REYMSA®

INSTALLATION, OPERATION & MAINTENANCE MANUAL

RT SERIES
COOLING TOWERS

CTI CERTIFIED

MODELS:

- RT, RTU, RTM
- RTP, RTUP, RTPM
- RTG, RTGM
- RTGTC & RTGMTC

INSTALLATION, OPERATION & MAINTENANCE MANUAL

Cooling Towers (RT Series)

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.

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" RT Series Towers. It includes the RT, RTU, RTG, RTGTC, RTM, RTGM & RTGMTC models with Standard, Low Sound, and Super Low Sound fans. It also includes the RTP, RTUP and RTPM models with standard fans, designed to perform at low sound level.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 optimal 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.

www.reymsa.com

INDEX

TABLE OF CONTENTS

A. INSTALLATION

A.1 LOCATION

Location of the Cooling Tower 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 Cooling Tower is situated downwind or in close proximity to a heat-emitting source, like another Cooling Tower, fired heaters, flare stacks, boilers, and warm air enters the Cooling Tower. Both phenomena causes a variation in the entering air wet bulb temperature, therefore affecting the Cooling Tower 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 recommended clearances between towers.

Table A-1: Minimum recommended distance between towers

MODEL RT	MINIMUM DISTANCE "D" (ft)	MODEL RTG/RTGTC	MINIMUM DISTANCE "D" (ft)	MODEL RTP	MINIMUM DISTANCE "D" (ft)
303	3	812	9	707	4
404		1012		708	5
505		1014	10	709	6
606		1016		808	5
707		1018	12	810	6
708	4	1020	13	812	7
709	5	1212	10	714	
808	4	1214	11	816	8
810	5	1216	12	819	9
812	6	1218	13	822	10
714		1220	14	824	9
816	7	1222	16	827	10
819	8	1223		1414	
822		1418	14	1616	12
824	9	1420	15	1619	14
827		1422	17	1622	15
1414		1423		1624	
1616	10	1425	18	1627	17
1619	11				
1622	13				
1624	14				
1627					

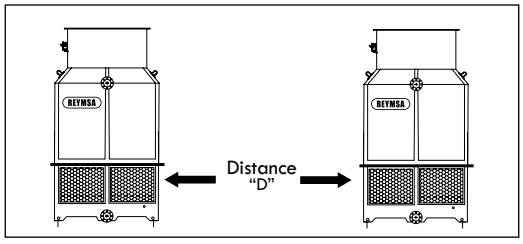


Figure A-1: Minimum recommended distance between towers

For a complete table of minimum distances between towers and obstructions please refer to "APPENDIX E: 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.

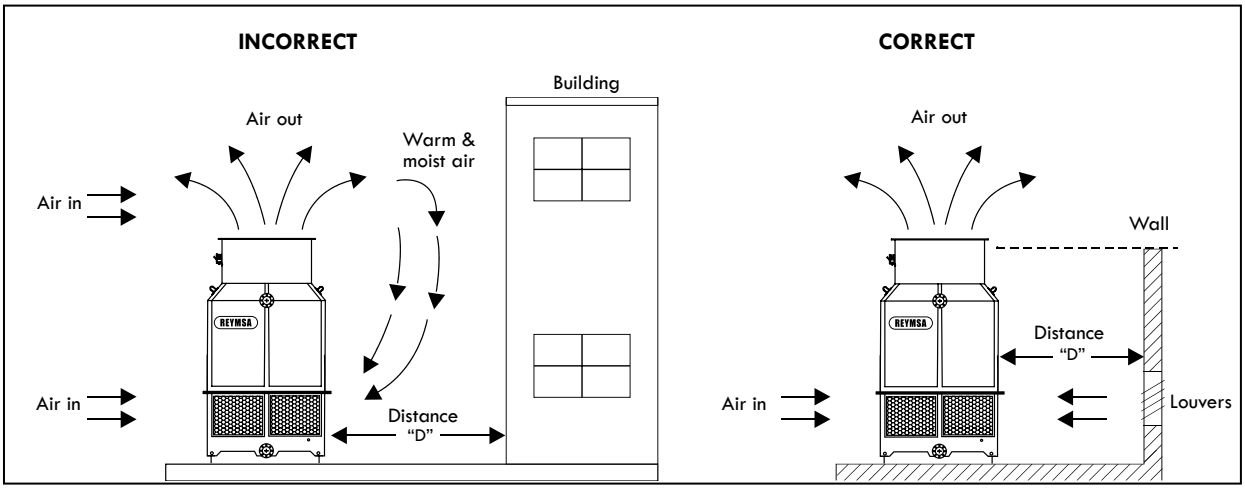


Figure A-2: Recirculation

- Do not place the Cooling Tower near exhaust fans or air intakes.
- Do not place the Cooling Tower 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

- Cooling Towers 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.11.3.1 PROCEDURE TO WIRE THE FAN MOTOR".
- Place the Cooling Towers on a leveled structural surface, capable of supporting the operational weight of the Tower. Refer to section "A.11.1 LEVELING AND TOWER SUPPORTS" of this manual for information about leveling and recommended support. Contact your REYMSA representative with any questions regarding the recommended support for the Cooling Tower.
- REYMSA Cooling Towers are industrial pieces of equipment with rotating parts. Care should be taken in placing them in a secure area where unauthorized access is minimized.
- Locate the Tower where there is a safe access for its maintenance.
- The Cooling Tower 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 Cooling Towers (drift). Consideration should be given to placing Cooling Towers away from high traffic areas such as entrances and parking lots.

A.2 ASSEMBLY INSTRUCTIONS FOR RT & RTP MODELS

A.2.1 SINGLE FAN TOWERS

Follow this procedure to assemble and install Single Fan Cooling Towers.

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

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

C. For crane lifting, it's recommended to use a minimum lifting angle of 60° between the strap and the horizontal. The basin section of the Single Fan towers has U-bolts on the flange for lifting, one on each corner. Place the straps through the u-bolts (as shown in Figure A-4). Don't balance until tensing the straps.

D. 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).

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

F. 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.11.1 LEVELING AND TOWER SUPPORTS".

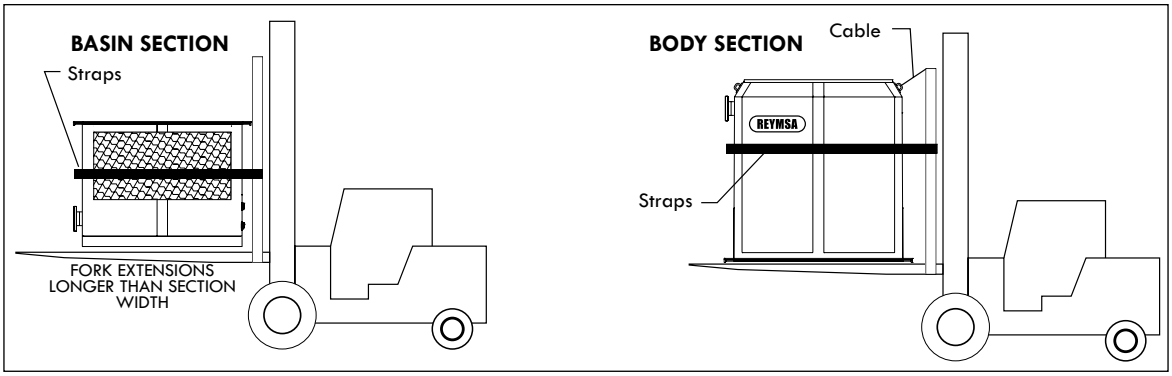


Figure A-3: Single Fan Tower fork lifting

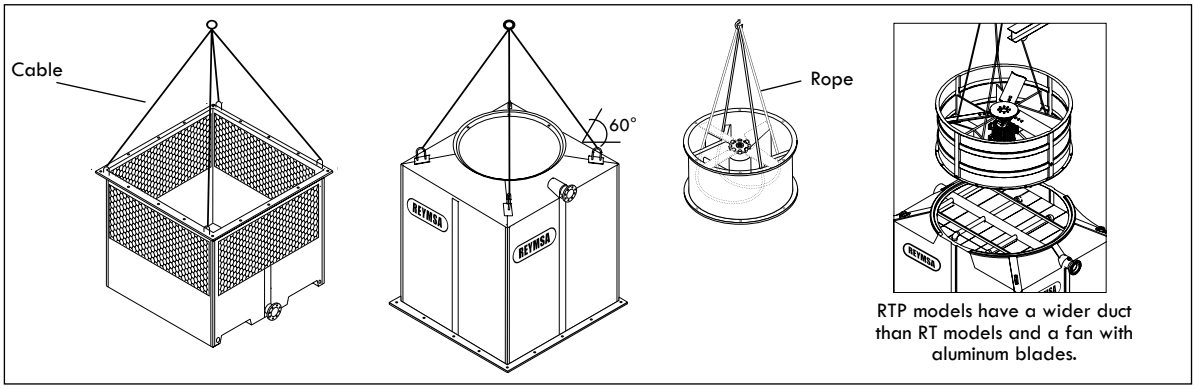


Figure A-4: Single Fan Tower crane lifting

G. Before you begin assembling the cooling tower, see the APPENDIX G: LABELING FOR ALIGNMENT AND ASSEMBLY SEQUENCE"

H. Place the basin section 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 galvanized steel nut and bolt sets (supplied by others) as shown on Figure A-5.

I. After the basin has been set in place, remove the U-bolts located on the flange before installing the next section (see Figure A-6).

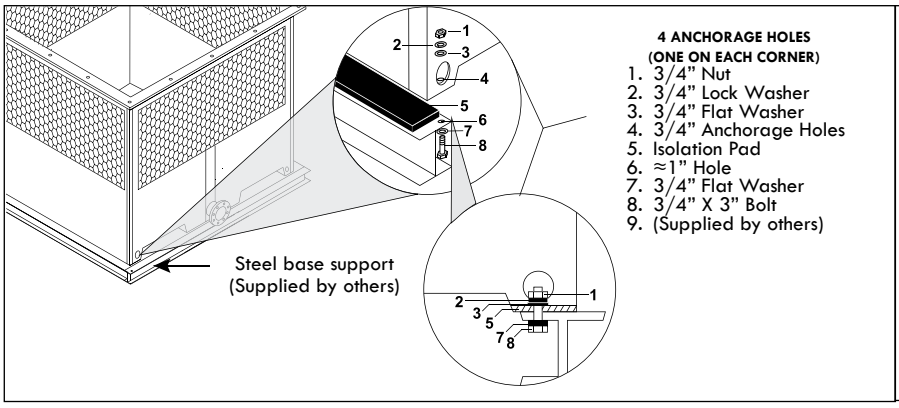


Figure A-5: Typical anchorage for a Single Fan Tower

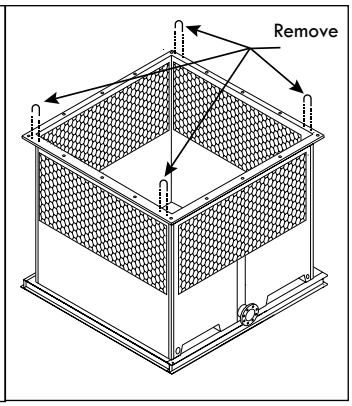


Figure A-6: Removing U-bolts from basin for a Single Fan Tower

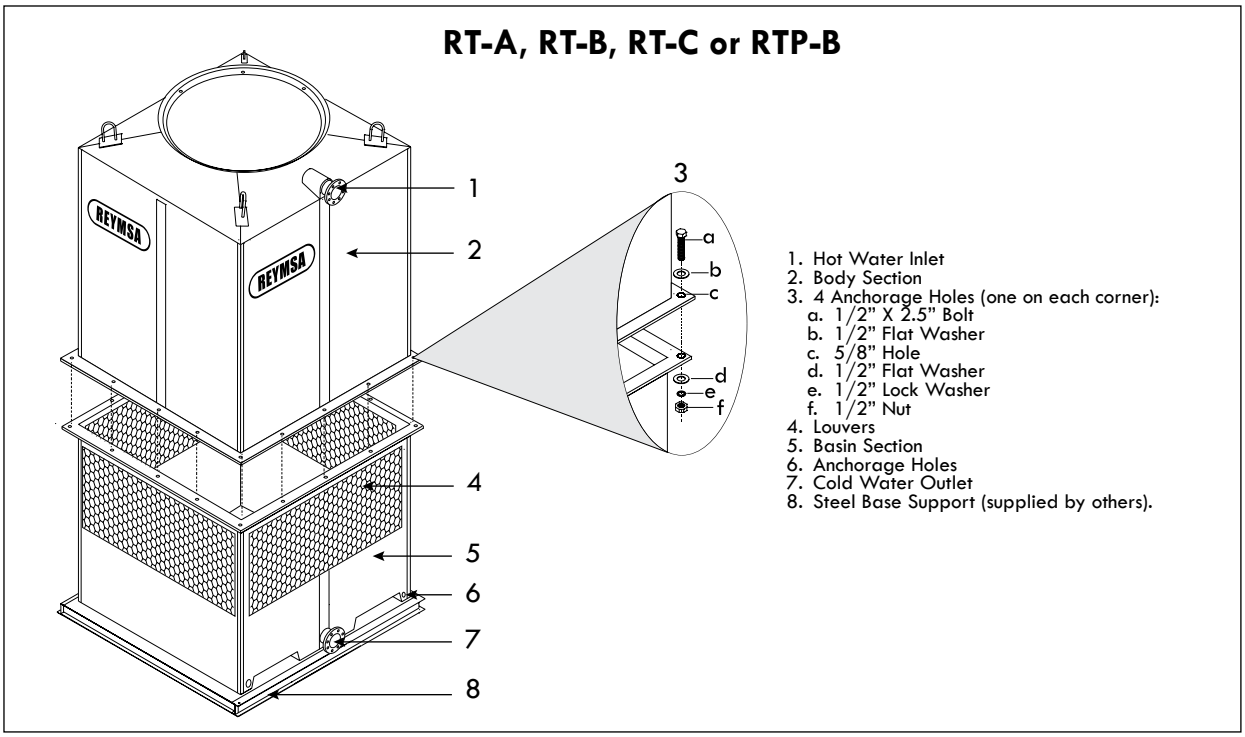


Figure A-7: Body and basin sections installation on RT-A, RT-B, RT-C, RTP-B

J. **<u>Only if your Tower is an RT-D or RTP-D model</u>**, it includes an additional part of body section (Lower Body section). Place the Lower Body section on top of basin section, then bolt down and secure the horizontal flanges with the stainless steel nut and bolt sets supplied by REYMSA (see Figure A-8).

K. After the Lower Body section has been set in place, remove the U-bolts located on the flange before installing the next section (see Figure A-9).

L. Assemble the body section (Upper Body section for RT-D or RTP-D) with the basin section (Lower Body section for RT-D or RTP-D). The body section comes assembled with u-bolts for lifting; then using a crane assemble both parts, use a drift pin to align bolt holes as the sections are being set (See figure A-7 and A-10). Make sure that the hot water inlet, and the cold water outlet are on the same side of the Tower when assembled.

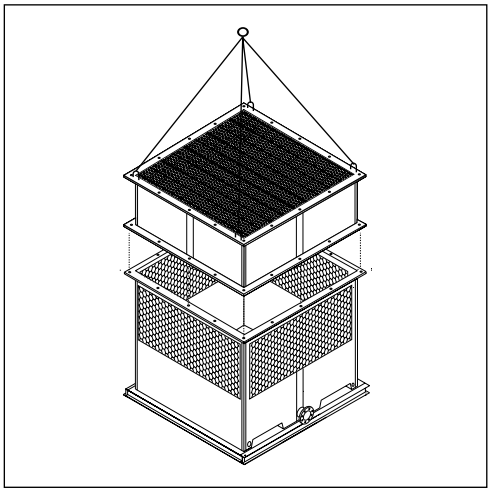


Figure A-8: Lower body installation for a Single Fan Tower (RT-D or RTP-D)

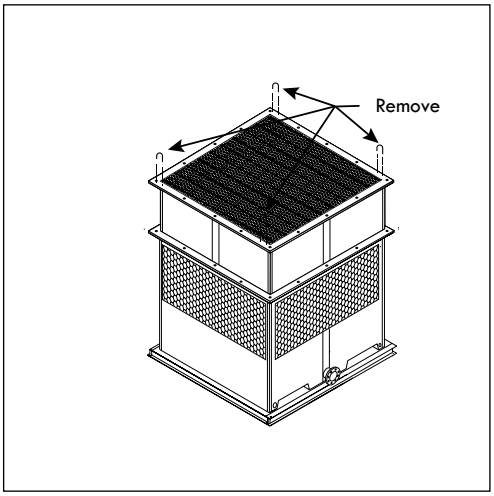


Figure A-9: Removing U-bolts from Lower Body section for a Single Fan Tower (RT-D or RTP-D)

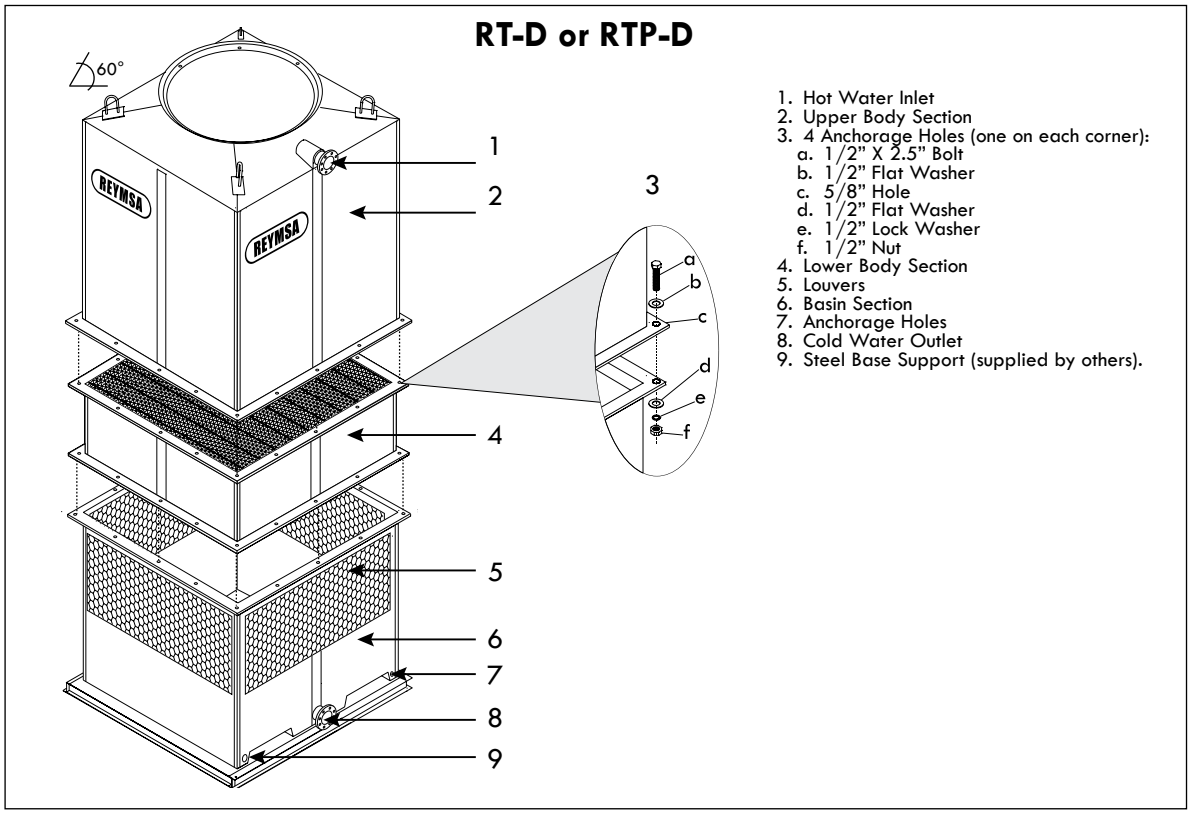
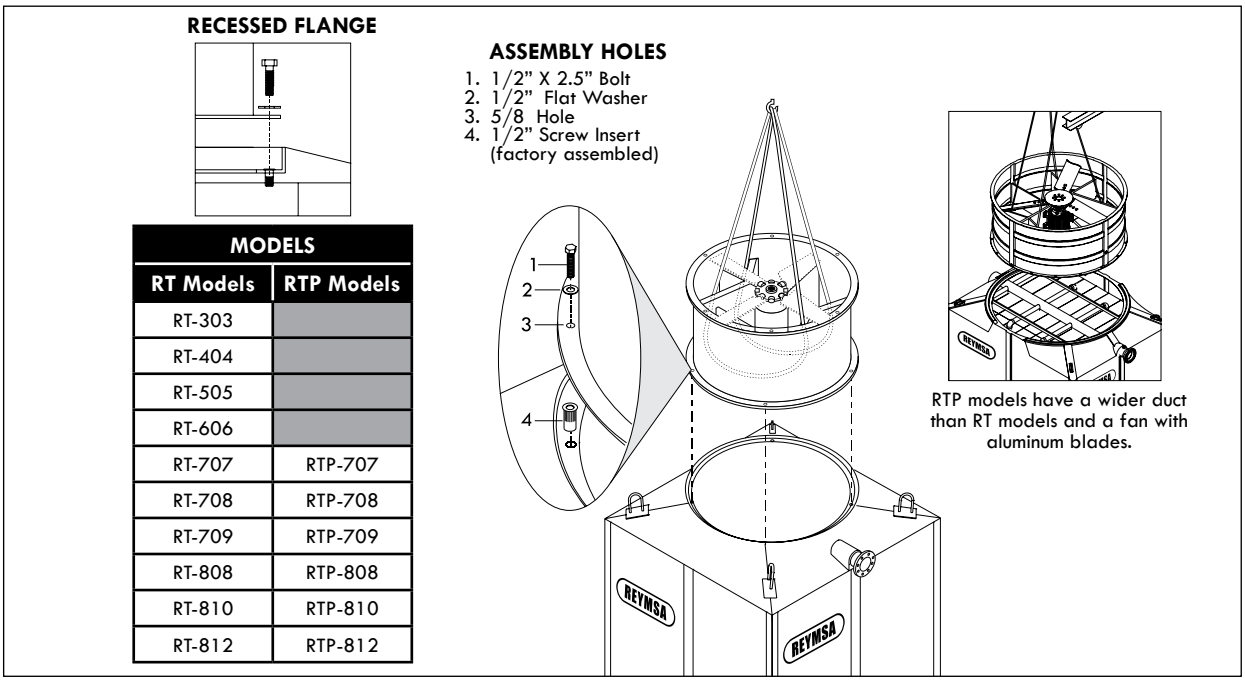


Figure A-10: Upper and Lower Body sections installation for a Single Fan Tower (RT-D or RTP-D)

L. Remove fan guard.

M. Then cradle/straddle the fan support with the straps (as shown in figure A-11) so you can lift the fan duct with a crane and assemble it.

N. Now place the fan duct on the receiving flange of the upper section; make sure the bolt holes and the marks inside the fan duct and the distribution manifold (located inside of body section) are aligned (see Figure A-11 and A-12). Secure it with the stainless steel nut and bolt sets supplied by REYMSA.



MODELS	
RT Models	RTP Models
RT-303	
RT-404	
RT-505	
RT-606	
RT-707	RTP-707
RT-708	RTP-708
RT-709	RTP-709
RT-808	RTP-808
RT-810	RTP-810
RT-812	RTP-812

Figure A-11: Fan Duct assembly for a Single Fan Tower

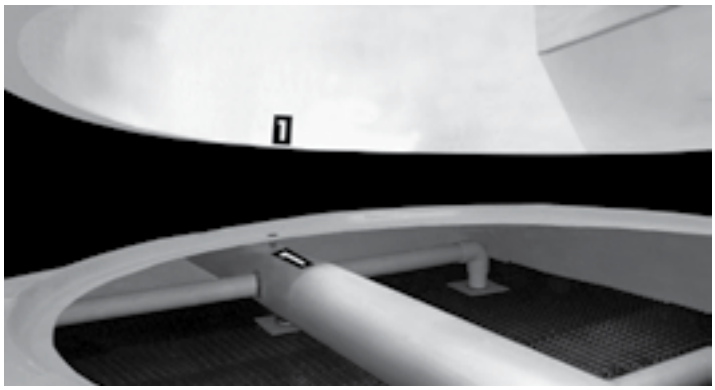


Figure A-12: Fan Duct alignment for a Single Fan Tower

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 Two Fan Cooling Towers.

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 condition, proceed to unload it piece by piece, with a crane or forklift of the appropriate capacity (see Figure A-13 and Figure A-14 for reference). If you unload with a forklift, use fork extensions of the proper pallet length according to the width of your model.

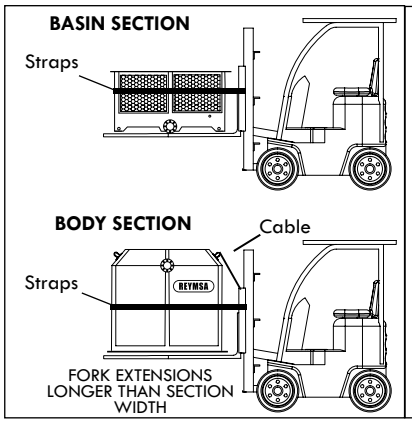


Figure A-13: Two Fan Tower fork lifting

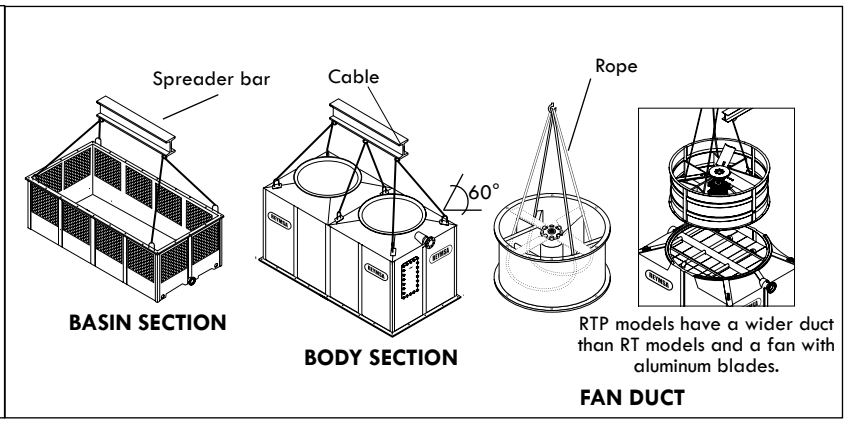


Figure A-14: Two Fan Tower crane lifting

C. For crane lifting, it's recommended to use a minimum lifting angle of 60° between the strap and the horizontal. The basin section of the Two Fan towers has U-bolts on the flange for lifting, one on each corner. Place the straps through the u-bolts (as shown in Figure A-14) and use a spreader bar to avoid damage on the upper edge of the Tower. Don't balance until tensing the straps.

D. 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).

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

F. 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.11.1 LEVELING AND TOWER SUPPORTS".

G. Before you begin assembling the cooling tower, see the APPENDIX G: LABELING FOR ALIGNMENT AND ASSEMBLY SEQUENCE"

H. Place the lower section of the Tower (basin) on top of the isolation pad and the base structure; Secure it with the galvanized steel nut and bolt sets (supplied by others) as shown on Figure A-15.

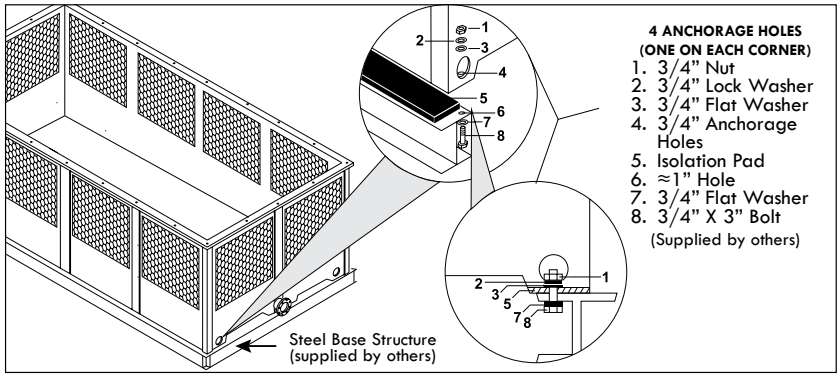


Figure A-15: Typical anchorage for a Two Fan Tower

I. After the basin has been set in place, remove the U-bolts located on the flange before installing the next section (see Figure A-16).

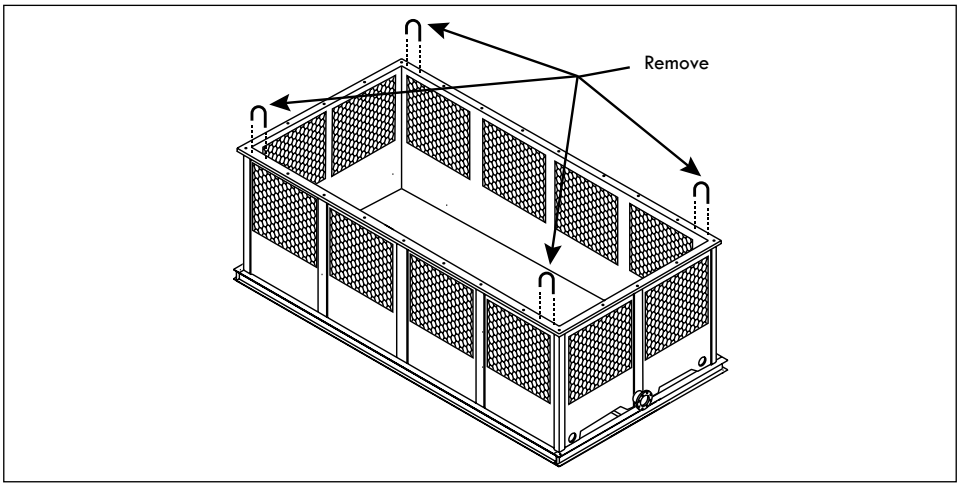
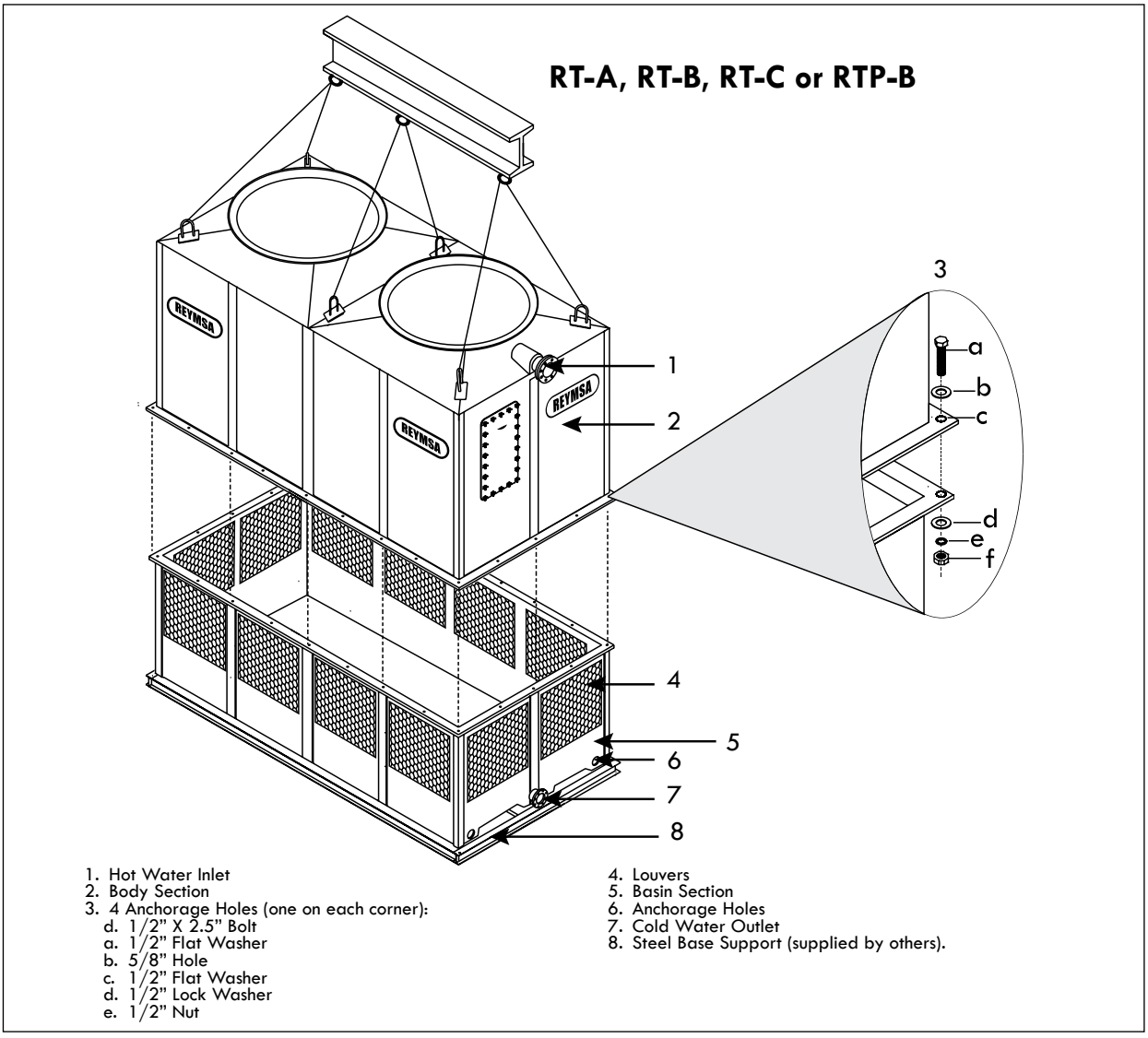


Figure A-16: Removing U-bolts from basin for a Two Fan Tower



1. Hot Water Inlet
2. Body Section
3. 4 Anchorage Holes (one on each corner):
   d. 1/2" X 2.5" Bolt
   a. 1/2" Flat Washer
   b. 5/8" Hole
   c. 1/2" Flat Washer
   d. 1/2" Lock Washer
   e. 1/2" Nut
4. Louvers
5. Basin Section
6. Anchorage Holes
7. Cold Water Outlet
8. Steel Base Support (supplied by others).

Figure A-17: Body and basin sections installation for a Two Fan Tower (RT-A, RT-B, RT-C, RTP-B)

J. **<u>Only if your Tower is an RT-D or RTP-D model</u>**: It includes additional part of body section (Lower Body section). Place Lower Body section on top of basin section, then bolt down and secure the horizontal flanges with the stainless steel nut and bolt sets supplied by REYMSA (see figure A-18).

K. After the Lower Body section has been set in place, remove the U-bolts located on the flange before installing the Upper Body section (see Figure A-19).

L. Assemble the body section (Upper Body section for RT-D or RTP-D) with the basin section (Lower Body section for RT-D or RTP-D). The body section comes assembled with u-bolts for lifting; then using a crane assemble both parts, use a drift pin to align bolt holes as the sections are being set (See figure A-17 and A-20). Make sure that the hot water inlet, and the cold water outlet are on the same side of the Tower when assembled.

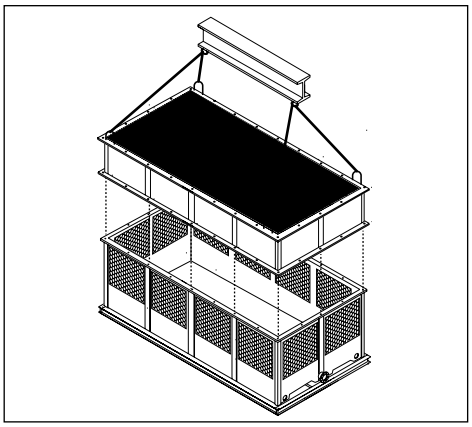


Figure A-18: Lower body installation for a Two Fan Tower (RT-D or RTP-D)

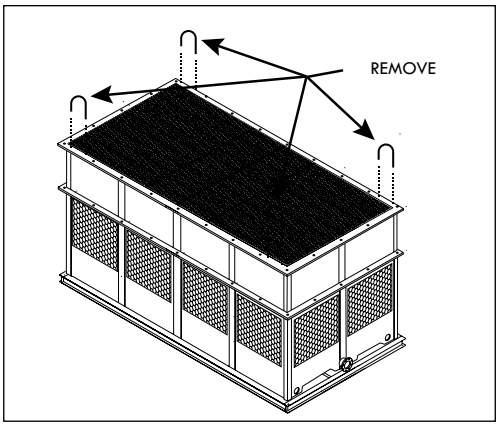


Figure A-19: Removing U-bolts from Lower Body section for a Two Fan Tower (RT-D or RTP-D)

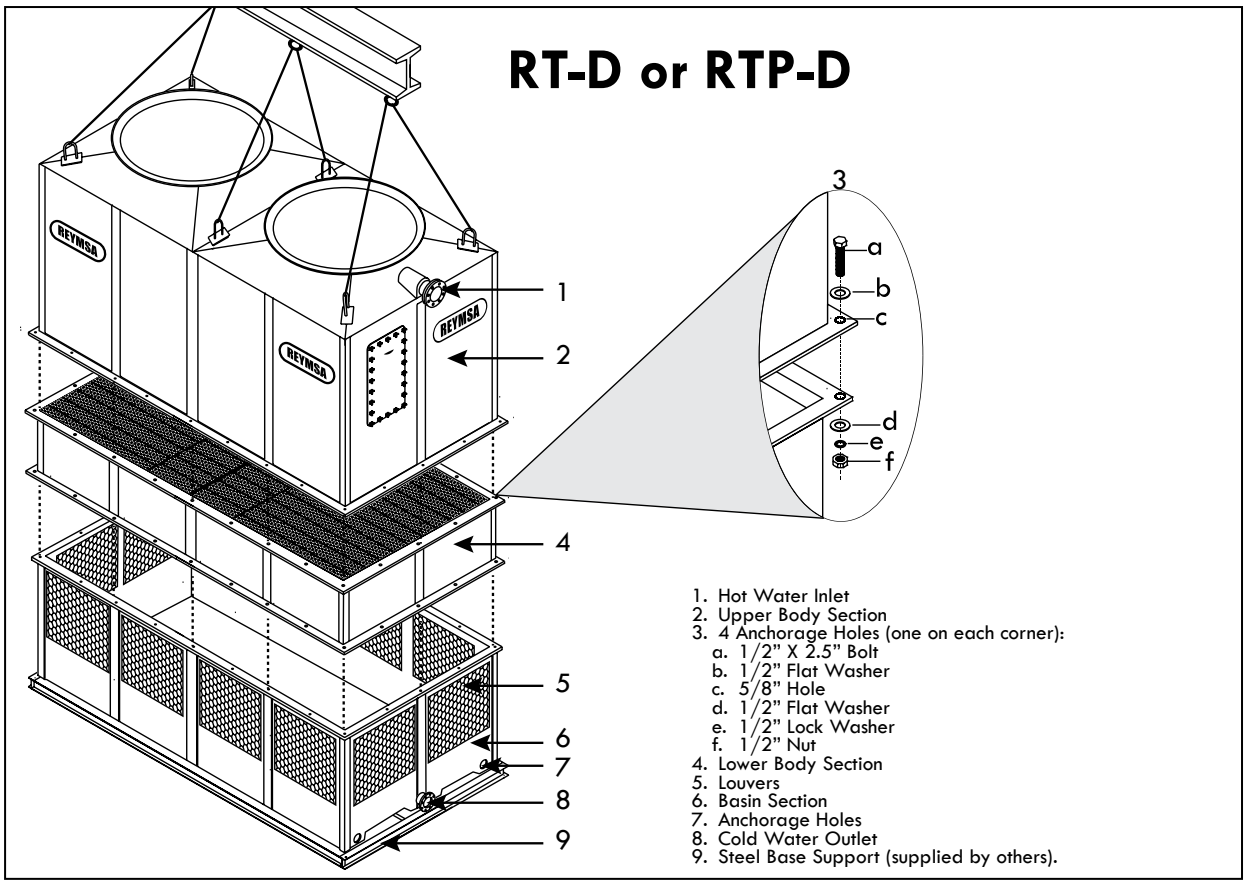


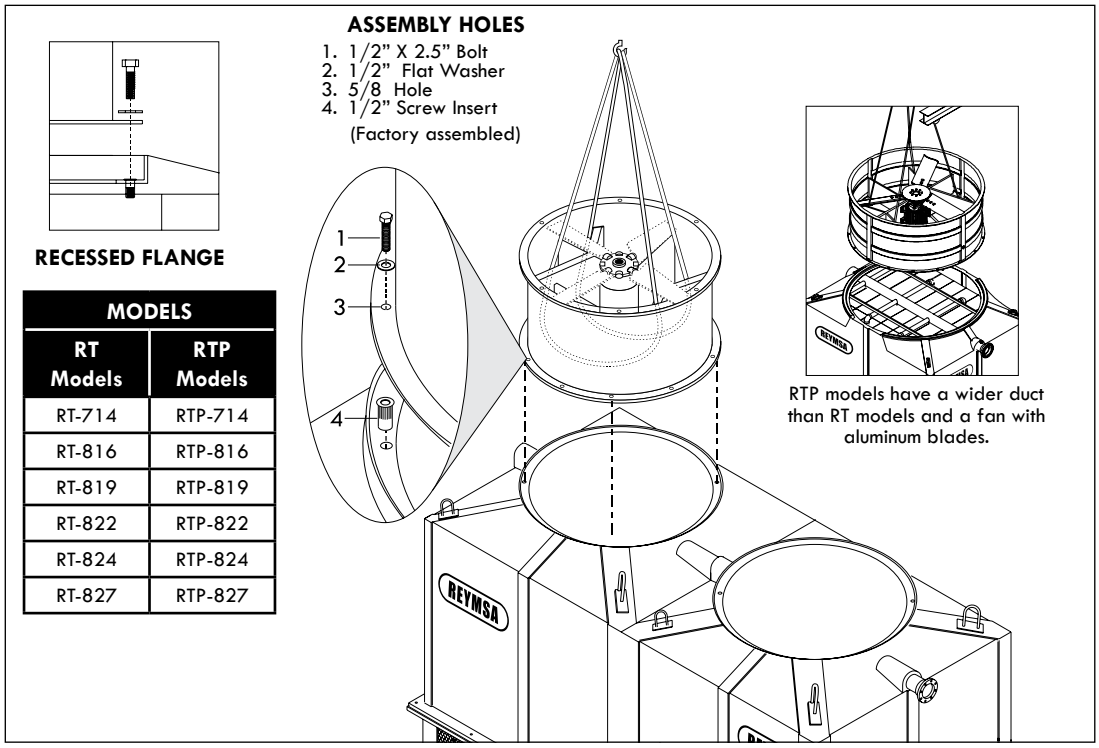
Figure A-20: Upper and Lower Body sections installation for a Two Fan Tower (RT-D or RTP-D)

M. Remove fan guard.

N. Then cradle/straddle the fan support with the straps (as shown in figure A-21) so you can lift the fan duct with a crane and assemble it.

O. 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 distribution manifold of the corresponding body section. Now place fan duct 1 on the correspondent receiving flange on top of the Tower; make sure the bolt holes and the marks inside the fan duct and the receiving flange are aligned (Figure A-21 and A-22). Secure it with the stainless steel nut and bolt sets supplied by REYMSA.

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



MODELS	
RT Models	RTP Models
RT-714	RTP-714
RT-816	RTP-816
RT-819	RTP-819
RT-822	RTP-822
RT-824	RTP-824
RT-827	RTP-827

Figure A-21: Fan Duct assembly for a Two Fan Tower

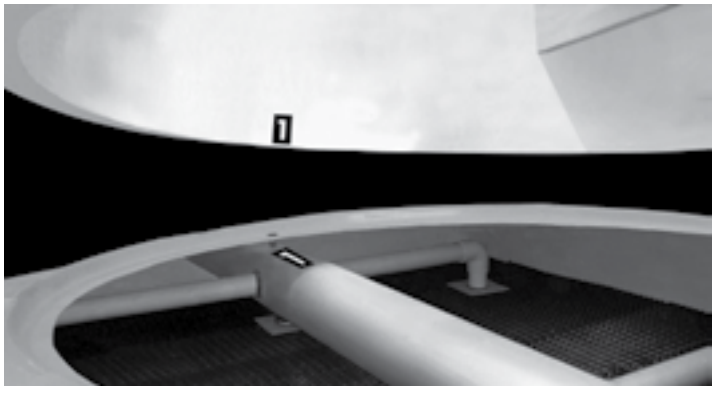


Figure A-22: Fan Duct alignment for a Two Fan Tower

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.2.3 FOUR FAN TOWERS

Follow this procedure to assemble and install Four Fan Cooling Towers.

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 condition, proceed to unload it piece by piece, with a crane or forklift of the appropriate capacity (see Figure A-23 and Figure A-24 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's recommended to use a minimum lifting angle of 60° between the strap and the horizontal. The basin section of the Two Fan towers has U-bolts on the flange for lifting, one on each corner. Place the straps through the u-bolts (as shown in Figure A-24) and use a spreader frame to avoid damage on the upper edge of the Tower. Don't balance until tensing the straps.

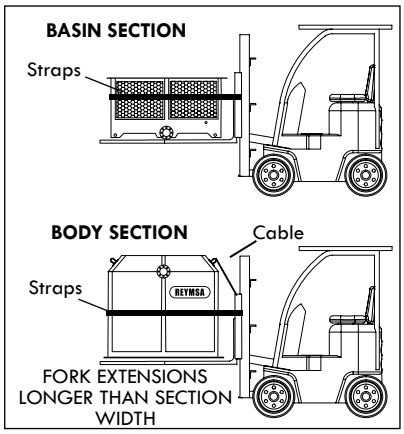


Figure A-23: Four Fan Tower fork lifting

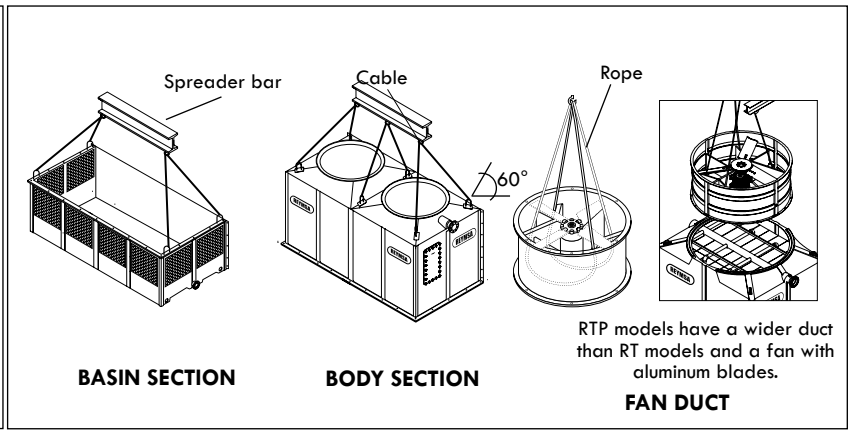


Figure A-24: Four Fan Tower crane lifting

D. 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).

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

F. 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.11.1 LEVELING AND TOWER SUPPORTS".

G. Before you begin assembling the cooling tower, see the APPENDIX G: LABELING FOR ALIGNMENT AND ASSEMBLY SEQUENCE"

H. Place the basin section of the Tower on top of the isolation pad and the base structure; Secure it with the galvanized steel nut and bolt sets (supplied by others) as shown on Figure A-25.

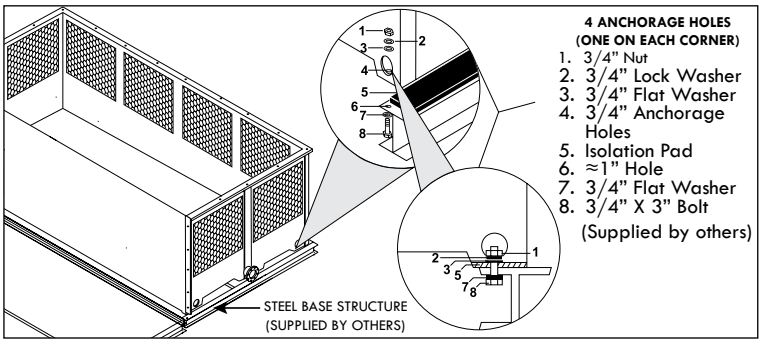


Figure A-25: Typical anchorage for a Four Fan Tower

I. Place the basin section #2 of the Tower following the same instructions of step F and G. Is strongly recommended the use of the spreader bar as illustrated on Figure A-26. Once both sections are in the structural base, proceed to bolt together the vertical flanges of basin sections 1 & 2 with the stainless steel nut and bolt set supplied by REYMSA and secure both sections to the structural base.

J. After the basin has been set in place, remove the U-bolts on top of each corner before installing the body section (see Figure A-27).

K. **Only if your Tower is an RT-D or RTP-D model**: This includes an additional part of body section (Lower Body section). Place Lower Body section #1 on top of basin section #1, then bolt down and secure the horizontal flanges with the stainless steel nut and bolt sets supplied by REYMSA. See Figure A-28.

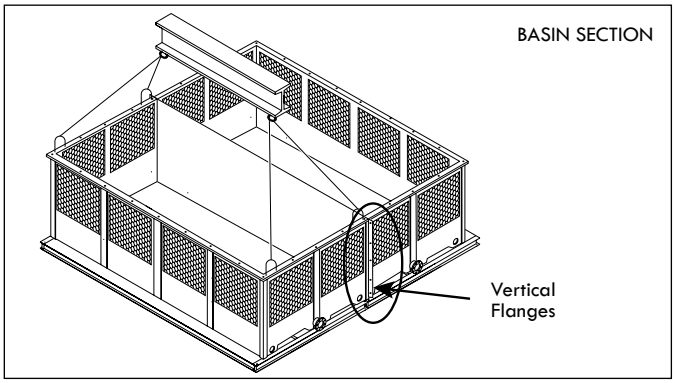


Figure A-26: Basin section 2 installation for a Four Fan Tower

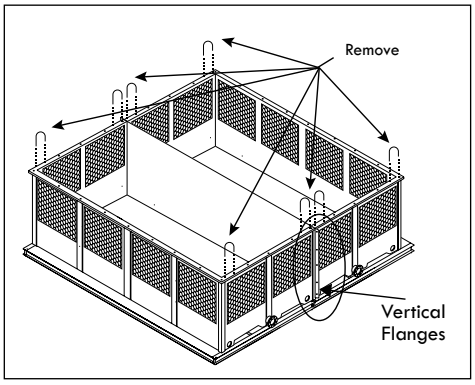


Figure A-27: Removing U-bolts from basin for a Four Fan Tower

L. Follow the same instruction to install the Lower Body section #2 on top of basin section #2. Once both sections are installed, then proceed to bolt together the vertical flanges of Lower Body section 1 & 2 with the stainless steel nut and bolt set supplied by REYMSA. Remove U-bolts from both sections (see Figure A-29).

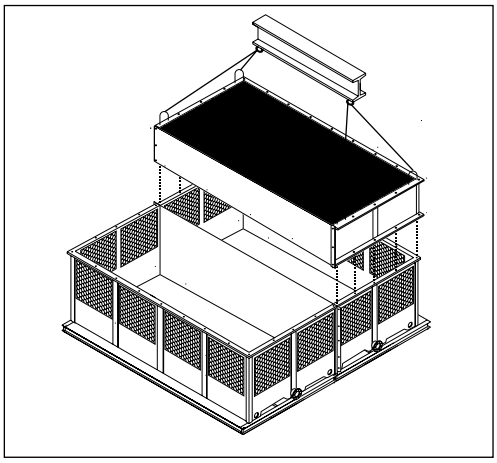


Figure A-28: Lower body section 1 installation for a Four Fan Tower (RT-D or RTP-D)

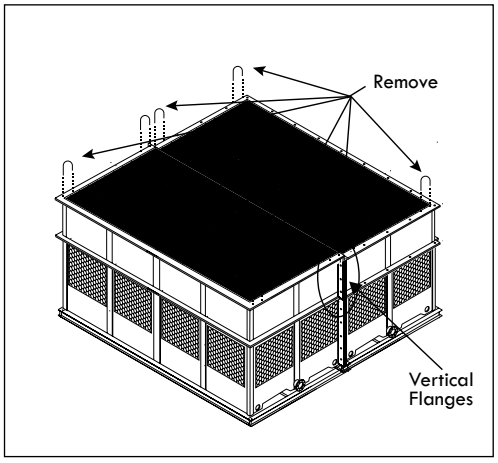


Figure A-29: Removing U-bolts from Lower Body section for a Four Fan Tower (RT-D or RTP-D)

M. Assemble the body section #1 (Upper Body section 1 for RT-D or RTP-D) with the basin section #1 (Lower Body section 1 for RT-D or RTP-D), making sure that the bolt holes on body section #1 (upper body section for RT-D) are aligned with the perforations on basin section #1(lower body section for RT-D), then bolt down and secure the horizontal flanges with the stainless steel nut and bolt supplied by REYMSA. See figure A-30 (wait the final tight until two upper section are on place and you can tighten the vertical flanges as well). Make sure that the hot water inlet and the cold water outlet are on the same side.

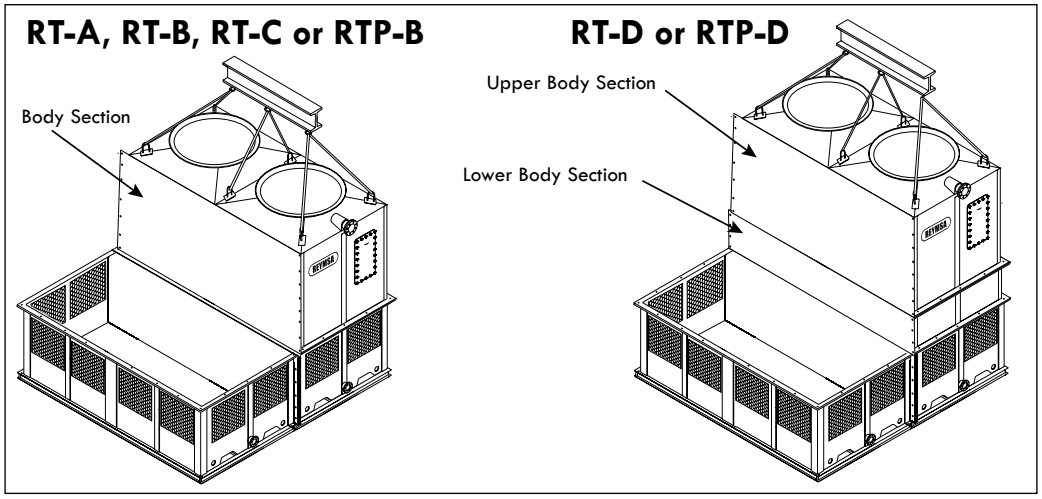


Figure A-30: Body section 1 (Upper Body section 1 for RT-D or RTP-D) on a Four Fan Tower

N. Assemble the body section #2 (Upper Body section 2 for RT-D or RTP-D) with the basin section #2 (Lower Body section 2 for RT-D or RTP-D), making sure that the bolt holes on body section #2 (Upper Body section 2 for RT-D or RTP-D) are aligned with the perforations on basin section #2 (Lower Body section 2 for RT-D or RTP-D), then proceed to bolt together the vertical flanges of body sections (Upper Body sections for RT-D or RTP-D) 1 & 2 with the stainless steel nut and bolt set supplied by REYMSA. Make sure that the hot water inlet and the cold water outlet are on the same side.

O. 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-31.

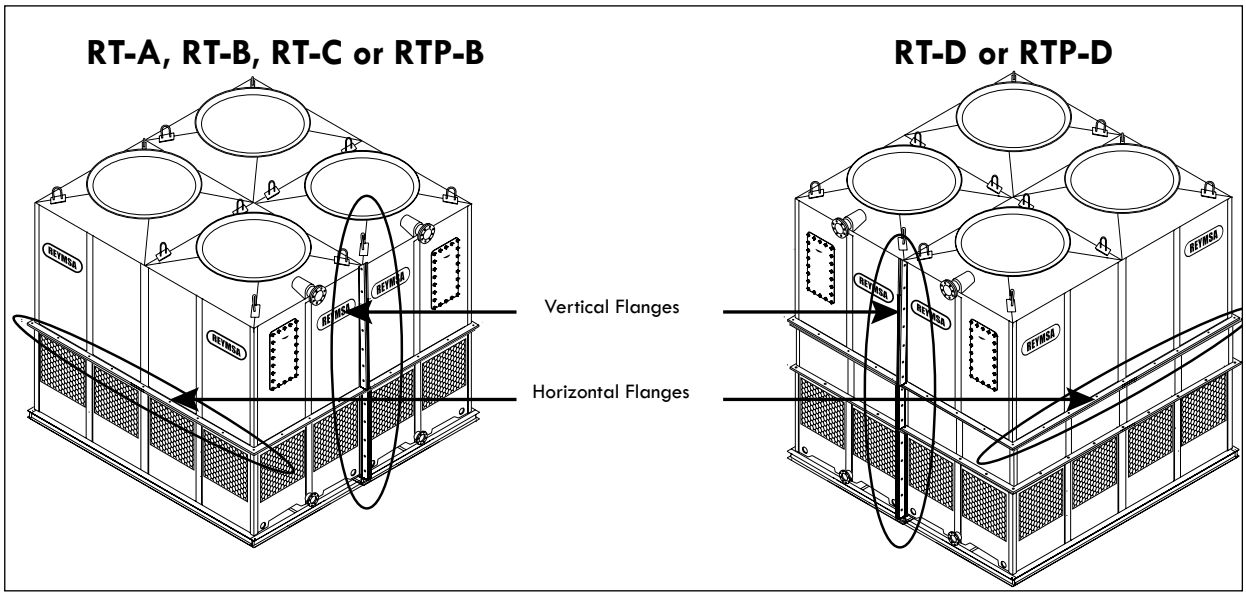


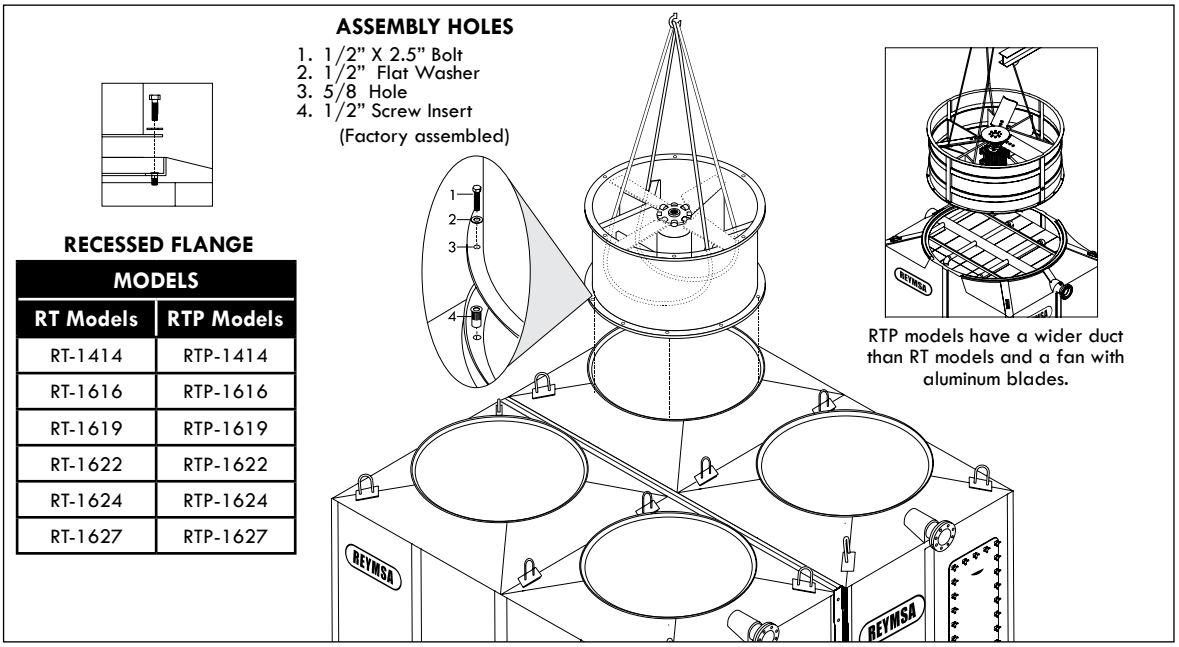
Figure A-31: Body section 2 (Upper Body section 2 for RT-D or RTP-D) on a Four Fan Tower

P. Remove fan guard.

Q. Then cradle/straddle the fan support with the straps (as shown in Figure A-32) so you can lift the fan duct with a crane and assemble it.

R. 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 distribution manifold of the corresponding body section. Place fan duct 1 on the corresponding receiving flange on top of body section 1 of the Tower; make sure the bolt holes and the marks inside the fan duct and receiving flange are aligned (Figure A-32 and A-33). Secure it with the stainless steel nut and bolt sets supplied by REYMSA.

S. Continue to place fan duct 2 on top of body section 1, following the same instructions mentioned on previous step. Follow the step O, P and Q for the remaining fan ducts.



RECESSED FLANGE

MODELS	
RT Models	**RTP Models**
RT-1414	RTP-1414
RT-1616	RTP-1616
RT-1619	RTP-1619
RT-1622	RTP-1622
RT-1624	RTP-1624
RT-1627	RTP-1627

Figure A-32: Fan Duct installation for a Four Fan Tower

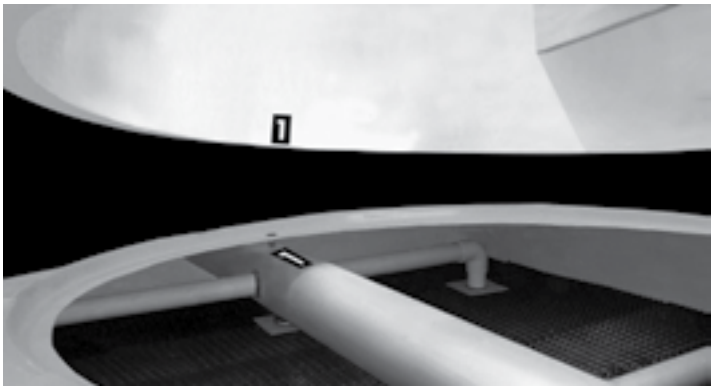


Figure A-33: Fan Duct alignment

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 TOWER: FAN ADAPTORS".

A.3 ASSEMBLY INSTRUCTIONS FOR RTU and RTUP MODELS

A.3.1 SINGLE FAN TOWERS (RTU and RTUP)

Follow this procedure to assemble and install Single Fan Cooling Towers.

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

B. After verifying the equipment is received in proper condition, proceed to unload it piece by piece, with a crane or forklift of the appropriate capacity (see Figure A-34 for reference). If you unload with a forklift, use fork extensions of the proper pallet length according to the width of your model.

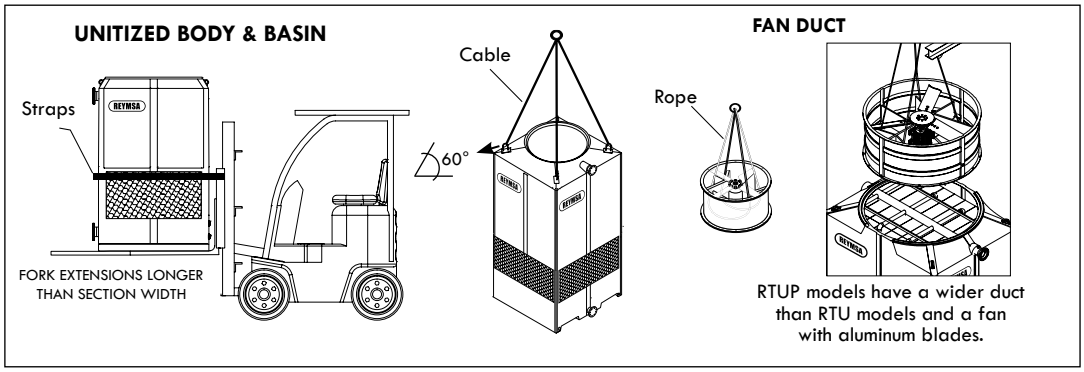


Figure A-34: Single Fan Tower fork and crane lifting

C. For unloading a tower from a container, refer to "APPENDIX A: EXAMPLE OF UNLOADING A COOLING TOWER FROM A CONTAINER".

D. For crane lifting, it's recommended to use a minimum lifting angle of 60° between the strap and the horizontal. The Tower has U-bolts for lifting, one on each corner. Place the straps through the u-bolts (as shown in Figure A-34) and use a spreader bar to avoid damage on the upper edge of the Tower. Don't balance until tensing the straps.

E. Remove the plastic wrap that surrounds the Tower and its components, and loosen the nuts and bolts that keep the Tower (unitized body & basin) attached to the wooden pallet (those located at the bottom of basin).

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

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.11.1 LEVELING AND TOWER SUPPORTS".

H. Before you begin assembling the cooling tower, see the APPENDIX G: LABELING FOR ALIGNMENT AND ASSEMBLY SEQUENCE"

I. Place the Tower (unitized body & basin) section 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 galvanized steel nut and bolt sets (supplied by others) as shown on Figure A-35.

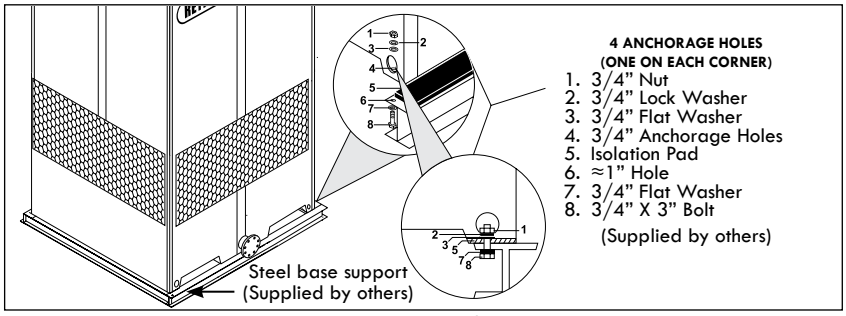
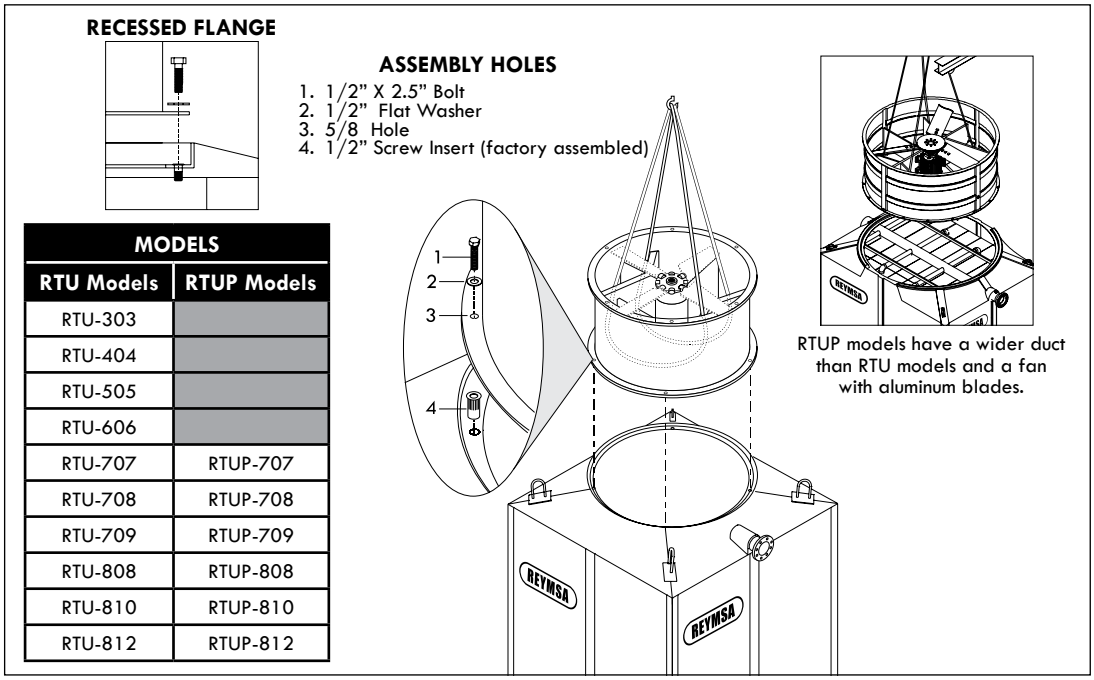


Figure A-35: Typical anchorage for a Single Fan Tower

J. Remove fan guard.

K. Then cradle/straddle the fan support with the straps (as shown in figure A-36) 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; make sure the bolt holes and the marks inside the fan duct and the distribution manifold (located inside of body section) are aligned (see Figure A-36 and A-37). Secure it with the stainless steel nut and bolt sets supplied by REYMSA.



MODELS	
RTU Models	RTUP Models
RTU-303	
RTU-404	
RTU-505	
RTU-606	
RTU-707	RTUP-707
RTU-708	RTUP-708
RTU-709	RTUP-709
RTU-808	RTUP-808
RTU-810	RTUP-810
RTU-812	RTUP-812

Figure A-36: Fan Duct assembly for a Single Fan Tower

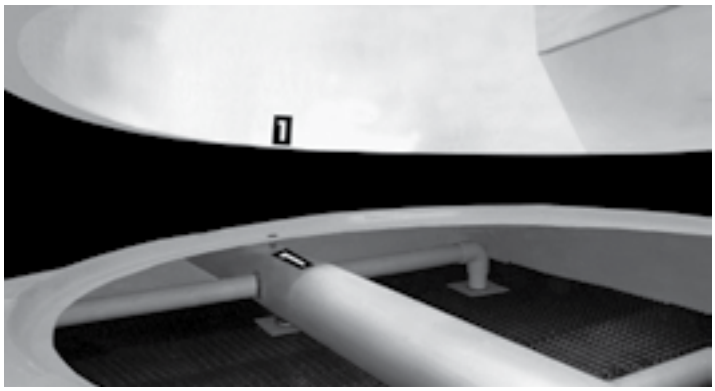


Figure A-37: Fan Duct alignment for a Single Fan Tower

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.3.2 TWO FAN TOWERS (RTU and RTUP)

Follow this procedure to assemble and install Two Fan Cooling Towers.

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 condition, proceed to unload it piece by piece, with a crane or forklift of the appropriate capacity (see Figure A-38 for reference). If you unload with a forklift, use fork extensions of the proper pallet length according to the width of your model.

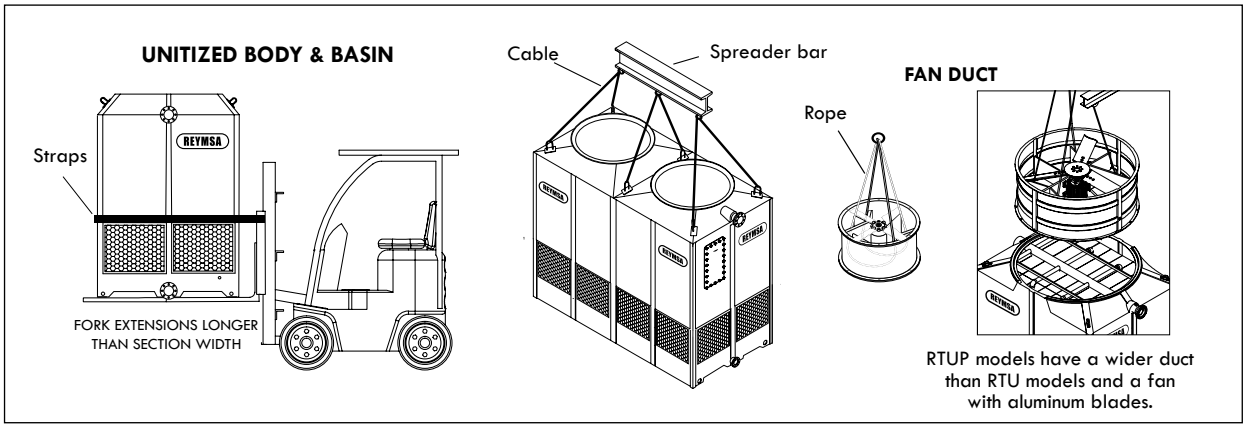


Figure A-38: Two Fan Tower fork and crane lifting

C. For unloading a tower from a container, refer to "APPENDIX A: EXAMPLE OF UNLOADING A COOLING TOWER FROM A CONTAINER".

D. For crane lifting, it's recommended to use a minimum lifting angle of 60° between the strap and the horizontal. The Tower has U-bolts for lifting, one on each corner. Place the straps through the u-bolts (as shown in Figure A-38) and use a spreader bar to avoid damage on the upper edge of the Tower. Don't balance until tensing the straps.

E. Remove the plastic wrap that surrounds the Tower and its components, and loosen the nuts and bolts that keep the Tower (unitized body & basin) attached to the wooden pallet (those located at the bottom of basin).

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

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.11.1 LEVELING AND TOWER SUPPORTS".

H. Before you begin assembling the cooling tower, see the APPENDIX G: LABELING FOR ALIGNMENT AND ASSEMBLY SEQUENCE"

I. Place the Tower (unitized body & basin) on top of the isolation pad and the base structure; Secure it with the galvanized steel nut and bolt sets (supplied by others) as shown on Figure A-39.

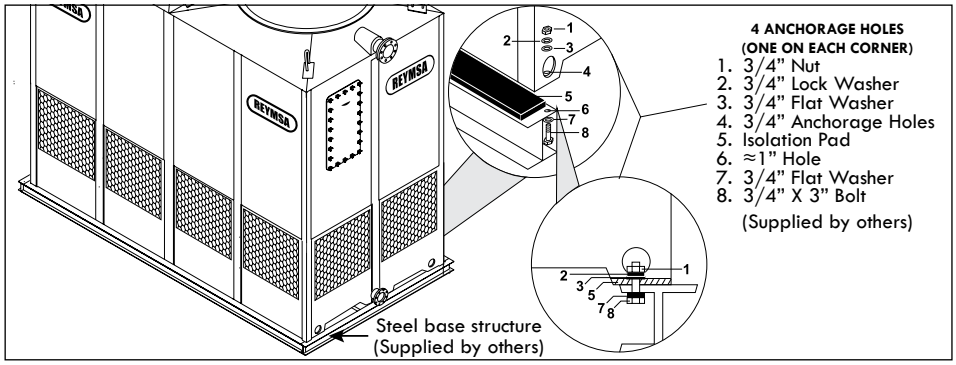


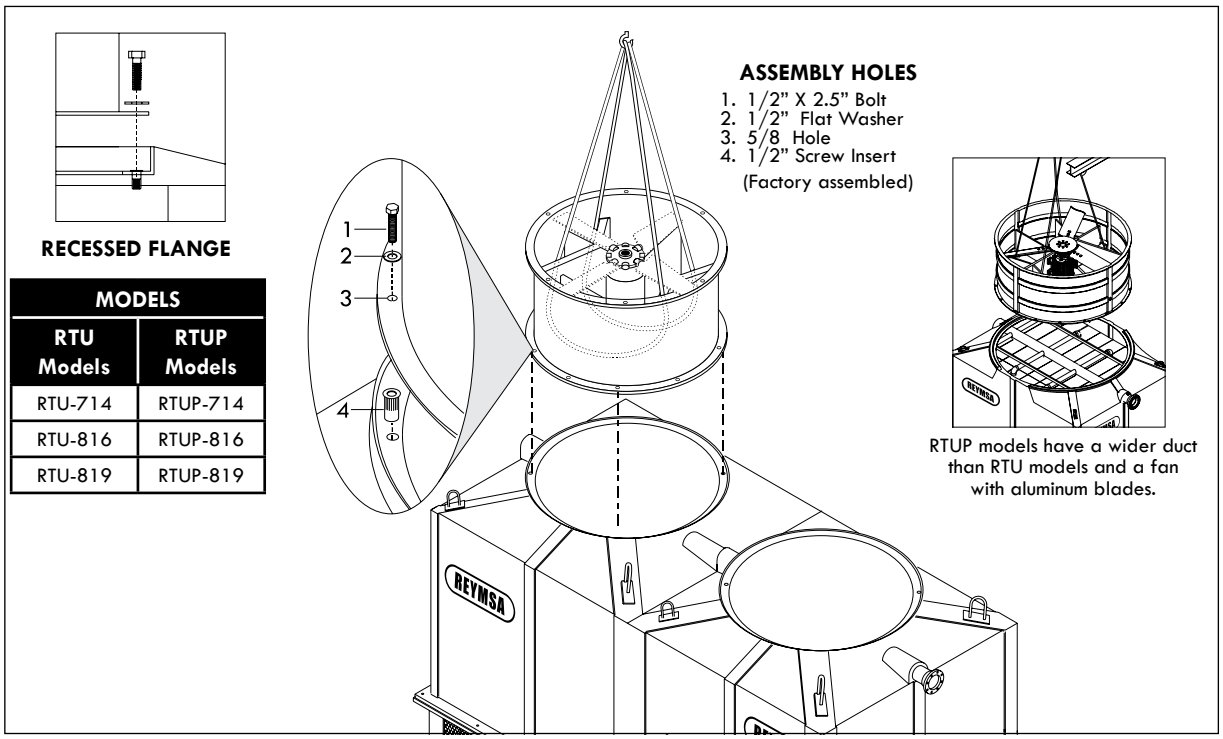
Figure A-39: Typical anchorage for a Two Fan Tower

J. Remove fan guard.

K. Then cradle/straddle the fan support with the straps (as shown in figure A-40) 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 distribution manifold of the corresponding body section. Now place fan duct 1 on the correspondent receiving flange on top of the Tower; make sure the bolt holes and the marks inside the fan duct and the receiving flange are aligned (Figure A-40 and A-41). Secure it with the stainless steel nut and bolt sets supplied by REYMSA.

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



MODELS	
RTU Models	RTUP Models
RTU-714	RTUP-714
RTU-816	RTUP-816
RTU-819	RTUP-819

Figure A-40: Fan Duct assembly for a Two Fan Tower

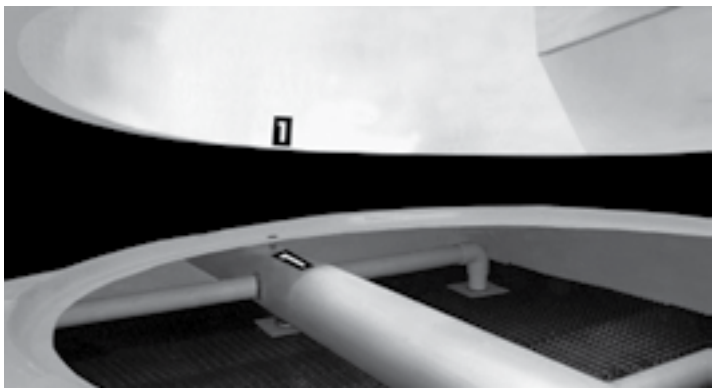


Figure A-41: Fan Duct alignment for a Two Fan Tower

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.3.3 FOUR FAN TOWERS (RTU and RTUP)

Follow this procedure to assemble and install Four Fan Cooling Towers.

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 condition, proceed to unload it piece by piece, with a crane or forklift of the appropriate capacity (see Figure A-42 for reference). If you unload with a forklift, use fork extensions of the proper pallet length according to the width of your model.

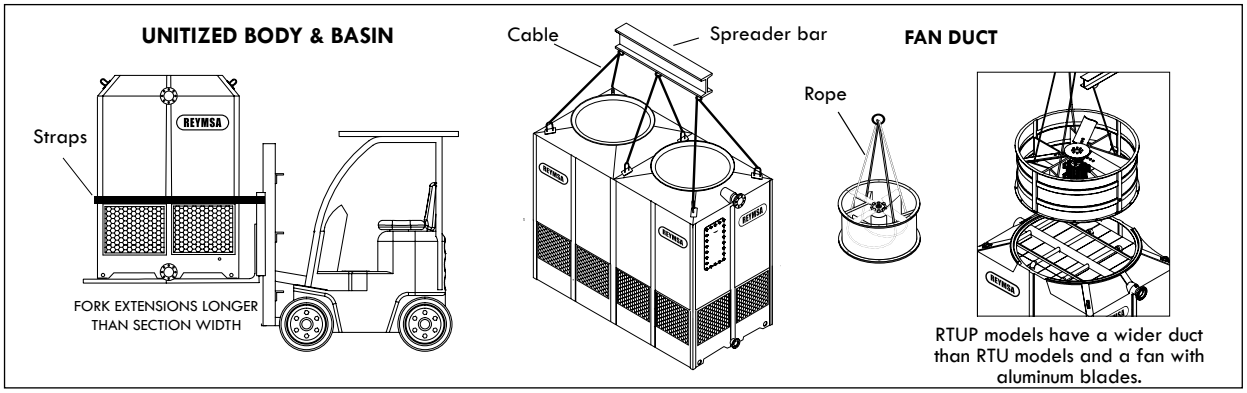


Figure A-42: Four Fan Tower fork and crane lifting

C. For unloading a tower from a container, refer to "APPENDIX A: EXAMPLE OF UNLOADING A COOLING TOWER FROM A CONTAINER".

D. For crane lifting, it's recommended to use a minimum lifting angle of 60° between the strap and the horizontal. The Body section has U-bolts for lifting, one on each corner. Place the straps through the u-bolts (as shown in Figure A-42) and use a spreader bar to avoid damage on the upper edge of the Tower. Don't balance until tensing the straps.

E. Remove the plastic wrap that surrounds the Tower and its components, and loosen the nuts and bolts that keep the Tower (unitized body & basin) attached to the wooden pallet (those located at the bottom of basin.

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

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.11.1 LEVELING AND TOWER SUPPORTS".

H. Before you begin assembling the cooling tower, see the APPENDIX G: LABELING FOR ALIGNMENT AND ASSEMBLY SEQUENCE"

I. Place the Section #1 (unitized body & basin) of the Tower on top of the isolation pad and the base structure; Secure it with the galvanized steel nut and bolt sets (supplied by others) as shown on Figure A-43.

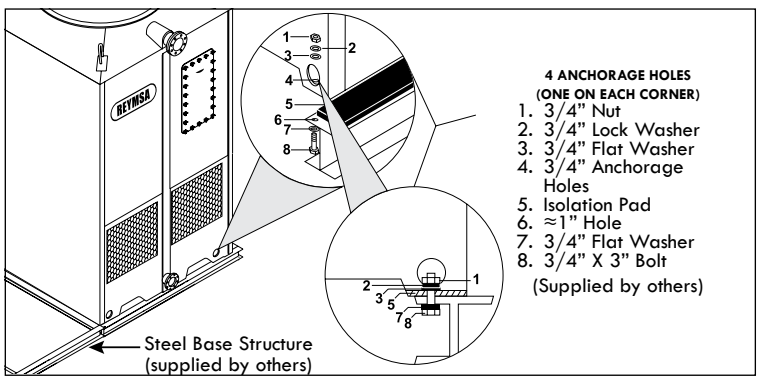


Figure A-43: Typical anchorage for a Four Fan Tower

J. Place Section #2 (unitized body & basin) on top of the isolation pad and the base structure next to Section #1 (unitized body & basin). Then bolt down and secure Tower Section #2 to the structural base with stainless steel nut and bolt sets (supplied by others) as shown on Figure A-43.

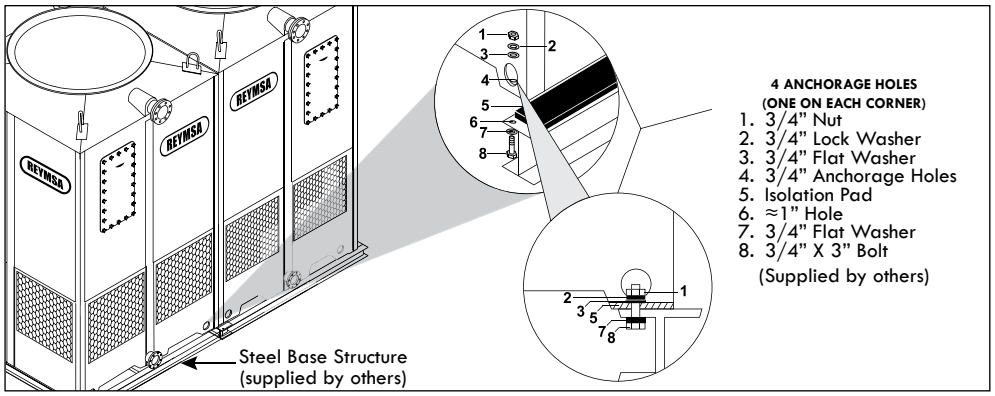


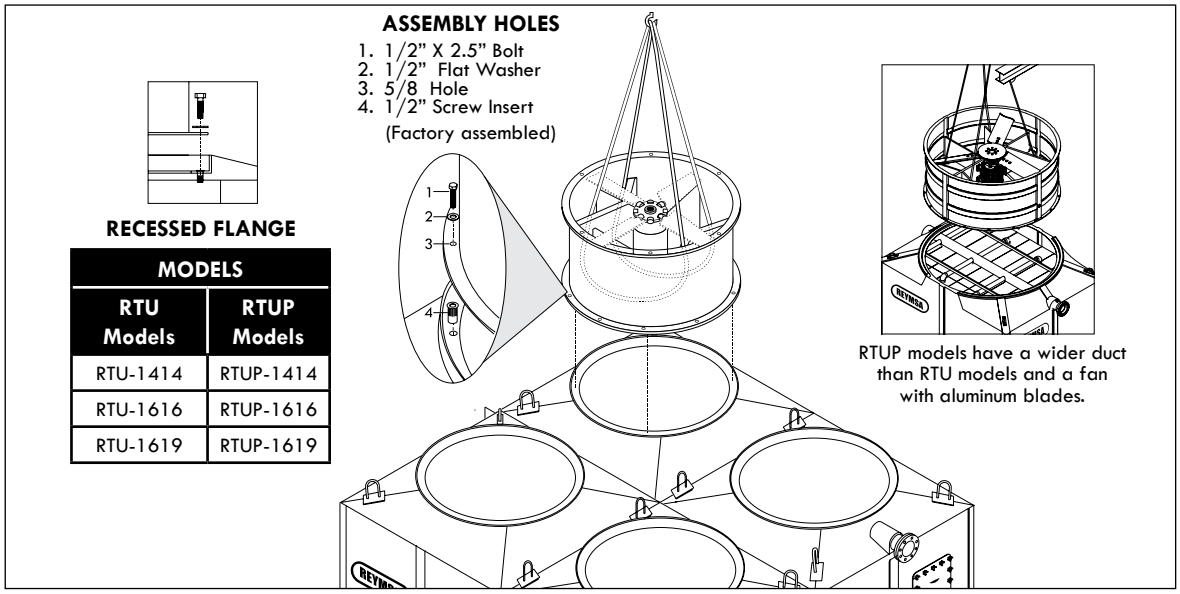
Figure A-44: Body section 2 installation for a Four Fan Tower

K. Remove fan guard.

L. Then cradle/straddle the fan support with the straps (as shown in Figure A-45) so you can lift the fan duct with a crane and assemble it.

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 distribution manifold of the corresponding body section. Place fan duct 1 on the corresponding receiving flange on top of body section 1 of the Tower; make sure the bolt holes and the marks inside the fan duct and receiving flange are aligned (Figure A-41 and A-45). Secure it with the stainless steel nut and bolt sets supplied by REYMSA.

N. Continue to place fan duct 2 on top of body section 1, following the same instructions mentioned in previous step. Follow the step J, K and L for the remaining fan ducts.



MODELS	
RTU Models	RTUP Models
RTU-1414	RTUP-1414
RTU-1616	RTUP-1616
RTU-1619	RTUP-1619

Figure A-45: Fan Duct installation for a Four Fan 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.4 ASSEMBLY INSTRUCTIONS FOR RTG AND RTGTC MODELS

Follow this procedure to assemble and install an RTG/RTGTC Cooling Tower. Use drift pins to align bolt holes and use stainless steel bolts to torque the sections together.

A. Upon the arrival of the equipment to its final destination, check for any abnormality or apparent damage on the packaging before unloading the Cooling Tower from the transportation vehicle.

B. After assuring the equipment is received in proper condition, proceed to unload it from the transportation vehicle, piece by piece, with a crane (using a spreader bar) or forklift of the appropriate capacity, see Figure A-46 for an example. 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's recommended to use a minimum lifting angle of 60° between the strap and the horizontal. Each section of the Tower has U-bolts for lifting. Place the straps through the U-bolts (as shown in Figure A-46) and use a spreader bar to avoid damage on the upper edge of the Tower. Don't balance until tensing the straps.

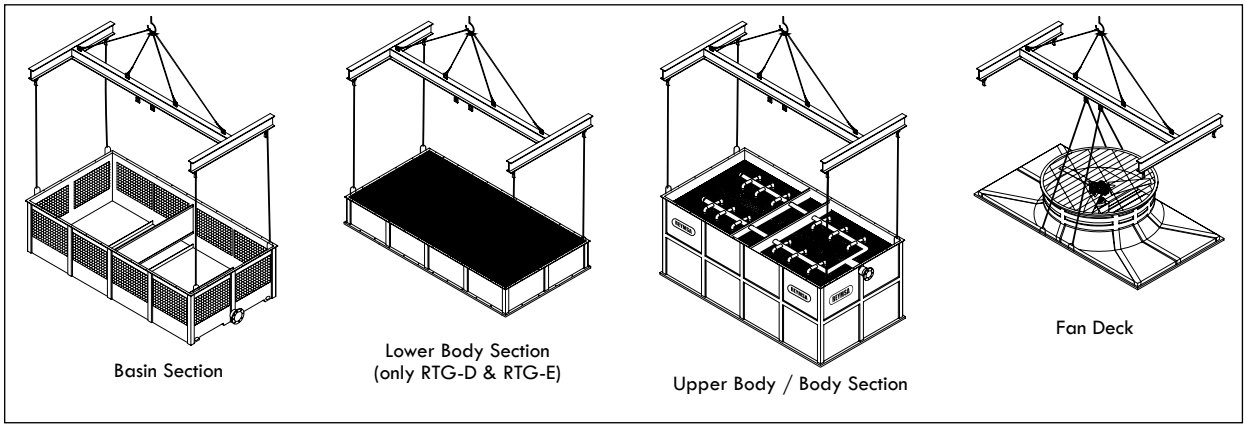


Figure A-46: Crane lifting for an RTG and RTGTC model.

D. Remove the plastic wrap that surrounds the Tower and its components, and loosen the nuts and bolts that keep the body & basin attached to the wooden pallet (those located at the bottom of basin).

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

F. 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.11.1 LEVELING AND TOWER SUPPORTS".

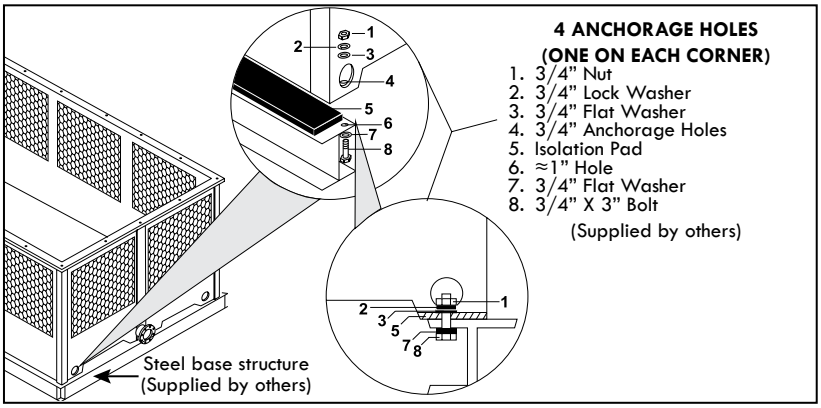


Figure A-47: Typical anchorage for an RTG and RTGTC model.

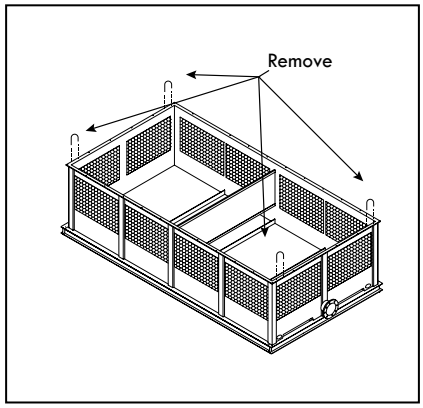


Figure A-48: Removing U-bolts from basin section of an RTG and RTGTC model.

G. Before you begin assembling the cooling tower, see the APPENDIX G: LABELING FOR ALIGNMENT AND ASSEMBLY SEQUENCE"

H. Place the basin section of the Tower on top of the isolation pad and the base structure; Secure it with the galvanized steel nut and bolt sets (supplied by others) as shown on Figure A-47.

I. After the basin has been set in place, remove the U-bolts located on the flange before installing the next section (see Figure A-48).

J. **<u>Only if your Tower is an RTG-D, RTG-E, RTGTC-G or RTGTC-H model</u>**: It includes an additional part of body section (Lower Body section). Place Lower Body section on top of basin section, then bolt down and secure the horizontal flanges with the stainless steel nut and bolt sets supplied by REYMSA (see figure A-49).

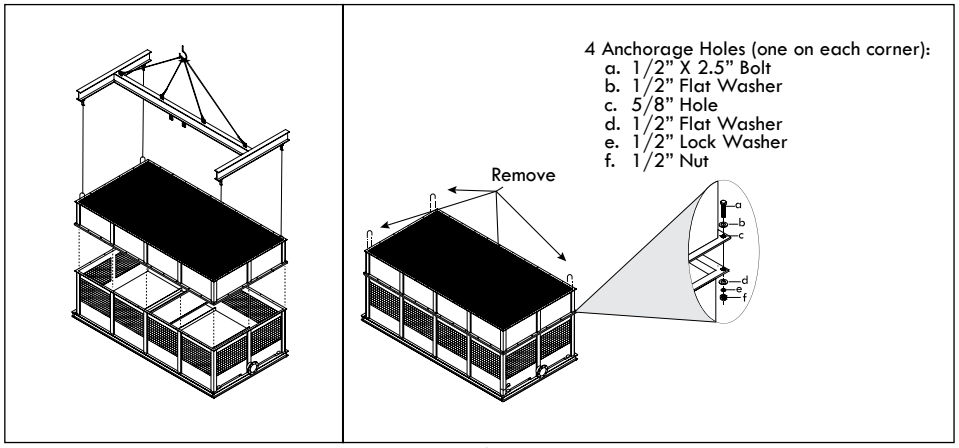


Figure A-49: Lower body section installation for an RTG-D, RTG-E, RTGTC-G and RTGTC-H models.

K. After the Lower Body section has been set in place, remove the U-bolts located on the flange before installing the Upper Body section (see Figure A-49).

L. Assemble the body section (Upper Body section for RTG-D, RTG-E, RTGTC-G or RTGTC-H) with the basin section (Lower Body section for RTG-D, RTG-E, RTGTC-G or RTGTC-H). The body section comes assembled with u-bolts for lifting; then using a crane assemble both parts, use a drift pin to align bolt holes as the sections are being set (See figure A-50). Make sure that the hot water inlet, and the cold water outlet are on the same side of the Tower when assembled.

M. After installing the body, remove the U-bolts before installing the Fan Deck (see Figure A-50).

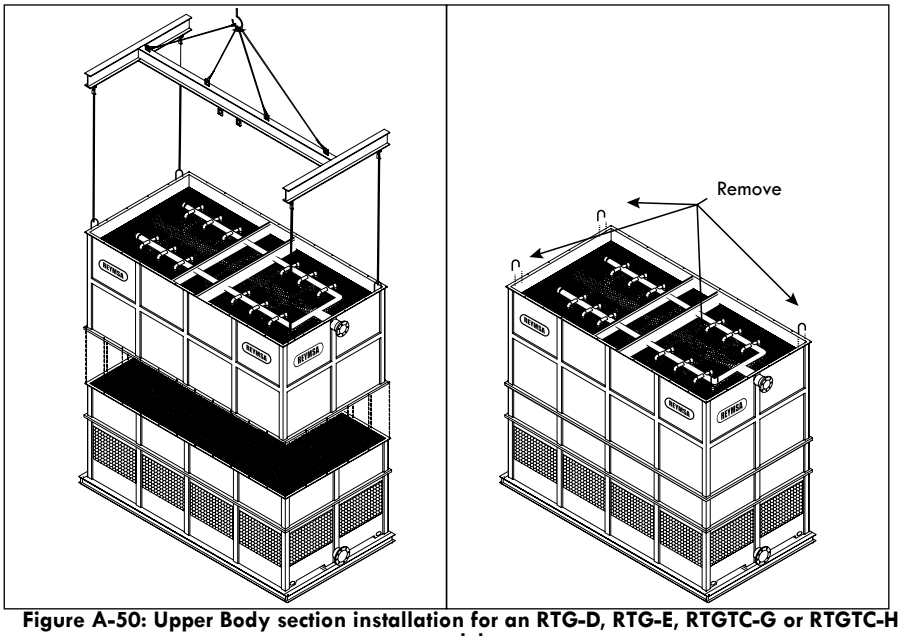


Figure A-50: Upper Body section installation for an RTG-D, RTG-E, RTGTC-G or RTGTC-H models.

N. RTG adn RTGTC models have a section called "Fan Deck" which is at the top of the Tower. The Fan Deck with duct contains a gear drive, a fan and a motor mounted on a structural Hot Dip Galvanized Steel support with an "I" shape configuration, and a corrosion resistant safety screen mesh. (See Figure A-51).

O. Before lifting the Fan Deck Section, remove the fan guard (only for RTG-8 and RTGTC-8 wide models).

P. Secure the Fan Deck Section using the U-bolts next to the fan duct to lift this section.

Q. The suggested way is to hook 4 rings when hoisting the fan deck (it's recommended that the bands be adjustable).

R. 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 nut and bolt sets supplied by REYMSA.

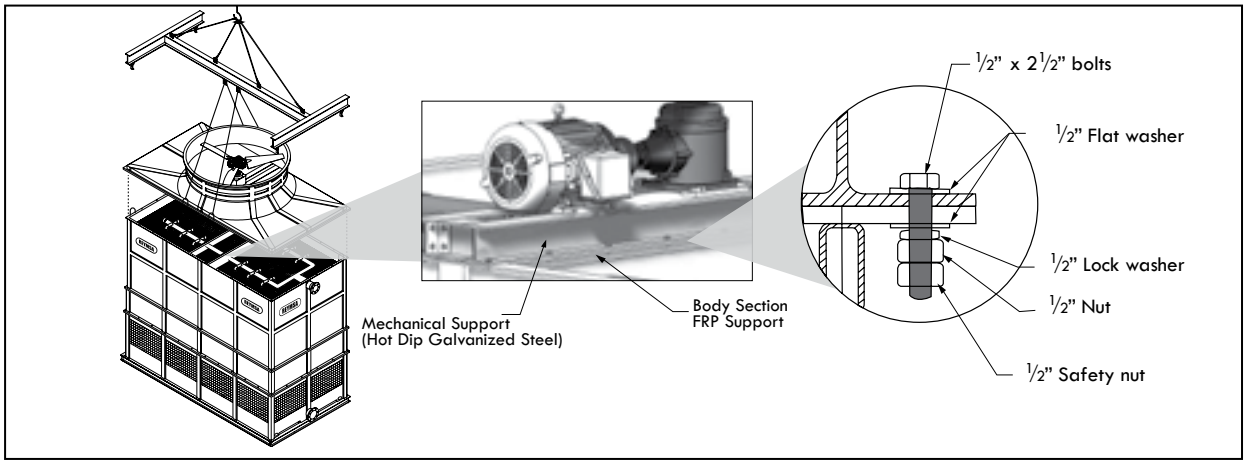


Figure A-51: Fan Deck assembly for an RTG and RTGTC model.

S. After installing the fan deck section, access to inside of the fan deck section and bolt down the Galvanized Steel mechanical support to the Fiberglass (FRP) support (see Figure A-51). The Galvanized Steel mechanical support is built in an "I" shaped configuration and this mechanical support must be bolted to the Fiberglass (FRP) support in the upper section on which it sets. The bolts must be installed on the full perimeter of the "I" shaped mechanical support. Access to perform this assembly inside the tower through the fan guard access door.

NOTE: If your tower has the optional Direct Drive Permanent Magnet Motor, refer to "SECTION A.10.6 DIRECT DRIVE PERMANENT MAGNET MOTOR FOR RTG, RTGTC, RTGM AND RTGMTC MODELS".

Only if your tower has the motor out of the air stream, follow steps S to W:

T. The fan, motor and gear box are installed on a hot dip galvanized mechanical support with a "T" shape configuration. (See A-52 figure).

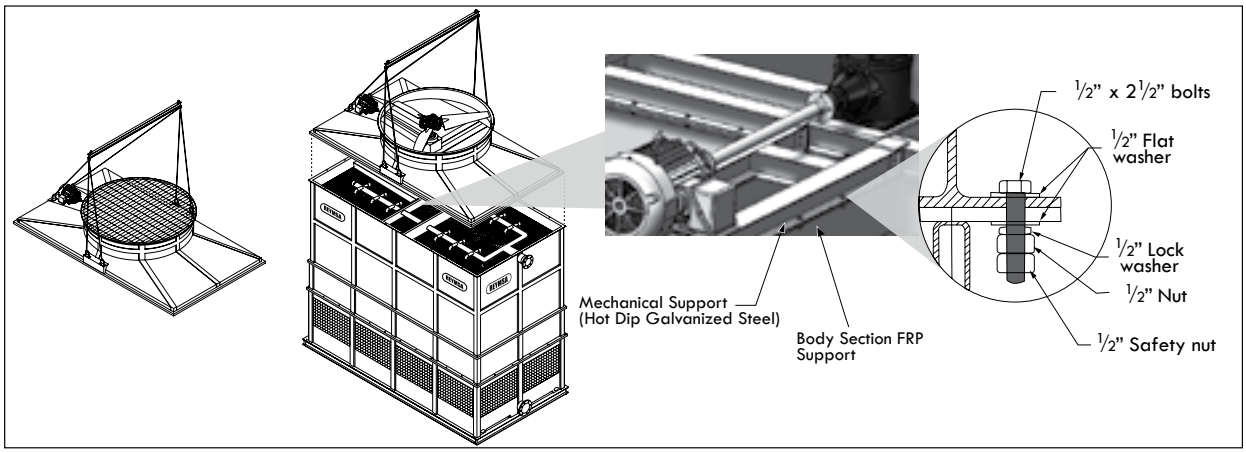


Figure A-52: Fan Deck installation of an RTG and RTGTC Tower with motor installed outside the airstream.

U. Secure the Fan Deck section using the U-bolts next to the fan duct to lift this section. Use the U-bolts next to the motor to stabilize this section.

V. Place the fan deck section over the body of the Cooling Tower, making sure that the holes of the fan deck section and the upper body section are aligned. Then proceed to secure the two sections together at the horizontal flanges using the stainless steel nut and bolt sets supplied by REYMSA.

W. After installing the fan deck section, access to inside the fan deck section and bolt down the Galvanized Steel mechanical support to the Fiberglass (FRP) support (see Figure A-52). The Galvanized Steel mechanical support is built in a "T" shaped configuration and this base must be bolted to the Fiberglass (FRP) support in the upper section on which it sets. The bolts must be installed on the full perimeter of the "T" shaped mechanical support. Access to perform this assembly inside the tower is through the fan guard access door (except for 8' wide models which require removal of the fan guard).

X. Place the fan guard over the duct section (see Figure A-53) and bolt it down (only for RTG-8 and RTGTC-8 wide models).

Y. The 10 and 12 wide RTG and 10, 12 and 14 wide RTGTC models have an access door on the fan guard to access the inside of the fan deck.

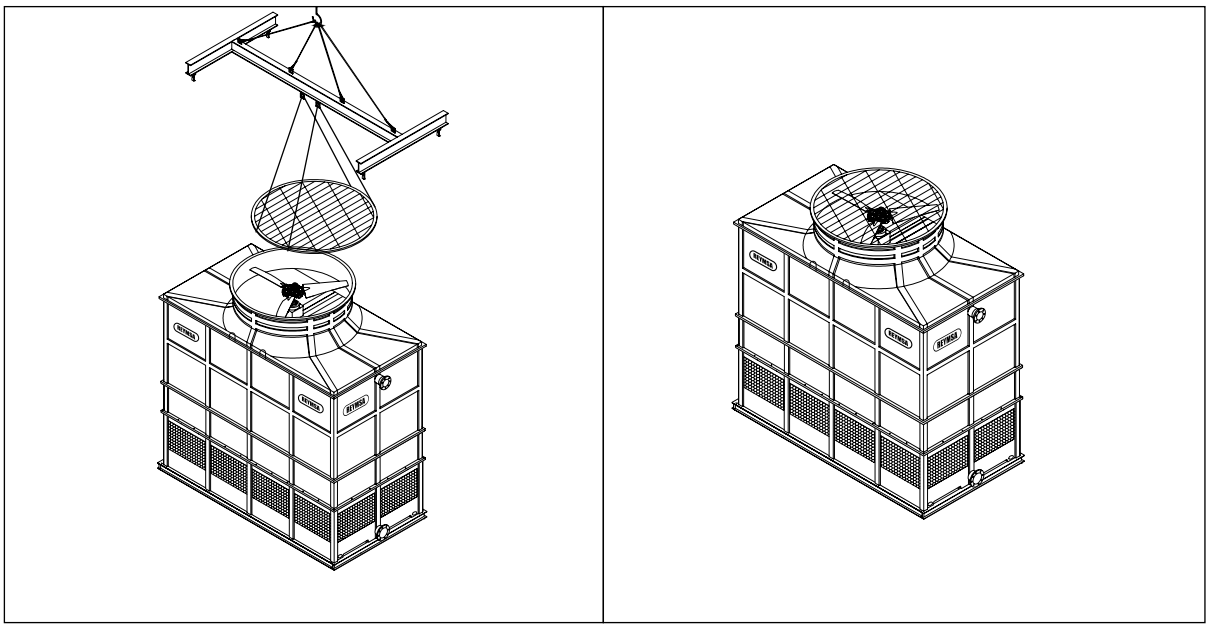


Figure A-53: Installation of the Fan guard on RTG and RTGTC model towers.

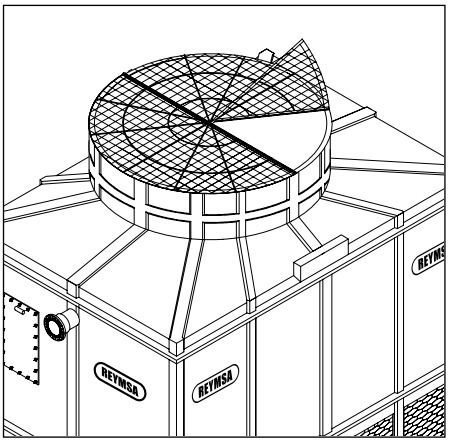


Figure A-54: Fan guard access door for RTG and RTGTC models.

A.5. ASSEMBLY INSTRUCTIONS FOR MODULAR TOWERS (RTM and RTPM)

A.5.1 GENERAL PROCEDURE

Follow this procedure to assembly and install an RTM or RTPM Cooling Tower. Use drift pins to align bolt holes and use the stainless steel bolts to torque the sections together.

A. Upon the arrival of the equipment to its final destination, check for any abnormality or apparent damage on the packaging before unloading the Cooling Tower from the transportation vehicle.

B. After assuring the equipment is received in proper condition, proceed to unload it from the transportation vehicle, piece by piece, with a crane (using a spreader bar) or forklift of the appropriate capacity, see Figure A-55 for an example. 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's recommended to use a minimum lifting angle of 60° between the strap and the horizontal. Each section of the Tower has U-bolts for lifting. Place the straps through the U-bolts (as shown in Figure A-55) and use a spreader bar to avoid damage on the upper edge of the Tower. Don't balance until tensing the straps.

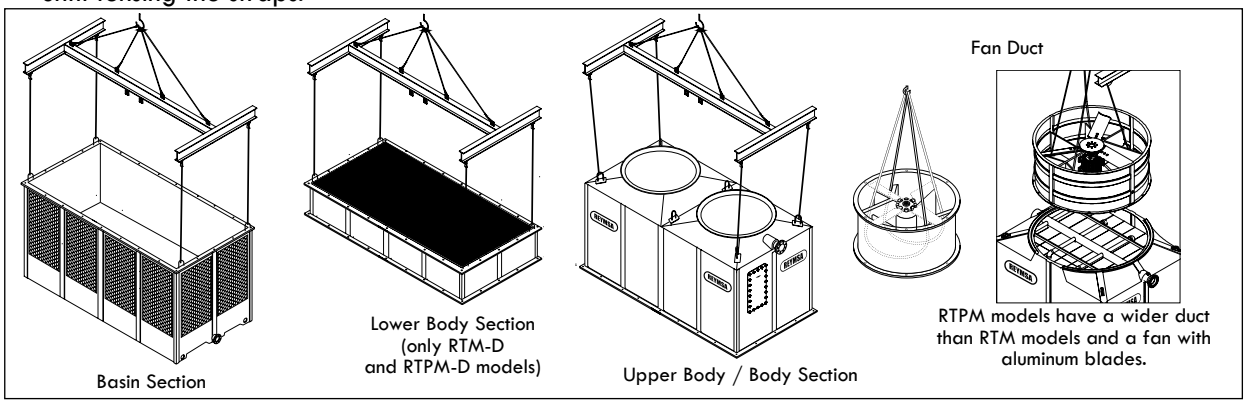


Figure A-55: Crane lifting for a modular tower (RTM or RTPM)

D. Remove the plastic wrap that surrounds the Tower and its components, and loosen the nuts and bolts that keep the body & basin attached to the wooden pallet (those located at the bottom of basin).

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

F. 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.11.1 LEVELING AND TOWER SUPPORTS".

G. Before you begin assembling the cooling tower, see the APPENDIX G: LABELING FOR ALIGNMENT AND ASSEMBLY SEQUENCE".

H. Each module of an RTM or RTPM tower model should be assembled on the floor before installing it on the steel base support.

I. Remove the U-bolts located on the flange of basin section #1 before installing the body section #1 (see Figure A-56).

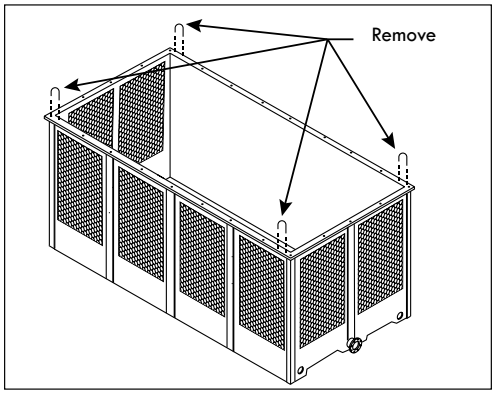


Figure A-56: Removing U-bolts from basin of a Modular Tower (RTM or RTPM)

J. Assemble body section #1 (for RTM-B or RTPM-B) with the basin section #1, making sure that the bolt holes on body section #1 are aligned with the perforations on basin section #1, then bolt down and secure the horizontal flanges with the stainless steel nut and bolt sets supplied by REYMSA (see Figure A-57 for reference).

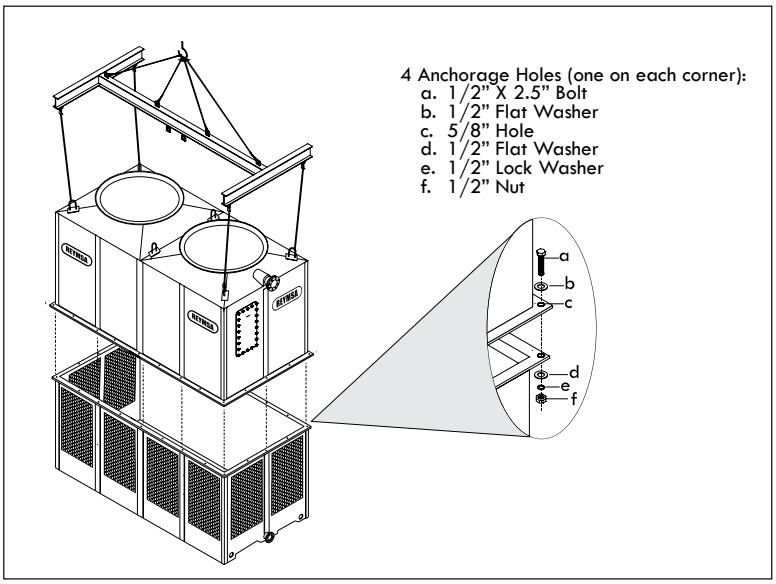


Figure A-57: Body section assemble for a Modular Tower (RTM-B or RTPM-B)

K. **Only for RTM-D or RTPM-D models**: Assemble Lower Body section #1 on top of basin section #1, make sure that the bolt holes on Lower Body section #1 are aligned with the perforations on basin section #1, then bolt down and secure the horizontal flanges with the stainless steel nut and bolt sets supplied by REYMSA (see Figure A-58).

L. **Only for RTM-D or RTPM-D models**: Remove U-bolts from Lower Body section before installing the next section (see Figure A-59). Place Upper Body section #1 on top of Lower Body section #1, making sure that the bolt holes are aligned (see Figure A-60). Bolt down and secure the horizontal flanges with the stainless steel nut and bolt sets supplied by REYMSA.

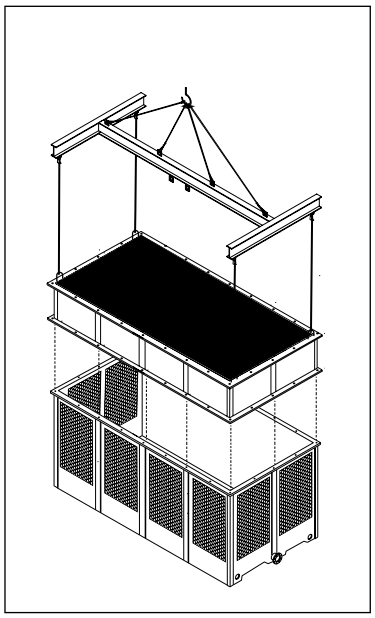


Figure A-58: Lower body section assemble for a Modular Tower (RTM-D or RTPM-D)

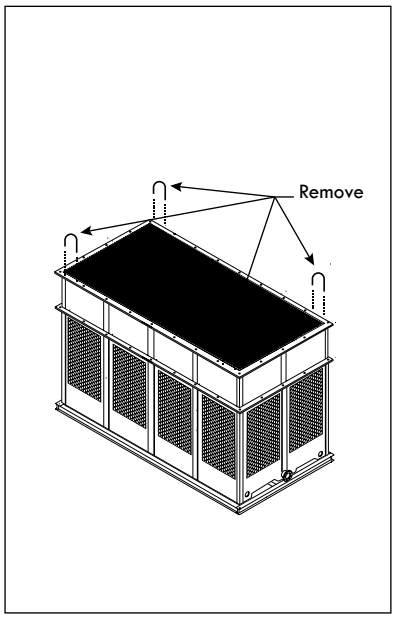


Figure A-59: Removing U-bolts from Lower Body section of a Modular Tower (RTM-D or RTPM-D)

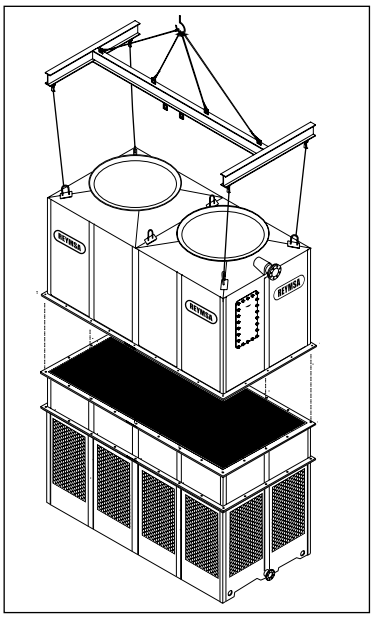


Figure A-60: Upper body section assemble for a Modular Tower (RTM-D or RTPM-D)

A.5.2 LARGE SIDE ARRANGEMENT FOR A MODULAR TOWER (RTM-L or RTPM-L)

The following steps are a procedure to install an RTM-B, RTM-D, RTPM-B or RTPM-D Modular Tower with **arrangement by the large side.**

Follow the same instructions from section "**A.5.1 GENERAL PROCEDURE**" to assemble the modules.

A. Once the basin and body sections have been assembled, lift the Tower using a crane and a spreader bar and place it on top of the isolation pad and the steel base structure. Secure it with the galvanized steel nut and bolts sets (supplied by others) as shown on Figure A-61 and Figure A-62.

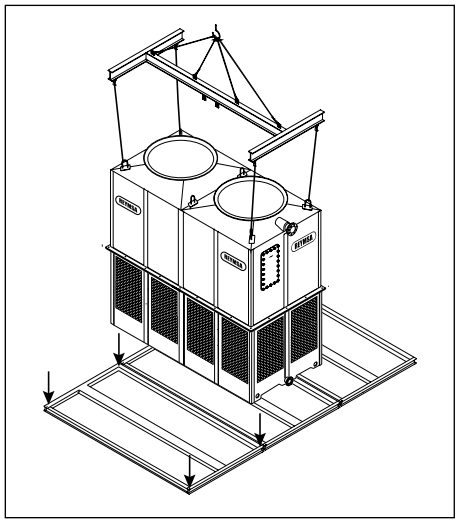


Figure A-61: L-Orientation - First T1 module lifting and installation (RTM-B-L or RTPM-B-L)

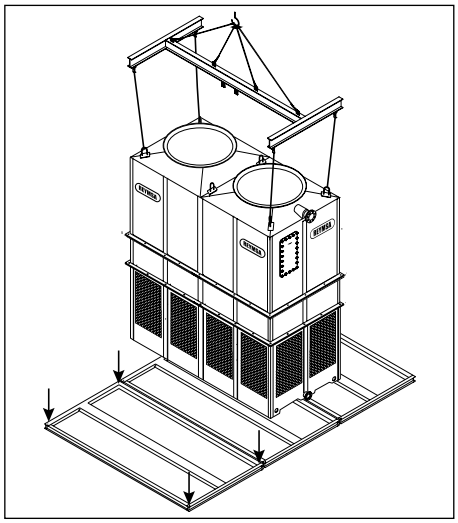


Figure A-62: L-Orientation - First T1 module lifting and installation (RTM-D-L or RTPM-D-L)

B. Repeat the previous steps to install the remaining modules. Pay attention to the correct module arrangement; Each module is labeled alphabetically (module 1: A; module 2: B, etc.) for a proper installation (see Figure A-63 and Figure A-64).

- First module assembled should be T1 module, with 3 air inlet sides (2 short sides, 1 large side).
- Next module(s) must be T2 module, with 2 air inlet sides (short sides).
- The final module must be T1 type module, with 3 air inlet sides (2 short sides, 1 large side).
- Make sure all the modules are bolted down and secured to the steel support.

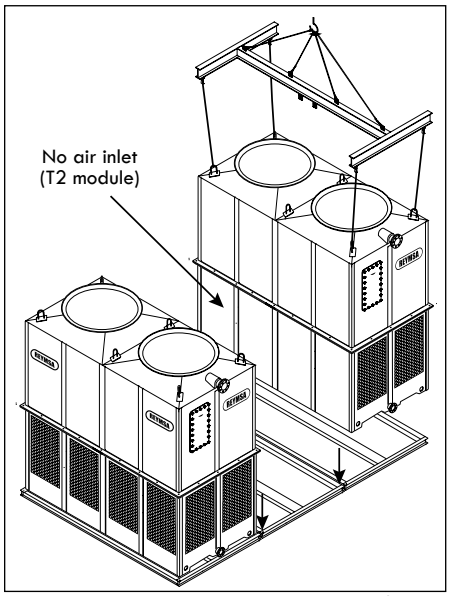


Figure A-63: L-Orientation - T2 module lifting and installation (RTM-B-L or RTPM-B-L)

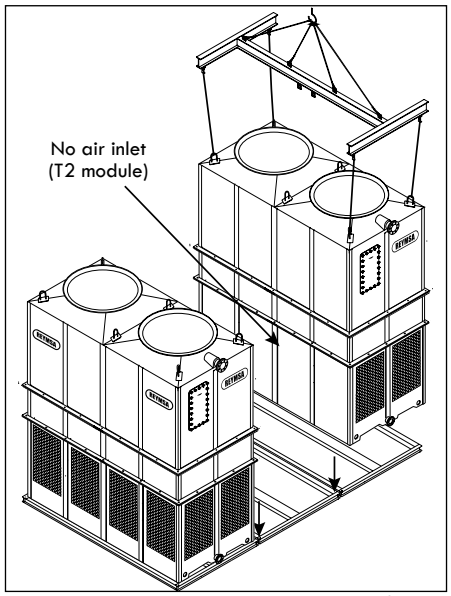


Figure A-64: L-Orientation - T2 module lifting and installation (RTM-D-L or RTPM-D-L)

After all the modules have been installed, proceed assemble the fan ducts.

C. Remove fan guard from fan section.

D. Then cradle/straddle the fan support with the straps (as shown in figure A-65 and A-66) so you can lift the fan duct with a crane and assemble it.

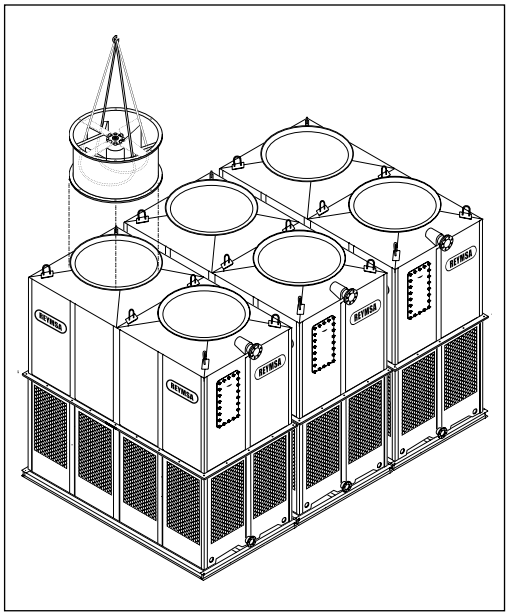


Figure A-65: Fan Duct installation for a Modular Tower (RTM-B-L or RTPM-B-L)

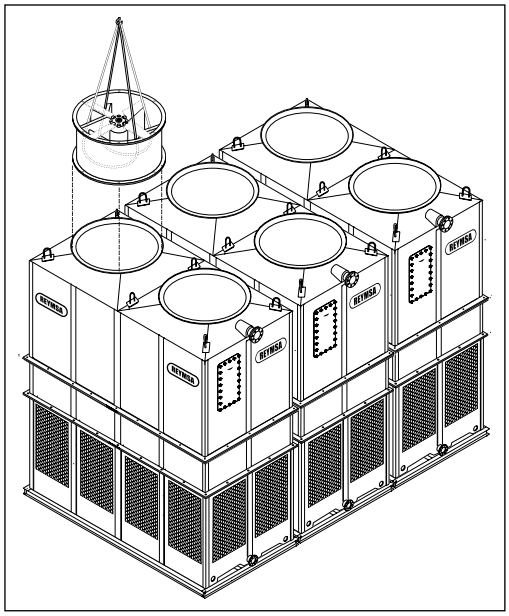


Figure A-66: Fan Duct installation for a Modular Tower (RTM-D-L or RTPM-D-L)

E. 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 distribution manifold of the corresponding body section. Now place fan duct 1 on the correspondent receiving flange on top of the Tower; make sure the bolt holes and the marks inside the fan duct and the receiving flange are aligned (see Figure A-67). Secure it with the stainless steel nut and bolt sets supplied by REYMSA.

F. Follow the same instructions to place the remaining fan ducts (see figure A-68).

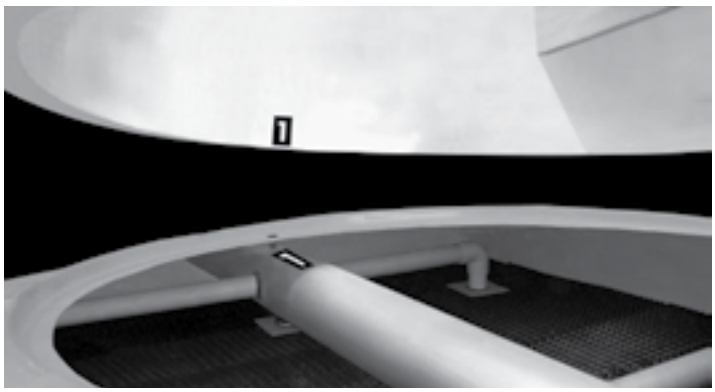


Figure A-67: Fan Duct alignment for a Modular Tower

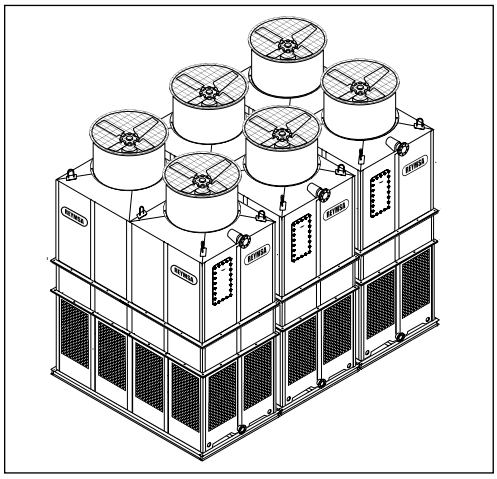


Figure A-68: Modular Tower installed by large side arrangement (-L)

A.5.3. SHORT SIDE ARRANGEMENT FOR A MODULAR TOWER (RTM-S RTPM-S)

The following steps are a procedure to install an RTM-B, RTM-D, RTPM-B or RTPM-D Modular Tower with **arrangement by the short side.**

Follow the same instructions from section "**A.5.1 GENERAL PROCEDURE**" to assemble the modules.

A. Lift the first module using a crane and a spreader bar and place it on top of the isolation pad and the steel base structure. Secure it with the galvanized steel nut and bolts sets (supplied by others) as shown on Figure A-69.

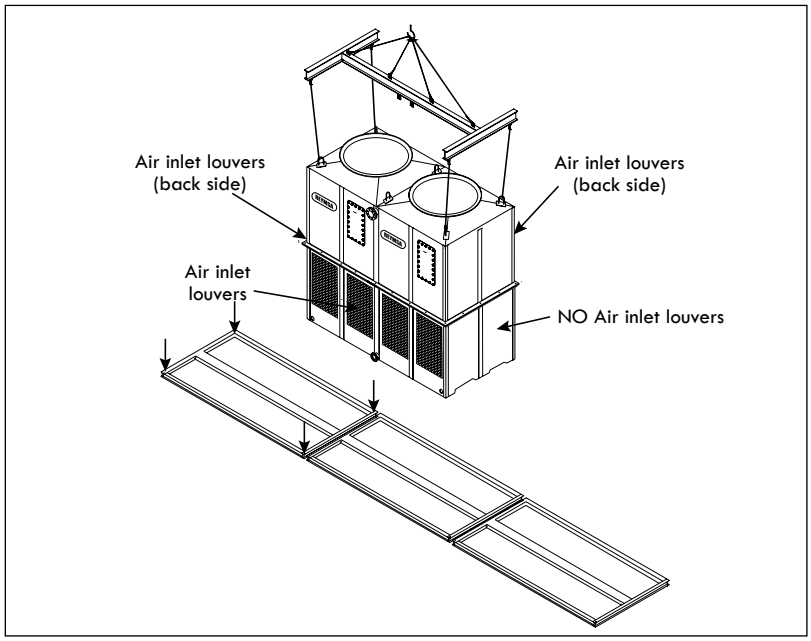


Figure A-69: S-Orientation - First T1 module lifting and installation (RTM-B-S or RTPM-B-S)

B. Follow the same procedure to install the next module. This module should have only two air inlets (on the large sides). See Figure A-70 for reference.

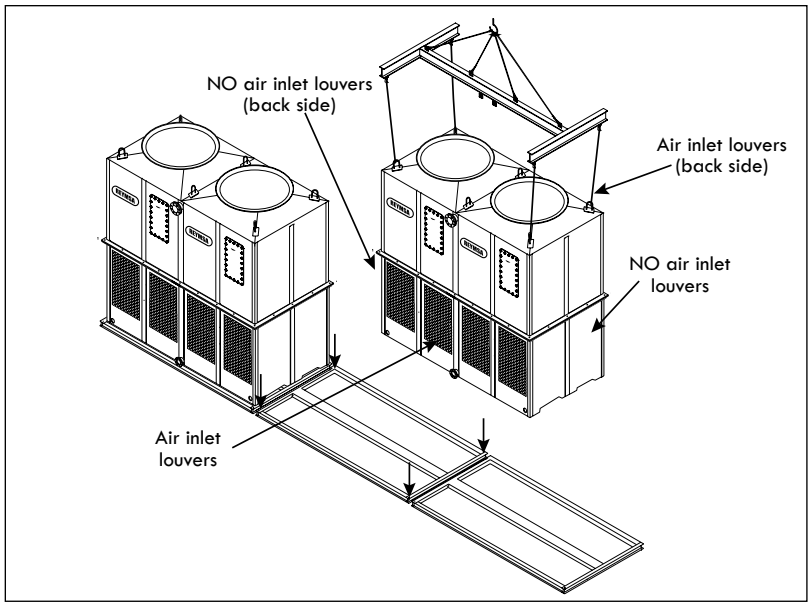


Figure A-70: S-Orientation - T1 module lifting and installation (RTM-B-S or RTPM-B-S)

C. Lift and install the last module. This module should have 3 air inlet sides (two large sides and one short side). See Figure A-71 for reference.

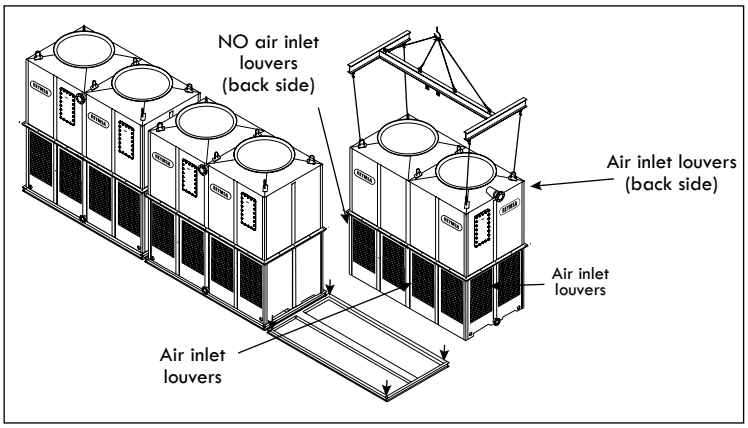


Figure A-71: S-Orientation - Last T1 module lifting and installation (RTM-B-S or RTPM-B-S)

D. After all the modules have been installed, proceed to assemble the fan ducts.

E. Remove fan guard.

F. Then cradle/straddle the fan support with the straps (as shown in figure A-72) so you can lift the fan duct with a crane and assemble it.

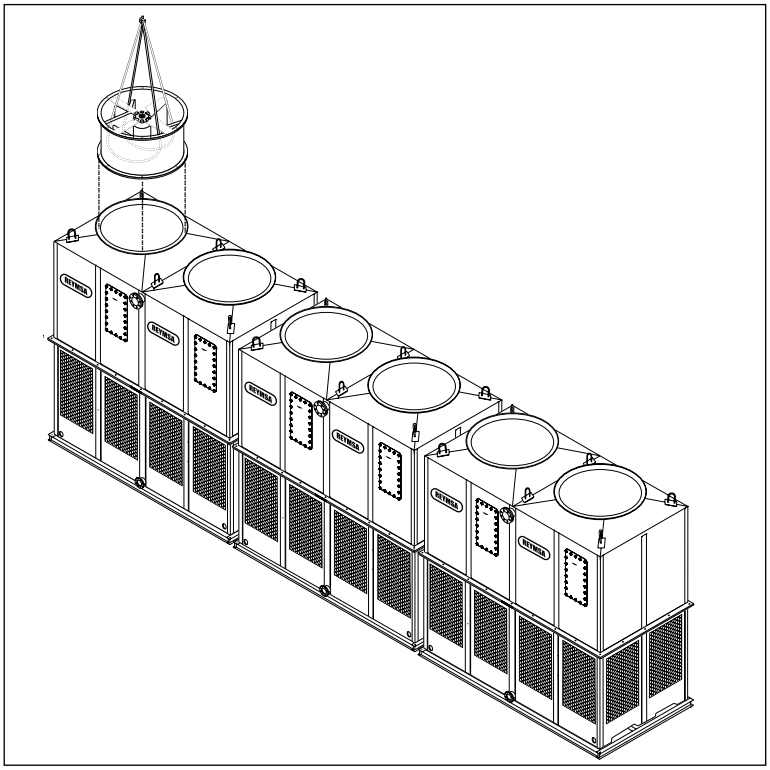


Figure A-72: Fan Duct installation for a Modular Tower (RTM-B-S or RTPM-B-S)

G. 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 distribution manifold of the corresponding body section. Now place fan duct 1 on the correspondent receiving flange on top of the Tower; make sure the bolt holes and the marks inside the fan duct and the receiving flange are aligned (see Figure A-73). Secure it with the stainless steel nut and bolt sets supplied by REYMSA.

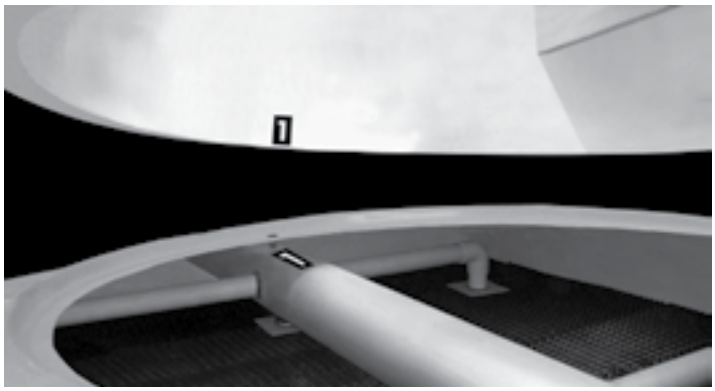


Figure A-73: Fan Duct alignment for a Modular Tower (RTM-B-S or RTPM-B-S)

H. Follow the same instructions to place the remaining fan ducts (see figure A-74)

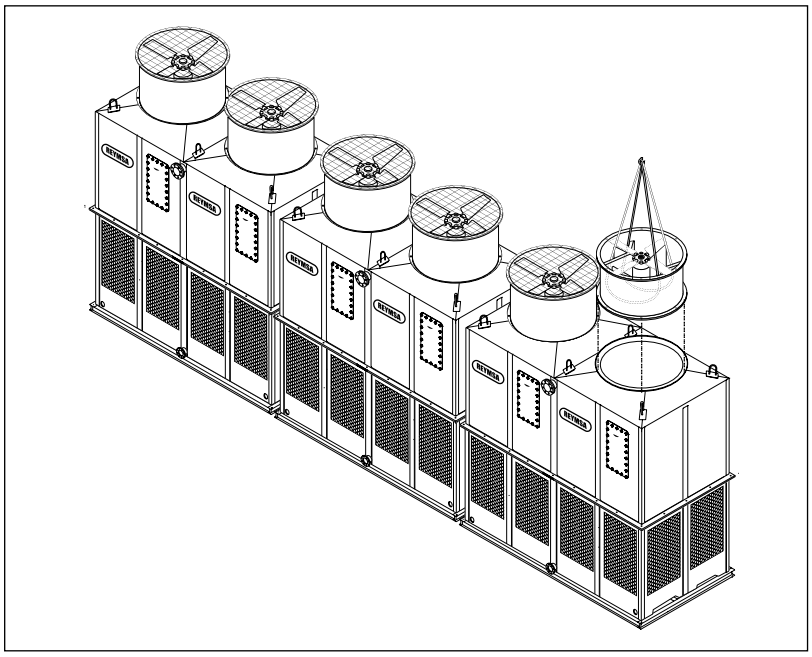


Figure A-74: Fan Duct installation for a Modular Tower (RTM-B-S or RTPM-B-S)

A.5.4 SQUARE ARRANGEMENT FOR A MODULAR TOWER (RTM-X or RTPM-X)

The following steps are a procedure to install an RTM-B, RTM-D, RTPM-B or RTPM-D Modular Tower in a four-module square arrangement with **one long side and one short side open** per module (**-X orientation**).

Follow the same instructions from section "**A.5.1 GENERAL PROCEDURE**" to assemble the modules.

A. Once the basin and body sections have been assembled, lift the Tower using a crane and a spreader bar and place it on top of the isolation pad and the steel base structure (see figure A-75).

B. Make sure that the water inlet and outlet are facing outward, and the sides without air inlets (louvers) are facing inward. Secure it with the stainless steel nut and bolts sets (supplied by others) as shown on Figure A-75.

C. Lift the second module and place it on top of the isolation pad and the steel structure, making sure that the side without air inlets is facing inward, parallel to the long side of the first module, and that the water inlet and outlet are facing outward. Secure it with the galvanized steel nut and bolts sets (supplied by others) as shown on Figure A-76.

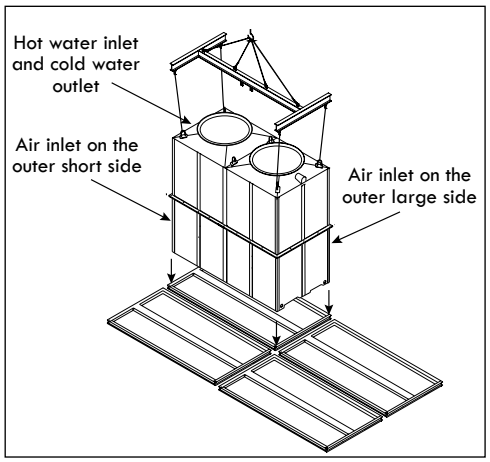


Figure A-75: X-Orientation - First T2 module lifting and installation (RTM or RTPM Models)

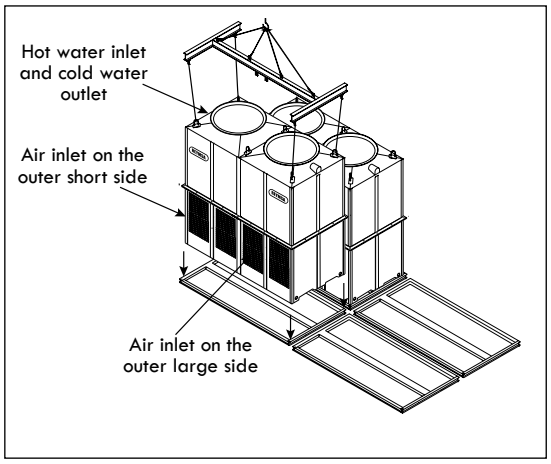


Figure A-76: X-Orientation - Second T2 module lifting and installation (RTM or RTPM Models)

D. Repeat the previous two steps to install the remaining modules. Pay attention to the correct module arrangement; Each module is labeled alphabetically (module 1: A; module 2: B, etc.) for a proper installation (see Figure A-77 and Figure A-78).

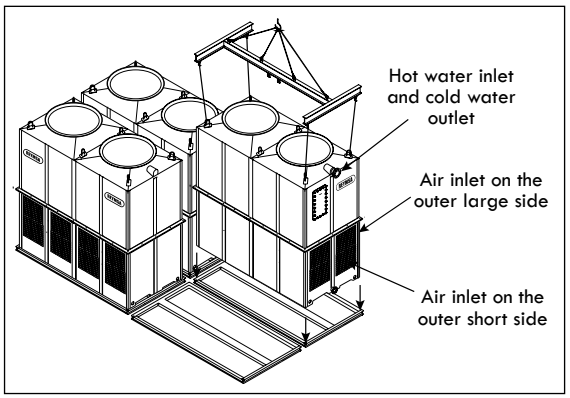


Figure A-77: X-Orientation - Third T2 module lifting and installation (RTM or RTPM Models)

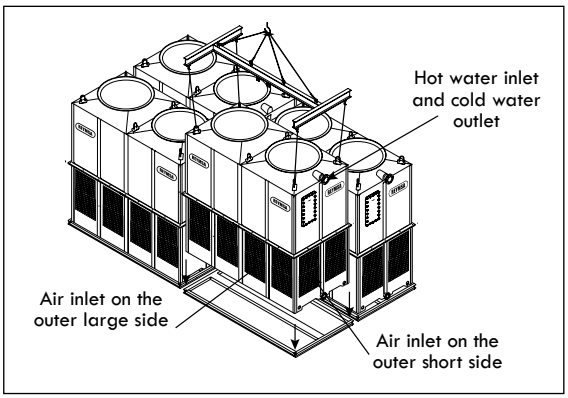


Figure A-78: X-Orientation - Fourth T2 module lifting and installation (RTM or RTPM Models)

E. After all the modules have been installed, proceed with the assembly of the fan ducts.

F. Remove fan guard from fan section.

G. Then cradle/straddle the fan support with the straps (as shown in figure A-79) so you can lift the fan duct with a crane and assemble it.

H. 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 distribution manifold of the corresponding body section. Now place fan duct 1 on the correspondent receiving flange on top of the Tower; make sure the bolt holes and the marks inside the fan duct and the receiving flange are aligned (see Figure A-80). Secure it with the stainless steel nut and bolt sets supplied by REYMSA.

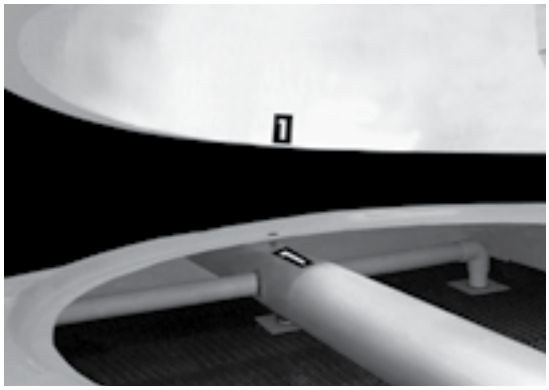


Figure A-79: Fan Duct alignment for a Modular Tower

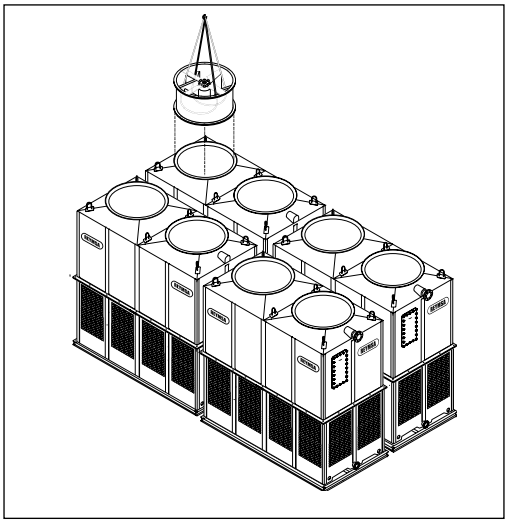


Figure A-80: Fan Duct installation for a Modular Tower (RTM or RTPM Models)

I. Follow the same instructions to place the remaining fan ducts (see figure A-81).

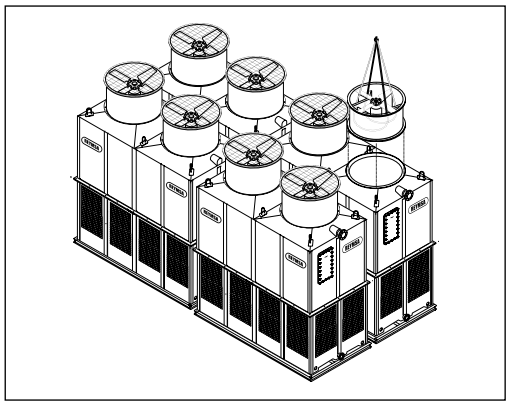


Figure A-81: Fan Duct installation for a Modular Tower (RTM or RTPM Models)

A.6. ASSEMBLY INSTRUCTIONS FOR MODULAR TOWERS (RTGM and RTGMTC)

A.6.1 GENERAL PROCEDURE FOR RTGMTC 8, 10, 12 AND 14 FT WIDE

Follow this procedure to assembly and install an RTGM or RTGMTC Cooling Tower. Use drift pins to align bolt holes and use stainless steel bolts to torque the sections together.

A. Upon the arrival of the equipment to its final destination, check for any abnormality or apparent damage on the packaging before unloading the Cooling Tower from the transportation vehicle

B. After assuring the equipment is received in proper condition, proceed to unload it from the transportation vehicle, piece by piece, with a crane (using a spreader bar) or forklift of the appropriate capacity, see Figure A-82 for an example.

C. For crane lifting, it's recommended to use a minimum lifting angle of 60° between the strap and the horizontal. Each section of the Tower has U-bolts for lifting. Place the straps through the U-bolts (as shown in Figure A-82) and use a spreader bar to avoid damage on the upper edge of the Tower. Don't balance until tensing the straps.

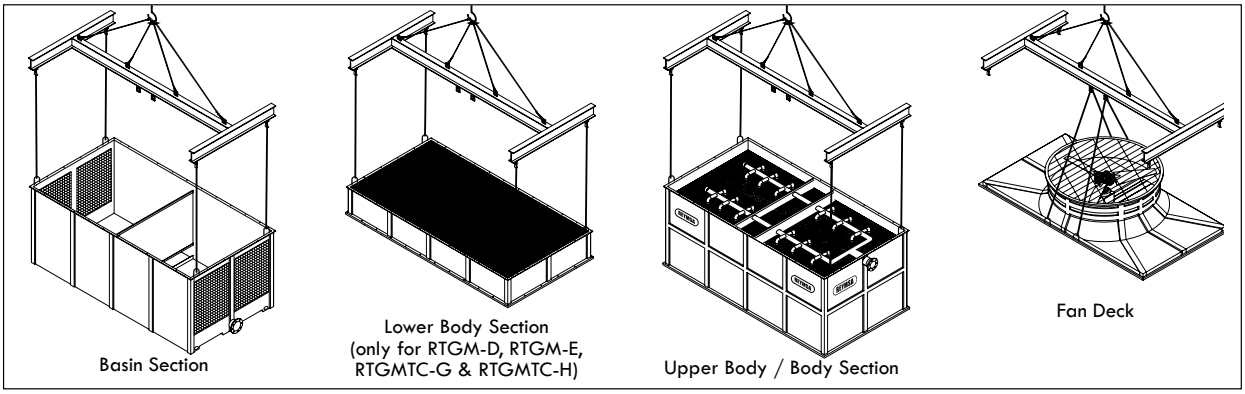


Figure A-82: Crane lifting for a Modular Tower (RTGM and RTGMTC)

D. Remove the plastic wrap that surrounds the Tower and its components, and loosen the nuts and bolts that keep the body & basin attached to the wooden pallet (those located at the bottom of basin).

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

F. 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.11.1 LEVELING AND TOWER SUPPORTS".

G. Before you begin assembling the cooling tower, see the APPENDIX G: LABELING FOR ALIGNMENT AND ASSEMBLY SEQUENCE".

H. Each module of an RTGM or RTGMTC model should be assembled on the floor before installing it on the steel base support.

I. Remove the U-bolts located on the flange of basin section #1 before installing the body section #1 (see Figure A-83).

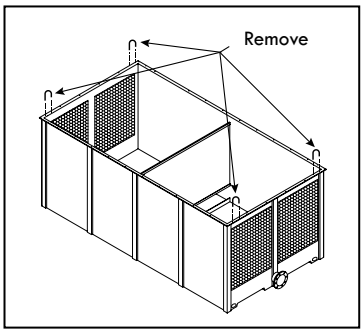


Figure A-83: Removing the U-bolts from basin of a Modular Tower (RTGM or RTGMTC)

J. Assemble body section #1 (for RTGM-B or RTGMTC-C2) with the basin section #1, making sure that the bolt holes on body section #1 are aligned with the perforations on basin section #1, then bolt down and

secure the horizontal flanges with the stainless steel nut and bolt sets supplied by REYMSA (see Figure A-84 for reference).

K. **Only for RTGM-D, RTGM-E, RTGMTC-G & RTGMTC-H models**: Assemble Lower Body section #1 on top of basin section #1, make sure that the bolt holes on Lower Body section #1 are aligned with the perforations on basin section #1, then bolt down and secure the horizontal flanges with the stainless steel nut and bolt sets supplied by REYMSA (see Figure A-85).

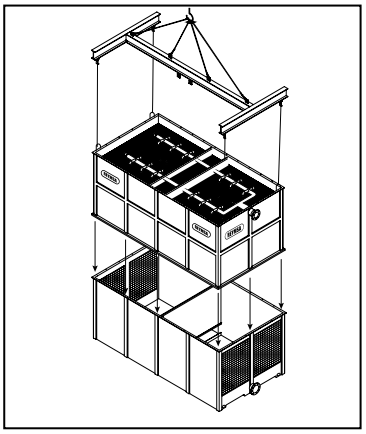


Figure A-84: Body section installation for a modular tower (RTGM-B or RTGMTC-C2)

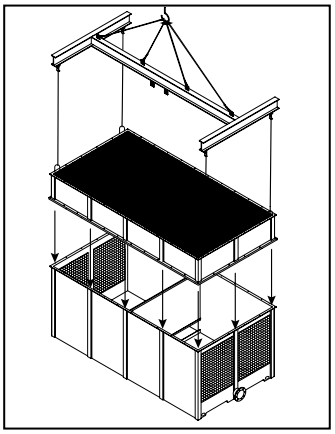


Figure A-85: Lower body section assembly for a modular tower (RTGM-D, RTGM-E, RTGMTC-G & RTGMTC-H)

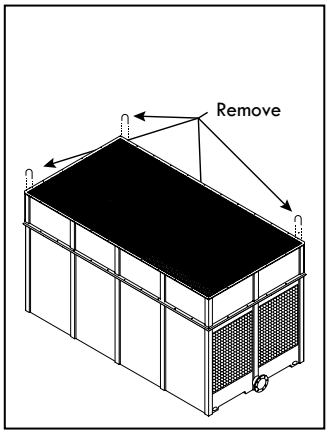


Figure A-86: Removing U-bolts from the Lower Body section for a modular tower (RTGM-D, RTGM-E, RTGMTC-G & RTGMTC-H)

L. **Only for RTGM-D, RTGM-E, RTGMTC-G & RTGMTC-H models**: Remove U-bolts from Lower Body section before installing the next section (see Figure A-86).

M. **Only for RTGM-D, RTGM-E, RTGMTC-G & RTGMTC-H models**: Place Upper Body section #1 on top of Lower Body section #1, making sure that the bolt holes are aligned (see Figure A-87). Bolt down and secure the horizontal flanges with the stainless steel nut and bolt sets supplied by REYMSA.

N. **Only for RTGM-D, RTGM-E, RTGMTC-G & RTGMTC-H models**: Remove U-bolts from top of the Upper Body section (see Figure A-88).

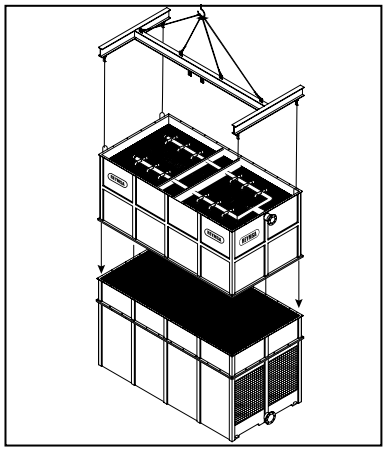


Figure A-87: Upper Body section installation for a modular tower (RTGM-D, RTGM-E, RTGMTC-G & RTGMTC-H)

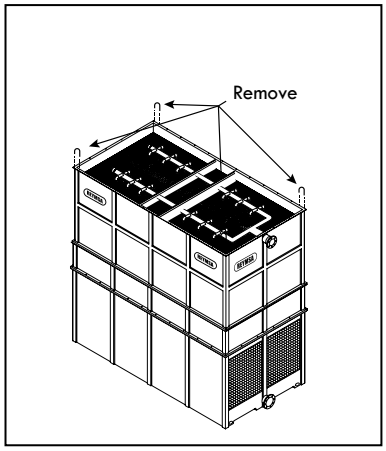


Figure A-88: Removing U-bolts from the Upper Body section of a modular tower (RTGM-D, RTGM-E, RTGMTC-G & RTGMTC-H)

O. RTGM and RTGMTC models have a section called "Fan Deck" which is at the top of the Tower (see Figure A-89). The Fan Deck with duct contains a gear drive fan and a motor mounted on a structural Hot Dip Galvanized Steel support with an "I" shape configuration, and a corrosion resistant safety screen mesh.

P. Before lifting the Fan Deck Section, remove the safety screen mesh (only for RTGM-8 and RTGMTC-8 wide models).

Q. Secure the Fan Deck Section using the U-bolts next to the fan duct to lift this section (It's recommended that the bands be adjustable).

R. 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 nut and bolt sets supplied by

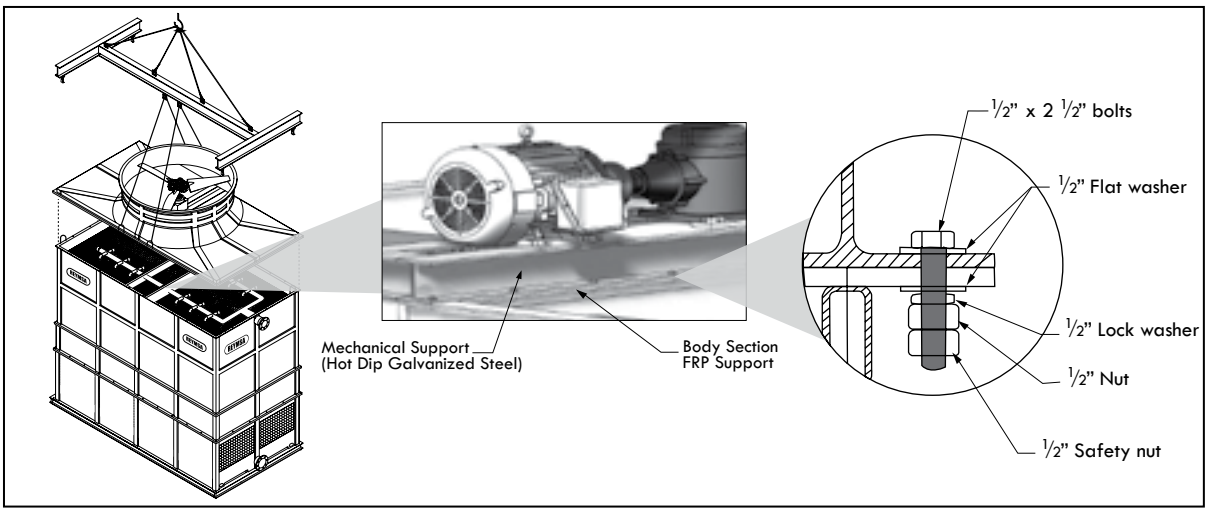


Figure A-89: Fan Deck assembly for an RTGM or RTGMTC model.

REYMSA.

S. After installing the fan deck section, access to inside of the fan deck section and bolt down the Galvanized Steel mechanical support to the Fiberglass (FRP) support (see Figure A-89). The Galvanized Steel mechanical support is built in an "I" shaped configuration and this mechanical support must be bolted to the Fiberglass (FRP) support in the upper section on which it sets. The bolts must be installed on the full perimeter of the "I" shaped mechanical support. Access to perform this assembly inside to tower is through the fan guard access door (see Figure A-92).

Only if your tower has the motor out of the air stream, follow steps T to Y:

T. The fan, motor and gear box are installed on a hot-dip galvanized steel support in a "T" shape configuration (See A-90 figure).

NOTE:
If your tower has the optional Direct Drive Permanent Magnet Motor, refer to "SECTION A.10.6 DIRECT DRIVE PERMANENT MAGNET MOTOR FOR RTG, RTGTC, RTGM AND RTGMTC MODELS".

U. Before lifting up the fan deck, remove the fan guard. See Figure A-91 (only for RTGM-8 and RTGMTC-8 wide models).

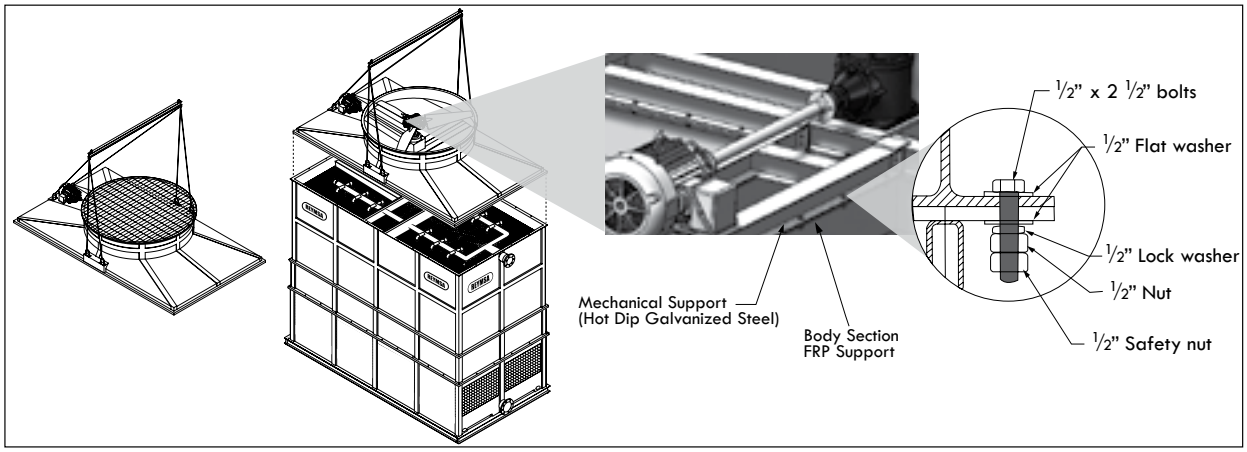


Figure A-90: Fan Deck installation of an RTGM or an RTGMTC Tower with motor installed outside the airstream.

V. Secure the Fan Deck Section using the U-bolts next to the Fan Duct to lift this section. Use the U-bolts next to the motor to stabilize this section.

W. Place the fan deck section over the body of the Cooling Tower, making sure that the holes of the fan deck section and the upper body section are aligned (see figure A-90). Then proceed to secure the two sections together at the horizontal flange using the stainless steel bolt and nut sets supplied by REYMSA.

X. After installing the fan deck section, access inside of the fan deck section and bolt down the Galvanized Steel support to the Fiberglass (FRP) support (see Figure A-90). The Galvanized Steel mechanical support is built in a "T" shaped configuration and this base must be bolted to the Fiberglass (FRP) support in the upper section on which it sets. The bolts must be installed on the full perimeter of the "T" shaped mechanical support. Access to perform this assembly inside the tower through the fan guard access door (except for 8' wide models which require removal of the fan guard).

Y. Place the fan guard back over the duct section (see Figure A-91) and bolt it down (only for RTGM-8 and RTGMTC-8 wide models).

Z. The 10 and 12 wide RTGM and 10, 12 and 14 wide RTGMTC models have an access door on the fan guard to access the inside of the fan deck (see Figure A-92).

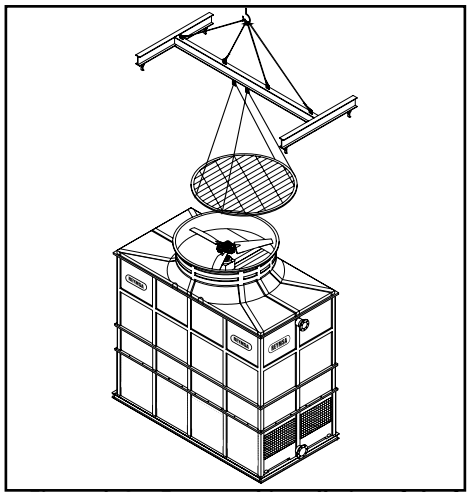


Figure A-91: Fan guard installation of the fan deck in an RTGM and RTGMTC Tower model.

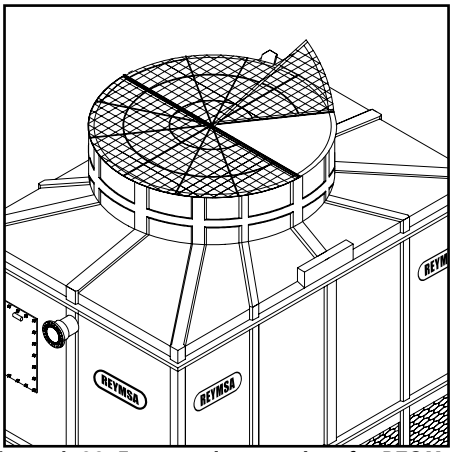


Figure A-92: Fan guard access door for RTGM and RTGMTC models.

A.6.2 LARGE SIDE ARRANGEMENT FOR A MODULAR TOWER (RTGM-L & RTGMTC-L)

The following steps are a procedure to install an RTGM or RTGMTC Modular Tower with **arrangement by the large side.**

Follow the same instructions from section "**A.6.1 GENERAL PROCEDURE**" to assemble the modules.

A. Once the basin and body sections have been assembled, lift the Tower using a crane and a spreader bar and place it on top of the isolation pad and the steel base structure (see Figure A-93 and Figure A-94). Secure it with the galvanized steel nut and bolts sets (supplied by others) as shown on Figure A-95.

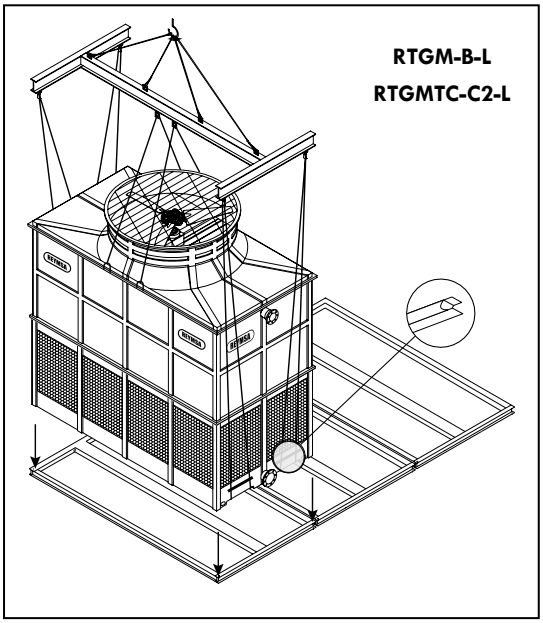


Figure A-93: L-Orientation - First T1 module lifting and installation (RTGM-B-L or RTGMTC-C2-L)

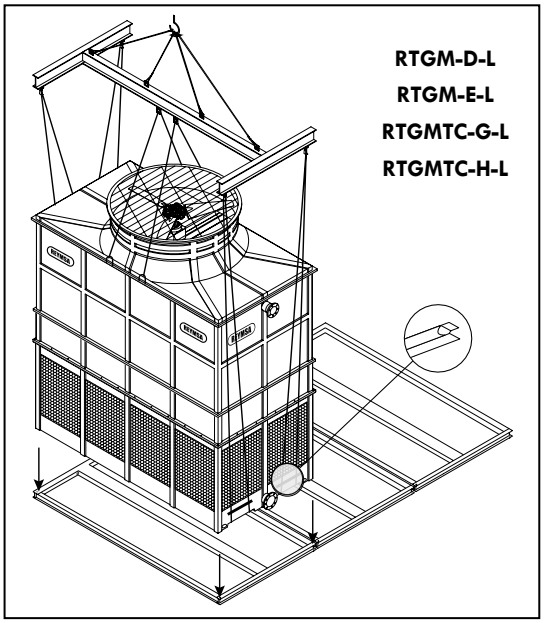


Figure A-94: L-Orientation - First T1 module lifting and installation (RTGM-D-L, RTGM-E-L, RTGMTC-G-L & RTGMTC-H-L)

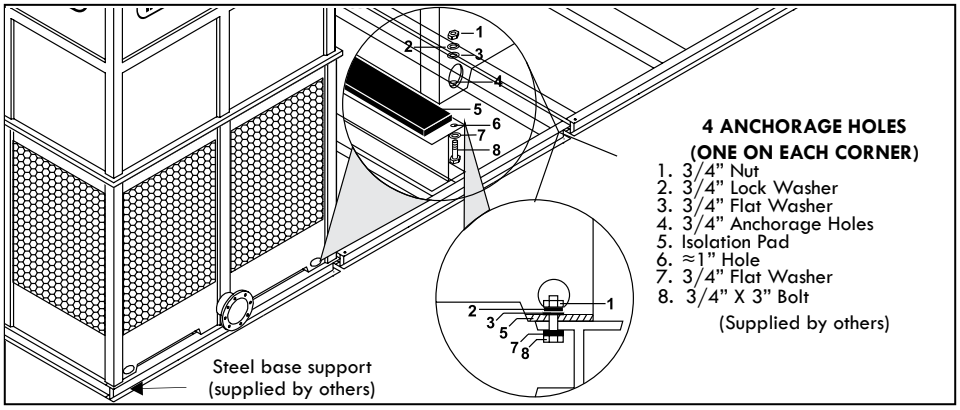


Figure A-95: Typical anchorage for a modular tower (RTGM or RTGMTC)

B. Repeat the previous steps to install the remaining modules. Pay attention to the correct module arrangement; Each module is labeled alphabetically (module 1: A; module 2: B, etc.) for a proper installation see Figure A-96 to Figure A-99).

- First module assembled should be T1 module, with 3 air inlet sides (2 short sides, 1 large side).
- Next module(s) must be T2 module, with 2 air inlet sides (short sides).
- The final module must be T1 type module, with 3 air inlet sides (2 short sides, 1 large side).

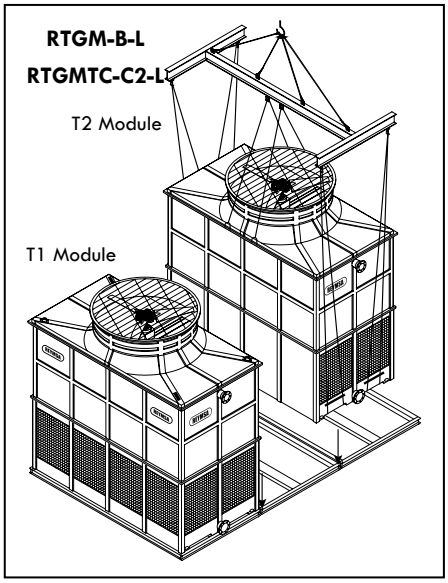


Figure A-96: L-Orientation - T2 module lifting and installation (RTGM-B-L or RTGMTC-C2-L)

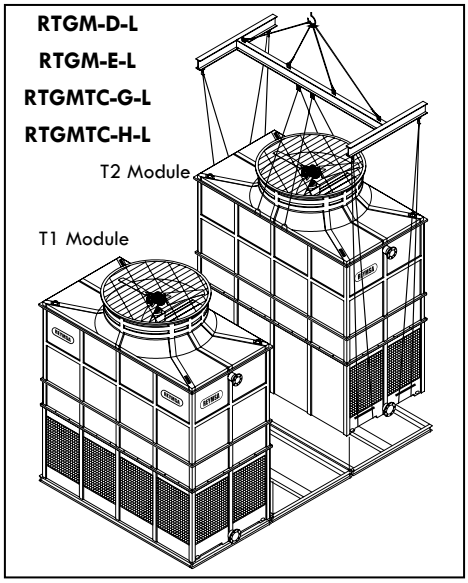


Figure A-97: L-Orientation - T2 module lifting and installation (RTGM-D-L, RTGM-E-L, RTGMTC-G-L & RTGMTC-H-L)

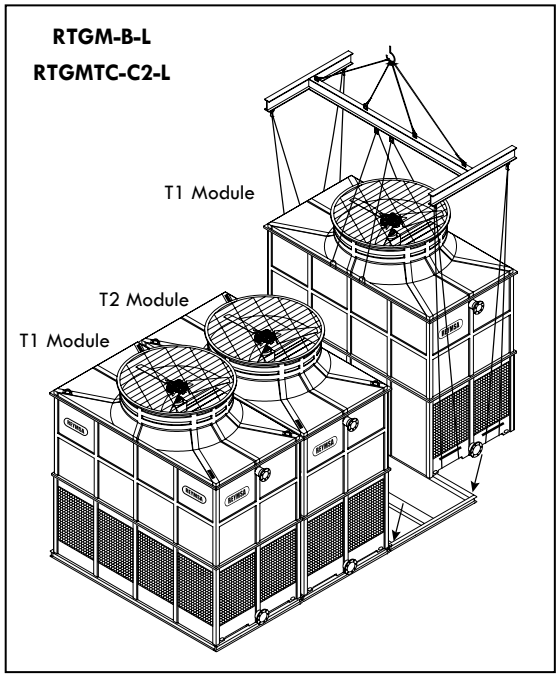


Figure A-98: L-Orientation - Last T1 module lifting and installation (RTGM-B-L or RTGMTC-C2-L)

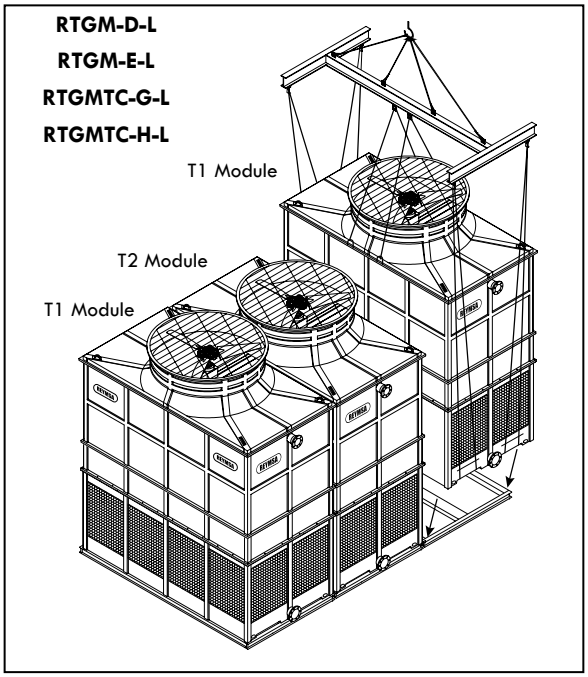


Figure A-99: L-Orientation - Last T1 module lifting and installation (RTGM-D-L, RTGM-E-L, RTGMTC-G-L & RTGMTC-H-L)

C. Make sure all the modules are bolted down and secured to the steel support.

A.6.3 SHORT SIDE ARRANGEMENT FOR A MODULAR TOWER (RTGM-S OR RTGMTC-S)

The following steps are a procedure to install an RTGM or RTGMTC Modular Tower with **arrangement by the short side.**

Follow the same instructions from section "**A.6.1 GENERAL PROCEDURE**" to assemble the modules.

A. Lift the first module using a crane and a spreader bar and place it on top of the isolation pad and the steel base structure. Secure it with the galvanized steel nut and bolts sets (supplied by others) as shown on Figure A-100.

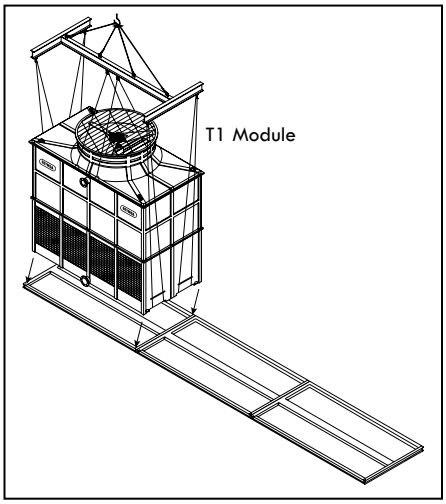


Figure A-100: S-Orientation - First T1 module lifting and installation (RTGM-B-S & RTGMTC-B-S)

B. Follow the same procedure to install the next module. This module should have only two air inlets (on the large sides). See Figure A-101 for reference.

C. Lift and install the last module. This module should have 3 air inlet sides (two large sides and one short side). See Figure A-102 for reference.

D. Make sure all the modules are bolted down and secured to the steel support.

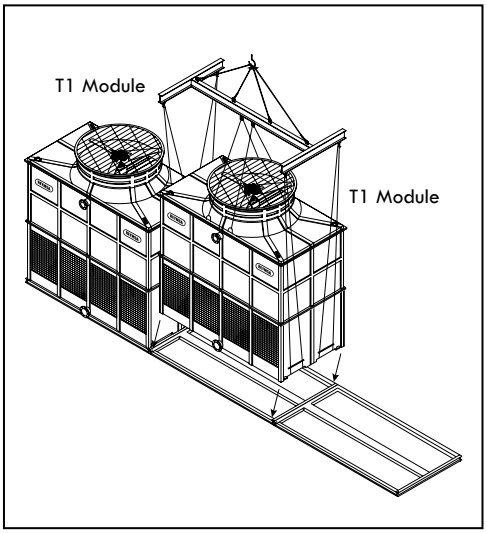


Figure A-101: S-Orientation - T1 module lifting and installation (RTGM-B-S & RTGMTC-C2-S)

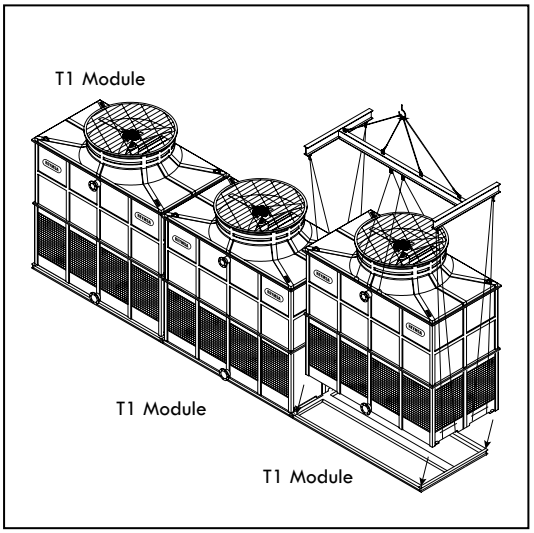


Figure A-102: S-Orientation - Last T1 module lifting and installation (RTGM-B-S & RTGMTC-C2-S)

A.6.4 SQUARE ARRANGEMENT FOR A MODULAR TOWER (RTGM-X & RTGMTC-X)

The following steps are a procedure to install an RTGM & RTGMTC Modular Tower in a four-module square arrangement with one long side open and one short side open per module (-X orientation).

Follow the same instructions from section "**A.6.1 GENERAL PROCEDURE**" to assemble the modules.

A. Once the basin, body and fan deck sections have been assembled, lift the Tower using a crane and a spreader bar and place it on top of the isolation pad and the steel base structure.

B. Make sure that the water inlet and outlet are facing outward, and the sides without air inlets (louvers) are facing inward. Secure it with the stainless steel nut and bolts sets (supplied by others) as shown on Figure A-103.

C. Lift the second module and place it on top of the isolation pad and the steel structure, making sure that the side without air inlets is facing inward, parallel to the long side of the first module, and that the water inlet and outlet are facing outward. Secure it with the galvanized steel nut and bolts sets supplied by others (see Figure A-104).

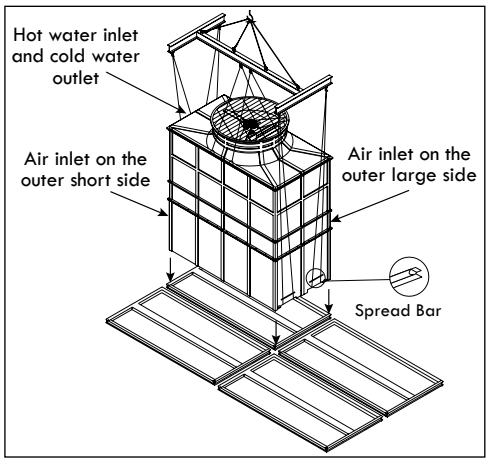


Figure A-103: X-Orientation - First T2 module lifting and installation (RTGM and RTGMTC Models)

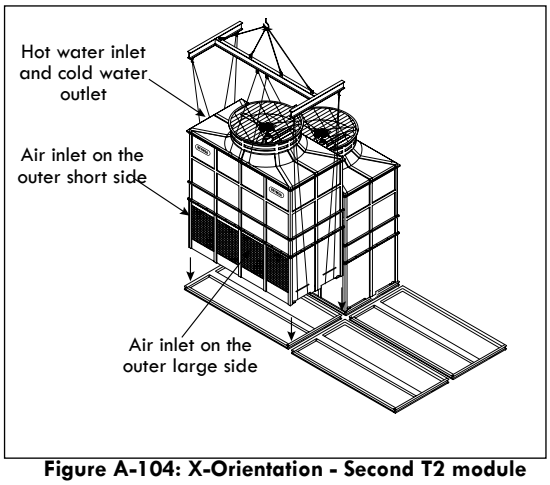


Figure A-104: X-Orientation - Second T2 module lifting and installation (RTGM and RTGMTC Models)

D. Repeat the previous two steps to install the remaining modules. Pay attention to the correct module arrangement; Each module is labeled alphabetically (module 1: A; module 2: B, etc.) for a proper installation (see Figure A-105 and Figure A-106).

E. Make sure all the modules are bolted down and secured to the steel support.

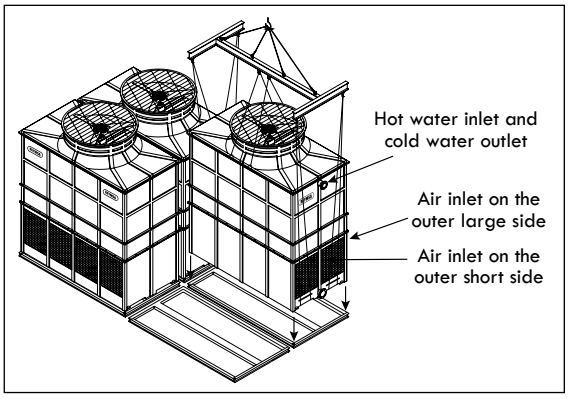


Figure A-105: X-Orientation - Third T2 module lifting and installation (RTGM and RTGMTC Models)

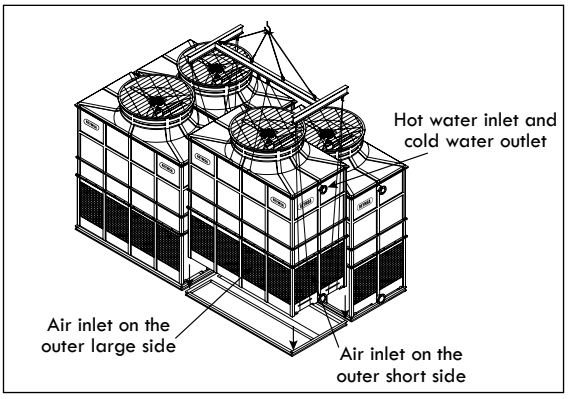


Figure A-106: X-Orientation - Fourth T2 module lifting and installation (RTGM and RTGMTC Models)

A.6.5 ASSEMBLY INSTRUCTIONS FOR MODULAR TOWERS RTGMTC FROM 20x18 TO 28x25 MODELS

Follow this procedure to assemble and install an RTGMTC Cooling Tower. Use drift pins to align bolt holes and use stainless steel bolts to torque the sections together.

A. Upon the arrival of the equipment to its final destination, check for any abnormality or apparent damage on the packaging before unloading the Cooling Tower from the transportation vehicle

B. After assuring the equipment is received in proper condition, proceed to unload it from the transportation vehicle, piece by piece, with a crane (using a spreader bar) or forklift of the appropriate capacity, see Figure A-82 for an example.

C. For crane lifting, it's recommended to use a minimum lifting angle of 60° between the strap and the horizontal. Each section of the Tower has U-bolts for lifting. Place the straps through the U-bolts (as shown in Figure A-107) and use a spreader bar to avoid damage on the upper edge of the Tower. Don't balance until tensing the straps.

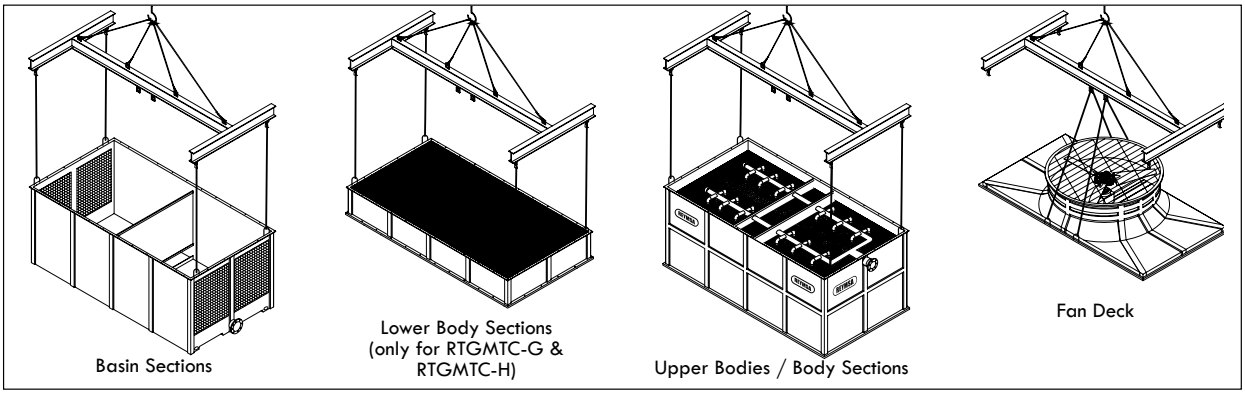


Figure A-107: Crane lifting for a Modular Tower (RTGMTC)

D. Remove the plastic wrap that surrounds the Tower and its components, and loosen the nuts and bolts that keep the body & basin sections attached to the wooden pallet (those located at the bottom of sections).

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

F. 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.11.1 LEVELING AND TOWER SUPPORTS".

G. Tower modules are identified by a label on each section. Basins, bodies and fan deck of module #1 will be labeled "M1A" and "M1B". Basins, bodies and fan deck of module #2 will be labeled "M2A" and "M2B", etc.).

H. Each module of an RTGMTC model should be assembled on the floor before installing it on the steel base support.

I. Remove the U-bolts located on the flange of basin section # "M1A" before installing the body section # M1A" (see Figure A-108).

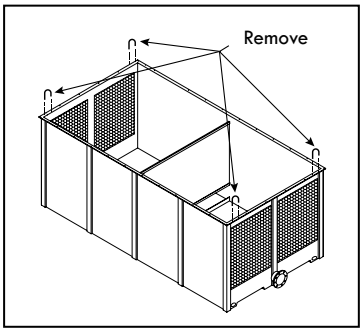


Figure A-108: Removing the U-bolts from basin of a Modular Tower (RTGMTC)

J. Assemble body section #1 (for RTGMTC-C2) with the basin section # "M1A", making sure that the bolt holes on body section # "M1A" are aligned with the ones perforations on basin section # "M1A", then bolt down and secure the horizontal flanges with the stainless steel nut and bolt sets supplied by REYMSA (see Figure A-109 for reference).

K. **Only for RTGMTC-G & RTGMTC-H models:** Only for RTGMTC-G & RTGMTC-H models: Assemble Lower Body section # "M1A" on top of basin section # "M1A", make sure that the bolt holes on Lower Body section # "M1A" are aligned with the ones on basin section # "MA1", then bolt down and secure the horizontal flanges with the stainless steel nut and bolt sets supplied by REYMSA (see Figure A-110).

L. **Only for RTGMTC-G & RTGMTC-H models**: Remove U-bolts from Lower Body section before installing the next section (see Figure A-111).

M. **Only for RTGMTC-G & RTGMTC-H models**: Place Upper Body section #M1A on top of Lower Body section #M1A, making sure that the bolt holes are aligned (see Figure A-112). Bolt down and secure the horizontal flanges with the stainless steel nut and bolt sets supplied by REYMSA.

N. **Only for RTGMTC-G & RTGMTC-H models**: Remove U-bolts from top of the Upper Body section (see Figure A-113).

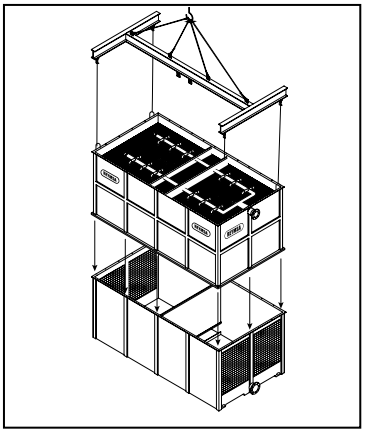


Figure A-109: Body section installation for a modular tower (RTGMTC-C2)

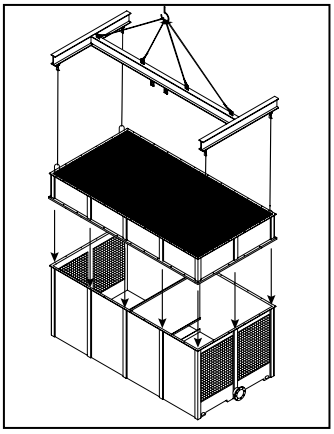


Figure A-110: Lower body section assembly for a modular tower (RTGMTC-G & RTGMTC-H)

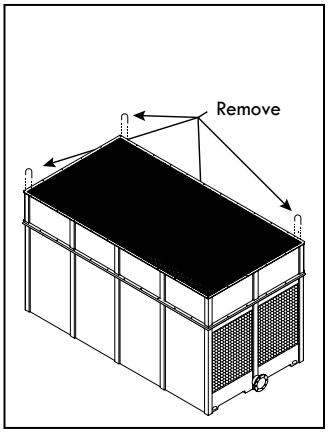


Figure A-111: Removing U-bolts from the Lower Body section for a modular tower (RTGMTC-G & RTGMTC-H)

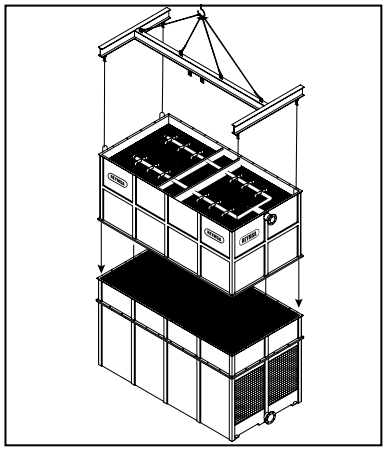


Figure A-112: Upper Body section installation for a modular tower (RTGMTC-G & RTGMTC-H)

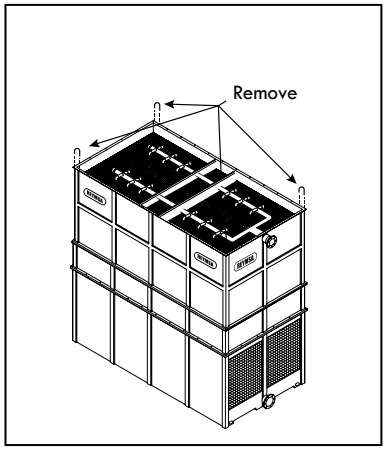


Figure A-113: Removing U-bolts from the Upper Body section of a modular tower (RTGMTC-G & RTGMTC-H)

O. Once the basin and body sections M1A have been assembled, lift the Tower using a crane and a spreader bar and place it on top of the isolation pad and the steel base structure (see Figure A-114). Secure it with the galvanized steel nut and bolts sets (supplied by others) as shown on Figure A-115.

P. Repeat procedure from step I to N to assemble the the basin and body sections M1B. Once the basin and body sections M1B have been assembled, lift the Tower using a crane and a spreader bar and place it on top of the isolation pad and the steel base structure next to the basin and body sections M1A (see Figure A-116). Secure it with the galvanized steel nut and bolts sets (supplied by others) as shown on Figure A-115.

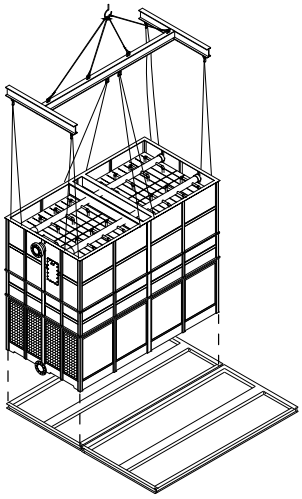


Figure A-114: Lift and install section M1A of the RTGMTC model.

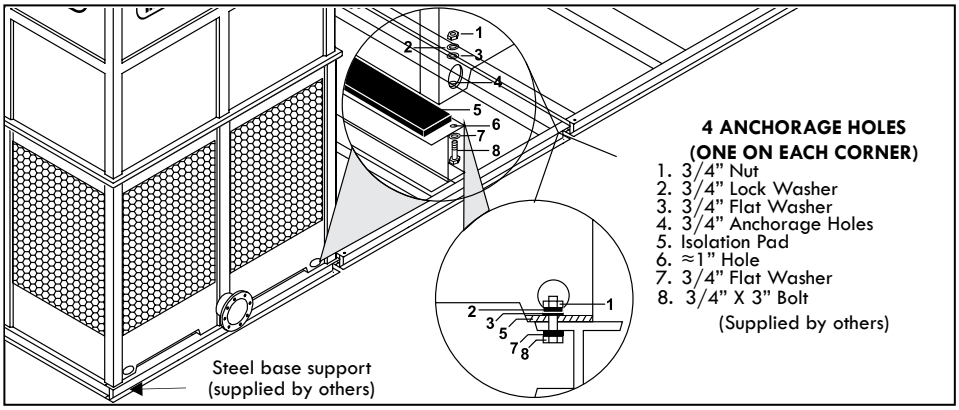


Figure A-115: Typical anchorage for a modular tower (RTGMTC)

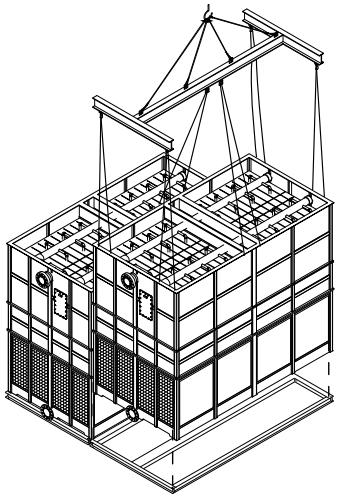


Figure A-116: Lift and install section M1B of RTGMTC model.

Q. RTGMTC models have a section called "Fan Deck" which is at the top of the Tower. The Fan Deck with duct contains a gear driven fan and a motor mounted on a structural Hot Dip Galvanized Steel support with an "I" shape configuration, and a corrosion resistant safety screen mesh.

R. To assemble the Fan deck section, initiate installing the Galvanized Steel mechanical support on top of the 2-module section. The Galvanized Steel mechanical support has installed on it one motor and one gear box. (See figure a-117).

S. The galvanized steel mechanical support must be bolted to the Fiberglass (FRP) support on the top of the 2-module section on which it sets. The bolts must be installed on the full perimeter of the "I" shaped mechanical support. (See figure A-118).

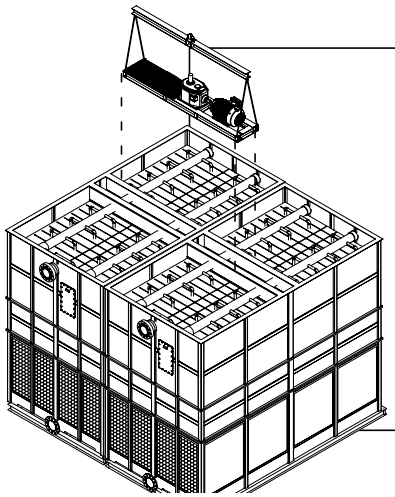


Figure A-117: Galvinazed Steel mechanical support installed on top of the 2-module section of the RTGMTC model.

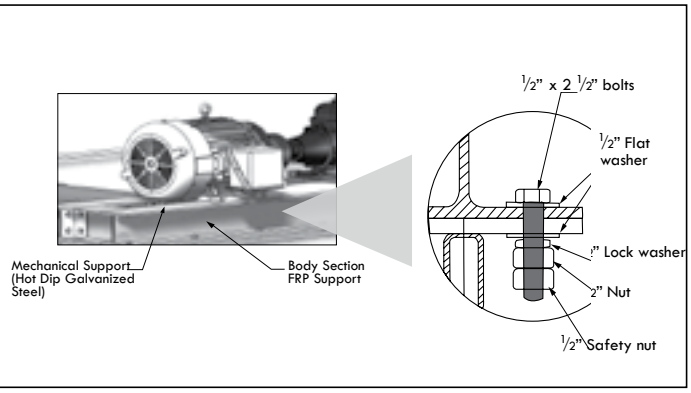


Figure A-118: Galvanized steel mechanical support assembly for RTGMTC model.

T. Assemble the Fan Deck by bolting each one of the 6 section as indicated. (See figure A-119).

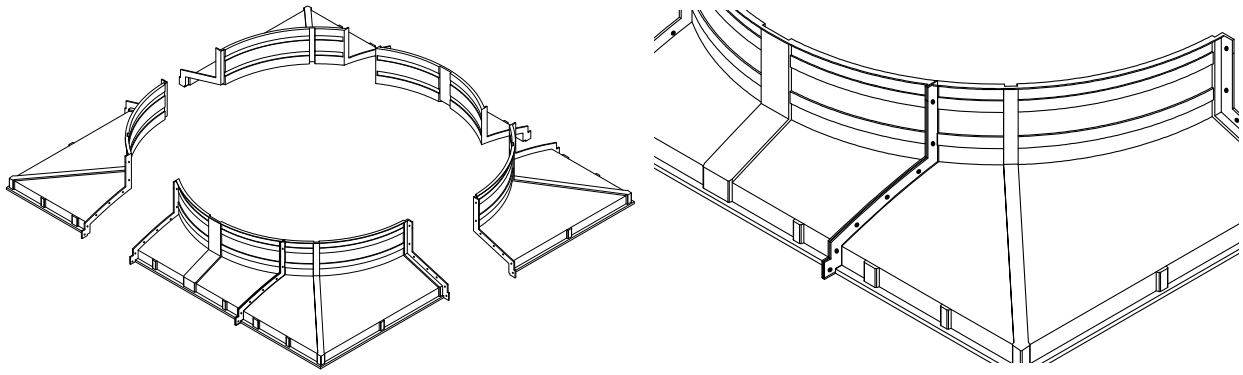


Figure 119: Assemble of the Fan Deck sections of an RTGMTC module.

U. 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 nut and bolt sets supplied by REYMSA.

V. Once the Fan Deck section has been assembled, secure the Fan Deck Section #M1 using the U-bolts next to the fan duct to lift this section (It's recommended that the bands be adjustable). Lift the fan deck section #M1 using a crane and a spreaded bar and install it on top of the 2-module Body Section #M1A and # M1B. Assemble Fan Deck section with body sections, making sure that the bolt holes on the Fan Deck Section are aligned with the ones on the 2-module Body Section #1. Secure it with stainless steel nut and bolt sets supplied by REYMSA. (See figure 120).

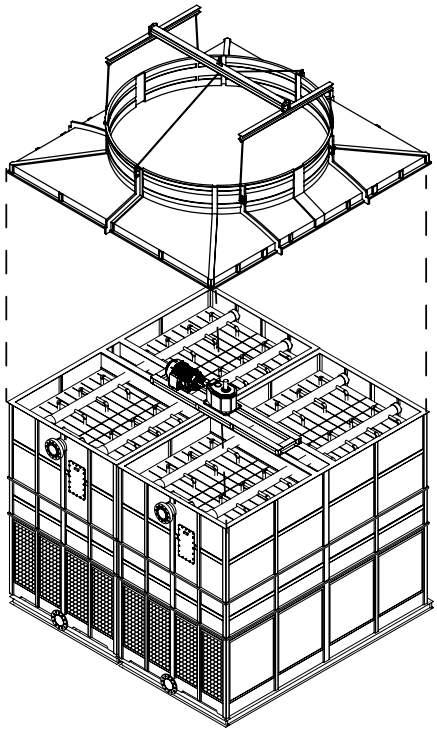


Figure A-120: Assemble of the Fan Deck on top of an RTGMTC module.

W. Once the Fan Deck section has been installed, assemble the fan on the ground. Using a crane and a spreaded bar lift the fan assembly and mount it on the gear drive box following the Fan assemble procedure (See figure A-121).

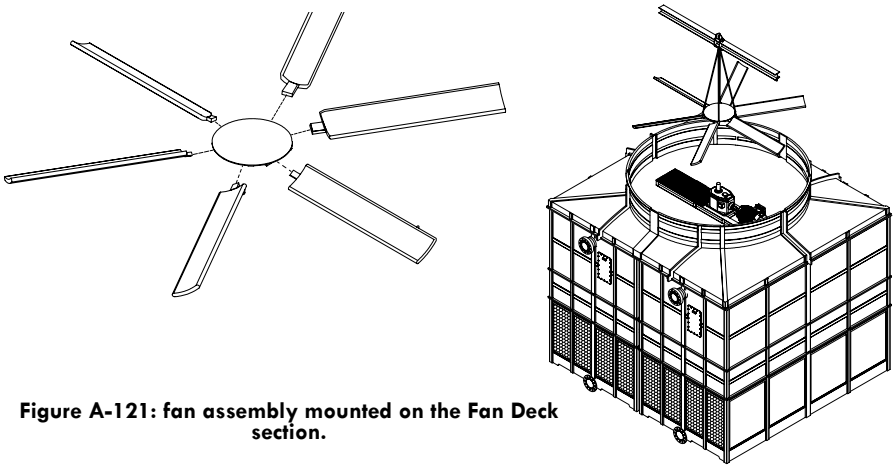


Figure A-121: fan assembly mounted on the Fan Deck section.

X. Assemble the 2-piece Fan Guard bolting each section as indicated. (See figure A-122).

Y. Once the fan Guard section has been assembled, secure the Fan Guard #M1 and lift this section (It's recommended that the bands be adjustable). Lift the fan Guard #M1 using a crane and a spreaded bar and install it on top of the fan deck Section #M1, making sure that the bolt holes on the Fan Guard Section are aligned with the ones on the Fan Deck Section #M1. Secure it with stainless steel nut and bolt sets supplied by REYMSA.(See figure A-122).

Z. Fan Guard section has an access door to allow perfom maintenance inside the fan Deck. (see Figure A-123).

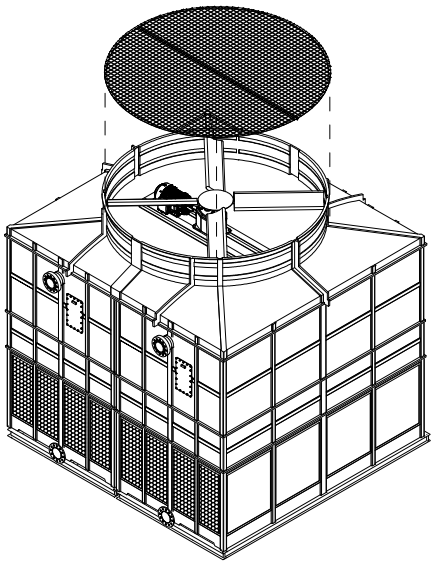


Figure A-122: Fan guard installation on the Fan Deck in a RTGMTC model

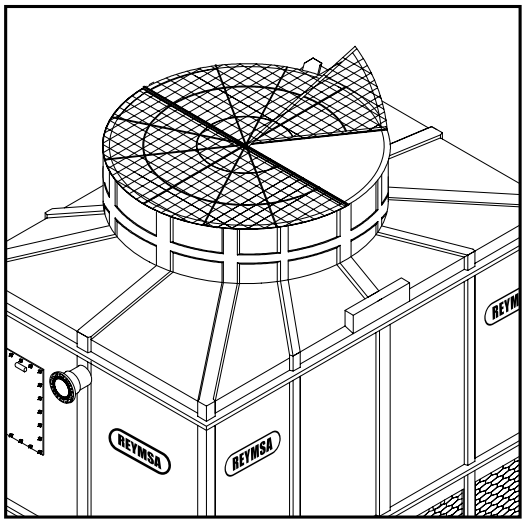


Figure A-123: Fan guard access door for RTGM and RTGMTC models.

NOTE
If your tower has the optional Direct Drive Permanent Magnet Motor, refer to "SECTION A.10.6 DIRECT DRIVE PERMANENT MAGNET MOTOR FOR RTG, RTGM, RTGTC AND RTGMTC MODELS

A.7 LOW SOUND FAN COOLING TOWERS: FAN ADAPTORS

Some RT models for low noise applications feature a Fan Adaptor (see Figure A-124) that differentiate them from the Standard Fan Models, along with sickle fan blades and lower RPM motors.

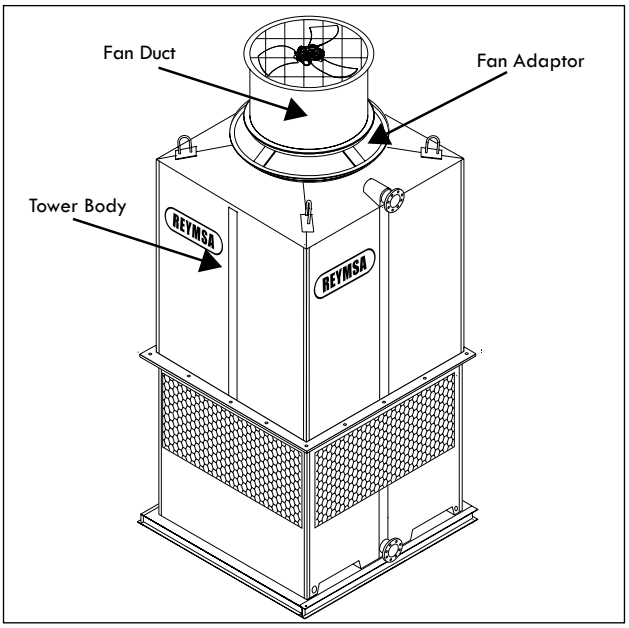


Figure A-124: Fan adaptor on a Single Fan Tower

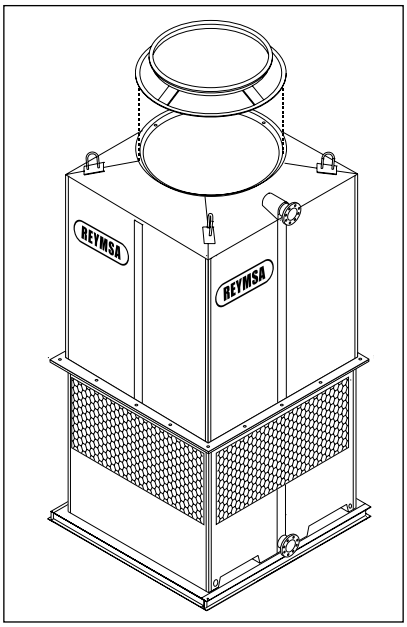


Figure A-125: Fan adaptor installation

When a Fan Adaptor is required, the assembly procedure for such Tower would be similar to the procedures already described in Sections A.2, A.3, A.5, (depending if it's a RT, RTU or a Modular 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, A.3, A.5 for reference), place the Fan Adaptor on the receiving flange located on top of the Tower (see Figure A-125); make sure the bolt holes and the marks inside the Fan adaptor are aligned (Figure A-126). Then secure it using the stainless steel nut and bolt sets supplied by REYMSA.

B. For the Two Fan, Four Fan and Modular Towers, follow the same instructions described in previous step to install remaining Fan Adaptors (see Figure A-127 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 distribution manifold of the corresponding body.

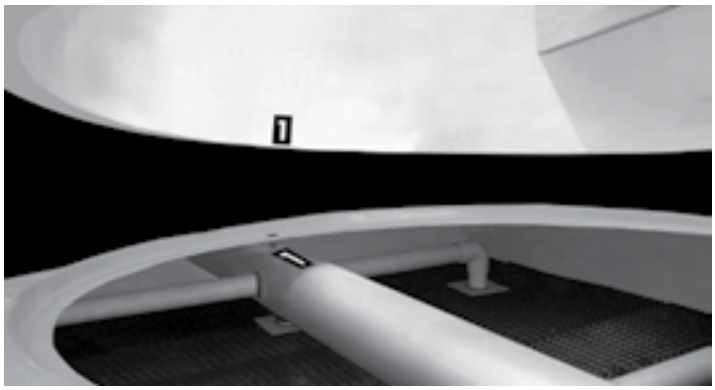


Figure A-126: Fan adaptor alignment

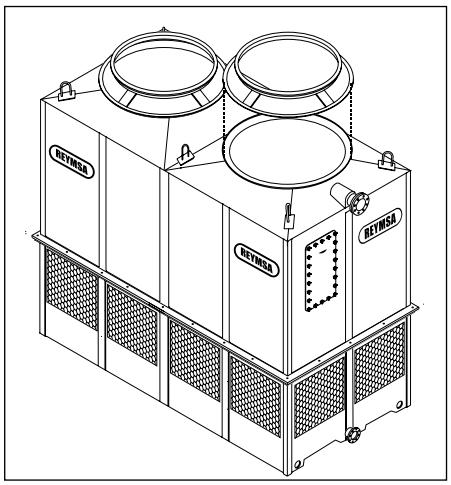


Figure A-127: Fan adaptor 2 installation on a Two Fan Tower

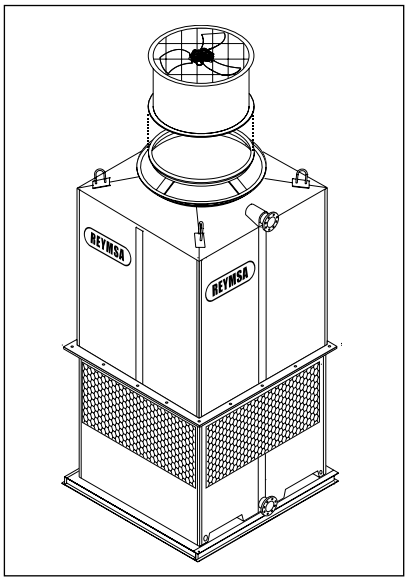


Figure A-128: Fan Duct installation on a fan adaptor

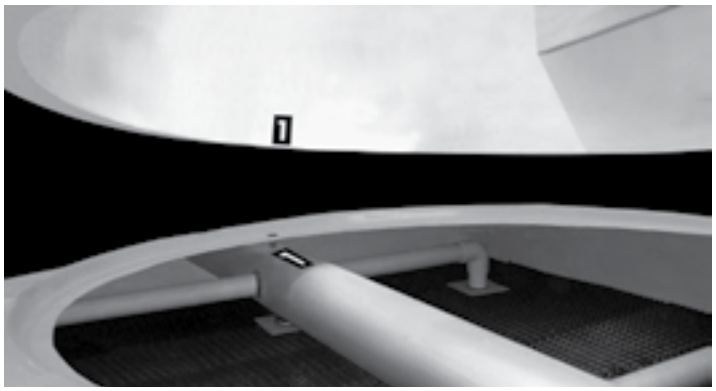


Figure A-129: Fan Duct aligment

C. Then place the fan duct on top of the fan adaptor; make sure the bolt holes and the marks inside the fan duct are aligned (see Figure A-128 and A-129). Then secure it using the stainless steel nut and bolt sets supplied by REYMSA.

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-130). 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 (see Figure A-129).

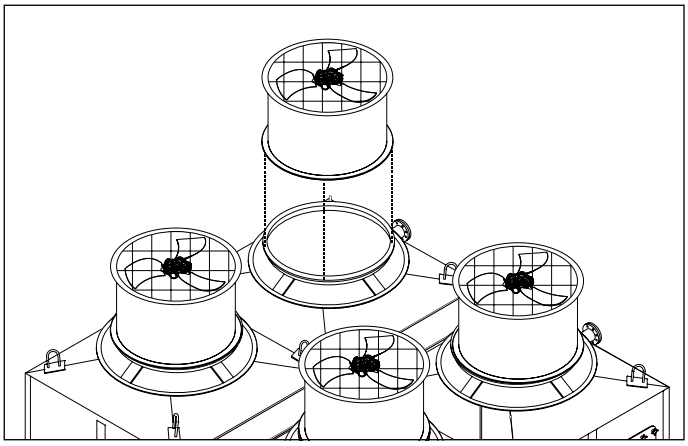


Figure A-130: Fan Duct installation on a fan adaptor for a Four Fan Tower

A.8 EQUALIZER LINE INSTALLATION

Some application will require multiple towers or basins feeding a common system. Care must be taken when multiple systems are operating together. Please observe the following recommendations:

- Install an equalizer line between towers, to maintain the same water level at the basins (see Figure A-131). Table A-2 shows the recommended sizes for the Equalizer connections.
- Install the overflow at the same level for each Tower as well as manual valves at the inlet and outlet of each Tower.
- An isolation valve on the equalizer line between each Tower is recommended for maintenance purposes.

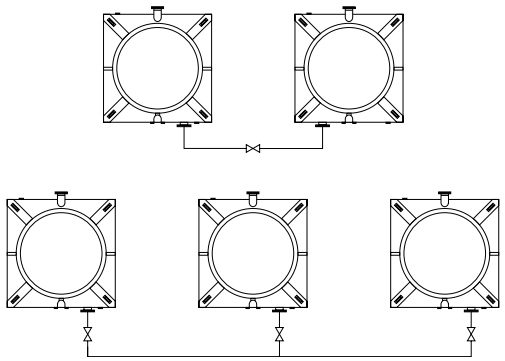


Figure A-131: Equalizer Line Installation

Table A-2: Equalizer Connection Sizes

MODEL RT, RTU, RTP, RTUP, RTM & RTPM	Ø SIZE
303	2"
404	
505	3"
606	4"
707	
708	
709	
808	6"
809	
810	
812	
714	
816	

MODEL RT, RTU, RTP, RTUP, RTM & RTPM	Ø SIZE
819	8"
822	
824	
827	
1414	6"
1616	
1619	8"
1622	
1624	
1627	

MODEL RTG, RTGTC, RTGM, RTGMTC	Ø SIZE
All	8"

A.9 BOTTOM OUTLET CONNECTION

For applications using a bottom outlet flange, follow this drawing with the instructions for connecting the outlet piping and tightening the bolts. (See Figure A-132).

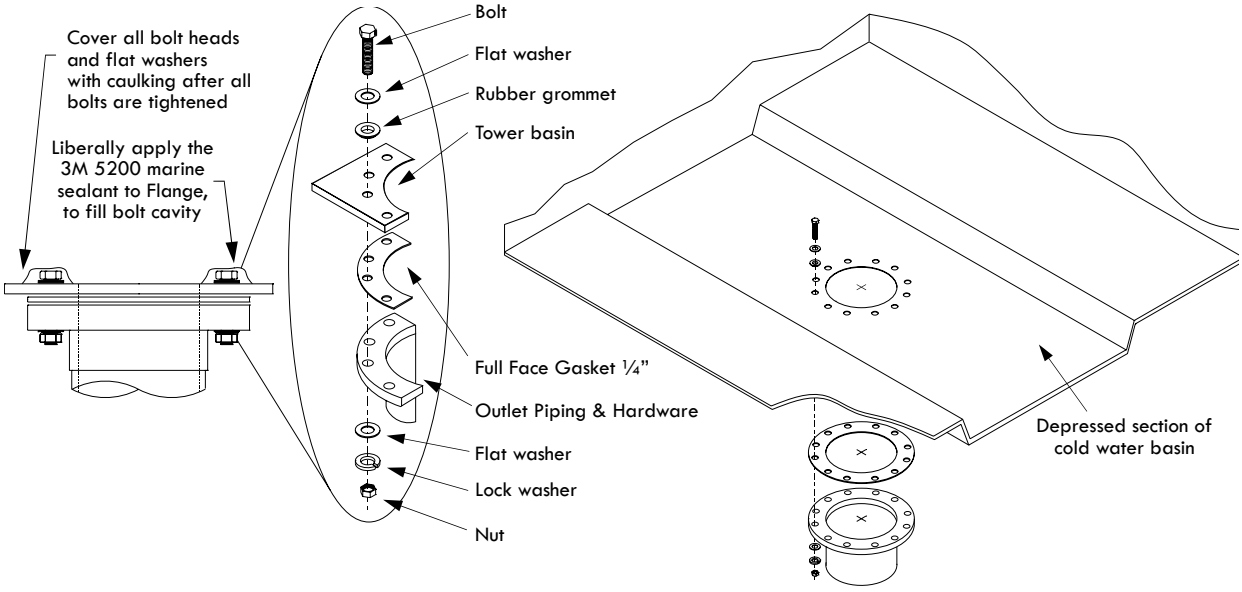


Figure A-132: Bottom outlet connection view

Notes: All piping must be independently supported. The Tower is not designed for any piping weight load; some deflection in the basin may occur. All metallic elements must be stainless steel. An isolation valve is recommended (supplied by others).

Flange Bolt Tightening Sequence

Lubricate bolt, nut threads and washer face. Assemble the flange hand tightening all the bolts, then start wrench tightening following the sequence of the numbers. During the sequence, keep any gap between flanges even all around. Tightening bolts with equal pressure, progressively increasing pressure with each complete rotation of the sequence (See Figure A-133 and Table A-3).

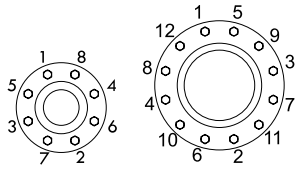


Figure A-133: Tightening sequence

Table A-3: Tightening Torque

Ø SIZE	BOLTS	TORQUE (lb-ft)
3”	4	20
4” - 8”	8	30
10” - 14”	12	30

NOTE: Most of the short term bolt preload loss occurs within 24 hours after initial tightening. Rechecking bolt tightness may be necessary.

A.10 OPTIONAL EQUIPMENT

A.10.1 SAFETY OPTIONAL EQUIPMENT

REYMSA offers a variety of optional accessories to help ensure the safety of the personnel operating the Cooling Tower, like ladder, catwalk, handrail, and davit support, hoist, and trolley (See Figure A-134). These accessories are designed for easy assembly with labeling on the point of contact and the part being installed.

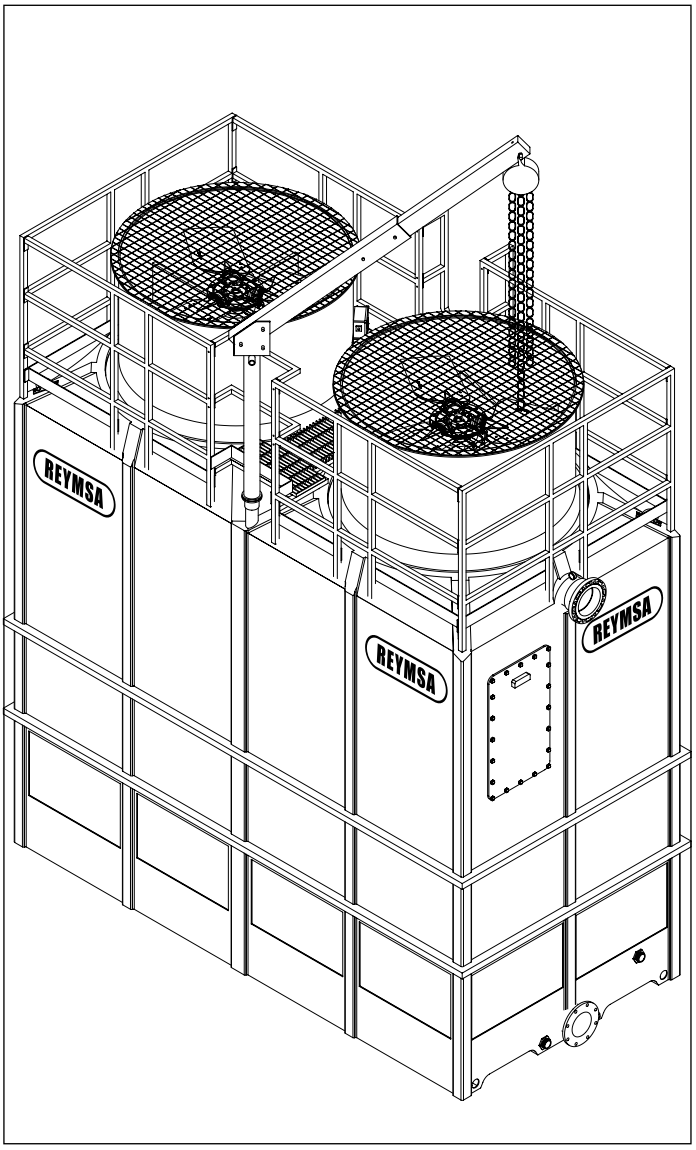
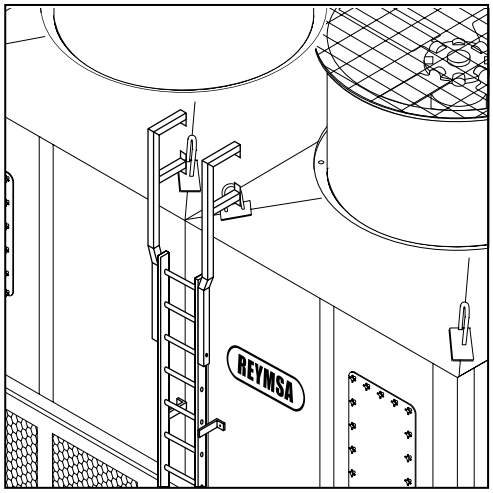


Figure A-134: Optional equipment by REYMSA

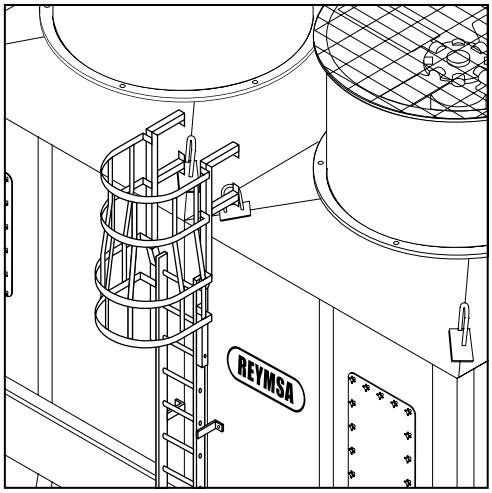
Following is a general procedure for installation; each Tower will be provided with specific instructions for that particular Tower. Assembly Instructions and drawings are issued with every Cooling Tower.

General installation instruction:

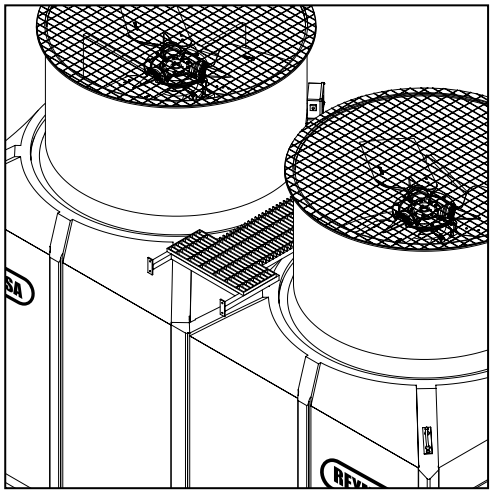
1. The accessories are composed of several parts.
2. Each part or section has a corresponding number (on a sticker) on its inner side, for identification.
3. Every section should be jointed with stainless steel screws/bolts and washers (supplied by REYMSA).
4. Do not mix the different sections to avoid assembly problems.



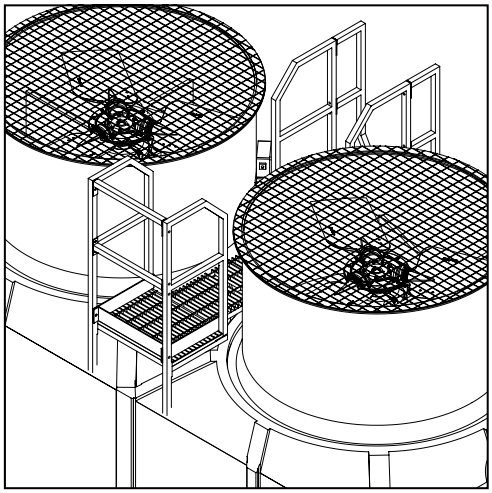
LADDER WITH STANDARD SUPPORTS
OSHA ladder with supports, stainless steel or galvanized steel.



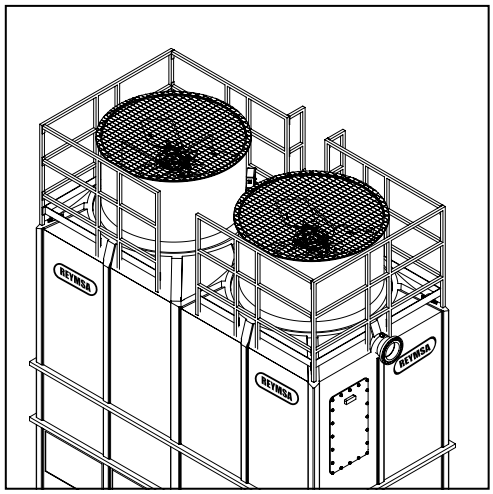
LADDER WITH OSHA SAFETY CAGE
OSHA ladder and Cage with supports, stainless steel or galvanized steel.



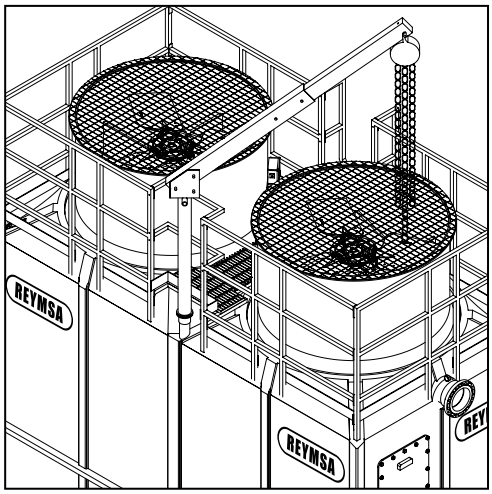
CATWALK
Corrosion-resistant FRP grating, supported by stainless/ galvanized steel structure.



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-135: Safety optional accessories

A.10.2 VIBRATION SWITCH

Vibration switches provided by REYMSA are shock sensitive mechanisms for shutdown of the Cooling Tower 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 Cooling Tower causing excessive vibration. The vibration switch shuts down the motor avoiding potential damage by shock or vibration.

A.10.2.1 INSTALLATION INSTRUCTIONS FOR VIBRATION SWITCH ON DIRECT DRIVE MODELS (RT, RTU, RTM, RTP, RTUP, RTPM).

Firmly secure the unit to the equipment using the base foot and mount to a satisfactory location, see Figure A-136 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.

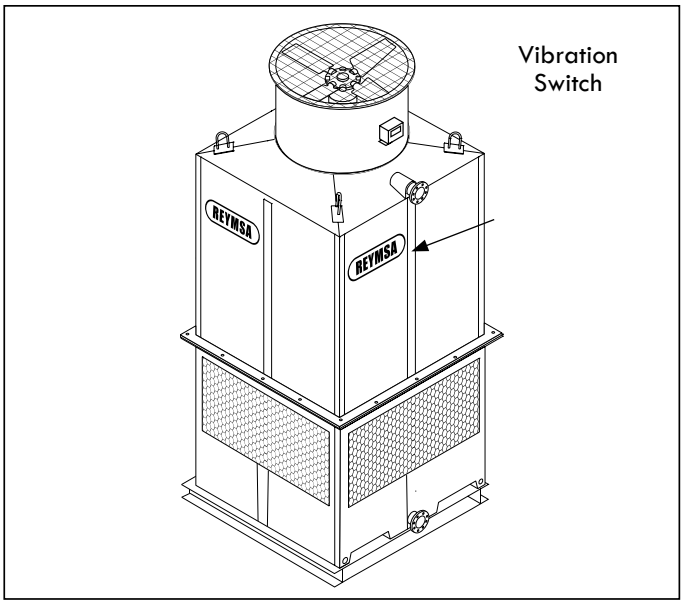


Figure A-136: Vibration Switch recommended location for RT, RTU, RTM, RTP, RTUP and RTPM models.

Make the necessary electrical connections to the vibration switch. See Figure A-137 for electrical terminal locations and Figure A-138 for a typical electrical diagram.

For vibration switch connections on VFD, see section "C.1.2 CONFIGURATION AND START-UP FOR ABB ACH550-UH", section "C.1.3 CONFIGURATION AND START-UP FOR DANFOSS VLT DRIVE FC 102", or "C.1.4 CONFIGURATION AND START-UP FOR ABB ACS880" for models with permanent magnet motors (RTP, RTUP, RTPM and RTG, RTGM, RTGTC or RTGMTC models) with the optional PM Motor

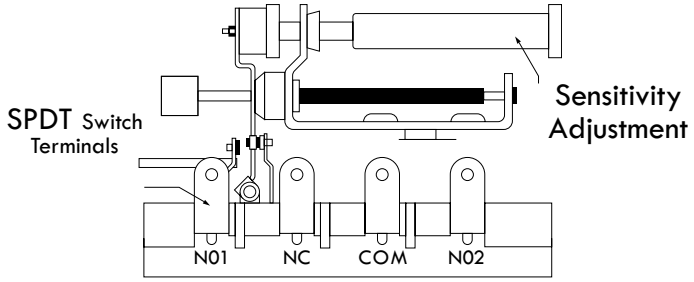


Figure A-137: Internal switches

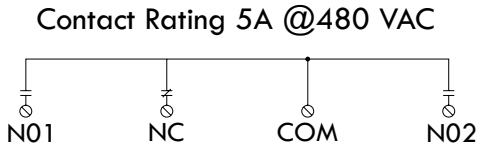


Figure A-138: Vibration Switch Electric Diagram

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 fan motor 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-139).

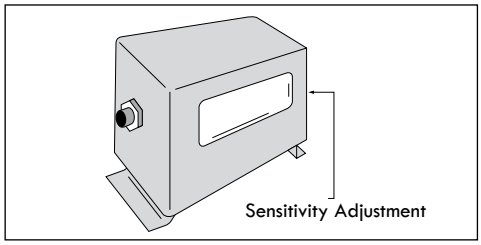


Figure A-139: Vibration Switch detail

- Start the fan motor. If the vibration switch trips on start-up, allow the fan motor to stop. Turn the sensitivity adjustment 1/4 turn clockwise (see Figure A-140): Depress the reset button and restart the fan motor. Repeat this process until the vibration switch does not trip on start-up.

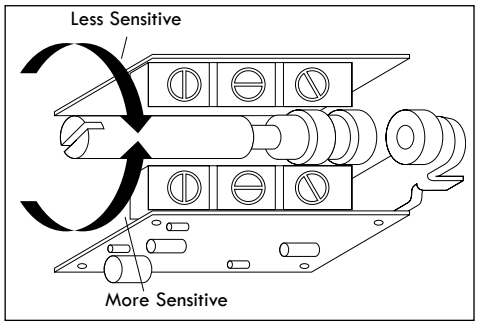


Figure A-140: Sensitivity adjustment

If the vibration switch does NOT trip on start-up, stop the fan motor. 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 vibration switch will not trip on start-up.

- 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.

A.10.2.2 INSTALLATION INSTRUCTIONS FOR VIBRATION SWITCH ON GEAR DRIVE SYSTEM MODELS (RTG, RTGM, RTGTC, RTGMTC).

Firmly secure the unit to the equipment using the base foot and mount it in a satisfactory location, see Figure A-141 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.

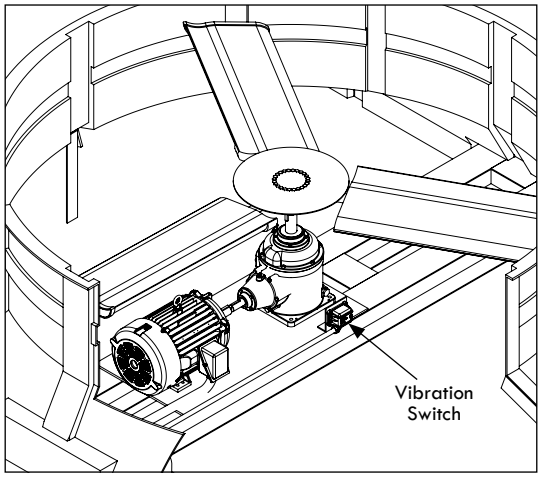


Figure A-141: Vibration Switch recommended location for RTG, RTGM, RTGTC and RTGMTC models

Make the necessary electrical connections to the vibration switch. See Figure A-142 for electrical terminal locations and Figure A-143 for a typical electrical diagram.

For vibration switch connections on VFD, see section "C.1.2 CONFIGURATION AND START-UP FOR ABB ACH550-UH", section "C.1.3 CONFIGURATION AND START-UP FOR DANFOSS VLT DRIVE FC 102", or "C.1.4 CONFIGURATION AND START-UP FOR ABB ACS880" for models with permanent magnet motors (RTP, RTUP, RTPM and RTG, RTGM, RTGTC or RTGMTC models) with the optional PM Motor

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.

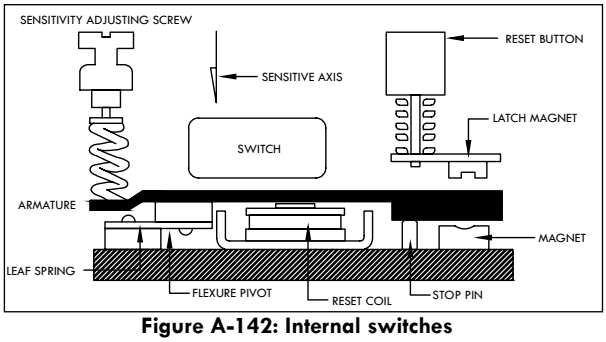


Figure A-142: Internal switches

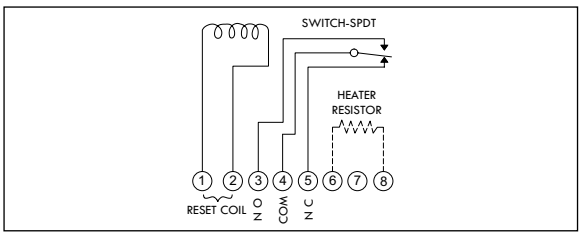


Figure A-143: Vibration Switch Electric Diagram

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-144.

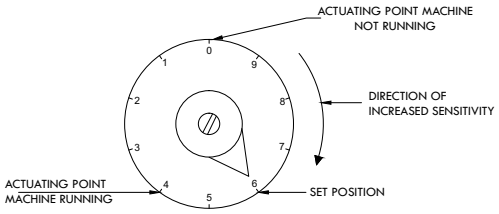


Figure A-144: Sensitivity adjustment

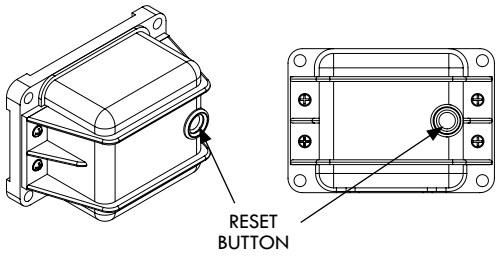


Figure A-145: Vibration Switch RESET button

B. With machine running, back off adjusting screw one turn CCW and reset (see Figure A-145). 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-146 for a remote reset connection example.

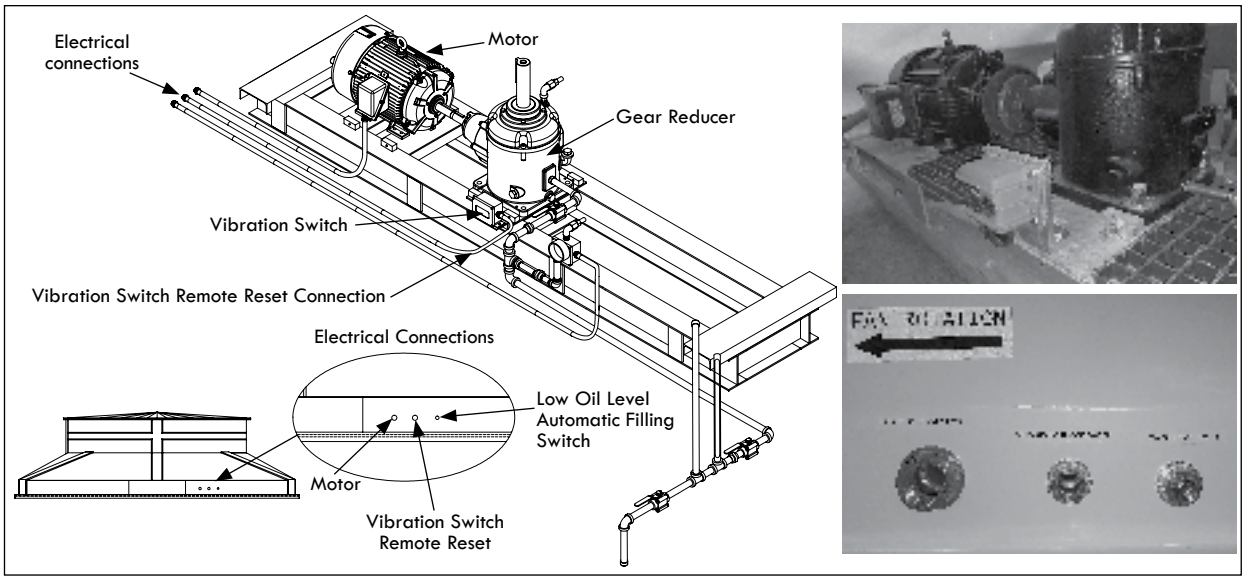


Figure A-146: Remote Reset connection for vibration switch

A.10.3 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-147).

Installation instructions

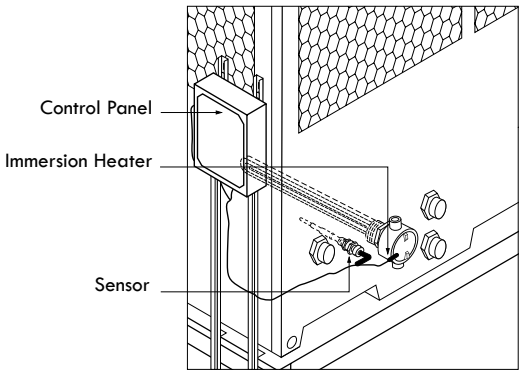


Figure A-147: Basin heater system

CAUTION

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

- 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 a combination temperature-liquid level sensor should be one inch (minimum) above the heater but below the water level. (See Figure A-148 for recommended distances and mounting).

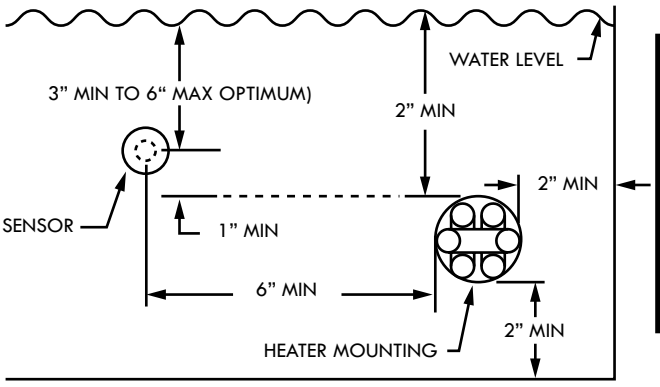


Figure A-148: Recommended basin heater mounting

WARNING

Inmension 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 a combination temperature-liquid level sensor assemble in the upper PVC adaptor.
- Mount control panel so a combination temperature-liquid level sensor cord will reach a combination 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-149).
- 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-149).

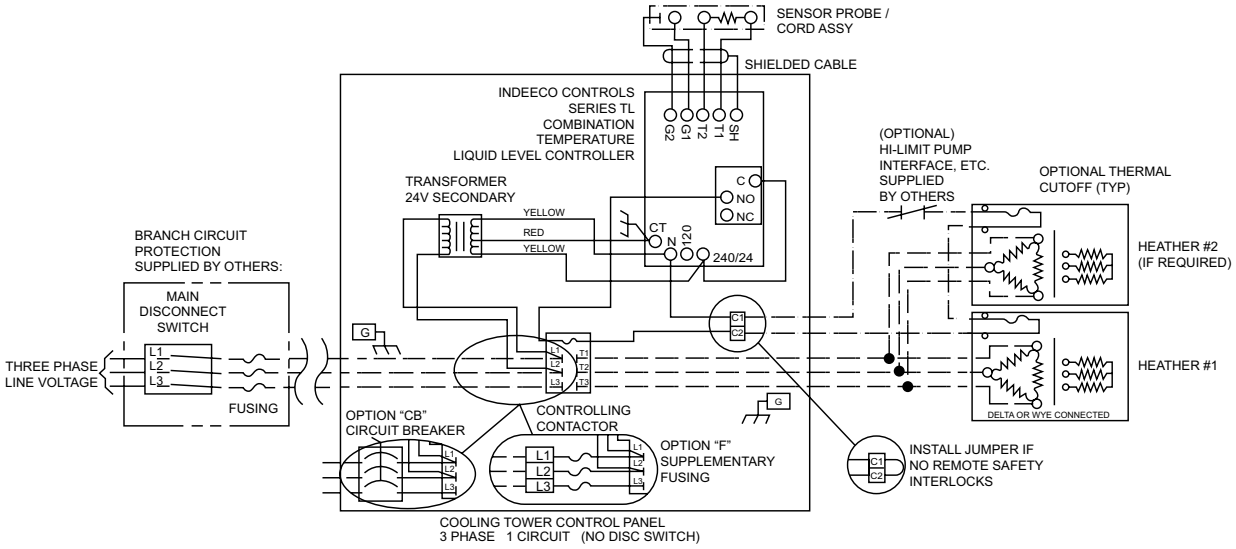


Figure A-149: Basin heater control panel diagram

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.10.4 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-150 & Figure A-151).

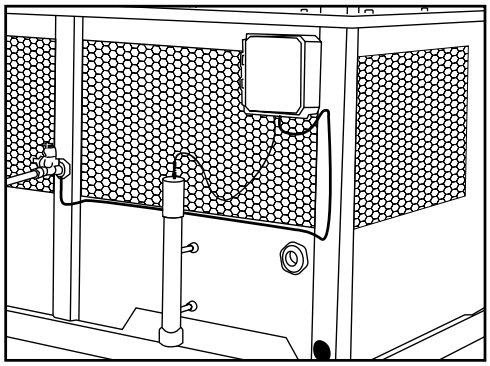


Figure A-150: Electric water level control system

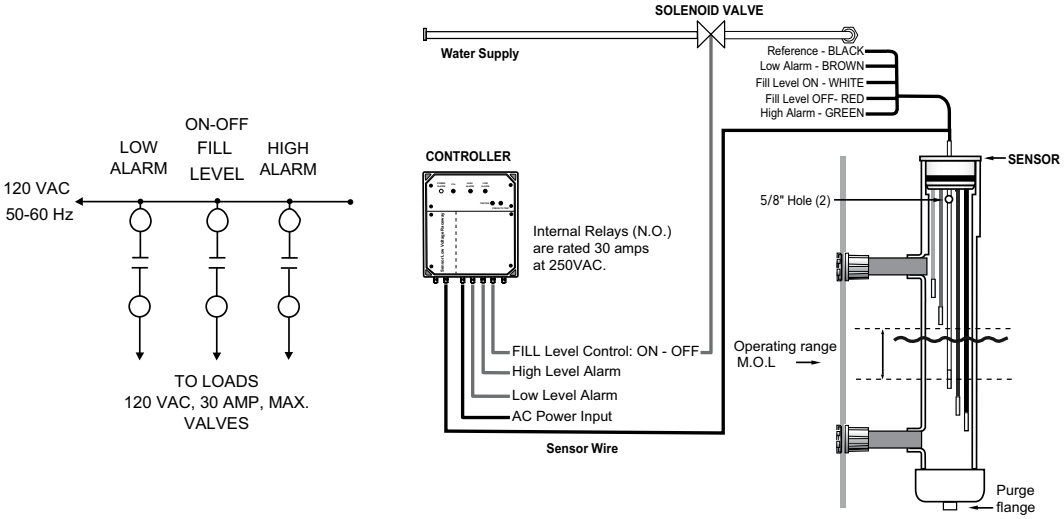


Figure A-151: Electrical Connections & Water Level Control Parts

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-151) 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.10.5 MOTOR SHAFT GROUNDING RING

Bearing-related problems are among the most common causes of motor failures. The VFD induced shaft voltages are capacitively coupled from stator to rotor through parasitic capacitance and create the possibility of bearing currents.

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-152 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-153).

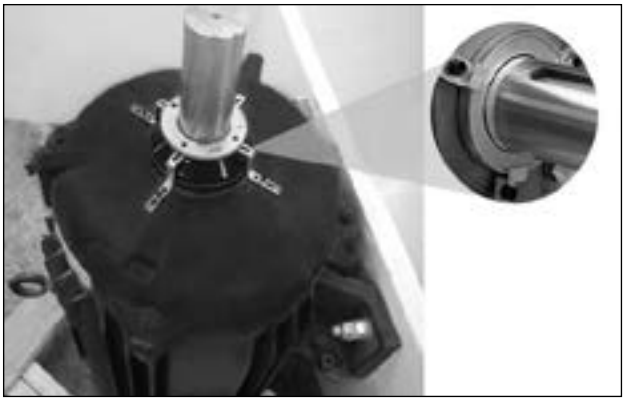


Figure A-152: Motor Shaft Grounding Ring

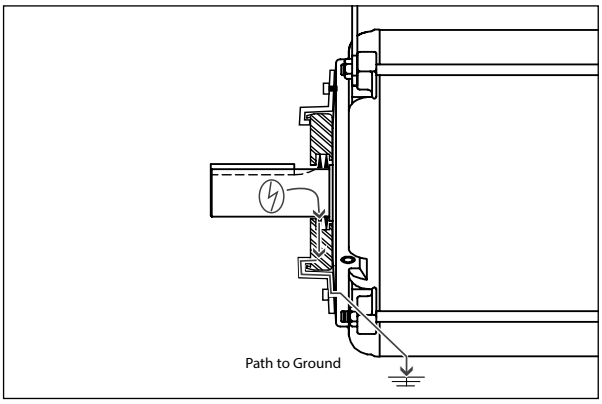


Figure A-153: Motor Shaft Grounding Ring Path to Ground

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.

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.10.6 DIRECT DRIVE PERMANENT MAGNET MOTOR FOR RTG, RTGM, RTGTC AND RTGMTC 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 used in RTG, RTGM, RTGTC and RTGMTC models is not the same permanent magnet motor used in RTP models. Permanent magnet motor in RTG, RTGM, RTGTC and RTGMTC 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.

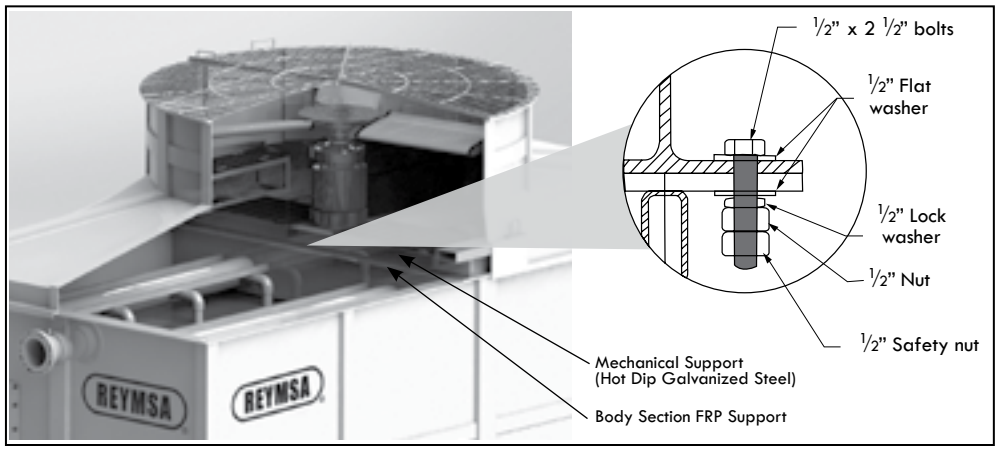


Figure A-154: Direct Drive Permanent Magnet Motor option for RTG, RTGM, RTGTC and RTGM Models

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 RTG, RTGM, RTGTC AND RTGMTC MODELS" to configure a VFD for the optional Permanent Magnet Motor.

A.11 TOWER SET-UP

A.11.1 LEVELING AND TOWER SUPPORTS

REYMSA Cooling Towers should always be installed on a level surface and adequately supported. REYMSA recommends supporting Cooling Towers 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-155). 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 C: EXAMPLE OF STRUCTURAL BASE FOR A REYMSA COOLING TOWER"; consult your REYMSA representative for more specifics.

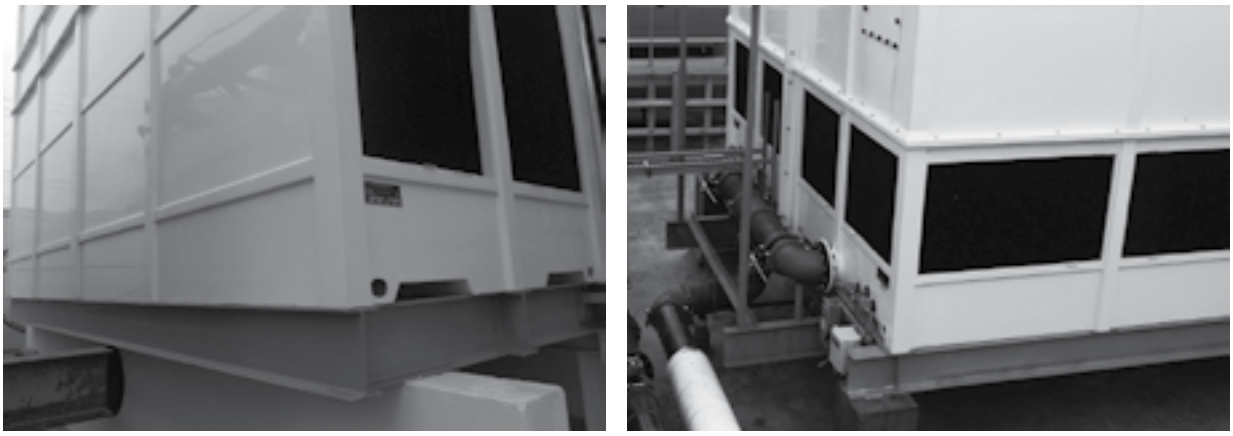


Figure A-155: Example of base support

A.11.2 PIPING CONNECTIONS

All connections to the Cooling Tower 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 Cooling Tower.

CAUTION

Tower should be installed on a level surface and adequately supported. Failure to do so could result in Cooling Tower and property damage.

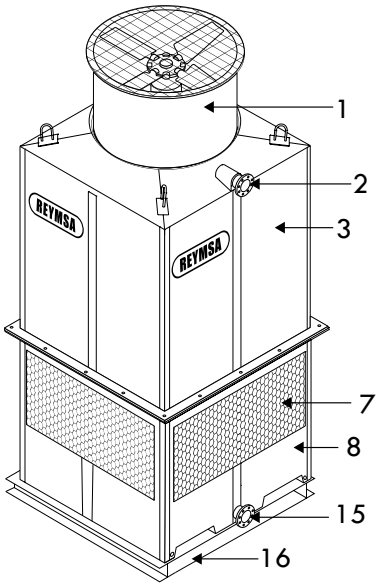
CAUTION

Piping should not be supported by the Cooling Tower 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 Cooling Tower.

Also, in case your area experiences extreme cold weather, care must be taken to protect all piping located on the exterior of the building from freezing (refer to section "C.4.1 COLD WEATHER OPERATION"). See Figure A-156, Figure A-157 and Figure A-158 for general scheme of the different connections in REYMSA Cooling Towers.

RT-A, RT-B, RT-C, RTP-B



1. Fan Section
2. Hot Water Inlet
3. Body Section (Rt-A, Rt-B, Rt-C)
4. Upper Body Section (Rt-D)
5. Access Door
6. Lower Body Section (Rt-D)
7. Louvers
8. Basin Section
9. Water Make-Up
10. Purge
11. Drain
12. Basin Heater
13. Temperature Sensor
14. Overflow
15. Cold Water Outlet
16. Steel Base Support (Supplied By Others)

RT-D, RTP-D

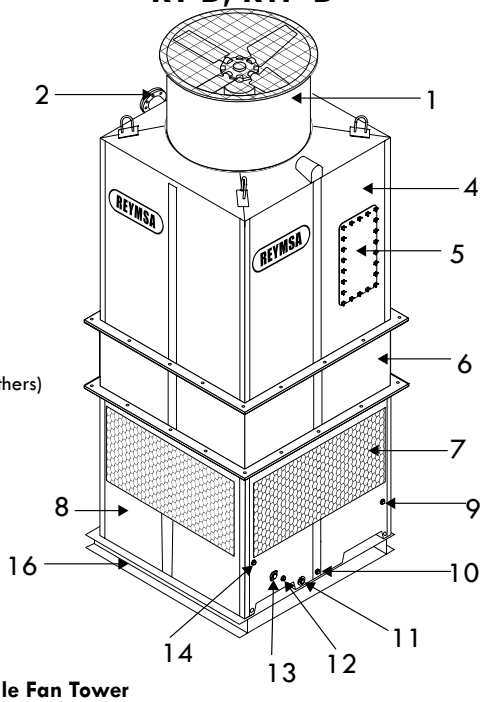
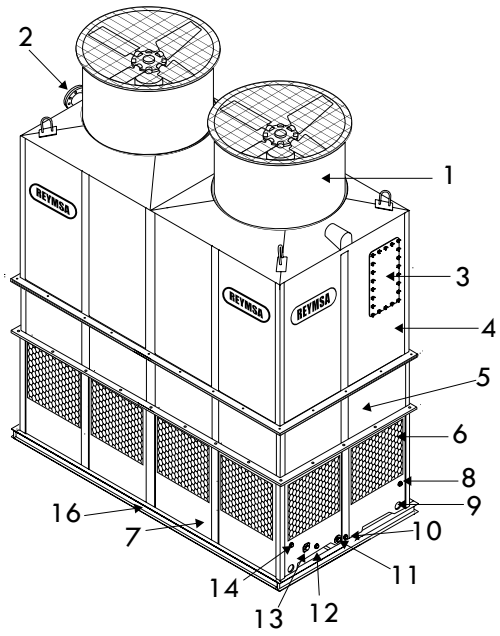


Figure A-156: Pipe connections for a Single Fan Tower

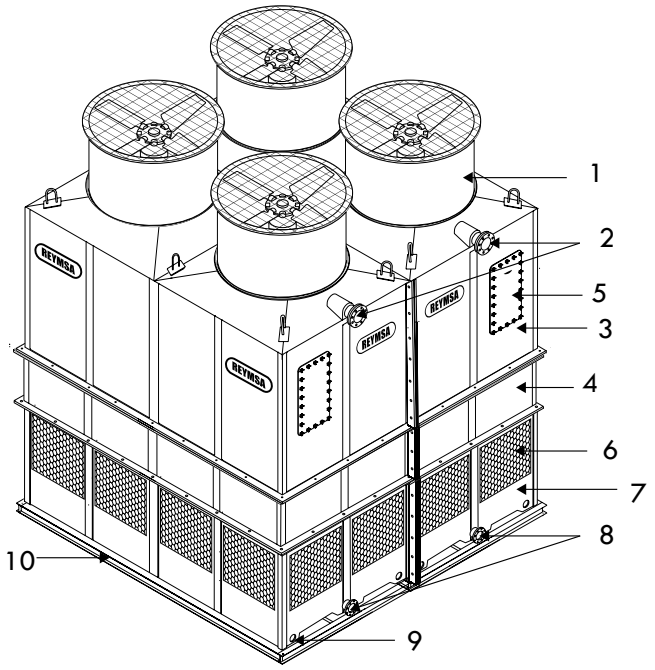
RT-D, RTP-D



1. Fan Section
2. Hot Water Inlet
3. Access Door
4. Body Section (Rt-A, Rt-B, Rt-C Models)
5. Lower Body Section (Only In Rt-D Models)
6. Louvers
7. Basin Section
8. Water Make-Up
9. Anchorage Holes
10. Purge
11. Drain
12. Basin Heater
13. Temperature Sensor
14. Overflow
15. Cold Water Outlet (Back Side)
16. Steel Base Support (Supplied By Others)

Figure A-157: Pipe connections for a Two Fan Tower (RT-D)

RT-D, RTP-D



1. Fan Section
2. Hot Water Inlet
3. Body Section (Rt-A, Rt-B, Rt-C Models)
4. Lower Body Section (Only In Rt-D Models)
5. Access Door
6. Louvers
7. Basin Section
8. Cold Water Outlet
9. Anchorage Holes
10. Steel Base Support (Supplied By Others)
11. Water Make-Up (Back Side)
12. Overflow (Back Side)
13. Temperature Sensor (Back Side)
14. Basin Heater (Back Side)
15. Drain (Back Side)
16. Purge (Back Side)

Figure A-158: Pipe connections for a Four Fan Tower (RT-D)

Configuration and Tower parts

- **Hot water inlet**

The Hot Water Inlet delivers warm water to be cooled from the process to the Cooling Tower distribution system. A PVC pipe flange is provided for the inlet water so that a field installed butterfly valve (supplied by others) can be installed. REYMSA recommends installing this valve in order to isolate the Tower on multiple Tower installations and also provides a means of adjusting and/or balancing the flow through the Cooling Tower. A ¼" NPT adaptor is provided in the piping inlet between the PVC flange and the Cooling Tower so that a field supplied pressure gauge with a valve can be installed. This gauge is required to determine when the proper amount of water is flowing through the Tower. The gauge should be selected with a 0 to 15 psi range.

- **Cold water outlet**

The Cold Water Outlet serves the process with the cooled water from the Tower. REYMSA recommends installing a valve (supplied by others) at the Cold Water Outlet to regulate flow from the Tower and also allow Tower isolation.

- **Make-up**

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.10.4 ELECTRIC WATER LEVEL CONTROL SYSTEM").

- **Overflow**

When excess water enters the basin, it automatically flows into the Overflow and is wasted. The Overflow connections are NPT threaded.

- **Purge**

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**

The drain is used to remove all the circulating water for Tower maintenance and cleaning. The drain connection is NPT and must have a valve (supplied by others).

- **Equalization**

The equalization connection is used to maintain equal water levels when the system consists on more than one basin (see Figure A-159). REYMSA recommends installing a valve (supplied by others) at the Equalization line to regulate flow and allow Tower isolation. Also see section "A.8 EQUALIZER LINE INSTALLATION".

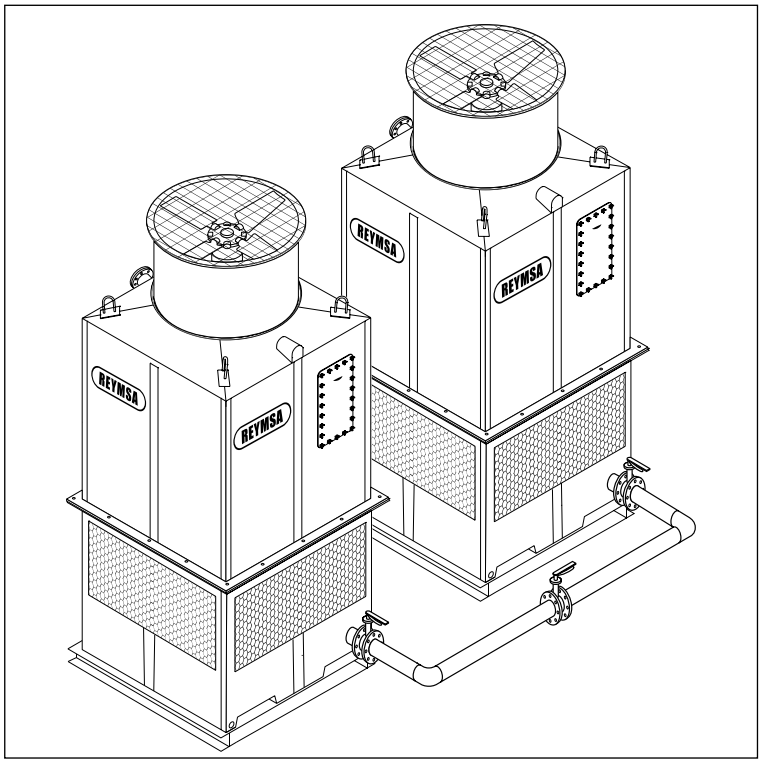


Figure A-159: Example of equalization line

A.11.3 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 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.11.3.1 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.10.2 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.

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 pumps and running water through the Tower, the piping system should be flushed out to remove any debris which may have gotten into the pipe during installation. Also, inspect the bottom section of the Tower and remove any debris, which may have accumulated during installation. For Start-up, proceed as follows:

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.

B. Check all flanged connections and piping for leaks.

C. Bleed air from piping by opening purge valve at pump until water flows out in a steady stream without interruption.

D. Close purge valve.

E. Fill completely the Tower's basin with water (without overflowing it).

B.2 CONTROLLING WATER LEVEL

WARRANTY VOID

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

REYMSA Cooling Towers provides a mechanical float valve as standard (see Figure B-1 or refer to "APPENDIX B: WATER MAKE-UP FLOAT VALVE"); an electric valve for automatic flow control is offered 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.

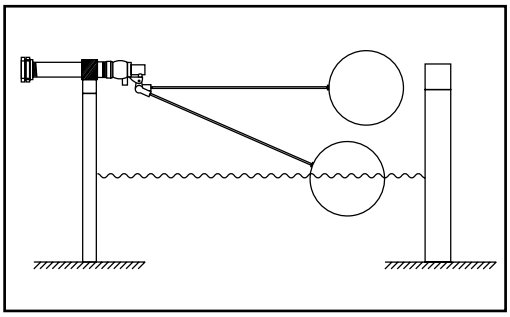


Figure B-1: Float valve installation

A. Remove Air Inlet Louvers within the area where float valve(s) is located.

B. Close make-up valve(s).

C. Check basin water level. The proper water level should be within the range of the operating level.

D. Loosen the nut on the adjustment bolt, and then loosen the bolt itself. Do not remove the bolt.

E. Rotate arm and stem to desired water level.

F. Tighten adjustment bolt and nut.

G. Restore water supply and verify that the water level is at the desired operating level.

H. Reinstall Air Inlet Louvers.

B.3 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 Cooling Tower.**

A. Before starting the pump(s), ensure that the suction piping is completely full of water.

B. Open inlet water valve to approximately 30% and start one pump.

C. Allow system to operate until the float valve closes to allow the make-up water to replenish the water removed from the basin by the pump.

D. If the pump surges, shut off the pump, close the make-up valve, and adjust the float valve to a higher setting. Repeat Steps A and B.

E. Open the make-up valve to the full open position.

F. Verify the operating level in basin to be in range, after the system has equalized.

G. If there are more than one pump, start remaining pumps one at a time by repeating steps D and E.

H. If the basin overflows, close the make-up valve, lower the float valve setting, and repeat Steps A to F. In case of experiencing problems with the pump(s), refer to Pump's IOM manual.

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 2,500 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 Cooling Tower, 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 Cooling Tower 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 fill access door is removed.
- Remove fill access door while fan is in operation.
- Operate the fan when the fan guard is removed.

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 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.

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

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.

Nominal Speed * 0.25 = Min Speed
(RPM on motor plate) (Min RPM)

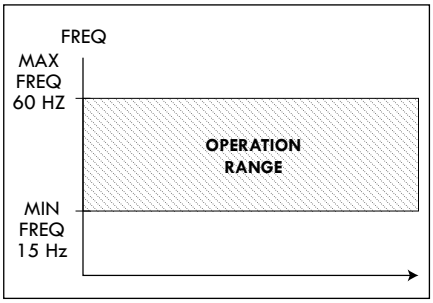


Figure C-1: VFD operation range for induction motors

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:

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

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.

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

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

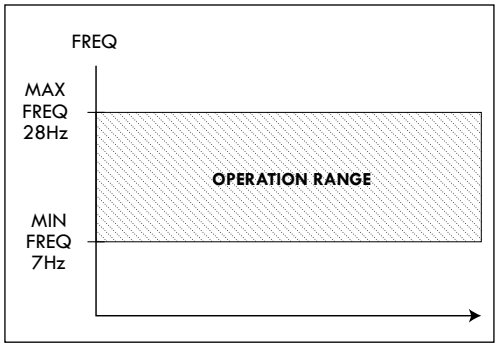


Figure C-2: Example of VFD operation range for permanent magnet motors.

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.

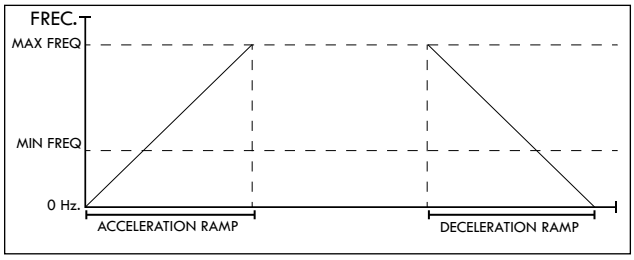


Figure C-3: Start-stop method

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

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.

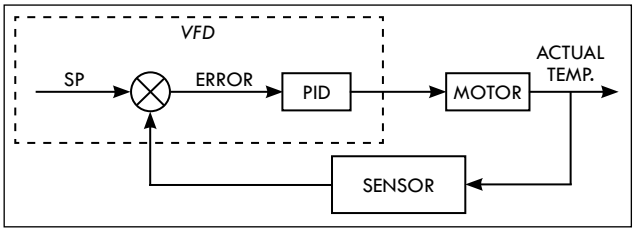


Figure C-4: Operation method

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

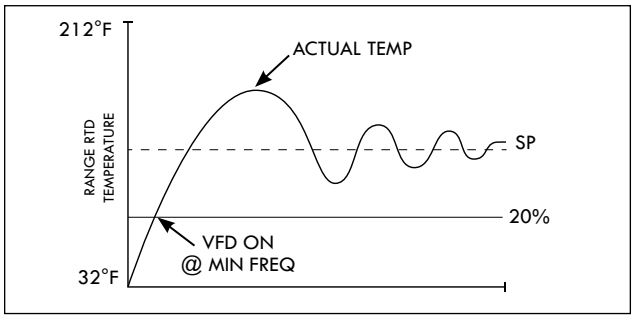


Figure C-5: Measuring range RTD

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

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

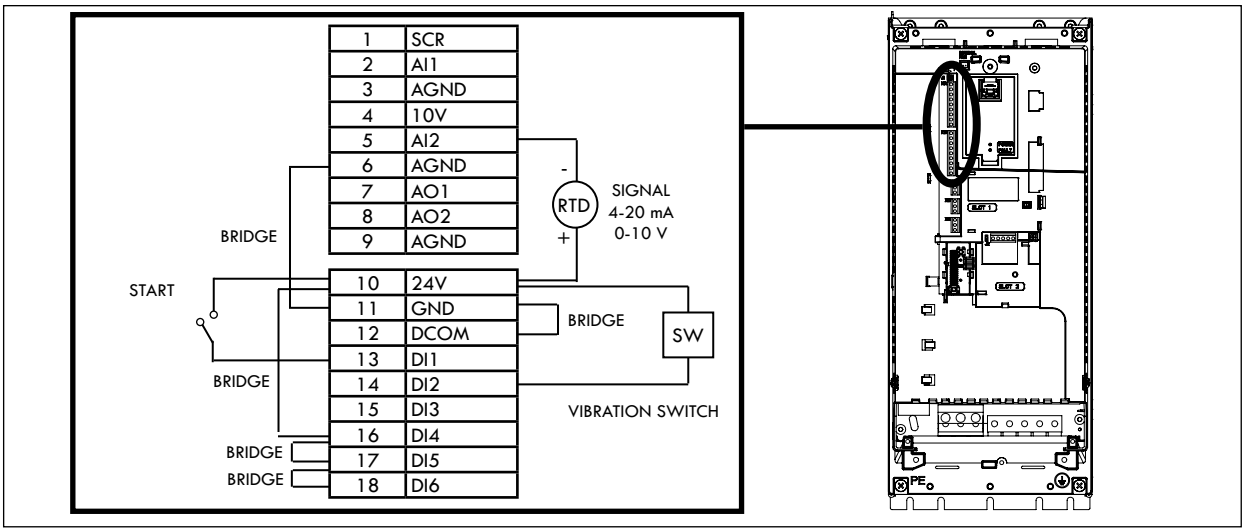


Figure C-6: Recommended Connection Diagram for ABB ACH550-UH.

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

C.1.3 CONFIGURATION AND START-UP FOR DANFOSS VLT DRIVE FC 102 FOR RTP, RTUP, RTPM MODELS

Permanent Magnet (PM) Motors must be operated only by the VFD (Variable Frequency Drive) included in the PM motor package and should never be connected directly to the electric current.

REYMSA recommends the next connection diagram for DANFOSS VLT DRIVE FC 102:

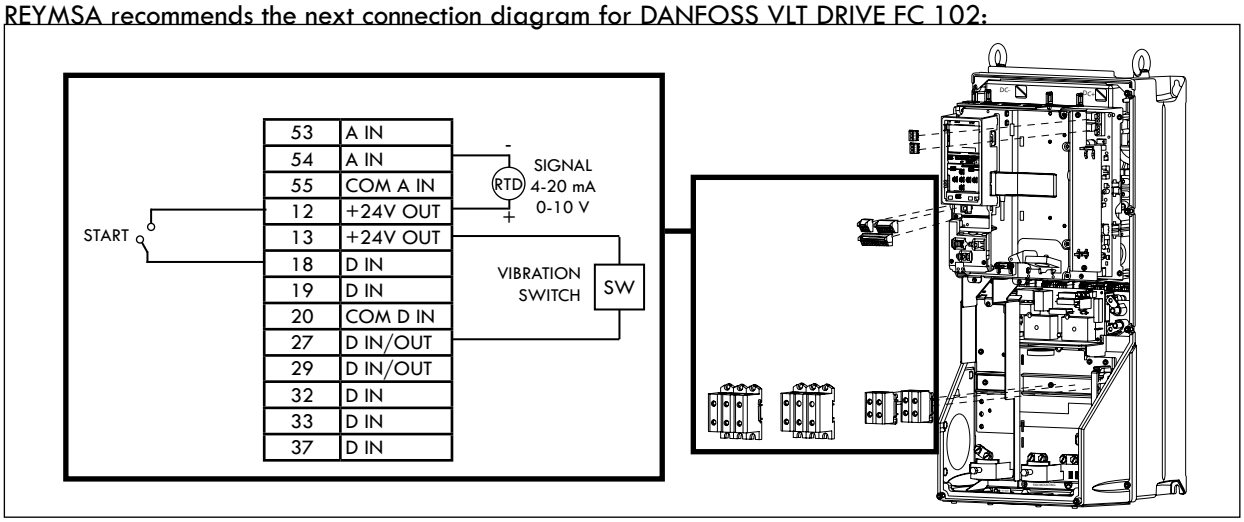


Figure C-7: Recommended Connection Diagram for DANFOSS VLT DRIVE FC 102.

See "FIGURE C-8: WIRING SCHEMATIC FOR DANFOSS VLT DRIVE FC 102"

DANFOSS – PROGRAMMING GUIDE – VLT DRIVE FC 102 FOR PM MOTOR

Initialize the frequency converter to default settings. (See 2.1.14 Initialization to Default Settings at Danfoss Programming Guide VLT HVAC Drive FC 102).

Recommended initialization (via parameter 14-22 Operation Mode):

1. Select parameter 14-22 Operation Mode.
2. Press [OK].
3. Select [2] Initialization.
4. Press [OK].
5. Cut off the mains supply and wait until the display turns off.
6. Reconnect the main supply - the frequency converter is now reset.
7. Change parameter 14-22 Operation Mode back to [0] Normal Operation.

To set-up the frequency converter for a **10 -15 hp PM Motor**. At the Control Panel, select QUICK MENU option to go through "02 Quick Setup" menu.

Table C-2: Example of parameters and values for DANFOSS VLT DRIVE FC 102 configuration for permanent magnet motors.

PARAMETER	UNITS	VALUE
0-01 Language		[0] English
1-24 Motor Current	[A]	***REFER TO "TABLE C-3: PM MOTOR DATA"***
1-25 Motor Nominal Speed	[RPM]	***REFER TO "TABLE C-3: PM MOTOR DATA"***
1-28 Motor Rotation Check		[0] Off
3-41 Ramp 1 Ramp Up Time	[s]	45
3-42 Ramp 1 Ramp Down Time	[s]	45
4-11 Motor Speed Low Limit	[RPM]	***REFER TO "TABLE C-3: PM MOTOR DATA"***
4-13 Motor Speed High Limit	[RPM]	***REFER TO "TABLE C-3: PM MOTOR DATA"***
3-19 Jog Speed	[RPM]	200
5-12 Terminal 27 Digital Input		[7] External Interlock
5-40 Function Relay		[0] [5] Running
1-29 Automatic Motor Adaptation (AMA)		[0] Off

At the Control Panel, select QUICK MENU option to go through "04 Smart Start" menu.

PARAMETER	[UNITS]	VALUE
Language		English
Which motor type is connected to the drive?		PM, non-salient SPM
Do you have a thermal motor protection connected?		No
Motor Current	[A]	***REFER TO "TABLE C-3: PM MOTOR DATA"***
Motor Nominal Speed	[RPM]	***REFER TO "TABLE C-3: PM MOTOR DATA"***
Motor Torque	[Nm]	***REFER TO "TABLE C-3: PM MOTOR DATA"***
Calculate Motor Torque?		No
Motor Poles		***REFER TO "TABLE C-3: PM MOTOR DATA"***
Calculate Motor Poles?		No
Minimum Reference	[C]	0 (32 F)
Maximum Reference	[C]	100 (212 F)
Apply max. reference to max. drive frequency and reference input (terminal 53) also?		No
Ramp 1 Ramp Up Time	[s]	45
Ramp 1 Ramp Down Time	[s]	45
Select your application		Fan
Would you like to run AMA (recommended but will take a few minutes)?		No
Resistance RS	[Ohm]	***REFER TO "TABLE C-3: PM MOTOR DATA"***
d-axis Inductance (Ld)	[mH]	
Back EMF at 1000 RPM	[V]	
Calculate BackEMF?		No

At the Control Panel, select MAIN MENU option to set-up the parameters.

PARAMETER	[UNITS]	VALUE
1-20 Motor Power	[kW]	***REFER TO "TABLE C-3: PM MOTOR DATA"***
1-22 Motor Voltage	[V]	
1-23 Motor Frequency	[Hz]	
1-24 Motor Current	[A]	
1-25 Motor Nominal Speed	[RPM]	
3-41 Ramp 1 Ramp Up Time	[s]	45
3-42 Ramp 1 Ramp Down Time	[s]	45
4-12 Motor Speed Low Limit	[Hz]	***REFER TO "TABLE C-3: PM MOTOR DATA"***
4-14 Motor Speed High Limit	[Hz]	
4-19 Max Hz output limit		***REFER TO ENGINEERING DATA SHEET***
4-60 Bypass low critical speed	[RPM]	***REFER TO ENGINEERING DATA SHEET***
4-62 Bypass high critical speed	[RPM]	***REFER TO ENGINEERING DATA SHEET***
0-20 Display Line 1.1 Small		(1613) Frequency
0-21 Display Line 1.2 Small		(1614) Motor Current
0-22 Display Line 1.3 Small		(1617 RPM)
0-23 Display Line 2 Large		(1652) Feedback
0-24 Display Line 3 Large		(1601) Reference Unit
1-00 Configuration Mode		(3) Close Loop
20-12 Reference/Feedback Unit		(60) C
20-13 Minimum Reference/Feedback	[C]	0 (32 F)
20-14 Maximum Reference/Feedback	[C]	100 (212 F)
20-93 PID proportional gain		4.50
6-22 Terminal 54 Low Current	[mA]	4
6-23 Terminal 54 High Current	[mA]	20
6-24 Terminal 54 Low Reference/Feedback, Value		0
6-25 Terminal 54 High Reference/Feedback, Value		100
6-01 Live Zero Timeout Function		(4) Max Seed
20-21 Set Point 1	[C]	29.4 (85 F) = cold water temperature set up
20-81 PID Normal/Inverse Control		(1) Inverse
20-94 PID Integral Time	[s]	20
20-95 PID Differentiation Time		Off
3-02 Minimum Reference	[C]	0 (32 F)
3-03 Maximum Reference.	[C]	100 (212 F)

3-15 Reference 1 Source		(0) No function
3-16 Reference 2 Source		(0) No function
3-17 Reference 3 Source		(0) No function
4-10 Motor Speed Direction		(0) Clockwise
4-19 Max Output Frequency	[Hz]	***REFER TO "TABLE C-3: PM MOTOR DATA"***
5-10 Terminal 18 Digital Input		(8) Start
5-11 Terminal 19 Digital Input		(0) No operation
5-12 Terminal 27 Digital Input		(7) External Interlock
5-13 Terminal 29 Digital Input		(0) No operation
5-14 Terminal 32 Digital Input		(0) No operation
5-15 Terminal 33 Digital Input		(0) No operation
5-4 Relays Function Relay 1 Function Relay 2		 (5) Running (9) Alarm
20-00 Feedback 1 Source		(2) Analog Input 54

Table C-3: PM MOTOR DATA

MOTOR POWER	UNIT	5 HP	7.5 HP	10 HP	15 HP
Motor Power	kW	3.73	5.59	7.46	11.19
Voltage	V	460	460	460	460
Phases	Ph	3	3	3	3
Poles	Po	6	8	8	8
Motor Current - FLA	A	6.0	9.3	12.5	18.5
Nominal Speed	RPM	500	500	500	500
Nominal Frequency	Hz	25	33	33	33
Motor Speed – High Limit	RPM	425	425	425	425
Motor Speed – High Limit	Hz	21	28	28	28
Motor Speed – Low Limit	RPM	106	106	106	106
Motor Speed – Low Limit	Hz	5	7	7	7
Torque	Lb-ft	52.5	78.8	105	158
	N-m	71.2	106.8	142.4	214.2
Resistance	Ohm	2.17	1.92	1.2	0.7
Inductance	mH	70.2	74.4	50.1	34.6
Back EMF	V	729	706	706	708

WARRANTY VOID

DO NOT OPERATE PERMANENT MAGNET MOTOR WITH A VFD THAT IS NOT DESIGNED FOR YOUR MODEL

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.

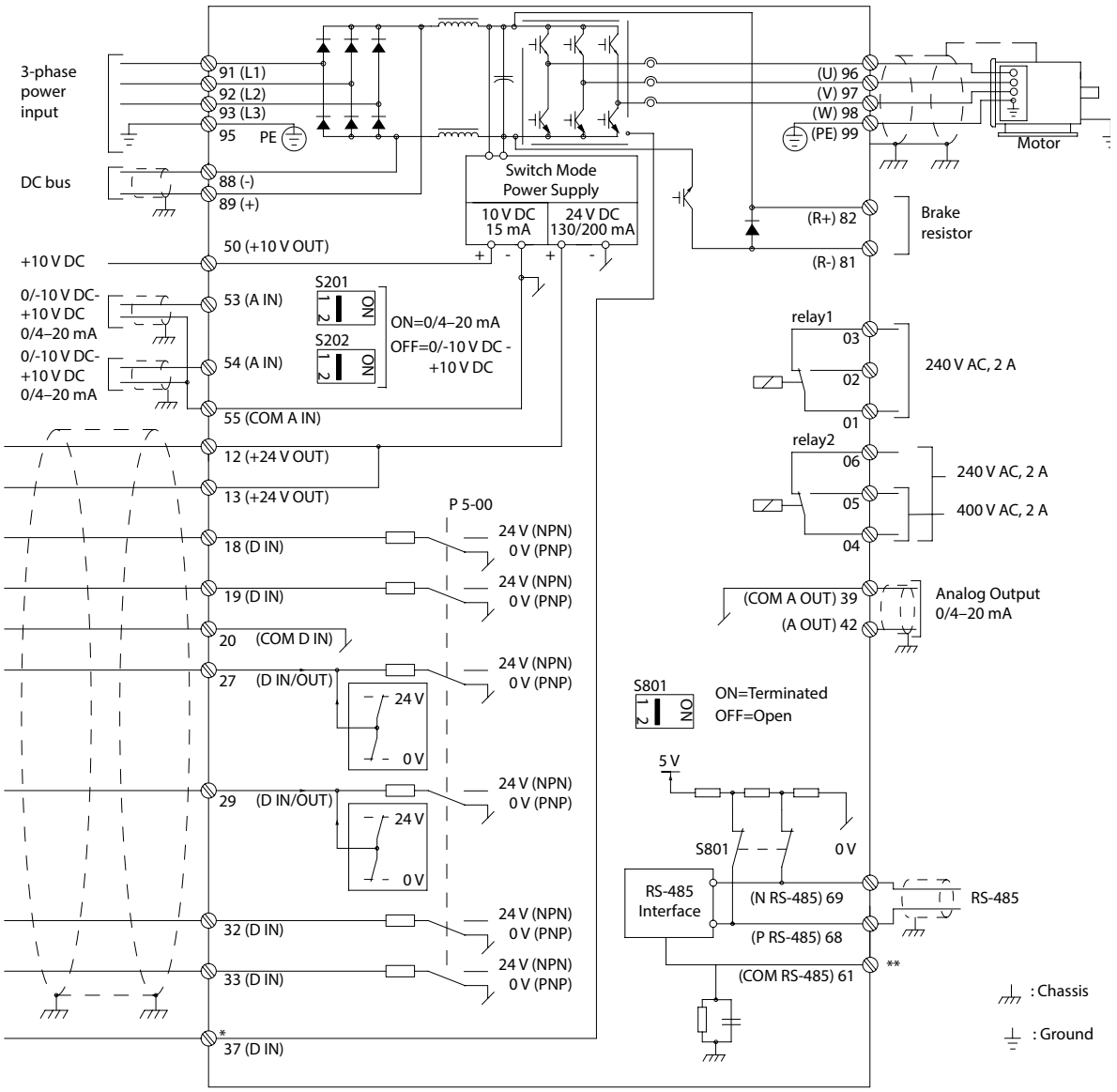
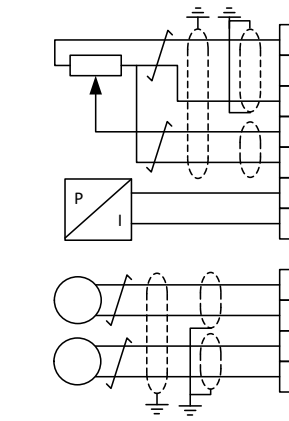


Figure C-8: WIRING SCHEMATIC FOR DANFOSS VLT DRIVE FC 102.

C.1.4 CONFIGURATION AND START-UP FOR ABB ACS880-01+N5350 COOLING TOWER DRIVES FOR PERMANENT MAGNET MOTORS ON RTG, RTGM, RTGTC AND RTGMTC MODELS

REYMSA recommends the next connection diagram for ABB ACS880:



XP0W	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-9: Recommended Connection Diagram for ABB ACS880 Drive.

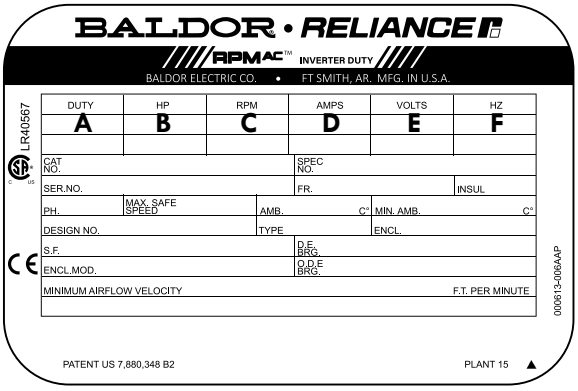
See next table for configuration and start-up.
Note: Refer to VFD user manual for more information.

Table C-4: Example of parameters and values for ABB ACS880 Drive configuration for permanent magnet motors.

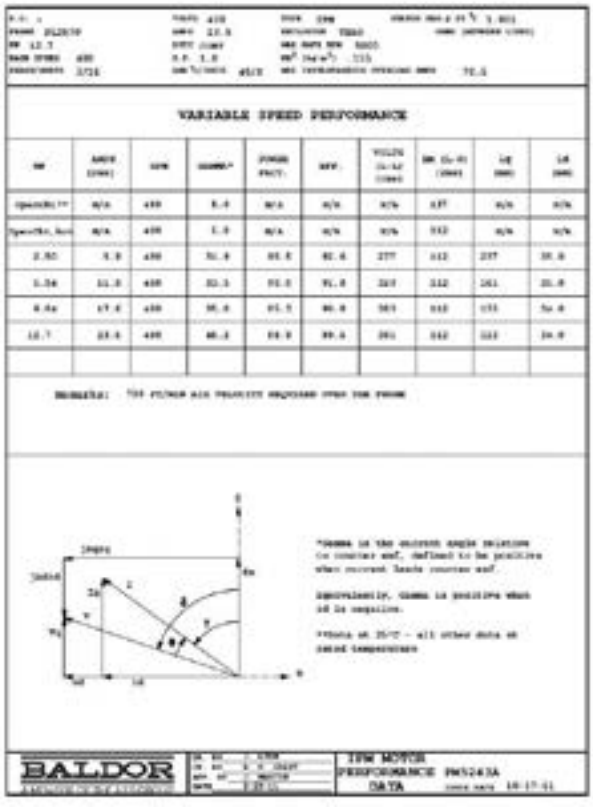
PARAMETER	VALUE
99 Motor data	
99.03 Motor type	Permanent magnet motor
99.04 Motor control mode	Scalar
99.06 Motor nominal current	**MOTOR NOMINAL CURRENT (SEE MOTOR PLATE EXAMPLES "D")**
99.07 Motor nominal voltage	**MOTOR NOMINAL VOLTAGE (SEE MOTOR PLATE EXAMPLES "E")**
99.08 Motor nominal frequency	**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

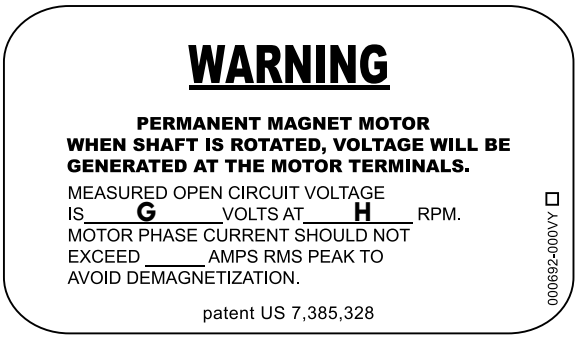
PARAMETER	VALUE
46 Monitoring/scaling settings	
46.01 Speed scaling	**MOTOR NOMINAL SPEED (SEE MOTOR PLATE EXAMPLES "C")**
47. Data storage	
47.02 Data storage 2 real32	80.000
47.11 Data storage 1 int32	269
76 CTD Motor Control	
76.03 Operating mode	PID
76.04 CT Minimum speed	20% of Motor Nominal Speed
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





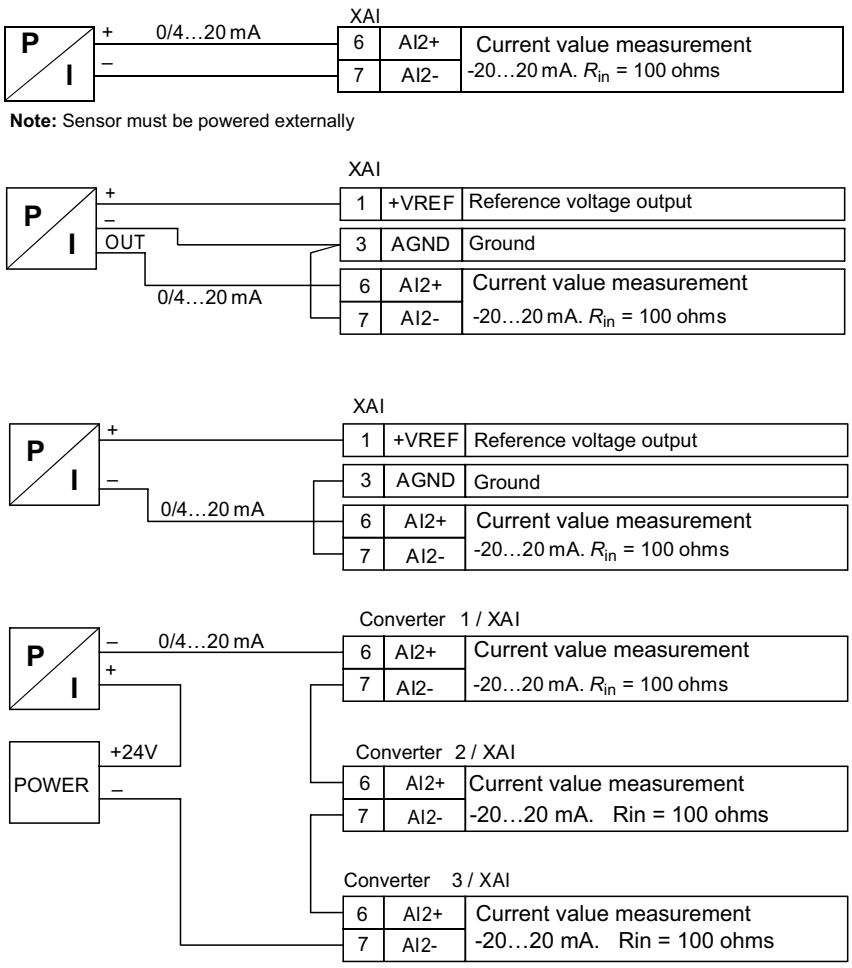


Figure C-10: Sensor connection examples for ABB ACS880 Drive.

C.2 WATER DISTRIBUTION SYSTEM

Water distribution is accomplished by a non-rotating, low pressure spray nozzle system, designed to provide a uniform water distribution for a specific flow rate (see Figure C-11). Take in account the following recommendations:

- The operating flow rate of the Cooling Tower must be as close as possible to the design flow rate. A different flow rate, whether is lower or higher, will affect the Cooling Tower 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 Cooling Tower performance. Never operate the nozzle continuously at pressures over 10 psi.
- If a VFD is installed, set the VFD to control the Cooling Tower 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-5 for the Maximum Continuous Operating Temperatures of the materials REYMSA uses for its fill media.

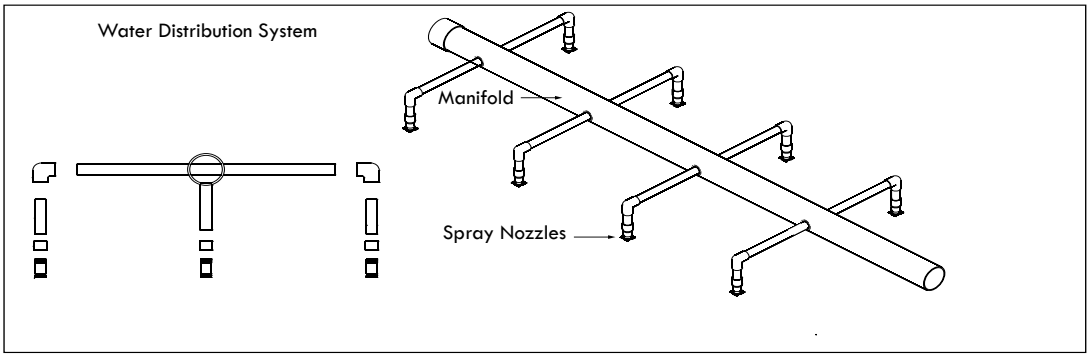


Figure C-11: Water distribution system schematic drawing

FILL MEDIA MATERIAL	MAXIMUM CONTINUOUS OPERATING TEMPERATURE
PVC	140°F (60°C)
HPVC	150°F (66°C)
PP	175°F (80°C)
ALUMINUM	> 175°F (80°C)

Table C-5: Maximum Operating Temperatures for Different Fill Media Materials

WATER DISTRIBUTION SYSTEM MATERIAL	MAXIMUM CONTINUOUS OPERATING PRESSURE
PVC	10 PSI

Table C-6: Maximum operating pressure

CAUTION

Operation at higher temperatures than temperatures shown on Table C-5 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 Cooling Tower 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 Cooling Tower 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 reduced 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-7.

Table C-7: 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.

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 Cooling Tower. It is recommended that every Cooling Tower is fitted with a solid separator. REYMSA offers a centrifugal separator as a design option for suspended solids control (see Figure C-12).

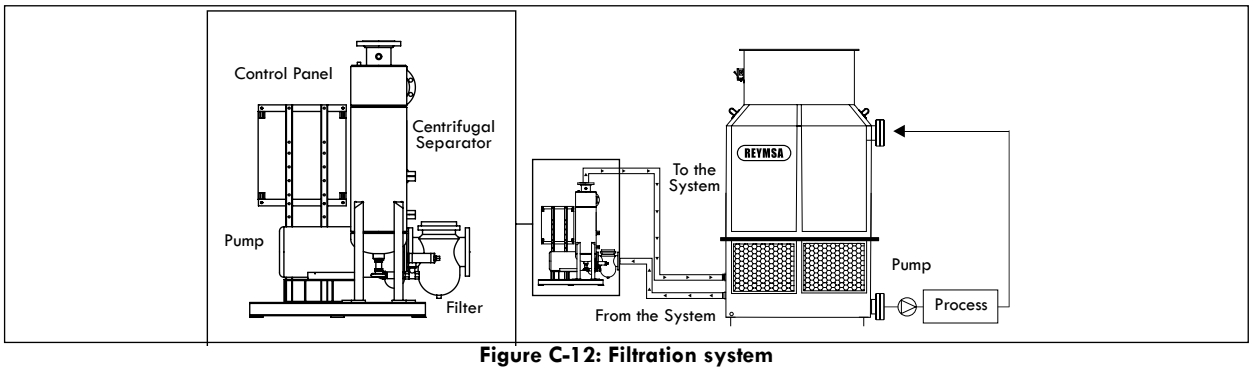


Figure C-12: Filtration system

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 and silica
- Algae growth, slime, and other micro-organisms

C.3.3 BIOLOGICAL GROWTH

Slime and algae 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, 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 Cooling Towers 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.

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

Cooling Tower 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 Cooling Towers are constructed of FRP, corrosion is not an issue for the tower.

C.3.5. AIR POLLUTION

A Cooling Tower 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 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-8, 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 Cooling Tower.

Table: C-8 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%

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

C.5. COLD WEATHER OPERATION

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

If the Cooling Tower 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.
- Maintain Tower temperature by cycling 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 the tower frequently 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

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

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.10.3. BASIN HEATER").

- Visually check that the water level is above sensor electrode. 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 thermostat set point and the water level is above the sensor level.

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 basin located in an indoor heated building is one option of freeze protection. When the Tower shuts down, the water is drained into the remote sump basin.

C.6. SEASONAL SHUT-DOWN

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

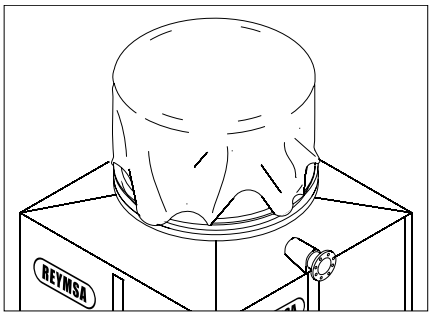


Figure C-13: Fan discharge covering

- Ensure that all 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 should to be carefully drained, cleaned, and all liquid blown outto prevent Freezing during winter season. It's recommended to use a mix of antifreeze in the final wash, followed by removal of all remaining liquid.
- As an advice, close the make up water valve and drain the line.
- 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-13) 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.
- **RTG, RTGM, RTGTC, RTGMTC 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".

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 Cooling Towers should be done by Qualified Personnel.

REYMSA recommends that Inspection of the Cooling Tower 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 Cooling Tower 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.

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 leakage -Excessive drift	*Monthly*																								
Check fan and inlet louvers	*Monthly*																								
Check water quality for biological contaminants contact your water treatment service	*Quarterly*																								
Basin, Tower Body, fan 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 bottom of the Tower to gain access to the lower 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 cold water outlet to prevent debris from falling into the basin or pump suction.
4. Inspect the bottom 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 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 air inlet louvers 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 basin 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 Cooling Tower.

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 induction motors **RT, RTU, RTM,** and the permanent magnet motors for **RTP, RTUP & RTPM** 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 induction motors (gear drive system) and the optional permanent magnet motors (direct drive system) in the **RTG, RTGM, RTGTC & RTGM** 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 assembly and motor. With the guard removed turn the fan assembly 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 and return to ground/roof level.

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 following of start-up, or before if its required, including change or bearing lubrication. 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, should then 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 assembly 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 2,500 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
175	5.5	21

OIL CAPACITY		
GEAR REDUCER MODEL	GALLONS	LITERS
1008	6	23
1110	8.5	32
1311	14	53
1712	21	80

Note: Please contact REYMSA to confirm the proper gear reducer model of your Cooling Tower.

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 basin 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 basin. 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 basin with fluid or turn on fluid flow. Check for leaks. In closed tanks make sure that all trapped air is removed from the basin. Bleed the air out of the liquid piping system and heater housing prior to operation.
12. After basin 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.

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 to be adjusted, call your REYMSA Representative for assistance
	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 Cooling Tower
	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. Cooling Towers 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 (RTG, RTGM, RTGTC & RTGMTC)	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

APPENDIX A: EXAMPLE OF UNLOADING A COOLING TOWER FROM A CONTAINER.

A. The body and duct sections are attached to the container. Make sure to unpin the Cooling Tower parts before unloading it. See Figure AP-1.

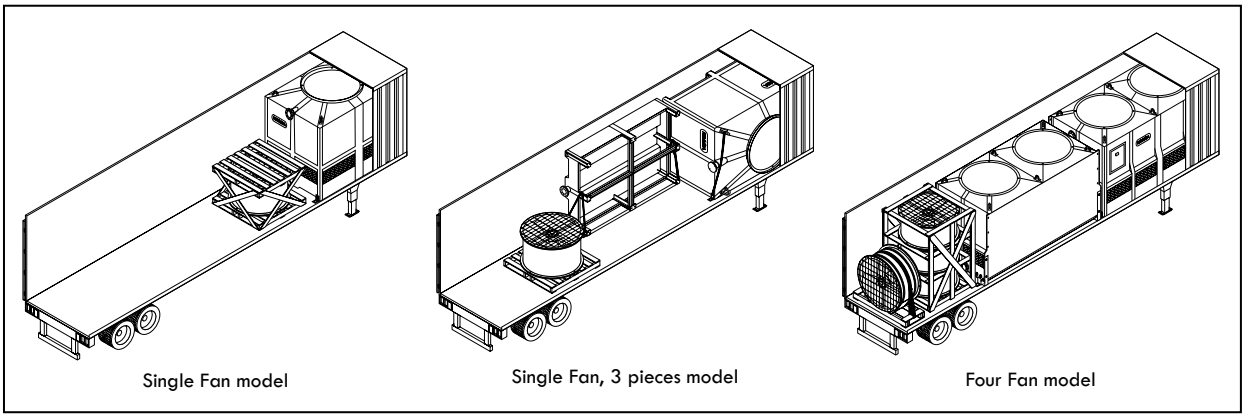


Figure AP-1: Unloading a Cooling Tower from a container

B. Make sure to remove the wooden blocks that keep the duct's boxes in place. Proceed to unload the duct, pulling the wooden skid to the edge of the container. If you don't have special equipment, use a steel cable to grab the wooden skid. Make sure to secure the steel cable on the strong support of the wooden skid. REYMSA recommends to use a forklift to unload the duct.

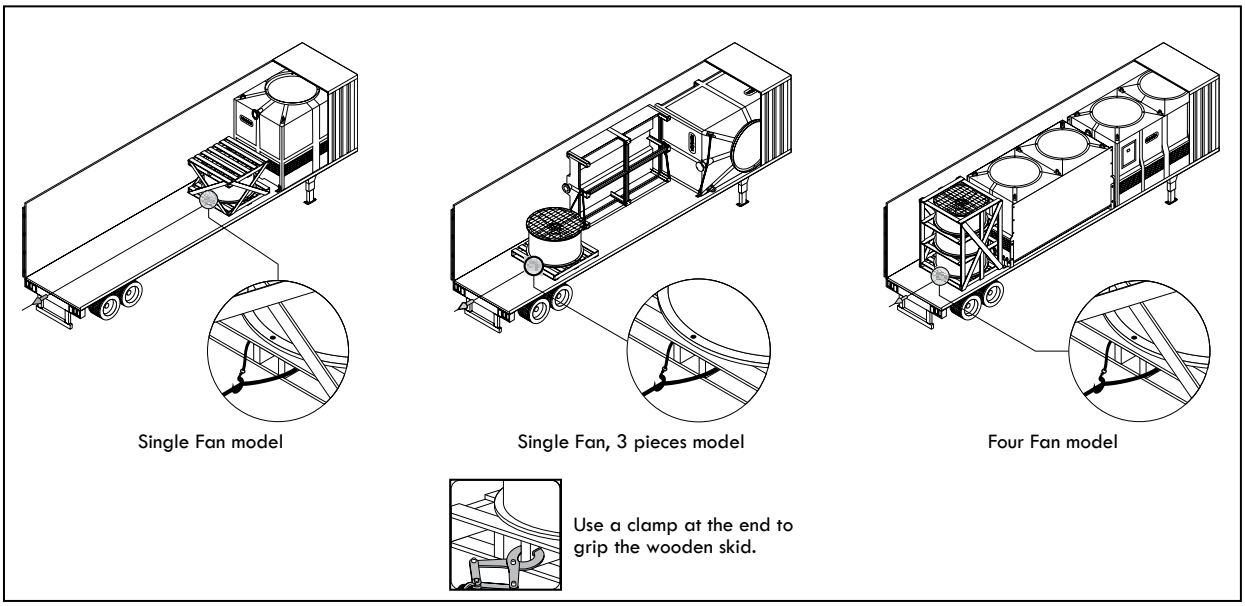


Figure AP-2: Unloading the fan duct from a container

C. Once the wooden skid is on the edge, proceed to lift and take out the fan duct. See Figure AP-3.

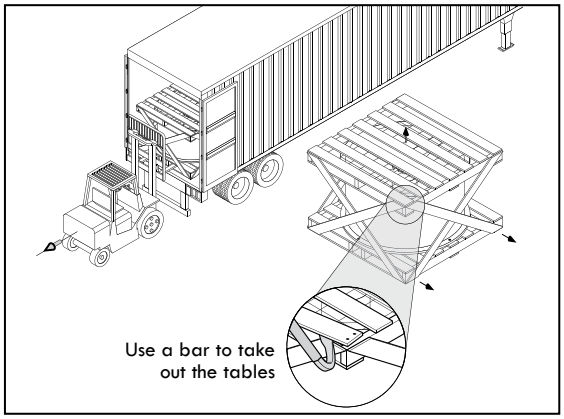


Figure AP-3: Lifting the fan duct with a forklift

D. Some models are shipped in a two-piece body. Basin section is mounted metal skids to protect and facilitate unloading. Use a steel cable to grab the metal skids and drag it to the edge of the container and leave half of basin section inside the container. See Figure AP-4.

E. Use a forklift to support the basin section from one end while a second forklift will support it from the large side and then place it on the floor. See figure AP5. Remove metal skids only if the Tower will be assembled.

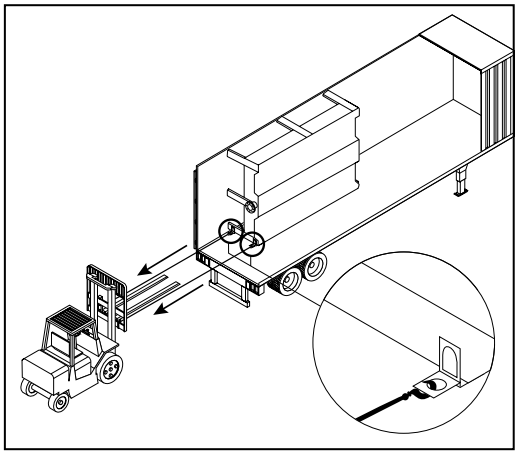


Figure AP-4: Pulling the basin out from a container

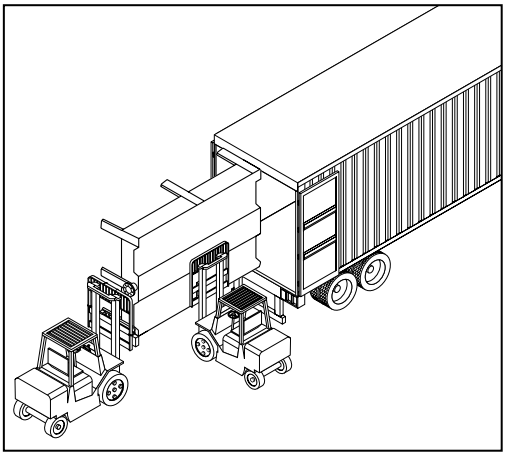


Figure AP-5: Unloading the basin with two forklifts

F. Repeat step "E" to unload the Body section. Remove metal skids only if the Tower will be assembled.

G. Secure the body section from the U-bolts and lift it slowly to set it in position for installation (see Figure AP-6). Maintain a minimum of 60° between the strap and the horizontal. Then assemble the Tower using a crane. Secure the sections with stainless steel bolt and nuts supplied by REYMSA.

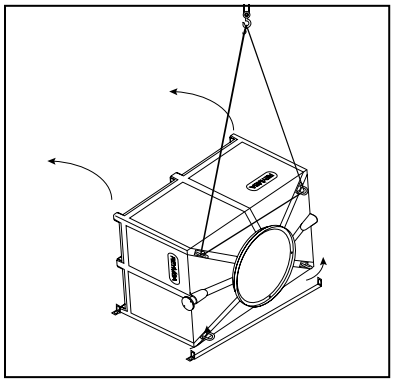


Figure AP-6: Positioning the body section with a crane

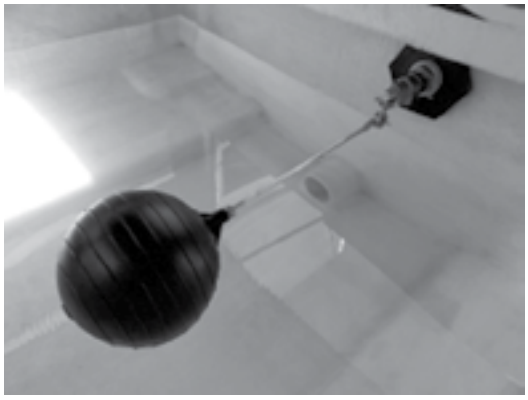
APPENDIX B: WATER MAKE-UP FLOAT VALVE.

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.

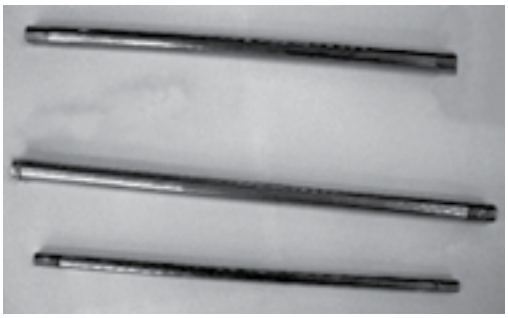
The water level in the basin can be adjusted by repositioning the float and stem using locknuts. The float valve is easily accessible from outside the unit through removable air inlet louver.

WARRANTY VOID

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



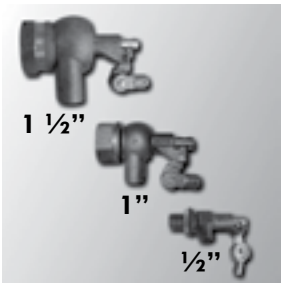
Float valve installed in a Cooling Tower



Example of stems

Plastic float

Copper float



Example of valves

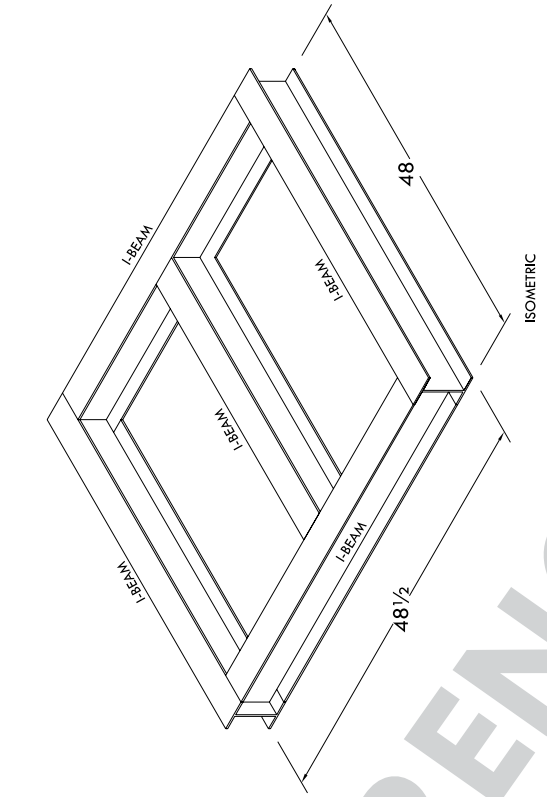
Figure AP-7: Float valve parts

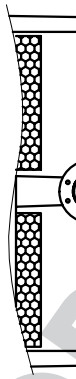
APPENDIX C: EXAMPLE OF STRUCTURAL BASE FOR A REYMSA COOLING TOWER.

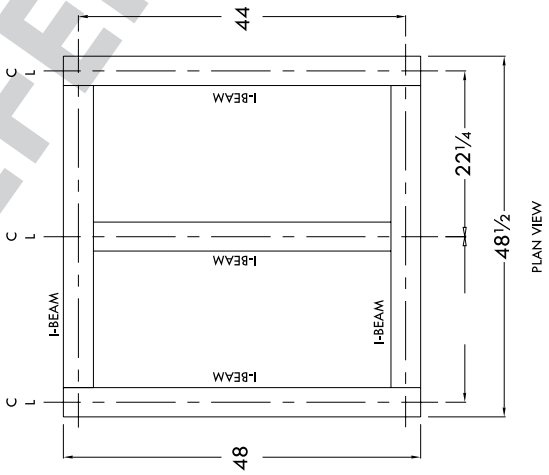
FOR REFERENCE ONLY

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

RECOMMENDED SUPPORT FOR REYMSA SINGLE FAN COOLING TOWER







REYMSA

SUGGESTED WIDE FLANGE BEAM

TYPE W-BEAM	INCHES CONFORMS TO ASTM-A6	SHOE WIDTH (IN)	SHOE THICKNESS (IN)	CENTER THICKNESS (IN)	Lbs / ft
W6 x 12	6.03 x 4.00	4.00	0.280	0.230	12

REYMSA COOLING TOWERS

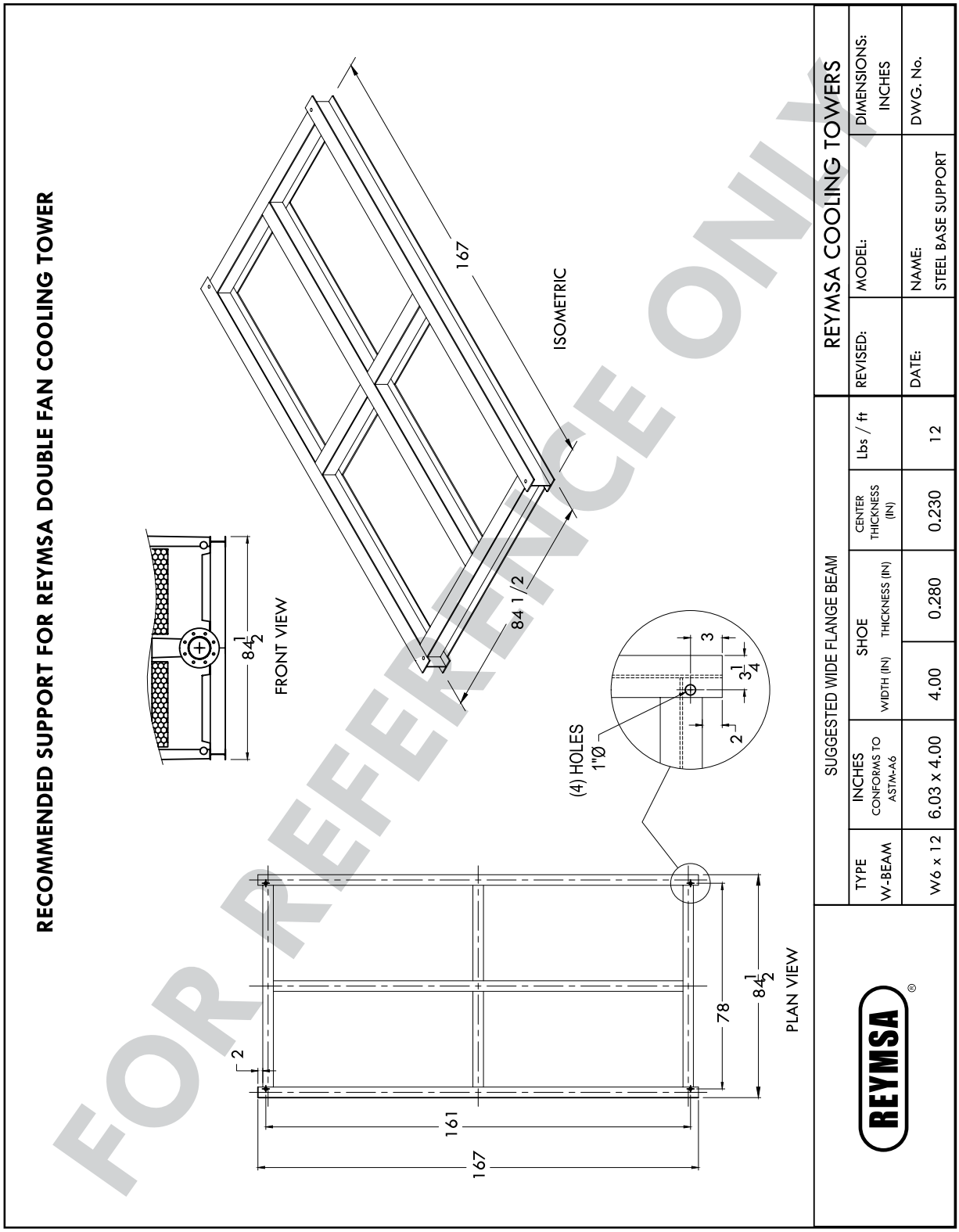
REVISED:	MODEL:	DIMENSIONS: INCHES
DATE:	NAME: STEEL BASE SUPPORT	DWG. No.

FOR REFERENCE ONLY

APPENDIX C: EXAMPLE OF STRUCTURAL BASE FOR A REYMSA COOLING TOWER.

FOR REFERENCE ONLY

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

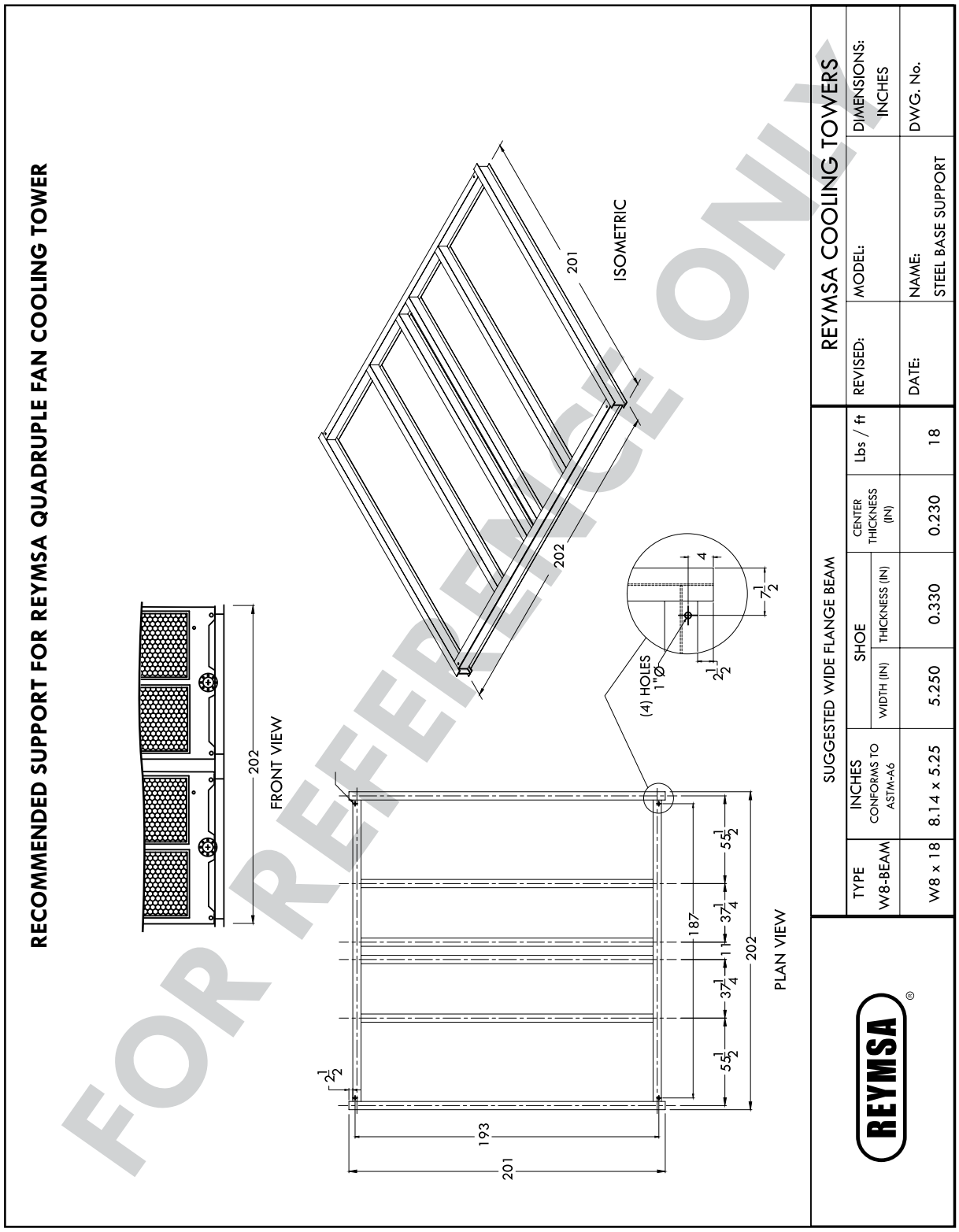


FOR REFERENCE ONLY

APPENDIX C: EXAMPLE OF STRUCTURAL BASE FOR A REYMSA COOLING TOWER.

FOR REFERENCE ONLY

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

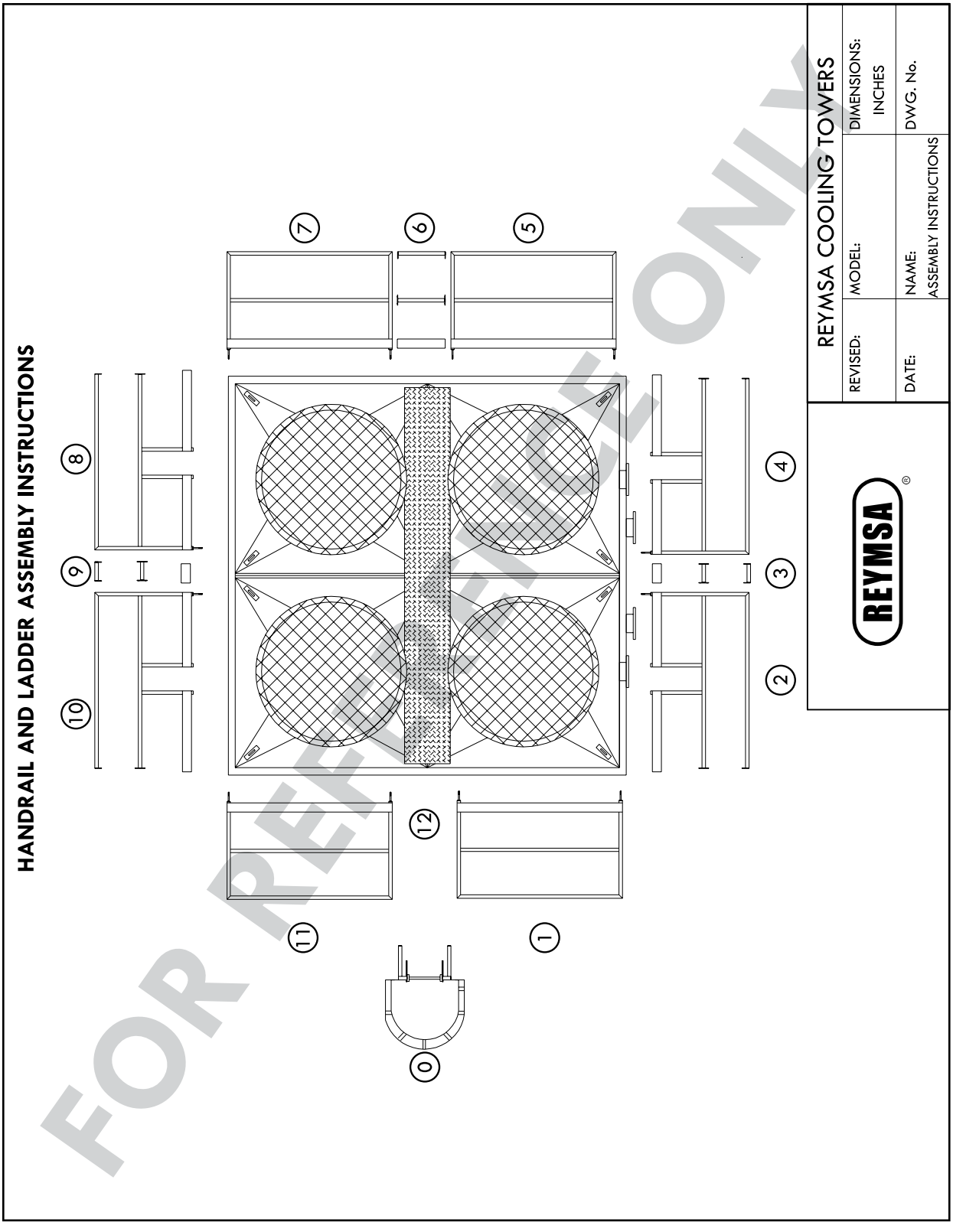


FOR REFERENCE ONLY

APPENDIX D: EXAMPLE OF ACCESSORIES ASSEMBLY INSTRUCTIONS.

FOR REFERENCE ONLY

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



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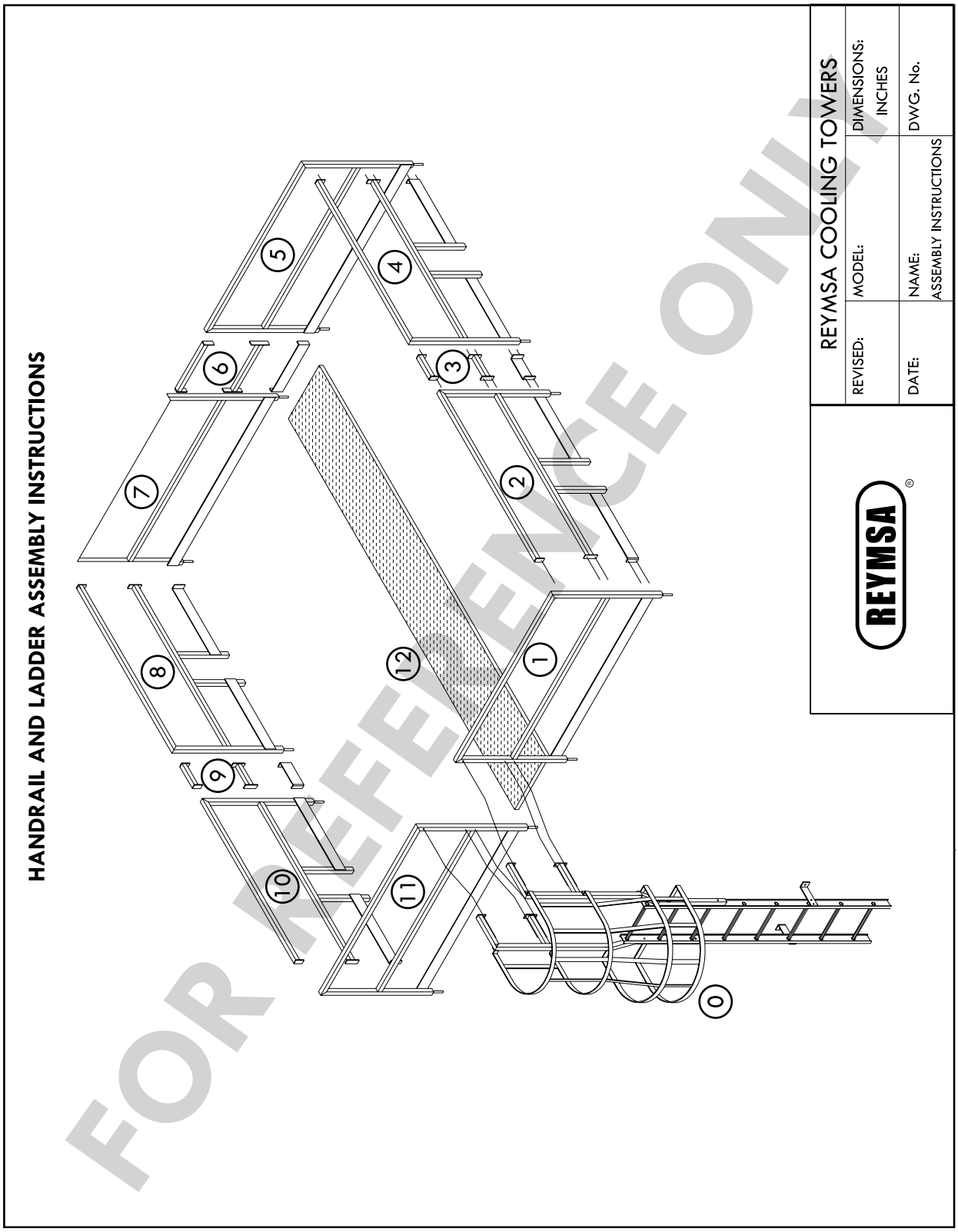
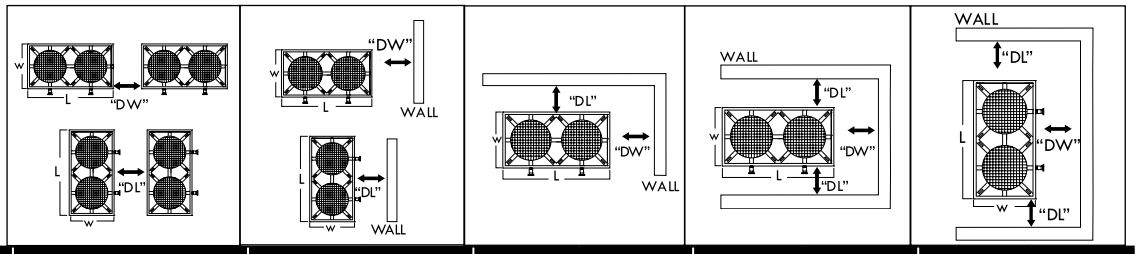


APPENDIX E: MINIMUM DISTANCE BETWEEN TOWERS AND OBSTRUCTIONS.

For RT-A, RT-B & RT-C models

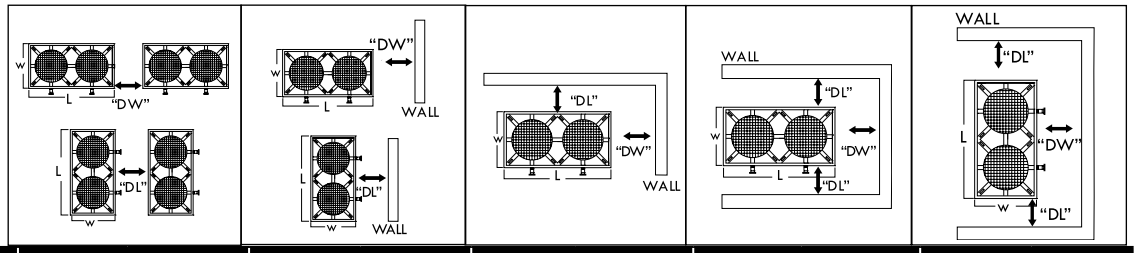


MODEL	BETWEEN TOWERS		ONE WALL		TWO WALLS		THREE WALLS (A)		THREE WALLS (B)	
	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"
RT-303	3	3	3	3	3	3	3	3	3	3
RT-404	3	3	3	3	3	3	3	3	3	3
RT-505	3	3	3	3	3	3	3	3	3	3
RT-606	3	3	3	3	3	3	3	3	3	3
RT-707	4	3	3	3	3	3	4	3	3	3
RT-708	4	4	3	3	3	3	4	3	4	3
RT-709	4	5	3	3	3	3	4	3	4	3
RT-808	4	4	3	3	3	3	4	3	4	3
RT-810	5	5	3	3	3	3	4	3	4	3
RT-812	5	6	3	3	3	4	5	4	5	3
RT-714	5	6	3	3	3	4	4	4	5	3
RT-816	5	7	3	4	4	4	5	4	5	4
RT-819	6	8	3	4	4	5	6	5	6	4
RT-822	5	8	3	4	4	5	6	5	6	4
RT-824	6	9	3	5	4	5	6	5	6	4
RT-827	6	9	3	5	4	5	6	5	6	4
RT-1414	8	9	4	5	5	5	6	5	7	5
RT-1616	10	10	5	5	6	6	8	6	8	6
RT-1619	11	11	6	6	7	7	9	7	8	7
RT-1622	11	13	6	7	7	8	9	8	9	7
RT-1624	11	14	6	7	7	8	9	8	10	7
RT-1627	11	14	6	7	7	8	9	8	9	7
LOW SOUND & SUPER LOW SOUND MODELS										
RT-707	4	3	3	3	3	3	4	3	3	3
RT-708	4	4	3	3	3	3	4	3	4	3
RT-709	4	5	3	3	3	3	4	3	4	3
RT-808	4	4	3	3	3	3	4	3	4	3
RT-810	5	5	3	3	3	3	4	3	4	3
RT-812	5	6	3	3	3	4	5	4	5	3
RT-714	4	6	3	3	3	4	4	4	4	3
RT-816	5	7	3	4	4	4	5	4	5	4
RT-819	6	8	3	4	4	5	6	5	6	4
RT-822	5	8	3	4	4	5	6	5	6	4
RT-824	5	8	3	4	4	5	6	5	6	4
RT-827	5	8	3	4	4	5	6	5	6	4
RT-1414	8	9	4	5	5	5	6	5	7	5
RT-1616	10	10	5	5	6	6	8	6	8	6
RT-1619	11	11	6	6	7	7	9	7	8	7
RT-1622	11	13	6	7	7	8	9	8	9	7
RT-1624	11	13	6	7	7	8	9	8	9	7
RT-1627	11	13	6	7	7	8	9	8	9	7

Projects that involves Modular arrangement (RTM models), please contact your local REYMSA representative for assistance.
Suggested clearances, conditions can vary.
All clearances are expressed in feet.

APPENDIX E: MINIMUM DISTANCE BETWEEN TOWERS AND OBSTRUCTIONS.

For RT-D models

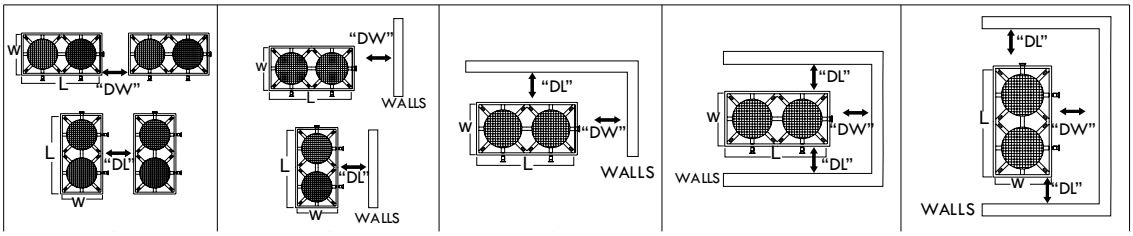


MODEL	BETWEEN TOWERS		ONE WALL		TWO WALLS		THREE WALLS (A)		THREE WALLS (B)	
	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"
RT-303	3	3	3	3	3	3	3	3	3	3
RT-404	3	3	3	3	3	3	3	3	3	3
RT-505	3	3	3	3	3	3	3	3	3	3
RT-606	3	3	3	3	3	3	3	3	3	3
RT-707	4	3	3	3	3	3	4	3	3	3
RT-708	4	4	3	3	3	3	4	3	4	3
RT-709	4	5	3	3	3	3	4	3	4	3
RT-808	4	4	3	3	3	3	4	3	4	3
RT-810	5	5	3	3	3	3	4	3	4	3
RT-812	5	6	3	3	3	4	5	4	5	3
RT-714	4	6	3	3	3	4	4	4	5	3
RT-816	5	7	3	4	4	4	5	4	5	4
RT-819	6	8	3	4	4	5	6	5	6	4
RT-822	5	8	3	4	4	5	6	5	6	4
RT-824	5	9	3	5	4	5	6	5	6	4
RT-827	5	9	3	5	4	5	6	5	6	4
RT-1414	8	9	4	5	5	5	6	5	7	5
RT-1616	10	10	5	5	6	6	8	6	8	6
RT-1619	11	11	6	6	7	7	9	7	8	7
RT-1622	11	13	6	7	7	8	9	8	9	7
RT-1624	11	13	6	7	7	8	9	8	9	7
RT-1627	11	14	6	7	7	8	9	8	9	7
LOW SOUND & SUPER LOW SOUND MODELS										
RT-707	4	3	3	3	3	3	3	3	3	3
RT-708	4	4	3	3	3	3	4	3	4	3
RT-709	4	4	3	3	3	3	4	3	4	3
RT-808	4	4	3	3	3	3	4	3	4	3
RT-810	5	5	3	3	3	3	4	3	4	3
RT-812	5	6	3	3	3	4	5	4	5	3
RT-714	4	6	3	3	3	4	4	4	4	3
RT-816	5	7	3	4	4	4	5	4	5	4
RT-819	6	8	3	4	4	5	6	5	6	4
RT-822	5	8	3	4	4	5	6	5	6	4
RT-824	5	8	3	4	4	5	6	5	6	4
RT-827	5	8	3	4	4	5	6	5	6	4
RT-1414	8	9	4	5	5	5	6	5	6	5
RT-1616	10	10	5	5	6	6	7	6	7	6
RT-1619	11	11	6	6	7	7	8	7	8	7
RT-1622	11	12	6	6	7	8	9	8	9	7
RT-1624	11	13	6	7	7	8	9	8	9	7
RT-1627	11	13	6	7	7	8	9	8	9	7

Projects that involves Modular arrangement (RTM models), please contact your local REYMSA representative for assistance.
Suggested clearances, conditions can vary.
All clearances are expressed in feet.

APPENDIX E: MINIMUM DISTANCE BETWEEN TOWERS AND OBSTRUCTIONS.

For RTU models



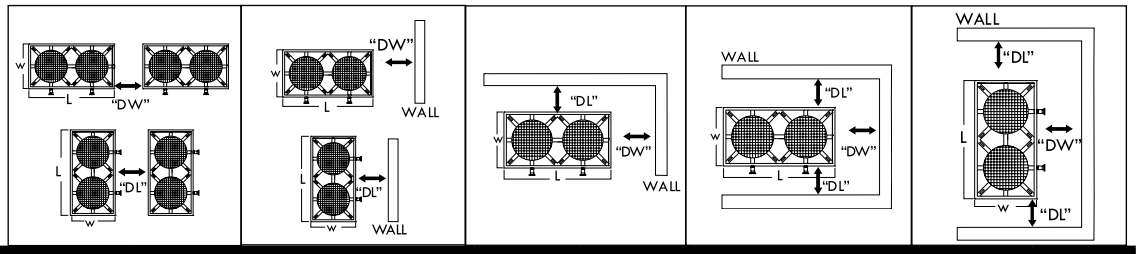
MODEL	BETWEEN TOWERS		ONE WALL		TWO WALLS		THREE WALLS (A)		THREE WALLS (B)	
	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"
RTU-303	3	3	3	3	3	3	3	3	3	3
RTU-404	3	3	3	3	3	3	3	3	3	3
RTU-505	3	3	3	3	3	3	3	3	3	3
RTU-606	3	3	3	3	3	3	3	3	3	3
RTU-707	4	3	3	3	3	3	4	3	3	3
RTU-708	4	4	3	3	3	3	4	3	4	3
RTU-709	4	5	3	3	3	3	4	3	4	3
RTU-808	4	4	3	3	3	3	4	3	4	3
RTU-810	5	5	3	3	3	3	4	3	4	3
RTU-812	5	6	3	3	3	4	5	4	5	3
RTU-714	4	6	3	3	3	4	4	4	5	3
RTU-816	5	7	3	4	4	4	5	4	5	4
RTU-819	6	8	3	4	4	5	6	5	6	4
RTU-1414	8	9	4	5	5	5	6	5	7	5
RTU-1616	10	10	5	5	6	6	8	6	8	6
RTU-1619	11	11	6	6	7	7	9	7	8	7
LOW SOUND MODELS										
RTU-707-LS	6	6	3	3	3	3	3	3	3	3
RTU-708-LS	6	6	3	3	3	3	3	3	4	3
RTU-709-LS	6	6	3	3	3	3	4	3	4	3
RTU-808-LS	6	6	3	3	3	3	4	3	4	3
RTU-810-LS	6	6	3	3	3	4	5	4	5	3
RTU-812-LS	6	6	3	3	3	4	5	4	5	3
RTU-714-LS	6	6	3	3	3	4	4	4	4	3
RTU-816-LS	6	7	3	4	4	4	5	4	5	4
RTU-1414-LS	8	8	4	4	5	5	6	5	6	5
RTU-1616-LS	11	10	6	5	6	6	8	6	7	6
SUPER LOW SOUND MODELS										
RTU-707-SLS	6	6	3	3	3	3	3	3	3	3
RTU-708-SLS	6	6	3	3	3	3	4	3	4	3
RTU-709-SLS	6	6	3	3	3	3	4	3	4	3
RTU-808-SLS	6	6	3	3	3	3	4	3	4	3
RTU-810-SLS	6	6	3	3	3	4	5	4	5	3
RTU-812-SLS	6	7	3	4	4	4	5	4	5	4
RTU-714-SLS	6	6	3	3	3	4	4	4	4	3
RTU-816-SLS	6	7	3	4	4	4	5	4	5	4
RTU-1414-SLS	9	8	5	4	5	5	6	5	6	5
RTU-1616-SLS	11	10	6	5	7	6	8	6	7	7

Suggested clearances, conditions can vary.

All clearances are expressed in feet.

APPENDIX E: MINIMUM DISTANCE BETWEEN TOWERS AND OBSTRUCTIONS.

For RTP-B and RTP-D models



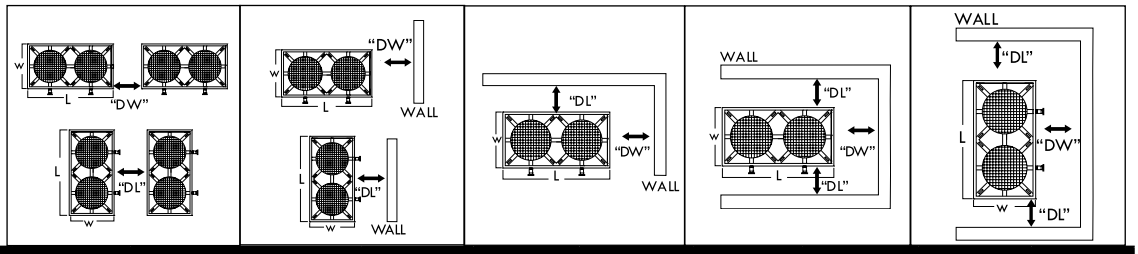
RTP-B MODELS										
MODEL	BETWEEN TOWERS		ONE WALL		TWO WALLS		THREE WALLS (A)		THREE WALLS (B)	
	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"
RTP-707	4	4	3	3	3	3	4	3	4	3
RTP-708	5	5	3	3	3	3	5	3	5	3
RTP-709	5	6	3	3	3	4	5	4	5	3
RTP-808	5	5	3	3	3	4	5	4	5	3
RTP-810	5	6	3	3	3	4	5	4	5	3
RTP-812	6	7	3	4	4	5	6	5	5	4
RTP-714	6	7	3	4	4	4	5	4	5	4
RTP-816	6	8	3	4	4	5	6	5	6	4
RTP-819	6	9	3	5	4	6	7	6	7	4
RTP-822	6	10	3	5	4	6	7	6	7	4
RTP-824	6	9	3	5	4	6	7	6	6	4
RTP-827	6	10	3	5	4	6	6	6	7	4
RTP-1414	10	10	5	5	6	6	8	6	7	6
RTP-1616	12	12	6	6	7	7	9	7	9	7
RTP-1619	12	14	6	7	8	8	10	8	10	8
RTP-1622	13	15	7	8	8	9	10	9	11	8
RTP-1624	13	15	7	8	8	9	10	9	10	8
RTP-1627	13	17	7	9	8	10	10	10	11	8

RTP-D MODELS										
RTP-707	4	4	3	3	3	3	4	3	4	3
RTP-708	5	5	3	3	3	3	5	3	5	3
RTP-709	5	6	3	3	3	4	5	4	5	3
RTP-808	5	5	3	3	3	4	5	4	5	3
RTP-810	5	6	3	3	3	4	5	4	5	3
RTP-812	6	7	3	4	4	5	6	5	5	4
RTP-714	6	7	3	4	4	4	5	4	5	4
RTP-816	6	8	3	4	4	5	6	5	6	4
RTP-819	6	9	3	5	4	6	7	6	7	4
RTP-822	6	10	3	5	4	6	7	6	7	4
RTP-824	6	9	3	5	4	6	7	6	6	4
RTP-827	6	10	3	5	4	6	6	6	7	4
RTP-1414	10	10	5	5	6	6	8	6	7	6
RTP-1616	12	12	6	6	7	7	9	7	9	7
RTP-1619	12	14	6	7	8	8	10	8	10	8
RTP-1622	13	15	7	8	8	9	10	9	11	8
RTP-1624	13	15	7	8	8	9	10	9	10	8
RTP-1627	13	17	7	9	8	10	10	10	11	8

Projects that involves Modular arrangement (RTPM models), please contact your local REYMSA representative for assistance.
Suggested clearances, conditions can vary.
All clearances are expressed in feet.

APPENDIX E: MINIMUM DISTANCE BETWEEN TOWERS AND OBSTRUCTIONS.

For RTUP-A models



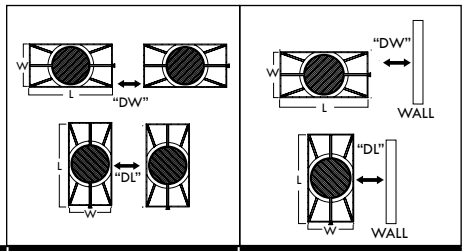
RTUP MODELS										
MODEL	BETWEEN TOWERS		ONE WALL		TWO WALLS		THREE WALLS (A)		THREE WALLS (B)	
	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"
RTUP-707	4	5	3	3	3	3	4	3	4	3
RTUP-708	5	5	3	3	3	3	5	3	5	3
RTUP-709	5	5	3	3	3	4	5	4	5	3
RTUP-808	5	5	3	3	4	4	5	4	5	4
RTUP-810	5	6	3	3	4	4	5	4	5	4
RTUP-812	5	7	3	4	4	4	5	4	5	4
RTUP-714	6	7	3	4	4	5	6	5	6	4
RTUP-816	6	9	3	5	4	5	7	5	7	4
RTUP-819	6	9	3	5	4	6	7	6	7	4
RTUP-822	6	9	3	5	4	6	6	6	7	4
RTUP-824	6	10	3	5	4	6	6	6	7	4
RTUP-1414	11	11	6	6	7	7	8	7	8	7
RTUP-1616	12	13	6	7	8	8	9	8	10	8
RTUP-1619	12	13	6	7	8	8	10	8	10	8
RTUP-1622	12	15	6	8	8	9	10	9	10	8
RTUP-1624	12	15	6	8	8	9	10	9	11	8

Suggested clearances, conditions can vary.

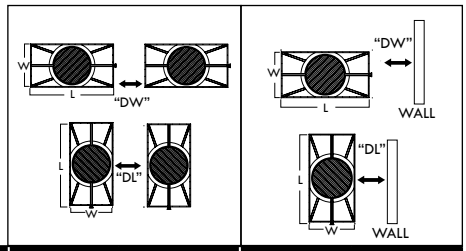
All clearances are expressed in feet.

APPENDIX E: MINIMUM DISTANCE BETWEEN TOWERS AND OBSTRUCTIONS.

For RTG & RTGTC models



MODEL	BETWEEN TOWERS		ONE WALL	
	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"
RTG-812	8	9	4	5
RTG-1012	8	9	4	5
RTG-1014	8	10	4	5
RTG-1016	8	10	4	5
RTG-1018	9	12	5	6
RTG-1020	9	13	5	7
RTG-1212	9	10	5	5
RTG-1214	10	11	5	6
RTG-1216	10	12	5	6
RTG-1218	11	13	6	7
RTG-1220	11	14	6	7
RTG-1222	12	16	6	8
RTG-1223	12	16	6	8



MODEL	BETWEEN TOWERS		ONE WALL	
	SHORT SIDE "DW"	LONG SIDE "DL"	SHORT SIDE "DW"	LONG SIDE "DL"
RTGTC-812	8	9	4	5
RTGTC-1012	8	9	4	5
RTGTC-1014	8	10	4	5
RTGTC-1016	8	10	4	5
RTGTC-1018	9	12	5	6
RTGTC-1020	9	13	5	7
RTGTC-1212	9	10	5	5
RTGTC-1214	10	11	5	6
RTGTC-1216	10	12	5	6
RTGTC-1218	11	13	6	7
RTGTC-1220	11	14	6	7
RTGTC-1222	12	16	6	8
RTGTC-1223	12	16	6	8
RTGTC-1418	12	12		
RTGTC-1420	12	12		
RTGTC-1422	12	12		
RTGTC-1423	12	12		
RTGTC-1425	12			
RTGMTC-2018	12			
RTGMTC-2020				
RTGMTC-2418				
RTGMTC-2423				
RTGMTC-2825				

Projects that involves Modular arrangement (RTGM models), please contact your local REYMSA representative for assistance.
Suggested clearances, conditions can vary.
All clearances are expressed in feet.

APPENDIX F: TIGHTENING TORQUE FOR STAINLESS STEEL BOLTS 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.

Projects that involves Modular arrangement (RTM, RTGM & RTGMTC models), please contact your local REYMSA representative for assistance.
Suggested clearances, conditions can vary.
All clearances are expressed in feet.

APPENDIX G: LABELING FOR ALIGNMENT AND ASSEMBLY SEQUENCE.

A. Cooling tower sections are identified by labels located on the front side of the tower, which is the side where the hot water inlet is located. These letters are also marked on the inside of the tower.

B. The label for each section is marked with a letter, and each section must be installed in ascending order. See figure AP-8.

"**A**" for the Basin, it is the first piece to be assembled.

"**B**" for the Body, assembled over the basin.

"**C**" for the fan Duct, assembled over the Body. If the cell/module has multiple fans, the fans should be labeled with a letter, followed by a number, for example: **C1**, **C2**.

Note: Some towers are larger and include an additional section called "lower body", which fits between the basin and the body. For these towers, the basin will be labeled **A**, the lower body will be labeled with the letter **B**, the body with **C** and the duct with **D**. See Figure AP-9.

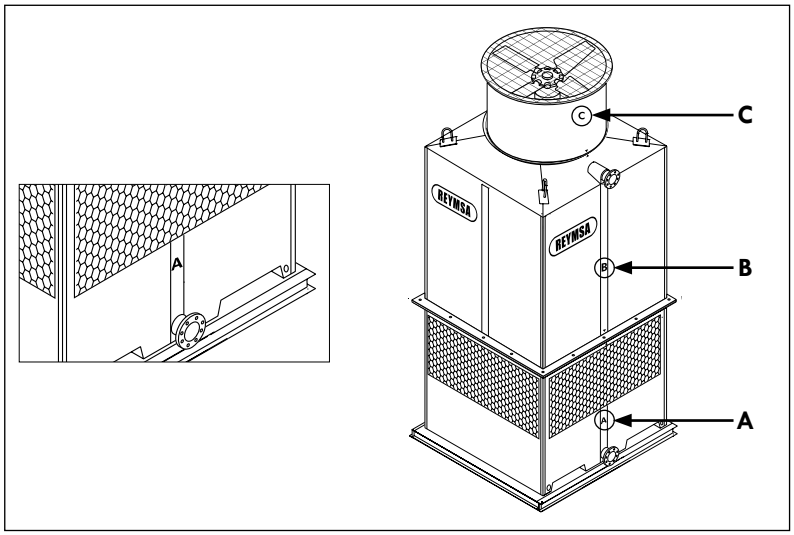


Figure AP-8: Assembly sequence labels for RT-A, RT-B or RT-C towers.

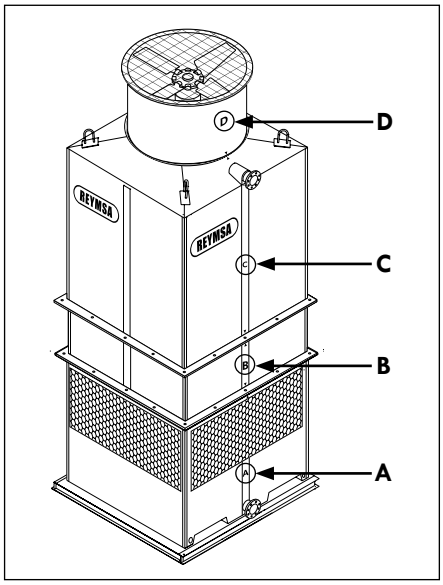


Figure AP-9: Assembly sequence labels for a RT-D tower.

C. The alignment of each piece is marked with a **bold line** on the inner side of the tower. See Figure AP-10.

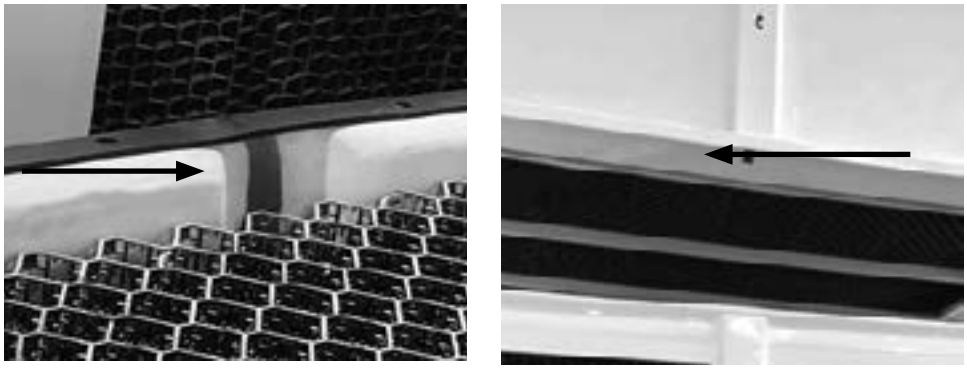


Figure AP-10: Alignment mark.

D. When **multiple towers** are going to be assembled, each tower will be identified by the label **"T"** and the number of tower, for example: **T1, T2, T3,** etc. See Figure AP-11.

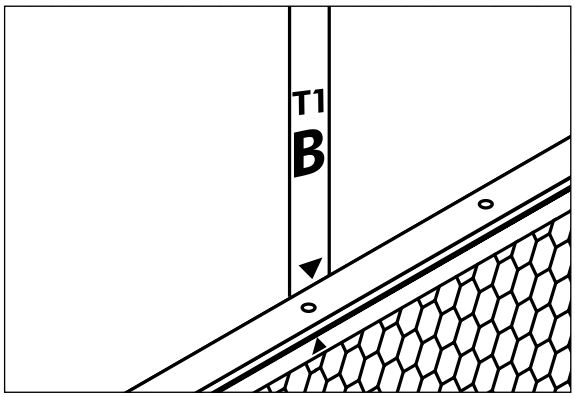


Figure AP-11: Multiple tower labels.

E. Modular Towers, each module will be identified with the letter **"M"** followed by the module number, and a letter that corresponds to the vertical position of that section, for example: **M1A, M1B, M1C, M2A, M2B,** etc. See Figure AP-12

F. If more than one modular tower with several modules is to be assembled, each module must be labeled with the **"T"** and the corresponding tower number, followed by the module number, and finally the letter of the corresponding section. For example: T1, M1A.

G. When more than one tower is to be assembled, each tower will have a **color code**: T1, **blue;** T2, **black;** T3, **red;** T4, **green.** This pattern will be repeated successively when there are more than 4 towers.

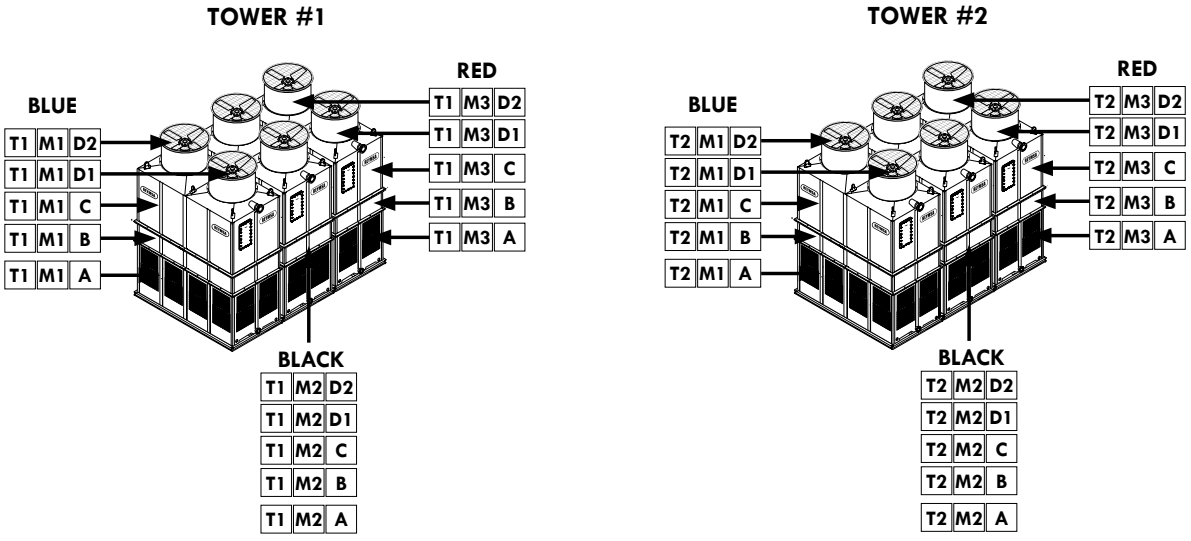


Figure AP-12: Color code for multiple tower assembly.

NOTES

REYMSA COOLING TOWERS, INC.

www.reymsa.com

(FEBRUARY 2024)