

ENERGY & TECHNICAL SERVICES CONFERENCE

SAVE ENERGY & REDUCE CARBON FOOTPRINT
OMNI ORLANDO RESORT AT CHAMPION'S GATE,
ORLANDO, FLORIDA. SEPTEMBER 7-10, 2008



Farm Fresh Alarm Response and Central Monitoring

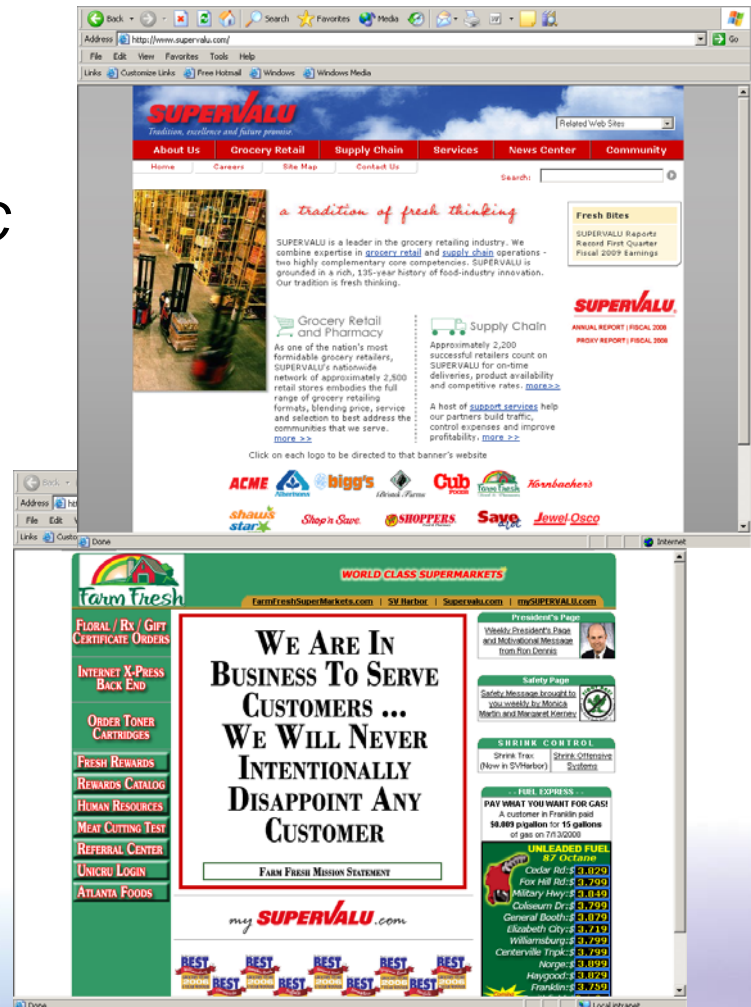
Listen to Farm Fresh's experiences, how they decided to develop a 24 hour a day central monitoring station for Refrigeration and HVAC, how it operates, and the lessons learned.

Jonathan Perry, Director, Energy and Maintenance, Farm Fresh, LLC

Facts about Farm Fresh

- We are a division of Supervalu approximately 2500 store chain
- Farm Fresh is 46 stores in VA and NC
- We operate our own design-build construction and maintenance department
- We operate our own central alarm monitoring office

Jonathan Perry, Director, Energy and Maintenance, Farm Fresh, LLC



How did Farm Fresh Central Monitoring Get Started?

- In 2000 Farm Fresh had 36 stores
 - Of those stores 20 stores had some form of building monitoring.
 - Those stores were all modem communication
 - The monitoring was mainly suction and discharge pressure, one temp sensor per circuit, and door switches on walk-in freezers
 - None of the stores actually worked dialing out, but there were main store alarms up front.

Early controllers and freezer doors

- Farm Fresh had the policy of shutting the fans off in freezers whenever the freezer door was open with a door switch and a refrigeration liquid line solenoid.
- The store would go into the freezer, work the product, and then leave, shutting the door. That procedure was supposed to cut down on evaporator ice-ups saving maintenance and energy.

Product loss was inevitable

- When there was product loss, the store would close the door, and book a call. The technician would be dispatched and spend hours looking for a problem. They would not find anything wrong. The next morning, the site would be dialed up after the problem and the logs would confirm how long product had been left without refrigeration.

There was no thought of a monitoring budget

- Everyone assumed that if they bought building automation and paid good money for it, and then paid good money to install it, the system should just work.
- The system was supposed to be reviewed periodically by the head of maintenance, but he already had enough to do. He was not trained and he was not allotted time to review it adequately.
- The stores were supposed to notify dispatch if there was an alarm. Dispatch was manned Monday to Friday, 8 hours per day, with two pagers at night. The technicians fielded all calls when on duty.
- No one could believe that a store might not shut a door or forget to do temperature checks all night.

The Bottom line: Everyone involved was mad

- The COO was mad because he had invested money and was not getting the results he wanted.
- The installers were mad because they installed the system correctly, but it was not working and they were being blamed.
- The technicians were mad because they were being blamed for the problem, but they were not at fault. They kept having to go out in the middle of the night and shut walk-in freezer doors.
- The head of maintenance was mad because the issues were operational. He was supposed to fix the issue, but all he could do was incur the expense of sending a technician out in the middle of the night.
- Operations was mad because they could never determine who opened the freezer door by the time the product was lost and they assumed it was a maintenance problem.
- The controls company was mad because they knew everyone felt the equipment did not work. So, it couldn't sell more.
- The Energy Manager was mad because he needed the walk-in freezer doors shut to save energy.

After numerous losses...

- The energy manager was asked to take over the monitoring as a side project since maintenance was struggling and it involved energy.
- Again, there was no budget for it.

During the First Month

- I fixed all communications
- This had to be done regularly because modems and phone lines are temperamental
- Of the alarms we received, there were many door alarms that had turned the refrigeration off to refrigerated freezers for long periods of time. I needed help from operations to address store behavior.
- I arranged a meeting with my supervisor VP of Engineering and the VP of Operations

During the First Month

- I was armed with graphs of many freezers that went without refrigeration because of how the stores were being operated. I asked for some help, because I new I could not improve the system without Operations.
- He explained to me the kind of issues I was discussing were impossible. If the issue was as bad as I thought, how is it that refrigerated losses were not higher?
- My answer to him is we must be selling the product to disgruntled customers or throwing it out and not reporting it.
- His answer was, I did not know what I was talking about, “Meeting adjourned”. It was a waste of time.

During the First Month

- I redoubled my efforts
- Of the total alarms received for the first 28 days, thirty were door alarms that had turned the refrigeration off to refrigerated freezers longer than 3 hours with me calling the store.
- Of those 30 alarms, 12 had been off longer than 6 hours.
- Of those the worst documented was 14 hours long and it was Ice Cream (The beauty of this alarm was that the door was open for 12 hours and then it was closed for 10 minutes. Bryer's had delivered ice cream and shut the door. Our associates then opened the door and did not notice the ice cream was bad until 2 hours later. Then, the door was shut and a refrigeration call was booked for "Refrigeration down")

During the First Month (the next day)

- Since the Ice Cream was bad in the main freezer. There was another meeting. How is it we have great monitoring and we still lost all the ice cream? What went wrong with the refrigeration system?
- I had graphs of all the doors for the month that had been ignored.

During the First Month

- I explained that the store opened the freezer door and the refrigeration stopped. The store never shut the door again or did a temp check. They did not pay attention to the computer alarm. They had placed it on ignore. I had called the store and talked to the store MOD and told them to shut it. They decided to ignore me and I decided to go to sleep. I had names and times of everyone I spoke to on all occurrences.

During the First Month

- I explained that this was a common occurrence.
- I explained we were selling product all the time that was bad or throwing it away and hiding it somehow in refrigeration loss numbers.
- This was in front of the COO and 13 VPs of our company. All of them were nervy because this problem was demanding answers.

During the First Month

- I again was told that it was impossible and I was summarily dismissed, by the VP of Operations.
- So, I said you can believe whatever you want. But this graph shows the freezer door was open for 14 hours and you lost most of your ice cream. I will bet the only Ice Cream you didn't lose was the Bryers Ice Cream. Am I right? Yes, that is because the door switch graph shows he delivered it into the main freezer and the freezer had been off for 12 hours. He shut the door and told the frozen food guy to keep the door shut. However, the store could not keep it together even then. They opened the ice cream freezer for another 2 hours before it was reported. The only salvageable product was the Ice Cream from Bryers.

Mr. Freezer Door Closer

- The result of that meeting is the next guy who became VP of Operations agreed to two things.
 - If I was awakened by operational alarms in the middle of the night, he would be awoken within 5 minutes of me getting the call, because I was done with dealing with people on store level and he personally would get their attention.
 - All reported loss had to be reported to maintenance before determining if it was refrigerated loss or not. All losses had to be tied to the refrigeration ticket to match the dollar loss to the maintenance problem.
 - Soon after I was labeled “Mr. Freezer Door Closer” to all my friends not in the grocer business.

Lack of Monitoring Commitment and Understanding

- Everyone here probably spends \$40,000 to \$60,000 per store in capital money for building automation.
- Very few chains spend adequately on electronic monitoring.

How much did you spend on monitoring without computer monitoring?

Some chains have customer based monitoring.

- This is where the customer comes up and tells your store they don't want to buy your ice cream and then the store manager reports his case down.
- Benefit of rock bottom low monitoring charges
- Negative of Low customer counts / High product loss

Some chains invest in manual temperature checks

- Some handle this with an assigned person for the whole store
- Some handle this by each department checking the department cases

How long does it take to walk to every case in the store and read a thermometer?

For me to walk a store, read the Temperature sensor at each case on 100 cases or freezers and put my hand on product and keep a log of the temperature, I average 30 minutes.

How often does a temperature check need to be done?

- At Farm Fresh maintenance felt we should do them every two hours.
- We “settled” for every three hours.
- Three hours were decided based on an at the time current loss of fresh meat. The meat turned discolored after losing temp for 3 hours and the amount of money it takes to do manual temperature checks

How much does it cost to do temperature checks for a year at a store?

- Minimum wage is now 6.55 \$/hour
- (Assume a 30% benefits package) 8.52 \$/hour
- There are 8 times per day you must check to cover 24 hours or 4 hours per day.
- That means $6.55 * 1.30 * 4 * 365 = 12,431$ \$/year
- For every 2 hours it is 18,647 \$/year
- Continuous monitoring of a store is or every half hour a temp check is done 74,591 \$/year

How much does it cost to do temperature checks for a year at a store?

Temperature Checks Interval in Hours

Pay	0.5	1	2	3	4
8	70080	35040	17520	11680	8760
9	78840	39420	19710	13140	9855
10	87600	43800	21900	14600	10950
11	96360	48180	24090	16060	12045
12	105120	52560	26280	17520	13140
13	113880	56940	28470	18980	14235
14	122640	61320	30660	20440	15330
15	131400	65700	32850	21900	16425

How much product is in a case?



4 foot dairy Grab'n Go
milk case \$650

5 Door ½ gallon Ice
cream Case \$6,000



3 Door frozen cake
case \$3,400

20x20x10 Main Freezer
\$20,000

How much potential product loss is there in a 50,000 sqft store?

The entire store holds approximately

Frozen Food	\$90,000
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Dairy	\$50,000
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Meat, Bakery, Deli, Seafood & Produce	\$200,000
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Total	\$340,000
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How long can product go without refrigeration?

Ice cream

Frozen Food

Fresh Meat

Deli

Produce

How much of the savings in product and labor for temp checks offset your Central Monitoring Budget?

None, my experience is chains state they do manual temperature checks, but that labor is used every where except on temperature checks. So, saving the labor does not get a “real” return.

Unless it is a military commissary because the people get thrown in the brig for disobeying orders.

How reliable is a good manual temperature check program?

Not very

- Computers give warnings faster than manual readings, because they can see more variables and can see trends.
- People start to fudge the numbers
- They don't understand when something is in defrost
- They are not sure what the correct temperature range is for a length of time
- The temp checker is on vacation or sick



How much does monitoring cost?

Low end \$75 per month per site

High end \$250 per month per site

Where are we today?

- We currently monitor 160 stores with in the Supervalu umbrella
- Mainly Emerson Controllers
- 70% Ethernet connections
- Mainly E2 and E1
- Some other controllers, but less than a few percent (Supervalu has other controllers among its banners)

Why did we decide to monitor our stores?

- We wanted to sell the best quality products, and we were having a lot of product loss
- We had installed early controllers in our stores, but they were not doing much more than being fancy pressure switches and defrost clocks
- Potential of Energy Savings
- Cut down on maintenance calls
- We wanted to get faster response times on failures
- We wanted a philosophy change, more predictive than reactive in our maintenance.
- We wanted to save money

How did we decide to monitor our stores ourselves?

- We had our own maintenance staff
- We had our own dispatch call center 40 hours per week
- We felt we knew our stores better than an outside company
- We felt we could develop things tailored to our chain
- We felt the intelligence of the store was not something you subcontract out

How are we staffed?

- We have 11 associates that are trained
 - 1 Director of Energy and Maintenance
 - 1 Manager of Central Monitoring
 - 6 Central Monitoring Analysts and Dispatchers
 - 3 People trained as backups
- We operate 23 to 24 hours a day
 - There are 2 times a day where people may be at lunch for 30 minutes.

What Volume of Alarms are we handling?

- We have a range of 600 to 1500 alarms per week of actual alarms
- We have a range of 2000 to 5000 alarms that are received a week
- The bulk of the alarms are nuisance alarms that may be caused by maintenance work, remodels, improper programming or failed sensors.
- We do not disable alarms, we allow them to ring in and we sleep them with pass down lists.
- Most of our early problems were with “sleeping” controllers.

What Volume of Alarms per store should you expect?

- 0.5 – 1.5 alarms per store per day for a full 50,000 square foot supermarket

How long does it take to respond per alarm?

- Each alarm can take from 2 minutes to 30 depending on the level of difficulty and the type of communication involved.
- Average Response Times are 10 minutes
 - This includes documentation
- Modem alarms on average take 2 minutes longer to reply to than Ethernet alarms
 - This is attributed to the slower connection speeds and the communication problems like hang-ups

How much does an average alarm cost to handle?

- With an average Ethernet site, an alarm that you must call the store and ask some questions, then call a tech, wait for a return call, then book a call with a person making 10 to 12\$ per hour and benefits and dividing the cost of training the person 90 days over a three year career? 5 to 6 \$/call
- A low store 15 alarms per month would cost 85 \$/month for 24 hour coverage.

What is it costing?

- Labor
- Computers
- Long distance and phone
- Management talent

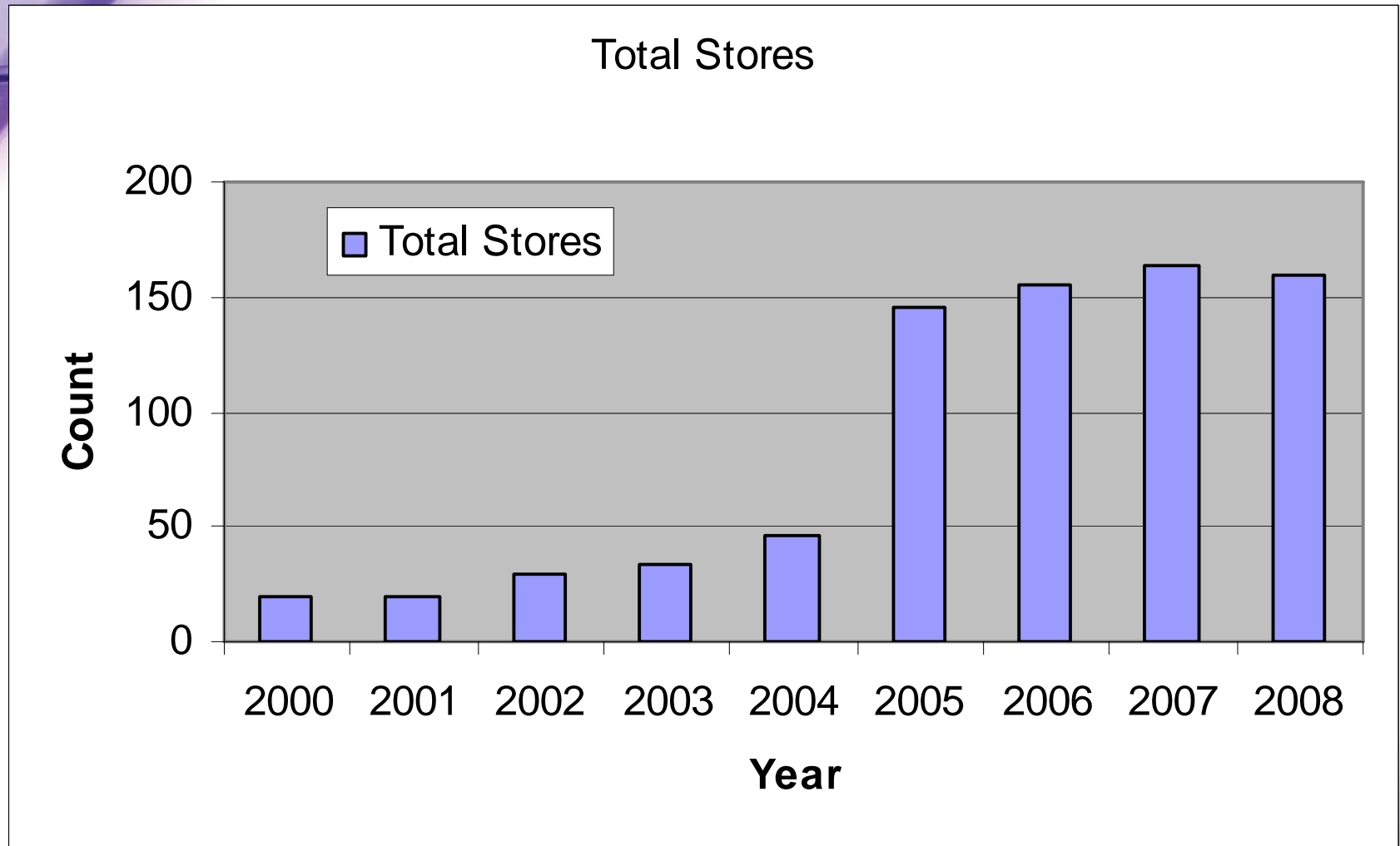
How is in house monitoring saving?

- The interpretation and translation of an outside monitoring center
 - I feel that most chains that don't have central monitoring are having to have the refrigeration technicians spend their time doing what I would consider the “office work” of central monitoring.
 - For instance an alarm calls in and the tech wants to avoid a call. He has to stop what he is doing and get to a computer dial in and review the call before he goes. He probably is doing it with a laptop that gets dropped once a year. He is probably slow on a computer. Slow in monitoring software and not 100% in the controller, all the while costing twice as much as the monitoring person ready to take the call.

What is monitoring saving?

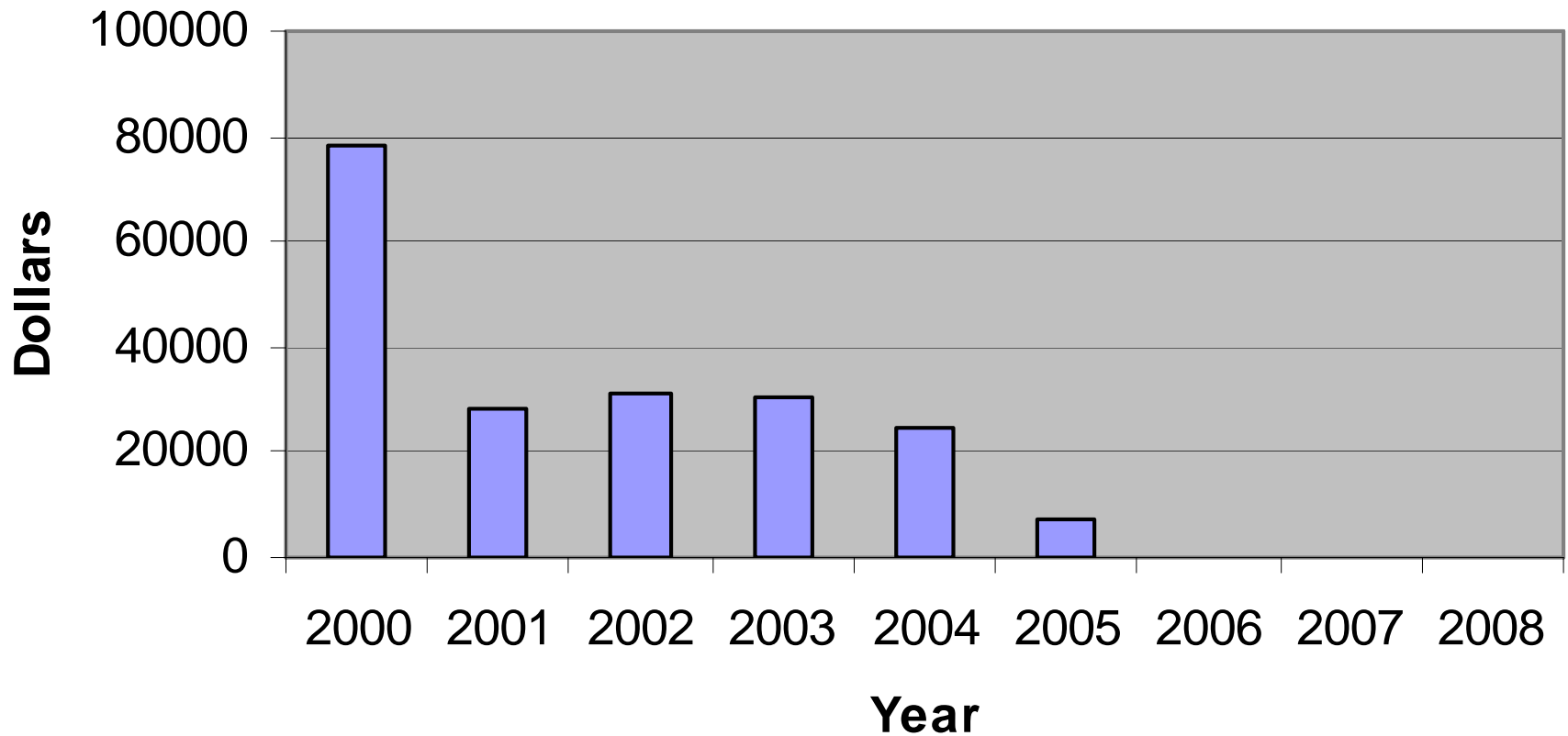
- Product Loss
- Product Quality
- Energy
- Maintenance
- Loss Prevention
- Improved store designs
- IT thinks it cuts down on security breaches
- Improved Electronic “As-builts”

How many stores do we monitor?

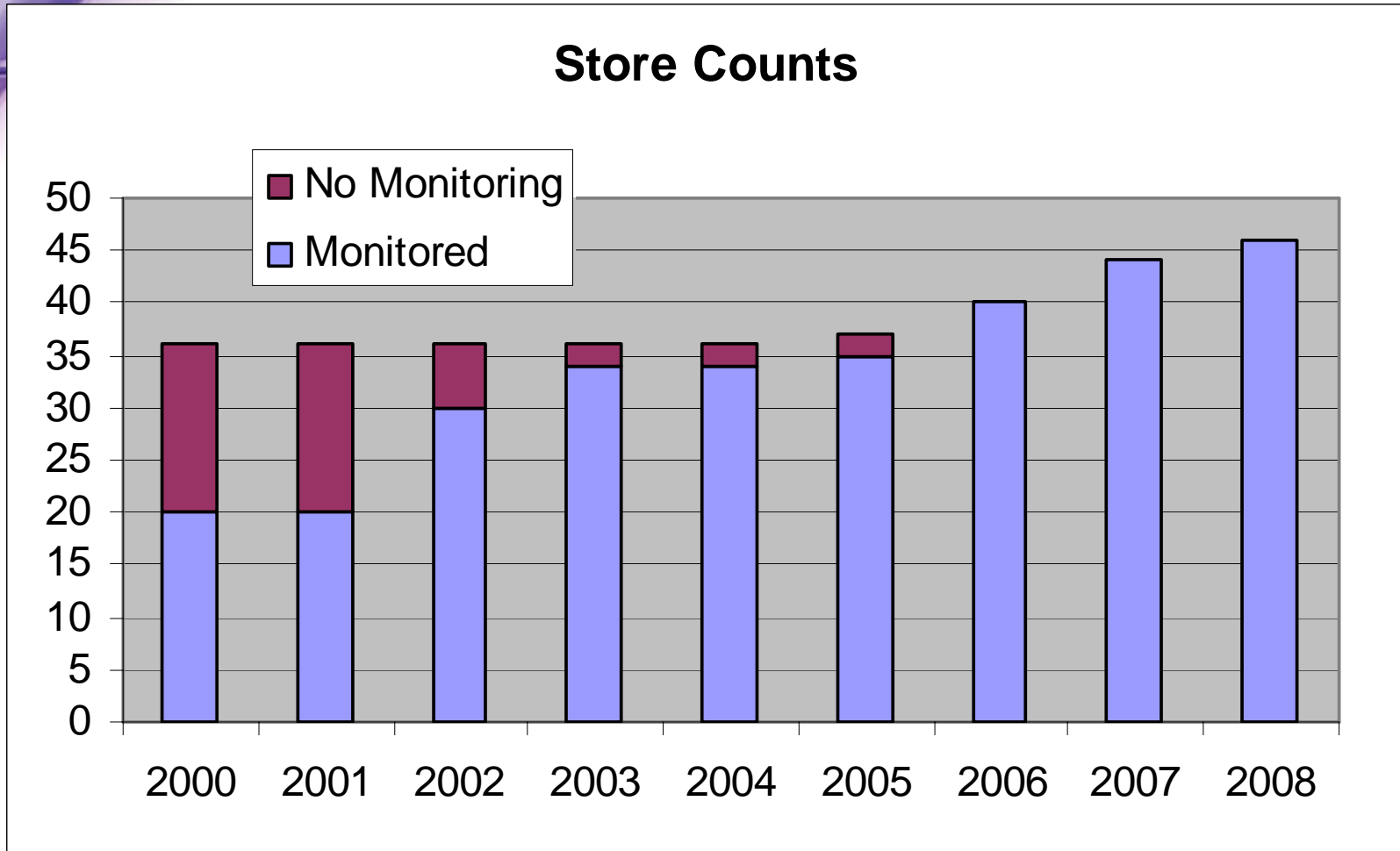


What is it saving?

Refrigerated Product Loss



What is it saving?



What is it saving in product loss?

- Comparing the stores we had no monitoring to the stores we had monitoring we showed about a \$1,900 improvement in refrigerated documented loss between the stores without monitoring and those with.

What is it saving in product quality?

- This is very hard to say...but I think it is like the iceberg rule where 90% of the issue is not noticed.
 - When we were early into this we would find cases on energy management circuits that had shut down 6 to 8 hours a night and no one ever noticed.
 - Cases that have are slow out of defrost by 45 minutes, etc.

Loss Prevention?

- We had a store that had a floor care crew that use to fill up on steaks and seafood at 4:00 AM every morning.
- The estimated loss on that store from the floor care crew for the length of time they were stealing was \$250,000.

What is it saving in energy?

- This is very difficult to say also
 - We definitely are keeping cooler doors shut
 - We do not have any overridden VFDs
 - We don't have suction and discharge setpoints changed.
 - We don't have hot water heater settings
- What does it cost to re-commission? Your controller should be setup to be the re-commissioning.
- There is no question it can save

Maintenance Savings

- It helps with training technicians
 - Technicians have someone to call 24/7/365
 - Increases training on Building Automation
- Central Monitoring screens bogus store calls reducing calls
 - Case is in defrost
 - Walk-in doors need to be shut
 - Plumbing calls go to plumbers, etc
- Walk stores through obvious issues such as case iced up. (store needs to clean)
- Cuts down on middle of the night non-priority calls
 - This reduces call outs of on call technicians

Maintenance Savings (cont.)

- Better Supervision
 - Cuts down on the problems with pass codes
 - Technicians realize their work is reviewed after the call
 - Determine response times and length of calls
 - Saves the tech time in programming and walking around a store when he needs an extra pair of eyes

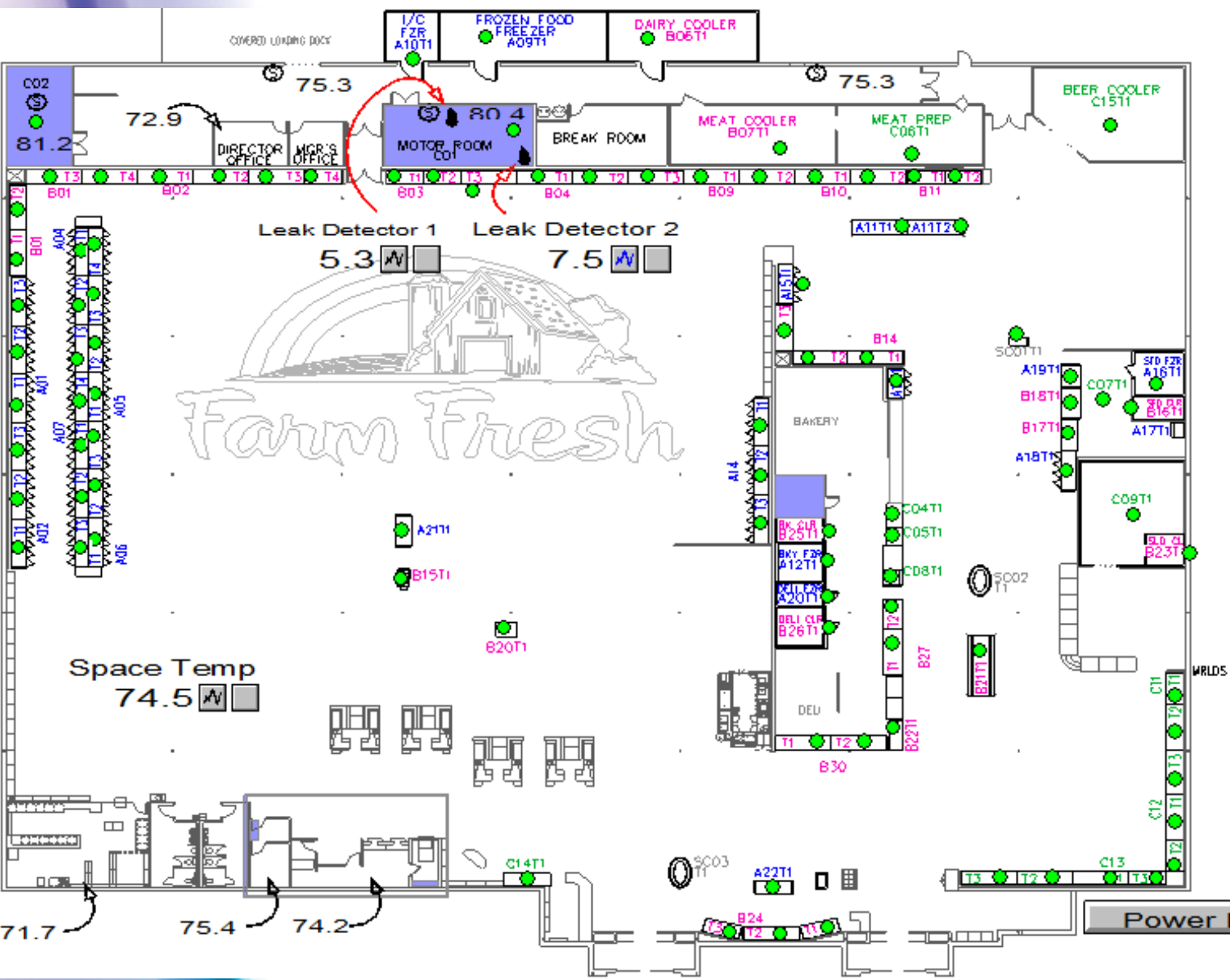
Building the best facility

- Live As-builts
 - Access to building automation on a computer
 - There are live circuit drawings (virtual walk-through drawings of electrical, mechanical, plumbing etc.)
 - Site specific information

Be An Innovative Company

- Innovative companies are attractive places to work.
- Technicians enjoy new challenges



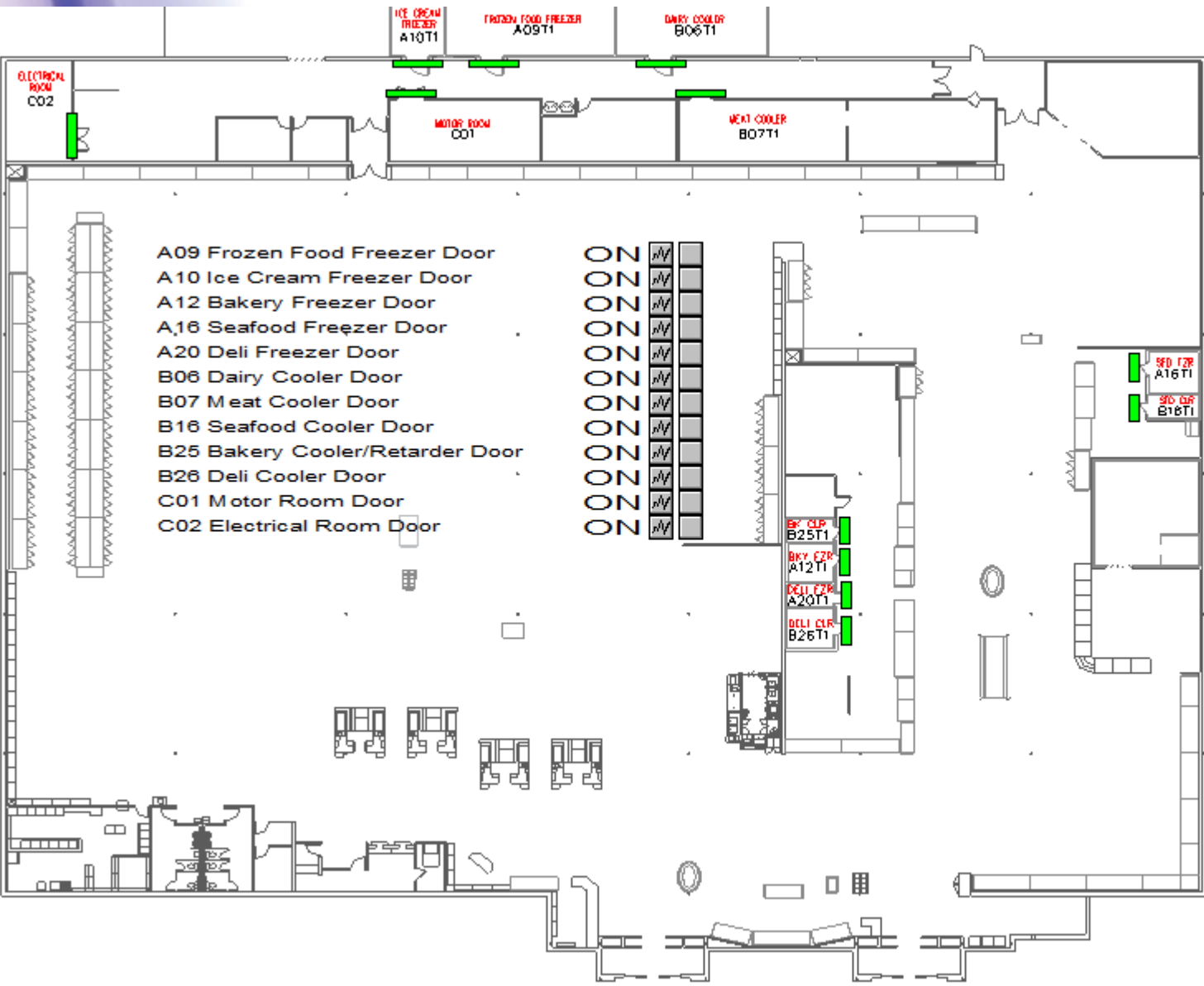


- Refrig Piping ▶
- Motor Rm Piping ▶
- Motor Rm Layout ▶
- Electrical Panels ▶
- Refrig Electrical ▶
- Plumbing/Drains ▶
- HVAC (M1) ▶
- Hoods (M2) ▶
- Air Handlers ▶
- Doors ▶
- Roof Plan ▶

Power Failure Checklist ▶



- Floorplan ▶
- Refrig Piping ▶
- Motor Rm Piping ▶
- Motor Rm Layout ▶
- Electrical Panels ▶
- Refrig Electrical ▶
- Plumbing/Drains ▶
- HVAC (M1) ▶
- Hoods (M2) ▶
- Air Handlers ▶
- Roof Plan ▶



- A09 Frozen Food Freezer Door
- A10 Ice Cream Freezer Door
- A12 Bakery Freezer Door
- A16 Seafood Freezer Door
- A20 Deli Freezer Door
- B06 Dairy Cooler Door
- B07 Meat Cooler Door
- B16 Seafood Cooler Door
- B25 Bakery Cooler/Retarder Door
- B26 Deli Cooler Door
- C01 Motor Room Door
- C02 Electrical Room Door

- ON
- ON
- ON
- ON
- ON
- ON
- ON
- ON
- ON
- ON
- ON
- ON

- BKY CLR B25T1
- BKY CLR A12T1
- DELI CLR A20T1
- DELI CLR B26T1

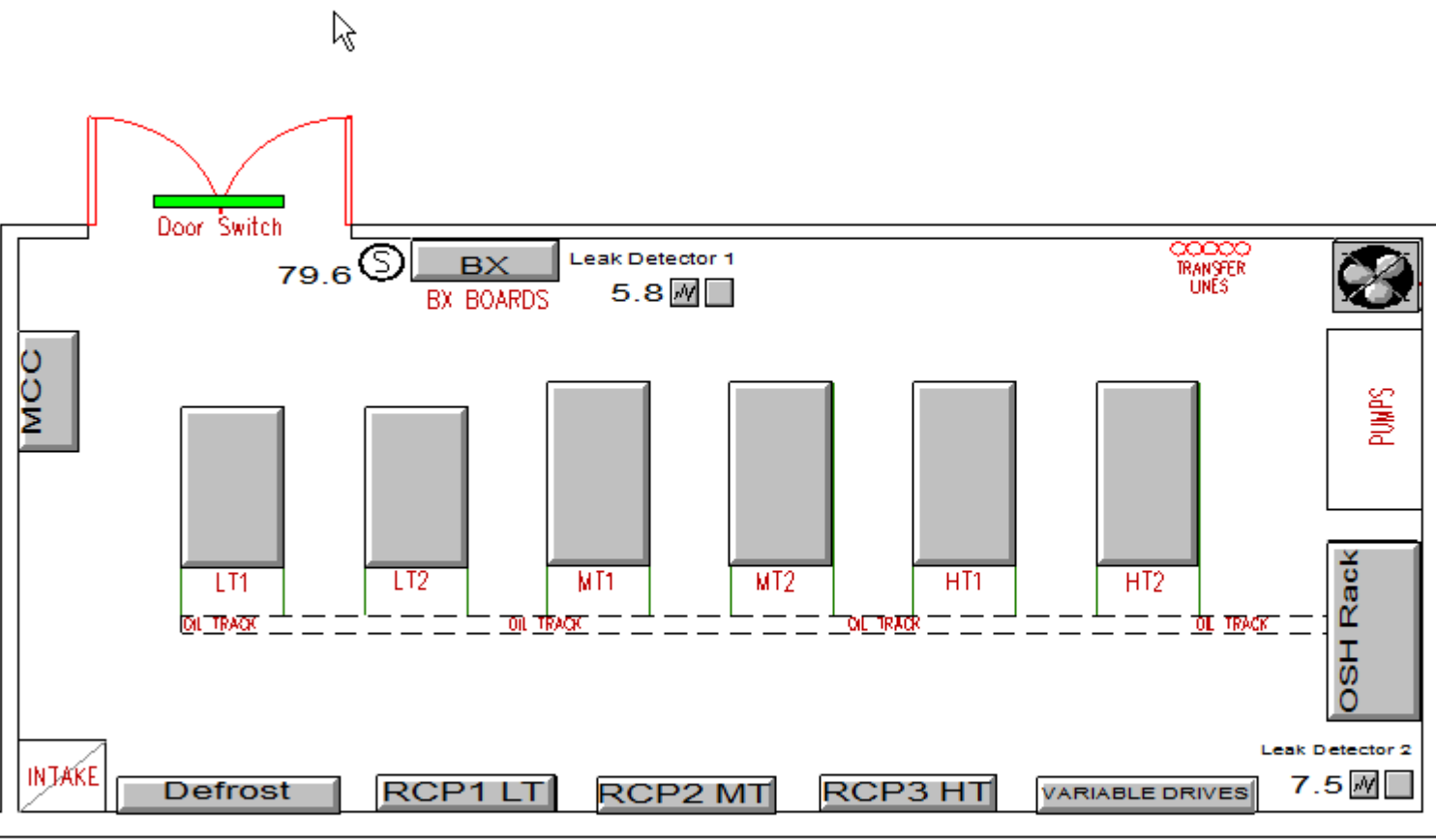
- SEA CLR A16T1
- SEA CLR B16T1



- Floorplan ▶
- Refrig Piping ▶
- Motor Rm Piping ▶

- Electrical Panels ▶
- Refrig Electrical ▶
- Plumbing/Drains ▶
- HVAC (M1) ▶
- Hoods (M2) ▶
- Air Handlers ▶
- Doors ▶
- Roof Plan ▶

- Dimensioned ▶



Medium Temp Cabinet

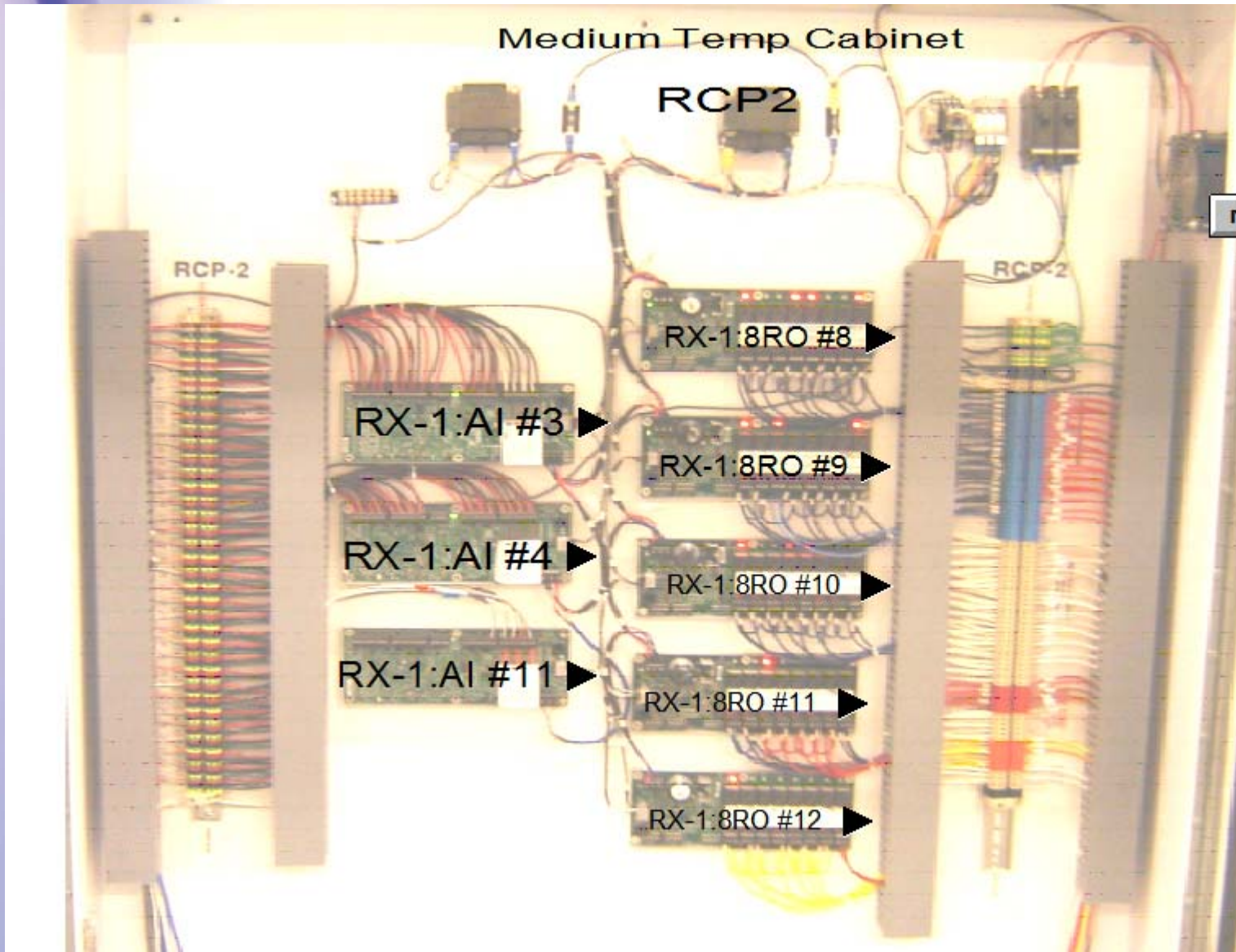
RCP2

Motor Room ▶

RCP-2

RCP-2

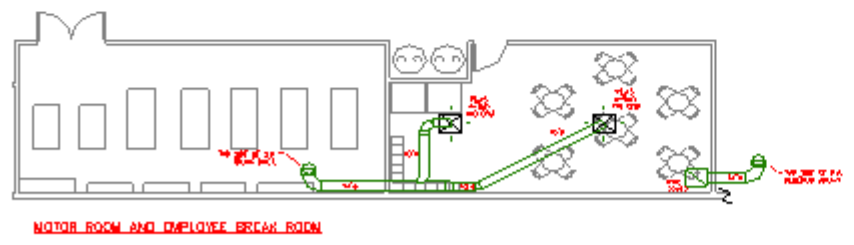
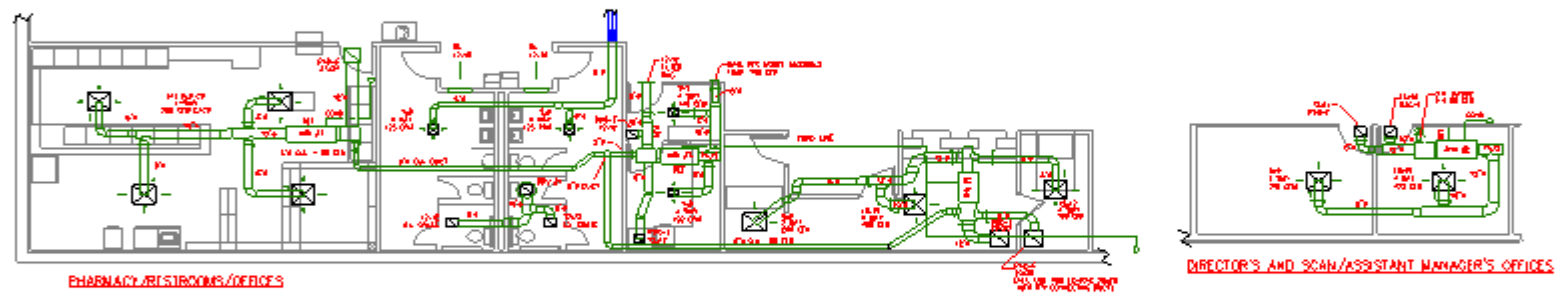
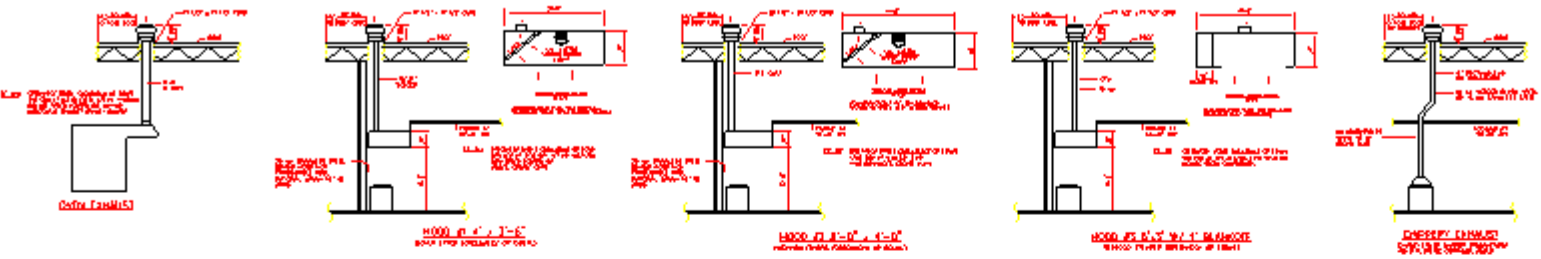
- RX-1:AI #3 ▶
- RX-1:AI #4 ▶
- RX-1:AI #11 ▶
- RX-1:8RO #8 ▶
- RX-1:8RO #9 ▶
- RX-1:8RO #10 ▶
- RX-1:8RO #11 ▶
- RX-1:8RO #12 ▶





- Floorplan ▶
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- Air Handlers ▶
- Doors ▶
- Roof Plan ▶



STORE AIR BALANCE

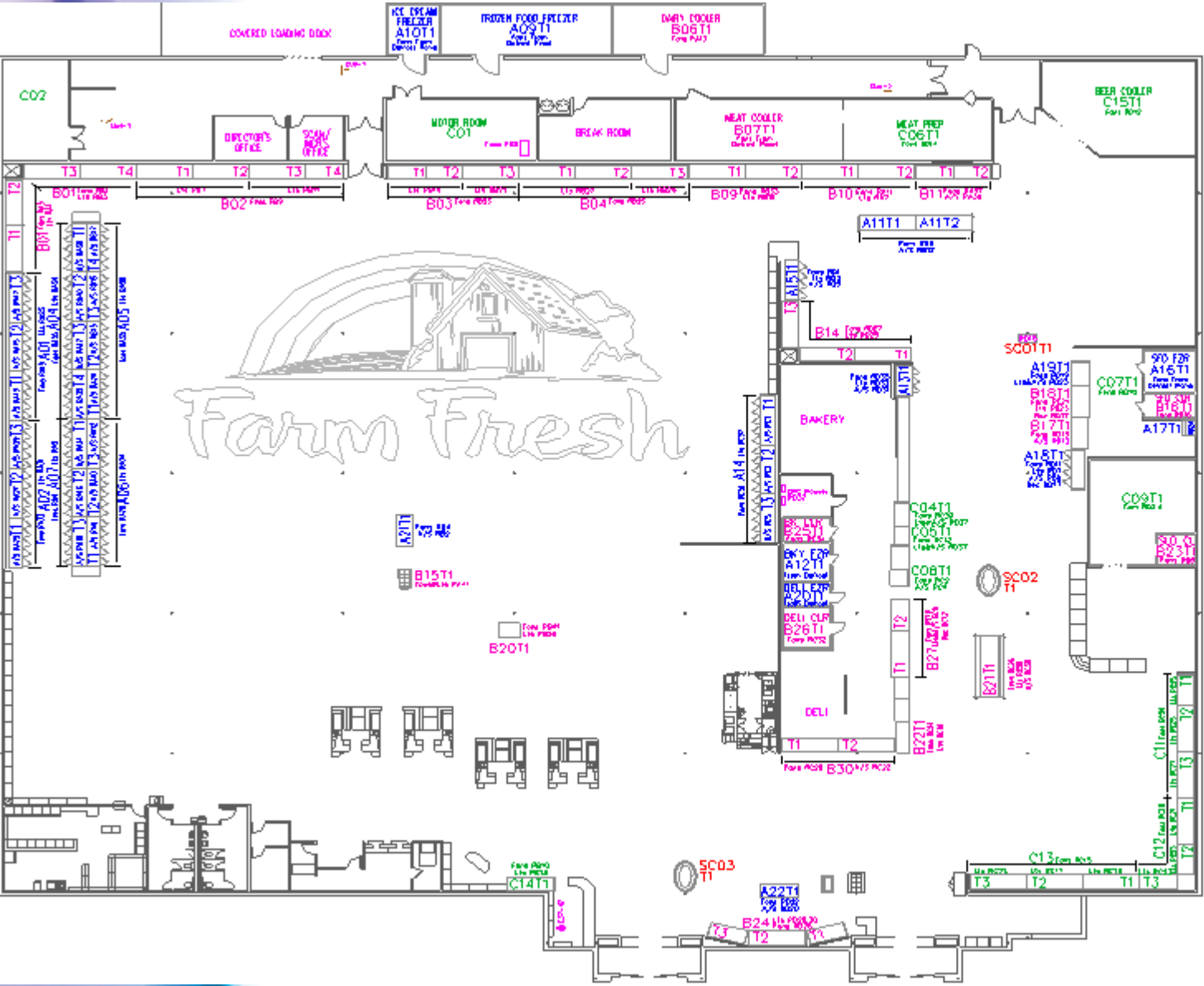
EQUIPMENT	EXHAUST CFM	O.A. & M.U. CFM
AHU-1 SALES		5,000 CFM
AHU-2 SCAN/DIRECTOR'S OFFICE		80 CFM
AHU-3 PHARMACY/RESTROOMS		40 CFM
AHU-4 PHARMACY		80 CFM
AHU-5 BANK		80 CFM
PP-1 MEN'S AND WOMEN'S RESTROOM	225 CFM	
OVN	750 CFM	
HOOD #1 DOWN FEED	825 CFM	
HOOD #2 DOWN FEED	1,200 CFM	
HOOD #3 SEAFOOD STEAMER	900 CFM	
EXHAUST	450 CFM	
TOTAL	5,161 CFM	5,260 CFM

1/2003 BY JPH/ED



- Floorplan ▶
- Refrig Piping ▶
- Motor Rm Piping ▶
- Motor Rm Layout ▶
- Electrical Panels ▶

- Plumbing/Drains ▶
- HVAC (M1) ▶
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- Doors ▶
- Roof Plan ▶





Floorplan

Motor Rm Piping

Motor Rm Layout

Electrical Panels

Refrig Electrical

Plumbing/Drains

HVAC (M1)

Hoods (M2)

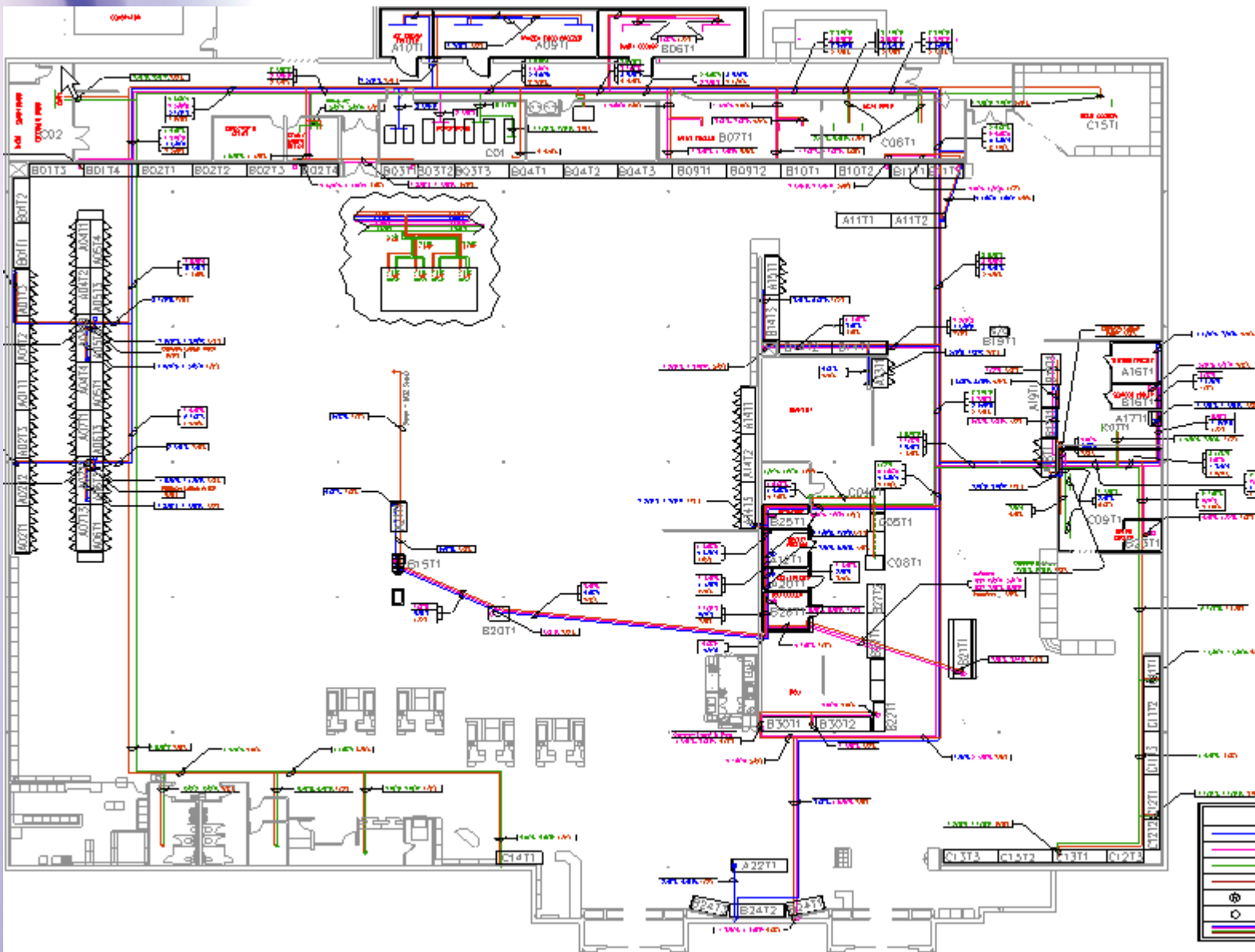
Air Handlers

Doors

Roof Plan

DRAWING LEGEND

	LOW-TEMPERATURE SUCTION LINE
	MEDIUM-TEMPERATURE SUCTION LINE
	HIGH-TEMPERATURE SUCTION LINE
	LIQUID LINE
	SUCTION RISER LINE
	STUB-UP FOR REFRIGERATION LINE
	INES IN TRENCH



What are we monitoring?

- Suction pressure
- Discharge pressure
- Temperatures
- Door switches
- Refrigerant Levels
- Refrigerant Leak Detectors
- Rack Superheats
- Rack Sub-cooling
- Compressor Proofs
- Photo cells
- Current Transformers
- Oil pressures and Temperatures
- Anti-Sweat Controllers
- Connectivity

Address <http://slam/slam/frigmonactive.html> Go

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Farm Fresh Refrigeration Network Monitor

Retailer	Store	Router IP Address	Refrig IP Address	Router Status	Refrig Status
bigg's	Hyde Park Store	10.115.190.75	10.112.140.226	Up	Up
bigg's	Skytop	10.119.190.38	10.116.93.226	Up	Up
bigg's	Colerain	10.119.190.42	10.116.101.226	Up	Up
bigg's	Delhi	10.119.190.62	10.116.130.226	Up	Up
bigg's	Eastgate	10.119.190.39	10.116.95.226	Up	Up
bigg's	Florence	10.115.190.17	10.112.61.226	Up	Up
bigg's	Highland/Ridge	10.115.190.20	10.112.67.226	Up	Up
bigg's	Union Center	10.119.190.45	10.116.114.226	Up	Up
bigg's	Western Hills	10.115.190.19	10.112.65.226	Up	Up
CUB West	Apple Valley	10.104.34.1	10.104.34.204	Up	Up
CUB West	Arden Hills	10.111.190.51	10.108.139.204	Up	Up
CUB West	Lyndale	10.107.190.52	10.104.136.204	Up	Up
CUB West	Blain South	10.104.38.1	10.104.38.204	Up	Up
CUB West	Brooklyn Park North	10.108.89.1	10.108.89.204	Up	Up
CUB West	Brooklyn Park South	10.104.40.1	10.104.40.204	Up	Up
CUB West	Burnsville	10.108.181.1	10.108.181.204	Up	Up
CUB West	Coon Rapids South	10.104.114.1	10.104.114.204	Up	Up
CUB West	Cottage Grove	10.107.190.8	10.104.46.204	Up	Up
CUB West	Crystal	10.104.48.1	10.104.48.204	Up	Up
CUB West	Duluth	10.104.50.1	10.104.50.204	Up	Up
CUB West	Eagan	10.107.190.11	10.104.52.204	Up	Up
CUB West	Forest Lake	10.104.86.1	10.104.86.204	Up	Up
CUB West	Greenbay East	10.89.97.1	10.89.97.204	Up	Up
CUB West	Greenbay West	10.89.99.1	10.89.99.204	Up	Up

What are the pitfalls to avoid?

- Don't lose communication
 - Make sure IP addresses and dial outs are programmed
 - Make sure phone connections work, bills paid
- Don't change an alarm set-point incorrectly
- Don't remove a sensor and not reprogram once it is installed.
- Don't acknowledge an alarm and not follow through because you get distracted before booking
- Be extremely cautious changing defrost length of times. If you type too long you will not get an alarm and you will be in defrost.
- Make sure the sites are backed up and the software matches
- Make sure the people have access don't change the site ids
- Reboot receiving computers often (weekly)
 - If the cache fills, it does not accept alarms

Lessons Learned

- Operations must be heavily involved
- Integrate Energy and Maintenance
- Understand that you don't just install controls and they work. You need to monitor them and re-commission them periodically this takes a budget.
- Central Monitoring saves other departments money, but it is difficult for Central Monitoring to be seen as anything except an expense.
- Focus on basics – Like door switches
 - If you cannot be consistent on something simple like door switches you cannot handle more complicated issues.

Lessons Learned

- Restrict programming access and controller access
- Monitor things that tell you something finite (For instance don't pay for an Electric meter if what you are really trying to understand is if your electric heat is kicking on)
- A night shift is very difficult to keep going. We see burnout every 2 years on night time Central Alarm Analysts.
- Upgrade to Ethernet

