LIVING AND LEARNING GREEN AT POMONA COLLEGE'S SONTAG AND POMONA HALLS STUDENT HOUSING

Whitney M. Wyatt[1]

INTRODUCTION

Pomona College is a private liberal arts college located within a desert landscape in the foothills of the San Gabriel Mountains in Claremont, California, and has a student body of approximately 1,500 students. Founded in 1887 and envisioned as "a college of the New England type" on the West Coast, the school was designed as an intimate "college in the garden" around the principles of community, conviviality, and collaboration in an effort to have students form close relationships with both faculty and each other. Even the non-academic spaces on campus, like the student dining halls and outdoor courtyards, promote opportunities for interaction between faculty and students, and the overall impression of the campus is one of a small tight-knit community united by a desire to learn and grow. As a residential campus, the school is committed to providing housing for all students, but to do so the College needed to increase its bed count by approximately 10 percent. To further complicate the issue, despite everyone being required to participate in the school meal plan, upper-class students were opting to move off campus in greater numbers each year due to the lack of student housing options that allowed for more independent apartment-style living arrangements—they felt the existing housing was too "dorm-like". As a result, in 2007 the College commissioned Ehrlich Architects to design a new residence hall that would house approximately 150 upper-class students in suite-style rooms containing 3, 4, or 6 individual bedrooms, a shared living room, and private bathing facilities.

KEYWORDS

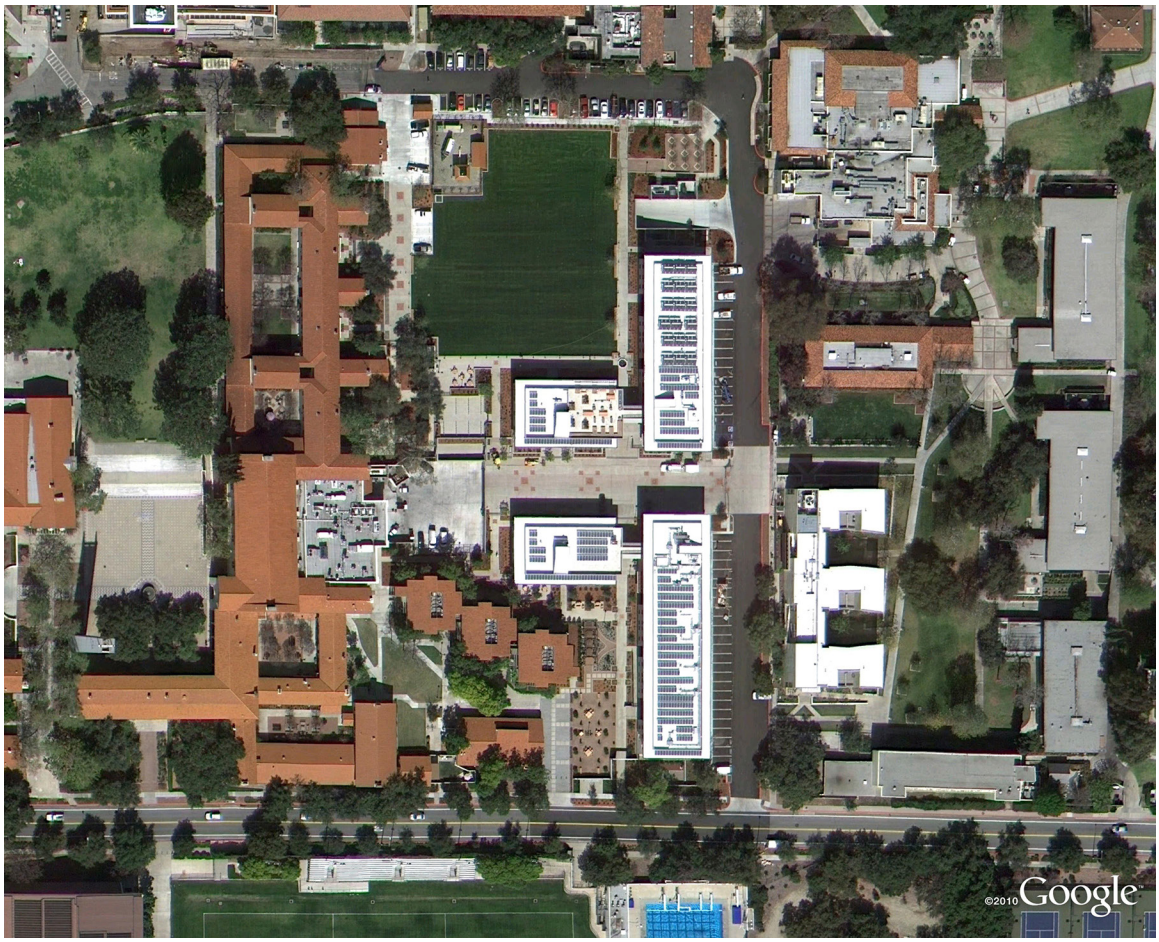
student housing, residence hall design, sustainability, LEED-Platinum certification

SUSTAINABILITY GOALS

Over the years, Pomona College has become an increasingly strong advocate of environmental stewardship and within the last decade the College has increased its commitment to sustainable design and improving the environment by pledging to reduce its carbon emissions 75% by 2050 and implementing Green Building Standards which require all new construction and major renovations to achieve a minimum of LEED-Gold certification. In addition to these general campus construction requirements, the residence halls in particular were charged

[1]AIA, LEED AP, Associate, Ehrlich Architects, www.ehrlicharchitects.com.

Aerial view of northeast corner of the Pomona College campus and project site (north is top of image). Immediately to the west of the project from top to bottom is the Clark I residence halls, Frary Dining Hall (the main dining hall on campus), Frary residence hall, and the Clark II residence halls.



with functioning as an example of living sustainability and as a teaching tool for students. All aspects of the design were to be considered with respect to how they could raise awareness, educate, and even assist the occupants in making more informed choices about living sustainably. The goal was to create an environment that would conserve resources and allow students to achieve their highest potential; an environment that would inspire behavioral change in the daily lives of its users that might ultimately develop into a new mindset and outlook on life.

DESIGN GOALS

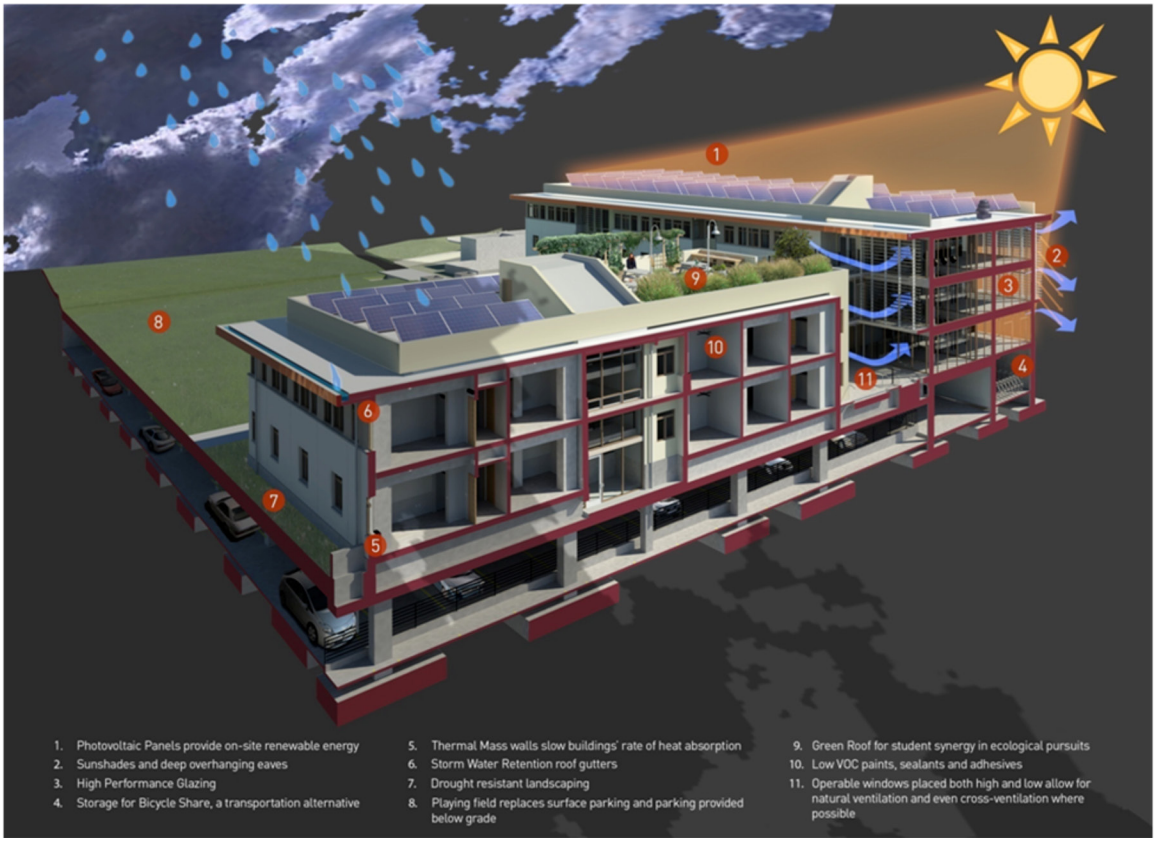
With a long history rooted in tradition and innovation, over the last century Pomona College has grown and developed a master-planning ethos that includes building socially, environmentally, and economically responsible structures to last at least 100 years, and the new residence hall was no exception. Rather than thinking of the housing as a self-contained revenue source which must essentially pay for itself over a specific period of time as is common at

Looking from Sontag Hall south across central plaza to Pomona Hall.

many other schools, Pomona budgets their residence halls like any other academic building on campus and therefore they must be of the same construction quality and durability. In response to this, the College stressed that the project should be built to last the next hundred years without major renovation and that the design should be of a timeless aesthetic in keeping with the school's architectural heritage. After assembling a design team task force composed of senior administration, faculty, and students, along with the design team's consultants, a series of visioning sessions were conducted to collectively identify the primary design goals and objectives:

1. Design a project that reflects the College's leadership role in advancing sustainability and sustainable living.
2. Think of every space (inside and out) as a learning opportunity and teaching aid to help raise awareness about sustainability and educate students and faculty through firsthand experience.
3. Design a project that celebrates the culture of place unique to Pomona and to its location.
4. Provide students with an environment that promotes community and collaboration while also providing privacy and tranquility.
5. Design the landscape and open space areas to serve as the connective tissue that unifies the design with the rest of campus and provides moments for students, faculty, and the community to come together.

Cross-sectional diagram illustrating a number of sustainable design features.



PROGRAMMING AND DESIGN

The initial program provided by the College included housing 150 students in a residence hall consisting of apartment-like suites and a separate above-grade parking structure. Each unit might contain three to eight individual bedrooms sharing a living room and private bathing facilities. In addition to the units, the program called for a common study space, a common lounge space, laundry and storage facilities, a secured bicycle storage area, and space to house the Outdoor Education Center, which serves as the physical hub where students and faculty gather to participate in outdoor recreation activities and workshops and includes equipment checkout and storage.

The project site is located at the northeast corner of campus adjacent to existing student housing known as Clark I, which was built shortly after the College was founded, within a 4.5-acre area that included several surface asphalt parking lots, an abandoned street, and a grass turf playing field. The site is also adjacent to the loading dock area serving the kitchen to the major campus dining hall, so initially the College thought the building might be located nearer to the Clark I residence hall and the parking structure at the campus edge to buffer it from the loading areas and psychologically connect it to the residential enclave of Clark I.

After receiving the preliminary program, the design team recognized the need to engage all the project stakeholders in the validation process so that everyone was in agreement on the direction moving forward. A series of surveys, outreach sessions, and workshops were conducted to gather input on a wide range of issues like whether the existing playing field

The project is a testament to an exceptionally communicative and collaborative design process and the results that approach can yield. From the very inception, the core design team included a task force of faculty, staff, and students who participated and were involved from programming through construction. Weekly meetings were held, campus-wide online opinion surveys were distributed, Q/A sessions were conducted in dining halls during meals, presentations were made on specific topics, including sustainability measures to be incorporated into the project, and full-scale mockups of room configurations were erected on campus, all in an effort to understand the College's culture, establish a shared vision, and bring the greatest value to the project. The Contractor was also brought on during the design phase to align goals and build a strong working partnership with the Owner and Architect. All this discussion and open dialogue helped solidify details concerning everyday use and long-term maintenance.

Ground, second, and third floor plans for Sontag and Pomona Halls (north is top of image).

Students, faculty, and staff reviewing plans during a summer dinner event with the Dean of Students.

really should be given over to a parking structure; whether the program should be broken up into smaller buildings that are interconnected; the optimal bed count within each suite; and the need for separate shower, toilet, and sink facilities within the suite. The design team also toured several existing facilities both locally in the Southern California area and on the east coast at competing college campuses to see and hear firsthand what seemed to work and what was less successful. Through all the analysis and information gathering, an overriding theme of community and connection emerged—to each other, to the rest of the College, to the surrounding community, and to the environment—and the consensus among stakeholders was that the residence halls should promote community and connection.

The College's program was refined in response to the results and continued interaction between the design team, the faculty, and the students throughout the design process. The General Contractor was also brought on board prior to the beginning of the construction document phase and provided pre-construction support in terms of constructability and pricing, and became indispensable partners in achieving the sustainable goals of the project. Listening to the feedback given by students, 4- and 6-person "friendship suite" room configurations were chosen as the primary building blocks for the project, along with separate shower, toilet, and sink facilities within the suite so simultaneous use would be possible and less tension would arise between roommates. Although initially the College wanted us to consider a single-loaded corridor circulation configuration since it was already common with the Clark I residences, it was later decided that for security reasons and in order to minimize the building footprint, a double-loaded corridor floor plan layout was preferred. Detailed conversations about the nature of the corridor as a social spine and the appropriate width needed to support its functioning as a hang out space in addition to circulation allowed the College to

View of Sontag Hall from the rooftop classroom of Pomona Hall. The project was charged with ushering in a new era of sustainable living that will last for the next 100 years.

conclude that in fact the double-loaded corridor was more conducive to promoting a sense of community and connection—particularly if the corridor could have a visual connection to the outdoors and natural daylight near to those particular moments sprinkled along the corridor where gathering was to be encouraged. Similar discussion also helped inform the common lounge space. Rather than providing one large lounge for everyone, students preferred the idea of a smaller lounge per floor that included cooking facilities that all the suites on the floor could share. Multiple lounges in closer proximity to each suite would help support a more independent way of living for the students who might chose to cook some meals on their own, as well as the social culture on campus that is often focused around meals and food. Student feedback also helped inform exterior areas. After initial requests for balconies were rejected by the senior administration for safety reasons, the design team task force suggested providing a larger and more secure roof terrace instead, and upon its approval the idea led the way to thinking about the roofs somewhat differently and how they too could be outdoor rooms and gathering spaces for both recreation and academic learning. Students also helped the design team better understand the importance of the existing playing field and how it too served as a gathering place for students; so upon comparing cost estimates for an above-grade structure and a subterranean garage, the parking was relocated to an underground parking garage, allowing the project to reclaim the open space as a more active part of campus and prioritize the pedestrian experience over the car.

Once these fundamental decisions were made, the final design synthesized the elements of the revised program, the site reevaluation, and the feedback provided by the Contractor. The massing evolved into two "L" shaped buildings (Sontag Hall to the north and Pomona Hall to the south) totaling 81,000sf, each with two- and three-story wings connected by a glass breezeway on the second floor placed along the site periphery to strengthen the edge of campus and allow the light, ventilation, and views of the existing Clark I dorms nearby to remain unobstructed. The two buildings flank a central plaza that serves as a new pedestrian gateway into campus from the east, in addition to providing continued vehicular access to the dining hall loading dock and back of the house area. The single-level 175 car parking garage was located beneath the north building (Sontag Hall) and the playing field, with ramp access down located at the northeast corner of the site and pedestrian access up made possible by either taking open stairs located at the periphery of the playing field or by an elevator that extends up into the lobby of Sontag Hall.

View of Sontag Hall through arched site walls linking the project back to campus (left). Existing Clark I residence halls built in 1929 (right).

Taking cues from the architectural language and materiality of existing residence halls nearby, the project ties back to the campus' architectural heritage and addresses issues of permanence while also looking forward and ushering in a progression in form to realize the College's new sustainable agenda. There is a transformation in the use of materials and architectural features that are prevalent elsewhere on campus. Terracotta, seen on nearby buildings in the form of tiles on sloped roofs, appears even more prominently on the new buildings' facades as horizontal plank sun-screens, spaced three feet in front of the floor-to-ceiling glass storefront areas to help reduce direct solar heat gain and glare while also allowing the roofs, now clad with a white EnergyStar rated "cool roof" thermoplastic membrane, to remain flat and support photovoltaic arrays that harvest solar energy. The cast-in-place concrete exterior walls with deeply recessed punched openings and the glazed clerestories seen in the Clark I structures also reappear but include high-performance insulated glass units above 11-inch thick precast concrete panels with a 3-inch thick Polystyrene thermal break insulation core and energy-efficient operable windows to optimize the thermal mass performance of the façade while simultaneously echoing the original campus aesthetic.

IMPLEMENTING GREEN STRATEGIES

With the College wanting the project to be the standard for green design, many strategies were explored and subsequently implemented to accomplish this goal. Some of the measures were already consistent with what the College was doing elsewhere on campus while others required a shift in thinking, but overall strategies were chosen with respect to how well they emphasized and supported creating an environment that promoted awareness and conservation, sharing resources, and building community.

View of Sontag Hall from the playing field above the subterranean parking garage. Located at the northeast corner of campus, the project defines the campus edge, serves as a gateway to the campus, and is a visual testimony to the College's commitment to green building and sustainable development for both local residents and visitors.

Looking from Pomona Hall bridge to Sontag Hall.

BUILDING MASSING, SITING, AND LANDSCAPE

The project's distribution of program, the overall building massing, and the landscape design address a variety of environmental quality issues including heat island effect reduction and creating onsite ecosystems. By locating the parking underground in a one-story subterranean parking garage and building portions of the project in three stories, the site plan maximizes open space, providing over twice as much green area as the overall building footprint and nearly three times as much usable open space as existed before. The former sea of surface parking lots has been transformed into a series of interconnected landscaped courtyards, each different in size and character, all of which help to promote a connection between inside and outside; between the individual and the environment; and function as restorative spaces for students and faculty to take advantage.

Rooftop eco-classrooms allow the entire campus to study sustainable design and environmental issues firsthand with the building serving as an ongoing research case study.

By increasing the usable open space, the playing field area also serves as an outdoor lawn that is park-like, where students can read and study or just take a sunbath. Outdoor barbeque and grille areas have been installed next to seating areas with tables and chairs to allow for outdoor meals to be possible; there is a trellis garden complete with group swings to encourage students to linger outside; the raised planter walls above the parking structure containing a number of different trees were designed so that they could also serve as seating areas and even a hammock garden was erected within found space between the project and the existing Clark I residence hall to the west. The nature of the surrounding outdoor and interstitial spaces is one of health and well-being, and the design truly underscores the campus' earliest mission to be a "college in the garden."

The landscaped areas are planted with native and adapted species, creating small ecosystems for grasses, succulents, shade foliage, and fruit trees, all of which have low water

(left) View from existing Clark residence halls looking east. Merging tradition with new beginnings pedestrian walks have been routed around mature trees left in place in order to respect what already exists. (right) Pomona Hall succulent garden with wood trellis and group swings.

Sontag Hall seen from the playing field above the subterranean parking garage.

requirements. Even the soil composition and the irrigation system for the turf playing field have been designed with water conservation in mind, with the soil composition in particular consisting of a specific blend of peat, pumice, and sand materials that slows the rate of drainage and evaporation without flooding the sod, and in total the overall water consumption has been reduced by 51.5% compared to the baseline design for the project.

In keeping with the goal of protecting the natural setting and retaining as many existing trees as possible, eight mature Oak trees were relocated in order to save them from demolition and pedestrian walks have been routed around other mature trees left in place in order to respect what was already there. On the roof of the two-story portion of Sontag Hall, a raised planter garden complete with fruit trees, vines, and herb beds was installed within the communal terrace to allow students opportunities to grow their own food and gain a better understanding about nutrition and food production. Throughout the landscape, signage has been installed indicating the plant species and their origins as well as their annual water consumption requirements to help increase awareness and educate the entire College community.

Outdoor seating area with water feature north of Sontag Hall and adjacent to the new playing field.

WATER

One hundred percent of the stormwater runoff collected on site is diverted from the city storm drain system and is either allowed to percolate through pervious materials on site or is captured in trench drains and subsurface perforated pipes connected to an underground detention basin with overflow drywell infiltration system located just south of the project site and buried twelve feet below grade. The detention basin is made up of a series of crush-resistant plastic cubes stacked together several rows high and is large enough to detain the precipitation anticipated for a 10-year storm event. Once the run-off water is collected, it passes through a filtration system at the base of the basin before being released back into an existing aquifer located directly south, in an area known as "The Wash."

Within the buildings, water-saving fixtures were used throughout the project, including 1.1 gpm dual and 1.6 gpf low-flush toilets, 1.6 gpm low-flow showers, .5 gpm low-flow lavatory faucets and 1.6 gpm kitchen faucets, EnergyStar rated dishwashers and commercial grade clothes washers resulting in 36.6% less regulated water use and 24.5% less process water use than a comparable baseline building. The annual regulated potable water use is approximately 15.17 gallons per square foot.

ENERGY

To achieve sustainability goals regarding energy consumption, the project first took advantage of the natural energy flows of sun and wind so common to desert climates like Claremont by employing the concepts of thermal mass, shading, and natural ventilation to optimize human comfort. The building skin is primarily composed of two systems that were used in various

locations on all four sides of both buildings to express the internal programmatic and functional differences between the public and private spaces. Public spaces are enclosed with a floor-to-ceiling glass storefront system while the private spaces (the suites) are located behind 11-inch think precast concrete panels that consist of two separate wythes (three 3-inch thick exterior and five 5-inch thick interior) that are tied together with fiber composite connectors through a 3-inch thick R-19 Polystyrene insulation layer which that also provides a thermal break between inside and outside. The thermal mass helps to modulate the large diurnal temperature swings experienced in the desert climate and creates a temperature lag effect which prevents the fluctuation in the inside building temperature from being too dramatic during the coolest and warmest times during the year. As a result, during the summer the wall assembly helps to absorb the cool energy during the night time when temperatures are quite low, which it then releases hours later during the day when outside temperatures can be quite high, thus reducing the cooling load required. By employing the thermal mass concept alone rather than a regular metal stud wall assembly, the project saves nearly 10% in annual energy consumption.

To address the direct solar heat gain and glare anticipated in the public areas where floor-to-ceiling glass storefront was installed, four other measures were also implemented. Wherever the storefront assemblies were located, 8-feet-deep roof overhangs were also located at the top floor of the assembly. High-performance insulated glazing units were installed within the storefront assemblies with a solar heat gain coefficient (SHGC) of .23, which is less than

A majority of the exterior envelope is constructed to utilize thermal mass to reduce mechanical system energy consumption with 11-inch thick insulated concrete walls that slow heat absorption and heat loss and minimize internal temperature fluctuations.

the ASHRAE 90.1-2004 Standard design target. Exterior sunscreens, consisting of 2-inch thick by 8-inch deep horizontal terracotta planks spaced vertically 10 inches on center, were installed three feet in front of the storefront assemblies to help reduce direct solar heat gain, and inside manually-operated shading devices with 3% openness were also installed to help reduce the direct solar heat gain even further and reduce glare. In both building skin systems operable windows were also installed (and in the case of the public areas they were installed both high and low) to allow for natural ventilation and maximum optimization of using the prevailing winds to help improve air movement and cooling of the space.

Thermal mass study diagram showing how students can use operable windows and ceiling fans to give occupants alternate approaches to controlling individual thermal comfort without relying on mechanical conditioning.

Energy efficiency and conservation were further achieved by installing photovoltaic (PV) arrays to harvest solar energy and offset over 130,000kWh of electricity consumption annually (approximately 14% of the building total) on three of the four building rooftops. In addition to PV, a passive solar thermal rooftop thermosiphon system, consisting of 54 solar collectors tilted at a 35 degree angle facing south and eighteen 116-gallon water storage tanks, were installed to supplement the boilers used for domestic hot water needs to offset approximately four to nine therms of natural gas usage per day, depending on the weather conditions. Once the PV design layout was finalized, the design team recommended allowing the section of panels located on the roof of the two-story portion of the south building (Pomona Hall) to be accessible to students and faculty and serve as an outdoor eco-classroom. The College fully embraced the idea of using the building as a case study for students to analyze and evaluate and installed additional stand-alone PV panels to be used for independent study and research projects where students might want to alter the PV in some fashion and compare the results to the building performance.

Inside the lighting was designed to lower lighting power densities in the suites (.60 watts/sf versus 1.0 per the ASHRAE 90.1-2004 Standard); circulation corridors (.63 watts/sf versus 1.0); and the parking garage (.247 watts/sf versus .3) by installing permanent, high-efficiency lighting in a manner that allowed for even distribution while also limiting the total wattage. For example, within the parking garage linear fluorescent fixtures were chosen over LED because nearly half the number of fixtures would be required, and by installing "Super T8" lamps and ballasts, the same lighting illumination as Standard T8 lamps and ballasts could be achieved while using nearly 20% less energy. Automatic daylight controls and occupancy sensor lighting controls were also installed in the public corridors, lounges, and suite hallways to help achieve additional lighting and cooling energy savings.

The Pomona Hall PV array and eco-classroom assist in sustainable design education.

To help residents limit their unintended power use, each suite bedroom has a power on/off wall switch to turn off electronic equipment plugged into the wall outlets and reduce energy consumption incurred through the power draw from phantom loads. The intent behind this feature is to make it convenient for students and encourage participation since flipping a switch to save power is much easier than unplugging electrical items anytime they are not in use. For clocks and other devices that might want to be left on 24/7, a separate wall outlet with the words "UNSWITCHED OUTLET" inscribed on the outlet plate was also provided, and upon moving in all new students are given a tour of the sustainable features within the suites by the resident advisors so they understand how to best use them.

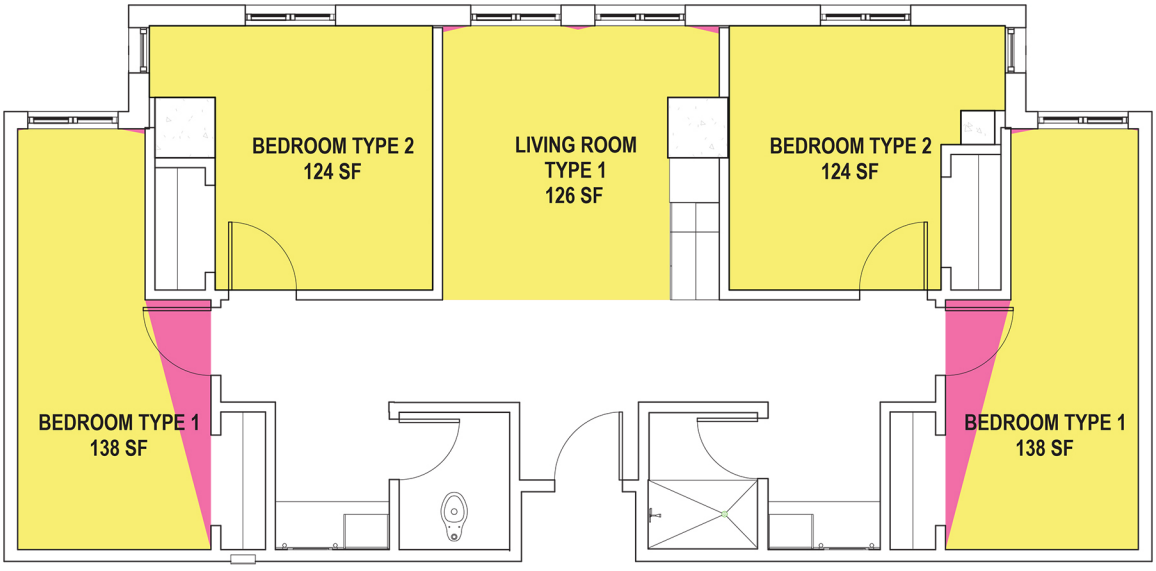
After much deliberation, the College decided to install a mechanical HVAC system, which they felt would be used as a last resort by students on those days when the outdoor temperature is in the triple digits and neither opening the window nor turning on the ceiling fans located in the suite bedroom, living room spaces, and public lounges would offer the necessary cooling needed. A four-pipe hydronic fan coil HVAC system was selected with tempered chilled and hot water distribution pumps and condenser water connected to reset controls which operate based on building load, outside dry-bulb temperature, and outside wet-bulb temperature respectively, thereby reducing the system's heating and cooling needs significantly. Since over 80% of the project can be naturally ventilated with operable windows, to insure that the mechanical system would not be running when windows are open, a low-voltage sensor was placed within the mullion frame of each window that triggers a disconnect at the fan coil unit serving the space when the window is opened. The low voltage wiring that is running from the window sensor at the building perimeter to the fan coil unit located nearly

Glass storefronts, shaded by roof overhangs and sunscreens, enclose portions of the double-loaded corridor and enhance the visual connection to the outdoors. Operable windows provided both high and low allow natural ventilation and upward airflow.

Typical suite bedroom. 4-ft. wide × 5-ft. tall windows provide a wealth of natural daylight and visual connection to the outdoors. Ceiling fans and operable windows with sensors that turn off the mechanical system when opened encourage the use of natural ventilation over air conditioning.

Typical suite living room.

Typical suite bedrooms and living room daylight/view study diagram (yellow zones represent extent of floor area with direct daylighting and views within 15 feet of a window).



20 feet away in the suspended ceiling near the suite entry had to be carefully routed inside highly flexible "smurf tube" conduit from the head condition of the window opening through the precast panel and to the nearest perpendicular interior wall partition without making more than three 90 degree elbow turns. This design feature involved a significant amount of coordination between the window manufacturer, the precast concrete wall fabricator, and the subcontractor who was installing the metal studs for the interior wall partitions since the inside face of the precast panels is exposed to view and the bedroom and suite common rooms do not have suspended ceilings. But in the end it gave the College the peace of mind needed to install the HVAC system without feeling too much guilt.

After occupying the building for one year, real-time metering results made available to the entire College via flat screen display monitors located in the main lobbies and a corresponding dashboard included on the College website showed that the actual annual energy consumption has been reduced by 22% as compared to the California Building Code (CBC) Title 24 Energy Code. The project performs 49% better than the ASHRAE 90.1-2004 Standard and the energy use intensity (EUI), including the on-site renewable energy contribution which was not operational for the first four months of assessment, equaled 53.47 kBTU per square foot per year, for a 40% reduction from the national average EUI value for a student housing building type.

INDOOR ENVIRONMENTAL QUALITY

The indoor environmental quality measures that Pomona prioritized included access to daylight, operable windows, natural ventilation, materials selection, and acoustic comfort.

Daylighting

Over 95% of all regularly occupied spaces in the project use daylight as the dominant source of light during daylight hours and have a direct line of sight view to the outside within 15 feet of an operable window. The public areas within the buildings such as the lounges and study rooms are all located along the perimeter of the floor plan and enclosed by floor-to-ceiling glass storefront systems with operable sections to provide a strong visual connection with the outdoors and surrounding landscape as well as reduce the reliance on artificial lighting. Each suite bedroom and shared common room is also placed at the building perimeter and has at least one 4ft.-wide × 5ft.-tall operable window (each common room has at least two) providing a wealth of natural daylight deep within the floor plate. Ceiling fans are also located in all rooms with operable windows to help circulate air as well and moderate thermal comfort.

Materials Selection

Materials were selected for their durability, resource efficiency, and effect on the indoor air quality. Over 18% of all building materials used are recycled, including the PVC roofing membrane, exterior copper elements, aluminum glazing systems, wood doors, carpet, and ceramic tile. The countertops throughout the project are made from either 100% recycled cardboard paper within the suites, 100% recycled plastic containers in the laundry rooms or a terrazzo-like mix made of recycled glass bottles within the lounge kitchen areas. 24% of all materials were regionally harvested within 500 miles of the project site and manufactured to reduce embodied energy and carbon footprint by shortening shipping distances. 72% of all wood products used are FSC-certified, including all exterior rooftop planter boxes, pergola, and trellis members, as well as all interior wood ceilings, millwork, wall base, door trim casing, and

window sill members. There are no products with added urea-formaldehyde and paints, sealants, and adhesives used throughout the building have either low or zero-VOCs. In general, the interior floor finish is a 3/8″ thick cementious topping with integral color, but for acoustic purposes the circulation corridor and lounge areas have wall-to-wall carpet tile installed with a floating floor method using 3-inch square adhesive stickers on the back side of each tile at the corners and midpoint along each side to connect the tiles to each other and provide dimensional stability without using any glue. The installation method is a faster, cleaner, and more earth-friendly alternative to traditional carpet spread adhesives and completely eliminates the odor and drying time. There is also greater flexibility long term with respect to selective tile replacement and/or accessing the subfloor as needed, both of which were major concerns for the housekeeping and facilities management departments.

Recycled aluminum glass storefronts are veiled behind custom terracotta horizontal "plank" sunscreens.

During construction the contractor implemented an Indoor Air Quality (IAQ) management plan to protect porous materials against moisture exposure and pollutant contamination and prior to occupancy a complete building flush out occurred with all finish materials installed and furniture in place lasting just under 60 days. The flush out involved circulating 14,000 cubic feet of outside air per square foot of building area while maintaining an internal temperature of at least 60°F and relative humidity no higher than 60%. This was relatively complicated to

The Pomona Hall two-story public lounge with FSC-certified wood ceiling and millwork, energy-efficient lighting connected to automatic daylight controls, exposed concrete structure, and recycled carpet tile flooring.

The Sontag Hall rooftop garden terrace with views of the solar thermal domestic water heating system and the San Gabriel Mountains to the northeast. The terrace includes recycled concrete pavers with a high Albedo, or light reflectance, to prevent heat island effect and are installed on a pedestal system to allow for conventional sloped roof drainage below. All exterior wood is 100% FSC certified.

complete because the flush out occurred between late February and late April, which is typically the rainiest time of the year in Claremont, and so as a counter measure the contractor also installed oversized fans through out the building to help circulate warm air throughout and minimize the internal humidity.

Acoustical Design

Acoustic privacy was initially addressed through the space planning of the suite layout. Private student bedrooms were buffered from the public circulation corridor by placing the private bathing facilities along the hallway in addition to providing double stud wall partitions with a minimum STC 50 rating. Horizontal sound isolation between floors was achieved by installing a 3/8″ thick cementious topping slab with a STC 50 rating over the 8″ thick post-tensioned concrete slab. Initially the topping slab had been designed with a 1/16″ thick acoustical non-woven fabric underlayment to specifically address foot fall or impact noise by creating a void and physically separating the topping finish from the floor slab; however, after a full-scale room mock-up was erected within one of the bedrooms the design team performed a series of tests to assess the performance and concluded that the felt underlayment resulted in a floor that was too acoustically bright from within the space (think of tap dancing feet) and so they decided to forgo the underlayment altogether.

EVALUATIVE FRAMEWORKS

How LEED was achieved—from Silver to Platinum

One of the challenges of any rating system is determining what a realistic certification goal is relative to the realities of a project like the budget, location, and schedule. The College's Green Building Standards mandated that we obtain LEED-Silver certification (the school has since increased the requirement to LEED-Gold) and the project budget and schedule took this into consideration;, however, as the first residential housing complex constructed on campus from the ground up in decades and in response to hearing prospective students ask more and more about the school's position on and commitment to sustainability, the College really wanted to aim higher and so the design team postponed evaluating the project against the LEED checklist scorecard initially in an attempt to think more holistically in terms of what kinds of sustainable measures we might want to consider implementing despite the number of LEED credit points (if any) they would receive.

Very early on the design team reached out to our sustainability consultant, CTG Energetics, and asked them to prepare a draft report analyzing the project and identifying the possible measures we could implement irrespective of the LEED scorecard. We then made numerous presentations on campus to the design task force; to students in an open forum setting during their dinner and late night snack sessions; and to the Board of Trustees to better understand the College's actual level of commitment: what the College and all of the project stakeholders actually wanted to pursue and what they felt comfortable in assuming ownership over the long term. The College initially expressed an interest in being as green as possible; however, after reviewing the list of design measures we could implement, they also stated that they did not want to be "trailblazers" when it came to testing out new technologies. As a result, certain measures, such as installing "Gravity Film Exchanger (GFX)" grey-water heat recovery devices on shower wastewater drainpipes was rejected because of the lack of tested

assemblies already in place. The College also opted out on upsizing the toilet exhaust ducts and roof top fans to accommodate a building night flush because they felt the occupants would be unreliable when it came to opening the operable windows at night. Despite these two issues when the design team completed the LEED NC v2.2 checklist scorecard with a total 47 points the results showed that the project could comfortably pursue LEED-Gold and even possibly LEED-Platinum certification depending on whether the College would commit to pursue five or more credit points.

Over the course of design development, construction documents, and even during construction, the College made adjustments to their thinking here and there based on the project budget and schedule and what they felt to be the best value for the project long-term and consistent with the College's sustainable mission as opposed to selecting credits that might be considered low-hanging fruit, like purchasing green power. The additional credits included enhanced commissioning of the MEP systems (EAc3); developing a measurement and verification plan to assess energy conservation over time (EAc5); instructing the contractor to perform a building flush-out prior to occupancy (IEQc3.2); agreeing to implement a thermal comfort survey within a period of six to eighteen months after occupancy and a correction plan if the survey results indicate that more than 20% of the occupants are dissatisfied (IEQ7.2); several Innovation in Design credits for exemplary performance in construction waste management; reducing potable water use in process and non-regulated water consuming fixtures; and implementing a green housekeeping program helped to increase the point total to 53. All in all, every point pursued received full credit with only four design application credits and nine construction application credits requiring additional information and/or clarification prior to the USGBC approving compliance, and as a result the project has the distinction of being the first LEED-Platinum certified student residence hall in the state of California.

Lessons Learned—Keys to a successful project

Overall the design of the project went fairly smoothly and there were few bumps along the way, but as with any project regardless of the size, scope, or client, we have found that those kinds of results are only possible when you keep sight of the following:

- Assemble the team early and have all stakeholders commit to staying engaged throughout the design process. It is important to include all the necessary parties needed, including end users, so that voices may be heard, ideas can be shared, and expectations can be properly managed.
- Know what the project goals are, restate them often and spend your time on where it matters most to the client/end user.
- Keep an open mind and be receptive to new ideas. Don't be afraid to explore many different options early on in order to assess which solutions are most appropriate for your particular project and don't discount an idea just because it comes from an unexpected source—areas of opportunity can come from just about anywhere.
- Don't underestimate the value of green features to the client, the end user, the community, and to the people involved with the project. Even if a client doesn't specifically state that they are interested in sustainability, most likely they are to some degree, so ask early and ask often what their goals are relative to the project design, schedule, and budget.

CONCLUSION

Pomona College's mission to create an intimate residential campus where students and faculty are gathered together to form a tight-knit community focused on enrichment, learning, and empowering individuals to make a difference for the greater good helped to establish a clear roadmap for creating a project that would reflect those values and made the task of implementing sustainable strategies easier to accomplish. A post-occupancy evaluation conducted a year after the buildings were fully occupied revealed that initial estimates on energy and resource reductions were being exceeded and that the student body living there has demonstrated change in their behavior as it relates to living more sustainably. The project has also been the focus of several student thesis studies and served as a tool in assessing both building performance as it relates to energy consumption and its impact on human behavior. By focusing on the goals of designing an environment to support the Pomona community and its culture; fostering the spirit of place and embracing the context of the College's setting; and creating a community of learning; the design team was able to create a student housing project that not only received the first LEED-Platinum certification in the state of California, but more importantly, serves the Pomona community and will continue to facilitate sustainable living well into the next century as planned.