012 -	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network						Building control system	

0 /2008 1:32:03 Primary Control Network Primary Controller P / F / C / D

Test Description TCP-7

TEST GOALS

1. To spot verify the portion of the ALC network associated with the operation of the condenser water system is ready for functional testing per the applicable requirements of 17010 Paragraph 3.05 EMCS Demonstration.

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Test Description TCP-7

ACCEPTANCE CRITERIA

Specific test critera will be called out for each test sequence at the approprate place in the test sequence. Note that passing this test in a system only configuration does not mean the EMCS demonstration test is passed. Additional spot checks of many of the items covered in this or any other individual system focused EMCS demonstration test will be made once each individual system test has been completed and the entire EMCS system is completely functional and after the permantent OWS has been installed.

012 -	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network						Building control system	

2 /2008 1:32:03 Primary Control Network Primary Controller P / F / C / D

Test Description TCP-7

GENERAL INSTRUCTIONS

1. Review 17010 Paragraph 3.05 to prior to testing.
2. Document all results as you proceed in the CACEA data base forms provided for the test.
3. Review all decisions to deviate from the procedure or recommended test sequence with other team members prior to making the change. Note any changes made for future reference.
4. If a test is suspended for any reason, go through the return to normal procedures to ensure that the system is left in a stable, known, satisfactory operating condition.

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Test Description TCP-7

TEST EQUIPMENT

The following test equipment is recommended for this test:

1. Standard hand tool kit.
2. Multimeter with amp measuring capability.
3. Temperature probe capable of measuring temperatures in a well.
4. The tempeature control contractor is to provide all necessary calibration equipment to demonstrate calibration of the sensors. All of this equipment should meet the accuracy requirements called out in Section 17000 for the individual sensor and in Section 17010 for general calibration and testing requirements.

P=Pass, F=Fail, C=Could't, D=Didnt

012 -	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network						Building control system	
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Test Description TCP-7

PREREQUISITES

The folllowing prerequisites should be completed or in place prior to this test.

1. Calibration and testing of all control components and control software associated with the cooling towers and condenser water pumps needs to be complete
2. Control programming for the cooling towers and condenser water system should be approved, installed, verified and debugged and fully functional.
3. EMCS startup, testing, adjusting and calibration should be complete for the condenser water system per the requirements of 17010 Paragraph 3.01 and documented in a start-up report.

P=Pass, F=Fail, C=Could't, D=Didnt

012 -	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network						Building control system	
5	/2008 1:32:03		Primary Control Network	Primary Controller			P / F / C / D

Test Description TCP-7

PRECAUTIONS AND PREPERATION

1. Observe standard safety precautions associated with working around live electrical equipment, pressurized piping and duct systems, refrigerants, and rotating machinery.
2. Familiarize yourself with the evacuation paths from mechanical spaces in the event of a refrigerant alarm or major leak.
3. Observe the contractor and facilities lock-out/tag-out proceedures.
4. Coordinate all tests with the contracting team and UCB Facilities If possible obtain a set of radios that allow you to communicate directly with the contractor and UCB. If this is not possible obtain key cell phone numbers and note them on this form.
5. The factory start-up and setting of the VFDs may be critical for this equipment. For instance, if something dropped a fan off line and then restarted it while it was spinning down, the drive would be starting against a spinning motor, which can cause problems like broken belts and drive failures if braking settings, accelleration times, etc. have not been properly set. Similar problems can occur if airflow patterns around the buildng cause a fan to spin backwards and then the drive engages to start it.
6. The operation of the water treatment system is critical for releasing this system to service after the completion of functioanl testing. If water treatment is not proper, the chillers and towers can be fouled in a matter of days or weeks if the system remains in operation.
7. There are critical loads requireing chilled water in this facility in normal operation which include the dehumidification units and AH-A and AH-B. During start-up, the key critical loads are likely going to be the dehumidification units. Loss of chilled water to these units will cause them to shut down on a head pressure safety and disrupt their commissioning and start-up process. The thermal flywheel of the chilled water piping system will likely carry the dehumidification units through a short term (10 minutes or less) chiller shut down as long as flow is maintained. If a long term shut down is required for some reason,it should be coordinate carefully with the commissioning and start-up team before proceding.
8. Loss of chilled water flow will also disrupt any efforts being made to use the dehumidification units and AH-A and B to dry out the area they serve. A short term loss is likely not a significant impact. A long term loss could have an adverse impact on pulling the spaces down to operarting conditions and delay the commissioning and acceptance process. If a long term shut down is required for some reason,it should be coordinate carefully with the commissioning and start-up team before proceding.
9. When forcing system variables to simulate a condition and verify a response, bear in mind that multiple processes may be dependent upon the variable you are about to manipulate. Prior to manipulating it, verify that your manipulation will not upset some other process and cause problems in the facility. For instance, forcing the outdoor air temperature to 75 degrees F in a cold day to verify the reset schedule on a condenser water system may also shut down the heating water system. If it is below freezing this could lead to a frozen coil.

012 -	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network						Building control system	

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Test Description TCP-7

REFERENCES

All of these items have been loaded onto the project portal unless otherwise noted.

1. System diagram
2. Mechanical drawings, sheets M001, M206A, M401, M401, M501, and M704 (1, 35, 39 - 41, and 51 of the .pdf drawing set)
3. Spec section 17010 Paragraph 3.05 (EMCS Commissioning Demonstration, page 136 of the spec .pdf file)
4. Spec section 15075 (Identification, page 86 of the spec .pdf file)
5. Spec section 17000, Paragraph 3.12 E (Graphic screens, page 88 of the .pdf file)
6. Design intent document
7. Condenser Water Control sequences
8. Control shop drawings
9. Final approved control programming (draft only available pending approval as of 02-06-08)
10. Start-up reports and factory start-up forms (To be furnished prior to testing)

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Test Description TCP-7

RETURN TO NORMAL

1. Release all manual over-rides and external triggers, simlulated conditions, etc. to totally return the system to normal operation.
2. Completion of this test sets up functional testing for the condenser water system. But this testing may not occur until a different day. Coordinate with the contractding team to determine the state that the system should be left in at the conclusion of testing.
3. Document all test results in CACEA and syncronize with the portal.
4. Create action items directed to McCarthy to address any contractual issues.
5. Create action items directed to UCB to address any non-contractual issues that have operational implications.

P=Pass, F=Fail, C=Could't, D=Didnt

011 -	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network							Building control system

10 /2008 1:32:03 Primary Control Network Primary Controller P / F / C / D

Test Description TCP-7

Demonstrate that the required software for the condenser water system is installed in the controller by showing the logic diagrams installed match the approved logic diagrams.

11 /2008 1:32:03 Primary Control Network Primary Controller P / F / C / D

Test Description TCP-7

Demonstrate that all points associated with the operation of the condenser water system can be interogated and commanded from the test OWS.

12 /2008 1:32:03 Primary Control Network Primary Controller P / F / C / D

Sensor selected for verification

Calibration method required (cite spec section) -
Specified end to end accuracy -
Observed end to end accuracy -
Required response time -
Observd response time -

Test Description TCP-7

Spot check 1 analog input selected at random for proper calibration using the same techniques required for the sensor in the specifications. Verify the following:

1. Required end to end accuracy vs. measured accuracy.
2. Response time.
3. Access.
4. Labeling.

The sensor should meet or exceed the specified end to end accuracy for the sensor type and respond in the specified time or less between when a change in state is triggered at the sensor and when it is observed at the OWS. Access should be adequate for maintenance including removal of the sensor with out a system shut down and include calibration provisions. Labeling should meet project requirements as specified in 15075 and 17000.

P=Pass, F=Fail, C=Could't, D=Didnt

011 -	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network						Building control system	

13 /2008 1:32:03 Primary Control Network Primary Controller P / F / C / D

Test Description TCP-7

Spot check 1 analog output associated with the condenser water system and selected at random for:

1. Proper start point
2. Proper span
3. Proper failure position
4. Tight closure or complete shutdown in the off or closed position.
5. Full flow or full on/maximum output in the on or open position.
6. Associated control loop tuning parameters are not set to factory defaults. If derivative gain is present, document the reason it was applied.
7. Response time.
8. Manual over-ride functionality (if applicable).
9. Access.

Document specified and observed requirements in the remarks section. The output parameters should match the design requirements and the response time should be less than or equal to the specified time between when a change in state is triggered at the OWS and when it is observed at the final control element. Labeling should meet project requirements as specified in 15075 and 17000. Access should be satisfactory for all normal maintenance activities including removal of any acutators from the final control element with out the need for a system outage.

Output selected for verification -

Start point
Required -
Observed -

Span
Required -
Observed -

Failure position -
Required -
Observed -

Tight closure/full off verified -

Full open/maxium speed verified -

Associated control loop parameters -
P gain -
I gain -
D gain and reason used if applied -

Response time
Required -
Observed -

Manual over-ride functionality
Specified requirement -
Observed functionality -

P=Pass, F=Fail, C=Could't, D=Didnt

011 -	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network						Building control system	
14	/2008 1:32:03		Primary Control Network	Primary Controller		*Input selected for verification* -	P / F / C / D

Test Description TCP-7

Spot check 1 digital input associated with the condenser water system and selected at random for:

1. Proper on state.
2. Proper off state.
3. Response time.
4. Labeling.
5. Access.

The input should accurately portray the measured parameter in the specified time or less between when a change in state is triggered at the sensor and when it is observed at the OWS. Labeling should meet project requirements as specified in 15075 and 17000. Access should be adequate for maintenance including removal of the sensor with out a system shut down and calibration provisions.

On state
Required -
Observed -

Off state
Required -
Observed -

Response time
Required -
Observed -

P=Pass, F=Fail, C=Could't, D=Didnt

011 -	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network						**Building control system**	

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Test Description TCP-7

Spot check 1 digital output associated with the condenser water system and selected at random for:

1. Proper position or action when on.
2. Proper position or action when off.
3. Proper failure position
4. Tight closure or complete shutdown in the off or closed position.
5. Full flow or full on/maximum output in the on or open position.
6. Response time.
7. Manual over-ride functionality.
8. Access.

Document specified and observed requirements in the remarks section. The output parameters should match the design requirements and the response time should be less than or equal to the specified time between when a change in state is triggered at the OWS and when it is observed at the final control element. Labeling should meet project requirements as specified in 15075 and 17000. Access should be adequate for normal maintenance including removal of any actuators with out requireing a system outage.

Output selected for verification -

On state
Required -
Observed -

Off state
Required -
Observed -

Failure position
Required -
Observed -

Response time
Required -
Observed -

Manual over-ride functionality
Specified requirement -
Observed functionality -

P / F / C / D

16 /2008 1:32:03 Primary Control Network Primary Controller

Test Description TCP-7

Spotcheck one point that is mapped to the ALC system from a BACNet interface to a VFD. Document the appropriate parameters as listed previously for an analog input, output, etc. in the remarks section.

BACNet Point selected for verification -

Observations as appropriate for the point type.

P / F / C / D

P=Pass, F=Fail, C=Could't, D=Didnt

011 -	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network							**Building control system**
17	/2008 1:32:03		Primary Control Network	Primary Controller			P / F / C / D
	Test Description			TCP-7			
	With both condenser water pumps in operation and both cooling tower fans at fulls peed, disconnect power to the control panel and document the response of the system. Reapply power and verify a coordinated start-up of the condenser water pumps and cooling tower fans.						
18	/2008 1:32:03		Primary Control Network	Primary Controller			P / F / C / D
	Test Description			TCP-7			
	Verify that the power source for the control panel is permanently documented on the panel and that it matches the actual power source.						
19	/2008 1:32:03		Primary Control Network	Primary Controller		*Response time -*	P / F / C / D
	Test Description			TCP-7			
	With both condenser water pumps in operation and both cooling tower fans at full speed, disconnect the communications trunk where it enters the control panell an: 1. Document the response of the system. 2. Verify a LAN failure alarm shows up at the OWS and note the response time.						

P=Pass, F=Fail, C=Could't, D=Didnt

011 -	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network							Building control system
20	/2008 1:32:03		Primary Control Network	Primary Controller		*Response time -*	P / F / C / D

Test Description TCP-7

Reconnect the LAN and verify the following:

1. Document the response of the system.
2. Verify the Lan failure alarm clears at the OWS and note the response time.

21	/2008 1:32:03		Primary Control Network	Primary Controller		*WWW IP Address -* *Username for FDE -* *Password for FDE -*	P / F / C / D

Test Description TCP-7

Demonstrate that all points associated with the condenser water system are being trended and are fully accessible from the WWW including points mapped across the BACNet interface. Document the IP adress for access and the log-in information in the remarks section.

P=Pass, F=Fail, C=Could't, D=Didnt

011 -	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network						Building control system	
22	/2008 1:32:03		Primary Control Network	Primary Controller			P / F / C / D

Test Description TCP-7

Demonstrate all applicable graphics associated with the condenser water system are present and fully functional. At a minimum, the following should be present:

1. Floor plan for the roof area showing the condenser water system equipment and controller locations. Links should be provided to open graphics for each item of equipment.
2. An animated schematic of the condenser water system that matches the general configuration shown on the design documents and the exact configuration installed in the field. All relevant control points, set points, and monitored or calculated parameters should be shown with appropriate levels of access set.
3. Each graphic should include current climate conditions.
4. All points associated with the condenser water system should show up in at least one graphic.
5. It should be possible to navigate between related graphics via hyperlinks.

Spot check 6 points in the graphics to verify appropriate levels of access are provided including at least one output, one set point, and one loop tuning parameter. Coordinate with UCB to verify access requirements.

See also 17000 Paragraph 3.12 E for additioanl details regarding graphic requirements.

P=Pass, F=Fail, C=Could't, D=Didnt

011 -	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network						Building control system	

P=Pass, F=Fail, C=Could't, D=Didnt