Planning a new green office and shop

It is a daunting job to design and build a new manufacturing facility or beamery with the necessary features to work well. Our business, Cabin Creek Timber Frames, had been in business since 1996. It was 2005 and we had been renting a 6000 square foot metal building in Franklin for the past two years. We wanted to build our own building for a number of reasons. Problems with the rented building and its location were rent, less than adequate heating and insulation, nauseous gases from propane tank businesses on two sides, obscure location, size of office and shop, limited parking and truck access, limited storage space for timbers.

We began looking for acceptable property. Criteria included, in approximate order, affordability, easy large truck access, space for building and storage, three phase power, and a relatively level property. We expected that given these features, we could make the other factors a reality.

We found two acres with excellent road access, level, on US 441, a major highway from Atlanta to the WNC area, a heavily traveled tourist route. The placement on US 441 cost significantly more, but brought many advantages, mostly exposure, and some problems, mostly noise. Before committing to the purchase, I checked on restrictions (none), power (available with upfront $6000), water (none- have to drill well), septic-two possibilities. One, a 5 bedroom equivalent septic tank and drain field was present unused partially on this tract and on the adjoining Little Tennessee Land Trust property. I offered $8000 to them to use this existing unused system. They refused. There was no way to place a drain field on our property. So I had little choice other than go with the second option, which came with the right to purchase a hook up (for $3500) to the private sewer treatment plant across US 441 and to pay a monthly fee for this privilege, and we proceeded with the purchase.

We planned a timber frame office with 1750 square feet to provide office space, meeting rooms, storage, a break/lunch room, and toilets. The shop or manufacturing area was to be a steel building-50x120 ft. It would include tool storage, wood storage, and work area.

After the shop was partially built, a recent change in the building code forced us to either install a sprinkler system (very expensive) to handle the fire danger from wet sawdust from green timbers at 70% moisture content or to build a separate building, less than 2500 square feet, to house the band saw, radial arm saw and planer. Apparently no fire danger from green sawdust exists in smaller buildings. So we built a smaller machine shop, 30x50 ft., to house the machine tools.

We wished to have certain features in the office and others in the shops. We had begun to accumulate a good bit of waste wood from cut offs in our manufacturing process. Disposing of this waste meant hauling it to the county landfill (haul bill and dump fee), selling it (unlikely), or giving it away (unlikely). We elected to keep it for fuel and accomplish two things. First, there would be no haul and dump bill, and no fuel bills (hopefully). After much thought the choice was made to purchase a detached furnace to reduce fire danger, and use it to heat hot water to be pumped to the three buildings for a radiant heat floor system for heat in the entire complex, 9256 square feet. The water pipe for this system is buried in concrete-a 6"polished slab in the shops (smooth and easy to clean), and a 3" lightweight slab with slate tiles above a crawlspace in the office. Programmable thermostats control various zones to adjust temperature.
The radiant heat system works as follows. One full furnace load lasts a cold night, and another the following day lasts until evening. Thermostats keep the office at 72 degrees, and the shop at 55-60. This is ideal for vigorous work in the shop, and our men are usually down to t-shirts by 10 am. There is a heat pump backup for the office, but it rarely engages. The warm floor acts as a large heat sink and keeps feet and legs warm. This is particularly welcome to those of us with some age and accompanying arthritis. This is much more comfortable than overhead blower units, and no space is required for the equipment. Even when doors are opened and cold air enters, the floor remains warm, and the air above quickly rewarms when the doors are closed.
The metal buildings have halogen lamps overhead, but often these are not needed due to the sidelights interspersed along the upper walls of the building. The sidelights are translucent fiberglass panels which supply very adequate light on bright days. We elected to use sidelights rather than overhead skylights for two reasons. One, there would be less chance of roof leakage, and there would be no condensation and subsequent dripping of water on tools and machinery. The metal buildings have fiberglass roll insulation on walls and ceiling. To protect the walls, plywood sheets were mounted on the lower 8 feet of the walls around the entire building to avoid timber and forklift damage or blight. The 24' wide doors of the shop can be easily rolled up by one man. They are wide so that 30'or longer timbers can be brought in by forklift with some maneuvering. The metal roll up doors came with no insulation, but we decided to insulate them with ¾" pink foam board for warmth and décor. Even this lightweight covering changed the weight on the springs of these massive 20x24' doors, and the spring tension had to be adjusted. The results were good. The shop was noticeably warmer early on cold mornings.

The office is insulated with structural insulated panels or SIPS, with R-17 walls and an R-38 roof. It is tightly sealed between panels and between walls and roof. This system is almost twice as efficient as an equally R-rated fiberglass/studwall system. It costs more initially, but usually pays for the increased cost over 5-6 years. Outside walls are painted board and batten, yellow pine.

Timber frame buildings go back many centuries, and as a tribute to our past, a 12th century timber frame design was used for the office frame. It is

similar to a Wealden Hall built in Southeastern England in the 12th-14th centuries. The frame is white pine.

A recent engineering study compared our complex, using energy use data over the past two years, with an imaginary complex, same size, minimum code requirements, using an all electric heating system. The results show our actual complex using 43% of the energy used by the standard building. The other 57% is not being spent on Middle Eastern Oil. This translates to a yearly savings of $9000.

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