Achieving Visible and Invisible Means to Serve Institutional Renewal Energy Goals

CO Architects — LOYOLA MARYMOUNT UNIVERSITY
Life Sciences Building

Creating a Green Roof

The new Life Sciences Building at Loyola Marymount University is part of a long-term campus master plan that will require larger buildings in order to allow for growth. As a response to the potentially adverse effects of densification on the environment and on the landscaped character of the campus, the design team planning the project introduced a large green roof. This landscaped plane, folded up to allow program space underneath it, still allows the space between the new building and the existing engineering building to feel open.

In addition, the green roof acts as an external means of circulation connecting all three floors, similar to external stairs and walkways all around campus. Access to views, nature, and outdoor spaces is provided on all levels benefitting both building occupants as well as surrounding campus goers.

The proposed 'extensive' green roof, measuring approximately 14,000 sf, is mainly composed of a pre-grown, tray system with four inches of growing medium. The majority of the planting is comprised of sedum types, interspersed with varieties of California wildflowers, for areas not accessible to occupants.

The base of the roof, as it folds up from the ground plane, will be planted with low water use grass and populated with benches to encourage pedestrian use. As a destination, another area of native grass will be provided at the top of the green roof for seating and relaxation with views over the campus.

From a sustainability point of view, the green roof will greatly reduce the urban heat island effect and improve air quality. It will retain more rainwater than conventional roofs and reduce the speed at which water is released back into the storm water system. A green roof will also provide additional thermal insulation which can lead to energy savings for heating/cooling and contribute to points for several LEED credits.

In addition, Biology and Natural Science departments in the new building are planning on using areas of green roof as a teaching tool for botany and environmental studies. Overall the green roof will help create a more pleasant learning and teaching environment for students, faculty, and staff.

Identifying Building Zones & Using Chilled Beams

Laboratory buildings generally use a lot more energy than other campus buildings. This building is no exception, but it benefits from relatively constant outside air temperatures.

To take advantage of the mild climate and offset the increased energy use, the design team separated the building into zones with different approaches to ventilation and cooling.

One zone, with faculty offices, conference rooms, study areas and corridors, is supplied by a displacement ventilation system. This provides air at low velocities and slightly higher temperatures compared to typical cooling systems, allows for energy savings due to reduced fan speeds and cooling requirements, and makes operable windows in offices and conferences rooms feasible. Another zone, which includes laboratories and support spaces with a very high density of fume hoods, is supplied purely by a traditional VAV reheat system.

The last zone, which includes laboratories and support spaces with a low density of fume hoods, combines a VAV reheat system with active chilled beams. These beams directly offset sensible heat loads while latent cooling is provided by the central air handling system. They contribute directly to energy savings by inducing and re-circulating room air, thus reducing fan and reheat energy.

In addition, active chilled beams, coupled with the VAV reheat system, provide the flexibility to customize the ventilation and cooling approach for each laboratory space. By directly offsetting some of the building's impact on the environment, chilled beam systems also enhance the approach to sustainability for the project.

Exploring Solar Thermal vs. Photovoltaic

At about sixty feet above grade, the overall height of the new Life Sciences Building at Loyola Marymount University exceeds adjacent buildings by approximately 10'-15'. A sloped canopy, floating just above the roof level floor line, visually reduces the scale of the building and helps to tie it back to its surroundings. In addition to hiding rooftop mechanical equipment as well as shading terraces and landscape areas below, this canopy also presents an opportunity for a 20,000 sf solar array. The university and the design team are now in the process of comparing Solar Thermal and Photovoltaic Systems to determine which is most suitable for the project.

A Solar Thermal system appears to require more building infrastructure in comparison to a PV system. The Solar Thermal panels are very heavy when filled with water, about four times the weight of PV's. This can have implications on the primary structure. The system also needs additional lines to be piped back through the building (or campus) domestic water loop and can require more storage tanks and pumps.

On the other hand, PV panels are thinner and relatively lightweight but require wiring as well as sizeable inverters in the building to convert DC power to AC power. They have more flexibility to be installed at lower angles facing the sun without adverse effects on performance.

However, PV panels are a lot less efficient and use only about 15%-20% of the sun's energy, compared to 70%-80% for Solar Thermal. PV panels also include a lot more embodied energy due to the intense manufacturing process of silicon based products.

Loyola Marymount University's extensive renewable energy goals include both Solar Thermal and Photovoltaic systems. The campus also benefits from an efficient, natural gas-powered central plant supplying domestic, heating hot water and cooling chilled water. As a laboratory building, this particular project has very high electrical load requirements and relatively small domestic hot water demand.

Generally, the design team's approach to sustainability is to try and offset as much of the buildings impact on the environment at its source. Water heated by a Solar

Thermal array mainly would be going back into the campus domestic hot water loop and only offset a reduced percentage of natural gas used by the central plant. At up to 300kW DC, a PV array could directly offset about 30%-35% of the building's electricity demand. State incentives and local utility rebates that significantly reduce costs, and the potential contribution of 3 LEED points are currently also weighing in favor of a Photovoltaic array.

A final decision, however, has yet to be made.

As a large Jesuit University, Loyola Marymount University does not view sustainability as a burden, but rather as a moral imperative to save the planet and to do what is right for future generations. The planning for their new Life Science Building is a means to honor that imperative. ■