

Scope of Work
 Chestnut Ridge Closed-Loop Water Systems Maintenance
 April 2018

Minimum qualifications:

1. Seller shall have 10 years of experience in maintaining, evaluating the performance of, and chemically treating closed-loop cooling, heating, boiler and acid scrubber water systems.
2. Seller shall have the ability to design treatment systems to meet the water quality of each system. The current treatment regimen is listed below. If the Seller proposes to change the treatment program, they shall address incompatibility of the current treatment program with new inhibitors from different manufacturers. If required, the system shall be drained, refilled, and the new inhibitor added.

Water Systems and Chemical Additions*			
Building	System	Volume (gal)	Current GE Chemical Additions
CLO	Boiler Water	10,000	Corrshield NT402/Spectrus NX114
CLO	2nd Floor Labs Cooling Water	-	Corrshield OR4407/Spectrus NX114
CNMS	Acid Scrubber	700	Spectrus NX114
CNMS	Equipment Cooling	3000	Corrshield OR4407/Spectrus NX114
JINS	Boiler Water	480	Corrshield NT402/Spectrus NX114
JINS	Chilled Water	740	Corrshield NT402/Spectrus NX114

Building 8610 Center for Nanophase Material Sciences (CNMS) Equipment Cooling Water System (ECWS), Building 8600 CLO 2nd Floor Cooling Water, and Building 8630 Shull-Wollan Center (JINS) Chilled Water System Deliverables:

1. Seller to sample, test and report on the current state of the chilled/cooling water and its water quality including make-up feed water. This information should be the basis for creation of water treatment plan.
2. Water quality in the chilled water closed-loop systems shall meet the following parameters:

Closed Loop Cooling Water Quality Factors and Limits*	
Testing Factor	Range
pH	9.0-9.5
"P" Alkalinity	100-500 ppm
Boron	100-200 ppm
Chemical Oxygen Demand	100 ppm (max)

Closed Loop Cooling Water Quality Factors and Limits*	
Testing Factor	Range
Soluble Copper	0.20 ppm (max)
TDS	10 ppm (max)
Ammonia	20 ppm (max)
Free Caustic Alkalinity	20 ppm (max)

Closed Loop Cooling Water Microbiological Limits*	
Limiting Factor	Limit
Total Aerobic Plate Count	1000 CFU/mL maximum
Total Anaerobic Plate Count	100 CFU/mL maximum
Nitrate Reducers	100 organisms/mL maximum
Sulfate Reducers	0 organisms/mL maximum
Iron Bacteria	0 organisms/mL maximum

*Values given are base values. Seller recommendations will be considered for the addition to and/or the replacement of these base values.

3. All equipment used in system testing shall be calibrated and kept current to applicable national standards. Submit calibration reports annually for record.
4. Seller shall design and submit for approval a written water treatment program to protect metal surfaces from oxygen attack, prevention of minimal precipitates, and precipitate accumulation on heat transfer surfaces. Metal surfaces shall be passivated to withstand attacks. The program shall neutralize the acidity in the closed-loop system.
5. Seller's treatment program shall eliminate corrosion, scale, sludge formation, microbiological contamination, and bacterial growth.
6. Seller shall design and install new equipment and chemical treatment program to inhibit corrosion to aluminum.
7. Seller shall use existing corrosion coupon racks shall be used for chemical analysis.
8. Seller shall perform, document and submit monthly site visit and testing reports for each visit. Submit reports within one (1) week of the sampling.

Building 8610 CNMS Acid Scrubber Deliverables:

1. Seller to sample, test and report on the current state of the acid scrubber water and its water quality including make-up feed water. This information should be the basis for creation of water treatment plan.

2. Seller shall develop, submit and implement a written water treatment plan to eliminate corrosion, scale, sludge formation, microbiological contamination, and bacterial growth.
3. All equipment used in system testing shall be calibrated and kept current to applicable national standards. Submit calibration reports annually for record.
4. Seller shall perform inspections as specified by the manufacturer on a quarterly basis, occurring at intervals of no less than 12 weeks and no more than 14 weeks. Perform testing for deposits of carbonates and bacteria, mineral scale and biological growth. Submittal of testing procedures and approval by the Company is required before use in the field.
5. Seller shall submit a procedure for treatment of mineral scale and bacterial growth (e.g., algae, bacteria). Treatment procedure shall be approved by the Company before implementation. After recirculation of the treatment solution, the sump shall be drained and the system thoroughly flushed.
6. Seller shall obtain prior approval for all chemicals brought on site. In the event that use of a chemical is rejected by the Company, the Seller is responsible for identifying an alternate chemical and having it approved for use.
7. Seller shall perform, document and submit monthly site visit and testing reports for each visit. Submit reports within one (1) week of the sampling.

Building 8600 Central Lab and Office (CLO) Boiler and Building 8630 Shull-Wollan Center (JINS) Boiler Deliverables:

1. Seller to sample, test and report on the current state of the boiler water and its water quality including make-up feed water. This information should be the basis for creation of water treatment plan.
2. Water quality in the heating water closed-loop system shall meet the following parameters:

Boiler Water Quality*	
Component	Quantity
Maximum TDS (ppm)	3500
Maximum Alkalinity (ppm)	700
Maximum hardness (ppm)	<20
Phosphate (ppm)	20-40
Hydroxide (ppm)	300 - 400
Sulfite (ppm)	30 - 60
Maximum Silica (ppm)	100
Total Organic Carbon (ppm)	70 - 100
Specific Conductance ($\mu\Omega/cm$)	7000

Boiler Water Quality*	
Component	Quantity
Caustic Alkalinity (ppm)	350
pH Value	11.0 - 12.0
Residual Sodium Sulphite	30 - 50
Residual Hydrazine	0.1 - 1.0
Ratio Na ₂ SO ₄ to Caustic Alkalinity	Above 2.5
Ratio Na ₂ SO ₄ to Total Alkalinity	Above 4.0
Silica	<0.4 of Caustic Alkalinity
Suspended Solids (ppm)	300

*Values given are base values. Seller recommendations will be considered for the addition to and/or the replacement of these base values.

3. Seller shall develop, submit and implement a written water treatment plan to protect against scale, corrosion, sludge, microbiology, and foaming.
4. Seller shall design and install new equipment and chemical treatment program to inhibit corrosion to aluminum.
5. All equipment used in system testing shall be calibrated and kept current to applicable national standards. Submit calibration reports annually for record.
6. Seller shall obtain prior approval for all chemicals brought on site. In the event that use of a chemical is rejected by the Company, the Seller is responsible for identifying an alternate chemical and having it approved for use.
7. Seller shall perform, document and submit monthly testing reports for parameters such as pH, total hardness, alkalinity, dissolved oxygen, chloride, conductivity, and residual phosphate and hydrazine. Submit reports within two (2) weeks of the sampling.
8. Seller shall perform, document and submit monthly corrosion coupon testing results.