seventhwave

What you need to know about residential furnaces and air conditioners if you're NOT an HVAC professional

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In accordance with the Department of Labor and Industry's statute 326.0981, Subd. 11,

"This educational offering is recognized by the Minnesota Department of Labor and Industry as satisfying **1.5 hours** of credit toward **Building Officials and Residential Contractors code /1 hour energy** continuing education requirements."

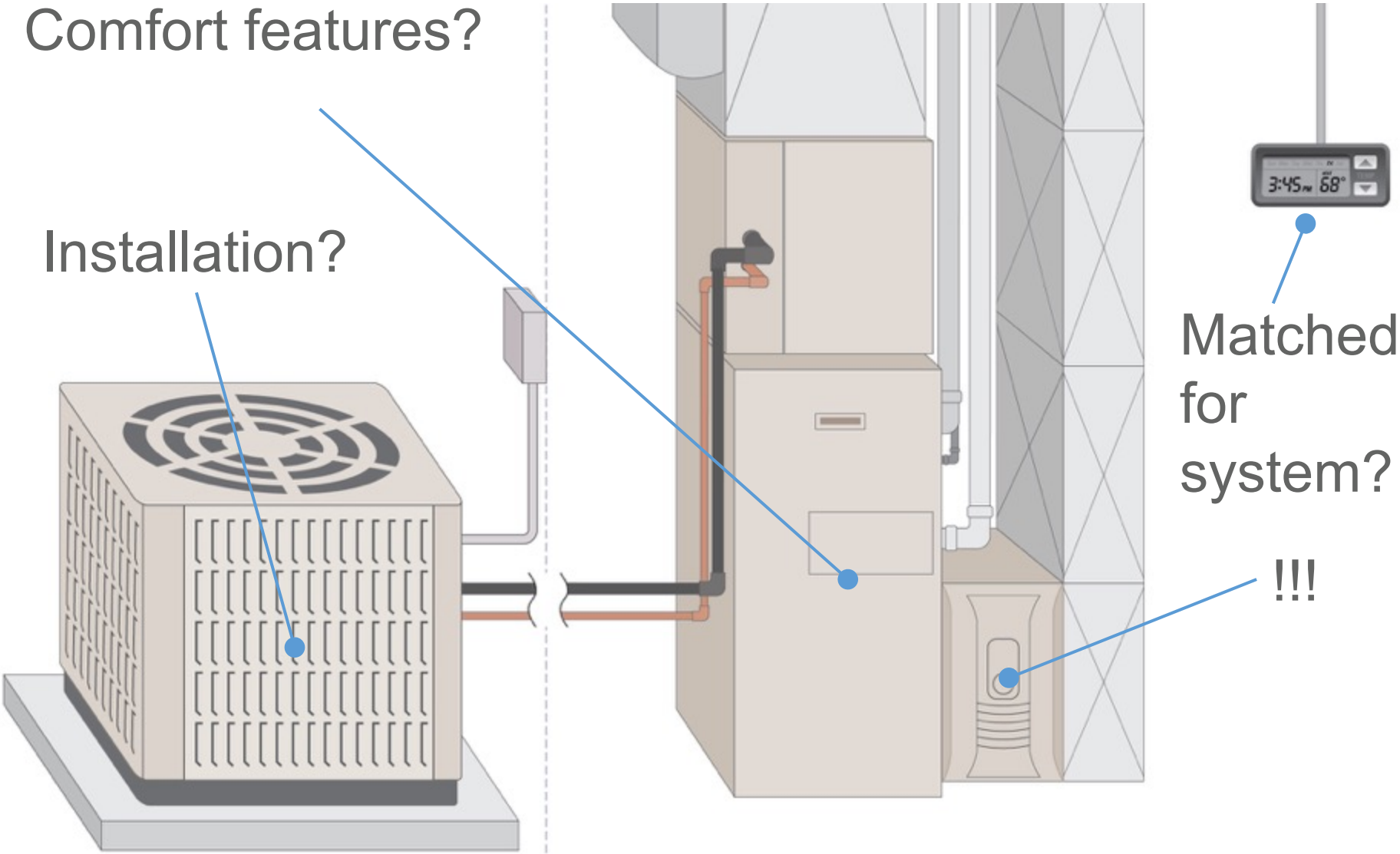
For additional continuing education approvals, please see your credit tracking card.

Who's here?

A. Builder / remodeler
B. Home Performance Consultant
C. Weatherization provider
D. Utility
E. HVAC contractor / distributor
F. Other

Comfort features?

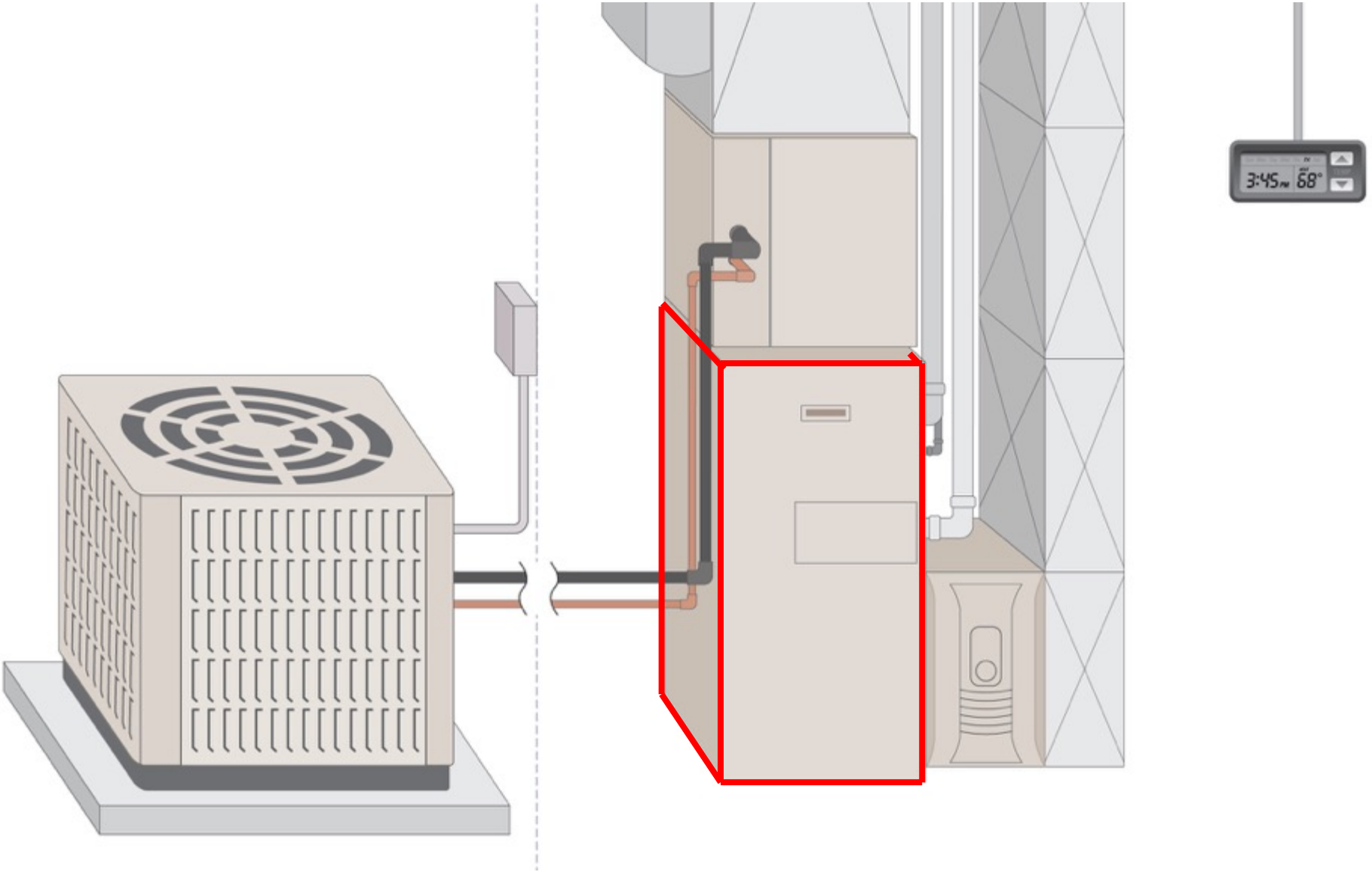
Installation?

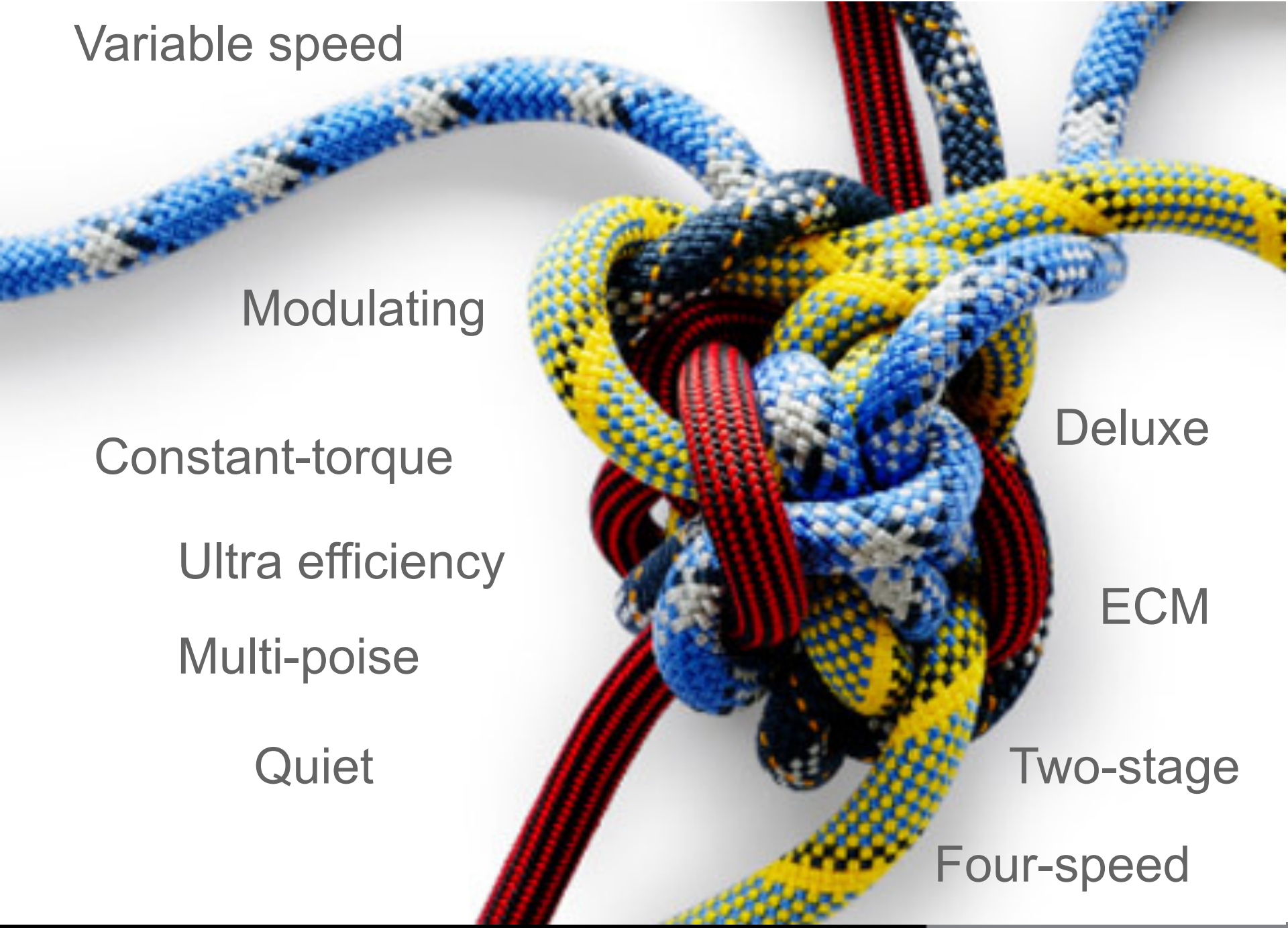


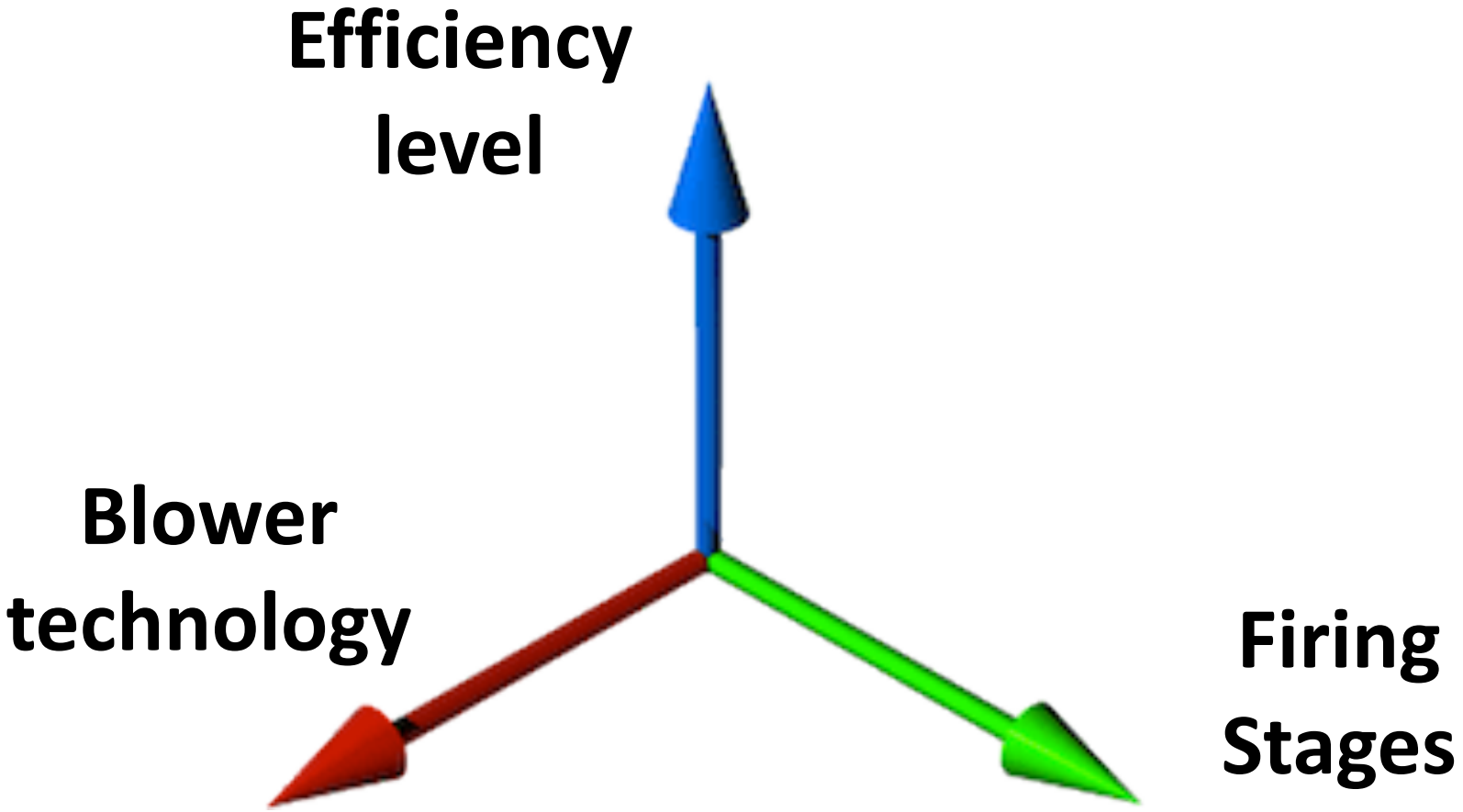
Matched for system?

!!!

Furnace



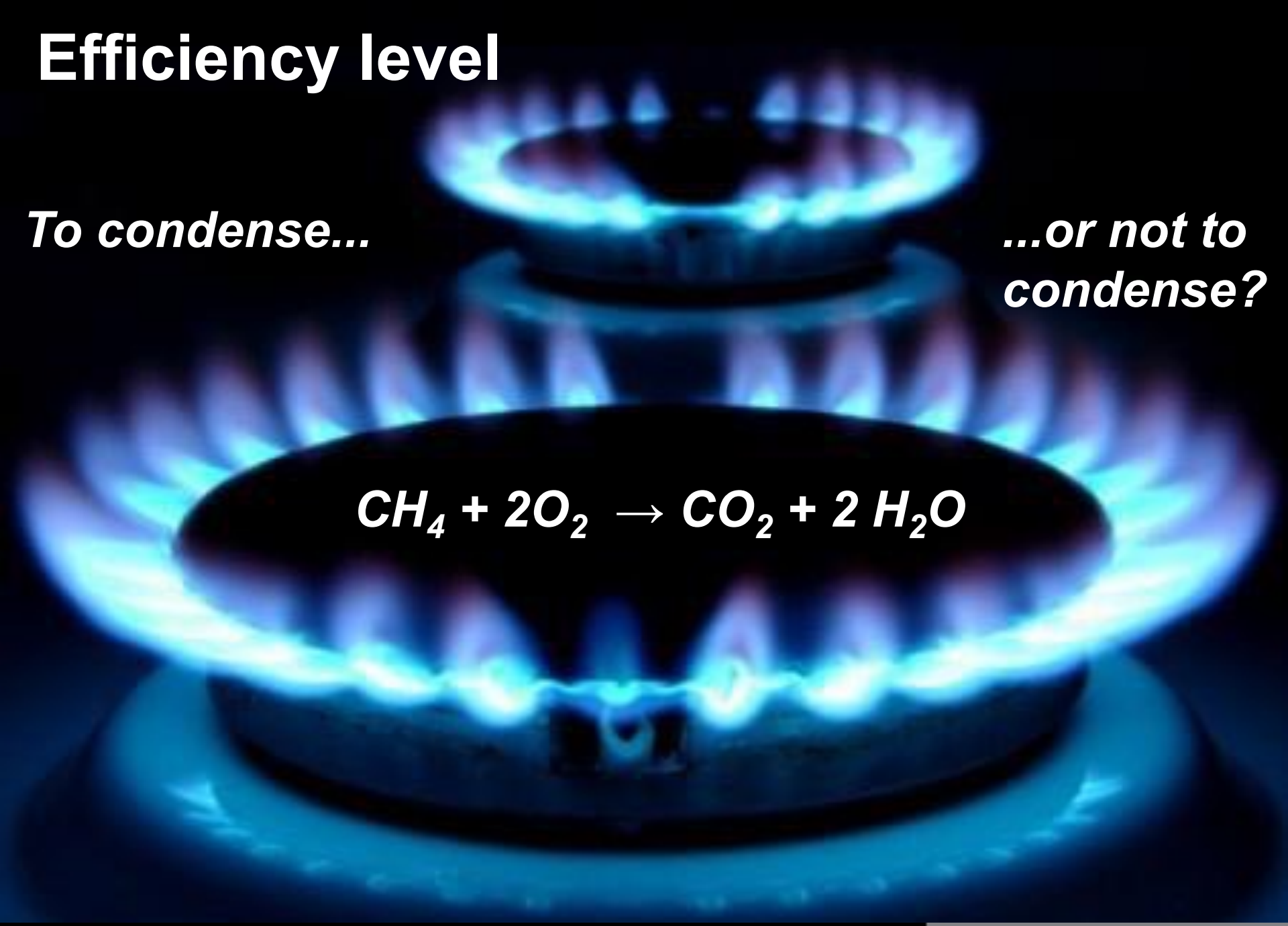

Variable speed
Modulating
Constant-torque
Deluxe
Ultra efficiency
ECM
Multi-poise
Quiet
Two-stage
Four-speed


Efficiency level
Blower technology
Firing Stages

Efficiency level

To condense...

...or not to condense?



$$CH_4 + 2O_2 \rightarrow CO_2 + 2\,H_2O$$

Non-condensing

The “gulf of corrosion”

Condensing

80%

85%

90%

95%

100%

Efficiency (AFUE)

MY furnace is…

A. …Non-condensing
B. …Condensing
C. (I'm not sure)

Annual Fuel Utilization Efficiency

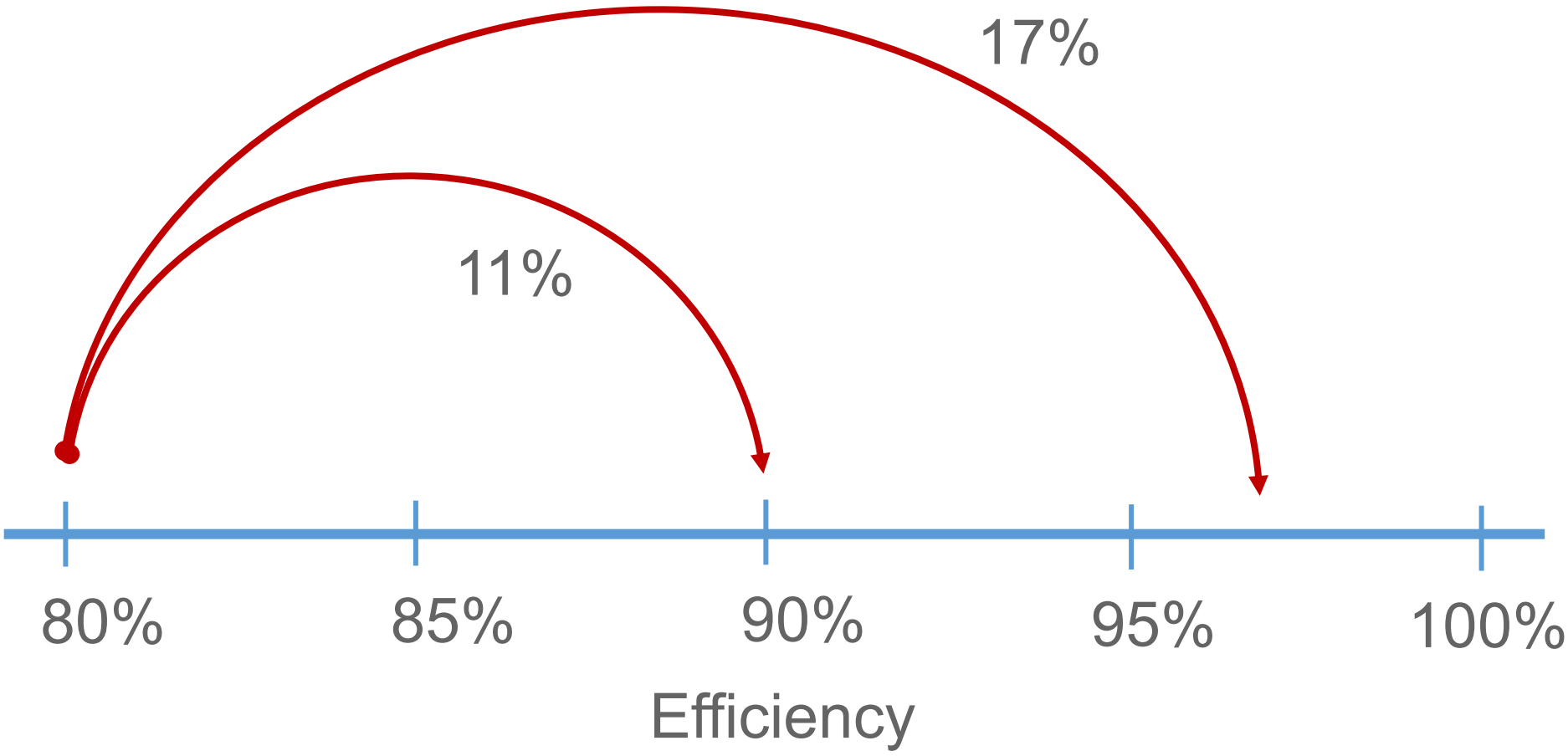
AFUE

The savings from upgrading from non-condensing to condensing are…

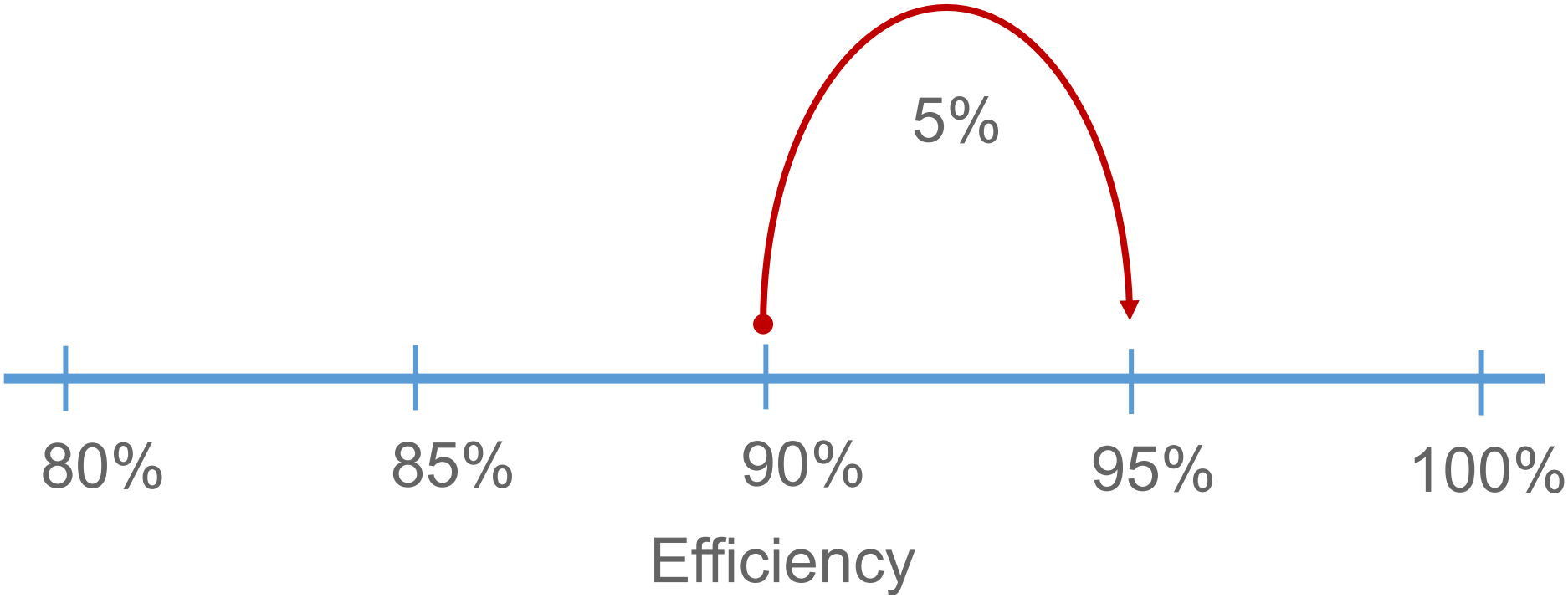
A. 5%
B. 10%
C. 15%
D. 20%
E. 25%

The savings from upgrading from non-condensing to condensing are…

A. 5%
B. 10%
C. 15%
D. 20%
E. 25%

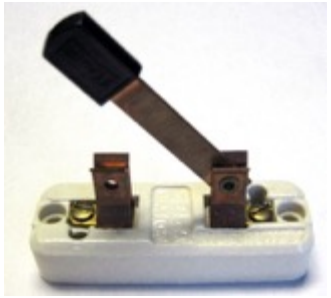

17%
11%
80%
85%
90%
95%
100%
Efficiency

Upgrade to higher efficiency condensing?



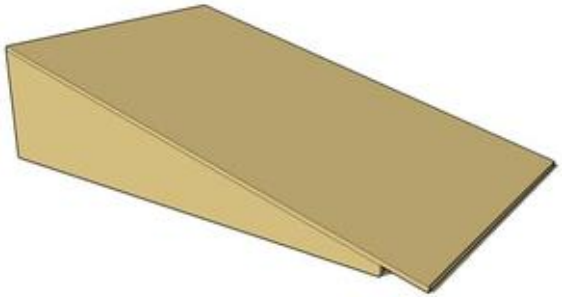
Firing stages

Single-stage

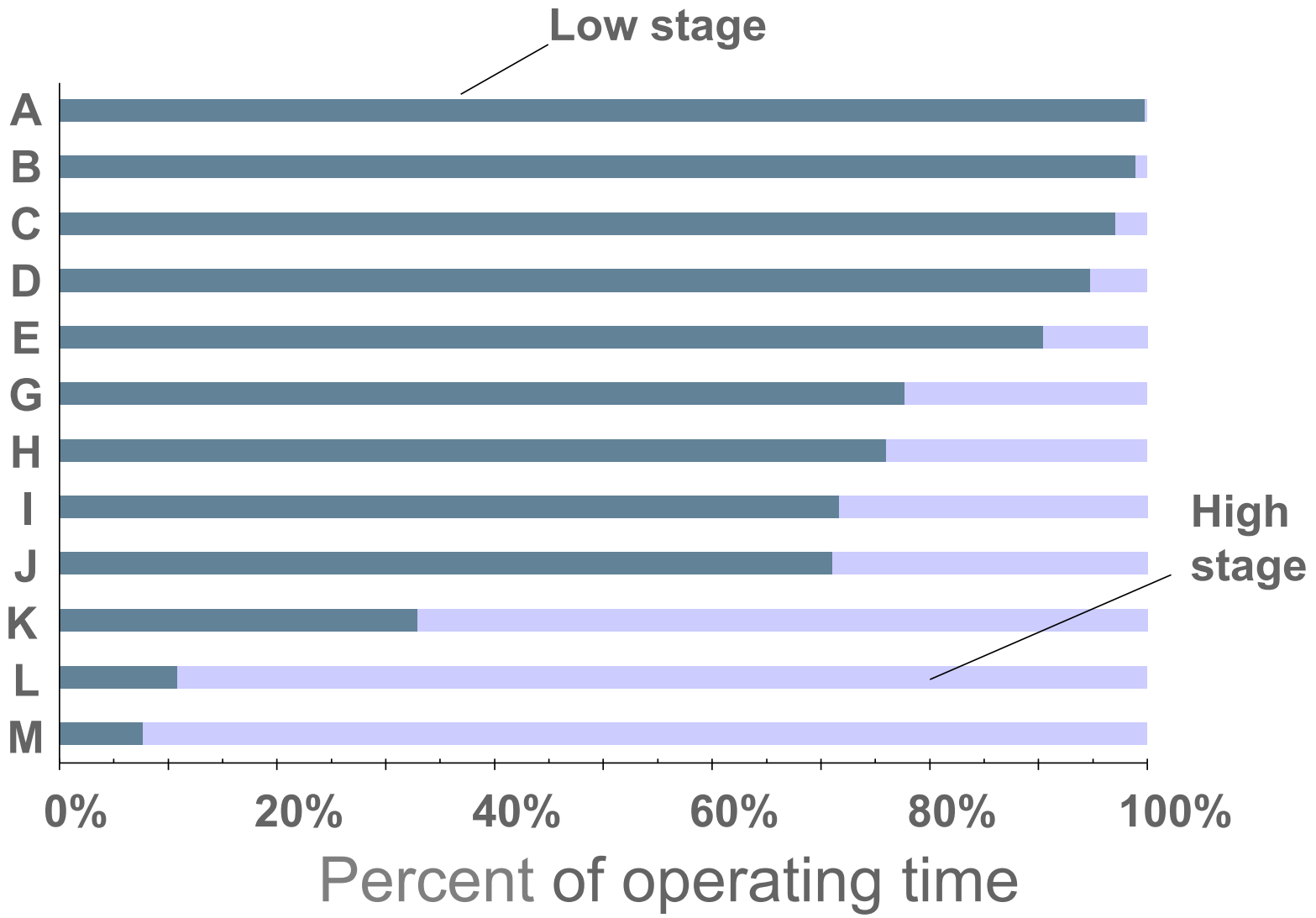


Multi-stage

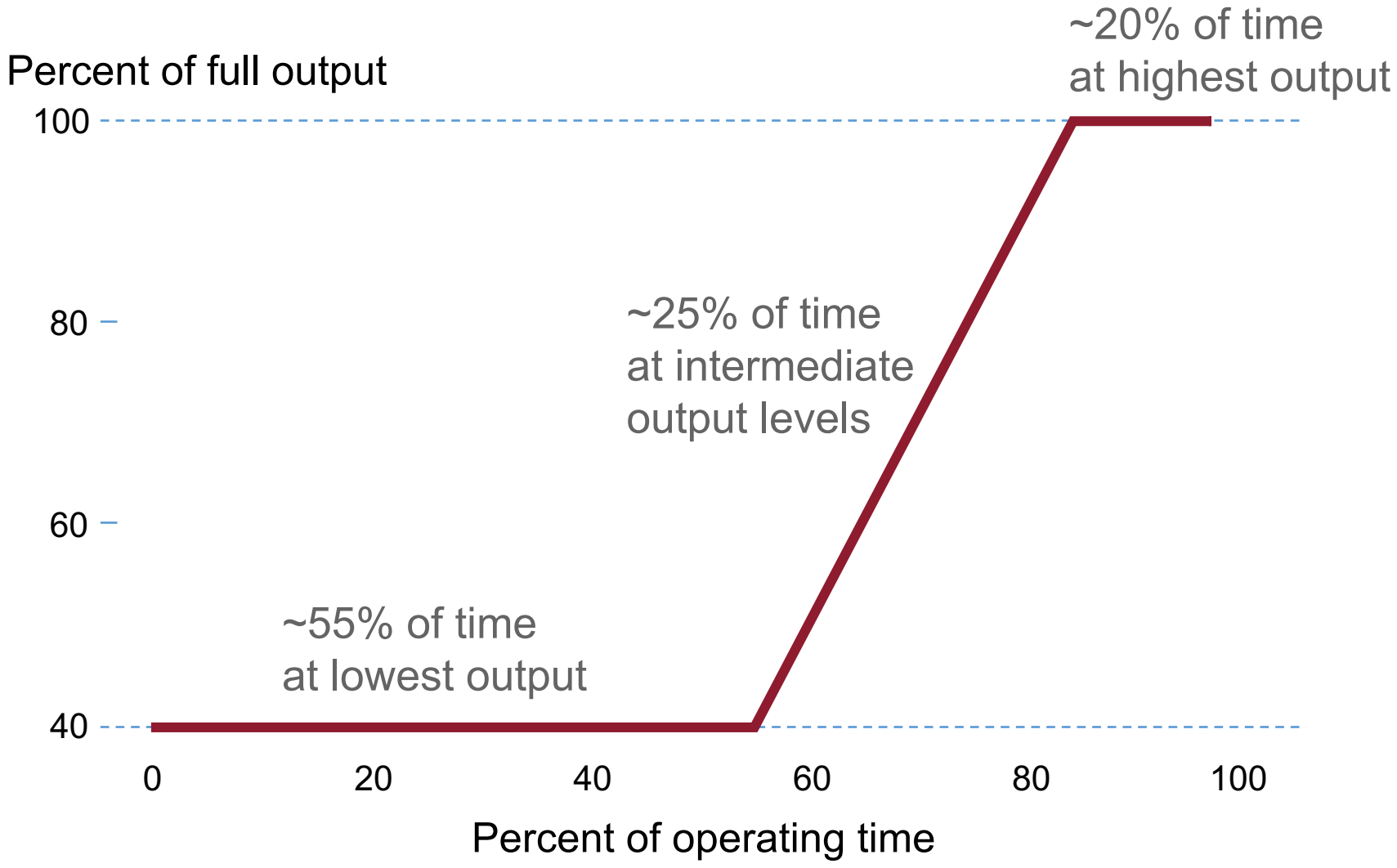
Modulating



Two-stage operation
(12 monitored furnaces)



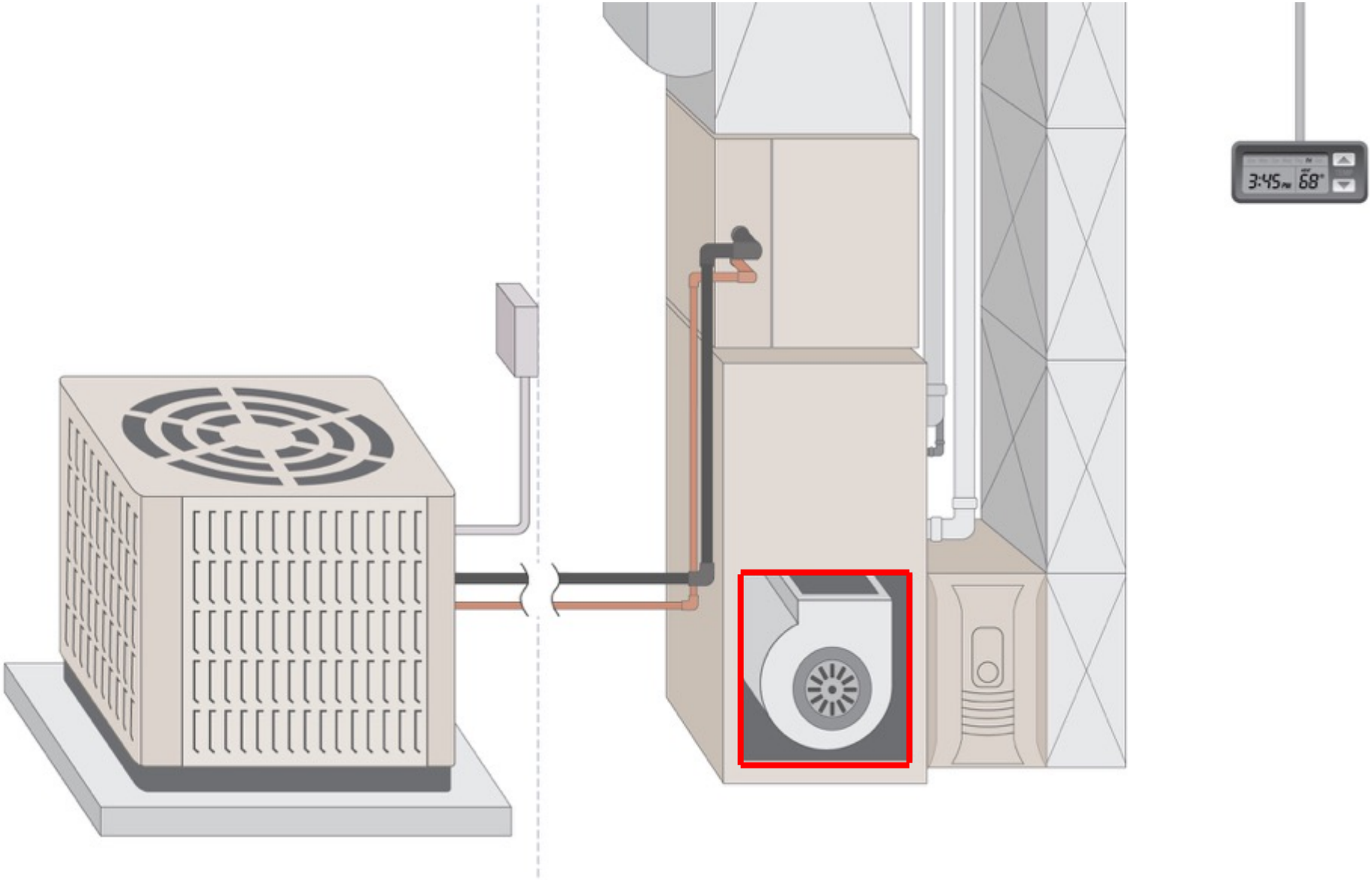
Modulating furnace



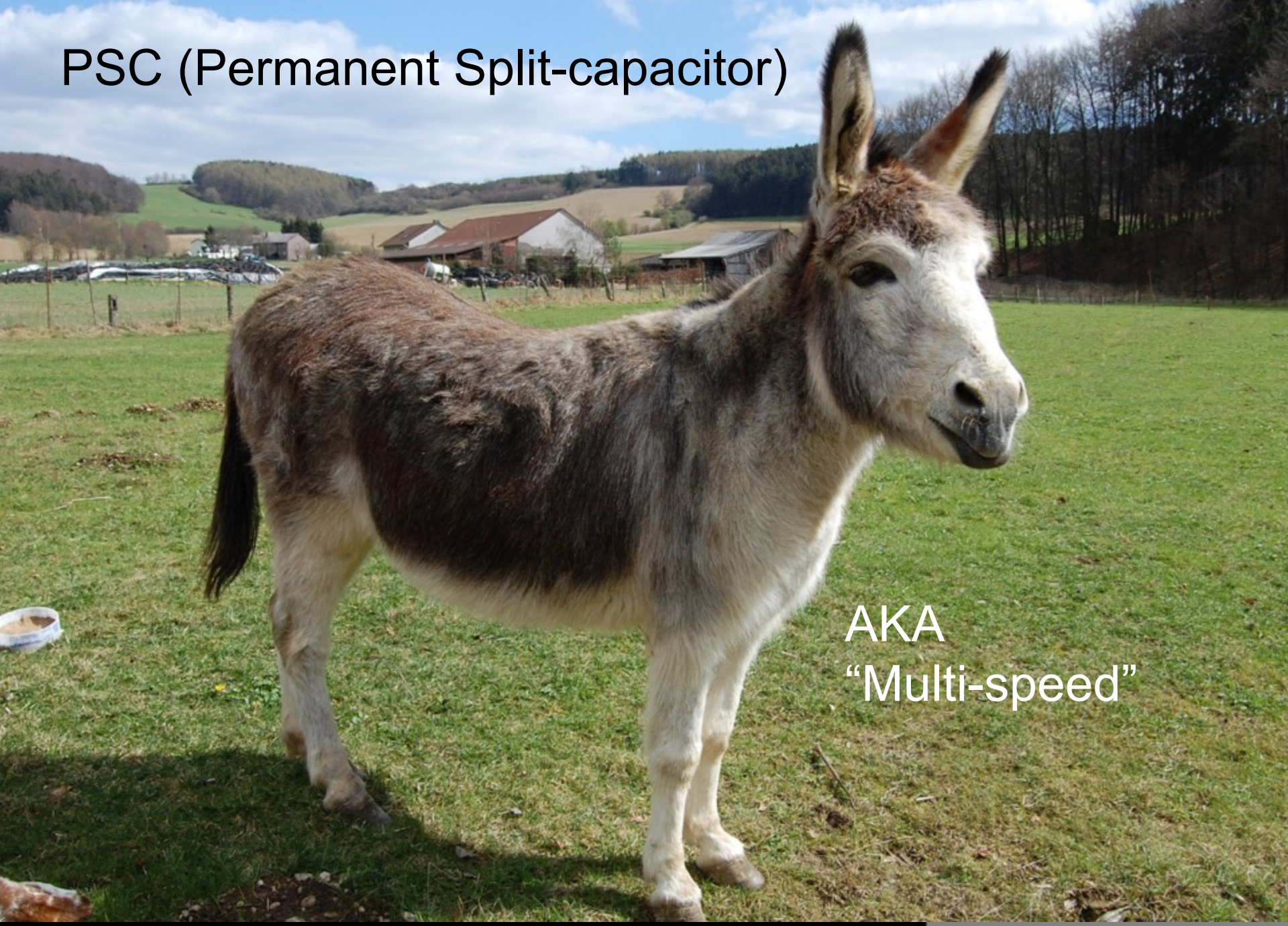
MY furnace is…

A. …Single-stage
B. …Multi-stage
C. …Modulating
D. (I’m not sure)

Blower technology

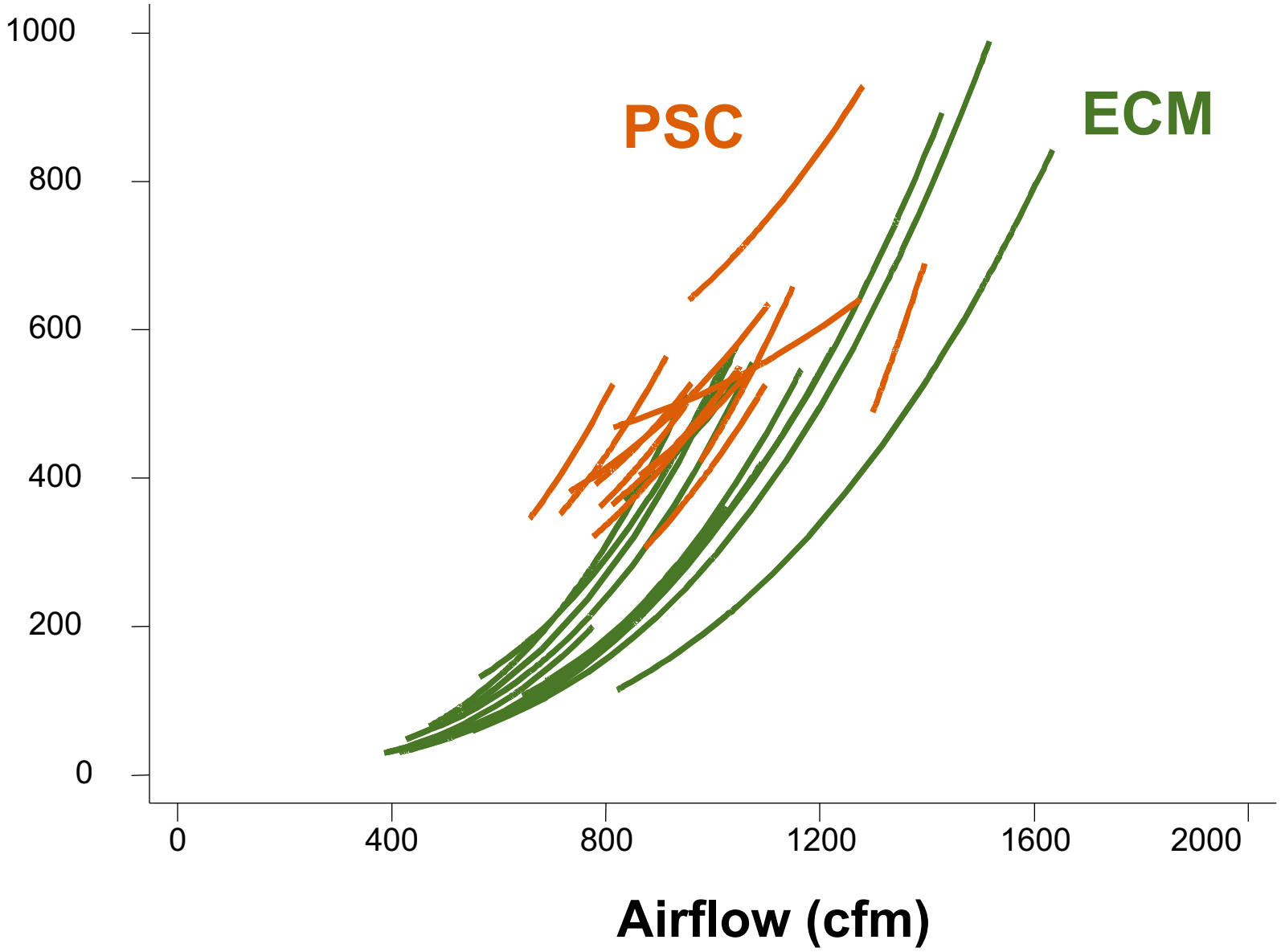


PSC (Permanent Split-capacitor)



ECM (Electronically commutated motor)

Electricity consumption (watts)



Yearly ECM electricity savings

Fan "ON" use

before	after	
		= $60
		= $450
		= $0

(@ 13 cents/kWh)

X-13 (trade name)

AKA
“constant torque”

MY furnace has…

A. …a PSC blower
B. …an ECM blower
C. …an X-13 blower
D. (I'm not sure)

Performance (efficiency & comfort)

Condensing Modulating ECM

Condensing Multi-stage ECM

Condensing Multi-stage X-13

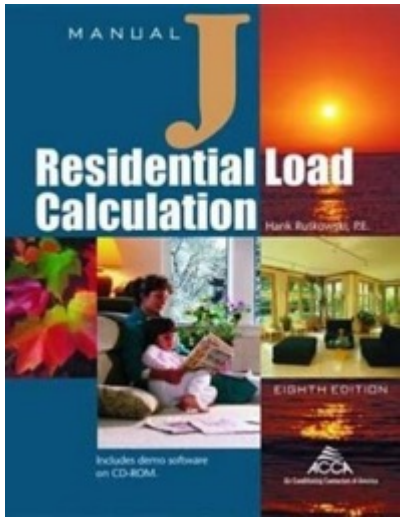
Condensing Single-stage PSC

Non-Condensing Multi-stage PSC

Non-condensing Single-stage PSC

Price

Furnace sizing



40,000 Btuh

60,000 Btuh

80,000 Btuh

100,000 Btuh

MN energy code: "Oversizing of heating equipment shall not exceed ___ percent of the calculated load requirement"

A. …5
B. …10
C. …20
D. …40

MN energy code: "Oversizing of heating equipment shall not exceed ___ percent of the calculated load requirement"

A. …5
B. …10
C. …20
D. …40

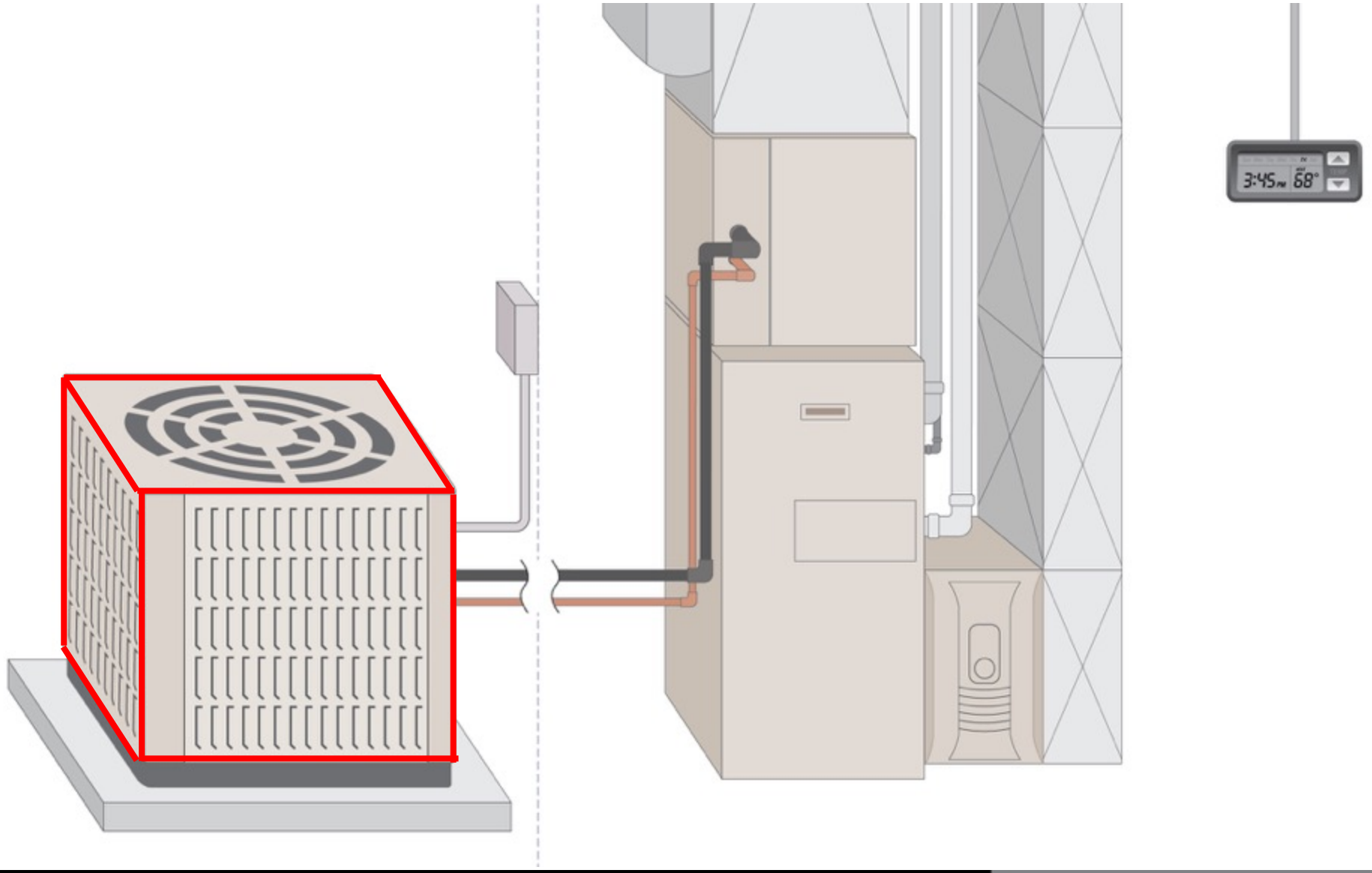
What percent of MN furnaces exceed the code limit for oversizing?

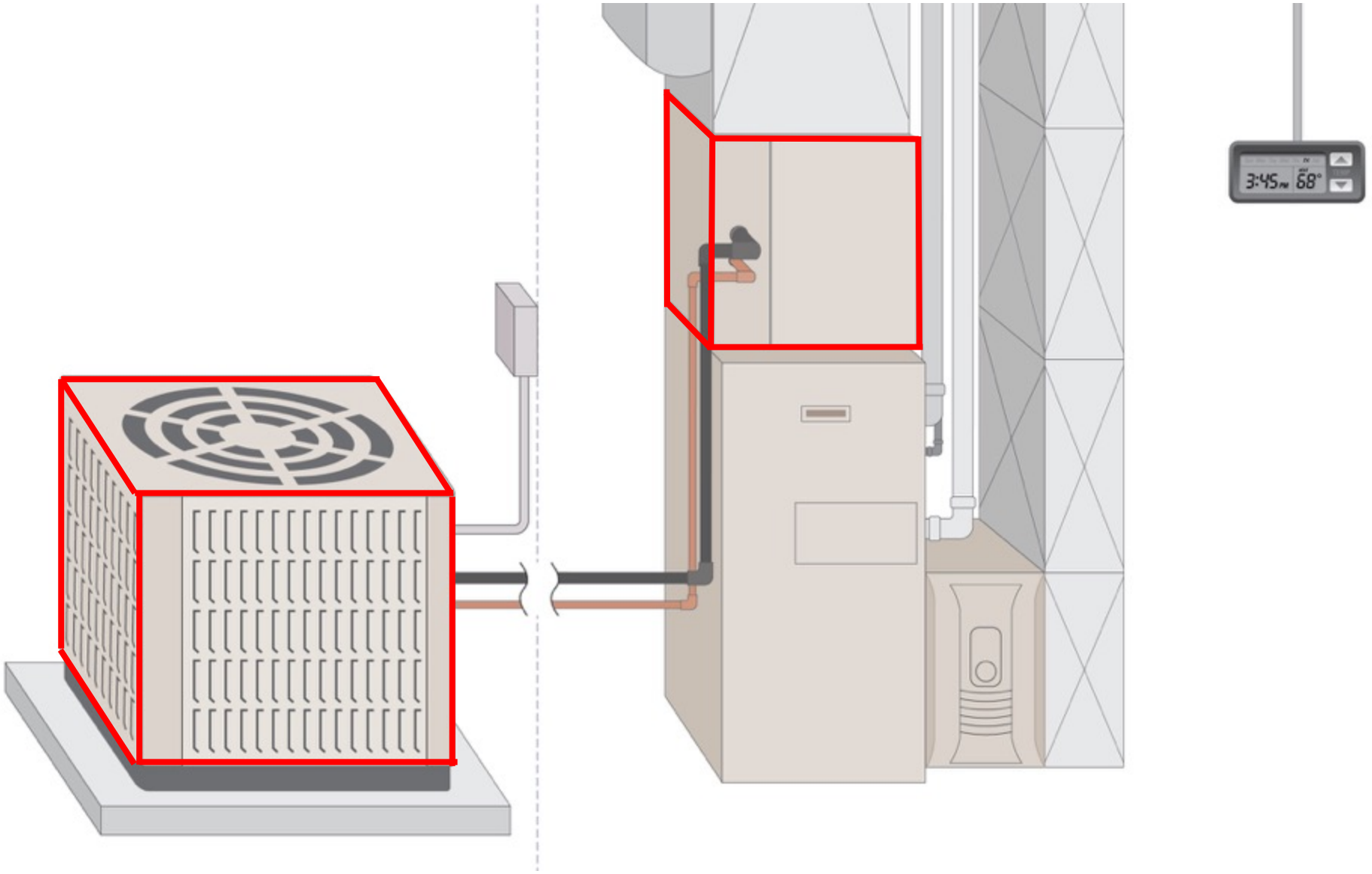
A. 15%
B. 30%
C. 60%
D. 95%

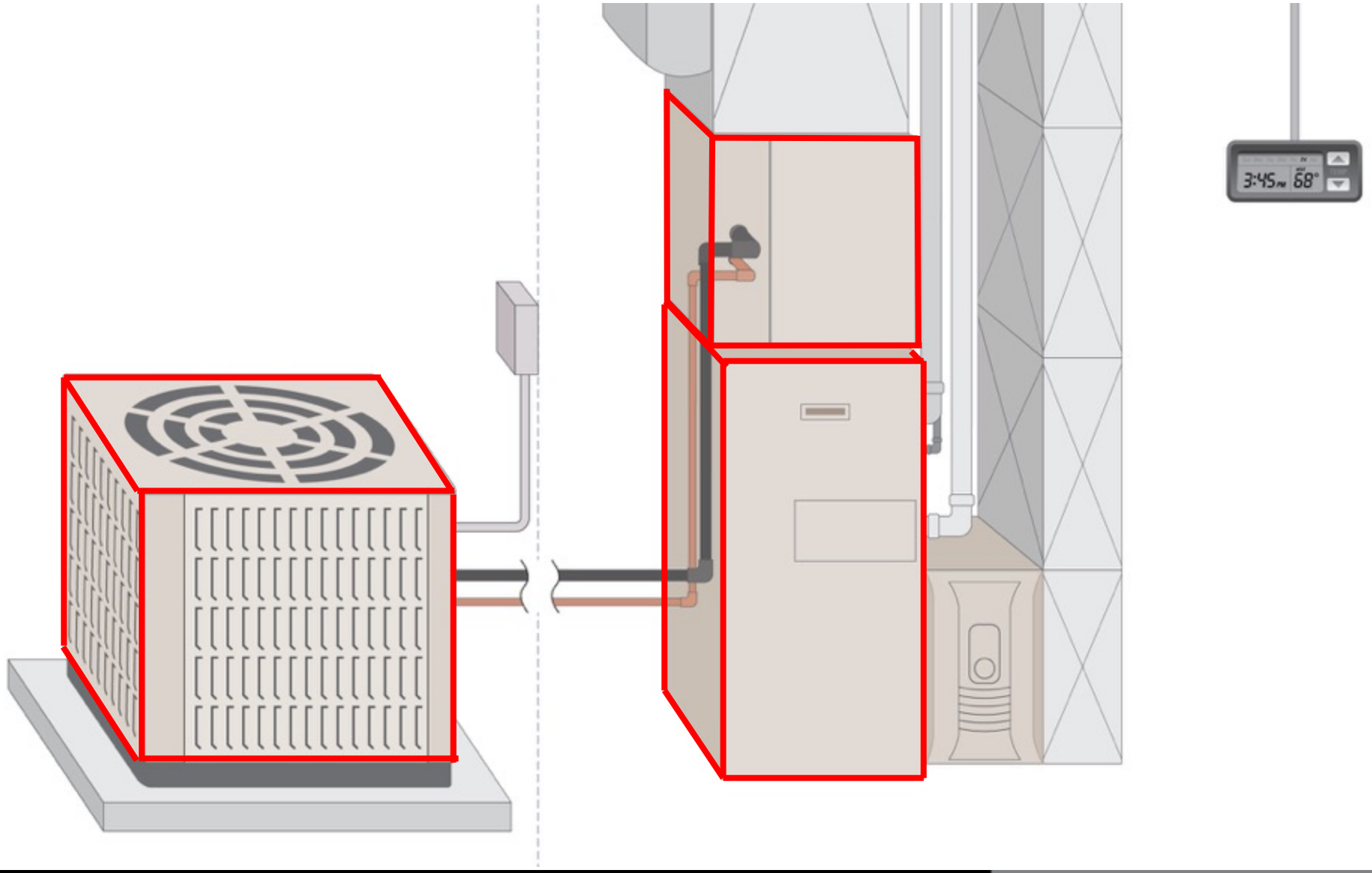
What percent of MN furnaces exceed the code limit for oversizing?

A. 15%
B. 30%
C. 60%
D. 95%

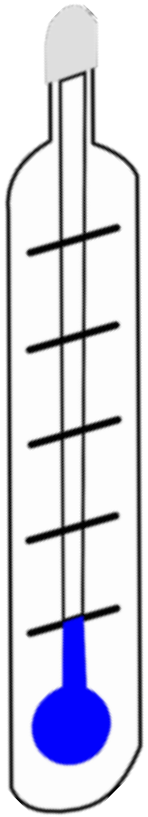
Air conditioner




3:45
68°

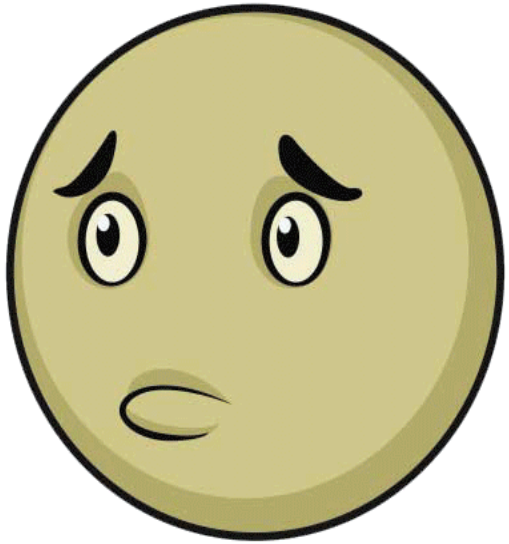

3:45
68°

The two jobs of an air conditioner

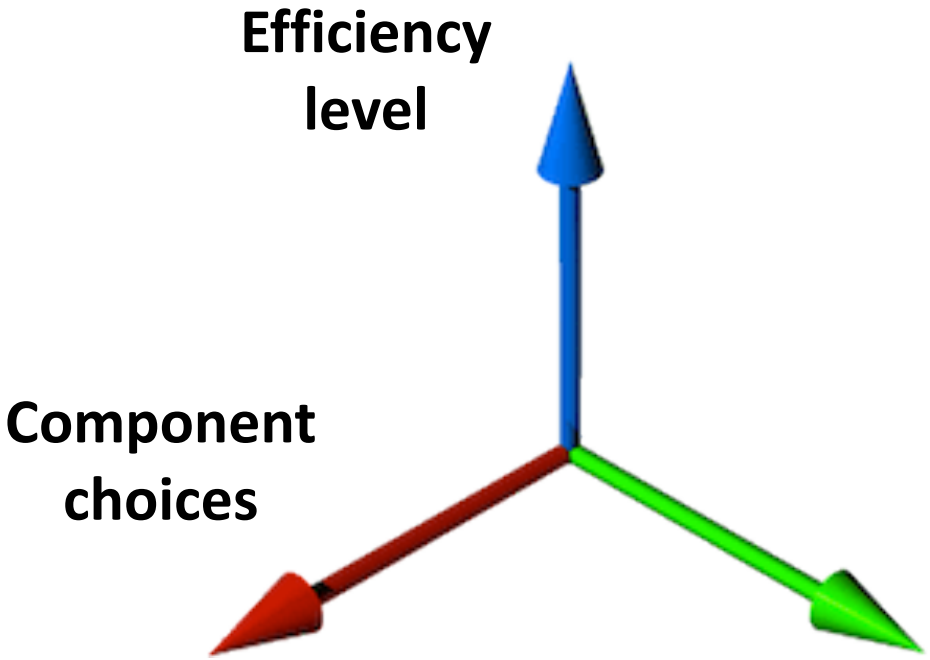


70%

30%



Installation?



Seasonal Energy Efficiency Ratio

SEER

How many hours per year does the average central air conditioner in Minneapolis run?

A. …120 hours
B. …240 hours
C. …325 hours
D. …450 hours
E. …630 hours

How many hours per year does the average central air conditioner in Minneapolis run?

A. …120 hours
B. …240 hours
C. …325 hours
D. …450 hours
E. …630 hours

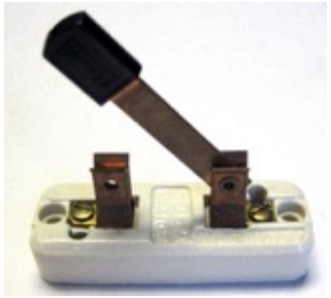
SEER upgrade savings

SEER	Savings (vs SEER 13)
13	$0
14	$5
15	$10
16	$15
17	$20
18	$25

(2.25 tons capacity, 325 annual hours, 13 cents/kWh)

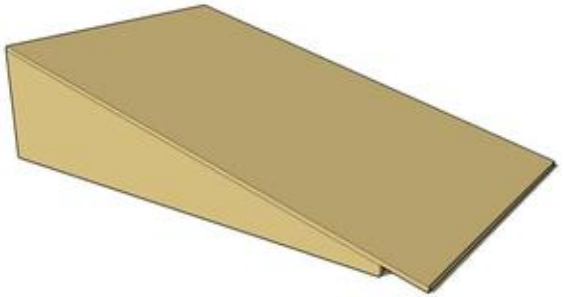
Cooling stages

Single-stage



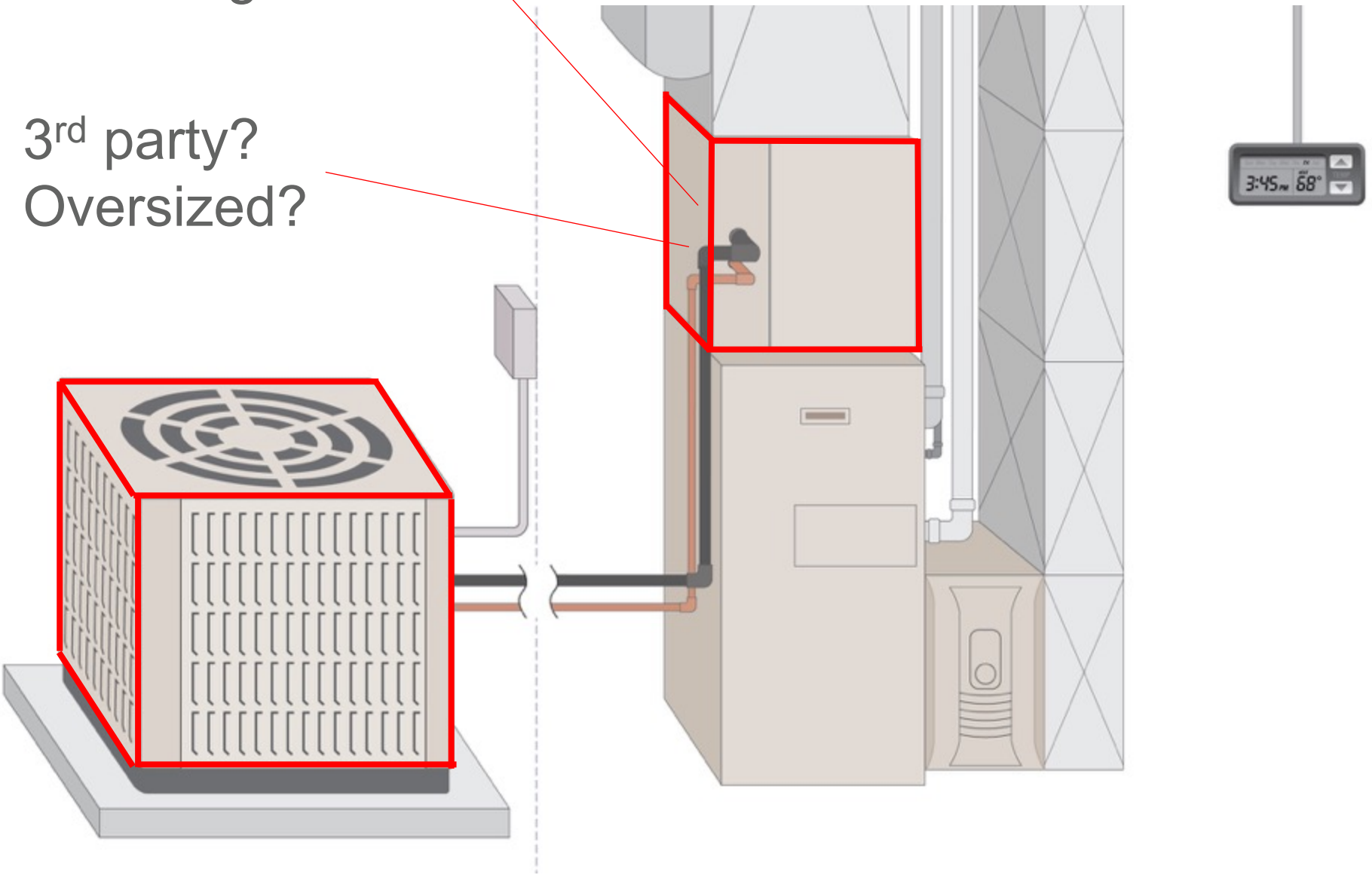
Two-stage

Modulating



Metering device?

3rd party?
Oversized?



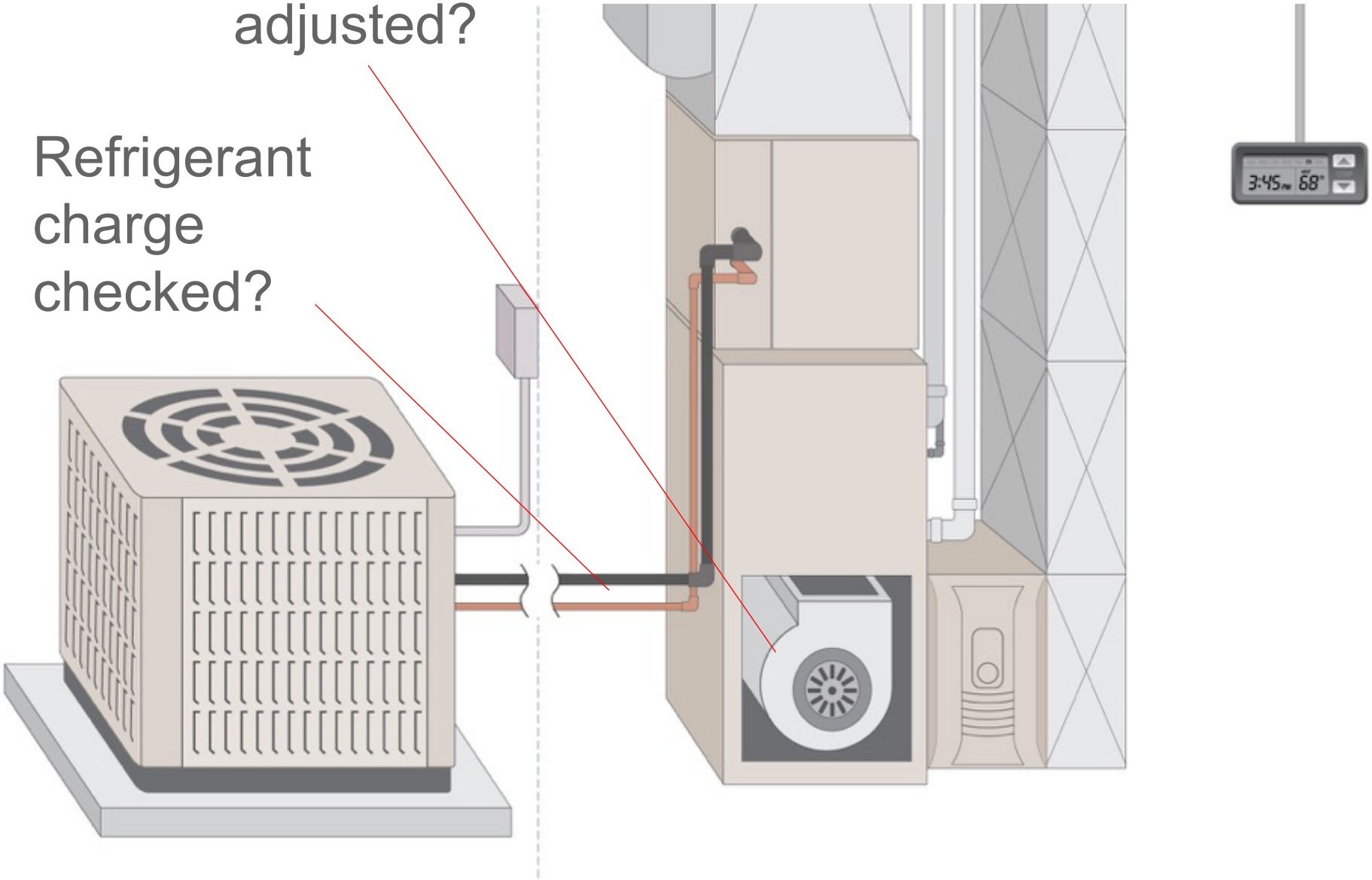
Metering device

Fixed orifice

Thermostatic expansion valve (TXV)

Airflow adjusted?

Refrigerant charge checked?



What percent of MN A/C systems have improper refrigerant charge or airflow?

A. …10%
B. …20%
C. …40%
D. …60%
E. …85%

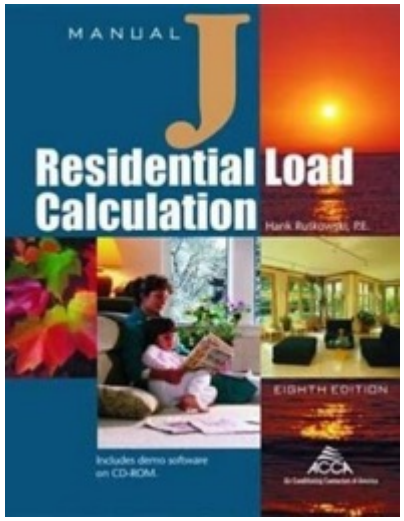
What percent of MN A/C systems have improper refrigerant charge or airflow?

A. …10%
B. …20%
C. …40%
D. …60%
E. …85%

Typical savings: 10%

One in six can save 25%+

A/C sizing

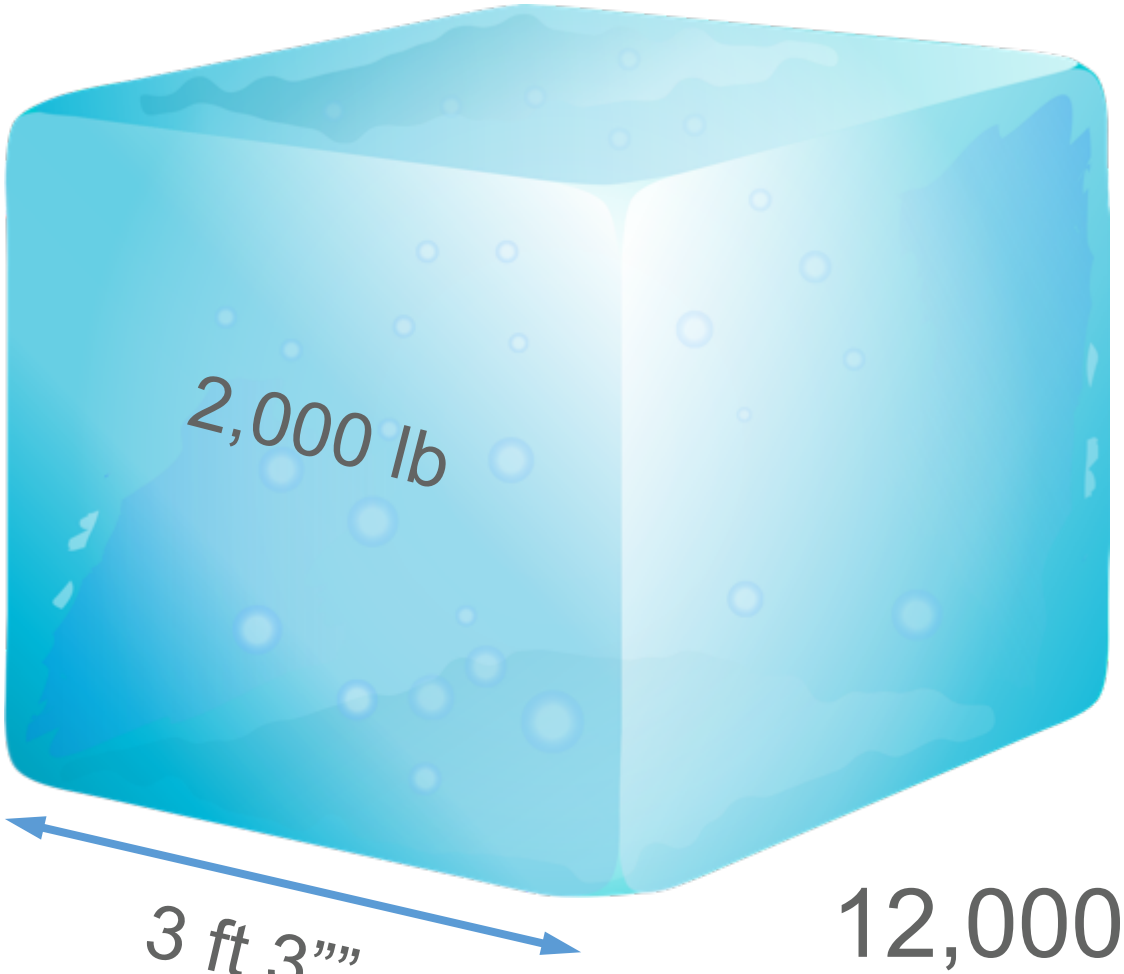


2 tons

2.5 tons

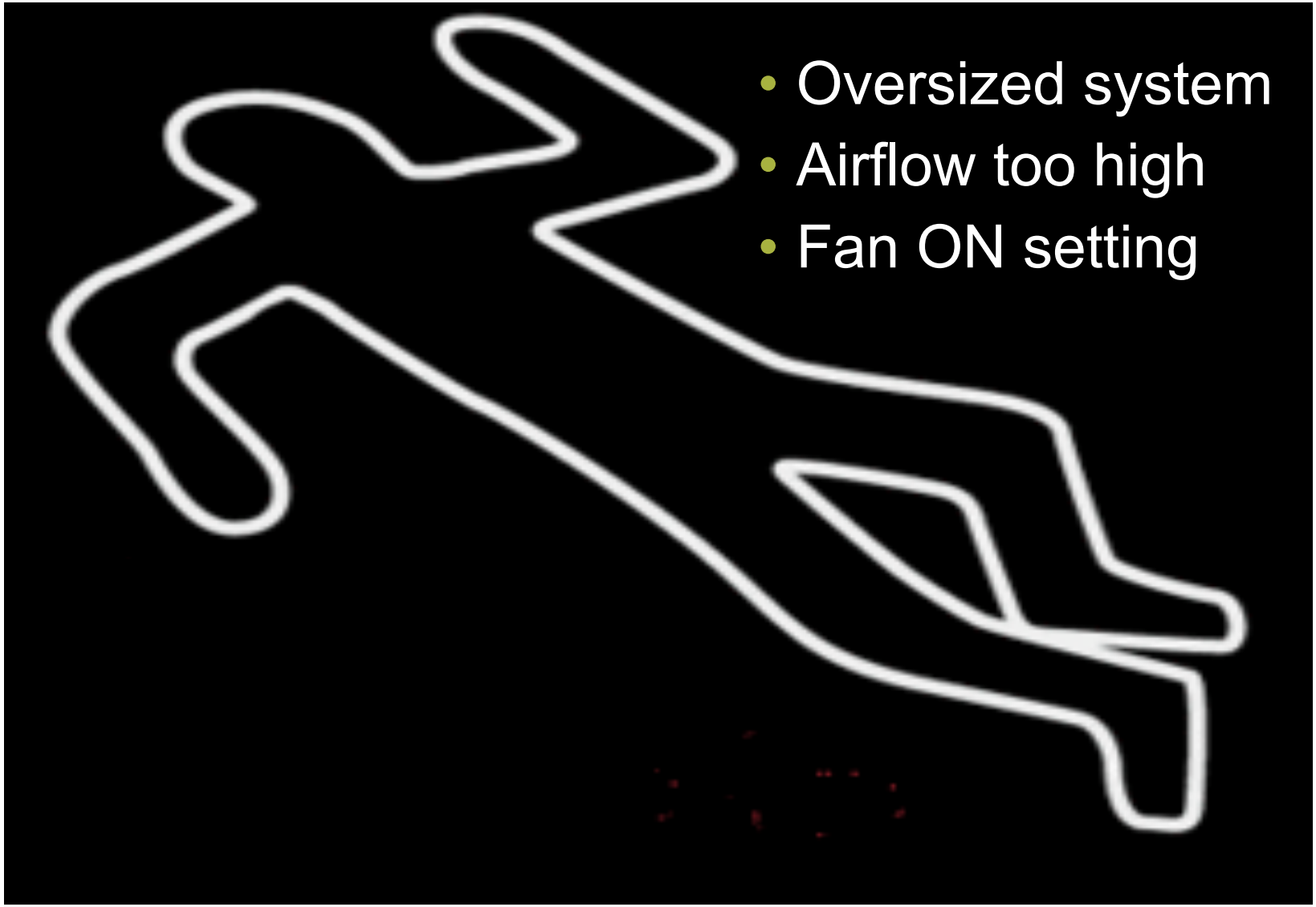
3 tons

What is a “ton” of cooling?

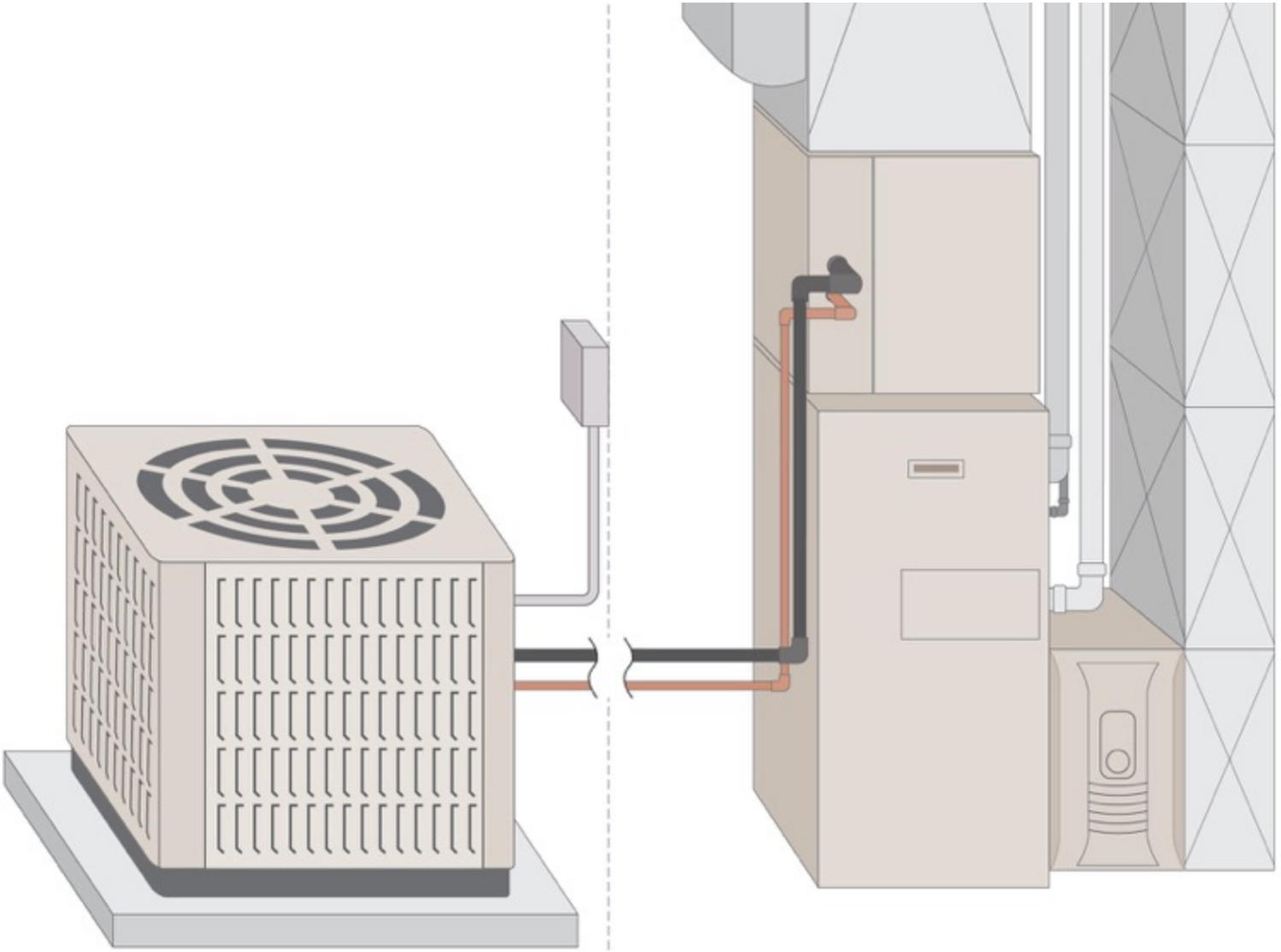


12,000 Btuh

The three dehumidification killers



Thermostat

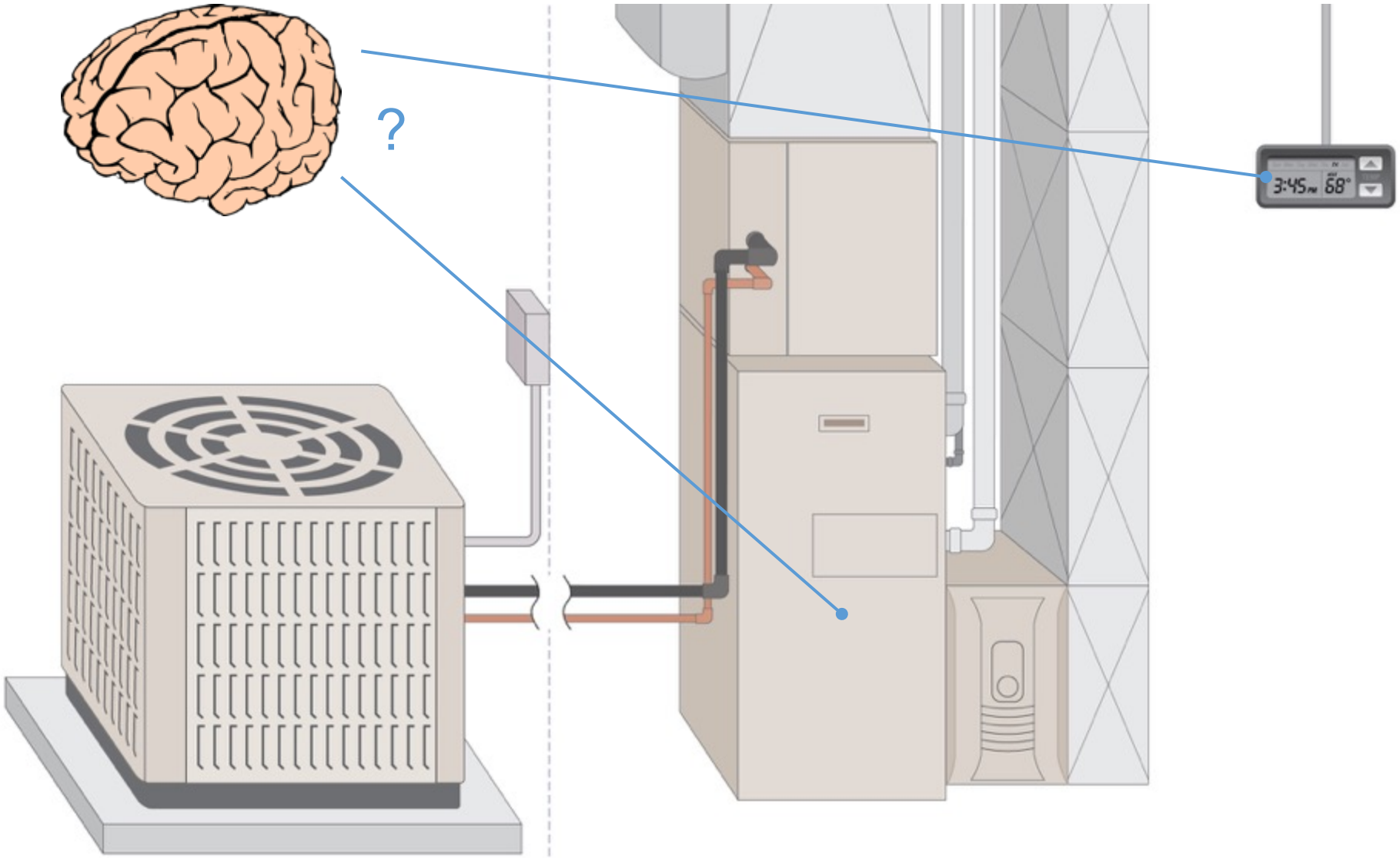


Lots of options

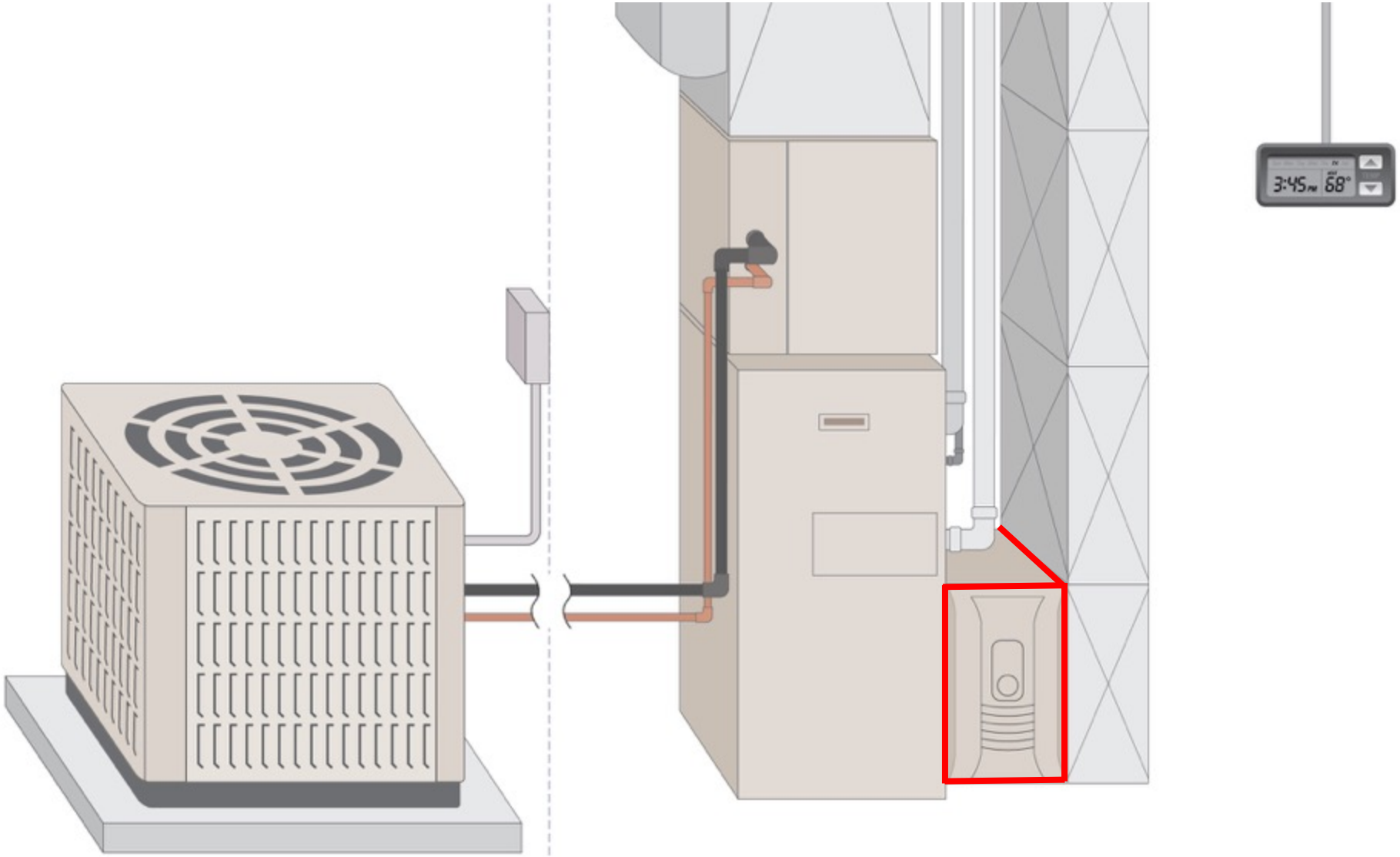
- Manual
- Programmable
- Connected/”Smart”

- Proprietary?

Where’s the brain?



Filter



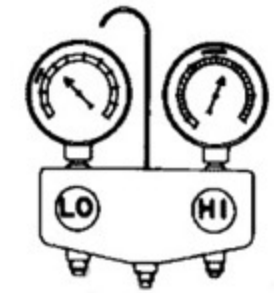
Options

- 1” disposable
- 4” disposable
- Electrostatic

Minimum Efficiency Reporting Value

MERV

Recipe for disaster


LO
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features
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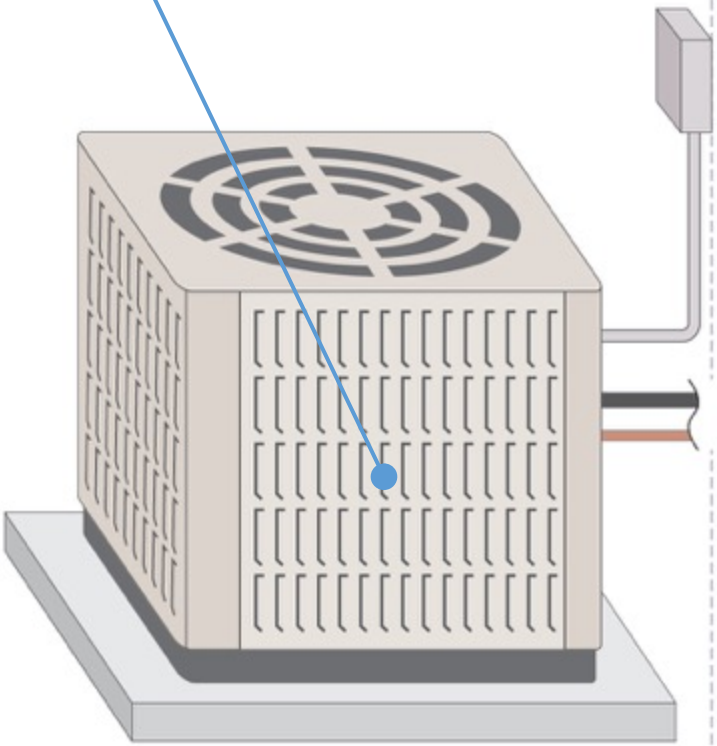
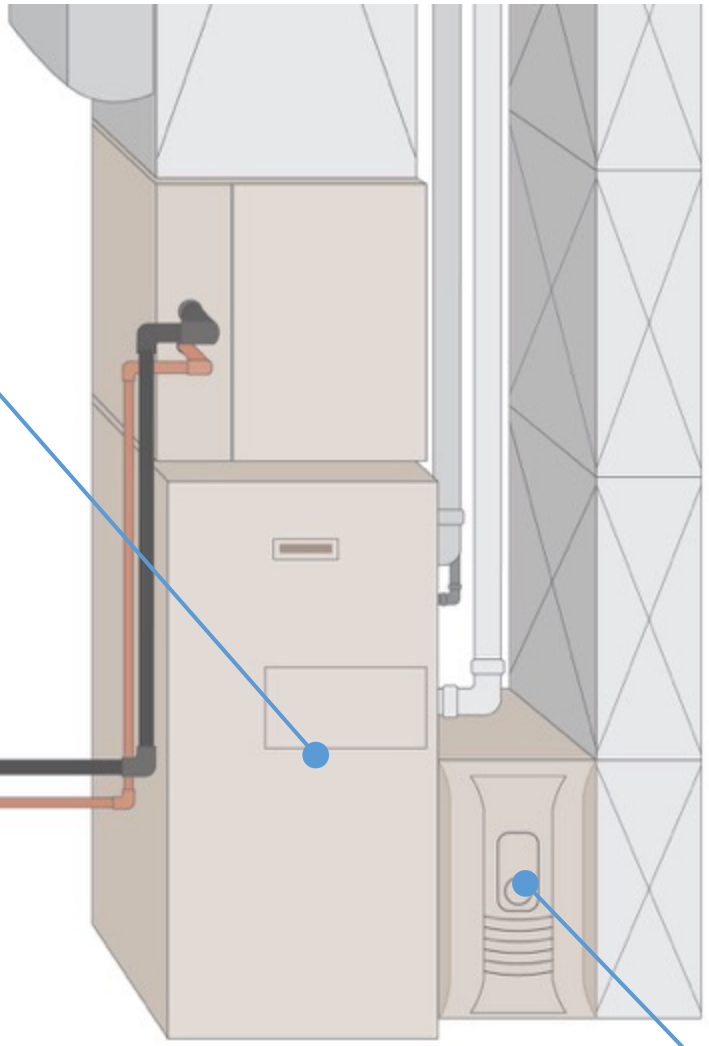
features



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