

7.0 MAINTENANCE PROCEDURES

7.1 General

Section 7 contains tables describing the periodic maintenance tasks to be performed in the plant. The tables are organized By Schedule and By Equipment and contain cross references to Sections 4 and 9. For detailed descriptions of each maintenance task, refer to the manufacturers' manuals in Section 9.

Tables for spare parts and miscellaneous equipment are included in this section.

Finally, a clear plastic sleeve contains maintenance, chlorination, and consumable logs. Make copies as required. **DO NOT USE THE LAST COPY** before making more copies. Keep a clean copy in the sleeve. The logs are an important part of facility operation. They should be filled out immediately following maintenance. They are critical to trouble shooting when problems arise, determining "rules of thumb" for operation, and are used for designing changes to the facility when required.

Consumables and spare parts are provided for convenient and fast maintenance, thereby causing very little down time. When consumables are used be sure to record the usage on the consumables log. Order replacement consumables with plenty of lead time so no disruption in water delivery occurs.

Sleeve	Contents: Chlorination Log, Maintenance Logs, and Consumables Usage/Reorder Log.
Table 7.1	Maintenance Tasks by Equipment
Table 7.2	Maintenance Tasks by Schedule
Table 7.3	Spare Parts and Miscellaneous Equipment

7.2 Maintenance Logs

The following tables are maintenance logs for facility operation. Please make copies from the clear sleeve, ensuring that a clean copy remains in the sleeve for future copying.

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**MAINTENANCE TASKS BY EQUIPMENT
TABLE 7.1**

Section 9 Tab	Section 4 Tables and Figs	Item	Maintenance Item	Schedule
9.1 PIPES, PIPE SUPPORT, VALVES, INTAKE SCREEN, AND FITTINGS				
9.1	-	Throttling Valve	Check For Leakage, And Smooth Operation	Daily
9.1	4.1, 4.4	Pipe Fittings	Check For Leakage	Daily
-	-	Bypass Hose	Check For Leakage, Tighten Monthly	Daily
9.2 PUMPS				
9.2	4.1	Submersible Intake Pump	Inspect For Wear	Annually
9.2	4.1	Submersible Pump Engine	Reactive Maintenance, page 25 of Franklin Electric Submersible Motor Manual	As Required
9.3 METERS AND GAUGES				
9.3	4.1, 4.3	Flow Meter & Accumulator	Record Flow Rate and Accumulator Reading	Daily
9.3	4.1	Pressure Gauge	Record Reading	Daily
9.3	4.1	Thermometer	Record Reading	Daily
9.4 WATER TREATMENT				
9.4	-	Chlorine	Inspect Containers for Leaks and Moisture	Weekly
9.4	4.1, 4.3	Chlorine Injection Pump	Replace and Clean Cartridge Valves as Required	Every 8 Months
9.4	4.1, 4.3	Chlorine Injection Pump	Clean or Replace Diaphragm as Required	Every 8 Months
9.4	4.1, 4.3	Chlorine Injection Pump	Clean or Replace Diaphragm on 5-way Valve as Required	Every 8 Months
9.4	4.1	Chlorine Mixer	Rinse Off Shaft and Agitator	Following Each Chlorine Mixing
9.4	4.1	Chlorine Mix and Feed Tanks	Inspect for Leaks and Clean	Following Each Chlorine Mixing

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TABLE 7.1**

Section 9 Tab	Section 4 Tables and Figs	Item	Maintenance Item	Schedule
9.4	4.1	PVC Ball Valves on Tanks	Check For Leakage, And Smooth Operation	During Each Chlorine Mixing
9.5 HEATING SYSTEM				
9.5	-	Radiant Heaters	Check For Correct Operation	Daily
9.5	-	Electric Heater Thermostat	Check For Correct Operation	Daily
9.5	-	Percentage Input Controller for Radiant Heaters	Check For Correct Operation	Daily
9.6 ELECTRICAL PANELS, AND ASSOCIATED ITEMS				
9.6	4.2	Breaker Panel	Test Breakers	Monthly
9.6	4.2	Main Disconnect in Breaker Panel	Test	Annually
9.6	4.2	Motor Starter for Submersible Pump	Check all Switches	Monthly
9.6	4.2	Meter Socket	Check that Meter is Operating	Monthly
9.7 GENERATOR				
9.7	4.2	Engine	Check Engine Oil Level per Engine Manual	Daily
9.7	4.2	Engine	Check Air Cleaner	Daily
9.7	4.2	Engine	Battery Maintenance and Connections	125 Hrs
9.7	4.2	Engine	Check Cooling System per Manual	125 Hrs
9.7	4.2	Engine	Change Engine Oil	125 Hrs
9.7	4.2	Engine	Change Oil Filter	500 Hrs
9.7	4.2	Engine	Change Fuel Filter	1000 Hrs
9.7	4.2	Engine	Check Valve Clearances	500 Hrs
9.7	4.2	Engine	Check V-belts	250 Hrs
9.7	4.2	Engine	Check Alarm System	250 Hrs
9.7	4.2	Engine	Check Fuel Strainer & Fuel Screen	1000 Hrs
9.7	4.2	Engine	Check Fastenings	1000 Hrs
9.7	4.2	Engine	Check Flame Type Heater Plugs	1000 Hrs
9.7	4.2	Engine	Change Bypass Oil Filter	500 Hrs
9.7	4.2	Engine	Check Injectors	3000 Hrs

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Section 9 Tab	Section 4 Tables and Figs	Item	Maintenance Item	Schedule
9.7	-	Generator & Alternator	Clean Cooling Air Openings	Monthly
9.7	4.2	Muffler	Check & Remove Ice From Exhaust Pipe	Daily During Winter
9.8 UNINTERRUPTIBLE POWER SYSTEM				
9.8	4.2	Uninterruptible Power System	Periodic Maintenance As Per Manual	6 Months or Per Alarm Conditions.
9.9 CONTROL PANEL, REMOTE CONTROL, AND ASSOCIATED ITEMS				
9.9	4.3	Pilot Lights	Observe Operation	Daily
9.9	4.3	Push Buttons	Observe Operation	Daily
9.9	4.3	Flow Switch	Inspect O Rings, Wheel And Paddles	Annually
9.9	4.3	Flow Sensor	Replace Paddle and/or Sensor	Per False Readings on Flow Gauge
9.10 ALARM ITEMS				
9.10	-	Alarm Thermostats	Check Operation	Weekly
9.10	4.5, 4.6	Fuel Level Sensor	Check Alarm Operation	Weekly
9.10	-	Horn	Check Operation	Weekly
9.10	-	Strobe Beacon	Check Operation	Weekly
9.10	4.3	Annunciator	Press Test Button	Weekly
9.11 LUMINARIES				
9.11	-	Emergency Light	Push To Test Button	Weekly
9.11	-	Exit Light	Test	Annually
9.11	-	Exterior Lighting	Check Lamps	Monthly
9.11	-	Overhead Lighting	Check Lamps	Monthly
9.11	-	Truck Arm Light	Check Lamps	Monthly
9.12 HEAT TRACE SYSTEM				
9.12	4.5	Heat Trace Controller	Check for Messages on Panel	Daily
9.12	4.4, 4.5	Heating Cable	Feel Conduit for Heat	Daily During Cold Weather Conditions
9.13 DIESEL FUEL SUPPLY				
9.13	4.5, 4.6	Fuel Tank (Main & Day)	Check For Corrosion And Leaks	Weekly
9.13	4.5, 4.6	Level Indicator	Check And Compare To Tank Level	Weekly

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Section 9 Tab	Section 4 Tables and Figs	Item	Maintenance Item	Schedule
9.13	4.5, 4.6	Fill and Vent Caps	Check If Closed And Locked	Weekly
9.13	4.5, 4.6	Drain Valve	Drain Water From Containment	Weekly
9.13	4.5, 4.6	Isolation Valves	Check If Open	Weekly
9.13	4.5, 4.6	Spill Containment	Check For Fuel Leakage, And Clean	Weekly
9.13	4.5, 4.6	Fuel Filter	Replace	Annually
9.13	4.5, 4.6	Flexible Connection	Check Stress On Connections	Annually
9.14 VENTILATION SYSTEM				
9.14	-	Blower Box & Motor	Check for Operation	Daily
9.14	-	Dampers	Check, Clean, and Lubricate	Every 3 Months
9.14	-	Actuators	Check, Clean, and Lubricate	Every 3 Months
9.14	-	Ventilation Thermostat	Check Setting	Weekly
9.15 SATELLITE PHONE SYSTEM				
9.15	-	Autodialer and Satellite Phone System	Test Operation	Weekly
9.16 LABORATORY AND SAFETY EQUIPMENT				
9.16	-	Chlorine Tester	Inventory Chemicals and Reorder as Necessary	Monthly
9.16	-	Fire Extinguisher	Maintain Per Manual's Instructions	Annually
9.16	-	Eyewash Station	Inventory Saline and Reorder as Necessary	Monthly
9.16	-	Valved Respirators	Inventory and Reorder as Necessary	Monthly
9.16	-	Safety Gloves	Inventory and Reorder as Necessary	Monthly
9.16	-	Rubberized Safety Apron	Inspect for Wear and Reorder if Necessary	Annually
9.16	-	Face Shield	Inspect for Wear and Reorder if Necessary	Annually

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MAINTENANCE TASKS BY EQUIPMENT
TABLE 7.1

Section 9 Tab	Section 4 Tables and Figs	Item	Maintenance Item	Schedule
9.17 MISCELLANEOUS ITEMS				
9.17	-	Winch	Lubricate and Inspect Cable on Spool	Annually
9.17	-	Winch Cable	Inspect for Corrosion and Fraying	Annually
9.17	-	Janitorial Equipment	Restock as Required	Monthly
9.17	-	Interior Paint	Inspect and Repaint as Necessary	Annually

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**MAINTENANCE TASKS BY SCHEDULE
TABLE 7.2**

Schedule	Section 9 Tab	Section 4 Tables and Figs	Item	Maintenance Required
HOUR SCHEDULE				
125 Hrs	9.7	4.2	Engine	Check Cooling System per Manual
125 Hrs	9.7	4.2	Engine	Battery Maintenance and Connections
125 Hrs	9.7	4.2	Engine	Change Engine Oil
250 Hrs	9.7	4.2	Engine	Check V-belts
250 Hrs	9.7	4.2	Engine	Check Alarm System
500 Hrs	9.7	4.2	Engine	Change Bypass Oil Filter
500 Hrs	9.7	4.2	Engine	Check Valve Clearances
500 Hrs	9.7	4.2	Engine	Change Oil Filter
1000 Hrs	9.7	4.2	Engine	Change Fuel Filter
1000 Hrs	9.7	4.2	Engine	Check Fuel Strainer & Fuel Screen
1000 Hrs	9.7	4.2	Engine	Check Fastenings
1000 Hrs	9.7	4.2	Engine	Check Flame Type Heater Plugs
3000 Hrs	9.7	4.2	Engine	Check Injectors
DAILY MAINTENANCE				
Daily During Cold Weather Conditions	9.12	4.4, 4.5	Heating Cable	Feel Conduit for Heat
Daily During Winter	9.7	4.2	Muffler	Check & Remove Ice From Exhaust Pipe
Daily	9.1	4.1, 4.4	Pipe Fittings	Check For Leakage
Daily	9.1	-	Throttling Valve	Check For Leakage, And Smooth Operation
Daily	9.12	4.5	Heat Trace Controller	Check for Messages on Panel
Daily	9.14	-	Blower Box & Motor	Check for Operation
Daily	9.3	4.1	Pressure Gauge	Record Reading
Daily	9.3	4.1	Thermometer	Record Reading
Daily	9.3	4.1, 4.3	Flow Meter & Accumulator	Record Flow Rate and Accumulator Reading
Daily	9.5	-	Percentage Input Controller for Radiant Heaters	Check For Correct Operation
Daily	9.5	-	Electric Heater Thermostat	Check For Correct Operation
Daily	9.5	-	Radiant Heaters	Check For Correct Operation

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**MAINTENANCE TASKS BY SCHEDULE
TABLE 7.2**

Schedule	Section 9 Tab	Section 4 Tables and Figs	Item	Maintenance Required
Daily	9.7	4.2	Engine	Check Engine Oil Level per Engine Manual
Daily	9.7	4.2	Engine	Check Air Cleaner
Daily	9.9	4.3	Push Buttons	Observe Operation
Daily	9.9	4.3	Pilot Lights	Observe Operation
Daily	-	-	Bypass Hose	Check For Leakage, Tighten Monthly
WEEKLY MAINTENANCE				
Weekly	9.10	4.5, 4.6	Fuel Level Sensor	Check Alarm Operation
Weekly	9.10	-	Alarm Thermostats	Check Operation
Weekly	9.10	4.3	Annunciator	Press Test Button
Weekly	9.10	-	Strobe Beacon	Check Operation
Weekly	9.10	-	Horn	Check Operation
Weekly	9.11	-	Emergency Light	Push To Test Button
Weekly	9.13	4.5, 4.6	Fuel Tank (Main & Day)	Check For Corrosion And Leaks
Weekly	9.13	4.5, 4.6	Isolation Valves	Check If Open
Weekly	9.13	4.5, 4.6	Spill Containment	Check For Fuel Leakage, And Clean
Weekly	9.13	4.5, 4.6	Drain Valve	Drain Water From Containment
Weekly	9.13	4.5, 4.6	Level Indicator	Check And Compare To Tank Level
Weekly	9.13	4.5, 4.6	Fill and Vent Caps	Check If Closed And Locked
Weekly	9.14	-	Ventilation Thermostat	Check Setting
Weekly	9.15	-	Autodialer and Satellite Phone System	Test Operation
Weekly	9.4	-	Chlorine	Inspect Containers for Leaks and Moisture
MONTHLY MAINTENANCE				
Monthly	9.11	-	Exterior Lighting	Check Lamps
Monthly	9.11	-	Truck Arm Light	Check Lamps
Monthly	9.11	-	Overhead Lighting	Check Lamps

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**MAINTENANCE TASKS BY SCHEDULE
TABLE 7.2**

Schedule	Section 9 Tab	Section 4 Tables and Figs	Item	Maintenance Required
Monthly	9.16	-	Chlorine Tester	Inventory Chemicals and Reorder as Necessary
Monthly	9.16	-	Valved Respirators	Inventory and Reorder as Necessary
Monthly	9.16	-	Safety Gloves	Inventory and Reorder as Necessary
Monthly	9.16	-	Eyewash Station	Inventory Saline and Reorder as Necessary
Monthly	9.17	-	Janitorial Equipment	Restock as Required
Monthly	9.6	4.2	Breaker Panel	Test Breakers
Monthly	9.6	4.2	Motor Starter for Submersible Pump	Check all Switches
Monthly	9.6	4.2	Meter Socket	Check that Meter is Operating
Monthly	9.7	-	Generator & Alternator	Clean Cooling Air Openings
ANNUAL MAINTENANCE				
Annually	9.11	-	Exit Light	Test
Annually	9.13	4.5, 4.6	Flexible Connection	Check Stress On Connections
Annually	9.13	4.5, 4.6	Fuel Filter	Replace
Annually	9.16	-	Fire Extinguisher	Maintain Per Manual's Instructions
Annually	9.16	-	Face Shield	Inspect for Wear and Reorder if Necessary
Annually	9.16	-	Rubberized Safety Apron	Inspect for Wear and Reorder if Necessary
Annually	9.17	-	Winch Cable	Inspect for Corrosion and Fraying
Annually	9.17	-	Winch	Lubricate and Inspect Cable on Spool
Annually	9.17	-	Interior Paint	Inspect and Repaint as Necessary
Annually	9.2	4.1	Submersible Intake Pump	Inspect For Wear

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**MAINTENANCE TASKS BY SCHEDULE
TABLE 7.2**

Schedule	Section 9 Tab	Section 4 Tables and Figs	Item	Maintenance Required
Annually	9.6	4.2	Main Disconnect in Breaker Panel	Test
Annually	9.9	4.3	Flow Switch	Inspect O Rings, Wheel And Paddles
MISCELLANEOUS				
As Required	9.2	4.1	Submersible Pump Engine	Reactive Maintenance, page 25 of Franklin Electric Submersible Motor Manual
During Each Chlorine Mixing	9.4	4.1	PVC Ball Valves on Tanks	Check For Leakage, And Smooth Operation
6 Months or Per Alarm Conditions.	9.8	4.2	Uninterruptible Power System	Periodic Maintenance As Per Manual
Every 3 Months	9.14	-	Dampers	Check, Clean, and Lubricate
Every 3 Months	9.14	-	Actuators	Check, Clean, and Lubricate
Every 8 Months	9.4	4.1, 4.3	Chlorine Injection Pump	Clean or Replace Diaphragm as Required
Every 8 Months	9.4	4.1, 4.3	Chlorine Injection Pump	Replace and Clean Cartridge Valves as Required
Every 8 Months	9.4	4.1, 4.3	Chlorine Injection Pump	Clean or Replace Diaphragm on 5-way Valve as Required
Following Each Chlorine Mixing	9.4	4.1	Chlorine Mixer	Rinse Off Shaft and Agitator
Following Each Chlorine Mixing	9.4	4.1	Chlorine Mix and Feed Tanks	Inspect for Leaks and Clean
Per False Readings on Flow Gauge	9.8	4.3	Flow Sensor	Replace Paddle and/or Sensor

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**TABLE OF SPARE PARTS & MISCELLANEOUS EQUIPMENT
TABLE 7.3**

Item	Part Description	Number	Location
1	Submersible Pump Motor	1	Inside Pumphouse
2	Submersible Pump	1	Inside Pumphouse
3	Throttle Valve	1	shelves in storage cabinet
4	Fuel Oil Gate Valve	1	shelves in storage cabinet
5	Fusible Link Valve	1	shelves in storage cabinet
6	Eyewash - Spare container of fluid.	1	shelves in storage cabinet
7	Damper Motors	1	shelves in storage cabinet
8	Thermostats	2	shelves in storage cabinet
9	Generator Fuel Filters	10	shelves in storage cabinet
10	Oil Filters	10	shelves in storage cabinet
11	Respirator Cartridges	12	shelves in storage cabinet
12	Fuel Filter Cartridges	5	shelves in storage cabinet
13	15W40 Engine Oil	12 L	shelves in storage cabinet
14	Chemical Injection Pump - replacement part kits.	3	shelves in storage cabinet
15	Flow Switch	1	shelves in storage cabinet
16	Chemical Feed Pump	1	shelves in storage cabinet
17	Nylon Tubing	5 m	shelves in storage cabinet
18	Pump Replacement Kits	3	shelves in storage cabinet
19	Lighting Lamps & Ballasts	2 for each light type.	shelves in storage cabinet
20	Breakers	2 for each size and type.	shelves in storage cabinet
21	Terminal Blocks c/w end caps, end plates, cross connectors, and tear off markers.	1 for each size and type.	shelves in storage cabinet
22	Motor Starter - pilot light and over load heaters.	6 of each type.	in motor starter panel
23	Motor Starter - Coil and Contact.	1	in motor starter panel
24	Pilot Light and Lense	1 of each type.	in control panel
25	Fuses	6	of each type in panels
26	Motor Starter - Coil and Contact.	6	shelves in storage cabinet, and some panels
27	Panalarm Alarm Annunciator	1	shelves in storage cabinet
28	Flow Gauge/Accumulator	1	shelves in storage cabinet
29	Heat Trace Controller	1	shelves in storage cabinet
30	Termination Boots	2	shelves in storage cabinet
31	RTD Sensor	1	shelves in storage cabinet

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**TABLE OF SPARE PARTS & MISCELLANEOUS EQUIPMENT
TABLE 7.3**

Item	Part Description	Number	Location
32	Mini Breakers	2 of each relay and timer. 1 of each relay and timer base.	shelves in storage cabinet
28	Ventilation Temp. Control Module	1	shelves in storage cabinet
33	Dust Masks	150	shelves in storage cabinet
34	Rubber Gloves - Fisher large, extra long, heavyweight.	12	shelves in storage cabinet
35	Face Shield	1	shelves in storage cabinet
36	Rubber Apron	1	shelves in storage cabinet
37	Fire Extinguisher	1	mounted by exit
38	Floor Cleaner - Industrial Quality, 20L.	1	on floor of pumphouse

8.0 TESTING AND CERTIFICATION DATA

8.1 General

Section 8 contains copies of the Commissioning Checklist, test results, initial settings for equipment, and warranties. If a warranty is not found in this section, it is probably part of the operating manuals in "Manufacturer Data and Service Information", Section 9. Please search the related material in Section 9 if a warranty for a certain component is not found here.

If a warranty for an item cannot be found anywhere in this manual, please contact the appropriate supplier as listed in Section 5. The supplier will be able to provide service information for the item.