Energy Recovery Fundamentals

Summer Operation

- Cools
- Dehumidifies

Outdoor Air
Dry Bulb 91°F
Web bulb 76°F
Humidity 113 grains/lb.

Exhaust Air
Dry Bulb 87°F
Web bulb 72.6°F°
Humidity 97 grains/lb.
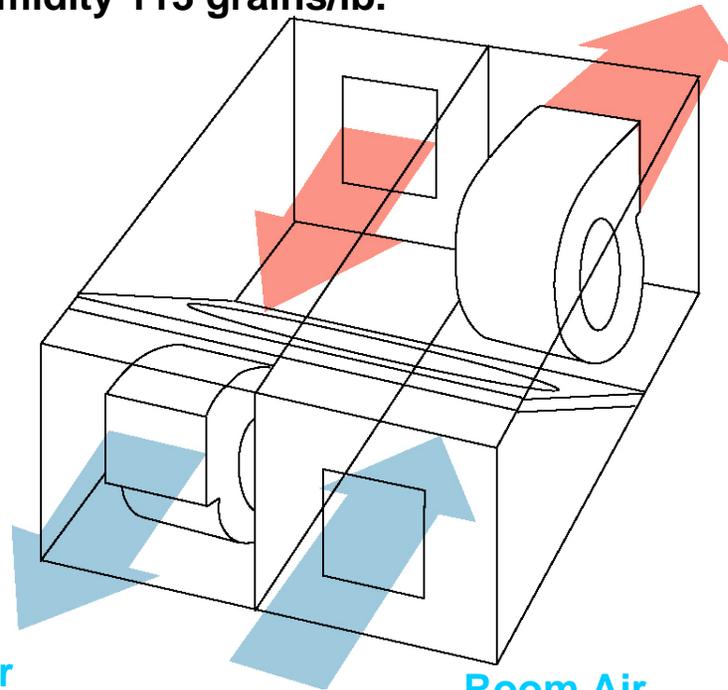
Supply Air
Dry Bulb 79°F
Web bulb 66°F (51% RH)
Humidity 74 grains/lb.

Room Air
(to be exhausted)
Dry Bulb 75°F
Web bulb 62.6°F (50% RH)
Humidity 65 grains/lb.

DAY IN. DAY OUT.

Dayton

Winter Operation

- Heats
- Humidifies

Outdoor Air
Dry Bulb 0°F
Humidity 2 grains/lb.

Exhaust Air
Dry Bulb 18°F
Humidity 12 grains/lb.

Supply Air
Dry Bulb 54°F
Humidity 31 grains/lb.

Room Air
(to be exhausted)
Dry Bulb 72°F
Humidity 41 grains/lb.
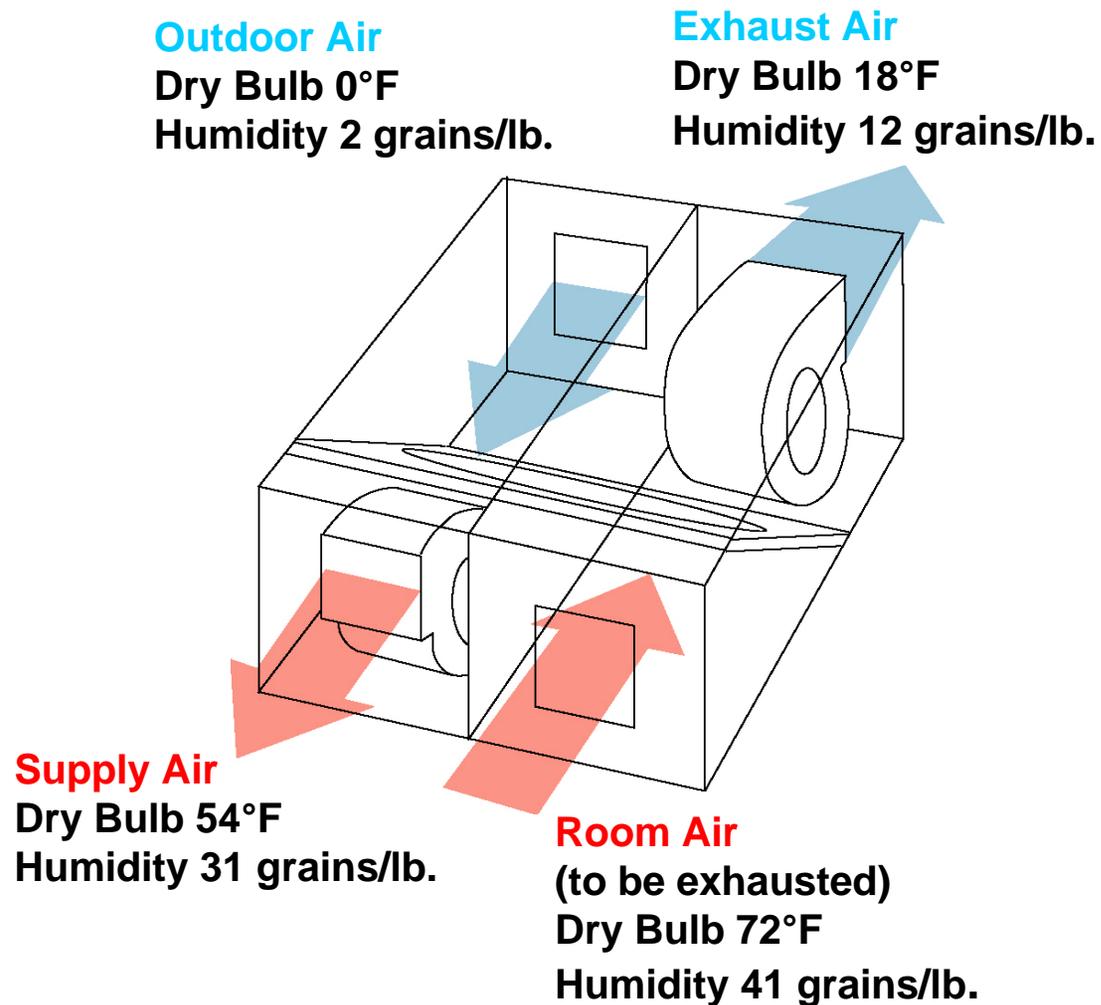
DAY IN. DAY OUT.

Dayton

Why use it?

- Comply with ASHRAE outdoor air requirements
  - Schools require 15 cfm/person
  - Offices require 10 cfm/person
- Saves Energy!
  - Downsize cooling
  - Reduced heating load
- Controls Humidity

DAY IN. DAY OUT.

Dayton

Recovery Basics on a Psych Chart

- **Sensible: Side-to-Side**
- **Latent: Up and Down**
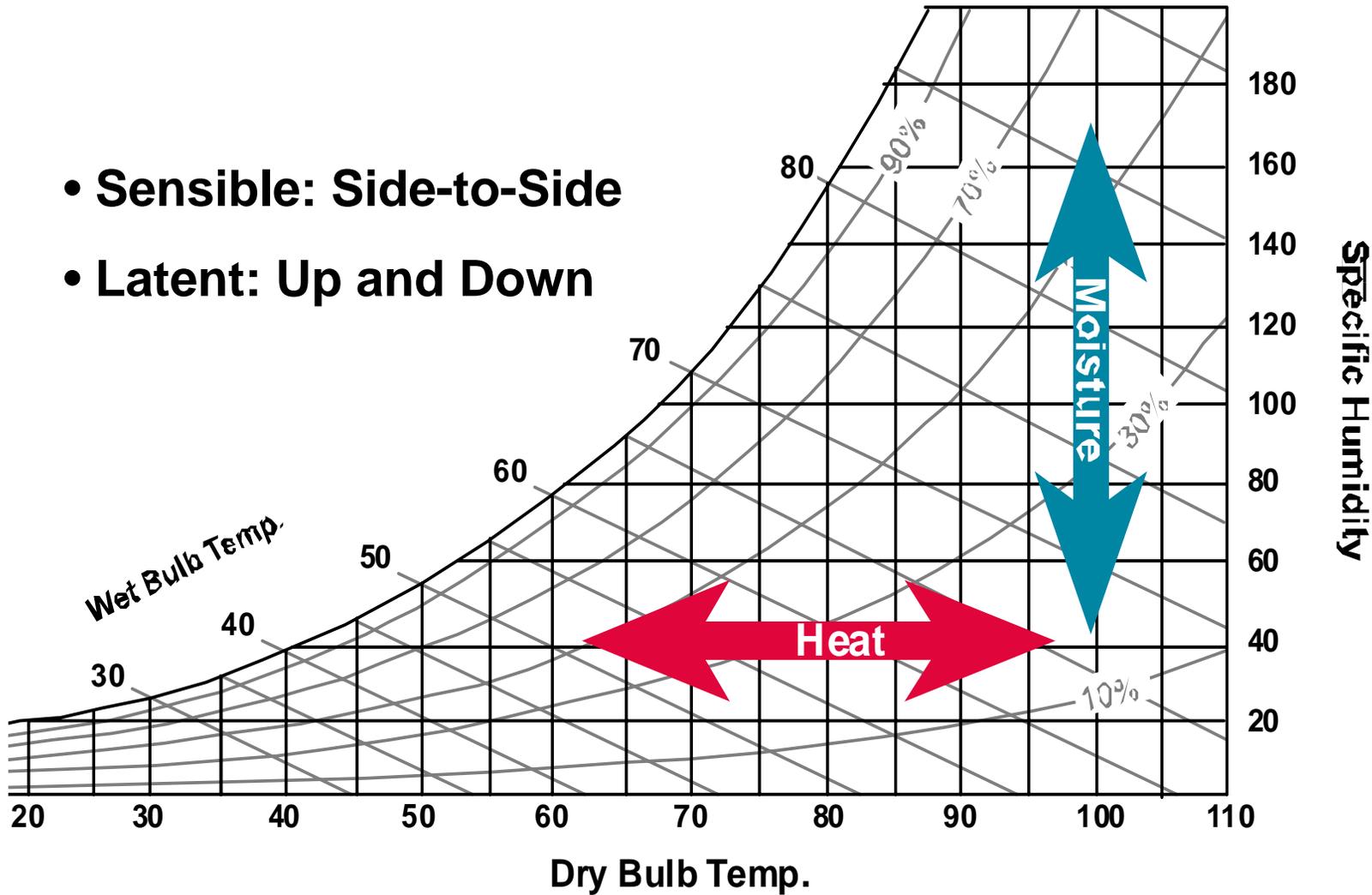
DAY IN. DAY OUT.

Dayton

Outdoor Air Load
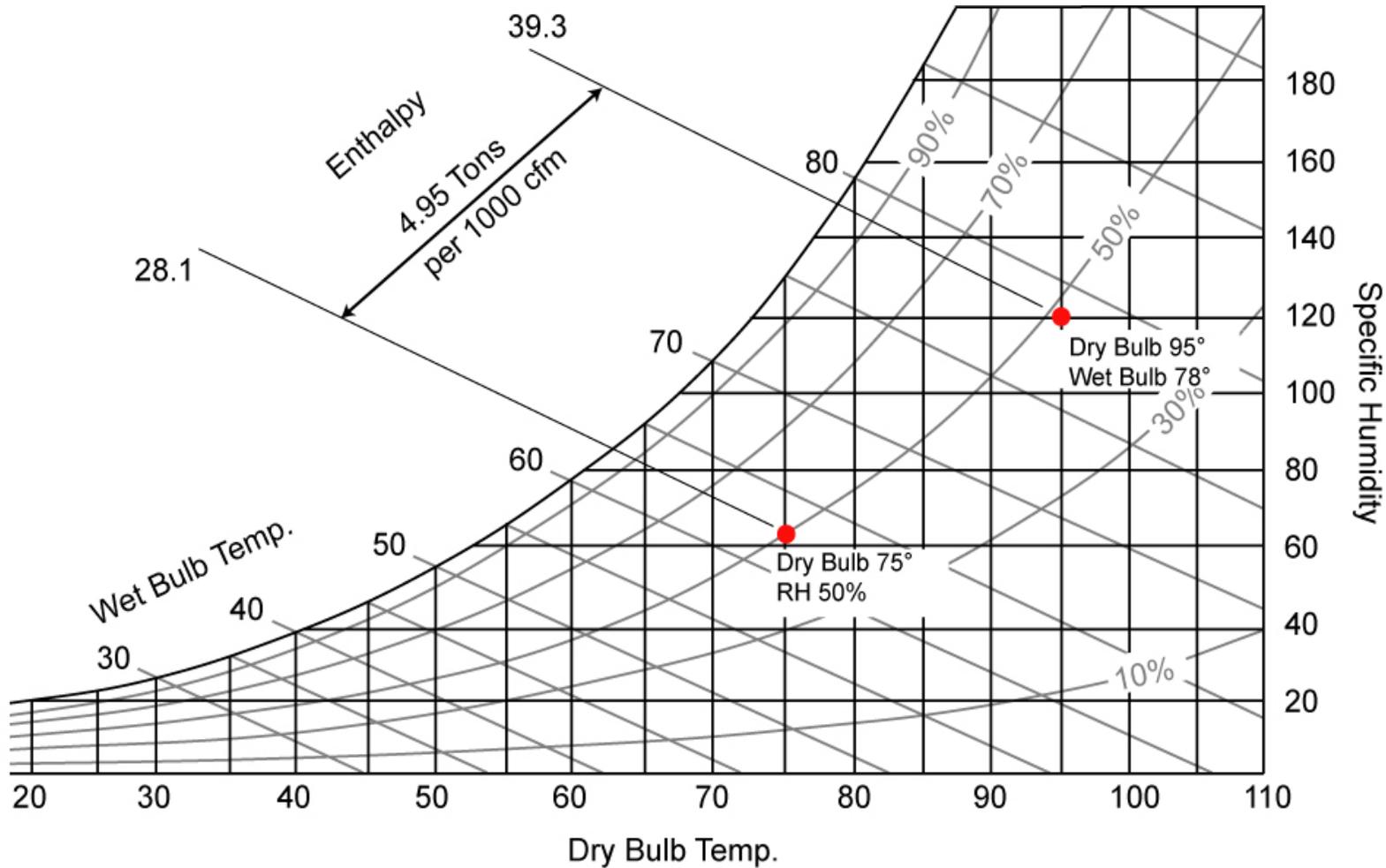
Load Reduction
(75% Effective Energy Wheel)
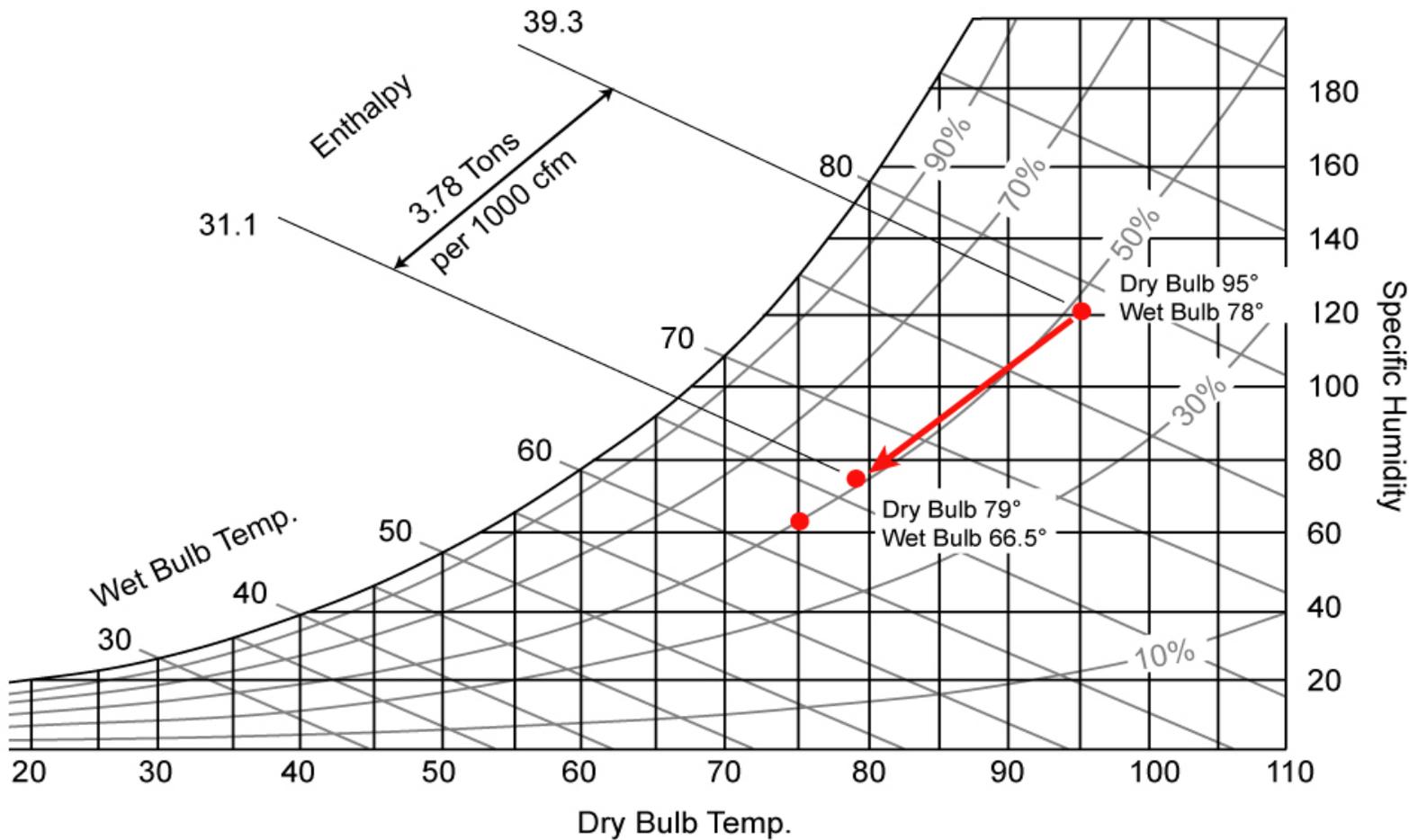
DAY IN. DAY OUT.

Dayton

Energy Recovery Fundamentals

- Recognize the energy stored in the exhaust air

- Extract that energy before the exhaust air exits the building

- Design your system to easily transfer the exhaust air energy to the outdoor air

DAY IN. DAY OUT.

Dayton

Energy Recovery Fundamentals

- Don't apply ER with contaminated air streams (I.e. laboratory fume exhaust, kitchen hood)

  If you can't breathe the exhaust air, don't use ER

DAY IN. DAY OUT.

Dayton

Benefits of Energy Recovery

Reduced air conditioning load

Tons of AC reduction per 1,000 cfm of outdoor air

Houston	4.6	Minneapolis	3.7
Miami	4.2	Charlotte, NC	3.7
Jackson	4.2	Atlanta	3.7
Washington, DC	3.9	Cleveland	3.7
St. Louis	3.9	Detroit	3.2
Kansas City	3.9	Boston	3.0
Dallas	3.9	San Diego	2.8
Philadelphia	3.7	Seattle	0.8

DAY IN. DAY OUT.

Dayton

Benefits of Energy Recovery

– ERVs reduce cooling load by 3-4 tons per 1000 CFM

– Energy savings on heating and cooling

Annual energy savings per 1,000 cfm of outdoor air

8 hr/day, 5 days/wk	(40 hours)	$300 - 400
16 hr/day, 5 days/wk	(80 hours)	$600 - 800
24 hr/day, 7 days/wk	(168 hours)	$1,200 - 1,800

DAY IN. DAY OUT.

Dayton

Benefits of Energy Recovery

Attractive payback

Payback - Instant
Payback ≤ 1 year
Payback 1-2 years
Payback 2-4 years

DAY IN. DAY OUT.

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