HVAC
How to save energy
(part 1)

State Energy Assessment Workshop

By:

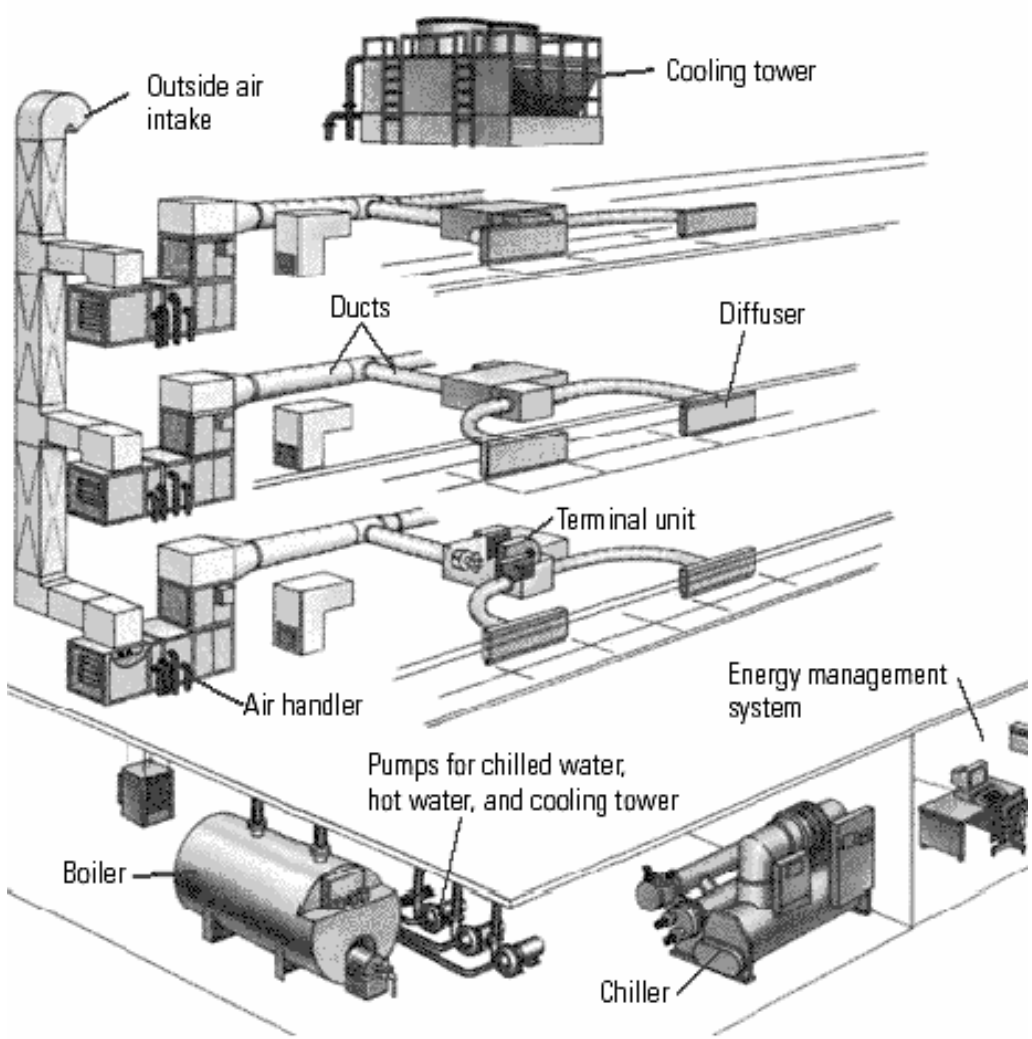
DTE Energy Partnership & Services

HVAC

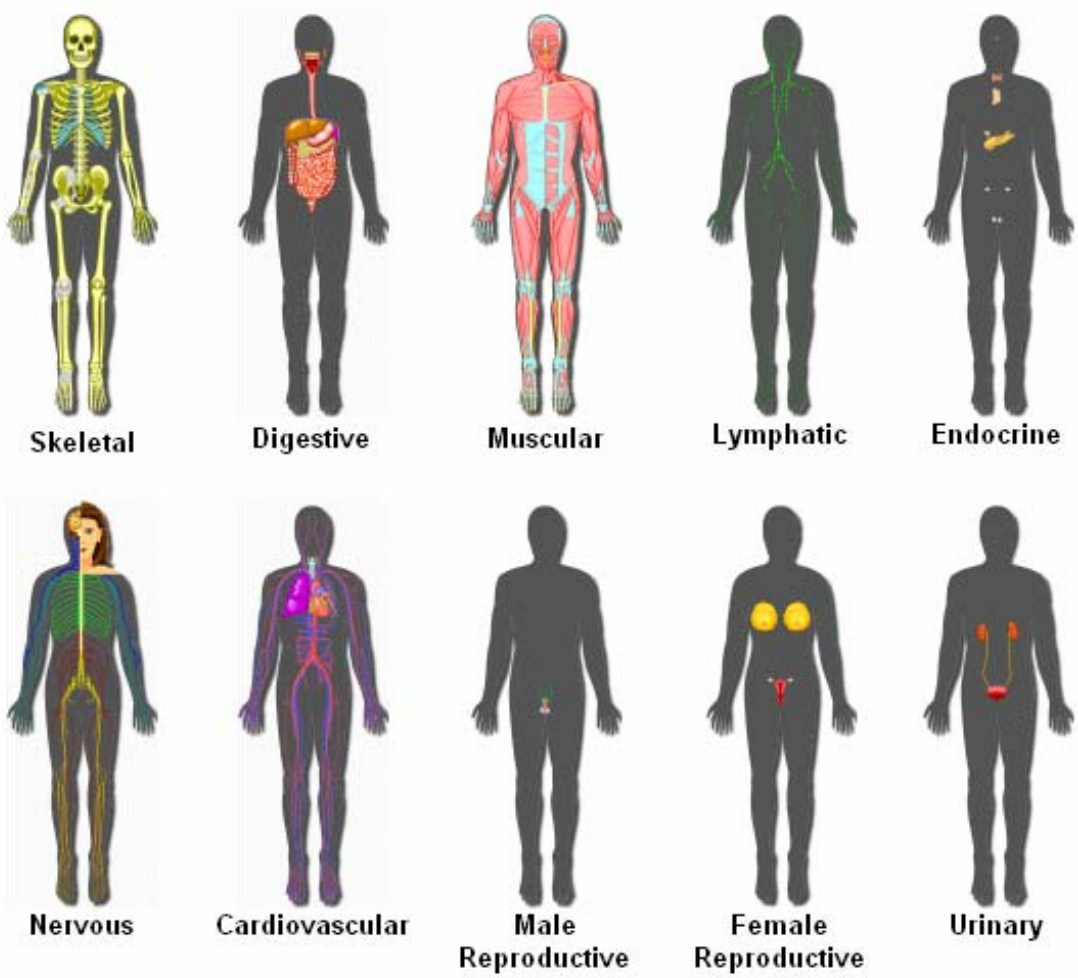
- *H – heating*
- *V – ventilation*
- *AC – air conditioning*

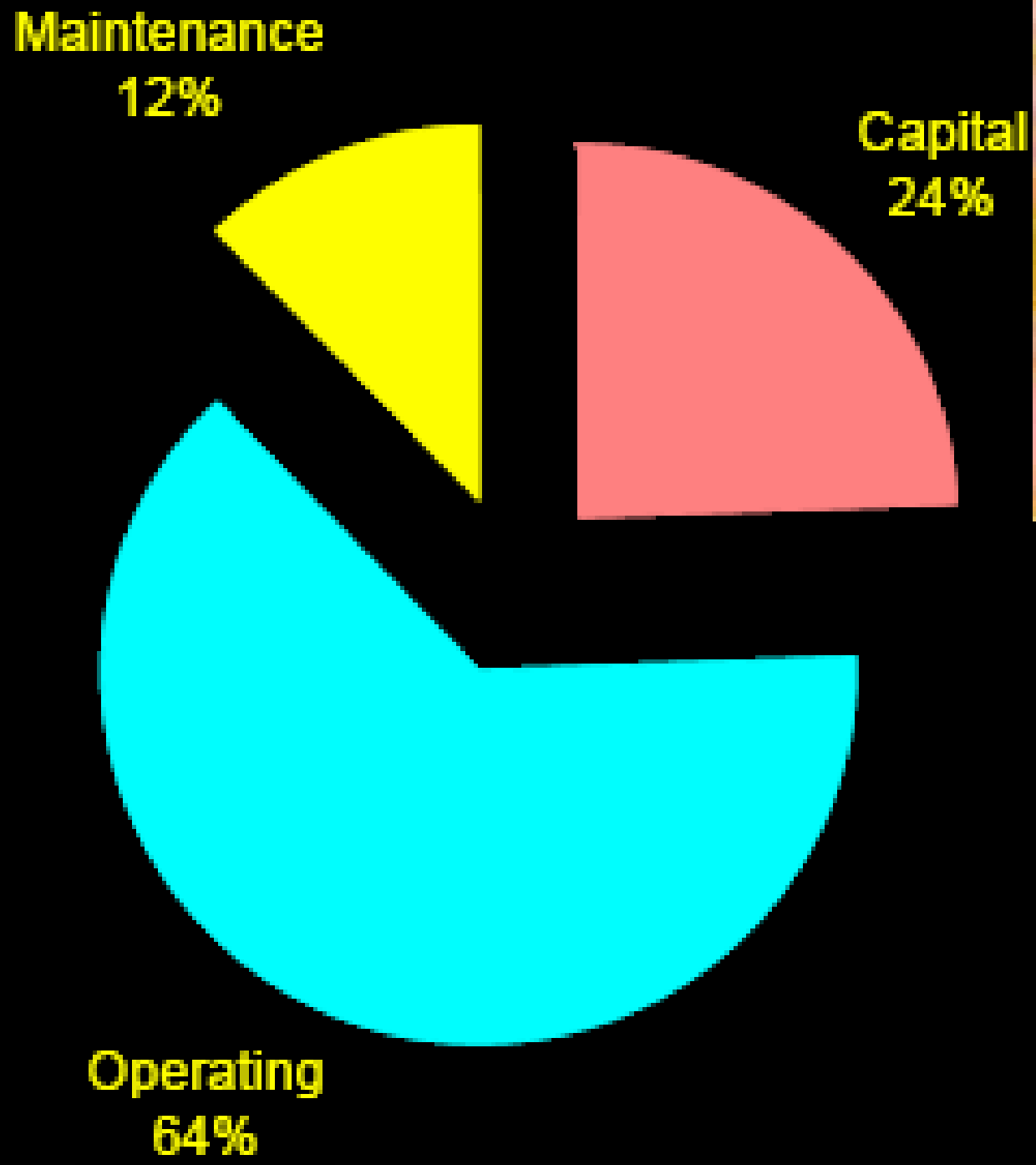
HVAC components

1. Building
2. Airduct system
3. Heating Hot water system
4. Steam/condensate system
5. Cooling tower water system
6. Chilled water system
7. Refrigeration system

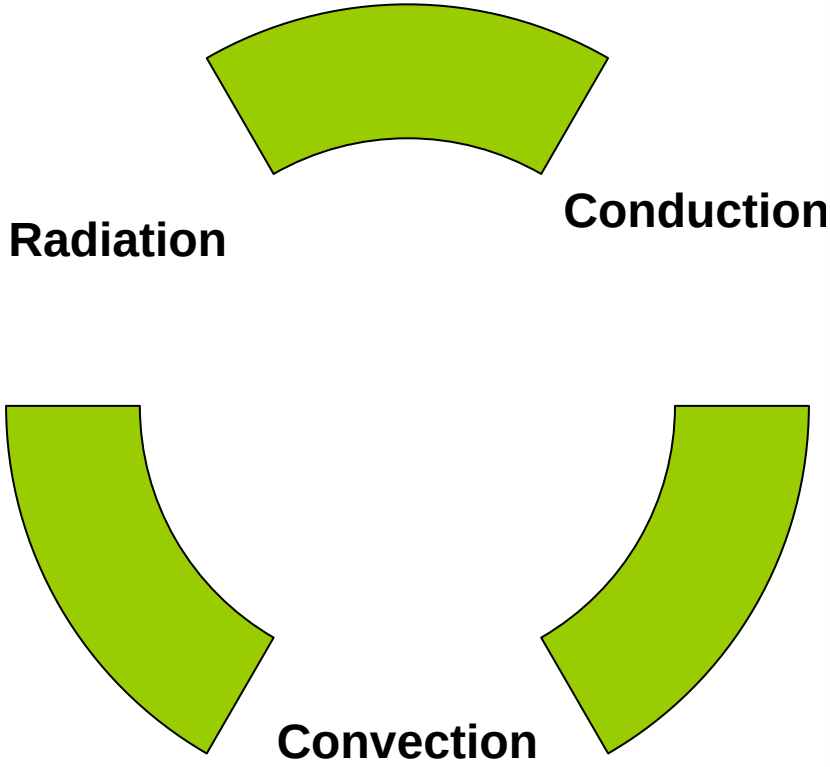


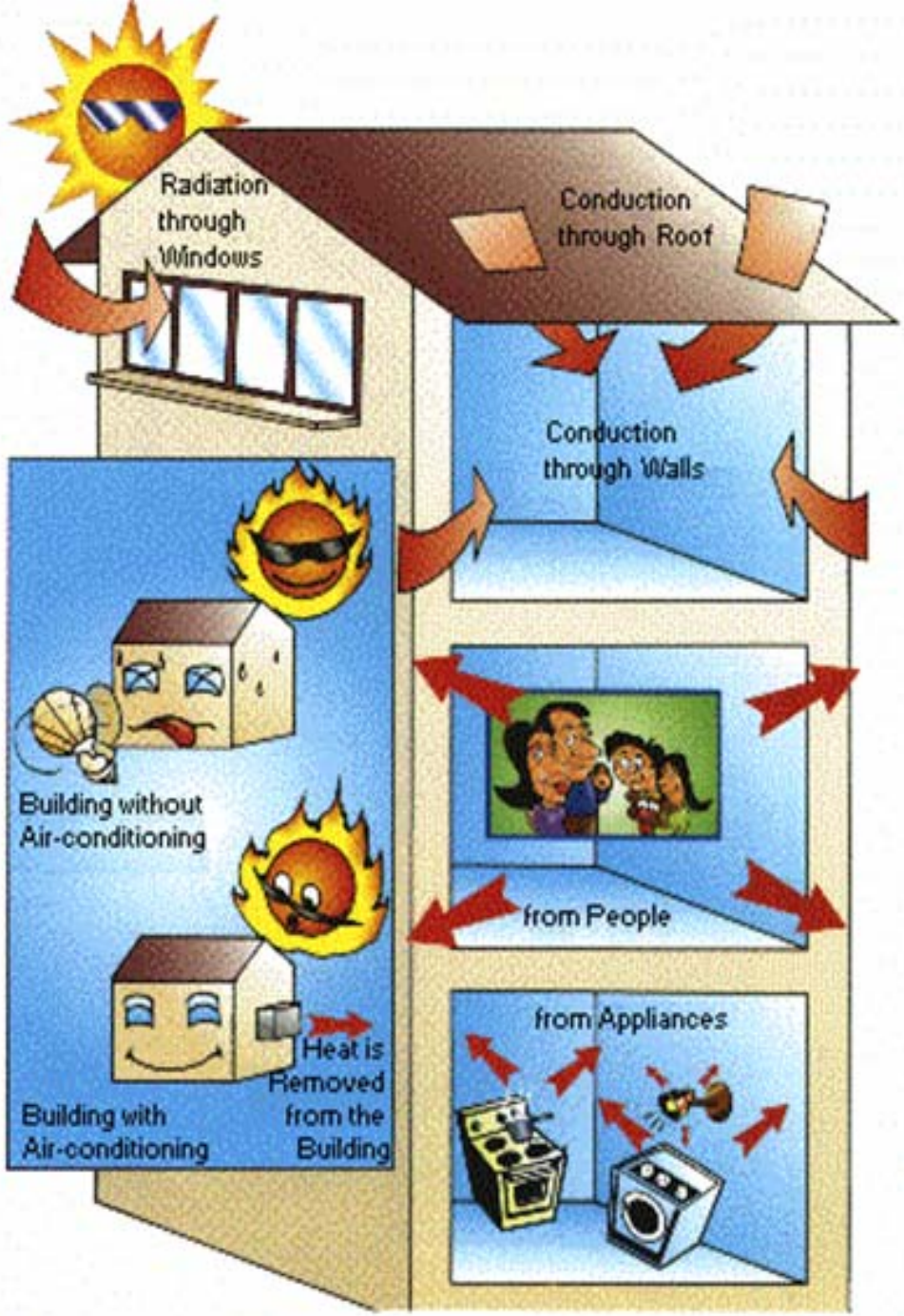
HVAC system is a group of components working together




Maintenance
12%
Capital
24%
Operating
64%

Building

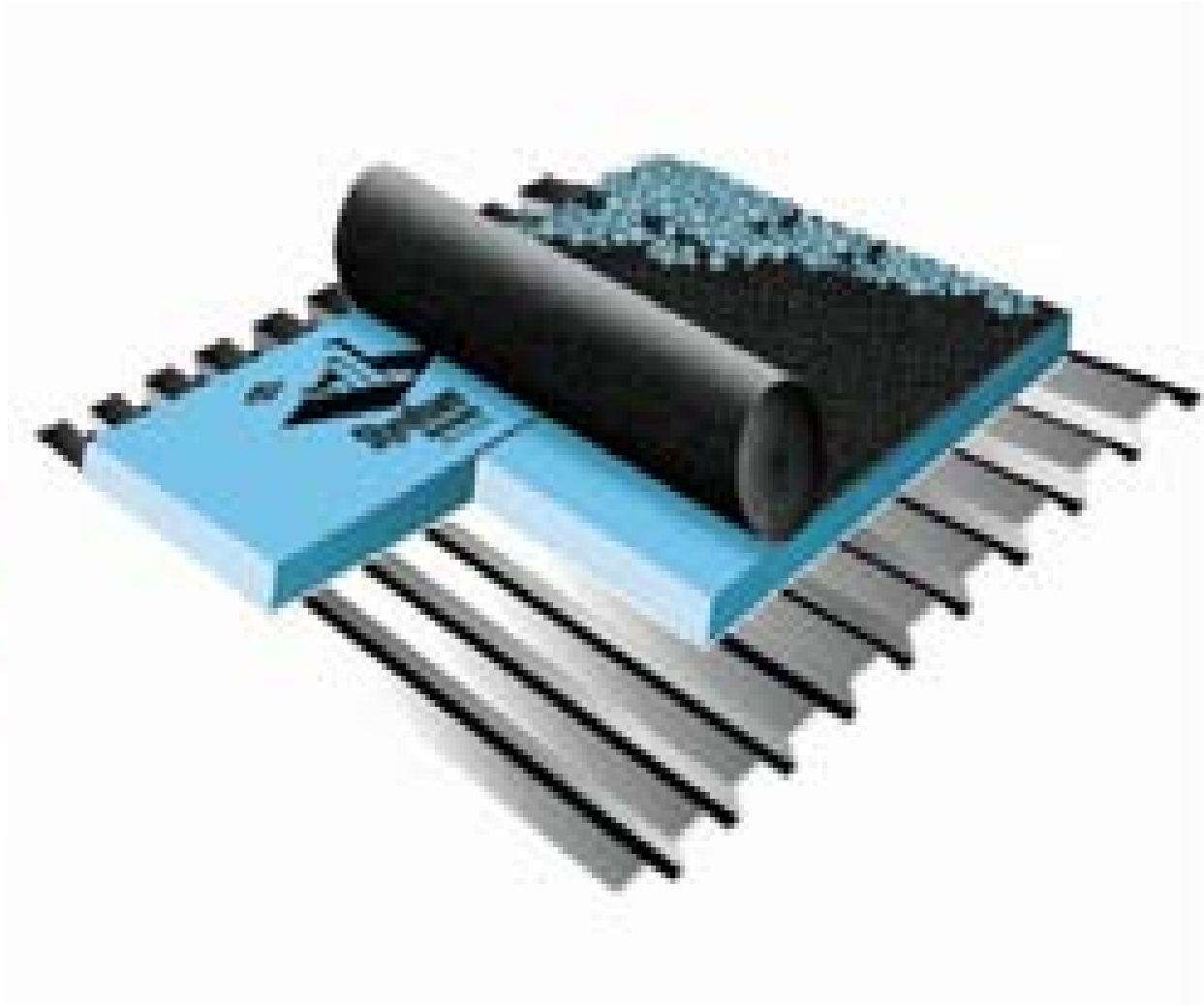

Radiation
Conduction
Convection


Radiation through Windows
Conduction through Roof
Conduction through Walls
Building without Air-conditioning
from People
from Appliances
Heat is Removed from the Building
Building with Air-conditioning

Building loads

- Winter
  - Conduction
  - Infiltration
- Summer
  - Conduction
  - Solar radiation
  - Internal heat gains

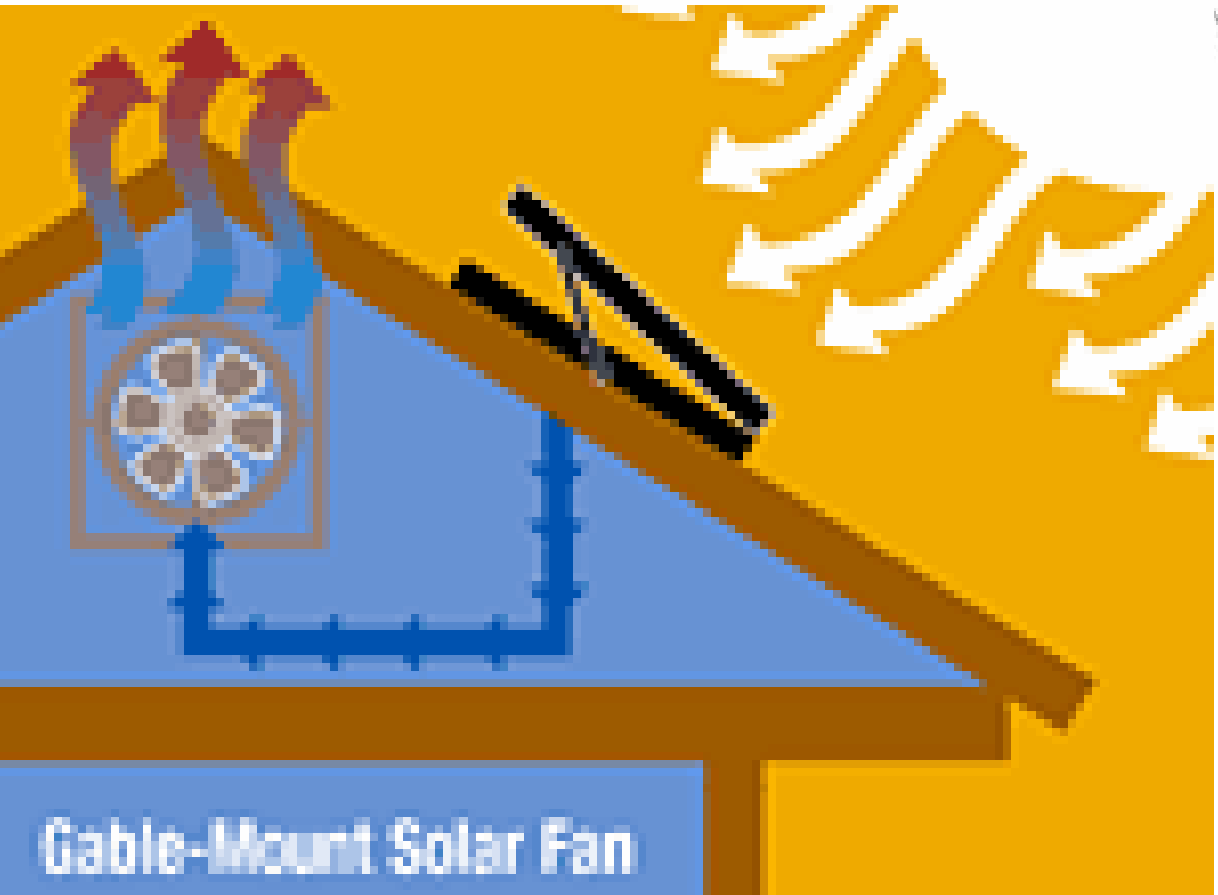
Roof insulation



- Windows sealing and caulking
- Pressurize area for 10%

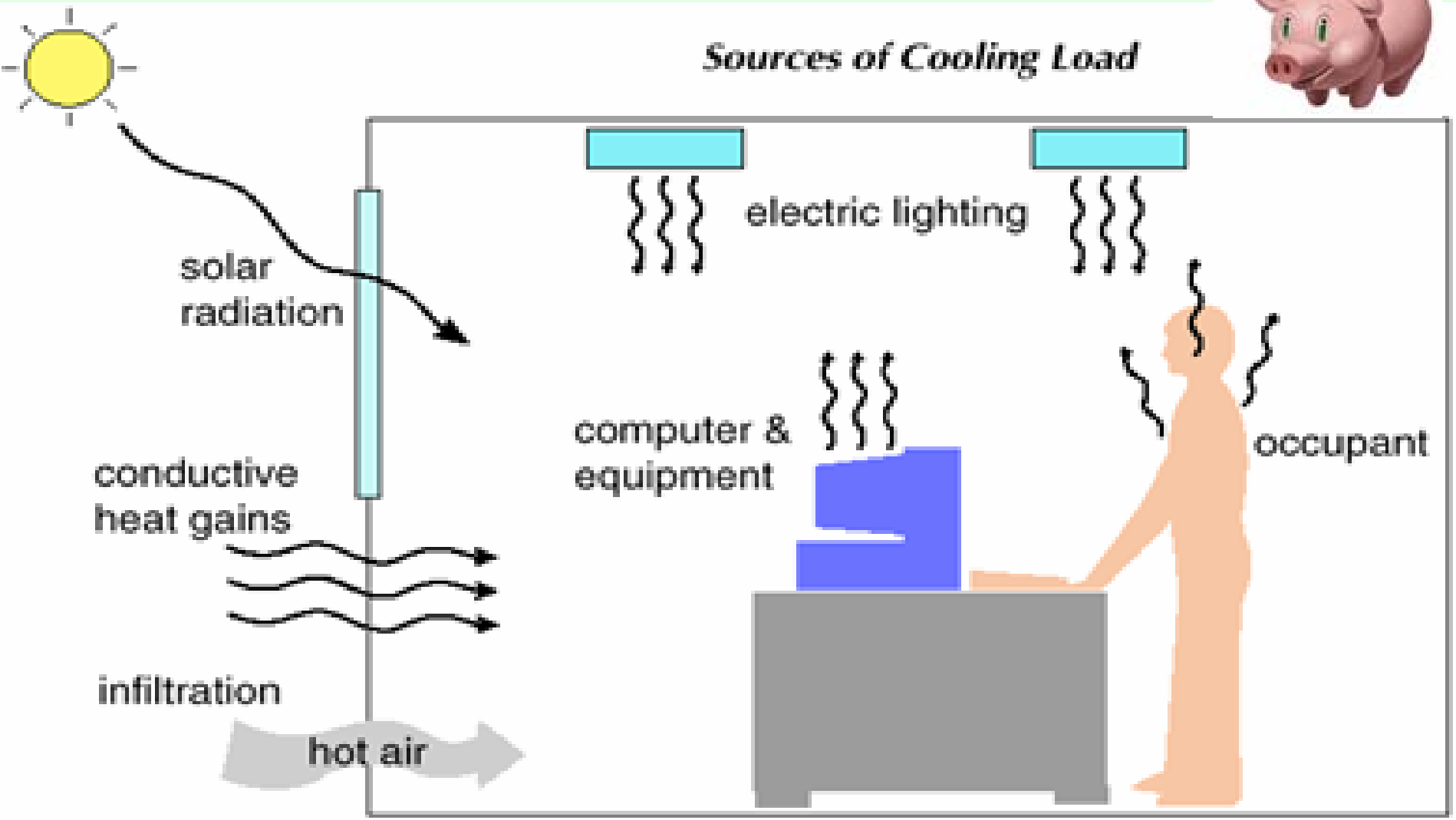
- Tined film (reduce shading coefficient from 0,65 to 0.22)

- Avoid skylights



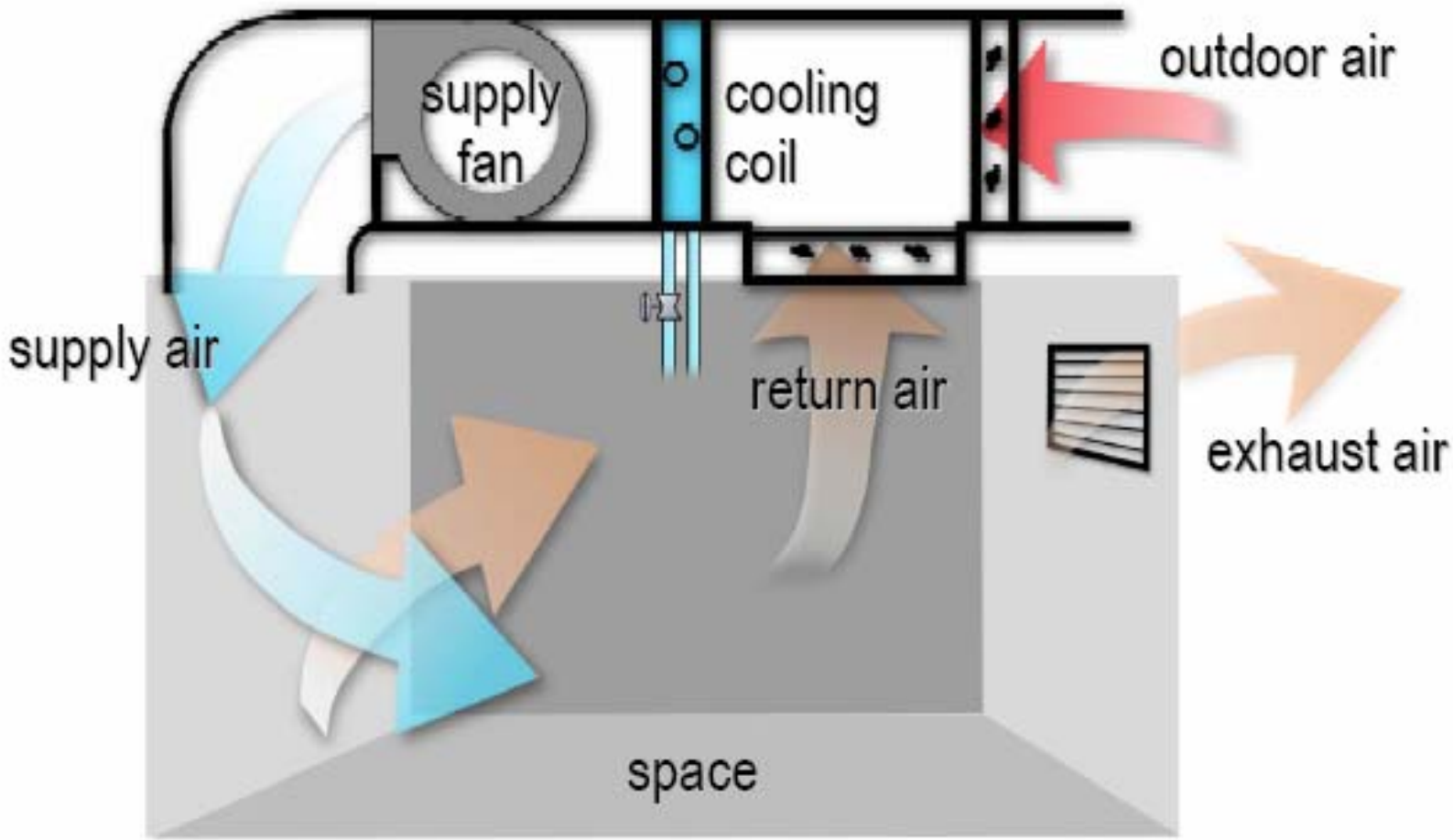
Attic Ventilation

Use energy efficient lights, occupancy sensors, timers



Air-Conditioning Equipment and Systems

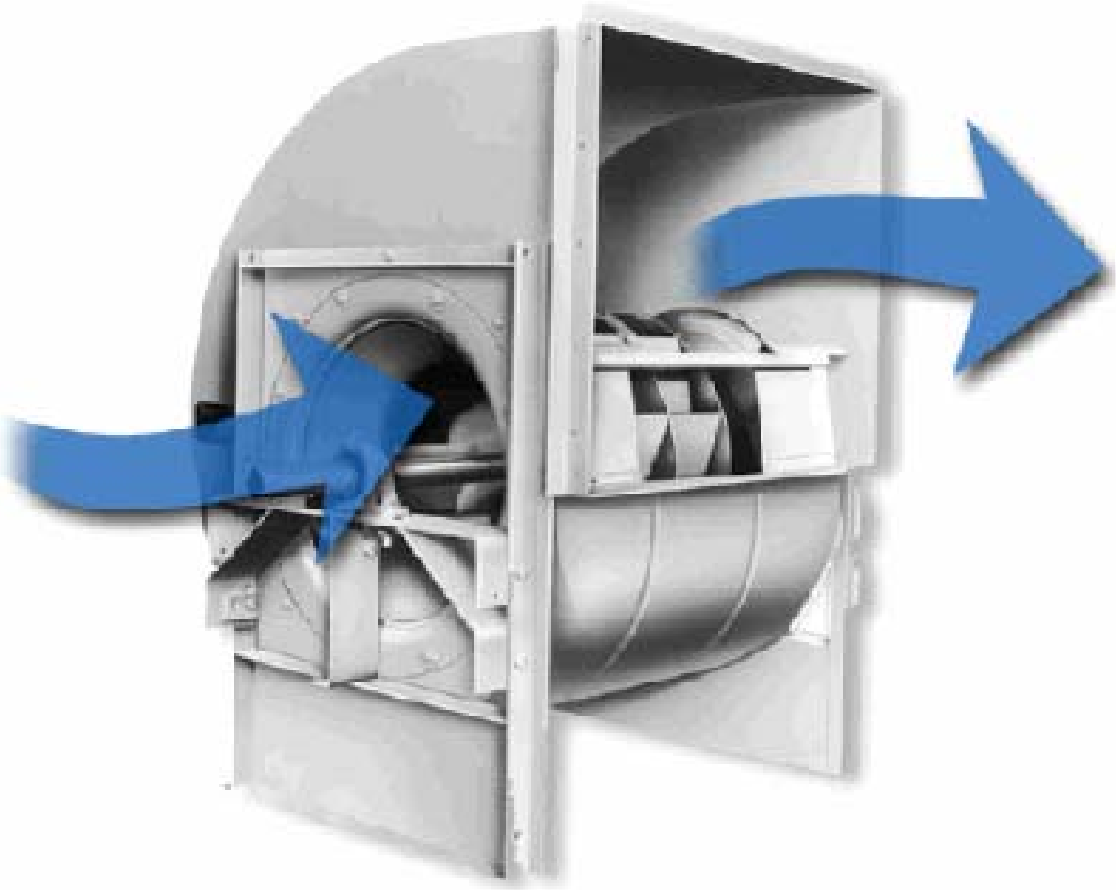
Air-Conditioning Operation



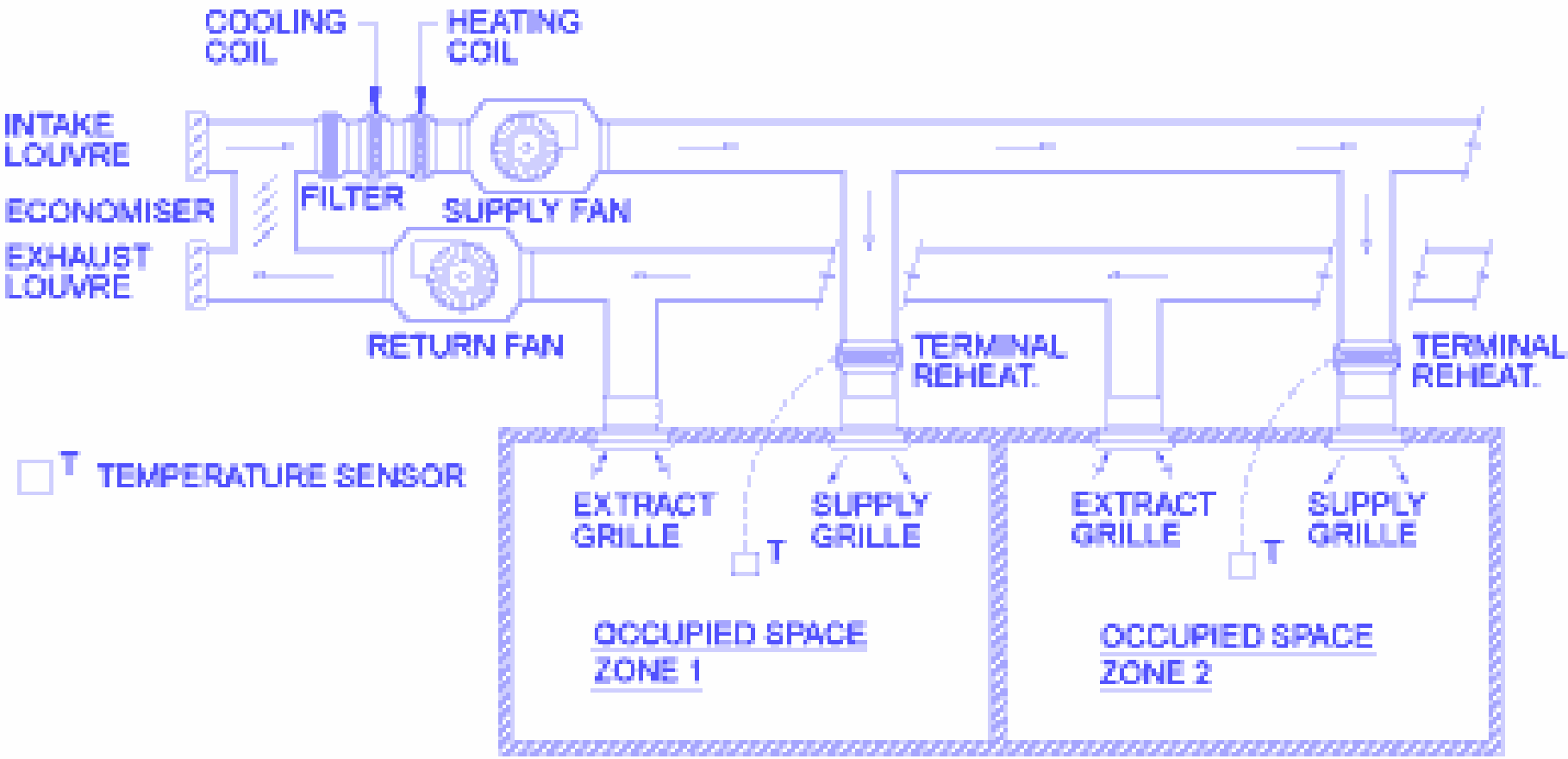
Economizer

- Use free cooling in spring
- Drop down temperature at night
- Use CO^2 sensors

Air Conditioning Fans



Constant Volume



Variable Air Volume

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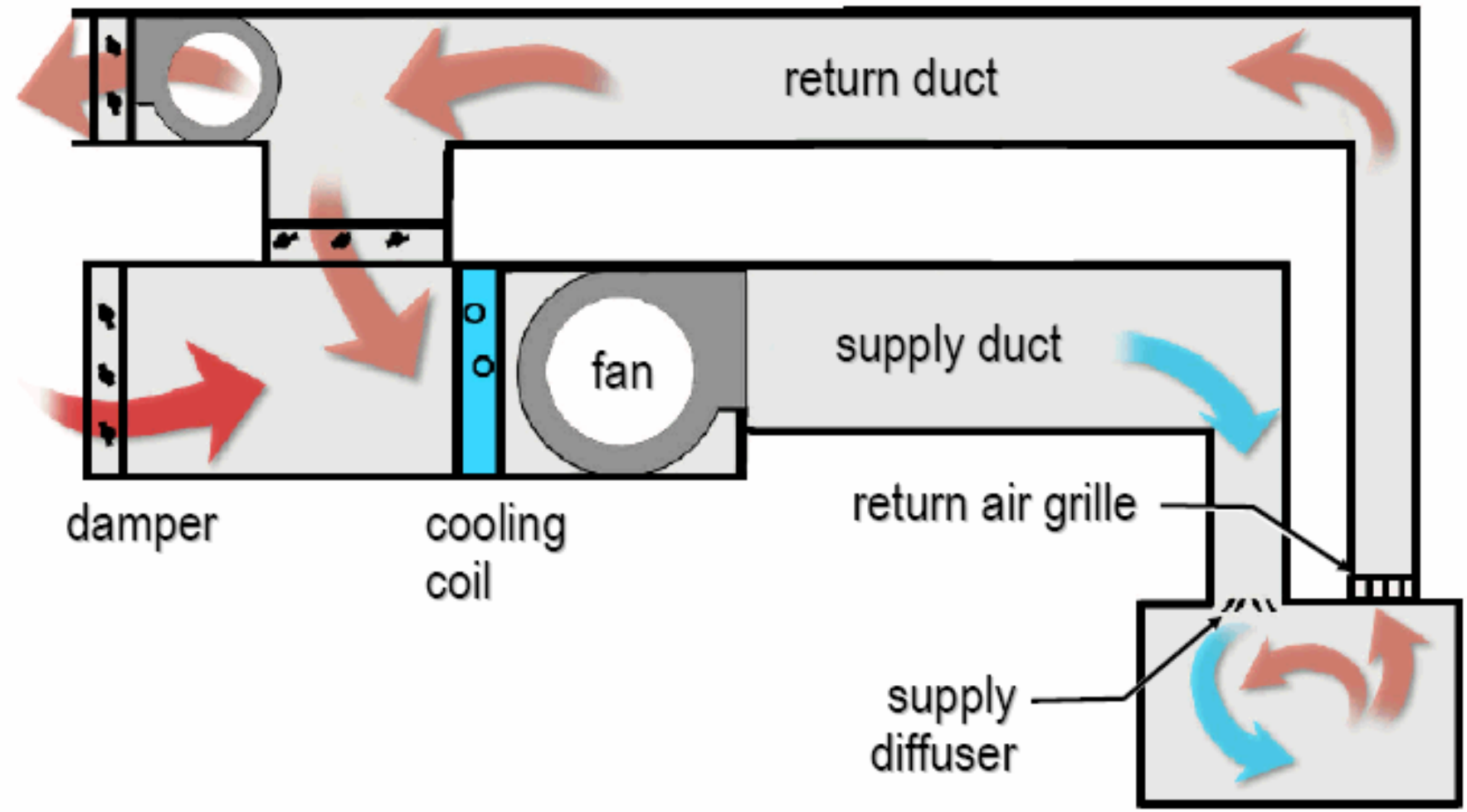
COOLING COIL
HEATING COIL
INTAKE LOUVRE
SUPPLY FAN
ECONOMISER
FILTER
EXHAUST LOUVRE
RETURN FAN
TERMINAL REHEAT DAMPER
TERMINAL REHEAT DAMPER
EXTRACT GRILLE
SUPPLY GRILLE
OCCUPIED SPACE ZONE 1
EXTRACT GRILLE
SUPPLY GRILLE
OCCUPIED SPACE ZONE 2
T TEMPERATURE SENSOR
P PRESSURE SENSOR

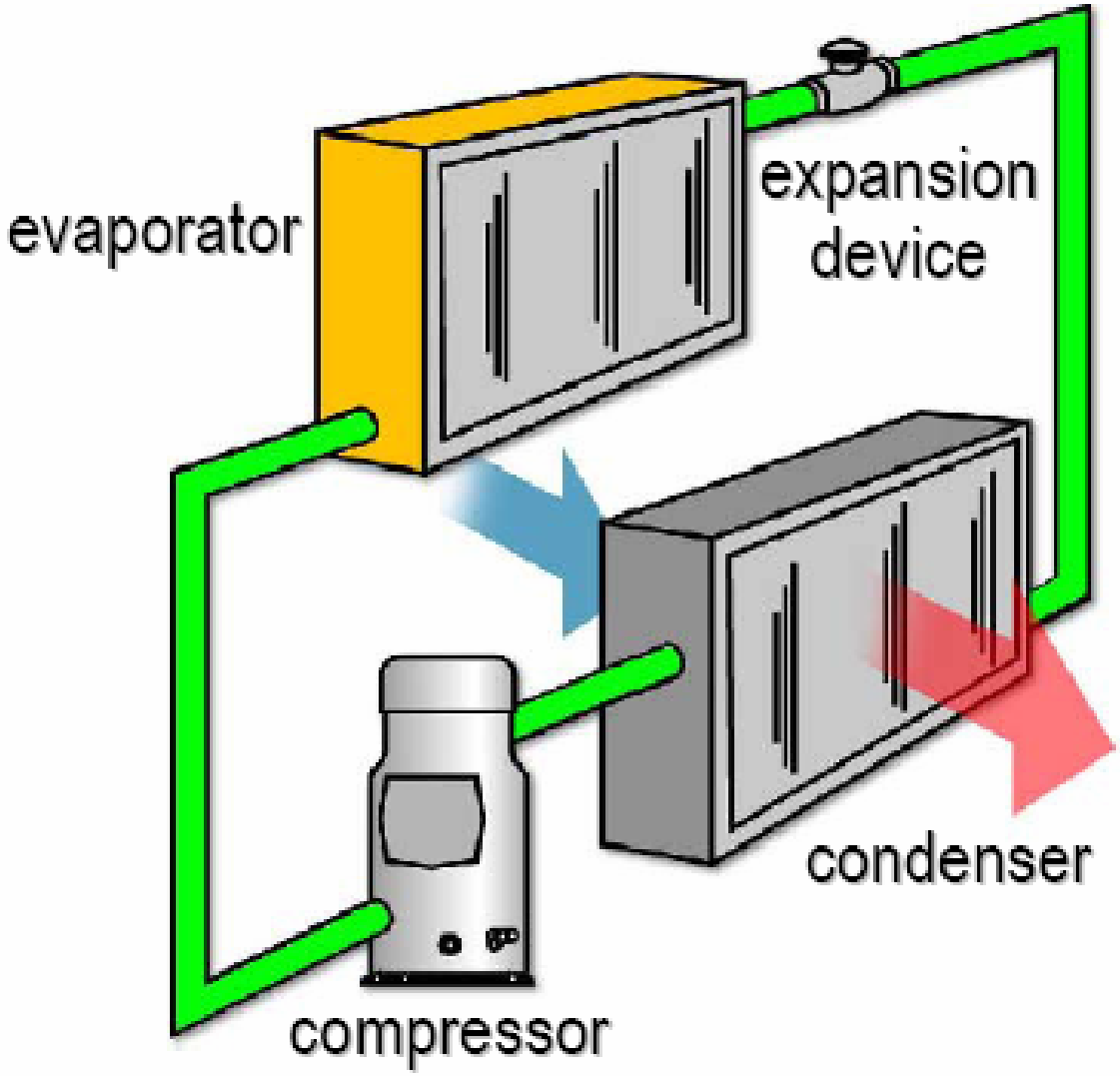
- Shut down system
- Use VAV
- Fan efficiency

Duct Work


return duct
fan
supply duct
damper
cooling
coil
return air grille
supply
diffuser

- Clean ductwork
- Insulate ducts
- Avoid flat duct
- Clean filters

Refrigeration System



- Refrigerant piping must be insulated
- Clean condenser surface
- Use new technologies
  - Hy-Save (booster pump and sub cooling)
  - Energy wheel

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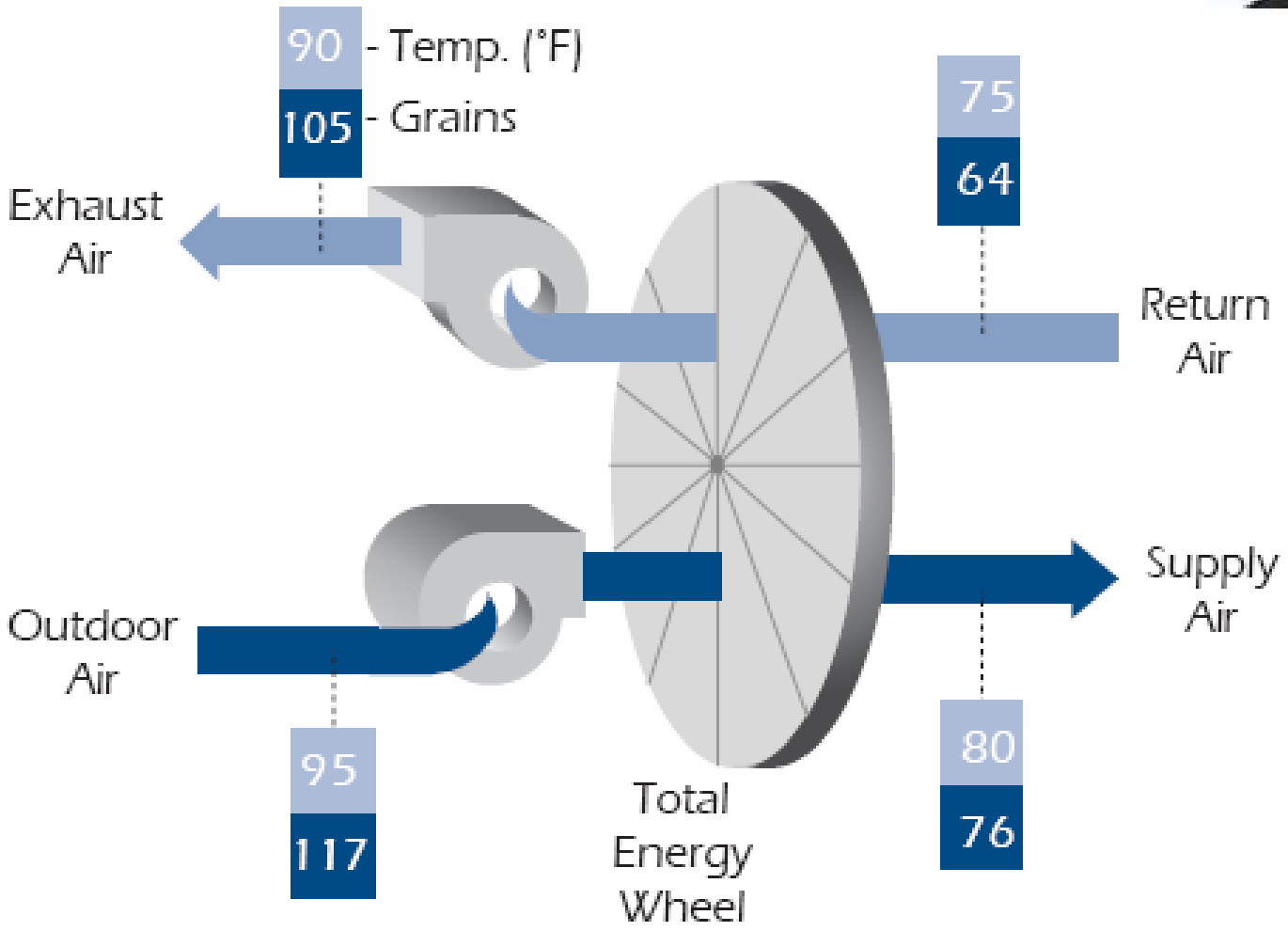
HOW MUCH WILL YOU SAVE WITH hy|save REFRIGERATION? LET US DO THE MATH.

Hy|save refrigeration will save you energy and dollars. How much depends on the rate you pay for electricity. Here are the potential savings for a supermarket operating low, medium and high-temperature food cases when a hy|save refrigeration system is installed on four racks of the facility's compressor systems. Substitute figures for your facility to determine your energy savings.

	ONE-TIME COST OF INSTALLATION	KWH USAGE BEFORE	KWH USAGE AFTER	KWH SAVINGS	AVG. ENERGY SAVINGS (%)	ENERGY RATE PER KWH	DOLLAR SAVINGS
rack a	$12,000	356,485	262,990	93,495	26.2	$.06	$ 5,609.70
rack b	$12,000	493,250	332,416	160,834	32.6	$.06	$ 9,650.04
rack c	$12,000	303,009	238,088	64,921	21.4	$.06	$ 3,895.26
rack d	$12,000	279,791	191,629	88,162	31.5	$.06	$ 5,289.72
annual totals				407,412	28.4		$24,444.72

initial investment — annual dollar savings = payback time
$48,000 ÷ $24,444.72 = 1.96 years

Energy Wheel



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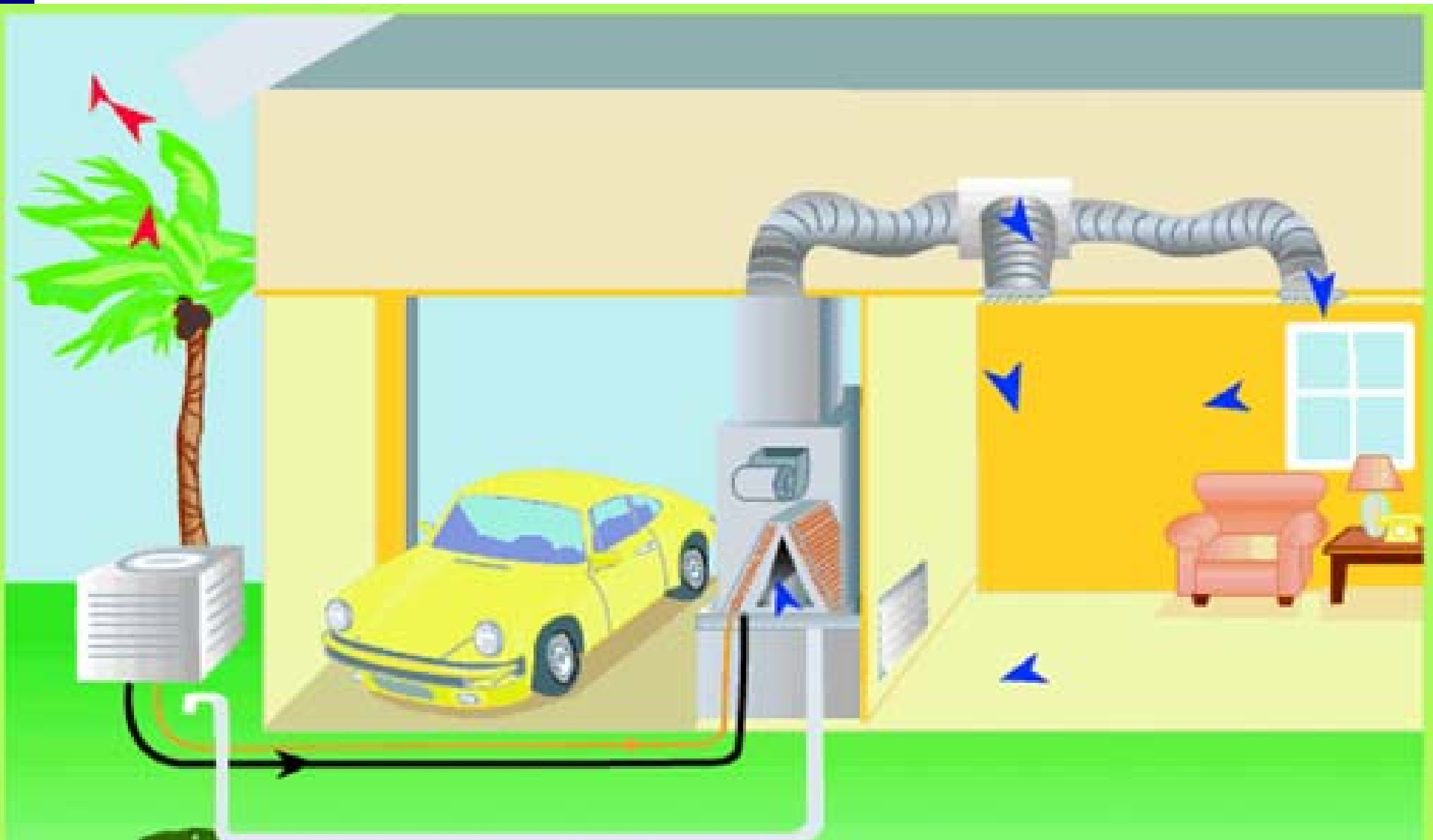
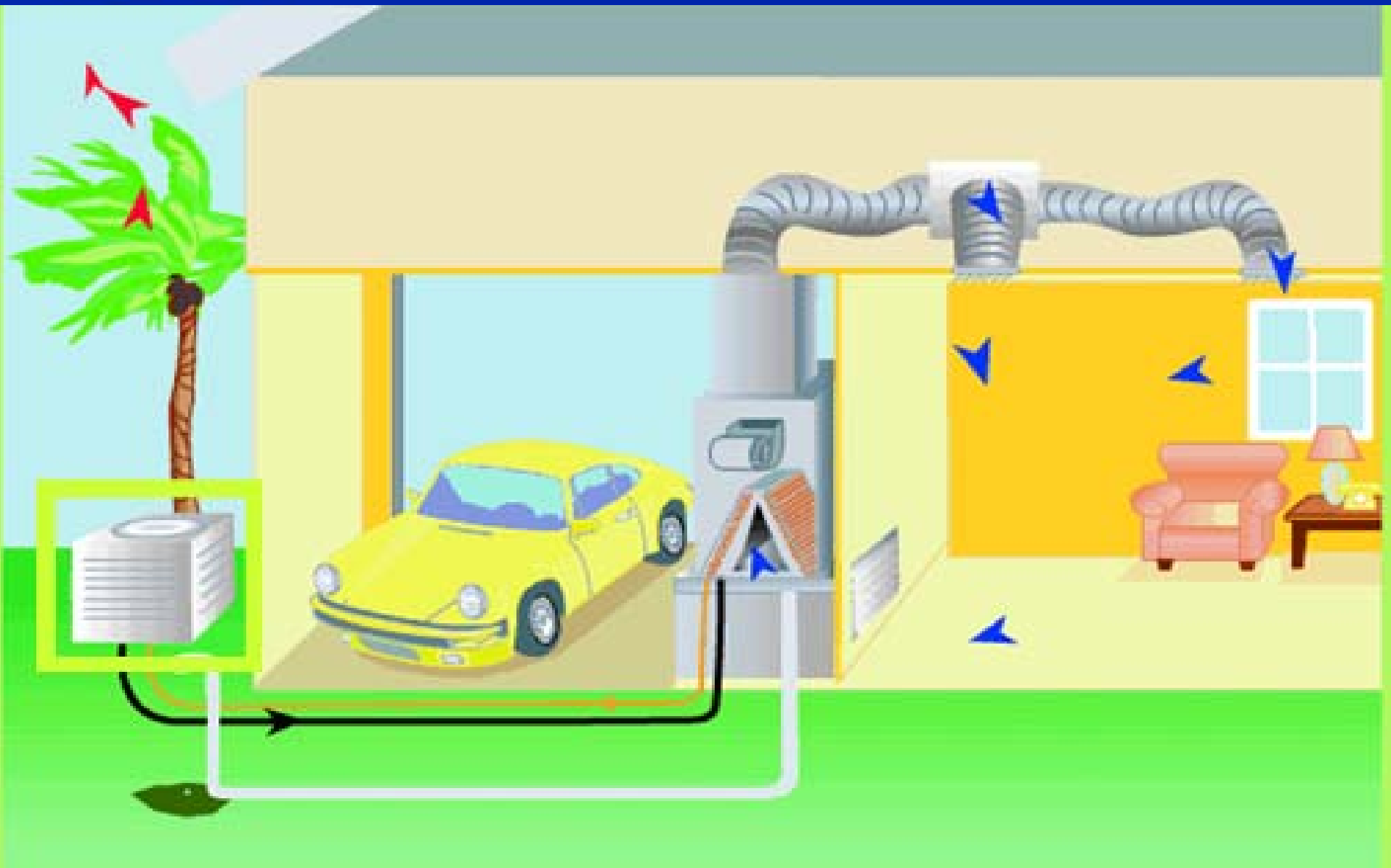
Your home HVAC

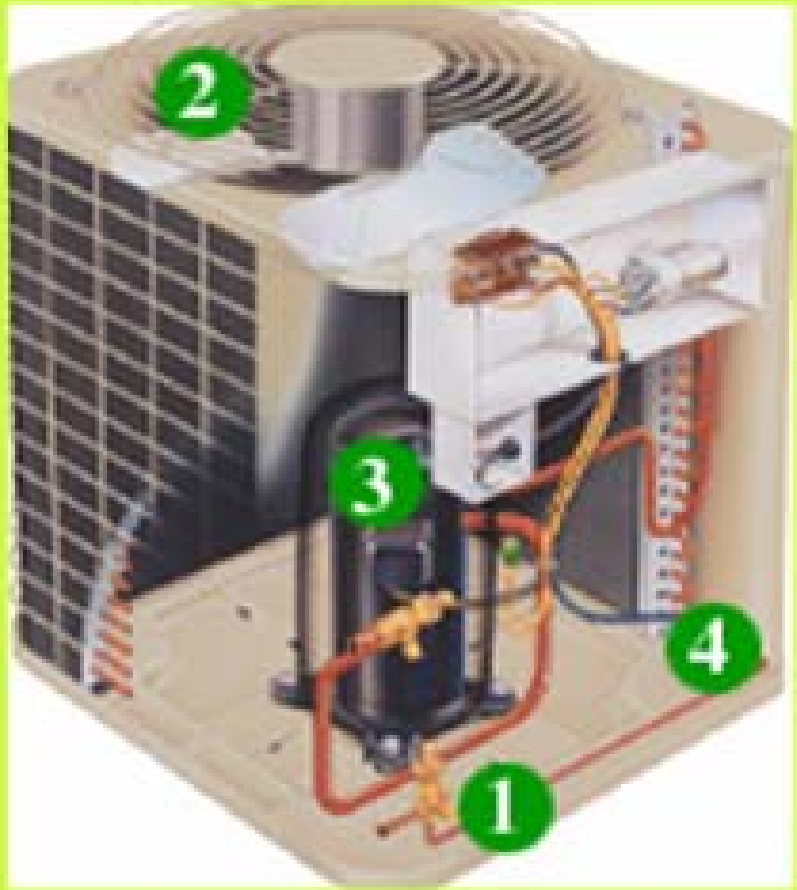


- Do not open windows when system is “on”
- Insulate roof
- Seal windows
- Use timers
- Ventilate attic in summer
- Turn down electrical devices
- Turn down exhaust fan in toilet room
- Organize cross ventilation for cooling

HVAC Components: Condenser



Condenser



1 Expansion valve

2 Fan

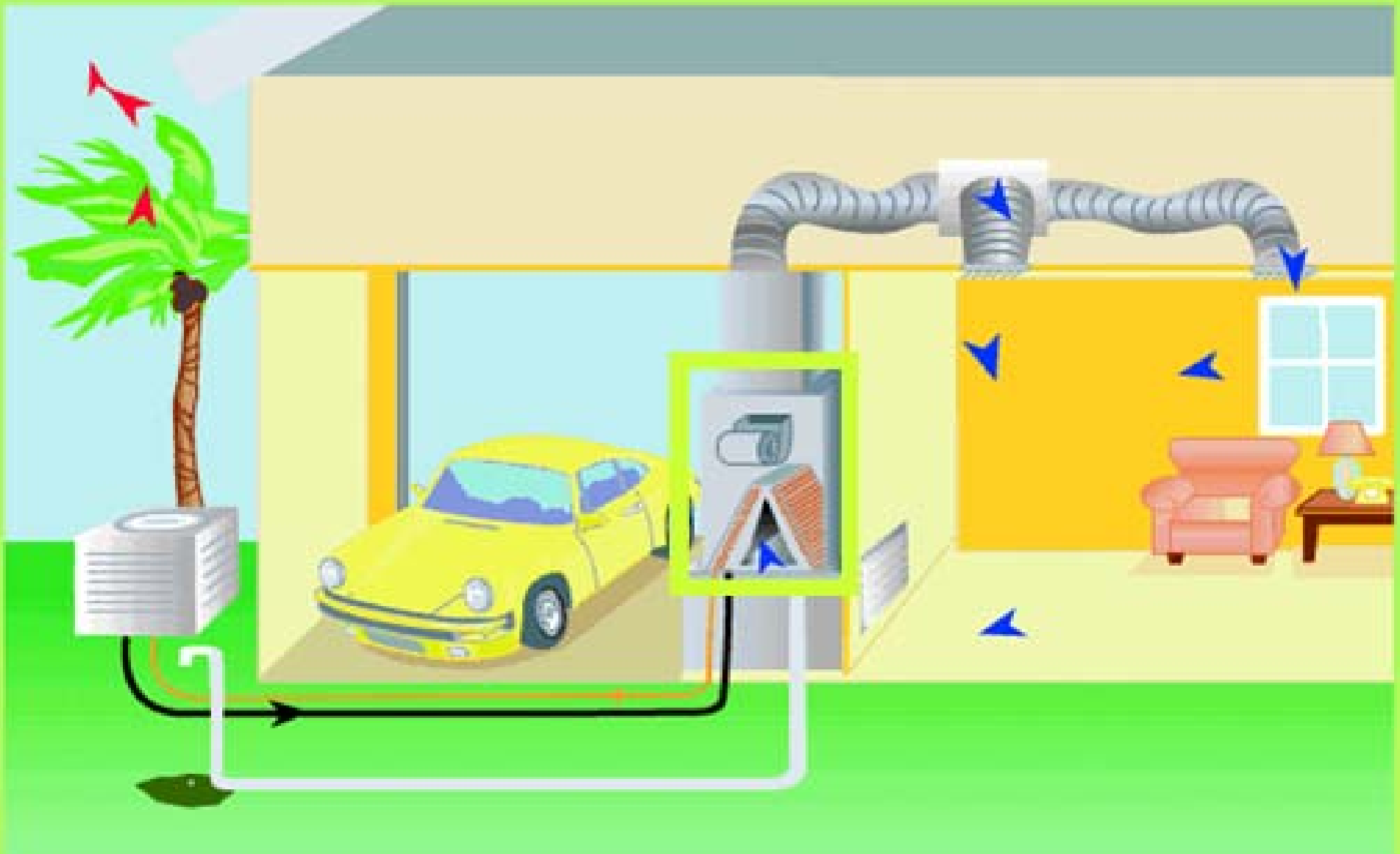
3 Compressor

4 Heat exchange coils

- Clean condenser

- Do not oversize unit

HVAC Components: Air Handler



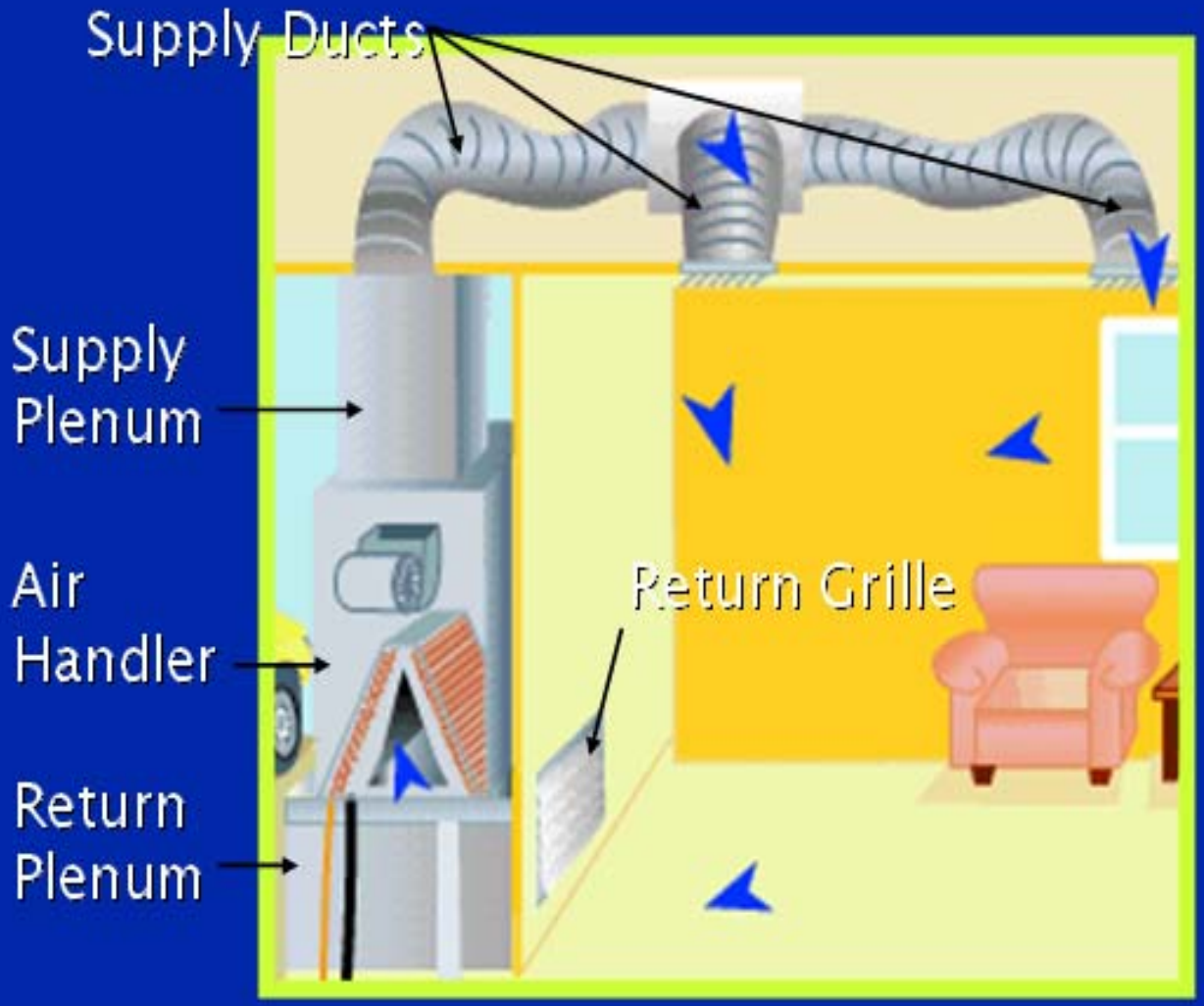
Air Handler

1 Heat exchange coils

2 Fan

- Pay back time < 15 years

HVAC Components: Duct System



- Clean ducts
- Do not block registers and grilles

Enjoy your home

The end

Wake up now!