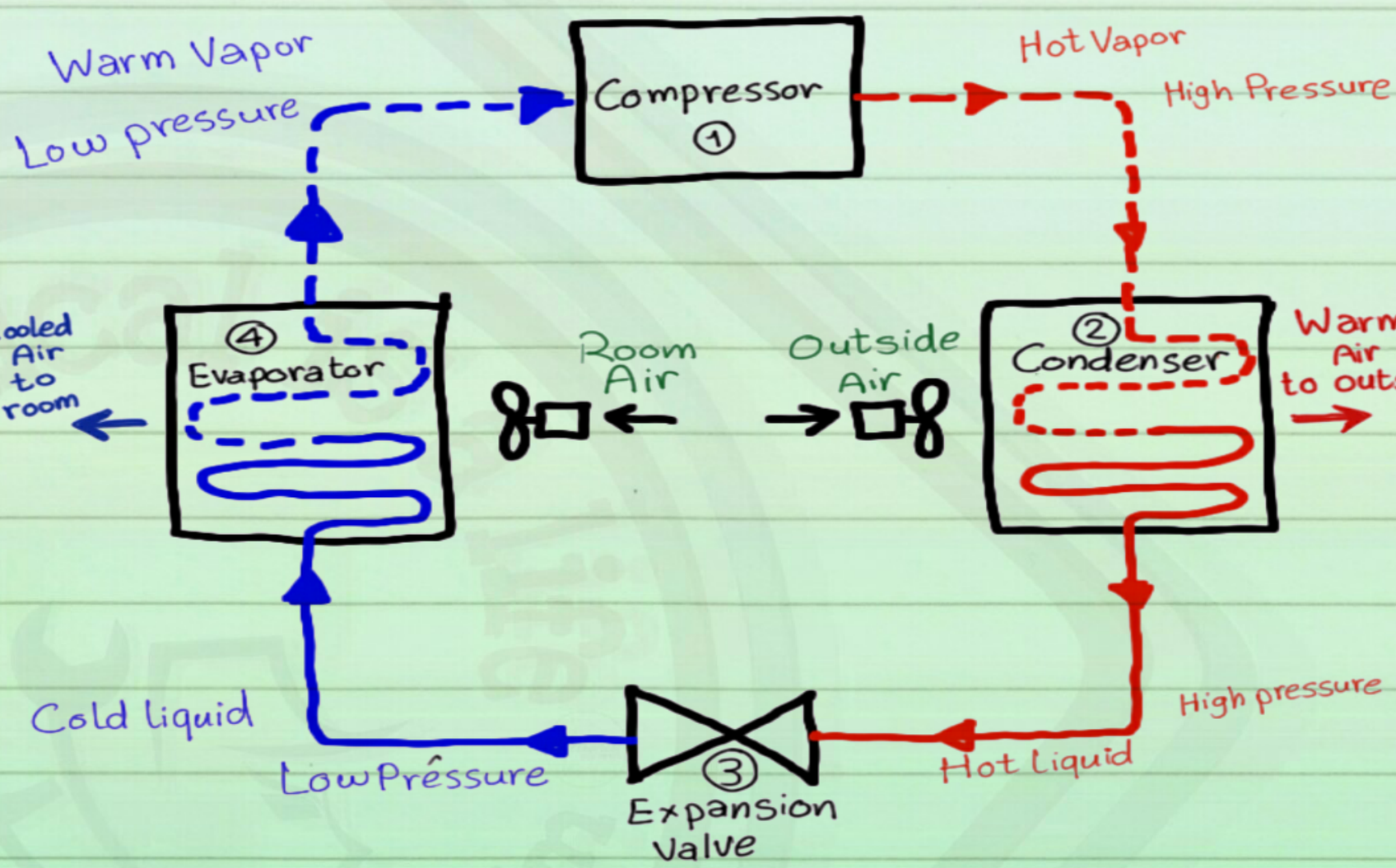
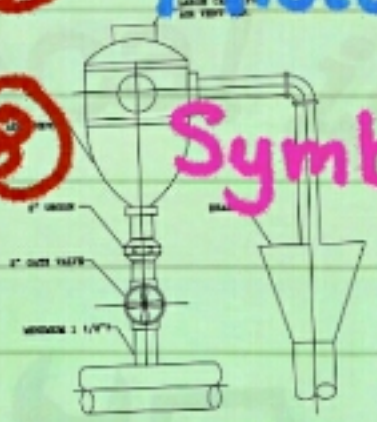
Heat Ventilation Air Condition



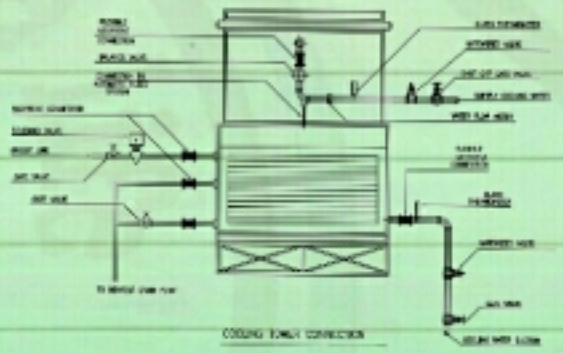
By Eng. : Ramy Ghoraba

PART 01

PART ① Contents

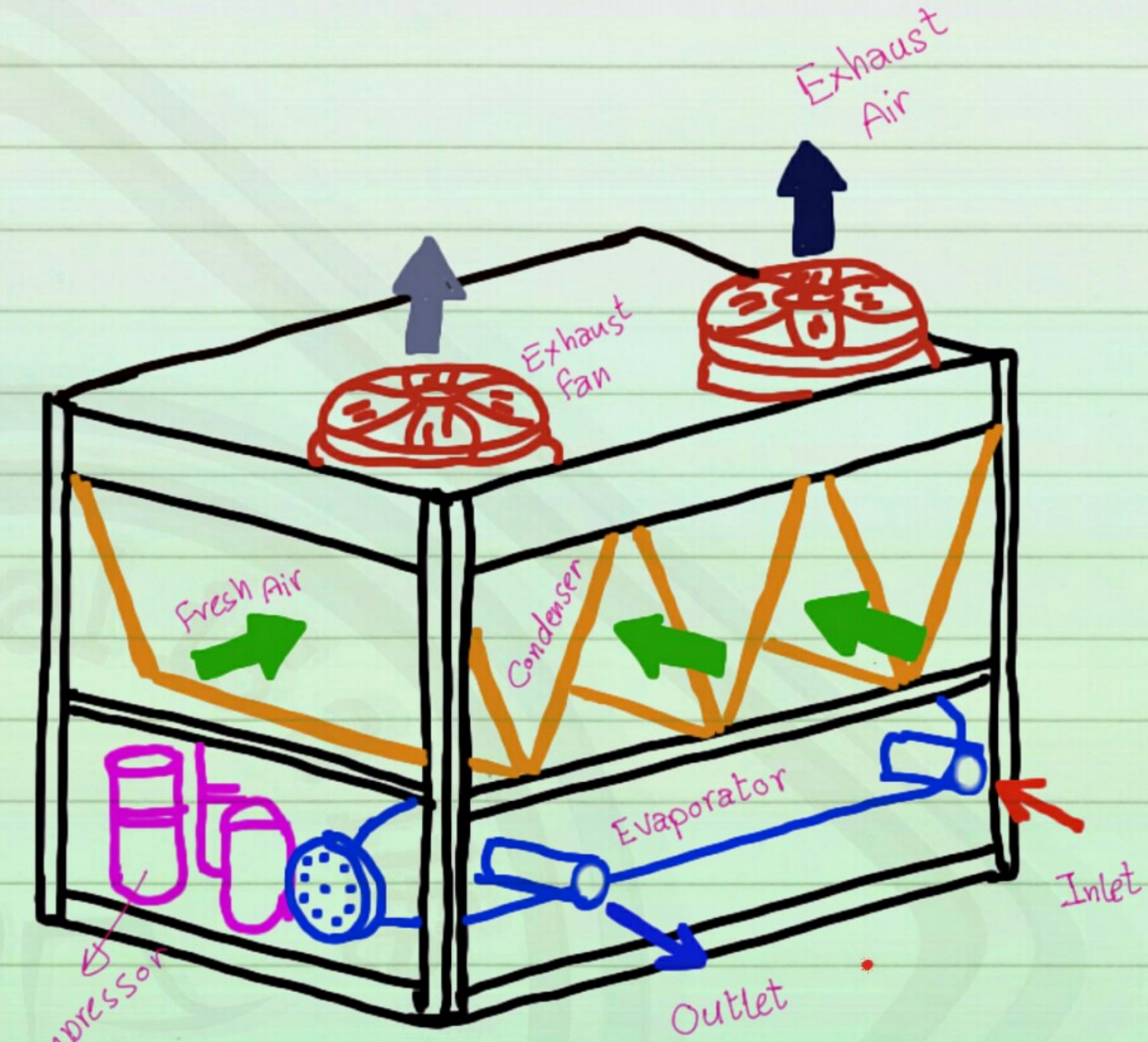


AUTOMATIC AIR VENT
ON MAIN HEADERS



④ CHILLED WATER AIR SEPARATOR

① Chiller



HVAC Chillers

- Vapor Compression Chillers
  - Reciprocating
  - Centrifugal
  - Screw
  - Scroll
- Vapor Absorption Chillers
  - Direct fired
    - Single effect
    - Double effect
  - Indirect fired
    - Lithium bromide-water
    - Ammonia-water
    - Single Stage
    - Double/multiple Stage
- Water Cooled Condensers
- Air Cooled Condensers
- Evaporative Condensers

Compressor Types

- Positive Displacement
  - Rotary
    - Lobe
    - Screw
    - Liquid Ring
    - Scroll
    - Vane
  - Reciprocating
    - Diaphragm
    - Double Acting
    - Single Acting
- Dynamic
  - Centrifugal
  - Axial

Air cooled scroll chiller

Water cooled scroll chiller

Air coold screw chiller

Food water chiller

Single compressor Water cooled

Double compressor water cooled

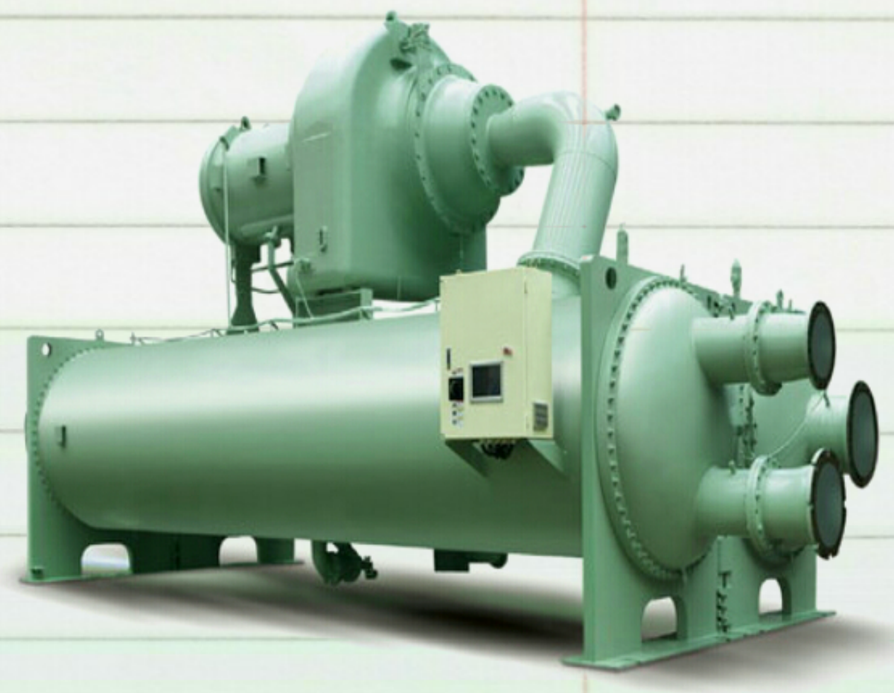
Scroll type plastic injection water

Brewery/beverage glycol chiller

-5 ℃ Chemical water chiller

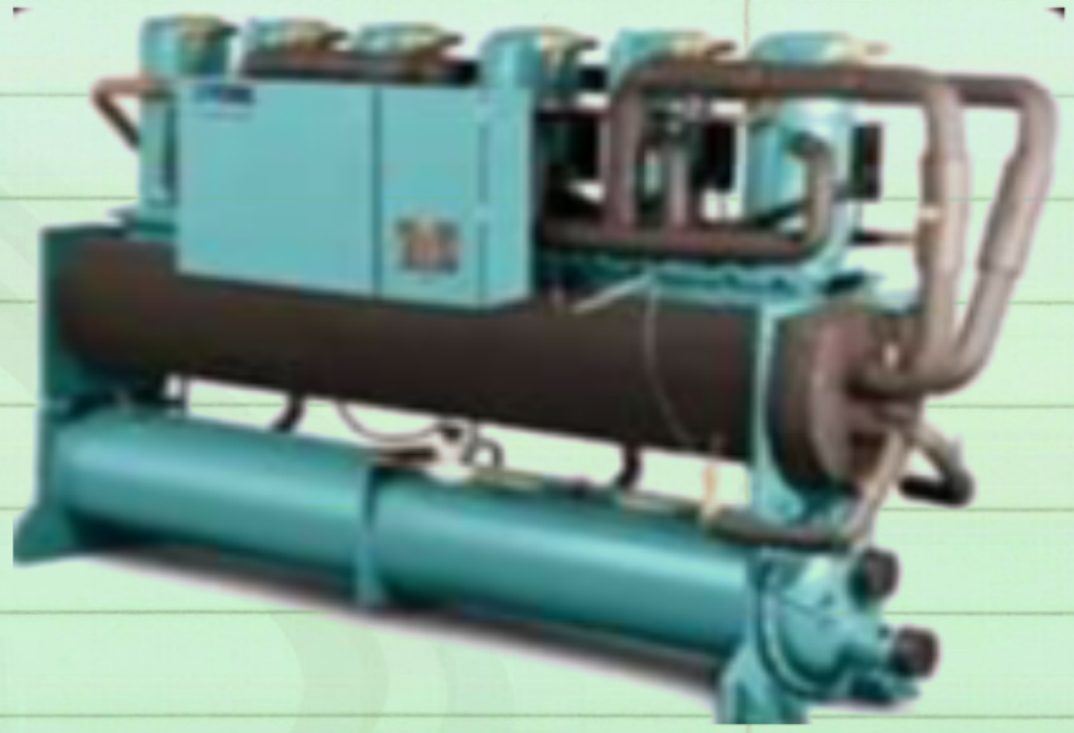
Types of CHILLERS

Reciprocating chiller



Centrifugal chiller

Screw chiller

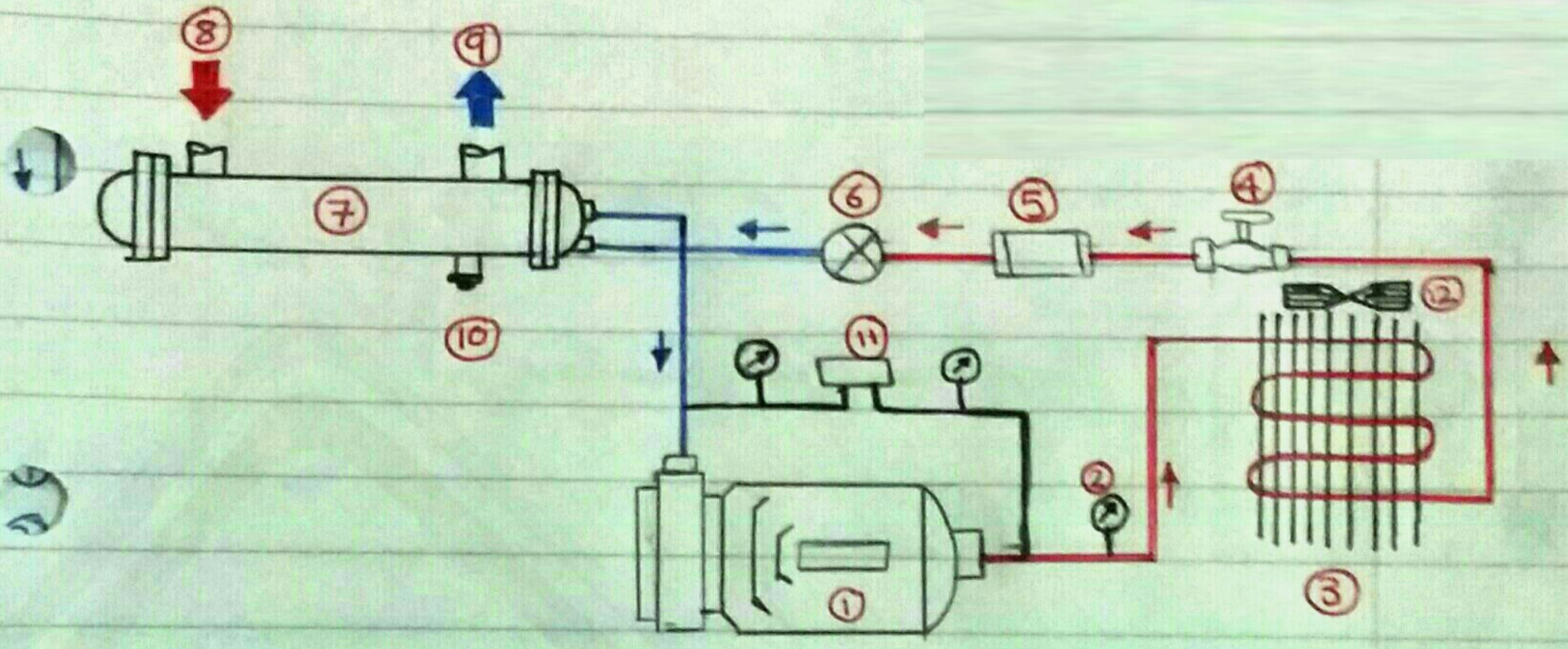


Scroll chiller

* Chilled Water System

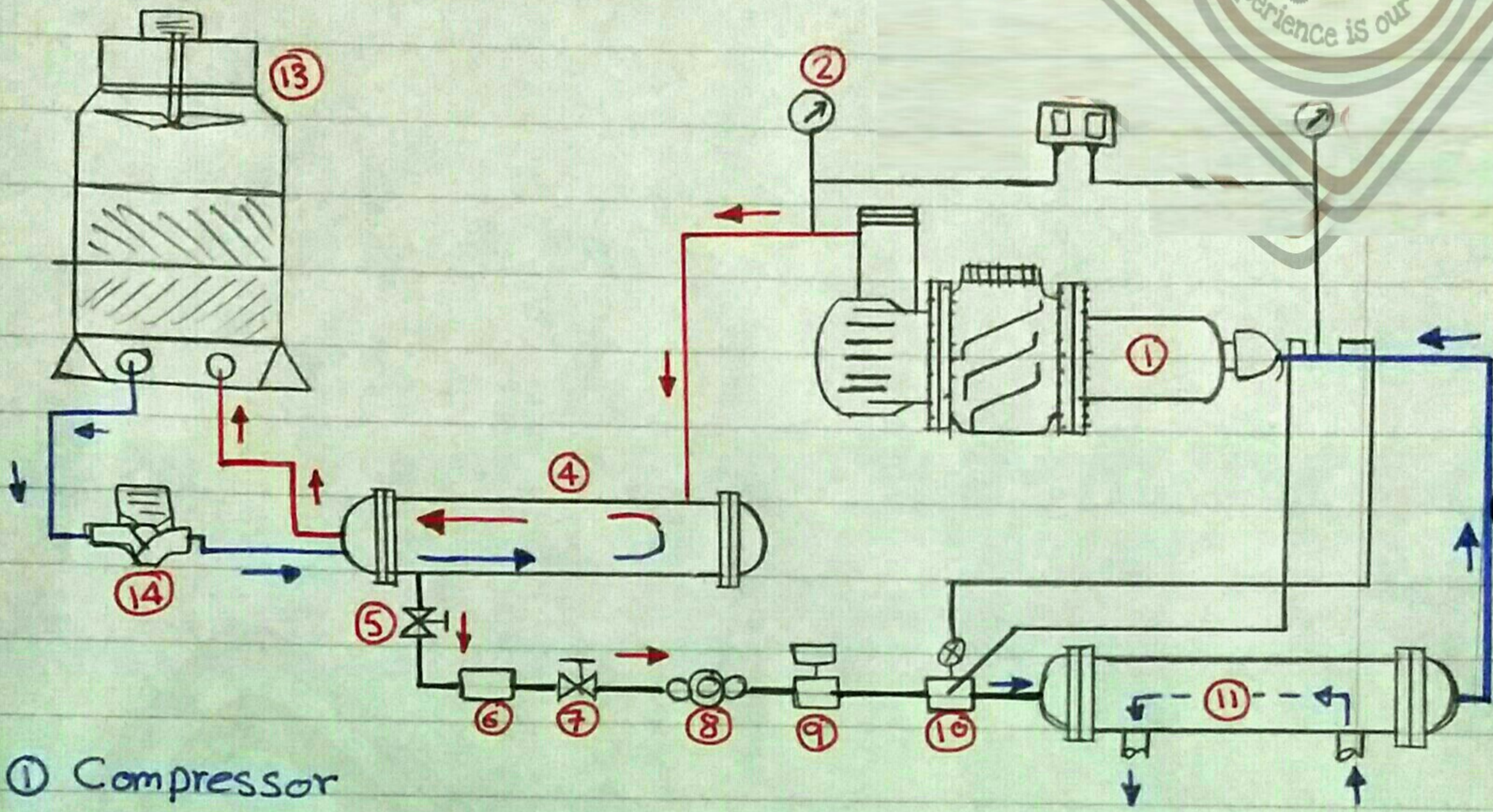
A Chiller

Air Cooled



1. Compressor
2. Pressure gauge
3. Condenser
4. Shut off valve
5. Filter dryer
6. Expansion valve
7. Evaporator
8. water IN
9. water OUT
10. Drain
11. High/low pressure protector
12. Condenser Fan.

(B) Water Cooled Chiller



① Compressor

② High pressure gauge

③ high/ low pressure protector

④ Condenser

⑤ Shutoff valve

⑥ Filter dryer

⑦ Shutoff Valve

⑧ Liquid mirror

⑨ Solenoid valve

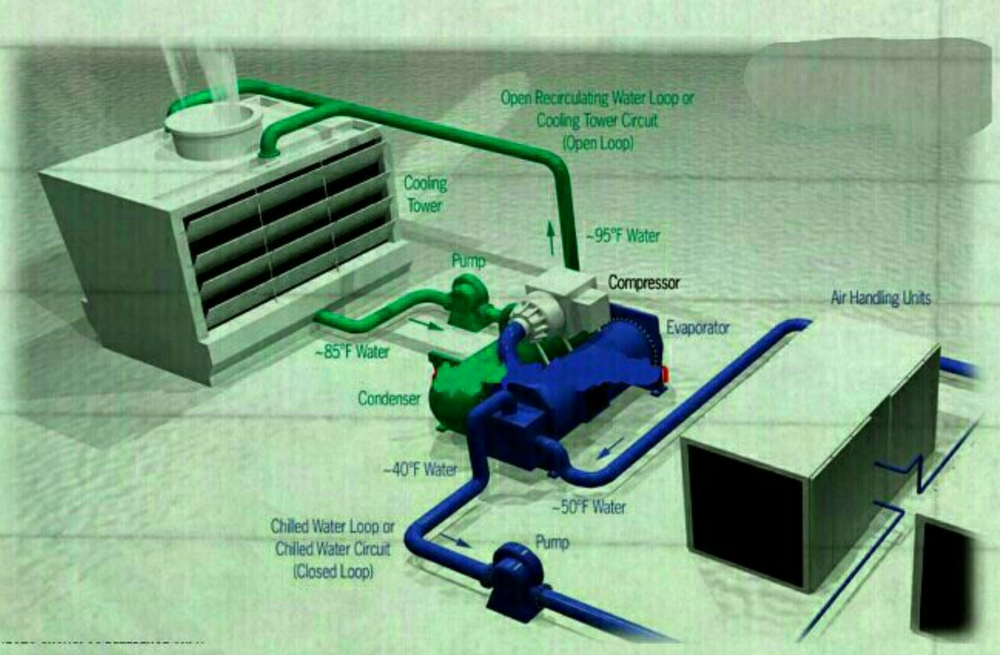
⑩ Expansion valve

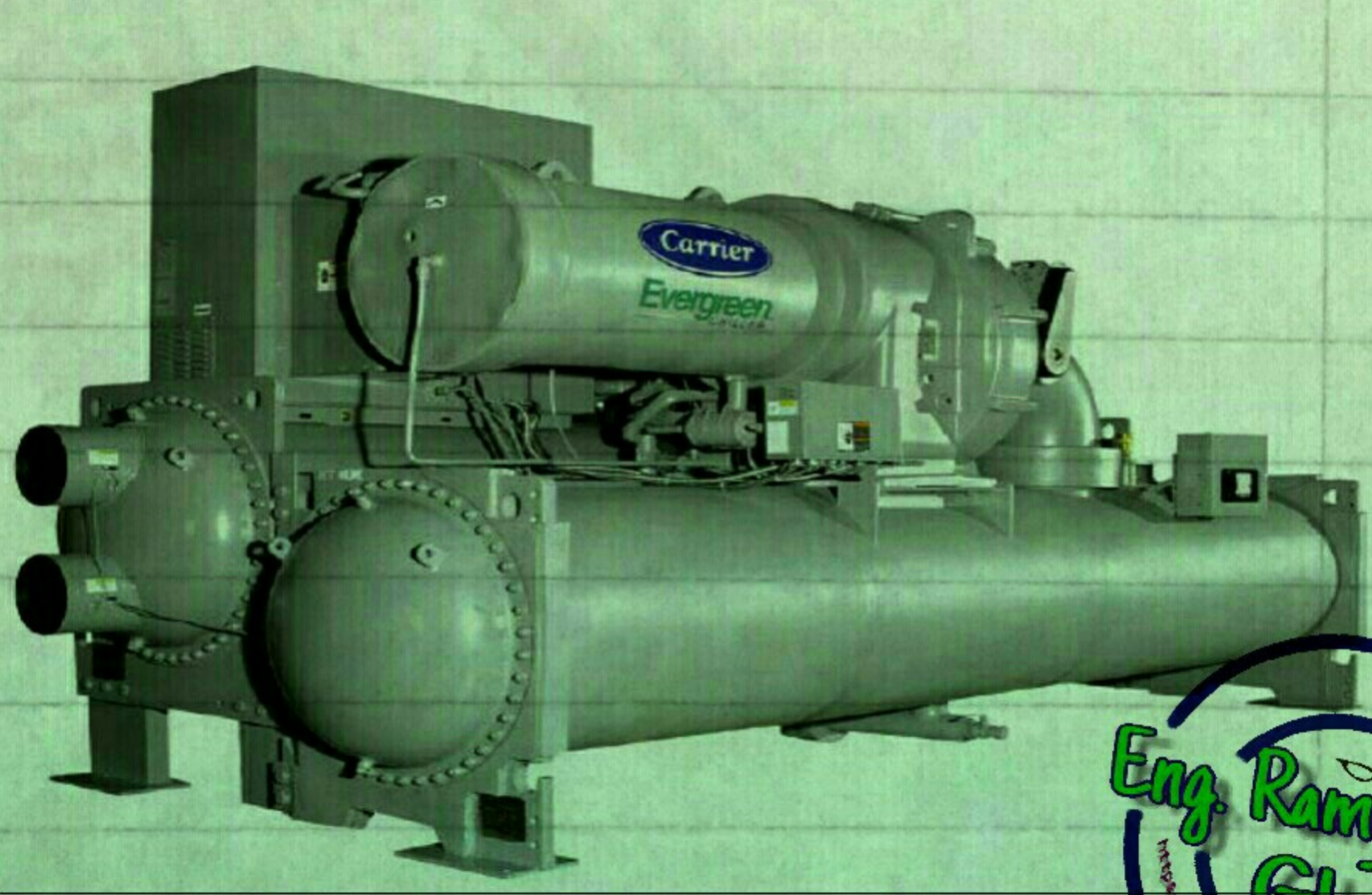
⑪ Evaporator

⑫ Low pressure gauge

⑬ Cooling tower

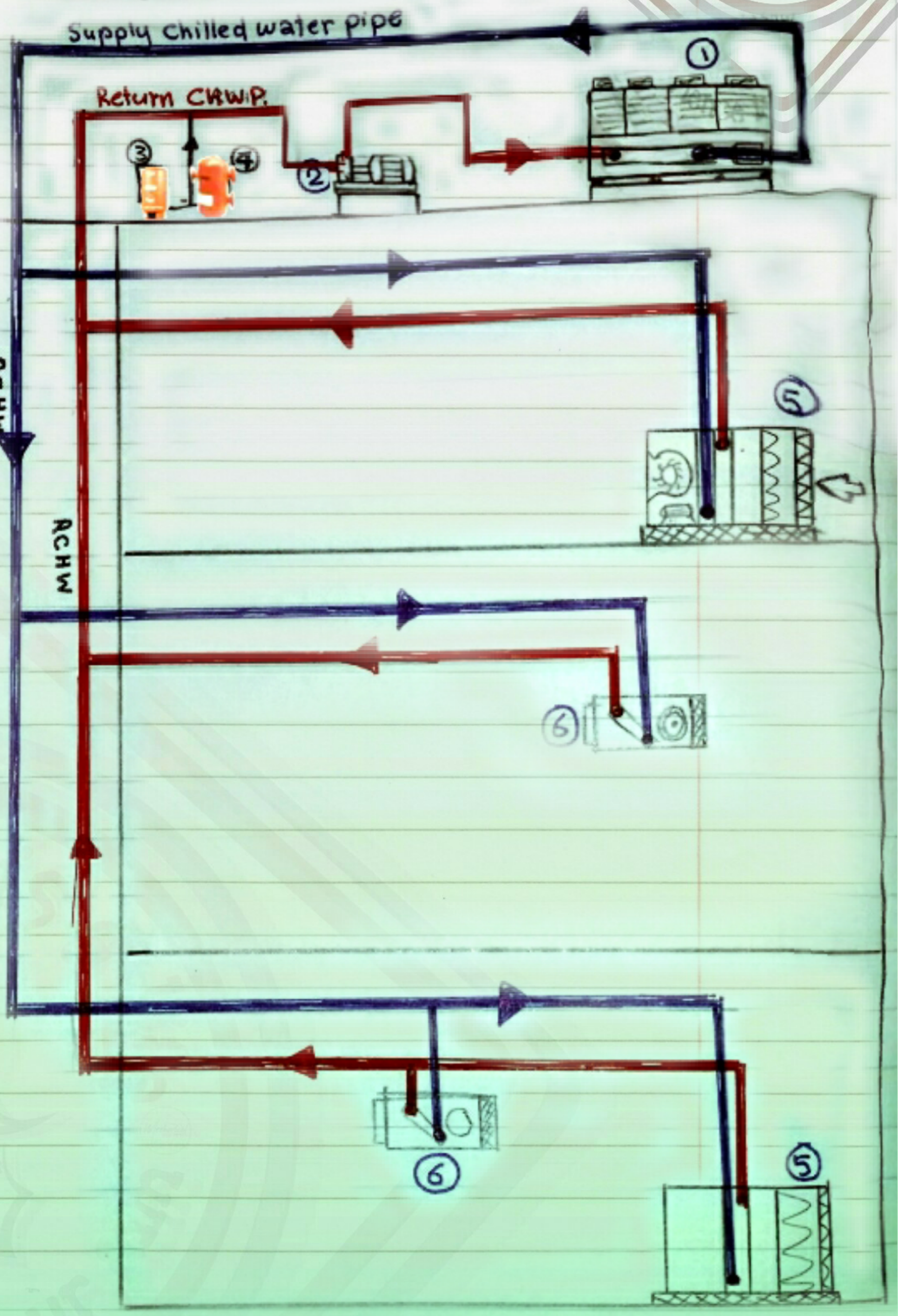
⑭ pump.





Chilled water System Sample

Air Cooled



1- Chiller

2- Pumps

3- Make up unit

4- Air Separator

5- Air handling unit

6- Fan coil unit

Water Cooled Chiller System Sample

1- Evaporator

2- Condenser

3- Compressor

4- Chilled water pump

5- Condensation pump

6- Cooling tower

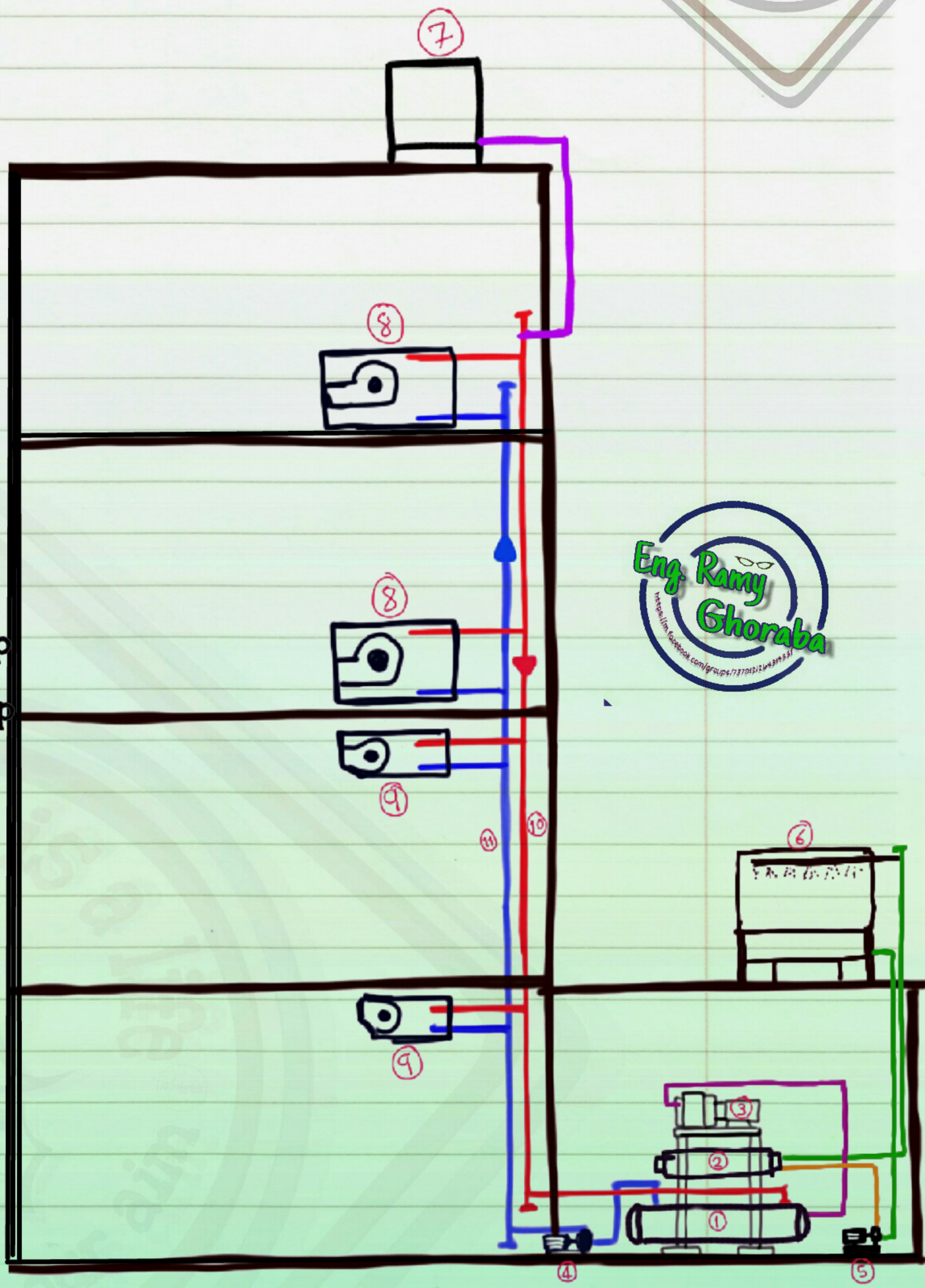
7- Expansion tank
(Makeup unit)

8- AHU

9- FCU

10- Chilled water
Return pipe

11- Chilled water
Supply pipe



② PUMP

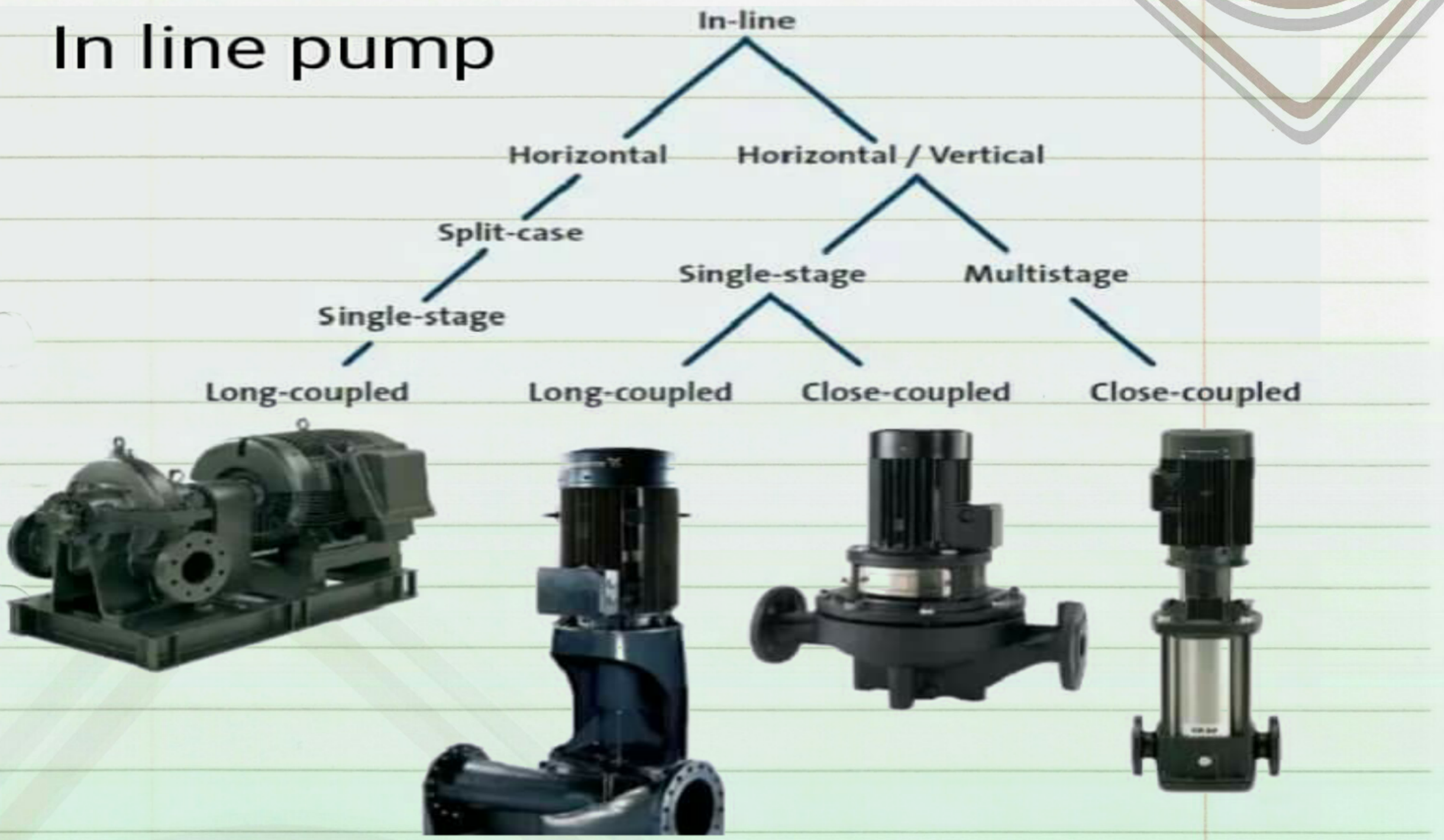
PUMPS

- ذات الإزاحة الموجبة — POSITIVE DISPALCEMENT
  - دوارة — ROTARY
  - ترددية — RECIPROCATING
    - مكبس — PISTON
      - فردية التأثير — SINGLE ACTING
      - مزدوجة التأثير — DOUBLE ACTING
    - كباس — PLUNGER
    - غشاء مرن — DIAPHRAGM
- ديناميكية — DYNAMIC
  - طاردة مركزية — CENTRIFUGAL
    - تدفق محورى — AXIL FLOW
    - تدفق قطرى — RADIAL FLOW
  - ذات تأثير خاص — SPECIAL EFFECT
    - السحب بتيار الغاز — JET GAS LIFT

- ترسية — GEAR
- حلزونية — SCREW
- فصوص — LOBE
- لقم منزلقة — SLIDE VANE
- مكبس — PISTON

Pump Types

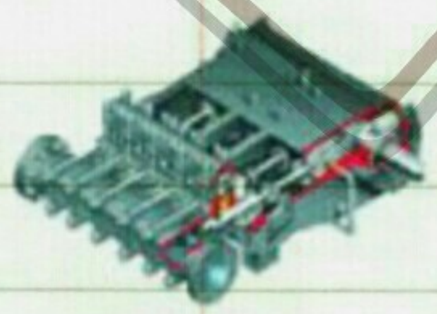
In line pump

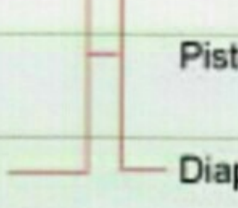


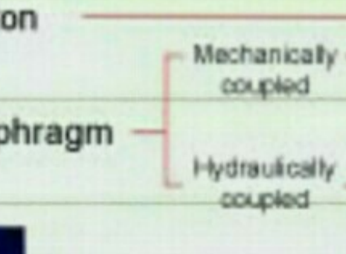
End suction pump

POSITIVE DISPLACEMENT PUMP TYPE CHART

- Positive displacement
  - Reciprocating
    - Steam
      - Horizontal
      - Vertical
      - → Double acting
        - Piston
        - Plunger
        - → Simplex
        - → Duplex
    - Power
      - Horizontal
      - Vertical
      - → Single acting
      - → Double acting
        - Piston
        - Plunger
        - → Simplex
        - → Duplex
        - → Multiplex
    - Controlled Volume
      - Horizontal
      - Vertical
      - → Plunger
      - → Piston
      - → Diaphragm
        - Mechanically coupled
        - Hydraulically coupled
        - → Simplex
        - → Duplex
        - → Multiplex
    - Blow case
  - Rotary
    - Vane
      - Blade, bucket roller or slipper
    - Piston
      - Axial
      - Radial
    - Flexible member
      - Tube
      - blade
      - liner
    - Lobe
      - Single
      - Multiple
    - Gear
      - External
      - Internal
    - Circumferential piston
      - Single
      - Multiple
    - Screw
      - Single
      - Multiple

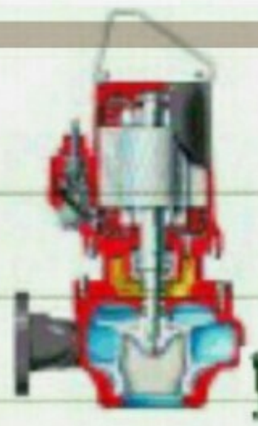


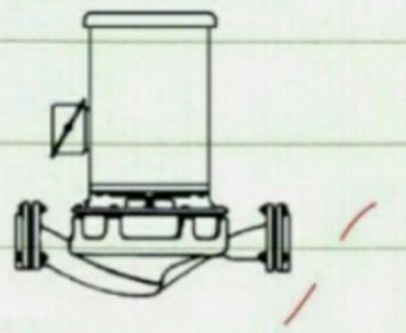


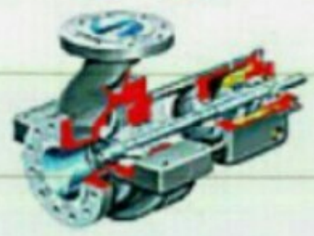


CENTRIFUGAL PUMP TYPES

- Centrifugal
  - Overhung impeller
    - Close coupled single & two stage
      - End suction incl. submersibles
      - in-line
    - Separately coupled single & two stage
      - in-line
      - self-priming
    - Frame mounted
      - Centerline support API 610
      - Frame mounted ANSI B73.1
    - Wet pit volute
      - Axial flow impeller (propeller) Volute type (horiz. & vert.)
  - Impeller between bearings
    - Separately coupled single stage
      - Axial (horiz.) split case
      - Radial (vert.) split case
    - Separately coupled multistage stage
      - Axial (horiz.) split case
      - Radial (vert.) split case
  - Turbine type
    - Vertical type single & multistage
      - Deep well turbines incl. submersibles
      - Barrel or can pump
      - Axial flow
      - Axial flow impeller (propeller or mixed flow type (horiz. or vert.)
- Regenerative turbine
  - Impeller overhung or between bearings
    - Single stage
    - Two stage
- Special effect
  - Reversible centrifugal
  - Rotating casing (pitot)

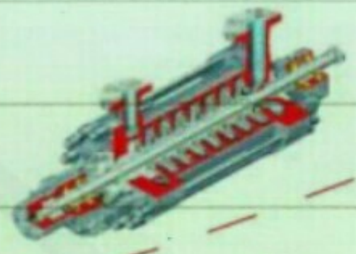





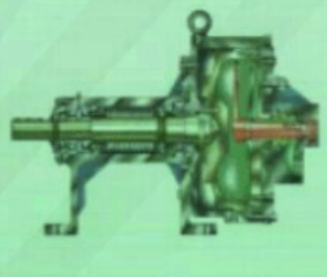




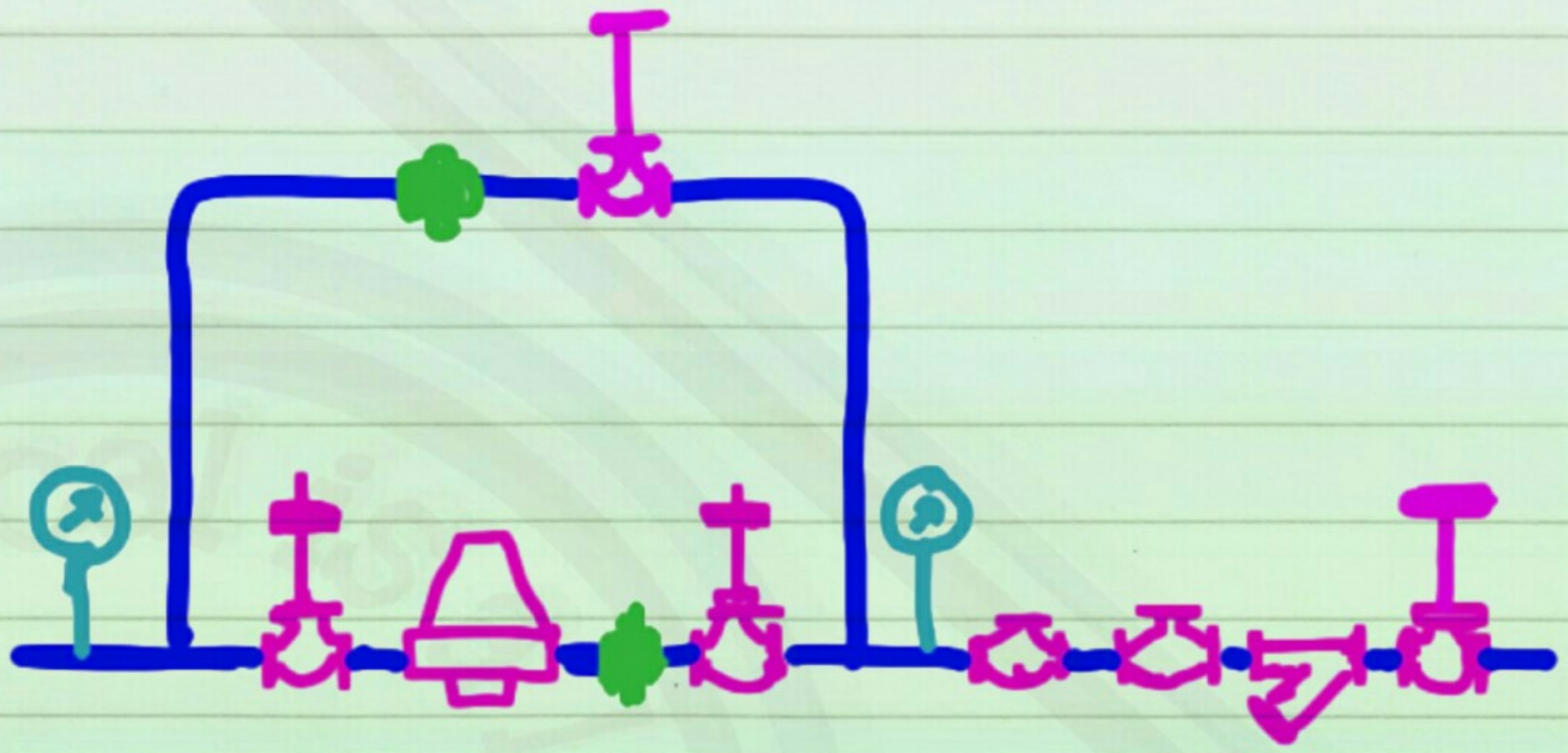







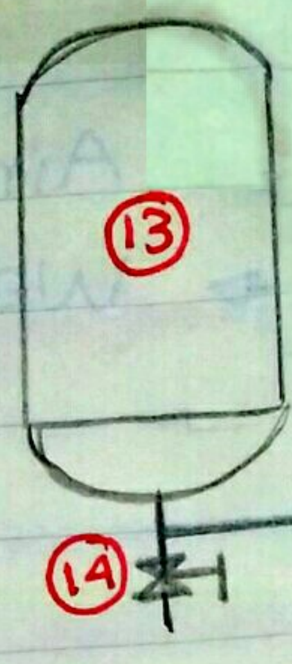


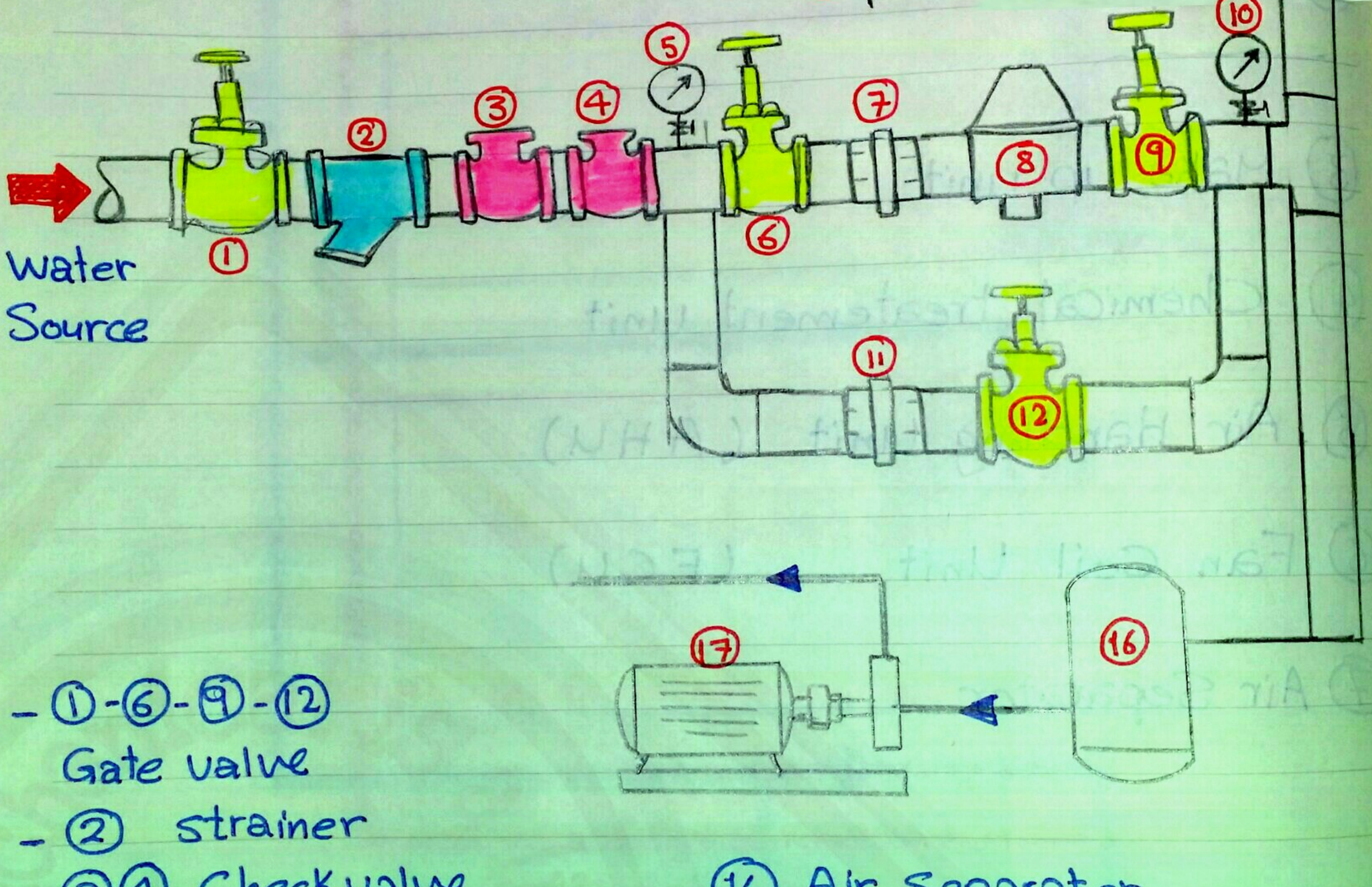
③ MAKE UP UNIT



⊛ Make Up Unit

⊛ IF the pressure decrease in the System because of any reason
It work to make up the pressure.





- ①-⑥-⑨-⑫ Gate valve
- ② strainer
- ③④ Check valve
- ⑤⑩ Pressure gauge
- ⑦⑪⑮ Union
- ⑧ Pressure reducing valve
- ⑬ Expansion tank
- ⑭ Ball valve
- ⑯ Air Separator
- ⑰ Pump

Backflow preventer

What is backflow?

Backflow is the undesirable reversal of the flow of water from its intended direction in any pipeline or plumbing system. Backflow is dangerous because it can allow drinking water in plumbing systems to become contaminated and unusable.

What is a backflow preventer?

Backflow preventers are mechanical plumbing devices installed in a plumbing system to prevent water from flowing backward in the system. A properly installed, tested and maintained backflow preventer at the service entrance to a building or property can reliably prevent the backflow of water of an unknown quality from flowing back into the community water system.

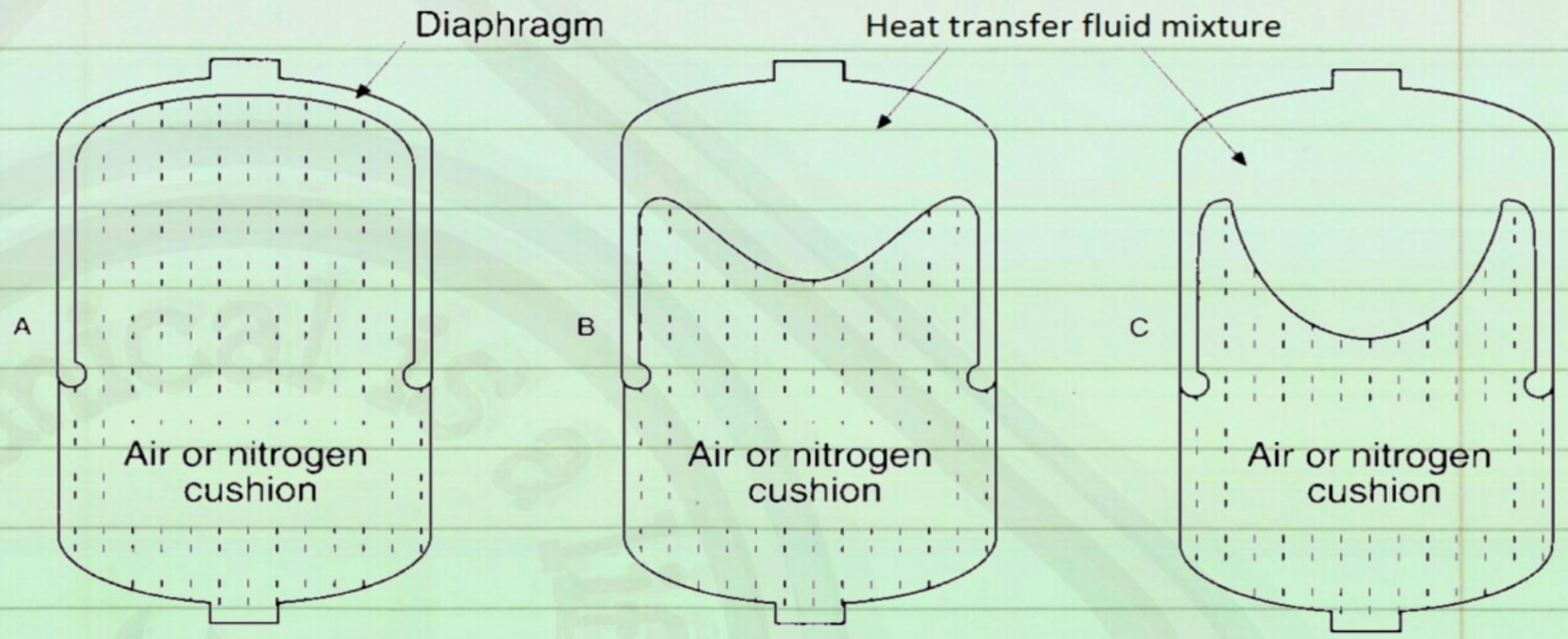
THE PRESSURE REDUCING VALVE : DEFINITION

This valve reduces the pressure of the water that goes through it, and is used to obtain a regulated and constant value at its outlet.

It is installed at the water mains (for a bungalow as for a flat). It protects the whole installation from problems due to excess pressure : noises in the pipes, water hammer, splashes, premature wear of household electrical appliances and taps.

The pressure reducing valves are completely automatic.

Expansion tank



A. When system is filled, no fluid enters tank when cushion and water pressure are in equilibrium

B. As temperature increases, diaphragm moves to accept heat transfer fluid mixture

C. When fluid rises to maximum, full acceptance of expansion is achieved

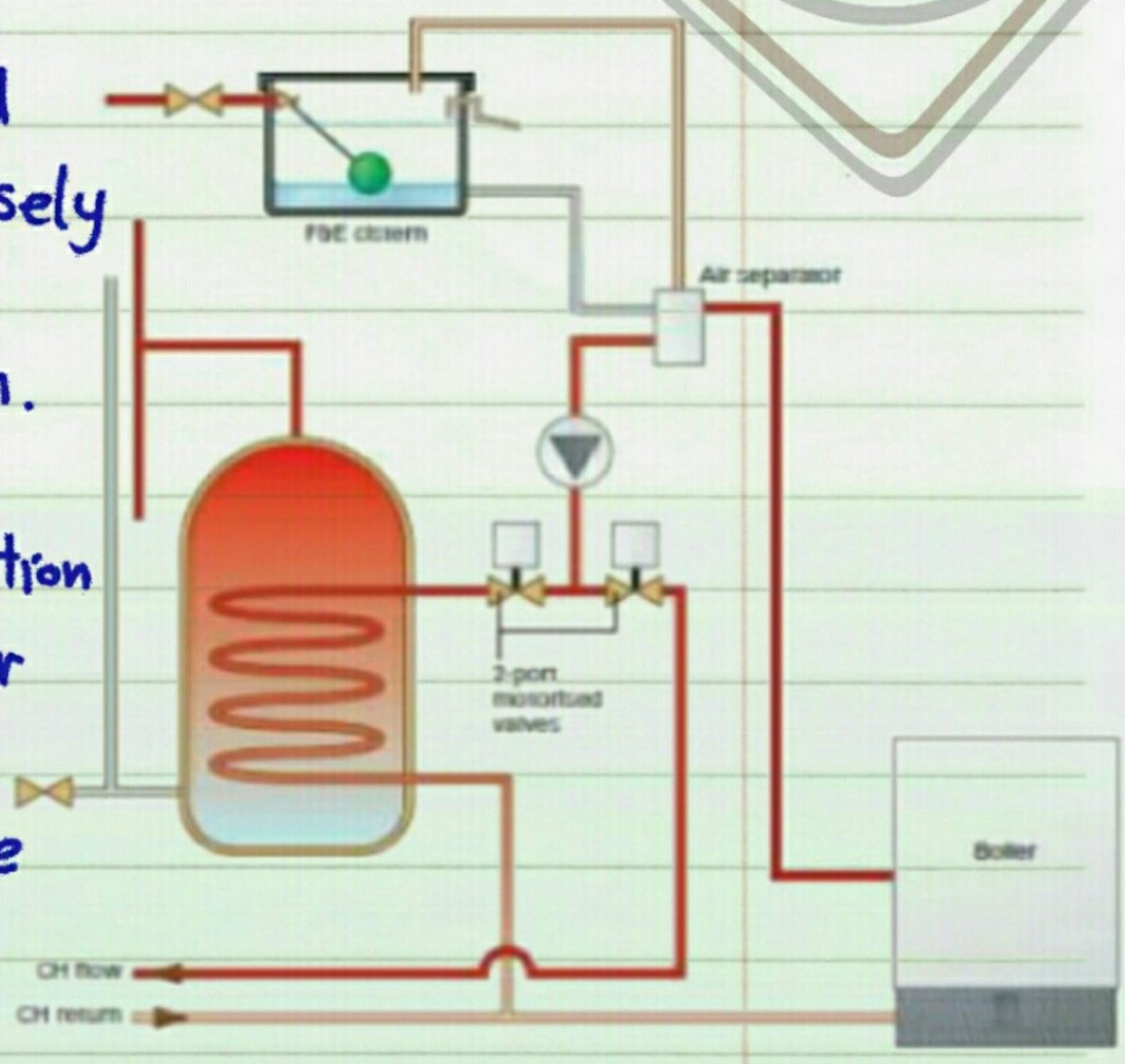
④ AIR SEPARETOR

Air Separator

Function

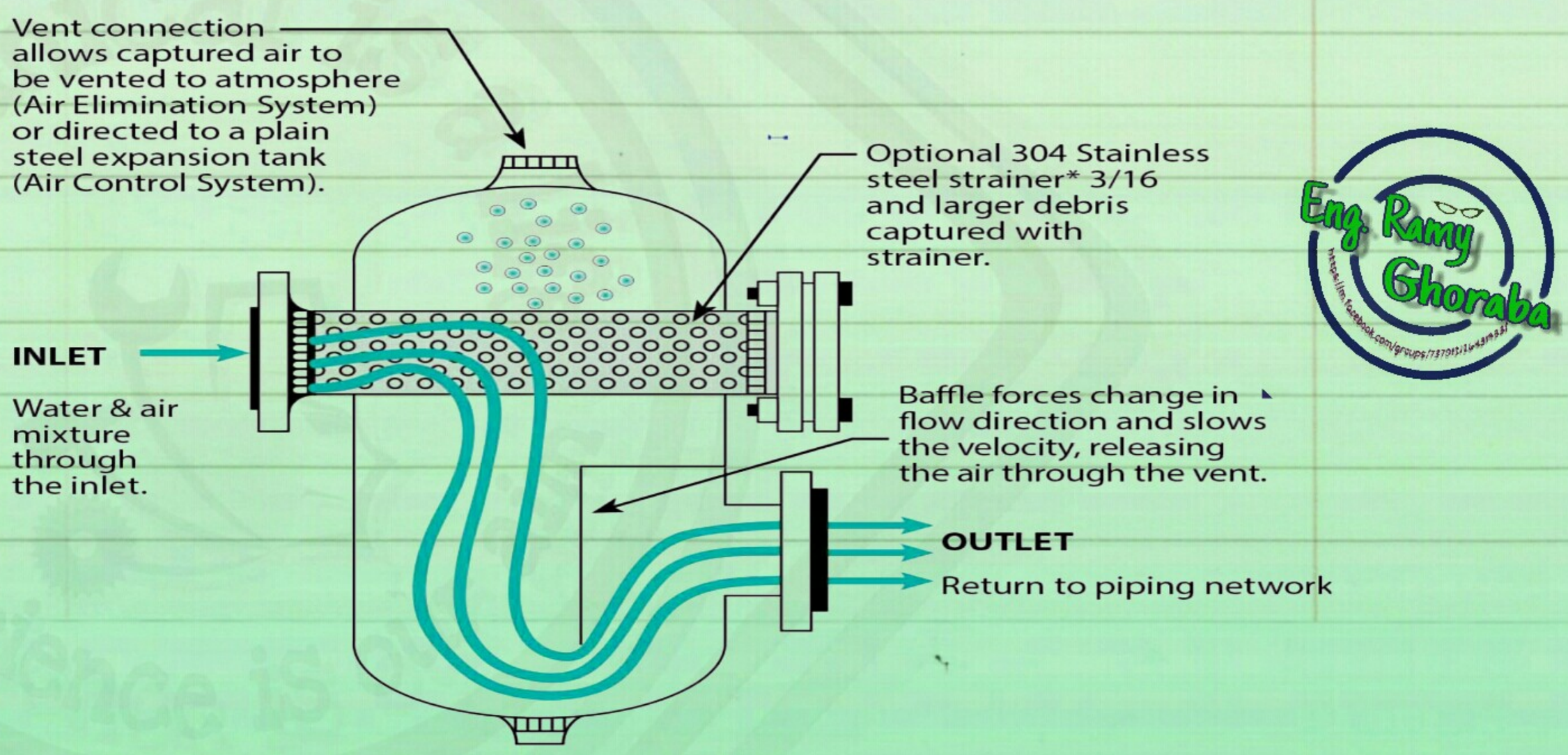
- To enable the cold feed and Vent pipe to be joined closely to gether into a correct layout to Serve the System.

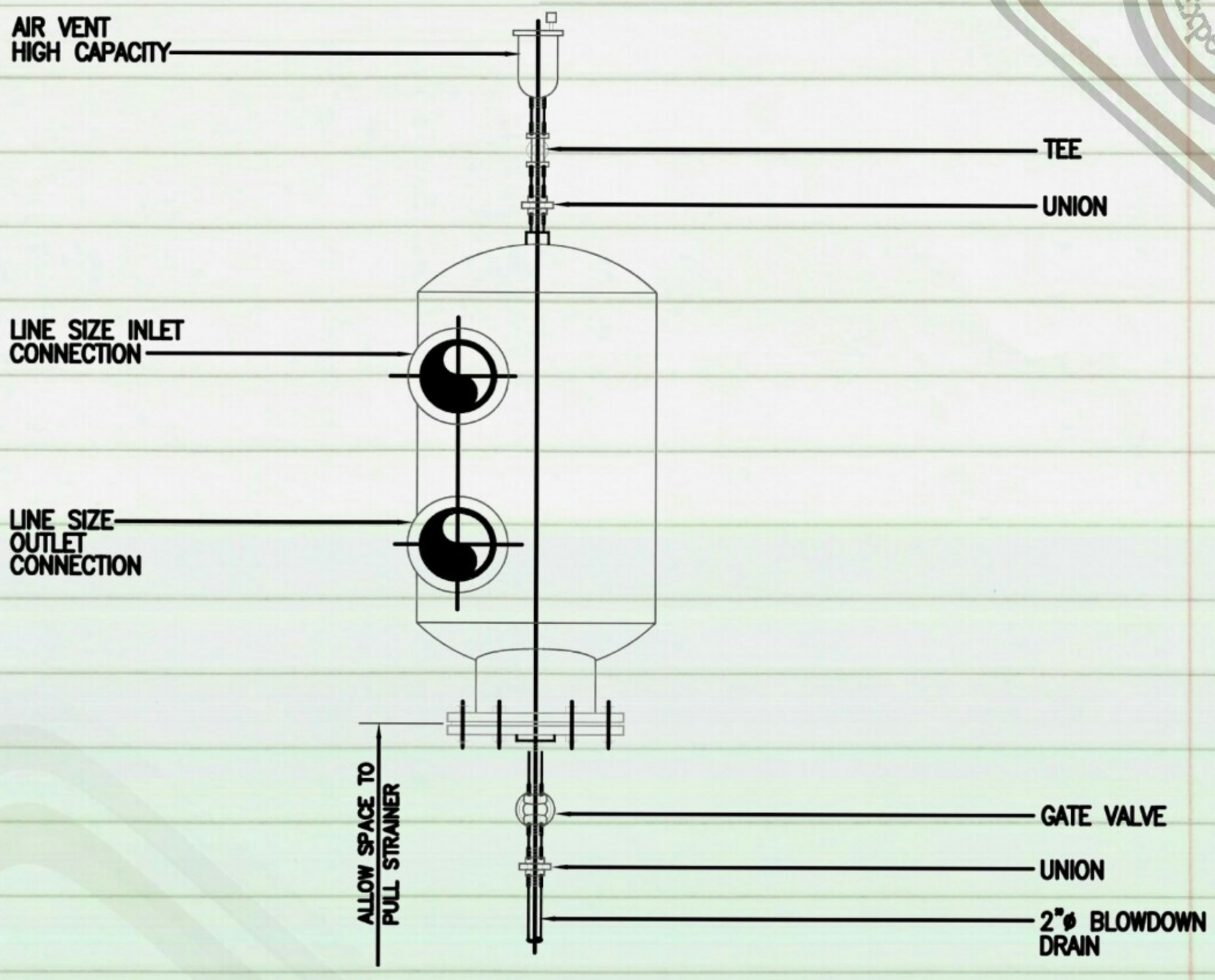
- The grouping of the Connection Causes turbulence of water flow in the separator which in turn removes air from the System



- This reduces noise in the system and lowers the risk of Corrosion.

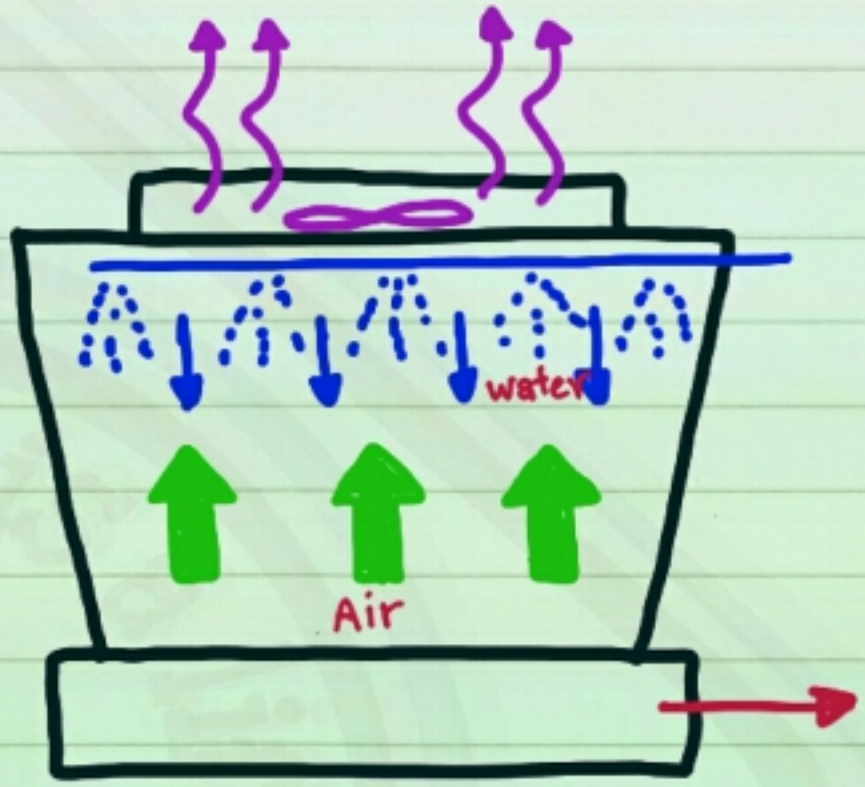
Air Separator Flow Pattern





Air Separator installed in a plant room.

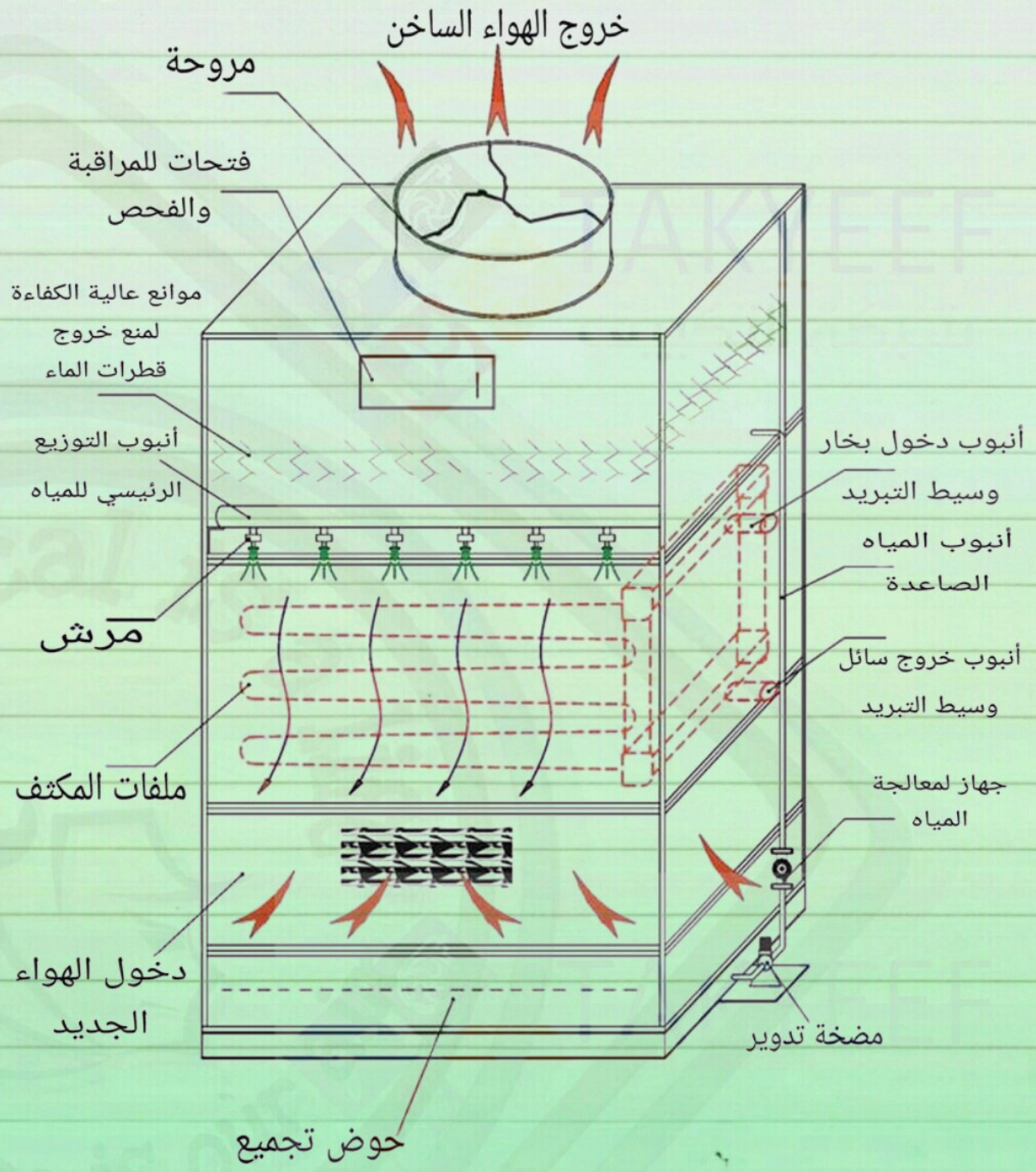
⑤ COOLING TOWER



Cooling Tower

Function

- Decrease the temprature of Water for the Condenser by water spray on a large area to achive maximum touching with air then the water evaporates with the heat.



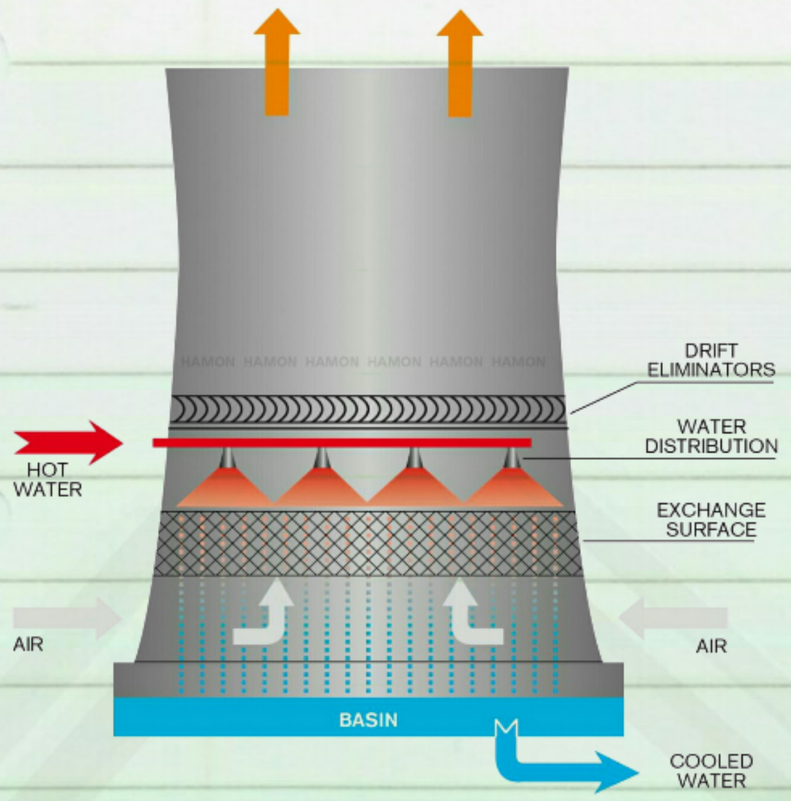
Cooling tower types

A- AS per Air entering

1- Natural draft

Natural circulization

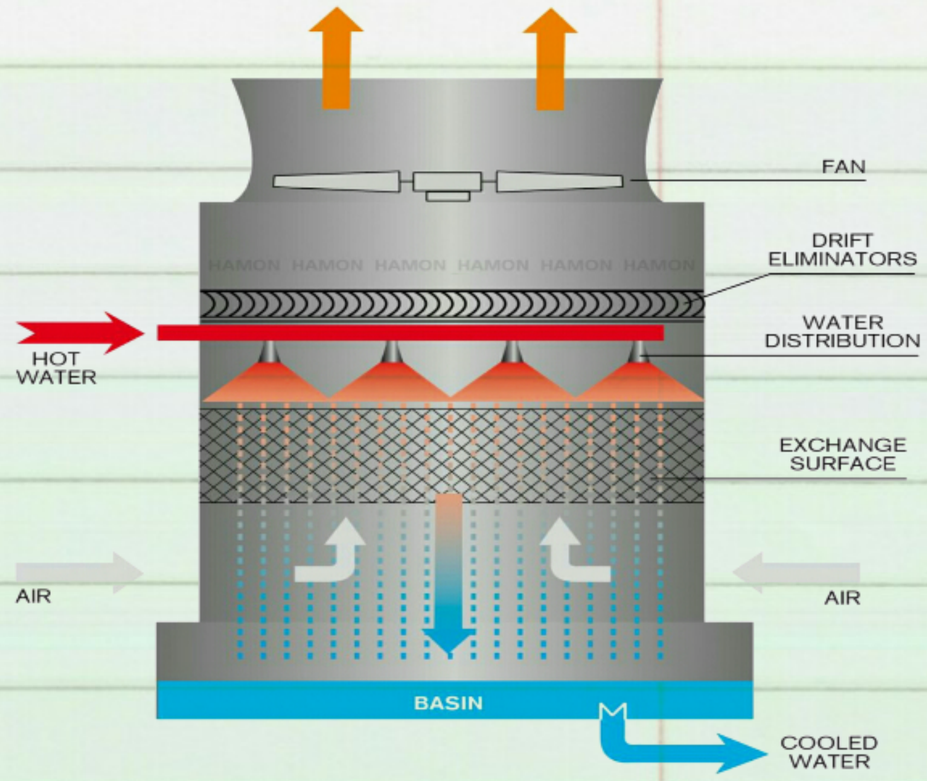
for the air



2- Mechanical draft

Used fans

for air moving



B- AS per heat removing

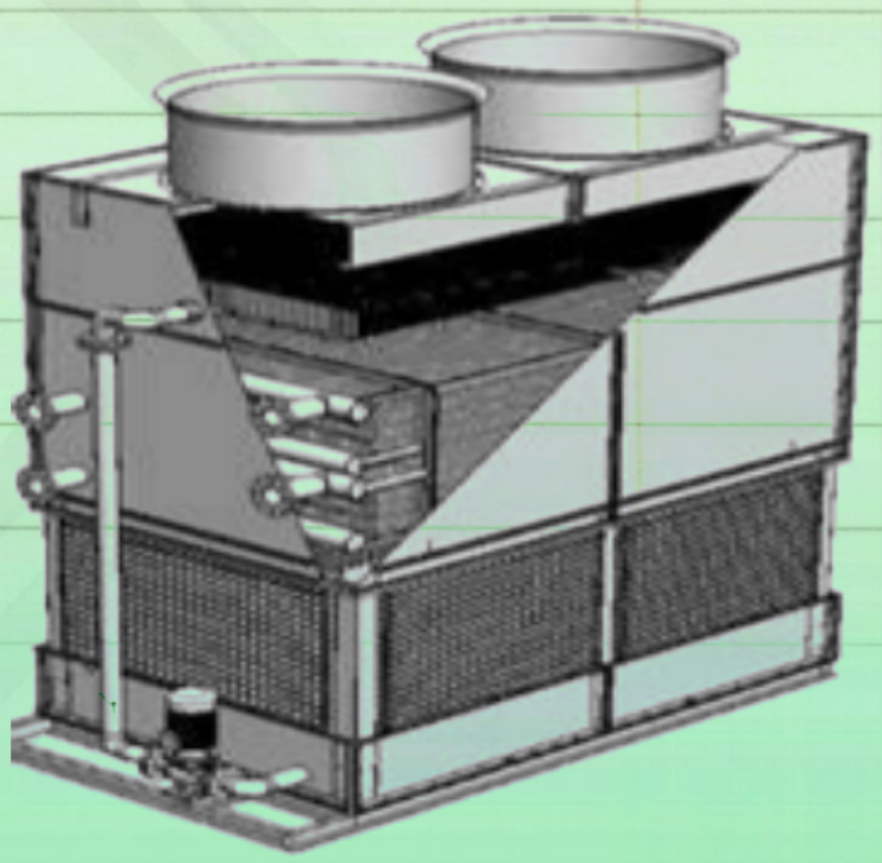
1- Open cooling tower

Water Spray from up

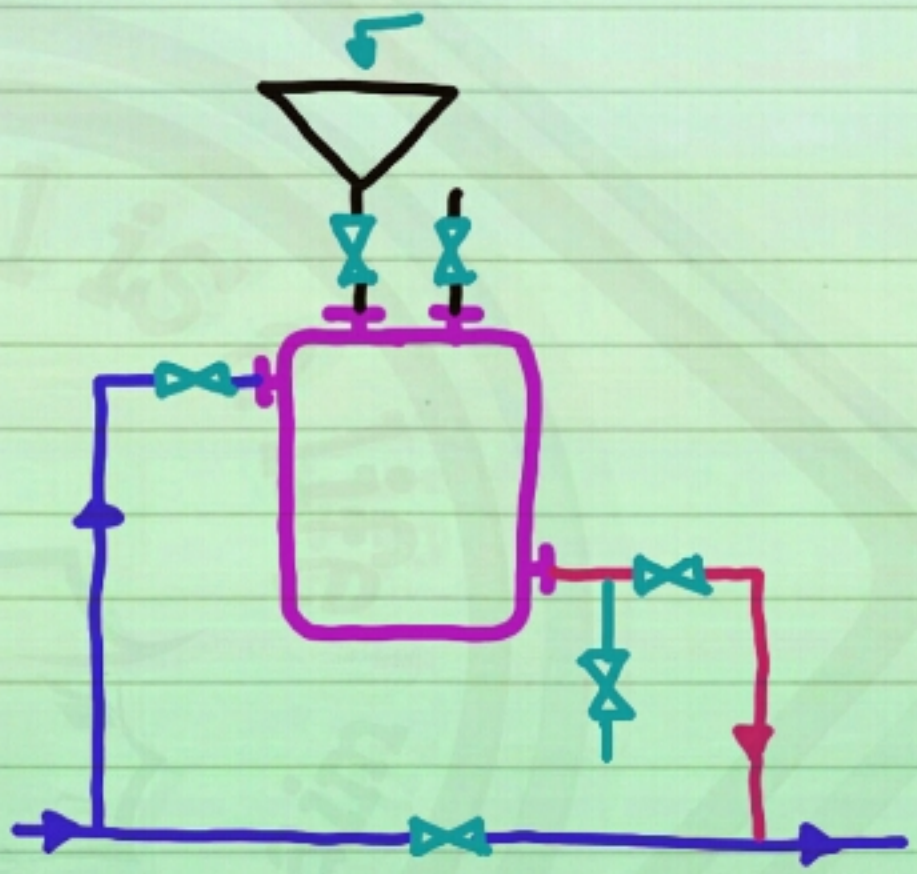
and take the heat from air

2- Closed cooling tower

Used Heat exchanger



⑥ CHEMICAL TREATMENT UNIT



Chemical treatment Unit

- Very important for the life of the System because it is a closed System.

- Chemical react with the pipes to form aprotective thin inside layers.

- Chemical help in maintaining of PH level.

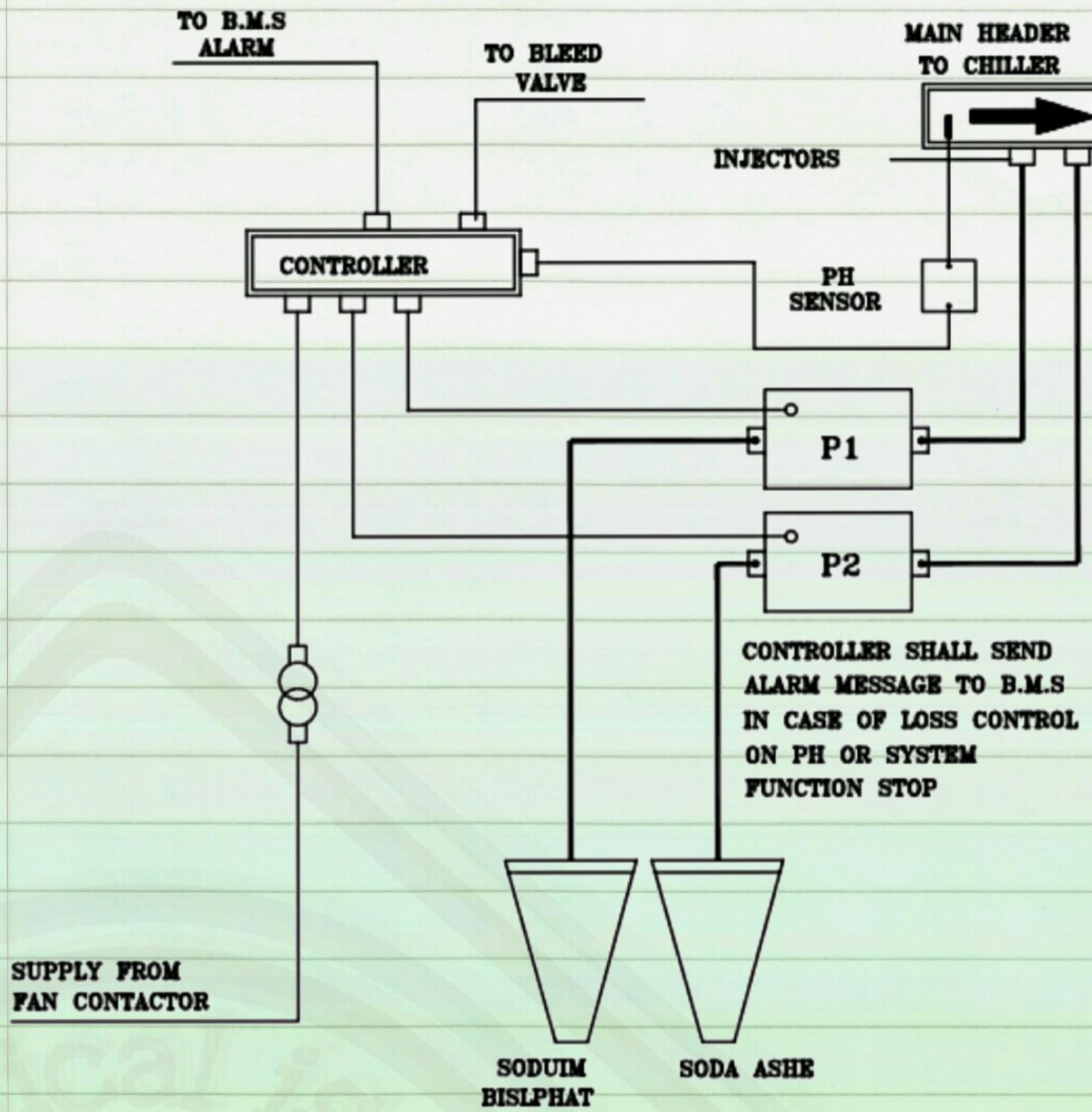
- Chemical remove Corrosive dissolved oxgyen in the water.

Dosing pump used to applying the predetermind quantities of chemical at regular intervals.

* Mechanical treatment:
  Before Commisstioning, System should be cleaned & flused using treated water.

* Filtration:
  Used for removing (or reducing) the Solid particles (like →
  - welding flush
  - Concrete.

Chemical treatment Station



7

PHOTO FROM REAL SITE

① Chiller

Air Cooled

Water Cooled

② Pumps

③ Make Up Unit

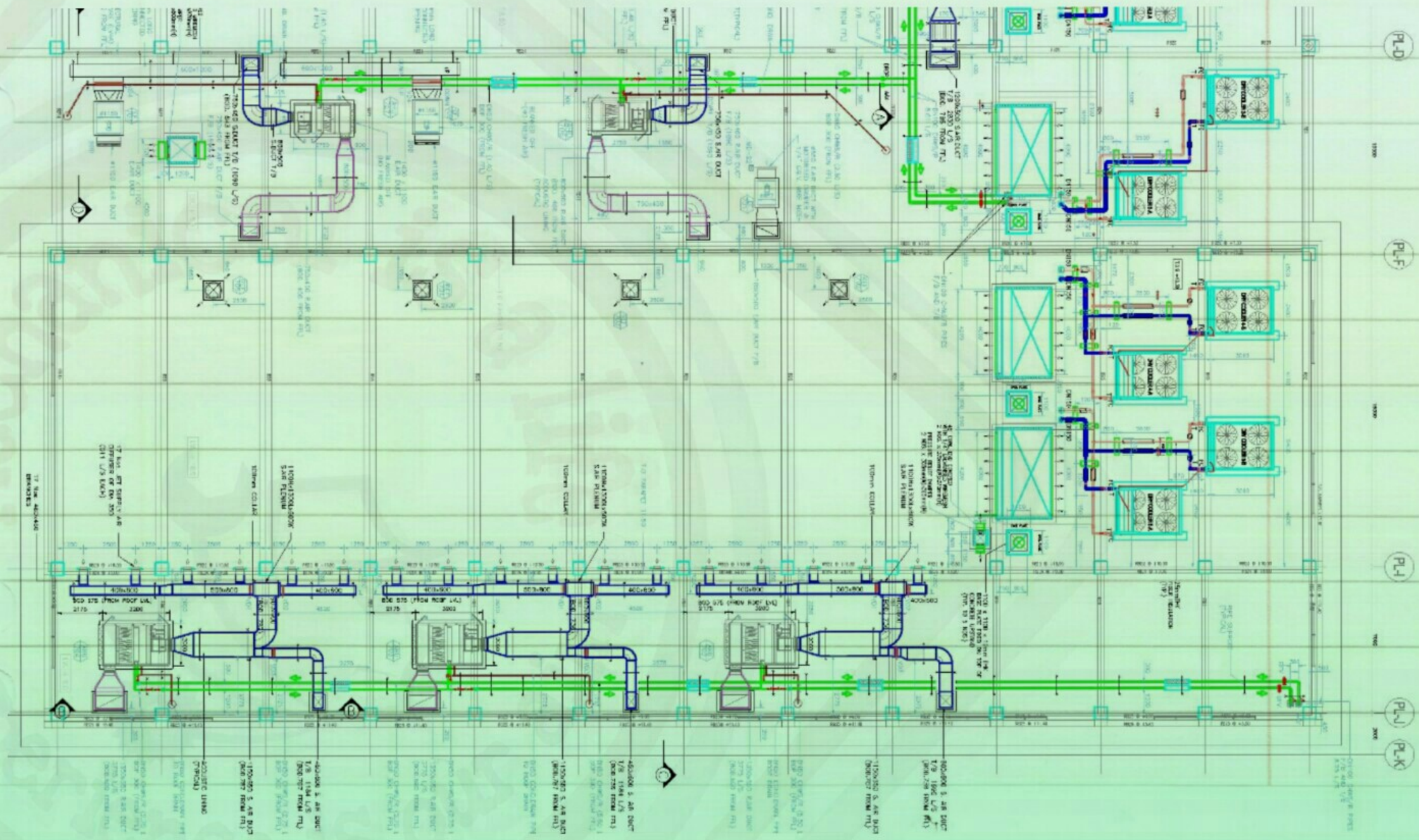
④ Air Separator

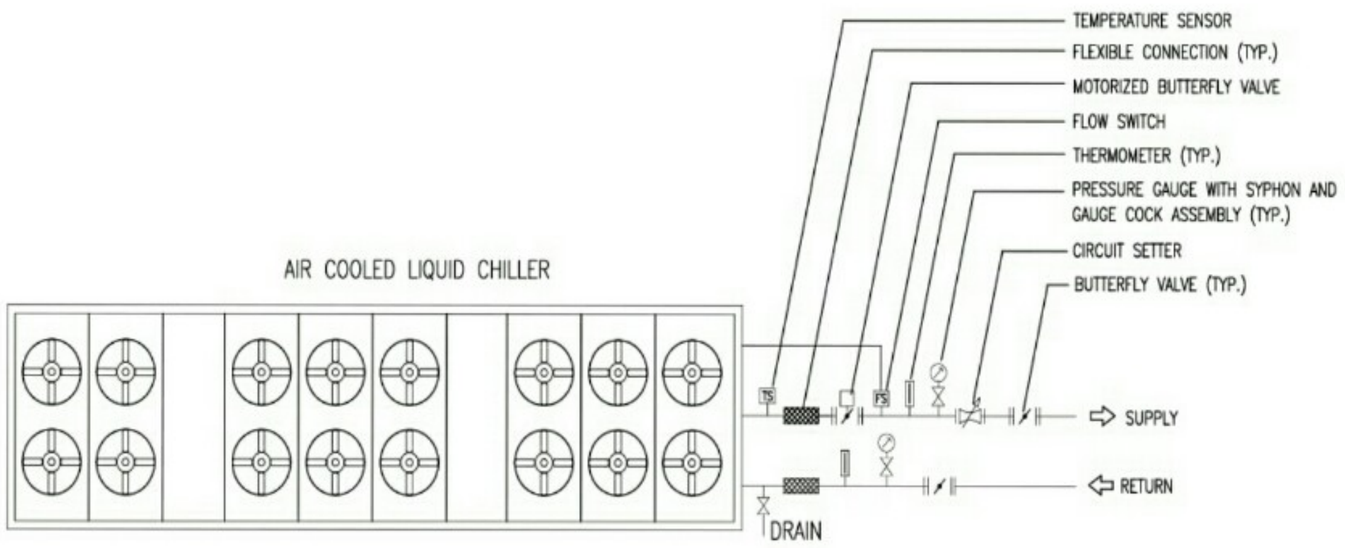
⑤ Cooling Tower

⑥ Chemical treatment Unit.

8

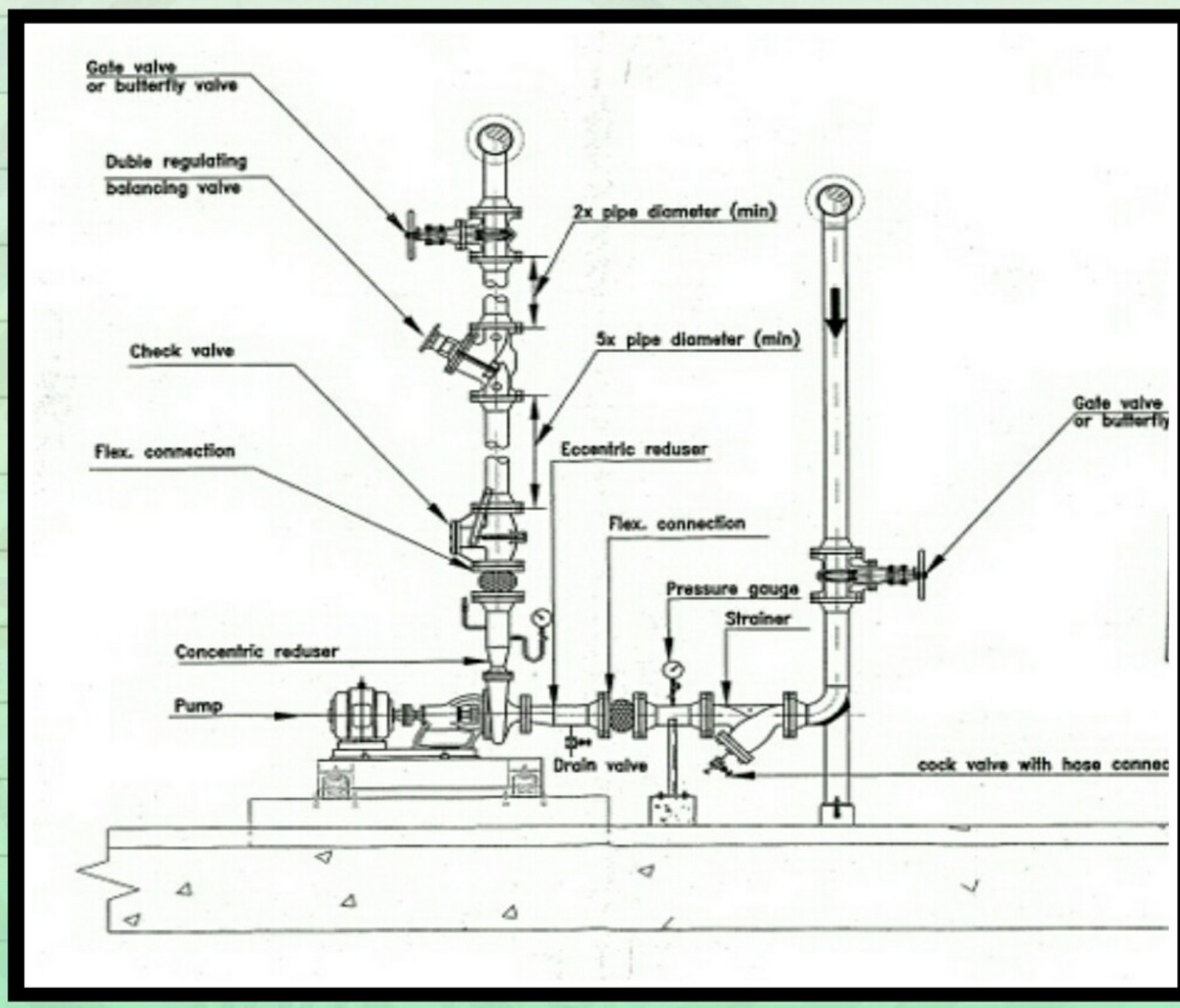
SYMBOL FROM IFC DRAWING



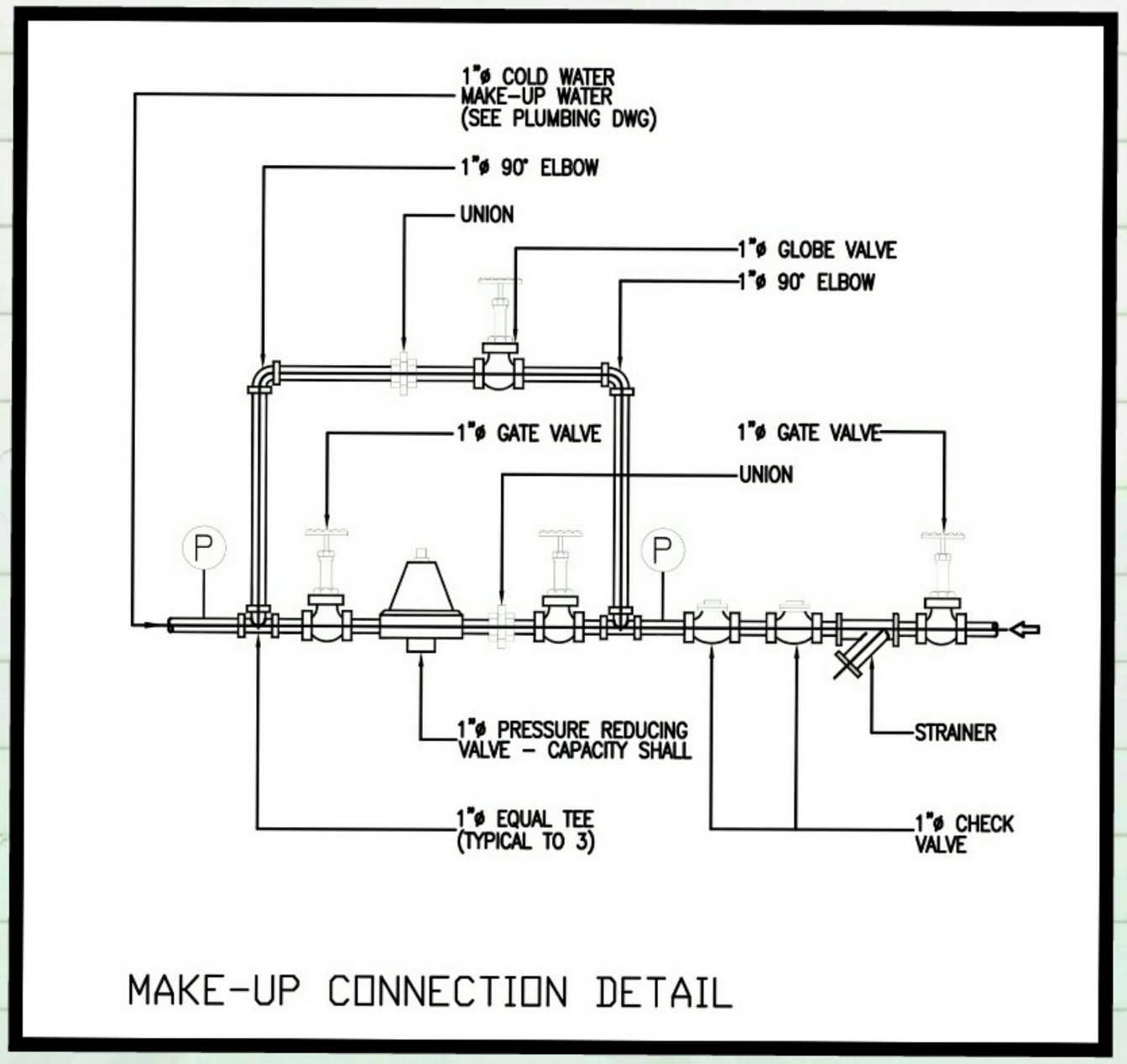


6 GM006 CHILLER AND PIPING ARRANGEMENT
N T S

Chiller

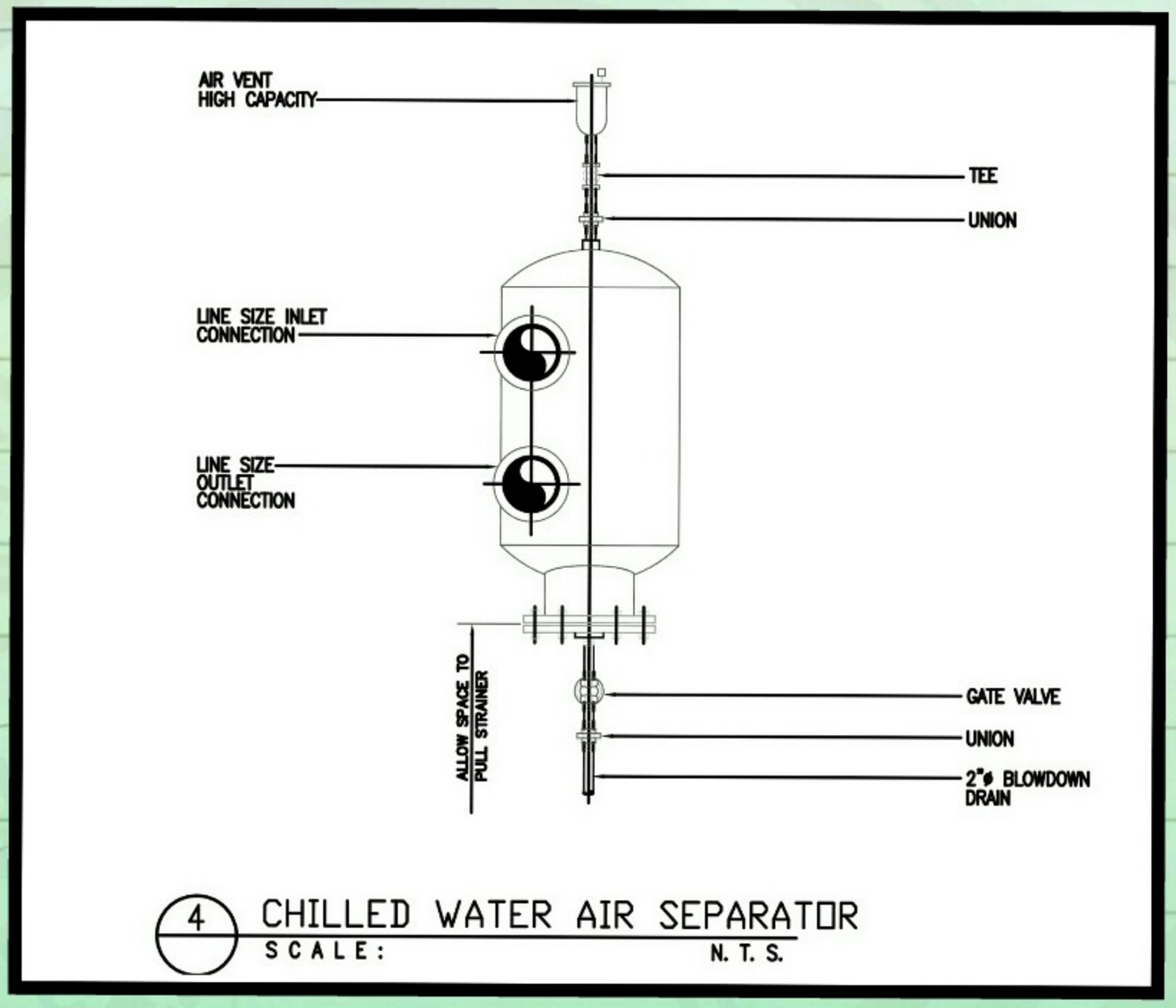


Pump



MAKE-UP CONNECTION DETAIL

Make up Connection



4 CHILLED WATER AIR SEPARATOR
SCALE: N. T. S.

Air Separator