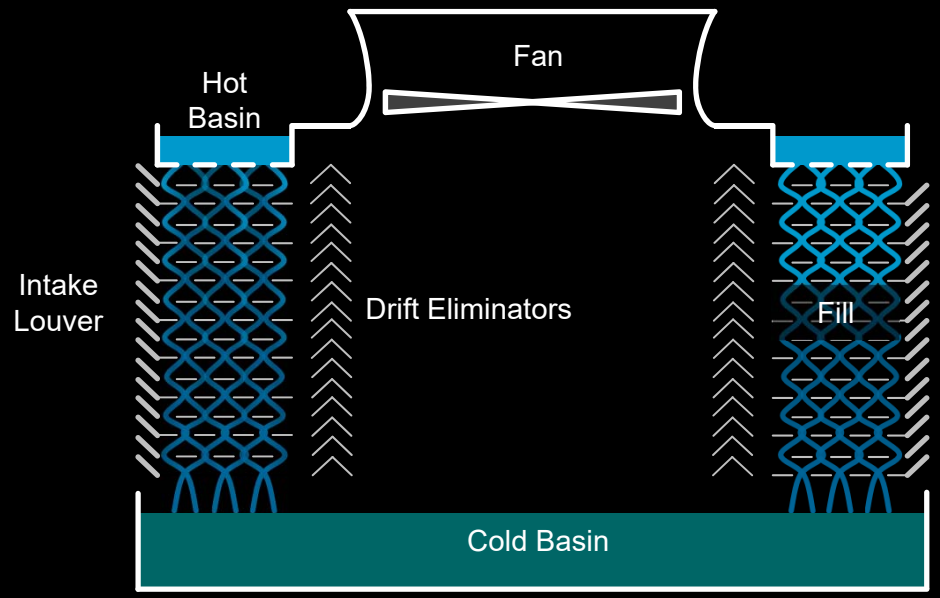
Cooling Towers

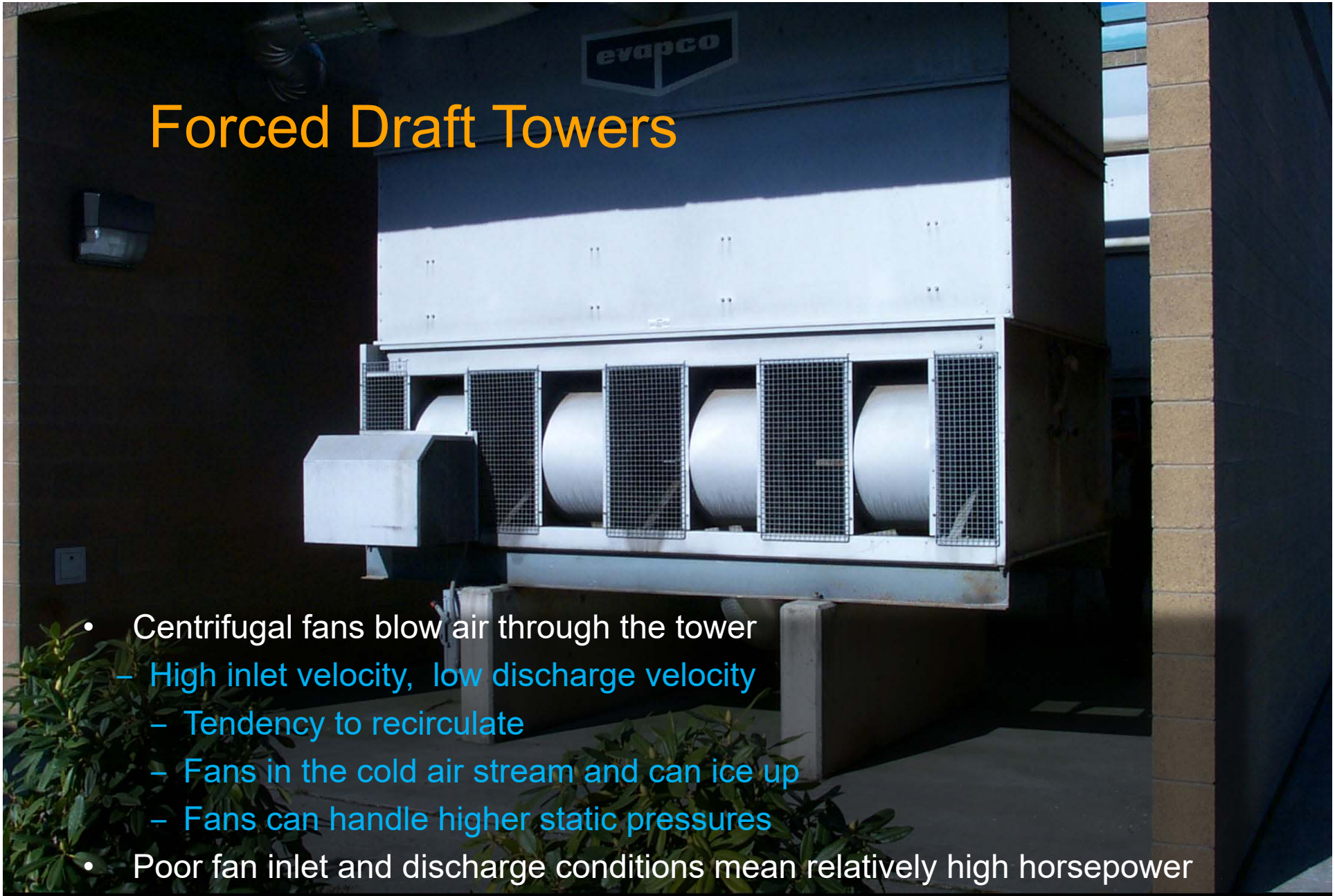
- An optimized evaporative cooling system
  - Maximize contact between air and water
  - 15°F approach to ambient wet bulb is standard
  - Approach less than 5°F starts to become impractical
- Multiple types
  - Cross flow
  - Counter flow
  - Natural draft
  - Induced draft
  - Forced draft
- Water quality issues
  - Equipment life
  - Human life



Natural Draft Towers

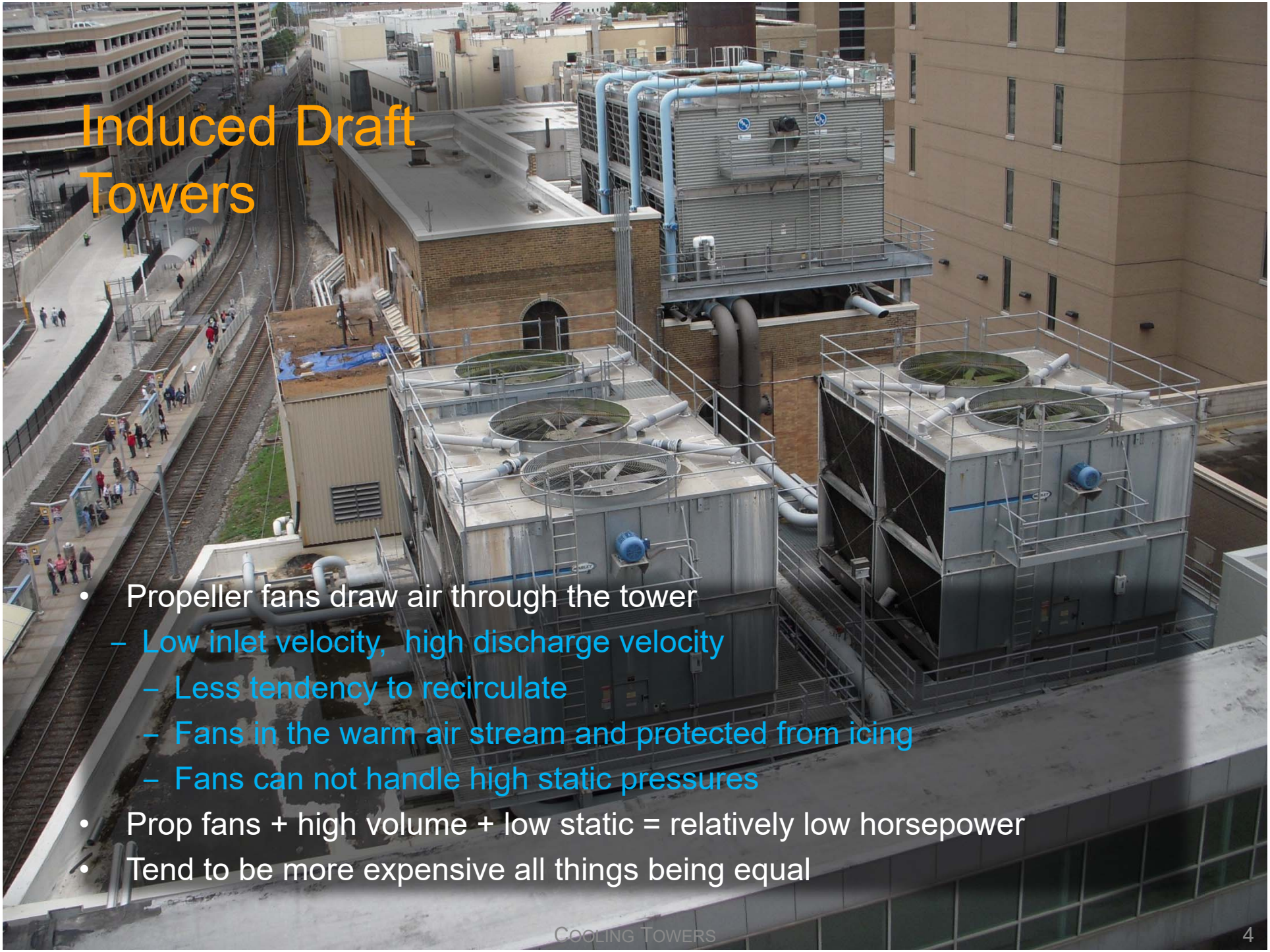
- No fans; operate on density difference like a chimney
- Not common for HVAC
- Typically found on large power plants

Forced Draft Towers



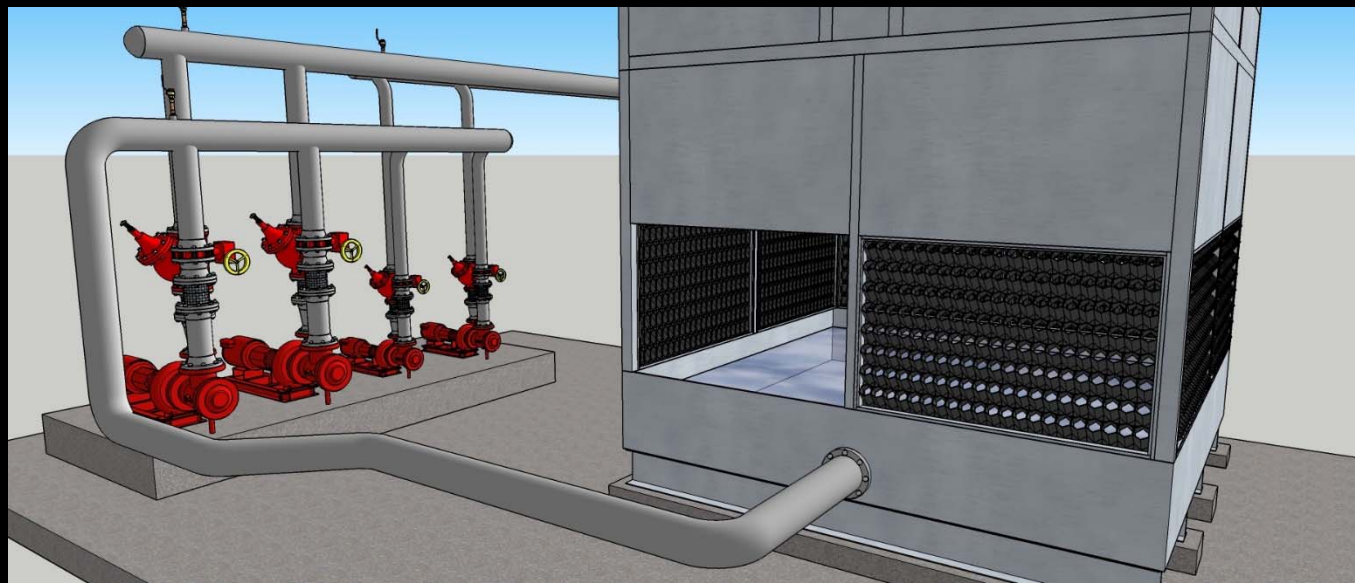
- Centrifugal fans blow air through the tower
  - High inlet velocity, low discharge velocity
    - Tendency to recirculate
    - Fans in the cold air stream and can ice up
    - Fans can handle higher static pressures
- Poor fan inlet and discharge conditions mean relatively high horsepower
- Tend to be less expensive all things being equal

Induced Draft Towers

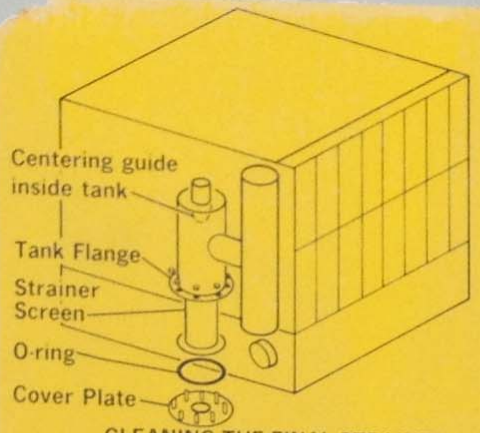


- Propeller fans draw air through the tower
  - Low inlet velocity, high discharge velocity
    - Less tendency to recirculate
    - Fans in the warm air stream and protected from icing
    - Fans can not handle high static pressures
- Prop fans + high volume + low static = relatively low horsepower
- Tend to be more expensive all things being equal

Cross Flow vs. Counter Flow

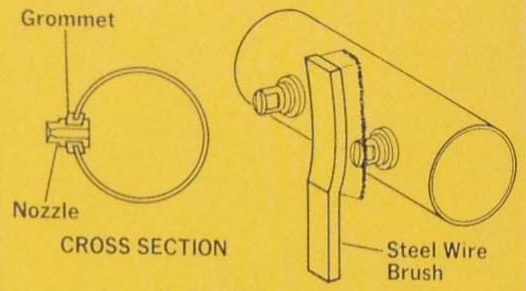


An Unusual Induced Draft Tower



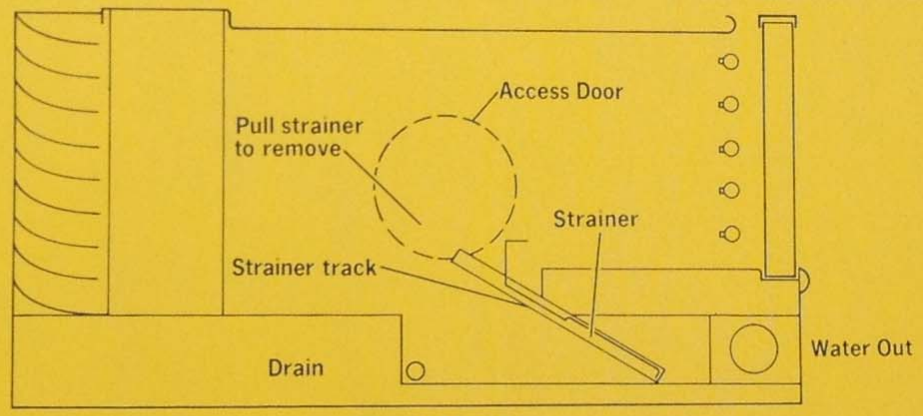
CLEANING THE FINAL STRAINER

1. Remove nuts holding cover plate. As cover plate is lowered, strainer screen will drop down with it.
2. Clean strainer using water spray or wire brush.
3. Slide strainer part way into tank body. Bring up cover plate with O-ring just inside bolt circle. Keeping all parts aligned, lift assembly up to tank flange. Install washers and nuts, tightening evenly.



CLEANING NOZZLES

1. With water running, scrub clogged nozzles with wire brush. A toothpick or other non-metal object is helpful in cleaning completely plugged nozzles.
2. If some nozzles remain clogged or plugged, mark their location and shut down unit.
3. Remove marked nozzles by grasping their flat sides with pliers and pulling straight out. Clean nozzles
4. Reinsert nozzle using pliers, aligning orifice slit vertical. This is important for satisfactory unit performance.



SUMP CLEANING

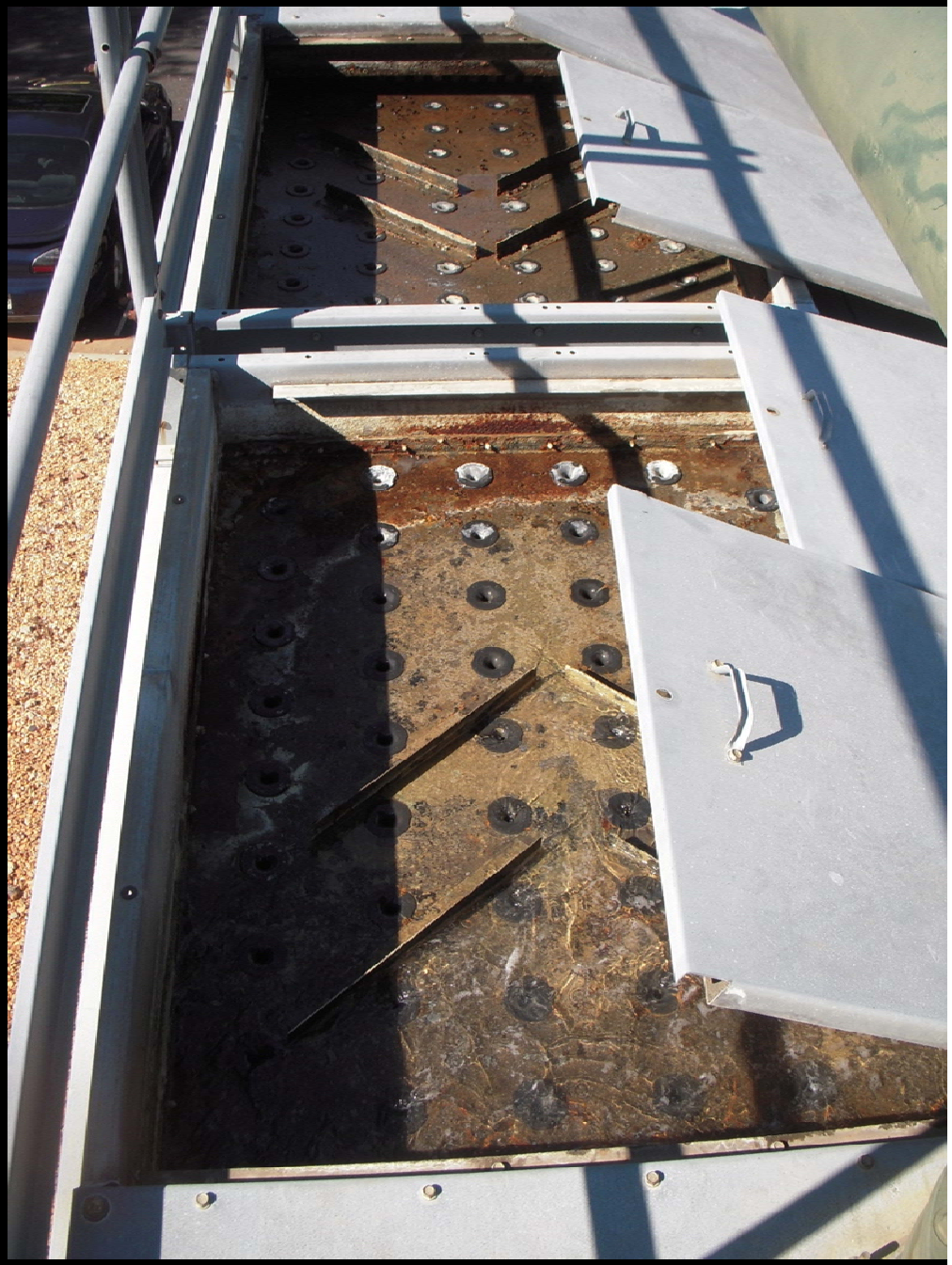
1. Leaving the sump strainers in place, open the drain connection and drain all water from the sump.
2. Thoroughly clean sediment and debris from sump and step portion of pan.
3. Remove the sump strainers and clean, using a water spray or wire brush to remove sediment.
4. Slide sump strainers back into track channels, with edge flanges pointed down as shown.
5. Refill the sump with water.

FOR MORE DETAILED INSTRUCTIONS SEE BULLETIN M220/1-0 27-189PB

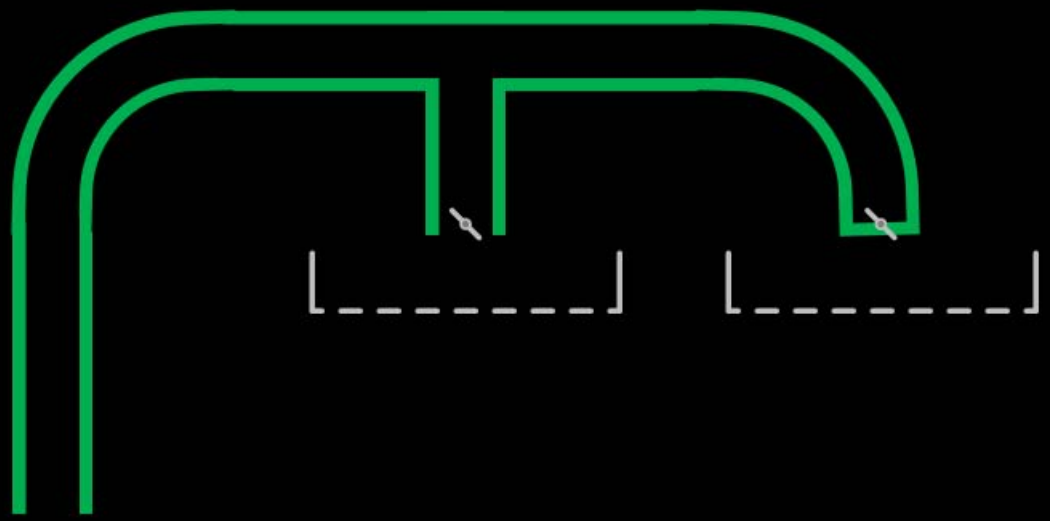
Cooling Towers in Action

- http://tinyurl.com/InsideACoolingTower
- http://tinyurl.com/CounterFlowTower

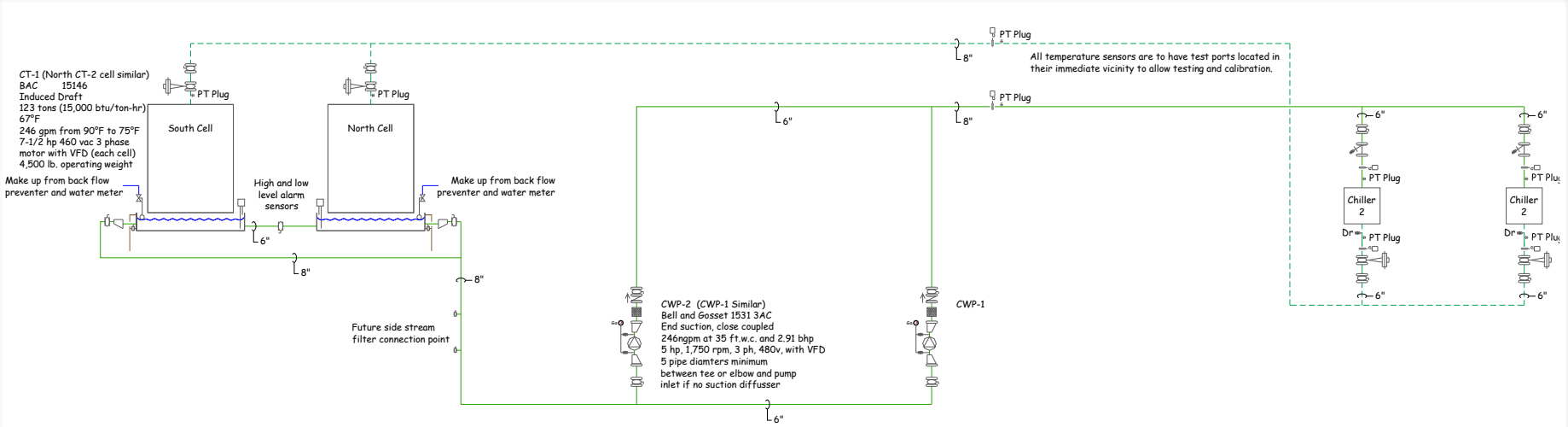
Water Distribution Is Critical



http://tinyurl.com/CoolingTowerFlow

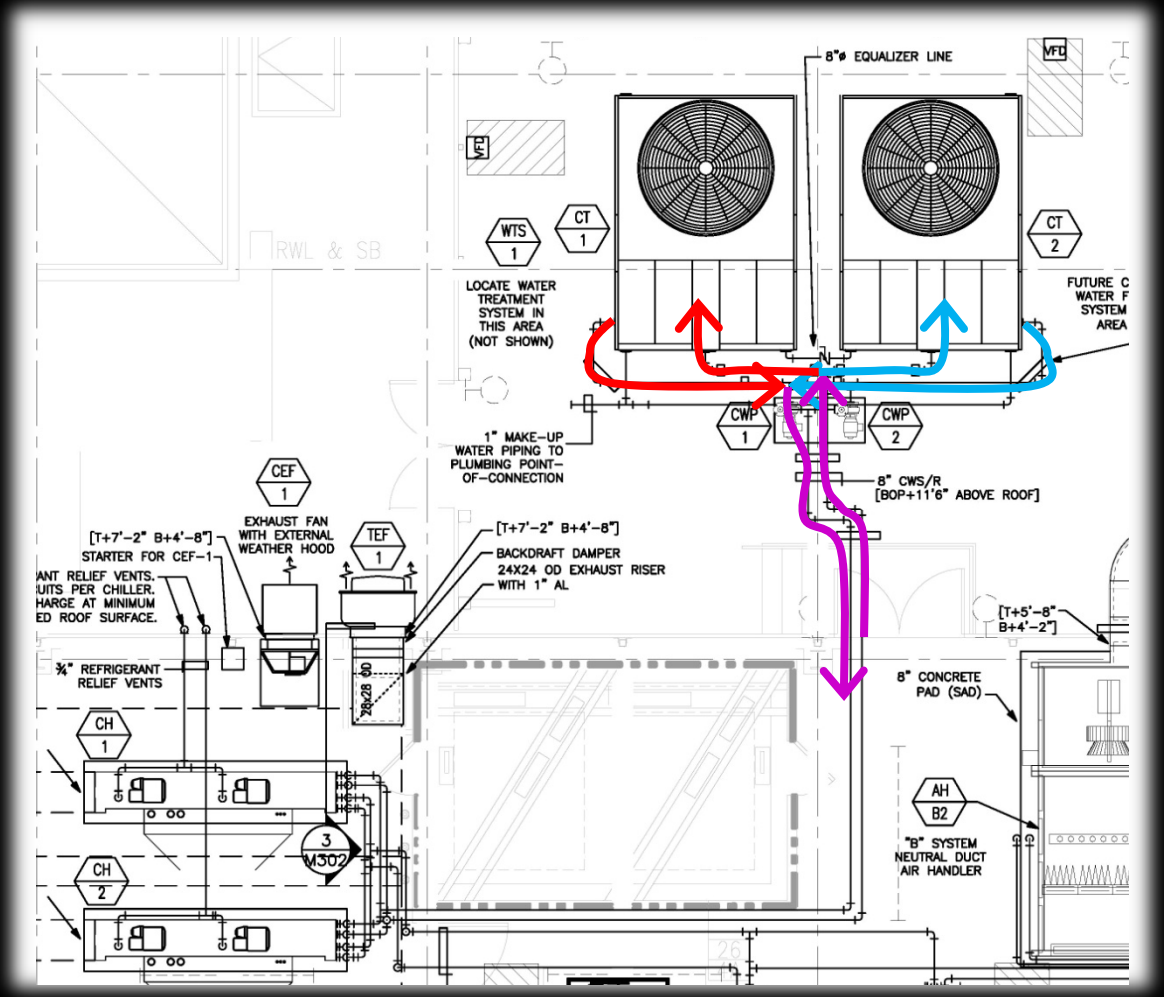


A Typical Condenser Water System

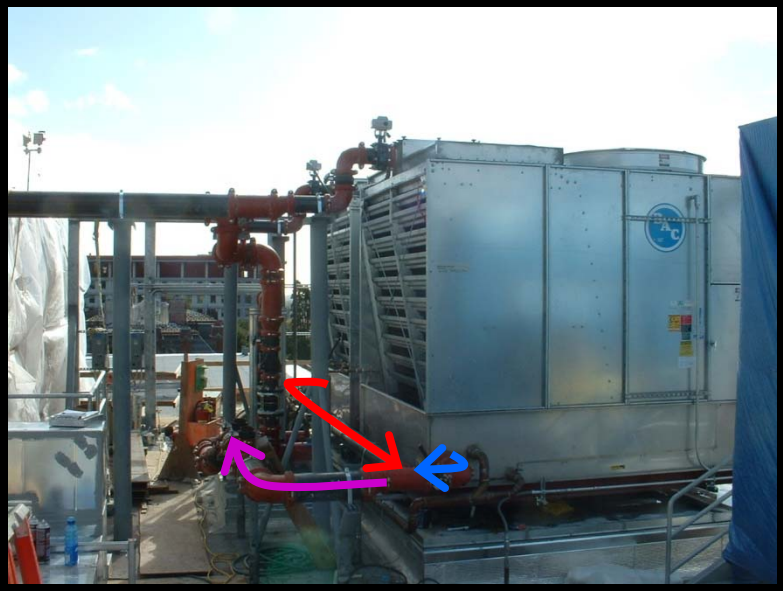


- Both pumps run at full load, equal flow rates
  - 246 gpm, 2.91 bhp each
- Both towers run at full load, equal flow rates
  - Flow critical to tower performance
  - Flow critical to tower to tower O&M issues

As Designed – Symmetrical Piping



As Installed



… not so symmetrical!