

برج های خنک کننده *Cooling Tower*

تهیه کننده:

فریدون اسدی آسیابدري

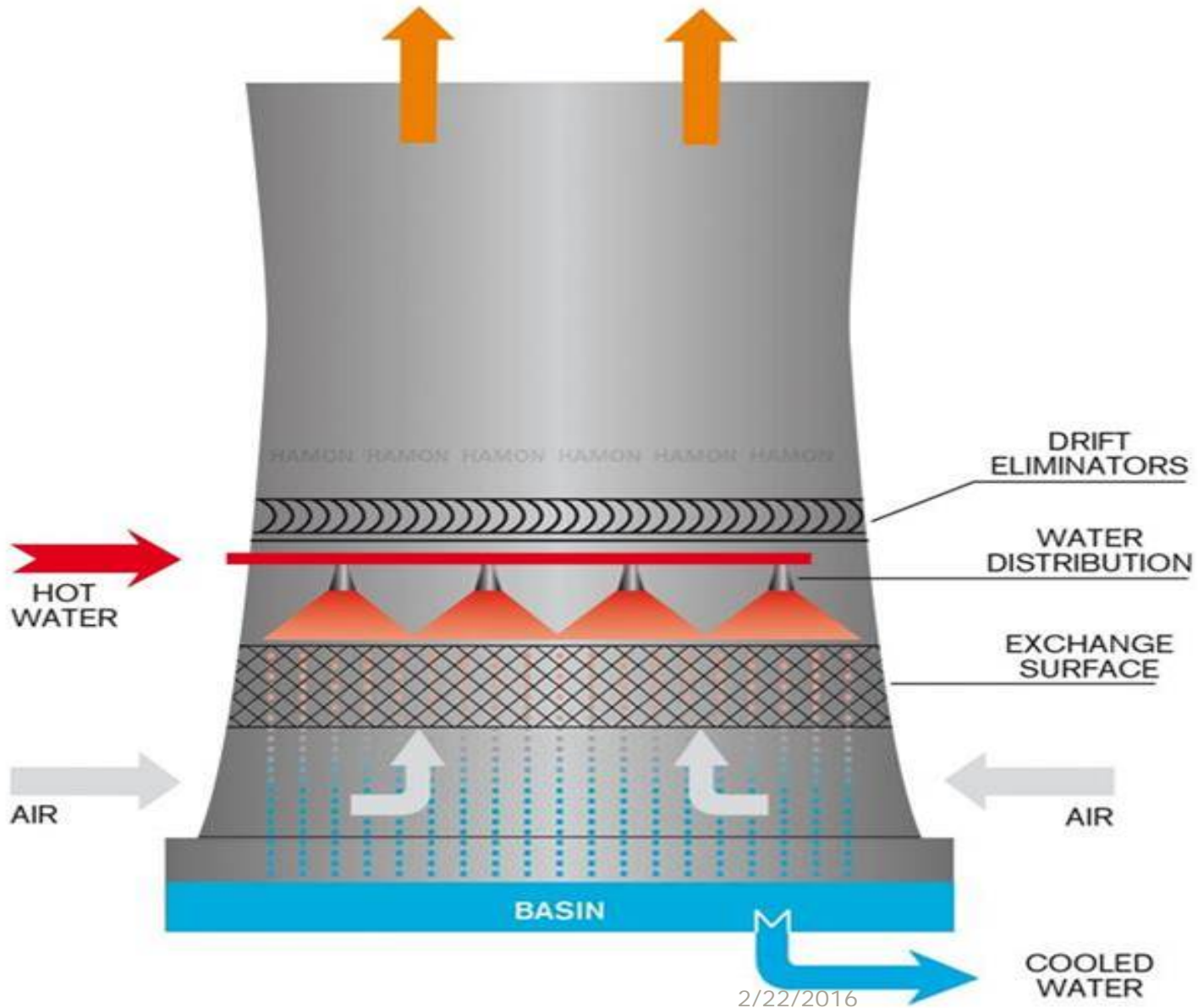
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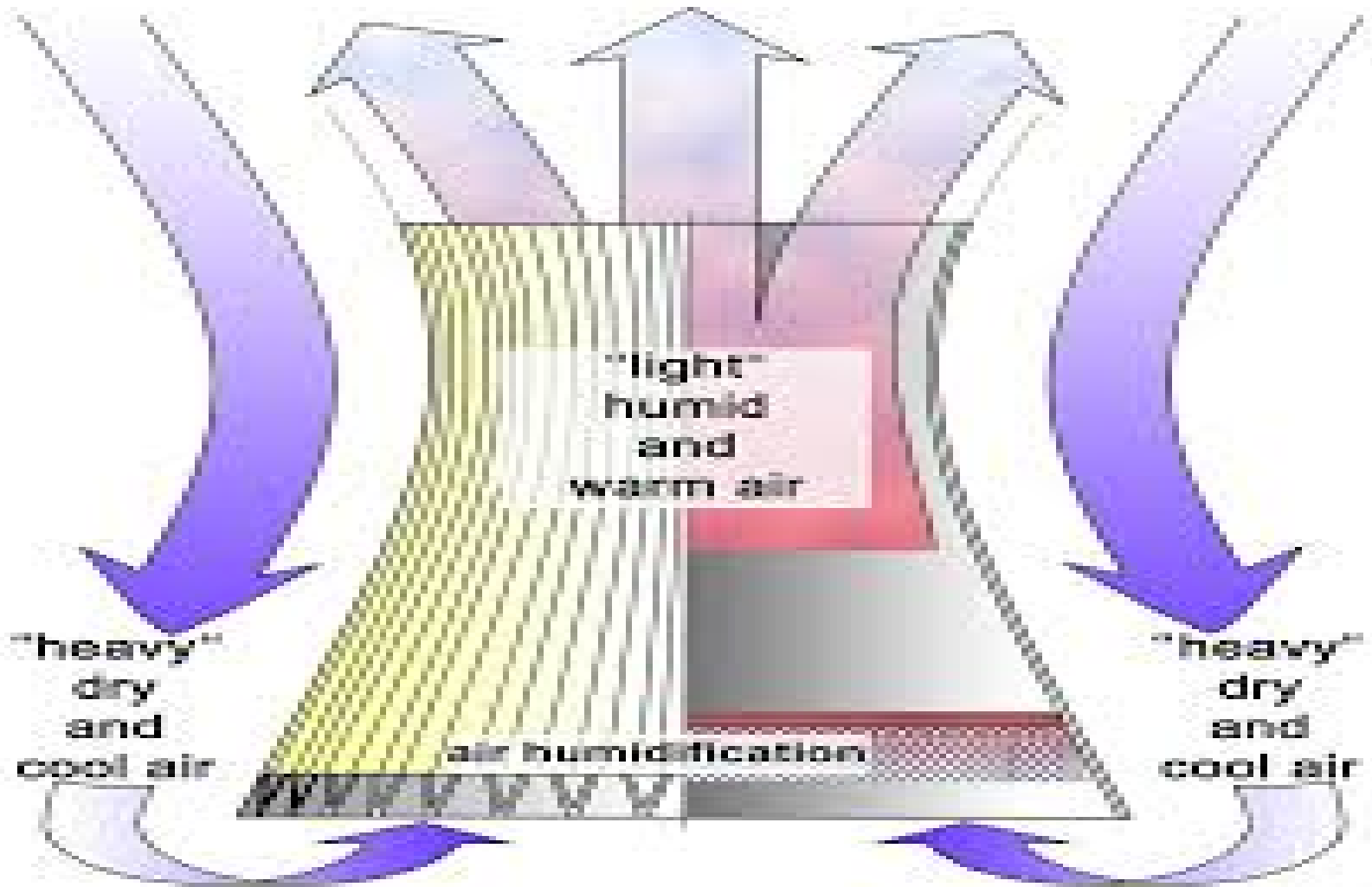
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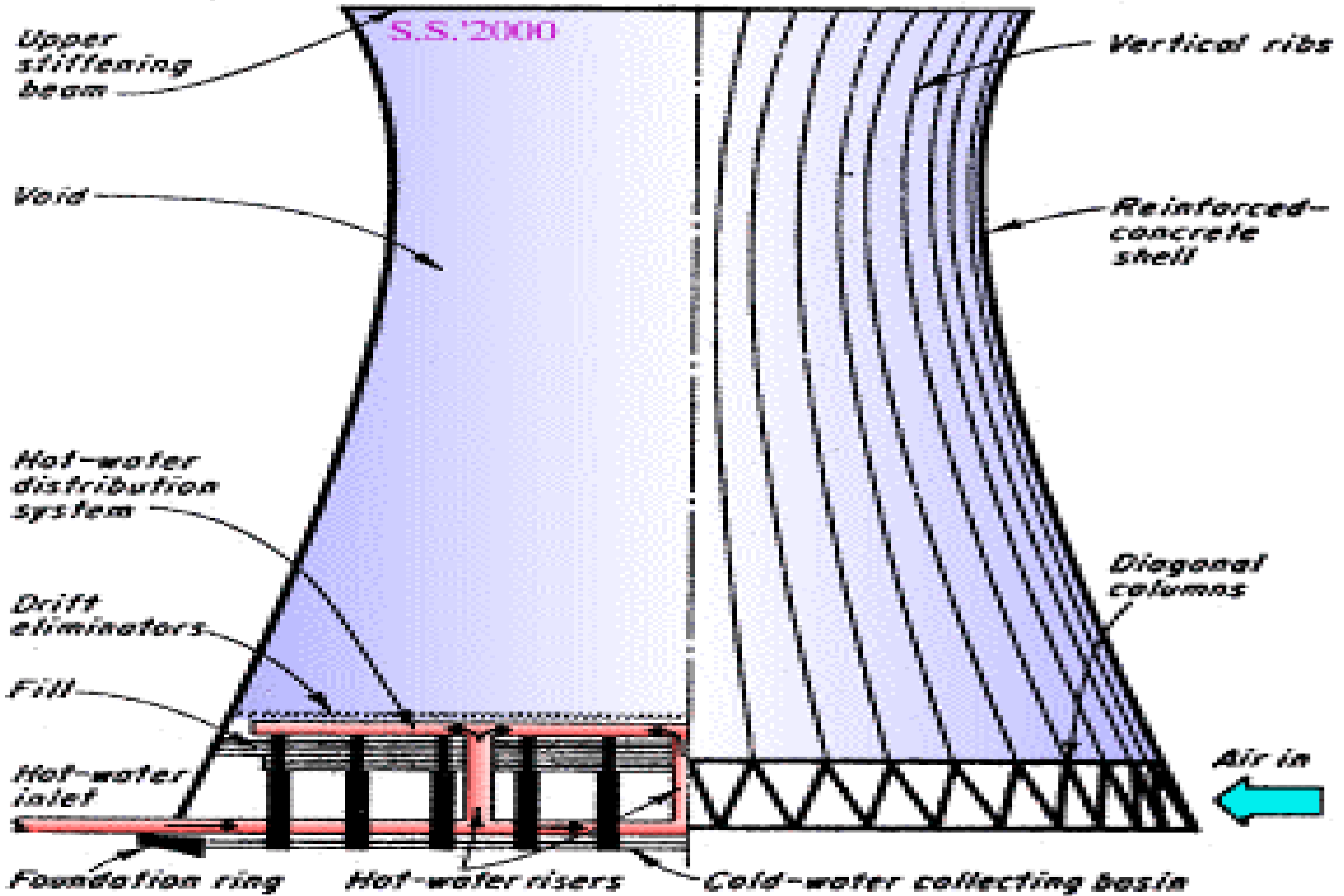
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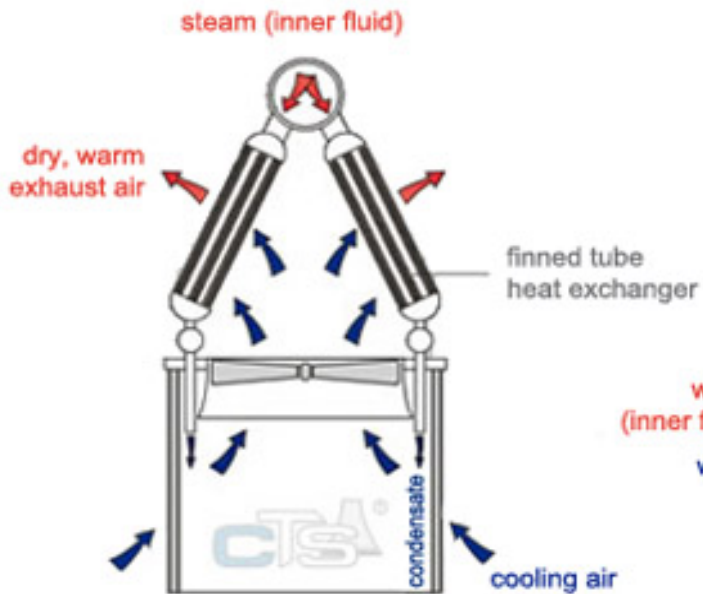
BY: DR. MOHAMMAD ALI SADEGHZADEH

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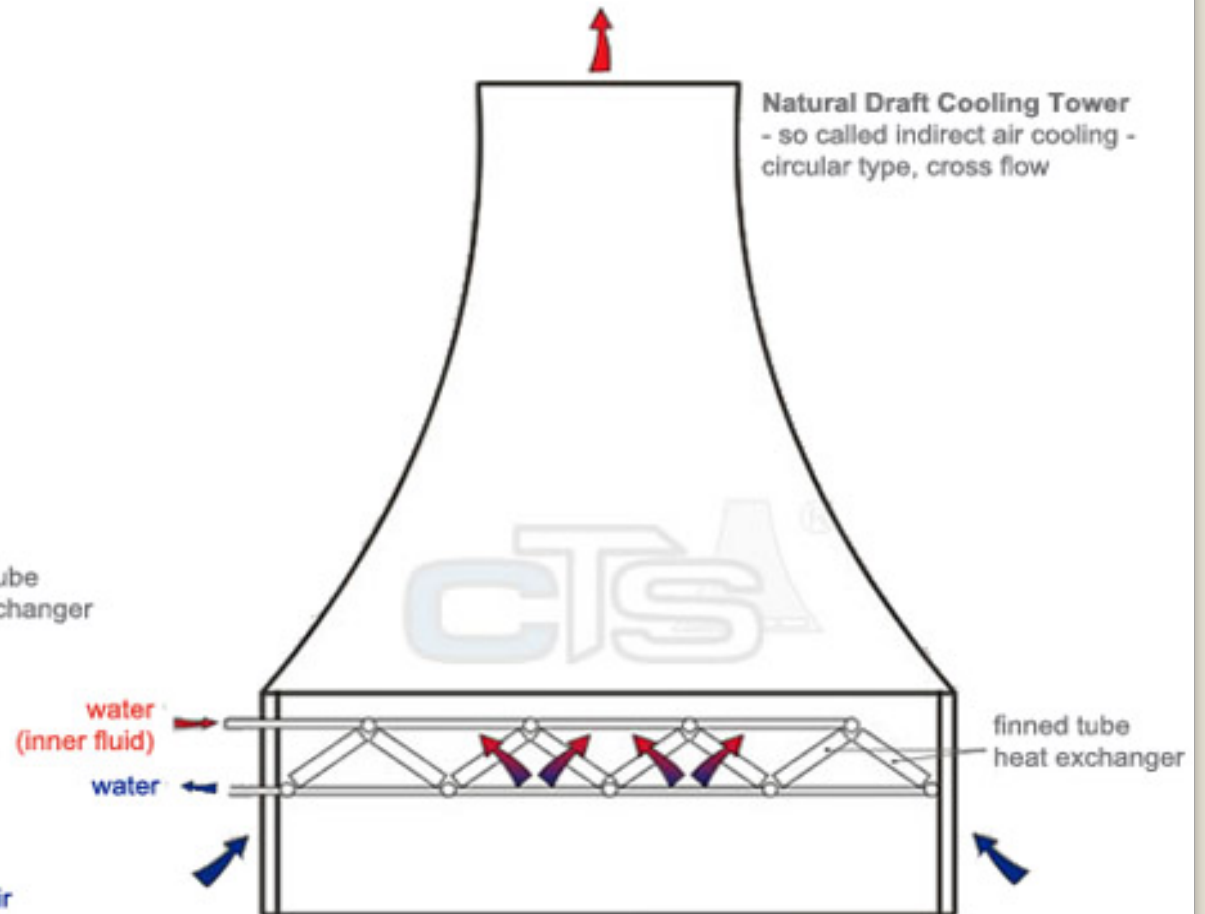
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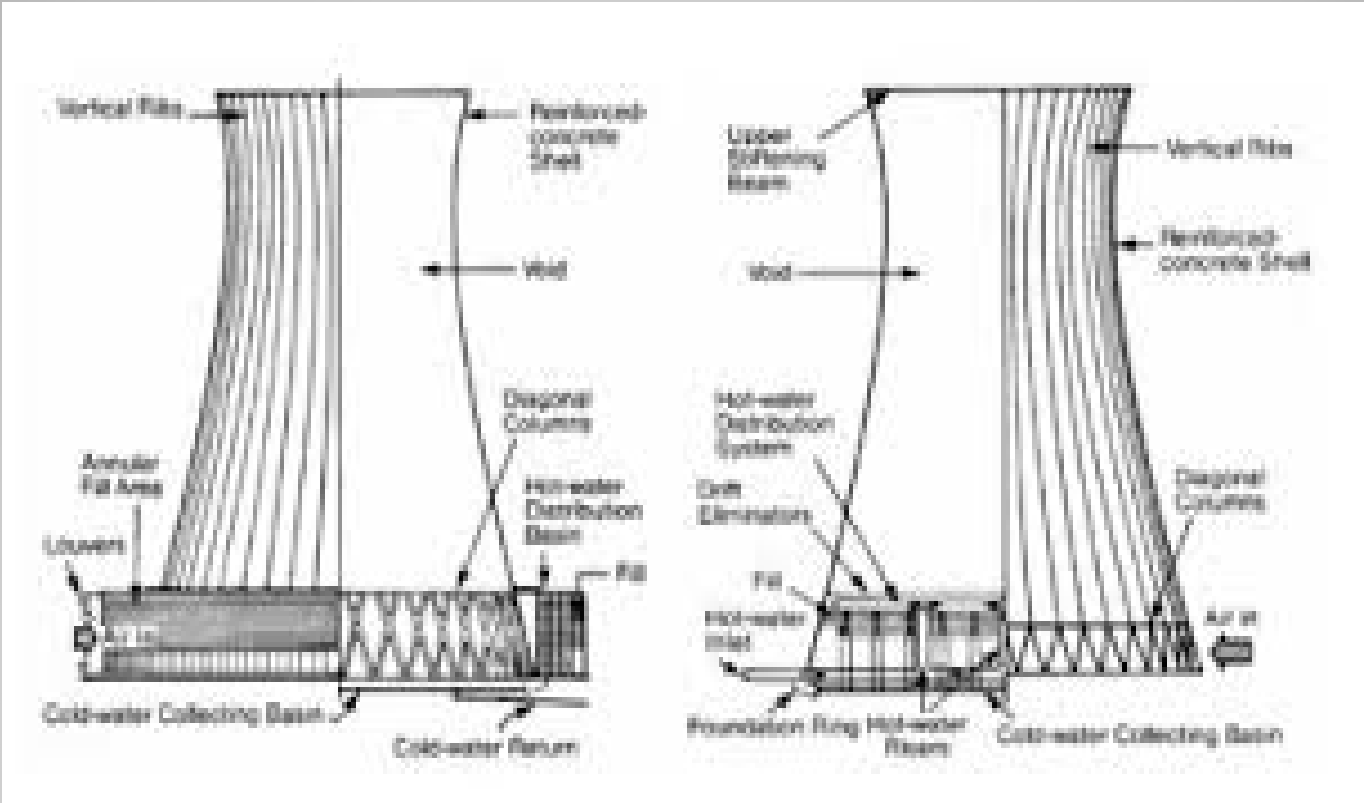


Air Cooled Condenser
 - so called direct air cooling -
 roof type, cross flow
 forced draft fan arrangement



Natural Draft Cooling Tower
 - so called indirect air cooling -
 circular type, cross flow







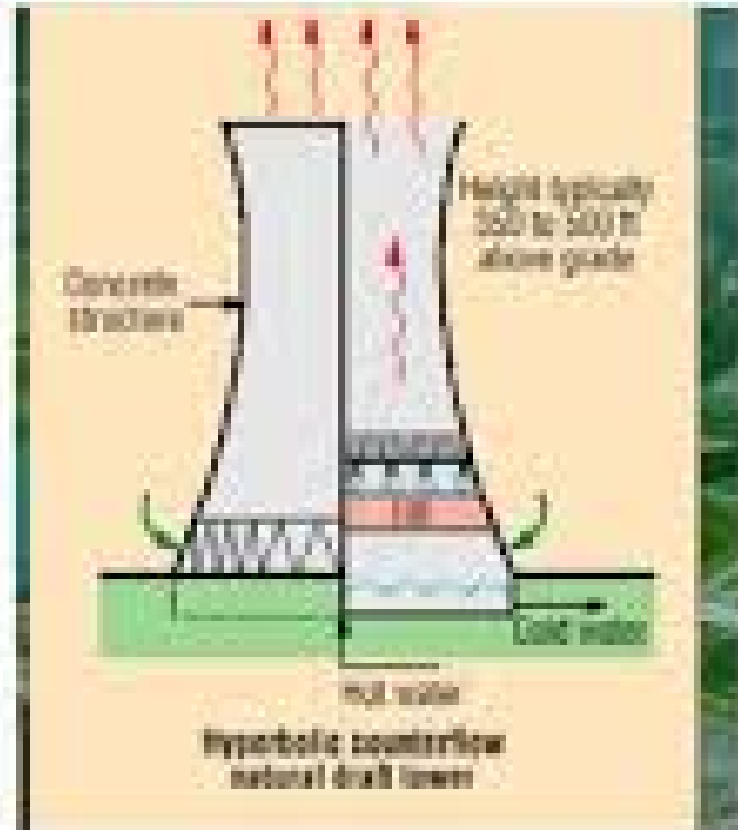
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Disney 2001

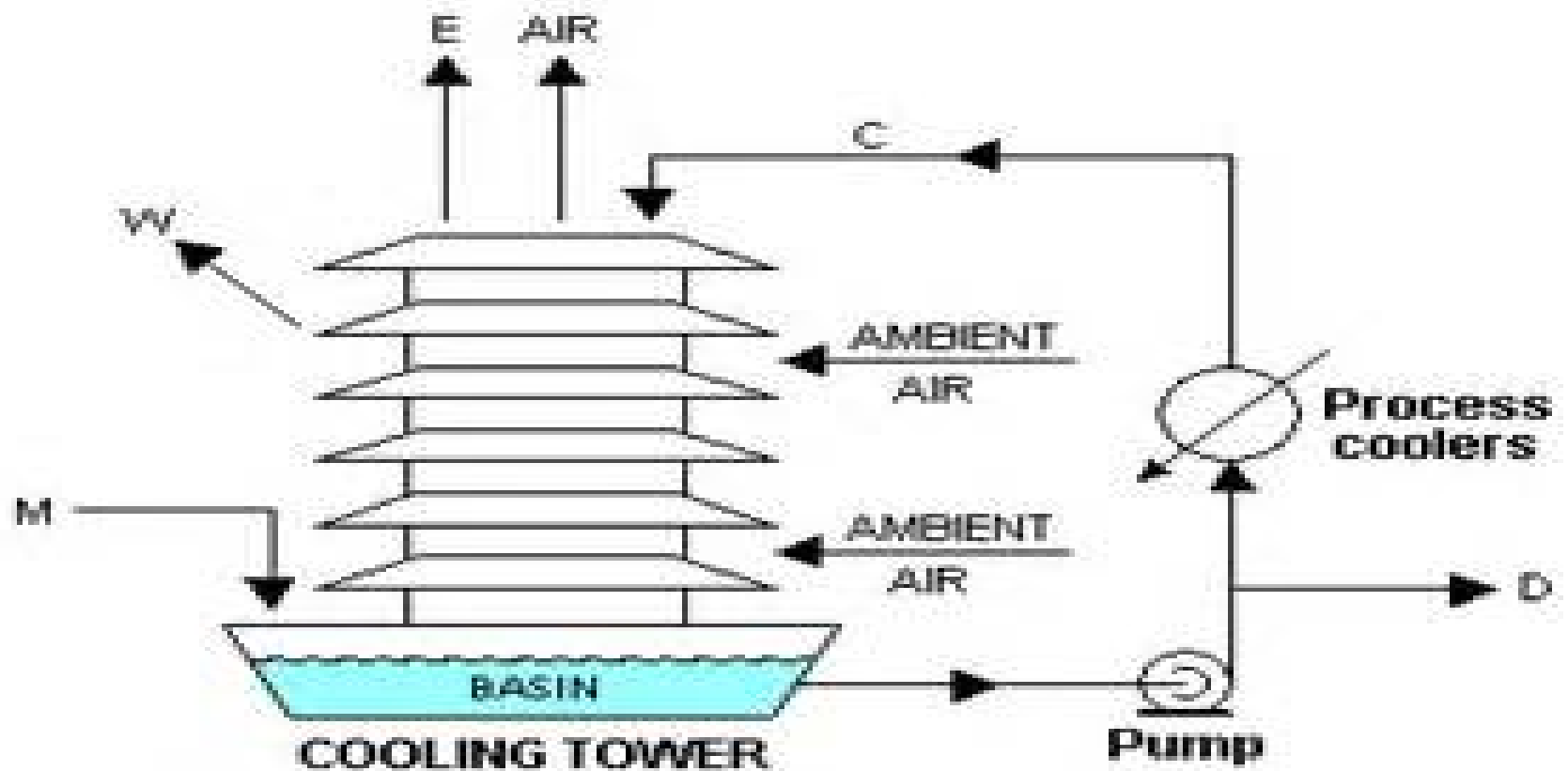
-Natural Draft Towers

Natural draft, which utilizes buoyancy via a tall chimney. Warm, moist air naturally rises due to the density differential to the dry, cooler outside air. Warm **moist air** is less dense than drier air at the same temperature and pressure. This moist air buoyancy produces a current of air through the tower.

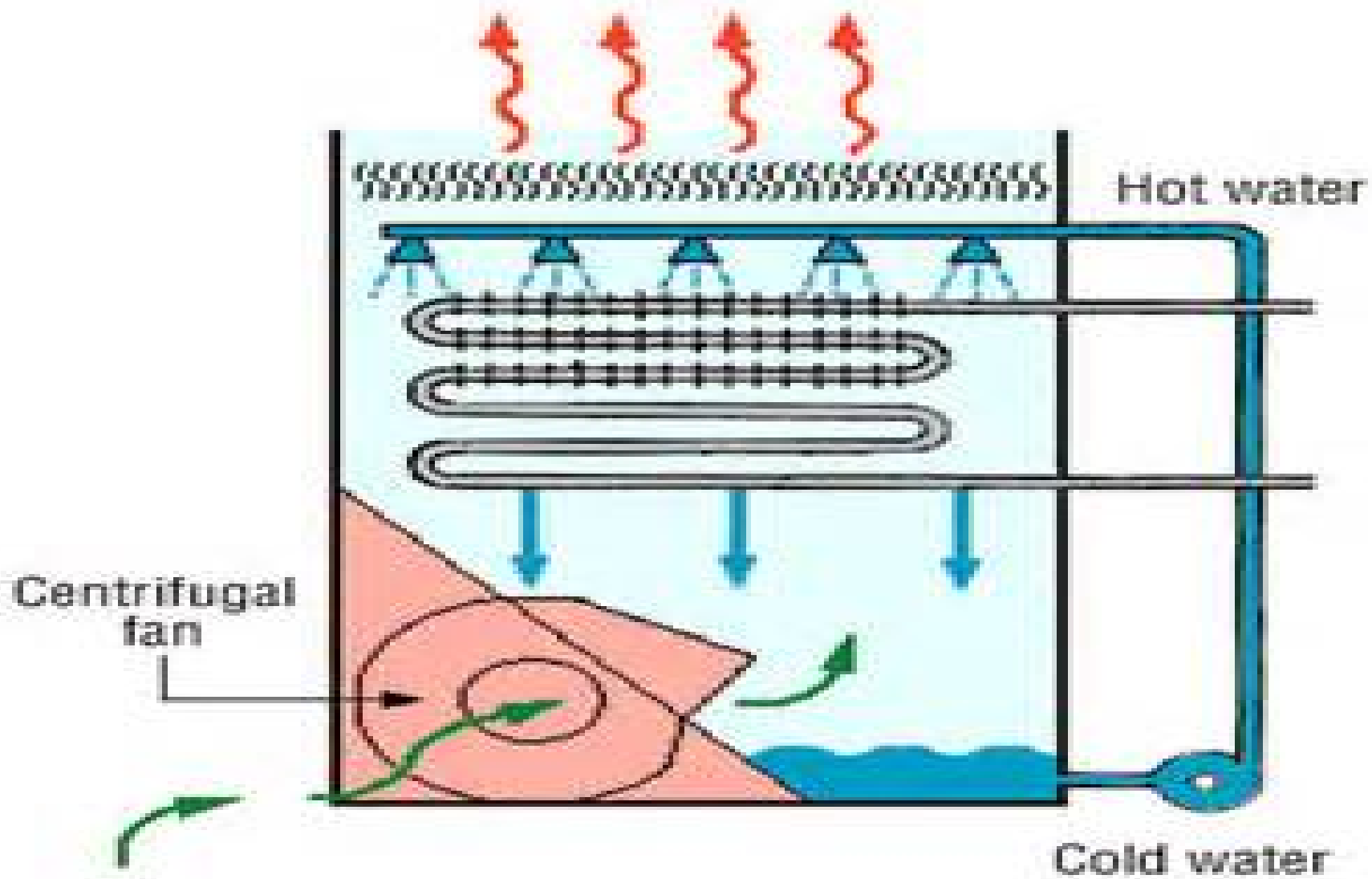
This photo shows a single natural draft cooling tower as used at a European plant. Natural draft towers are typically about 400 ft (120 m) high, depending on the differential pressure between the cold outside air and the hot humid air on the inside of the tower as the driving force. No fans are used,

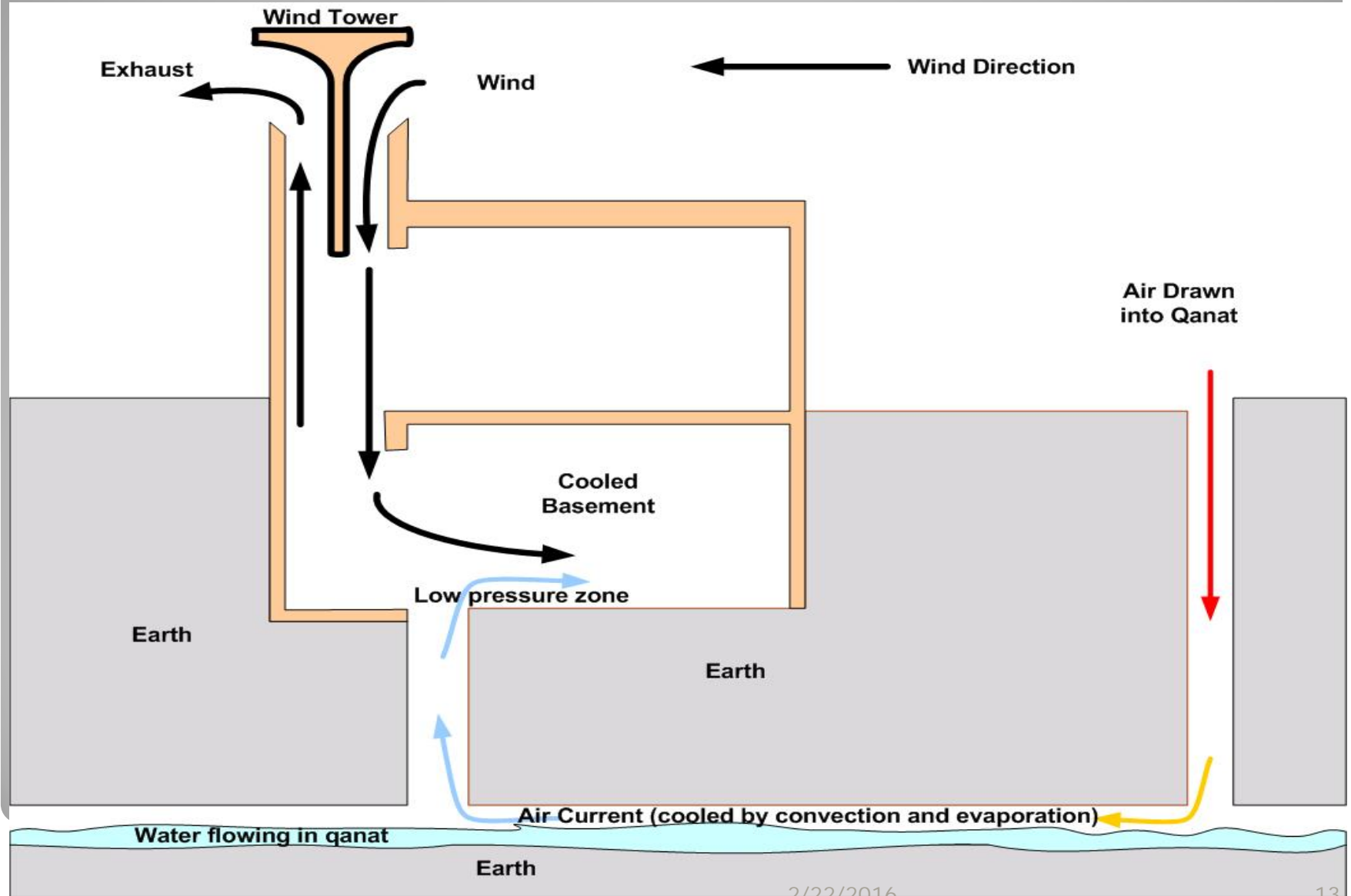


COOLING TOWER SYSTEM

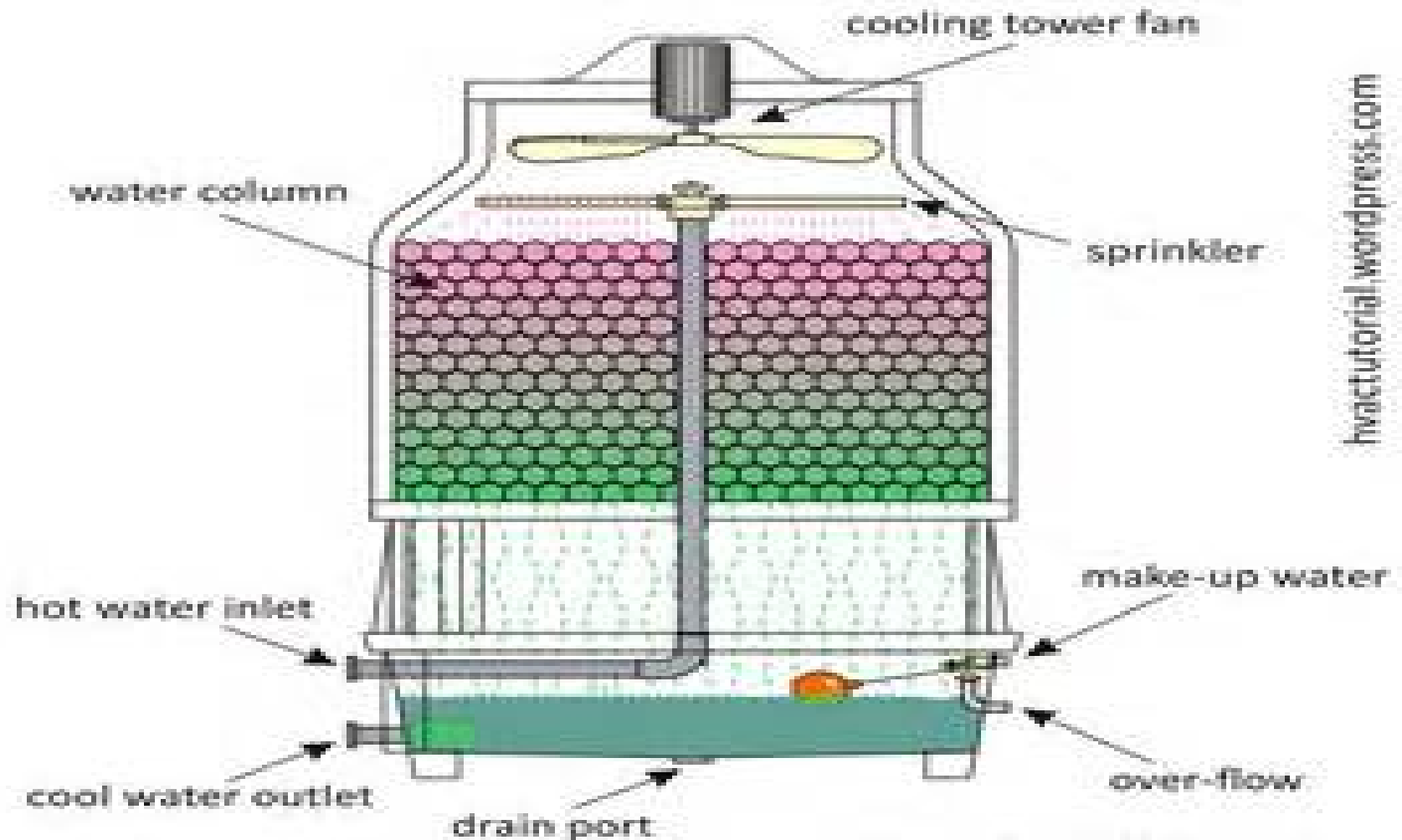


- C** = CIRCULATING COOLING WATER
- E** = EVAPORATED WATER
- W** = WINDAGE or DRIFT LOSS
- M** = MAKEUP WATER
- D** = DRAWOFF or BLOWDOWN WATER





COOLING TOWER

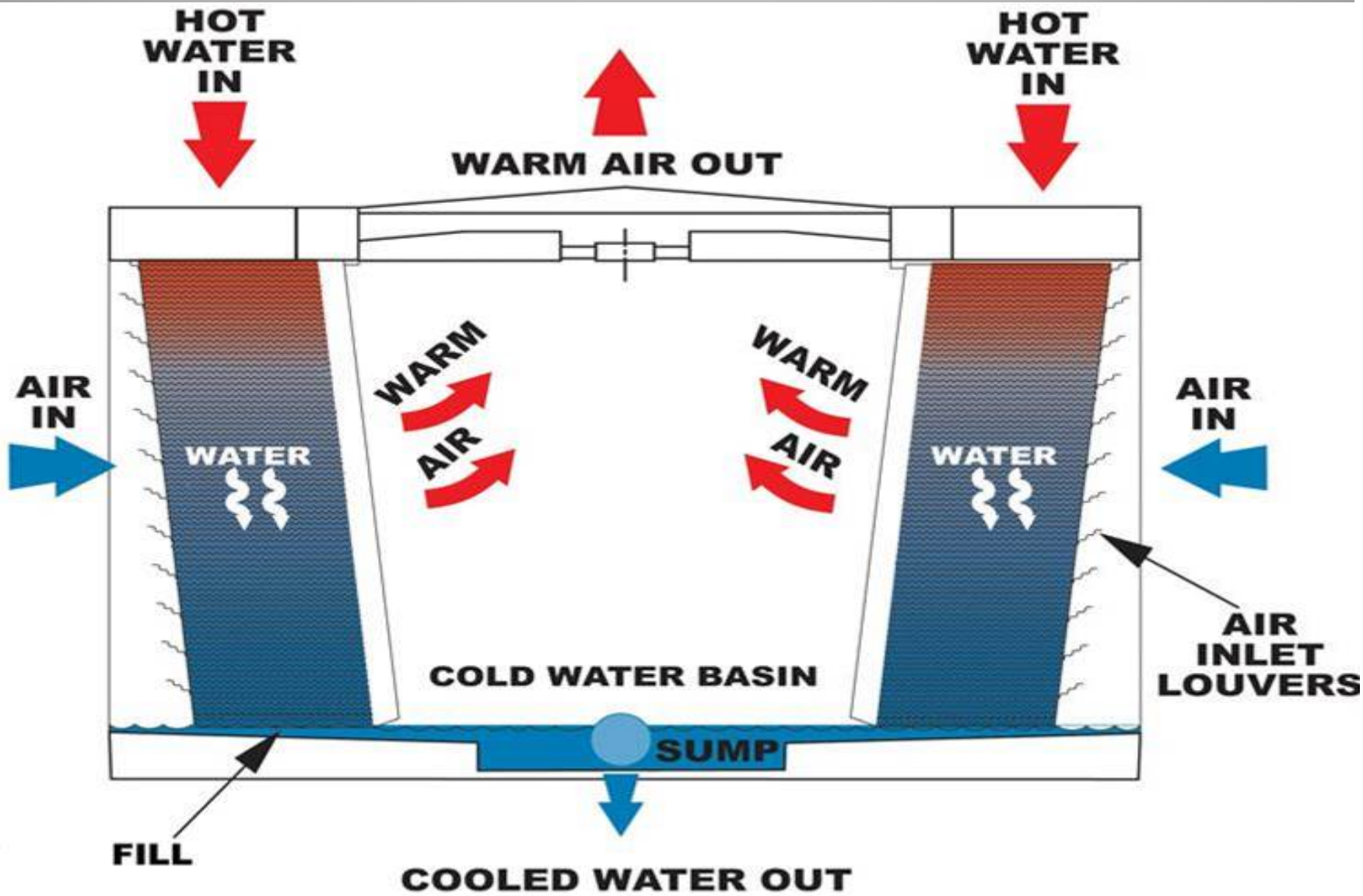


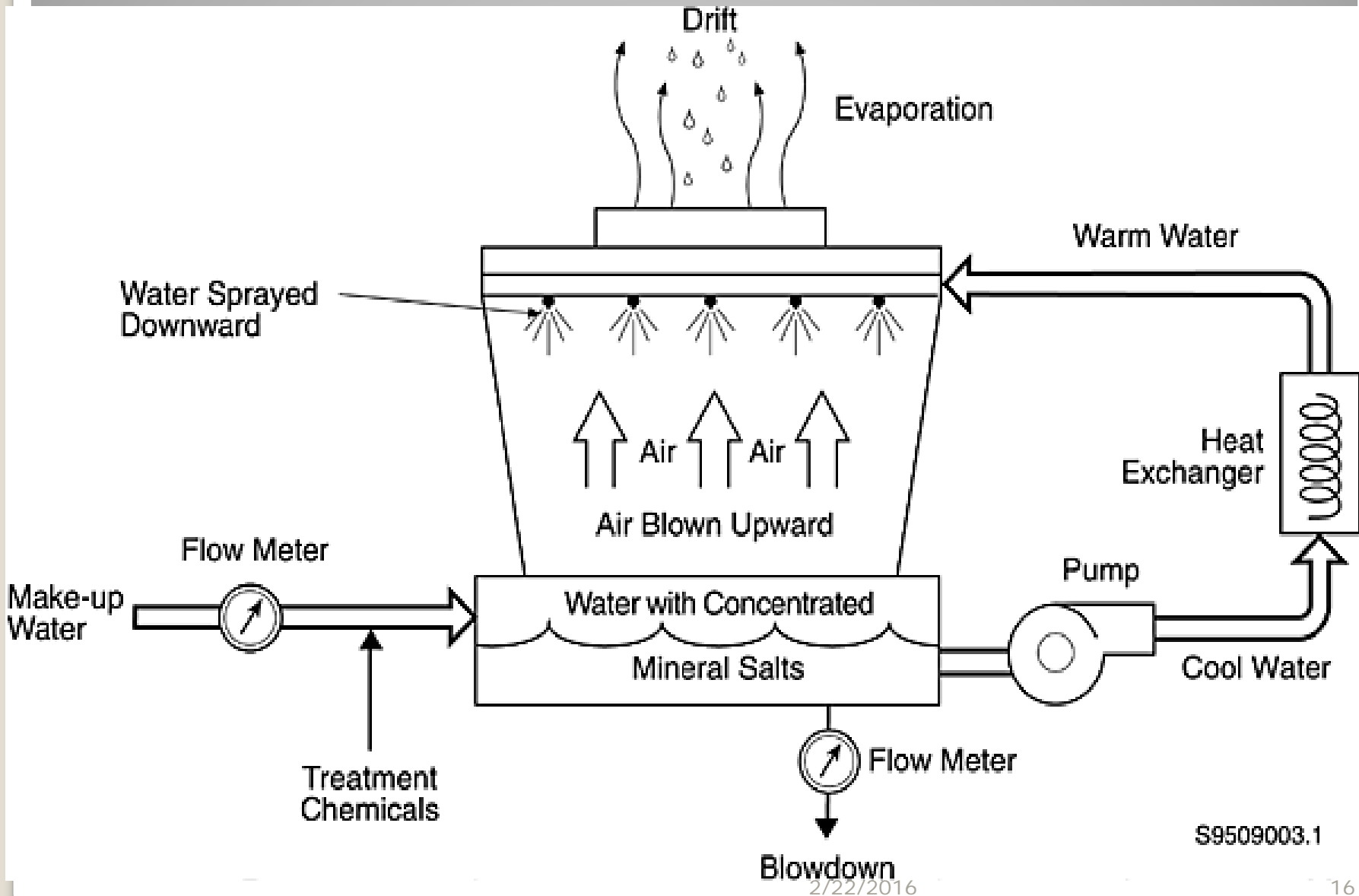
hvactutorial.wordpress.com

drawn and marked by hermusian

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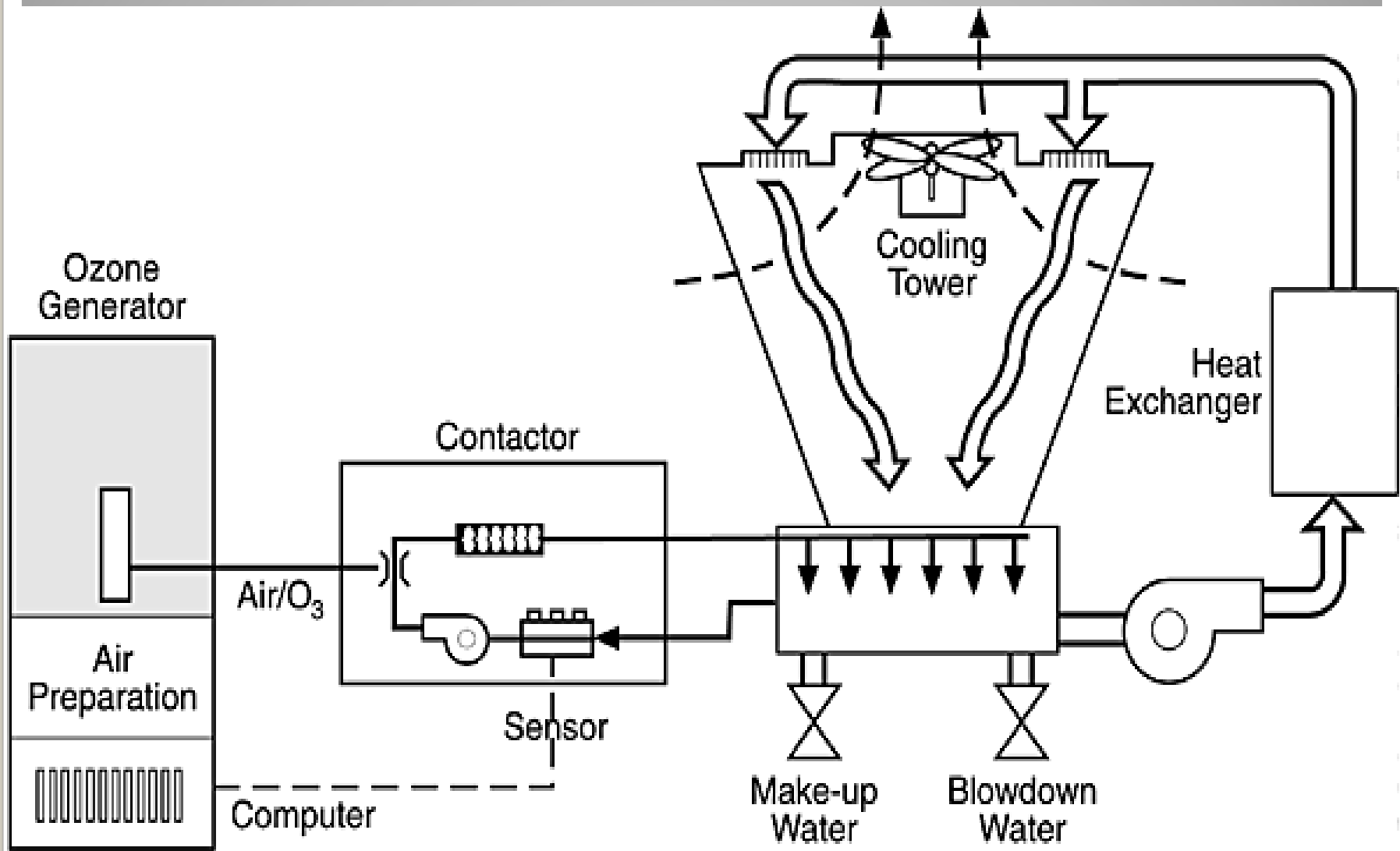
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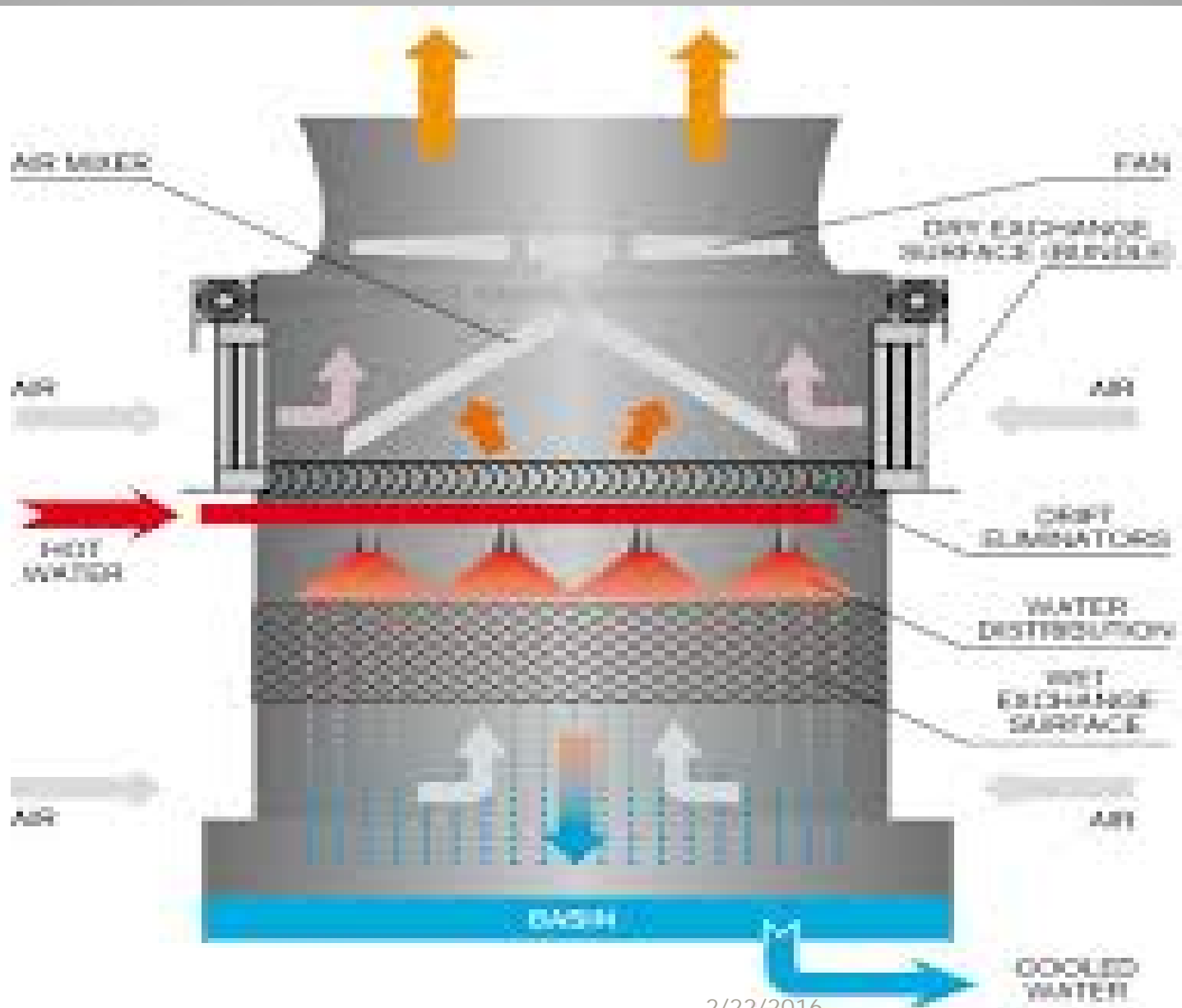
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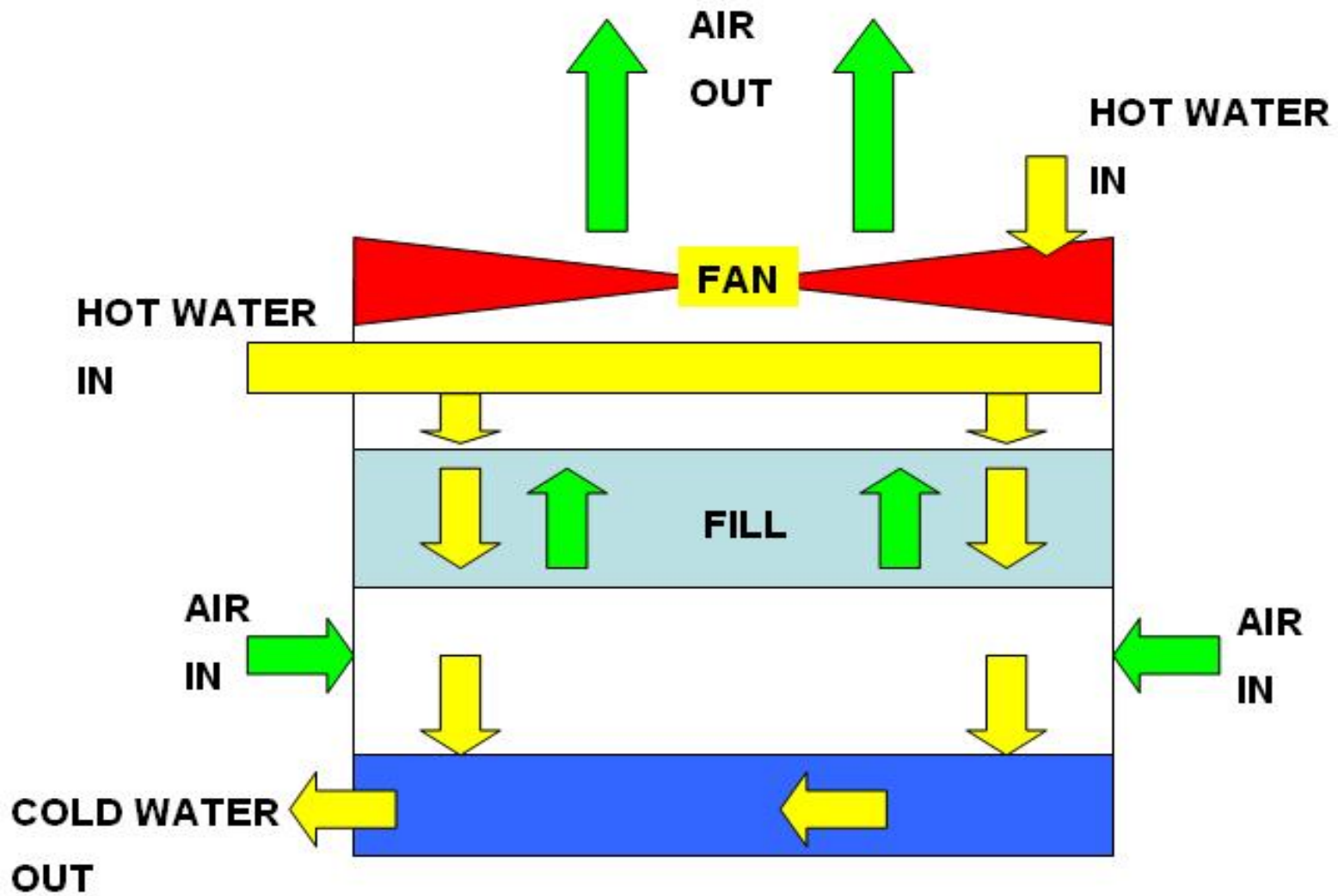
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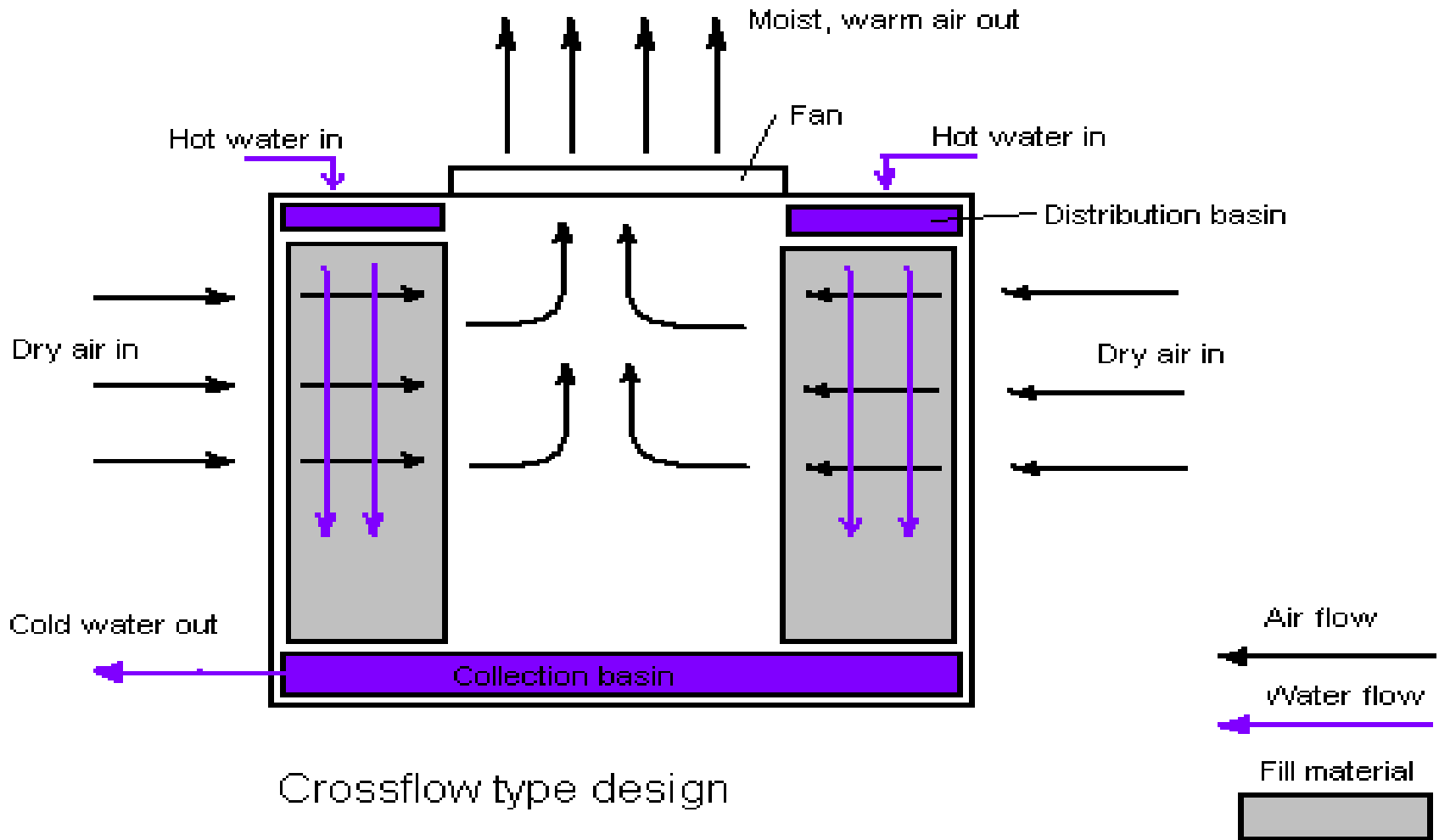
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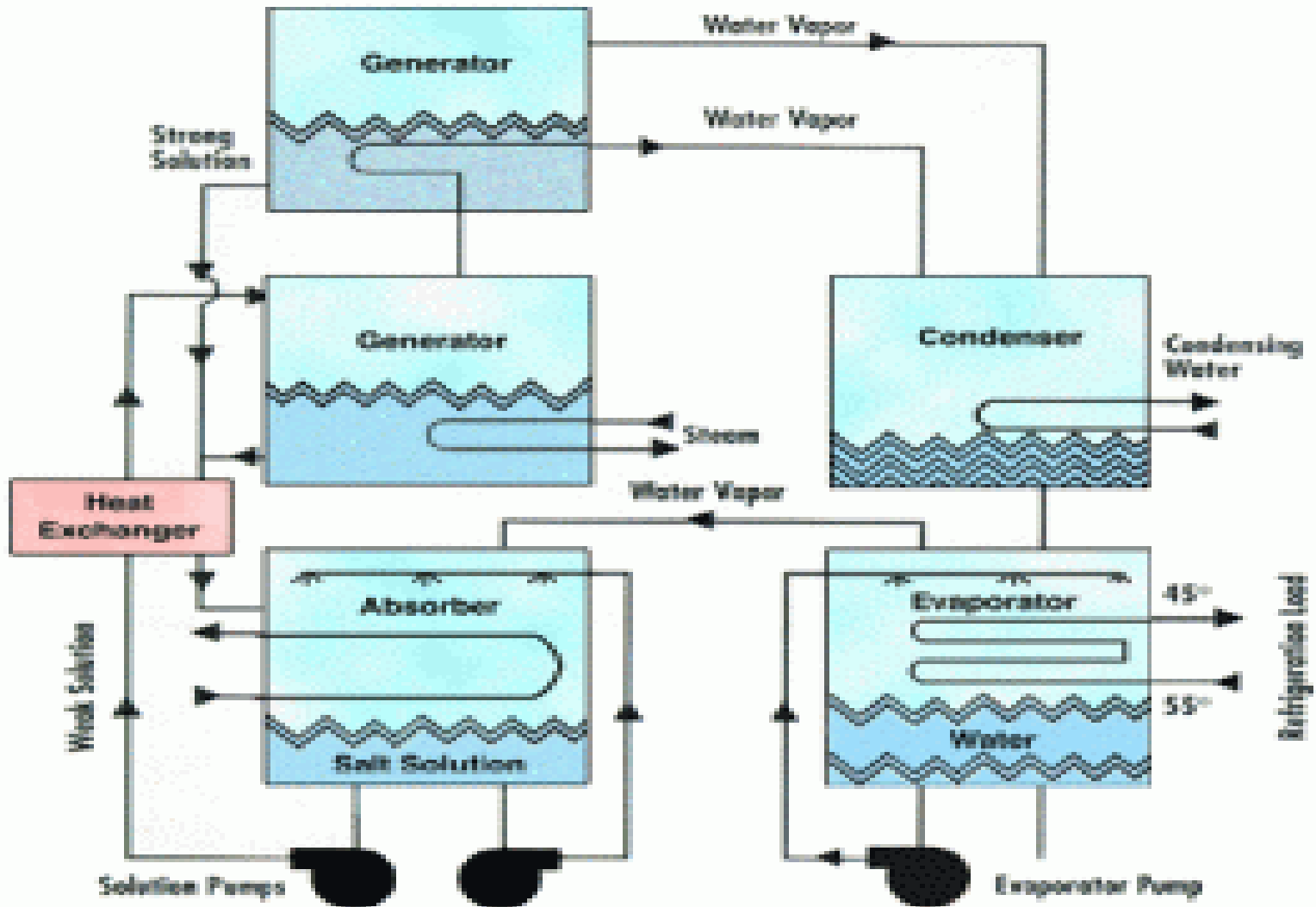
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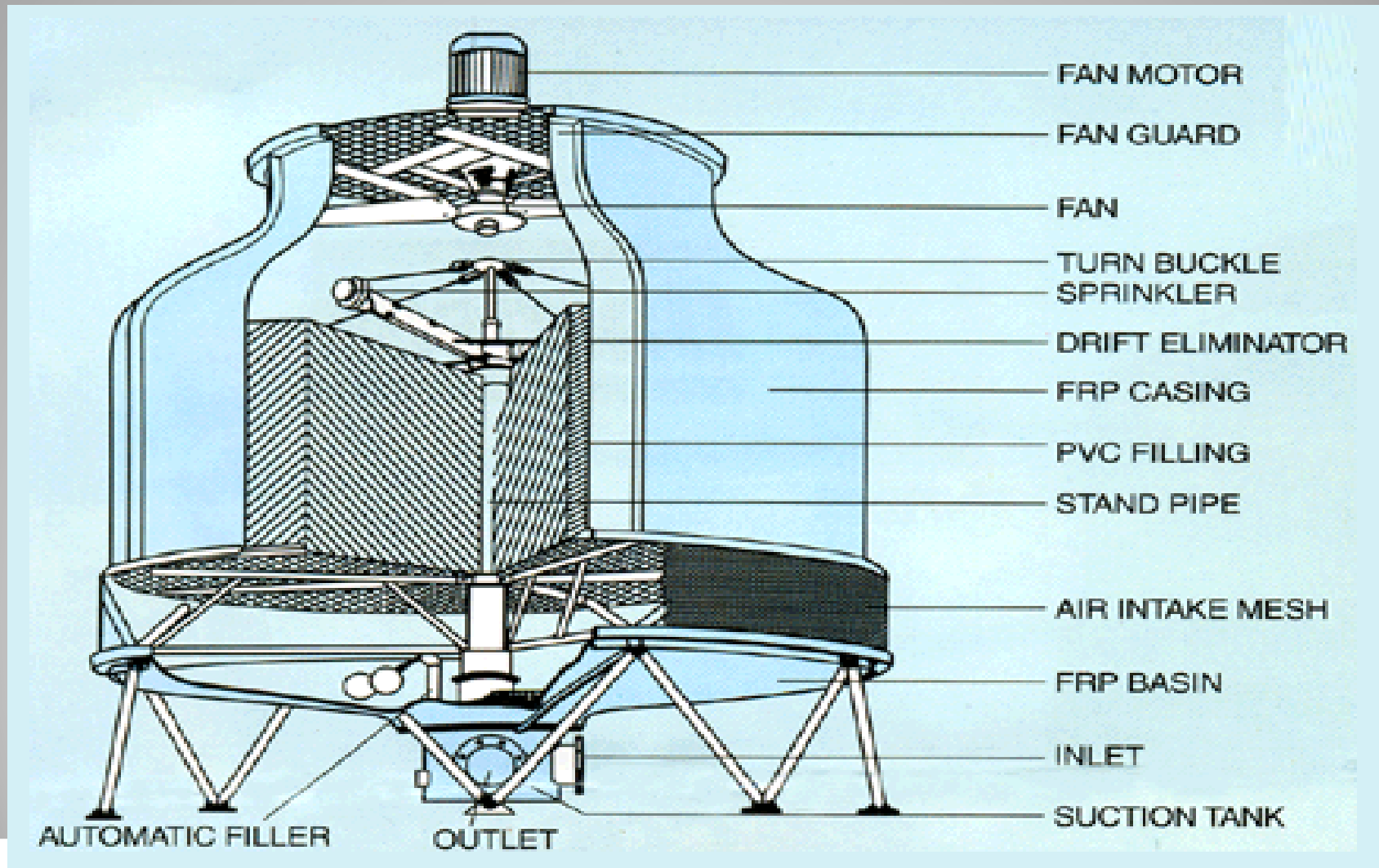


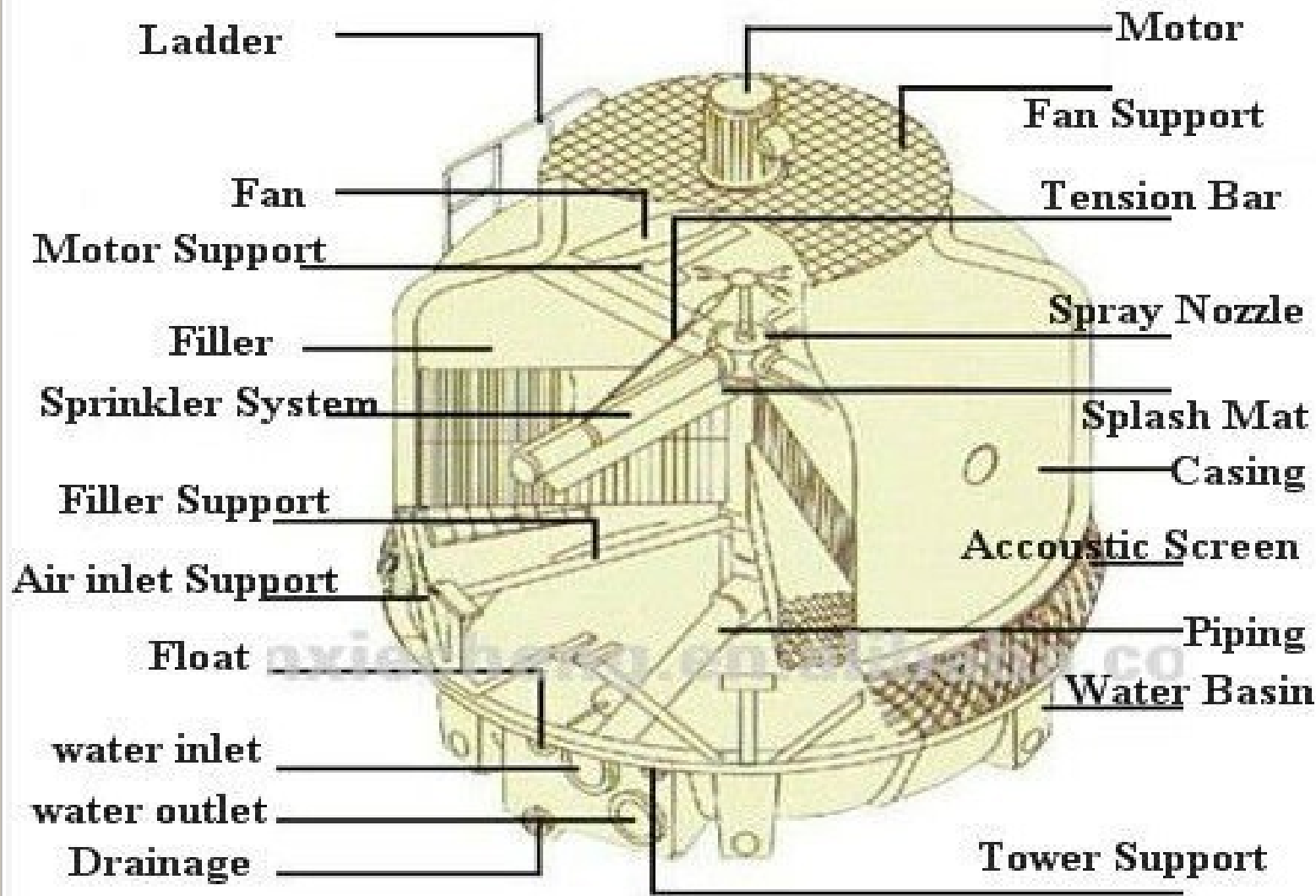


Crossflow type design

Two-Stage Absorption Cooling Cycle

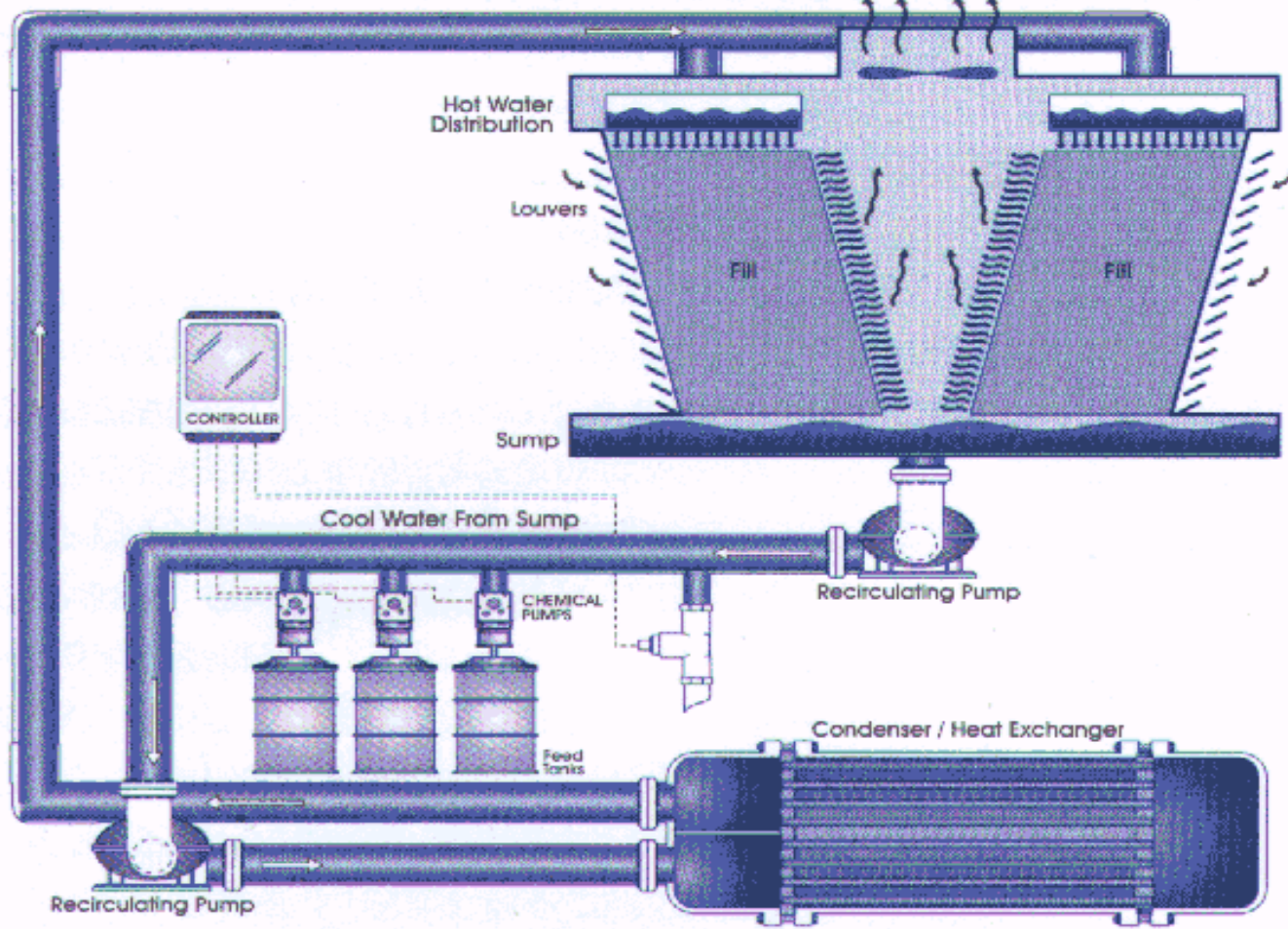






Cooling Tower • Heating Flow Schematic

Mechanically induced Draft



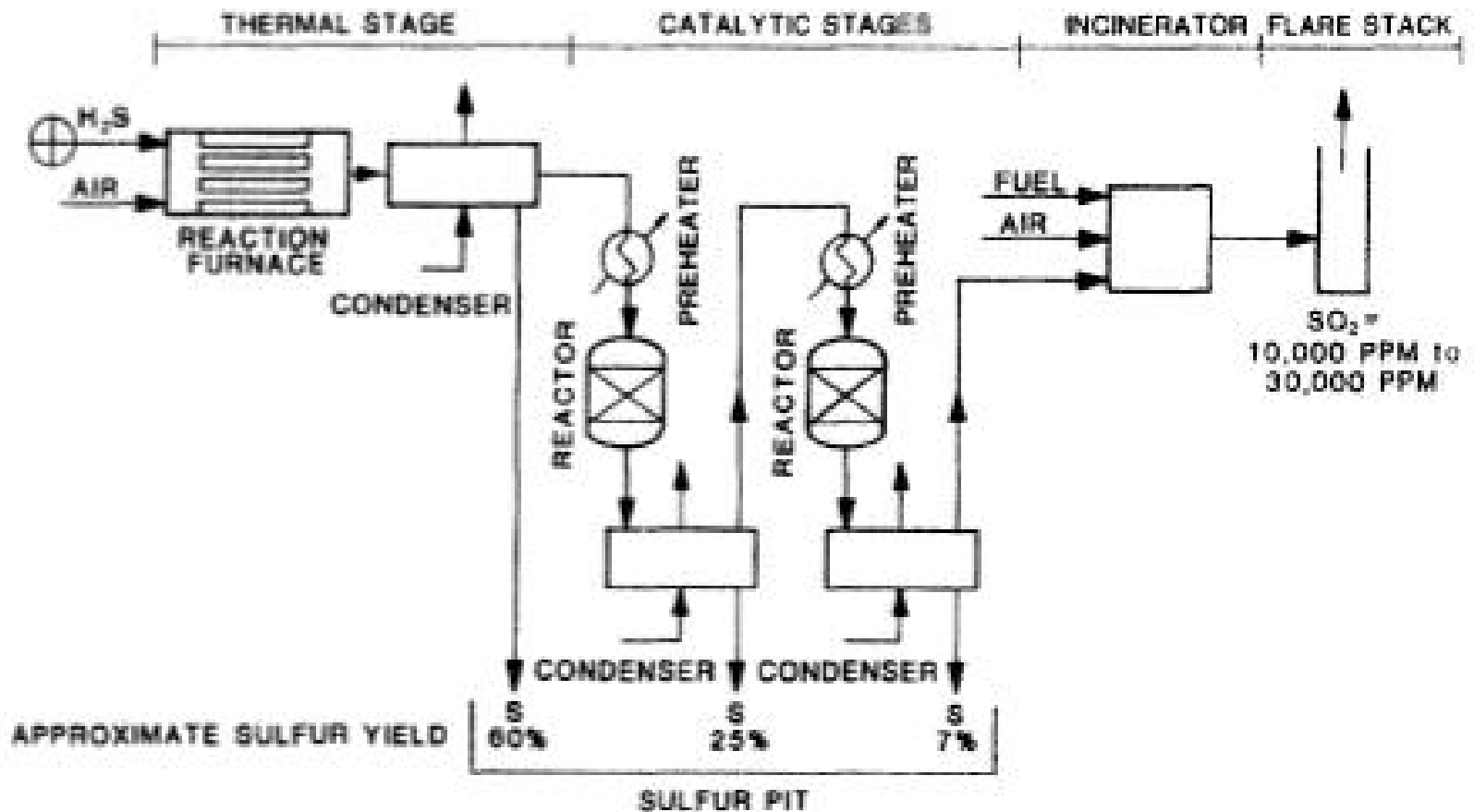
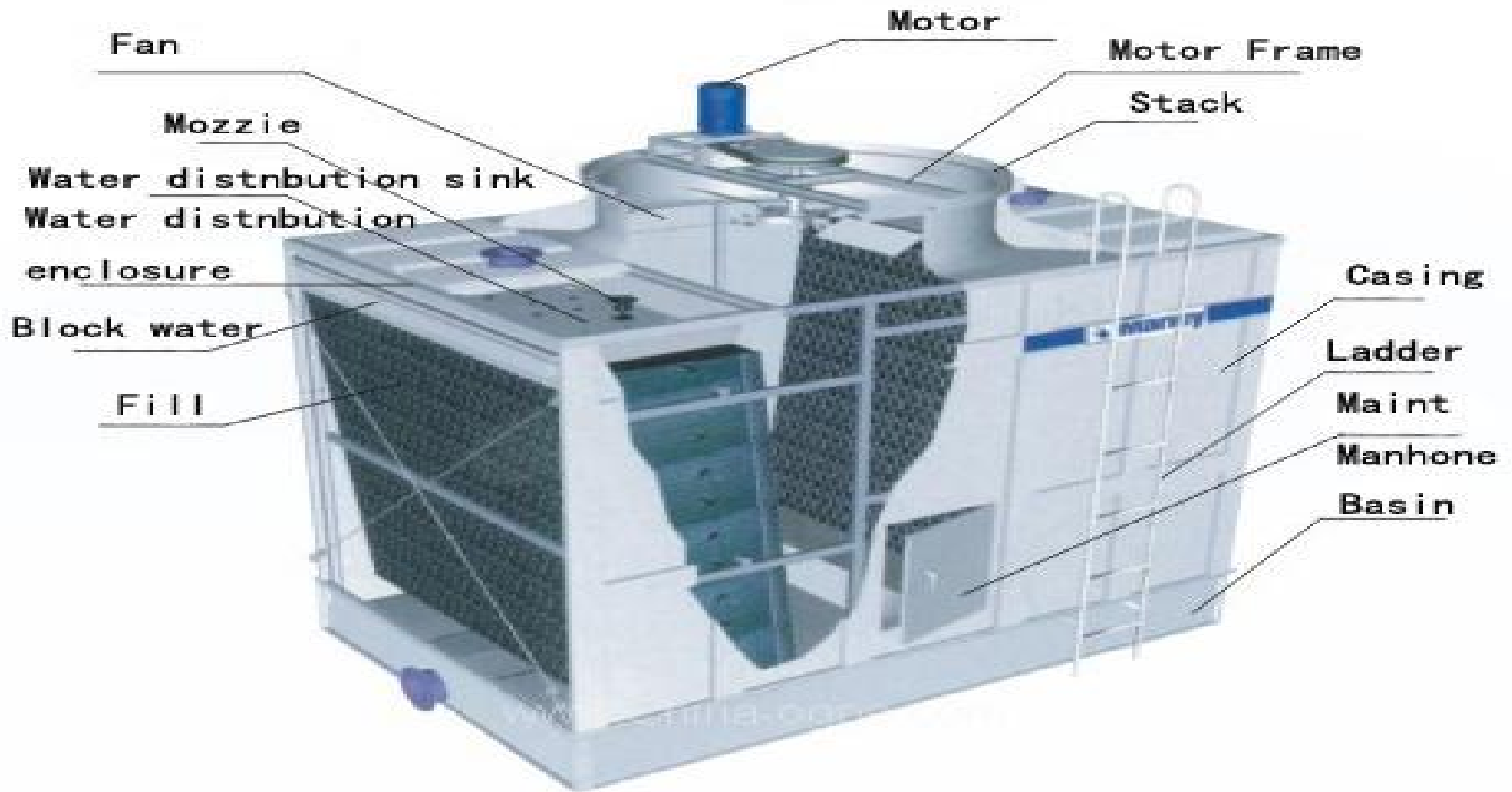
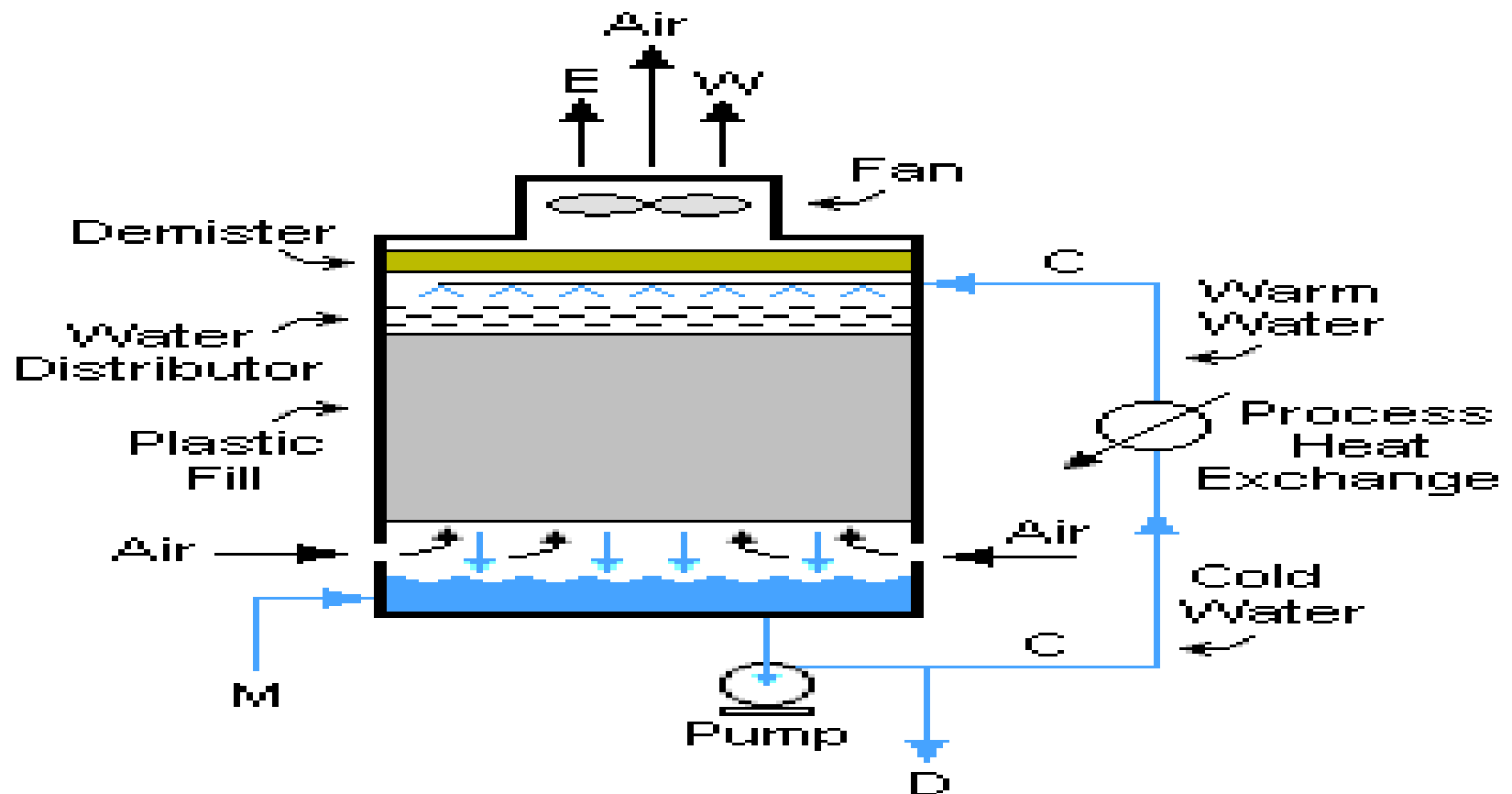


Figure 7-7. Two-stage Claus process plant.

SFB-G series intellectual cooling tower





- C = Circulating cooling water
- M = Makeup water
- E = Evaporated water
- W = Windage (or drift) water loss
- D = Drawoff (or blowdown) water

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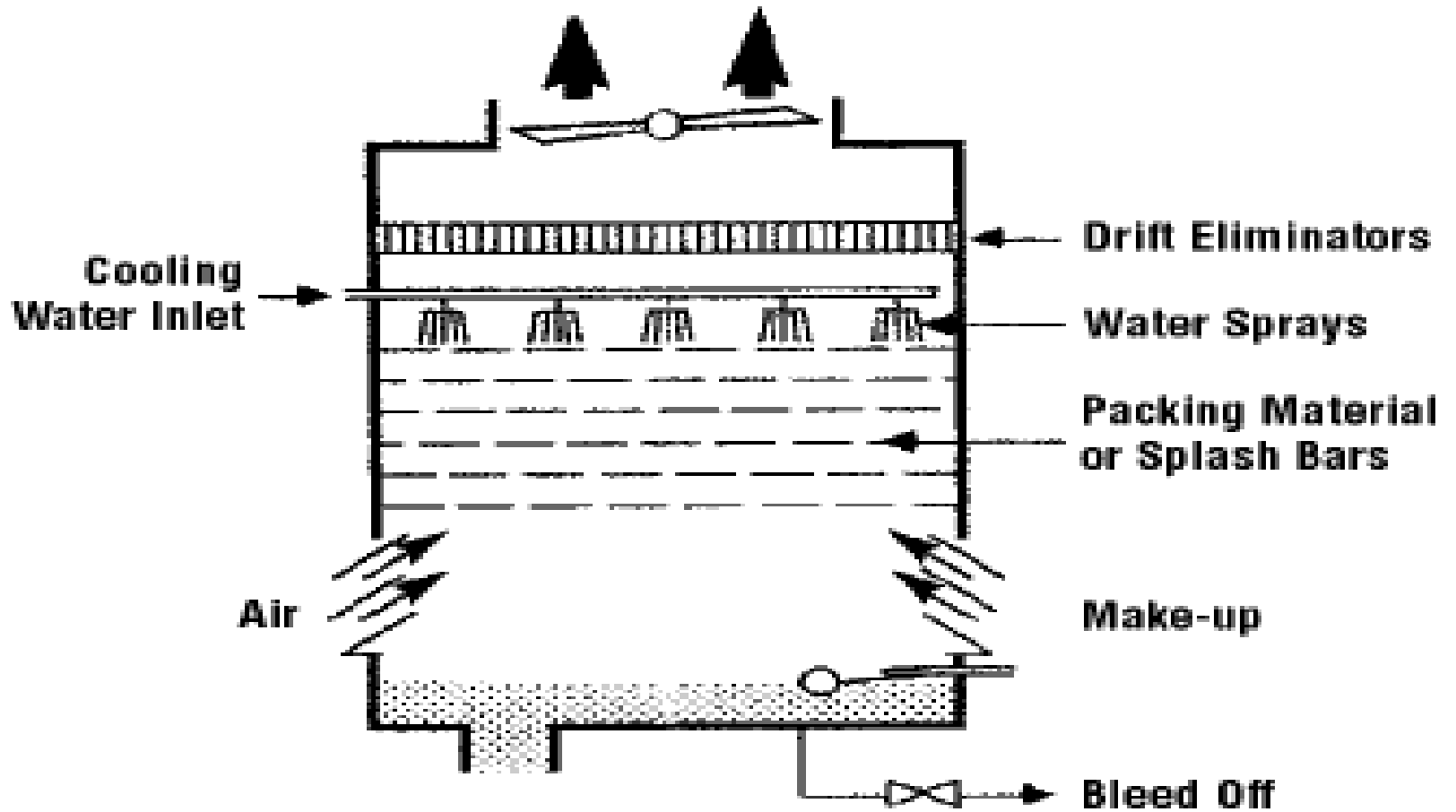
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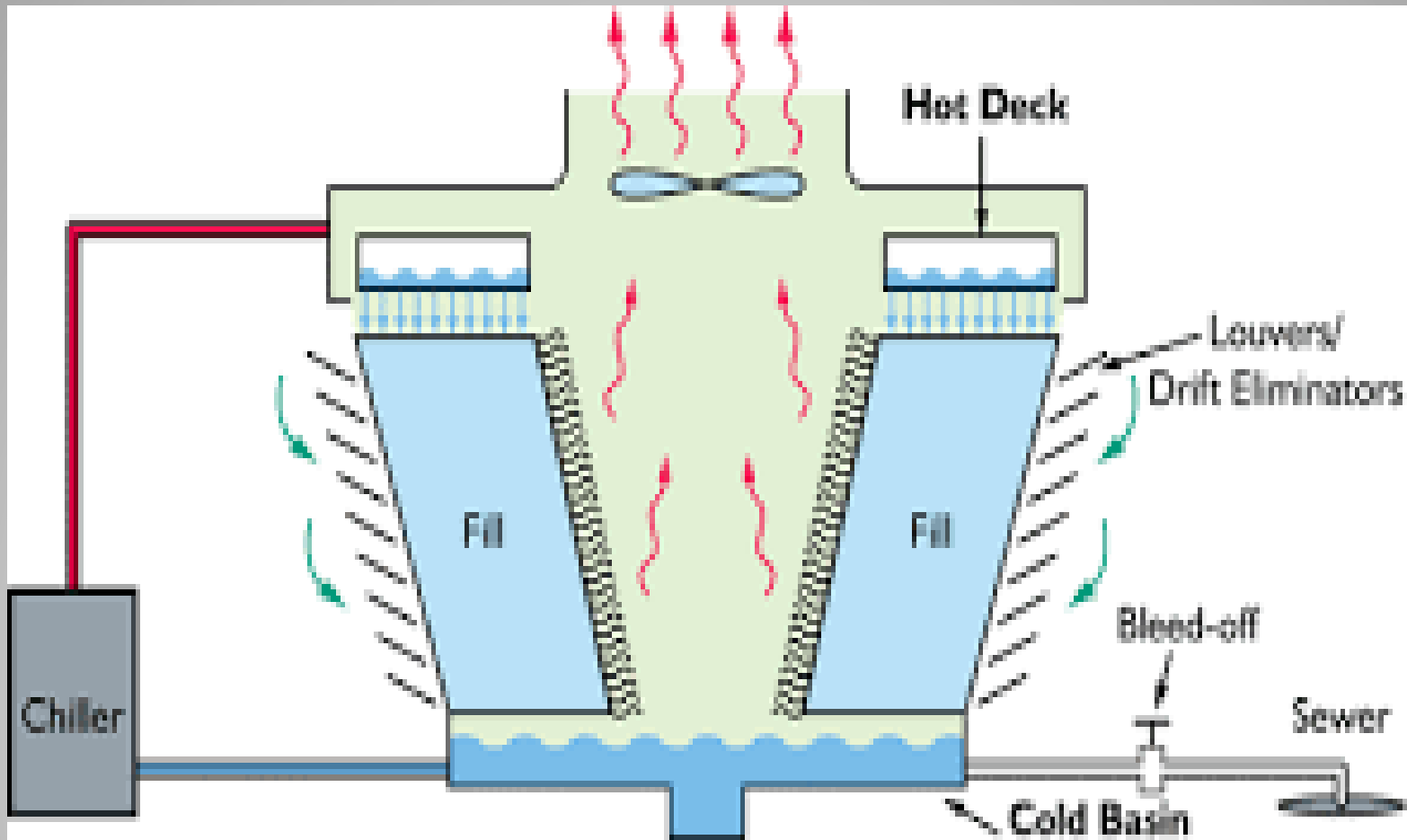


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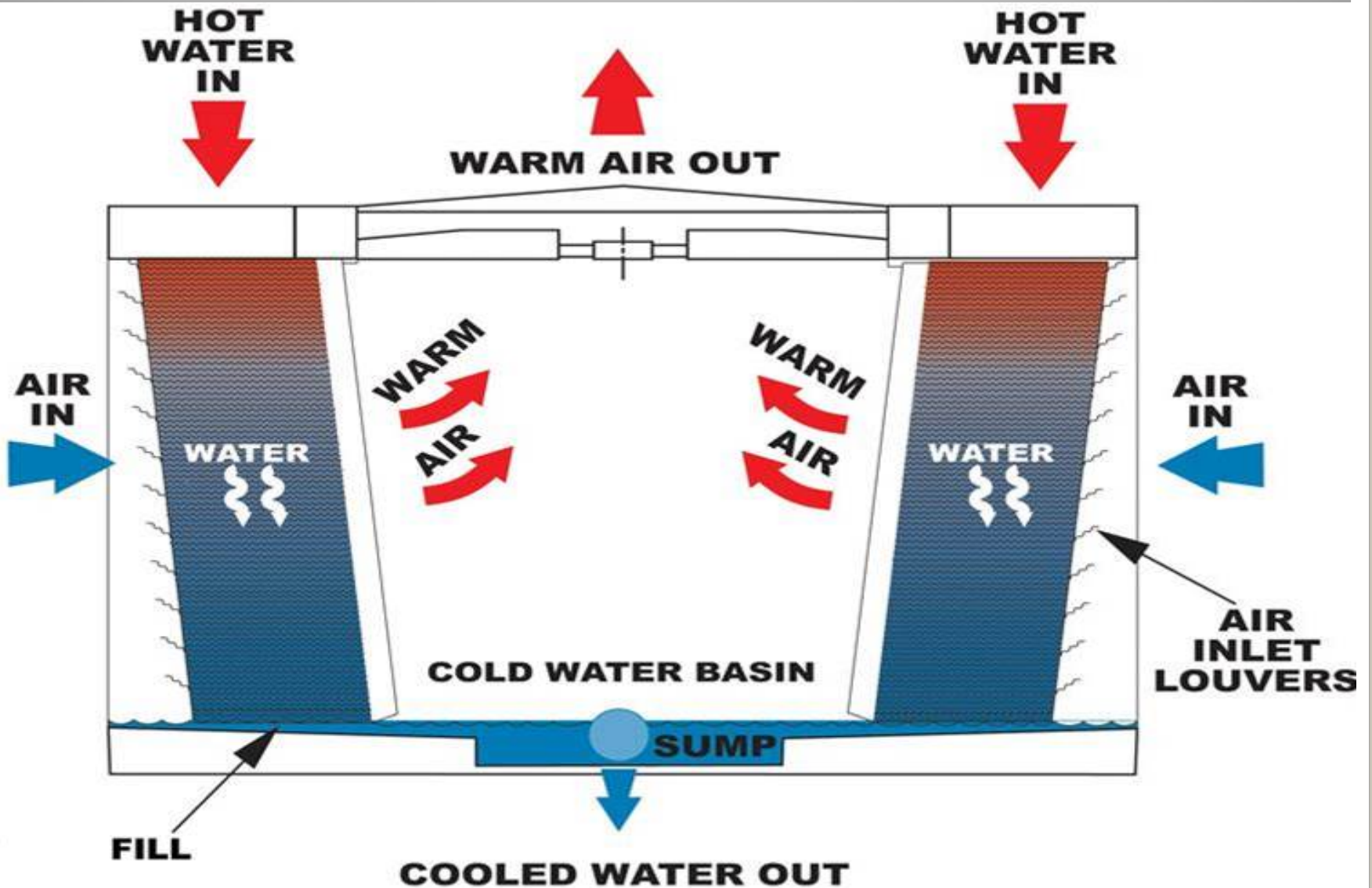
Air/Water Vapour Drift



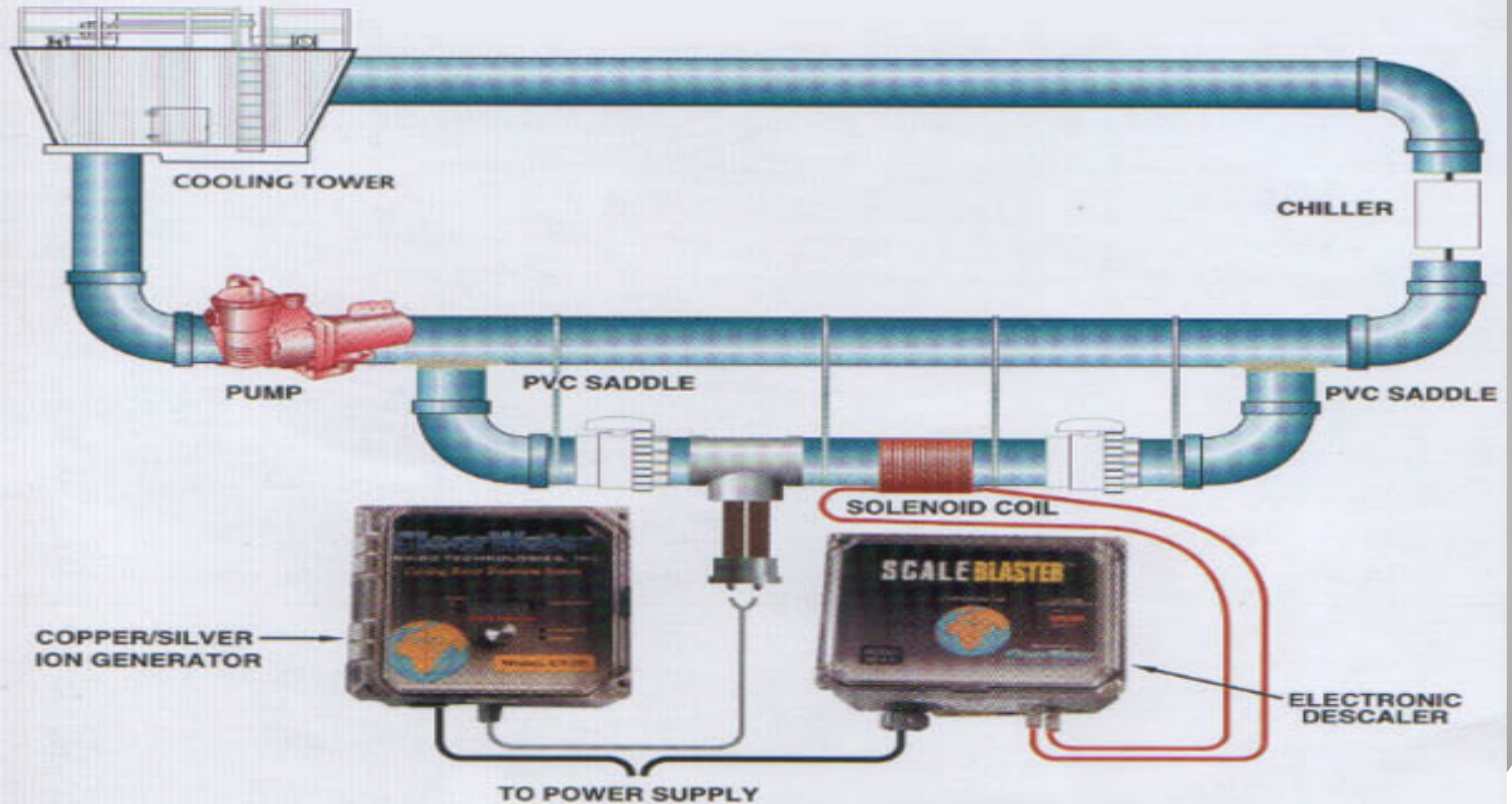


Typical Tower/Chiller Schematic

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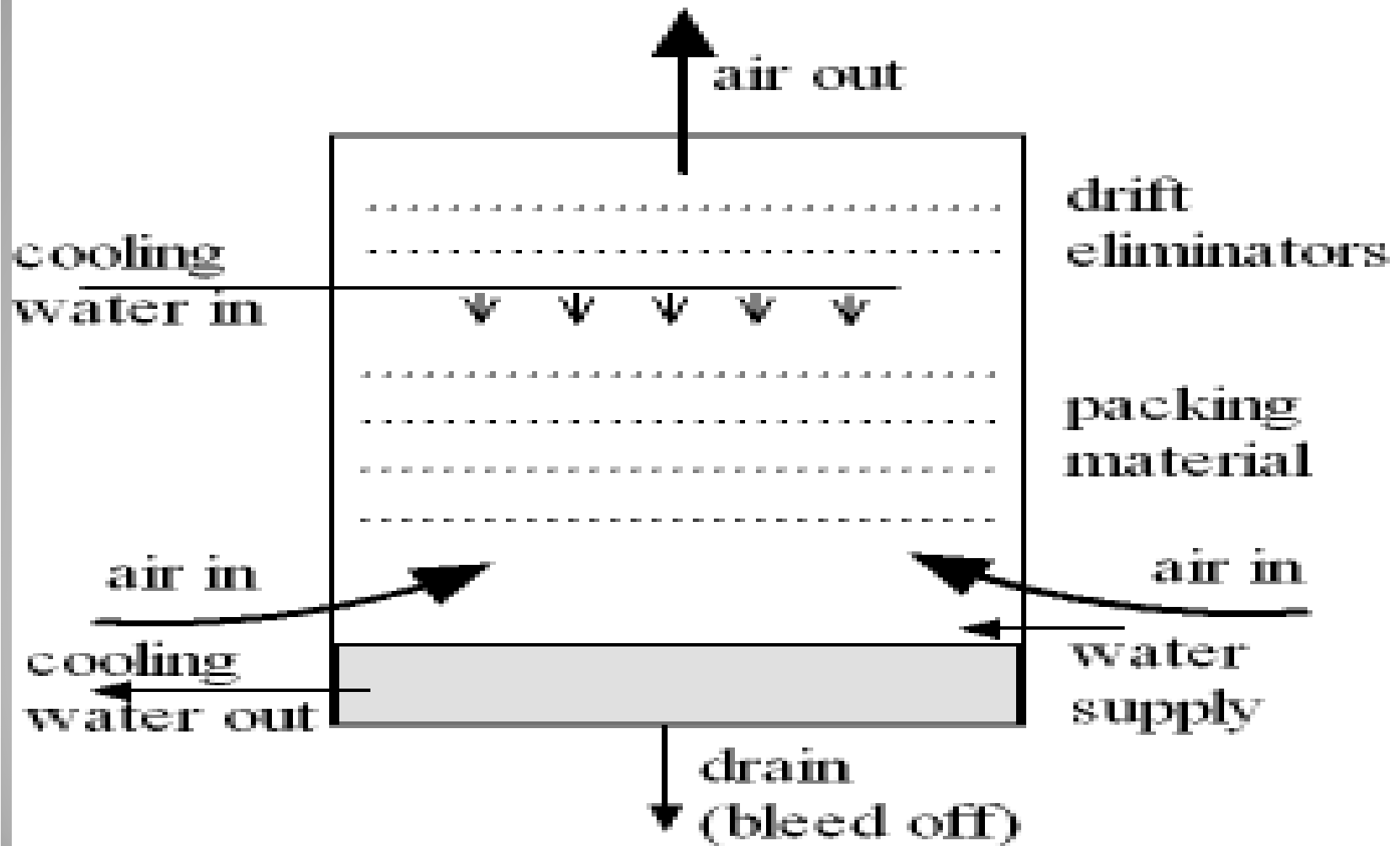


HOW THE CLEARWATER COOLING TOWER TREATMENT SYSTEM IS INSTALLED



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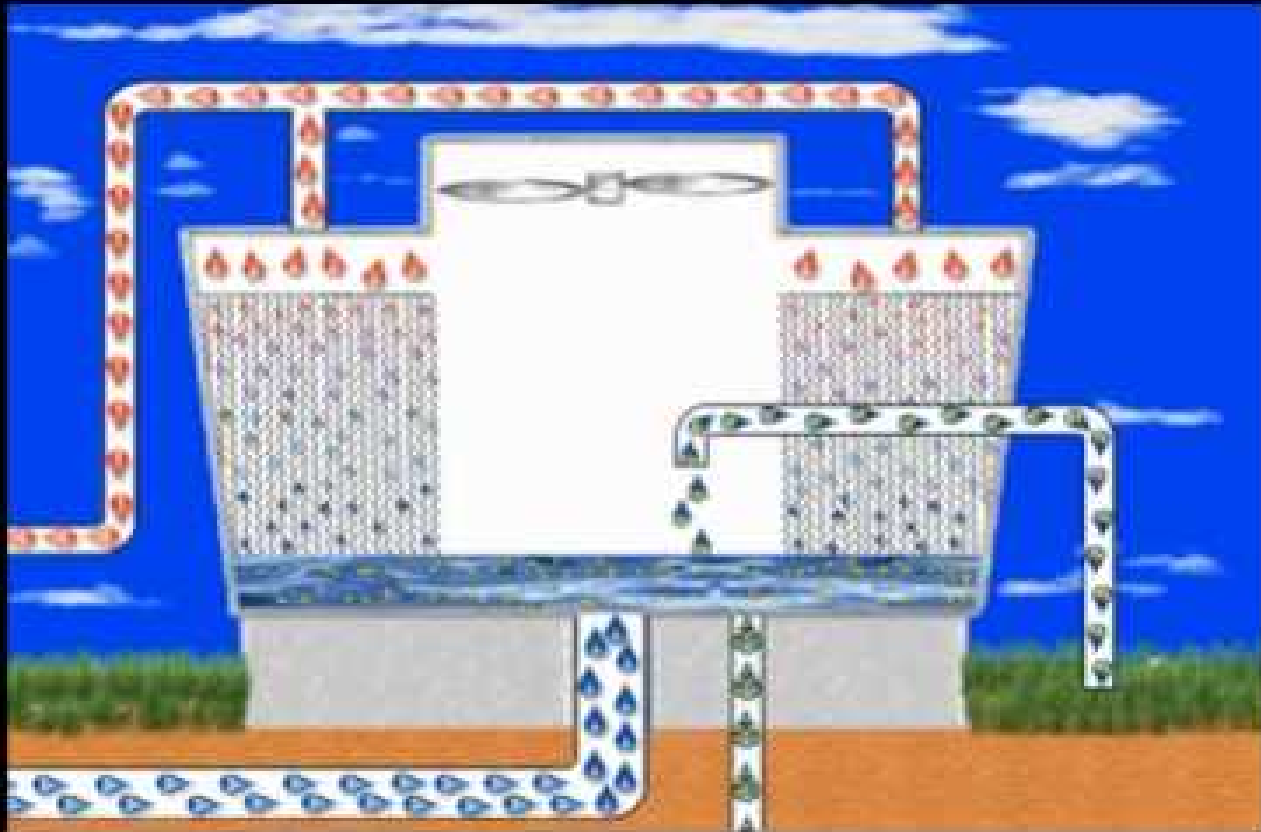
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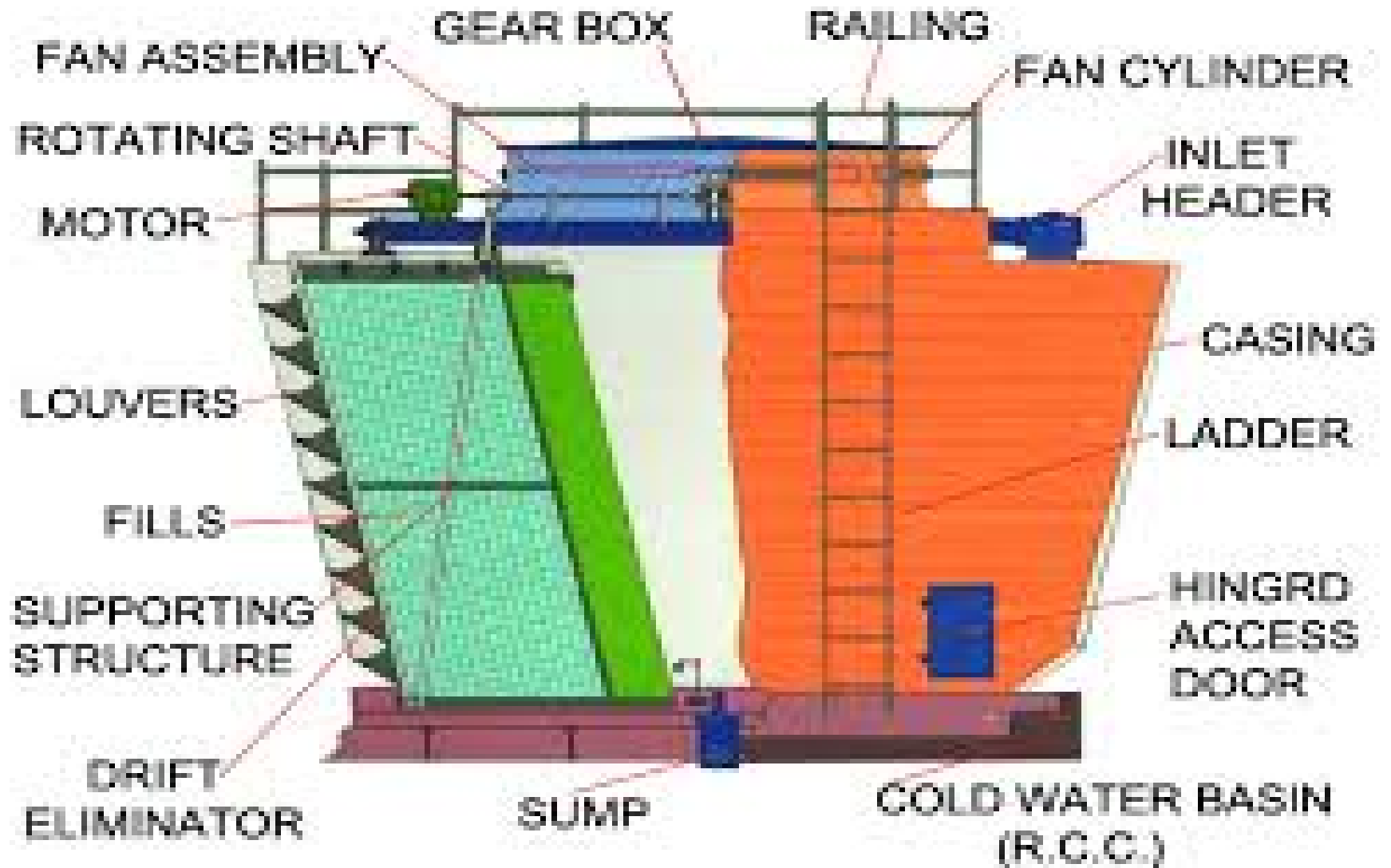


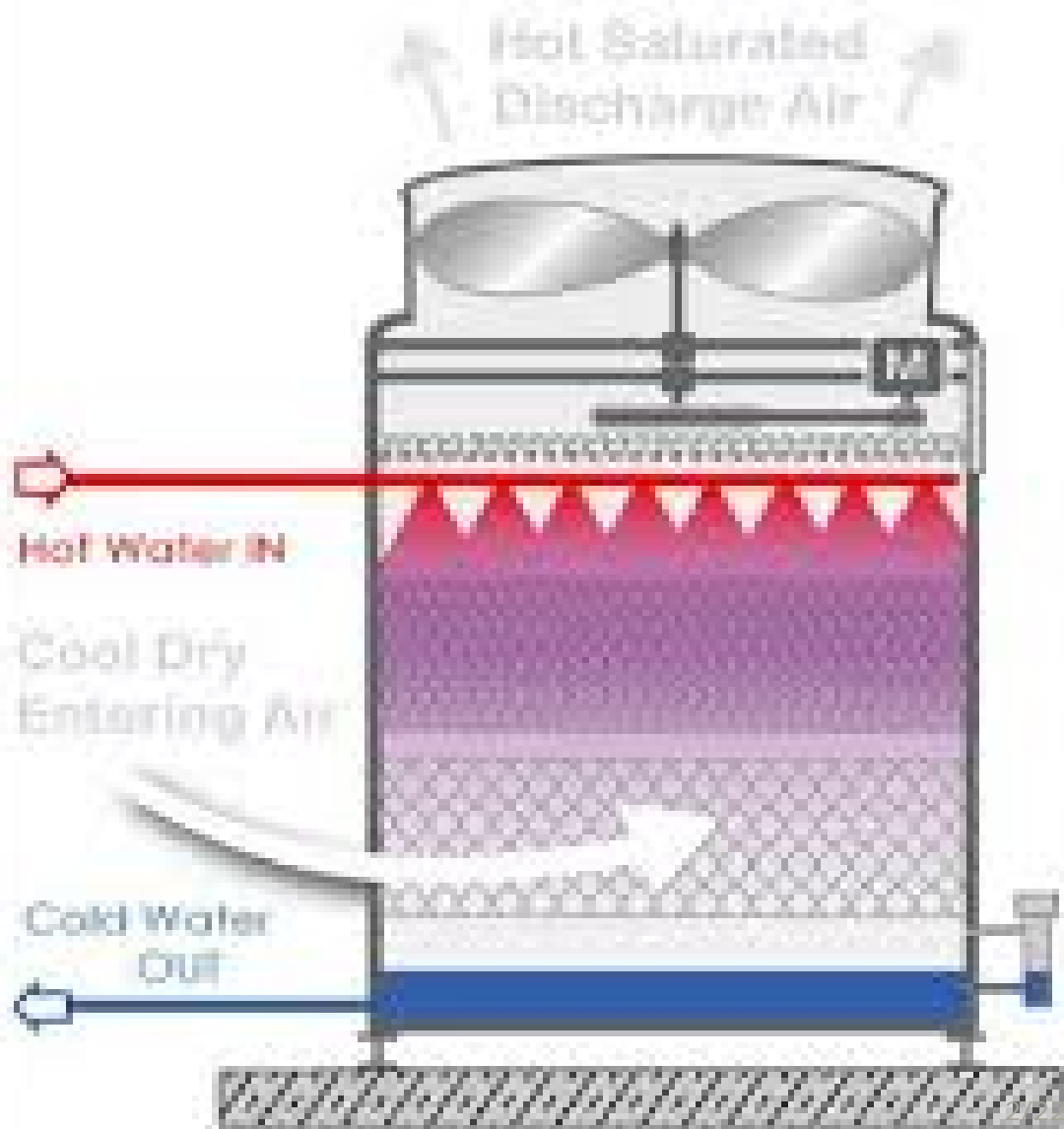
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Super Low Sound Fan

Power-Band Belt Drive, For Motor Access Doors

Dirt Eliminator

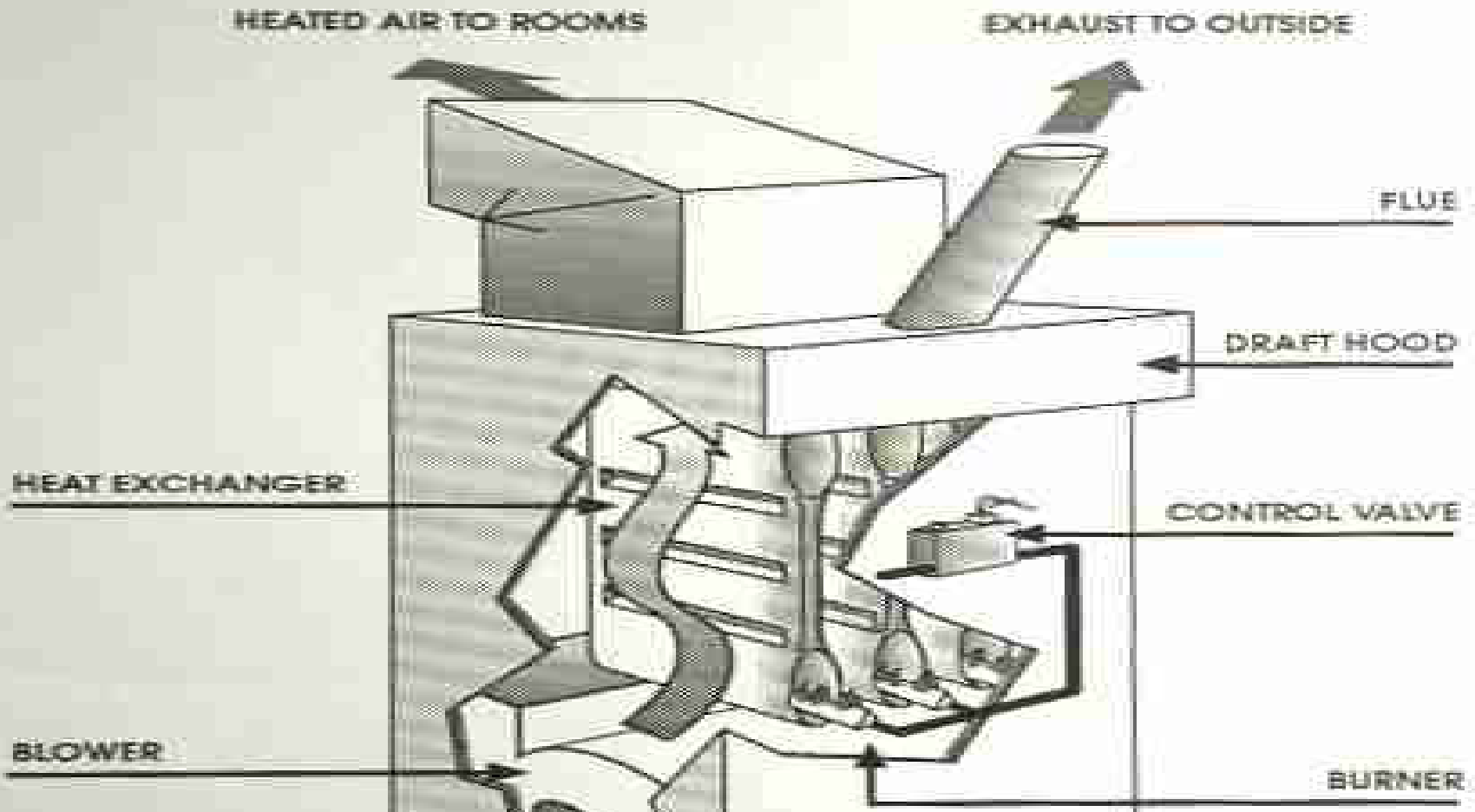
Water Distribution System

Cooling Tower Fill

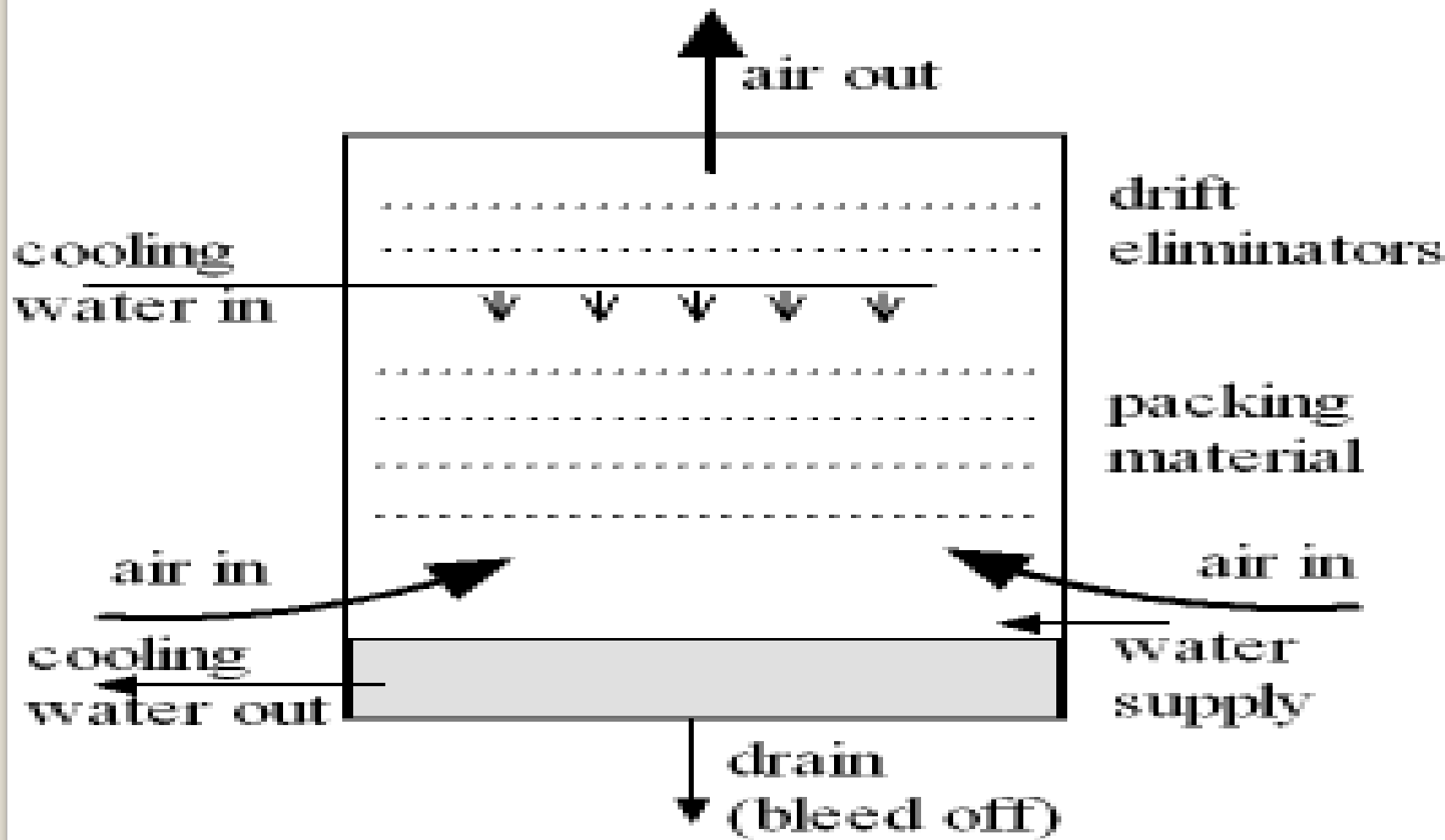
Superior Air Inlet Louver and Screen Design

Water Level Control

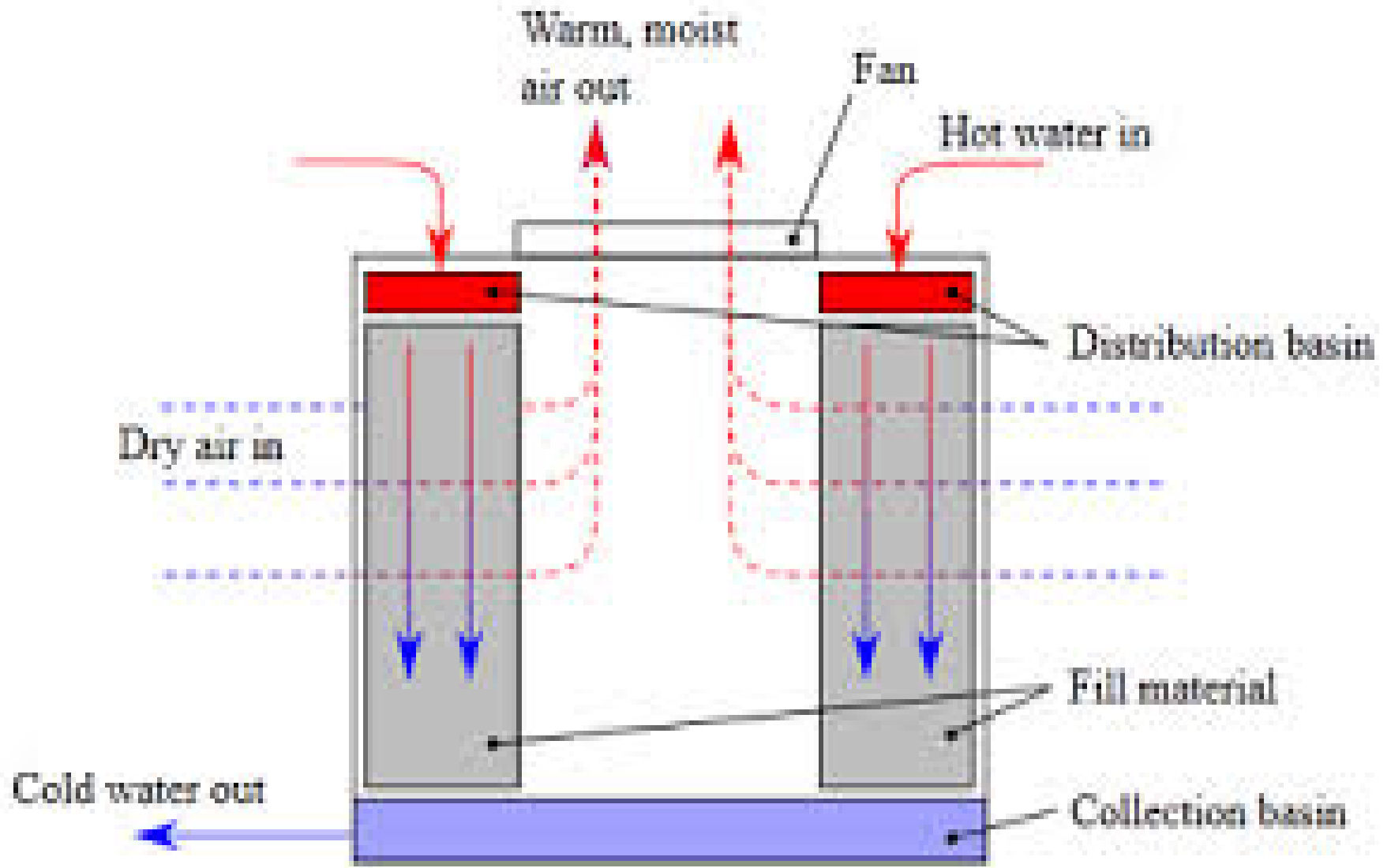
Water Basin



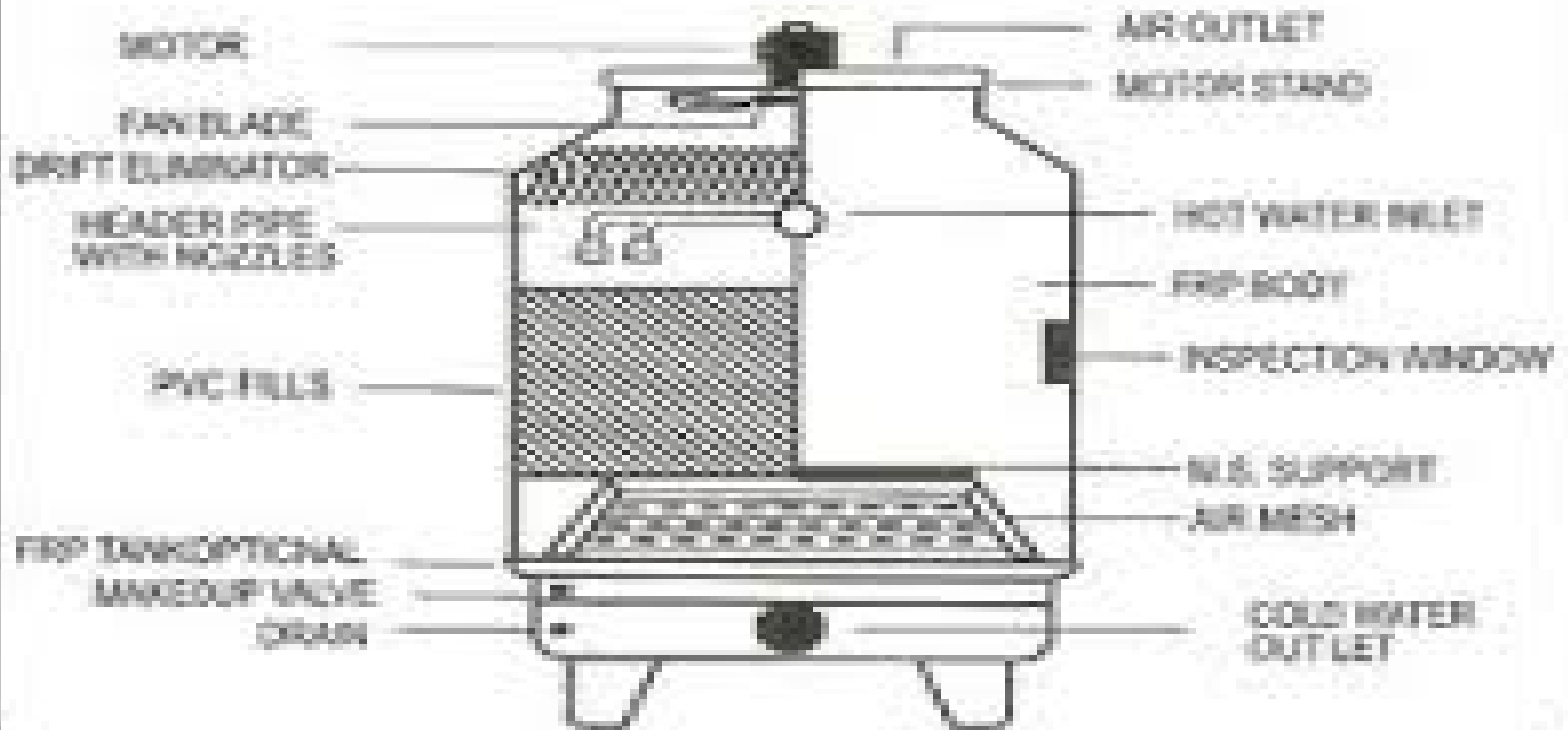
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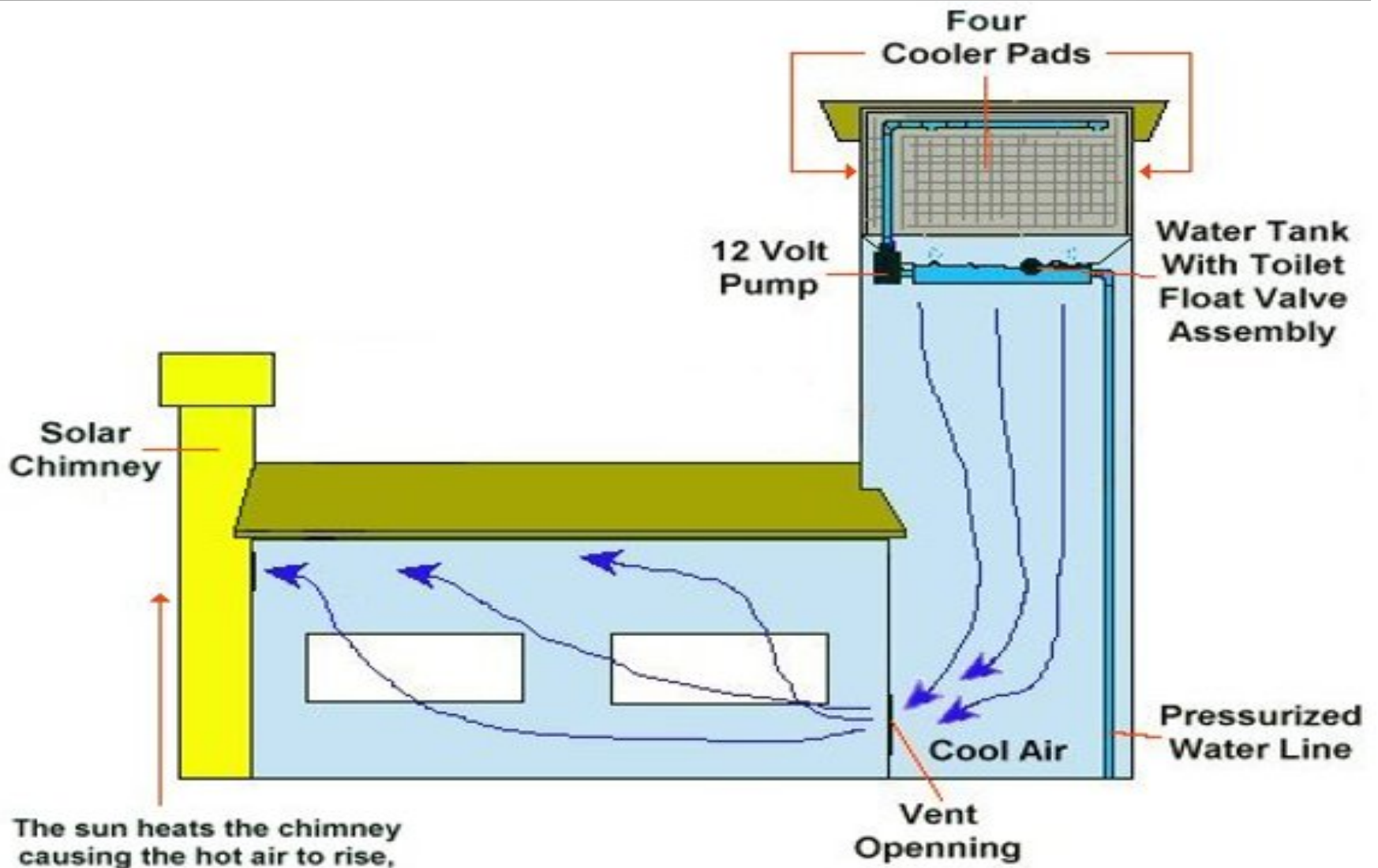


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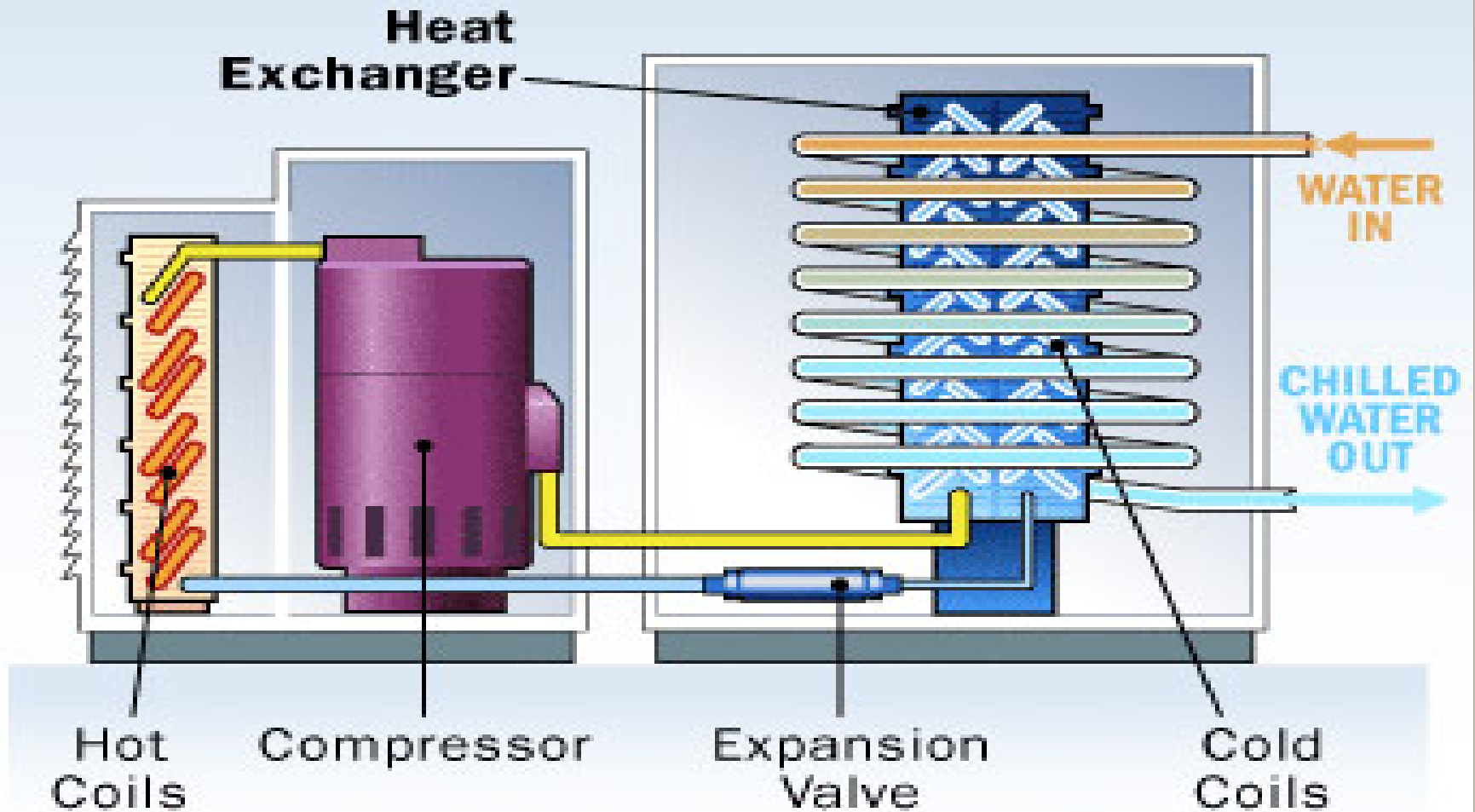
Internal View of Square / Rectangular Shape FRP Cooling Tower





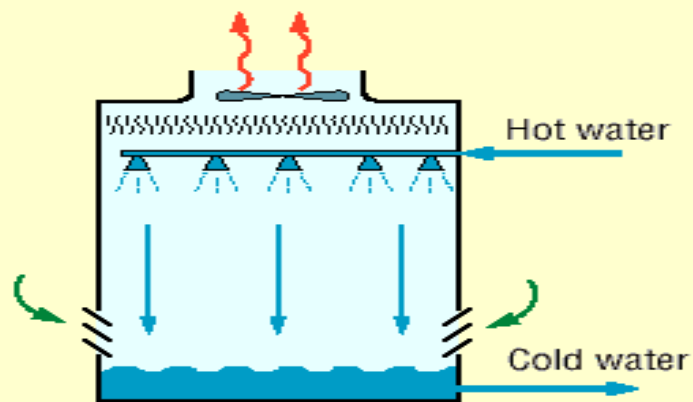
Chilled Water System

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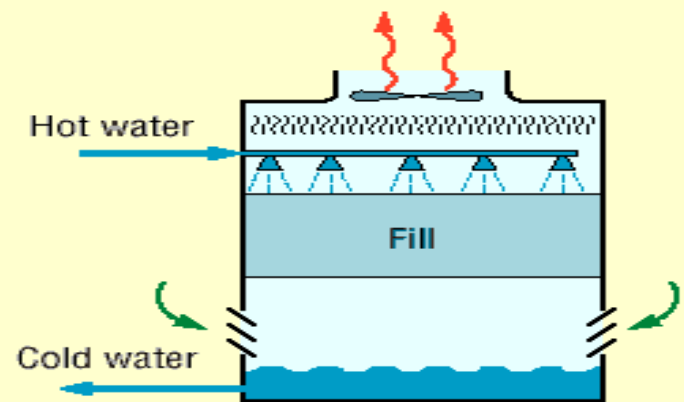


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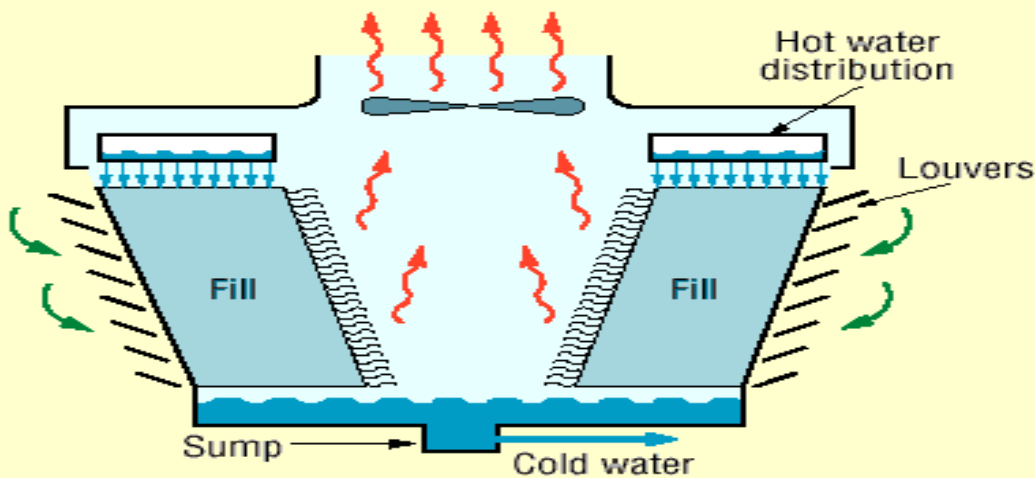
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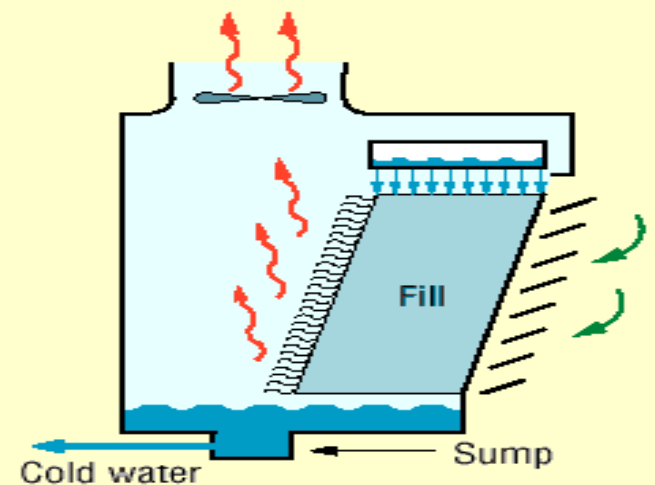
Induced draft counterflow tower



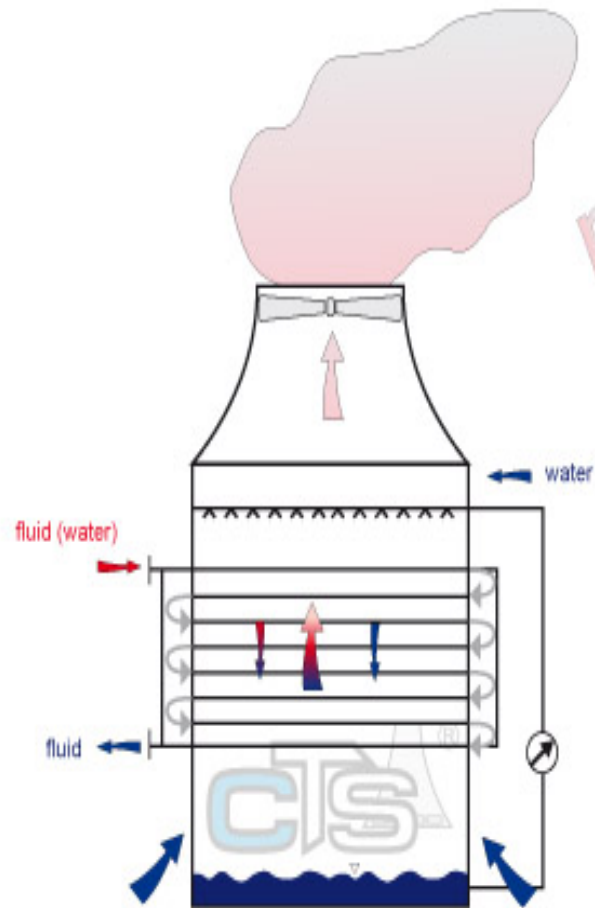
Induced draft counterflow tower with fill



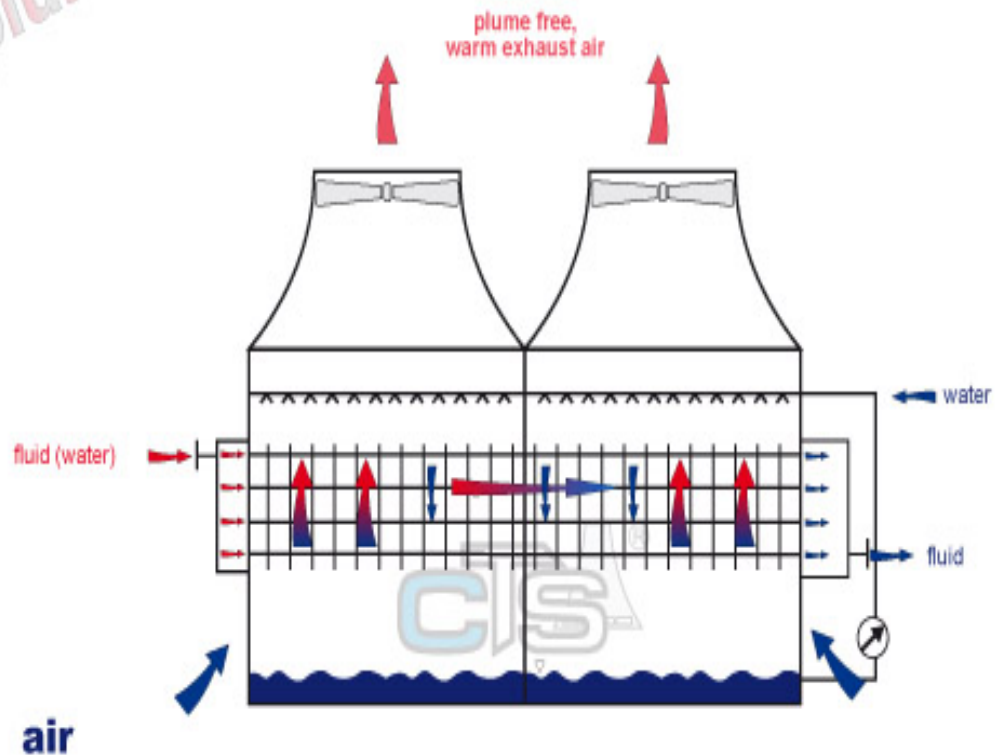
Induced draft, double-flow crossflow tower



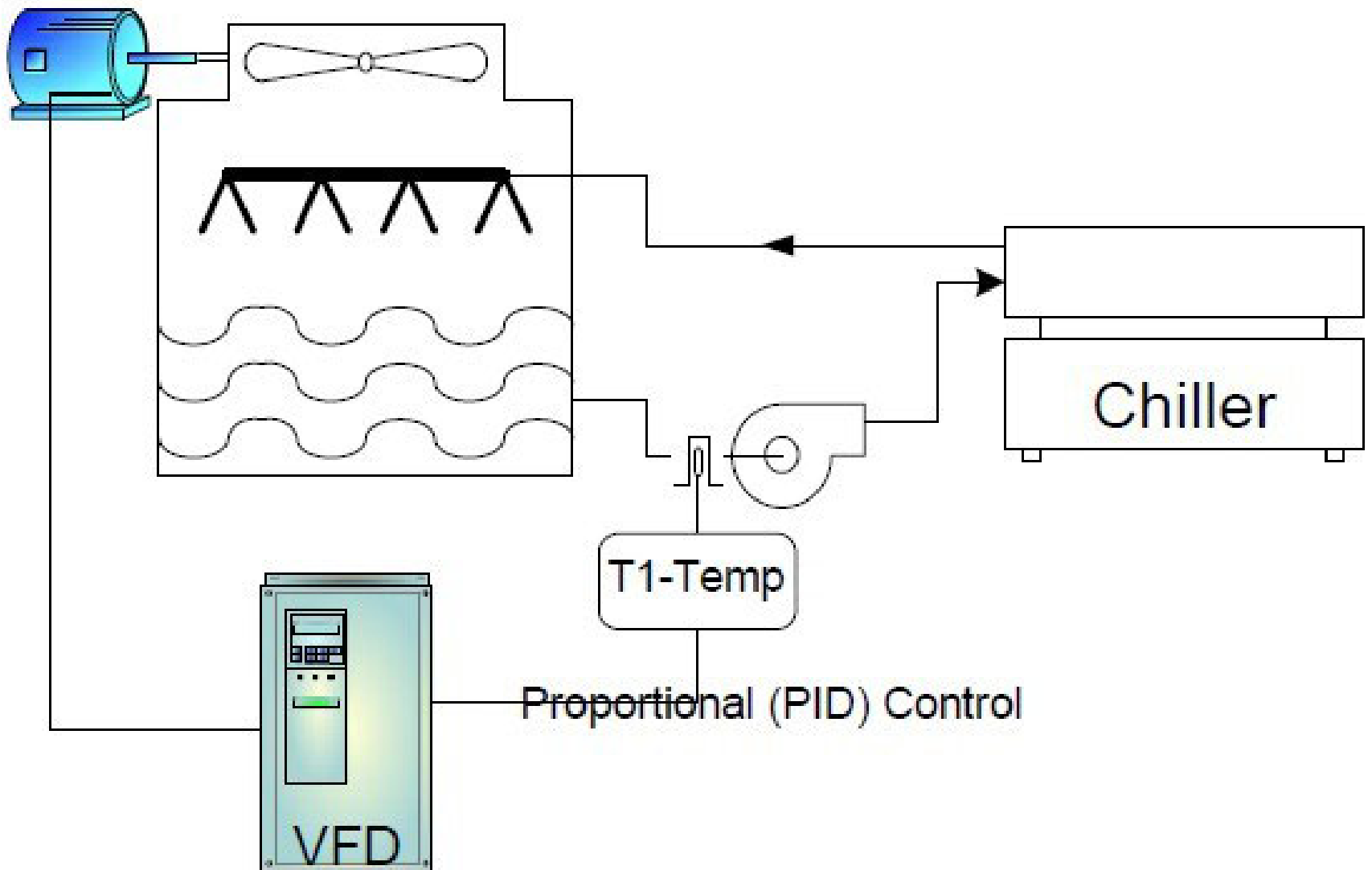
Induced draft, single-flow crossflow tower

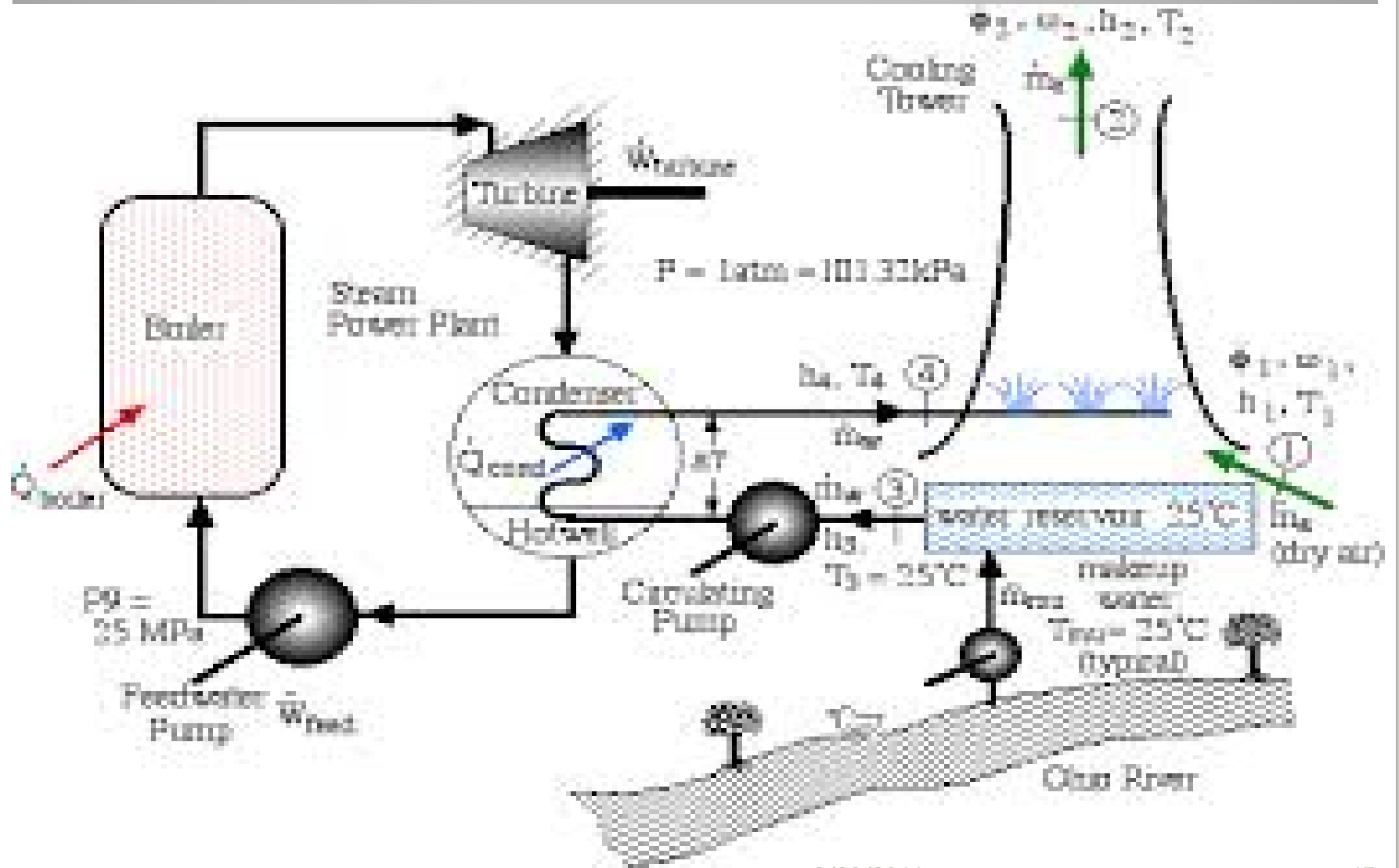


bare tube heat exchanger
 counter flow air - water
 co-current flow fluid - water

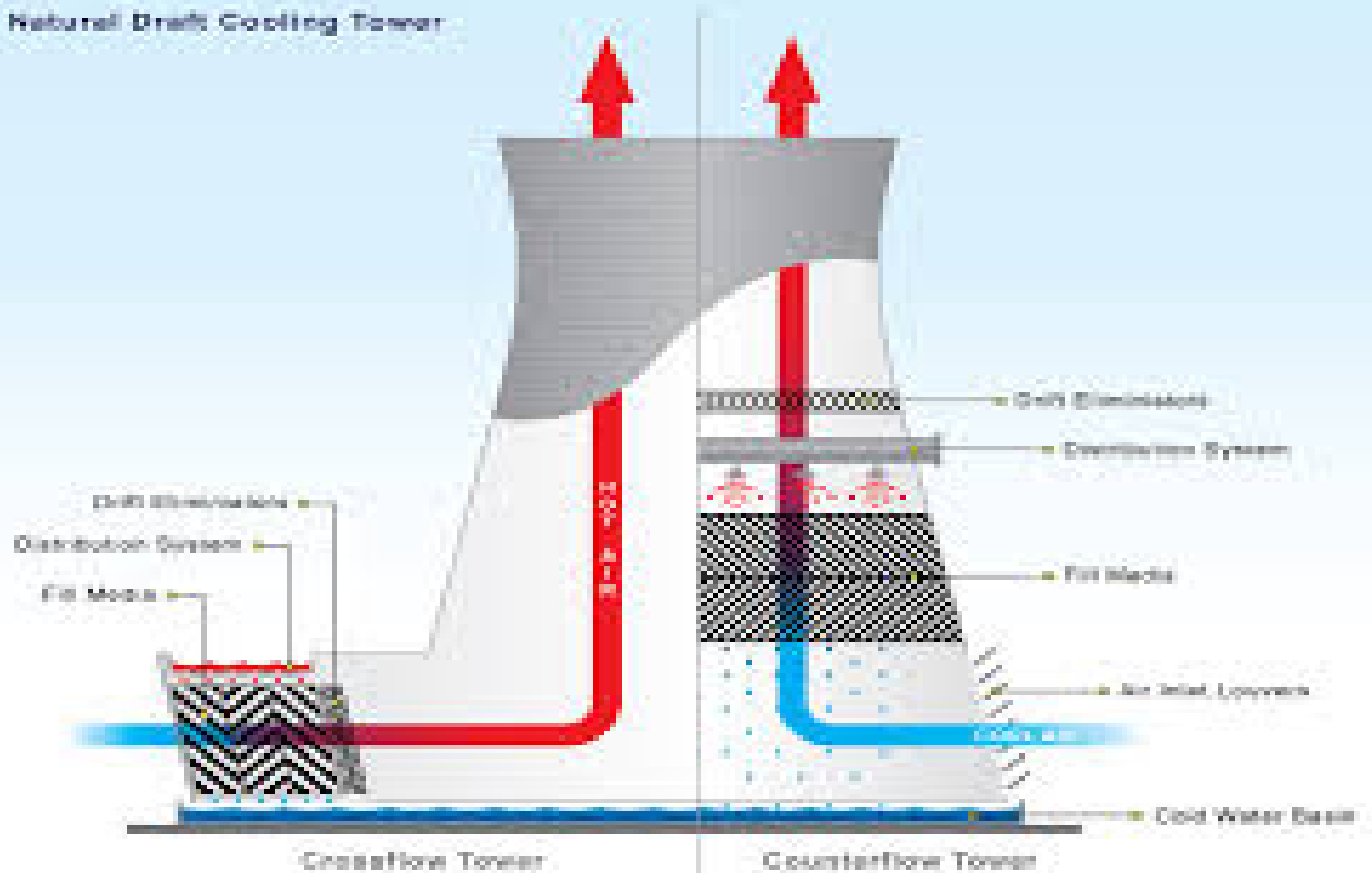


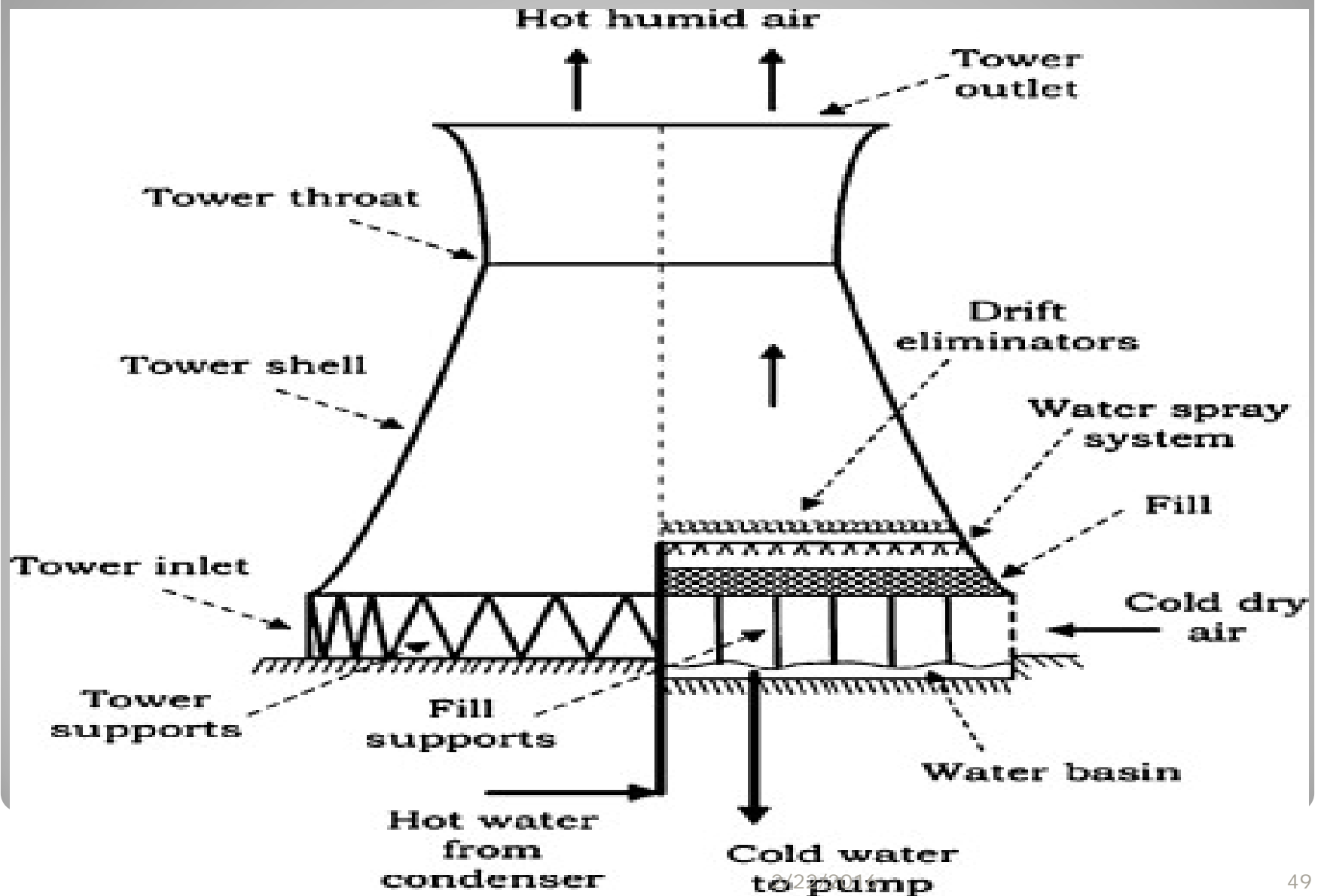
finned tube heat exchanger
 counter flow air - water
 cross flow fluid - water

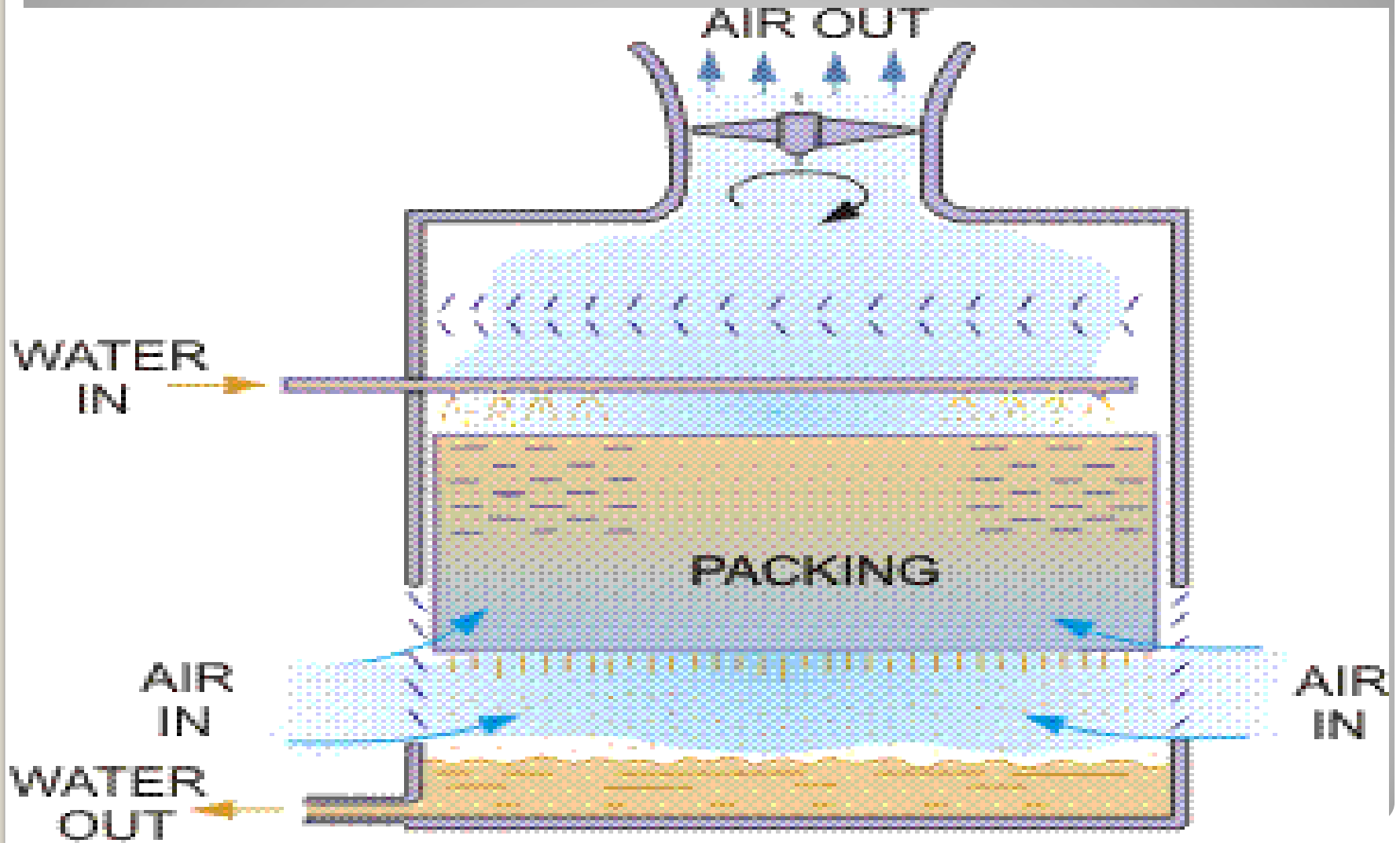




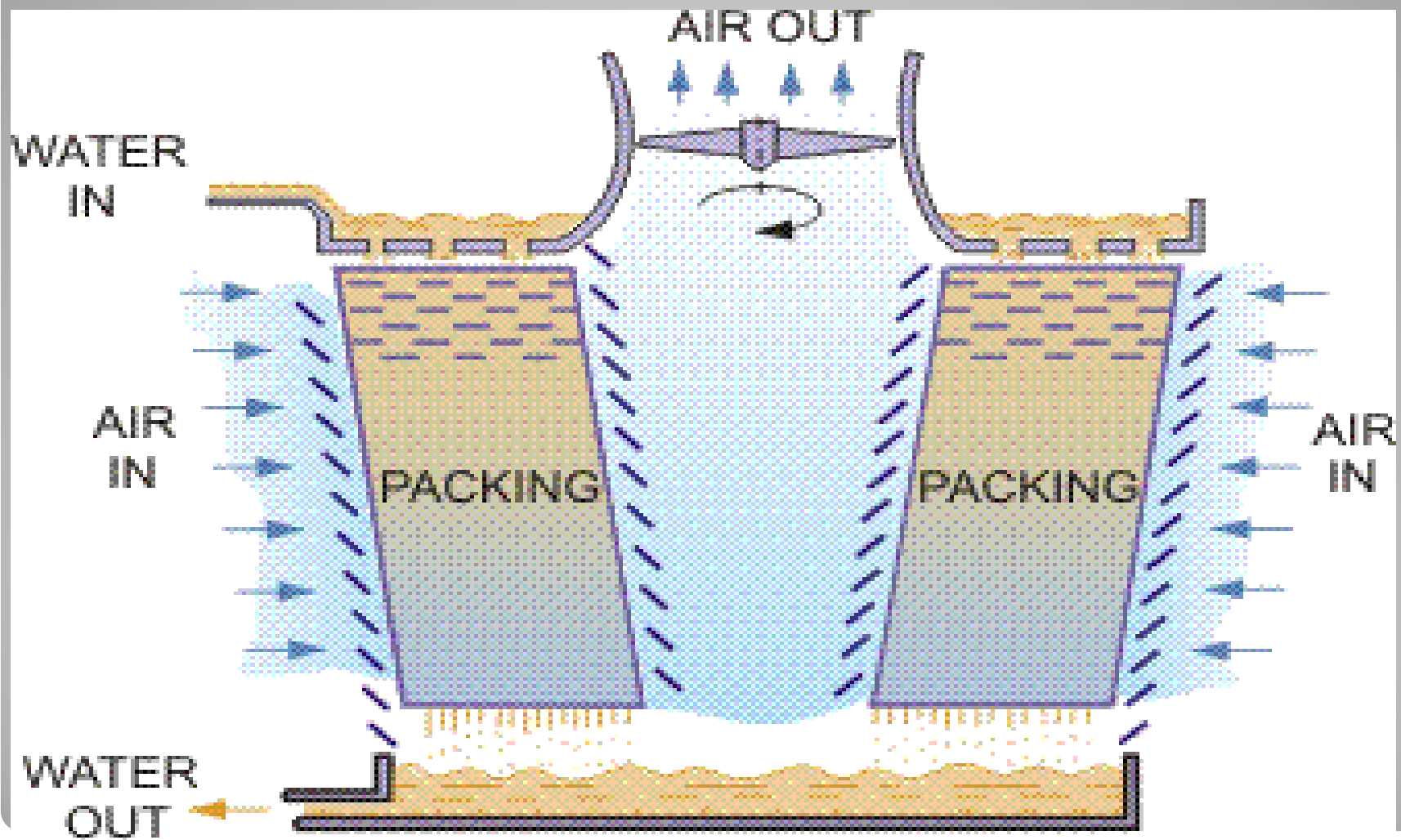
Natural Draft Cooling Tower







(b)
2/22/2016



(c)

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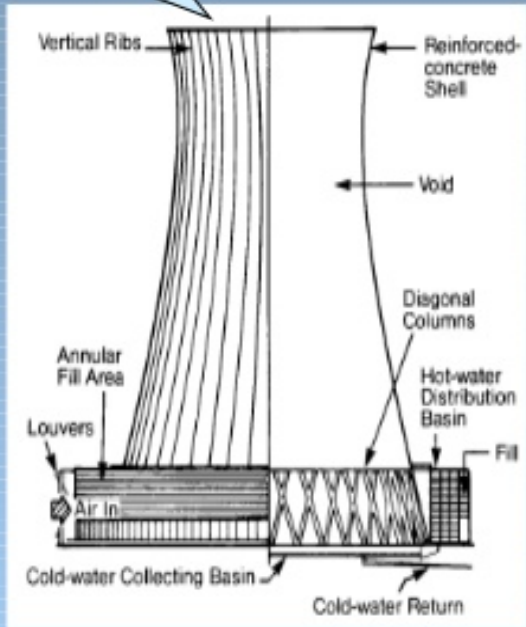
of Cooling Towers

nal Draft Cooling To

- Air drawn across falling water
- Fill located outside tower

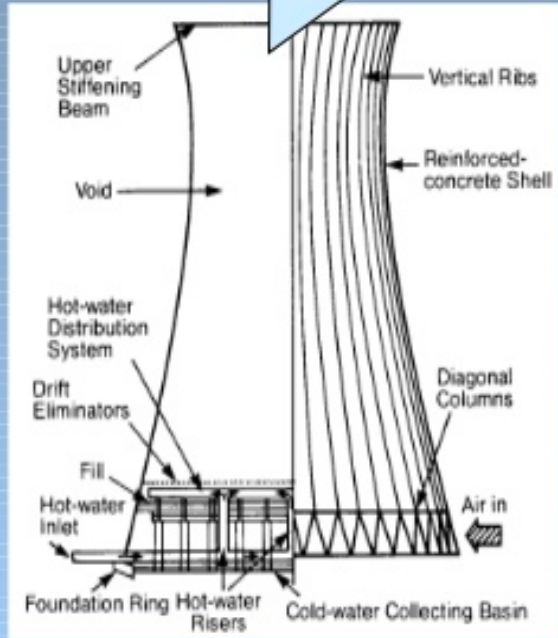
- Air drawn up through falling water
- Fill located inside tower

Electrical Equipment/
Cooling Towers

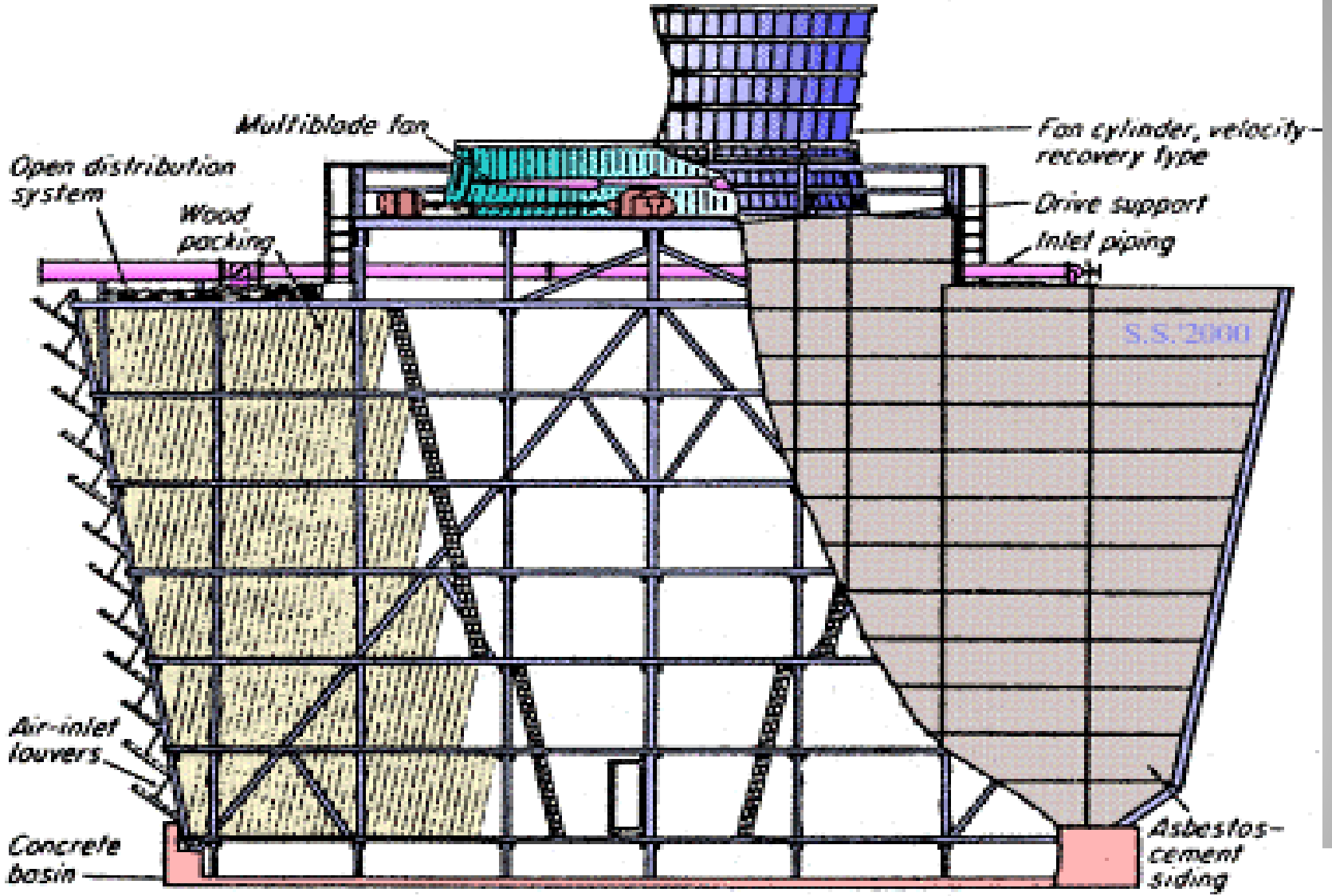


Cross flow

(Gulf Coast Chemical Commercial Inc.)



Counter flow



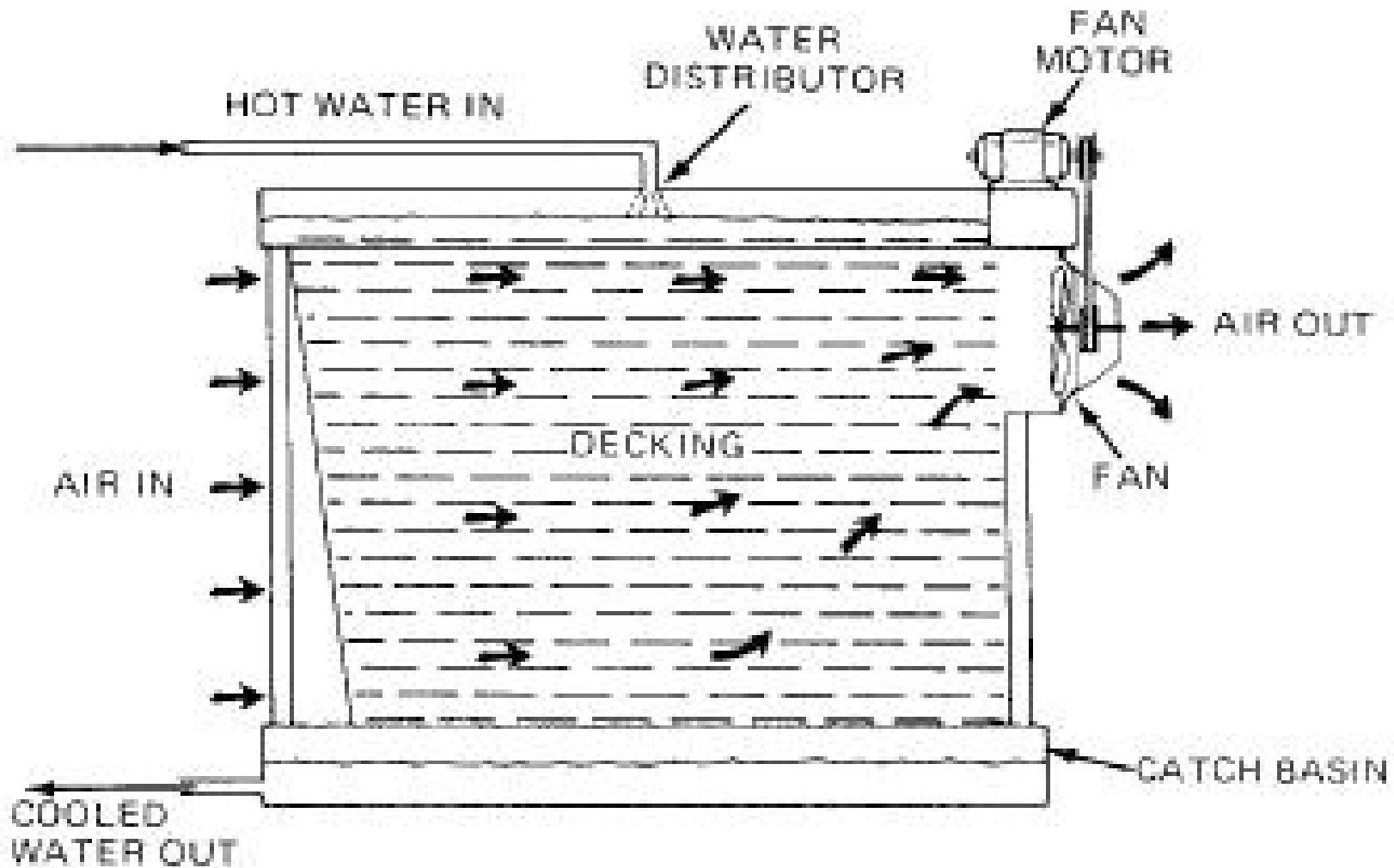


Figure 8-16 Small induced-draft cooling tower.

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