

Summary of Changes (v23.08)

1. At page 2 and 3, of 9, delete subsection 1.05 Penalties for nonperformance.

**1. Coordination Issues:**

**1.1 Electrical:**

- 1.1.1 Power requirements.
- 1.1.2 Locate duplex receptacles adjacent to control panel.

**2. Design Issues: (Not Used)**

**3. Drawing Notes:**

- 3.1 Information Required on the drawings:
- 3.1.1 Pipe connections to chilled water and condenser water systems.
  - 3.1.2 Location and mounting height of control panel.
  - 3.1.3 Location and connection points for pot feeder.

**4. Standard Drawings:**

- 4.1 Condenser Water Chemical Treatment Schematic Diagram

**5. Specification Notes:**

- 5.1 For a new facility with new equipment and piping, delete reference to existing chemicals and compatibility with existing equipment and piping.

**6. Guide Specification:**

- 6.1 SECTION 15189 WATER TREATMENT FOR AIR CONDITIONING

*SPECIFIER'S NOTE: Blue colored italicized text is used for notes to the specifier and should be completely deleted from the final text. Where [Red colored italicized text in parentheses] is shown in this specification section, insert wording, numbers, etc. as appropriate and delete parentheses. Where <Red colored text in brackets> is shown, a choice is indicated. Make the appropriate choice and delete the brackets. Maintain footer notation with the current version used (e.g. TG12320 v02.02). Verify that section titles cross referenced in this Section correspond to this Project's specifications; Section titles may have changed.*

## SECTION 15189 - WATER TREATMENT FOR AIR CONDITIONING

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Provide chemical water treatment for air conditioning system as indicated, complete with chemicals, testing and equipment to maintain and monitor the systems with treated water.

#### 1.02 SUBMITTALS (Submit six (6) copies of the following to the Engineer):

- A. Shop drawings and manufacturer's product data showing construction and installation details, equipment, products and chemicals with MSDS.
- B. Manufacturer's installation instructions.
- C. Manufacturer's schematic diagrams.
- D. Manufacturer's operations and maintenance manual.
- E. Manufacturer's guaranty/warranty.
- F. Maintenance Service Contract.
- G. Test Results

#### 1.03 QUALITY ASSURANCE

- A. Water Treatment Contractor (WTC) shall have a minimum of five (5) years water treatment service experience in Hawaii and provides necessary equipment, chemicals and services required to control corrosion, scale, and biological growth in the following systems:
  - 1. cooling tower
  - 2. condenser water
  - 3. chilled water
- B. Use qualified personnel with a minimum of five (5) years of field experience or engineering degree in maintaining a water treatment program.

#### 1.04 GUARANTY AND WARRANTY

- A. Provide a written guaranty against all defects in materials, workmanship and installation. He shall certify that he will correct any defects other than ordinary wear or improper use that may develop within one year from the date of project acceptance at no cost to the State.
- B. The WTC shall warrant the chemicals used in the water treatment program and offered therein will not: endanger the health or safety of persons coming into contact with the materials, damage personal or real property, have a detrimental effect on the metallic or non-metallic materials in the equipment being treated; as long as the WTC instruction are followed.

#### ~~1.05 PENALTIES FOR NONPERFORMANCE~~

- ~~A. The Contractor shall not be responsible for repairs/penalties due to flagrant vandalism, fire, storm or related damages that can be attributed to causes beyond his control. However, the~~

~~contractor shall be responsible for such repairs/penalties if the damages are caused by the Contractor's negligence or failure to properly maintain and repair the equipment/system.~~

- ~~1. The WTC shall clean the system at no cost to the State within thirty (30) days of discovery of the Contractor's failure to meet minimum and service requirements.~~
- ~~2. If the corrosion rate exceeds 2 mils pr year for copper and/or 4 mils per year for steel, the WTC shall be assessed damages of \$3,000.00 per chiller in the system.~~
- ~~3. If the bacterial population in the condenser water exceeds 10,000 colonies or is judged to be out of control by the State, the WTC shall take immediate corrective action to reduce the population below 10,000 colonies.~~
- ~~4. The WTC may be assessed \$50.00 per incident for each and every calendar day from the date of non compliance. If the WTC fails to correct any condition which does not meet the minimum and service requirements indicated above, the State reserves the right to require the Contractor to replace the WTC and to not allow the WTC to bid or participate in any future State work.~~
- ~~5. If water meter readings indicated excessive water usage by the condenser water system in the absence of mechanical problems in the system, the cost of the excess water used as calculated by the State will be deducted from the WTC billing to the State.~~
- ~~6. Should a chemical cleaning of the chiller tubes become necessary, the WTC shall perform same including the re-brushing of the chiller tubes all at no additional cost to the State, and in addition be assessed \$500.00 per chiller per occurrence.~~
- ~~7. Should corrosion damage to any part of the system occur due to the use of oxidizing biocides, halogen levels exceeding 0.5ppm, the WTC shall be required to repair or correct the damages, and in addition be assessed \$500.00 per chiller per occurrence or as assessed in paragraph 1.05.A.2 of this section at the State's discretion.~~
- ~~8. Should an unsatisfactory condition be discovered or upon notification, the WTC shall correct it immediately and re-check the system within one week and submit a new report. Failure to re-check and submit new report shall cause the WTC to be assessed \$25.00 per incident for each and every calendar day from the date of non compliance until the re-check and report is submitted.~~

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. A minimum of 10% of the estimated annual usage of chemicals specified herein must be delivered to the service sites prior to the start date of this contract. Each package of chemicals delivered shall be labeled with directions for usage per the approved dosage for each chemical. Submit the appropriate MSDS sheets for all chemicals with the initial delivery.
- B. The treatment furnished by the WTC shall be one that has been specifically selected and engineered for the water being used in each system of this project.
- C. The chemical containers and equipment shall be located within a leak containment system. The WTC shall have an absorbent an/or clean-up system/program that must be available at each site and be submitted and approved by the State prior to start date of this contract.

- D. The water treatment shall constantly prevent the build-up of adherent mineral deposits on the heat transfer surfaces of the equipment being treated. Periodic circulation of inhibited descaling acids will not be considered as meeting these specifications.
- E. The WTC shall provide any and all testing (e.g.-Legionella, etc.) As may be required to safeguard and protect the State should suspect conditions, allegations or complaints be experienced or as requested at no additional cost to the State.

## 2.02 CHEMICALS

### A. General

1. All chemicals shall be supplied in their original factory containers and no dilution of chemicals is allowed. Handling of chemicals shall be by the WTC and shall include specific application information, safety, and quality control information, including MSDS sheets.
2. The chemicals provided must meet OSHA, Environmental Protection Agency, and ISO-9000 requirements for safety to personnel and the environment, and must be approved by the State.
3. All chemicals supplied shall have been registered and in satisfactory use in Hawaii for at least two years. Bidder may be required to provide evidence of satisfactory performance of the chemicals offered. The State shall be the sole judge of such satisfaction and the State's decision shall be final.
4. Chemicals, other than those presently being used in the water treatment program, hereinafter referred as "new chemicals", shall be compatible with the existing chemicals, scale and corrosion inhibitor and broad spectrum bacteriostat.
  - a. Verification by an independent testing laboratory for the compatibility of the new chemicals shall be submitted upon award and prior to commencement of work.
  - b. This verification is required for all chemicals not presently being used in the treatment program.
  - c. Should the new chemicals be determined to be incompatible with the chemicals presently in use, the WTC shall be responsible for flushing the system to remove all chemicals before the new chemicals are introduced into the system. Any damages to the system resulting from the failure of the WTC to satisfactorily flush the system shall be repaired by the WTC at his expense and at no cost to the State.

### B. Scale and Corrosion Control

1. Scale and corrosion shall be inhibited by the controlled use of scale and corrosion prevention materials as herein noted.
2. The use of essentially toxic and staining corrosion inhibitors such as chromate will not be permitted. The chilled water system is closed systems and can use nitrite solutions.
3. Inhibitor such as organic phosphorous type will be permitted.
4. The WTC selected corrosion inhibitors shall have been proven effective by at least two years of usage in the State of Hawaii.
5. Poly-phosphates are not considered effective corrosion inhibitors and shall not be permitted.

### C. Biological Growth Control

1. Bacteria, algae and slime growths shall be prevented in all water circuits by using suitable biocides. Total colonies shall not exceed 10,000.
2. Chemicals may be fed into water circuits requiring continuous make-up by automatic proportional feeding devices or by adding directly to the tower sump as required. Chemicals shall be slug fed into the system on a regular basis and not added continuously.
3. Bromine oxidizing biocides may be used, but shall not include metallic salts, such as tin.
4. A sufficient halogen residual shall be maintained to prevent Legionella. Quaternaries may be used, but only with oxidizing biocides.

### 2.03 CHEMICAL FEED SYSTEM

- A. Provide an automatic chemical feed and monitoring system for condenser water system.
  1. The system shall include a completely automatic proportional pump feed and the bleed-off shall be directly proportional to equipment load indicated by the makeup water.
  2. Controls and instrumentation shall include a solid state conductivity meter, controller and a flow through sensor probe.
  3. The controller is to be programmed to bleed-off the system and to regulate a preset, adjustable rate solution feed pump.
  4. A biocide timer to regulate a preset, adjustable solution feed pump.
  5. All components shall be chemical resistant and recommended for use for the chemicals provided.
  6. Provide all components as indicated in the Condenser Water Chemical Treatment Schematic Diagram.
  7. Plastic piping and fittings shall be PVC, Schedule 40, solvent joint or threaded connections.
  8. Metal piping and fittings to connect to the condenser water system shall be the same material and connection type as the main condenser water system.
  9. Equipment and interconnecting piping shall be mounted to a wall mounted, backboard, 3/4 inch thick marine plywood, painted to match the adjacent surfaces or approved equal.
- B. Provide a closed system valved bypass pot feeder for the chilled water system as a point of insertion of chemicals when required or requested to maintain residual concentration level. Pot feeder shall include drain and fill connections, vertical style with removable fill cover that is rated for the chilled water design pressure. Provide all isolation valves, throttling valve and drain valves required to allow adjusting flow during operation, draining and isolating the pot feeder when not on-line.

### 2.04 CORROSION TEST COUPON RACK

- A. A certified corrosion test coupon rack kit with test coupons to establish corrosion rates in the condenser water system shall be provided and fully operational when the new air conditioning equipment is started. Test system shall include strainer, isolation and Dole valves, piping kit and test coupons wall mounted on a removable backboard.

- B. Prior to installation, the WTC must submit to the State for approval the proposed test system installation plan layout or schematic piping diagram. WTC to perform an ISO 9000 corrosion analysis and test coupons replacement semi-annually at the end of 6 months and 12 months. Make adjustments to the water treatment program as required by findings and submit reports to the State within one (1) month of coupon replacements. Corrosion rates shall be less than 2 mils per year for copper and 4 mils per year for steel - both with no pitting.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A. The Contractor and Installer shall examine the areas and conditions under which the water treatment system is to be installed. Should any condition be found unsuitable, no work shall be done until the unsatisfactory conditions have been corrected and are acceptable to the Installer. Proceeding with work will imply acceptance of the conditions by the Installer.

*Specifier's Note: For renovation or repair projects where the existing water treatment system is being repaired or replaced, include the following paragraph. For new projects, delete paragraph.*

- B. The State will require the WTC to use the State's existing on-site stock of chemicals before purchasing additional chemicals. If the existing chemicals are not compatible with the new chemicals, they shall be legally disposed of by the WTC within the first two months of the contract and at no cost to the State. All other on-site aged, unused or stored chemicals must also be legally disposed of by the WTC within the first two months of the contract and at no cost to the State.

#### **3.02 INSTALLATION**

- A. Assemble and install the water treatment system in accordance with the manufacturer's instructions and recommendations, complete and ready to use.
- B. Coordinate installation of the connections to the chilled water and condenser water systems as required and in accordance with the construction schedule to minimize air conditioning outages.

#### **3.03 SERVICE REQUIREMENTS**

- A. The WTC shall visit the service sites to make an initial detailed chilled, condenser and raw water analysis to establish the prescribed treatment program. Submit the program for approval.
  - 1. The initial service calls shall include establishment of treatment dosages, bleed schedules, and interval to replenish chemicals for automatic feed system.
  - 2. The WTC shall submit report on the results of the initial water analysis and the prescribed water treatment program including findings and recommendations. These reports shall be submitted to the State within three (3) calendar days following the service call to each site.
  - 3. The WTC shall also submit supplemental monthly, semi-annual and other supplemental reports as required and shall initiate and document any changes required from the initial prescribed water treatment program and the one year maintenance service contract.
- B. The WTC shall make service calls and water analysis/testing at intervals of a maximum of thirty (30) calendar days for condenser water and one hundred eighty (180) calendar days for chilled water, or sooner if required or notified of concern. WTC shall notify the using agency's point of contact at least 7 days prior to conducting the service and upon completion of the service/testing. The WTC shall:

1. provide initial application of each material and shall continuously furnish specific treatment of the water as required.
  2. investigate any unusual conditions pertaining to scale deposition as indicated by condenser operating data, corrosion and algae growths, and implement corrective action as required.
  3. submit the results of the water analysis and the prescribe water treatment including findings and recommendations and service requirements performed in a report. This report shall be submitted to the State within three (3) calendar days following the service call.
- C. The WTC shall be totally responsible for a continuous water treatment program.
1. WTC shall be available on-site during the performance of the cooling tower and condenser tube cleaning services and coordinate the inspection with the Contractor and the State. Only one (1) chiller per site can be down at any time.
  2. The WTC shall be totally responsible for the water treatment equipment and shall keep it functioning at its optimum through proper maintenance, repair or replacement as required. The water treatment system including piping and electrical components of the water treatment system and includes the maintenance tasks for the One Year Maintenance Service Contract in paragraph 3.05 below.

#### 3.04 INSTRUCTION TO PERSONNEL

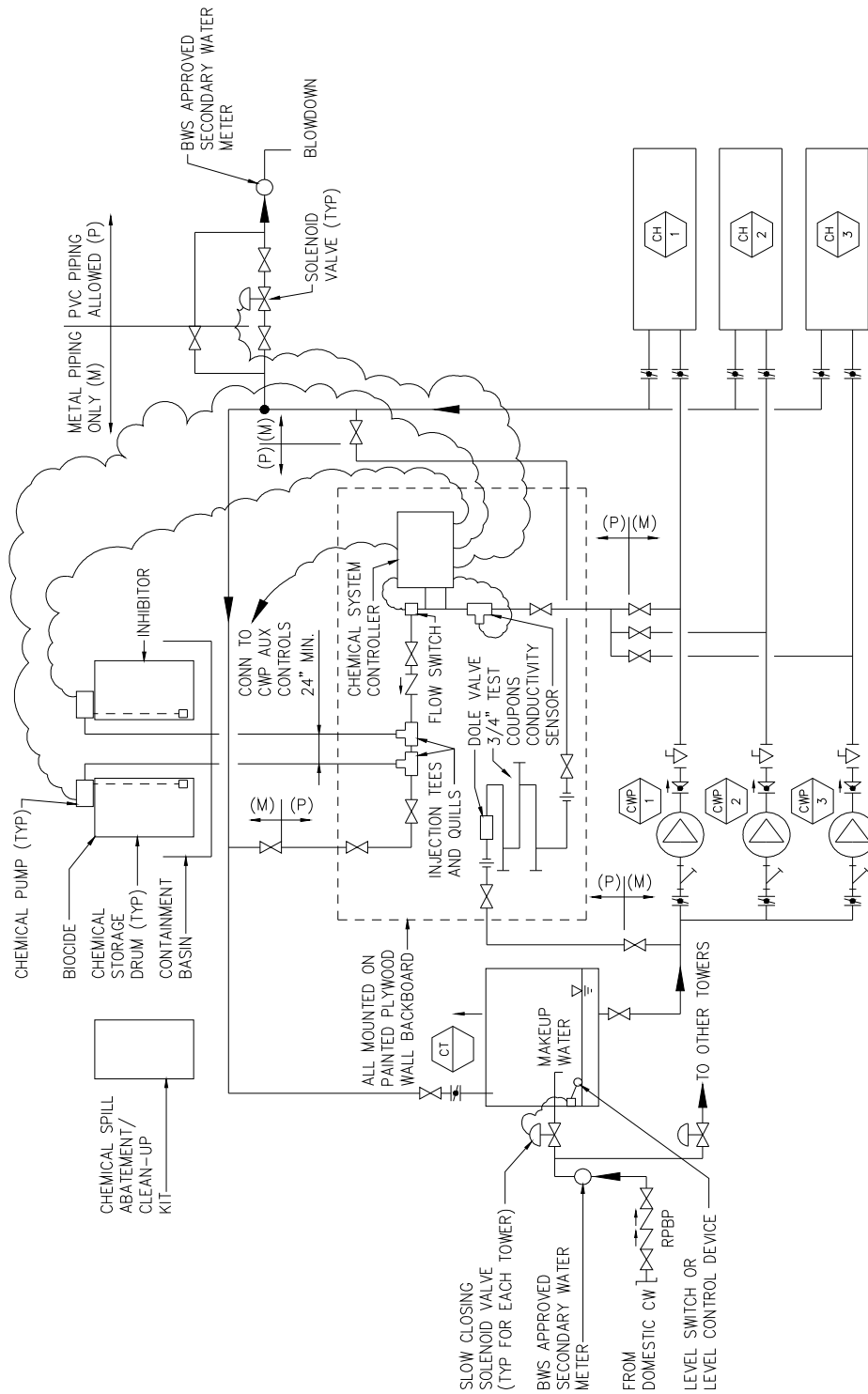
Instruct the operations personnel in the aspects of safety, operation and maintenance of the water treatment system.

#### 3.05 ONE YEAR MAINTENANCE SERVICE CONTRACT

- A. In addition to the Guaranty on materials and workmanship noted in Paragraph 1.04 of this Section, the Installer shall provide a Maintenance Service Contract, countersigned by the General Contractor.
- B. The maintenance service contract shall provide for all labor, chemicals, material, equipment and parts to service the water treatment system complete, on a periodic basis, so as to assure its proper operation and function as defined in this Section.
- C. The Maintenance Service Contract shall extend for a period of one (1) year commencing on the Project Acceptance Date. All costs for periodic maintenance services shall be included in the lump sum base bid price.
- D. Following each service/inspection, furnish an inspection report to the user agency. All work done and all material furnished shall be subject to inspection and approval of the Engineer to determine compliance with the requirements and intentions of the contract.
- E. All maintenance work shall be performed between the hours of 7:30 a.m to 4:00 p.m. on normal working days from Monday through Friday, excluding State holidays. The contractor shall schedule their visits and work with the user agency.
- F. The maintenance contractor shall exercise caution during the progress of his maintenance and repair work to prevent damage to the ceilings and other building elements. The contractor shall restore the existing construction, damaged by his negligence, to its original condition at his own expense.
- G. The Maintenance Contractor shall keep a separate log recording all maintenance calls to the project at his office. The log shall include as a minimum, the following information:
  1. Name of the person making the service call.

2. Date of the service call.
  3. Time in and out from the project.
  4. Findings and work performed.
- H. The Maintenance Service Contract does not include repairs resulting from vandalism, negligent use or misuse of the equipment.
- I. Chilled Water Chemical Feed System shall be serviced semiannually at 6 months and 12 months as follows:
1. Check chemical concentration and add chemicals as needed to keep the residual concentration in 800 to 1000 PPM range. Should recharging be required, it shall be performed within one week from discovery or notification along with a new report to be submitted immediately.
  2. Certify that system has received semiannual service and report residual concentration and the amount of chemical used at each site.
- J. Condenser Water Chemical Feed System shall be serviced monthly as follows:
1. Check chemical feed pumps for proper operation and adjust or repair as required for normal operation.
  2. Check condition of chemical drums and containment system for leaks and repair/replace and refill as required.
  3. Check operations of automatic chemical controller system, sensor and piping for proper operation.
  4. Check for leaks and repair. Report items that were serviced, adjusted, repaired etc.
  5. Calibrate chemical feed as required by water analysis from test results. Indicate amount of each chemical used at each site. Record and analyze readings of raw and systems water samples to include but not be limited to: pH, conductivity (micro-mho), silica, alkalinity, calcium hardness, magnesium, chlorides, bio-organism counts, halogen levels if applicable and nitrite residuals.
  6. Log water meter readings for make-up and bleed at sites where available. Remove empty chemical containers and clean water treatment areas.
  7. Record set points and recommended ranges including (make-up and bleed water meter readings at locations where available) and quantities of each chemical used and remaining.
  8. Certify that system has received monthly service and report all discrepancies, adjustments, repairs or corrections performed.





END OF SECTION 15189

CONDENSER WATER CHEMICAL TREATMENT SCHEMATIC DIAGRAM  
SCALE: NONE