

# Detailing a Basement Wine Cellar

Last Updated: Wednesday, November 28th, 2018, Created: Wednesday, November 28th, 2018

John wants to create a wine cellar in his basement. Here I have answered him thoroughly enough to perhaps help you detail your own cold room, whether it is under a concrete porch, or just built in the corner of the basement -- trying to deal with the questions of insulation, condensation, vapour barriers and ventilation.

## John's situation

Hi ! Love your show! Building a wine cellar in a small basement area. 5'x17', two exterior walls (insulated, 1 long, one short), 1 long wall running along interior garage (mostly below garage level, and the final short wall accessing the finished basement. The floor is concrete and the ceiling is not finished or insulated with a heated floor above it. There is an electrical box at the far end which will be enclosed but easily accessible. I plan on levelling the floor and installing 1'x2' slate tiles. Insulating the door wall and ceiling (vapour barriers? Leaving the garage wall concrete. Stripping the 2 exterior walls of their gypsum and insulation - concrete wall. I do not plan on putting a cooling unit in. Any helpful advice would be greatly appreciated. Sincerely, John

## Controlling natural cooling

Heat flow (and cooling effects) are always an interesting challenge when we want to basically make a naturally cool storage room. Being partially below ground level and with some exterior walls, the Canadian tactic is usually to lightly protect from the coldest portion of the envelope, use insulation to prevent condensation and use more insulation to protect from the warmest portion of the envelope – hopefully leaving the room slightly colder than desired, and then use a small 500 watt baseboard heater with a wall-mounted thermostat to keep the temperature exactly what we want. Actually the temperature three or four feet below grade is usually close to what we want all year round in a cold room or wine cellar.

My general recommendations can be found by looking up Cold Room in the Search Tab. So how to do that in John's particular room?

## The Ceiling

Often these cold cellars are built under an exposed concrete slab, the front porch – and in such cases we lightly insulate the ceiling, more to prevent condensation on the concrete than to control heat loss. But you have a heated floor above – which probably means that you have a rim joist on the outside walls. The most important here is to totally air seal (caulking or spray foam or caulked Styrofoam boards 1" thick) all faces of the joist area that connect with the outdoors (or with an unheated garage). This is mostly for moisture control. This room will be colder than the basement so any air movement from the basement will establish much higher Relative Humidity in the cold room than in the warmer basement – and we don't want hidden condensation on cold surfaces. The ceiling itself, which faces a heated room above, can be insulated or not with batt insulation and no vapour barrier should be used. Why no VB on the ceiling, because the warm-in-winter side of this face is on the top and moisture will be moving from the top down, so putting a traditional VP over the batt insulation (on the drywall side of the ceiling) could trap moisture, not block it. So insulating the ceiling and how much is a variable element – blocking heat from above if the room is not cool enough. No moisture control needed except on the outside rim joist – but do stop all air leaks.

## Indoor walls

All walls connected to an inside space, usually 2x4 construction, should be filled with batt insulation and covered with gyprock – no vapour barriers – it is basically above condensation temperatures on

both sides of the wall. Yes, we are basically working on blocking heat from getting to the room than from escaping from it. Since all of this is going to be a bit of a long-term experiment of real operating temperatures, we don't really want to mess with walls more than once because you will be building shelves, etc. So R12 in the walls gives us a base to work from. We can adjust heat gain with an insulated or not insulated door, and playing with insulation or not on the ceiling.

#### Outdoor walls

We don't want walls with -20 C surface temperatures – so I would put about 1” of foam insulation on all outside concrete walls from the joist space down to two feet below grade. If you use Extruded Polystyrene (blue Dow Styrofoam, or pink Celfort panels), the insulation itself will resist moisture passage. (Expanded beadboard would require a vapour barrier). Use foam panel adhesive to glue it to the walls (continuous horizontal lines, not blobs -- see Below Grade Walls in my overview of Air Spaces in Walls. Seal all around the edges to the concrete with either the foam panel adhesive, or latex caulking (solvent-based products will melt the foam). We don't want any moisture moving into the very cold space between the foam and the concrete. Tapcon a nailing strip along the bottom and another along the top for attaching drywall. You can put a little glue (blobs OK here, this is a warm space) for the drywall and the screws are just there to protect against fire (code required) – glue doesn't hold in a fire and the drywall would fall off without a few screws.

Note that on the outdoor walls, the bottom portion of the wall is exposed concrete. This will help to bring in the temperature of the soil to the cold room but the wall is warm enough to prevent condensation.

#### Cold Room Ventilation

Now comes the always difficult question about ventilation of this space. Probably the technique with the most promise is to put a 4 inch duct hole to the outdoors at one end of the room, and another at the other end of the room. If there is a predominant wind direction, put a duct on the hole on the upwind side and drop it to the floor. The wind, or just convection, will tend to come in through that duct at the floor level and rise and leave at the downwind side of the room. Put dampers on both holes – remember, we are building this room so that all the hot/cold variables are adjustable.

#### The ultimate frost protection

Then I add that little 500 watt heater set to your minimum desired temperature, which may almost never come on, but will serve to prevent freezing anything in January.

#### Fine tuning the heat loss/gain variables

With all of this you have a room that will tend to be cooler than the basement – and is condensation and frost protected. But you will have to adjust the adjustable things to balance both heat losses and heat gains to keep this room barely cooler than your target -- then the heater thermostat will automatically adjust the last variable in real time.

I assume you asked because you knew it would be complicated.

jon

#### **Keywords:**

Heat Loss, Cold Room, Walls, Air Sealing, Baseboard, Ceiling, Foam, Cooling, Basement, Heating, Insulation, Ventilation