Introduction

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Overview

• What is Floor Heaving?
• What Prevents Floor Heaving
• Types of Construction
• Floor Heaving Effects
• Repairs and Solutions
What is Frost Heaving in Freezers?

• As the earth below a freezer drops below freezing, the moisture in the soil will freeze, form ice, and expand.

• The formation of this ice can cause floors to crack, break, and lift up or “heave”.

• Ice Formation will lift columns, push foundation walls over, and rip open roofs.
How Do You Prevent Frost Heaving?

• Underfloor heating is the most common method of preventing floors from heaving in refrigerated warehouses

• There are a few methods of underfloor heating
  – Electric Heat
  – Pumped Fluid-Glycol
  – Forced Ventilation
  – Natural Ventilation
Construction Detail

• Most Common Approach
  – UF Heat System
  – Concrete Sub Slab
  – 10 mill Poly Vapor Barrier
  – 2 Layers of Extruded Polystyrene (5”-6”-7”)
  – 6 mill Poly Slip Sheet
  – Concrete Finish Floor (5”-8”)
What Is The Best System?

• Everyone has different opinions
• Each system has pros and cons
• Use your and others experience to solve your problem
• Key Factors:
  – Design and Installation
  – Life Cycle Cost
  – Maintenance
  – Repairs
Electric Heating
Electric Heating
Electric Heating

- Electric heat trace is placed in metal conduit that is buried in the concrete sub slab
- Temperature of the sub slab is monitored by a control system
- Controls cut on and off the heat and electricity as you need it
Electric Heating

PROS:

• Easily monitored by maintenance personnel
• Easily installed by a local electrician
• Easy replacement of heat trace cable
• Lower Capital Expense
**CONS:**
Must be monitored by maintenance
Maintenance Turnover and Lack of Control
Cost Rate for Electricity
Lack of Insulation-Run time
Troubleshooting if not installed properly
Forced Fluid-Glycol

- Glycol or other warm fluids is pumped through pipes. Glycol is most common.
- Fluids are usually heated from waste heat off the refrigeration system.
- Piping or circuits are typically overlapped in case of a leak or problem with a circuit.
Forced Fluid-Glycol
Forced Fluid-Glycol
Glycol

PROS:

• Refrigeration contractors love these systems because they use their waste
• Reliable System when maintained properly
• Maintenance personnel may be more familiar with these systems
Glycol

CONS:

• Piping material deteriorate and causes leaks
• No easy way to find and repair leaks
• Pipe Blockage-Ice or Building Settling
• Creating Environmental Issue?
• Requires Monitoring of Fluid Concentration
• Troubleshooting if not installed properly
Natural Ventilation

• Most Commonly Known As Vent Pipes
• Many Different Methods
  – Ductwork or Pipes Straight Through
  – Ductwork or Pipes in U Bend Shape
  – Concrete Block Channels
Natural Ventilation
Natural Ventilation Design

Most Commonly Uses 6” or 8” diameter pipe on 6’ centers

Ductwork should be sloped to allow for condensation to drain

Pros:
- Inexpensive construction
- Low or No operating expense
Natural Ventilation CONS

• **Cons:**
  - Complex Thermodynamic calculations
  - Piping material deteriorates
  - Ductwork becomes clogged
  - Ice forming inside of ductwork
  - Air flows to least resistance, not with construction design
  - Expensive Repairs
Forced Ventilation

- Air is forced through ductwork
- Requires ductwork or piping that needs to last for many years
- Requires a fan to blow air through the system. (may require supplemental heat)
Forced Ventilation
Problems with Forced Ventilation

- Ductwork material deteriorates
- Ductwork clogs with debris or rodents
- Condensation and drainage issues
- Ice forming from condensation leads to plugged pipes
- Fan failure (access and silent)
• WHAT DID WE LEARN?

• ALL REQUIRE PREVENTATIVE MAINTENANCE AND ATTENTION!!
Effects of Floor Heaving

- Interruption of Operations
- Building Structure Compromised
- OSHA Violations-Safety Concerns
- Initial Repair Expenses
- Long Term Repair Expenses
- Lost Production Time
- Lost Rental Income
Foundation Walls
Freezers and Blast Cells
Doorways
Refrigerated Docks
Wall to Roof Juncture
How Can I Fix My Problem?

• Turn on floor heating system or make sure yours is hooked up properly! 😊
• Demo the floor and install a new floor heat system
• Retrofit a floor heat system
Financially What Makes Sense?

• If the system was turned off or not hooked up properly, this will save you tons of $$$$$.
• Empty Freezer and Replace With New Construction.
• Retrofit an UF Heat System
• What makes sense for your business??
Demolition of Freezer Slab

- Shut Down Freezer
- Empty Racks
- Remove Racks
- Demo Floor System
- Install New Floor Heat System
- Install New Floor Insulation and Concrete
- Big Expenses and NO INCOME!!!
Retrofit a Floor System

- Install Glycol System, Pumps, Tubing
- Install and Electric Heat System
Retrofitted Electric Heat System

• Get a specific design completed
• From outside, drill holes under the freezer
• Add heat to these holes to melt the ice formation
• Once Melted, floor can be maintained at a normal operating temperature and at normal budget costs.
Getting Started
Retrofitted UF Heat System
Retrofitted UF Heat System
Retrofitted UF Heat System
Retrofitted Vent Pipe
QUESTIONS?

Thanks for your time and patience, please let me know if there is anything that we can do for you!!!