



REFRIGERATION REVIEW

Underfloor Heating Systems

As described in my book *Construction of Refrigerated Storage Facilities and Basic Industrial Refrigeration Systems*, underfloor heating systems are usually one of three types. The simplest of these is an air duct system which is predominantly used in coastal areas and south of the Mason-Dixon line, where the average temperature is well above 60° to 70°. When placed in solid pipe that is sloped slightly from one end to the other, air velocities can range in the 9 to 10 mph range which will provide adequate heating of the underfloor system to prevent ground heaving from frost formation.

The next system is a glycol system, usually an ethylene or propylene glycol not unlike antifreeze, in a 50% solution circulated in 1" tubes on 3' centers. It is generally preferred to have them configured in straight runs so if failure occurs, the tube could be used by installing electrical cable. The glycol can be heated, quite often with a discharge shell and tube or plate heat exchanger to provide 50° to 60° glycol.

The third system would be an electric self-regulating heating cable installed in 1" conduit.

NOTE: There were some original designs that used air with ventilated pipe in a rock base, which was intended to let water condense and go into the ground. This was done with terra cotta pipe or perforated pipe, similar to a septic tank field. In time, these systems all failed, primarily because they fed water into the ground under a freezer, which in turn increased the soil's conductivity, and gradually the whole system would freeze and heave the floors

of the freezers. There have been cases over the years, particularly when frozen concentrate was at its heyday in the 20s and 30s, where freezer rooms were constructed without floor heating systems, some on limestone in Miami, and they all failed. Some of these cases cantilevered the floor slabs 3 feet into the air.

Floor heaving is often a misunderstood concept where one would think it is simply the expansion of ice with the ground. Floor heaving in its purest sense is a totally different phenomenon where water would rather be frozen onto itself and anything above it – rocks, stones, concrete slabs – is simply pushed vertically as the water continues to form ice crystals and push upward. I have seen walls that were heaved 2 feet in the air where, once the faulty air system was provided electric heat cables, the ice melted and the walls returned to their original level.



Glycol Tubes Being Laid



Glycol Tubes



Glycol Underfloor Heating System



Electric Underfloor Heating System Being Installed

If you would like to purchase a copy of the book *Construction of Refrigerated Storage Facilities and Basic Industrial Refrigeration Systems*, please call our office at 904-389-6700. They are \$10 each if you want to pick one up locally, or \$15 to have them sent UPS Ground. Visa and MasterCard are accepted.
