

NEEDS IN COLD STORAGE DESIGN

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The cost of constructing a cold storage facility like everything else is steadily increasing. In 1969, at the Vallonia Nursery , it was possible to erect a 37,500 cubic foot building for approximately \$80,000. Seven years later at the Mason Nursery \$80,000 was only enough money to construct a 13,500 cubic foot building.

Not only are construction costs high, but in many states it is getting difficult to obtain funds for any type of construction. It is necessary then, that the dollar obtained be used in the most efficient manner. In looking back over the construction of these two facilities, there are several basic features that should be taken into consideration when designing a new cold storage building:

BUILDING MATERIALS
EQUIPMENT & CONTROLS
DOORS
STORAGE SYSTEM
BUILDING SIZE

BUILDING MATERIALS: Most buildings are constructed with the use of prefabricated panels. There are at least two types of these panels.

The panels in the Vallonia building are made of a thin sheet of aluminum, 1/4 inch plywood, foam insulation, 1/4 inch plywood, and another thin sheet of aluminum. The panels at the Mason Nursery only have an exterior sheet of aluminum, foam insulation and an interior sheet of vinyl. Of the two type, I prefer the panels with the plywood. This makes for a stronger and more durable panel.

After constructing the building at the Mason Nursery it was necessary to come back and request additional funds to install a chain link fence around the interior of the building. This was necessary to prevent damage to the thin vinyl covering. If this covering were to be damaged the insulating value of the panels would be drastically reduced.

Also, these panels are not strong enough to allow you to walk on them. Now this may not seem to be very important, but with the amount of snow we have been getting the last few years it has been necessary to remove snow from the roofs of many of our buildings to prevent damage. With these panels it is not possible to get on the roof of the building. This past winter we spent some anxious weeks waiting for the snow to melt off of the roof. We had already lost one building from snow load and almost lost part of another building. Had these panels included plywood it would have been

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possible to remove the excessive amount of snow from the roof.

EQUIPMENT C CONTROLS: The compressors and other equipment must be designed for operation during the period of time that the building will be used. In all cases this would be October - May. One of the problems we encountered in the Mason building was the fact that the engineers set up the cooling system to operate during the period May - October. In other words, during the summer rather than the winter. The biggest problem this presented was that there were no oil heaters on the compressors. During really cold spells this caused difficulty in starting and could have damaged the compressor unit from a lack of adequate oil pressure.

One of the problems we encountered with the structure at Vallonia was that the compressors and timers and other controls were placed above ground level on the outside of the structure and were not adequately protected from the elements. This led to continuous break downs in the operation of the equipment. The best set up is to have a small building or room where this equipment is protected from the elements and is at ground level where it can be worked on without having to use ladders.

The extreme change in weather that has occurred in the last two winters presented a problem at the Mason Nursery. We utilize a storage temperature of 34° F. The winter of 1977 we had temperatures that dropped to 27° below zero. This caused the temperature inside our cold storage building to drop to 19° F. To overcome this problem we had to request additional funds to install a fan-jet heating system. This system is similar to the heating systems installed in greenhouses. With this system we are able to maintain 34° F at any outside temperature.

DOORS: The Mason building has an elaborate door opening system that allows two sliding doors to be opened by electric motors. Not only is this an expensive system but, it is really not necessary. We have found that during the shipping season we are in and out of the cooler so often it is easier and faster to just leave the doors open. An overhead door or manually operated sliding doors are more than adequate. The money saved here could be used to purchase an air curtain.

If I were designing a new structure I would give very serious consideration to the installation of air curtains over each door. The air curtains will prevent temperature changes that occur when the doors are left open. Also, they do not present any problems when entering with carts or forklifts. An alternative to the air curtain, for the energy conscious, would be a door system sold through Forestry Suppliers that consists of overlapping strips of clear plastic. This system should prevent temperature changes and yet allow easy access with carts or forklifts.

STORAGE SYSTEM: I prefer the use of the TIER-RACK system for storing trees inside the cooler. These racks can be built to any specifications, are portable and, if desired, allow the use of a forklift.

Whatever system you use for storing the trees you should try and include the cost of these items in the overall project. At the Mason

Nursery we use 82 racks to store approximately 600,000 seedlings. In 1977 these racks cost \$23.00 each F.O.B. the Iowa factory. If you are talking about enough racks for 1.5-2 million trees at today's prices it adds up to a sizeable sum.

SIZE OF BUILDING: This is probably the most important consideration in the design of a cold storage facility. As a rough figure, you need a building large enough to store at least half of your yearly production. If you normally ship 3 million seedlings you should have enough space to store at least 1.5 million seedlings.

The building at Vallonia is 50 ft. by 50 ft. with a 15 ft. ceiling. Depending on the species being stored it will hold over 1.5 million seedlings. If it were all conifer stock it would probably hold close to 2 million seedlings. The structure at the Mason nursery is only 50 ft. by 30 ft. with 9 ft. of useable ceiling height. This building is crowded when filled with 650,000 seedlings.

When determining the size of the building you need to allow ample room for aisle space, especially if you intend to utilize a fork lift system.

These are a few of the problems that I have encountered in my association with both the Vallonia and Mason Nurseries. Some of the things mentioned may seem trivial, and you are probably saying those could not happen to me, but they do happen. Cold storage construction is expensive, but if you incorporate these suggestions into your design you will have a well built building with a long useable life.