
Teaching and Research Winery
and the **August A. Busch III Brewing**
and **Food Science Laboratory**

Flad Architects

“Moving in here, we’re 10, 15, even 20 years ahead of where commercial wineries are. The hope is that since this has been designed in a flexible way as a platform for innovation, we can be constantly ahead of the industry.”

David Block, Biochemical Engineer and UC Davis Vice Chair of the Viticulture and Enology Department

Program

insights

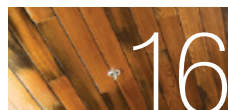
Contents



**Programs Winery
Brewery / Food**



Instructional Areas



**Communication/
Interaction**



**Access and
Material Flow**

R&D Magazine
2011 Lab of the Year
– High Honors

WBF

A Showcase for Institute Programs

The WBF truly completes the Robert Mondavi Institute for Wine and Food Science (RMI). Made possible by the gift of a generous donor, the facility fulfills the university's ambitious vision: to set the standard for global innovation in wine and food sciences education, become a leader in industry research, and model sustainable production practices for its corporate counterparts.





Key Objectives

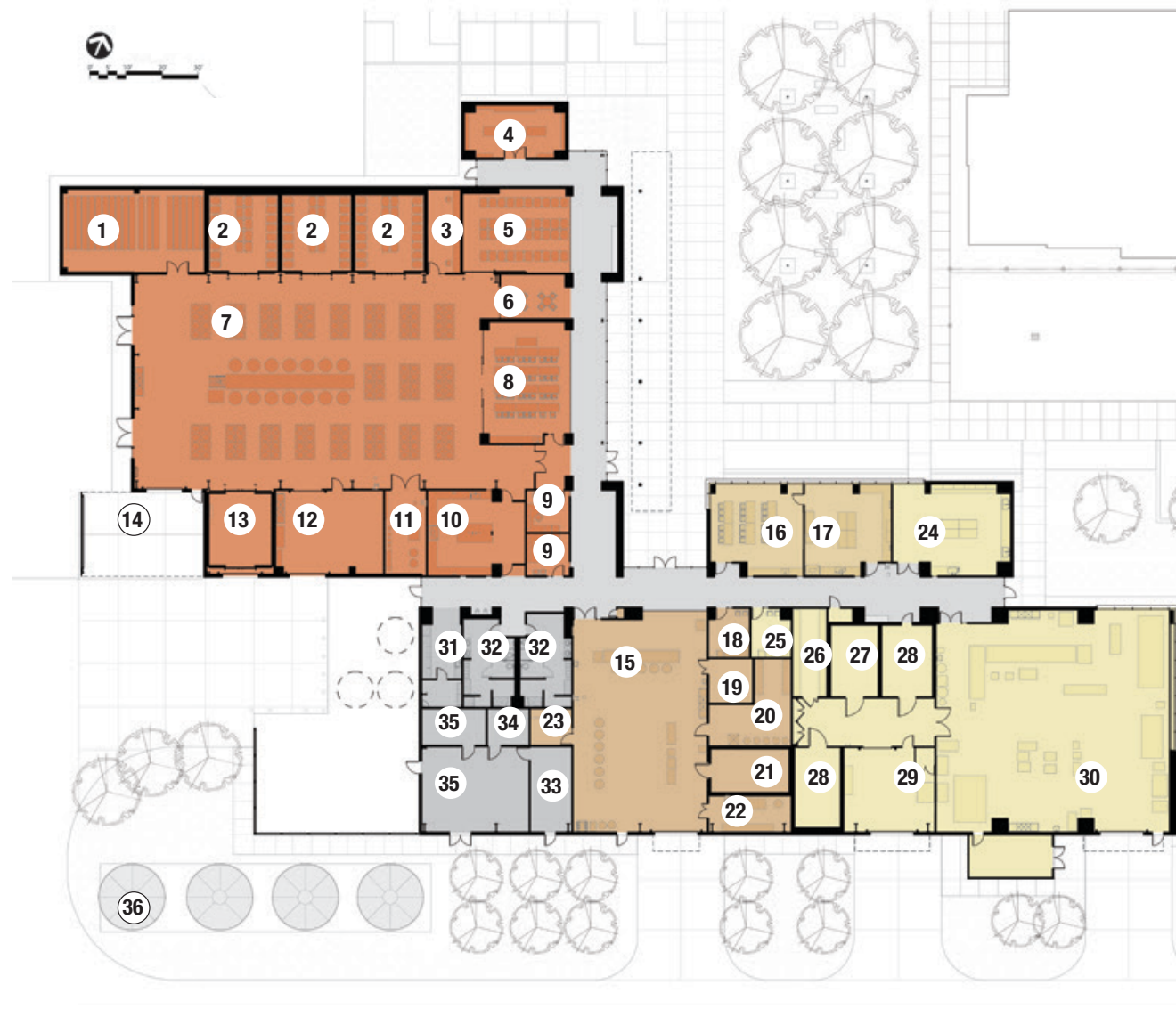
- **Provide distinct, clear identities for the Departments of Viticulture and Enology, and Food Science and Technology.**
- **Create a sophisticated learning environment for future industry leaders.**
- **Showcase the most advanced process technologies.**
- **Accommodate future program growth with an expandable building design.**
- **Physically connect research and production through a demonstration vineyard.**

Planning the Facility

The WBF includes process facilities for brewing, wine-making, and food production, supported by testing laboratories and classrooms. While researchers in each field have a common background in industrial chemistry, the individual demands of their specialties required specific spaces and equipment. Therefore, all the researchers working in the facility were invited to participate in design discussions.

Since these researchers also have a great deal of experience with private sector production, they were invaluable partners in developing innovative, highly efficient environments that could ultimately be translated to large-scale production in their parent industries.

In planning for the facility, each program component was scrutinized — ensuring that it would function well individually and would work in harmony with the building as a whole.



WBF Organization

The south wing of the complex houses the August A. Busch III Brewing and Food Science Laboratory, including a brewery, general foods processing plant, and milk processing lab. The north wing is home to the teaching and research winery.

Laboratory Safety

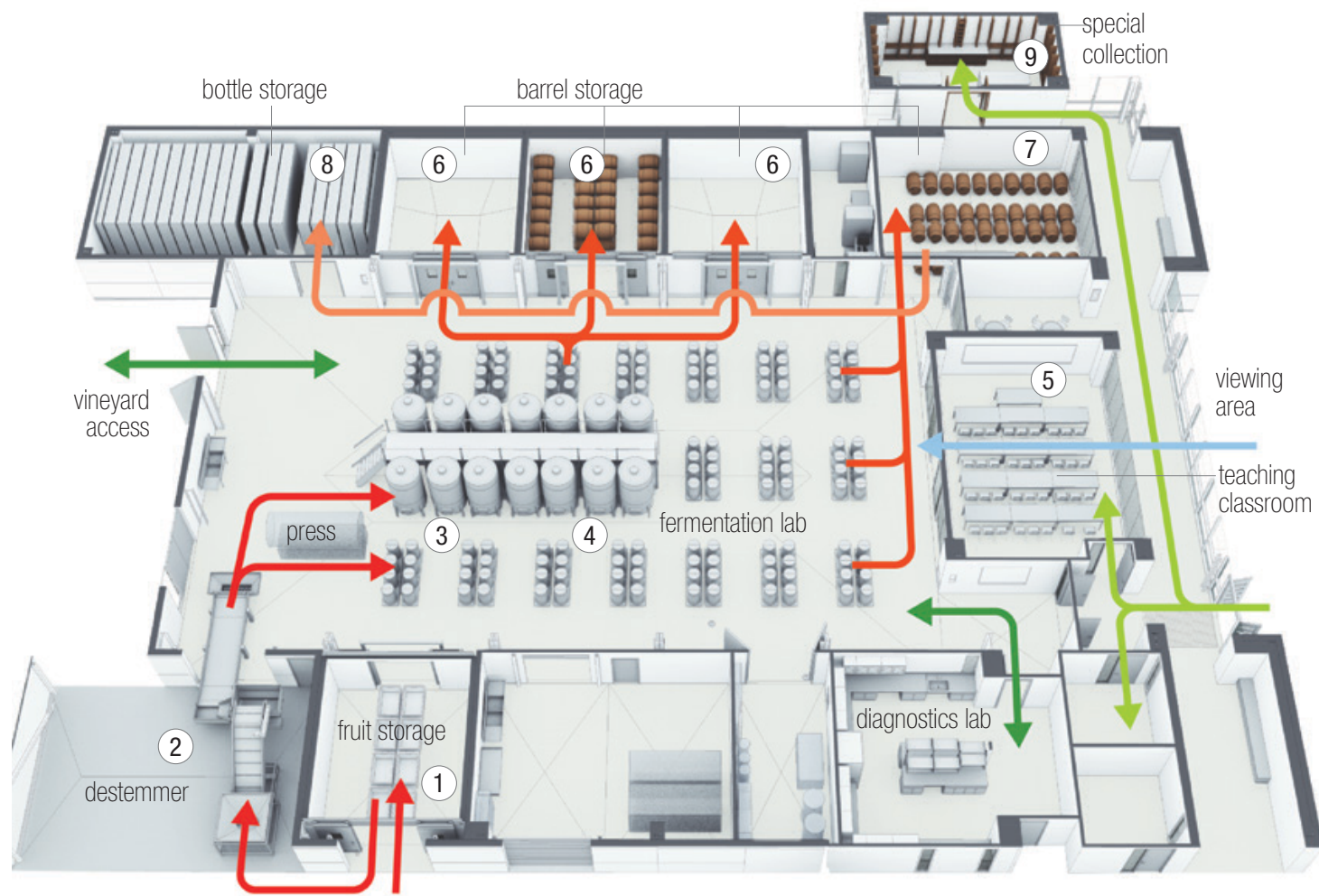
Lab safety features throughout the facility include eye wash stations and emergency showers, which meet both campus and OSHA standards. In addition, wet process area floors have a two percent maximum slope, ensuring both good drainage and safe working conditions. To preserve air quality, the fermenter capture system purges carbon dioxide from the fermentation halls.

Laboratory Process Flows

Clear, sequential process flows enhance the production processes, resulting in efficient, logical work spaces.

The following three pages discuss components of each major program area.

Floor Plan Key	Wine Lab	Beer Lab	Food Lab	Support
	<ul style="list-style-type: none"> 1 research bottles 2 cellar 3 data 4 special collections 5 long-term barrels 6 break 7 winery fermentation lab 	<ul style="list-style-type: none"> 8 classroom 9 office 10 diagnostics lab 11 CIP 12 equipment 13 fruit cellar 14 crush pad 	<ul style="list-style-type: none"> 15 brewery lab 16 classroom 17 diagnostics lab 18 office 19 mill 20 dry storage 21 cooler 22 clean-in-place 23 write-up 	<ul style="list-style-type: none"> 24 dairy lab 25 office 26 dry storage 27 freezer 28 cooler 29 equipment 30 general food processing lab



Laboratory Flows

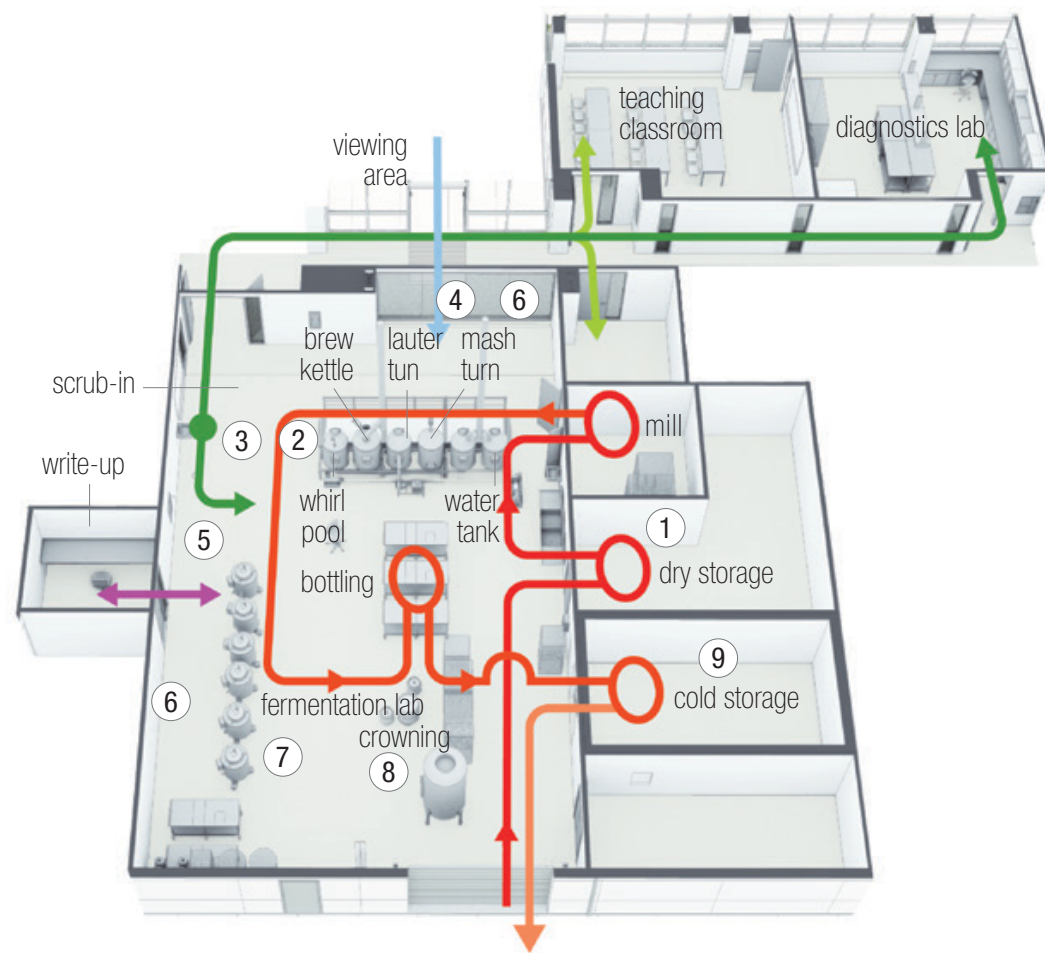
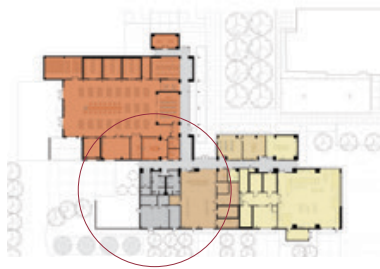
- Red = Process Flow
- Orange = Product Flow
- Dark Green = Researcher Flow

- Light Green = Visitor Flow
- Blue = View Corridor

Teaching and Research Winery

The winery functions as both a classroom and a laboratory, so UC Davis can educate students while conducting research that will lead to industry innovations. Currently, 50 students are enrolled in the master's degree program in viticulture and enology.

- ① 120 tons of grapes are received and processed during the academic year. In a 24-hour period a maximum of 16 tons can be cooled from 85°F to 50°F.
- ② Shaded crush pad accommodates a bin dumper, sorting table, de-stemmer, and conveyor up to the top of the fermenter for red wine. White grape juice is pumped from the press to the fermenter.
- ③ Mobile press can be located on the crush pad or in the fermentation hall, depending upon process.
- ④ 152 research fermenters (55 gallons each) and fourteen 2,000-liter stainless steel tanks used for small research lots and bulk production.
- ⑤ Teaching/multifunctional room has direct access to the fermentation hall. It visually links controlled and public areas, supporting science on display.
- ⑥ Three temperature- and humidity-controlled barrel storage/fermentation rooms act as analytical labs supporting research studies, bottling, and teaching activities. Rooms accommodate 24 single-stack barrels, with a capacity of 225 to 240 liters each.
- ⑦ Up to 40 barrels can be stored here for aging and research. This area is visible to the public and used year-round.
- ⑧ Roughly 80 percent of wine produced in the WBF is destroyed, since the facility is not bonded. The remainder is retained in high density storage, for future research and teaching purposes.
- ⑨ Housing a special wine collection, this area has precise and reliable temperature and humidity controls. It is open for public viewing and wine tastings.



Laboratory Flows

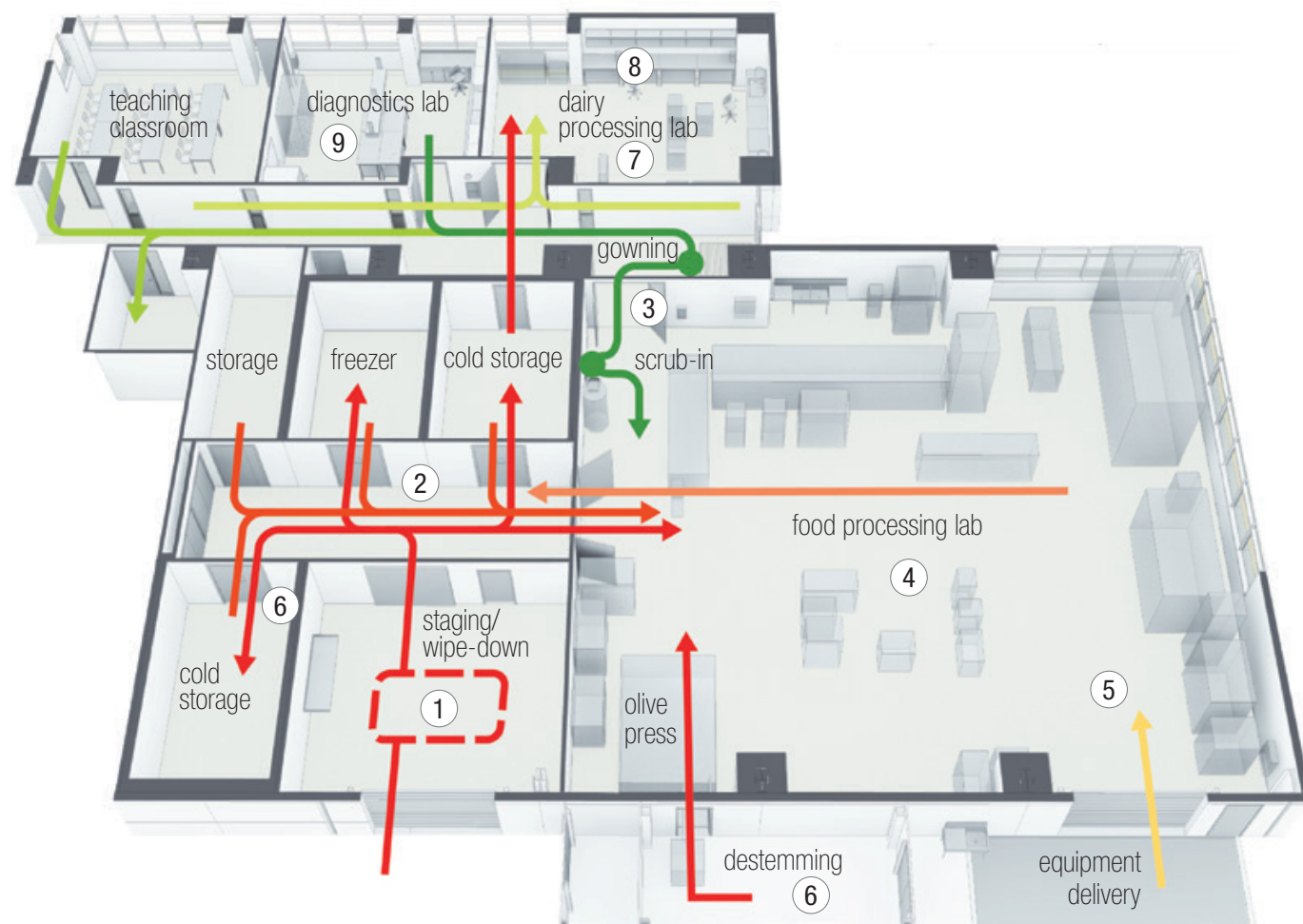
Red = Process Flow
 Orange = Product Flow
 Dark Green = Researcher Flow

Light Green = Visitor Flow
 Blue = View Corridor
 Purple = CIP

Brewing Science Laboratory

In this spacious, flexible, and hygienic environment, students are introduced to common production practices – the foundation for their education in the art and science of beer-making.

- ① Dedicated rooms for material storage and the malt mill, with dust control.
- ② Brew train designed as a 1.5 barrel pilot brewery composed of process water tank, mash cooker, mash tank, lauter tub, brew kettle, and whirlpool.
- ③ Wort cooled by a combination of water and a glycol temperature control system.
- ④ Easy circulation and clear sightlines for viewing instructors and process demonstrations.
- ⑤ Washable epoxy room surfaces support cleaning of all process equipment and process lines, with sloped floors to slot drains.
- ⑥ Strahman hose stations distributed in brew hall for flexible cleaning protocols.
- ⑦ Six movable 62-gallon fermenters with glycol cooling connections allow for relocation when not in use.
- ⑧ Beer packaged with a KHS filler and crowner, using a portable pump for filtration and transfer.
- ⑨ Finished product stored in a temperature controlled room at 29°F.



Laboratory Flows

Red = Process Flow
 Orange = Product Flow
 Dark Green = Researcher Flow

Light Green = Visitor Flow
 Yellow = Equipment Flow

Food Science Laboratory

Accommodating 200 students from 50 undergraduate, and 15 graduate degree programs, the multidisciplinary food processing pilot facility focuses on metabolism, food safety, packaging, and water management of effluent streams.

- ① Material delivered into a holding/wipe down area prevents possible contamination and allows for quality inspection.
- ② Cleaned material enters the food grade environment and is either sent to a storage space or processing area.
- ③ Students and faculty put on personal protection clothing prior to entering food processing areas and sanitize their hands at an electronically operated sink with a HEPA controlled air-blade drying station.
- ④ Flexible, open plan processing hall with perimeter wall and ceiling-mounted, quick disconnect utilities allows for an evolving layout of equipment based on season and pedagogical requirements.
- ⑤ Seasonal equipment rotation is facilitated through direct access from exterior.
- ⑥ Due to intense waste production during olive de-stemming, the process has its own dedicated area. The olives are pressed for oil in the food-grade environment.
- ⑦ A “ballroom” layout (one with perimeter and ceiling mounted utilities) allows flexible configuration for yogurt, ice cream, and related dairy research, where progressive stations are required to reflect manufacturing processes.
- ⑧ Perimeter stainless steel tables can be easily removed so the lab can be thoroughly cleaned.
- ⑨ The diagnostics lab can be easily reconfigured with an overhead service carrier and mobile tables.



Instructional Areas

To prepare students for their future careers in wine, beer, and food processing, much of the WBF mirrors a typical industrial setting. However, the laboratories are specially designed to encourage innovation and collaboration, aided by visual transparency between rooms. The building's sustainable design elements are integrated throughout these spaces – evident in the material selection for laboratory components, the emphasis on natural lighting, and expansive views of the outdoors.

The UC Davis program engages students in “active learning” – through team-based problem-solving in every area of the facility. Experiments are conducted in the fermentation halls and in bench-top labs and then analyzed in classrooms.

Offices and Faculty Support

Few faculty members are permanent residents in the WBF – most of them have offices in nearby buildings. Instead they use unassigned, “open” workspaces in the WBF. Offices for building operators, however, are specifically located adjacent to process facilities and in direct proximity to research and teaching areas. This way the building operators can easily observe lab conditions and ensure that safety procedures are being followed.

Systems and equipment within processing areas may be adjusted to pursue new projects or methods in instruction and research.



Communication and Interaction

The WBF shares conference and meeting rooms in the adjacent RMI complex; however, two rooms provide non-traditional opportunities for meetings. The multi-purpose winery classroom can be used for conferences and training sessions. It can also be opened to the outdoors when hosting special events. The special collections room provides a unique setting for intimate meetings with donors and prospective benefactors.

Student collaboration is primarily project-based; as students learn to use the technology in the building, these opportunities are plentiful. Researchers collaborate with one another on projects in the WBF labs, but also with their counterparts in industry as they translate their findings into real world solutions.

The special collection room accommodates small meetings with donors and prospective benefactors.



Building Access and Material Flow

The WBF can be accessed at several points. The facility's primary entrance welcomes visitors. A pathway crosses the building, connecting faculty to other RMI complexes and connecting students to the main campus. Vehicle access is limited to service and delivery zones at the south and west of the WBF.

As a single-story building, all rooms are accessible. In wet process areas, all floors have a two percent maximum slope, both for good drainage and for maximum accessibility.

While general research materials are received in the central service yard, agricultural products can be delivered directly to the brewing, wine-making, and food science areas. While brewing operations continue unabated, all year round, wine and food production ebbs and flows with the harvest season. In each area, products follow strict protocols for safe food and beverage transport and handling.



Andrew Cunningham, RIBA, LEED AP, Principal, Flad Architects

Andrew Cunningham appreciates the built landscape. Growing up in Scotland, he studied the storied architecture of that country, from its historical monuments to the evolving contemporary architecture. Today he helps shape the landscape of his new home – California – preserving what is historically interesting and important, while planning for a dynamic, environmentally responsible future.

“I’m very proud that, through this LEED Platinum certified design, we’ve had such a positive impact on an entire commercial sector – it illustrates what can be done right now to improve processes, increase efficiency, and mitigate the environmental impact of food and wine production. Perhaps best of all, I know that the students who come through this program, who work and study and learn in this lab, will make even greater advances. With every new discovery, they will have a profound effect on the future of the industry.”

Andrew Cunningham, *Flad Architects*

Mr. Cunningham has more than 25 years of experience with research and development projects for private and public sector clients. He has served as project manager for an array of building types, ranging from pharmaceutical/biotech research and manufacturing plants, to vivaria and specialized containment facilities, as well as academic, retail, hospitality,

and office buildings. The Teaching and Research Winery and the August A. Busch III Brewing and Food Science Laboratory at the University of California, Davis, is his first foray into structures designed for cutting-edge viticulture and food processing.

Flad Architects ■

Flad Offices

Atlanta, GA Gainesville, FL Madison, WI Princeton, NJ Raleigh, NC
San Francisco, CA Stamford, CT Tampa, FL www.flad.com ©2011 Flad