I.O.M. #107 *updated 09/13/2015*

INSTRUCTION MANUAL • INSTALLATION • OPERATION • MAINTENANCE

POWER TOWER



Covering Models From
45 - 540 tons.

ADVANTAGE®
MAKING WATER WORK™

ADVANTAGE ENGINEERING, INC.
525 East Stop 18 Road Greenwood, IN 46142
317-887-0729 fax: 317-881-1277
Service Department fax: 317-885-8683
www.AdvantageEngineering.com
E-mail service@AdvantageEngineering.com

Model: _____

Serial Number : _____

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INSTRUCTION MANUAL
FIBERGLASS MODELS

COVERING

INSTALLATION
OPERATION
MAINTENANCE

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1.0 GENERAL

1.1 Introduction
1.2 Receiving Instructions
1.3 Safety
1.4 Efficiency
1.5 Water Treatment
1.6 Model Designation
1.7 Warning Labels
1.8 Components

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1.1 INTRODUCTION

A. This manual covers cooling tower cells from 45 to 540 tons in the Power Tower Series of fiberglass cooling towers. Consult the factory if you have questions about the operating temperature range of your cooling tower.

B. The intent of this manual is to serve as a guide in the installation, operation and maintenance of your cooling tower. Improper installation can lead to equipment damage and poor performance. Failure to follow the installation, operation and maintenance instructions may result in damage to the unit that is not covered under the limited warranty. This manual is for standard products. The information contained in this manual is intended to be general in nature. The information is typical only and may not represent the actual unit purchased.

C. When calling for assistance from the Manufacturer's Service Department, it is important to know the model and serial number of the particular unit. The model number includes critical unit information which is helpful when troubleshooting operating difficulties. The serial number allows the service team to locate manufacturing and testing records which can have additional information relating to a particular unit.

1.2 RECEIVING INSTRUCTIONS

A. Some cooling towers are shipped horizontal, skid mounted and wrapped in plastic prior to shipment. The base frame for these models is shipped separately. Other cooling towers are shipped upright and attached to the supporting base frame. Check the overall condition of the equipment prior to accepting delivery.

B. Inlet louvers and other miscellaneous parts are shipped in a separate box.

C. Check for visible damage and document any evident damage on the delivery receipt. Shipping damage is the responsibility of the carrier.

D. In order to expedite payment for damages, should they occur, follow proper procedures and keep detailed records. Take photographs of any suspected damage.

1.3 SAFETY

A. It is important to become thoroughly familiar with this manual and the operating characteristics of the unit.

B. It is the owner's responsibility to assure proper operator training, installation, operation, and maintenance of the unit.

C. Observe all warning and safety placards applied to the chiller. Failure to observe all warnings can result in serious injury or death to the operator and severe mechanical damage to the unit.

D. Observe all safety precautions during installation, startup and service of this equipment due to the presence of high voltage and a rotating fan. Only qualified personnel should install, startup and service this equipment.

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E. When working on this equipment, observe precautions in literature and on tags, stickers and labels located on the equipment. Wear work gloves and safety glasses. Follow all required lockout - tagout procedures before starting work.

1.4 WATER TREATMENT

A. The use of untreated or improperly treated water in a cooling tower may result in scaling, erosion, corrosion, algae, slime and the potential for Legionella.

B. It is recommended that the services of a qualified water treatment specialist be engaged to determine what water treatment is required.

C. Advantage assumes no responsibility for equipment failures which result from untreated or improperly treated water. See Section 2.5 for additional information.

D. The water used in the cooling tower must be filtered.



WARNING: *Improper water treatment will void unit warranty.*



WARNING: *This equipment contains hazardous voltages that can cause severe injury or death. Disconnect and lock out incoming power before installing or servicing the equipment.*

1.6 MODEL DESIGNATION

A. The Serial Number identifies the exact configuration of your unit and should be available when contacting the Factory for service or information.

B. There maybe additional numbers and letters at the end of the model number to indicate additional configuration options on the machine.

Model Designator for Power Tower® Cooling Towers

PT-135ES or **TC-135F**

Ⓐ Ⓑ Ⓒ Ⓐ Ⓑ Ⓒ

Ⓐ **Cooling Tower**

Ⓑ **Tons of Capacity** 3 gallons per minute per ton from 95°F to 85°F at a 78°F entering wet bulb temperature

Ⓒ **Construction** **F:** Fiberglass **ES:** Fiberglass

1.7 WARNING LABELS

1. Alerts users to the danger of high voltage.

2. Alerts user to the danger of the rotating fans.

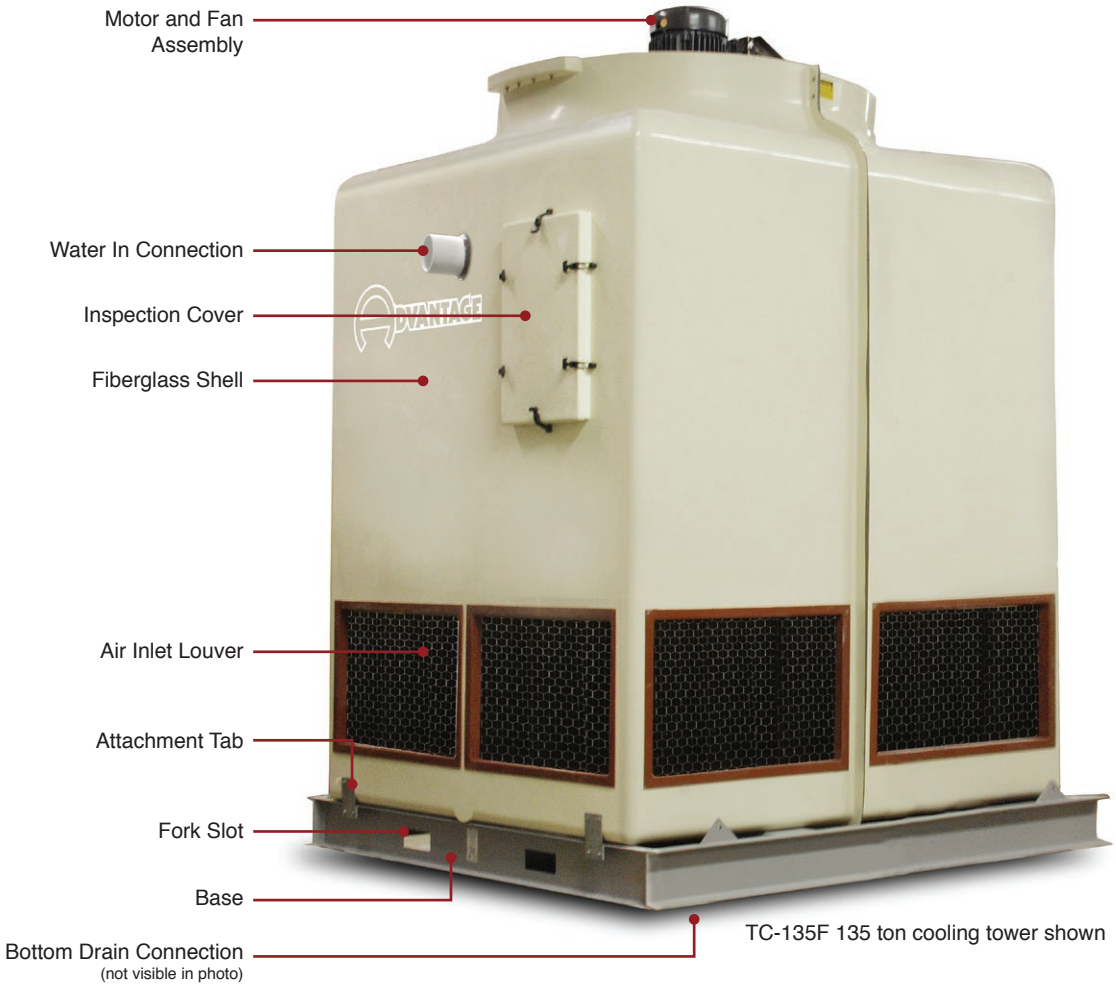


1



2

1.8 COMPONENTS



TC-135F 135 ton cooling tower shown

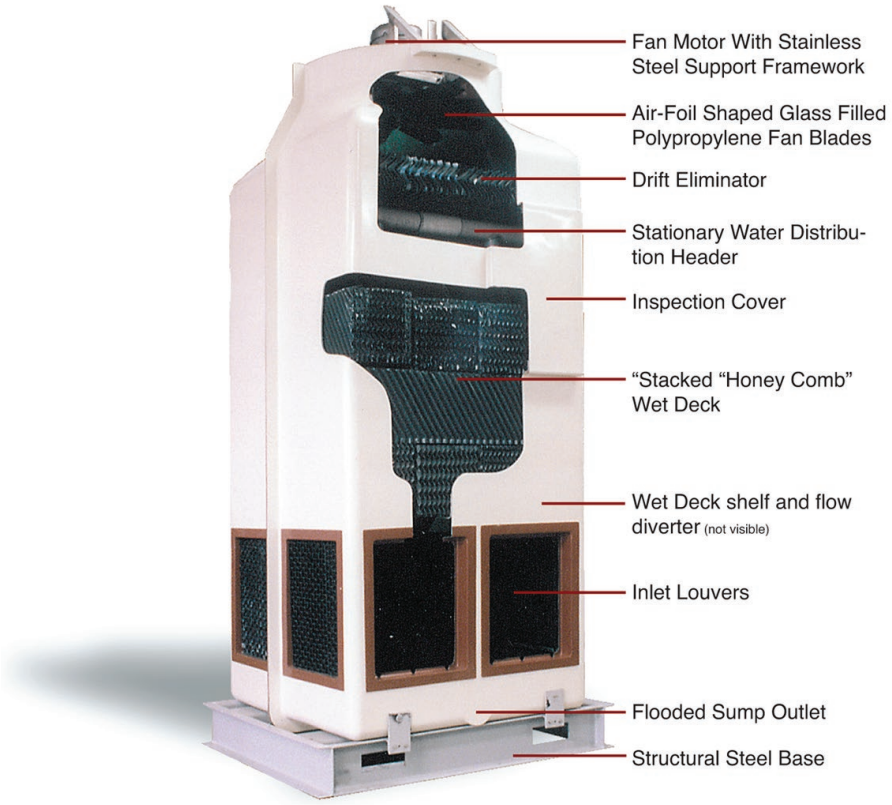


TC-405F 405 ton cooling tower shown



TC-270F 270 ton cooling tower shown

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2.0 INSTALLATION AND OPERATION

2.1 Outdoor Location and Installation
2.2 Starting The System
2.3 Water Treatment
2.4 Year Round Operation in a Freeze Climate

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2.1 OUTDOOR LOCATION AND INSTALLATION

A. The Power Tower Cooling Tower is designed to be installed outside. Considerations when locating and installing a cooling tower:

1. **AIR :** Atmospheric conditions that include an unusual amount of industrial smoke, chemical fumes, salt and dust that may be introduced to the tower can create a corrosive solution and conditions that foul the tower wet deck and process heat transfer surfaces.

WATER : Impurities in the water can be alkaline or acidic and can result in scaling or fouling of the wet deck surface and plant heat transfer surfaces reducing the tower's effectiveness.

2. A cooling tower should be located away from windows or vents through which air or water noise could be transmitted. Consider nearby neighbors that might be exposed to the tower noise especially when windows are open.

3. The tower should be located so that a clearance of 3' is available on all sides. The tower should not be installed in a pit.

B. A water treatment system must be part of any cooling tower system installation. The services of a professional qualified water treatment company is required. Water quality control is critical for tower operation. Water quality control consists of controlling scaling, corrosion, biological and bacterial growth. Failure to control the quality of the water can result in premature unit failure, fouling of plant wide heat transfer surfaces, bacterial and biological growth that can cause sickness and death. See Section 2.3 for more information.



WARNING: *A water treatment system must be part of any cooling tower system installation. The services of a professional qualified water treatment company is required to prevent scale, corrosion, bacterial and biological growth.*

C. The tower should be carefully leveled and anchored on steel or wooden beams, concrete pad or a firm surface capable of bearing the load. Space for maintenance should be left of all sides.

D. The fan and direct drive motor assembly is shipped mounted to the cooling tower.

E. Some models require removing the unit from the skid and rigging final assembly. See instructions shown elsewhere in this manual.

F. Inlet louvers are boxed and shipped separate from the tower cell. The louvers are cut to fit the inlet openings. Simply set the louver into the opening and press to set into place. Inlet louvers should fit tight and snug. Note: be certain the louvers are oriented so the inside angle is pointing down.

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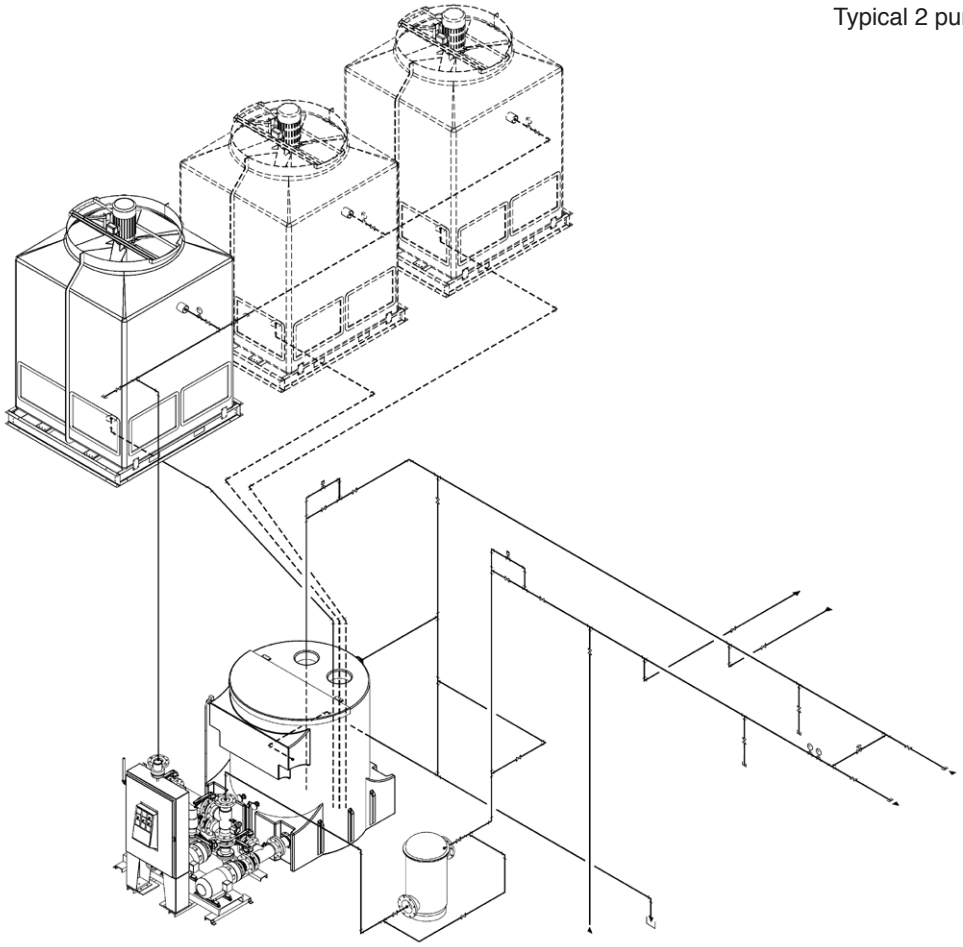
2.2 STARTING THE SYSTEM

A. The cooling tower cell is generally part of a larger system that requires start-up by a technician with knowledge about the entire system. Other system components that generally accompany the cooling tower cell include an indoor reservoir, process and cooling tower pumps, a water filtering system, a control system and a water treatment system.

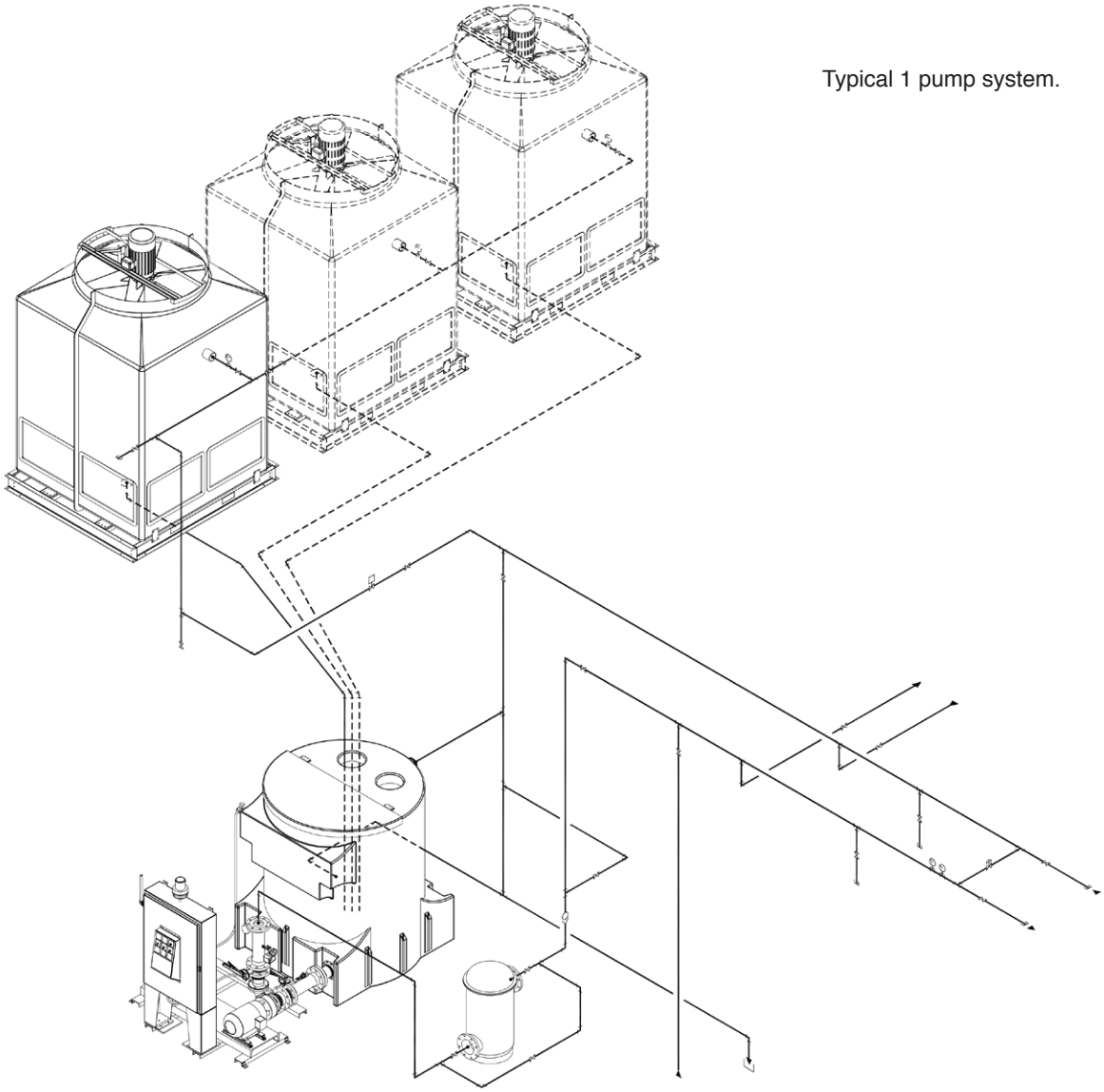
B. Establish proper flow to the cooling tower. The approximate pressure drop required at the tower inlet is 8 PSI to provide full spray coverage over the tower cell wet deck. When a bottom outlet tower is used with an indoor reservoir proper flow will show when there is about 1-2” of water in the base of the tower and continuous flow. If the basin of the tower fills beyond this the flow rate is too high and needs to be adjusted.

1. A system using a dedicated process pump and independent tower water recirculating pump is the preferred system. This system is often referred to as a 2-pump system. In this system the process pump delivers the cooled water to the process while a second pump delivers the returned warm water to the cooling tower. The process and tower flow are independent of each other. This allows the tower pump to be set at the correct flow rate for the tower which does not change while the process flow can vary.

Typical 2 pump system.



2. A 1-pump system has a single pump that delivers the cooled water to process and directly back to the cooling tower for cooling. The flow to the tower can vary in this system which decreases the overall tower performance.



Typical 1 pump system.

WARNING: *Do not connect the unit to a voltage supply not equal to the unit's voltage requirements as specified on the unit's data plate. Use of incorrect voltage will void the unit's warranty and cause a significant hazard that may result in serious personal injury and unit damage.*

C. Once the proper flow is established the tower fan can be engaged to promote cooling. Very little cooling is accomplished when the fan is off.

1. The fan is typically controlled by a thermostat or other means of temperature control that monitors the process water temperature and turns the fan on and off to maintain a desired setpoint temperature or varies the speed of the fan to do the same thing.

2. With the fan running confirm that the tower fan is turning the correct direction. The fan is turning in the correct direction when air is drawn through the tower inlet louvers and out the top. An easy test is to hold a piece of paper near the louver inlet. If the paper is drawn to the louver the fan is turning in the correct direction. If the fan is not turning in the correct direction, stop the fan, disconnect power following all lock-out, tag-out procedures, switch any two power leads at the power disconnect. Re-apply power and check rotation again as described above.

3. Following all safety procedures, check the amp draw on all three legs of the fan motor when it is running and compare the reading to the motor rating. The amps read should be at or below the fan motor nameplate reading on all legs and the difference between legs should have a variance of 10% or less.

D. Once operating your cooling tower should provide trouble free performance with little maintenance. The motor must be lubricated every 6 months and proper water quality must be maintained. Periodically check the water flow rate.

2.3 WATER TREATMENT

A. **A water treatment system must be part of any cooling tower system installation. The services of a professional qualified water treatment company is required. A water treatment system typically consists of a plan to control scaling, corrosion and biological growth. Failure to control the quality of the water can result in premature unit failure, fouling of plant wide heat transfer surfaces and biological growth that can cause sickness and even death.**

B. **Keeping the water in a cooling tower system clean has benefit by reducing scale and fouling and ensuring that the cooling process is operating efficiently. Fouling can lead to a loss of plant performance.**

C. Advantage assumes no responsibility for equipment failures or other results from untreated or improperly treated water.

D. **Legionella.** Cooling towers must be treated for and protected from Legionella. Follow ASHRAE Standard 188P and/or CTI Guidelines WTB-14B, and /or OSHA Guidelines Section III Chapter 7 and/or the recommendation of your professional water treatment expert to prevent Legionella in your tower. Failure to prevent Legionella may result in sickness or death.

2.4 YEAR-ROUND OPERATION IN A FREEZE CLIMATE

A. The Power Tower is designed to provide year-round service for industrial cooling.

1. In a freezing climate, the cooling tower must be elevated and the water must gravity drain to a reservoir located in a non-freeze location. It is highly recommended that a 2-pump style system be used so that both the tower

fan and pump circulating water to the tower can be controlled to minimize the chance of freezing. Piping from the tower outlet to the indoor reservoir should be sloped at an angle of about 10% to promote free flow draining. The distance between the outdoor cooling tower and indoor reservoir should be keep to a minimum and the reservoir must be selected to hold the entire amount of water contained in the tower and piping to and from the tower when off.

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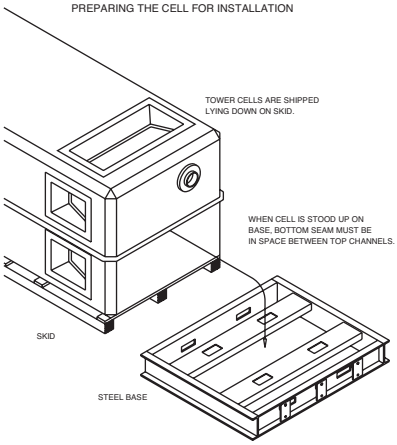
3.0 TECHNICAL INFORMATION

3.1 Assembly & Rigging Instructions
3.2 Inlet Louver Retaining System
3.3 Typical Tower Cell Support Stand
3.4 Tower Stand Mounting Options
3.5 Typical 1 Pump Tower System Configuration
3.6 Typical 2 Pump Tower System Configuration
3.7 Typical Vacuum Breaker
3.8 Expandable Tower Cell Installation
3.9 Recommended Operation and Maintenance Schedule

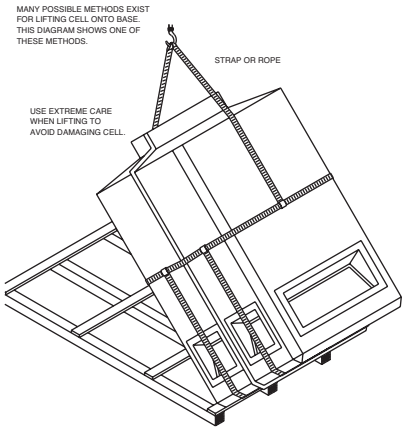
3.1 RIGGING AND ASSEMBLY INSTRUCTIONS

(APPLIES TO TC-35F, TC-75F & TC-120F - ADVANTAGE DRAWING #2038)

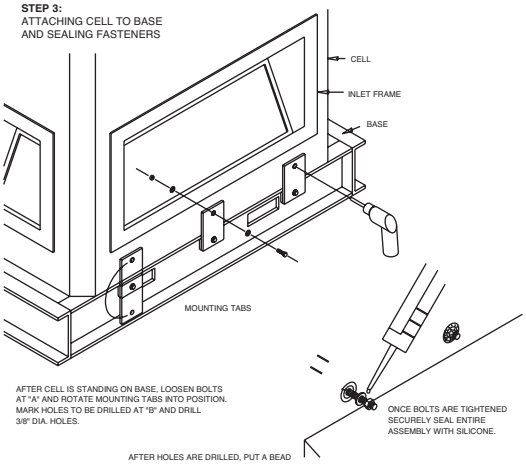
STEP 1:
PREPARING THE CELL FOR INSTALLATION



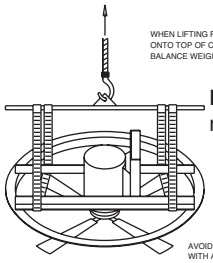
STEP 2:
LIFTING CELL FROM SKID ONTO BASE



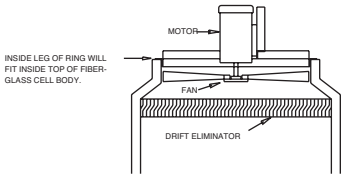
STEP 3:
ATTACHING CELL TO BASE AND SEALING FASTENERS



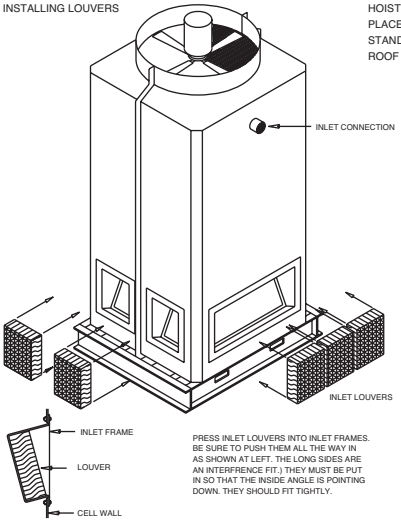
STEP 4:
SETTING FAN UNIT ASSEMBLY



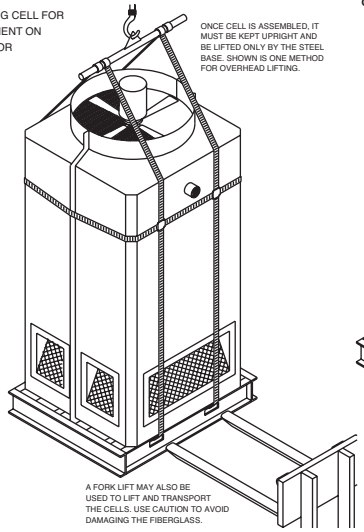
NOTE: This step may not be required on some models.



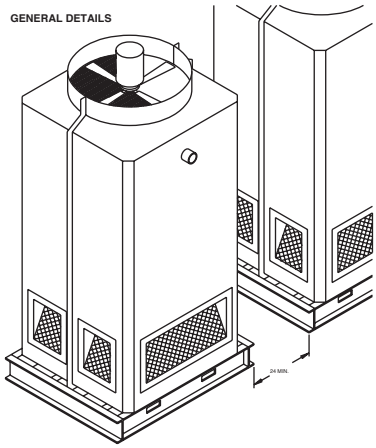
STEP 5:
INSTALLING LOUVERS



STEP 6:
HOISTING CELL FOR PLACEMENT ON STAND OR ROOF



GENERAL DETAILS



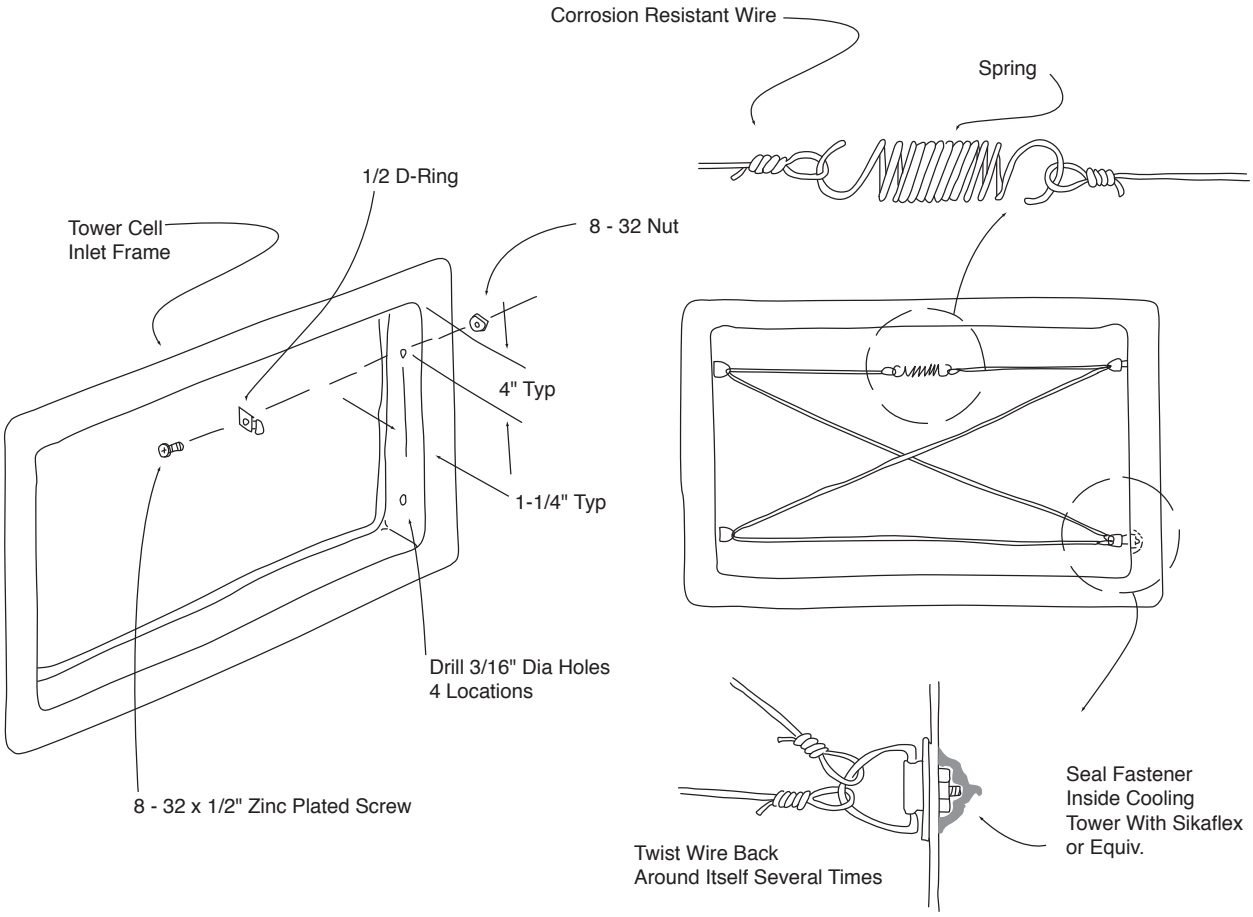
3.2 INLET LOUVER RETAINING SYSTEM

A. Cooling tower cells should not be operated without all of the air intake louvers properly installed. The air inlet louvers serve several important purposes including keeping airborne debris from entering the tower and minimizing water loss caused by high winds.

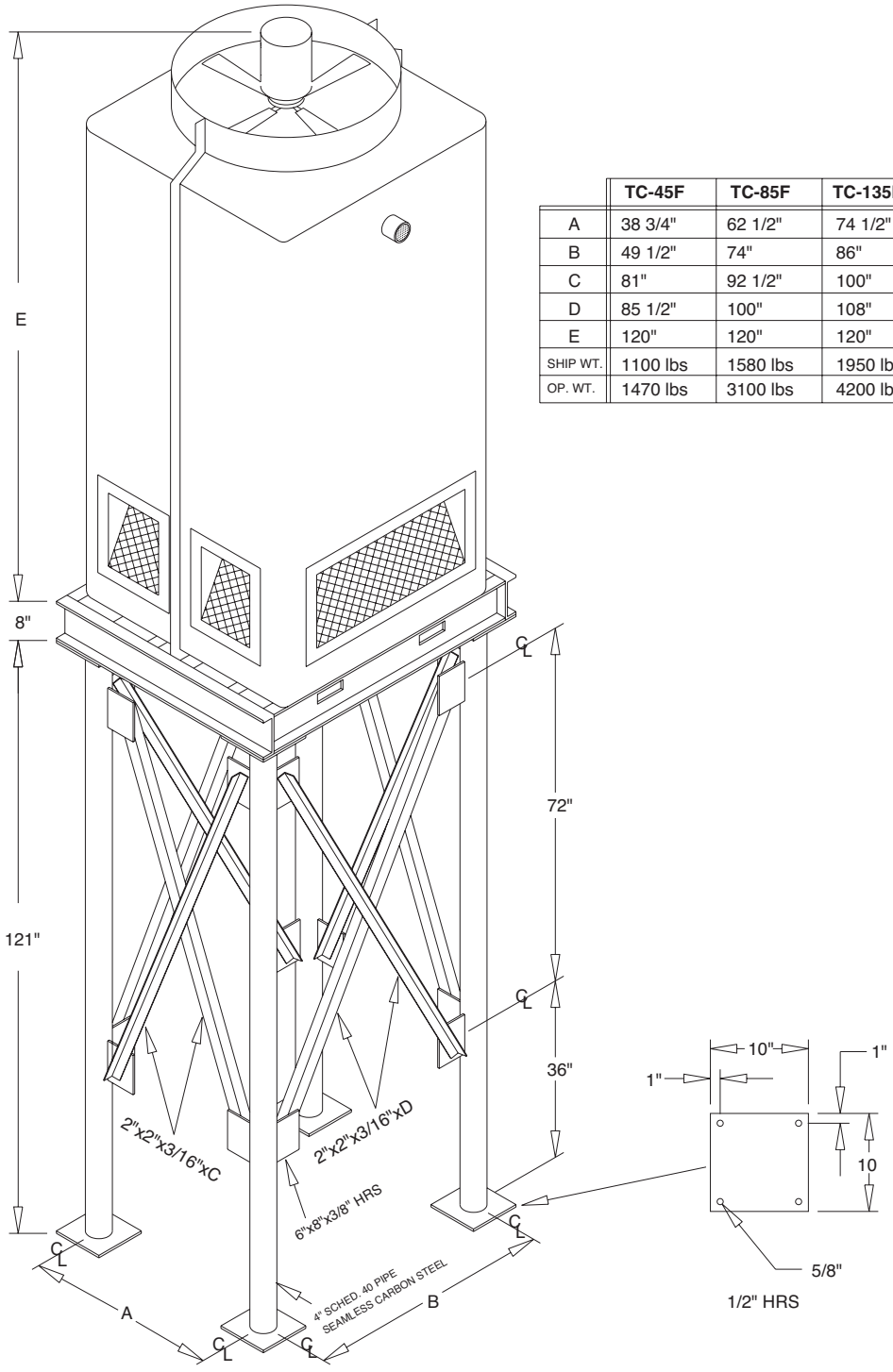
B. The louvers in the cooling tower are friction fit into position. They can be removed without tools for inspection of the tower sump.

C. If your tower is or will be located in an extremely windy location or if you want your louvers to be less easily removed, the factory recommends the use of a simple physical louver retaining system as described below. This retaining system can be factory or field installed.

D. All parts described below are available at any local home improvement store.



3.3 TYPICAL TOWER CELL SUPPORT STAND



	TC-45F	TC-85F	TC-135F
A	38 3/4"	62 1/2"	74 1/2"
B	49 1/2"	74"	86"
C	81"	92 1/2"	100"
D	85 1/2"	100"	108"
E	120"	120"	120"
SHIP WT.	1100 lbs	1580 lbs	1950 lbs
OP. WT.	1470 lbs	3100 lbs	4200 lbs

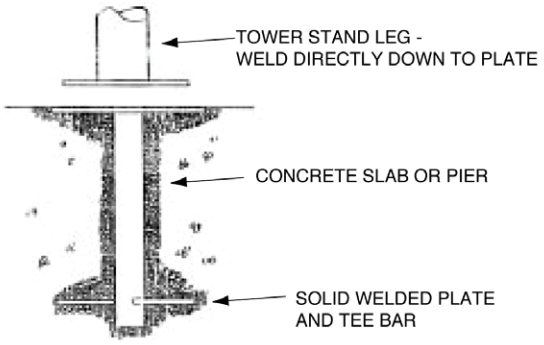
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3.4 TOWER STAND MOUNTING OPTIONS

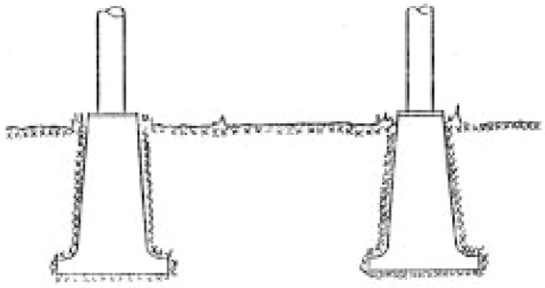
A. The tower stand must be adequately secured. Several general options are shown below.

B. Consult a local engineering company for requirements for your stand based on the tower size, weight, stand height, wind loading, seismic conditions, soil conditions and any other conditions unique to your installation.

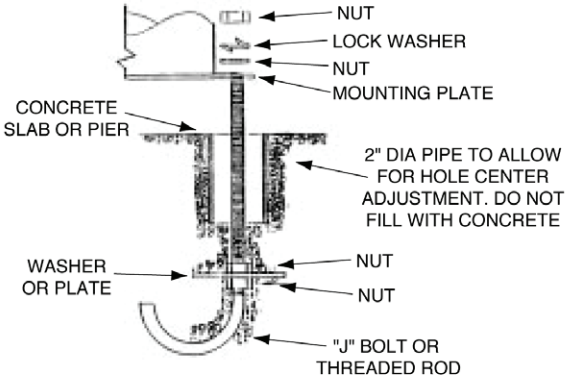
TOWER STAND MOUNTING - PERMANENT



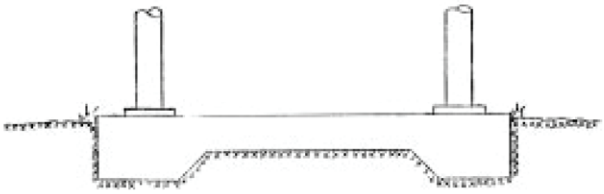
TOWER STAND MOUNTING - PIER MOUNTING



TOWER STAND MOUNTING - REMOVABLE



TOWER STAND MOUNTING - SLAB MOUNTING



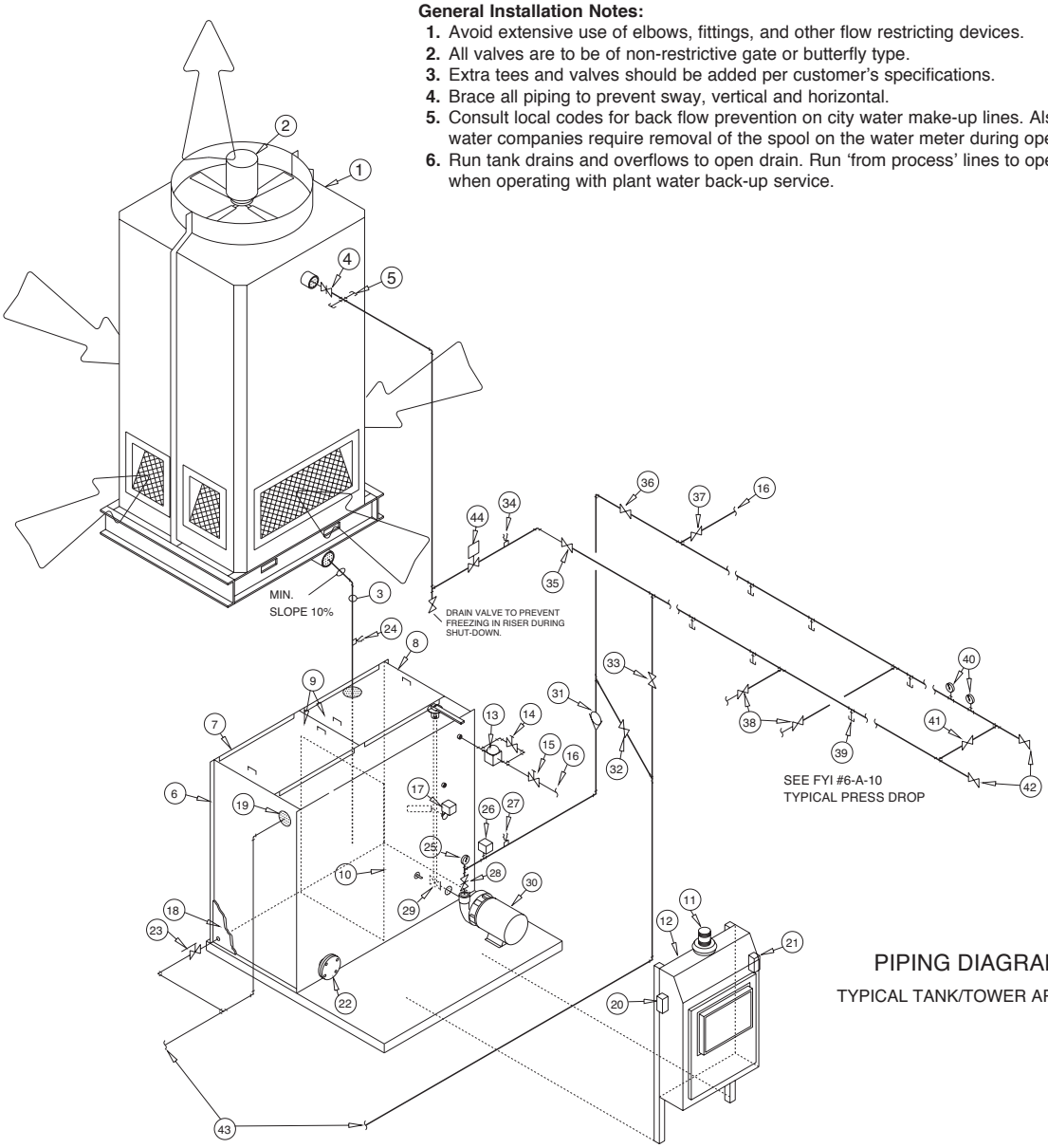
SEE WEIGHTS OPERATING FOR LOAD REQUIREMENTS. DIMENSIONS VARY WITH CAPACITY AS WELL AS GEOGRAPHIC REGION AND TYPE OF SOIL.

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3.5 TYPICAL 1 PUMP TOWER SYSTEM CONFIGURATION

General Installation Notes:

1. Avoid extensive use of elbows, fittings, and other flow restricting devices.
2. All valves are to be of non-restrictive gate or butterfly type.
3. Extra tees and valves should be added per customer's specifications.
4. Brace all piping to prevent sway, vertical and horizontal.
5. Consult local codes for back flow prevention on city water make-up lines. Also, some water companies require removal of the spool on the water meter during operation.
6. Run tank drains and overflows to open drain. Run 'from process' lines to open drain when operating with plant water back-up service.



PIPING DIAGRAM

TYPICAL TANK/TOWER AREA

1-PUMP TOWER SYSTEM

*Items included with typical ATS

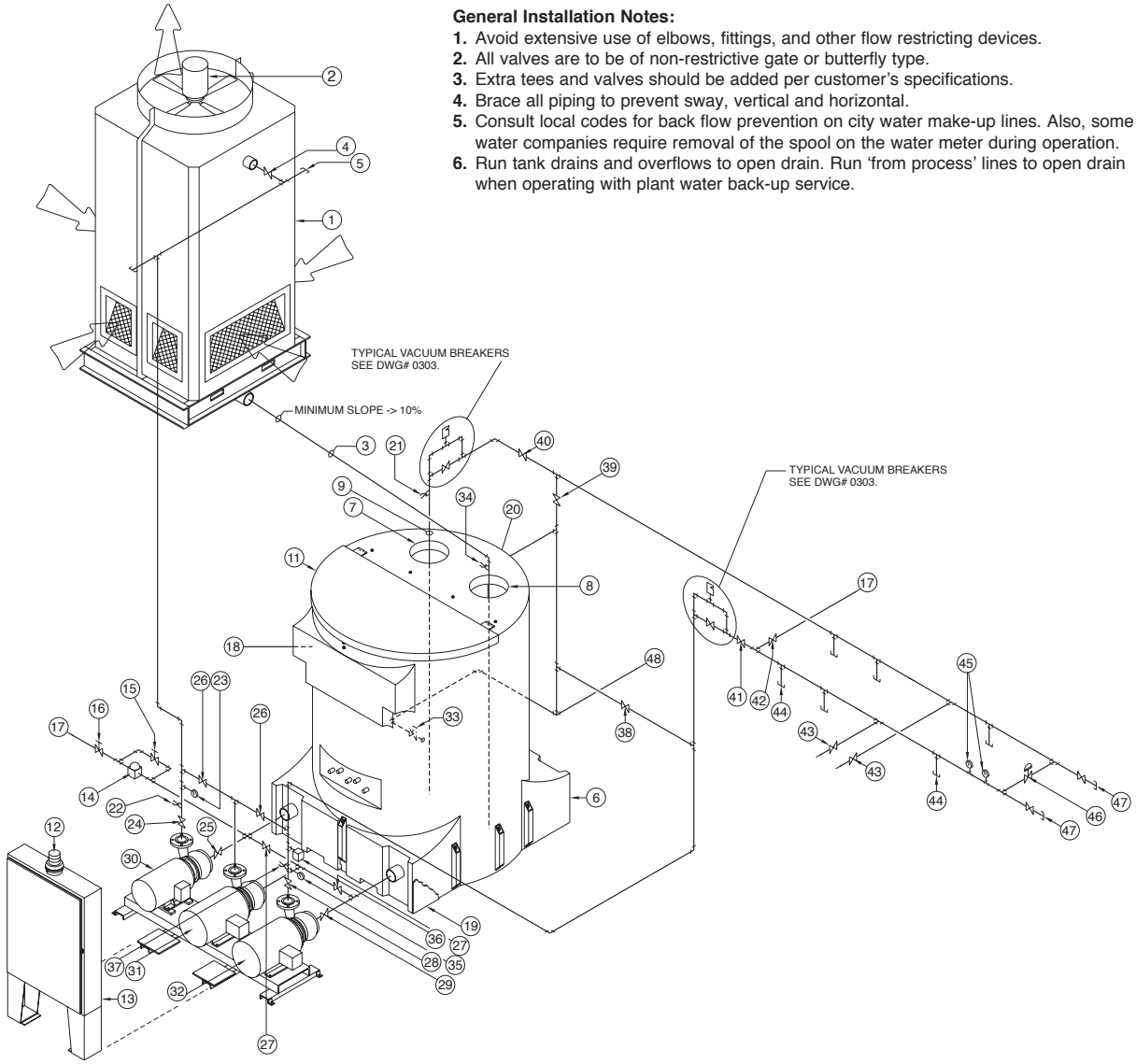
^Options

* 1 tower cell
* 2 tower fan motor
3 tower return line to tank 8-10" from bottom
* 4 tower balance valve
5 capped tees for future add'l tower cells
* 6 PTS pump tank assembly
7 tank hot side - from process
8 tank cold side - to process
^ 9 tank lid - hinged or lift-off
*10 tank baffle
^11 system temperature and pressure alarm
^12 'SCC' system control console
^13 automatic water make-up solenoid
^14 manual fill valve
15 tank make-up service valve
16 from plant water service
^ 17 water level control
^ 18 tank insulation - recommended for outdoors applications in freeze areas
* 19 tank overflow port
* 20 tower fan thermostat
* 21 alarm thermostat
* 22 extra port for future pump - capped
* 23 tank drain valve
* 24 'tower out' temperature probe
* 25 system supply pressure gauge
^ 26 alarm pressure switch
* 27 'to process' temperature probe
* 28 process pump discharge valve
* 29 process pump suction valve
* 30 process pump
31 check valve - required only if header system is run above tank level to retain water in piping during shut-down
32 tower bleed valve - set at 2 gpm per ton of tower capacity
33 emergency operation drain valve
* 34 'from process/tower in' temperature probe
35 main header valve - from process
36 main header valve - to process
37 emergency operation water supply valve
38 valves at header branches to provide service flexibility and balance flow
39 tees at existing and future machine drops
40 temperature and pressure gauges at header end to monitor performance
41 system balance valve - sized per system capacity. Use CASH ACME K-20, K-5 or equivalent
42 valve or cap header ends to allow for future expansion
43 to plant open drain
44 motorized ball valve - need ed when the header is equal to or above level of tower inlet - close on system shut-down

3.6 TYPICAL 2 PUMP TOWER SYSTEM CONFIGURATION

General Installation Notes:

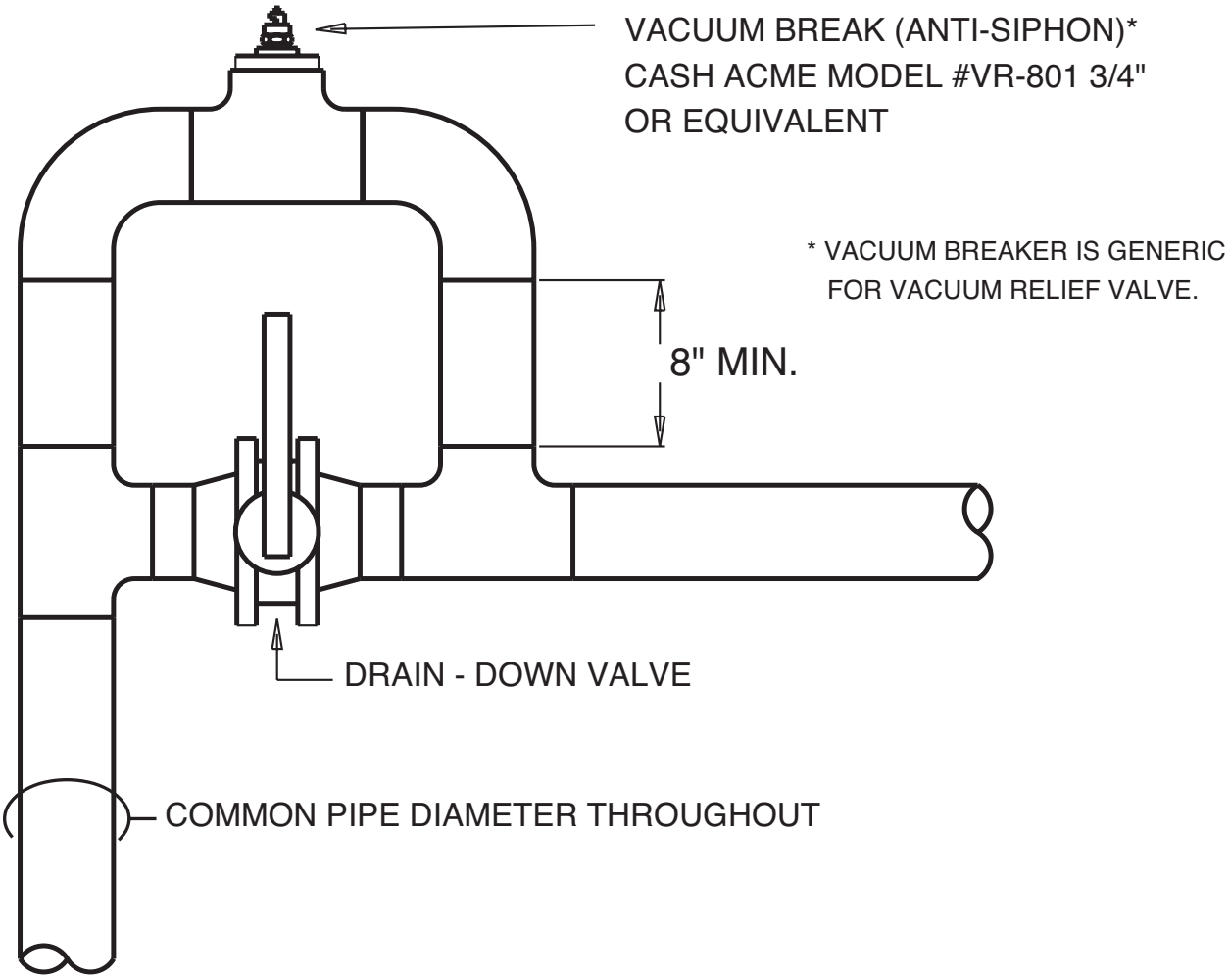
1. Avoid extensive use of elbows, fittings, and other flow restricting devices.
2. All valves are to be of non-restrictive gate or butterfly type.
3. Extra tees and valves should be added per customer's specifications.
4. Brace all piping to prevent sway, vertical and horizontal.
5. Consult local codes for back flow prevention on city water make-up lines. Also, some water companies require removal of the spool on the water meter during operation.
6. Run tank drains and overflows to open drain. Run 'from process' lines to open drain when operating with plant water back-up service.



TWO PUMP TOWER SYSTEM
* Items included in typical ATS
^Options

1* Tower cell
2* Tower fan motor
3 Tower return line to tank; 12"-18" from bottom
4^ Tower balance valve
5^ Capped tees for future tower cells
6* "TTK" pump tank assembly
7 Tank hot side - from process
8 Tank cold side - to process
9 From process header; 12"-18" from bottom
10* Tank baffle (not shown - inside tank)
11* Hinged tank lid
12^ System pressure & temperature alarm
13^ System control console
14^ Automatic water make-up solenoid
15^ Manual fill valve
16 Tank make-up service valve
17 From plant water service
18^ Water level control
19^ Tank insulation - recommended for out-door application in freeze areas
20* Tank overflow port
21* From Process temperature probe
22* Tower In temperature probe
23* Tower pump discharge pressure gauge
24* Tower pump discharge valve
25* Tower pump suction valve
26^ Stand-by pump discharge valves
27^ Stand-by pump suction valves
28* Process pump discharge valve
29* Process pump suction valve
30* Tower pump
31^ Stand-by pump
32* Process pump
33* Tank drain valve
34* Tower Out temperature probe
35* System supply pressure gauge
36^ Alarm pressure switch
37* To Process temperature probe
38 Tower bleed valve - set at 2gpm/ton of tower
39 Emergency operation drain valve
40 Main header valve - from process
41 Main header valve - to process
42 Emergency operation water supply valve
43 Valves at header branches to provide service flexibility and balanced flow
44 Tees at existing & future machine drops
45 Temperature & pressure gauges at header end to monitor performance
46 System balance valve - sized per system capacity. Use Cash ACME K-20, K-5 or equiv.
47 Cap & valve header ends to allow for future expansion
48 To plant open drain

3.7 TYPICAL VACUUM BREAKER / ANTI-SIPHON SYSTEM



INSTALLATION NOTES:

1. The purpose of the vacuum breaker/anti-siphon (also called a drain-back dam), is to retain water in the header system during shut-down, and to eliminate air purge and shock to plumbing during start up.

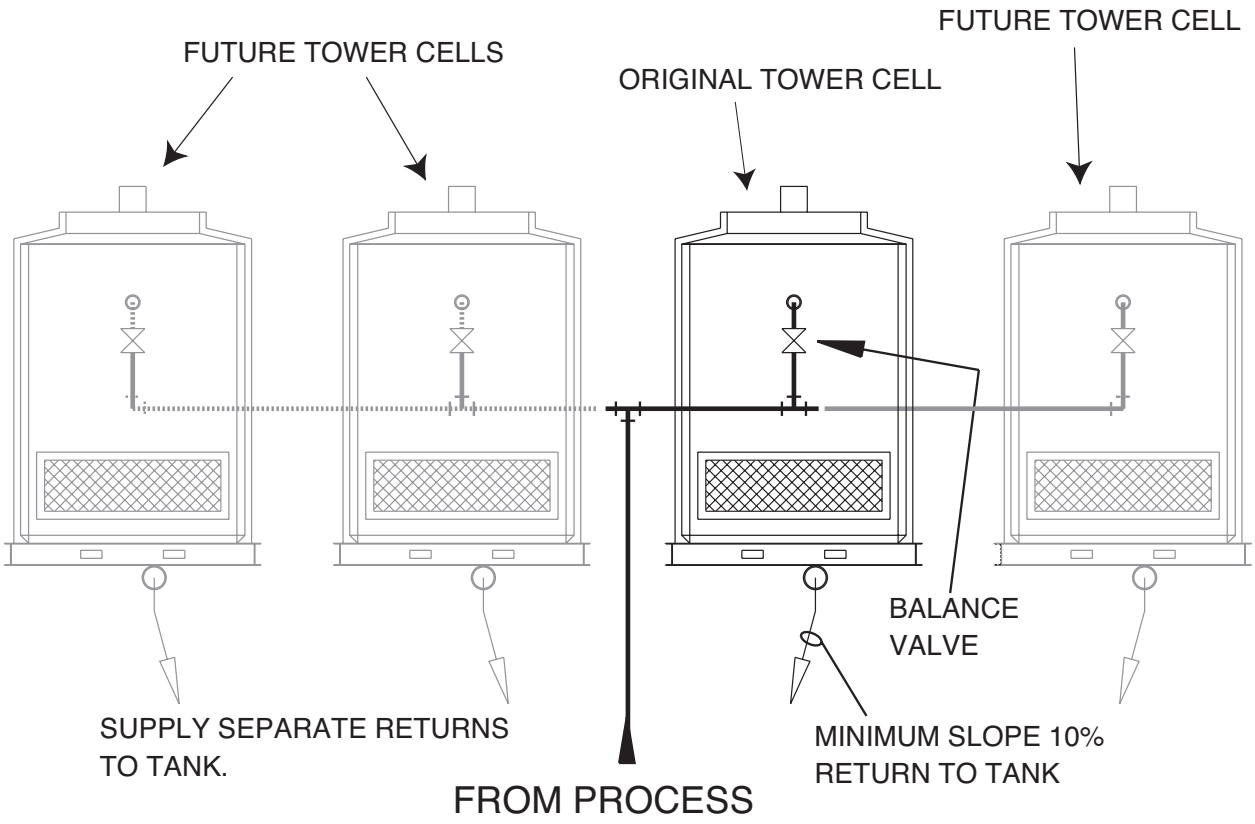
2. It is necessary to duplicate this arrangement on both the supply and return lines. If a check valve is installed in the “to process” line the vacuum breaker system may not be required in the line through check valves may not seal entirely over time allowing piping drain back.

3. The drain-down valve allows header drainage for system maintenance and is closed during normal operation.

4. The vacuum breaker must be located at the highest point in the system, nearest to the tank to be most effective. A nipple length of 8 inches minimum is required to create sufficient vacuum to open the Cash Acme model VR-801.

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3.8 MULTIPLE COOLING TOWER CELLS - PLANNING FOR EXPANSION



NOTES:

1. Size tower supply piping for total system flow rate including anticipated expansion.
2. Install balance valve at each tower inlet.
3. Install capped tees for future tower cells. Balance valves will be required at each tower inlet.
4. When operating with more than one tower cell, adjust balance valve at each tower to divide flow rate.
5. Indoor reservoir and pumping system must be capable of supporting anticipated future expansion.

3.9 RECOMMENDED OPERATION AND MAINTENANCE SCHEDULE

SERVICE	*START-UP*	*MONTHLY*	*6 MONTHS*	*SHUT DOWN*	*YEARLY*
Inspect general condition of unit	X	X			
Clean debris from unit	X	X		X	
Clean and flush sump	X	X		X	
* Check and adjust sump water level	X	X			
Inspect heat transfer section (fill)	X	X			
Inspect spray nozzles	X	X			
Check and adjust bleed rate	X	X			
*Check operation of make-up valve	X	X			
Check unit for unusual noise or vibration	X	X			
Check motor voltage and current	X		X		
Lubricate fan motor bearings	X	X			
Check fan for roation without obstruction	X				
Check fan and pump motor for proper rotation	X				
Drain sump and piping	X				
Inspect protective finish					X
Lubricate fan motor			X		

*For units without a remote sump

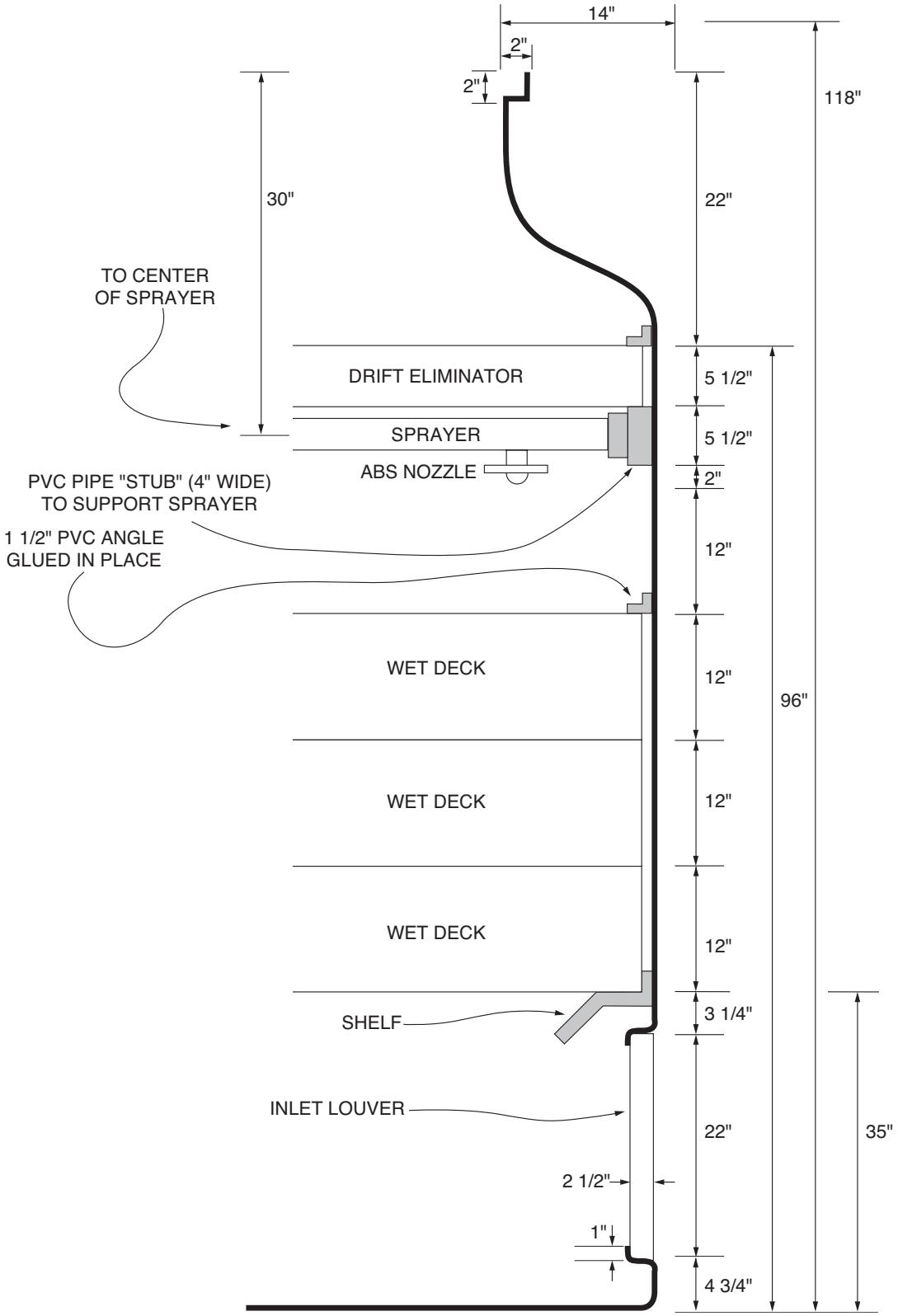
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4.0 PHYSICAL DRAWINGS

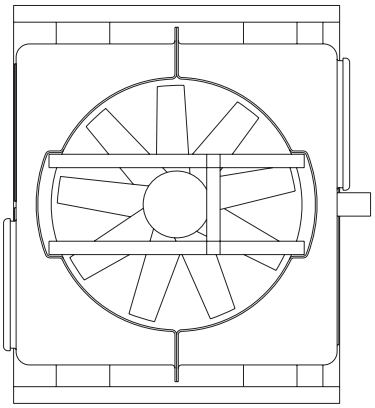
4.1 Cross Sectional View
4.2 Physical TC-45F
4.3 Physical TC-85F
4.4 Physical TC-105F
4.5 Physical TC-135F
4.6 Physical TC-170F
4.7 Physical TC-210F
4.8 Physical TC-270F
4.9 Physical TC-315F
4.10 Physical TC-405F
4.11 Physical TC-540F

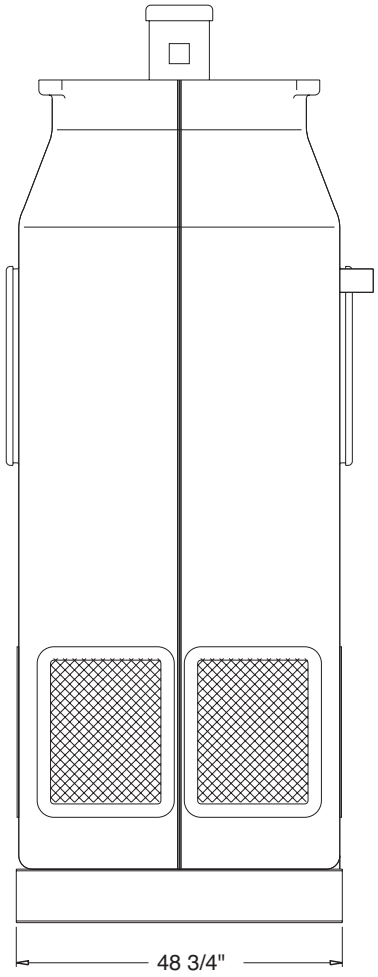
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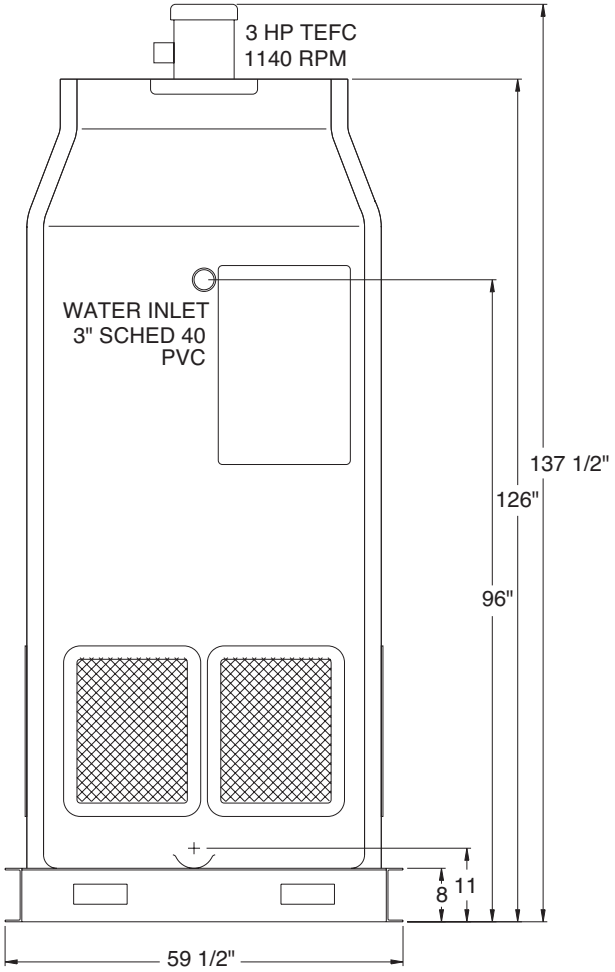
4.2 CROSS SECTIONAL VIEW

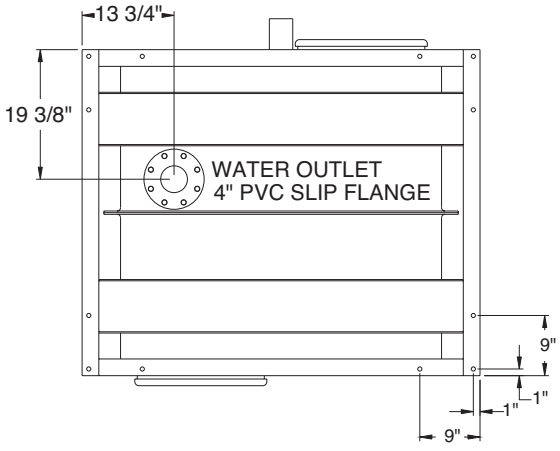


4.3 TC-45F PHYSICAL



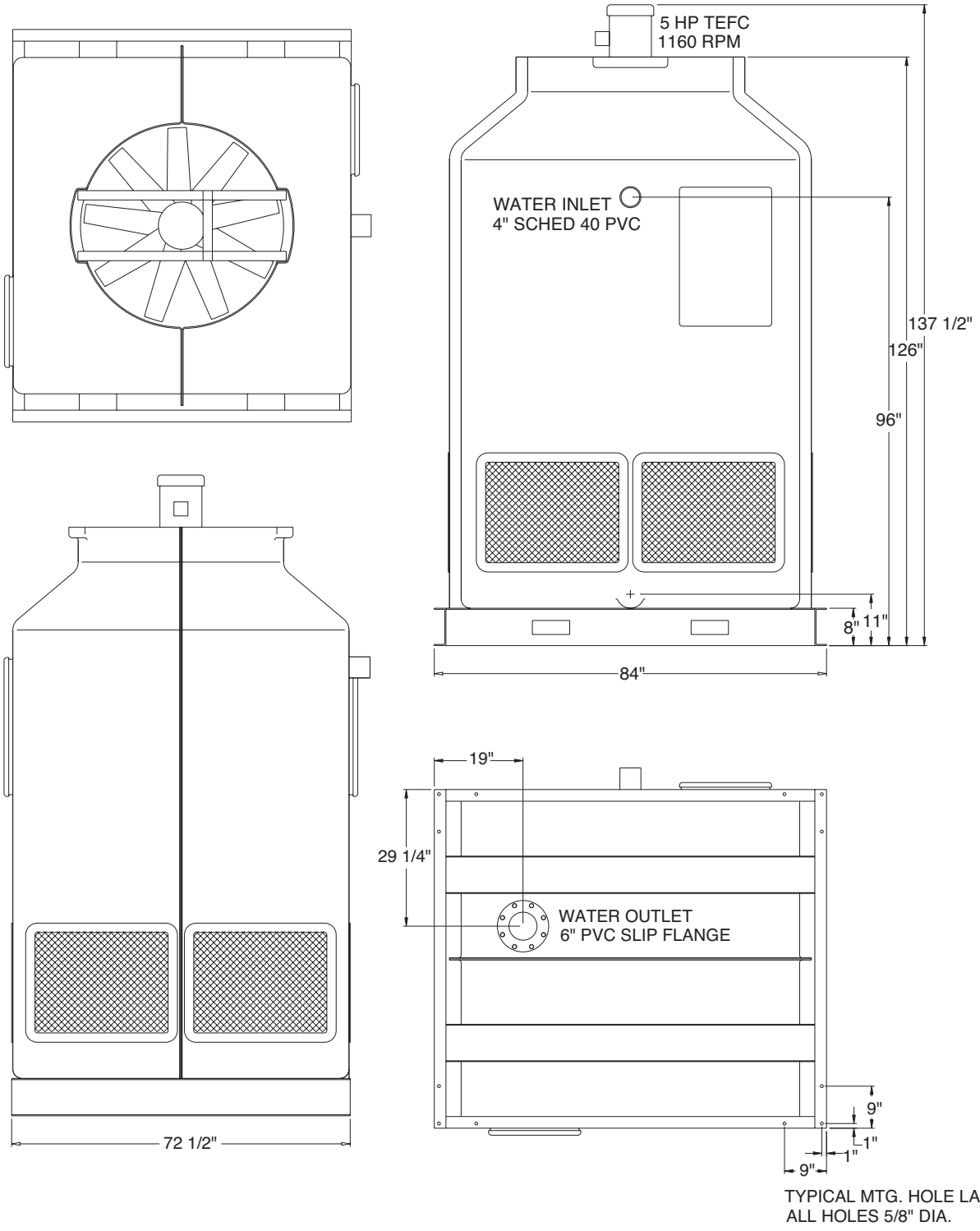






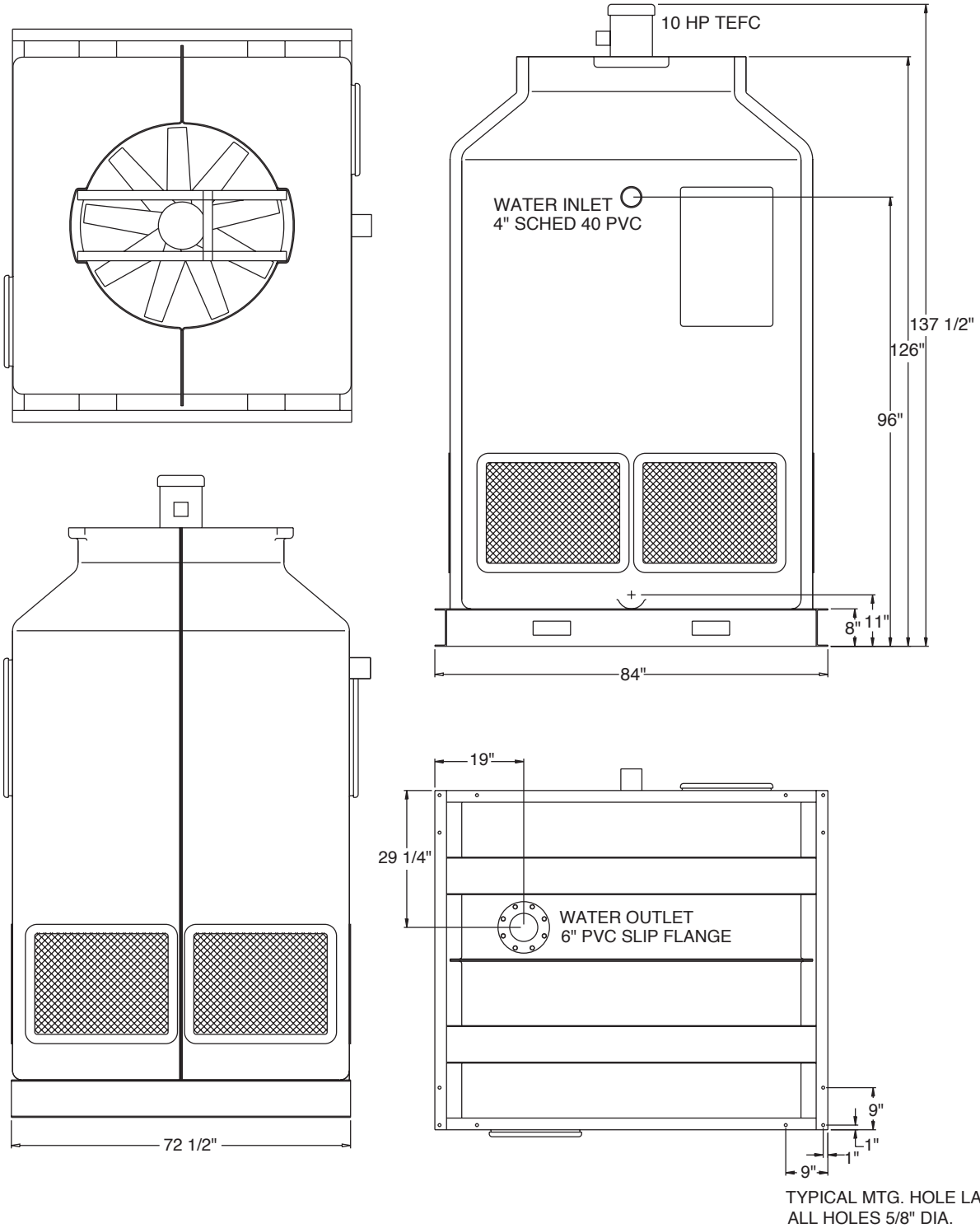
TYPICAL MTG. HOLE LAYOUT
ALL HOLES 5/8" DIA.

4.4 TC-85F PHYSICAL



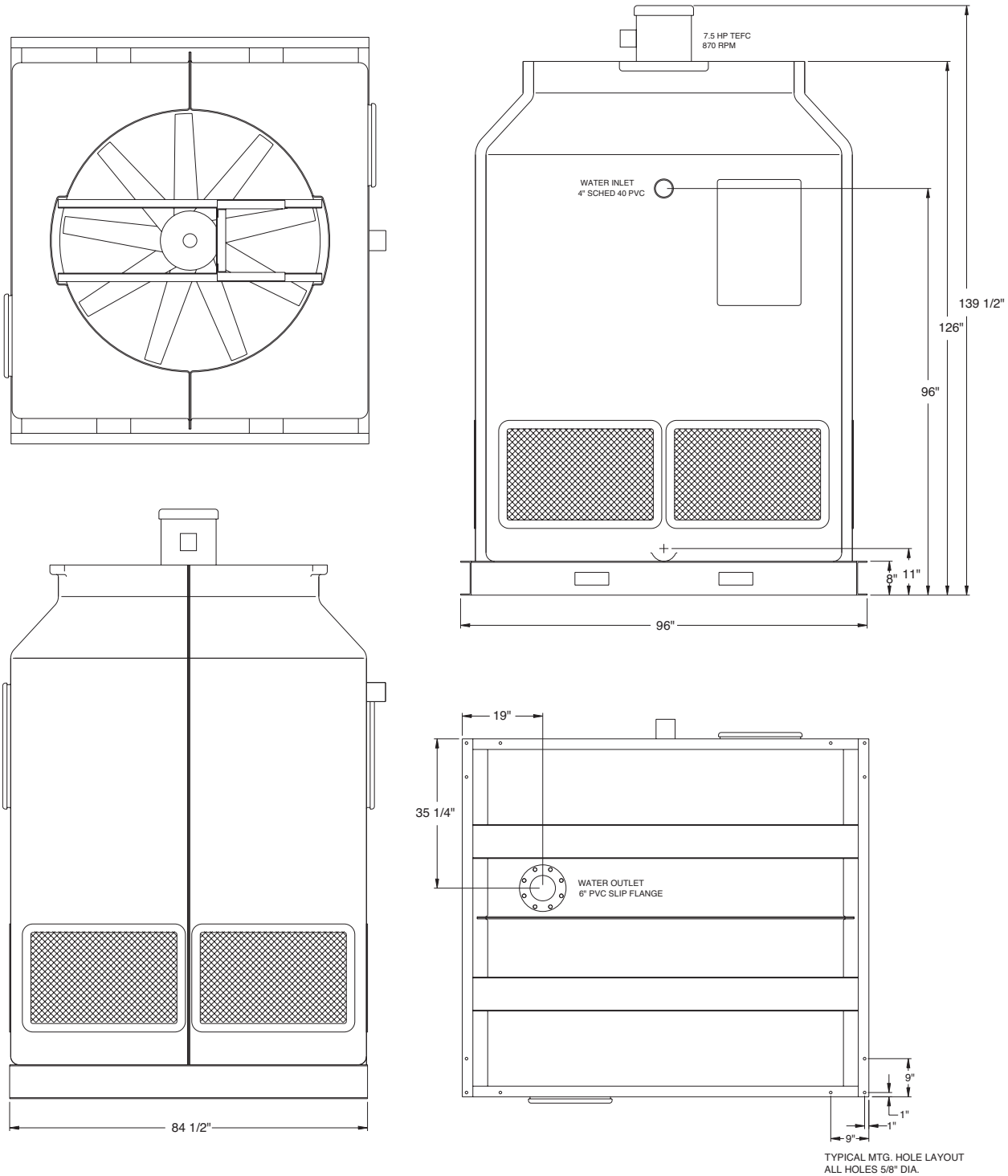
TYPICAL MTG. HOLE LAYOUT
ALL HOLES 5/8" DIA.

4.5 TC-105F PHYSICAL



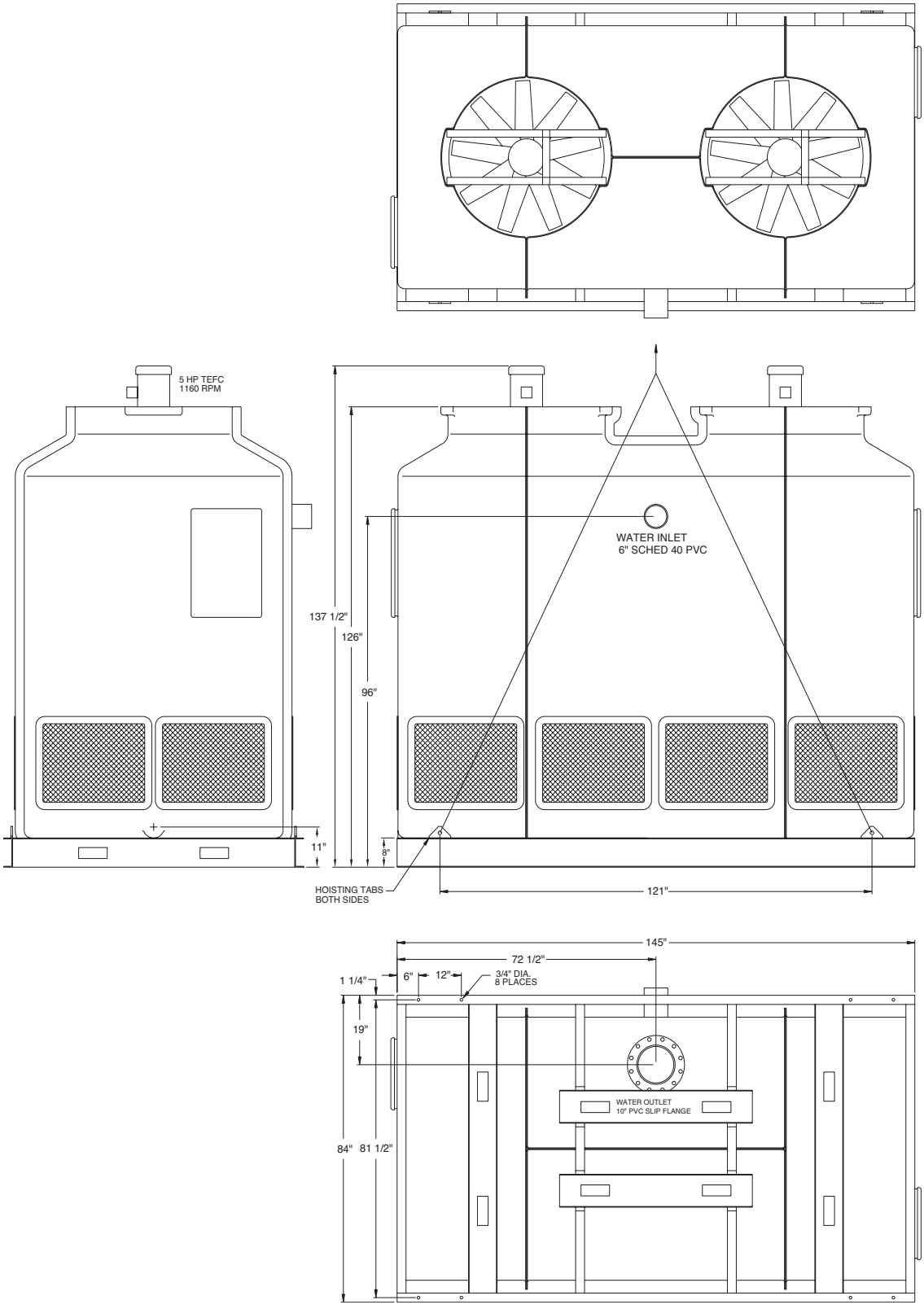
TYPICAL MTG. HOLE LAYOUT
ALL HOLES 5/8" DIA.

4.6 TC-135F PHYSICAL

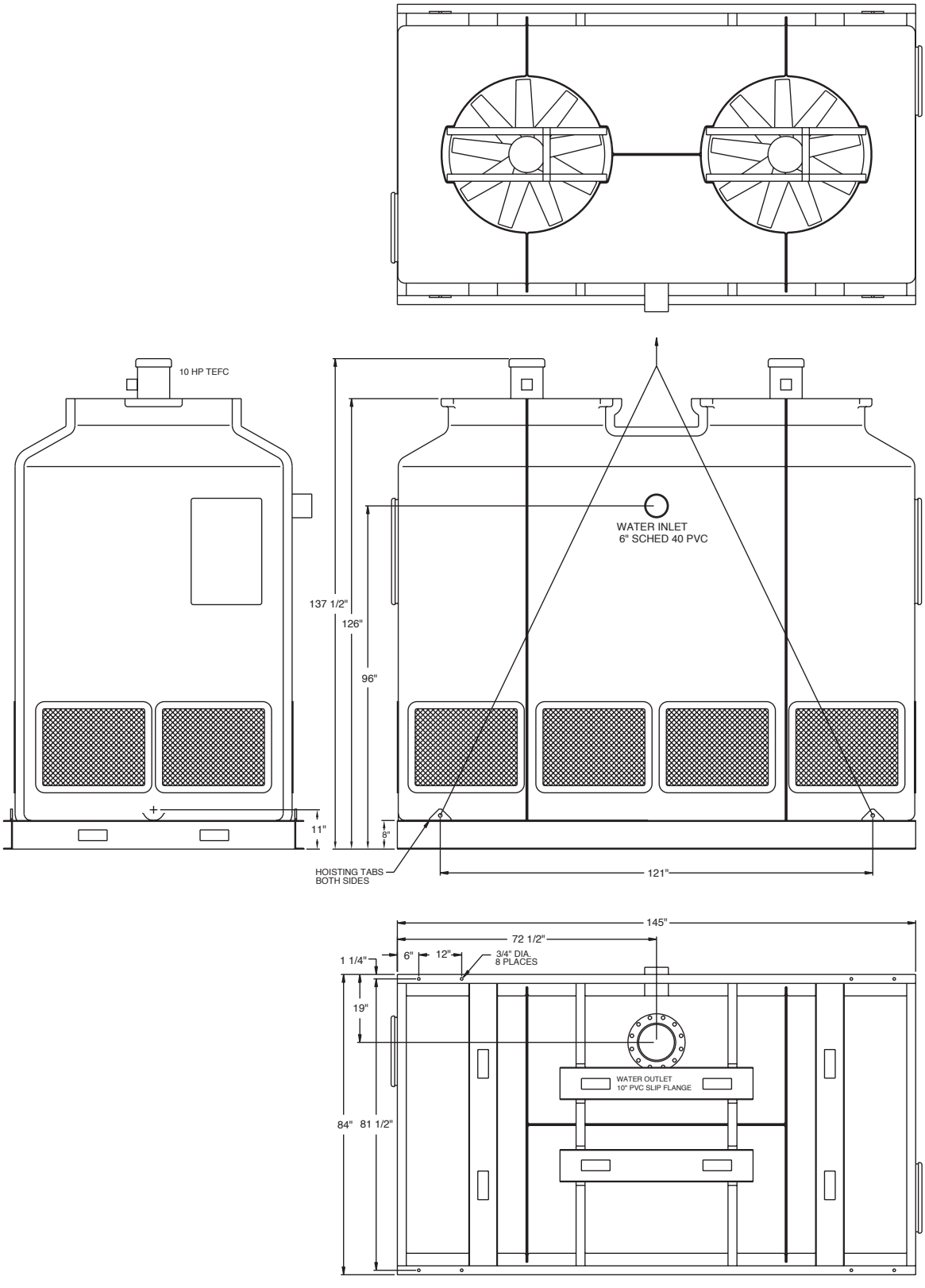


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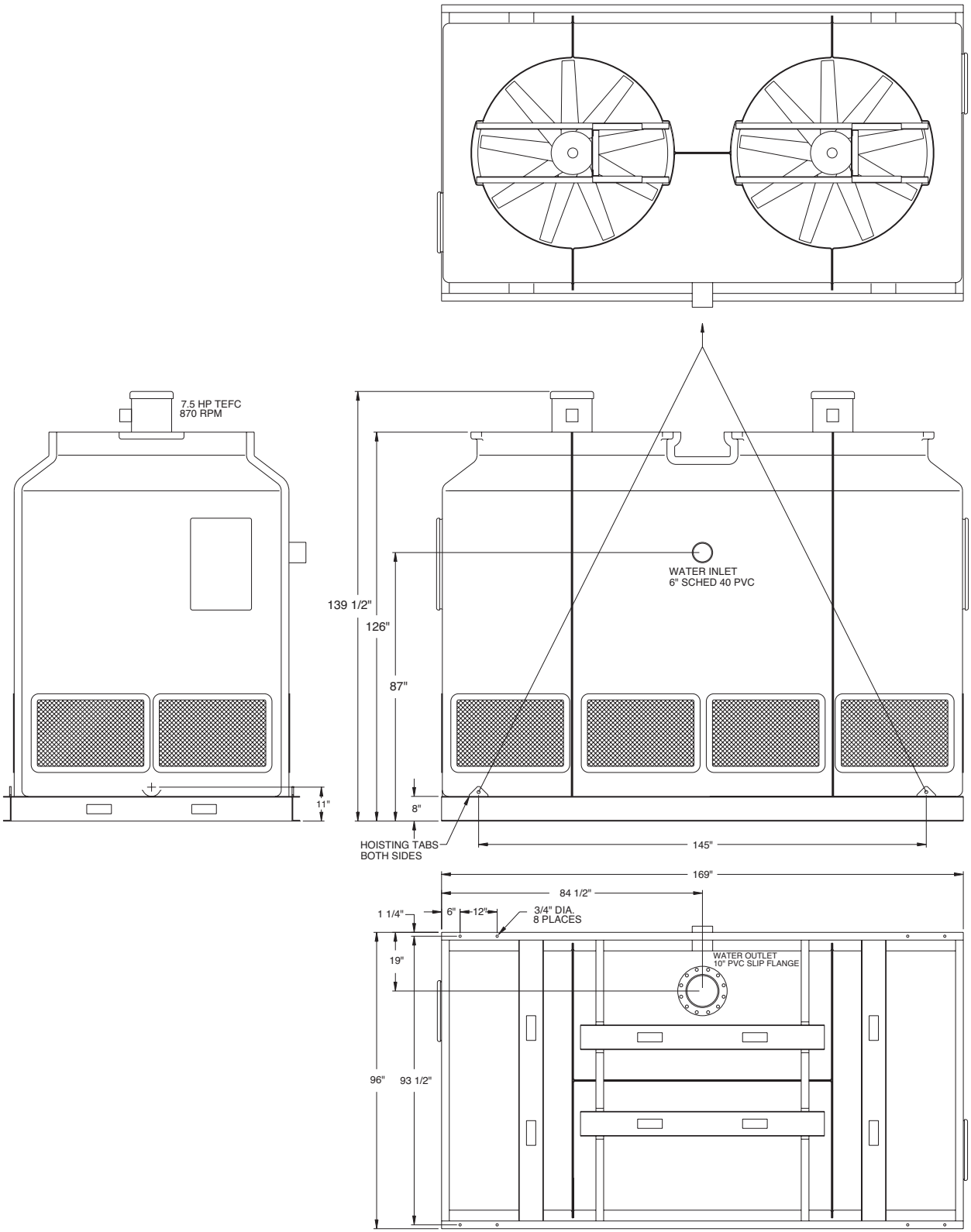
4.7 TC-170F PHYSICAL



4.8 TC-210F PHYSICAL

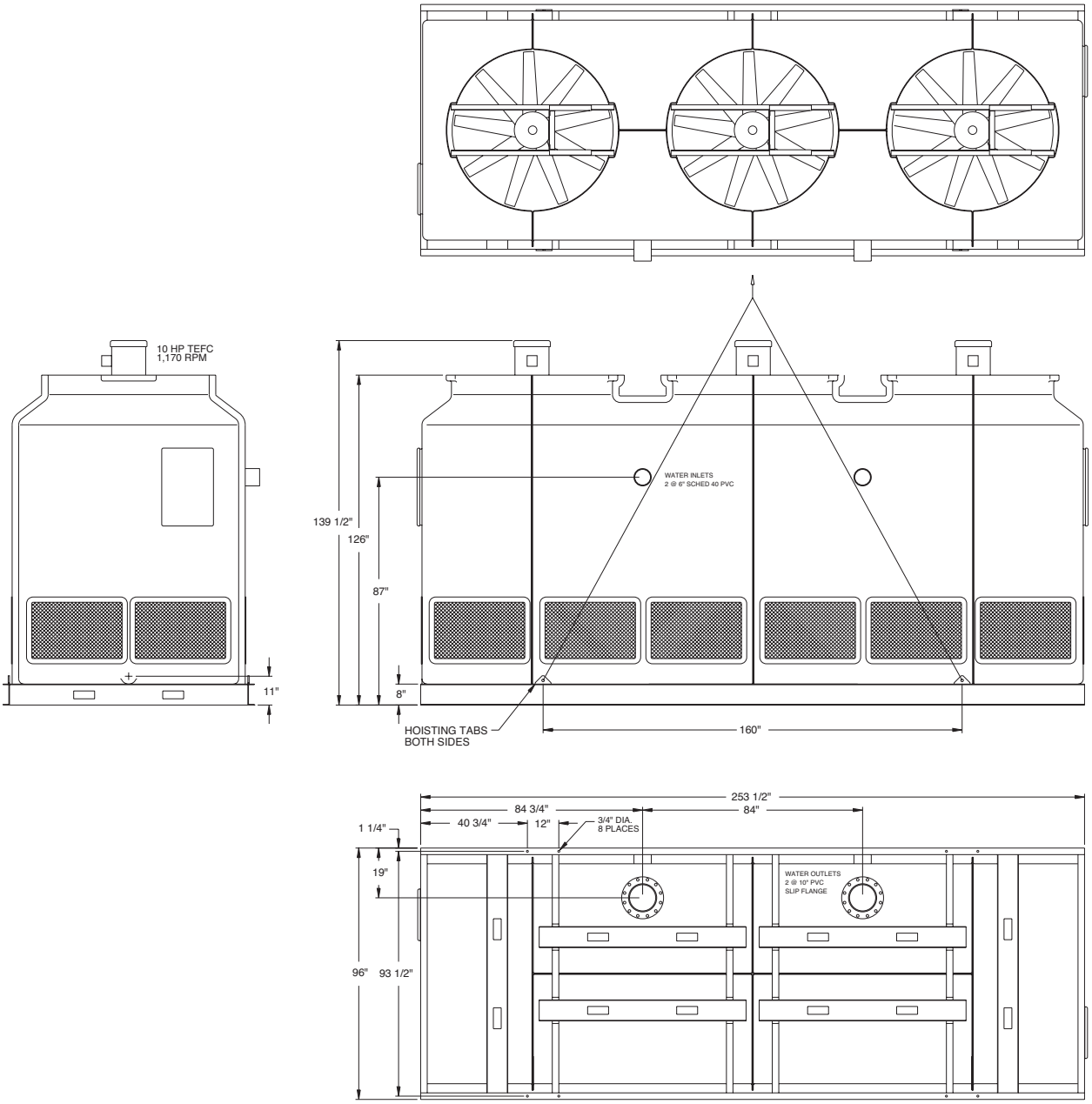


4.9 TC-270F PHYSICAL

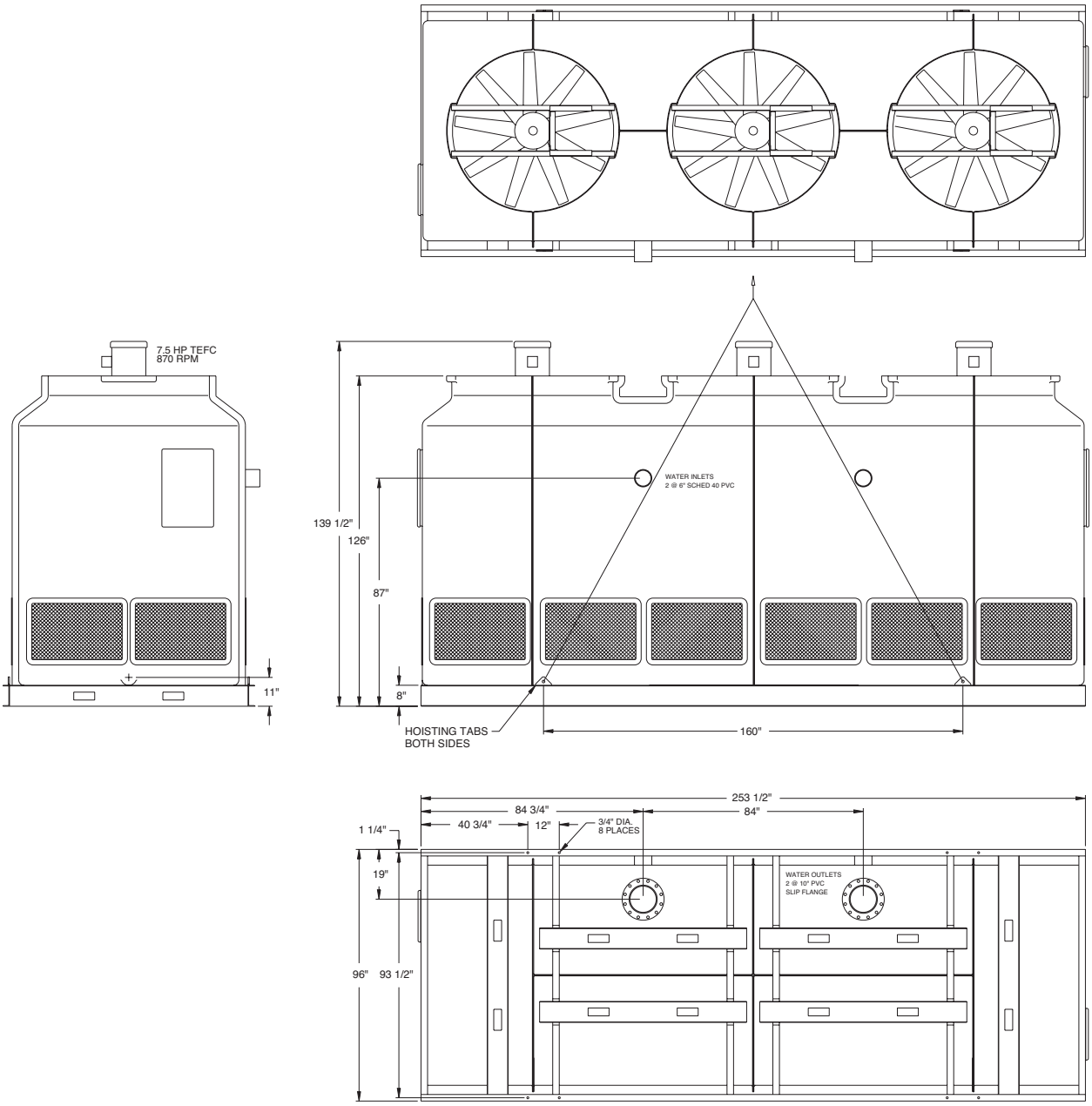


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4.10 TC-315F PHYSICAL

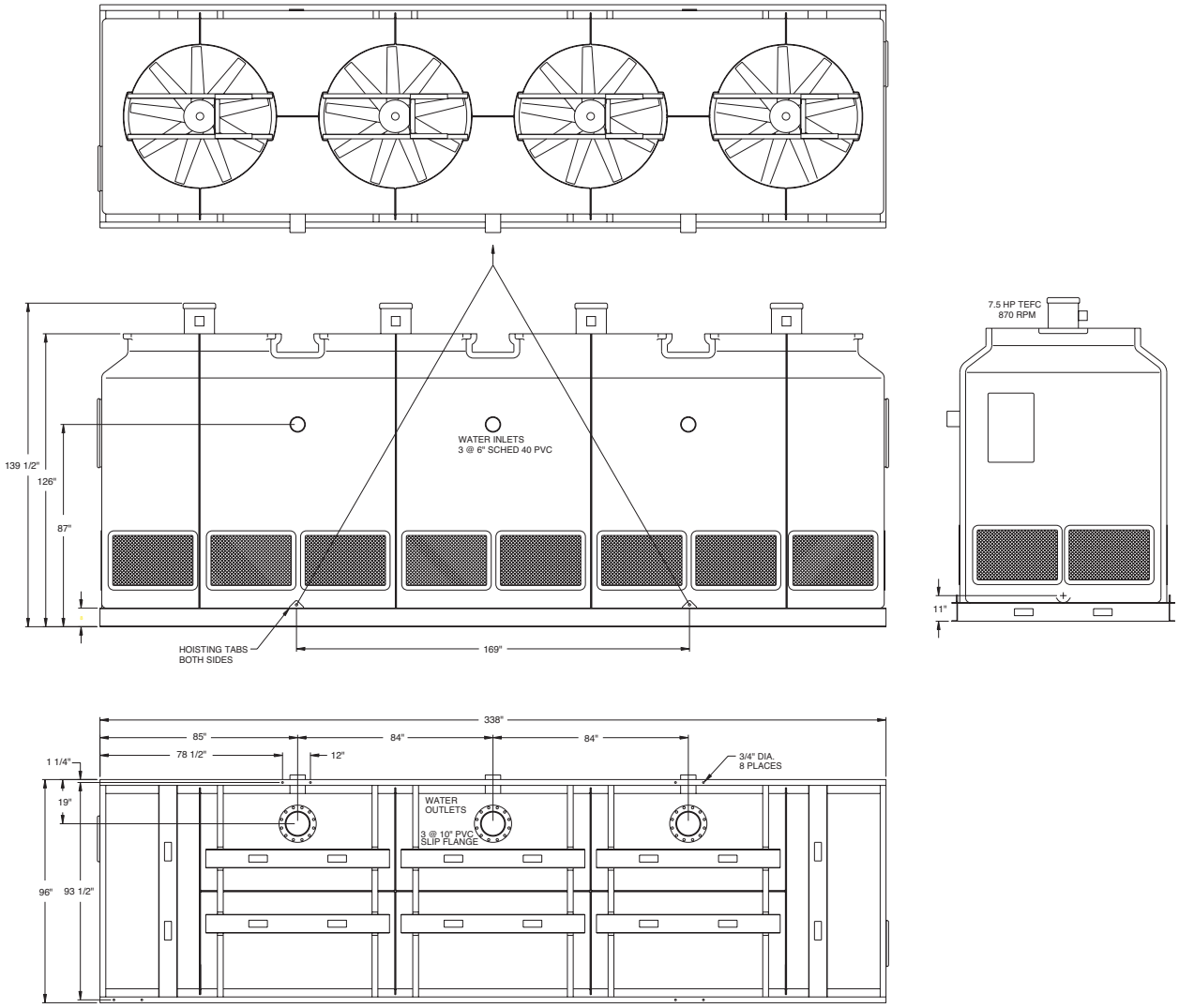


4.11 TC-405F PHYSICAL



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4.12 TC-540F PHYSICAL



END

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