and collaborative classrooms
- Created central community hubs and breakout spaces that attracted people and fostered interaction and collaboration
- Created a social heart and active pedestrian connection between the eight buildings in the science district
- Provided infrastructure required of physics labs, shops, and an immersive planetarium

Innovative new features within the building include;

- A digital planetarium with a 360-degree immersive view of the night sky;
- An 80-100 seat colloquium;
- A large 50-seat classroom;
- Six math classrooms, including three 30-seat classrooms and an applied math lab;
- Outdoor physics labs; seven physics teaching labs, including a space for the College's electron microscope; machine, wood and metal shops;
- A two-story atrium; collaborative study spaces and lounges and a garden courtyard.

One of the central challenges was the existing Colloquium, an important space that was rarely used due to the inhospitable design which included a steep rake and fixed seats that disassociated the lecturer from the students making even eye-contact difficult. The newly envisioned Colloquium supports active learning and collaborative team work in addition to lectures and demonstrations. The new adjacency to the lobby and courtyard allows the gracious expansion of the room for special events. Throughout the project, significant upgrades were completed to all major systems while increasing programmable space. The building's striking interior features light wood, large windows and floating staircases.

The revamped facility is not intended for use only by students and faculty of Pomona College. The digital planetarium -its dome visible from College Avenue and Sixth Street - will provide opportunities for local schools and organizations to visit for special events, performances and astronomy classes.

Built to the LEED requirements set by the U.S. Green Building Council, the new Millikan implements a variety of features that will reduce the College's carbon footprint. This includes decoupled air-handling, and heating and cooling systems, featuring advanced chilled metal beam technology. The building's exterior and interior walls have been disconnected, creating a thermal barrier to improve insulation. Other environmentally-friendly features include new LED lighting, native landscaping and a cooling and heating system which automatically adjusts to open windows.

PROJECT DETAILS

Size: 75,000 sq. ft. .

Cost: $41 million

Completion: 2015

LEED Platinum

left: Active Hub With Signage
Photo by: Jim Simmons Photography

POMONA COLLEGE

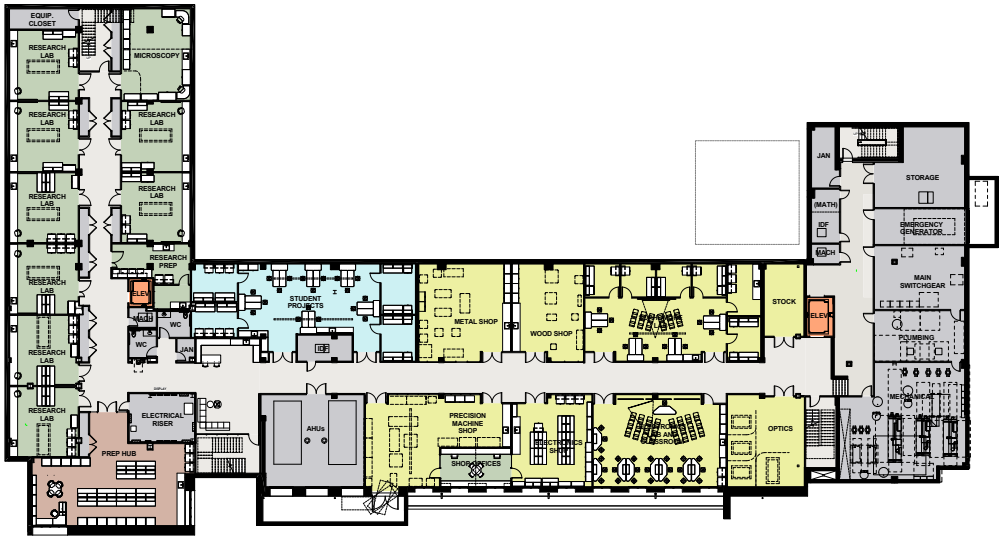
MILLIKAN SCIENCE BUILDING

Levels 1 and 2 Legend

- Classrooms/Learning Spaces
- Staging/Prep Rooms
- Storage, Restrooms, Utility Rooms
- Reception/Colaborative Spaces
- Elevator
- Offices

Basement Legend

- Classrooms/Shops
- Staging/Prep Rooms
- Storage, Utility Rooms
- Colaborative Spaces
- Elevator
- Labs



top(right): Level 2 Floor Plan
bottom (right):: Level 1 Floorplan
left: Basement Floor Plan
Photo by: EHDD

PROJECT **TEAM:**

Owner:
Pomona College

Architect:
EHDD Architecture

General Contractor:
Matt Construction

CONSULTANT **TEAM:**

Structural Engineering:
Rutherford & Chekene

MEP Engineers:
Integral Group

Civil Engineering:
Stantec

Landscape Design:
EPT Design

Telecom + Security:
TEECOM Design Group

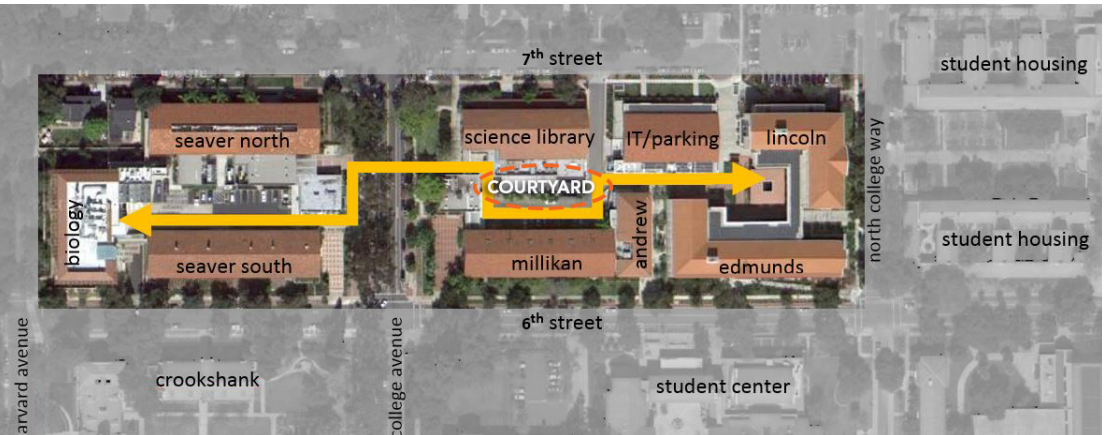
Laboratory:
HKS Architects

Acoustics:
Charles Salter & Associates

Lighting Design:
JS Nolen + Associates

above: Collaborative spaces feature plenty of windows to allow natural light into the space -
Photo by: Jim Simmons Photography

VISION + **COMMITMENT**



A new courtyard replaced the existing parking lot and mechanical yard with landscaping, an outdoor classroom, and social spaces spilling out from the Colloquium and collaborative spaces. The courtyard includes a series of Physics Interactives that are used to let students tangibly experience physics principals. The courtyard and interactives are open to the public, as is the planetarium which regularly hosts school groups to introduce them to astronomy. Parking was eliminated from the site with 98% of students living on campus and many faculty biking to campus on the well-developed, flat bike lane network.

> "The Pomona College Vision is to achieve Carbon Neutrality by 2030, by creating a socially engaged just environment that provides active learning experiences, small footprints, and powerful results"
>
> *Brian Faber, Pomona College Project Manager*

top: Before - Parking Lot
middle: After - View of NW facing courtyard
bottom: Science District site plan
Photo Credit:
Photo by Jim Simmons Photography

DESIGN + **INNOVATION**

Pomona College is located inland Southern California with mild winters, hot summers in the triple digits, and is subject to poor air quality due to its valley location east of Los Angeles. Daylighting and solar control were fundamental forces that shaped the design at every stage, a key strategy was to manage solar gain to minimize cooling while optimizing daylight. The thin east-west building massing allowed for effective shading on the south using the roof overhang and external sunshades. The west façade minimizes glazing and shades it with exterior horizontal shades. The building primarily uses a radiant ceiling for heating & cooling; by minimizing solar gain the cooling can often be supplied using only cooling towers rather than compressor based cooling. Ceiling fans extend the comfort to a broader temperature and provide personal control. Double stud exterior walls were used to match the deep window recesses elsewhere on campus, and provide a thermal break and R26.5 insulation. Virtually all regularly occupied rooms have operable windows for personal control on the many pleasant days. A dedicated outside air system provides continuous source of filtered fresh air at all times, including days with air quality problems when windows remain closed.

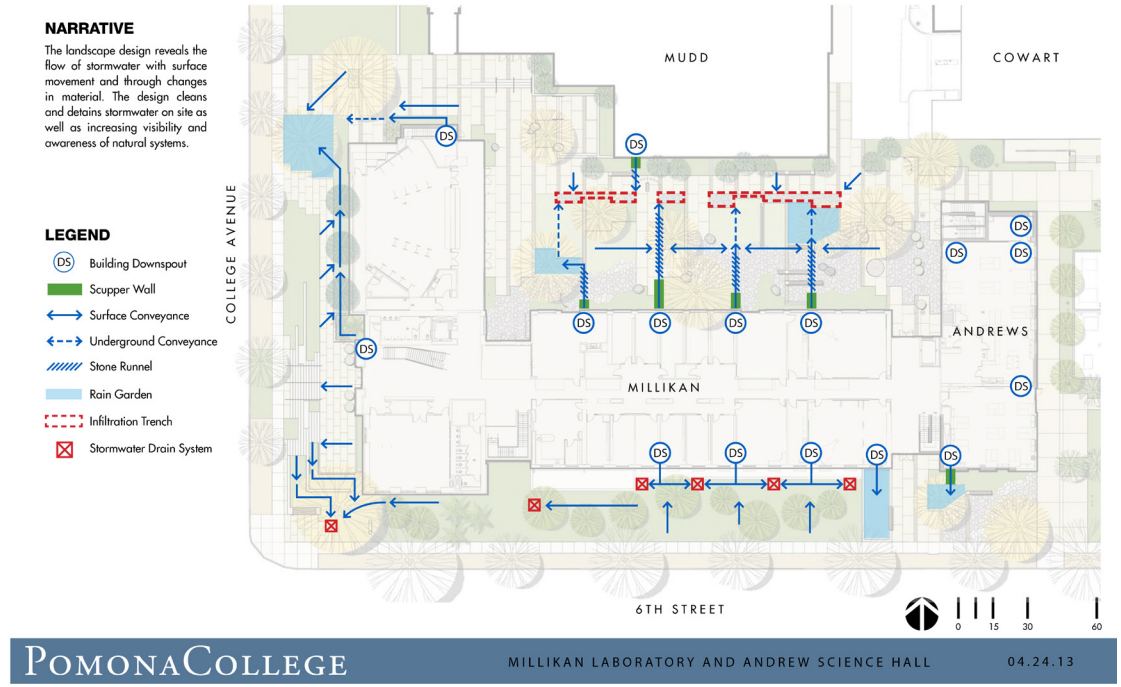
below: Interior of Daylit Colloquium
Photo by: Jim Simmons Photography

Stormwater treatment best management practices are an integral part of the stormwater plan earning all LEED points including an Exemplary Performance point. The stormwater is distributed throughout the site. The associated rain gardens populated with Juncus patens, Achillea millefolium, Carex divulsa, and Iris douglasiana blanket the foundation of the buildings perimeter. Within the central courtyard space, native California Sycamore and Western Redbud species are strategically placed to accommodate the physic interactive pieces, provide summer shade, and allow for winter sunlight in the space. It was desirable to use species that could benefit the biology department studies, so the courtyard uses a mix of sun and shade tolerant native species that include Carpenteria californica, Heteromeles arbutifolia, Mahonia repens, and Rhamnus californica. The site provides flexibility for a variety of uses, including programmed events, academic study, and daily lounging for students and faculty. Movable furniture was provided throughout to suit their needs.

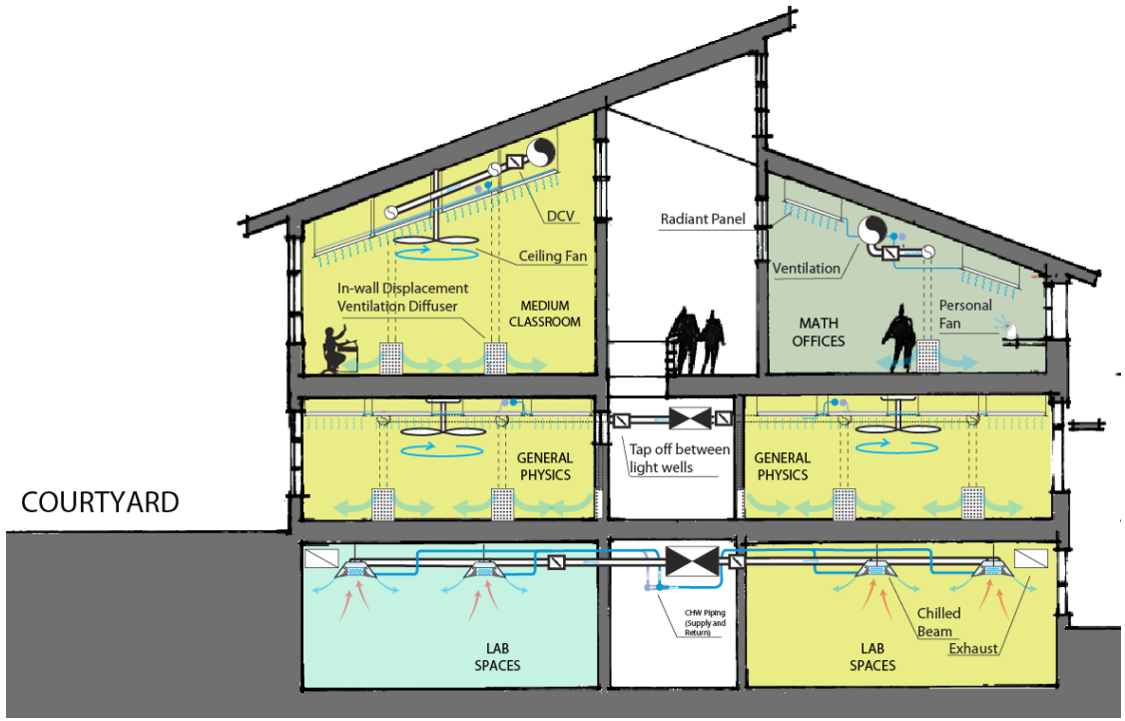
During workshops with the math and science faculty, they wanted to make the stormwater strategies visible to increase the student's awareness and understanding of natural systems. As a result, a "revelatory design concept" was developed with the landscape architect and civil engineers. Rainwater from building downspouts flows into concrete scupper walls that are design features in the landscape. These direct the water into stone-lined runnels across the courtyard and into a stone-filled infiltration trench, making the entire journey visible. Along the remainder of the building perimeter, a series of rain gardens slows the water flow to provide additional infiltration through the landscape.

above: Stormwater Management
Photo by: EPT Design
below: HVAC Distribution Strategy
Photo by: Integral Group

STORMWATER MANAGEMENT PLAN



PomonaCollege MILLIKAN LABORATORY AND ANDREW SCIENCE HALL 04.24.13



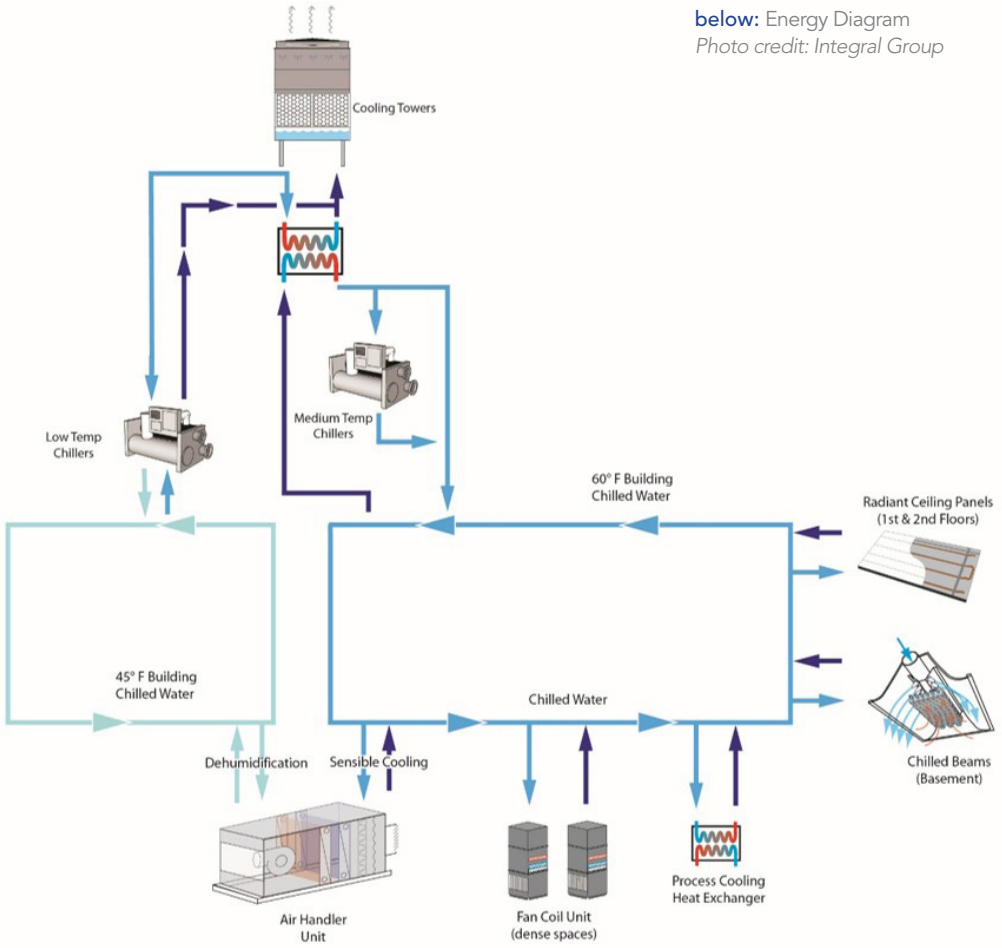
Courtyard with Physics Interactives and Drought resistive native plants at dusk
Photo by: Jennifer Cheung Photography

ENERGY

PERFORMANCE DATA

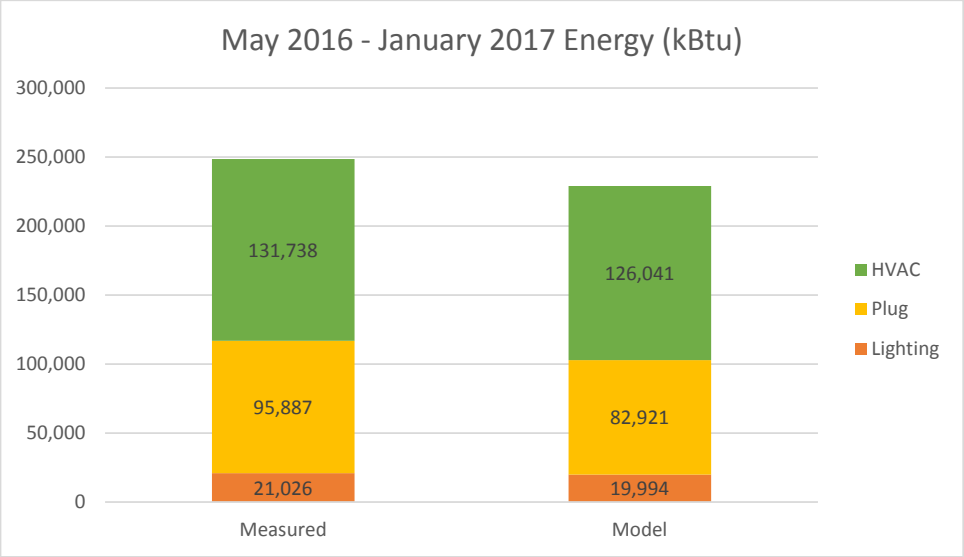
The building utilizes systems that optimize energy efficiency while meeting the goals of the project. Lab spaces use active chilled beams, a highly efficient best practice system recommended by I2SL (formerly Labs 21). Cooling is provided through these chilled beams, allowing energy to be reduced drastically during periods of low heat load. Heat recovery is implemented on the lab exhaust through a run-around coil, which allows for pre-conditioning of the outside air.

Classrooms and offices use displacement ventilation to provide outside air, reducing fan energy associated with traditional ventilation distribution. CO2 sensors are also provided in classrooms, allowing the ventilation system to match the needs for varying class sizes. These spaces also use radiant ceiling panels for heating and cooling, eliminating reheat while providing optimum thermal comfort.
The central plant uses highly efficient, variable flow cooling towers and chillers. The design is centered around minimizing compressor based cooling. A medium temperature chilled water loop provides conditioning to chilled beams, radiant ceiling panels, and ventilation air. Providing elevated chilled water temperatures allows for an extended range where partial and full water-side economizing can be used. A low temperature chilled water loop is provided for use only during periods of high humidity.

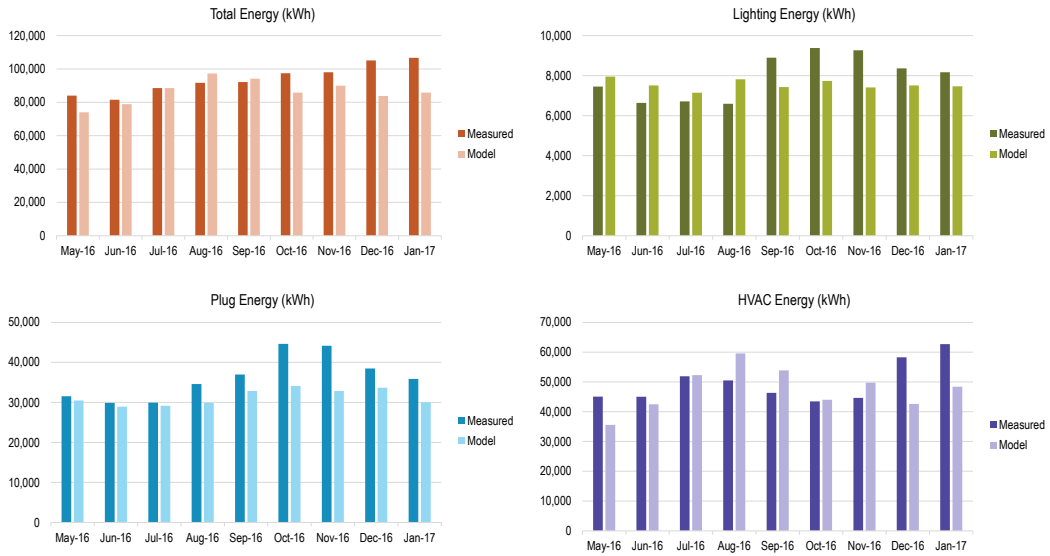


below: Energy Diagram
Photo credit: Integral Group

Energy Use Intesity				
Predicted:	Baseline:	Goal:	Savings:	Measured:
41	185.3	55.6	78%	46
(kBtu/ft²/yr)	(kBtu/ft²/yr)	(kBtu/ft²/yr)		(kBtu/ft²/yr)



Monthly Energy Performance

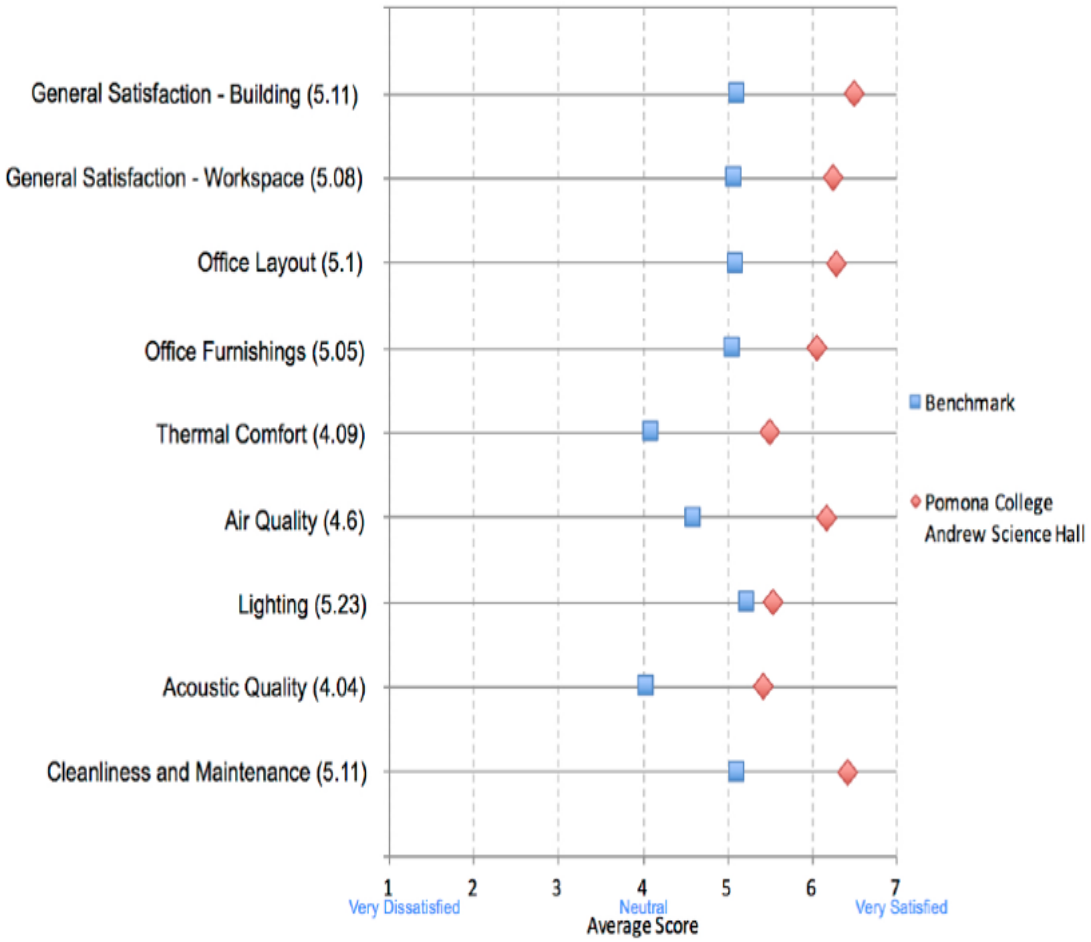


top right: Energy Performance Data
bottom right: Monthly Energy Performance Data
Photo credit: Integral Group

Great design advances civilization while recognizing our responsibility to the future. It respects the changing needs of users, the evolution of communities and the impact on the natural environment.

SUSTAINABLE **DESIGN**

The project had an extensive commissioning effort. The collaborative effort included an independent commissioning agent, the mechanical contractor, the MEP engineer, and Pomona College operations staff. It earned the LEED Enhanced Commissioning credit. It is also one of the first Higher Education projects to include the LEED Dynamic Plaque which benchmarks performance AND operations over time. The project earned all three LEED Measurement and Verification points. A CBE Post Occupancy Survey was conducted in the Spring of 2016 with results below:



above: Active hub spaces on both the 1st and 2nd floor with view of penrose patttern at left. *Photo credit: Jim Simmons Photography*

POMONA COLLEGE

MILLIKAN SCIENCE BUILDING

LEED Certification Review Report

This report contains the results of the technical review of an application for LEED® certification submitted for the specified project. LEED certification is an official recognition that a project complies with the requirements prescribed within the LEED rating systems as created and maintained by the U.S. Green Building Council® (USGBC®). The LEED certifcation program is administered by the Green Building Certification Institute (GBCI®).

Millikan

Project ID	1000033057
Rating system & version	LEED-NC v2009
Project registration date	05/30/2013

CERTIFIED SILVER GOLD PLATINUM

D and C Application Decision

CERTIFIED: 40-49, SILVER: 50-59, GOLD: 60-79, PLATINUM: 80+

LEED FOR NEW CONSTRUCTION & MAJOR RENOVATIONS (V2009)

ATTEMPTED: 83, DENIED: 0, PENDING: 0, AWARDED: 89 OF 110 POINTS

leed-nc

SUSTAINABLE SITES — 24 OF 26

SSp1 Construction Activity Pollution Prevention	Y
SSc1 Site Selection	1 / 1
SSc2 Development Density and Community Connectivity	5 / 5
SSc3 Brownfield Redevelopment	1 / 1
SSc4.1 Alternative Transportation-Public Transportation Access	6 / 6
SSc4.2 Alternative Transportation-Bicycle Storage and Changing Room	1 / 1
SSc4.3 Alternative Transportation-Low-Emitting and Fuel-Efficient V	3 / 3
SSc4.4 Alternative Transportation-Parking Capacity	2 / 2
SSc5.1 Site Development-Protect or Restore Habitat	0 / 1
SSc5.2 Site Development-Maximize Open Space	1 / 1
SSc6.1 Stormwater Design-Quantity Control	1 / 1
SSc6.2 Stormwater Design-Quality Control	1 / 1
SSc7.1 Heat Island Effect, Non-Roof	1 / 1
SSc7.2 Heat Island Effect-Roof	1 / 1
SSc8 Light Pollution Reduction	0 / 1

WATER EFFICIENCY — 6 OF 10

WEp1 Water Use Reduction-20% Reduction	Y
WEc1 Water Efficient Landscaping	2 / 4
WEc2 Innovative Wastewater Technologies	0 / 2
WEc3 Water Use Reduction	4 / 4

ENERGY AND ATMOSPHERE — 32 OF 35

EAp1 Fundamental Commissioning of the Building Energy Systems	Y
EAp2 Minimum Energy Performance	Y
EAp3 Fundamental Refrigerant Mgmt	Y
EAc1 Optimize Energy Performance	18 / 19
EAc2 On-Site Renewable Energy	7 / 7
EAc3 Enhanced Commissioning	2 / 2
EAc4 Enhanced Refrigerant Mgmt	2 / 2
EAc5 Measurement and Verification	3 / 3
EAc6 Green Power	0 / 2

MATERIALS AND RESOURCES — 5 OF 14

MRp1 Storage and Collection of Recyclables	Y
MRc1.1 Building Reuse-Maintain Existing Walls, Floors and Roof	0 / 3
MRc1.2 Building Reuse, Maintain 50% of Interior	0 / 1
MRc2 Construction Waste Mgmt	2 / 2
MRc3 Materials Reuse	0 / 2
MRc4 Recycled Content	2 / 2

MATERIALS AND RESOURCES — CONTINUED

MRc5 Regional Materials	1 / 2
MRc6 Rapidly Renewable Materials	0 / 1
MRc7 Certified Wood	0 / 1

INDOOR ENVIRONMENTAL QUALITY — 12 OF 15

IEQp1 Minimum IAQ Performance	Y
IEQp2 Environmental Tobacco Smoke (ETS) Control	Y
IEQc1 Outdoor Air Delivery Monitoring	1 / 1
IEQc2 Increased Ventilation	1 / 1
IEQc3.1 Construction IAQ Mgmt Plan-During Construction	1 / 1
IEQc3.2 Construction IAQ Mgmt Plan-Before Occupancy	1 / 1
IEQc4.1 Low-Emitting Materials-Adhesives and Sealants	1 / 1
IEQc4.2 Low-Emitting Materials-Paints and Coatings	1 / 1
IEQc4.3 Low-Emitting Materials-Flooring Systems	1 / 1
IEQc4.4 Low-Emitting Materials-Composite Wood and Agrifiber Products	1 / 1
IEQc5 Indoor Chemical and Pollutant Source Control	0 / 1
IEQc6.1 Controllability of Systems-Lighting	1 / 1
IEQc6.2 Controllability of Systems-Thermal Comfort	1 / 1
IEQc7.1 Thermal Comfort-Design	1 / 1
IEQc7.2 Thermal Comfort-Verification	1 / 1
IEQc8.1 Daylight and Views-Daylight	0 / 1
IEQc8.2 Daylight and Views-Views	0 / 1

INNOVATION IN DESIGN — 6 OF 6

IDc1.1 Exemplary Performance: Stormwater Design	1 / 1
IDc1.1 Innovation in Design	0 / 1
IDc1.2 Exemplary Performance: Maximize Open Space	1 / 1
IDc1.2 Innovation in Design	0 / 1
IDc1.3 Green Cleaning Policy	1 / 1
IDc1.3 Innovation in Design	0 / 1
IDc1.4 Green Building Education	1 / 1
IDc1.4 Innovation in Design	0 / 1
IDc1.5 Sustainable Purchasing Policy	1 / 1
IDc1.5 Innovation in Design	0 / 1
IDc2 LEED® Accredited Professional	1 / 1

REGIONAL PRIORITY CREDITS — 4 OF 4

SSc4.1 Alternative Transportation-Public Transportation Access	1 / 1
SSc7.1 Heat Island Effect, Non-Roof	1 / 1
WEc2 Innovative Wastewater Technologies	0 / 1
WEc3 Water Use Reduction	1 / 1
EAc2 On-Site Renewable Energy	1 / 1
IEQc8.1 Daylight and Views-Daylight	0 / 1

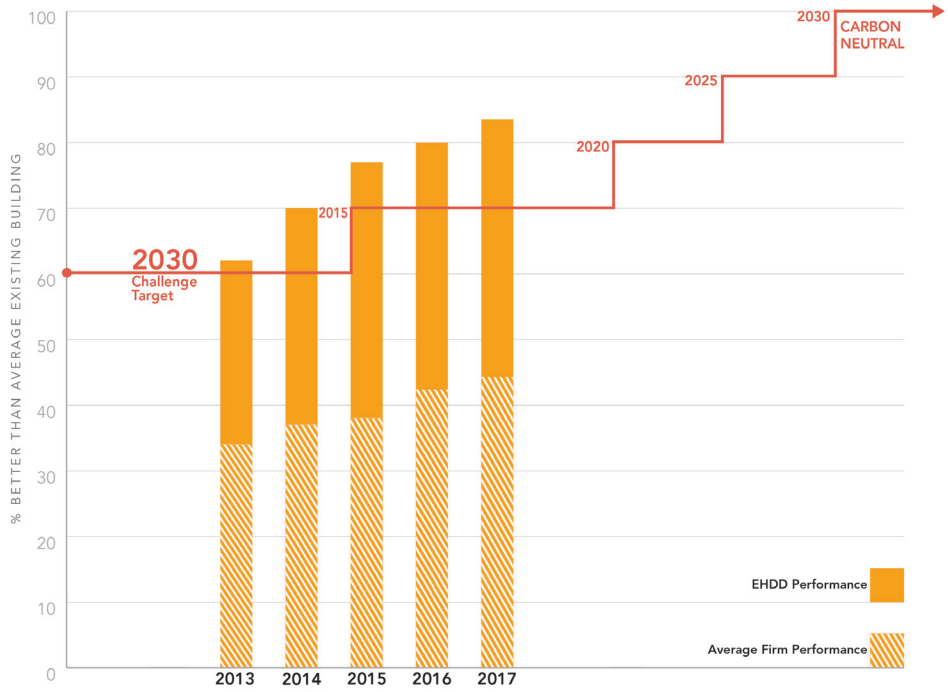
TOTAL — **89 OF 110**

ADVANCING
SUSTAINABILITY

We believe sustainable communities and organizations are much more profound than just green buildings. We believe that addressing climate change is the grand challenge of our generation, and therefore, our scale of response must be commensurate with the size of the problem. This requires the architectural industry to push beyond simply modest improvements and calls for dramatic changes—like EHDD's intense focus on net zero energy buildings. In the last ten years, our firm has realized that the biggest barrier in creating these types of buildings is the mental challenge of believing it can't be done. Beginning with small projects at 7,000 sq. ft. and working our way up to 330,000 sq. ft., we have found that it can certainly be done—even within a rational cost and delivery process. Architects have the opportunity to design and create the future that we want and need.

EHDD's leadership in sustainable design is exemplified by our 12 LEED Platinum projects, 10 LEED Gold projects, and two LEED Silver projects. EHDD has also designed both the first and the largest Net Zero Energy Certified projects—The David and Lucile Packard Foundation office building and IDeAs Z^2 Design Office in San Jose, California. The Exploratorium at Pier 15 is on track to become the largest Net Zero Energy museum in the United States. EHDD has also won six AIA National Committee on the Environment "Top Ten Green Projects" awards and is currently ranked 4th by AIA COTE. We are on track to outpace the 2030 challenge, which states that all new buildings, developments, and major renovations shall be carbon-neutral by the year 2030.

EHDD has pioneered Net Zero Energy concepts over the past 15 years. California policy is targeting all new buildings to be NZE by 2030. The AIA 2030 Commitment is a program that enlists architecture firms to commit to stepping up their portfolio performance every 5 years until the ultimate net zero goal is reached in 2030. While the industry in general is struggling to make it halfway to the target (only approximately 4% of firms are meeting the current targets, with the average performance less than 40% reduction) EHDD's entire portfolio has beat the target each year with a 80% performance savings in 2016, achieving the 2030 targets 4 years early. This is largely due to the prevalence of zero energy projects in EHDD's work; however, the fundamental design approach is consistent whether a project is seeking NZE or not.



POMONA COLLEGE

MILLIKAN SCIENCE BUILDING

Claremont, California

Photo credit: Jim Simmons Photography