Energy & Store Development Conference

E+SD 2014

September 7-10, 2014
St. Louis Union Station Hotel
St. Louis, MO

FMI

THE VOICE OF FOOD RETAIL

HVAC 101

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Basics of Heating, Ventilation, and Air Conditioning

Retail / Commercial

Design Considerations:
- Comfort- Temp °F
- Ventilation – Dilution & Distribution

System Results:
- Occupant Comfort
- Safe Breathing
- Energy

Supermarket

Design Considerations:
- Comfort- Temp °F
- Humidity- Moisture in Air
- Ventilation – Dilution & Distribution

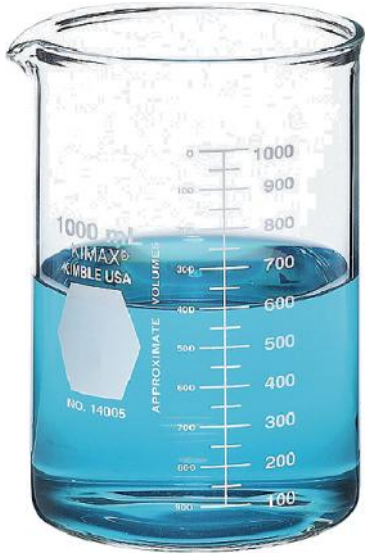
System Results:
- Occupant Comfort
- Limited Icing on Refrigeration System
- Safe Breathing
- Product Shelf Life
- Energy- Systems Interaction

FACTORS THAT DRIVE DESIGNS

Dry Bulb temperature (T_{db}) Measured in °F

Ventilation Rates (CFM)

Commercial Office



Refrigeration Equipment Design Requirements

Volume of Water within Supermarket (Humidity)

Ventilation Rates

Supermarket

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Case Environmental Requirements

Hill PHOENIX
REFRIGERATION SYSTEMS

ZERO ZONE®

KYSOR/WARREN

HUSSMANN®

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Case Environmental Requirements

8 **GENERAL INFORMATION**

Thank you for choosing Hillphoenix display cases for your food merchandising needs. This handbook contains important technical information and will assist you with the installation and operation of your new display cases. By closely following the instructions, you can expect attractive fit and finish, peak performance, and long case life.

We are always interested in your suggestions for improvements to Hillphoenix products and accessories—case design, technical documents, etc. Please feel free to contact our Marketing Services group at the toll-free number listed below. Thank you for choosing Hillphoenix, and we wish you the very best in outstanding food merchandising.

CASE DESCRIPTION

XRBH and XNRBH reach-in door merchandisers.

OPERATING DATA & DIMENSIONAL DRAWINGS

Operating data and dimensional drawings for the cases listed in this manual can be found on pages 2–5.

STORE CONDITIONS

Hillphoenix cases are designed to operate in an air-conditioned store that maintains a 75°F (24°C) store temperature and 55% (max) relative humidity (CRMA conditions). Case operation will be adversely affected by exposure to excessively high ambient temperatures and/or humidity.

REFRIGERATION SYSTEM OPERATION

Air-cooled condensing units require adequate ventilation for efficient performance. Machine-room temperatures must be maintained at a minimum of 65°F in winter and a maximum of 95°F in summer. Minimum condensing temperatures should be no less than 70°F.

RECEIVING CASES

Examine fixtures carefully and in the event of shipping damage and/or shortages, please contact the Service Parts Department at 1-800-283-1109.

CASE DAMAGE

Claims for obvious damage must be 1) noted on either the freight bill or the express receipt and 2) signed by the carrier's agent; otherwise, the carrier may refuse the claim. If damage becomes apparent after the equipment is unpacked, retain all packing materials and submit a written request to the carrier for inspection within 14 days of receipt of the equipment.

LOST/MISSING ITEMS

Hillphoenix equipment is carefully inspected before shipping to insure the highest level of quality. Any claim for lost/missing items must be made to Hillphoenix within 48 hours of receipt of the equipment.

SERVICE/TECHNICAL SUPPORT

For service or technical questions, please contact our Case Division Customer Service Department at 1-800-283-1109. For questions regarding our refrigeration systems or electrical distribution centers, please contact our Systems Division Customer Service Department at 1-770-388-0706.

PARTS ORDERING

If you need to contact Hillphoenix regarding specific fixtures or parts, please call 1-800-283-1109 and ask for a Service Parts Representative. Provide the following information about the part you are ordering:

- Model number and serial number* of the case for which the part is intended.
- Length of the part (if applicable).
- Color of part (if painted) or color of polymer part.
- Whether part is for left- or right-hand application.
- Quantity

*Serial plate is located inside the case on the top-right panel.

If the parts are to be returned for credit, ask the Parts Department to furnish you with a Return Material Authorization Number.

AUTHENTIC Hillphoenix PARTS

Hillphoenix
1925 Ruffin Mill Rd.
Colonial Heights, VA 23834
Mon.-Fri. (8 a.m to 5 p.m EST)
Tel: 1-800-283-1109
Fax: 804-526-7450
Web site: www.hillphoenix.com

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Case Environmental Requirements

STORE CONDITIONS

Hillphoenix cases are designed to operate in an air-conditioned store that maintains a 75°F (24°C) store temperature and 55% (max) relative humidity (CIRMA conditions). Case operation will be adversely affected by exposure to excessively high ambient temperatures and/or humidity.

HVAC Required for Refrigeration Systems

Refrigeration equipment manufacturers design their equipment to perform at optimum conditions and efficiency. These Optimum conditions represent a balance point of operation between the cooling components and compressors.

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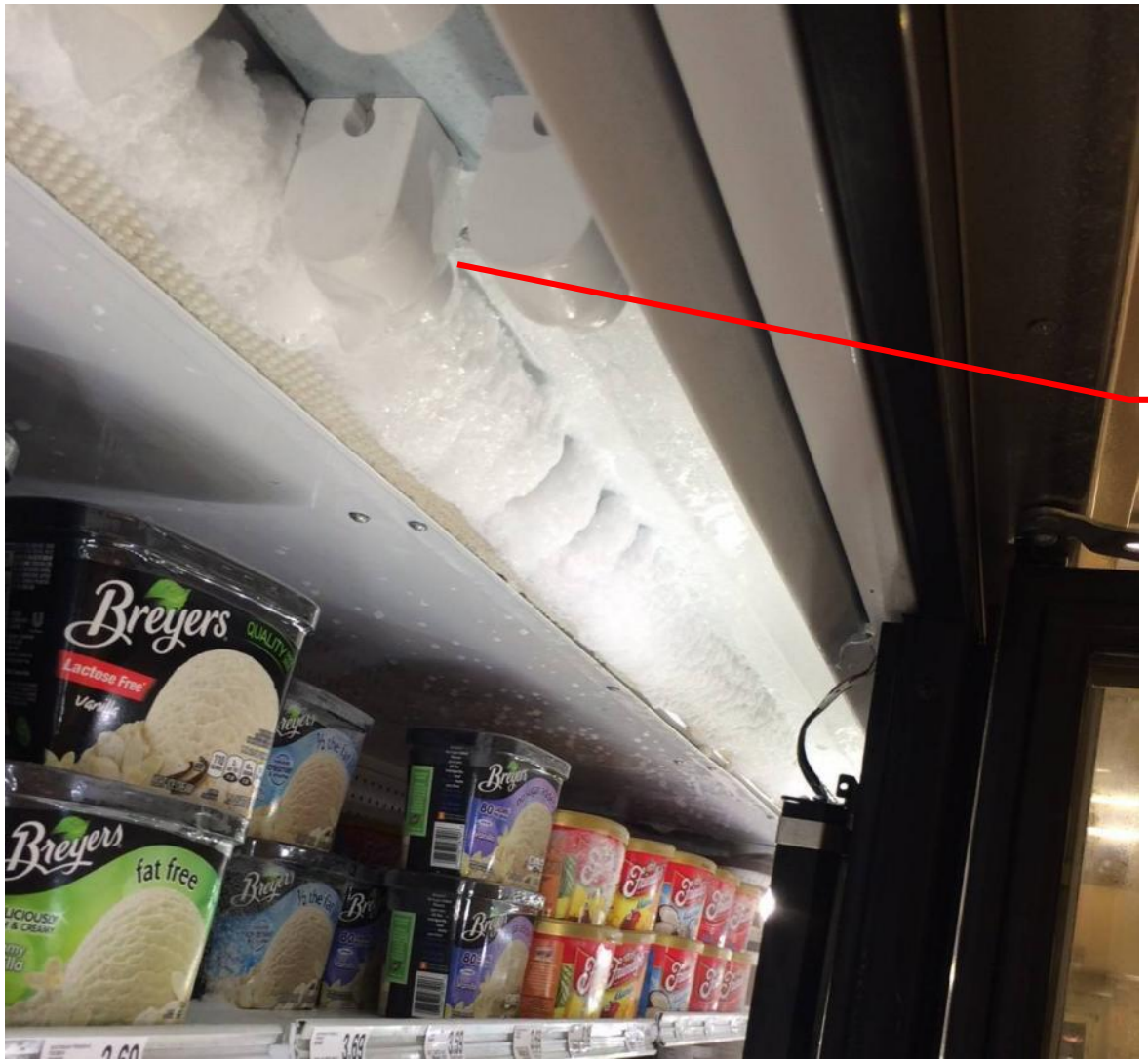
HVAC is an Integral Part of Supermarket Systems



High humidity in store can cause case sweating and coil icing, impacting performance and product quality and life.

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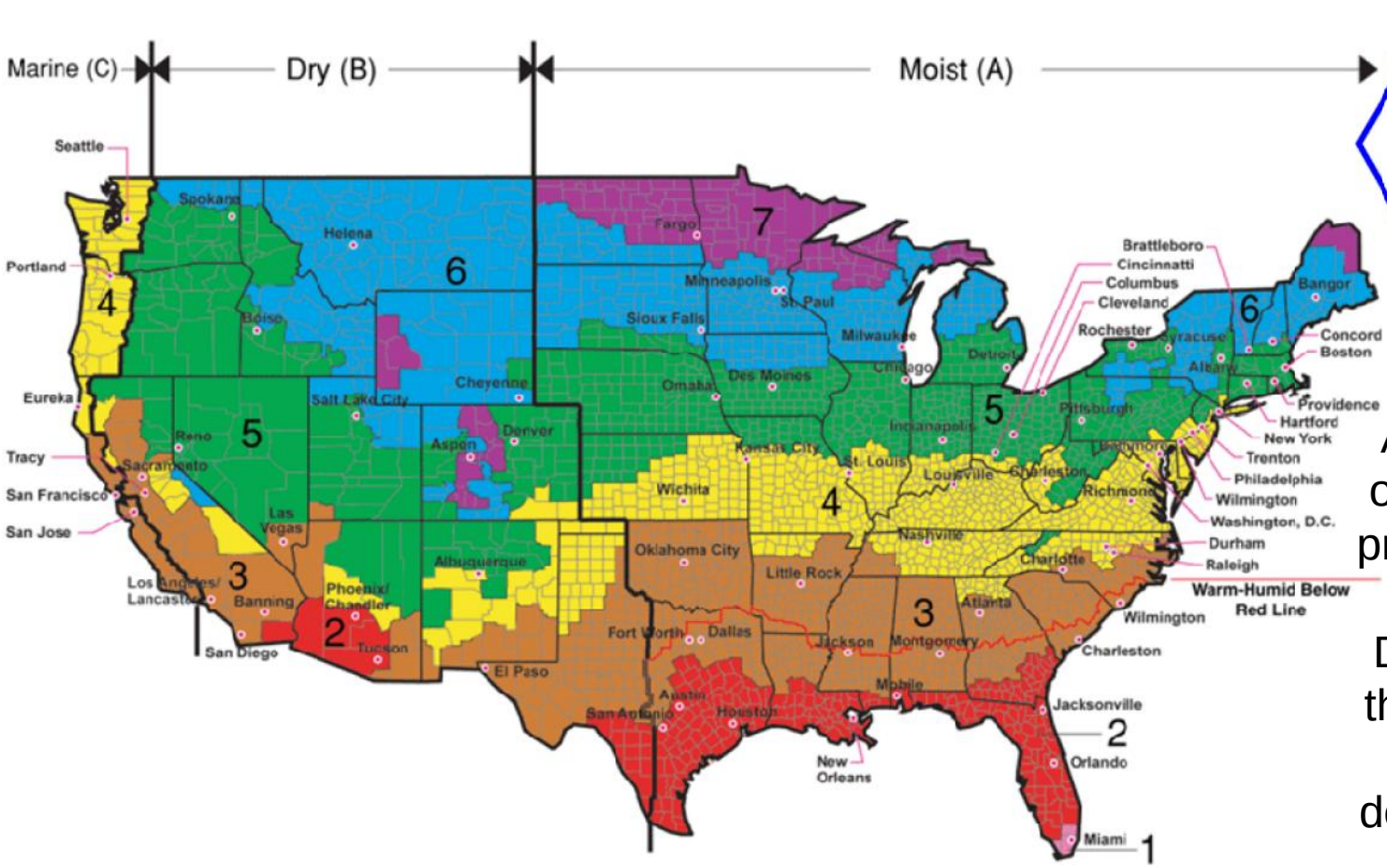
Regional Design Criteria



ASHRAE and other agencies provide regional climate data. Designers use this data as the first step in developing load calculation.

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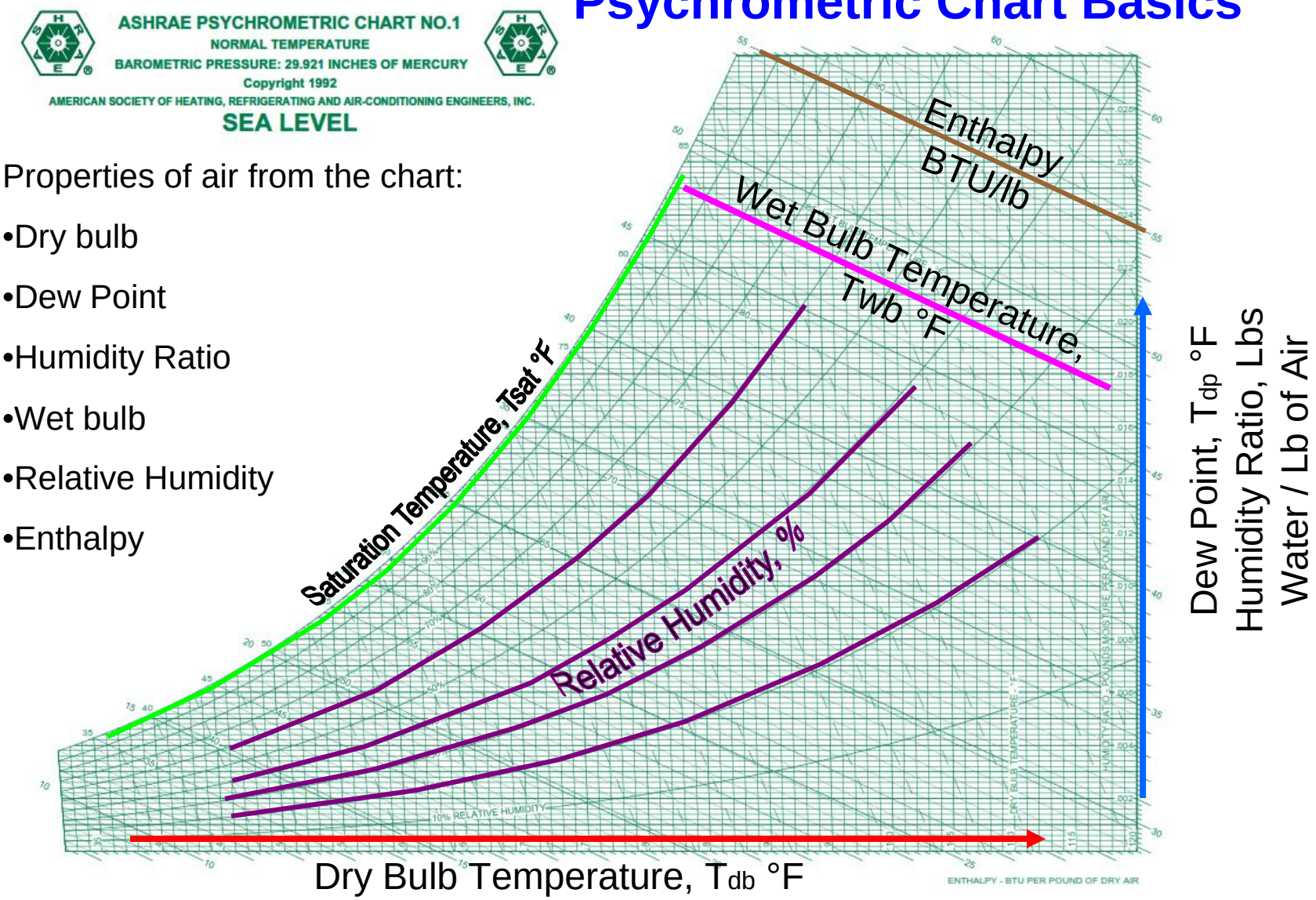
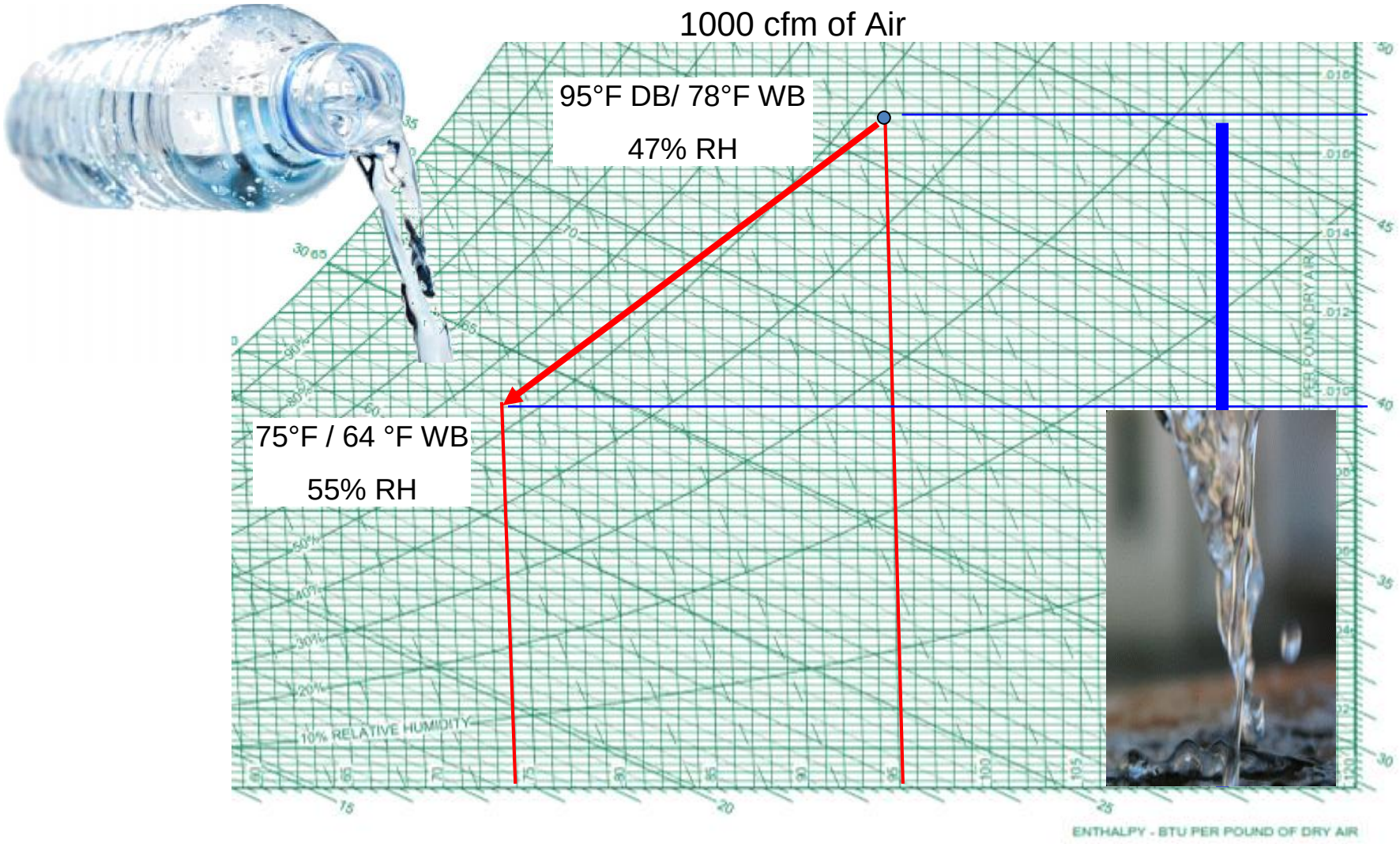
Psychrometric Chart Basics



Properties of air from the chart:

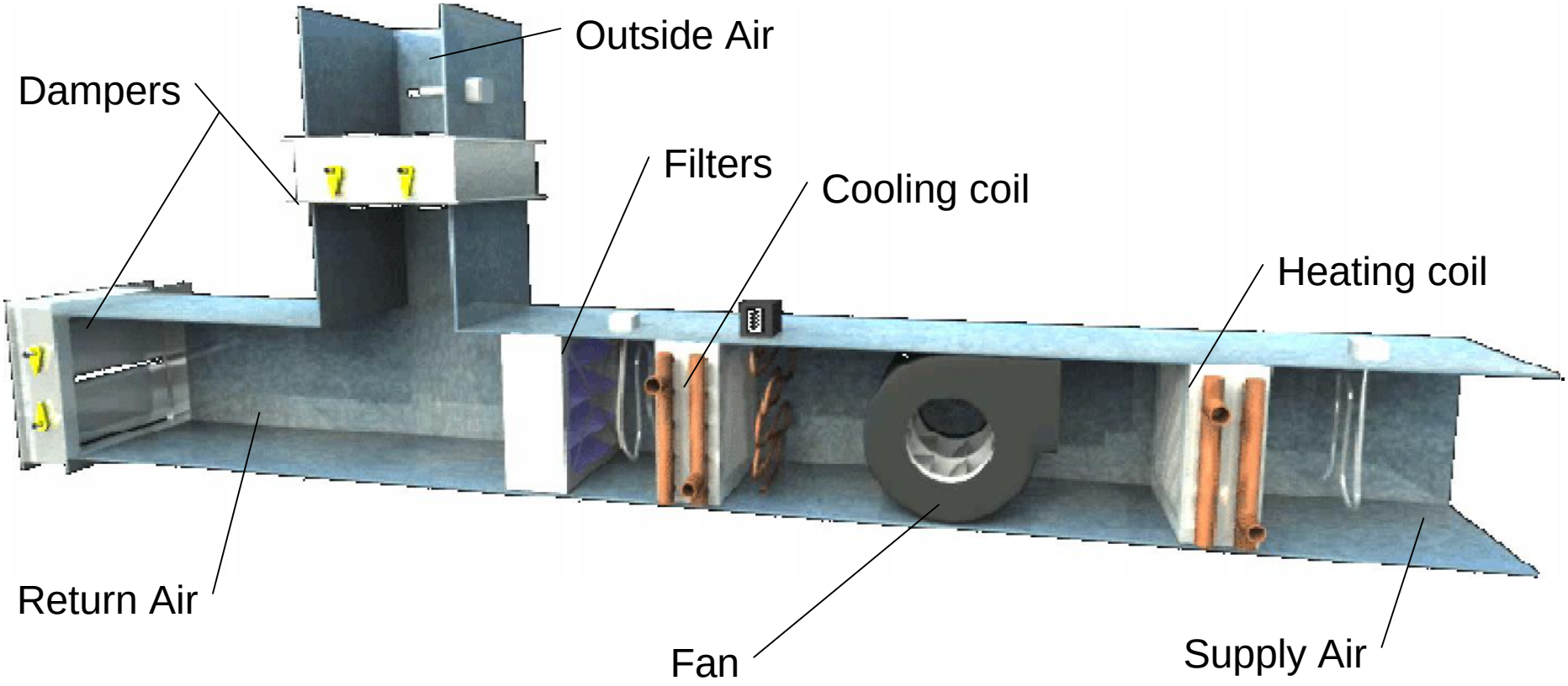
- Dry bulb
- Dew Point
- Humidity Ratio
- Wet bulb
- Relative Humidity
- Enthalpy

Psychrometric Chart Basics



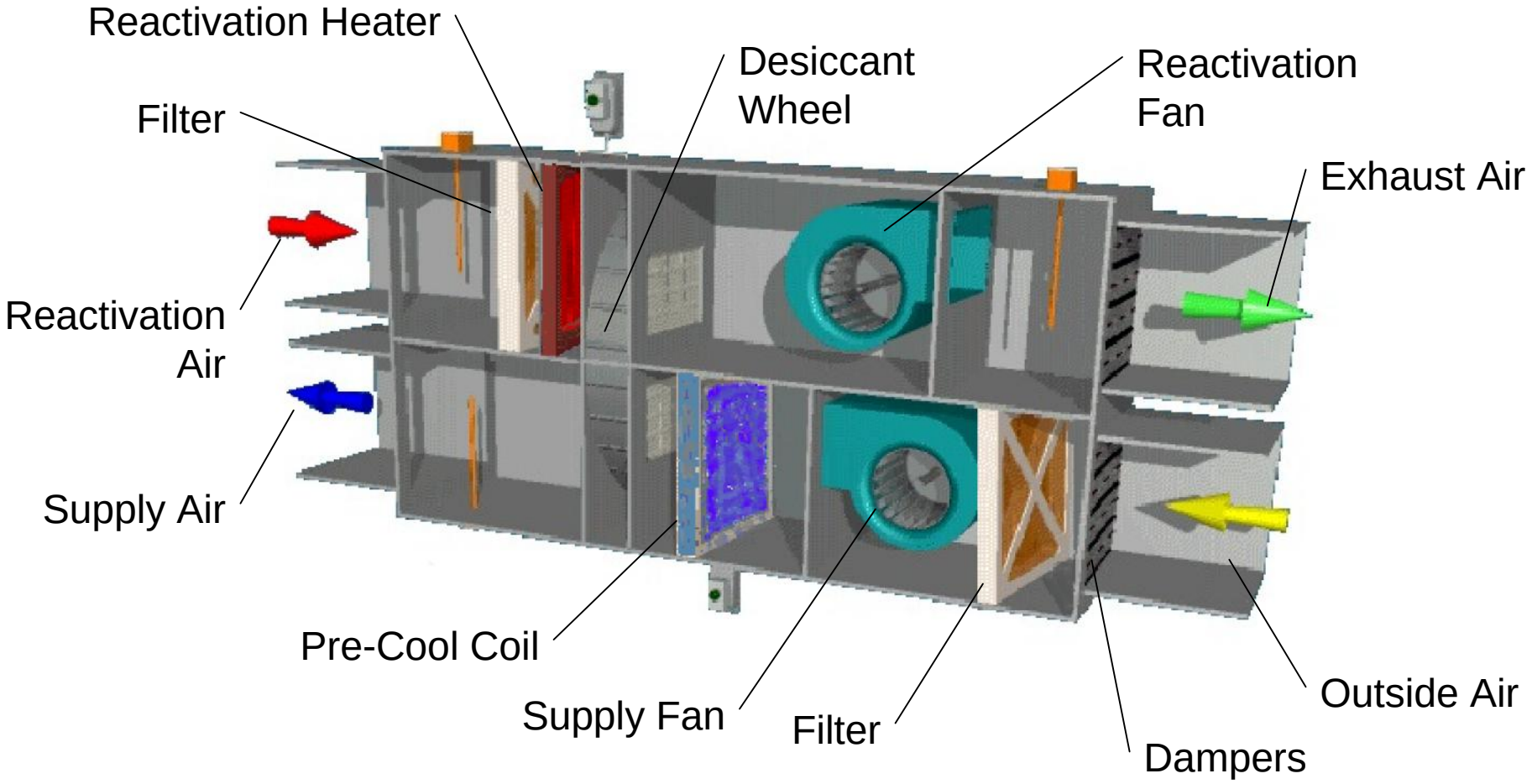
Common Supermarket HVAC Systems

1. Mechanical Cooling- DX system



Common Supermarket HVAC Systems

2. Desiccant Chemical Dehumidifier

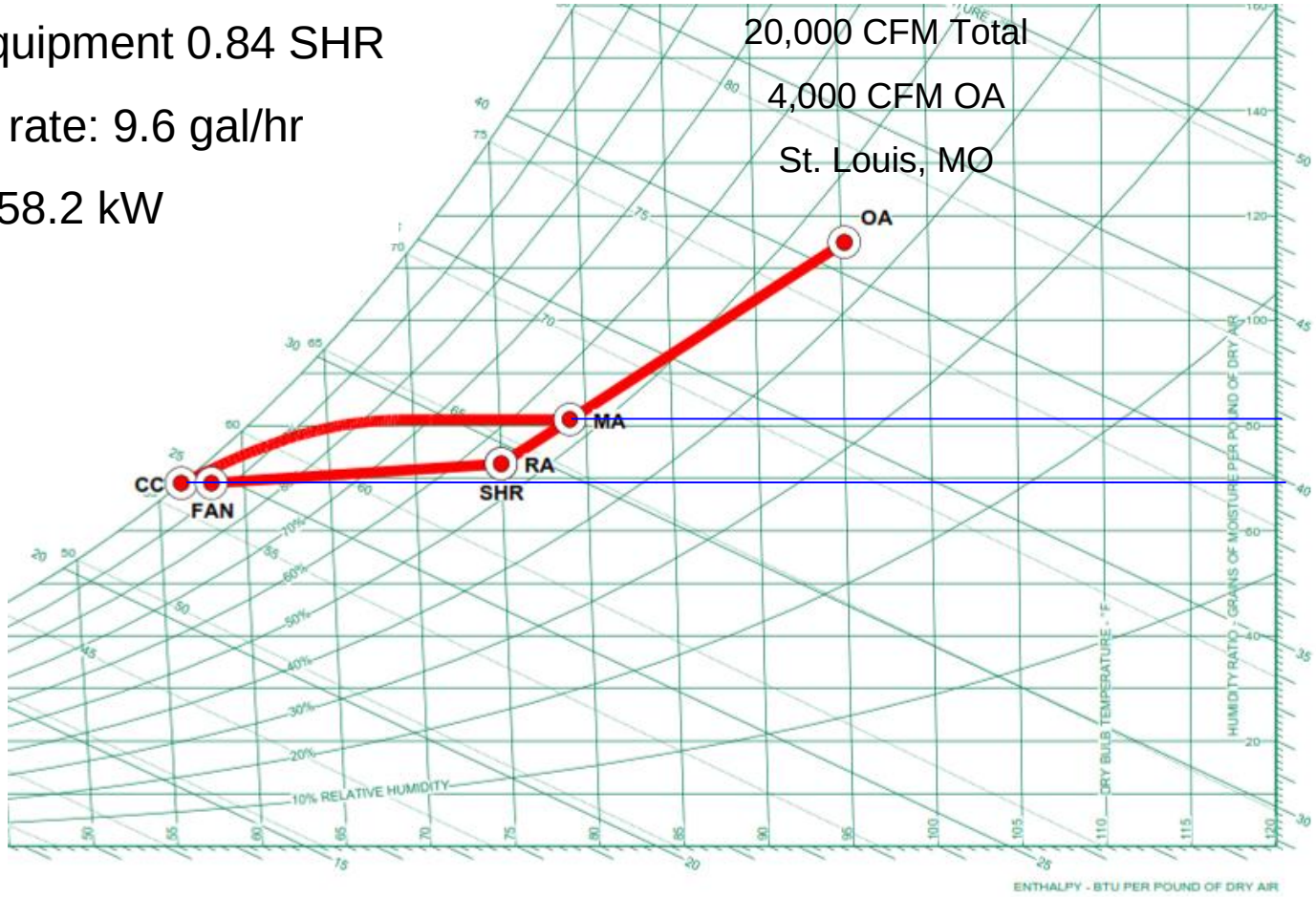


Moisture Removal Capacity
Off the Shelf vs. Applied

Standard HVAC Equipment 0.84 SHR

Water removal rate: 9.6 gal/hr

Work: 158.2 kW



Moisture Removal Capacity
Off the Shelf vs. Applied

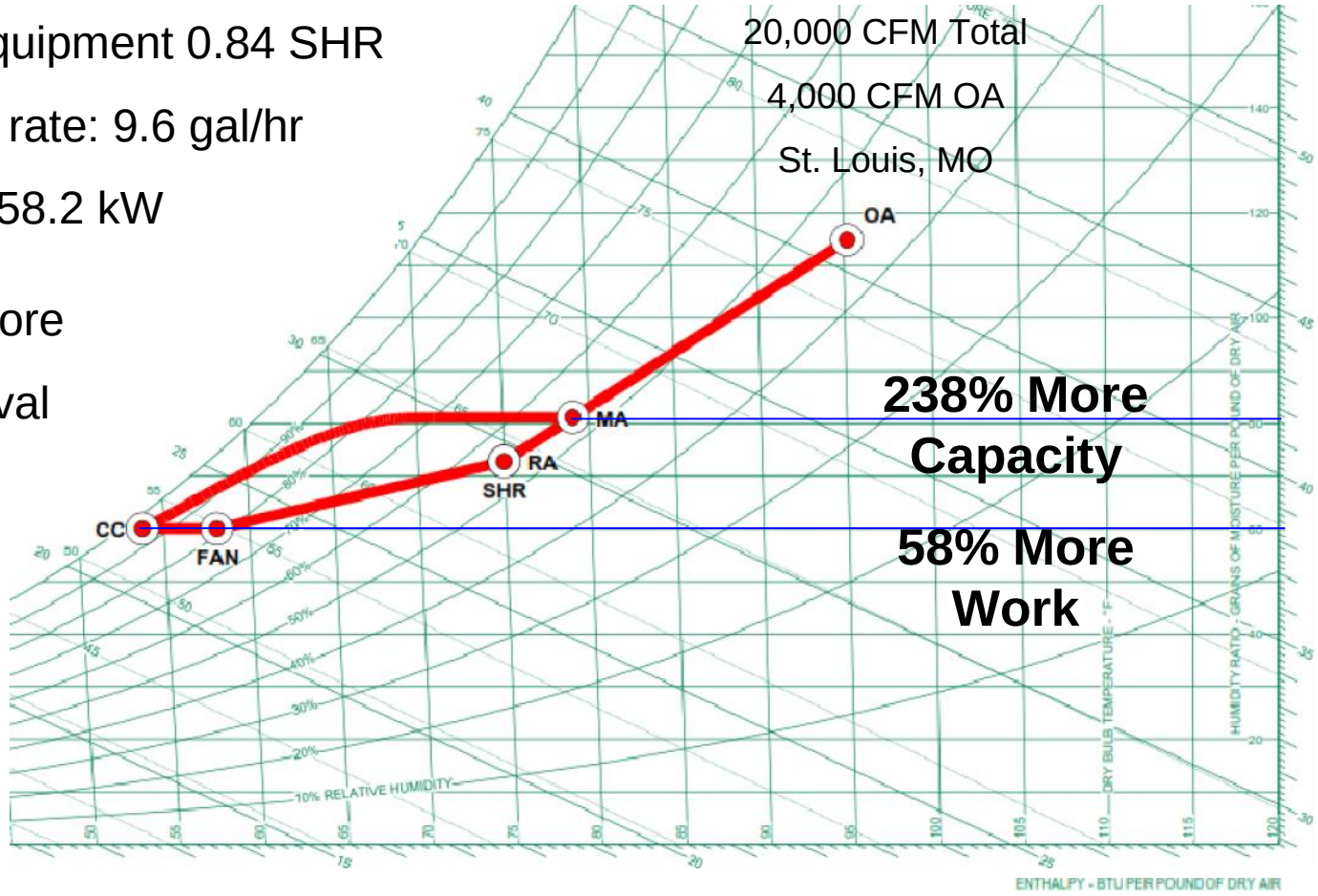
Standard HVAC Equipment 0.84 SHR

Water removal rate: 9.6 gal/hr

Work: 158.2 kW

22.3 gal/hr More

Water Removal



Ventilation

Code Compliance

Building Pressure

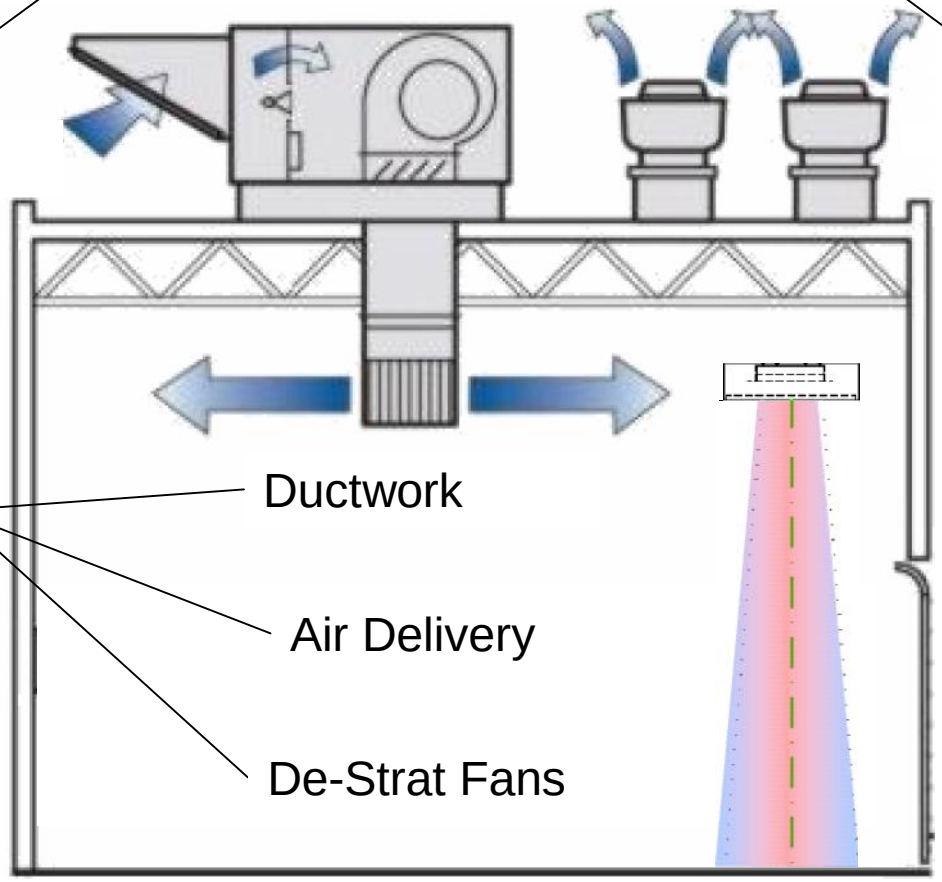
Make Up Air

Exhaust

Toilets

Delis

Equipment Rooms



Air Distribution

Ductwork

Air Delivery

De-Strat Fans

MUA Ventilation Requirements

MUA Ventilation is determined by the GREATER of either:

Code Required Ventilation

- Minimum ventilation requirements
- IMC Requires 15 CFM/Person
- IMC specifies 8 people/1000 SF of occupied space
- IMC and ASHRAE standards specify ventilation for refrigerant areas
- ASHRAE standards address various issues related to ventilation

- OR -

Total Exhaust Airflows

- Deli NET Exhaust (Exhaust – Make up Air)
- Break room Exhaust
- Toilet Exhaust
- Machine Room Exhaust

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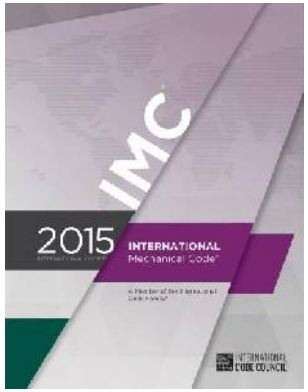
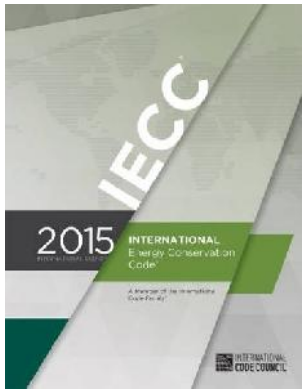
Codes Regulating HVAC Design

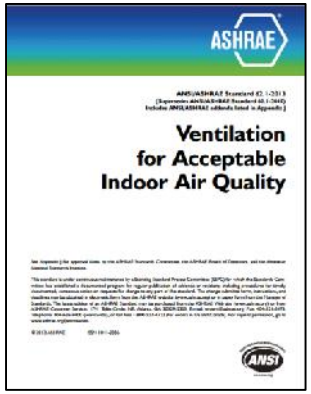


Mechanical Code

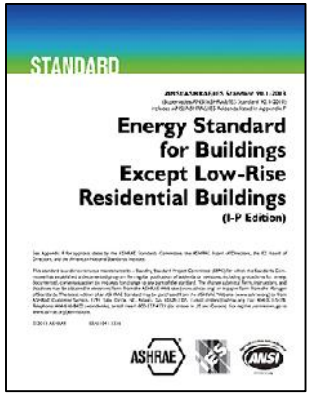


Energy Code

ICC Codes are the basis for most State Building Codes



ASHRAE 62.1



ASHRAE 90.1

ASHRAE Standards are the basis or are referenced in for several code sections

Design Trends For Discussion

- **Elimination of Undercase Returns**
  - Remove pathogen source
  - Improve return air quality
- **Decoupled Outside Air from Interior Zones**
  - Proven effective in energy use and ventilation control.
- **Zoning within the Building Envelope**
  - Deli, Produce, Pharmacy, Cold Aisles, Offices, Vestibules, Prep areas, Backroom, etc.

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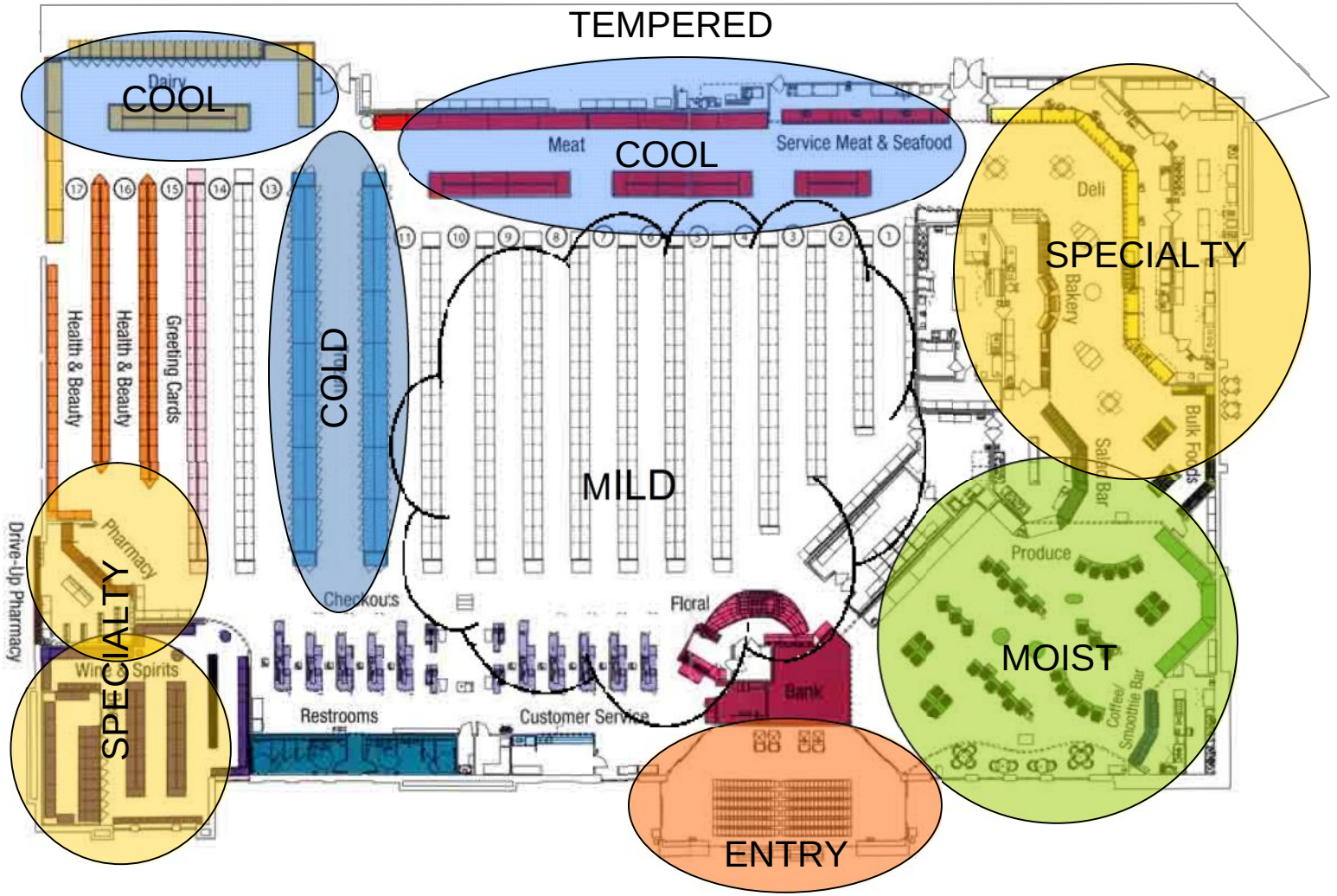
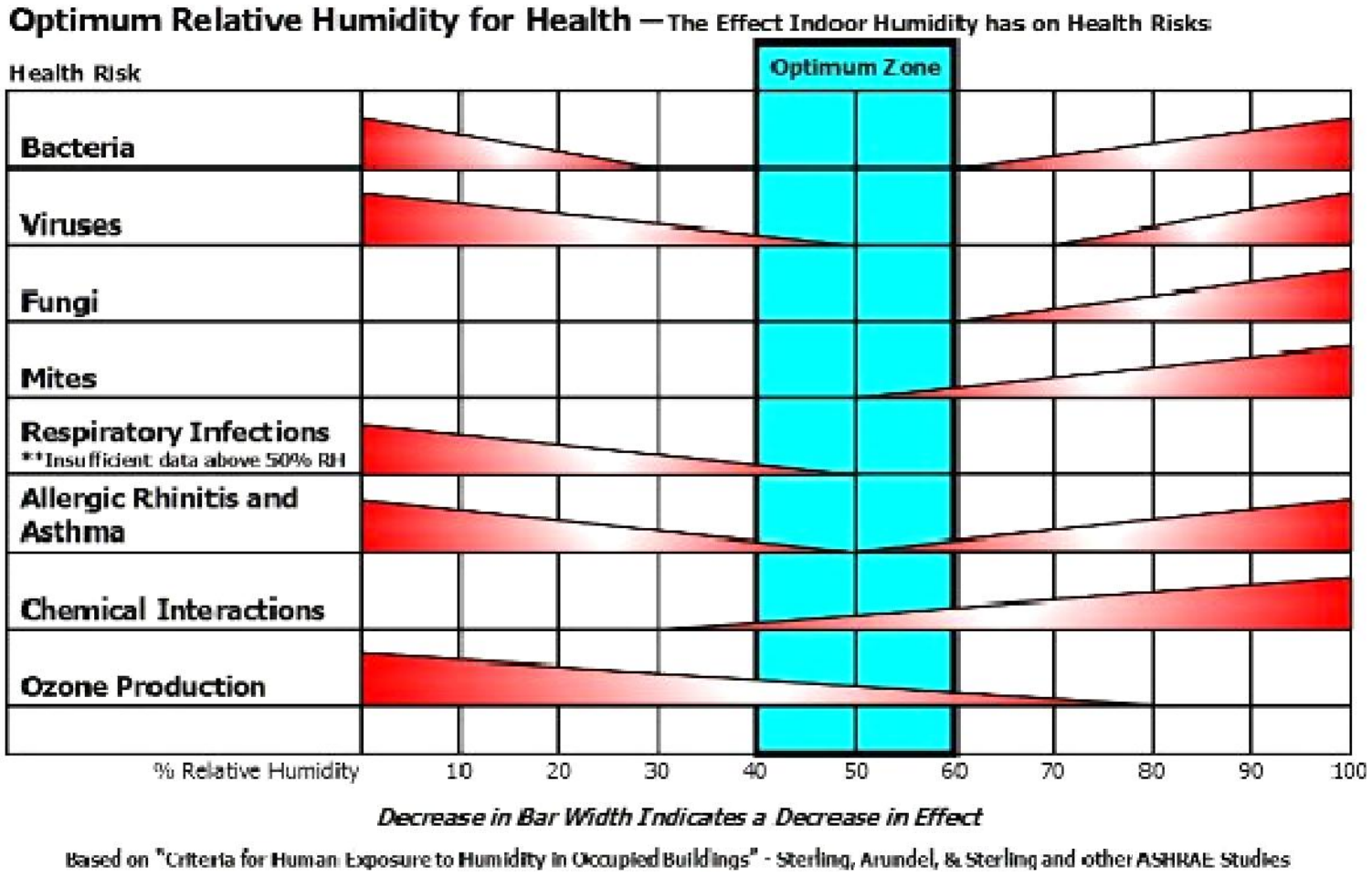
STORE ZONES



Indoor Air Quality Issues



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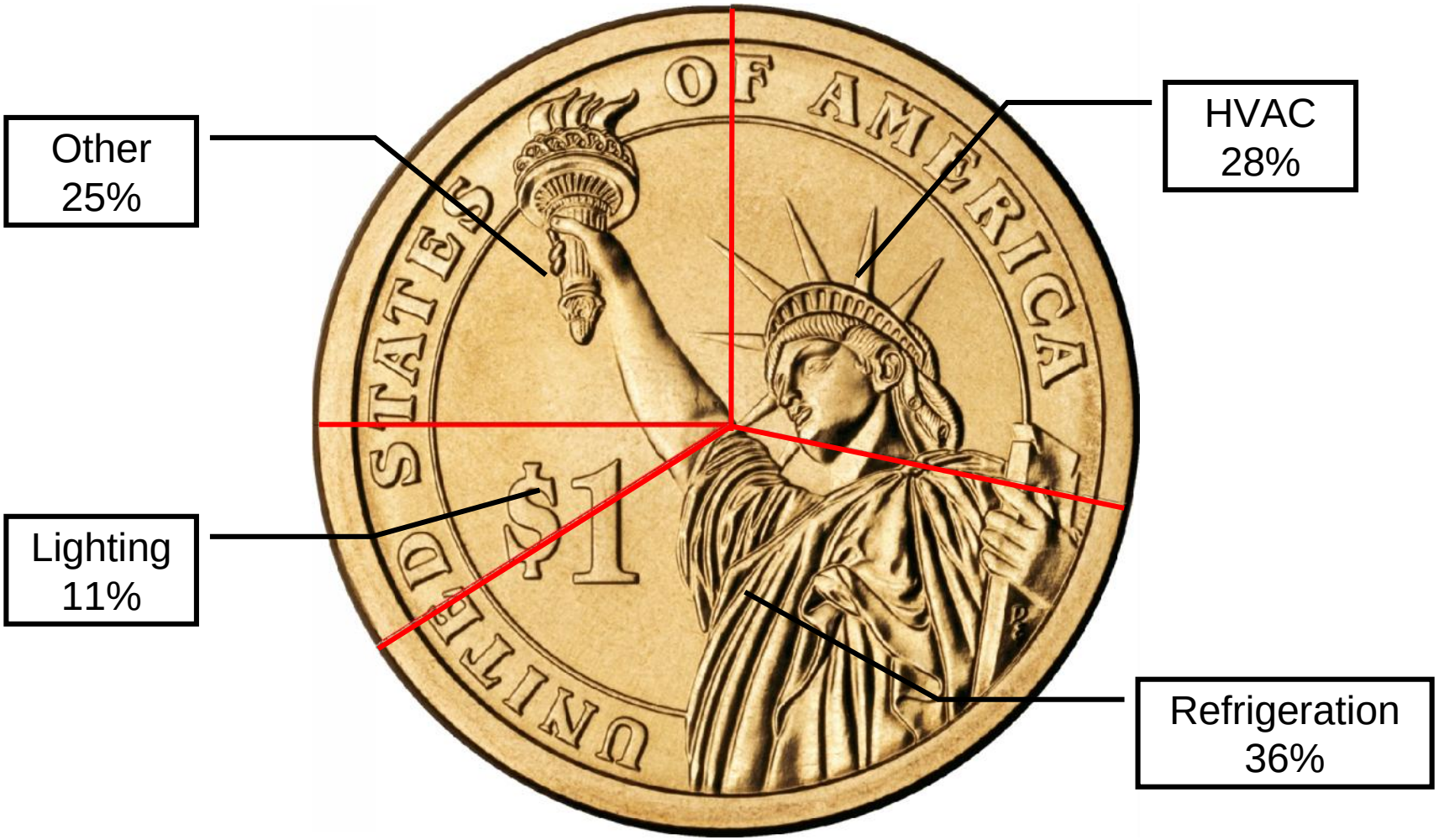
HVAC is an Integral Part of Supermarket Operations



Based on the EPA's Energy Information Administration 2003 Commercial Building Energy Survey. All energy converted to equivalent consumption units.

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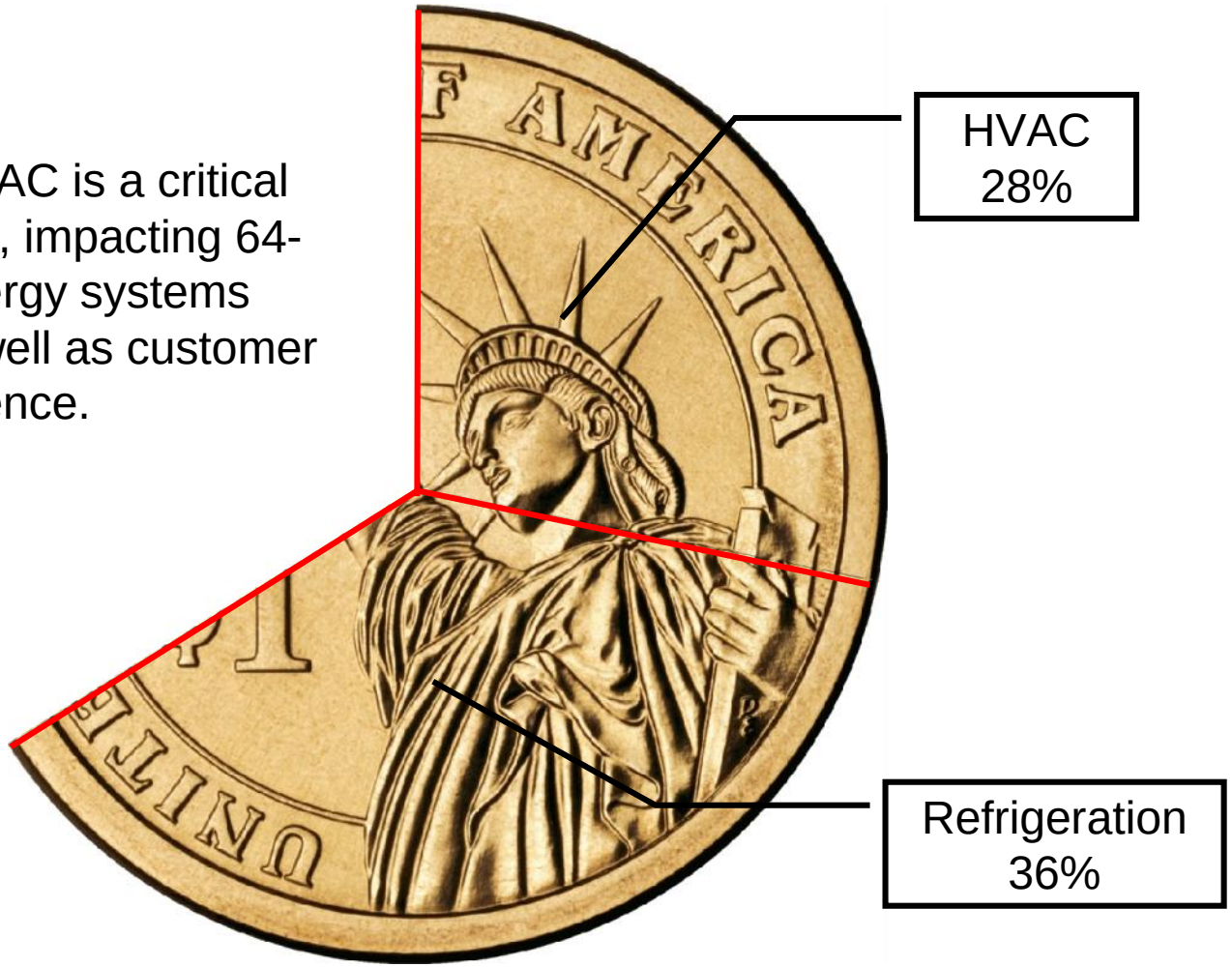
HVAC is an Integral Part of Supermarket Operations

Supermarket HVAC is a critical business process, impacting 64-75% of the energy systems performance, as well as customer experience.



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