REYMSA®

INSTALLATION, OPERATION & MAINTENANCE MANUAL

HFC SERIES

CLOSED CIRCUIT FLUID COOLER

CTI CERTIFIED

MODELS:

- HFC, HFC-SL
- HFC-F

The
All-Fiberglass
Cooling Towers

INSTALLATION, OPERATION & MAINTENANCE MANUAL

Closed Circuit Fluid Cooler (HFC Series)

Standard, -SL and HFC-F models

Model: ____________________

Serial Number: ____________________

Customer: ____________________

Project: ____________________

Date of shipment: ____________________

IMPORTANT

Due to the nature of printed material, there may be new information that was added after this manual was printed. The digital version of the IOM Manual has priority over the printed version.
Visit our website **www.reymsa.com** and download an updated digital manual.

REYMSA COOLING TOWERS, INC.
www.reymsa.com

INTRODUCTION

Thank you for choosing REYMSA Cooling Towers as your best Fiberglass Cooling Tower option.

Since 1969, REYMSA Cooling Towers has been providing cost effective heat transfer solutions for the HVAC, industrial and plastic markets, having more than 5,000 installed Cooling Towers around the world. REYMSA's towers are manufactured with high quality materials and are designed to provide years of reliable service when properly operated and maintained.

The following manual has been prepared to support our customers with the installation and maintenance process of the "state of the art" Closed Circuit Fluid Cooler HFC Series. Our INSTALLATION, Operation & Maintenance manual (IOM) has been written and reviewed by our engineering department based on theoretical knowledge and practical experience. A recommended guide is included for the start-up process assuring a secure and optimized installation. Regarding maintenance, REYMSA Cooling Towers strongly recommends establishing a scheduled maintenance program and ensure it is followed; this manual could be used as a guide to establish it.

It is highly recommended that the whole manual and warranty are read before the installation and start-up.

If you have any doubts or need additional information, please contact your local REYMSA representative or visit our website.

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TABLE OF CONTENTS

A. INSTALLATION

A.1. LOCATION

Location of the Closed Circuit Fluid Cooler is important to assure it achieves its desired performance. A bad location choice could lead into performance, safety and environmental issues. The following considerations are meant to be a guideline to avoid such problems.

A.1.1. RECIRCULATION AND INTERFERENCE

Recirculation is the recapture of a portion of warm and humid air by the same tower. Interference is caused when a Closed Circuit Fluid Cooler is situated downwind or in close proximity to a heat-emitting source, like another Closed Circuit Fluid Cooler, fired heaters, flare stacks, boilers, etc. and warm air enters the Closed Circuit Fluid Cooler. Both phenomena causes a variation in the entering air wet bulb temperature, therefore affecting the Closed Circuit Fluid Cooler performance. To avoid recirculation and interference, consider the following guidelines:

- Remove any obstructions that might prevent the free flow of the entering and exiting air.
- Make sure that the area provides enough clearance for safe operation. Place towers far enough apart so that discharge air from one tower is not drawn in by another. See Table A-1 and Figure A-1 for suggested clearances between towers.

Table A-1: Minimum recommended distance between towers

MODEL			MINIMUM DISTANCE "D", FT
HFC	HFC-SL	HFCP	
505			6
606			
707	707-LS	707	
808	808-LS	808	
810	810-LS	810	
812	812-LS	812	
510			
612			
714	714-LS	714	
816	816-LS	816	
819	819-LS	819	
822	822-LS	822	
827	827-LS	827	
1010			
1212			
1414	1414-LS	1414	7
1616	1616-LS	1616	
1619	1619-LS	1619	9
1622	1622-LS	1622	
1627	1627-LS	1627	

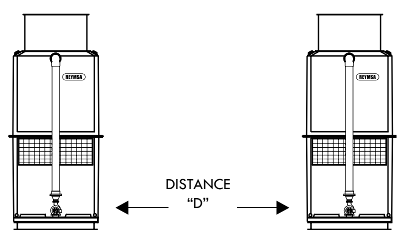


Figure A-1: Minimum recommended distance between towers

For a complete table of minimum distances between towers and obstructions please refer to "APPENDIX C: MINIMUM DISTANCE BETWEEN TOWERS AND OBSTRUCTIONS".

- Place the Cooling Tower where it will have at least the recommended clearance on all sides for servicing and for adequate air intake. It is advisable and preferred to have the top of the Tower above the roofline of any adjacent building or other nearby obstructions. This will limit the possibilities of the air recirculation back into the towers air intake (See Figure A-2). Use prevailing summer winds as a guideline for placing a Tower in a location that minimizes interference.

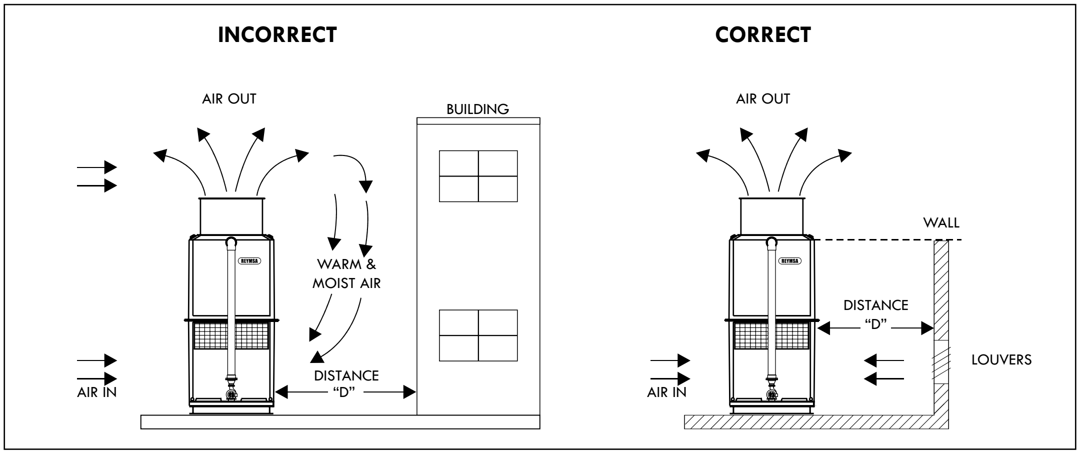


Figure A-2: Recirculation

- Do not place the Closed Circuit Fluid Cooler near exhaust fans or air intakes.
- Do not place the Closed Circuit Fluid Cooler near air make-up units where there is a possibility of the moist tower discharge air mixing with the air being drawn in by it.

A.1.2. ENVIRONMENTAL AND SAFETY

- Closed Circuit Fluid Coolers must be installed in accordance to all applicable construction, electrical and safety standards, as well as Federal, State and Local regulations and codes.
- Before proceeding with the installation, make sure the area is provided with a grounded power source supplying the correct voltage (required by the motor and pump). Field wiring should be completed by qualified personnel. All electrical wiring should comply with the electrical codes. Also see section "A.3.3. PROCEDURE TO WIRE THE FAN MOTOR".
- Place the Closed Circuit Fluid Coolers on a leveled structural surface, capable of supporting the operational weight of the tower. Refer to section "A.3.1. LEVELING AND TOWER SUPPORTS" of this manual for more information about leveling and recommended support. Contact your REYMSA representative with any questions regarding the recommended support for the Closed Circuit Fluid Cooler.
- REYMSA Closed Circuit Fluid Coolers are industrial equipment with rotating parts. Care must be taken to install them in a safe area whose access is restricted only to authorized personnel.
- Locate the tower where there is a safe access for its maintenance.
- The Closed Circuit Fluid Cooler must be installed in a location where the tower's discharge air cannot be drawn into any surrounding building fresh-air ducts.
- There is a certain amount of water that can be carried over in the discharge air of all Closed Circuit Fluid Coolers (drift). Consideration should be given to placing Closed Circuit Fluid Coolers away from high traffic areas such as entrances and parking lots.

A.2. ASSEMBLY INSTRUCTIONS

A.2.1. SINGLE FAN TOWERS

Follow this procedure to assemble and install single fan Closed Circuit Fluid Cooler with Direct Drive.

A. Upon the equipment arrives with the end user, check any abnormality or apparent damage in the packaging before any landing maneuver of the Closed Circuit Fluid Cooler and its components. The packing list must match the goods received. Any absence or abnormality of the equipment should be reported immediately and directly to your local REYMSA representative.

B. After verifying the equipment is received in proper conditions, proceed to unload it piece by piece, with a crane or forklift of the appropriate capacity (see Figure A-3, Figure A-4 and Figure A-5 for reference).

C. For crane lifting, it is recommended to use a minimum elevation angle of 60 ° between the belt and the horizontal, also pay special attention when lifting the bottom of the tower (basin with copper coil), because it does not count with lifting brackets due to their weight. Explicit instructions are described below.

D. Surround the lower section of the tower with the straps, placing them through the basin openings (as shown in Figure A-4), it's important to use a spreader bar to avoid damage on the upper edge of the tower, when lifting don't balance until tensing the straps (see Figure A-4), pad the strap areas on the tower to avoid scratching.

E. Remove the plastic wrap that surrounds the tower and its components, loosen the nuts and bolts that keep the basin section attached to the wooden pallet (the body comes unattached), the nuts and bolts are located at the bottom of the basin (some models comes totally unattached to the pallet).

F. See "APPENDIX E: STAINLESS STEEL BOLT TORQUE FOR COOLING TOWER ASSEMBLY" before assembling the cooling tower sections.

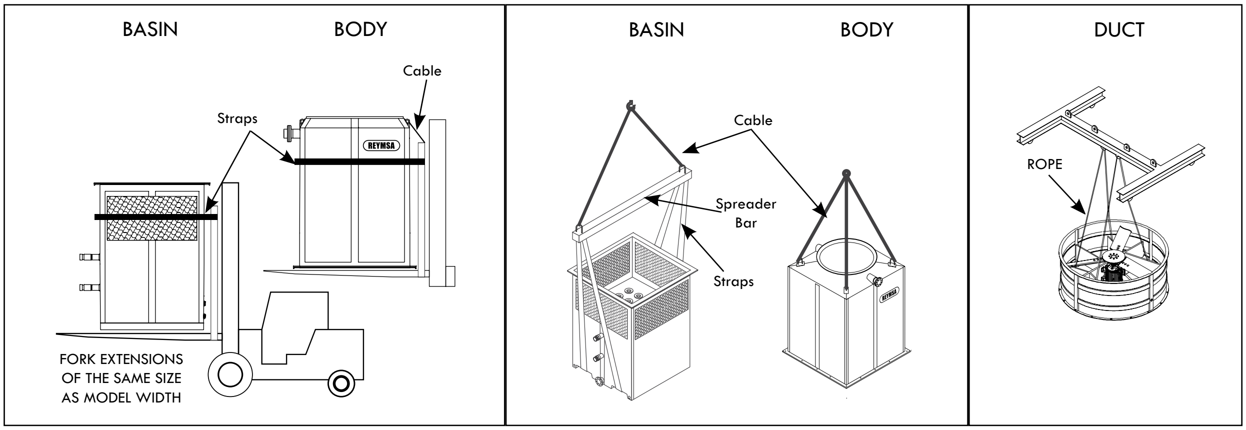


Figure A-3: Single fan tower fork lifting **Figure A-4: Single fan tower crane lifting** **Figure A-5: Fan duct lifting**

G. Before tower's assembly, REYMSA recommends to install a steel base structure that supports the tower's operational weight; also place an isolation pad (supplied by others) between the tower and the base structure for support purposes. Verify that the base structure has the proper dimensions (for construction, refer to factory certified drawings). For more information, see section "A.3.1. LEVELING AND TOWER SUPPORTS".

H. Place the lower section of the tower (basin with copper coil) on top of the isolation pad and the steel base structure; for crane lifting, notice that some towers doesn't have basin openings for the straps, care must be taken to avoid them get stocked between the tower and the base. (See figures A-4 and A-6). Making sure that the anchorage holes on the bottom of the tower are aligned with the perforations of the base. Then proceed to bolt it down and secure it with stainless steel nut and bolt sets (supplied by others).

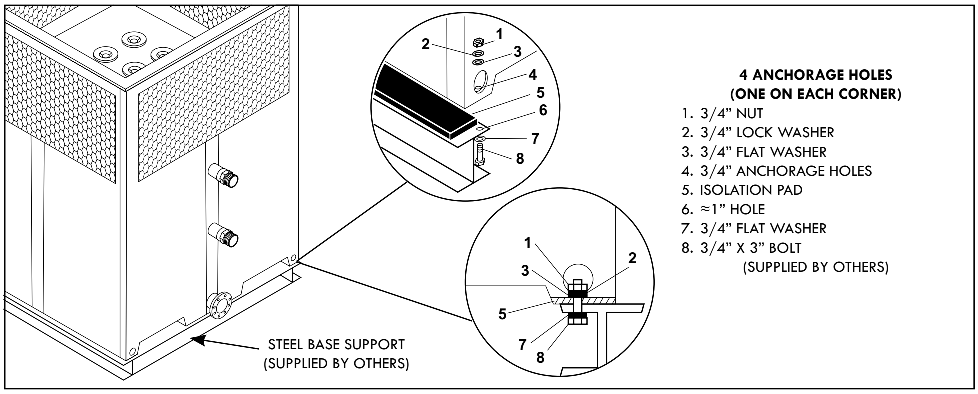


Figure A-6: Typical anchorage for a single fan tower.

I. Assemble the upper section with the lower section, the upper section comes assembled with u-bolts for lifting; then using a crane assemble both parts, use a guide pin to align bolt holes as the sections are being set (See figure A-7). Make sure that the recirculation water inlet, and the recirculation water outlet are on the same side of the tower when assembled.

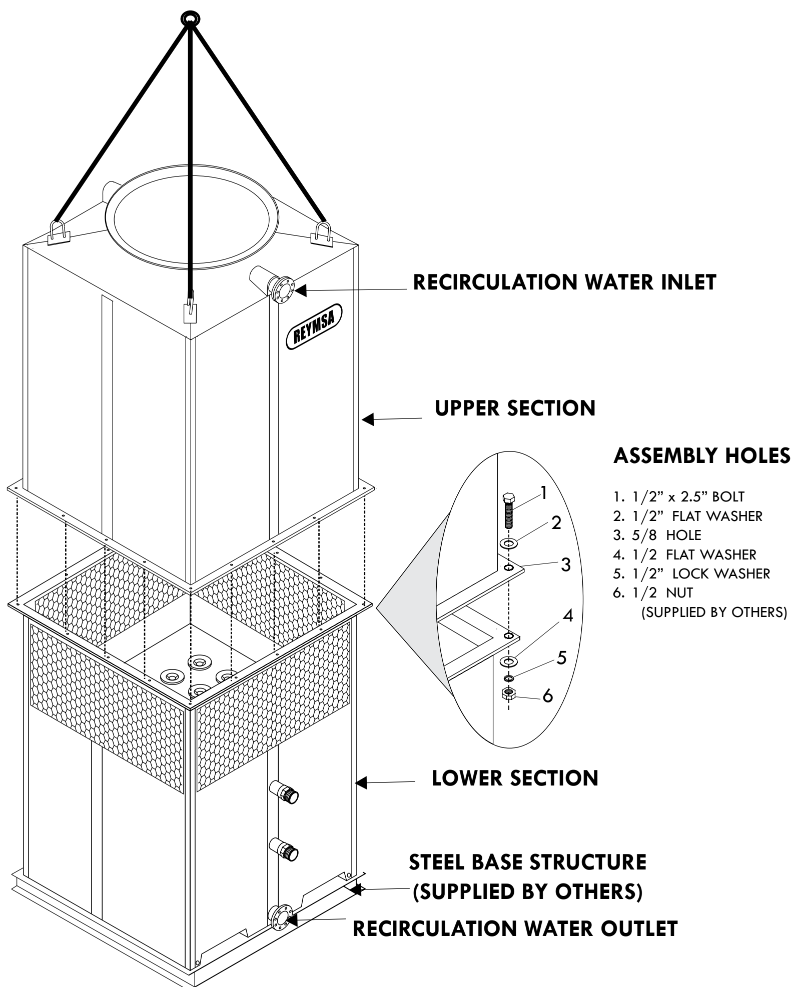


Figure A-7: Upper and lower parts installation

J. Remove fan guard.

K. Then cradle/straddle the fan support with the straps (as shown in figure A-8) so you can lift the fan duct with a crane and assemble it.

L. Now place the fan duct on the receiving flange of the upper section (see Figure A-8); make sure the bolt holes and the marks inside the fan duct and the receiving flange are aligned (see Figure A-9). Secure it with the stainless steel nut and bolt sets supplied by REYMSA. There are two different types of receiving flanges, each one has its own assembly pieces (see Table A-2 to verify the type of receiving flange of your tower).

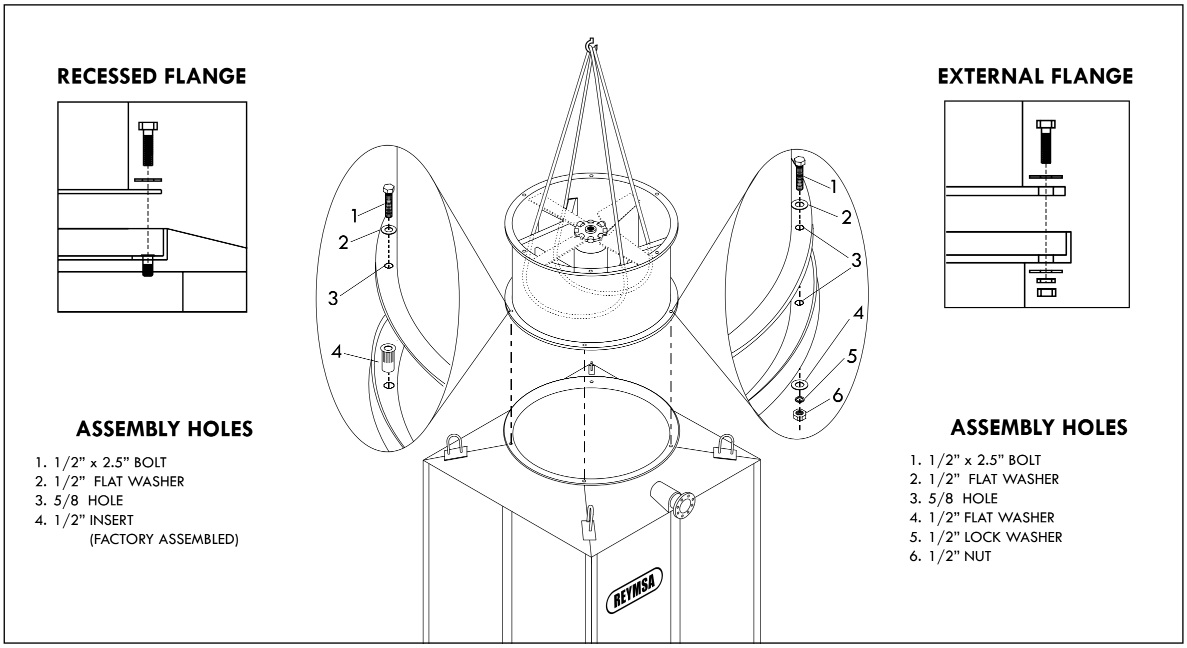


Figure A-8: Fan duct assembly for a single tower

HFC SINGLE FAN MODELS	
RECESSED FLANGE	**EXTERNAL FLANGE**
505	808
506	810
707	812

Table A-2: Receiving flange type (single fan towers)
Note: Also applies for low sound fans.

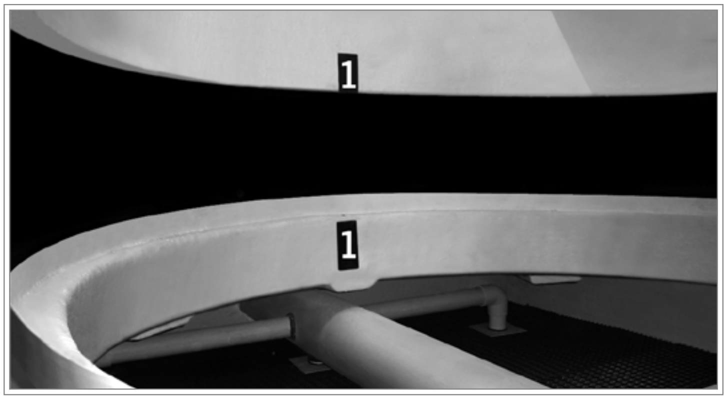


Figure A-9: Fan duct alignment for a single tower

NOTE
If your Tower is for a low sound application and it includes a fan adaptor please see Section "A.7 LOW SOUND FAN COOLING TOWERS: FAN ADAPTORS".

A.2.2. TWO FAN TOWERS

Follow this procedure to assemble and install double fan Closed Circuit Fluid Coolers.

A. Upon the arrival of the equipment to its final destination, check for any apparent damage to the packaging before unloading the Cooling Tower. The packing list must match with the received merchandise. Any equipment absences or abnormality must be reported to your local REYMSA representative.

B. After verifying the equipment is received in proper conditions, proceed to unload it piece by piece, with a crane or forklift of the appropriate capacity (see Figure A-10, Figure A-11 and Figure A-12 for reference). If you unload with a forklift, use fork extensions of the proper pallet length according to the width of your model.

C. For crane lifting, it is recommended to use a minimum elevation angle of 60 ° between the belt and the horizontal, also pay special attention when lifting the bottom of the tower (basin with copper coil), because it does not count with lifting brackets due to their weight. Explicit instructions are described below.

D. Surround the lower section of the tower with the straps, placing them through the basin openings (as shown in Figure A-11), use a spreader frame to avoid damage on the upper edge of the tower, when lifting don't balance until tensing the straps (see Figure A-11), pad the strap areas on the tower to avoid scratching.

E. Remove the plastic wrap that surrounds the tower and its components, loosen the nuts and bolts that keep the basin section attached to the wooden pallet (the body comes unattached), the nuts and bolts are located at the bottom of the basin (some models comes totally unattached).

F. See "APPENDIX E: STAINLESS STEEL BOLT TORQUE FOR COOLING TOWER ASSEMBLY" before assembling the cooling tower sections.

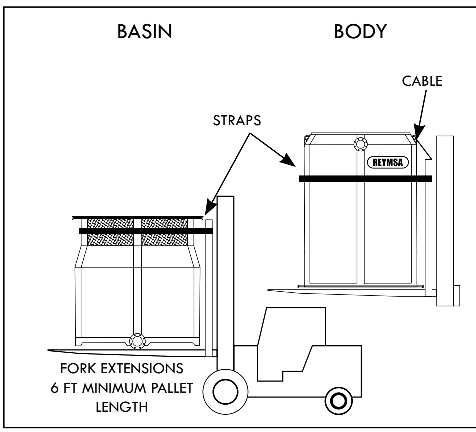


Figure A-10: Two fan tower fork lifting

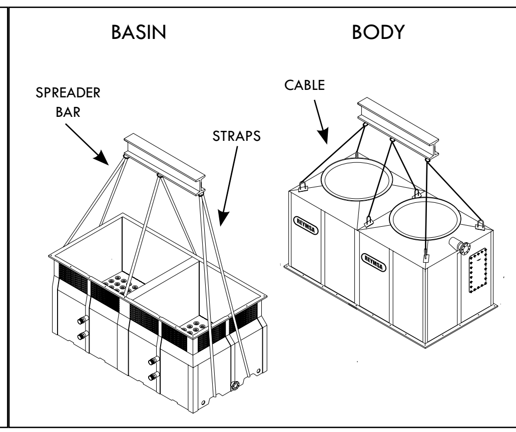


Figure A-11: Two fan tower crane lifting

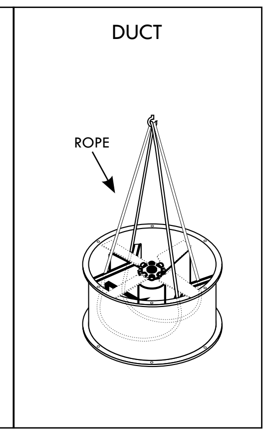


Figure A-12: Fan duct lifting

G. Before tower's assembly, REYMSA recommends to install a steel base structure that supports the tower's operational weight; also place an isolation pad (supplied by others) between the tower and the base structure for support purposes. Verify that the base structure has the proper dimensions (for construction, refer to factory certified drawings). For more information, see section "A.3.1. LEVELING AND TOWER SUPPORTS".

H. Place the lower section of the tower (basin whit copper coil) on top of the isolation pad and the steel base structure; for crane lifting, notice that some towers doesn't have basin openings for the straps, care must be taken to avoid them get stocked between the tower and the base. (See figures A-11 and A-13). Making sure that the anchorage holes on the bottom of the tower are aligned with the perforations of the base. Then proceed to bolt it down and secure it with stainless steel nut and bolt sets (supplied by others).

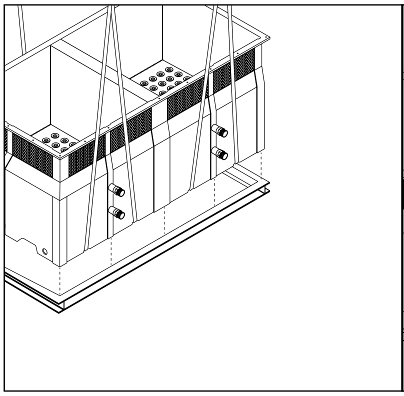


Figure A-13: Basin lifting (optional)

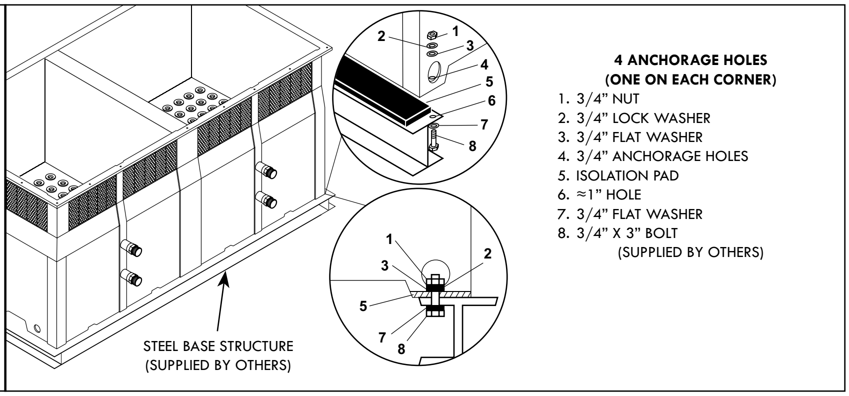


Figure A-14: Typical anchorage for a two fan tower

I. Using a crane, assemble the upper section with the lower section, the upper section comes assembled with u-bolts for lifting; use a guide pin to align bolt holes as the sections are being set. In case that the upper section comes with detached cover, detailed explanations are described bellow for assembly.

J. Models 819, 822, 827, 1619, 1622 and 1627, come with the upper section cover separated, for assembly first you have to bring together the upper section (provided with steel frame supports placed under the flange and u-bolts for lifting), with the lower section, and then put the upper section cover on the top, using the u-bolts and a spreader beam to assemble both parts. Bolts are to remain after assemble.

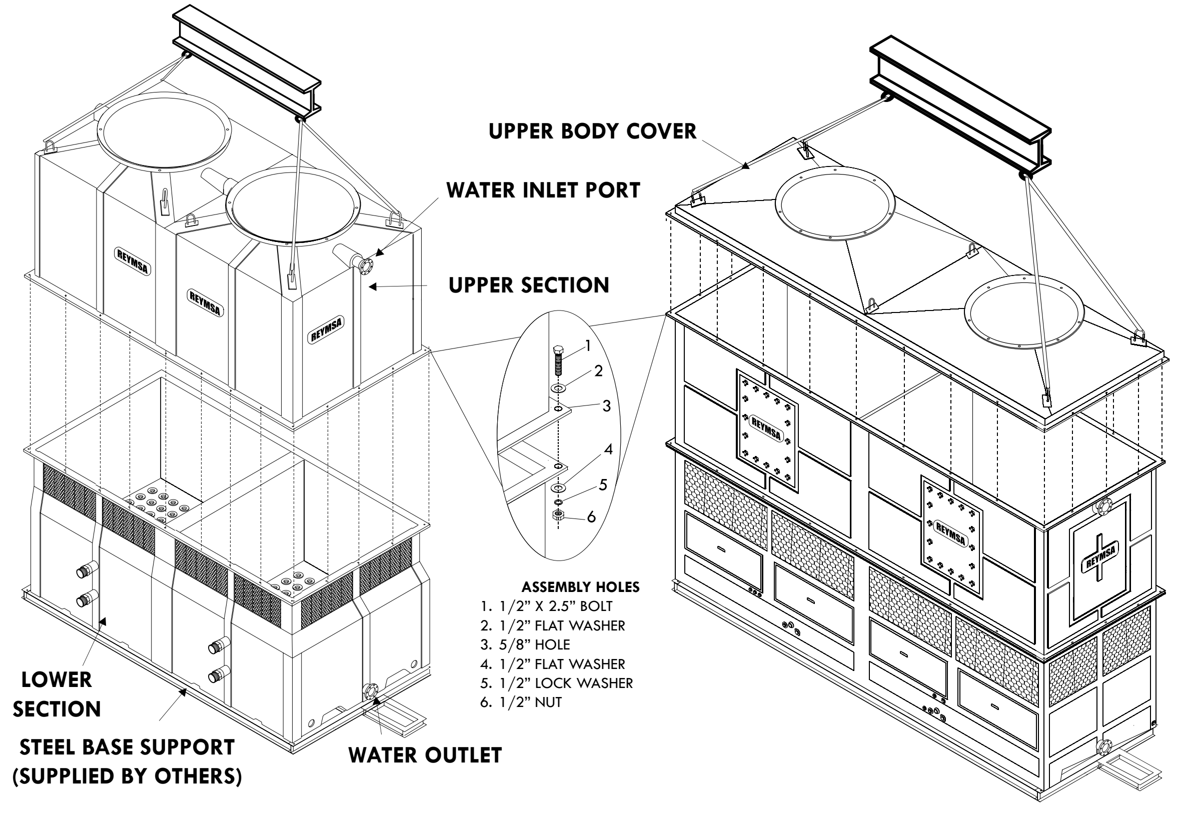


Figure A-15: Fan duct, upper and lower parts installation

K. Remove fan guard. Then cradle/straddle the fan support with the straps (as shown in figure A-16) so you can lift the fan duct with a crane and assemble it.

L. Identify each fan duct, they are labeled with a number on the inside of the lower edge. For a correct installation, this number must match the number on the receiving flange. Now place fan duct 1 on the correspondent receiving flange on top of the tower (see Figure A-16); make sure the bolt holes and the marks inside the fan duct and the receiving flange are aligned (Figure A-17). Secure it with the stainless steel nut and bolt sets supplied by REYMSA. There are two different types of receiving flanges, each one has its own assembly pieces (see Table A-3 to verify the type of receiving flanges of your tower).

M. Follow the same instructions to place fan duct 2.

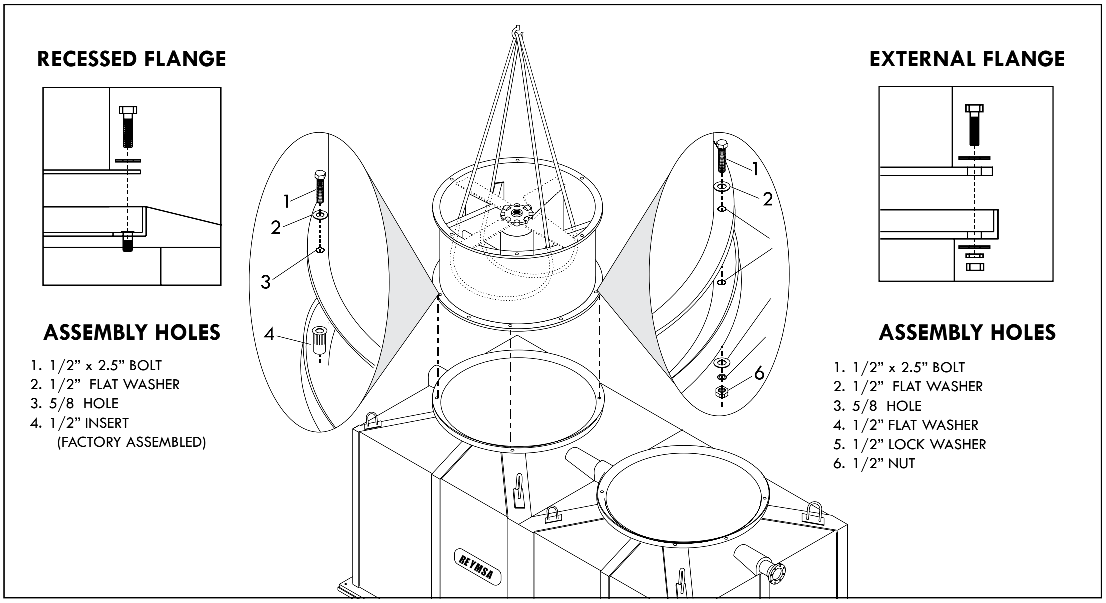


Figure A-16: Fan duct assembly for a double fan tower

Table A-3: Receiving flange type (two fan towers)

Note: Also applies for low sound fans.

HFC TWO FAN MODELS	
RECESSED FLANGE	EXTERNAL FLANGE
510	816
612	819
714	822
	827

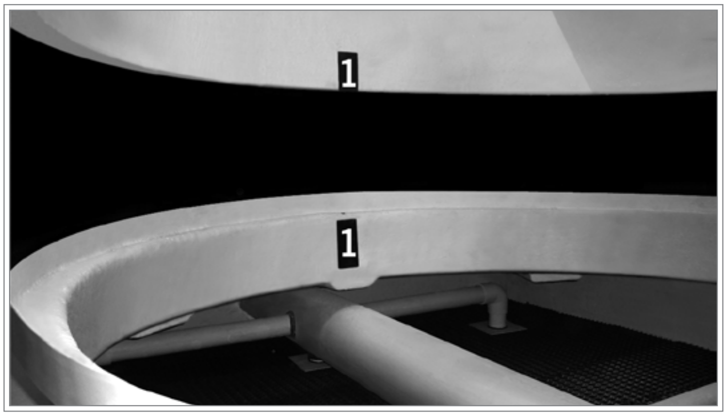


Figure A-17: Fan duct alignment for a double fan tower

A.2.3. FOUR FAN TOWERS

Follow this procedure to assemble and install four fan Closed Circuit Fluid Coolers.

A. Upon the arrival of the equipment to its final destination, check for any apparent damage to the packaging before unloading the Cooling Tower. The packing list must match with the received merchandise. Any equipment absences or abnormality must be reported to your local REYMSA representative.

B. After verifying the equipment is received in proper conditions, proceed to unload it piece by piece, with a crane or forklift of the appropriate capacity (see Figure A-18, Figure A-19 and Figure A-20 for reference). If you unload with a forklift, use fork extensions of the proper pallet length according to the width of your model.

C. For crane lifting, it is recommended to use a minimum elevation angle of 60 ° between the belt and the horizontal, also pay special attention when lifting the bottom of the tower (basin with copper coil), because it does not count with lifting brackets due to their weight. Explicit instructions are described below.

D. Surround the lower section of the tower with the straps, placing them through the basin openings (as shown in Figure A-19), use a spreader frame to avoid damage on the upper edge of the tower, when lifting don't balance until tensing the straps (see Figure A-19), pad the strap areas on the tower to avoid scratching.

E. Remove the plastic wrap that surrounds the tower and its components, loosen the nuts and bolts that keep the basin section attached to the wooden pallet (the body comes unattached), the nuts and bolts are located at the bottom of the basin (some models comes totally unattached).

F. See "APPENDIX E: STAINLESS STEEL BOLT TORQUE FOR COOLING TOWER ASSEMBLY" before assembling the cooling tower sections.

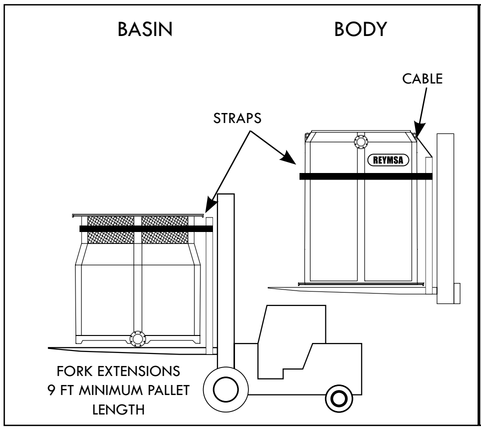


Figure A-18: Double fan tower fork lifting

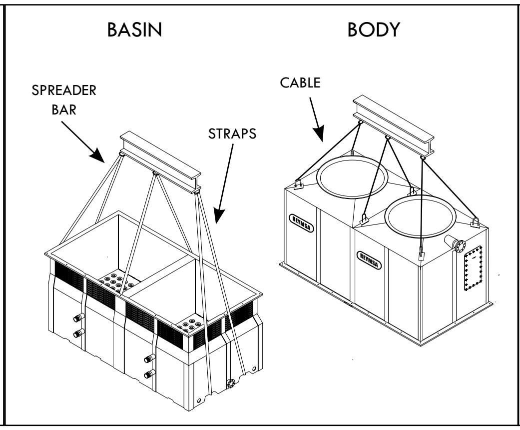


Figure A-19: Double fan tower crane lifting

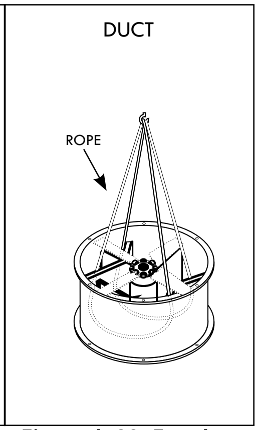


Figure A-20: Fan duct lifting

G. Before tower's assembly, REYMSA recommends to install a steel base structure that supports the tower's operational weight; also place an isolation pad (supplied by others) between the tower and the base structure for support purposes. Verify that the base structure has the proper dimensions (for construction, refer to factory certified drawings). For more information, see section "A.3.1. LEVELING AND TOWER SUPPORTS".

H. Place the lower section of the tower (basin whit copper coil) on top of the isolation pad and the steel base structure; for crane lifting, notice that some towers doesn't have basin openings for the straps, care must be taken to avoid them get stocked between the tower and the base (See figures A-19 and A-21). making sure that the anchorage holes on the bottom of the tower are aligned with the perforations of the base. Then proceed to bolt it down and secure it with stainless steel nut and bolt sets (supplied by others).

I. Place the lower section #2 of the tower following the same instructions G. Is strongly recommended the use of the spreader frame as illustrated on Figure A-23. Once the both section are in the structural base, then proceed to bolt together the vertical flanges of Sections 1 & 2; use firsts the galvanized bolts and nuts to join sections (supplied by others); then replace the galvanized bolts with the stainless steel nut and bolt set supplied by REYMSA. Then bolt down and secure both sections to the structural base with stainless steel nut and bolts set (supplied by others, see figure A-22).

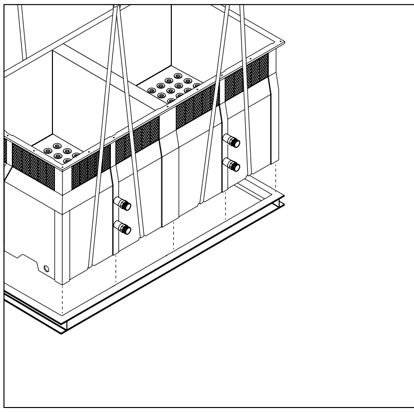


Figure A-21: Basin lifting (optional)

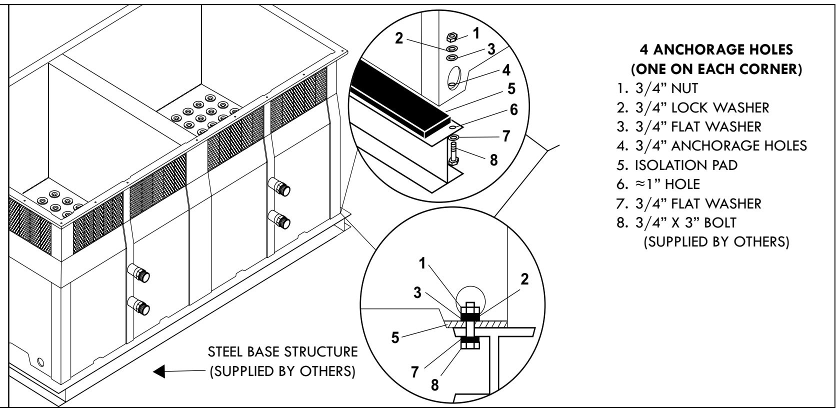


Figure A-22: Typical anchorage for a double fan tower

J. Proceed to lift the Upper section 1 over the top of Lower section 1, making sure that the bolt holes on Upper section 1 are aligned with the perforations on Lower section 1, then bolt down and secure the horizontal flanges with the stainless steel nut and bolt supplied by REYMSA. See figure A-24 (wait the final tight until two upper section are on place and you can tightened also the vertical flanges).

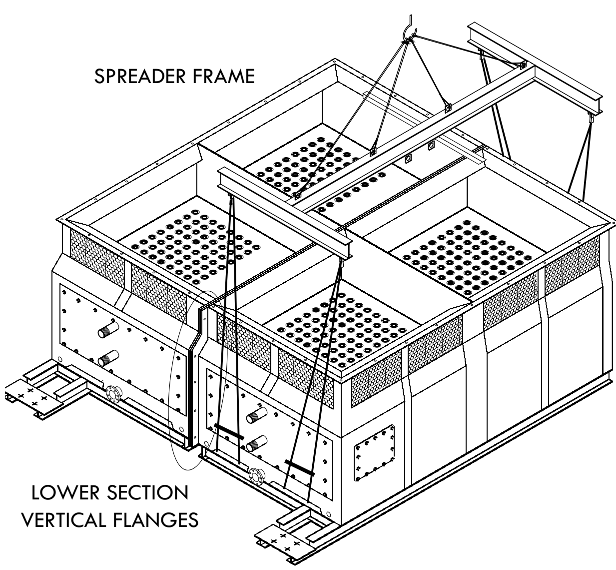


Figure A-23: Lower section installation for four fan tower

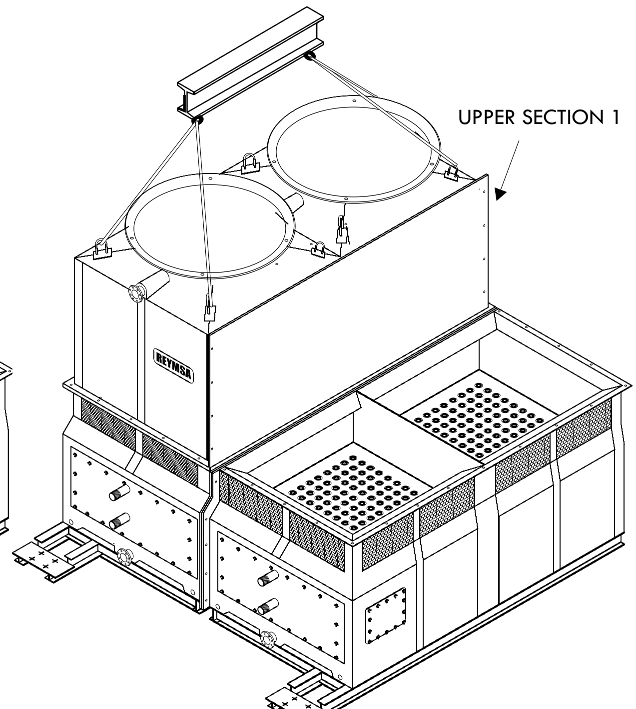


Figure A-24: Upper section 1 four fan tower

K. Place the Upper section 2 on top of Lower section 2, making sure that the bolt holes on Upper section 2 are aligned with the perforations on Lower section 2, then proceed to bolt together the vertical flanges of sections 1 & 2; use first the galvanized bolts and nuts to join sections (supplied by others), once both sections are well together then replace galvanized bolts with the stainless steel nut and bolts sets supplied by REYMSA.

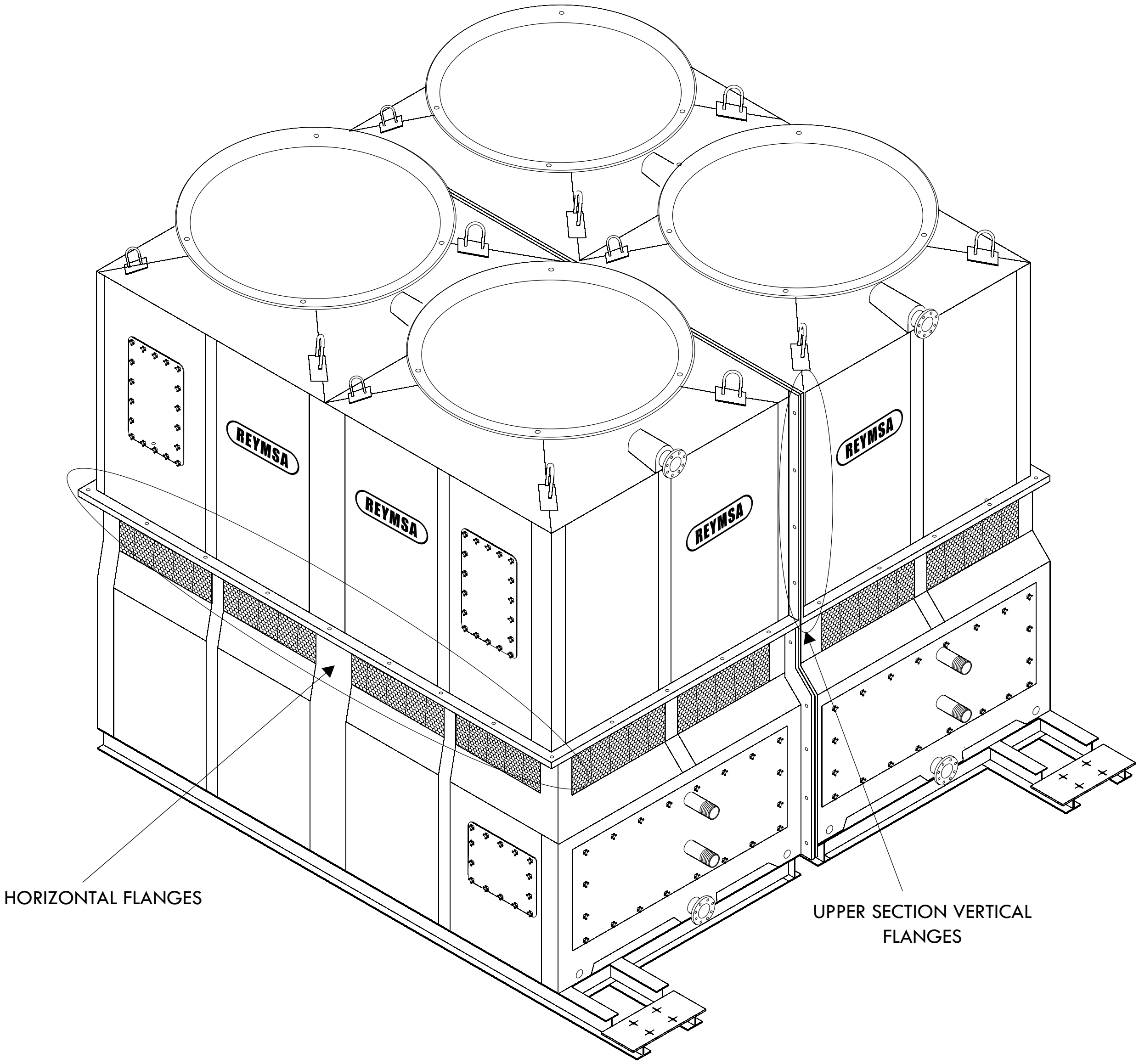


Figure A-25: Upper Section 1 & 2 for four fan tower on plane

L. Now with the two upper sections together, proceed to bolt down and secure horizontal flanges with the stainless steel nut and bolts sets supplied by REYMSA. See Figure A-25.

M. Identify each fan duct, they are labeled with a number on the inside of the lower edge. For a correct installation, this number must match the number on the corresponding receiving flange. Place fan duct 1 on the corresponding receiving flange on top of section 1 of the tower (see Figure A-26); make sure the bolt holes and the marks inside the fan duct and receiving flange are aligned (Figure A-27). Secure it with the stainless steel nut and bolt sets supplied by REYMSA. There are two different types of receiving flanges, either one has its own assembly pieces (see Table A-4 to verify the Type of receiving flange of your tower).

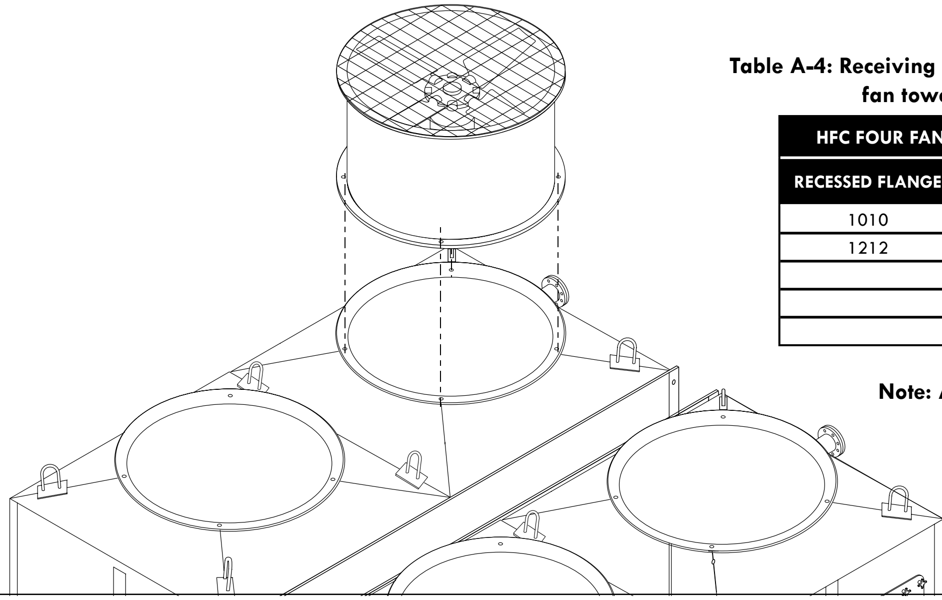


Table A-4: Receiving flange type (four fan towers)

HFC FOUR FAN MODELS	
RECESSED FLANGE	EXTERNAL FLANGE
1010	1414
1212	1616
	1619
	1622
	1627

Note: Also applies for low sound fans.

Figure A-26: Fan duct installation for a four fan tower

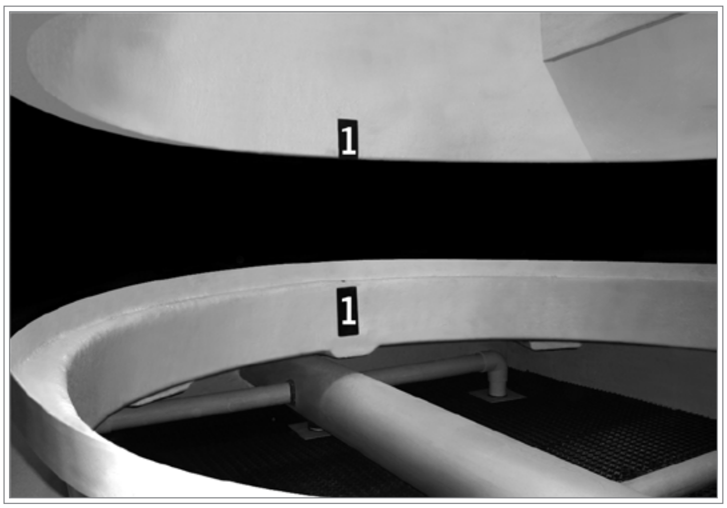


Figure A-27: Fan duct alignment for a four fan tower

N. Continue to place fan duct 2 on top of tower section 1, following the same instructions mentioned on previous step. Follow the same instructions for the remaining fan ducts.

A.2.4. SINGLE FAN TOWERS (GEAR DRIVEN MODELS)

Follow this procedure to assemble and install single fan Closed Circuit Fluid Cooler with Gear Drive System.

A. Upon the equipment arrives with the end user, check any abnormality or apparent damage in the packaging before any landing maneuver of the Closed Circuit Fluid Cooler and its components. The packing list must match the goods received. Any absence or abnormality of the equipment should be reported immediately and directly to your local REYMSA representative.

B. After verifying the equipment is received in proper conditions, proceed to unload it piece by piece, with a crane or forklift of the appropriate capacity (see Figure A-28 for reference).

C. For crane lifting, it is recommended to use a minimum elevation angle of 60 ° between the straps and the horizontal, also pay special attention when lifting the bottom of the tower (basin with copper coil), because it does not count with lifting brackets due to their weight. Explicit instructions are described below.

D. Surround the lower section of the tower with the straps, placing them through the basin openings (as shown in Figure A-28), it's important to use a spreader bar to avoid damage on the upper edge of the tower, when lifting don't balance until tensing the straps, pad the strap areas on the tower to avoid scratching.

E. Remove the plastic wrap that surrounds the tower and its components, loosen the nuts and bolts that keep the basin section attached to the wooden pallet (the body comes unattached), the nuts and bolts are located at the bottom of the basin (some models comes totally unattached to the pallet).

F. See "APPENDIX E: STAINLESS STEEL BOLTS TORQUE FOR COOLING TOWER ASSEMBLY" before assembling the cooling tower sections.

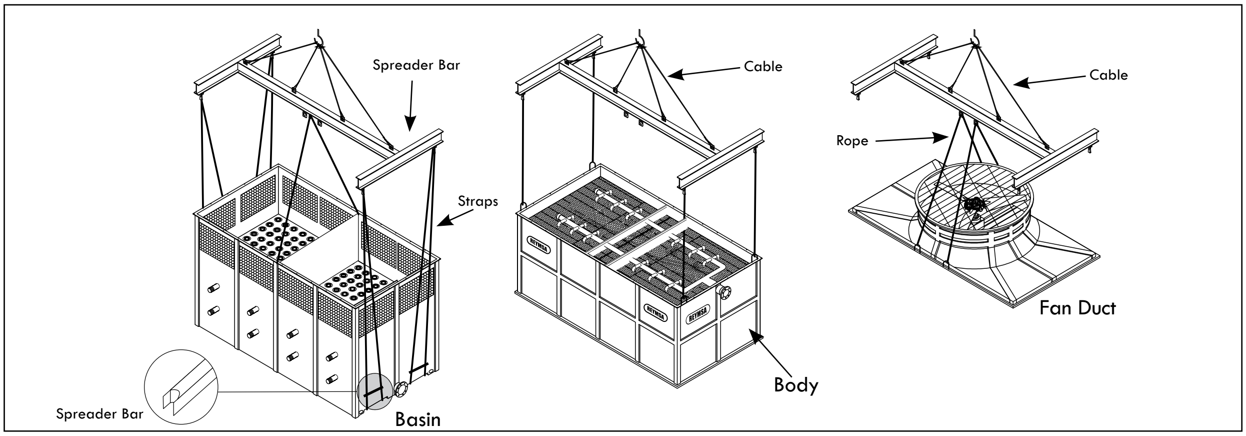
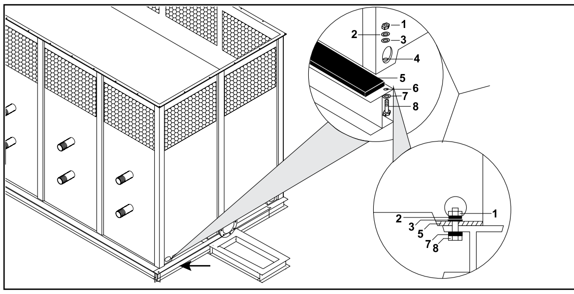


Figure A- 28: Crane lifting for HFC-F models

G. Before tower's assembly, REYMSA recommends to install a steel base structure that supports the tower's operational weight; also place an isolation pad (supplied by others) between the tower and the base structure for support purposes. Verify that the base structure has the proper dimensions (for construction, refer to factory certified drawings). For more information, see section "A.3.1. LEVELING AND TOWER SUPPORTS".

H. Place the lower section of the tower (basin with copper coil) on top of the isolation pad and the steel base structure, making sure that the anchorage holes on the bottom of the tower are aligned with the perforations of the base. Then proceed to bolt it down and secure it with stainless steel nut and bolt sets (supplied by others, see Figure A-29).



4 ANCHORAGE HOLE (ONE ON EACH CORNER)

1. 3/4" NUT
2. 3/4" LOCK WASHER
3. 3/4" FLAT WASHER
4. 3/4" ANCHORAGE HOLES
5. INSOLATION PAD
6. ≈1" HOLE
7. 3/4" FLAT WASHER
8. 3/4" x 3" BOLT

(SUPPLIED BY OTHERS)

Figure A- 29: Typical anchorage for HFC-F models

I. Assemble the upper section with the lower section, the upper section comes assembled with u-bolts for lifting; then using a crane assemble both parts, use a guide pin to align bolt holes as the sections are being set (See figure A-30). Make sure that the recirculation water inlet, and the recirculation water outlet are on the same side of the tower when assembled.

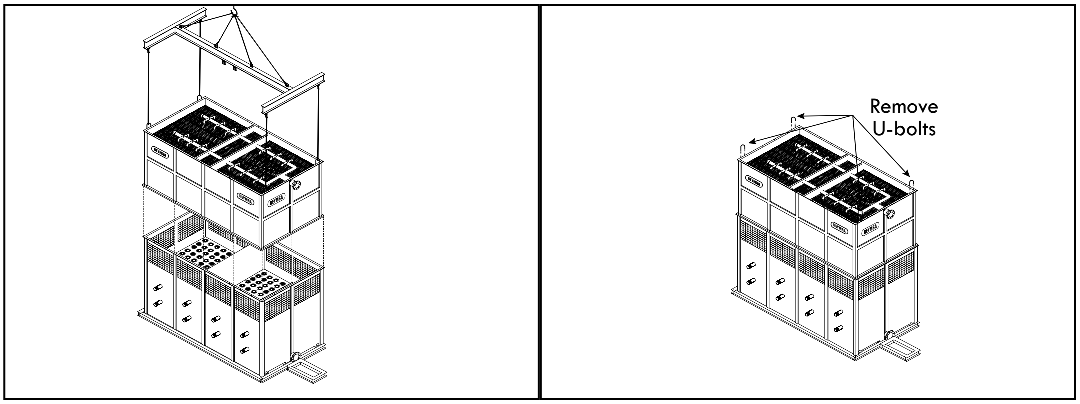


Figure A-30: Upper Body Section INSTALLATION for HFC-F models

J. HFC-F models have a section called “Fan Deck” which is at the top of the Tower structure. The Fan Deck with duct contains a gear drive fan and a motor mounted in a structural Hot Dip Galvanized Steel, and a corrosion resistant safety screen mesh.

K. Before the lifting of the Fan Deck Section, remove the safety screen mesh on the floor.

L. Assemble Fan Deck Section with Body Section, making sure that the holes on the Fan Deck Section are aligned with the holes on the Body Section. Secure it with stainless steel bolts.

M. After The Fan Deck has been set in place, proceed to bolt down the Hot Dip Galvanized Steel mechanical support to the Body Section FRP support inside of the Fan Deck Section (see figure A-31).

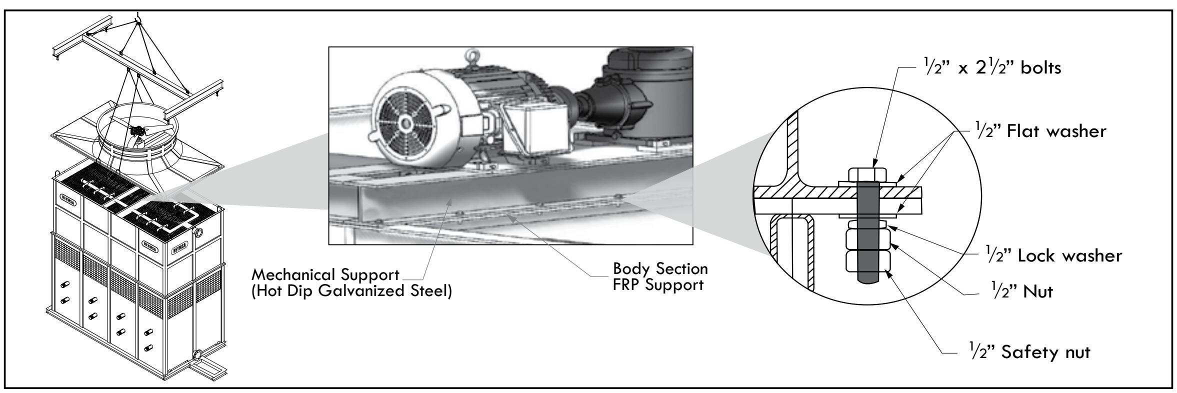


Figure A-31: Fan duct assembly for HFC-F models

N. Place the corrosion resistant safety screen mesh on top of the Fan Deck Section (see figure A-32).

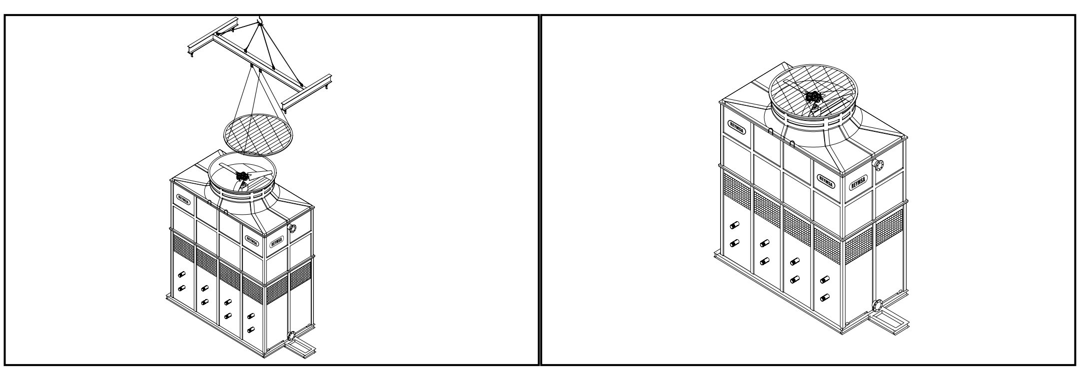


Figure A-32: Screen mersh assembly for HFC-F models

A.2.5. SPRAY PUMP

1. Remove the spray pump from the packaging. Assemble spray line assembly to the spray pump using the bolts and gasket (supplied by REYMSA).
2. Check to make sure that the piping is aligned to the spray pump in a straight line position (see Figure A-33).
3. Check that the motor of the spray pump is operating in the correct direction, it is indicated by an arrow on the pump casing.
4. Install the gasket on the face of the flange, aligning the bolt holes, place the elbow with the flange assembly.
5. Insert the bolts & flat washers in one side. Install the flat washers, lock washers and nuts in each bolt on the opposite side, and tighten the nuts by hand until snug.
6. Use uniform pressure over the flange face. Tighten the bolts applying 25% of recommended torque following the standard torque sequence until reaching the recommended torque. (see Table A-5)

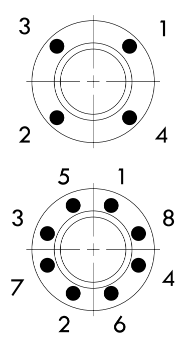
CAUTION

If the pump is not to be installed and operated soon after arrival, store it in a clean dry place having slow moderate change in ambient temperature. Rotate the shaft weekly to coat the bearings with lubricant and to retard oxidation and corrosion.

PARTS LIST

1. GASKET
2. BASIN SECTION FRP FLANGE
3. BOLT
4. FLAT WASHER
5. LOCK WASHER
6. NUT
7. SPRAY PIPE LINE
8. BODY SECTION PVC FLANGE
9. SPRAY PUMP
10. BASE SUPPORT (BY OTHERS)

TORQUE SEQUENCE



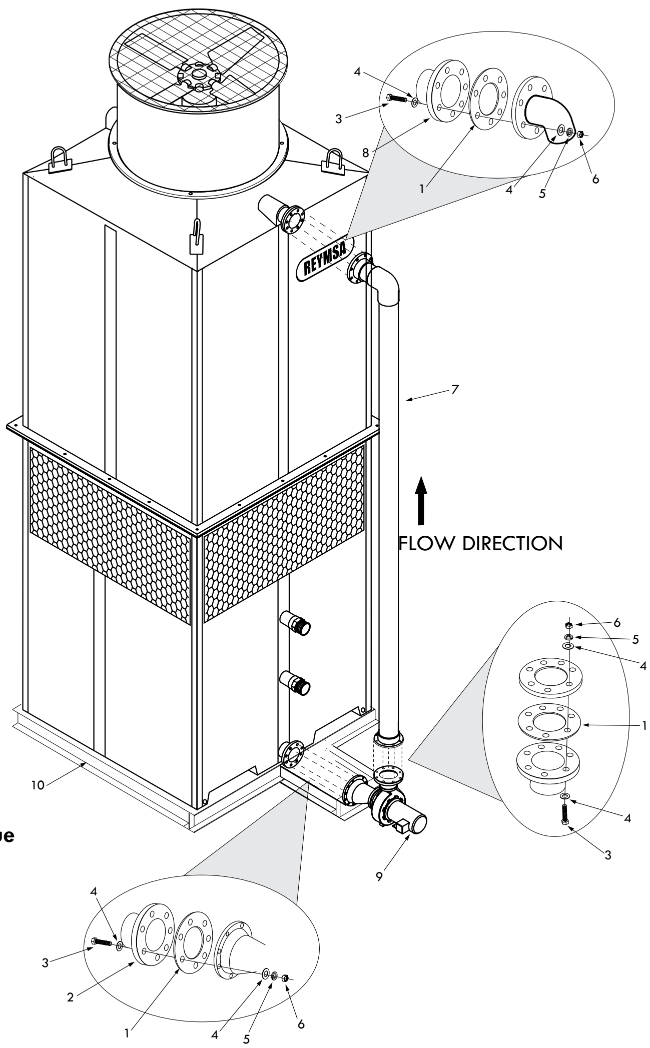


Table A-5: Flanges recommended torque

FLANGE SIZE (in)	RECOMMENDED TORQUE (lb.ft)
1 - 1/2	12
2 - 4	25
5	30
6 - 8	40

Figure A-33 - Spray pump and water return pipe assembly to tower

7. Install the spray pump and spray line assembly with the gaskets on the face of the flanges aligning the bolt holes. (Repeat the steps 5 & 6).
8. The joints must be inspected during the start-up to assure that there are no water leaks in the connections.

CAUTION

Unnecessary over torque will damage the flange

A.2.6. COPPER COIL UNIT

The copper coil unit comes already installed (See figure A-34).

The hot process water connects to the lower port (process fluid inlet), and the cold process water connects to the upper port (process fluid outlet). For Maintenance purposes please refer to section "D.8. COPPER COIL UNIT" of this manual.

CAUTION

The chemical treatment supply connection is not factory installed. This connection must be installed on the basin (below the copper coil) to dilute the chemicals in the water. Direct exposure of the copper coil to the chemicals may accelerate corrosion.

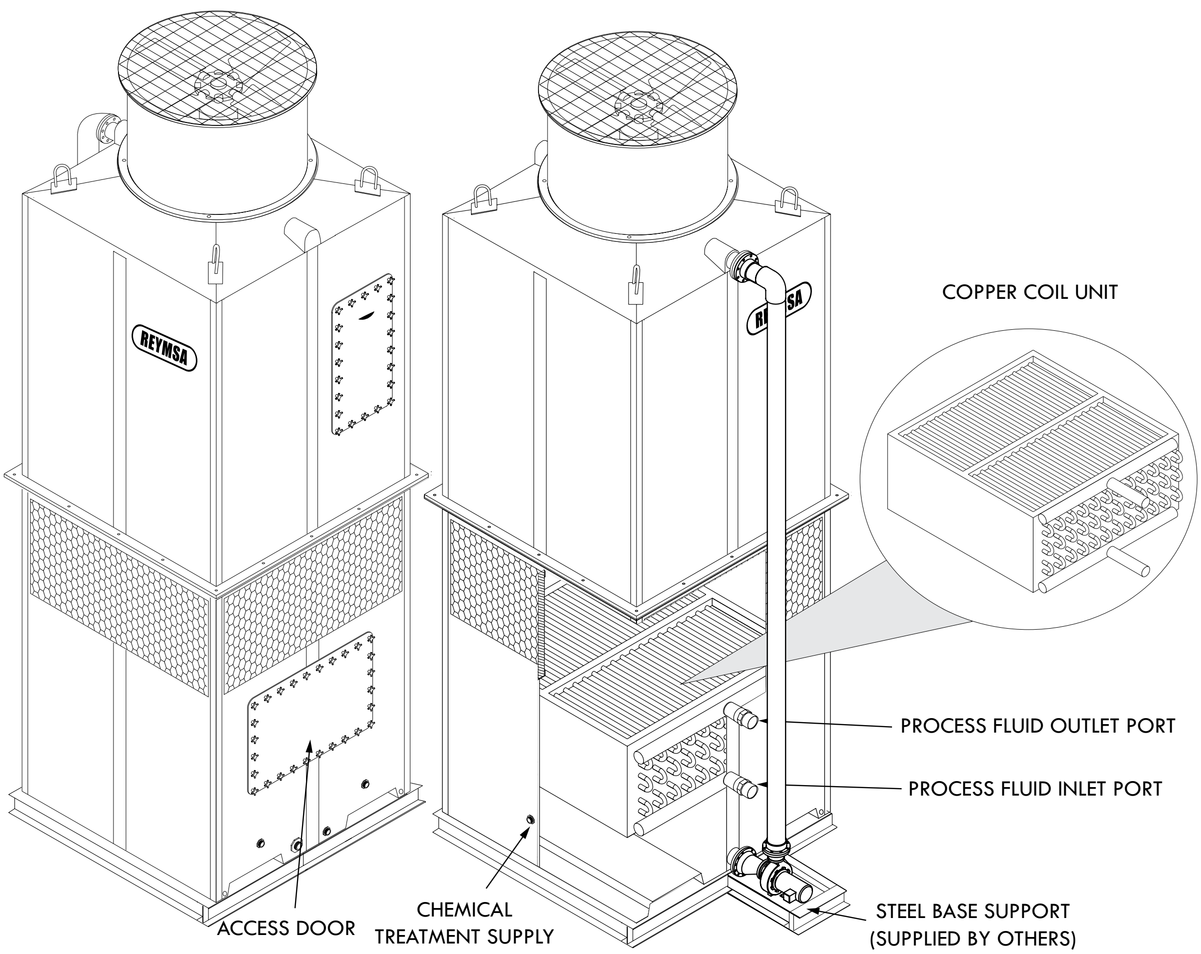


Figure A-34: Copper coil unit

A.2.7. LOW SOUND FAN CLOSED CIRCUIT FLUID COOLER: FAN ADAPTORS

A Fan Adaptor is one of the features of the HFC Low Sound Series for low noise applications (see Figure A-35) that differentiate them from the Standard Fan Series, along with sickle fan blades and smaller fan motors.

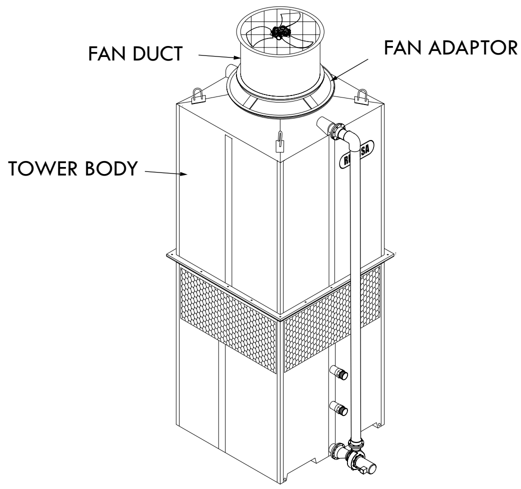


Figure A-35: Fan adaptor in a single fan tower

When a Fan Adaptor is required, the assembly procedure for such tower would be similar to the procedures already described in Sections A.2.1, A.2.2, A.2.3 (depending if it is a Single, Double, or a Quadruple Fan Tower respectively) with exception of the steps regarding Fan Duct INSTALLATION. Assembly Instructions should be modified as follows:

A. Before installing the Fan Duct (see sections A.2.1, A.2.2 or A.2.3 for reference), place the Fan Adaptor on the receiving flange located on top of the tower (see Figure A-36); make sure the bolt holes and the marks inside the Fan adaptor are aligned (Figure A-37). Then secure it using the stainless steel nut and bolt sets supplied by REYMSA.

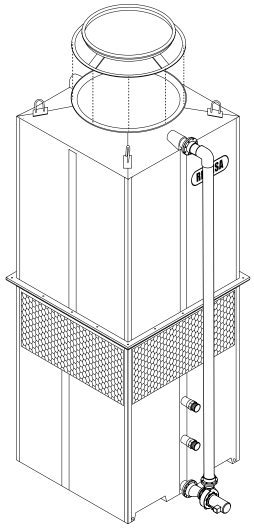


Figure A-36: Fan adaptor installation

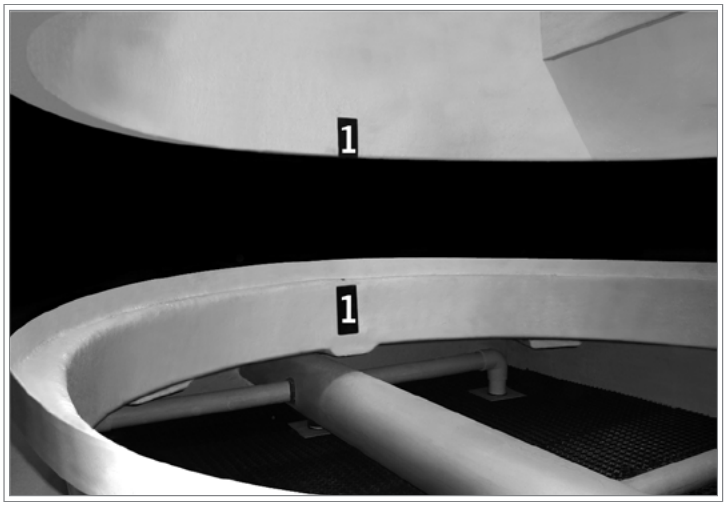


Figure A-37: Fan adaptor alignment

B. For the Double Fan and Quadruple Fan, follow the same instructions described in previous step to install remaining Fan Adaptors (see Figure A-38 for an example). Each fan adaptor is labeled with a number on the inside of the upper edge; for a correct installation, this number must match the number on the corresponding receiving flange.

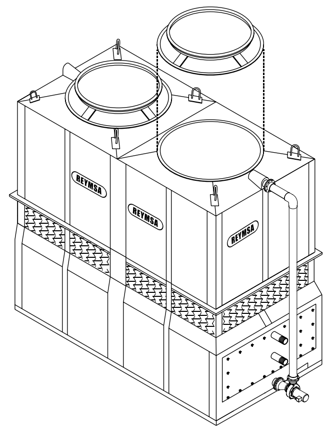
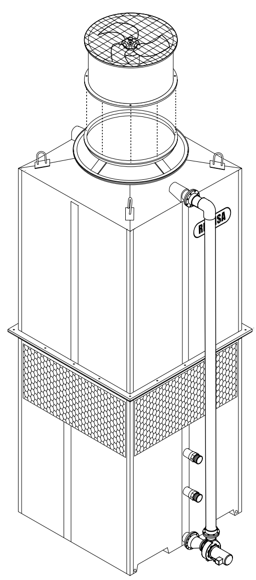


Figure A-38: Fan adaptor 2 installation

C. Then place the Fan Duct on top of the Fan Adaptor (see Figure A-39); make sure the bolt holes and the marks inside the Fan Duct are aligned (see Figure A-40). Then secure it using the stainless steel nut and bolt sets supplied by REYMSA.



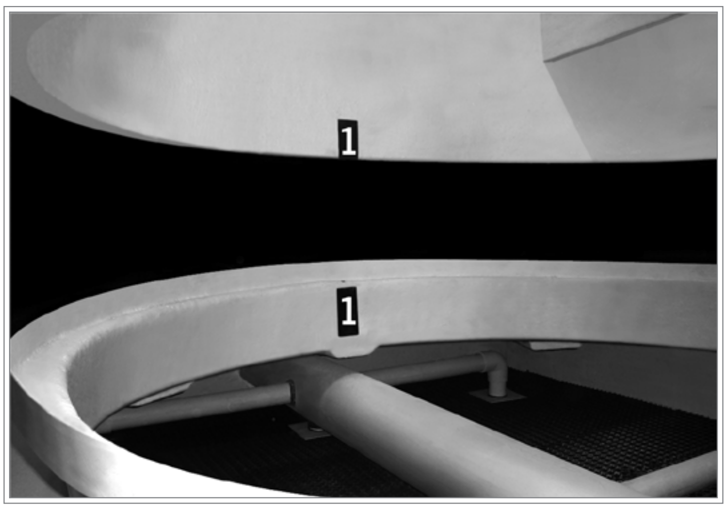


Figure A-40: Fan duct alignment

Figure A-39: Fan duct installation in a fan adaptor

D. If there is more than one fan, follow the same instructions from previous step to install remaining Fan Ducts (see an example in Figure A-41). Each fan duct is labeled with a number on the inside of the lower edge; for a correct installation, this number must match the number on the corresponding fan Adaptor.

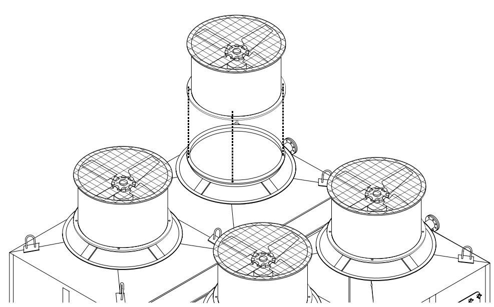


Figure A-41: Fan duct installation in a fan adaptor for a four fan tower

A.2.8. OPTIONAL ACCESSORIES

A.2.8.1. ACCESSORIES - SAFETY

REYMSA offers a variety of optional accessories to help ensure the safety of the personnel operating the Closed Circuit Fluid Cooler, like ladder, catwalk, handrail, and davit support, hoist, and trolley (See Figure A-42). These accessories are designed for easy assembly with labeling on the point of contact and the part being installed (See figure A-42).

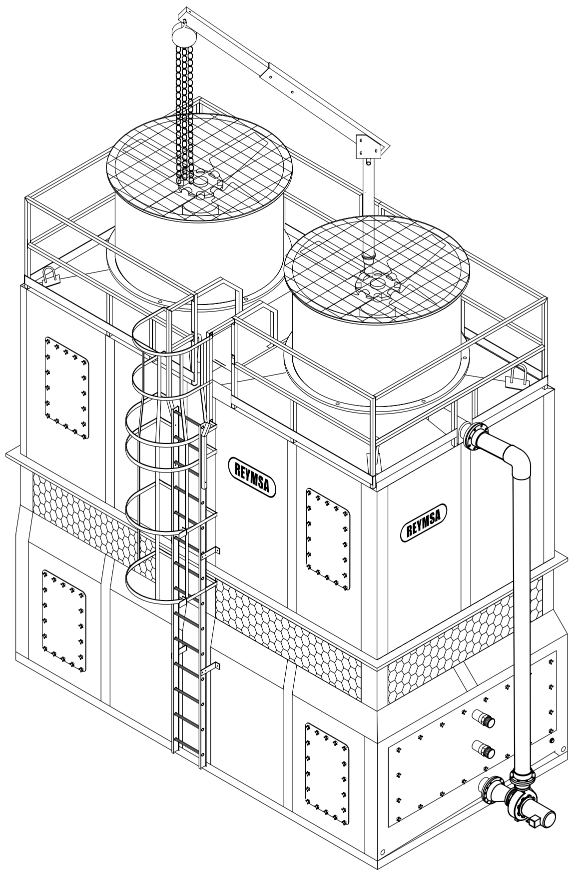
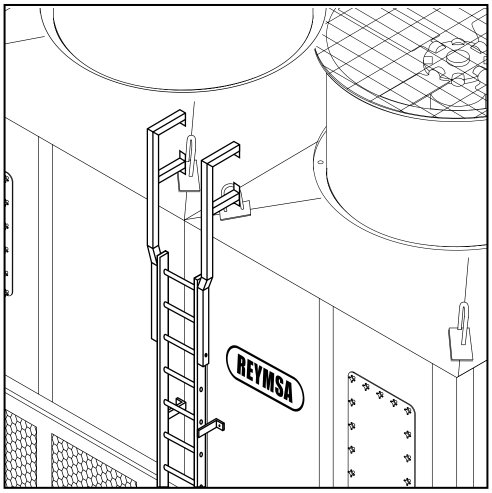


Figure A-42: Optional accessories by REYMSA

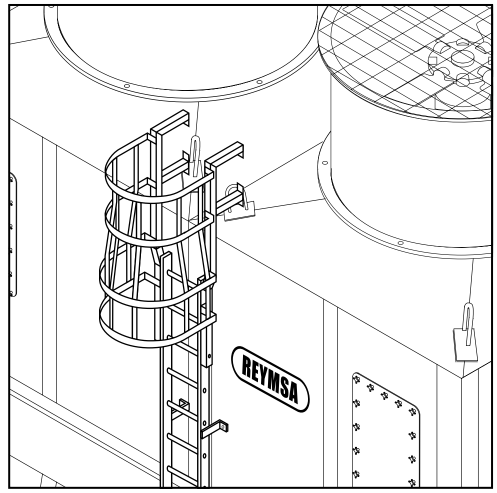
Following is a general procedure for installation; each tower will be provided with specific instructions for that particular tower. Assembly Instructions and drawings are issued with every Closed Circuit Fluid Cooler.

General installation instructions:

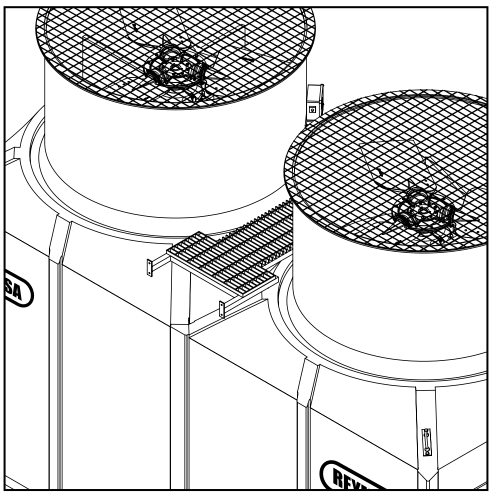
1. The accessories are composed of several parts.
2. Components and parts are labeled with stickers for identification in the tower.
3. Every section should be jointed with stainless steel bolts, washer and nuts (supplied by REYMSA).
4. Do not mix the different sections to avoid assembly problems.



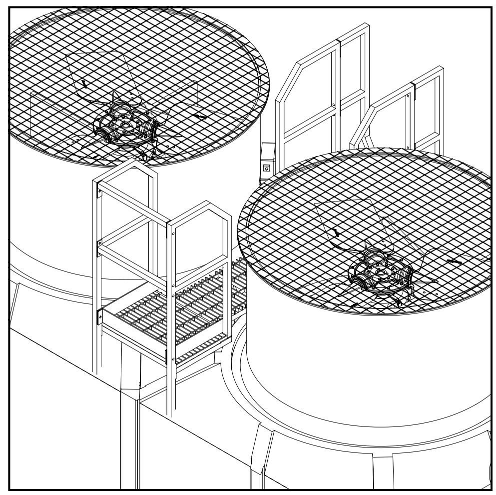
LADDER WITH STANDARD SUPPORTS
OSHA ladder with supports, stainless steel or galvanized steel.



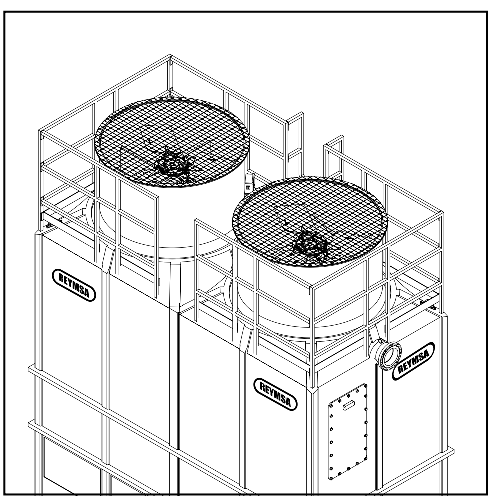
LADDER WITH OSHA SAFETY CAGE
OSHA ladder and Cage with supports, stainless steel or galvanized steel.



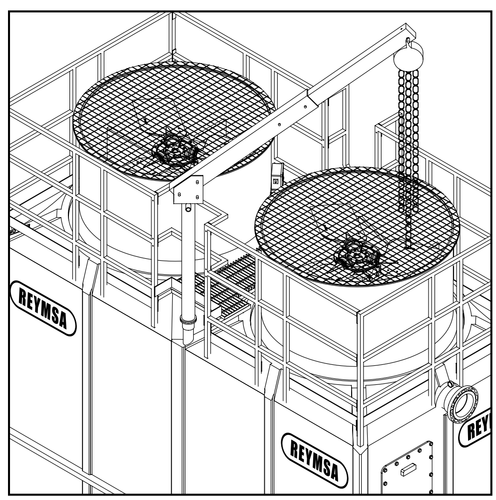
CATWALK
Corrosion-resistant FRP grating, supported by stainless/galvanized steel structure.



CATWALK WITH HANDRAIL
Corrosion-resistant FRP grating, supported by stainless/galvanized steel structure, with safeguard handrails on each end.



PERIMETER HANDRAIL
Stainless/galvanized steel railing OSHA construction, including toe guard.



FIXED DAVIT AND REMOVABLE DAVIT
Stainless steel tubular support and galvanized steel davit structure.

Figure A-43: Optional safety accessories

A.2.8.2. VIBRATION SWITCH

Vibration switches provided by REYMSA are shock sensitive mechanisms for shutdown of the Closed Circuit Fluid Cooler fan motors. These switches use a magnetic latch to ensure reliable operation whenever shutdown protection from damaging shock/vibration is desired. As the level of vibration or shock increases an inertia mass exerts force against the latch arm and forces it away from the magnetic latch causing the latch arm to operate the contacts. Sensitivity is obtained by adjusting the amount of the air gap between the magnet and the latch arm plate.

CAUTION

Stop fan motor and disconnect all electrical power, tag and lock in off position before beginning installation.

Failure to do so may result in personal injury or property damage.

Note: During severe cold weather conditions, ice can form on the fan blades of Closed Circuit Fluid Cooler causing excessive vibration. The vibration switch shuts down the motor avoiding potential damage by shock or vibration.

A.2.8.2.1 INSTALLATION INSTRUCTIONS FOR VIBRATION SWITCH ON DIRECT DRIVE MODELS

Firmly secure the unit to the equipment using the base foot and mount to a satisfactory location, see Figure A-44 as an example of a recommended location. The vibration switch is factory mounted (if bought with the Closed Circuit Fluid Cooler); wiring to the control panel needs to be done in the planned location of the Closed Circuit Fluid Cooler.

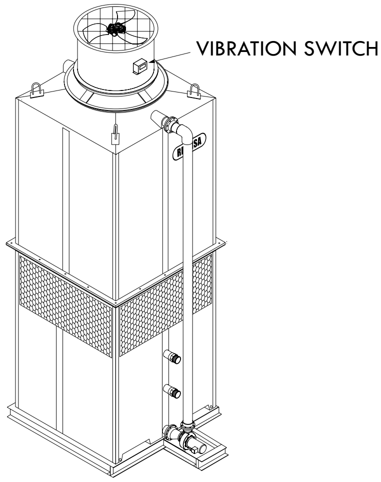


Figure A-44: Vibration switch recommended location

Make the necessary electrical connections to the vibration switch. See Figure A-45 for electrical terminal locations and Figure A-46 for a typical electrical diagram. For vibration switch connections on VFD, see section "C.1.2 CONFIGURATION AND START-UP FOR ABB ACH550-UH" for induction motor models (HFC, HFC-LS; see section "START-UP FOR ABB ACS880" for models with the optional permanent magnet motors, HFC-F).

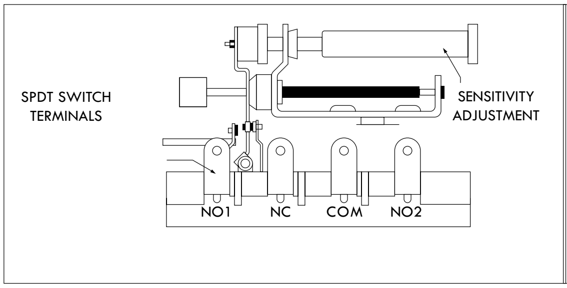


Figure A-45: Internal switches

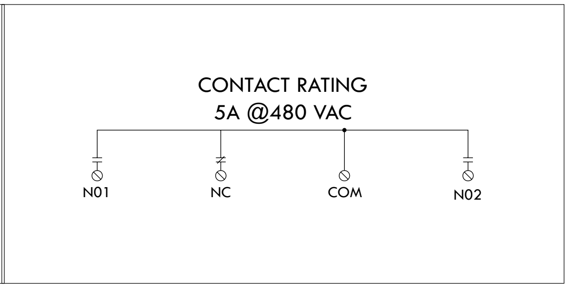


Figure A-46: Typical electric diagram

WARNING

Do not exceed voltage or current ratings of the contacts

Follow appropriate electrical codes/methods when making electrical connections. Make sure that the electrical cable run is secured to the machine and is well insulated from electrical shorting. Use of conduit is recommended.

Sensitivity Adjustment

Each vibration switch is adjusted to the specific piece of machinery on which it is installed. After the switch has been installed, the sensitivity adjustment will be increased or decreased so that the switch does not trip during start-up or under normal operating conditions. This is typically done as follows:

- Remove all covers, lids, and electrical enclosures.
- Press the reset push button to engage the magnetic latch. To be sure the magnetic latch has engaged, observe latch through the window on the vibration switch (see Figure A-47).

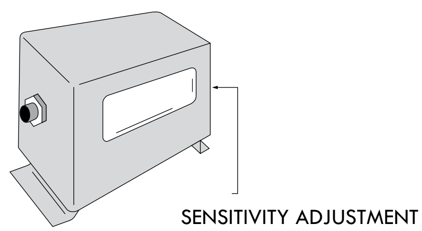


Figure A-47: Vibration switch detail

- Start the fan motor. If the vibration switch trips on start-up, allow the machine to stop. Turn the sensitivity adjustment 1/4 turn clockwise (see Figure A-48): Depress the reset button and restart the machine. Repeat this process until the unit does not trip on start-up.

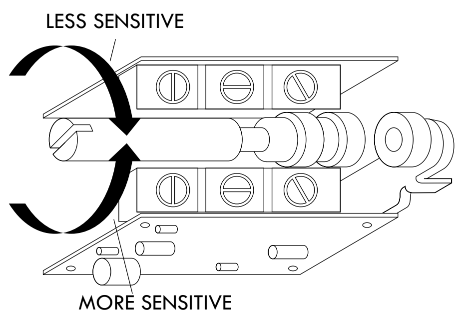


Figure A-48: Sensitivity adjustment

If the vibration switch does NOT trip on startup, stop the machine. Turn the sensitivity adjustment 1/4 turn counter-clockwise. Repeat the start-up/stop process until the vibration switch trips on start-up. Turn the sensitivity adjustment 1/4 turn clockwise (less sensitive). Restart the motor to verify that the instrument will not trip on start-up.

- At this setting, you should expected the vibration switch will trip when abnormal shock/vibration exists.
- Verify the vibration switch sensibility annually to prevent any malfunction.

A.2.8.2.2 INSTALLATION INSTRUCTIONS FOR VIBRATION SWITCH ON GEAR DRIVE SYSTEM MODELS (HFC-F).

Firmly secure the unit to the equipment using the base foot and mount it in a satisfactory location, see Figure A-49 as an example of a recommended location. The vibration switch is factory mounted (if bought with the Cooling Tower); wiring to the control panel needs to be done in the planned location of the Cooling Tower.

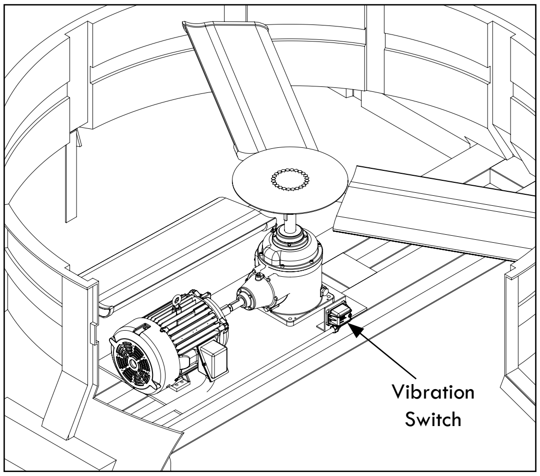


Figure A-49: Vibration Switch recommended location for HFC-F models.

Make the necessary electrical connections to the vibration switch. See Figure A-50 for electrical terminal locations and Figure A-51 for a typical electrical diagram. For vibration switch connections on VFD, see section "C.1.2 CONFIGURATION AND START-UP FOR ABB ACH550-UH" for induction motor models (HFC, HFC-LS; see section "START-UP FOR ABB ACS880" for models with the optional permanent magnet motors, HFC-F).

Follow appropriate electrical codes/methods when making electrical connections. Make sure that the electrical cable run is secured to the fan motor and is well insulated from electrical shorting. Use of conduit is recommended.

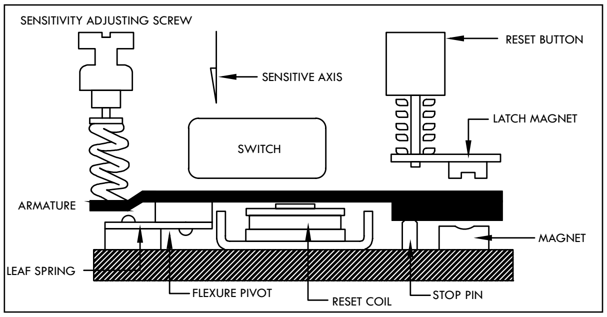


Figure A-50: Internal switches

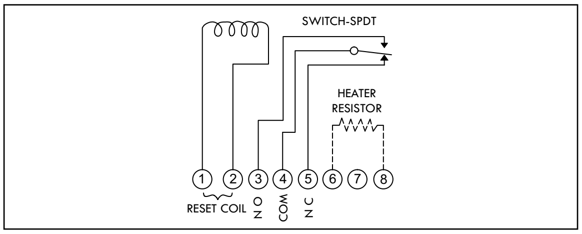


Figure A-51: Vibration Switch Electric Diagram

WARNING

Do not exceed voltage or current ratings of the contacts.

Sensitivity Adjustment

Each vibration switch is adjusted to the specific piece of machinery on which it is installed. After the switch has been installed, the sensitivity adjustment will be increased or decreased so that the switch does not trip during start-up or under normal operating conditions. This is typically done as follows:

A. With the equipment not running, back off the adjusting screw counterclockwise (CCW) two turns and press reset button. Then turn screw slowly clockwise until actuation occurs. This is the ZERO VIBRATION POINT, or actuating point, with the machine not running. The trip point for zero (no vibration) of the detector will occur at different points depending on its mounting orientation with respect to gravity. A mark should made with lead pencil or other convenient means to permanently record this “zero point”. Subsequent measurements are made relative to this point. See Figure A-52.

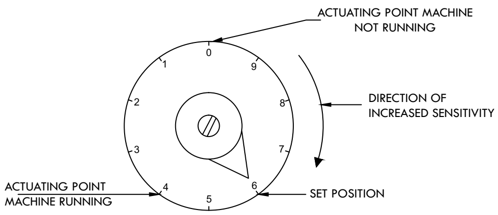


Figure A-52: Sensitivity adjustment

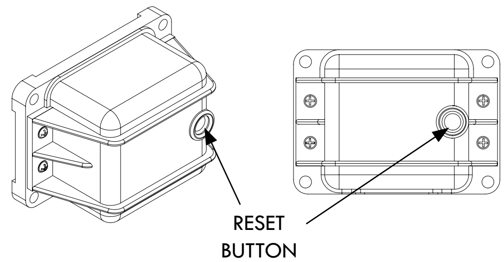


Figure A-53: Vibration Switch RESET button

B. With machine running, back off adjusting screw one turn CCW and reset (see Figure A-53). If it will not reset, back screw off two turns CCW, etc. Again turn screw slowly clockwise until actuation occurs. The difference between the two actuating points in “a” and ‘‘b” is the normal vibration level in divisions. One dial division is 0.1G; one full revolution is 1.0G.

C. Back off screw CCW from the last position in “b” to the desired or shutdown level. The exact amount must be determined from experience.

At this setting, you should expect the vibration switch will trip when abnormal shock or vibration exist.

Verify the vibration switch sensibility annually to prevent any malfunction.

Remote Reset

The Vibration Switch is self powered and does not require external power to operate (Except remote reset). The VIBRASWITCH may be reset by depressing the reset button or by applying power to the electrical reset coil. See image A-54 for a remote reset connection example.

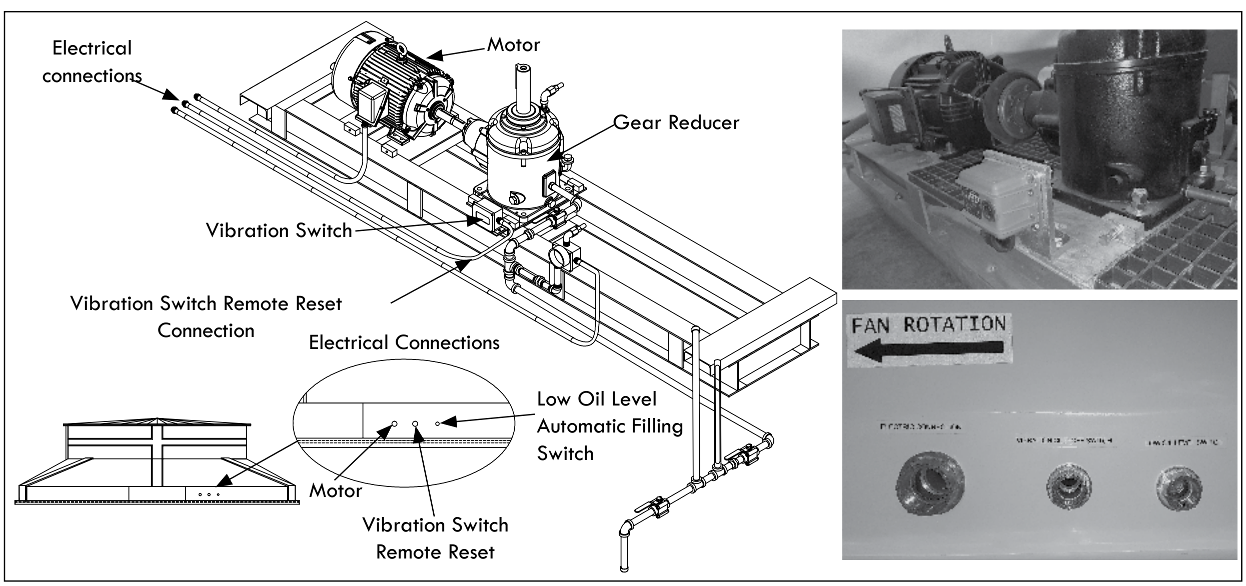


Figure A-54: Remote Reset connection for vibration switch

A.2.8.3. BASIN HEATER

REYMSA offers as an optional accessory the basin heater system, designed to provide freeze protection during shutdown or standby conditions. The basin heater system consists of an electric immersion heater(s), a heater control panel and a combination temperature/liquid level sensor. Electric immersion heaters are sized (kW rating, voltage, phase, and sensor cord immersion length) for the specific tower, basin size, and climate. Basin heater control panel(s) are self contained and require no control wiring. The control panel should be mounted separately on mounts (provided by others) (see Figure A-55).

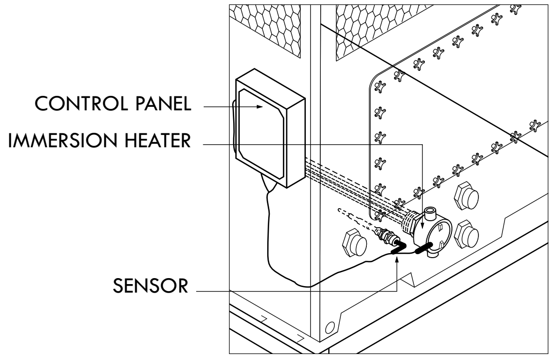


Figure A-55: Basin heater system

> **CAUTION**
>
> **The level sensor must be installed higher than heater while is energized to prevent any failure by overheating**

INSTALLATION instructions

- Before installation, verify that power supply voltage and phasing match the heater unit.
- Two inch hubs are used to insert the heater and a combination temperature/liquid level sensor in the stainless steel couplings located at the basin (identified with labels). Immersion heater should be located 2 inches (minimum) above the basin bottom. The access port for the combination temperature/liquid level sensor should be one inch (minimum) above the heater but below the water level. (See Figure A-56 for recommended distances and mounting).

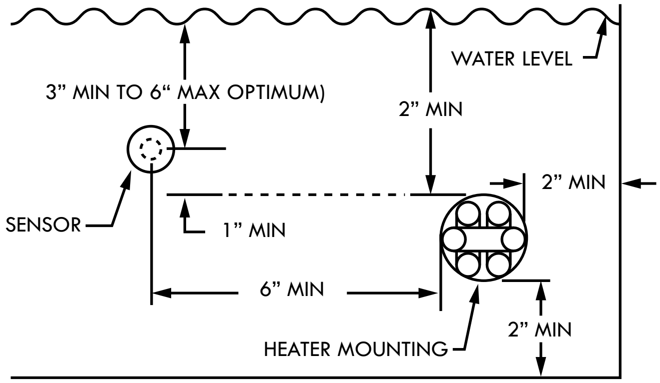


Figure A-56: Recommended basin heater mounting

> **WARNING**
>
> **Immersion heater should be covered with at least 2" of fluid, while heater is energized to prevent any failure by overheating**

Install the immersion heater using appropriate sealing tape or compound to prevent leakage at joint. Sealing material must be suitable for temperature, pressure and material heated. Make sure heater is adequately supported over its immersed length.

- Install stainless steel temperature/liquid level sensor assemble in the upper PVC adaptor.
- Mount control panel so temperature/liquid level sensor cord will reach temperature/liquid level sensor easily.
- The heater element connection box is water tight, unused ports must be seal to prevent leakage.

WARNING

Do not allow moisture to enter cap before installing on sensor.

- Using suitable wire connect heater to panel on "T" terminals, located on right side of contactor in panel (See Figure A-57).
- Using suitable wire from an overload protected disconnect device, connect to the "L" (line) terminals of the panel contactor, located on the left side of contactor in panel (see Figure A-57).

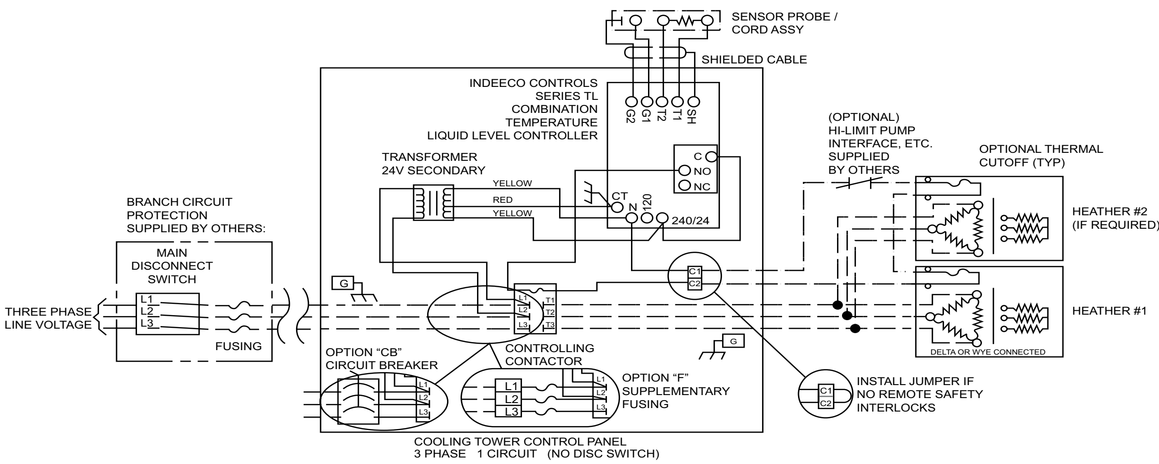


Figure A-57: Basin heater control panel diagram

WARNING

Improper operation, maintenance or repair of basin heater can be dangerous and could result in injury or equipment damage.
Safety precautions and warnings are provided in section "D.6 BASIN HEATER " of this manual.

A.2.8.4. ELECTRIC WATER LEVEL CONTROL SYSTEM

Electric water level control system is an optional accessory offered by REYMSA includes water level controller, stilling chamber, and solenoid valve for water make up (see Figure A-58 & Figure A-59).

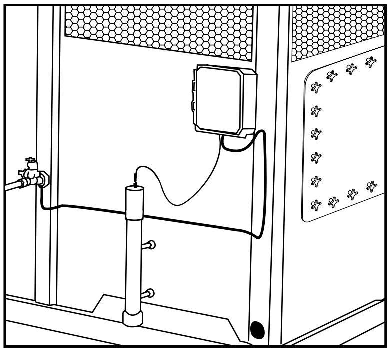


Figure A-58: Electrical Water level control system

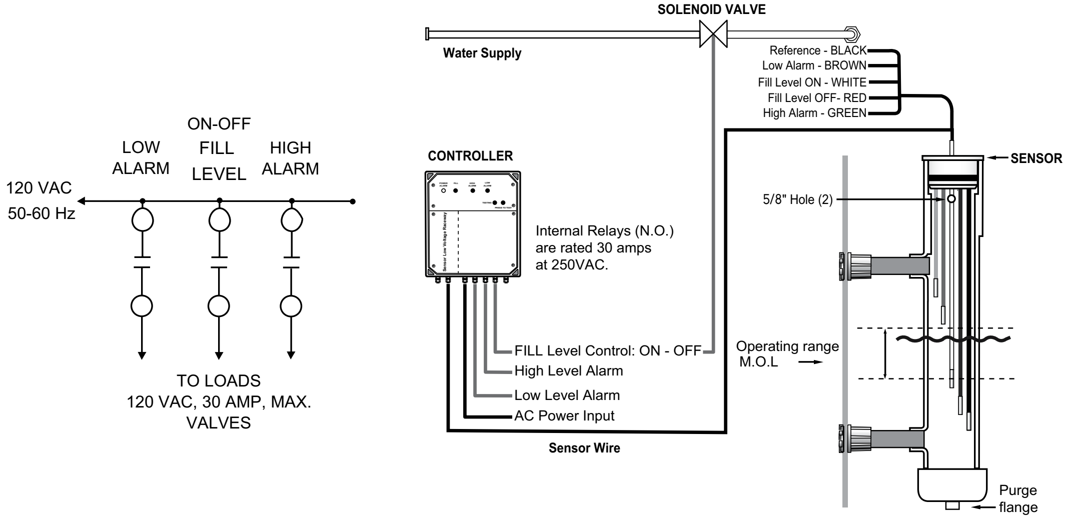


Figure A-59: Electrical Connections & Water Level Control Parts

Sensor assembly installation

1. Assemble the waterline control in a convenient location where splashing water or dew will not affect the unit. The unit and the input/output wiring must be securely attached to the mounting surface.

2. The sensor assembly (Figure A-59) must be made so that the end of the PVC pipe is below the minimum level of water to be maintained.

3. Secure the sensor assembly to the basin of the tower with the two ½" npt fittings.

NOTE: In the PVC pipe there are two small ⅝" vent holes near the top of the housing. Be certain these two vent holes are not covered or obstructed in any way. They must be clear to allow the sensor assembly to function properly.

4.- The probe assembly is supplied with the sensor cable pre-installed. Be sure to route the cable in an appropriate place and shorten the length if it is determined if necessary. The cable can be shortened to a more suitable length as needed.

NOTE: The sensor wires must not be spliced in order to increase the length.

5.- After connecting the cable to a tight PVC compression connector, install it at the bottom of the Waterline WLC casing. The output control cables are connected to the output terminals of the relays using the user supplied ¼" plug connector.

NOTE: the rating on the relay should not be exceeded.

6.- Use water tight PVC conduit for all connections and route the location desired by the end user. If the depth of the probes need to be seen while the sensor assembly is installed mark the sensor probe levels on the outside of the pipe with a "Sharpie". The center of the nominal fill level is marked with a black button in the outer pipe.

A.2.8.5. MOTOR SHAFT GROUNDING RING

Variable Frequency Drives can create stray currents that run along the shaft and discharge through the motor bearings and bearings of coupled equipment, causing fusion craters, pitting, frosting and fluting.

Unless the PM Motor has the shaft grounding ring integrated, this problem can be solved grounding the motor shaft with the Shaft Grounding Ring (optional accessory, see figure A-60) to provide a path of least resistance to ground and divert current away from the motor's bearings.

The Motor Shaft Grounding Ring conducts harmful shaft voltages away from the bearings to ground. Voltage travels from the shaft, through the conductive microfibers, through the housing of the ring, through the hardware used to attach the ring to the motor, to ground (see figure A-61).

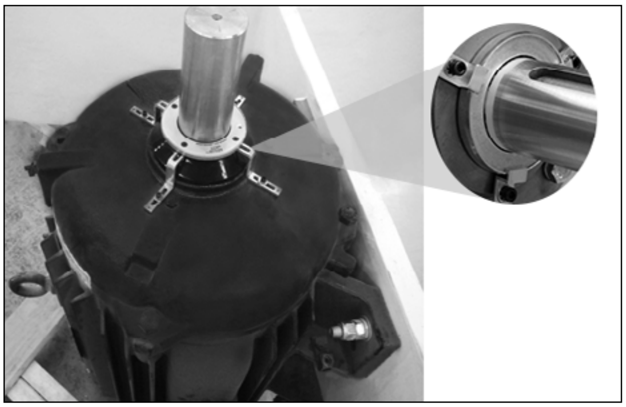


Figure A-60: Motor Shaft Grounding Ring

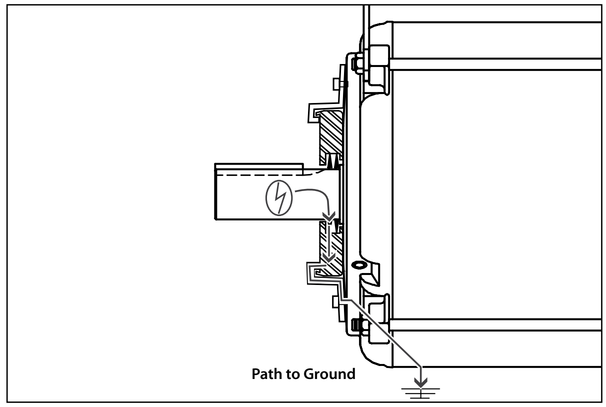


Figure A-61: Motor Shaft Grounding Ring Path to Ground

CAUTION

- **Care should be taken when handling the ring to prevent fiber damage during installation.**
- **Do not use thread lock to secure the mounting screws as it may compromise the conductive path to ground.**

CAUTION

- **Motor must be grounded to common earth ground with drive according to applicable standards.**
- **Rings should not operate over a keyway because the edges are very sharp.**

A.2.8.6 DIRECT DRIVE PERMANENT MAGNET MOTOR FOR HFC-F MODELS

- The optional Permanent Magnet Motors are directly coupled to the fan assembly, eliminating the need for additional components such as gear reducer.
- Permanent magnet motor in HFC-F models has regreasable bearings.
- The permanent magnet motor is factory installed or can replace the gearbox drive system of a previously installed tower.

To replace a previously installed Gear Drive System with the Direct Drive PM motor, contact your local REYMSA representative.

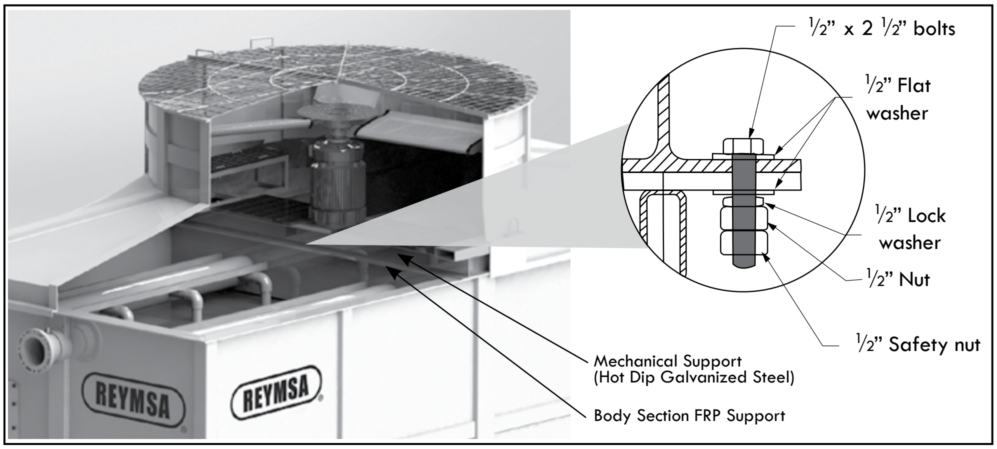


Figure A-62: Direct Drive Permanent Magnet Motor option for HFC-F Models.

WARNING

FAN WITH PERMANENT MAGNET MOTOR

Permanent magnet (PM) motors are not suited for operation on line power and must be operated by a VFD (Variable Frequency Drive). Attempting to run in bypass mode (across the line) may cause motor damage. To provide bypass functionality, consider the use of a second VFD.

Refer to Section "C.1.4 CONFIGURATION AND START-UP FOR ABB ACS880-01 +N5350 COOLING TOWER DRIVES FOR PERMANENT MAGNET MOTORS ON HFC-F MODELS" to configure a VFD for the optional Permanent Magnet Motor.

A.3. TOWER SET-UP

A.3.1. LEVELING AND TOWER SUPPORTS

REYMSA Closed Circuit Fluid Coolers should always be installed on a level surface and adequately supported. REYMSA recommends supporting Closed Circuit Fluid Coolers on an isolation pad and a structural base; care must be taken to ensure that the basin sump (the lowest portion of the tower basin) is completely supported (see Figure A-63). Always make sure the structural base will support the Tower's operational weight. Also verify that such support has the proper dimensions; always refer to factory certified drawings for construction purposes. An example of a recommended base support is shown in "APPENDIX A: EXAMPLE OF STRUCTURAL BASE FOR A REYMSA CLOSED CIRCUIT FLUID COOLER"; consult your REYMSA representative for more specifics.

Figure A-63: Example of a base support (provided by others)

> **CAUTION**
>
> **Tower should be installed on a level surface and adequately supported.**
>
> **Failure to do so could result in Closed Circuit Fluid Cooler and property damage.**

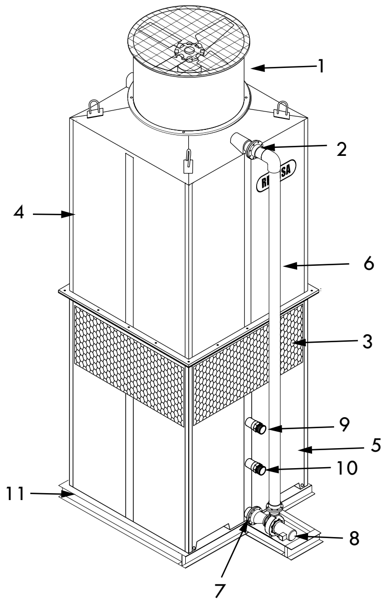
A.3.2. PIPING CONNECTIONS

All connections to the Closed Circuit Fluid Cooler module must be field fitted after tower installation to prevent stress on the tower. All piping should be self-supported and NEVER supported by the Closed Circuit Fluid Cooler.

> **CAUTION**
>
> **Piping should not be supported by the Closed Circuit Fluid Cooler at any time.**
> **Failure to do so could result in tower and property damage.**

Piping should be adequately sized in accordance with accepted engineering principles. All piping and other external equipment must be self-supported, totally independent from the Closed Circuit Fluid Cooler.

In extreme cold weather, care must be taken to protect all piping located on the exterior of the building from freezing (refer to section "C.5. COLD WEATHER OPERATION").



1. FAN SECTION
2. RECIRCULATION WATER INLET
3. AIR INLET LOUVERS
4. UPPER BODY SECTION
5. BASIN SECTION
6. WATER RETURN PIPE
7. RECIRCULATION WATER OUTLET
8. SPRAY PUMP
9. PROCESS FLUID OUTLET
10. PROCESS FLUID INLET
11. STEEL BASE SUPPORT (SUPPLIED BY OTHERS)
12. BODY SECTION ACCESS DOOR (FILL ACCESS)
13. BASIN SECTION ACCESS DOOR (COIL ACCESS)
14. LATERAL ACCESS DOOR (BASIN ACCESS)
15. WATER MAKE-UP
16. OVERFLOW
17. DRAIN
18. PURGE
19. TEMPERATURE SENSOR
20. BASIN HEATER

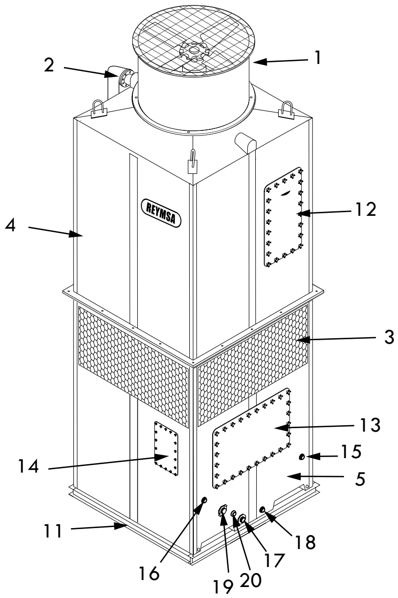
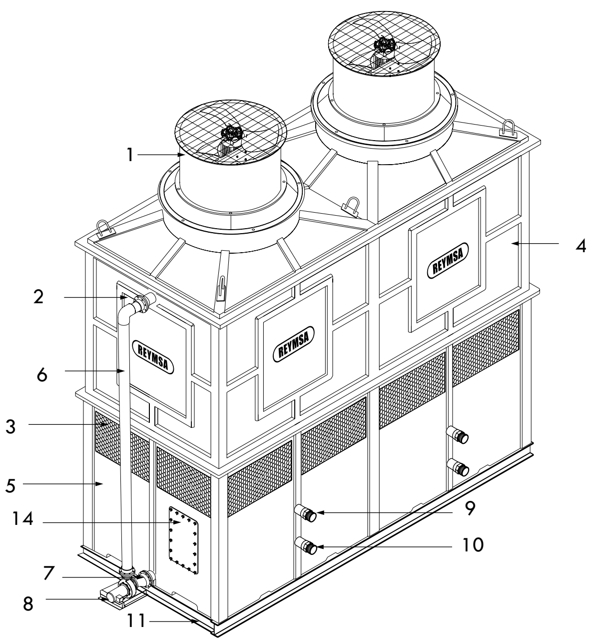


Figure A-64: Pipe connections for a single fan tower



1. FAN SECTION
2. RECIRCULATION WATER INLET
3. AIR INLET LOUVERS
4. UPPER BODY SECTION
5. BASIN SECTION
6. WATER RETURN PIPE
7. RECIRCULATION WATER OUTLET
8. SPRAY PUMP
9. PROCESS FLUID OUTLET
10. PROCESS FLUID INLET
11. STEEL BASE SUPPORT (SUPPLIED BY OTHERS)
12. BODY SECTION ACCESS DOOR (FILL ACCESS - BACK SIDE)
13. BASIN SECTION ACCESS DOOR (COIL ACCESS - BACK SIDE)
14. LATERAL ACCESS DOOR (BASIN ACCESS)
15. WATER MAKE-UP (BACK SIDE)
16. OVERFLOW (BACK SIDE)
17. DRAIN (BACK SIDE)
18. PURGE (BACK SIDE)
19. TEMPERATURE SENSOR (BACK SIDE)
20. BASIN HEATER (BACK SIDE)

Figure A-65: Pipe connections for a double fan tower

1. FAN SECTION
2. RECIRCULATION WATER INLET
3. AIR INLET LOUVERS
4. UPPER BODY SECTION
5. BASIN SECTION
6. WATER RETURN PIPE
7. RECIRCULATION WATER OUTLET
8. SPRAY PUMP
9. PROCESS FLUID OUTLET
10. PROCESS FLUID INLET
11. STEEL BASE SUPPORT (SUPPLIED BY OTHERS)
12. BODY SECTION ACCESS DOOR (FILL ACCESS)
13. BASIN SECTION ACCESS DOOR (COIL ACCESS)
14. LATERAL ACCESS DOOR (BASIN ACCESS)
15. WATER MAKE-UP
16. OVERFLOW (BACK SIDE)
17. DRAIN (BACK SIDE)
18. PURGE (BACK SIDE)
19. TEMPERATURE SENSOR (BACK SIDE)
20. BASIN HEATER (BACK SIDE)

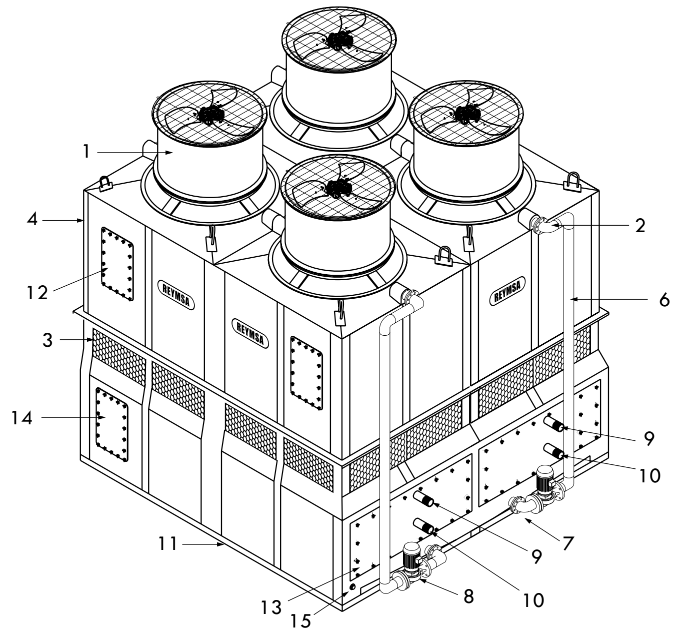


Figure A-66: Pipe connections for a four fan tower

Principle of operation

- Counter-flow - Air movement is vertically upward through the fill, counter to the downward fall of water.
- Induced draft - The fan is located on top of the tower, over the fill section so that the air is pulled through it.

Configuration and tower parts

- **Suction line** (basin section) - The hot water in the basin is suctioned by the spray pump to supply water to distribution system.
- **Make-up** (basin section) - Make-up water needs to compensate the water losses due to evaporation, drift and purge. To control make-up water flow, a mechanical float valve is included by REYMSA as a standard feature. A NPT connection is provided and marked as Make-up Water. Electric automatic fill valve with control is available as an optional (refer to section "A.2.8.4. ELECTRIC WATER LEVEL CONTROL SYSTEM").
- **Overflow** (basin section) - Overflow occurs when the water level within a tower basin rises above this level, the water flows down overflow pipe into a sewer. The overflow connections are NPT threaded.
- **Purge** (basin section) - Purging is done to remove circulating water high in dissolved solids concentration. The purge connection is NPT threaded and must have a valve (supplied by others).
- **Drain** (basin section) - The drain is used to remove all the basin water for tower maintenance and cleaning. The drain connection is NPT and must have a valve (supplied by others).
- **Process fluid** (basin/coil section) - The process fluid inlet receives the hot water that needs to be cooled by the system. The process fluid outlet returns the cooled process water. The process fluid water runs inside the coil without having contact with the environment.
- **Lateral access door** (basin section) - Lateral door with access to the copper coil for maintenance and revision purposes.
- **Body/basin section access door** - Access for maintenance and revision purposes.

A.3.3. WIRING

All electrical work should be performed by qualified personnel and in accordance to applicable electrical codes, best practices and safety standards. All wiring must conform to federal, state and local electrical codes.

CAUTION

Electrical wiring must be handled ONLY by qualified personnel. Failure to do so may result in severe personal injury or property damage.

A.3.3.1. PROCEDURE TO WIRE THE SPRAY PUMP MOTOR

1. Remove the cover (spray pump) motor junction box and pull the leads to connect the power supply.
2. Wire the pump motor following the wiring diagram placed in the motor. Ensure that the motor is properly grounded.
3. Procedures for verifying shaft rotation:

If the shaft is visually accessible verify that is rotating in the correct direction (to the outlet of the pump motor) as indicated by the arrow cast on the pump volute.

If the motor is sealed and you have no visual access to the shaft, use a pressure gauge on the pump, if there is no pressure, change the shaft rotation.

4. For 3-phase motor only, momentarily energize the motors to ensure that the rotation is correct as indicated by the arrow cast into the pump volute. If rotation is incorrect, interchange two wires at the motor starter terminals T1 and T2.

CAUTION

Check the voltage and phases of the incoming power source. Wire the motor per manufacturer's instructions for proper installation.

VOLTAGE HAZARD

This equipment is powered by a three-phase alternating current, as specified on the serial tag and data plate. A properly sized ground wire from the incoming power supply must be connected to the chassis ground terminal inside the electrical enclosure.

Improper grounding can result in severe personal injury.

Always disconnect, tag and lock the incoming main power source before opening the electrical enclosure.

A.3.3.2. PROCEDURE TO WIRE THE FAN MOTOR

REYMSA suggests that after extended shut down, the model should be checked with insulations tester prior to restarting motor.

1. To gain access to the motor, remove the fan guard on top of the fan duct.
2. Remove the cover to the motor junction box.
3. Wire the motor following the wiring diagram in the fan motor nameplate. A piece of flexible conduit is installed to facilitate wiring. Ensure that the motor is properly grounded.
4. Rotate the fan by hand to verify that it rotates freely. The fan should not touch the wall of the Tower fan duct and there should be no noises coming from the motor.
5. Place the junction box cover on the motor and the fan guard on the fan duct. Select motor starter and disconnecting device for the motor: size, voltage and FLA; in accordance with federal, state and local electrical code. The three-phase motor control circuit must contain:
   - A motor controller (motor starter) with over-current protection.
   - A motor disconnecting device must be installed with lockable means to disconnect the main power source.
   - A ground fault protection for the motor.

As optional equipment, REYMSA recommends a vibration cut-off switch to shutdown the electrical motor in case of excessive vibrations caused by malfunctioning of the fan (see section "A.2.8.2 VIBRATION SWITCH" for installation guidelines).

CAUTION

Do not proceed without disconnecting all electrical power, tag and lock in the off position for the motor and pump. Use an OSHA approved ladder and follow manufacturer's instructions for proper use. Failure to do so may result in personal injury or property damage.

WARNING

FAN WITH INDUCTION MOTOR

Use a soft-starter or VFD as motor starter. When using a Variable Frequency Drive (VFD), is not uncommon to exhibit resonant frequencies that result in vibrations, damaging all components of the system. To prevent premature failure, the VFD must be programed to "skip" resonant frequencies that cause unusual rumbling or grinding noise.

CAUTION

In parallel motor applications, the drive cannot provide overload protection for the individual motors. Therefore, it is necessary to install overload/thermal protection for the individual motors (fuses or circuit breakers).

WARNING

FAN WITH PERMANENT MAGNET MOTOR

Permanent magnet (PM) motors are not suited for operation on line power and must be operated by a VFD (Variable Frequency Drive) for PM motors. Attempting to run in bypass mode (across the line) may cause motor damage. To provide bypass functionality, consider the use of a second VFD.

WARRANTY VOID

FOR INDUCTION MOTORS

If fan motors are cycling (ON-OFF) at full voltage controlled by temperature signal or heat load demand. Rapid ON-OFF cycles can damage the motor and the fan.

B. START-UP

Before starting the pump and running water through the tower, inspect the basin of the tower and remove any debris, which may have accumulated during installation.

B.1. FILLING SYSTEM WITH WATER

A. Open make-up valve(s) and allow basin(s) and piping to fill to the tower overflow level. REYMSA's Closed Circuit Fluid Coolers are previously marked with the operation level on the basin, as a reference you could use Table B-1.

B. Assure the pump is completely filled with water by manually filling the basin to the overflow.

C. Install a pressure gauge (supplied by others) in the discharge (OUTLET) line to monitor the pump performance, wide fluctuation could indicate cavitations or vapor air locked.

Table B-1: Operation and Start-up basin level

HFC MODELS	START-UP & OPERATION LEVEL
505XXX - 510XXX	11.5"
606XXX - 612XXX	13"
707XXX - 714XXX	15"
808XXX - 810XXX	
812XXX - 816XXX	
819XXX - 822XXX	
1010XXX - 1212XXX	
1414XXX - 1616XXX	
1619XXX - 1622XXX - 1627XXX	

HFC-F MODELS	START-UP & OPERATION LEVEL
1012XXX	13"
1016XXX	12"
1216XXX	
1218XXX	

HFCP MODELS	START-UP & OPERATION LEVEL
707XXX - 714XXX	15"
808XXX - 810XXX	
812XXX - 816XXX	
819XXX - 822XXX	
1010XXX - 1212XXX	
1414XXX - 1616XXX	
1619XXX - 1622XXX - 1627XXX	

B.2. CONTROLLING WATER LEVEL

WARRANTY VOID

If inlet pressure to the mechanical float valve exceeds 50 psi.

REYMSA Cooling Towers utilize a mechanical float valve as standard (see Figure B-1 or refer to APPENDIX D: "WATER MAKE-UP FLOAT VALVE" for more information); an electric valve for automatic flow control is available as optional. Use the following instructions to adjust the make-up water mechanical float valve on the basin section of the tower to produce the highest water level without overflowing the tower.

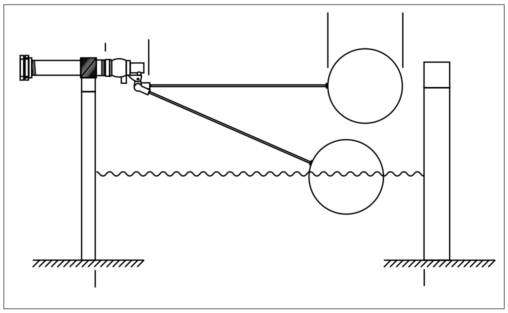


Figure B-1: Float valve installation

A. Close water make-up valve(s).
B. Remove the access door to reach the area where float valve(s) are located.
C. Threaded the bronze valve and nipple into the PVC connector and place the float arm with plastic or copper ball, using the bolt.
D. Adjust the water level approximately 1" below the overflow level, then tight the bolt.
E. Restore water supply and verify that the water level is at the desired operating level.
F. Close the access door.

B.3. SPRAY PUMP

CAUTION

- **Refer to pump's IOM manual to ensure pump proper installation, operation and start-up.**
- **Do not run the pump(s) dry or when the suction is not full of water; damage may occur.**
- **Do not start pump(s) with the valve fully-open; there is risk of overflowing the Closed Circuit Fluid Cooler.**

A. Before starting the spray pump, ensure that it is completely full of water.

B. Start the pump motor and make a visual inspection of the pump and piping for leaks.

C. Check the pressure gauge in the discharge line pump.

D. Check the voltage and amperage per the motor data plate.

E. If the pump surges: shut off the pump, verify the operating level in basin is within range, after the system has equalized.

F. Close the water make-up valve, and adjust the float valve to a higher setting. Repeat steps A and B.

G. If there are more than one pump, start remaining pumps one at a time by repeating steps "B.2. CONTROLLING WATER LEVEL".

H. If the basin overflows, close the water make-up valve, lower the float valve setting, and repeat ("B.2. CONTROLLING WATER LEVEL"). In case of experiencing problems with the pump(s), refer to pump's IOM manual.

I. Shut off pump(s) if required.

B.4. GEAR REDUCER

A. Check all fittings on the gear reducer to ensure that there are no visible leaks.

B. Make sure that the gear reducer is filled with the proper amount and type of lubricant.

C. The initial oil level should be to the middle of the oil level sight gauge and should be maintained so that the oil level is always visible in the sight gauge window when the unit is stationary, level, and the oil is at ambient temperature.

D. If shimming is required, take precautions to prevent distortion of the housing. Align driver and gear reducer to obtain parallel and angular alignment. Recheck alignment after two weeks of operation.

E. For VFD see section "C.1 FAN CONTROL - VFD".

F. For gear reducer maintenance refer to section "D.5 GEAR REDUCER".

CAUTION

When using a variable frequency drive (VFD), do not operate gear drive below 450 RPM fan motor speed.

CAUTION

- **The original oil should be replaced after 500 hours of operation or four weeks, whichever comes first.**
- **After the initial oils change, oils should be changed every 2500 hours or every six months, whichever comes first.**

B.5 FAN

WARNING

- **Never operate the fan when the fill access door or the fan guard is removed.**
- **Never remove fill access door while fan is in operation.**

A. Before starting fans for first use, ensure that the fan rotates freely, each fan should have a minimum tip clearance of no less than ¼ inch. Although tip clearances are quality checked before releasing any REYMSA Closed Circuit Fluid Cooler reinspect them to ensure there was no movement during shipping. Report any non-comformance to your REYMSA Representative.

B. Verify that all fan guards are in place and secure.

C. Start Closed Circuit Fluid Cooler fan(s) and make sure they are rotating as indicated on the fan duct and that air is entering at the bottom of the Tower and discharging through the fan duct. Reverse rotation of the fan motor if required. For units with VFDs, refer to "C.1 FAN CONTROL - VFD".

D. Verify that amperage of the motor does not exceed the amperage shown on the data plate. If this happens the pitch of the fan blades must be adjusted to decrease the amperage, but not less than 10% of the value described on the data plate. To adjust the pitch of the fan blades, call your local REYMSA representative for assistance.

E. The sound data included in engineering data sheet is only a theoretical calculation under free-field conditions and should be used only as guideline. Any reflections or obstructions impact directly the sound level.

Never:

- Operate the fan when the access door is removed.
- Remove fill access door while fan is in operation.
- Operate the fan when the fan guard is removed.

WARNING

FAN MOTOR

Use a soft-starter or VFD as motor starter.

When using a Variable Frequency Drive (VFD), is not uncommon to exhibit resonant frequencies that result in vibrations, damaging all components of the system. To prevent premature failure, the VFD must be programed to "skip" resonant frequencies that cause unusual rumbling or grinding noise.

WARRANTY VOID

If fan motors are cycling (ON-OFF) at full voltage controlled by temperature signal or heat load demand. Rapid ON-OFF cycles can damage the fan.

WARNING

In Two-Fan Closed Circuit Fluid Cooler (per cell), ensure to Start-Stop the fan motors at the same time. If you need more information, please contact REYMSA.

C. OPERATION

C.1 FAN CONTROL - VFD

Variable Frequency Drives (VFDs) are the preferred method for both fan motor and capacity control on Cooling Towers. Using a VFD in Cooling Tower applications has advantages over traditional single or two speed motor control. The primary purpose of controlling a motor with a VFD is to save energy and operating cost. In addition, it reduces the mechanical and electrical stress on the motor and mechanical equipment.

Applications utilizing variable frequency drives (VFDs) for the fan motor control must use inverter duty motors built in compliance with NEMA Standard MG-1, part 31. All Premium efficiency motors used by REYMSA Towers allow to work with VFDs.

CAUTION

MOTOR NOT SUITED FOR OPERATION ON LINE POWER
Permanent magnet motors can only be properly operated by a variable frequency drive (VFD) for PM motors. Attempting to run in bypass mode (across the line) may cause motor damage.

CAUTION

In parallel motor applications, the drive cannot provide overload protection for the individual motors. Therefore, it is necessary to install overload/thermal protection for the individual motors (fuses or circuit breakers).

CAUTION

TEFC and TEAO motors used for typical Cooling Tower applications may lose proper cooling at very low fan or VFD speeds. REYMSA recommends a minimum fan operation at 25% of nominal speed.

WARRANTY VOID

- **If the motor is operated below 25% of nominal speed.**
- **If gear box is operated with motors working below 450 RPM.**

When using a Variable Frequency Drive, it is recommended to use a Motor Shaft Grounding Ring (optional accessory) to prevent damage on the motor bearing. See section "A.10.5. MOTOR SHAFT GROUNDING RING" for more information. Permanent Magnet Motors in RTP, RTUP and RTPM models do not require a Shaft grounding ring.

C.1.1 PARAMETERS FOR VFD OPERATION

Most VFD brands include protections for overcurrent, overheating, unexpected failures, in addition to a soft starting processes by means of acceleration and deceleration ramps, which offers an increase of the life of the motor and fan.

REYMSA recommends using the following basic operation parameters on their Cooling Towers with **induction motors**, to ensure a long life expectancy.

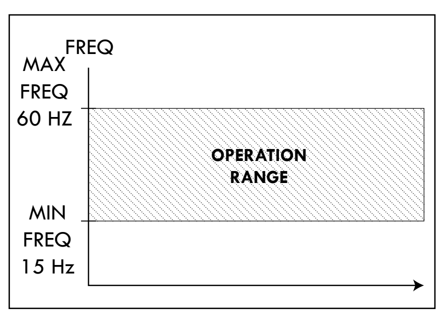


Figure C-1: VFD operation range for induction motors

Maximum Frequency

Usually 60 Hz. This data is shown on the motor data plate.

Minimum Frequency

REYMSA recommends operating motor at 25% of nominal speed. Minimum speed for gear driven models must be 450 RPM. Minimum operating frequency can be calculated:

$$\underset{\text{(RPM on motor plate)}}{\text{Nominal Speed}} * 0.25 = \underset{\text{(Min RPM)}}{\text{Min Speed}}$$

$$\text{Min Freq} = \frac{60\text{ Hz} * \text{Min Speed}}{\text{Nominal Speed}}$$

REYMSA recommends using the following basic operation parameters on their Cooling Towers with **permanent magnet motors**, to ensure a long life expectancy.

Maximum Frequency

Verify the nominal speed (rpm) and the frequency (hz) for the permenent magnet motor in the engineering spec or the tower plate.

Minimum Frequency

The minimum operating speed of the permanent magnet motor is 25% of the maximum speed.

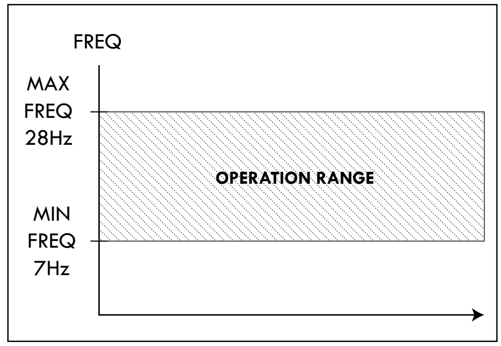


Figure C-2: Example of VFD operation range for permanent magnet motors.

$$\underset{\text{(RPM on motor plate)}}{\text{Nominal Speed}} * 0.25 = \underset{\text{(Min RPM)}}{\text{Min Speed}}$$

$$\text{Min Freq} = \frac{28\text{ Hz} * \text{Min Speed}}{\text{Nominal Speed}}$$

Start-Stop Methods

Soft-start is the prefered method for start-stop fan motor by means of an acceleration and deceleration ramp.

Acceleration time is the required time of output frequency from 0 Hz to 60 Hz maximum frequency (33 Hz for permanent magnet motors). Deceleration time is from a frequency decrease to 0 Hz.

Acceleration ramp on **ABB ACH550-UH Drive** for induction motors is 30 seconds.

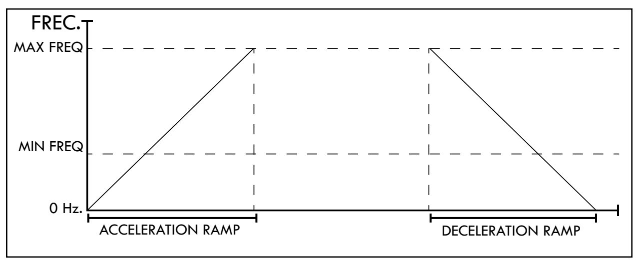


Figure C-3: Start-stop method

Acceleration ramp on **DANFOSS VLT DRIVE FC 102** for permanent magnet motors is 45 seconds.

Acceleration ramp on **ACS880-01 +N5350 COOLING TOWER DRIVES** for permanent magnet motors is 45 seconds.

Operation Method

The VFD will modulate motor from minimum to maximum speed based on the output from a PID loop.

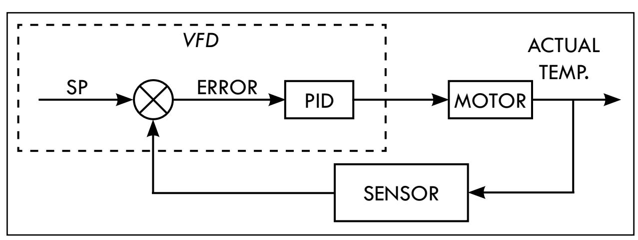


Figure C-4: Operation method

VFD shall remain modulating as long as there is a difference in temperature between the set point and the actual temperature.

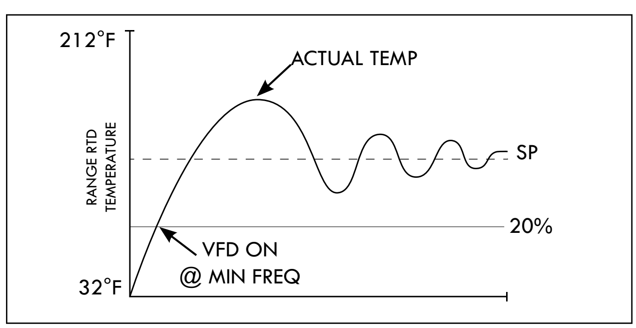


Figure C-5: Measuring range RTD

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C.1.2 CONFIGURATION AND START-UP FOR ABB ACH550-UH FOR INDUCTION MOTORS

REYMSA recommends the next connection diagram for ABB ACH550-UH:

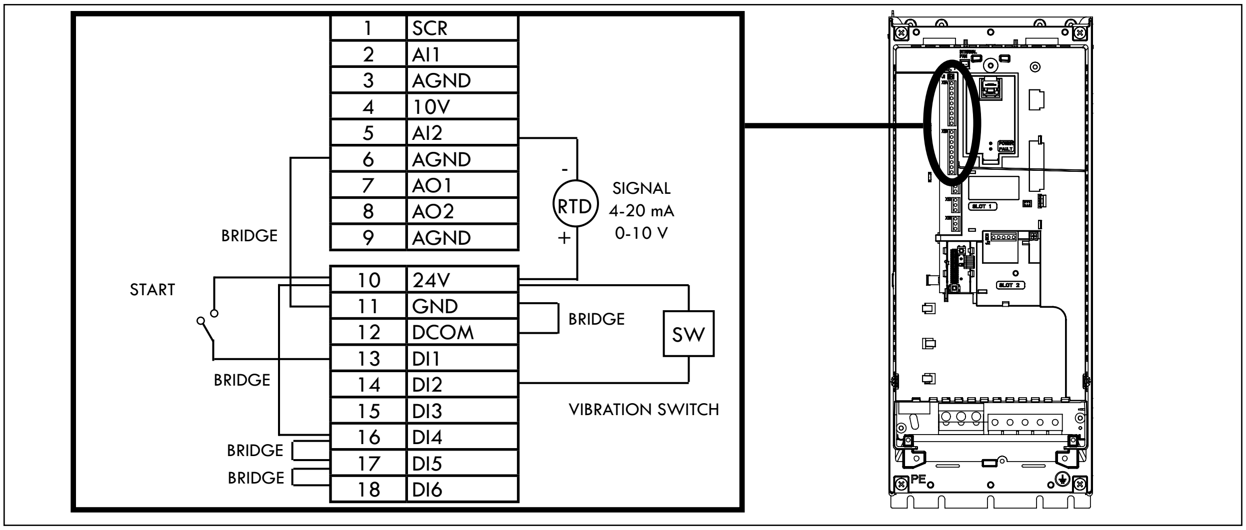

Figure C-6: Recommended Connection Diagram for ABB ACH550-UH.

See next table for configuration and start-up.
Note: Refer to VFD user manual for more information.

Table C-1: Example of parameters and values for VFD configuration for induction motors

PARAMETER	VALUE
Select MENU to enter the main menu.	
Select ASSISTANTS with the Up/Down buttons and select ENTER.	
Scroll to COMMISION DRIVE with the Up/Down buttons and select ENTER.	
9905 MOTOR NOM VOLT:	DATA PLATE
9906 MOTOR NOM CURR:	DATA PLATE
9907 MOTOR NOM FREQ:	DATA PLATE
9908 MOTOR NOM SPEED:	DATA PLATE
9909 MOTOR NOM POWER:	DATA PLATE
9902 APPLIC MACRO:	(4) CLNG TWR FAN
Do you want to use mechanical HAND-OFF-AUTO switch?	YES
EXT1 (HAND) Start command must be connected to DI1 and EXT2(AUTO) Star command to DI6.	OK
Do you want to continue with Reference set-up?	CONTINUE
1103 REF1 SELECT:	(2) AI2
1302 MINIMUM AI2:	20%
1305 MAXIMUM AI2:	100%
1104 REF1 MIN:	15Hz
1105 REF1 MAX:	60Hz
1106 REF2 SELECT:	(19) PID1OUT
1107 REF2 MIN:	20%
1108 REF2 MAX:	100%
2007 MINIMUM FREQ:	15Hz
2008 MAXIMUM FREQ:	60Hz
Do you want to continue with start and stop set-up?	CONTINUE
1001 EXT1 COMMANDS:	(1)DI1
1002 EXT2 COMMANDS:	(6)DI6
2101 START FUNCTION:	(8)RAMP
2102 STOP FUNCTION:	(2)RAMP
2202 ACCELER TIME 1:	30.0 s
2203 DECELER TIME1:	30.0 s
Do you want to continue with protections set-up?	CONTINUE
2203 MAX CURRENT:	15% UP OF NOM CURRENT IN DATA PLATE

2014 MAX TORQUE SEL:	(0) MAX TORQUE 1
Configure Run & Start Enable commands?	YES
1601 RUN ENABLE:	(1) DI1
1608 START ENABLE 1:	(4) DI4
1609 START ENABLE2:	(5) DI5
Configure Emergency stop commands?	YES
2109 EMERG STOP SEL:	(0) NOT SEL
2208 EMERG DEC TIME:	1.0 s
Configure Fault functions?:	NO
Configure Autoreset functions?:	NO
Do you want to continue with const speeds set-up?	SKIP
Do you want to continue with PID control set-up?	CONTINUE
Do you wish to use the PID controller?	YES (activate PID)
Select setpoint source:	INTERNAL
On the next screen select the transmitter's measurement units.	OK
4006 UNITS:	(9)°C
4007 UNIT SCALE:	1
On the next two screens select the transmitter's output range.	OK
4008 0% VALUE:	0.0 °C
4009 100% VALUE:	100.0°C
4011 INTERNAL SETPNT:	DESIRED COLD WATER TEMPERATURE
Select transmitter's range:	4-20mA(2-10V)
As feedback increases drive speed should:	INCREASE
Do you want to change PID tunings?	YES
4001 GAIN:	10
4002 INTEGRATION TIME:	30.0 s
4003 DERIVATION TIME:	0.0 s
4004 PID DERIV FILTER:	1.0 s
2202 ACCELER TIME 1:	30.0 s
2203 DECELER TIME 1:	30.0 s
Do you want to use Sleep function?:	NO
Do you want to continue with low noise set-up?	SKIP
Do you want to continue with panel display set-up?	CONTINUE
Configure Process Variable 1?	YES
3401 SIGNAL1 PARAM:	(102) SPEED
3402 SIGNAL1 MIN:	0 rpm
3403 SIGNAL1 MAX:	1000 rpm
3404 OUTPUT1 DSP FORM:	(9) DIRECT
3405 OUTPUT1 UNIT:	(7) rpm
3406 OUTPUT1 MIN:	0 rpm
3407 OUTPUT1 MAX:	1000 rpm
Configure Process Variable 2?	YES
3408 SIGNAL2 PARAM:	(128) PID 1 SETPNT
3409 SIGNAL2 MIN:	0.0 °C
3410 SIGNAL2 MAX:	100.0 °C
3411 OUTPUT2 DSP FORM:	(9) DIRECT
3412 OUTPUT2 UNIT:	(9) °C
3413 OUTPUT2 MIN:	0.0 °C
3414 OUTPUT2 MAX:	100.0 °C
Configure Process Variable 3?	YES
3415 SIGNAL3 PARAM:	(130) PID 1 FBK
3416 SIGNAL3 MIN:	0.0 °C
3417 SIGNAL3 MAX:	100.0 °C
3418 OUTPUT3 DSP FORM:	(9) DIRECT
3419 OUTPUT3 UNIT:	(9) °C
3420 OUTPUT3 MIN:	0.0 °C
3421 OUTPUT3 MAX:	100.0 °C
Do you want to continue with timed funcs set-up?	SKIP
Do you want to cont. With relay and analog output set-up?	SKIP
Do you want to copy parameters to panel?	YES
Parameters upload successful	OK

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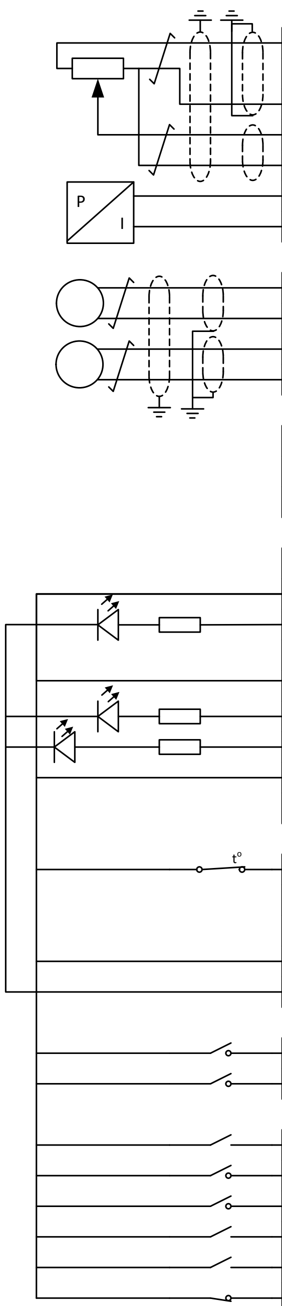
C.1.3 CONFIGURATION AND START-UP FOR ABB ACS880-01 +N5350 COOLING TOWER DRIVES FOR PERMANENT MAGNET MOTORS ON HFC-F MODELS

REYMSA recommends the next connection diagram for ABB ACS880:



XPOW	External power input	
1	+24VI	24 VDC, 2 A
2	GND	
XAI	Reference voltage and analog inputs	
1	+VREF	10 VDC, R_L 1...10 kohm
2	-VREF	-10 VDC, R_L 1...10 kohm
3	AGND	Ground
4	AI1+	**Process or Speed reference**
5	AI1-	0(2)...10 V, R_{in} > 200 kohm
6	AI2+	**Process feedback**
7	AI2-	0(4)...20 mA, R_{in} > 200 kohm
XAO	Analog outputs	
1	A01	**Motor speed rpm**
2	AGND	0...20 mA, R_L > 500 ohm
3	A02	**Motor torque %**
4	AGND	0...20 mA, R_L > 500 ohm
XD2D	Drive-to-drive link	
1	B	Drive-to-drive link
2	A	
3	BGND	
XR01, XR02, XR03	Relay outputs	
1	NC	**Ready**
2	COM	250 VAC / 30 VDC
3	NO	2 A
1	NC	**Running**
2	COM	250 VAC / 30 VDC
3	NO	2 A
1	NC	**Faulted (-1)**
2	COM	250 VAC / 30 VDC
3	NO	2 A
XD24	Digital interlock	
1	DIIL	Digital Interlock, Thermostat, Ramp Stop
2	+24VD	+24 VDC 200 mA
3	DICOM	Digital input ground
4	+24VD	+24 VDC 200 mA
5	DIOGND	Digital input/output ground
XDIO	Digital input/outputs	
1	DI01	Trickle current enable
2	DI02	De-Ice mode enable
XDI	Digital inputs	
1	DI1	Stop (0)/ Start (1) – Speed or Process Control
2	DI2	Speed control (0) / Process Control (1)
3	DI3	ACC/DEC Time Set 1(0)/Set 2(1)
4	DI4	Constant Speed 2 (1=ON)
5	DI5	Fault Reset
6	DI6	External Event, Vibration Switch
XSTO	Safe torque off circuits must be closed for the drive to start. See Hardware manual of drive.	
X12	Safety options connection	
X13	Control panel connection	
X205	Memory unit connection	

Figure C-7: Recommended Connection Diagram for ABB ACS880 Drive.

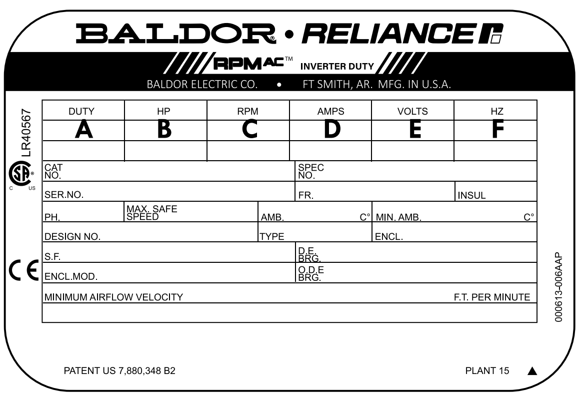
See next table for configuration and start-up.
Note: Refer to VFD user manual for more information.

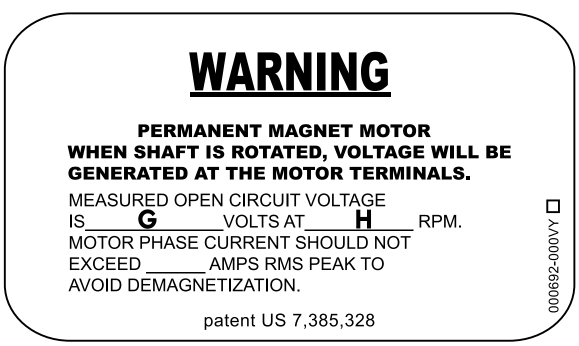
Table C-2: Example of parameters and values for ABB ACS880 Drive configuration for permanent magnet motors.

PARAMETER	VALUE
99 Motor data	
99.03 Motor type	Permanent magnet motor
99.04 Motor control mode	Scalar
99.06 Motor nominal current	**MOTOR NOMINAL CURRENT (SEE MOTOR PLATE EXAMPLES "D")**
99.07 Motor nominal voltage	**MOTOR NOMINAL VOLTAGE (SEE MOTOR PLATE EXAMPLES "E")**
99.08 Motor nominal frequency	**MOTOR NOMINAL FREQUENCY (SEE MOTOR PLATE EXAMPLES "F")**
99.09 Motor nominal speed	**MOTOR NOMINAL SPEED (SEE MOTOR PLATE EXAMPLES "C")**
99.10 Motor nominal power	**MOTOR NOMINAL POWER (SEE MOTOR PLATE EXAMPLES "B")**
30 Limits	
30.11 Minimum speed	Application program
30.12 Maximum speed	**MOTOR NOMINAL SPEED (SEE MOTOR PLATE EXAMPLES "C")**
30.14 Maximum frequency	**MOTOR NOMINAL FREQUENCY (SEE MOTOR PLATE EXAMPLES "F")**
30.17 Maximum current	**MOTOR NOMINAL CURRENT (SEE MOTOR PLATE EXAMPLES "C")**
40 Process PID set 1	
40.07 Set 1 PID operation mode	Off
40.12 Set 1 unit selection	PID user unit 1
40.15 Set 1 output scaling	**MOTOR NOMINAL SPEED (SEE MOTOR PLATE EXAMPLES "C")**
40.21Set 1 internal setpoint 1	**DESIRED COLD WATER TEMPERATURE**
40.27 Set 1 setpoint max	100.00
40.31Set 1 deviation inversion	Inverted (Fbk - Ref)
40.32 Set 1 gain	10.00
40.33 Set 1 integration time	30.0
40.35 Set 1 derivation filter time	0.0
40.36 Set 1 output min	10% of Motor Nominal Speed
40.37 Set 1 output max	**MOTOR NOMINAL SPEED (SEE MOTOR PLATE EXAMPLES "C")**
6 Controls and status words	
6.02 Application control word	0x047e
7 System info	
7.21 Application environment status 1	0b0101
11 Standard DIO, FI, FO	
11.05 DIO1 function	Input
11.09 DIO2 function	Input
12 Standard AI	
12.15 AI1 unit selection	mA
12.17 AI1 min	4.000
12.18 AI1 max	20.000
12.20 AI1 scaled at AI1 max	**MOTOR NOMINAL SPEED (C)**
13 Standard AO	
13.18 AO1 source max	**MOTOR NOMINAL SPEED (C)**
20 Start/stop/direction	
20.06 Ext2 commands	Application program
20.07 Ext2 start trigger type	Level
21 Start/stop mode	
21.10 DC current reference	43.8
22 Speed reference selection	
22.12 Speed ref2 source	P.47.2
23 Speed reference ramp	
23.12 Acceleration time 1	50.000
23.13 Deceleration time 1	30.000
45 Energy efficiency	
45.17 Tariff currency unit	USD

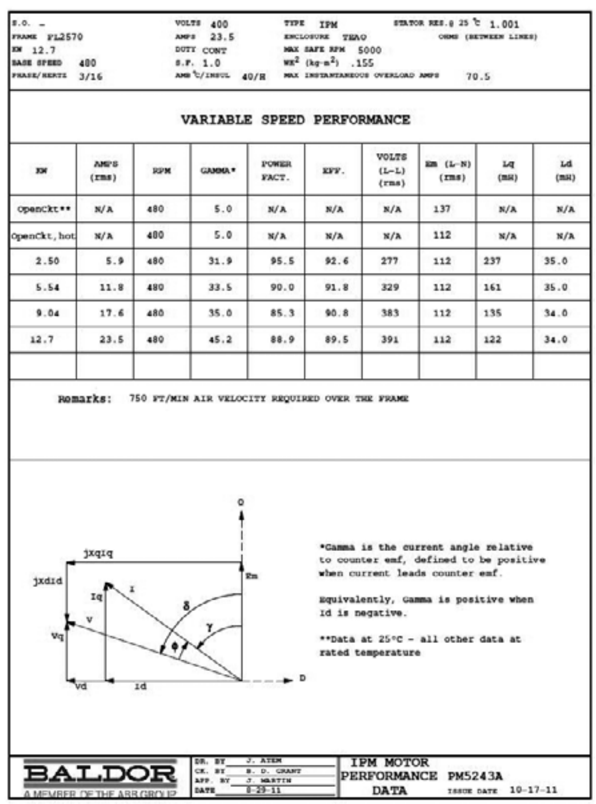
PARAMETER	VALUE
46 Monitoring/scaling settings	
46.01 Speed scaling	**MOTOR NOMINAL SPEED (SEE MOTOR PLATE EXAMPLES "C")**
47. Data storage	
47.02 Data storage 2 real32	80.000
47.11 Data storage 1 int32	269
76 CTD Motor Control	
76.03 Operating mode	PID
76.04 CT Minimum speed	20% of Motor Nominal Speed
95 HW configuration	
95.01 Supply voltage	**MOTOR NOMINAL VOLTAGE (SEE MOTOR PLATE EXAMPLES "G")**
96 System	
96.01 Language	English
96.16 Unit selection	0b0001 0001
98 User motor parameters	
98.02 Rs user	***REFER TO MOTOR DATA SHEET***
98.06 Ld user	***REFER TO MOTOR DATA SHEET***
98.07 Lq user	***REFER TO MOTOR DATA SHEET***
98.08 PM flux user	***REFER TO MOTOR DATA SHEET***
98.09 Rs user SI	***REFER TO MOTOR DATA SHEET***
98.13 Ld user SI	***REFER TO MOTOR DATA SHEET***
98.14 Lq user SI	***REFER TO MOTOR DATA SHEET***
200 Safety	
200.254 CRC of the configuration	100

MOTOR PLATE EXAMPLES





MOTOR DATA SHEET EXAMPLE



S.O. –
FRAME FL2570
KW 12.7
BASE SPEED 480
PHASE/HERTZ 3/16
VOLTS 400
AMPS 23.5
DUTY CONT
S.F. 1.0
AMB °C/INSUL 40/H
TYPE IPM
ENCLOSURE TEAO
MAX SAFE RPM 5000
WK^2 (kg-m^2) .155
MAX INSTANTANEOUS OVERLOAD AMPS 70.5
STATOR RES.@ 25 °C 1.001 OHMS (BETWEEN LINES)

VARIABLE SPEED PERFORMANCE

KW	AMPS (rms)	RPM	GAMMA*	POWER FACT.	EFF.	VOLTS (L-L) (rms)	Em (L-N) (rms)	Lq (mH)	Ld (mH)
OpenCkt**	N/A	480	5.0	N/A	N/A	N/A	137	N/A	N/A
OpenCkt,hot	N/A	480	5.0	N/A	N/A	N/A	112	N/A	N/A
2.50	5.9	480	31.9	95.5	92.6	277	112	237	35.0
5.54	11.8	480	33.5	90.0	91.8	329	112	161	35.0
9.04	17.6	480	35.0	85.3	90.8	383	112	135	34.0
12.7	23.5	480	45.2	88.9	89.5	391	112	122	34.0

Remarks: 750 FT/MIN AIR VELOCITY REQUIRED OVER THE FRAME

*Gamma is the current angle relative to counter emf, defined to be positive when current leads counter emf.

Equivalently, Gamma is positive when Id is negative.

**Data at 25°C – all other data at rated temperature

BALDOR A MEMBER OF THE ABB GROUP
DR. BY J. ATEM
CK. BY B. D. GRANT
APP. BY J. MARTIN
DATE 8-29-11
IPM MOTOR PERFORMANCE DATA PM5243A
ISSUE DATE 10-17-11

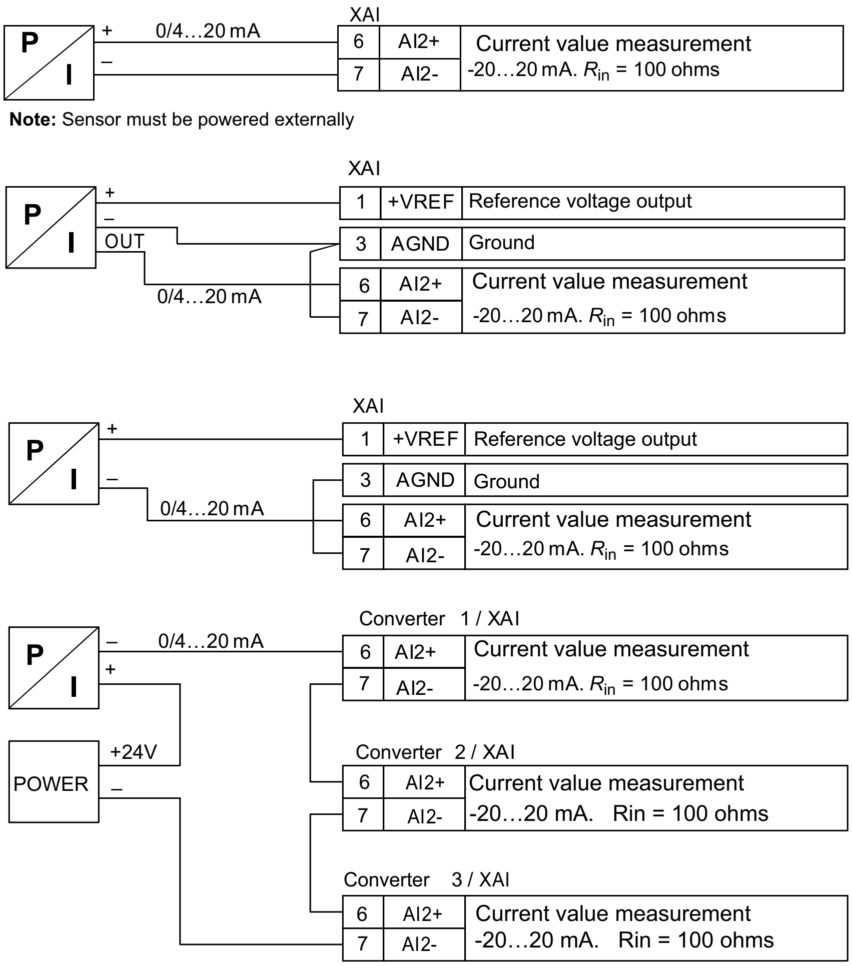


Figure C-8: Sensor connection examples for ABB ACS880 Drive.

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C.2. WATER DISTRIBUTION SYSTEM

Water distribution is accomplished by a non-rotating, low pressure spray nozzle system and a gravity nozzles pan, designed to provide a uniform water distribution over the fill media and copper coil (as shown in Figure C-9). Take in account the following recommendations:

- The recirculation flow rate of the Closed Circuit Fluid Cooler must be as close as possible to the design flow rate. A different parameter, whether lower or higher, will affect the Closed Circuit Fluid Cooler performance.
- The normal operation range of spray nozzles is 2-10 psi. REYMSA recommends maintaining water inlet pressure between 4-8 psi to achieve a proper water distribution. Operation below this range will cause the nozzle to produce smaller than expected spray cone, lowering fill´s performance. Operation of the nozzle above this range may cause flow-induced vibration, which can contribute to nozzle blowout from the pipe adapter. Both conditions will negatively affect Closed Circuit Fluid Cooler performance. Never operate the nozzle continuously at pressures over 10 psi.
- Verify there are no obstructions in the gravity nozzles pan.
- If a VFD is installed, set the VFD to control the Closed Circuit Fluid Cooler fan to the desired process water temperature.
- Never operate temperatures above the allowed level for each material; failure to do so may result in damaged to the internal components. Refer to Table C-3 for the Maximum Continuous Operating Temperatures of the materials REYMSA uses for its fill media.

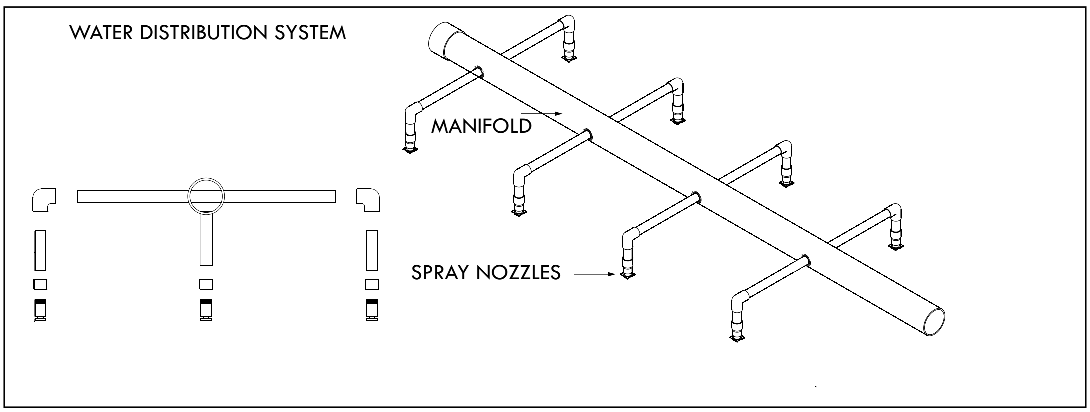


Figure C-9: Water distribution system schematic drawing

Table C-3: Maximum operating temperatures

FILL MEDIA MATERIAL	MAXIMUM CONTINUOUS OPERATING TEMPERATURE
PVC	140°F (60°C)

Table C-4: Maximum operating pressure

WATER DISTRIBUTION SYSTEM MATERIAL	MAXIMUM CONTINUOUS OPERATING PRESSURE
PVC	10 PSI

CAUTION

Operation at higher temperatures than temperatures shown on Table C-1 will damage the Fill Media.

CAUTION

Operation at pressure greater than 10 PSI may cause improper operation and damage to the distribution system.

C.3. WATER TREATMENT AND WATER CHEMISTRY

The Closed Circuit Fluid Cooler requires a water treatment program to ensure the efficiency of the system operation, extending its service life. A qualified water treatment company should design a specific program for the tower best operation.

A Closed Circuit Fluid Cooler is part of a carefully engineered heat exchange system. Any film or deposit which forms on the waterside heat exchange surface reduces the heat exchange efficiency of the system. System reliability can be sharply increased by maintenance shutdowns required for removal of waterside deposits, replacement of spray pump shaft seals damaged by suspended particles in the water, or repairs required by waterside corrosion failures.

A water conditioning program must always address the following areas to maintain system reliability:

- Suspended solids
- Scale formation
- Microbiological contamination
- Corrosion
- Air Contamination

For optimal heat transfer and tower operation, the water chemistry of the recirculating water should be maintained within the guidelines listed in Table C-5.

Table C-5: Water chemistry guidelines

WATER CHEMISTRY GUIDELINES	
CHARACTERISTIC	**CONCENTRATION**
pH	6.5 - 9
Hardness (as $CaCO_3$)	30 - 500 ppm
Alkalinity (as $CaCO_3$)	500 ppm max.
TDS (Total Dissolved Solids)	1500 ppm max.
Chlorides (as Cl)	450 ppm max.
Silica (as SiO_4)	180 ppm max.
Sulfates (as SO_4)	250 ppm max.
Phosphates (as PO_2)	15 ppm max.

Note

Risk of scale will be greatly reduced by following this guidelines.

These values do not represent the chemical resistance of FRP.

CAUTION

The chemical treatment supply connection is not factory installed. This connection must be installed on the basin (below the copper coil) to dilute the chemicals in the water. Direct exposure of the copper coil to the chemicals may accelerate corrosion.

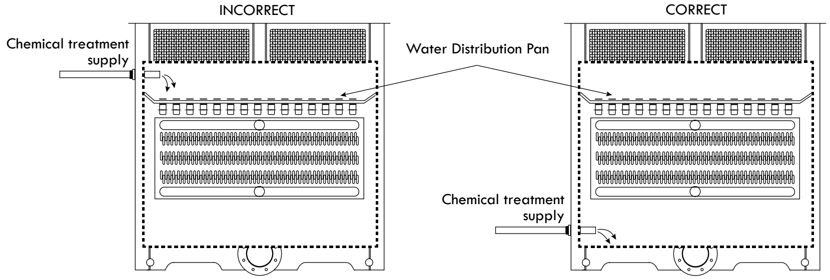


Figure C-10: Chemical treatment connection installation.

C.3.1. SUSPENDED SOLIDS

Sedimentation of solid materials occurs in the Tower basin, pipes and equipment as a product of corrosion, mill scale particles, silt or fly ash scrubbed from air by the Closed Circuit Fluid Cooler. It is recommended that every Closed Circuit Fluid Cooler is fitted with a solid separator. REYMSA offers a centrifugal separator as a design option for suspended solid control (see Figure C-11).

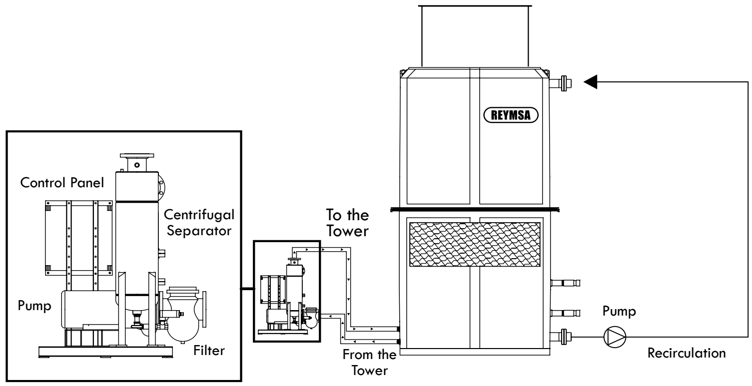


Figure C-11: Filtration system

C.3.2. SCALE FORMATION

Scale is the most widely-known water-caused trouble. Indeed the term is so familiar that it is often applied incorrectly to all solid accumulations in water systems. Scale is but a single type of fouling; others being sedimentation, corrosion, slime, etc. a true scale forms by crystallization of a dissolved salt when its concentration exceeds its solubility.

The most common formed scale consists of:

- Calcium carbonate (lime scale)
- Calcium sulfate & silica
- Algae growth, slime, and other micro-organisms

C.3.3. BIOLOGICAL GROWTH

The growth of algae, slime and other micro-organisms in cooling systems are frequently spoken of and handled as though they were a single word and single problem. Algae require sunlight for their growth, which can be prevented by reducing the sunlight exposure. Minimizing the development of algae and bacterial slimes is important because they reduce the heat transfer and system capacity, decrease cooling water flow, localize corrosion, and serve as a mortar for permitting rapid build-up of deposits consisting of an agglomeration of sediments, corrosion products, and scale.

The aim in cooling water treatment is microbiological control to avoid significant slime or algae growth, not the almost impossible goal of maintaining circulating water completely sterile. The many treatment chemicals available for microbiological control in Closed Circuit Fluid Coolers include chlorine and other compounds which yield available chlorine, some of these compounds have broad spectrum effectiveness and others are specific for a more limited range of organisms.

Periodic measurement of the overall bacterial population of the water is recommended to maintain a biological control, via culturing techniques and visual inspections for evidence of bio-fouling.

Finally, whenever flagrant microbiological growths develop, chemical or mechanical cleaning must be included along with micro biocide treatment in any effective program for promptly re-establishing microbiological control.

CAUTION

Closed Circuit Fluid Cooler must be cleaned periodically to prevent the growth of bacteria including legionella pneumophica, to avoid the risk of sickness or death.

C.3.4. CORROSION

Corrosion is a process of metal dissolution usually by oxidation; this process provokes degradation on the metal surface, creating pits or even holes on it. Corrosion of system components shortens its life, reducing operational reliability. However, since REYMSA Closed Circuit Fluid Coolers are constructed of FRP, corrosion is not an issue for the tower, but it is for the system and the copper coils.

C.3.5. AIR POLLUTION

A Closed Circuit Fluid Cooler draws air as a part of its operation, it can attract a variety of particles on it, interfering with its performance. Do not locate the unit close to smoke stacks, discharge ducts, vents or gas flue exhausts.

C.4 MAKE-UP WATER REQUIREMENTS

Make-up water is added to compensate for the volume of water lost throughout evaporation, drift and blowdown. Evaporation accounts for the largest loss of water from a water cooling system and is independent of system's flow for typical operating temperatures. To achieve one ton of cooling, a Tower will evaporate about 1% of process water flow each minute, per every 10°F range.

As this water evaporates, it leaves behind any dissolved solids it may have been carrying. If allowed to go unchecked, these solids will eventually precipitate out or scale the heat transfer surfaces. To aid in controlling dissolved solids a portion of the process water must be discharged from the system and replaced by fresh make up water thus diluting the remaining process water. Blow-down or bleed are common names given to this discharge.

Determining the amount of blow-down required is heavily influenced by the quality of water used for make up. As the dissolved solids content of the make up water increases the need for higher blow-down rates will also increase. Cycles of concentration are used in establishing the blow-down rate. The value of the cycles of concentration is the ratio between the process water concentration of dissolved solids and the make up water concentration of dissolved solids. A chemical analysis by a water treatment professional is the recommended method for determining the optimum cycles of concentration for the cooling Tower water.

Water is also lost from the cooling Tower itself in the form of liquid droplets, which become entrained in the cooling Tower air stream and discharged with it. Known as drift, the amount of water blown out of the Tower is dependent on the Tower's eliminators and the flow through the Tower. Generally 0.001% of the Tower flow rate may be used as an estimate for drift in a counter-flow Tower.

In Table C-6, there is an example which may be used for estimating water usage in a typical fully loaded system, with a 10°F temperature drop through the Tower. Flows are represented as a percentage of the total flow through the Closed Circuit Fluid Cooler.

Table: C-6 Cycles of concentration

CYCLES OF CONCENTRATION (CC)	EVAPORATION	DRIFT	PURGE	MAKE-UP
2	1.0%	0.001%	0.999%	2.0%
3	1.0%	0.001%	0.499%	1.5%

$$\%\ \text{PURGE} = \frac{\%\ \text{EVAPORATION} - \%\ \text{DRIFT}}{\text{CYCLES OF CONCENTRATION} - 1}$$

OPERATION

C.5. COLD WEATHER OPERATION

Units installed in a cold weather operation environment must use a freezing protection system; Closed Circuit Fluid Cooler operates in ambient temperatures 32°F or below there is a risk of the Tower's water freezing. Build-up of ice can strongly affect air flow and lead to components failure.

If the Closed Circuit Fluid Cooler will operate in a freezing climate, take into account the following precautions to help lessen the chances of damaging property due to freezing water:

- Assure adequate air flow; risk of recirculation must be minimized. Recirculation can result in inlet louvers and fan freezing.
- Drain water from the Tower when not in service for any extended period of time.
- All external piping that is not drained must be heat traced and insulated, as well as system accessories like water level control, make-up water valve, spray pump, etc.
- Maintain the highest water temperature in the Tower system that will satisfy the cooling load. Outlet water temperature must be maintained at a minimum of 40°F. The higher the water temperature is, the lower the ice formation potential.
- Adjust Tower temperature by cycling fans, cycle the fans off or modulate fan speeds (no lower than 50%) to maintain water temperature above freezing. Do not operate fans with air temperatures below freezing. It is recommended the use of a variable frequency drive (VFD) to allow the closest control of the leaving water temperature and the fan speed (refer to section "C.1 FAN CONTROL - VFD).
- When using a VFD, it is recommended that the minimum speed be set at 50% of full speed to minimize ice formation. Low leaving water temperature and low air velocity through the unit can cause ice formation.
- Inspect frequently the Tower and the area around the Tower for unacceptable amounts of ice formation. If ice formation is found, determine where the water is coming from and take corrective action.
- A simple way to manage ice build-up is cycling off the fan motors while keeping the pump on. During a period of fans idle operation, warm water is entering and flows over the unit and helps melt the ice that has formed in the fill, basin or louver areas.

WARNING

FAN MOTOR

Use a soft-starter or VFD as motor starter.

When using a Variable Frequency Drive (VFD), is not uncommon to exhibit resonant frequencies that result in vibrations, damaging all components of the system. To prevent premature failure, the VFD must be programed to "skip" resonant frequencies that cause unusual rumbling or grinding noise.

WARRANTY VOID

If fan motors are cycling (ON-OFF) at full voltage controlled by temperature signal or heat load demand. Rapid ON-OFF cycles can damage the fan.

WARNING

In Two Fan cooling towers (per cell), ensure to Start-Stop the fan motors at the same time. If you need more information, please contact REYMSA.

C.5.1. BASIN HEATER OPERATION

REYMSA recommends the use of an Immersion Heater System in the Tower basin, designed to provide freeze protection. Such system consists on heating element (3-12 kW), control panel, temperature and level sensors (refer to section "A.2.8.3. BASIN HEATER").

- Visually check that the water level is above level sensor. The heater element should be covered with at least 2" of fluid, while heater is energized.
- The heater will energize if the temperature of the basin water falls below the temperature set point and the water level is above the level sensor.

WARNING

Immersion heater should be covered with at least 2" of fluid, while heater is energized to prevent any failure by overheating

C.5.2. REMOTE SUMP OPERATION

A remote sump tank located in an indoor heated building is a simple option of freeze protection. When the Tower shuts down, the water is drained into the remote sump tank which is in a heated atmosphere.

C.5.3. COIL FREEZING PROTECTION

The method recommended to protect the copper coil from freezing-up is to use an ethylene glycol solution inside the coil, if an anti-freeze solution is not used, the coil must be drained immediately if the flow stops. The recommended Solution freezing protection temperature is showed in the table below.

Table C-7: Recommended solution freezing protection temperature

	ETHYLENE GLYCOL (by volume)			
FREEZE POINT	**20%**	**30%**	**40%**	**50%**
°F	14	3	-14	-38
°C	-10	-16	-26	-39

If the minimum fluid flow cannot be maintained or an anti freeze solution is not in the coil, it needs to be drained as soon as possible if the pumps are shut down or lack of flow during freezing conditions. This is accomplished by having automatic drain valves and air vents in the piping to and from the cooler. Care must be taken to ensure that the piping is insulated to allow water to flow from the coil. This method of protection should be used only in emergency situations, and is neither a practical not recommended freeze protection method. Coils should not be drained for an extended period of time.

C.5.4. PUMP FREEZING PROTECTION

If freezing conditions exist for a long period of time, during shut down the pump must be completely drained and blow out of all liquid, from pump passages, casing, and pockets, using compressed air.

C.6. SEASONAL SHUT-DOWN

When the system needs to be shut-down for a certain period of time longer than 3 days, REYMSA Cooling Towers recommends the following procedure.

- Ensure that all electrial/electronic components (fan, motors, and control panels) are unplugged and locked out, failure to do so could result in personal injury or property damage.
- The basin and all piping needs to be carefully drained, cleaned, and blown out all liquid, making sure there's not water inside to prevent Freezing in the winter season. It's recommended to use a mix of antifreeze in the last wash and vacuum it to stay clear of ice.
- As an advice, close the make up water valve and drain the line.

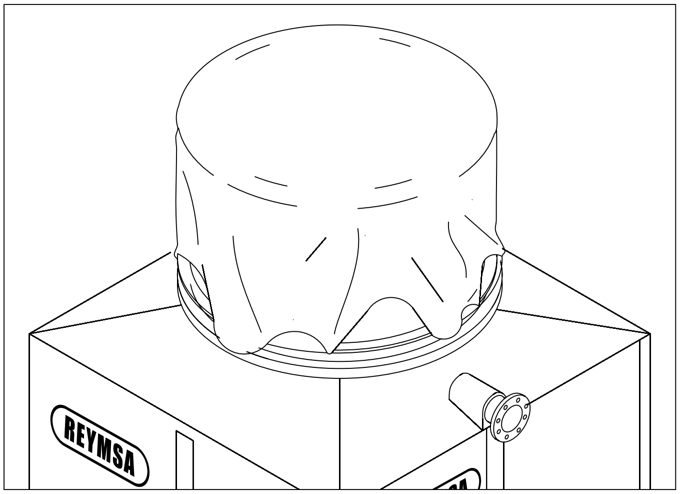


Figure C-12: Fan discharge covering

- To avoid any ice formation due to rain or snow and keep out dirt from inside and outside the towers components, covered them. Especially the fan discharge opening. (As shown in Figure C-12) Taking advantage that the system is turned off, you may want to do Tower service and maintenance. (Adjust motor base screw, balance and adjust fan assembly, clean the inside and outside of the equipment).
- Turn on the motor once a week for about 5 minutes. Before starting the motor, verify there is no obstruction on the fan.
- **HFC-F Models:** If the drive is to be inactive for a prolonged period, it is recommended that the unit be completely filled with oil. Drain excess oil before returning the gear box to service.
- After the seasonal shut-down period you may follow the start up instruction discussed on "Section B. START-UP".

> **CAUTION**
>
> **If the pump is not to be operated for a long periord of time, store it in a clean dry place having slow moderate change in ambient temperature. Rotate the shaft weekly to coat the bearings with lubricant and to retard oxidation and corrosion.**

D. MAINTENANCE

Proper maintenance is necessary to increase the equipment's service life. Adequate knowledge of the operation and maintenance of REYMSA cooling towers is essential for efficient and safe operation.

WARNING

Operation, Maintenance and Repair of REYMSA Closed Circuit Fluid Cooler should be done by Qualified Personnel.

REYMSA recommends that inspection of the Closed Circuit Fluid Cooler should be performed yearly; appropriate cleaning or repairs should be performed if necessary; however, it is also convenient to perform regularly a general inspection for any unusual noises, vibration, water leakages, excessive drift and the set-up of initial conditions, like amps and water flow (see also section "E. TROUBLE-SHOOTING"). The water quality needs to be checked also on a regular basis.

The yearly inspection routine includes the basin, the Tower's body (which includes the water distribution system, the fill media and the drift eliminators) and the fan and its motor; see on Table D-1 the Maintenance schedule recommended by REYMSA.

WARNING

Follow maintenance guidelines as recommended by REYMSA to avoid unnecessary equipment malfunction and assure good Closed Circuit Fluid Cooler performance.

WARNING

Do not proceed with any Inspection or Maintenance Procedure without disconnecting and locking out Power for the Motor and Pump. Failure to do so may result in personal injury or property damage.

REYMSA®

D.1 TOWER MAINTENANCE SCHEDULE

Table D-1: Recommended Tower and optional equipment maintenance schedule

REYMSA COOLING TOWERS - MAINTENANCE SCHEDULE

PROCEDURE	FREQUENCY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Inspection for: -Unusual noises -Vibration -Water lea kage -Excessive drift	*Monthly*																								
Lubricante pump motor	*According to manufacture instructions*																								
Check fan and inlet louvers	*Monthly*																								
Check water quality for biological contaminants contact your water treatment service	*Quarterly*																								
Fan and motor inspection and cleaning	*Yearly*																								
Basin and Tower Body inspection and cleaning	*Yearly*																								
Water treatment control	*Monthly*																								
Clean the strainers	*Monthly*																								
Gear reducer: Initial oil change	*After 500 hours or four weeks of operation*																								
Gear reducer: Check oil level	*Weekly*																								
Gear reducer: Change oil	*Every Six Months or 2,500 hours of operation*																								
Drive Shaft	Rechecking bolt 24 hours after initial tightening may be necessary																								

REYMSA COOLING TOWERS - OPTIONAL ACCESSORIES

PROCEDURE	FREQUENCY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Basin heater inspection for scale build-up and clean electrode ends and junctions box	*Quarterly*																								
Electric water level control inspect and cleaning all components	*Quarterly*																								
Vibration switch enclosure for loose wiring and moisture and adjust sensitivity	*Quarterly*																								
Ladders and handrail corrosion and screw loose	*Yearly*																								

D.2. BASIN

Basin, including the Air Inlet Louvers, should be inspected yearly and cleaned as required.

Inspection

1. Remove the air inlet louvers at the middle of the tower to gain access to the gravity nozzles pan section of the tower.
2. Inspect the Louvers for build-up of dirt or debris that could inhibit airflow to the tower.
3. Cover and protect the gravity nozzles to prevent debris from falling over the gravity nozzles.
4. Inspect the bottom of the gravity noozles pan of the tower for black, wavy pieces of PVC fill. The fill is located directly above the air intakes and can be easily seen. A large amount of fill in the bottom of the gravity nozzles pan of the tower may indicate damage, usually to the top layer. This layer can be inspected through the access doors. On new towers it is not uncommon to find some small pieces (shavings) which should simply be removed.
5. Inspect the bottom of the tower and the underside of the fill for biological growth (slime) and mineral deposits. An excessive amount of growth or deposits is an indication of inadequate water treatment. If allowed to go unchecked biological growth and mineral deposits will reduce the capacity of the tower and eventually completely plug the fill requiring it to be replaced.
6. Inspect the cold water strainers for biological growth, mineral deposits, or any dirt that may obstruct the flow of water.
7. Clean all debris from the bottom of the tower being careful not to let any fall into the cold water outlet.
8. Remove the protective covering from the cold water outlet and replace the air inlet louvers.

Cleaning(If needed):

1. Drain the water from the entire basin.
2. Clean the exterior surface with water and mild detergent.
3. Remove the basin access door to gain access to the basin section of the tower.
4. Wash the Air Inlet Louvers using a low-pressure water hose. Remove any dirt or debris.
5. Cover and protect the cold water outlet to prevent debris from falling into the tank or pump suction.
6. Clean all the debris which may have accumulated at the bottom of the basin or at the strainer.
7. Flush with fresh water to remove the silt, mud or slime.
8. Inspect the sidewalls and the bottom for any possible crack or damaged part. If any damages are found, call your local Representative for assistance.
9. Remove, clean and replace the strainer.
10. Refill the basin with fresh water.
11. Remove the protective covering from the cold water outlet (mentioned above on #5).
12. Put the Louvers back into place in the Closed Circuit Fluid Cooler.

D.3. TOWER BODY

Tower body should be inspected annually and cleaned as required; this includes the tower external shell, the water distribution system, the fill media and the drift eliminators.

Inspection:

1. Remove the access door to obtain complete access to the upper section. You will be able to see the top layer of the fill, the underside of the drift eliminators and the water spray nozzles.
2. The spray nozzle(s) have a threaded connection and are screwed into the water distribution header. Visually inspect the nozzle(s) for any clogged or damage.
3. Inspect the drift eliminators to ensure there is no damage or gaps between the pieces, and that they are laying flat.
4. Remove any debris found inside of the tower.
5. Inspect for biological growth (slime) and mineral deposits. An excessive amount of growth or deposits is an indication of inadequate water treatment. If allowed to go unchecked biological growth and mineral deposits will reduce the capacity of the tower and eventually completely plug the fill requiring it to be replaced.
6. Before replacing the access doors inspect the door gaskets for damage and replace if required. Clean all dirt from the face of the gasket and the surface area of the door and tower. Apply a bead of non-drying, non-shrinking caulk if there is any doubt about the integrity of the gaskets and new gaskets are not available.
7. Replace the access doors being careful not to over tighten the bolts.

Cleaning:

1. Remove the access door(s).
2. Remove the fill from the middle of the tower towards the sidewalls.
3. Clean the fill with a low-pressure water to remove any buildup. If fill is damaged or has excessive build up it may require replacing.
4. Remove the spray nozzle(s) from the water distribution manifold. The spray nozzle(s) have a threaded connection for easy removal.
5. Clean the spray nozzle(s) of any foreign object or trash that might be accumulated and could clogged the proper water dispersion. Visually inspect the nozzle(s) for any defect, obstruction or breaks, in case of existence replace with a new one.
6. Unscrew the first FRP drift eliminator support and remove the drift eliminator.
7. Clean the drift eliminator with low-pressure water to remove any buildup. If drift eliminator is damaged or has excessive build up it will require replacement.
8. Flush the interior with low-pressure water and remove any buildup.
9. Inspect the sidewalls, the fill and drift eliminator supports and the water distribution manifold for any cracks or damaged part. If the drift eliminators have cracks or are damaged, call your local REYMSA Representative for assistance.
10. Reverse the procedure to install the drift eliminators, nozzle(s) and fill.
11. Before replacing the access doors inspect the door gaskets for damage and replace if required. Clean all dirt from the face of the gasket and the surface area of the door and tower. Apply a bead of non-drying, non- shrinking caulk or never-seize non-metal lubricant, if there is any doubt about the integrity of the gaskets and new gaskets are not available.
12. Replace the access doors being careful not to over tighten the bolts.

D.4 FAN MOTOR

Fan and motor should be inspected yearly, and if required, a corrective maintenance should be performed.

A. The motors in **HFC and HFC-LS** models are TEFC (Totally Enclosed Fan Cooled) or TEAO (Totally Enclosed Air Over) with permanently lubricated ball bearings and special moisture protection on the bearings, shaft and windings, no regreasing is required.

B. Regreasable bearings: the standard motors (gear drive system) and the optional permanent magnet motors (direct drive system) in the **HFC-F** models have regreasable bearings; refer to the manufacturer's IOM Manual for relubricating instructions.

CAUTION

Do not proceed without disconnecting and locking out power for the motor and pump. Failure to do so may result in personal injury or property damage.
Do not attempt any maintenance, inspection, repair or cleaning in the vicinity of rotating equipment. The driver controls must be in the "OFF" position, locked and tagged.

NOTE: It will be necessary to use a ladder to access the fan and motor located in the fan duct section at the very top of the Tower. Use the safety equipment required by federal, state and local regulations.

WARNING

INDUCTION FAN MOTOR

Use a soft-starter or VFD as motor starter. When using a Variable Frequency Drive (VFD), is not uncommon to exhibit resonant frequencies that result in vibrations, damaging all components of the system. To prevent premature failure, the VFD must be programed to "skip" resonant frequencies that cause unusual rumbling or grinding noise.

WARRANTY VOID

FOR INDUCTION FAN MOTORS

If fan motors are cycling (ON-OFF) at full voltage controlled by temperature signal or heat load demand. Rapid ON-OFF cycles can damage the fan.

WARNING

In Two Fan Cooling Towers (per cell), ensure to Start-Stop the fan motors at the same time. If you need more information, please contact REYMSA.

WARNING

FAN WITH PERMANENT MAGNET MOTOR

Permanent magnet (PM) motors are not suited for operation on line power and must be operated by a VFD (Variable Frequency Drive). Attempting to run in bypass mode (across the line) may cause motor damage. To provide bypass functionality, consider the use of a second VFD.

Inspection:

1. Remove the fan guard to obtain access to the fan assemble and motor. With the guard removed turn the fan blades by hand to ensure that it moves freely and there are no indications of mechanical problems with the motor or scraping of the fan blades against the side of the fan duct.
2. Replace the fan guard.

Preventive maintenance (fan motor):

CAUTION

Do not proceed without disconnecting and locking out power for the motor and pump. Failure to do so may result in personal injury or property damage.

It is recommended to do general maintenance to the fan motor after 36 months of start-up, or before if its required. Maintenance should be performed only by qualified personnel.

1. Remove the fan guard on top of the cylindrical air discharge to gain access to the motor.
2. Remove the stainless steel plate on top of the fan hub by removing the (3) hex screws.
3. Once the plate has been removed; remove the (3) hex screws that holds the bushing to the hub. Note: The bolts that are being removed in this step use the non-threaded holes of the bushing. (The bushing threaded holes are empty.)
4. The bolts, that were removed, need to be screwed into the adjacent threaded holes of the bushing. Tighten the bolts following a clockwise sequence; this will push the hub-airfoil assembly out of the bushing – releasing the hub-airfoil assembly from the bushing.
5. Remove the hub-airfoil assembly from the motor shaft.
6. Inspect the fan assemble to assure that there is no damage such as broken or loose fan blades.
7. In case of fan wheel vibration it will be necessary to have the fan dynamically balanced by a qualified technician.
8. Gently remove any buildup from the fan blade with a plastic brush.
9. Disconnect electrical wiring and conduit to remove the motor.
10. Loosen the stainless steel bolts and nuts that connect the motor to the FRP motor support inside the fan duct.
11. Support the weight of the motor using a lifting device.
12. Remove the connecting bolts while holding the motor steady.
13. Lower the motor to the ground.
14. Clean the outside surface of the motor to ensure proper motor cooling. Check the motor insulation at a manufacturer's authorized service station.
15. Reverse procedure to install fan and motor.
16. Replace the fan guard.

D.5 GEAR REDUCER

Inspection

- Daily visual inspections and observation for oil leaks and unusual noises and vibrations are recommended. If any of these occurs, the unit should be shut down and the cause found and corrected.
- Periodic checks should be made of the alignment of all components of the system. Also, all external fasteners should be checked for tightness.

CAUTION

For reverse operation please contact REYMSA.

CAUTION

When using a variable frequency drive (VFD), do not operate gear drive below 450 RPM fan motor speed.

Maintenance

CAUTION

Do not proceed without disconnecting and locking out power for the fan motor. Failure to do so may result in personal injury or property damage.

By following the next procedures, gear reducer will provide years of useful service.

1. Check oil level weekly with each unit stopped. Add oil if level is below oil level indicator.
2. The original oil should be replaced after 500 hours or four weeks of operation, whichever comes first.
3. After the initial oil change, oil should be changed every 2500 hours or every six months, whichever comes first.
4. Special precautions are necessary during periods of inactivity in excess of one week. When the internal parts are not continually bathed by the lubricant as during operation, the gear reducer is particularly vulnerable to attacks by rust and corrosion. For best results, let the drive cool for approximately four hours after shutdown, start the fan and let run for approximately five minutes. This will coat the internal parts of the drive with cool oil. Thereafter, run the fan for five minutes once a week throughout the shutdown period to maintain the oil film on the internal parts of the gear drive.
5. If the drive is to be inactive for a prolonged period, it is recommended that the unit be completely filled with oil. This can be accomplished by filling through the air breather port. Cover the drive with a tarpauling or other protective covering. Drain the excess oil before returning the gear drive to service.
6. Use only Rust and Oxidation Inhibited Gear Oils in accordance with AGMA (American Gear Manufacturers Association). For general operating conditions, use a lubricant having an AGMA lubricant number of 5. Gear oils containing Extreme Pressure (EP) additives are not recommended.

Table D-2:
Oil capacity for gear reducer models.

OIL CAPACITY		
GEAR REDUCER MODEL	GALLONS	LITERS
85	1	4
110	2	8
135	3	11
155	5.5	21

Note: Please contact REYMSA to confirm the proper gear reducer model of your Closed Circuit Fluid Cooler.

D.6 BASIN HEATER

Maintenance

1. Check for leakage around screw plug.
2. Periodically inspect heater sheath for evidence of scale build up, sludge, corrosion, or "dry fire." Clean sheath when necessary to remove scale or sludge.
3. Periodically check line connections for tightness and evidence of moisture, oil, or dirt. If these conditions are evident take the necessary steps to correct the problem. Water, oil , and dirt can enter the heater through its terminal end causing premature failure. If this is severe the unit should be taken out of service and tested. We recommend that it be returned to the factory for cleaning and testing.
4. If there is evidence of corrosion or a "dry fire" the unit should be taken out of service and replaced before a failure occurs.

CAUTION

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. If further information is needed for a particular application problem contact the factory.

5. Assemble screw plug in mating coupling in tower basin using appropriate sealing tape or compound to prevent leakage at joint.
6. If heater is to be installed in horizontal position (immersed length parallel to the tank bottom) make sure heater is adequately supported over its immersed length.
7. Heater should be positioned so that the heater is completely immersed, with fluid, at all times under the minimum liquid level or flow conditions. Heater should be covered with at least 2" of fluid, and must be located above any sludge or deposits that may collect in the bottom of tank. If heater is subject to a "dry fire" heaters failure will occur resulting in those hazards.
8. Make sure power supply leads have been turned "off" or are disconnected before attempting to make any electrical hook-up.
9. Remove housing cover. Connect housing using appropriate conduit. Connect lead wires to respective terminals. Make sure connections are tight, in accordance with proper procedures as in any electrical hookup of this type. When connecting supply leads make sure the lead is sandwiched between the two flat washers provided on the unit. It is important not to put more than 10 inch pounds of torque on the terminal pin of the heater. Greater torque will cause the terminal stud to twist off in the heater. Proper lead wire selection is mandatory. Connect ground wire to appropriate ground lug on unit.
10. Replace housing cover. If a gasket is used make sure gasket is properly seated before assembling cover.
11. Fill tank with fluid or turn on fluid flow. Check for leaks. In closed tanks make sure that all trapped air is removed from the tank. Bleed the air out of the liquid piping system and heater housing prior to operation.
12. After tank is full or flow is established turn heater on.

WARNING

The inmension heater should be covered with at least 2" of fluid, while heater is energized to prevent any failure by overheating.

D.7. SPRAY PUMP

It is of the utmost importance to have the bearings properly lubricated at all times.

CAUTION

Overgreasing bearings can cause premature bearing failures.
Do not mix dissimilar greases.
Do not lubricate while pump is running.
Do not remove or install drain plug while pump is running.

Ball Bearings:

Ball bearings are greased at the manufacturer's factory. Grease will not flow out during shipment, so no checking will be required at start-up.

Regrease bearings as indicated by motor manufacturer's instructions. Normally greasing is required every two (2) years or 3,000 hours of operation. On motors, grease is usually introduced with a grease gun through a grease fitting.

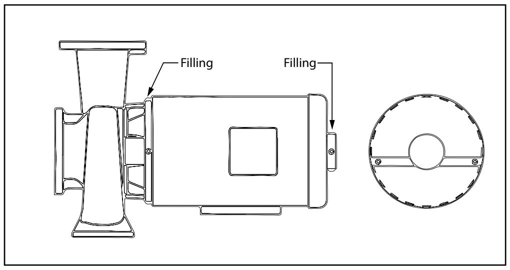


Figure D-1: Lubrication Points.

Mechanical Seal

Mechanical seals are the most delicate component of the pump. Special care has to be given to them to assure trouble-free operation.

The sealing element of a mechanical seal consists of a carbon washer rotating against a stationary ring. Surfaces of both are highly lapped to assure sealing.

Any dirt that penetrates between the two mating parts will cause a rapid wear of the seal faces and will ultimately result in seal leakage.

New heating systems are usually contaminated by various materials such as construction debris, welding slugs, pipe joint compound, mill scale, etc. It is of utmost importance that such systems be cleaned out thoroughly before putting pump into continuous operation.

Cleaning of a heating system is simple and easy. First flush out system with cold water at city pressure to remove all loose foreign materials that penetrated into the system. Afterwards, flush out the system with chemicals to remove dirt adhering to pipes.

Chemicals most commonly used for this procedure are sodium triphosphate, sodium carbonate or caustic soda but any nonfoaming detergents as used in dishwashers can be applied.

Fill system with clean water, add cleaning chemicals (1 lb. for every 40 to 50 gallons of water or manufacturer's instruction). Start pump and heat up system. Let system run for a few hours and then drain and refill with fresh water. Your pumps are now ready for continuous duty.

CAUTION

If the pump is not to be operated for a long periord of time, store it in a clean dry place having slow moderate change in ambient temperature. Rotate the shaft weekly to coat the bearings with lubricant and to retard oxidation and corrosion.

D.8. COPPER COIL UNIT

The copper coil unit should be inspected annually or as needed, and cleaned as required.

Remove the service door(s) for copper coil(s) unit(s) access and unscrew bolts that support the coil, located at either side, down on each slide-angle that supports the copper coil unit. Then, in case you are located on the ground; place a forklift right in front of a lengthwise set of forks that totally cover the unit size. Should the tower be in a roof area, use a mobile floor crane with the right load capacity, and a steel work table as an hook device, see Table D-3 for Copper Coil Unit(s) total weight by model. Finally pull the coil out carefully, avoiding contact with tower body to prevent any damage. (See Figures D-2 and D-3 for reference.)

Place the copper coil unit in a well lighted open room, and proceed as follows:

1. Blow compressed air across the coil, use a plastic brush to wash and remove the debris accumulated out of the coil.
2. Use a pressure washer to spray fresh water and remove the silt, mud or slime for the coil.
3. The use of cleaning agents must follow the manufacturer's directions for proper mixing and cleaning. Verify there are no chemical residues still remaining in the coil after the cleaning process.
4. The rinsing process is important to avoid the clean agent residue could initiate a corrosion process.
5. If the Closed Circuit Fluid Cooler is located in a very aggressive environment, periodic cleaning process must be required.

Tabla D-3: Copper coil unit(s) weight by model

HFC SINGLE FAN (DIRECT DRIVE)	COIL WEIGHT (lbs)	HFC DOBLE FAN (DIRECT DRIVE)	COIL WEIGHT (lbs)	HFC QUADRUPLE FAN (DIRECT DRIVE)	COIL WEIGHT (lbs)	HFC SINGLE FAN (GEAR DRIVE)	COIL WEIGHT (lbs)
Model-Qty Coil		Model-Qty Coil		Model-Qty Coil		Model-Qty Coil	
505XXX- ONE COIL	620	510XXX- TWO COILS	620	1010XXX- FOUR COILS	620	1012XXX- FOUR COILS	1558
606XXX- ONE COIL	890	612XXX- TWO COILS	890	1212XXX- FOUR COILS	890	1016XXX- FOUR COILS	2148
HFCP SINGLE FAN (DIRECT DRIVE)		HFCP DOBLE FAN (DIRECT DRIVE)		HFCP QUADRUPLE FAN (DIRECT DRIVE)			
707XXX- ONE COIL	1270	714XXX- TWO COILS	1270	1414XXX- FOUR COILS	1269	1216XXX- FOUR COILS	2193
808XXX- ONE COIL	1570	816XXX- TWO COILS	1570	1616XXX- FOUR COILS	1569	1218XXX- FOUR COILS	3218
810XXX- TWO COILS	1245	819XXX- FOUR COILS	1170	1619XXX- EIGHT COILS	1169		
812XXX- TWO COILS	1378	822XXX- FOUR COILS	1280	1622XXX- EIGHT COILS	1279		
		827XXX- FOUR COILS	1450	1627XXX- EIGHT COILS	1451		

CAUTION

The chemical treatment supply connection is not factory installed. This connection must be installed on the basin (below the copper coil) to dilute the chemicals in the water. Direct exposure of the copper coil to the chemicals may accelerate corrosion.

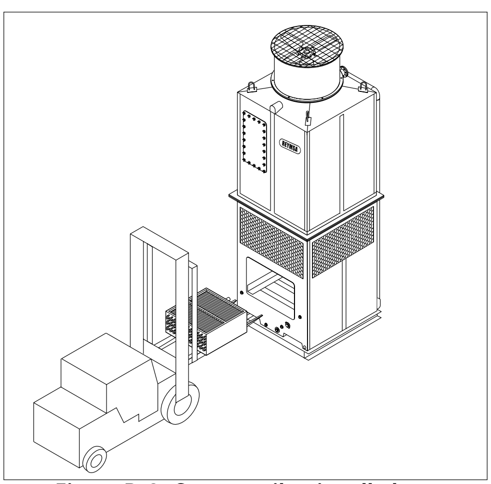


Figure D-2: Copper coil unit pulled out for maintenance purpose when tower is on the ground.

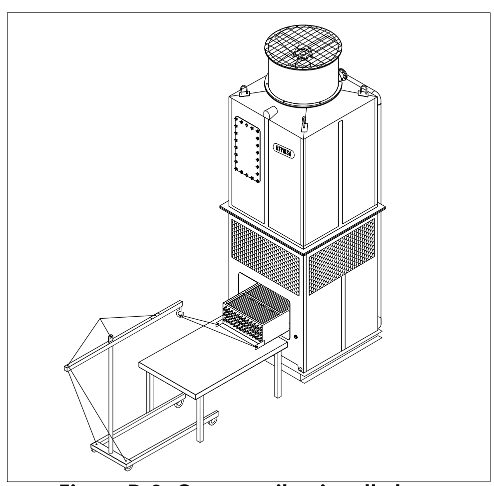


Figure D-3: Copper coil unit pulled out for maintenance purpose when tower is on the roof.

E. TROUBLE-SHOOTING

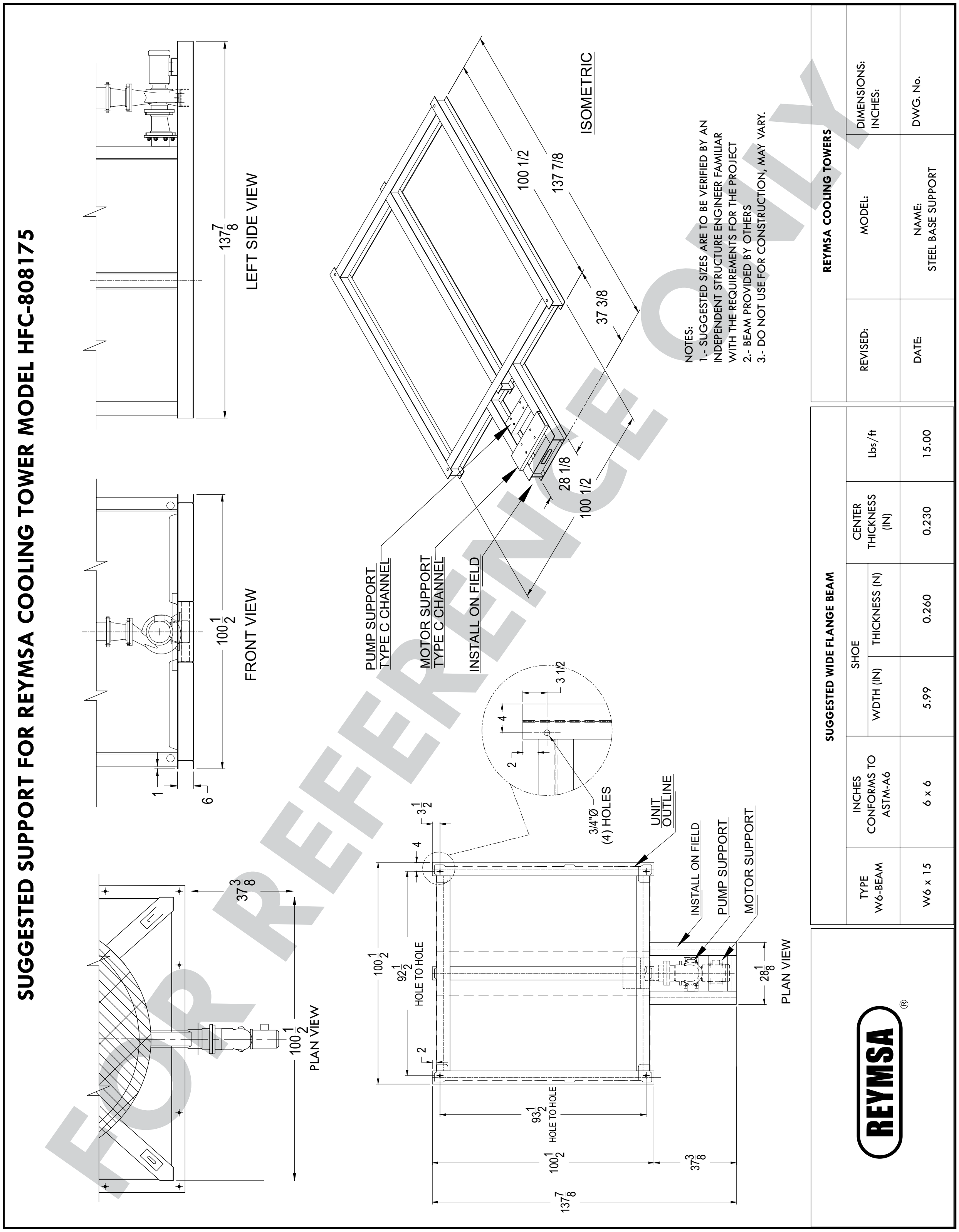
PROBLEM / SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Exiting water temperature is too high	Excessive water flow	Adjust the water flow rate to design value.
	Insufficient air flow	Clean fill media and drift eliminators. Verify that the amperage is not less than 10% than shown on the data plate of the motor. If so, pitch of the fan blades needs adjustment.
	Higher heat load through copper coil unit.	Compare actual heat load versus design heat load. Contact your REYMSA representative for advice on possible upgrade or addition of another Closed Circuit Fluid Cooler. Verify the GPM and Delta T.
	Higher heat load through Tower that designed for	Compare actual heat load versus design heat load. Contact your REYMSA representative for advice on possible upgrade or addition of another Closed Circuit Fluid Cooler.
	Recirculation of hot discharge air back into cooling Tower air inlet.	Eliminate obstructions that impede correct air discharge or call your REYMSA representative for advice.
	Higher Wet-bulb Temperature than design.	Consult your REYMSA representative.
	Improper operation of the water distribution system	Perform cleaning on the entire system (see maintenance procedure, section "D.2 BASIN" of this manual).
	Heat transfer system obstruction.	Inspect and make the proper cleaning and maintenance, if required (see maintenance procedure, section "D.2 BASIN" of this manual).
Unusual noises when the Tower is operating	The propeller fan might be scraping against the side of the fan duct	Remove the fan guard to obtain access to the propeller. By hand, check to see that the propeller moves freely and that there are no indications of mechanical problems with the motor. If so, call your REYMSA representative for assistance.
	The motor is having mechanical problems	Have the motor checked by qualified personnel.
	Misalignment, friction or unstable mounting of Gear Reducer or Drive Shaft.	Check alignment of all components. External fasteners should be checked for tightness. Check oil level.
	Vibration of the fan wheel	Perform a dynamic balance of the fan wheel by qualified technical personnel.
Pump cavitation	Low water operating level	Adjust the water make-up valve to raise the operating water level.
	Make-up valve malfunction	Verify that water is available to the make-up valve. Repair or replace the make-up valve.
Low cold water flow rate	Clogged nozzle(s)	Check spray nozzles and clean or replace as required.
	Low water level on the basin	Check water level control and adjust if necessary.
	The flow of water through the water outlet strainers is obstructed	Inspect and make the proper cleaning and maintenance, if required (see maintenance procedure, section "D.2 BASIN" of this manual).

PROBLEM / SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
The water is not falling uniformly from the fill.	Clogged nozzle(s)	Clean nozzles and replace as required.
	Low pressure at the water inlet	Check pressure at the inlet and adjust as necessary (while pumps are running).
	Obstructed fill media	Inspect and perform cleaning and maintenance if required (see section “D.2 BASIN” of this manual).
Water leaking around the access door	Improperly installed or damaged gasket	Ensure that the bolts attaching the access door are all in place and are properly tightened. If leakage does not stop it will be necessary to take the Tower out of service to inspect or replace the gasket.
Water leaking from a crack in the fiberglass	The Tower was not handled properly during installation or some other impact has occurred	Call your local REYMSA Representative for advice.
Water leaking through the air inlet louvers	High water operating level	Adjust the water make-up valve to a lower operating level.
	System water is overflowing the Tower when pumps are stopped	Check piping height, grade and check valve in pump discharge.
	Excessive water flow through the Tower	The Tower should have been installed with a water pressure gauge and throttling valve at the water inlet. Check the pressure reading at the Tower inlet and ensure that is does not exceed the recommended pressure for each Tower. Use the throttling valve to adjust the pressure. Closed Circuit Fluid Coolers are designed to operate between 2 psi and 10 psi at the Tower inlet, REYMSA recommends to work between 4-8 psi.
	Damaged or reversed louvers	Replace the louvers if damaged. Confirm that louvers are installed properly, parts facing inward and downward.
Excessive Drift	Excessive water flow through the Tower	The Tower should have been installed with a water pressure gauge and a throttling valve at the Tower inlet. Check the pressure reading at the inlet and ensure that it does not exceed recommendations. Use the throttling valve to adjust the pressure.
	Drift Eliminators are damaged, are not lying flat or improperly aligned	Inspect the drift eliminators to ensure that there is no damage, that they are lying flat and that there are no gaps between them.
Excessive accumulation of debris or dirt in the bottom of the basin	Unsatisfactory water treatment	Remove the debris and dirt while the Tower is out of service.
	Excessive airborne contamination	Consider filtration.
Unusual noise or vibration in the Gear Reducer (HFC-F Models)	Misalignment	Stop operation of the tower. Make sure that gear drive, drive shaft and motor are bolted and tighten
	Torsional Vibrations	
	Unstable support	Make sure the motor support is secured.
Coil incrustation	Unsatisfactory water treatment.	Clean the inside coil as manufacturer recommends.
Coil leaks	Damaged coil.	Find the leak and close the damaged line.

APPENDIX A: EXAMPLE OF STRUCTURAL BASE FOR A REYMSA CLOSED CIRCUIT FLUID COOLER.

FOR REFERENCE ONLY

Consult your REYMSA representative for the recommended support of a specific model



SUGGESTED WIDE FLANGE BEAM

TYPE W6-BEAM	INCHES CONFORMS TO ASTM-A6	SHOE WDTH (IN)	SHOE THICKNESS (N)	CENTER THICKNESS (IN)	Lbs/ft
W6 x 15	6 x 6	5.99	0.260	0.230	15.00

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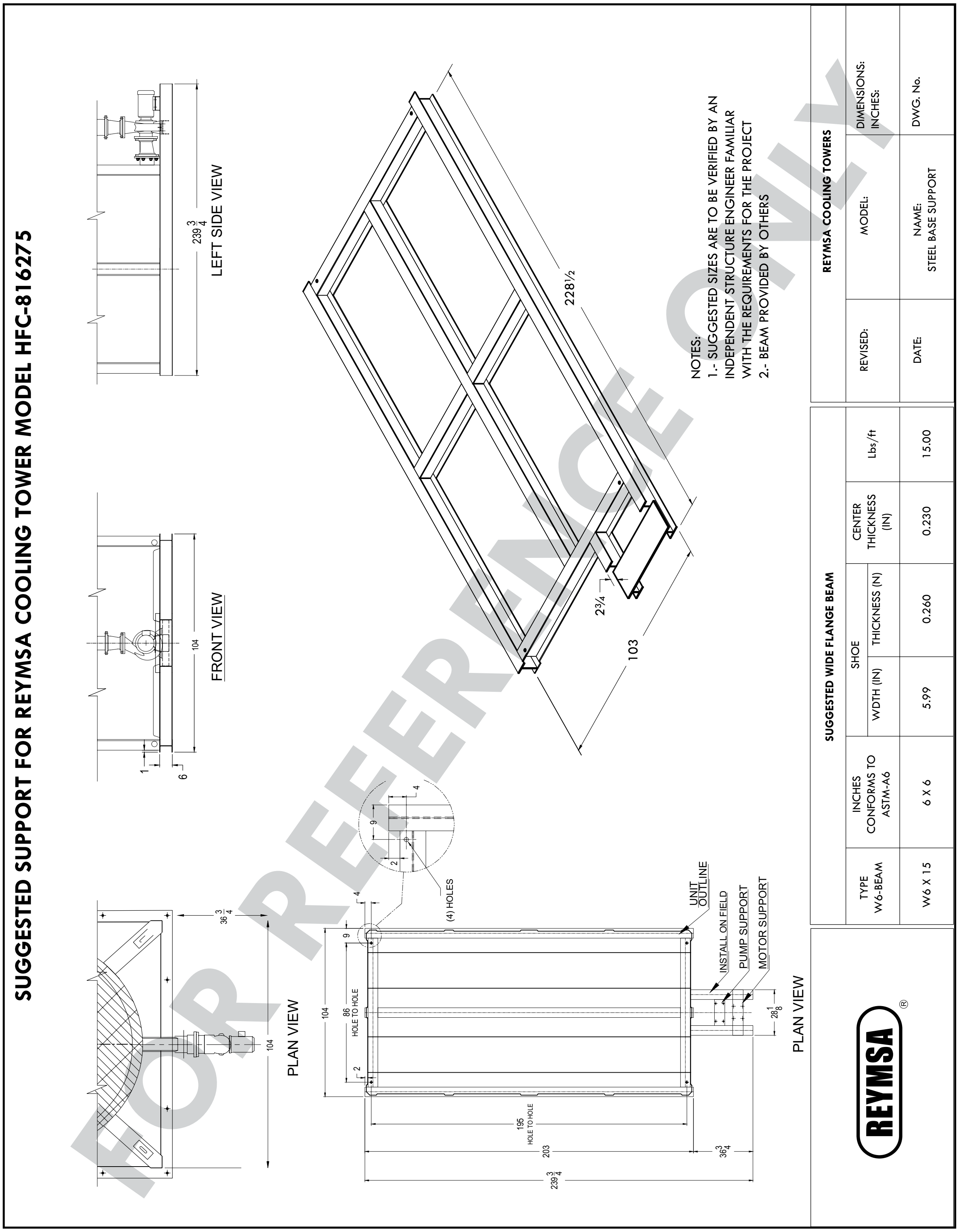

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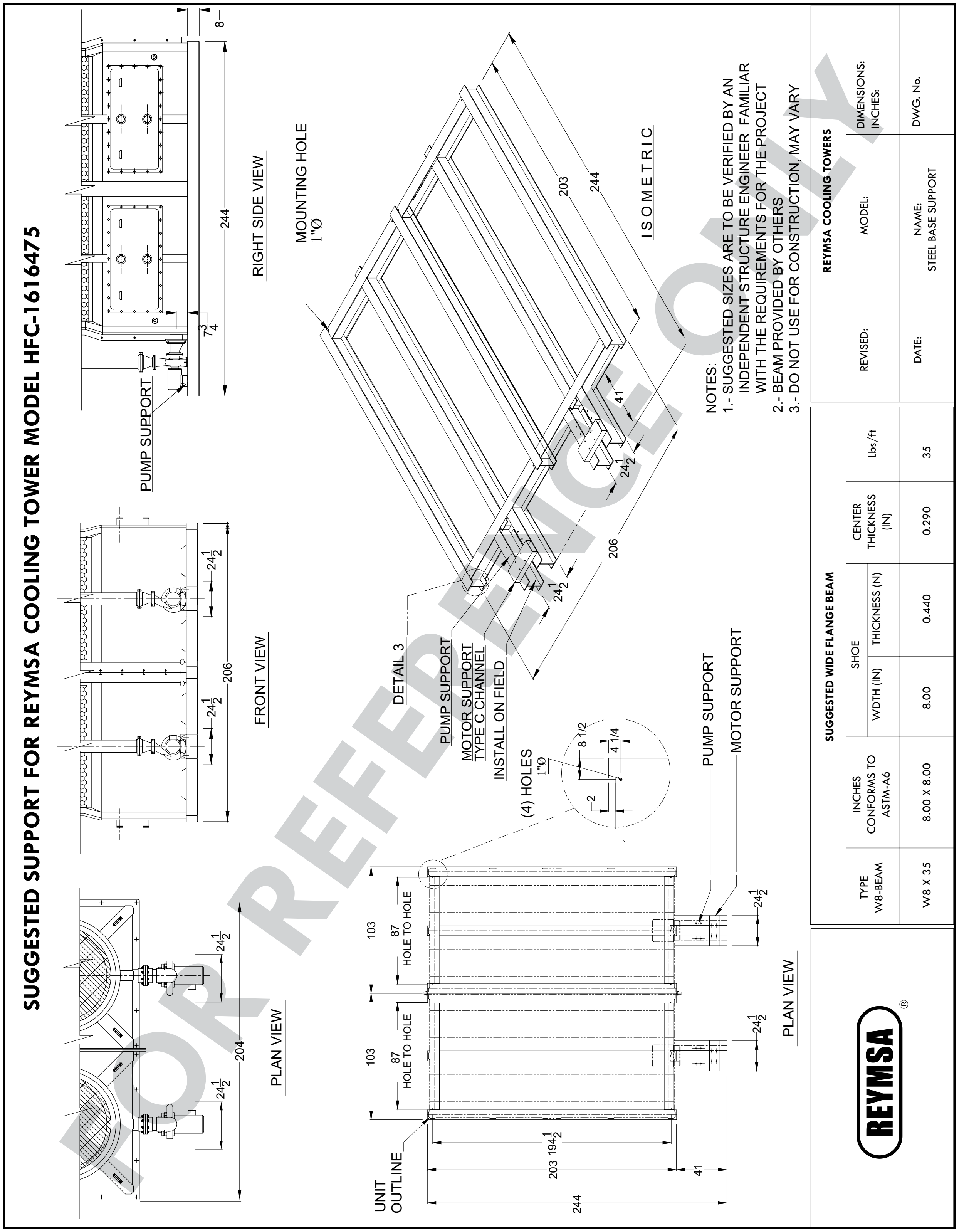


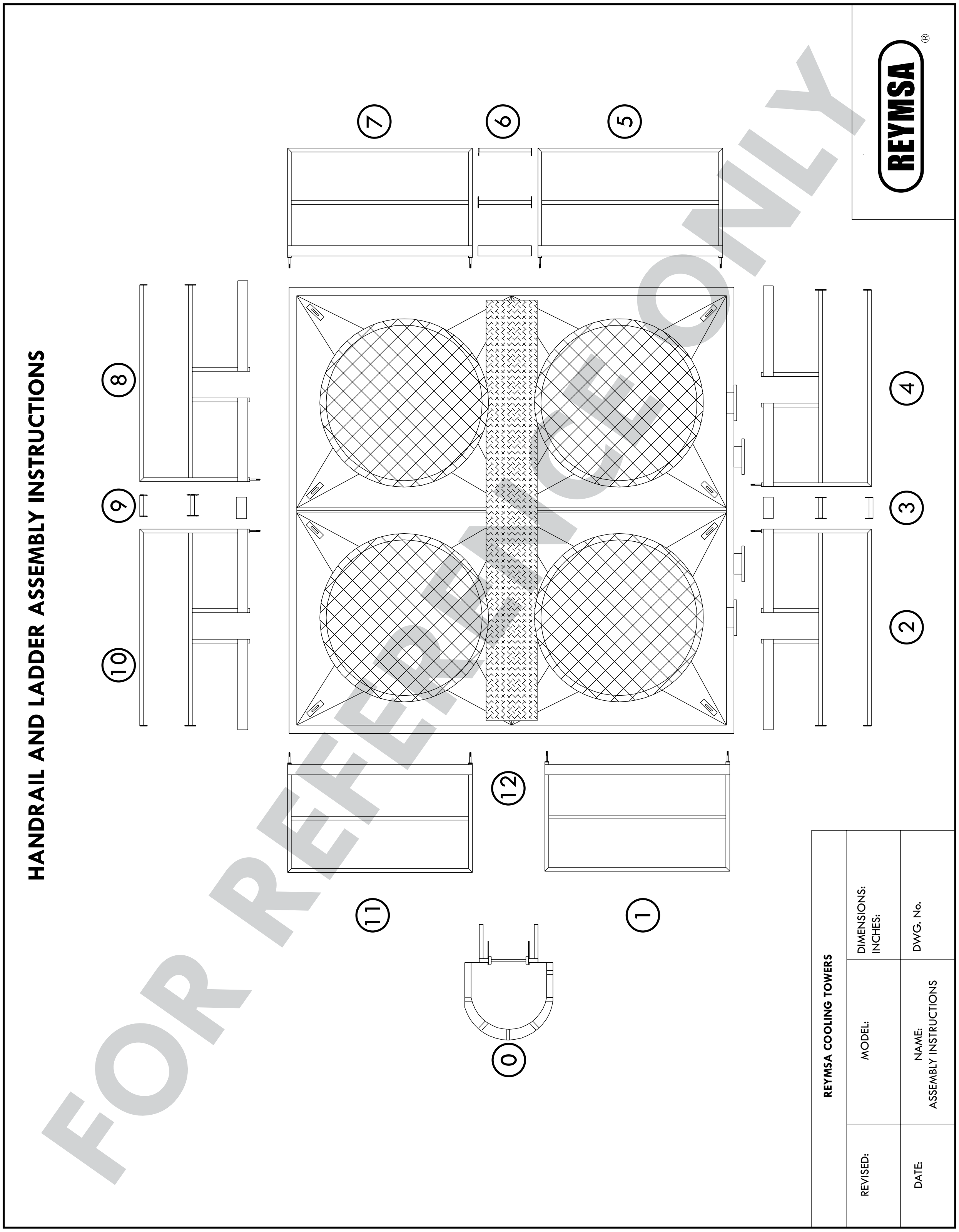
SUGGESTED WIDE FLANGE BEAM

TYPE W8-BEAM	INCHES CONFORMS TO ASTM-A6	SHOE		CENTER THICKNESS (IN)	Lbs/ft
		WDTH (IN)	THICKNESS (N)		
W8 X 35	8.00 X 8.00	8.00	0.440	0.290	35

APPENDIX B: EXAMPLE OF ACCESSORIES ASSEMBLY INSTRUCTIONS.

FOR REFERENCE ONLY

Consult your REYMSA representative for the recommended support of a specific model



APPENDIX B: EXAMPLE OF ACCESSORIES ASSEMBLY INSTRUCTIONS.

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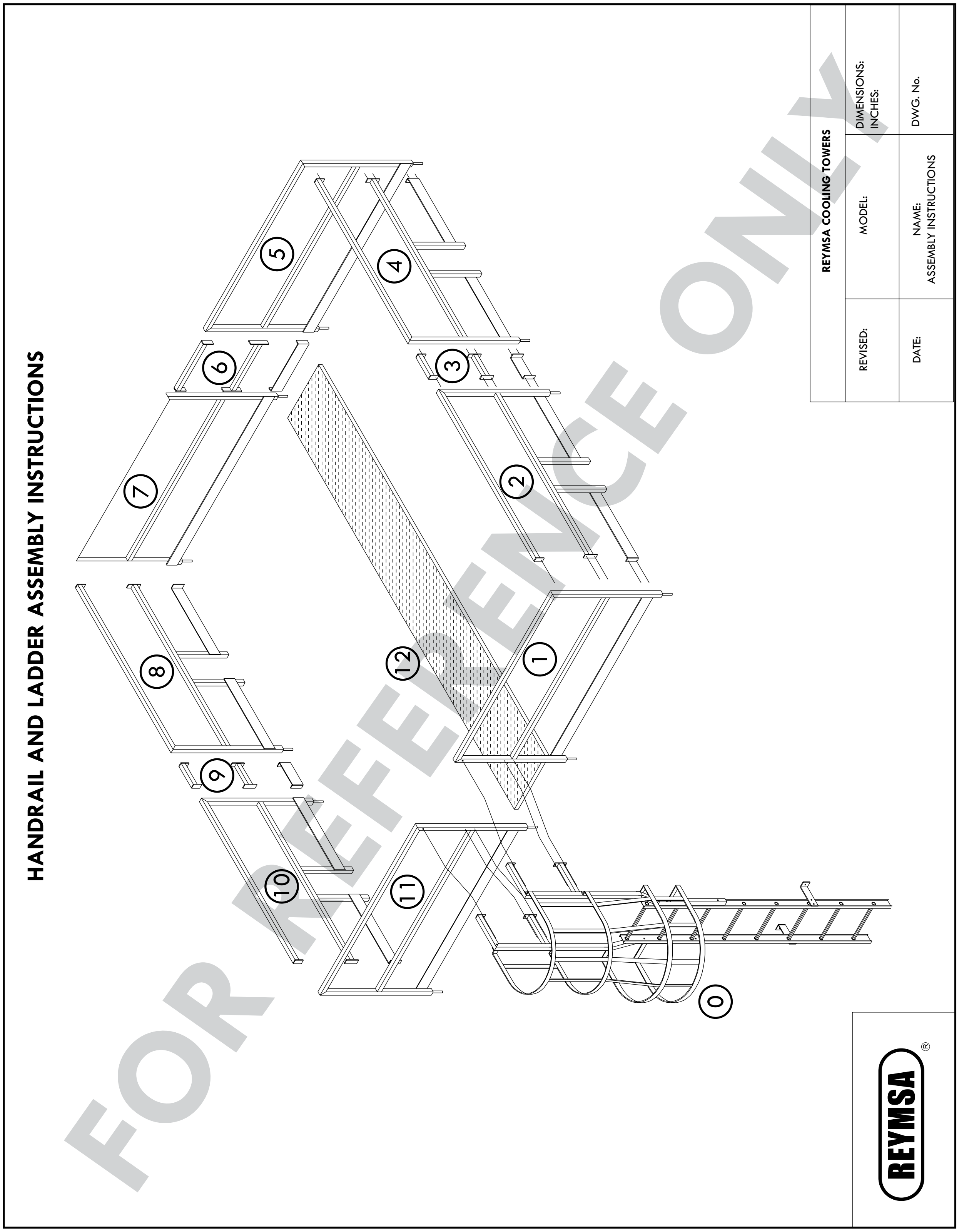

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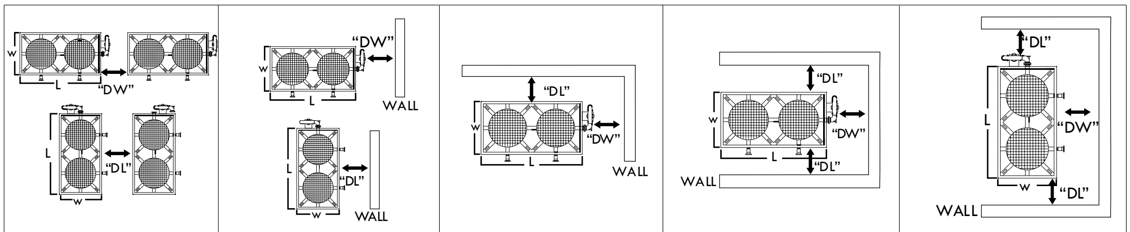
APPENDIX C: MINIMUM DISTANCE BETWEEN TOWERS AND OBSTRUCTIONS

COMPLETE CONFIGURATION



MODEL	BETWEEN TOWERS		ONE WALL		TWO WALLS		THREE WALLS (A)		THREE WALLS (B)	
	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"
505	6	6	3	3	3	3	3	3	3	3
606	6	6	3	3	3	3	3	3	3	3
707	6	6	3	3	3	3	4	3	4	3
808	6	6	3	3	3	3	4	3	4	3
810	6	6	3	3	3	3	4	3	5	3
812	6	6	3	3	3	3	5	3	5	3
510	6	6	3	3	3	3	3	3	3	3
612	6	6	3	3	3	3	4	3	4	3
714	6	6	3	3	3	3	4	3	5	3
816	6	6	3	3	3	4	5	4	5	3
819	6	6	3	3	3	4	6	4	5	3
822	6	7	3	4	3	4	5	4	6	3
827	6	8	3	4	3	5	6	5	6	3
1010	6	6	3	3	3	3	5	3	5	3
1212	6	6	3	3	4	4	6	4	6	4
1414	7	7	4	4	5	5	7	5	7	5
1616	8	8	4	4	5	5	8	5	8	5
1619	9	8	5	4	6	6	9	6	8	6
1622	8	10	4	5	6	7	8	7	9	6
1627	9	12	5	6	6	7	9	7	9	6
707-SL	6	6	3	3	3	3	4	3	4	3
808-SL	6	6	3	3	3	3	4	3	4	3
810-SL	6	6	3	3	3	3	4	3	4	3
812-SL	6	6	3	3	3	3	4	3	5	3
714-SL	6	6	3	3	3	3	4	3	5	3
816-SL	6	6	3	3	3	4	5	4	5	3
819-SL	6	6	3	3	3	4	6	4	5	3
822-SL	6	6	3	3	3	4	5	4	5	3
827-SL	6	7	3	4	3	5	5	5	6	3
1414-SL	7	7	4	4	5	5	7	5	7	5
1616-SL	8	7	4	4	5	5	7	5	7	5
1619-SL	9	8	5	4	6	6	9	6	8	6
1622-SL	8	10	4	5	6	7	8	7	9	6
1627-SL	9	12	5	6	6	7	8	7	9	6
1012-F	6	6	3	3	4	4	5	4	4	4
1016-F	6	8	3	4	5	5	6	5	4	5
1216-F	8	9	4	5	5	5	6	5	5	5
1218-F	9	10	4	5	5	6	7	6	5	6

* Suggested clearances and conditions can vary
* All clearances are expressed in feet

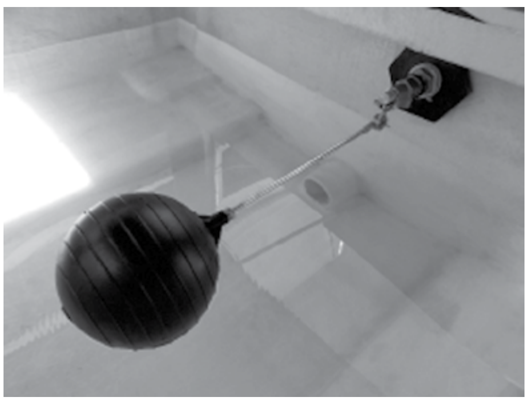
APPENDIX D: WATER MAKE-UP FLOAT VALVE.

A mechanical float valve assembly is provided as standard to supply make-up water to basin. The standard make-up assembly consist of a heavy duty bronze make-up valve connected to a plastic or copper float using a threaded stem.

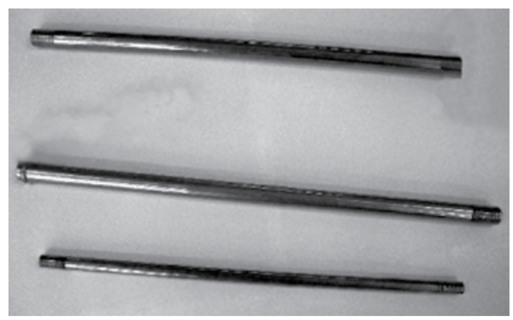
The water level in the basin can be adjusted by repositioning the float and stem using locknuts. The float valve is easily accessible from outside the unit through removable air inlet louver.

WARRANTY VOID

If inlet pressure to the mechanical float valve exceeds 50 psi.



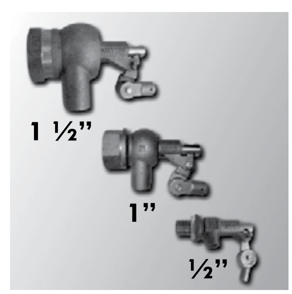
Float valve installed in a cooling Tower



Example of stems

Plastic float

Copper float



Example of valves

Figure AP-1: Float valve parts

APPENDIX E: STAINLESS STEEL BOLT TORQUE FOR COOLING TOWER ASSEMBLY

STAINLESS STEEL BOLT AND NUTS

Bolt thread galling between stainless steel bolts and nuts occurs when the surface oxide film for corrosion protection is temporarily broken due to friction between the parts, causing small metal particles to lock-up the bolt, preventing it from being unscrewed.

To reduce friction between stainless steel bolt and nuts, apply nickel-based anti-seize (Not supplied by REYMSA) on the screw thread before installation.

TORQUE FOR THE COOLING TOWER ASSEMBLY

The following table shows the torque for the cooling tower assembly according to the bolt diameter.

STAINLESS STEEL BOLT TORQUE	
BOLT DIAMETER	FT-LBS
⅜''	30
½''	30
¾''	50

Please contact REYMSA to get proper instructions if your tower has seismic and wind anchorage requirements, special or custom design.

NOTES

NOTES

REYMSA COOLING TOWERS, INC.
www.reymsa.com

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