



# Evaluation of Thermal Destratifiers

Peter Ly

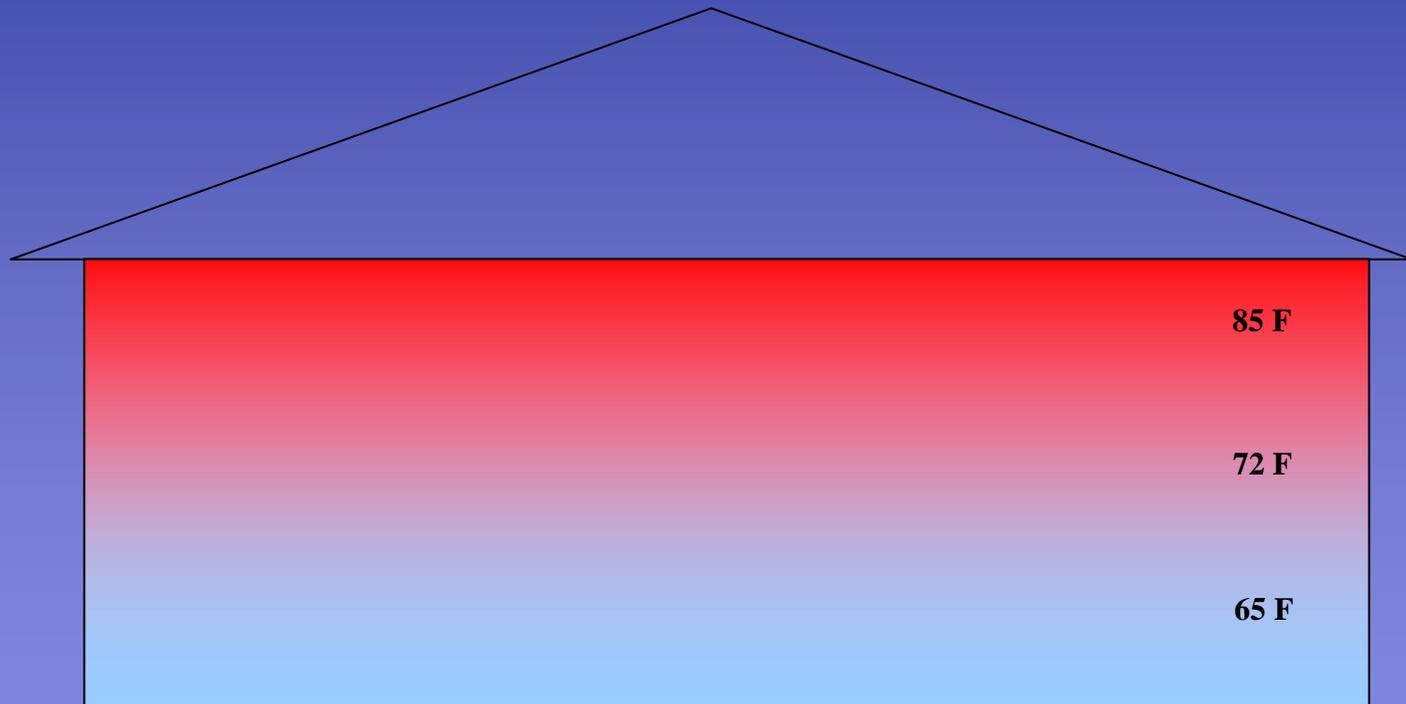
Naval Facilities Engineering Service  
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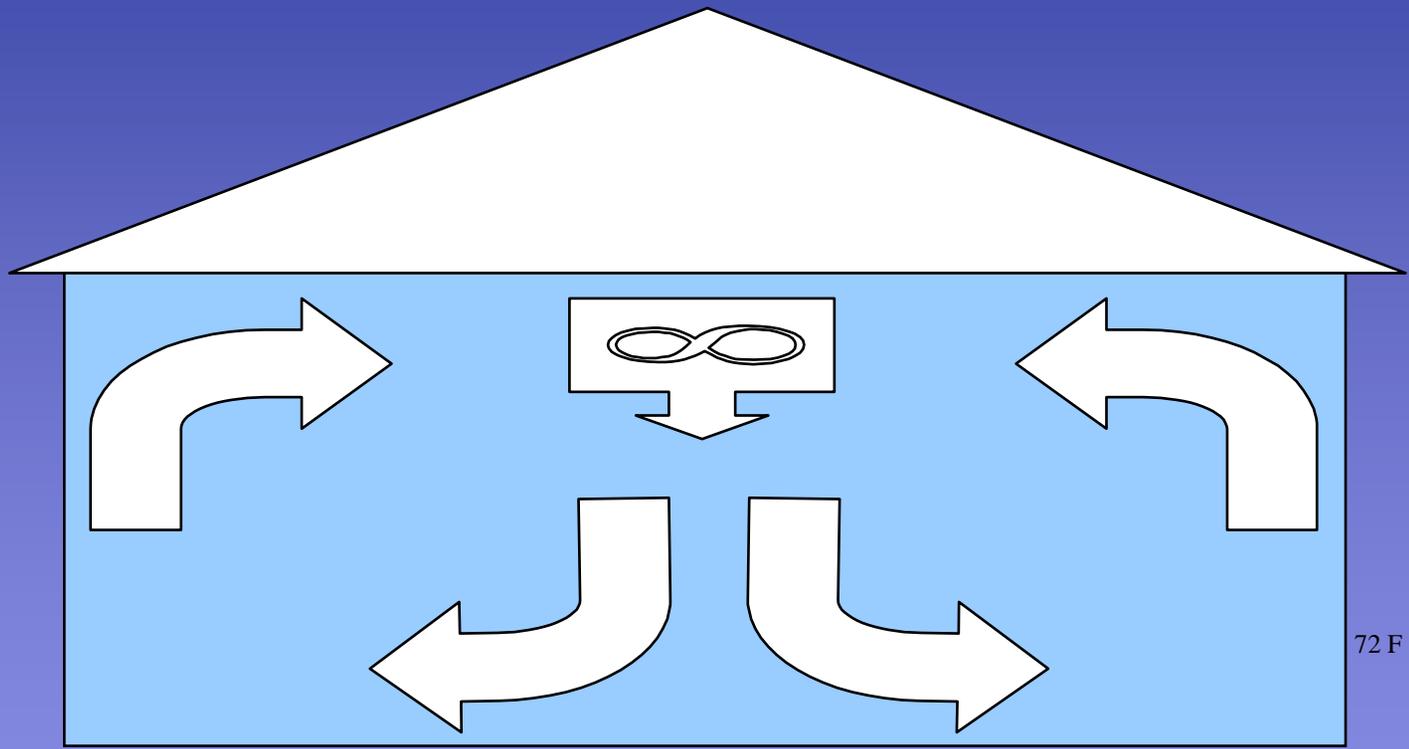


# Typical Stratification





# Desired Destratification





# Navy Techval Demonstration

## Thermal Destratifier





# Validated Benefits

- Cost to install and operate can be favorable
- Low maintenance after fan cracking resolved
- Energy savings are achievable





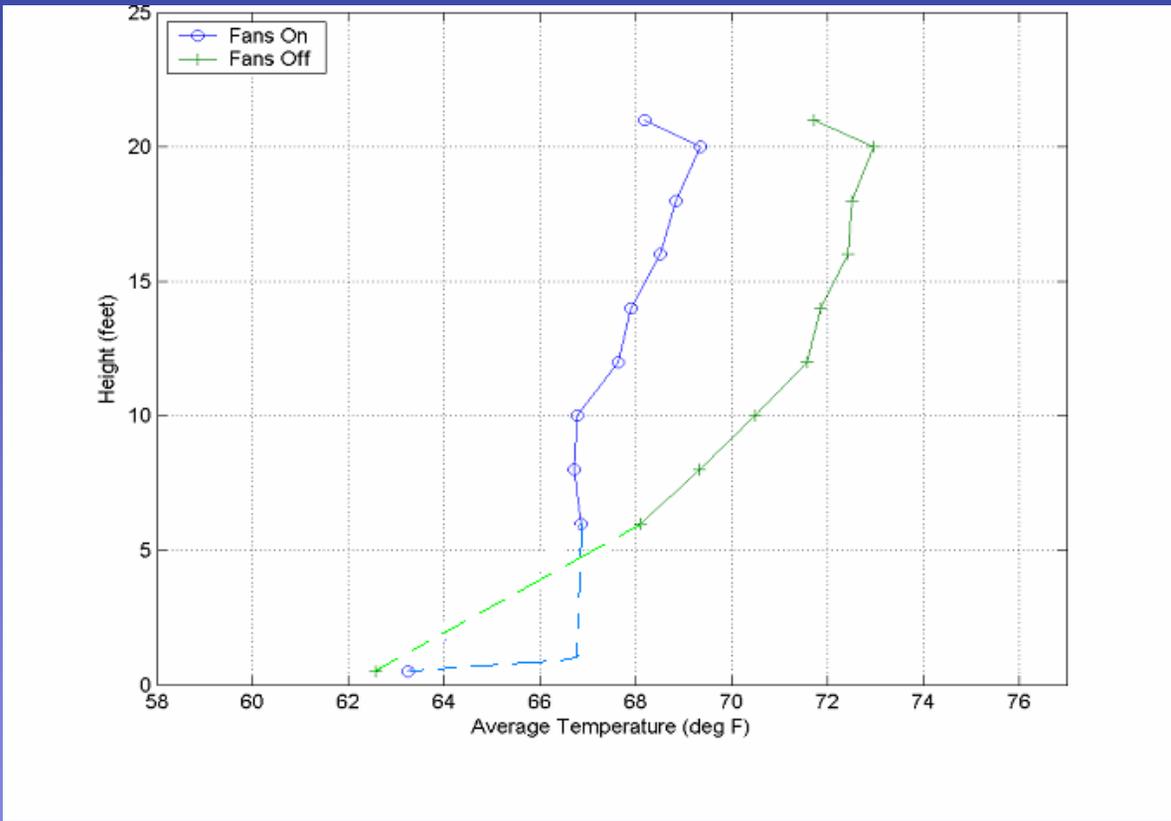


# Electric Heat Pump Application

- Machine Shop
- Non-insulated facility with metal siding for roof and walls
- Max. ceiling height: 27 feet
- Single electric heat pump with 14 heat diffusers located at the ceiling
- Installed 6 destratification fans

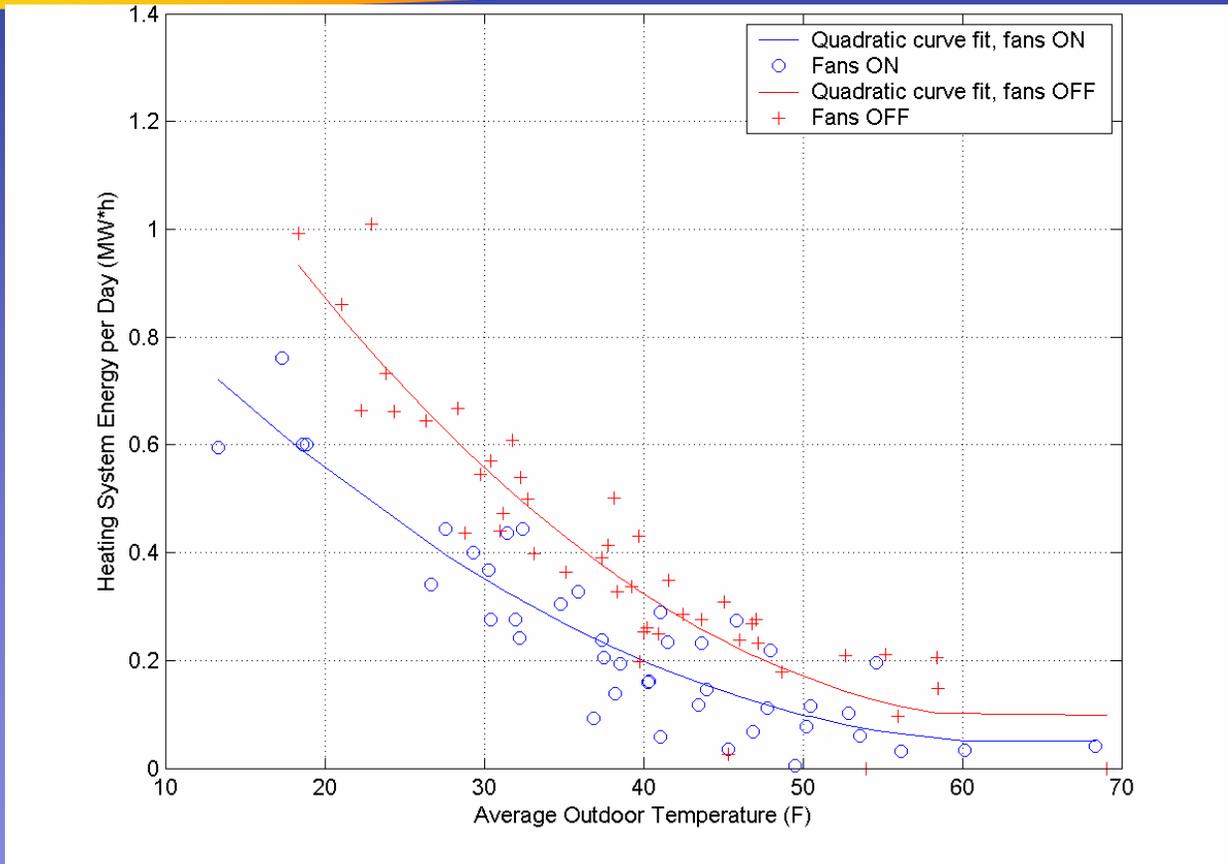


# Bethesda Stratification Profile





# Bethesda Energy Consumption





# Bethesda Case Study

- Electricity: \$0.056/KWH
- Heating Degree Days: 4,240
- Installed Cost: \$8,100
- Operational Cost of 6 fans: \$71 per year
- Annual Savings: \$1,370 per year
- Simple Payback: 6 years (in 2005)
- Electricity rate now at \$0.094/KWH
  - Annual Savings: \$2,339 → SPB: 3.5 years



# Steam Heating Application

Naval Support Activity Crane, Crane, IN



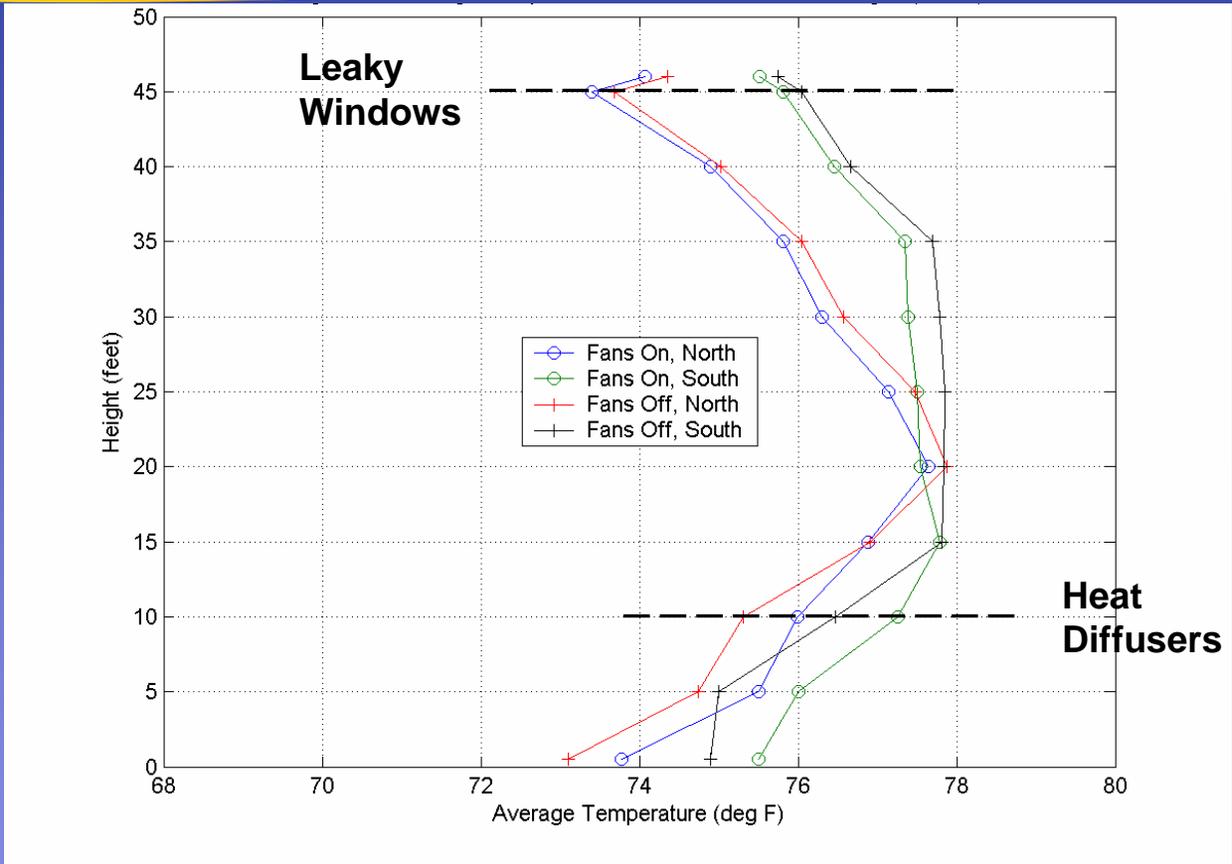


# Steam Heating Application

- Equipment Assembly Area
- Non-insulated concrete facility with high-bay doors at each end and leaky windows
- Max. ceiling height: 49 feet
- Serviced by a natural gas boiler
- 11 steam unit heaters
- Installed 54 destratification fans

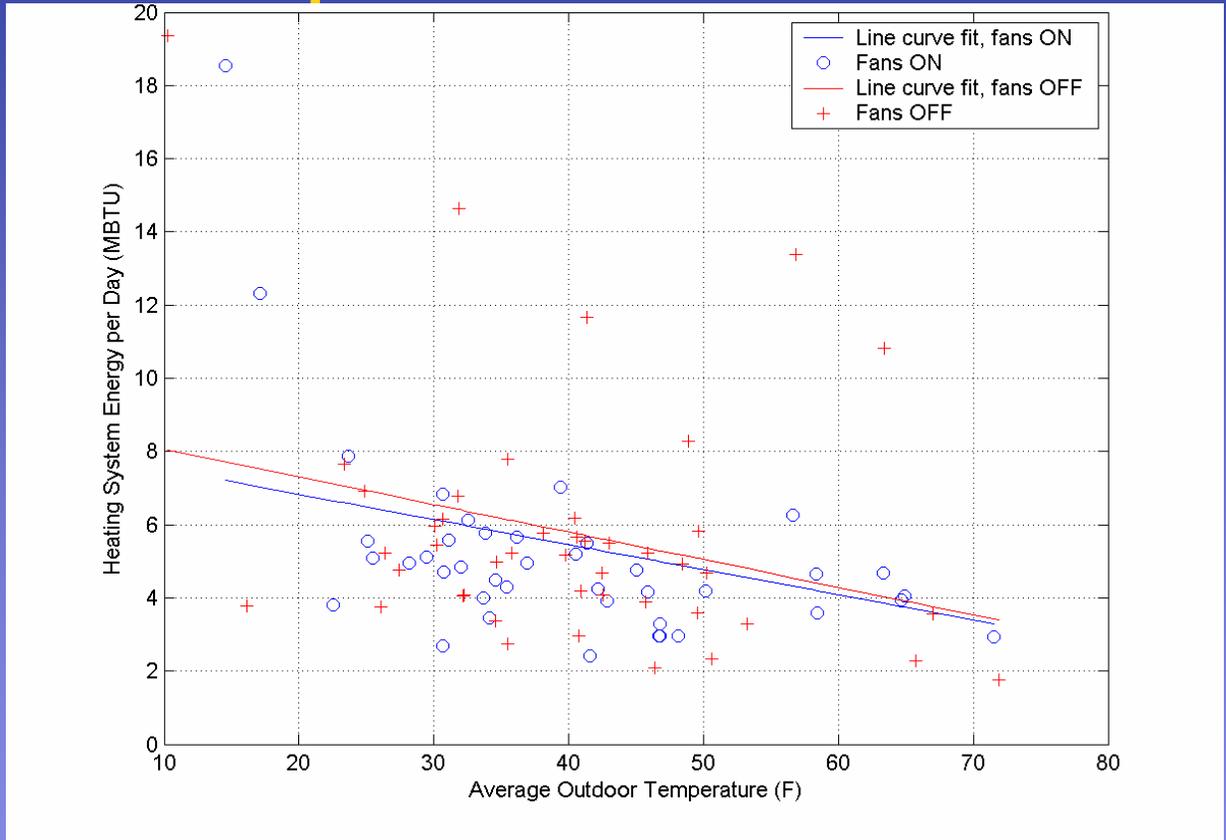


# NSA Crane Stratification Profile





# NSA Crane Energy Consumption



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August 6

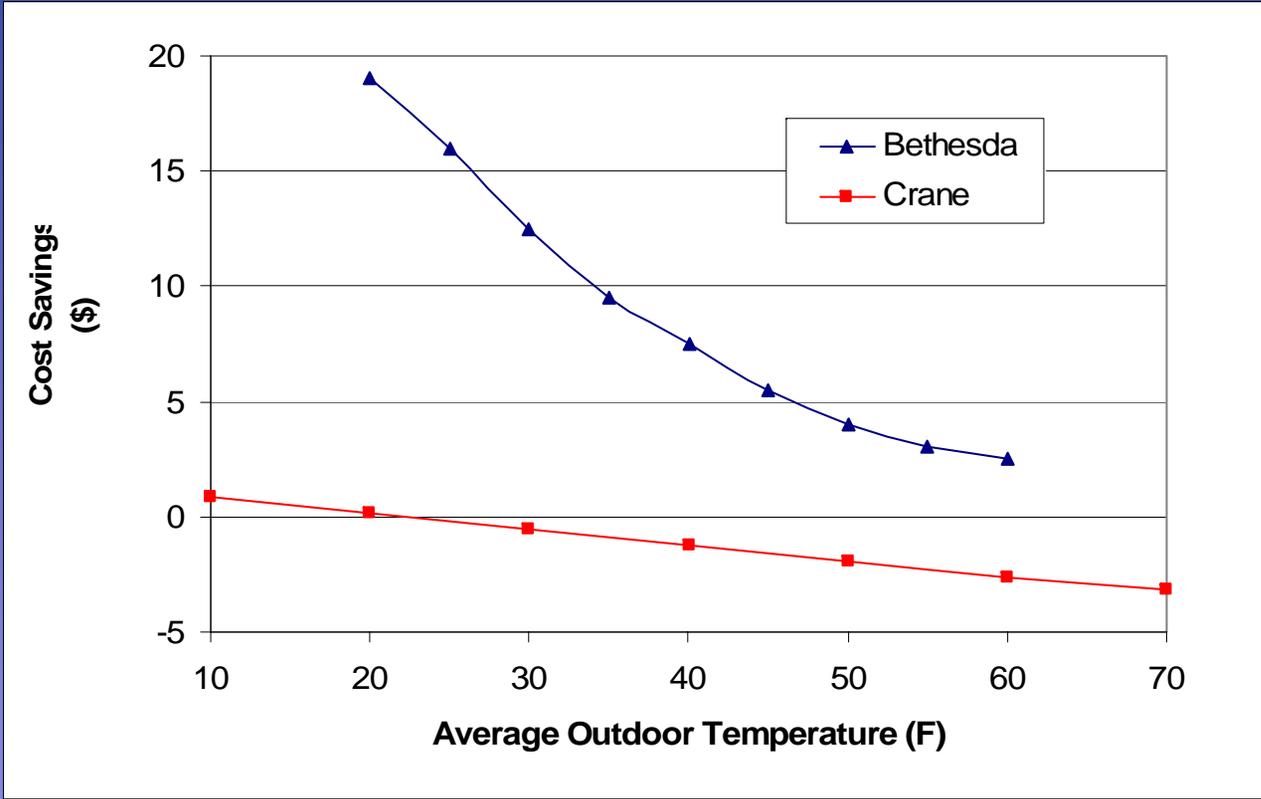


# NSA Crane Case Study

- Electricity: \$0.039/kWh
- Natural Gas: \$0.855/therm
- Heating Degree Days: 4,637
- Installed Cost: \$44,400
- Operational Cost of 54 fans: \$915 per year
- Annual Loss: \$150 per year
- Natural gas must cost \$1.02/therm to break even



# Cost Savings Potential





# Quality Control

## Fan Blade Cracking:

- 1 fan at Bethesda; 4 fans at Crane
- No material was ejected
- All fans were replaced by the manufacturer
- Manufacturer improved QC process
  - No further incidents



# Future IR Heating Application

Naval Air Station Oceana, Oceana, VA

- 2 Hanger bays
- Sloped ceiling – 30 to 40 ft
- 6 IR heaters per bay
- Installed 20 destratification fans per bay
- IR control system in one bay responds just to air temperature and other bay system responds to radiation, air temperature, and air velocity



# Conclusions

- Energy and cost savings are possible for:
  - Thermally stratified buildings
    - Solid building envelope and high ceiling
  - High heating cost and low electric rate
    - For electric heating systems → high electric rates
  - Long heating seasons
- Occupant comfort was improved
  - Both Bethesda and Crane sites have since purchased and installed more systems



# Would you like to know more about this session?

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- Don't forget to fill out and drop off your session evaluations.



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