

Blending Vintage Wine with Building Science:

Reserve These Tannin-Techniques to Ensure Your Cellar's Body Has Legs

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I love wine. People think I must know something about the stuff because I drink a lot of it. I don't really know much, but I do know what I like: red, French, and with a cork. Most of the questions I get, I have no clue about, so I make up stuff—I am a consultant, after all. But I know how to store the stuff.

Here is the magic formula for storing wine: 55° F at 70 per cent relative humidity. Where does that come from? Old French guys.¹ That is not the temperature you should drink it at but the temperature and relative humidity you should store bottles at. Drinking temperatures are more difficult to pin down. There is no consensus; it varies by type of wine and which nation produces it.²

The colder you store wine, the longer it will last. So why not store it colder? We want it to *age*, which means we want chemical reactions to continue in the bottle for a long time. If it is too cold, these reactions don't happen. There is a difference between “preserving” wine and “aging” wine.

How did the French pick 55° F? Tradition, mostly. Wine was stored in cellars—that is why we call them *wine cellars*. If you have a



A French Chateau's cellar is the traditional place to store wine, as it remains at the accepted 55° F naturally.



A professional at work in the wine cellar.



Barrels need higher humidity conditions than bottles.



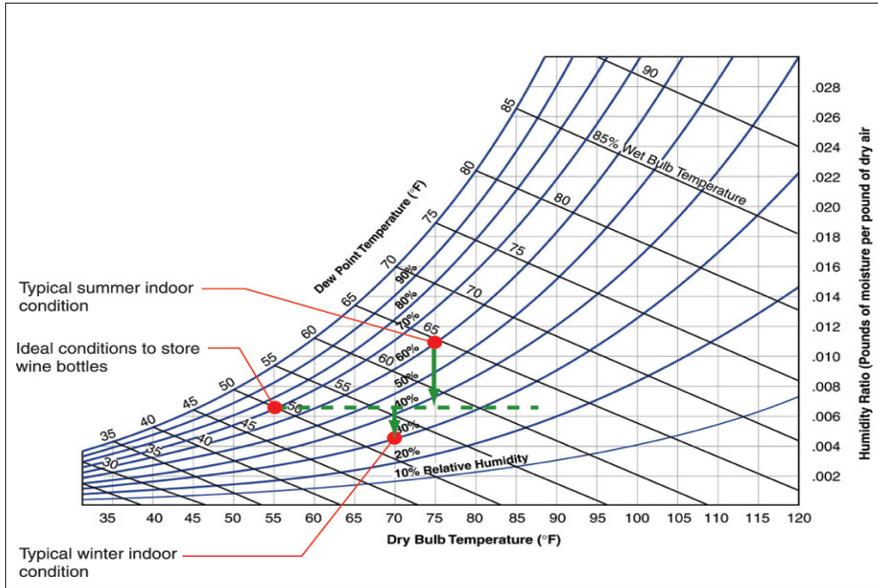


Figure 1: The typical indoor conditions in both summer and winter in North America. Vapour flow occurs into the wine cellar during the summer and out of the wine cellar during the winter.

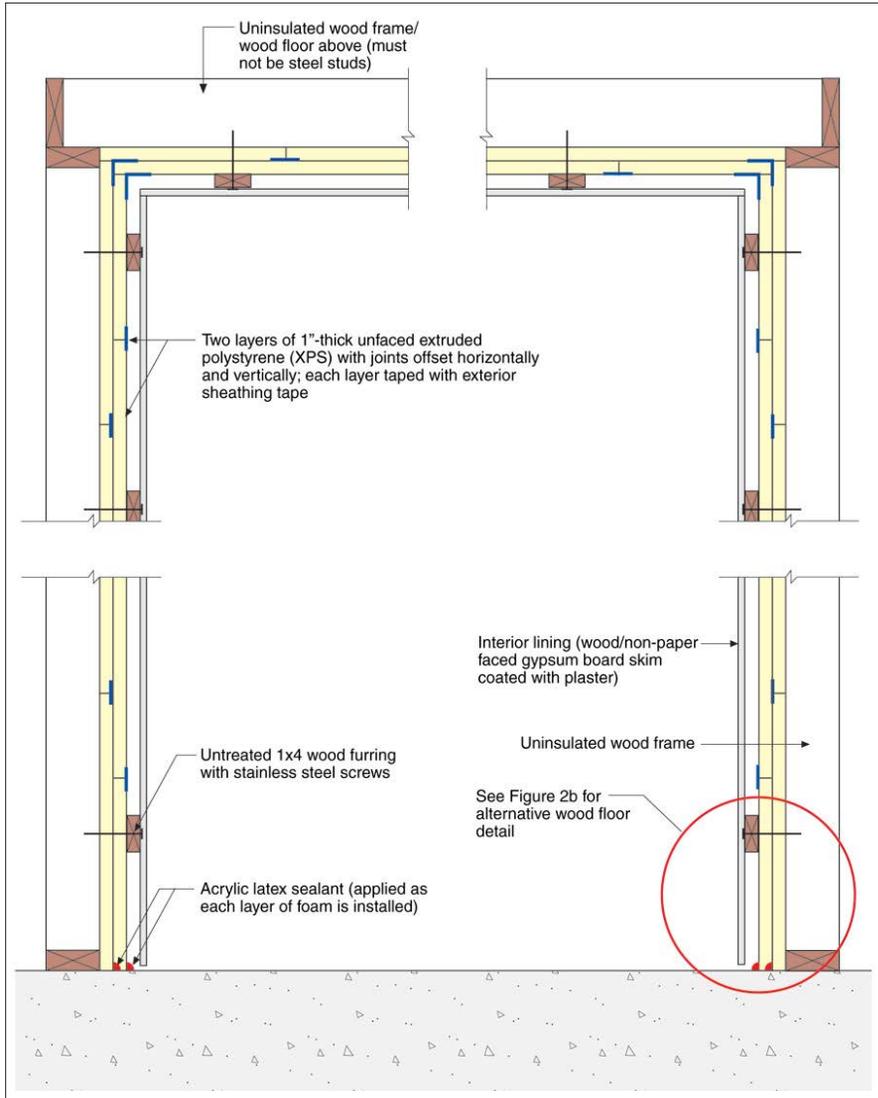


Figure 2: Bi-directional vapour flow through semi-vapour impermeable extruded polystyrene. Note the back ventilated interior lining and the absence of paper-based materials.

big, old-fashioned French Chateau handy, you will find the temperature in the cellar at about 55° F.

What about relative humidity? Notice, earlier I said “bottles.” Most wine in the Chateaus starts out in barrels. Drinking out of the barrel is complicated—you can’t move them easily to the dining room so you need a guy with a “thingy” (yes, that’s the technical term) that extracts wine directly from the barrel into a waiting glass. The French, the innovators they are, figured bottles made from glass—small enough to carry—would be more convenient.

Why not put wine into glass bottles straightaway? Not so fast. The barrels are made of wood, and the wine needs the wood to be able to taste like wine (read: *good wine*).³ The type of wood the barrel is made of is a big deal. Oak is optimum. French oak is magnifique for French wine, American oak is ideal for American wine, Slovenian oak is preferable for Italian wine, etc.

The barrels themselves are not impermeable. Wood is not a vapour barrier, nor an alcohol barrier, nor an oxygen barrier. Water diffuses out, as does alcohol, while oxygen diffuses in this outward diffusion of water, and alcohol concentrates the flavours, whereas the diffusion inward of the oxygen governs the chemical reactions.

For the wine-making process, it’s important the vapour diffusion outward is controlled—slowed down, but not stopped. This is done by storing the barrels at a high relative humidity. How high? Back to the French, again. A cellar in France has about 80 to 90 per cent relative humidity.

You’re not going to find those conditions in a cellar in California unless you get help from an ASHRAE member. Even with help from an ASHRAE member, you’re not going to get conditions identical to France. You’ll get close, but it will not be the same. You’re going to get California conditions. Therefore, you’re going to get wine that taste differently.

Now, let’s think about the consequences of temperature and relative humidity conditions relating to 55° F and 80 to 90 per cent relative humidity. Great for making wine and storing wine barrels—not so great for the space. Without fail, you’ll get all kinds of mould. Is this mould good or bad? The mould on the walls doesn’t seem to be a problem; it’s how the mould is cleaned that can be the problem. Cleaning with bleach leads to something called 2,4,6-trichloranisole (TCA). If

TCA gets into wine, it becomes tainted. The French don't worry about the mould on the walls in their wine cellars that store barrels. They also never use chlorine in their wineries for cleaning purposes—simply soap, water, and elbow grease. They tend to build these cellars out of rocks and wood rather than paper-faced gypsum board and engineered lumber. It's harder to get mould on rocks and wood than what we use in North America.

In the U.S., particularly California, the zeal to eliminate mould with chlorine led to tens of millions of dollars' worth of tainted wine. I love to watch the French in California, especially near food or a winery—their heads would explode.⁴ We also put chlorine in water. It's not a good idea to have chlorinated water anywhere near a winery or a wine cellar.

The barrels are made of wood, and the wine needs the wood to be able to taste like wine (read: good wine).

What the French do worry about is mould in corks. This becomes more of a problem once we take the wine out of barrels and store them in bottles. Too much humidity, and we get mouldy corks. Too little humidity, and we get dry ones. With a dry cork, air can get into the bottle, and that will lead to spoilage and potential evaporation. That's why wine is stored horizontally, so the wine keeps the cork wet on one side, maintaining the seal.

Why not get rid of the cork and use something that seals better for longer? The only reason we used cork in the first place is because it was the only technology available at the time. It's like the designated hitter rule in baseball: there will never be peace between the American League and the National League. The folks who want to get rid of the cork are American League-types—why use poor technology (e.g., corks), and why watch a lousy hitter (e.g., pitchers)? The folks who want to retain the cork are National League-types—purists and traditionalists.

If we have cork-in wine bottles and want to store the wine, what do we do? Back to the answer at the beginning of this story: 55° F at 70 per cent relative humidity. The 70 per cent

relative humidity is just about the maximum we can maintain without damaging corks. It's also a good humidity to keep the cork from drying out. What's the rate of moisture entry into the cork on the wine side versus the rate of evaporation on the outside-seal side? We have 100 per cent relative humidity on one side and 70 per cent on the other. Seems to work. How do we know? Watching lots of bottles for lots of years.

What do 55° F and 70 per cent relative humidity mean for wine cellars? Well, for the French and their Chateaus, it means they must install dehumidifiers in their cellars if they want to store their wine in bottles with corks and paper labels.

If you don't happen to be French and have a Chateau with a cellar and a dehumidifier, what do you do? You construct a wine cellar using a psychrometric chart and some building science (see Figure 1 on page 14).

To make this work, I need an assembly that handles bi-directional vapour flow. I prefer materials that are semi-vapour impermeable and more-or-less homogenous. That way, flow is slow in both directions, but isn't eliminated in either direction. Figure 2 on page 14 provides a pretty easy way to

construct a wine cellar if you don't happen to have one.

Cheers! ■

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AUTHOR'S MUSINGS

1. Yes, I know other folks also make good wine. However, it is much like asking Canadians about hockey, even though other folks play pretty good hockey. They are the “experts.”
2. For example, ASHRAE legend Ollie Fanger carried around a gold thermometer with him wherever he went to ensure the wine he drank was at precisely the correct temperature.
3. Some wine manufactures do this part of the process in large stainless-steel vessels they spike with wood chips.
4. Memo to the French: the rest of us also think the folks in California are crazy.

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