

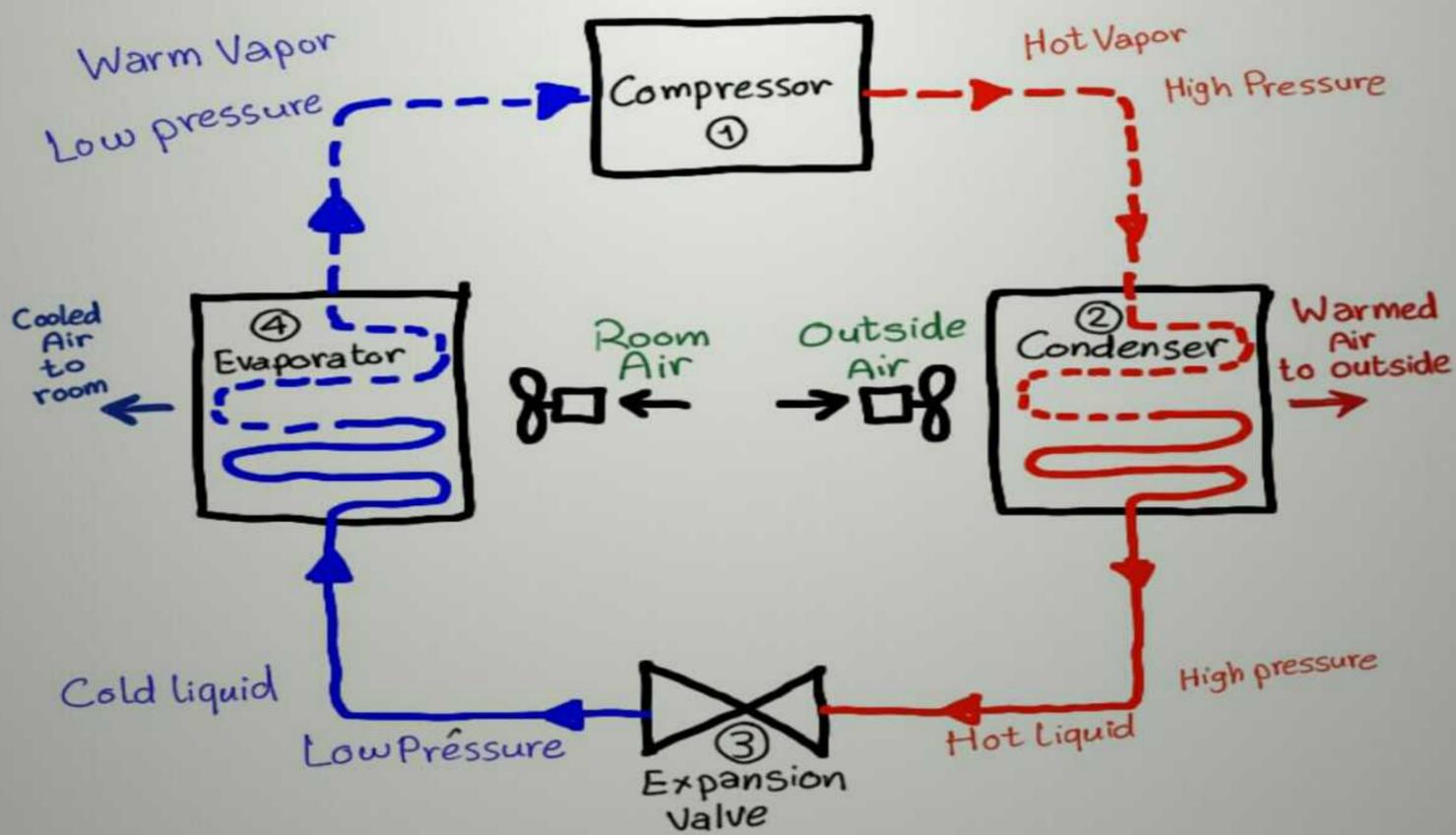


Heat

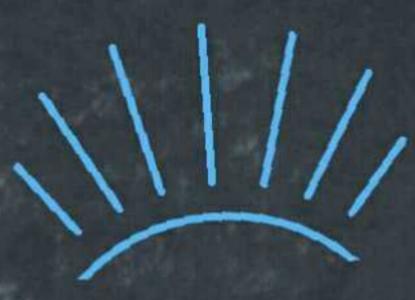
Ventilation

Air

Condition



Eng. Ramy Ghoraba



HVAC

PART

04



DUCT CONSTRUCTION 02

By

Eng. Ramy Ghoraba

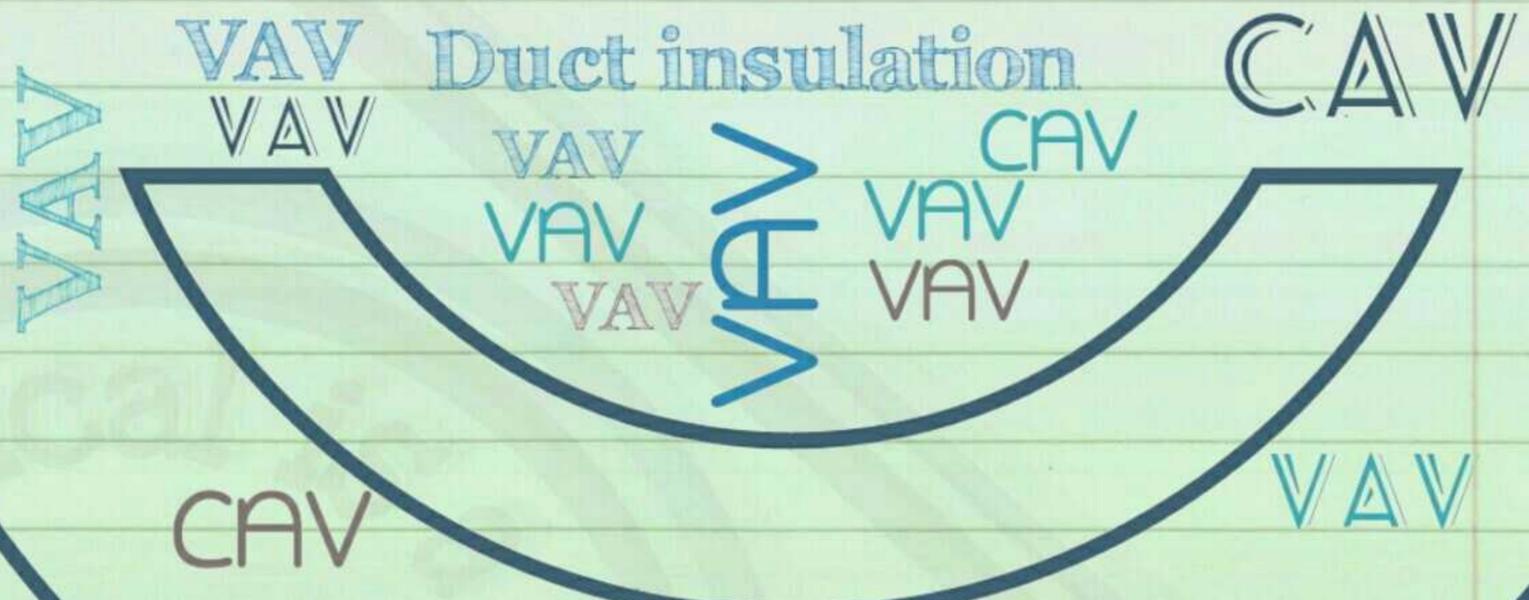


Duct construction
Duct construction

CAV Duct construction
HEAT RECOVERY CAV



Duct construction



CAV Duct insulation
CAV VAV





Part 04 contents

1. Duct insulation
2. Duct insulation installation
3. Duct insulation materials
4. Duct quantities calculation
5. Constant air volume { CAV }
6. Variable air volume { VAV }
7. Energy recovery ventilation { ERV }



ramygh.1982@gmail.com





Materials Materials

Duct insulation

Installation

MATERIALS

INSTALLATION Materials

Duct insulation

Installation

Installation

Materials

DUCT INSULATION

Duct insulation

Duct insulation

Duct insulation





* Duct Insulation

(A) Sound Insulation

- Install in
 - Supply duct after the unit
 - Return duct before the Unit
 - Elbow (IF needed)
- Insulation will be inside the duct.
- Insulation material is ArmaFlex

↳ Function

→ Damping the Sound level.



③ Heat Insulation



- Function → To prevent the heat transfer
 → To prevent Condensation of water vapor on the duct surface.
 → Install for all duct network.

↳ Insulation material

→ Fiber glass

Density

12 Kg/m³



Thickness

1 inch

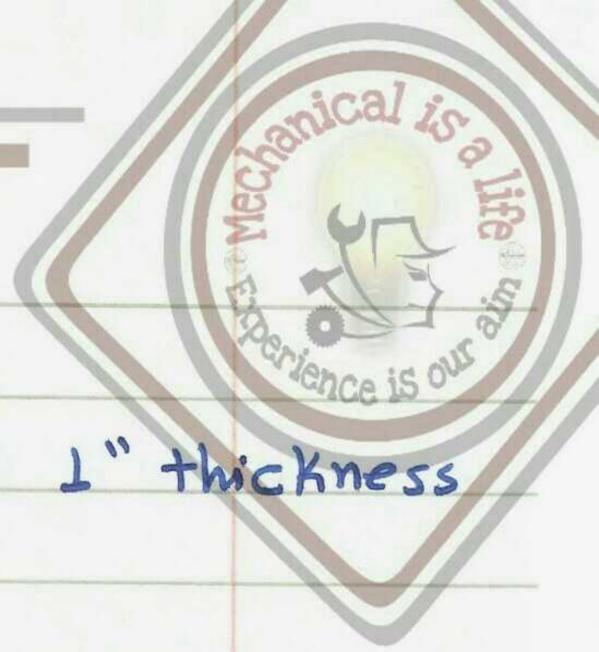
24 Kg/m³



2 inch

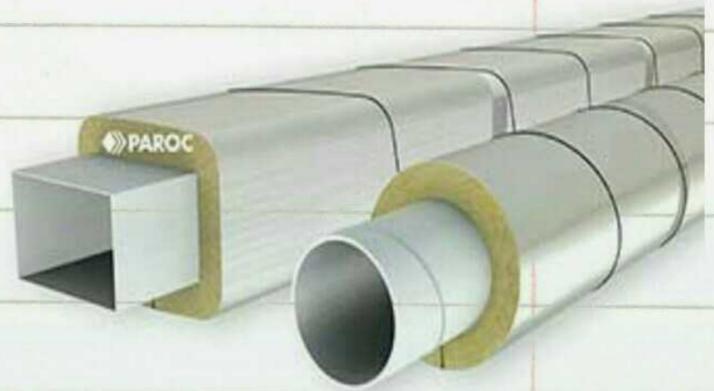
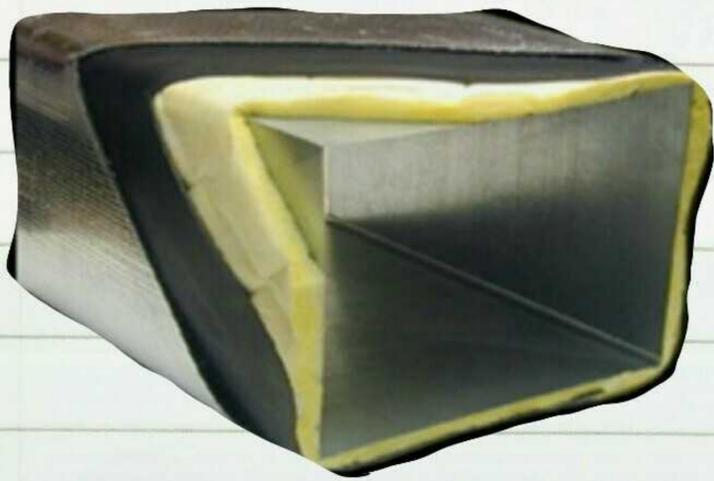
48 Kg/m³





- Indoor duct

Installed with 24 kg/m^3 density & 1" thickness
or as project specs.



- Outdoor duct

Installed with 48 kg/m^3 density & 2" thickness
Or as project specs.

Then we install Aluminum cladding



Materials Materials

Duct insulation

Installation

MATERIALS

INSTALLATION Materials

Duct insulation

Installation

Installation

Materials

DUCT INSULATION

Duct insulation

Duct insulation

Duct insulation



* Duct Insulation Steps

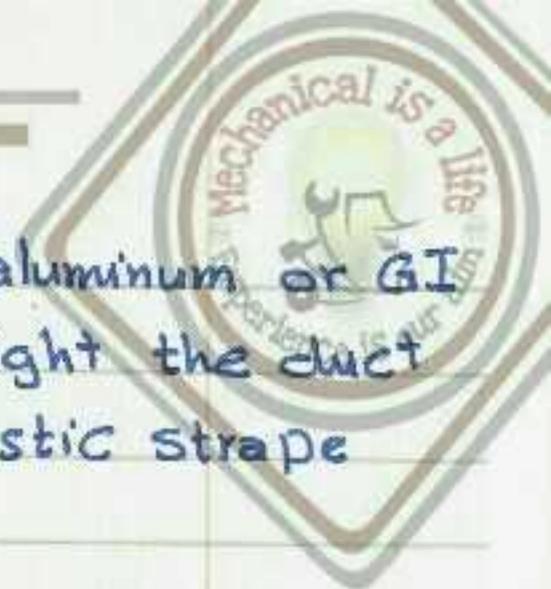
① Clean the duct surface Very well

② paint an adhesive called (Pattix) on all duct surface with brush.



③ Install the insulation on the painting area one area by one area, then cut the extra insulation, and plast the insulation with tap.





- ④ After insulate the duct, Install aluminum or GI angle bar on each corner and tight the duct with angle bar strongly by the plastic strape and clamps

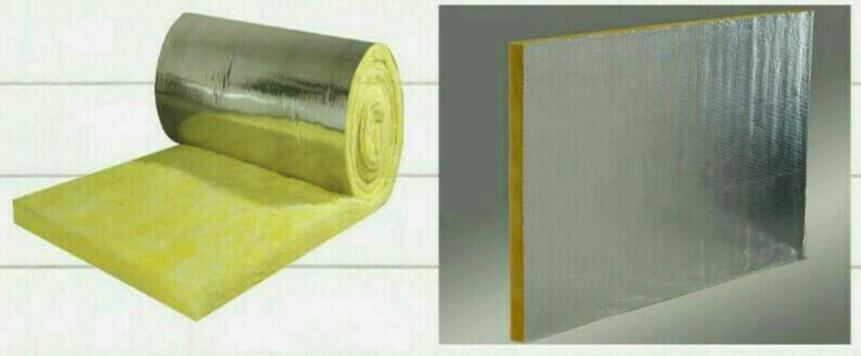


- ⑤ Install cloth cladding on the insulation





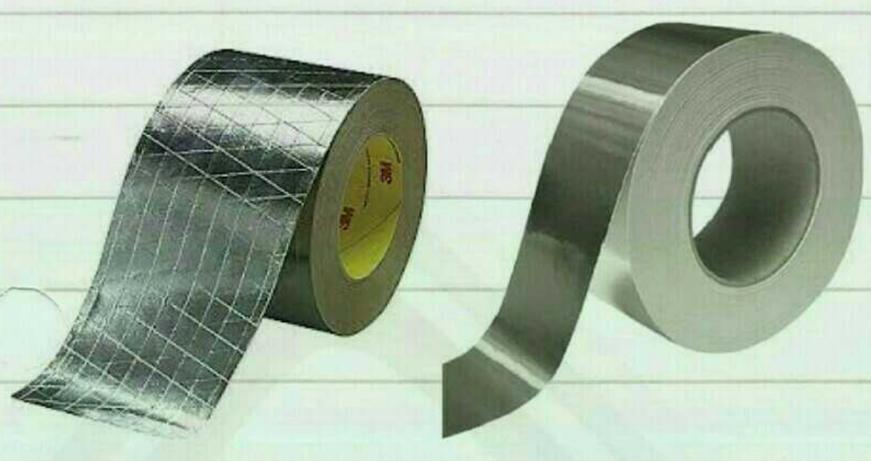
⊗ Insulation Material



Insulation (Roll - Board)



Stick pin



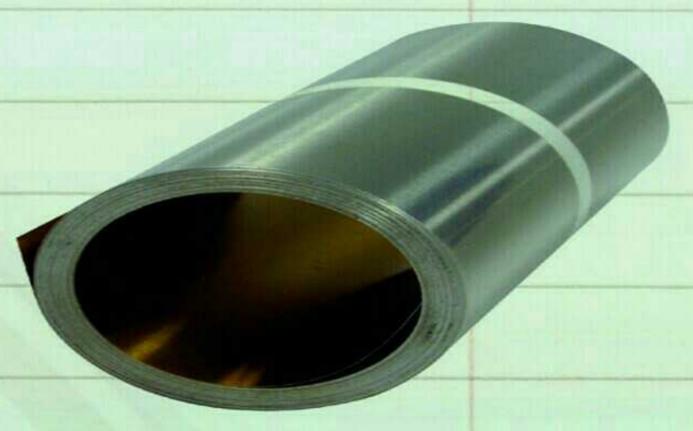
Aluminum tape



Plastic strap with clips



Cloths cladding



Aluminum cladding



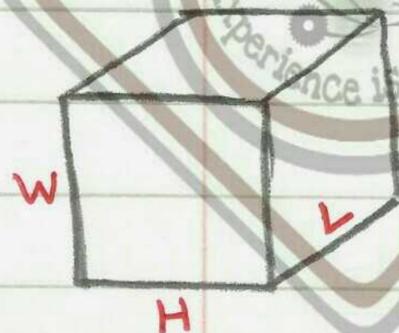


* Duct Calculation

$$\text{Area} = 2 * (w + H) * L$$

m^2 m m m

*



Duct weight (kg) = Area (m²) x below Table

Gauge	thickness (mm)		By	To obtain
26	0.55	x	4.42	(kg)
24	0.7	x	5.64	(kg)
22	0.85	x	6.86	(kg)
20	1	x	8.1	(kg)
18	1.3	x	10.52	(kg)
16	1.61	x	12.96	(kg)



* Insulation area Calculation

$$\text{Area} = 0.05 (w + H) * L$$

(m^2) inch inch m

*



* VAV & CAV



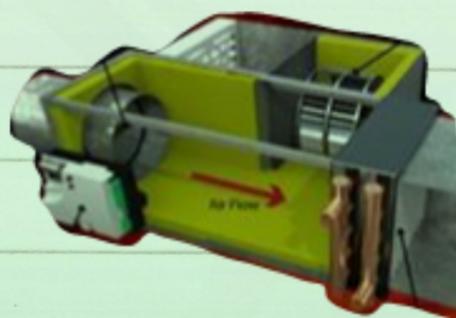
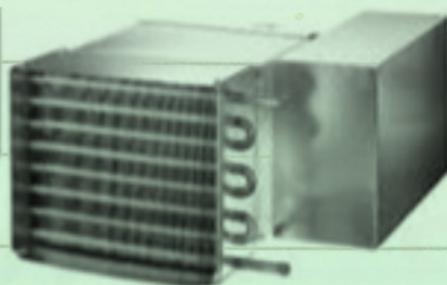
① VAV - Variable air Volume

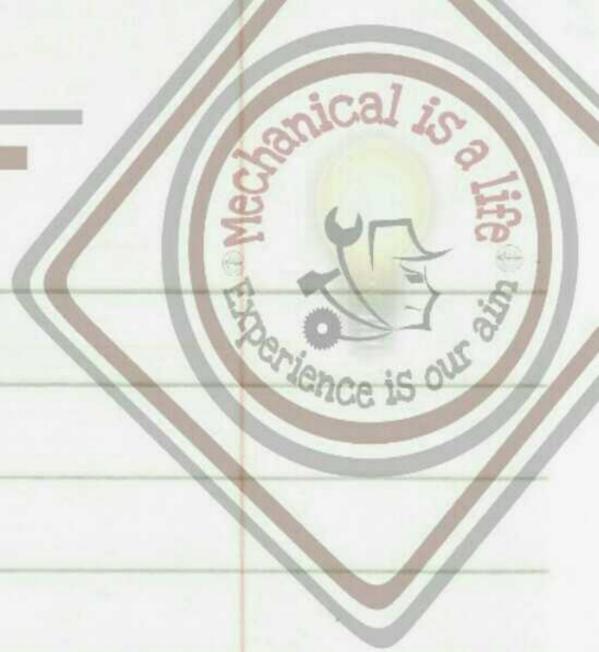


- Temperature is Constant.
- Air Flow is Varied.
- Separate temperature Control for each room by thermostat

→ Types

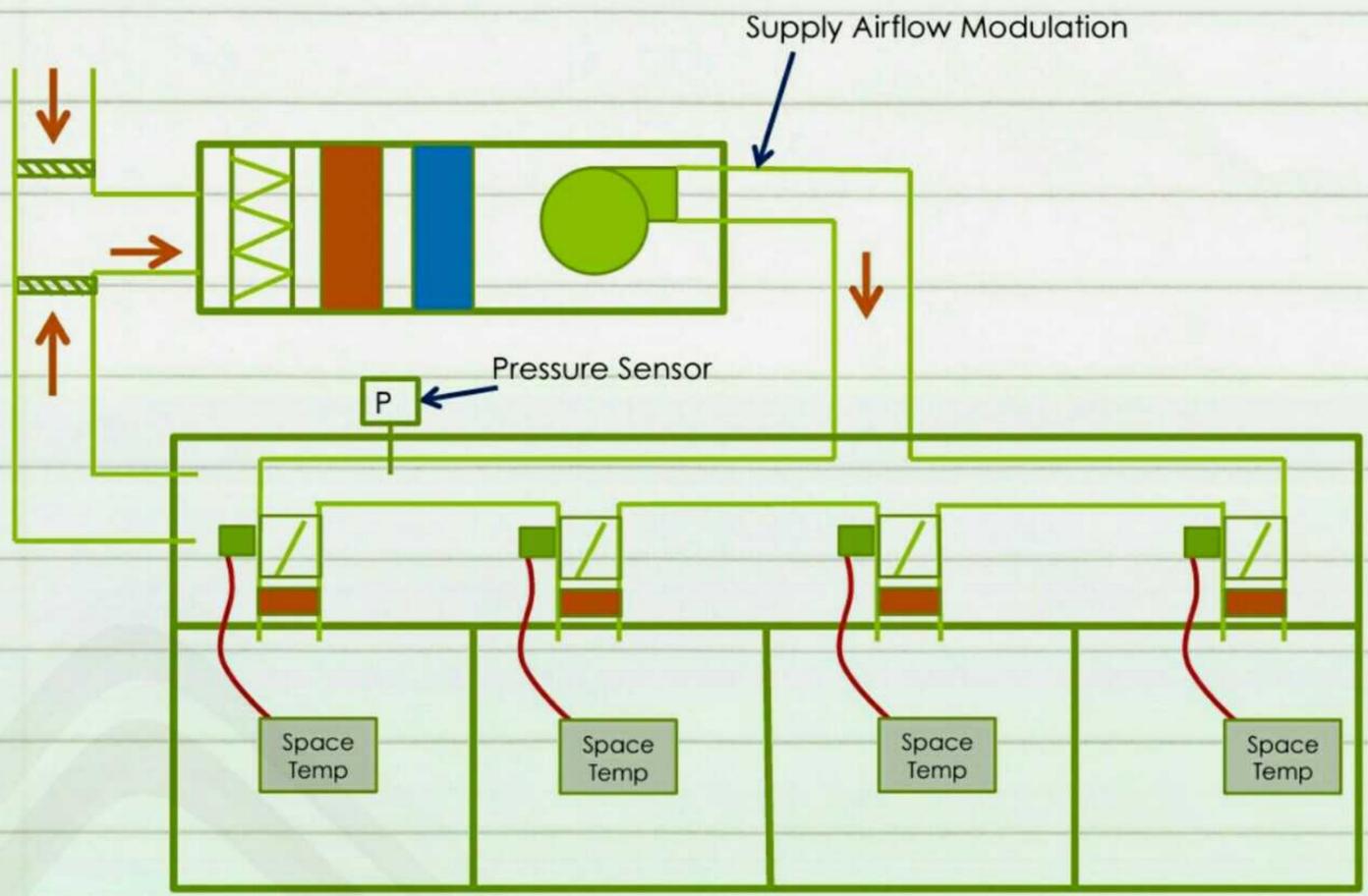
- ① Single duct Cooling only
- ② Single duct Cooling with hot water coil
- ③ Dual duct unit
- ④ Parallel fan - powered unit Cool only
- ⑤ Parallel fan - Powered unit with hot water^{coil}
- ⑥ Parallel fan - Powered unit with electric coil



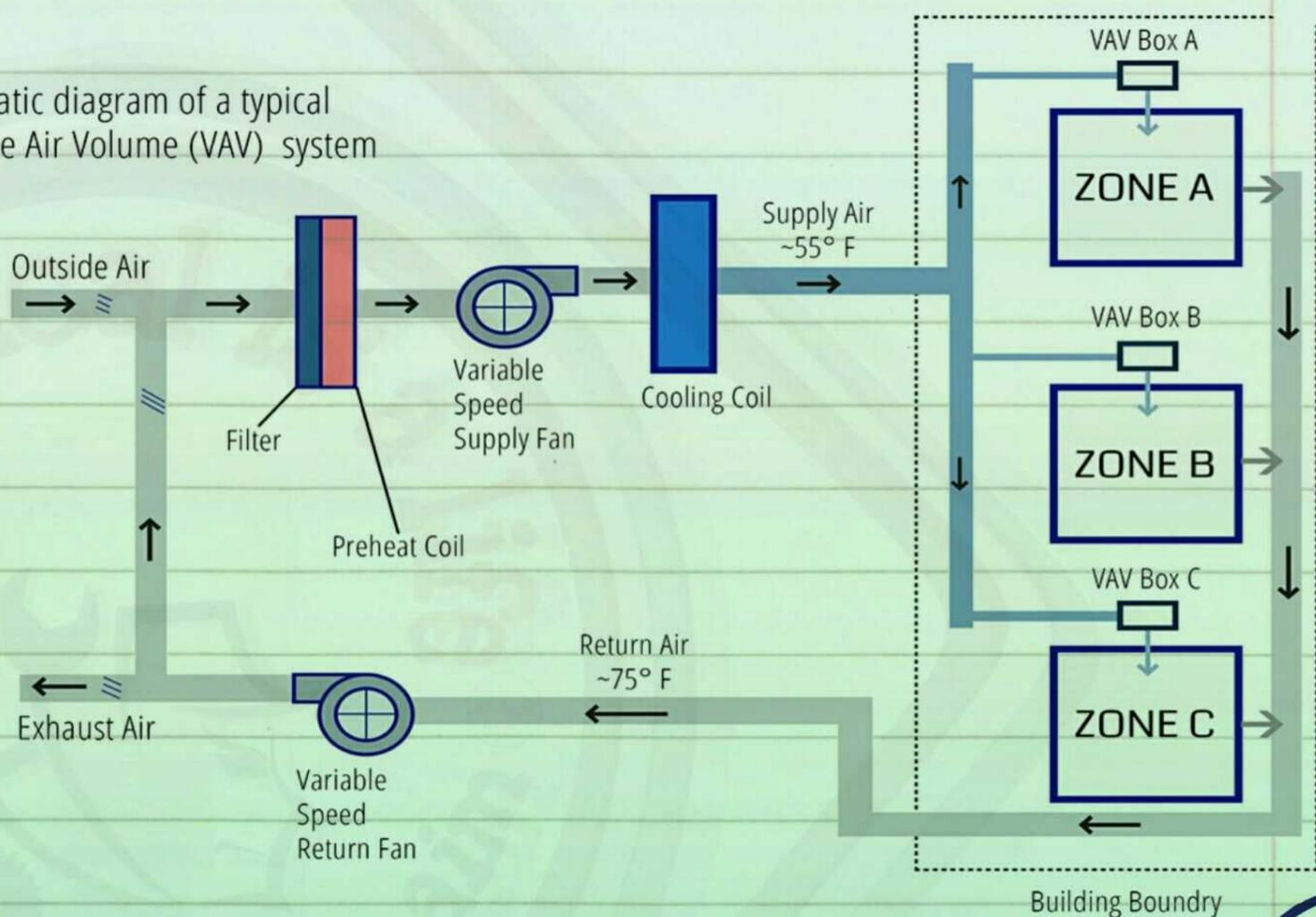


VAV System

Basic Concept

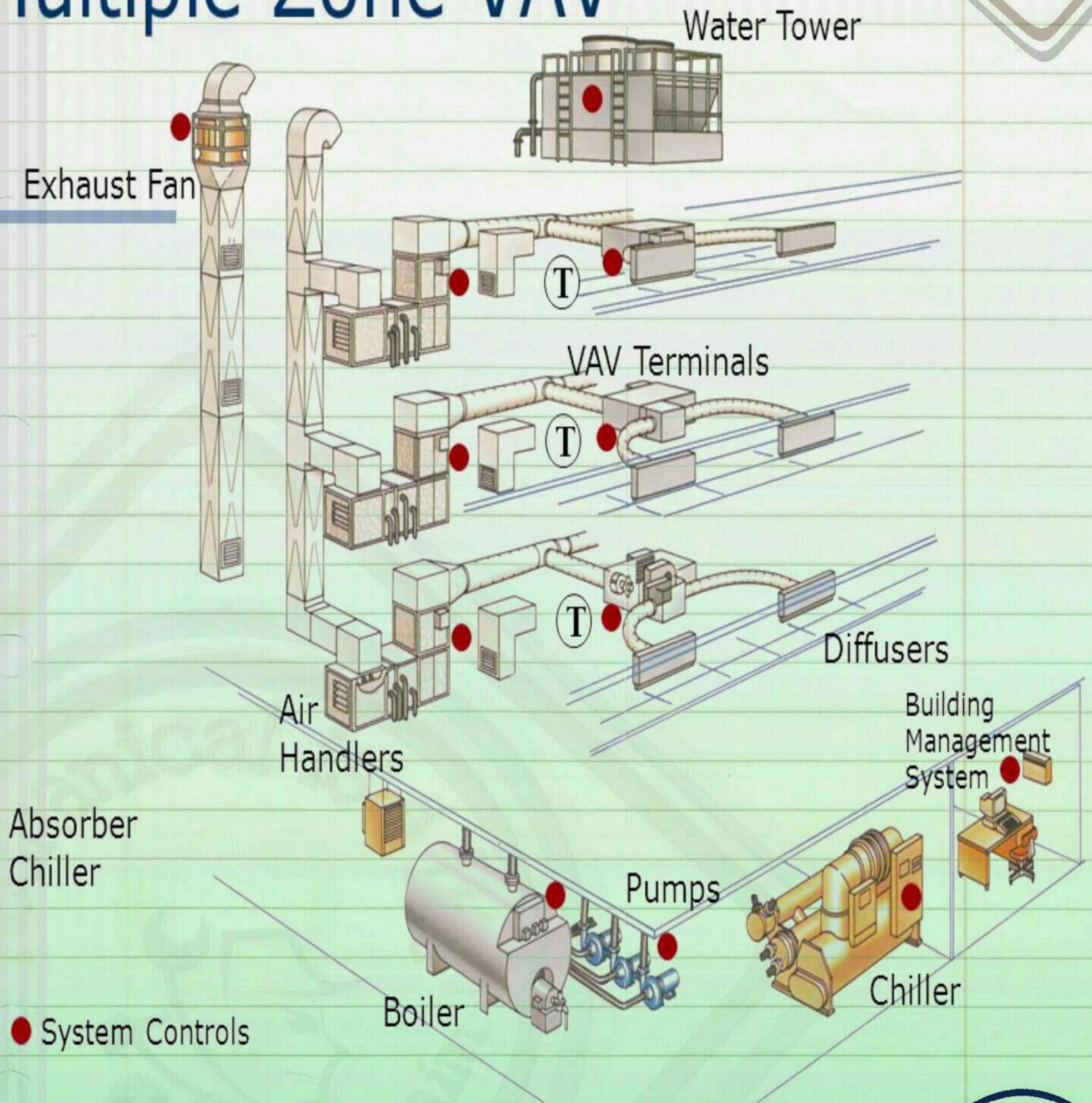


Schematic diagram of a typical Variable Air Volume (VAV) system



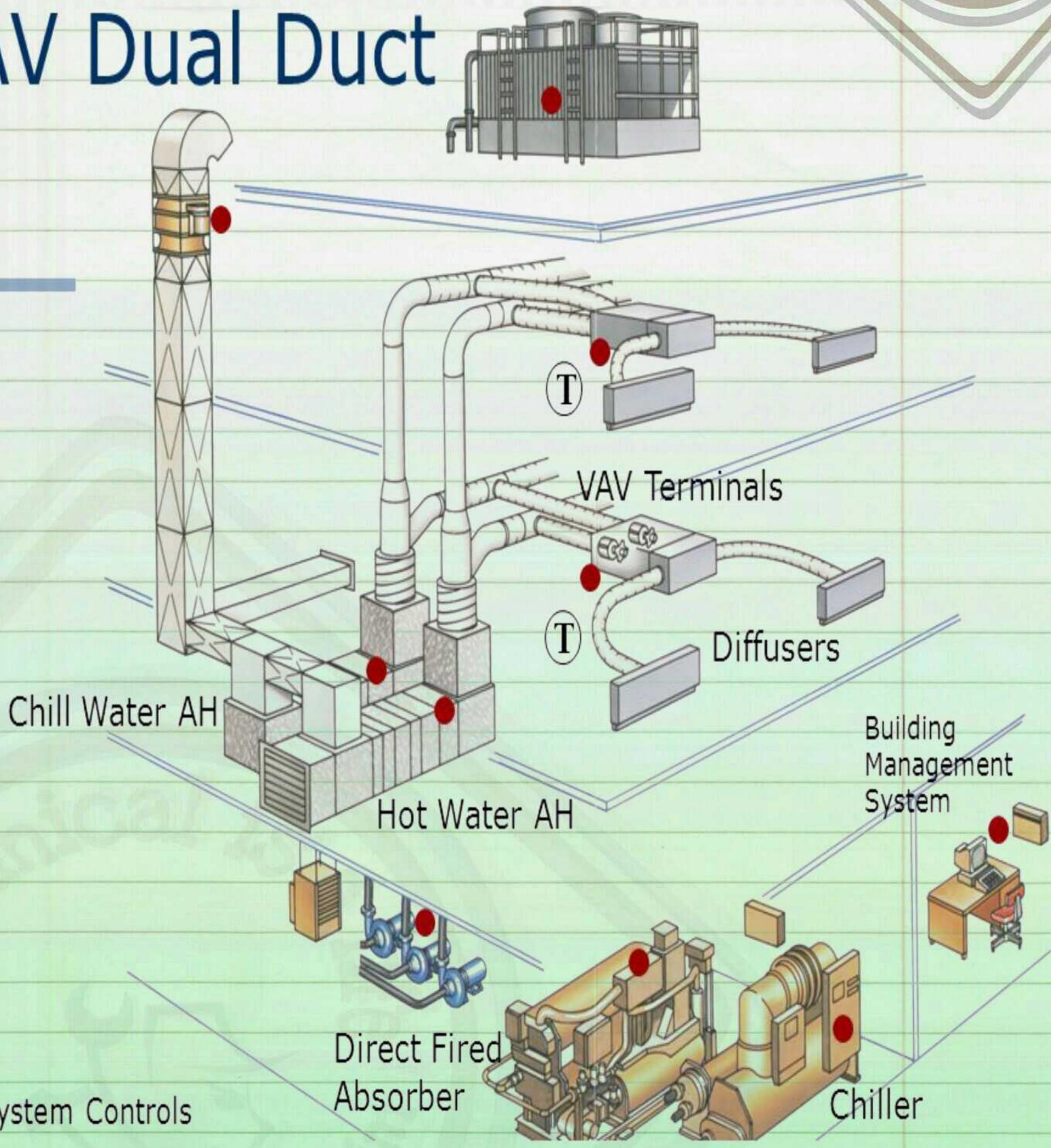


Multiple Zone VAV





VAV Dual Duct



● System Controls





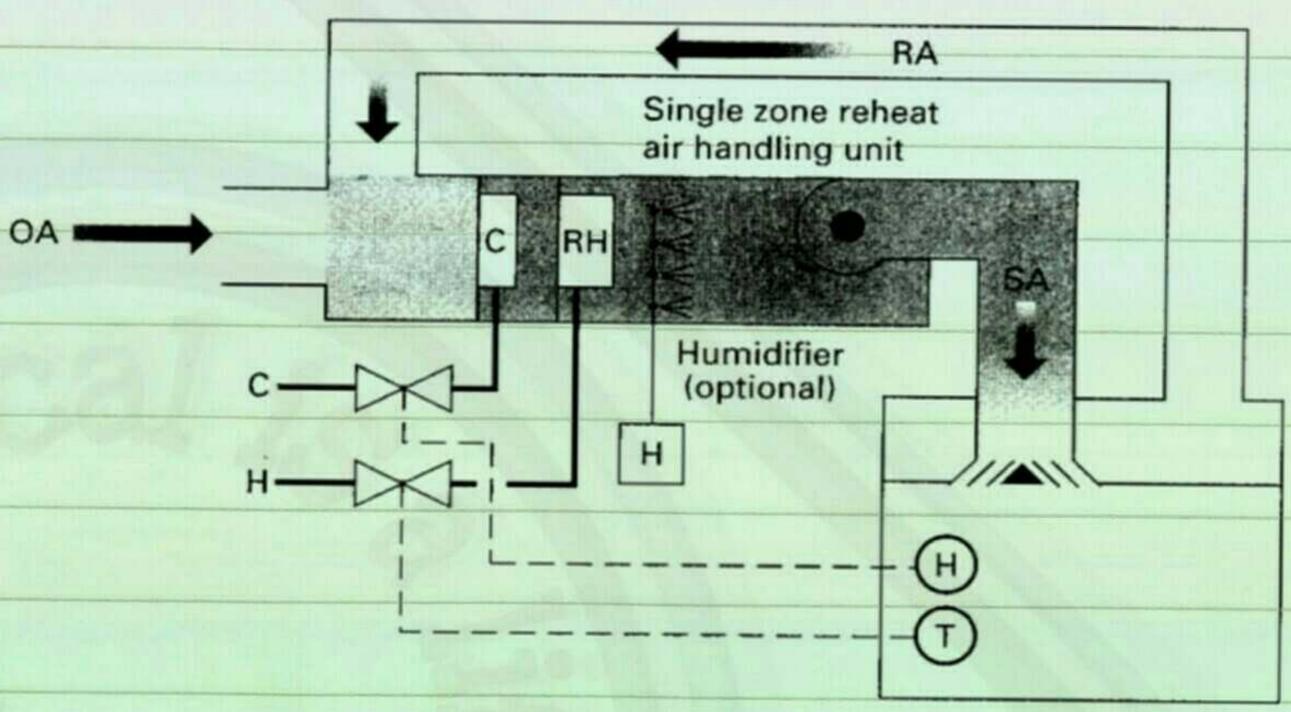
② CAV - Constant air Volume

- Temperature is Varied
- Air Flow is Constant
- Serve only a single zone
- Types



- ① CAV single Zone
- ② CAV with reheat
- ③ CAV primary - secondary
(Can serve multiple Zones)

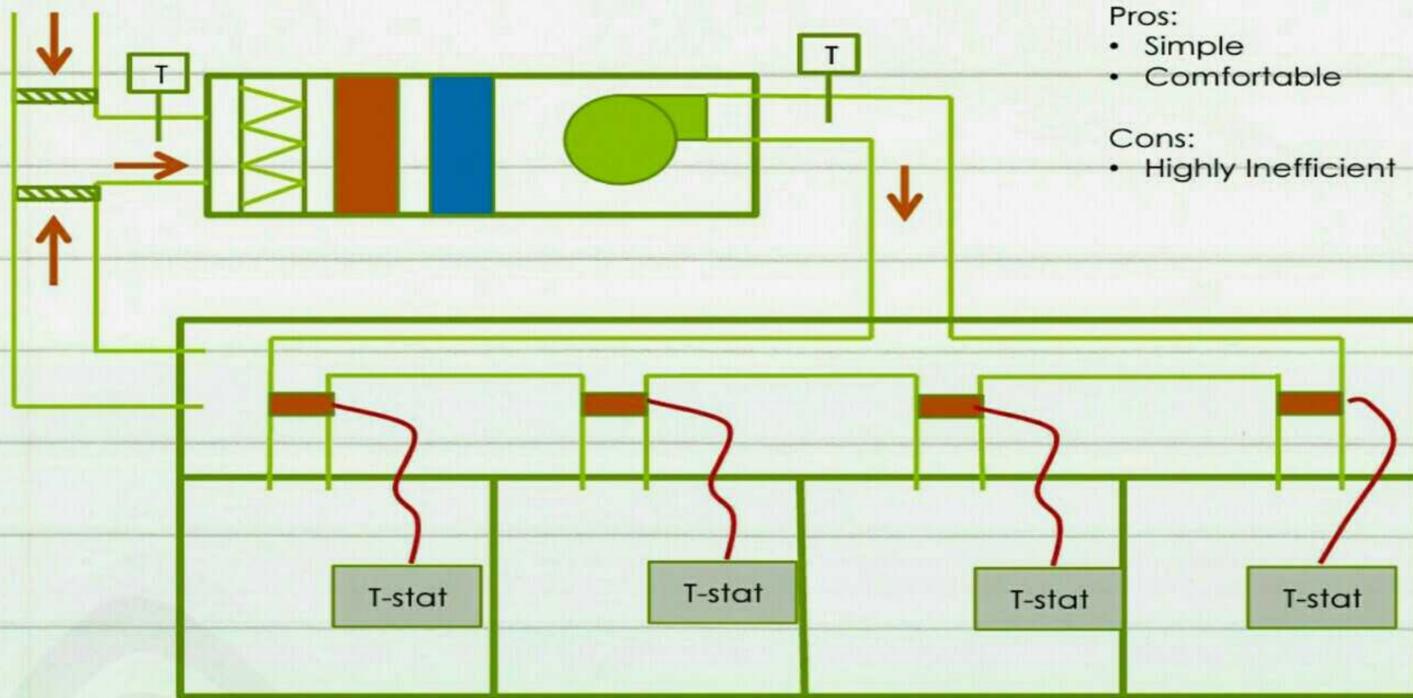
Single zone CAV





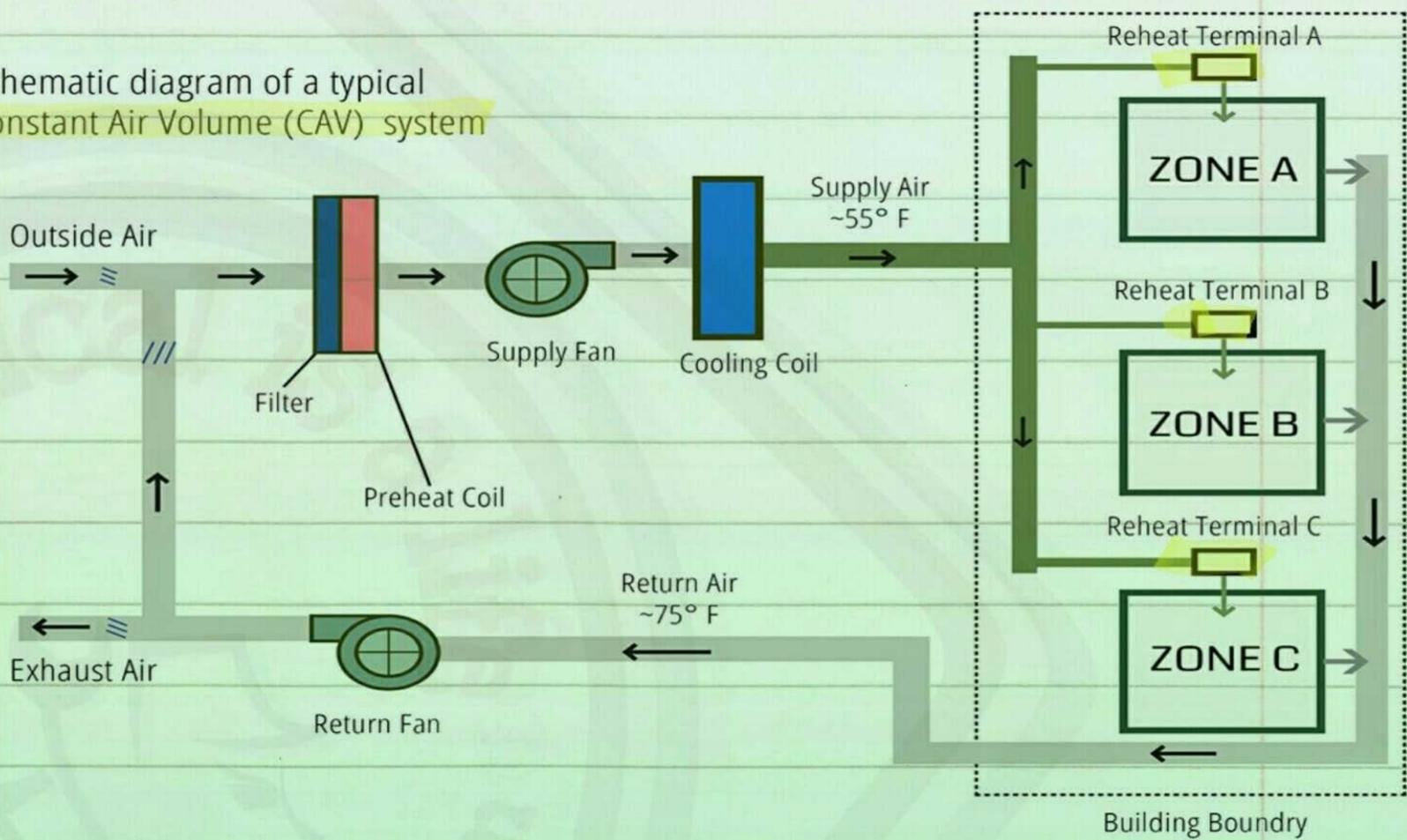
Constant Volume System

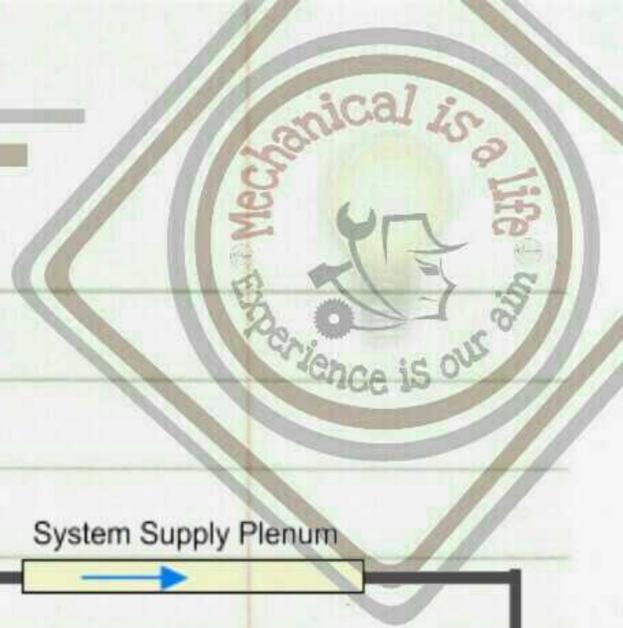
Zone Reheat – Space Control



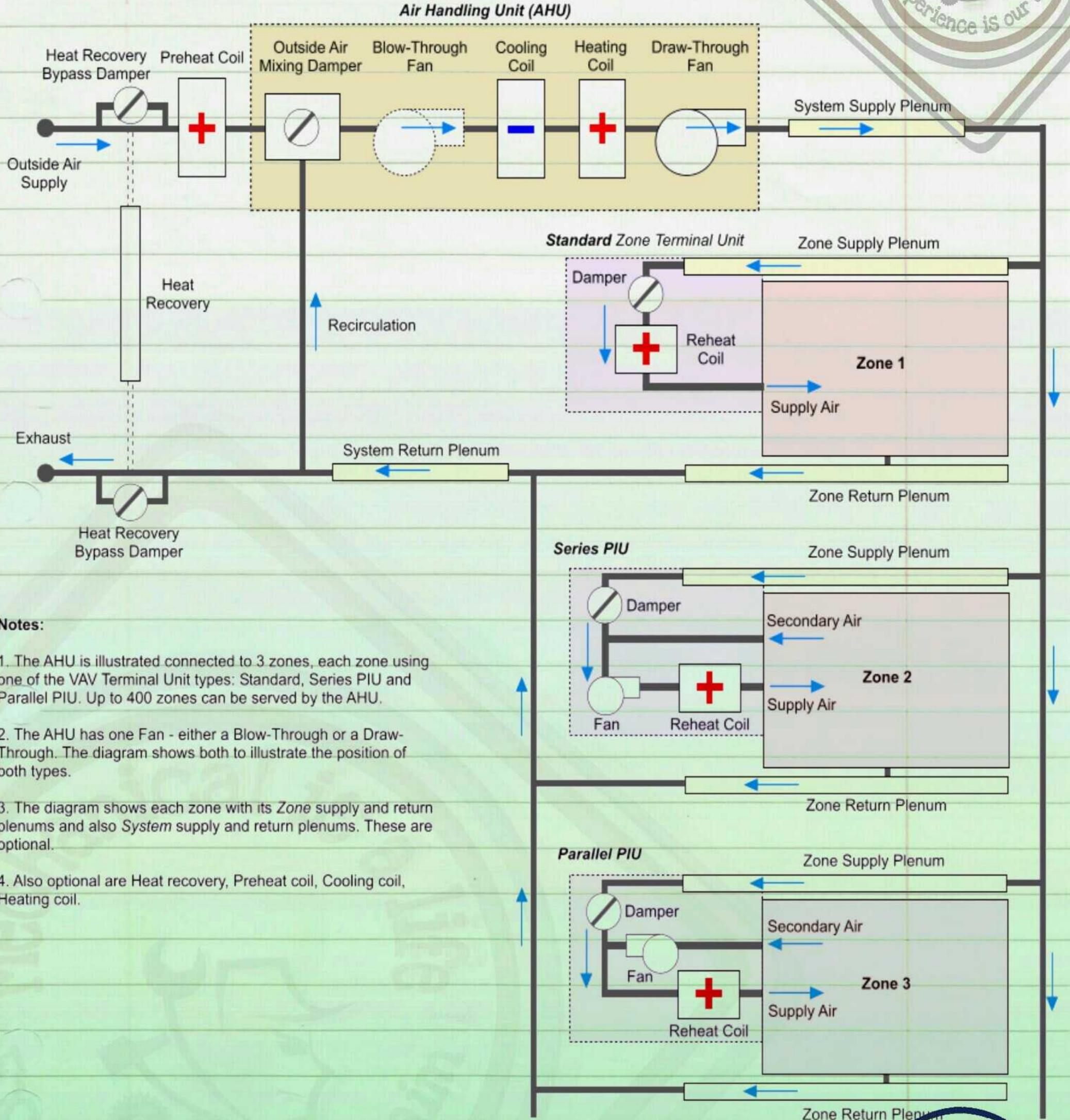
- Pros:
- Simple
 - Comfortable
- Cons:
- Highly Inefficient

Schematic diagram of a typical Constant Air Volume (CAV) system





VAV Compact HVAC Airflow Schematic

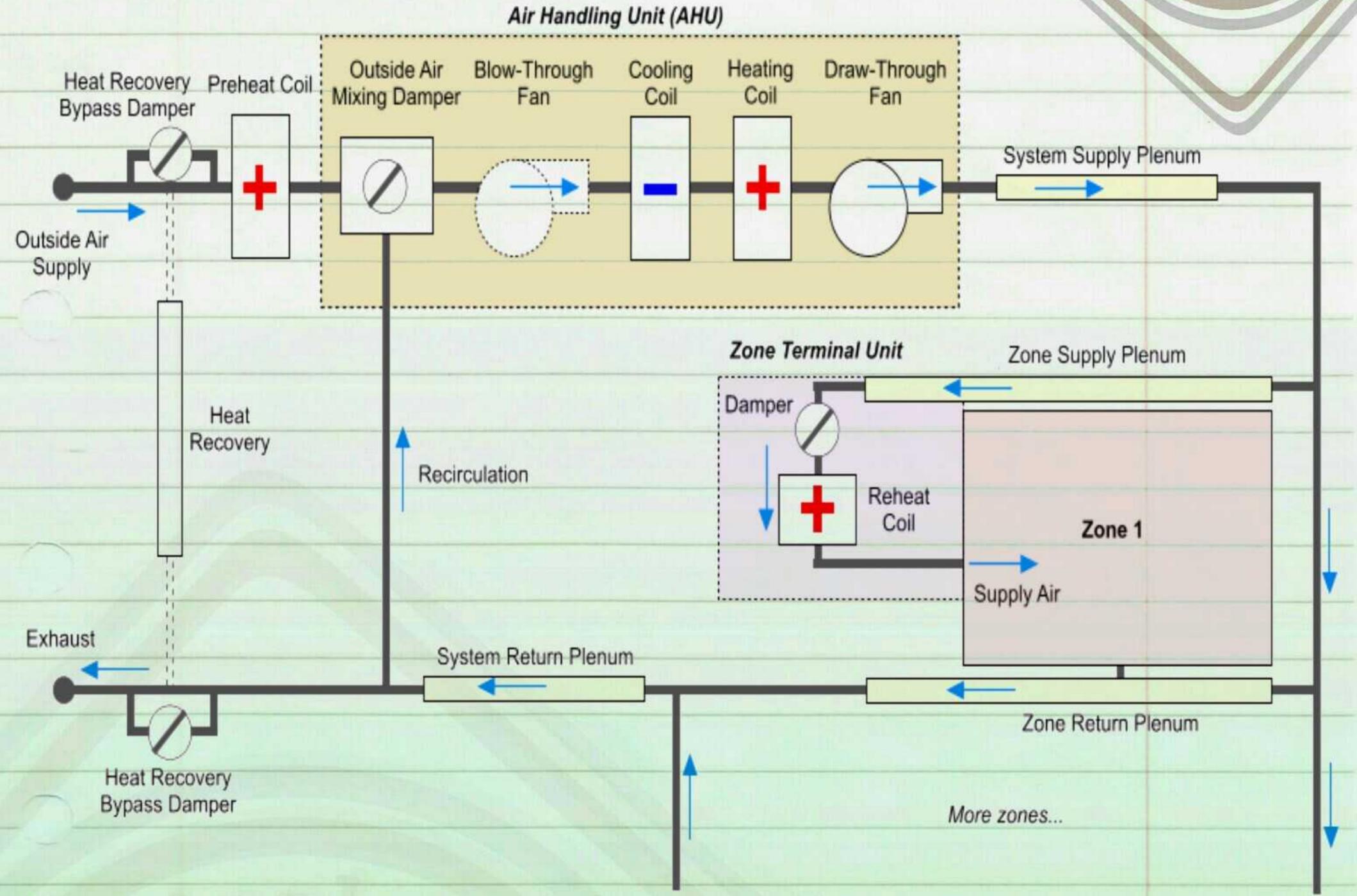


- Notes:**
1. The AHU is illustrated connected to 3 zones, each zone using one of the VAV Terminal Unit types: Standard, Series PIU and Parallel PIU. Up to 400 zones can be served by the AHU.
 2. The AHU has one Fan - either a Blow-Through or a Draw-Through. The diagram shows both to illustrate the position of both types.
 3. The diagram shows each zone with its Zone supply and return plenums and also System supply and return plenums. These are optional.
 4. Also optional are Heat recovery, Preheat coil, Cooling coil, Heating coil.





CAV Compact HVAC Airflow Schematic



- Notes:**
1. The AHU is illustrated connected to a single zone. Up to 400 zones can be served by the CAV AHU.
 2. The AHU has one Fan - either a Blow-Through or a Draw-Through. The diagram shows both to illustrate the position of both types.
 3. The diagram shows each zone with its Zone supply and return plenums and also System supply and return plenums. These are optional.
 4. Also optional are Heat recovery, Preheat coil, Cooling coil, Heating coil.

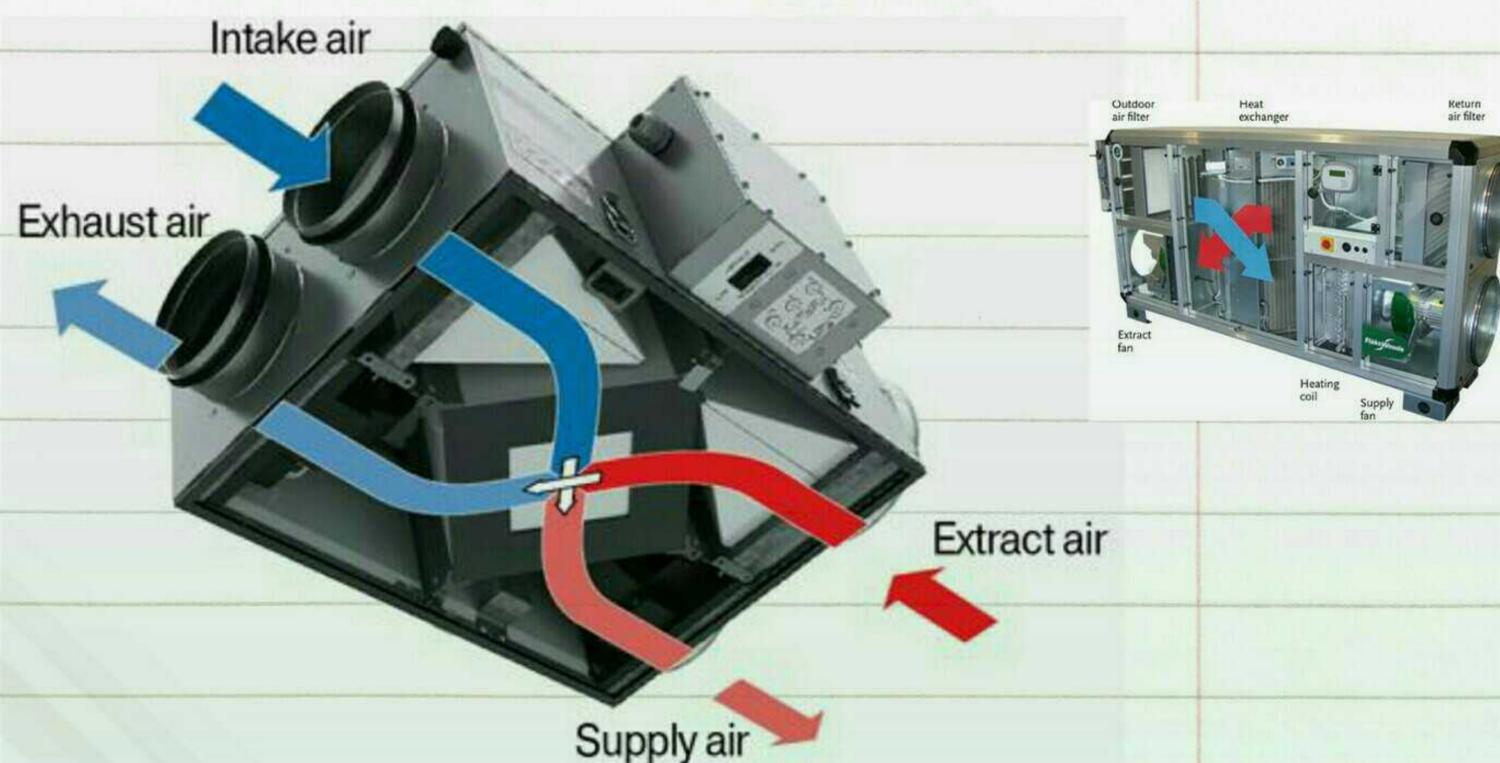




Energy Recovery Ventilation - ERV

The recovery of heat by the heat transfer between the exhaust air (cold air) and the fresh air from outside

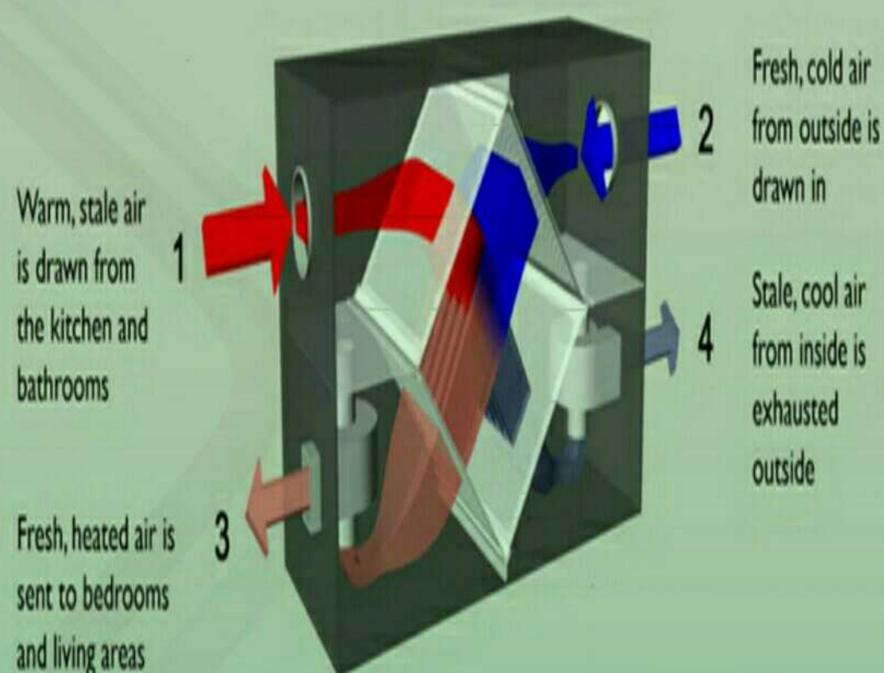
It reduce the energy cost and the capacity of the equipement

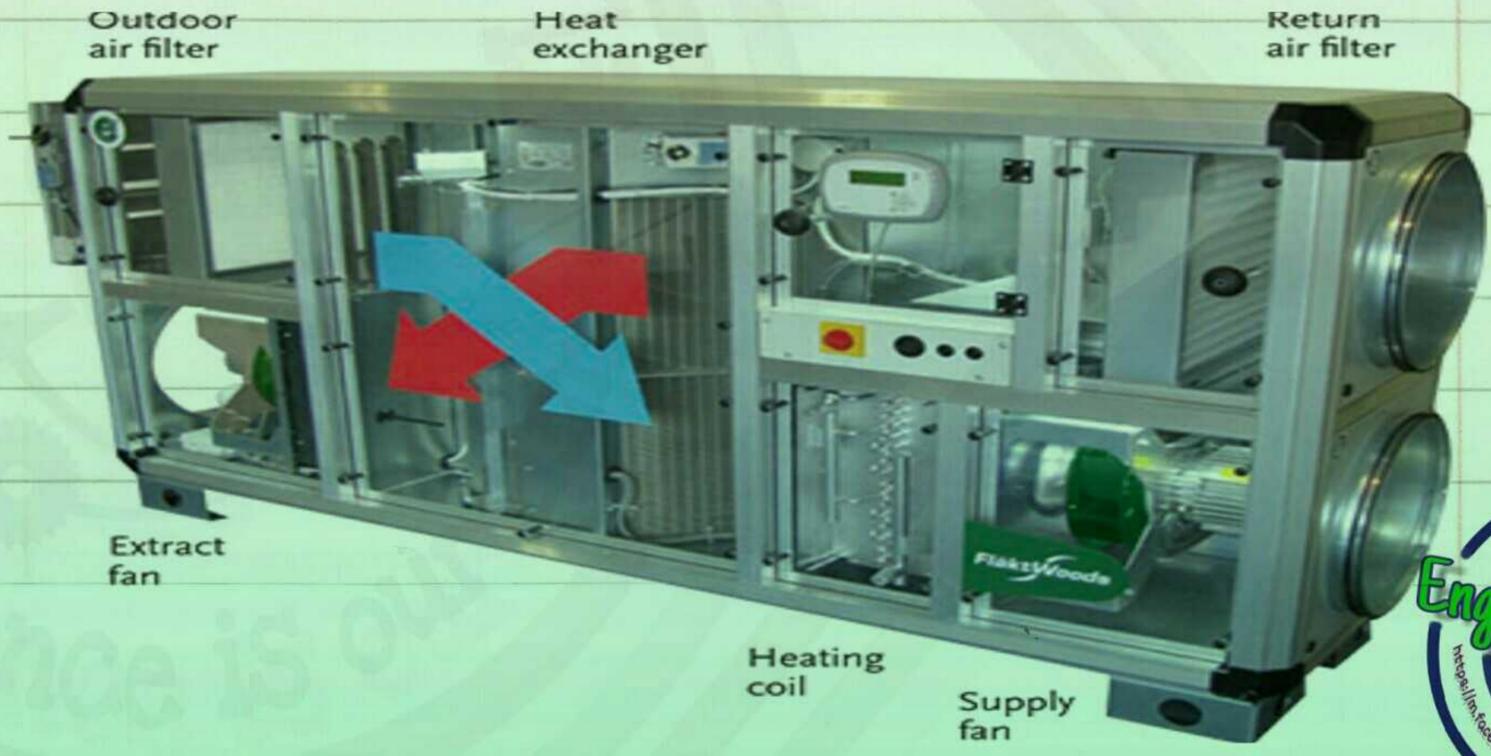
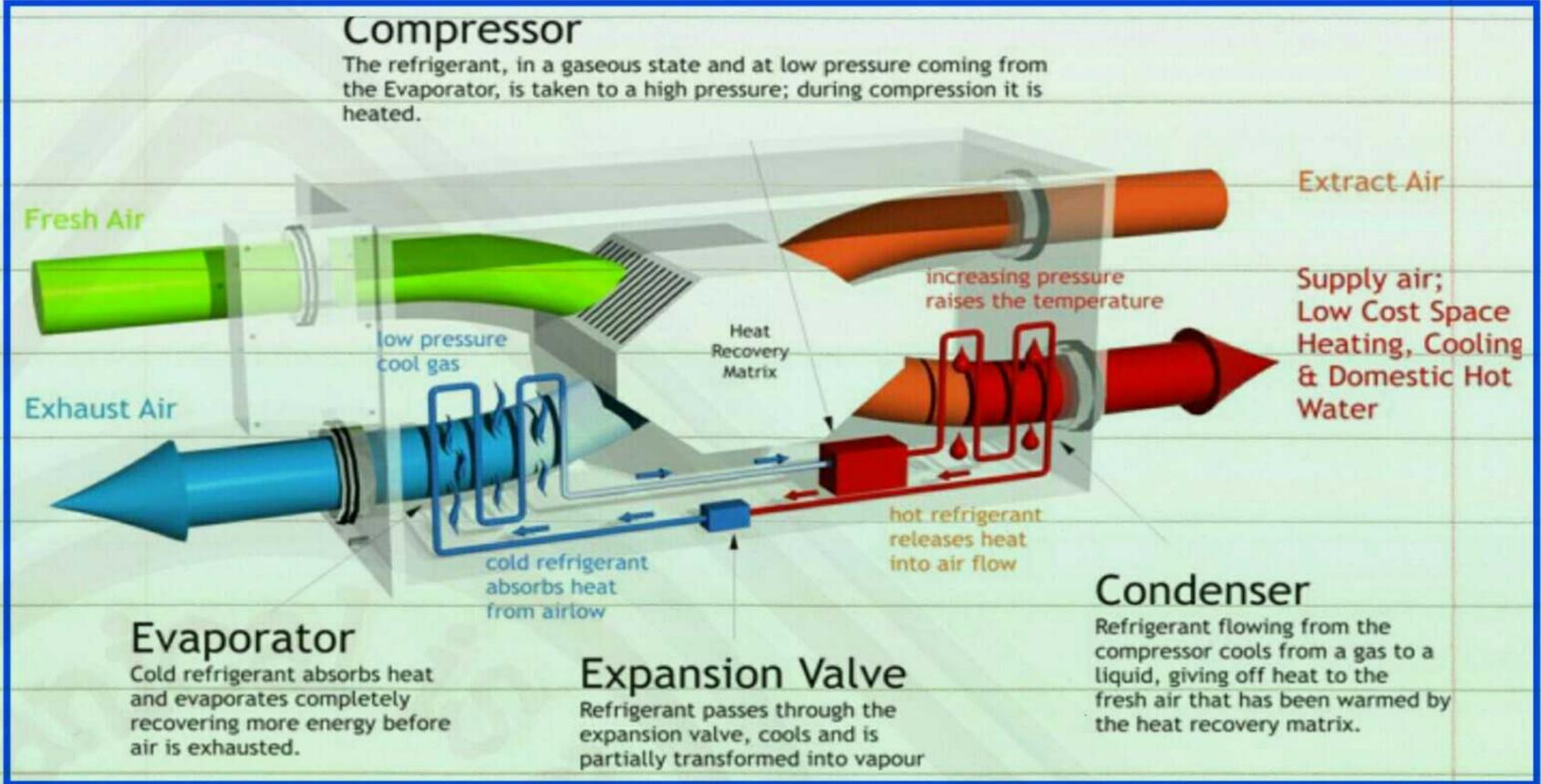
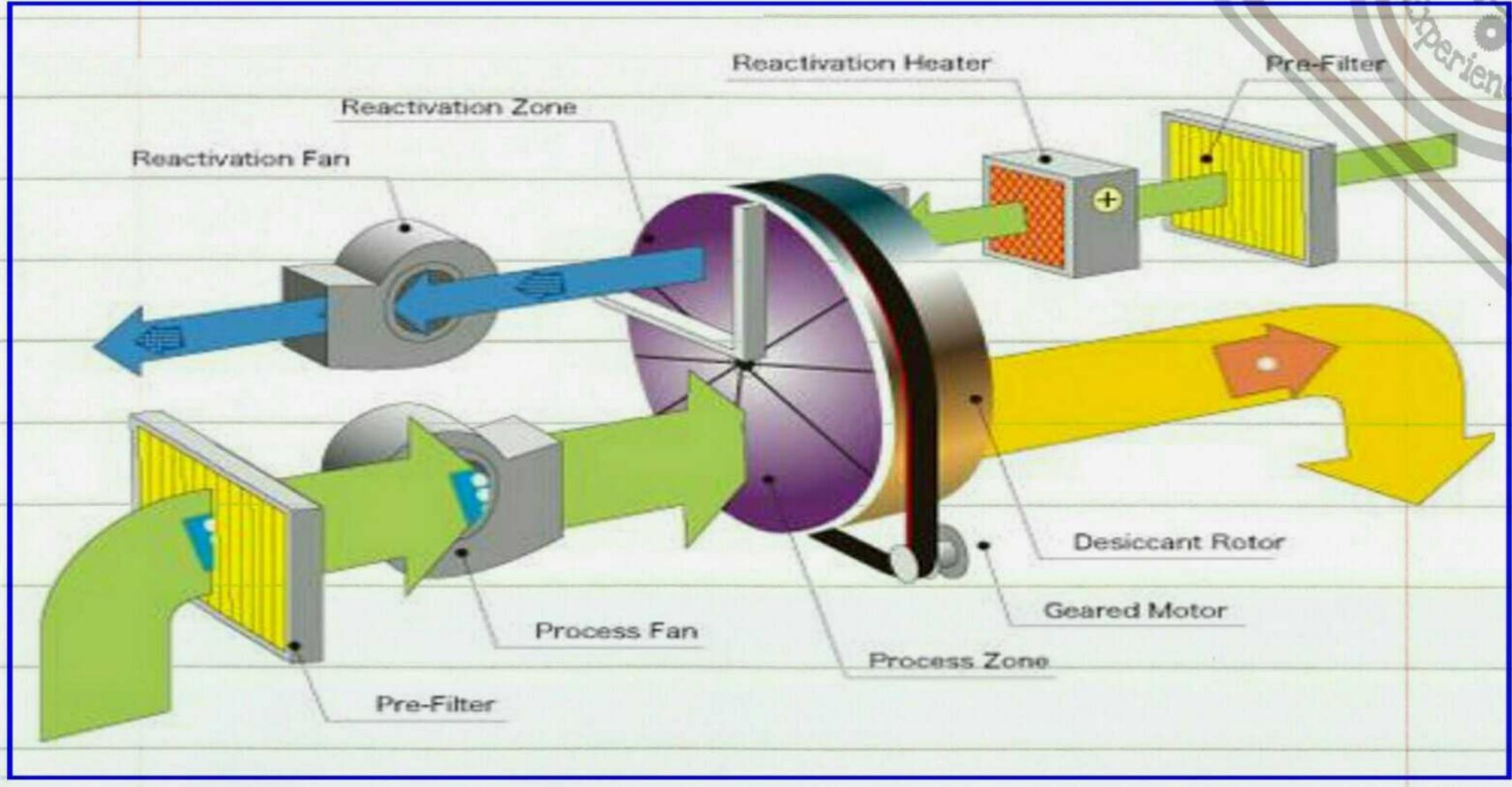
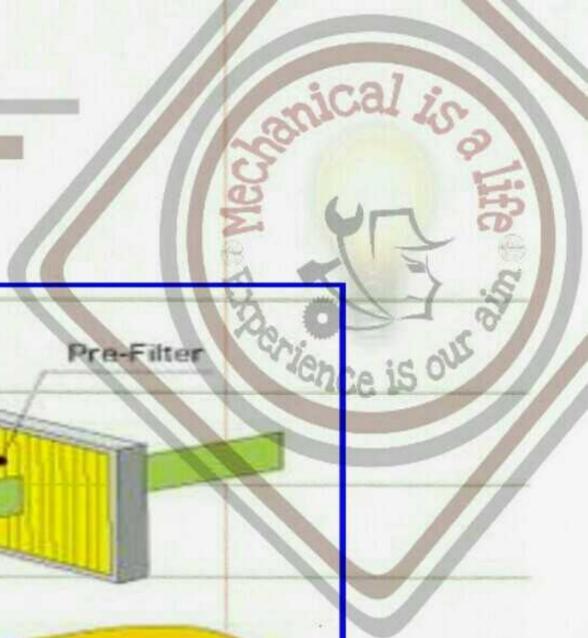


Heat Recovery Wheel / Desiccant Cooling

- ▶ The wheel is positioned typically in the duct system so that return air is drawn through its one half and outdoor air is drawn through its other half in a counter flow pattern.
- ▶ The wheel is rotated at 2 to 20 rpm
- ▶ Sensible heat is transferred as the metallic substrate picks up and store heat from the hot air steam and gives it up to the cold one.
- ▶ Latent heat is transferred as the desiccant on the wheel absorbs moisture from the higher humidity air stream and releases the same into the air stream that has a lower humidity ratio

How a Heat Recovery Ventilator Works







Ramy Ghoraba