ALC Network   Building control system

200			Primary Control Network	Primary Controller	Controller		P / F / C / D
	Test Description			TCP-AHU-1	AHU-1		

TEST GOALS

1.   To spot verify the portion of the control network associated with the operation ofAHU-1 is ready for functional testing per the applicable requirements of 17010 Paragraph 3.05 EMCS Demonstration.

201			Primary Control Network	Primary Controller	Controller		P / F / C / D
	Test Description			TCP-AHU-1	AHU-1		

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.

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

202			Primary Control Network	Primary Controller	Controller		P / F / C / D
	Test Description			TCP-AHU-1	AHU-1		

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.

203			Primary Control Network	Primary Controller	Controller		P / F / C / D
	Test Description			TCP-AHU-1	AHU-1		

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

AHU	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status

ALC Network   **Building control system**

204			Primary Control Network	Primary Controller	Controller		P / F / C / D
				TCP-AHU-1	AHU-1		

Test Description

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 withhu-1 needs to be complete
2. Control programming for AHU-1 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

ALC Network   **Building control system**

| 205 | | | Primary Control Network | Primary Controller | Controller | | P / F / C / D |

Test Description   TCP-AHU-1   **AHU-1**

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 the Owner. If possible obtain a set of radios that allow you to communicate directly with the contractor and Owner. 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 VFD serving AHU-1 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 through the buildng cause a fan to spin backwards and then the drive engages to start it.
6. 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 un an AHU.

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

AHU	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status

ALC Network | | | | | | | **Building control system**

206 | | | Primary Control Network | Primary Controller | Controller | | P / F / C / D

| | | | | TCP-AHU-1 | AHU-1 | | |

Test Description

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. AHU-1 control sequences
8. Control shop drawings
9. Final approved control programming
10. Start-up reports and factory start-up forms.

207 | | | Primary Control Network | Primary Controller | Controller | | P / F / C / D

| | | | | TCP-AHU-1 | AHU-1 | | |

Test Description

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 forAHU-1. 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 the contractor to address any contractual issues.
5. Create action items directed to the Owner to address any non-contractual issues that have operational implications.

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

ALC Network   **Building control system**

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208   Primary Control Network   Primary Controller   Controller   **P / F / C / D**

Test Description   TCP-AHU-1   AHU-1

Demonstrate that the required software for AHU-1 is installed in the controller by showing the logic diagrams installed match the approved logic diagrams.

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209   Primary Control Network   Primary Controller   Controller   **P / F / C / D**

Test Description   TCP-AHU-1   AHU-1

Demonstrate that all points associated with the operation of AHU-1 system can be interogated and commanded from the test OWS.

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210   Primary Control Network   Primary Controller   Controller   *Sensor selected for verification -*   **P / F / C / D**

Test Description   TCP-AHU-1   AHU-1   *Calibration method required (cite spec section) -*

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.

Specified end to end accuracy -
Observed end to end accuracy -

Required response time -
Observed response time -

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

ALC Network   **Building control system**

211   Primary Control Network   Primary Controller   Controller   *Output selected for verification -*   P / F / C / D

Test Description   TCP-AHU-1   AHU-1   *Start point*
Spot check 1 analog output associated with AHU-1 selected at random for: *Required -*
                                                                                                                        Observed -

1. Proper start point   *Span*
2. Proper span   *Required -*
3. Proper failure position   *Observed -*
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.   *Failure position*
6. Associated control loop tuning parameters are not set to factory defaults. If derivative gain is   *Required -*
present, document the reason it was applied.   *Observed -*
7. Response time.
8. Manual over-ride functionality (if applicable).   *Tight closure/full off verified -*
9. Access.

                                                                                                                        Full open/maxium speed verified -
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   *Associated control loop parameters -*
specified time between when a change in state is triggered at the OWS and when it is observed   *P gain -*
at the final control element. Labeling should meet project requirements as specified in 15075 and   *I gain -*
17000. Access should be satisfactory for all normal maintenance activities including removal of   *D gain and reason used if applied -*
any acutators from the final control element with out the need for a system outage.

                                                                                                                        Response time
                                                                                                                        Required -
                                                                                                                        Observed -

                                                                                                                        Manual over-ride functionality
                                                                                                                        Specified requirement -
                                                                                                                        Observed functionality -

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

ALC Network   **Building control system**

| 212 | | | Primary Control Network | Primary Controller | Controller | *Input selected for verification -* | P / F / C / D |

Test Description   TCP-AHU-1   AHU-1

Spot check 1 digital input associated with AHU-1 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

ALC Network   **Building control system**

213   Primary Control Network   Primary Controller   Controller   *Output selected for verification -*   **P / F / C / D**

Test Description   TCP-AHU-1   AHU-1   *On state*

Spot check 1 digital output associated with AHU-1 and selected at random for:

Required -
Observed -

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.

Off state
Required -
Observed -

Failure position
Required -
Observed -

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.

Response time
Required -
Observed -

Manual over-ride functionality
Specified requirement -
Observed functionality -

214   Primary Control Network   Primary Controller   Controller   *BACNet Point selected for verification -*   **P / F / C / D**

Test Description   TCP-AHU-1   AHU-1   *Observations as appropriate for the point type.*

Spotcheck one point that is mapped to the control 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.

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

ALC Network **Building control system**

	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
215			Primary Control Network	Primary Controller	Controller		P / F / C / D
				TCP-AHU-1	AHU-1		

Test Description

With AHU-1 operating at 80% of full speed or more, disconnect power to the control panel and document the response of the system. Reapply ower and verify a coordinated start-up of AHU-1 and related system components.

	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
216			Primary Control Network	Primary Controller	Controller		P / F / C / D
				TCP-AHU-1	AHU-1		

Test Description

Verify that the power source for the control panel is permanently documented on the panel and that it matches the actual power source.

	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
217			Primary Control Network	Primary Controller	Controller	*Response time -*	P / F / C / D
				TCP-AHU-1	AHU-1		

Test Description

With AHU-1 operating at 80% of full speed or more, disconnect the communications trunk where it enters the control panell and:

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

AHU	Date	Type of Test	Function	Component	Device	Expected/Actual Results: / Remarks	Status
ALC Network						**Building control system**	
218			Primary Control Network	Primary Controller	Controller	*Response time -*	P / F / C / D
				TCP-AHU-1	AHU-1		

Test Description

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.

| 219 | | | Primary Control Network | Primary Controller | Controller | *WWW IP Address -*
Username for FDE -
Password for FDE - | P / F / C / D |
| | | | | TCP-AHU-1 | AHU-1 | | |

Test Description

Demonstrate that all points associated with AHU-1 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