

Project Manual

Bid Package 02
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Divisions 25

Cherokee Nation WILMA P. MANKILLER HEALTH CENTER EXPANSION

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Division	Section Title	Pages
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PROCUREMENT AND CONTRACTING DOCUMENTS GROUP

SPECIFICATIONS GROUP

Facility Services Subgroup

DIVISION 25 - INTEGRATED AUTOMATION

25 5050.1 CONTROLS ANALYTICS

8

END OF TABLE OF CONTENTS



CA5338(PE)



CA5338(PE)

SECTION 25 5050.1

CONTROLS ANALYTICS

PART 1 GENERAL

- A. The ATC provider shall include the cost of all labor, tools, and subscriptions in order to provide the scope of services described in this section. Using data available from the control system, analytics shall be leveraged by ATC and energy professionals to identify performance trends and deviations from normal building operation, develop energy cost saving measures accordingly, and provide operational adjustment recommendations as well as risk assessments of the deviations as they relate to building reliability.

PART 2 PRODUCTS

- A. See Direct Digital Control System Specifications.

PART 3 EXECUTION

3.1 HVAC SYSTEM PERFORMANCE SERVICE

A. Description

1. Shall provide data collection, analytics and professional analysis for general facility performance, airside systems , variable air systems and chiller performance including, but not limited to, analytics, charts and graphs which indicate both current building performance and opportunities for building and HVAC system performance improvement.

2. The ATC Contractor shall provide this service for a nominal period of one (1) year beginning on the date of substantial completion. The contractor shall provide a full report of the analytics four times throughout the first year. The report shall be presented by personnel trained in building analytics with appropriate professional credentials (P.E., CEM, etc...). In addition to the initial four reports in the first year after substantial completion, the ATC contractor shall provide pricing to extend this work into a second year with options for a single follow report, two follow up reports, or four follow up reports. The initial four reports shall follow the following scheme:
 - a. Report 1 – Approximately 3.5 months after the date of project substantial completion, should present analytics run on data collected from months 1 through 3 after substantial completion
 - b. Report 2 – Approximately 6.5 months after the date of project substantial completion, should present analytics run on data collected from months 4 through 6 after substantial completion.
 - c. Report 3 – Approximately 9.5 months after the date of project substantial completion, should present analytics run on data collected from months 7 through 9 after substantial completion
 - d. Report 4 – Approximately 12 months after the date of project substantial completion, should present analytics run on data collected from months 10 through 12 after substantial completion.

B. Service Performance Standards

1. Data Collection Standards

- a. The Building Performance Service must be capable of:

- 1) Continuous collection of building interval data, 24 hours/day, 7 days/week
- 2) Remote access to building/system data, 24 hours/day, 7 days/week

2. Communication architecture shall allow data to be collected by hardwired, or wireless, direct connection to range of gateways including:

- a. Tridium (Niagara) platforms: JENE, JACE or other
- b. Tracer SC
- c. Trane Connectivity Module

3. HVAC System Performance Service shall use “push” technology to communicate with and send data to the central server, requiring limited outbound ports

4. Data shall be stored in a Class 5 secure hosting location protected by ISO 5001-complaint firewall and intrusion detection systems with support for major network security protocols such as HTTPS and SFTP to securely access and store data.

5. Professional Analysis Standards

a. Provider shall have trained personnel with relevant professional credentials in HVAC systems, energy management and building optimization methodologies to be able to:

- 1) Identify building system performance trends and deviations from normal operation
- 2) Prepare actionable recommendations to optimize HVAC system performance
- 3) Prepare recommendations for operational adjustments
- 4) Prepare risk analysis of emergency maintenance or failure
- 5) Develop Energy Conservation Measures (ECMs)

C. Mandatory HVAC System Performance Service Capabilities and Tests

1. For all of the analytics listed in this section, the Building Performance Service must be capable of indicating evidence of failures and exceptions that could result in energy savings or improved performance.

2. General Facility Analytic Capabilities shall include:

- a. Weather conditions at the actual building location
- b. Validation of the accuracy of outside air temperature and humidity sensors
- c. Identification of user-initiated overrides that could affect system performance

3. Outdoor Air Temperature and Relative Humidity Accuracy Test : Outdoor air temperature and relative humidity versus reference; the reference selection is auto-calculated based on the customer facility latitude and longitude. This test determines if the Outdoor Air Temperature and Relative Humidity sensors are accurate.

4. Airside System Analytics Capabilities Shall include:

- a. Constant volume operation

- b. Economizer damper status and operation
- c. Percentage of outside air used to ventilate the building
- d. Control of space temperature
- e. Ventilation control

5. Economizer Operation Tests

- a. Air handling unit shall use mechanical cooling in lieu of economizer: this test indicates that the air-handling unit should have the capability to meet its cooling load by economizer alone. If this condition is detected, energy is being wasted and the opportunity to provide beneficial ventilation.
- b. Air handling unit controls making improper economizer decision: this test compares the calculated outdoor air intake percentage against the commanded economizer output percentage in order to identify improper economizer physical damper operation. This can detect outdoor air dampers stuck open or closed, both of which result in significant energy waste.

6. Unitary System Tests

- a. Space, zone temperature versus setpoint: this test calculates the difference between the actual space, the zone temperature, and its setpoint. The defined averaged results are over a time range. In addition, this test detects excessively positive or negative space temperature control, which can result in approaching comfort and equipment service problems.
- b. Space, zone temperature versus setpoint: this test calculates the difference between the actual space temperature and its setpoint. The standard deviation of the resulting values is then calculated over a defined time range. This test detects erratic space temperature control that can result in approaching comfort and equipment service problems.

7. 1.3.2.3 Ventilation Test

- a. Compares outdoor ventilation setpoint to measured value; this indicates that outdoor air ventilation is unacceptably low when compared to the setpoint.

8. Variable Air Systems (VAS) Analytics capabilities shall include:

- a. Distribution of VAV box airflows
- b. Individual VAV box damper positions

- c. Comparison of the current position of a VAV box to the mean position for the variable air system

9. Supply air temperature control tests shall include:

- a. Building and Air-handling Unit Static Pressure Tests
- b. Supply air pressure setpoint versus measured value; this calculates the difference between the actual supply air pressure and the mean of the supply air pressure setpoint values over a defined time range. This test detects erratic static pressure control that can result in energy waste and acoustic problems.
- c. Systemic variable air volume box (VAV) position versus variable air system (VAS) mean; this identifies prolonged periods of time when VAV boxes in a VAS remain below the normal range, indicating that the fan speed was unnecessarily high. This test detects opportunities for the deployment of duct static pressure reset and associated energy savings.
- d. Supply air pressure setpoint versus measured value; this calculates the difference between the actual supply air pressure and the setpoint. In addition, it also calculates the standard deviation of the value over the defined time range. This test detects erratic static pressure control that can result in energy waste and acoustic problems.
- e. Building static pressure setpoint versus measured value; this calculates the difference between the measured space pressure and setpoint, and averages that value over the defined time range.
- f. Building static pressure setpoint versus measured value/erratic control; this calculates the difference between the measured space pressure and setpoint. In addition, it also calculates the standard deviation over the defined time range.
- g. Variable Air Volume Box Terminal Test
 - 1) Analyzes the behavior of individual VAV box positions during occupied periods: under normal circumstances, the majority of VAV box position samples should lie within their identified normal control range. Abnormal position proportions shall be a precursor to problems with space ventilation, comfort, and acoustics.

10. Chiller Data Analytics Capabilities shall include analysis of the following parameters:

- a. Operating mode

- b. Approach temperature
- c. Condenser water and chilled water flow status
- d. Chilled water temperature control
- e. Performance of compressor, condenser, evaporator, various motors, purge system
- f. Overview of oil system

11. Chiller Equipment Tests

- a. Compare chilled water setpoint to actual leaving value: this poor chilled water control can be an indicator of many issues including approaching maintenance conditions, obvious energy waste, and process and comfort problems.
- b. Compare condenser water set point to actual leaving value: a poor condenser water control can be an indicator of many issues including approaching maintenance conditions and obvious energy waste due to poor efficiency.
- c. Compare chilled water pump status to flow system status: detecting stuck closed switch status can help prevent improper chiller operation, which can result in machine damage.
- d. Compare condenser pump status to actual flow status: detecting stuck closed switch status can help prevent improper chiller operation, which can result in machine damage.
- e. Compressor short cycle: this compares the operation of compressors over time and determine if they are operating properly per specification. Excessive compressor starts and stops can deteriorate the life of a compressor.
- f. Motor performance: this compares voltage, current, and temperature of motor versus specification on an ongoing basis. This can determine approaching maintenance requirement and prevent failures.
- g. Purge pump out: this demonstrates activity of purge activity and can be used to detect oncoming centrifugal breach problems.
- h. Evaporator efficiency: this maps the evaporator approach temperatures versus chiller load over time. In addition, it compares this data to as built chiller data, and is used to troubleshoot evaporator issues and predicting maintenance events.

- i. Condenser efficiency: this maps the condenser approach temperatures versus chiller load over time. In addition, it compares this data to as built chiller data and is used to troubleshoot evaporator issues and predicting maintenance events.

D. Analytics Reports

1. Failed test reports: reports can be requested from a library of failed tests. A report is generated and is placed in a system library each time a test fails. Each report is available in the various electronic formats.
2. Ad hoc retrieval of reports: these reports can be requested by user on an ad hoc basis. The user can select reports based on time and date range and output to various electronic formats.
3. Raw data reports; any data logged in the system can be accessed by the user. The user can select data based on time, date range, attribute and individual equipment or category of equipment.
4. Predefined reports: the user can select from a large library of reports based on time and date including the following:
 - a. Scheduling (inventory of time programs)
 - b. Override (inventory of user initiated override actions)
 - c. Equipment Inventory (listing of control automation and mechanical equipment)
 - d. Event and Alarms (topical events and alarms that have occurred in the facility)
 - e. Exceptions (listing of all detected failed test)

E. Professional Analysis Services

1. Initial Assessment shall include the baseline performance of the building.
2. HVAC system and equipment analysis shall diagnoses system performance against expectations for optimal operation and must indicate the following in order to assess the severity of the issue: most recent failure, count of failures and exceptions throughout building history for a particular point, most dramatic failure or exception for a particular point, first time the exception or failure was generated.

Energy analysis includes tracking monthly energy consumption for benchmarking purposes.

END OF SECTION