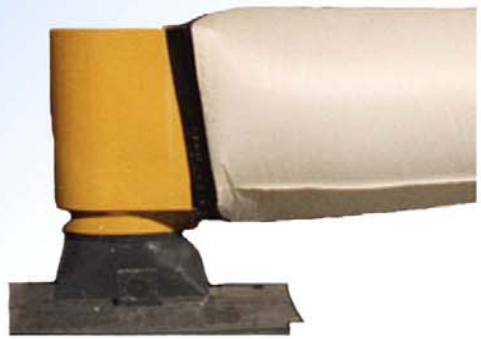

Heating · Cooling · Dehumidifying · Ventilating · Site-Surveillance · Air-Cleaning
TEMPAIR



THERMAL REMEDIATION

FROM TEMPAIR®

Mimoun Abaraw

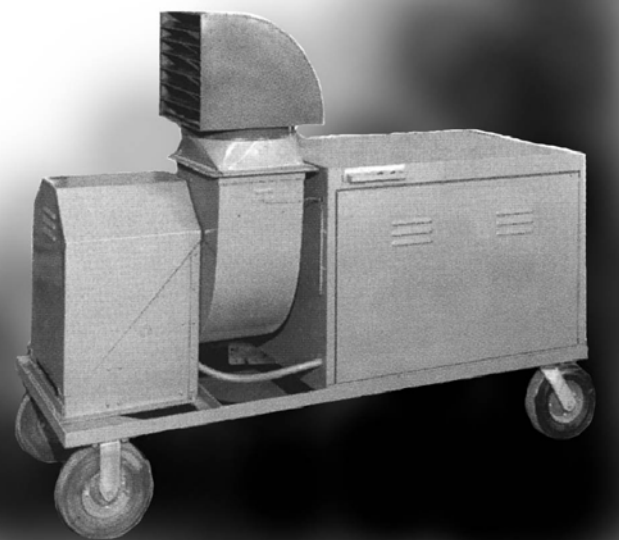
Product Manager

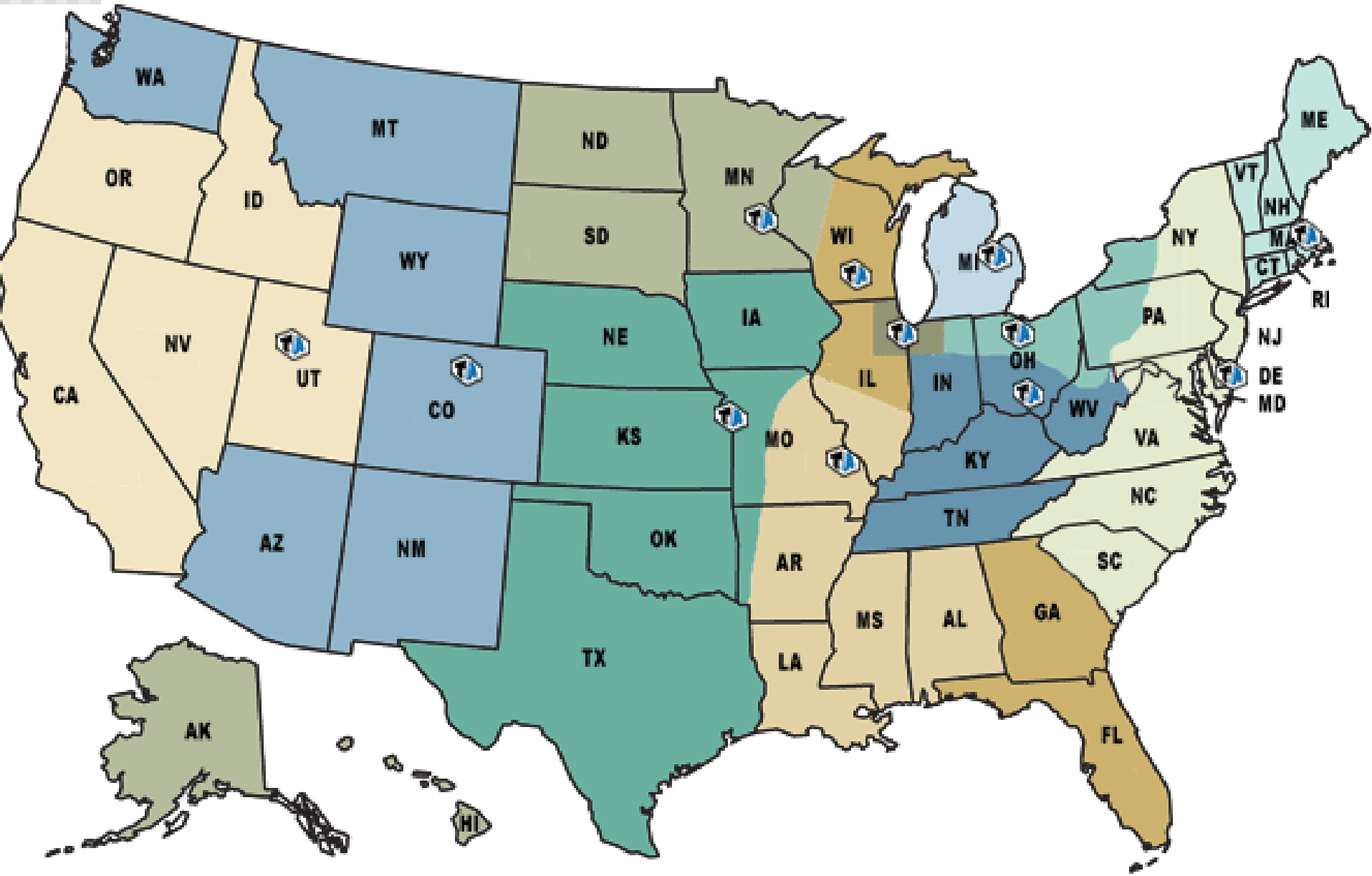
TEMP-AIR

Division of Rupp Industries, Inc.

History

- 1965 Rupp Industries was founded
- 38 years later Rupp has grown into a multi-million dollar corporation
- The largest temporary heating supplier in North America

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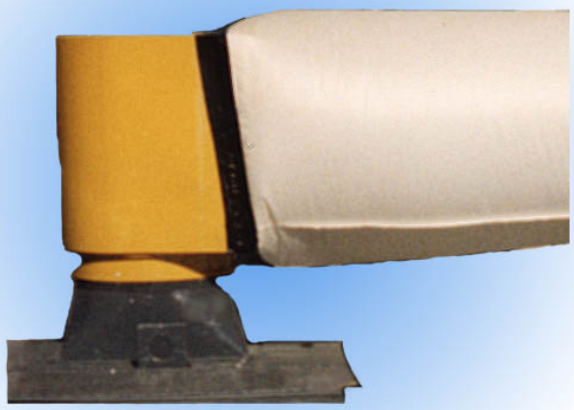
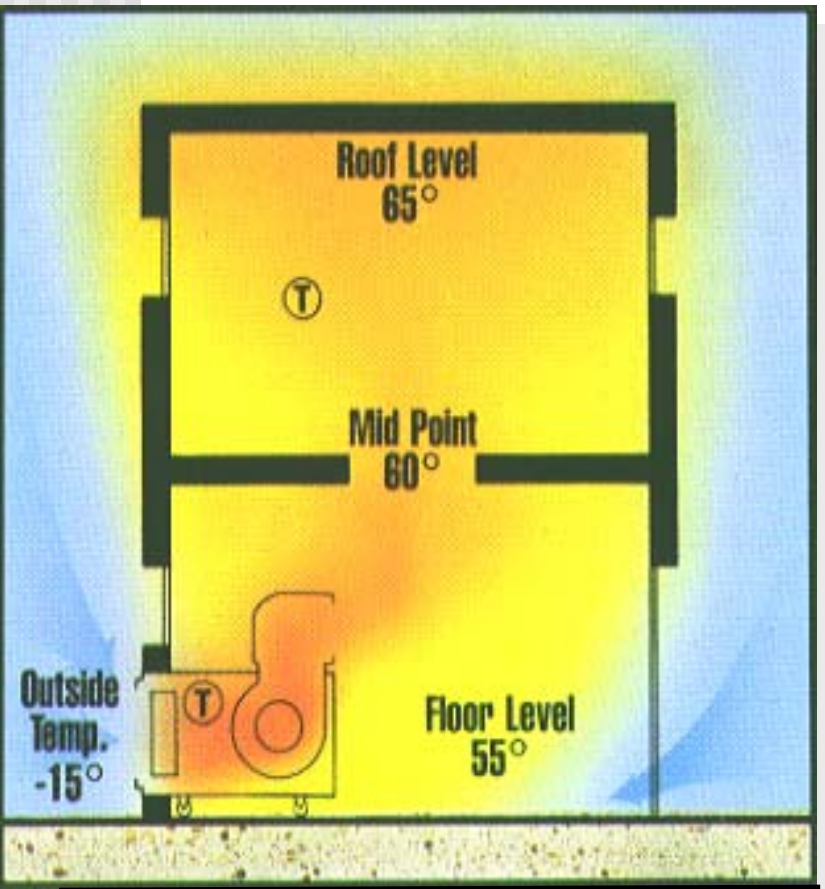


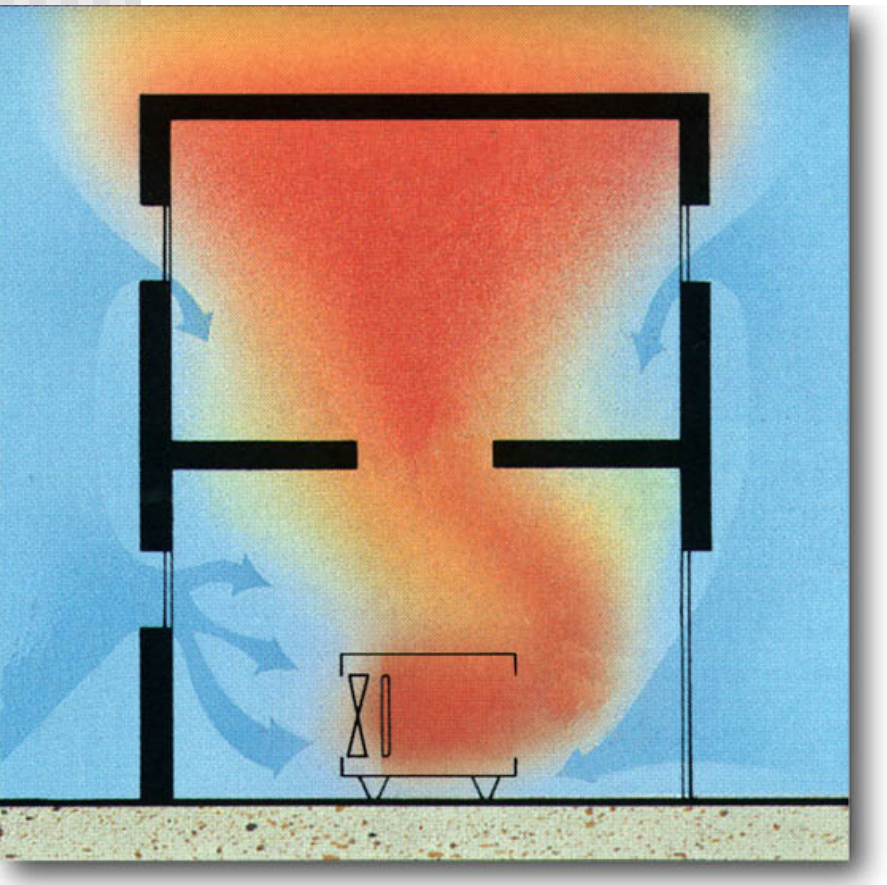
Process

100% Outside Air (Patented Process)



- **Positive pressure**
  - **Good air distribution**
  - **Hot air is pushed to the corner and through the cracks**
- **Calculated and controlled infiltration (4-6 air changes per hour)**
- **Lower relative humidity**

Re-circulating Inside Air



- **Negative pressure**
- **Bad air circulation**
- **Uncontrolled infiltration**
  - **No air changes**

Equipment

Natural Gas / Propane Heaters

THP - Series

- From 300,000 to 4.5 Million Btu/Hr
- From 2,000 to 27,000 CFM
- Small to large physical size
- Contained flame
  - “Makeup-air” style

Advantages of THP Series

- **Works on either natural gas or propane**
- **Maintains desired temperature with remote Electronic Modulating Control Valve that constantly monitors and adjusts the gas flow to the burner, which translates to reduction in fuel consumption and steady discharge temperature in fluctuating ambient temperatures**
- **High/Low temperature shutdown**

Advantages of THP Series (cont.)

- **Does not recycle dust and other contaminants in air stream by constantly introducing fresh, outside air into space**
- **Provides even temperature distribution and lower humidity control level**
- **Infinite modulation with the BTU range**
- **Discharge temperatures control from 90 to 240 ºF**
- **From 10% of its maximum BTU rating to its maximum input**

Advantages of THP Series (cont.)

- **THP heaters provide 10:1 Fan Induction Ratio (air movement of ten times more air than you are supplying) compared to Prop-fan units that have 4:1 Induction Ratio**
- **Available with National ETL Approval and meet or exceed American National Standard Institutes Z83.7**
- **Available with CSA certification**

THP - Standard Safety Controls

1. **Electronic Burner Control – Provides supervision of the flame and locks system out in the event of failure to ignite, or loss of flame signal**
2. **High Limit #1 – Mechanical limit shuts burner off if flame is not properly contained**
3. **High Limit #2 – FM approved electronic limit, shuts burner off if discharge air temperature exceeds set point. Requires manual reset**

THP - Standard Safety Controls (cont.)

4. **Proof of Air Flow Switch – Shuts burner off in the event of inadequate air flow through unit**

5. **Proof of Closer Switch – Prevents burner from starting if main gas valve is not in the fully closed position**

6. **Starter Interlock – Shuts burner off if blower motor overload condition is detected**

7. **Redundant Main Gas Valves – Two main gas valves, one motorized, ensure the flow of gas to the burner is shut off**

THP - Standard Safety Controls (cont.)

8. **External Pressure Regulator – External pressure regulator, with internal pressure relief, supplies low pressure gas to unit. If regulator should fail, excess gas pressure is vented out regulator and not down stream to heater**

9. **Electronic Temperature Control System – Modulates gas flow to burner to maintain constant discharge air temperature. Prevents over heating of the air stream**

THP - Standard Safety Controls (cont.)

10. **Spark Arresting Final Filter – This unit is equipped with a stainless steel final filter**

11. **Heavy duty, double wall steel construction**

CH Series

- From 300,000 to 1 Million Btu/Hr
- From 1,700 to 7,000 CFM

Disadvantages of CH Series

- **Extremely high discharge temperatures out of the heater**
- **Pre-set high and low discharge temperature (either low fire or high fire)**
- **Requires at least 500 ºF rated discharge duct and a limit of 50 feet of duct (static pressure)**
- **Half of the CFM of the comparable THP series heater**

Disadvantages of CH Series (cont.)

- **Requires at least 10 feet clearance from the discharge of combustible materials**
- **Due to lower CFM ratings, the heater would operate on high fire longer to heat the same area than the THP series heater (higher fuel consumption)**

Relationship Between Btu's & CFM

Btu's = 1.08 x ΔT x CFM

Example:

- **3.0 Million Btu = 1.08 x ΔT x 9000 CFM**
- **ΔT = 3.0 million / 1.08 x 9000 = 308.64ºF**
- **Assuming the outside ambient temperature is 80ºF**
- **Then, the discharge temperature is 388.64ºF**

Energy Cost Comparison

22.5 Million BTUs Using Gas Heater (5 THP- 4,500)

Key

460 Volts / 3 Phase / 60 Hz / 30 Amps

5 x 23.90 kW/Hr = 119.51 kW/Hr

Electric Energy Cost:

119.51 kW / Hr x 24 Hours x $0.07/ kW = **$200.78 / Day**

Using Propane

5 x 1,180.3 Gal/Day x $0.70/Gal.

$ 4,331.78 / Day

Using Natural Gas

5 x 108 dKt/Day x $5.00

$ 2,900.78 / Day

Electric

- **Require high power (460V / 3ϕ / 195 Amps)**
- **Limited to a maximum of 150kW or 500,000 BTU/Hr**
- **Mostly indoor use only (re-circulate the inside air)**
  - **Low temperature rise**
- **Expensive (Generator cost or internal power cost)**

Energy Cost Comparison

22.5 Million BTUs Using Electric Heaters

Key

1 kW = 3,412 Btu's

(22.5 million Btu's * 1 kW) / (3,412 Btu's) = 6,594.4 kW

Using in House Power

6,594.4 Kw x 24 hrs x $0.07/kW

$ 11,078.6 / Day

Using Generator

6,594.4 kW x 24 hrs x $0.16/kW

$ 25,322.5 / Day

Steam / Hot Water

- **Same effect as electric (re-circulates the inside air)**
- **More applicable for bin treatment**
- **High cost installing distribution system (supply and return lines, insulation…)**

Fans

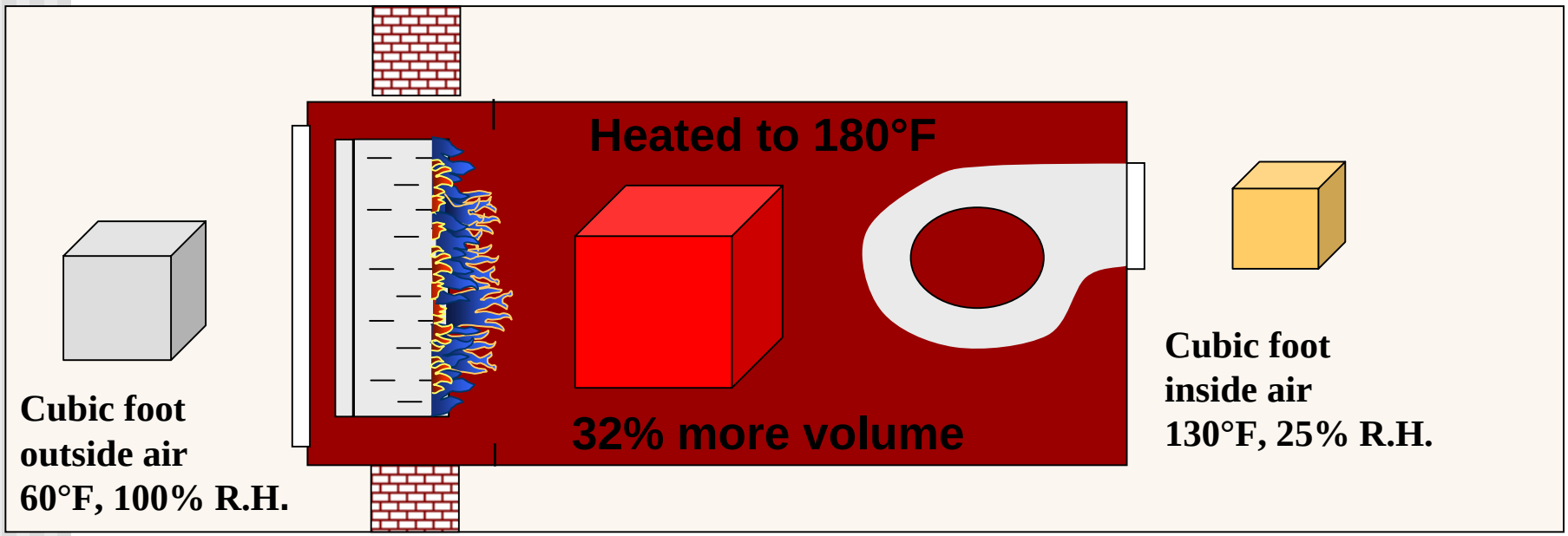
- Fans are used to redistribute heat during heat treatment
- From 4,000 CFM to 27,000 CFM


GAS

Humidity Control

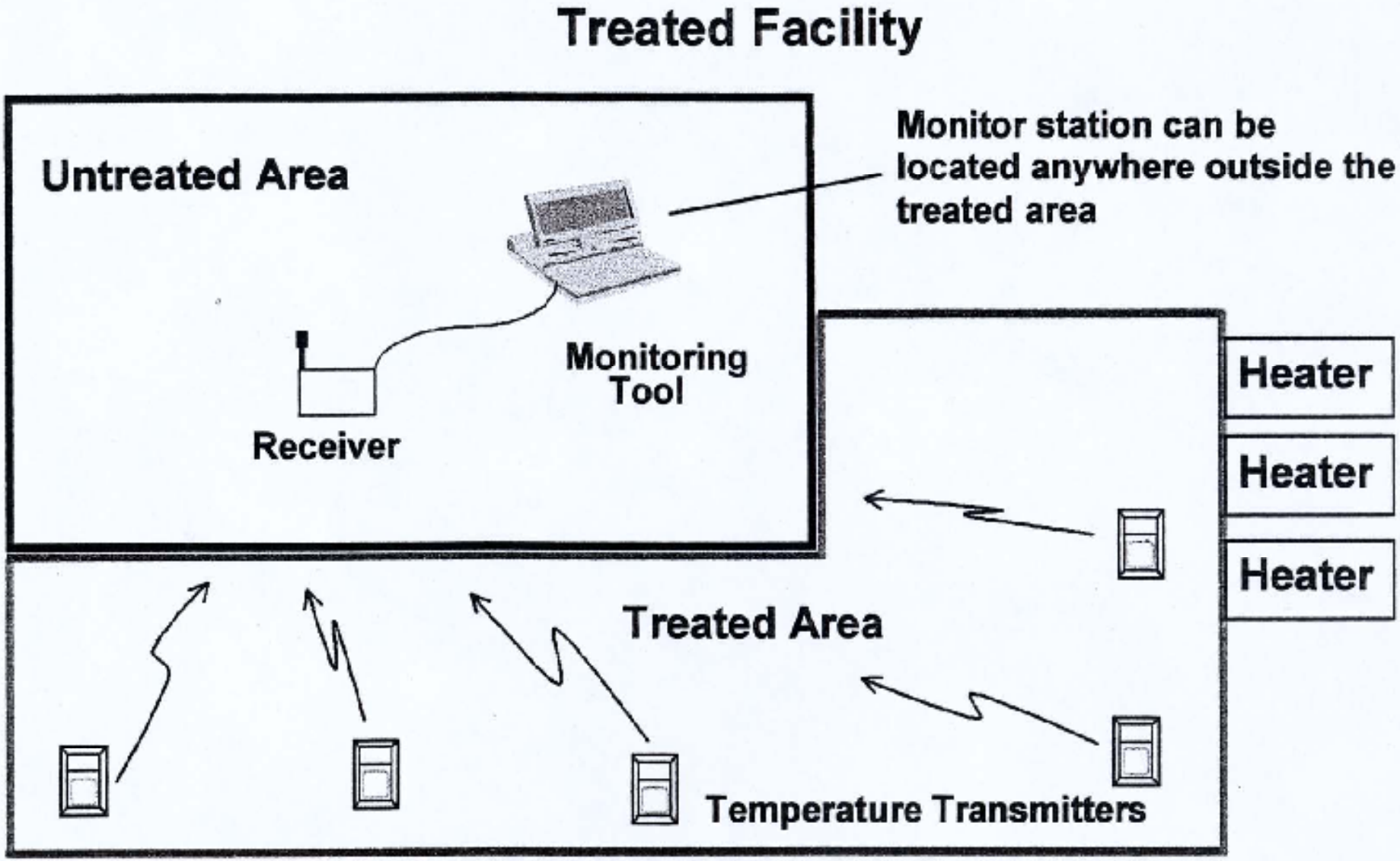
Lower humidity = Quicker kill

Cold air expands as it is heated and can absorb more moisture



Wireless Temperature Monitoring System

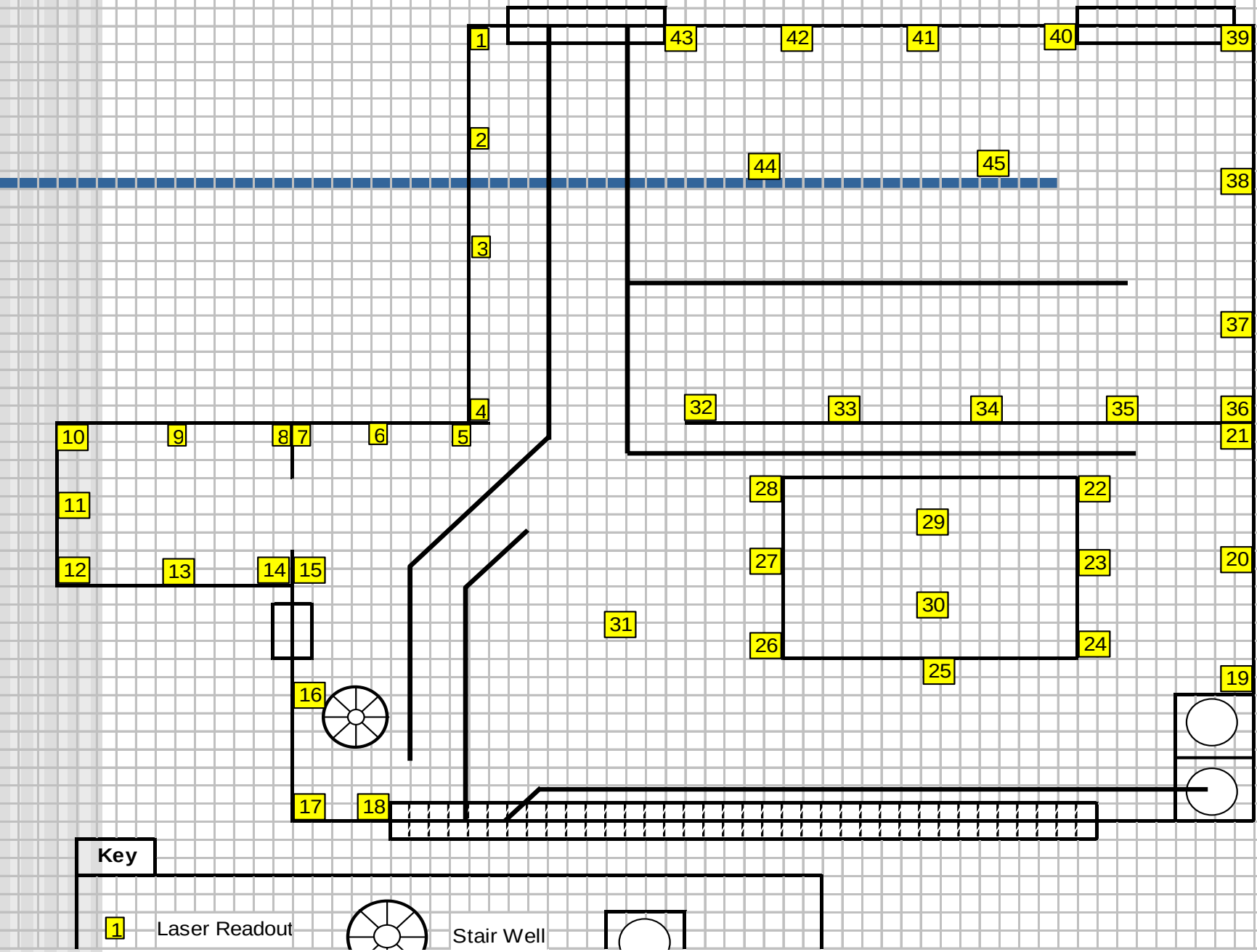
WIRELESS TEMPERATURE MONITORING PROPOSAL

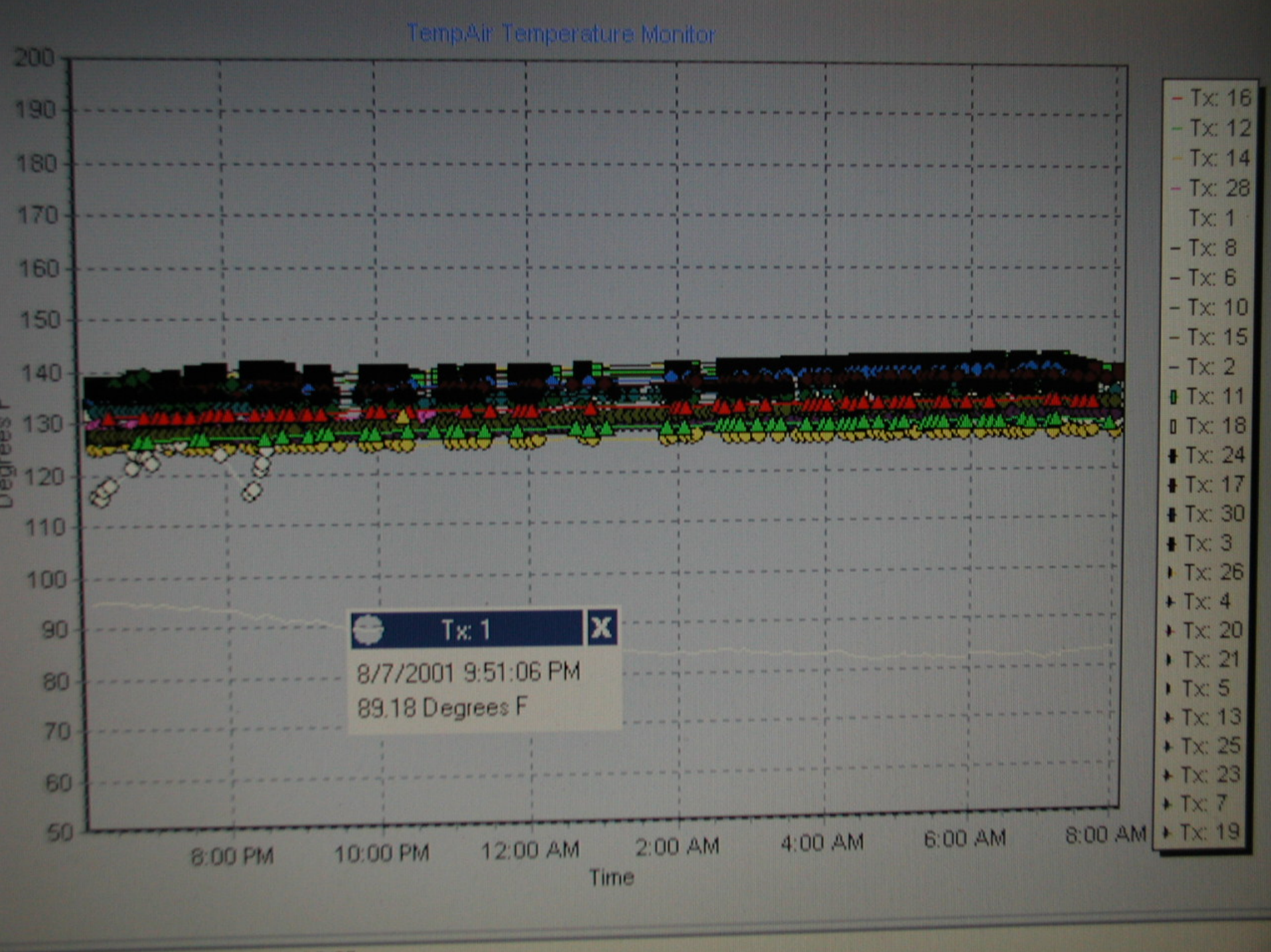


Technology & Components

- **900 MHz Spread Spectrum RF technology**
- **Far superior than older narrow band RF technology in its building structure penetration and jam-resistance ability**
- **RF Repeater is available to increase transmission distance in extremely large facilities or in case where there are very large metal obstructions**
- **Maximum distance from a transmitter to receiver is dependent on building characteristics (200 – 700 feet)**

Feed Mill 1st Floor

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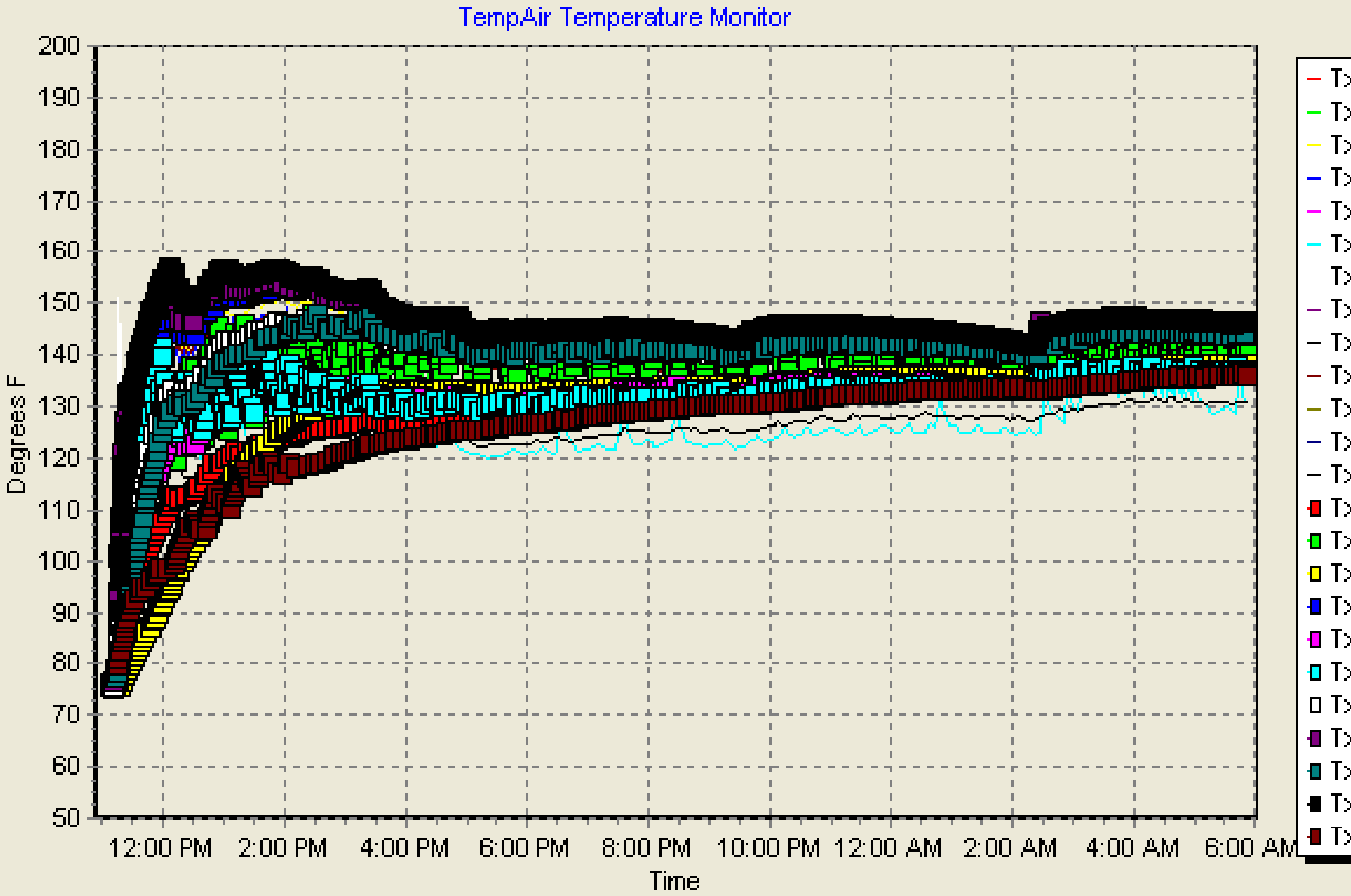
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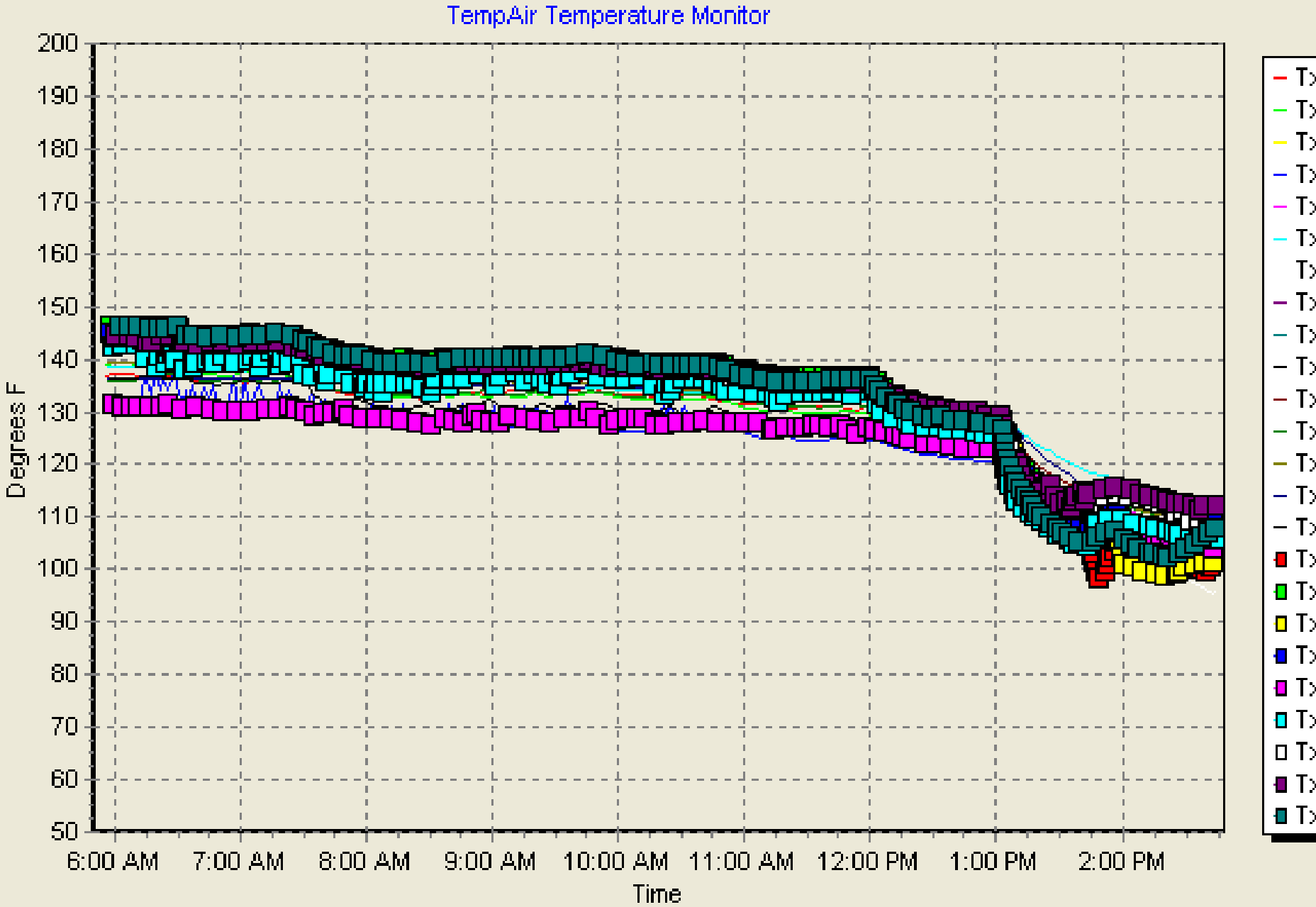
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Time

Data Saved & Stored

Id/Channel	7/20/2003 6:00	7/20/2003 6:05	7/20/2003 6:10	7/20/2003 6:15	7/20/2003 6:20	7/20/2003 6:25	7/20/2003 6:30	7/20/2003 6:35
Tx: 118/Temp.	136.9		137.1	136.9	137.0		137.0	136.3
Tx: 117/Temp.	139.0	138.6		139.1	138.6	138.2		137.6
Tx: 113/Temp.	143.0	144.6	144.5	140.1	140.0	141.9	140.8	139.0
Tx: 116/Temp.	129.4	129.3	129.3	135.1	135.5	134.8	135.5	132.7
Tx: 109/Temp.	143.7	143.7	143.7	143.8	143.7	143.7	143.7	142.3
Tx: 108/Temp.	138.6	138.4	138.4	138.4	138.6		138.6	138.2
Tx: 102/Temp.	146.3	146.4		146.4	146.4	146.4		144.3
Tx: 115/Temp.	146.5	146.6	146.5	146.3	146.4	146.2	145.6	144.1
Tx: 123/Temp.	146.9	147.2		146.9	146.9	146.9	147.0	145.2
Tx: 112/Temp.	146.2	146.6	146.4	146.5	146.5	146.6	145.2	143.8
Tx: 106/Temp.	139.4	139.4	139.4	139.6		139.8	139.8	138.9
Tx: 107/Temp.	136.0	135.7	135.7	137.0	138.0	137.1	137.0	136.2
Tx: 105/Temp.	139.3	139.3	139.3		139.4	139.4	139.3	138.7
Tx: 125/Temp.	136.2	136.2	136.3	136.3	136.2		136.3	136.3
Tx: 121/Temp.	136.3	136.5	136.5		137.1	136.4	136.4	136.0
Tx: 101/Temp.	145.7	145.9	145.9	145.7	145.7		145.2	143.2
Tx: 103/Temp.	146.3	146.3	146.3		146.3	146.3	145.8	144.5
Tx: 119/Temp.	145.1	145.2	145.2	145.2	145.1	144.9	145.1	143.9
Tx: 104/Temp.	144.9	145.0	145.1	145.2	145.2		145.1	144.1
Tx: 120/Temp.	131.4	131.3	131.2	130.9	131.1	131.3		130.8
Tx: 114/Temp.	142.6	142.8	142.9	140.1	139.7	140.3	141.1	138.2
Tx: 111/Temp.	144.0	144.1	144.0	143.6	143.8	144.3	144.5	143.8
Tx: 110/Temp.	144.6		144.4	143.5	143.3	144.6	144.6	143.4
Tx: 124/Temp.		146.5	146.5	146.3	146.1	146.1	146.2	144.7

Pictures


CAUTION
BUMP CAPS
MUST BE WORN
IN THIS AREA
NO
SMOKING
EATING or
DRINKING
TEMP-HEAT


TEMP-HEAT

RUPP
Temporary Climate
TEMP-HE


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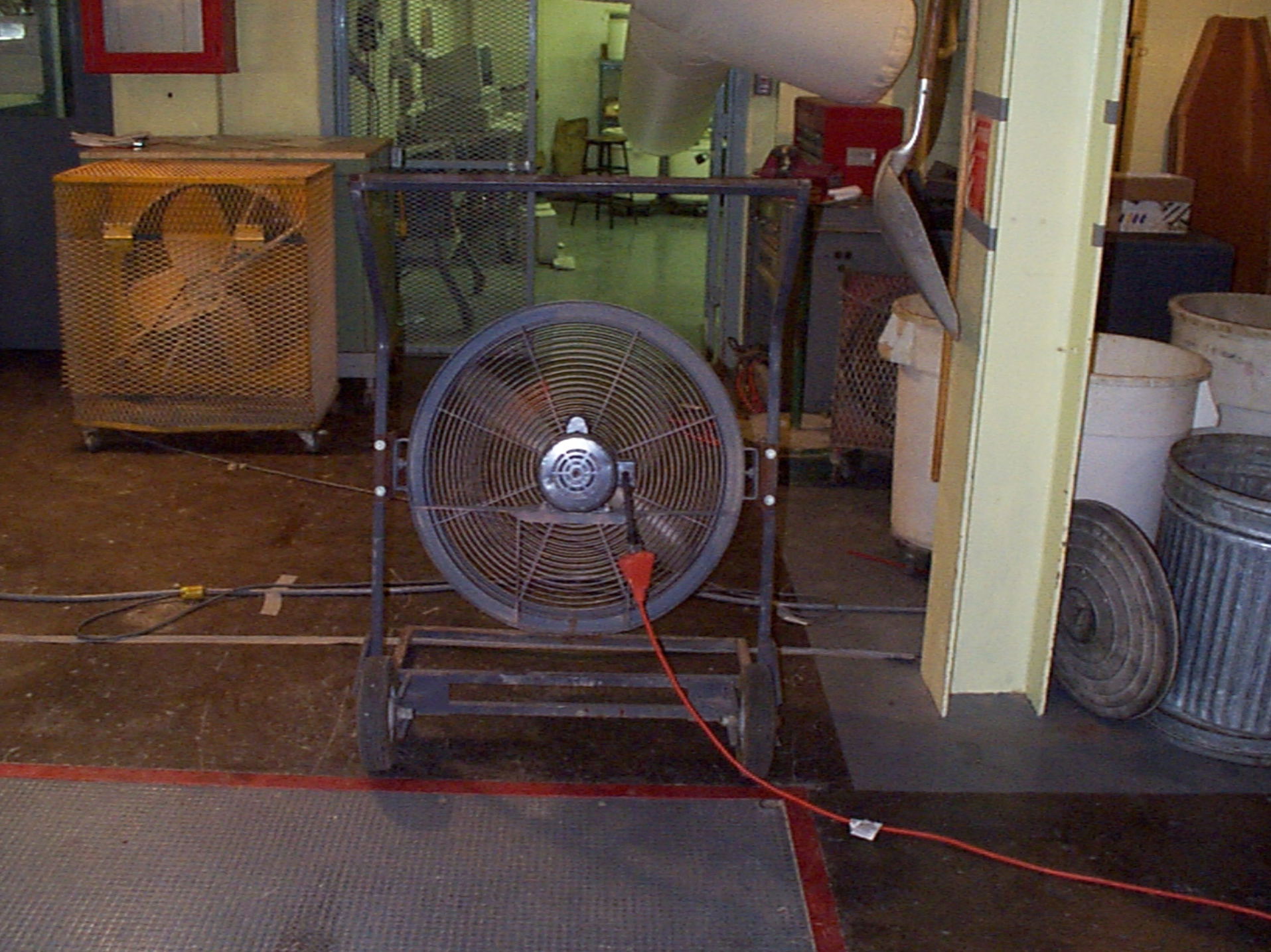


TEMP-COOL


KSU
KANSAS
STATE
MAJOR SCALE
SCALE DISCH GATE CLOSED
SCALE DISCH GATE OPEN
SCALE DISCH GATE CLOSED
SCALE DISCH GATE OPEN
BIN SELECT
143.8
ε=0.95


176.4
ε=0.95