

MACPHAIL FAMILY WINERY

MacPhail Family Winery with a big red barn door open to the fermentation room. The “L” shaped floor plan created an opportunity for outdoor covered work space to receive grapes and convenient access to cool temporary storage in the barrel room to hold grapes prior to processing.

Producing artisan Pinot Noir in proficient workspace

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MacPhail Family Wines has built a proficient winery on a one-acre parcel of land just outside the city limits of Healdsburg, CA. James MacPhail (proprietor and winemaker) created a small and efficient winery in his backyard adjacent to his residence. “This home and winery match my vision. It is located in a winegrowing region with a long history of agriculture and small family farms.”

With a use permit to make only 5,000 cases, it was clear that production would remain small. This is fine for James, who wishes to focus on handcrafted, high-quality wines sourced from small vineyards with limited yields. After making his first six vintages in a custom crush facility 20 miles away, MacPhail realized that the care and diligence he required to make his fine wines would mean building his own facility.

The challenge was to place this highly functional, energy-efficient winery on a one-acre parcel of land shared with a home, detached garage, and all utilities that are common with rural properties, such as septic and water systems. MacPhail was looking for a perfect fit both functionally and aesthetically. The new winery could not overwhelm the residence, the surrounding context, or the quiet rural neighborhood.

Factors affecting the design of a winery include aesthetics, function, production flow, energy efficiency, and life cycle costs. For James MacPhail and his design team, the process was complicated by the size of the parcel on which the winery was to be built.

Challenges of a small site

From preliminary sketches, MacPhail’s collaboration with the architect centered on site placement and production flow, which were critical for the winery to function effi-

ciently while providing privacy for the residence. The 4,200-square-foot structure needed to be compact and practical, leaving few options when deciding where to place the winery. The site had to accommodate a 40-foot bottling truck that would maneuver into position under a covered work area at least once each year.

Vernacular images of rural barns and utilitarian structures became the starting point. The southwest corner of the property became the prime location, as it made use of an existing driveway and parking areas. Pushing the winery to the far corner preserved valuable real estate in front of the winery and the westerly views from the home’s kitchen.

An L-shaped floor plan was chosen to facilitate production flow. The main room of the winery is the fermentation room, where eight six-ton stainless steel and two French oak fermentors are located. Perpendicular to this, with a large glass roll-up door, is the barrel room.



Access from the barrel room to the covered crush pad is through two large doors. Blending tanks are located on the exterior east wall of the barrel room and are close to the bottling truck docking station. A covered work area is adjacent to the lab and barrel room. The lab is located on the northeast corner of the fermentation room, a central location to receive samples and for visual control of the property's entrance.

The design blends in with the rural farmland setting and integrates with existing structures on the property.

The winemaker's approach to winemaking

Understanding winemaking and the procedures involved helped to inform the design process for the new winery. MacPhail makes only Pinot Noir from grapes sourced from quality vineyards in the Sonoma Coast and Anderson Valley appellations. Working with growers who share his commitment to sustainable farming practices, his goal is to produce premier wines from single vineyards. A non-interventionist approach is grounded in the belief that extraordinary wines come from extraordinary grapes.

Artisan methods used to create MacPhail wines include hand-sorting of the fruit, first in the vineyard and then on the crush pad. Grapes are de-stemmed without crushing and fermented in small lots. Only native yeast is used for primary fermentation, with a boost of a commercial yeast for completion.

All punch-downs are done by hand and the wine is moved by gravity to barrel, where malolactic fermentation is completed. The wines are aged "sur lies" (on the lees) and stirred for flavor extraction (*batonnage*) prior to bottling. To achieve the desired richness, the winemaker chooses not to fine or filter the wines.

Adjacencies, placement, production flow and, proximity were key to the harmonious flow of winemaking from crush to bottling. The length of the fermentation room was in direct response to the size and quantity of the stainless steel fermentors required. Since this equipment is used only once each year for a brief period, the fermentors were placed on an outside wall, which allows the center of the room to remain open. The winery reflects MacPhail's minimalist approach to wine production.

Sustainable building elements

A steel frame was chosen because it is efficient, fast to erect, and cost-effective. Steel frames generally use fewer structural members and span greater distances than conventional wood framing. In addition, MacPhail wanted to limit the use of wood whenever possible to avoid the possibility of contaminating the winery with molds. A high percentage of the content of steel framing is recycled and considered a sustainable product.

Preliminary design ideas considered solar orientation, shading, daylighting, and natural ventilation. Quality windows and good insulation play a key factor as part of the building's envelope and lead to considerable energy savings. Such simple sustainability and energy-saving features were incorporated by the design team, which included mechanical engineer Paul Larkin of Larkin & Associates (now merged with Guttman & Blaevet Consulting Engineers in Santa Rosa, CA).

As a proponent of "integrated design," Larkin explains that efficient building design and orientation are essential, and together with passive energy systems, establish the energy



The crush pad with P&L Specialties conveyor and sorting table for careful hand-sorting of grapes. Glycol jacketed blending tanks line the outside wall of the barrel room.

profile of a project before mechanical conditioning systems are applied.

Solar systems

Incorporated into the winery’s design is correct solar orientation, solar shading, and the use of cool roofs (see below). The completed structure features an efficient, insulated panel wall and roof system, with orientation and window placement to minimize solar heat gain. South-facing roof areas are suitable for future solar electric and hot water systems. Installation of solar panels in 2010 should reduce the monthly electricity bill to a minimum.

Cooling and Heating systems

A night-air cooling system for the barrel storage room uses night-time ambient air to cool the thermal mass contained in the barrels of wine, which, in turn, minimizes the need for mechanical cooling. This is accomplished with a single exhaust fan placed high, and some low, motorized air-intake louvers with automatic controls.

The water heating system uses a multi-stage boiler and a small, insulated storage tank, to minimize heat loss. Highly efficient HVAC and refrigeration systems lead to further cost savings.

Daylighting

Natural daylight plays a key role in the winery, which gives the occupant a

feeling of well-being, health, and comfort. The fermentation room has south-facing clerestory windows running the length of the room. A large overhang cuts off any direct sunlight, which helps to avoid any heat gain. High windows in the gable end bring in morning light, and skylights help to give the room a natural atmosphere.

In winery design, there is a delicate balance between the values of natural light and the reduction of heat gain, especially in the barrel room where high thermal containment is necessary.

Cool Roof

Cool roofs consist of materials that very effectively reflect the sun’s energy from the roof surface. They also have high emissivity, allowing them to emit infrared energy. Cool roofs have a high solar reflectance or “albedo,” which helps to reflect sunlight and heat away from a building, reducing roof temperatures. A high thermal emittance also plays a role, particularly in warm and sunny climates.

Together, these properties help roofs to absorb less heat and stay up to 50° to 60°F (28° to 33°C) cooler than conventional materials during peak summer weather, thereby reducing the heat transferred into the building below. This helps to reduce energy costs, improve occupant comfort, cut maintenance costs, and increase the life cycle of the roof.



The 200 square foot lab is located in one corner of the fermentation room, ideal for receiving and processing samples and to greet visitors. The long counter has two functions; everyday lab work, and a place to have guests sample wine.

Wastewater “wetland system”

Heather Shepherd (with The Wallace Group in 2007), designed the wastewater management system to fit and enhance the site while allowing reuse of treated wastewater. With only an acre to work with, the solution was not immediately obvious.

The choices included a traditional septic tank with leachfield, a package plant system with irrigation reuse, or a constructed wetland (CW) with irrigation reuse. The leach field option was eliminated because of limited space



Forklift dumps grapes into one of eight open-top stainless steel fermenters in the 30 foot x 60 foot fermentation room. Natural light enters the room through clerestory windows above the fermentation tanks.



Maximum capacity of the barrel room is 300 barrels. Between the rows of barrels are gravel-filled drain-trenches. Inset: Night-cooling fans and Smart Fog ES 100 humidifier.

and the inability to reuse the water for landscape irrigation. The package plant system would offer irrigation reuse and a small footprint, but would be more expensive and energy-intensive. The constructed wetland became the most logical choice.

With a constructed wetland, the only energy use is for pumping the wastewater. Installation costs are generally less than for package plant systems, and the system itself becomes a landscape feature that can enhance the site. Constructed wetland systems offer both physical and biological treat-

ment mechanisms for a winery's process wastewater (PWW).

The intricate and expansive root systems intercept particulate matter from the PWW while providing a scaffolding for microorganisms that break down the dissolved constituents in the PWW. Energy to drive the system comes from the sun, and the treated water can be reused for landscape irrigation.

The constructed wetland is 12 feet wide and 54 feet long and designed to manage the PWW from up to 5,000 cases of wine per year. The treated



The constructed wetland was designed to enhance the site as a landscape feature and provide a system to allow the reuse of treated wastewater.

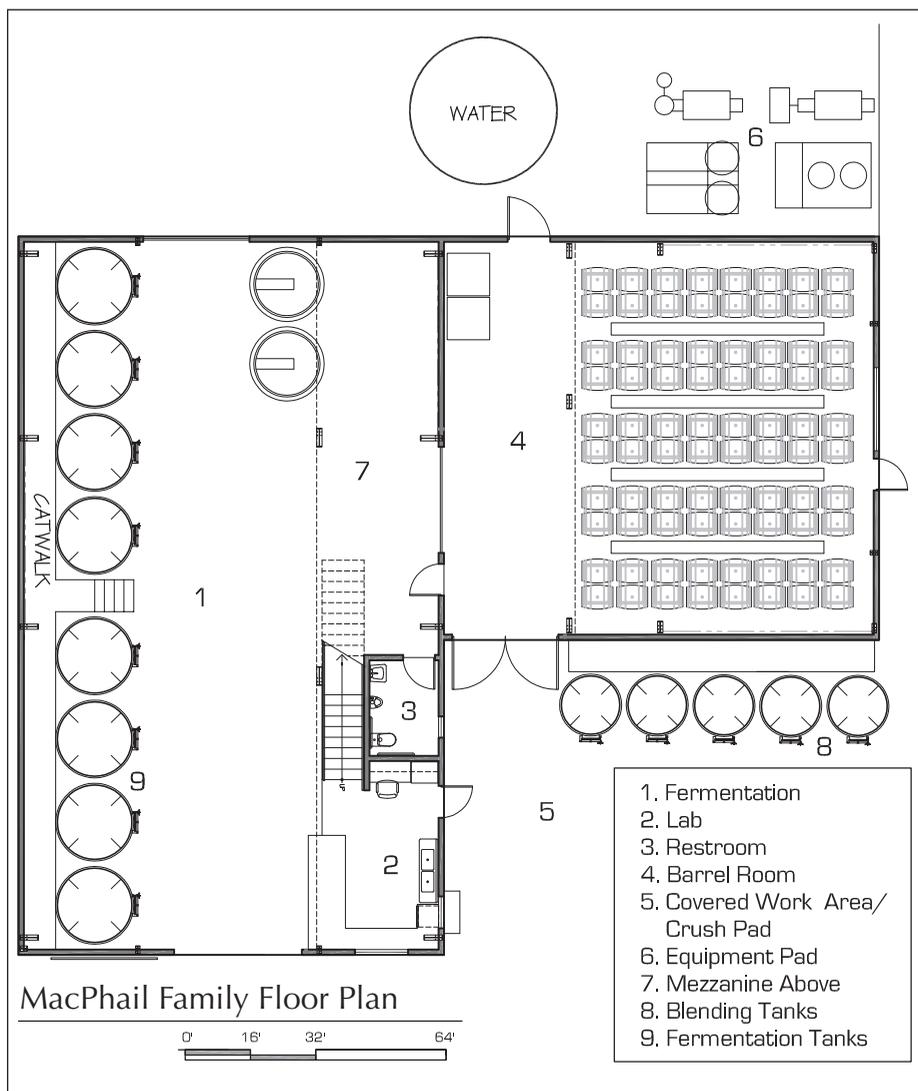
PWW is stored in a 3,000-gallon tank to avoid irrigation during winter storms and to meter out the water for irrigation use during the dry seasons. This treated water provides up to about 75% of the landscape irrigation needs for the property.

Maintenance for the constructed wetland includes adjusting water levels during the first year or two of operation. Once the plants are established and the ideal water level attained, annual trimming of plants is required. Semiannual inspection of plants, irrigation lines, and the tank are necessary to ensure proper function, and occasionally some plants may need replacement.

NOTE: Heather Shepherd is part of the Sustainable H₂O Solutions consortium of four dedicated to providing water solutions for a sustainable future. E-mail contact: sustainableH2O solutions@gmail.com.

Conclusion

Two harvests are now complete at MacPhail Family Winery and the facility is functioning well. The success of the design is a testament to the importance of collaborative planning and working with an owner who has a vision. ■



Practical Winery & Vineyard

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