RSD™
FIBERGLASS COOLING TOWERS

Operations Manual

RSD Cooling Tower Operation Manual

1. GENERAL

The following information is intended to assist you in obtaining efficient, long-term performance from your RSD COOLING TOWER. Tower construction & function as well as field adjustment and inspection procedures are described below.

2. DESCRIPTION

2.1 Tower Shell

The tower shell is a cylindrical, bottle shaped design which minimizes internal pressure drop. This design virtually eliminates ineffective space in the cooling layers, thus providing excellent cooling efficiency and space economy.

2.2 Motors

All tower motors are U.L. RECOGNIZED for outdoor duty. Models RSD003 through RSD175 utilize direct drive motors ranging from 6 pole(1150 rpm) through 10 pole(600rpm). Models RSD200 through RSD1000 utilize 4 pole motors with gear reducers. Due to superior tower design, motor hp and consequently energy consumption is significantly less than on traditional towers.

2.3 Fans

Our axial flow fans have been specifically designed for tower use. They provide a large volume of stable air at low pressure while maintaining desired low noise levels.

2.4 Sprinkler Assembly

The sprinkler assembly is constructed of 100% non corrosive material. Mounted on the top of a center stand pipe, the sprinkler assembly distributes the water evenly through 4, 6 or 8 distribution tubes. A

minimal head pressure is required to ensure proper rotation. The specific RPM can be obtained by adjusting the distribution tube angle. Refer to the table in paragraph 4.2 for RPM requirements.

2.5 Fill

Our standard tower fill is constructed of a heat embossed honeycombed P.V.C film. This honeycomb construction ensures even water distribution and high efficiency water to air heat transfer. The fill will withstand a maximum inlet water temperature of 130f, however, to ensure long life inlet temperatures over 115f.are not recommended. The fill is guaranteed for two (2) years providing 115f.maximum inlet water and proper water treatment.

2.6 Casing

The tower casing is constructed of Fiberglass Reinforced Polyester. (FRP) This material is light weight, durable and non-corrosive. The resilient nature of (FRP) will provide an additional margin of safety during high winds, earthquakes, etc.

2.7 Water Basin

The water basin is constructed of 100% F.R.P. Our tapered bowl design channels all outgoing water to a recessed sump which ensures a steady flow of water to the pump; even when operating at low water levels, minimizing the chance of cavitation. This design also allows for easy access to the entire basin surface for easy cleaning. All fluid connections are located on a common bulkhead directly adjacent to the sump. RSD400 and larger towers have the addition of an auxiliary suction tank to simplify connections.

2.8 Air Inlet Louvers

All towers RSD40 and above are equipped with our premium air inlet louvers. These louvers virtually eliminate splash from the tower basin. They also prevent airborne debris from entering the tower. Premium louvers are available as optional equipment

on smaller RSD003 thru RSD030.

2.9 Support Systems

RSD3 through RSD350 towers employ F.R.P. support legs that are an integral part of the basin construction. On RSD400 and larger towers, the support structure is constructed of hot dipped galvanized steel. Motor support assemblies and fill support components are also constructed of cast aluminum or hot dipped galvanized material. R.S.D. utilizes exclusively stainless steel fasteners to ensure long life and easy disassembly during maintenance and repair operations.

2.10 Ladders

All towers RSD100 and larger are equipped with an OSHA standard ladder for safety and convenience.

3. INSTALLATION GUIDELINES

In order to ensure that you receive the best possible performance from your RSD Cooling Tower, it is important that you follow some basic guidelines

3.1 Location

1. **RSD** towers are designed for outdoor installation. If indoor installation is desired, contact our technical support department to determine if our product is suitable for your application.

2. In all cases your tower should be located to ensure sufficient airflow. Refer to the tower nameplate or RSD catalog to determine the required CFM for your particular model.

3. If the tower will be located in a parapet or behind an enclosure refer to the following guideline;

   a. **For a ventilated enclosure;** ensure that the louvers are sized to allow for the cfm requirements of your tower.

b. **For a non-ventilated enclosure**; there must be a distance equal to ½ the tower diameter on all sides of the tower.
c. **For a rectangular or odd shape enclosure**; it is acceptable to locate the tower adjacent to the enclosure wall providing there is a minimum distance equal to at least 1 tower diameter on one side.

d. **To Avoid Short Cycling;** the unit must be mounted to ensure that the top of the wall is no more than ½ the fan diameter or 36" (which ever is less.) above the tower stack. It is also not recommended that the tower be installed directly under or near an overhang.

Service Access; should always be considered we installing a cooling tower. Select a location that would allow for easy maintenance and service access. This is particularly important on gear drive towers that may require crane access for motor assembly repairs.

3.2 Mounting Base

It is very important that the tower mounting base be as level as possible. If the tower leans too severely, there is a possibility for poor sprinkler rotation and/or failure.

Towers that are installed on any raised platform must be firmly secured. There is a mounting hole in the center of each basin leg for this purpose. The factory can provide you with the basic mounting dimensions to aid in platform construction.

Note: Prior to any roof top or elevated installation be certain that the support structure meets all applicable building codes as they pertain to the tower operating weight. Also vibration or seismic isolation be used as required. RSD can provides OSPOD approved Isolation kits for all models.

On towers RSD100 and larger, field assembly is sometimes required. If possible, the tower should be assembled on the actual support structure. If it becomes necessary to lift the tower, consult the factory for specific load point and lifting requirement. RSD can provide specifications and drawings for support frames if desired.

3.3 Fluid Connections

All fluid piping must be in accordance with local plumbing and mechanical codes. On towers with iron pipe supply and return water lines AVOID HANGING THE WEIGHT OF THE PIPING ON THE TOWER FLANGES. It is recommended that the piping be supported no more than 18" from the actual tower connections. Failure to do this could cause damage to the tower bulkhead and void the warranty.

It is also recommended that a vibration joint be installed to protect these fittings from possible line vibration.

3.4 Electrical Connections

Models RSD003 through RSD008 are available 115/230 1ph only. RSD010 through RSD020 are available 115/230 1ph or 230/460 3ph. Models RSD025 and larger are available 230/460 3ph only. On all towers with gear reducer fan drivers, the motor should be wired for soft (low torque) start. This can be accomplished by either using a wye-delta starter, a solid state soft start controller, or a (VFD) variable frequency drive. Failure to do this may cause premature gear reducer failure. **See Sec 6.0 for Wiring detail**

3.5 Freeze Protection

The following precautions should be taken on any low ambient installation. (any tower that will routinely see temperatures below +30F.). Thermostatically controlled sump heaters should be installed to protect against tower freeze up and possible basin damage. On towers that are not used during winter months the tower basin and stand pipe should be

drained.

3.6 Water Treatment

To avoid poor performance and premature system failure, WATER TREATMENT IS ESSENTIAL.

Scale:
During typical tower operation water evaporates at the rate of 1.7 gph per ton. Proper water treatment prevents these minerals from forming scale on all of the surfaces in the system. Failure to properly treat your tower will result in the formation of scale and can significantly reduce the efficiency of your system and ultimately cause failure.

B. **Bacteria**:
Under certain environmental conditions high bacteria content in the water may cause algae to form in the tower. If this occurs tower performance will be impaired.

3.START UP PROCEDURES

4.1 Cleaning

During assembly and/or transportation of the tower it is likely that dirt and other materials have accumulated. Remove any material from the basin that may not be carried out by normal water flow. Open the drain and wash the basin thoroughly.
NOTE: It is safe to enter the tower and walk on the basin. On RSD80 and above use care around seams and support leg cavity covers to avoid possible seal damage.

4.2 Trial Water Circulation

Reach in through either the top or the side inspection hole and rotate the sprinkler assembly clockwise to ensure that it spins freely. Fill the tower to operation level (approximately even with the lower lip of the tower basin). It may be necessary to adjust the float up or down to

maintain the proper water level. Start and run the circulating pump until all air is driven out of the piping. When the circulating water becomes steady, check to be sure the sprinkler is rotating smoothly and at the proper clockwise RPM as specified below. See section 5.2 for adjustment procedure.

MODEL	R.P.M.	MODEL	R.P.M.
RSD 3	15-23	RSD225-350	3.5-4
RSD5-30	7-12	RSD400-700	2.5-5
RSD40-80	5-8	RSD800-1000	2-3
RSD100-200	5-7		

4.3 Inspection Check List

A. After the circulation test is complete, examine the tower strainer and the distribution tubes, and remove any material that may have collected.

B. Spin the fan by hand to be sure it rotates freely and has ample tip clearance.

C. On RSD175 and larger check gear reducer oil level. Add oil if necessary.

D. Double check and re-tighten all fan and motor assembly bolts. On RSD40 and above be sure to check the fan blade u-bolts.

E. Confirm that the fan motor supply voltage is correct. Run the fan momentarily to ensure proper clockwise rotation.

F. Run the fan for two to three hours and check for abnormal noise or vibration. Check the phase, current and voltage measurements to ensure that they agree with motor nameplate data. (NOTE: on larger towers that employ gear reducers, noise levels at start up will be higher than normal due to gear break in. See section 6.1 for more information.

G. Double check make-up water system and float valve adjustment.

H. Install and secure tower fan guard and air inlet louvers.

YOUR R.S.D. COOLING TOWER IS NOW READY FOR ONLINE OPERATION.

4. MAINTENANCE

In order to obtain trouble free operation and optimum system capacity, it is essential that a scheduled maintenance procedure be established and adhered to. The following is our suggestion for a typical installation. Please keep in mind that all installations are unique and that environmental and system conditions may justify special handling.

5.1 Motor & Gear Reducer (where applicable)

A. After the first week of operation the original lubricating oil should be removed. For best results, the oil should be removed while at working temperature. To drain the gear reducer oil, simply open the hand valve located on the side of the assembly and drain the contents into an appropriate container.

B. Thoroughly flush the gear box with mineral flushing oil containing no additives.

C. Refill the gear box to the top fill line on the reducer dip stick. To locate the dip stick remove the pipe cap located adjacent to the drain valve. The suggested lubricants are listed below.

MANUFACTURE	LUBRICANT
CHEVRON	AW MACHINE 220
EXXON	TERESSO 85

MOBILE	DTE BB
SHELL	TELLUS 71

D. Check the oil level weekly and add oil as needed. Check for signs of moisture condensation or oil sludge. If condensation or sludge is present, change the oil immediately.

E. Under normal conditions, the lubricating oil should be changed EVERY SIX MONTHS OR 3000 HOURS OF OPERATION. However there are conditions that may make it necessary to change the oil at one or two month intervals. Unusually high ambient temperatures with intermittent tower load can cause the gear reducer temperatures to rise and fall rapidly. This condition may cause higher than normal condensation to occur which will contaminate the oil and cause sludge to form.

F. Motor & gear reducer adjustment: After start-up or during motor or gear replacement, it may be necessary to adjust the alignment of the motor and gear reducer. The assembly basically consists of two mesh gears one motor (pinion) gear and one main (drive) gear. The only adjustment is on the horizontal plane. To obtain the best feel of the gear alignment, remove the fan housing from the top of the motor. By rocking the motor cooling fan in a clockwise/counter-clockwise direction you will feel the actual gear tolerance. You should experience approximately 1/8" of play in the assembly. Adjustment is achieved by loosening the (4) mounting bolts that secure the motor to the reducer. If the gear is too loose, simply tap the motor in, toward the center of the reducer. Check the play in the gears and continue the process until the desired tolerance is achieved.

5.2 Sprinkler Assembly

Although the sprinkler assembly is constructed of non corrosive materials, water scale and entrained material can affect its operation.

A visual inspection of the sprinkler distribution tubes should be conducted EVERY 30 DAYS. check to

ensure that the water is flowing smoothly out of all tube holes. On RSD40 and larger towers the inner most holes are the smallest thus this is where any restriction should be first observed.

A. **Cleaning**: Distribution tubes can be cleaned or replaced as required. In doing so, first loosen the locking nut, and then unscrew the tube. On RSD40 and larger towers you may remove the distribution end cap to clean the inner wall of the tube. NOTE: when cleaning out the distribution tube holes avoid enlarging the holes by drilling as this will affect the water distribution pattern and tower performance.

B. **Adjusting**: To adjust distribution tubes; while facing the sprinkler head rotate the tubes until the outlet holes are at approximately the 4 o'clock position. This will provide you with a good starting point. Start the circulating pump and compare your actual R.P.M. to the chart in section 4.2. To increase R.P.M. rotate the tubes counter clockwise. To decrease R.P.M. rotate the tubes clockwise. Once the desired speed is obtained tighten down locking nuts.

C. **Removing Sprinkler Head**: If uniform low water flow and/or slow rotation is observed it may be necessary to remove and clean the sprinkler head assembly. This can be accomplished by first removing all distribution tubes and then unscrewing the head assembly from the tower stand pipe.

5.3 Strainer

The cooling tower strainer is intended to prevent foreign material from reaching the pump, heat exchanger and water distribution system. A periodic cleaning of the strainer will ensure proper water flow and aid system operation.

5.4 Fill

In order to maintain optimum tower efficiency,

EVERY 6 MONTHS OR 3000 HOURS OF OPERATION, it is recommended that the fill be examined for signs of deterioration and non-uniform water distribution. Under normal conditions (95 to 115 degree f. return water) the fill should retain its effectiveness for many years. However, application conditions such as suspended solids, poor water treatment or higher than normal return water temperatures (over 115 degree f.)may cause premature clogging and/or fill deterioration.

A: Fill removal and replacement:

RSD3 through 30:
1. Remove the fan guard, motor frame and fan assembly.
2. Remove the FRP upper casings.
3. Remove the sprinkler assembly.
4. You should now be able to remove fill sections as needed.

RSD40 through 1000:
1. Remove the fan guard, motor frame and fan assembly.
2. Remove fan guard.
3. Loosen and remove 1/2 of the motor frame mounting bolts.
4. Remove 2 to 3 FRP upper casings.
5. Remove the sprinkler assembly.
6. You should now be able to remove fill sections as needed.

To replace the fill, reverse the above process. You may have to trim some of the new sections in order to conform to the actual dimensions of your tower

5.5 Water Basin

Although the water basin does not require any routine maintenance, you may want to periodically drain and clean out collected solids. Fresh water and a stiff bristle brush are recommended. Nu-Calgon 4330-08 liquid scale dissolver or equivalent can also be used as needed. NOTE: Avoid the use of industrial cleaning chemicals as some may have

detrimental effects on the fiberglass material. Also, on RSD70 and larger towers avoid scraping the basin floor particularly near basin seams.

5.6 Casing

The F.R.P casing is coated with a UV inhibiting (Gelcoat) material which is maintenance free. In the event that the casing is damaged and requires repair, simply sand off the gelcoat surrounding the damaged area, complete your fiberglass repair and gelcoat the area.

5.7 Painting

Although all metal components are corrosion resistant it is recommended that they be cleaned and painted periodically. Use of an epoxy-base paint is recommended. Frequency of painting depends on environmental and operating conditions.

5.8 Water Make-up

RSD cooling towers are equipped with a float valve assembly that will maintain the basin water level. To determine the amount of make-up water actually required, you must combine the evaporation loss, drift loss and the desired bleed-off or blow down.

A: **Evaporation loss**; is approximately 1.7 GPH per ton at 10 degree range. Use the following formula to calculate the evaporation loss for your system:

(E)% = (range / 1080) x 100.

Example: based upon 10 degree range, 100 GPM tower usage.

(E)% = (10 / 1080) x 100
(E) = 0.926%
0.926% x 100 GPM x 60 (minutes) = 55.56 GPH

B: **Drift loss**: is the amount of entrained moisture (water vapor) that is exhausted out the top of the tower. The RSD design limits drift loss to 0.002% - 0.003% of circulated water volume.

C: **Bleed-off or Blow down**: is a component of the water treatment process, where a small volume of water is removed from the circulating system. The intent is to keep the concentration of dissolved solids in the tower water to an acceptable minimum. The actual amount of bleed required on your system will depend on system load and water quality. On average you can expect 1 to 2 gallons per hour per ton of load.

D: PIPING HINTS

1. The tower pump should be located as close as possible to the tower outlet.
2. If the piping layout requires a vertical run down stream from the pump, be sure to install a check valve to avoid water flooding back to the tower.
3. Be certain that all water lines are sizes to minimize pressure drop, with a max flow rate of less than 8 feet per second.

6. ELECTRICAL

1. All motors shall be connected to an U.L. listed overload protective device, rated or set at not more than 125% of the motor full load rating.

2. All motors over 3 hp should be connected using either a wye delta (transitional starter) an electronic soft starter or a (VFD) variable frequency drive.

3. When wiring to a (VFD)variable frequency drive use across the line wiring.

4. All motors must be wired for clockwise rotation opposite shaft end.

6.1 Wiring Information

All Tower motors are UL recognized IEC frame construction. Use the charts below to determine the proper wiring configuration for your particular tower.

Motor Data				
Model	**H.P.**	**Voltage**	**RLA**	**Wiring**
RSD 003	1/6	115/230-1	2.67/1.33	4-wire
RSD 005	1/6	115/230-1	2.67/1.33	4-wire
RSD 008	1/6	115/230-1	2.67/1.33	4-wire
RSD 010	1/4	115/230-1	3.44/1.72	4-wire
RSD 015	1/2	115/230-1	4.8/2.4	4-wire
	1/2	230/460-3	2.30/1.15	9-wire
RSD 020	1/2	115/230-1	4.8/2.4	4-wire
	1/2	230/460-3	2.30/1.15	9-wire
RSD 025	3/4	230/460-3	2.8/1.4	9-wire
RSD 030	3/4	230/460-3	2.8/1.4	9-wire
RSD 040	1	230/460-3	3.50/1.75	9-wire
RSD 050	1	230/460-3	3.50/1.75	9-wire
RSD 060	1.5	230/460-3	4.8.2.4	9-wire
RSD 070	1.5	230/460-3	5.6/2.8	9-wire
RSD 080	1.5	230/460-3	5.6/2.8	9-wire
RSD 100	2	230/460-3	7.0/3.50	9-wire
RSD 125	3	230/460-3	9.0.4.50	9-wire
RSD 150	3	230/460-3	12.0/6.0	9-wire
RSD 175	3	230/460-3	12.0/6.0	9-wire
RSD 200	7.5	230/460-3	19.0/9.5	12-wire
RSD 225	7.5	230/460-3	19.0/9.5	12-wire
RSD 250	7.5	230/460-3	19.0/9.5	12-wire
RSD 300	10	230/460-3	25.0/12.5	12-wire
RSD 350	10	230/460-3	25.0/12.5	12-wire
RSD 400	15	230/460-3	36.0/18.0	12-wire
RSD 500	15	230/460-3	36.0/18.0	12-wire
RSD 600	20	230/460-3	48.0/24.0	12-wire
RSD 700	20	230/460-3	48.0/24.0	12-wire
RSD 800	25	230/460-3	59.4/29.7	12-wire

RSD 1000	30	230/460-3	70.0/35.0	12-wire

IEC to NEMA Wiring Conversion					
9 - Wire			**12 - Wire**		
IEC		**NEMA**	**IEC**		**NEMA**
U1	=	T1	U1	=	T1
V1	=	T2	V1	=	T2
W1	=	T3	W1	=	T3
U2	=	T4	U2	=	T4
V2	=	T5	V2	=	T5
W2	=	T6	W2	=	T6
U5	=	T7	U5	=	T7
V5	=	T8	V5	=	T8
W5	=	T9	W5	=	T9
			U6	=	T10
			V6	=	T11
			W6	=	T12

Motor Wiring					
Single Phase					
115v (4-wire)			230v (4-Wire)		
T1	=	2 + 4	T1	=	1
T2	=	1 + 3	T2	=	4
			Tie Together 2 -3		

3-phase Across the Line					
230-3 (9-Wire)			460-3 (9-Wire)		
T1	=	U1+U5	T1	=	U1
T2	=	V1+V5	T2	=	V1
T3	=	W1+W5	T3	=	W1
Tie Together U2+V2+W2			Tie Together U2+U5, V2+V5, W2+W5		

230-3 (12-Wire)			460-3 (12-Wire)		
T1	=	U1+U5+W2+W6	T1	=	U1+W6
T2	=	V1+V5+W2+U6	T2	=	V1+U6
T3	=	W1+W5+V2+V6	T3	=	W1+V6
			Tie Together		

	U2+U5, V2+V5, W2+W5

3-phase Wye Delta					
230-3 (12-Wire)			460-3 (12-Wire)		
T1	=	U1+U5	T1	=	U1
T2	=	V1+V5	T2	=	V1
T3	=	W1+W5	T3	=	W1
T4	=	U2+U6	T4	=	U6
T5	=	V2+V6	T5	=	V6
T6	=	W2+W6	T6	=	W6
			Tie Together U2+U5, V2+V5, W2+W5		

RSD COOLING TOWER WARRANTY

RSD warrants this product to be free of defects in materials and/or workmanship to the extent, but only the extent set forth below, and is limited to product that is properly applied and installed:

(A)FRP components for ten (10) years from the date of installation. To be replaced or repaired as needed.
(B) PVC fill material for two (2) years from date of installation. To be replaced as needed.
(C)All electrical, mechanical and non-FRP structural components for one (1) year from date of installation. To be repaired or replaced as needed.

RSD REPLACEMENT PARTS WARRANTY

All replacement parts are guaranteed for 90 days from the date of installation.

The foregoing expressed warranty is in lieu of all other warranties, expressed, implied, or statutory (including, but not limited to, warranties of merchantability and fitness for a particular purpose.) RSD shall in no event be liable for any consequential, incidental or special damages and/or expenses.

RSD Fiberglass Cooling Towers, a Division of

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