Performance Objective

For

Retro-Commissioning Services

August 2009

BRADLEY AIR NATIONAL GUARD, CT/Bldg 1, Maintenance Hangar; Bldg 17, Civil Engineering; Bldg 24, Wing Operations; Bldg 78, MPF, Security Police, CATM, Recruiting, State Headquarters Administration, Base Training.

ORANGE ACS, CT/Bldg 20, ACS Headquarters.

1. Purpose.
   1.1. This Performance Objective supplements the Performance-Based Statement of Work provided under Blanket Purchase Agreement W901UZ-08-A-0006.

2. Scope.
   1.2. Retro-commissioning services shall be performed on the facilities listed later in these objectives on Appendix A.

3. Definitions.
   3.1. Current Facility Requirements (CFR): Defines the users' current operational needs and requirements for a building. It typically includes items addressing temperature and humidity set points, lighting levels, operating hours, filtration, vibration, sound and/or specialty needs.
   3.2. Facility Improvement Measure (FIM). Alterations or revisions to systems or equipment planned to improve building and system performance, reduce Operations and Maintenance (O&M) costs and/or improve the indoor environmental quality.
   3.3. Retro-Commissioning (RCx). The application of the commissioning process to an existing building that has not previously undergone the commissioning process.
   3.4. Return on Investment (R01). The ratio of the money gained or lost on an investment relative to the cost of the investment. To calculate ROI, the benefit (return) of an investment is divided by the cost of the investment; the result is expressed as a percentage or a ratio. ROI = (Gain from Investment - Cost of Investment) / Cost of Investment.

4. Objectives
   4.1. Verify that a facility and its systems meet the CFR.
   4.2. Optimize control systems through calibration of sensors, review of metered data and trend logs, and functional equipment testing.
   4.3. Improve building performance by saving energy and reducing operational costs.
   4.4. Identify and resolve building system operation, control, and maintenance problems.
   4.5. Reduce or eliminate occupant comfort complaints and increase occupant satisfaction.
   4.6. Improve indoor environmental comfort and quality.
   4.7. Document system operation.
   4.8. Identify operational and maintenance enhancements that result in improvements in energy efficiency, occupant comfort, or indoor air quality.

4.9. Identify Operational & Maintenance (O&M) practices that could be implemented and additional training that the staff may benefit from.

4.10. Extend equipment life-cycles.

5. Process. The following summarizes the project steps, which are detailed in the following sections.
   5.1. Phase I:
      5.1.1. Planning Phase. Review of existing documentation and requirements, preparation of a retro-commissioning plan.
      5.1.2. Investigation Phase. Field inspections, data gathering, testing, and analysis to accurately assess system performance and identify improvement opportunities.
   5.2. Phase II:
      5.2.1. Implementation Phase. Facility improvements are implemented and the results and performance are verified.

6. Planning Phase.
   6.1. Documentation Review - Review building drawings and documentation to understand the building energy usage, initial basis of design and evaluate the system integration. The review process includes the evaluation of all old and new drawings, specifications, Test and Balance Reports, Operations & Maintenance Manuals (typically related to mechanical, electrical and controls), and any past Commissioning Reports.
   6.2. Review the current facility functions to identify changes from the original design criteria and assumptions.
   6.3. Review current codes and standards to identify those applicable to the CFR.

7. System Actions Required.
   7.1. General. For task orders that have an identified "Other Direct Cost" (ODC's) line item, defective components shall be replaced as part of the investigative services. Individual expenditures up to $1,000 may be made without further approval. Expenditures above this amount must be approved by the Contracting Officer's Representative (COR). An ODC allowance amount and stipulation will be identified as part of the task order line item. The Service provider shall not exceed this criteria and when remaining ODC balance is approaching zero, notify the COR of pending balance.

8. Investigation Phase.
   8.1. System condition analysis. Check systems for conditions that may impact operation of the respective systems. This shall include items such as cleanliness of coils, condition of filters and belts, and required preventative maintenance actions.
   8.2. Site Review/Survey - Conduct a thorough and detailed building walk through with base maintenance personnel to evaluate the issues identified in the Planning Phase and observed during the drawing and documentation review. Important facility information not found during the Documentation Review may need to be recreated during the site survey (i.e. TAB analysis to determine current air/water flows, or if sequences of operation are unavailable, perform functional performance testing to determine how systems operate). During this step additional issues which are not captured through the Documentation Review should be noted.

8.3. Building Occupant Interviews — Interview the Owner's maintenance personnel, utility personnel, occupants, and other relevant parties to understand the current needs and issues related to system operations and maintenance. A formal interview process is recommended to systematically assist in understanding potential issues and problems, uncover potential improvement opportunities, confirm the CFR and to develop consensus on the commissioning process goals.

8.4. Facility Performance Analysis and Performance Baseline Establishment.

8.4.1. Collect and analyze available energy, non-energy and other system performance data to establish baseline benchmarks for facility performance. Available facility performance baseline data shall include utility billing data, sub-metering data, work orders, comfort complaint logs, indoor air quality parameters, occupant satisfaction survey results, BAS trend data, and/or stand alone data logger data and other data deemed necessary to develop and establish the facility baseline.

8.4.2. Data shall be gathered a minimum of two weeks prior to commencing any modifications to the systems and after completion of any modifications.

8.5. Systems Diagnostic Monitoring — Develop a diagnostic monitoring strategy and then perform comprehensive system diagnostic monitoring. Diagnostic monitoring methods can include BAS trending, portable data logger trending, and energy and weather data collection. The collected data is analyzed to identify issues and improvement opportunities and highlight particular problems that may require more rigorous and focused investigation.

8.6. Test Development - Develop Test Procedures for the systems identified in the project scope. Test plans typically focus on confirming that the system performance is meeting the performance requirements of the occupants set forth in the CFR.

8.7. System Testing - Perform system testing to evaluate the building systems performance. In addition, any anomalies or issues identified in earlier Investigation Phase steps should be considered for further evaluation during system testing to determine root causes and possible solutions. The testing process includes the verification and calibration of all sensors.

8.7.1. Special consideration should be given to chiller plants and conventional atmospheric boilers. Specifically, operational efficiency performance evaluation and requirements noted in paragraph 9 that follows. The timing of this contract and seasonal operation of this equipment may not coincide. Every attempt should be made on these systems so they are evaluated and adjusted during the season while in use, regardless whether the execution of the contract is in the planning, investigative or Implementation phase.

8.8. If the task order in which this work is being performed under, has the "Other Direct Cost" (ODC's) line item, simple repairs or improvements identified during the Investigation Phase monitoring and testing should be completed in accordance with Paragraph 7 above. If the task order doesn't include the ODC line item, a list of all items requiring replacement should be identified and incorporated into the retro-commissioning plan.

8.9. Develop the retro-commissioning plan with input from the facilities staff. The plan shall at a minimum contain the following information, description of what was evaluated including scope and methodology, findings and proposed implementation plan.

8.10. Conduct a scoping meeting to review, discuss, and agree to the retro-commissioning plan.

8.11. Deliverables:

8.11.1. Retro-commissioning plan.

8.11.2. Minutes of scoping meeting.

9. Implementation Phase.

9.1. General, this phase implements and executes the recommendations of the Retro-commissioning plan, making system adjustments to meet the requirements of the Objectives noted earlier. Execution of this phase may allow the remaining ODC funds balance, not used during the investigative phase, to be accessible for component replacement during this phase or additional ODC funds may be contractually added.

9.2. The following paragraphs make reference to sketches or marked up "As Builts". The intent of this requirement is to have the RCx firm provides a document that shows the pertinent information in a clear and understandable fashion that will be a useable reference for the future. This does not need to be a CAD drawing but must be a legible document.

9.3. Implement modifications to control settings to reflect changes to code or the CFR.

9.4. Chiller Plant. Sketch system schematic or mark up "As-Built" drawings and evaluate for given application. Document set points (e.g. chilled water temperatures and normal refrigeration checks, supply air temperature). Document Seq0p. Evaluate SeqOp for the given application.

9.5. Cooling Towers.

9.5.1. Sketch system schematic (may be included in chiller plant schematic) or mark up "As-Built". Document set points (e.g. condenser water leaving temperature). Measure supply, return condenser water temperatures, flow. Document SeqOp

9.5.2. Evaluate SeqOp for the given application.

9.6. Boilers.

9.6.1. Combustion analysis and operational checks and adjustments on conventional atmospheric boilers. Combustion analysis will not be required on the modular high performance boilers.

9.6.2. Verify operations and sequence of boiler and pumps.

9.7. Air Distribution System (Includes air handling unit, ducting, related fans in zone, related terminal boxes, etc.)

9.7.1. Sketch system schematic or mark up "As-Built" and evaluate for given application. Document set points (e.g. supply air temperature), measure supply, return, mixed, outside air temperatures. Verify proper chilled water, hot water, and/or steam valve operation.

9.7.2. Verify proper economizer operation (if present). Document SeqOp Evaluate SeqOp for the given application.

9.7.3. Balance check of exhaust air —vs- outside air and building pressures, identifying excess infiltration or outside air.

9.7.4. Testing and balancing of all diffusers and VAV boxes.

9.8. DX Air Conditioning System (Includes all items associated with packaged DX system, such as compressors, condenser fans, economizer, air distribution system, etc.)

9.8.1. Sketch system schematic or mark up "As-Built" and evaluate for given application. Document set points (e.g. supply air temperature). Measure supply, return, mixed, outside air temperature. Verify proper economizer operation (if present). Document Seq0p. Evaluate SeqOp for the given application.

9.9. Various other HVAC components such as VFD's Outside Air resets and economizer operations, assuring proper operation and evaluate given applicability.

9.10. Building Automation and Energy Management Control Systems

9.10.1. Verify that remote monitoring of points and system are established and properly reporting.

9.10.2. Verify operation and accuracy of all sensing and control points.

9.11. HVAC Control Systems.

9.11.1. Verify accuracy of all sensors falls into the range established by the manufacture. Calibrate or replace as required.

9.11.2. Modify sequence of operations or reprogramming. Recommend software upgrades and connectivity and system network compatibility.

9.11.3. Verify compliance with control sequences of operation.

9.12. VAV Boxes

9.12.1. Verify VAV box response to room temperature set point adjustment. Adjust as required

9.12.2. Verify reheat coil operation

9.12.3. Check primary air damper maximum/minimum flow settings and compare to actual measured flows. Adjust as required

9.13. Hydronic Systems.

9.13.1. Test and balance.

9.13.2. Operation of pumps.

9.14. Building Exhaust Systems.

9.14.1. Check fan operations and do a TAB.

9.15. Lighting.

9.15.1. Evaluate facility lighting levels and identify areas that seem excessive lit.

9.15.2. Lighting Controls.

9.15.2.1. Verify acceptable operation and settings of occupancy sensors. Identifying locations where operational changes could and should be implemented.

9.15.2.2. Verify operation and settings of daylighting sensors. Adjust levels as necessary.

9.15.2.3. Identify recommended location changes to improve operation of occupancy and or daylighting sensors.

10. Deliverables

10.1. Progress Reports. Reports shall be submitted bi-weekly commencing at the award of the task order and continuing until submission of the Final Retro-Commissioning Report. The report shall identify work completed, work in progress, and status of the ODC allowance, any problems, and the schedule for the remaining work.

10.2. At conclusion of Investigative Phase:

10.2.1. Minutes of Retro-commissioning plan scoping meeting.

10.2.2. Retro-commissioning plan.

10.3. At Conclusion of the Implementation Phase:

10.3.1. Final Retro-Commissioning Report (3 copies, 2 to the base and 1 to CETSC) including the following information:

10.3.1.1. Executive summary

10.3.1.2. Project background and scope of the commissioning project

10.3.1.3. Facility Metrics. Provide data on conditions and utility consumption rates at the start of the process and upon completion, highlighting the changes. Provide data for the following:

10.3.1.3.1. Building energy usage and savings as the result of the RCx efforts.

10.3.1.3.2. Conditions in areas of concern. Data shall include temperatures, humidity, air velocity, etc, as appropriate.

10.3.1.4. Overview of activities conducted and changes implemented.

10.3.1.5. Details of all potential improvements identified and other findings, including:

10.3.1.5.1. Documentation of equipment conditions

10.3.1.5.2. Identify Operational & Maintenance (O&M) practices that could be implemented and recommended training that would benefit the staff.
10.3.1.5.3. Missing critical documentation

10.3.1.6. Current system operation sequences for all equipment and systems included

10.3.1.7. Recommended capital improvements. Provide the following data for each item:

10.3.1.7.1. Estimated implementation cost.
10.3.1.7.2. Estimated energy and cost savings.
10.3.1.7.3. LCC.
10.3.1.7.4. ROI.

10.3.1.8. In Appendix:

10.3.1.8.1. The Retro-Commissioning Plan
10.3.1.8.2. The EMCS / data logger trended data, analysis, and annotated results.
10.3.1.8.3. Electronic copies of the data shall be provided.
10.3.1.8.4. Completed calibration worksheets
10.3.1.8.5. TAB work forms

11. Government Furnished Support.

11.1. Administrative space during on-site phases.
11.2. Semi-secured site for testing and equipment storage

Appendix A

Retro-Commissioning Work Sheet

P.O.C. Name: Douglas Margelony Rank: SMSgt

Position: Facility Manager Comm. Phone #: 860-292-2596

1. Base: Bradley Air National Guard
2. Building Number and Using Organization; Bldg 1 Maintenance Hangar
   Admin. Space-9920

3. Square Footage; 79,157
   Year Built and last renovation; 1958 Last renovation 2001
   Has CETSC ever done a TAB on this Facility Y/N — No
4. Utilities Electrical: Is Facility Metered? Yes
   Does it have advanced Metering? Yes
   Is Monthly Consumption for One Year available? Yes

5. Other: Are any of these Metered, Is Monthly Consumption for One Year available?

   Natural Gas—Yes

   Fuel Oil

   Central Plant

   Water—Yes

6. Equipment: Chillers; How Many and Size? No
   Boilers; How Many and Size? 2 boilers, Burham V912
   Air Handling Units; How Many? 10
   Air Terminal Devices (VAV's), Fan Coil Units (FCU's), etc.
   How Many?

   Other Devices

Does the Building have Direct Digital Controls? No

Manufactures Name:

7. Lighting Systems, Ballast type, switching, compact vs. led lamps, T12 vs. T8 etc.

Interior Lighting

2 Lamp, U-shaped	FB31T8/6	Qty=258
1 Lamp, 4 feet	F32T8	Qty=25
2 Lamp, 4 feet	F32T8	Qty=43
4 lamp, 4 feet	F32T8	Qty=141
2 Lamp 8 Feet	F96T8	Qty=24
2 Lamp 8 Feet	F96T12/CW	Qty=6
HID High Pressure Sodium	HPS 100	Qty=9
HID High Pressure Sodium	HPS 400	Qty=28
HID Metal Halide	MH 175	Qty=7
HID Metal Halide	MH 400 .	Qty=20
HID Metal Halide	MH 1000	Qty=32
Exit Sign	CFT7W	Qty=9
Exterior Lighting		
HID High Pressure Sodium	HPS 400	Qty=4

8. Ceiling Types and Heights:
   a. Approx percentage for ceiling type - grid ceiling with 4 foot tiles and 2 foot tiles for ceiling in office areas located on the east and west side of the buildings .
   b. Approx percentage for ceiling heights — 10 feet

Summary

Building was constructed in 1956, with renovations in 1986 and 1992. This building is a large, two story hangar used for aircraft storage and maintenance along with support offices and shops. The maintenance hangar bay is surrounded on two sides by office and shop areas. This building contains: the main hangar, welding, pneudralic, machine, electric, and other shop; office areas; locker rooms; and break rooms. Typical occupancy for the building during normal operation is approximately 110 personnel. During drill weekend, the occupancy for the building is approximately 400 personnel. Normal operations for this building are from 0700 hours to 1630 hours.

Lighting System

The total connected lighting load for building 01 is approximately 95,453 watts. This connected load represents a large portion of fluorescent 4 lamp fixtures and HID High Pressure sodium high bay fixtures lighting in the maintenance hangar. Fluorescent lighting is used to illuminate the offices, hallways, and storage rooms. Most of the fluorescent lighting is produced by T8 fluorescent lamps with electronic ballasts. All interior lighting is manually controlled by the occupants.

Heating

The office and shop areas of this building are heated by two 2,102 MBH natural gas fired steam boilers. These boilers deliver stem to perimeter baseboard heaters, steam unit heaters, and steam coils in the air handling, heating, and ventilating units. The main hangar is heated by twelve natural gas fired radiant tube heaters (each burner rated at 360 MBH) mounted at the ceiling level. The radiant tube heaters were installed in 1993 and require yearly repair costs.

In order to capture the loss of heat and air from the hangar doors opening each time aircraft enter and exit the hangar, we proposed the following being installed in the hangar bay area. (See Proposal for Connecticut ANG-Hangar)

The hot water is pumped to the heating coils in the air handling units, the heating and ventilating units, the unit heaters in mechanical rooms, and the perimeter baseboard units throughout the building. The boilers were in installed in 1993 and a SRM contract was awarded on 14 July 08 to have cast iron section leaks repaired.

Cooling

This building is cooled by direct expansion units utilizing air cooled condensing units with indoor air handling units or packaged equipment, such as rooftop units. All units are at the end of the life cycle and repairs costs average approximately $400 yearly.

Air Distribution

All air conditioning, heating, and ventilating units are single zone, constant volume systems located throughout the building.

Controls

The boilers are automatically energized by outdoor temperature sensors. At approximately 55 degrees Fahrenheit the boilers are staged to maintain 8 psi. The unit heaters and baseboard heaters have thermostats which operate their respective valves. The air conditioning units are controlled by electric room thermostats to maintain the set point.

Domestic Hot Water Heating

Domestic hot water is provided by one natural gas fired water heater and by one electric water heater. The natural gas fired water heater is a 125 gallon, 399 MBH manufactured by PVI-Polyshield. The electric water heater is a 4.5kW unit manufactured by SEPCO. The water temperature was measured at 144 degrees Fahrenheit. Currently SRM project is out to bid through contracting to have the 125 PVI-Polyshield replaced with a Ranni On demand gas fired hot water system. This bid closes in contracting on 21 July 08.

Proposal

For

Connecticut Air National Guard

Hangar

Executive Summary

Airius LLC is pleased to provide Connecticut ANG. with a proposal for its Thermal Equalization System for the hangar facility at the East Granby Connecticut location. As will be shown in this proposal, the system will allow for thermal equalization of the area proposed, resulting in significant energy savings as well as increased worker comfort during the winter months.

Background

Airius LLC is a Colorado based firm that designs, manufactures and delivers the line of Airius products for thermal equalization. As a division of Avedon Engineering, a 40 year old company dedicated to precision engineering design, Airius has designed and produced a patented line of thermal equalization fan systems. These innovative systems save energy and increase occupant comfort while equalizing temperature levels.

Hangar Environment

The Connecticut ANG facility under review is the hangar, an area with extremely high ceiling (from 27 feet to 54 feet at the peak) and as a result an extremely high cost of heating in the winter. The Airius Model 45 Thermal Equalizer; properly deployed (one per 1,500 sq. ft.), will easily and cost effectively solve this heating dilemma. Designed to push a gentle column of air from the ceiling, all the way to the floor, each unit will thermally equalize (to within 2 degrees F.) a 1,500 square foot area. This will not only increase the comfort level of the employees in the hangar, but will "re-capture" lost heat, reducing the amount of energy needed to heat the complex.

It is estimated that the heat savings in the hangar will be from 25%-30% based on the ceiling height and heat distribution used. Not only will air be thermally equalized, but floors will be warmed and over time act as a thermal barrier. The rate of heat loss through the ceiling will be reduced by the percentage of the reduction of the differential between inside and outside temperature. Additionally, the personnel using the hangar will find significant increase in comfort as the air space is thermally equalized.

Proposed Solution

What follows is the proposed solution for the Connecticut ANG hangar facility.

We recommend 31 model 45 Airius Thermal Equalizer units for the hangar facility. A proposed layout has been forwarded by separate email, and gives an idea of where units would be deployed. Actual work areas, etc, will dictate exact placement. The units will dramatically increase comfort, and dramatically decrease heating expense in the hangar.

Each Airius Thermal equalizer is equipped with a six (6) foot cord. Receptacle boxes should be mounted within six (6) feet of the designated location of the individual units. The units are plugged into the receptacle to allow for easy removal for periodic preventive maintenance (primarily cleaning) of the units. It is recommended that one additional unit (30 to be deployed, one spare) be purchased to facilitate the cleaning effort, allowing a unit to be replaced, cleaned, then used to replace the next unit etc

Airius LLC offers a one year warranty on parts and workmanship. If there is a problem with any unit still within warranty, the unit can be returned and replaced with a new unit. For units beyond the warranty period, there is a Factory Refurbishment Program which allows for refurbishment or replacement of the unit for approximately one half the then current standard price for the Airius model in question.

The price of the Model 45 Airius Thermal Equalizer unit is based on the standard price list. The standard conditions of sale are; full amount of invoice is due upon receipt. The invoice will be sent at time of shipment

Equipment Cost:

Cost per Model 45 unit	$695.00
Shipping & Handling per unit	$20.00
Number of Model 45 units	31
Total Thermal Equalizer Cost	$21,545.00
Total Shipping and Handling Cost	$620.00
Total Cost	**$22,165.00**

The Airius Model 45 units can be shipped within 8 weeks of receipt of your purchase order.

We look forward to working with Connecticut ANG to address your air distribution heat energy reduction requirements.

Retro-Commissioning Work Sheet

P.O.C. Name: Douglas Margelony Rank: SMSgt

Position: Facility Manager Comm. Phone #: 860-292-2596

1. Base: Bradley Air National Guard

2. Building Number and Using Organization; Bldg 17 Civil Engineering

3. Square Footage; 34,768

Year Built and last renovation; 1982. Last renovation 1998 Has

CETSC ever done a TAB on this Facility Y/N — Yes, 1998.

4. Utilities: Electrical: Is Facility Metered? Yes

Does it have advanced Metering? Yes

Is Monthly Consumption for One Year available? Yes

5. Other: Are any of these Metered, Is Monthly Consumption for One Year available?

Natural Gas —Yes

Fuel Oil

Central Plant

Water — Yes

6. Equipment: Chillers; How Many and Size?

Boilers; How Many and Size? 1 boiler, Burham V912 Air

Handling Units; How Many?

Air Terminal Devices (VAV's), Fan Coil Units (FCU's), etc.

How Many?

Other Devices

Does the Building have Direct Digital Controls? Yes

Manufactures Name: RCMS

7. Lighting Systems, Ballast type, switching, compact vs. led lamps, T12 vs. T8 etc.

Interior **Lighting**

2 Lamp, 4 feet	F32T8	Qty=31
3 Lamp, 4 feet	F32T8	Qty=12
4 lamp, 4 feet	F32T8	Qty=4
2 Lamp 8 Feet	F96T12/CW	Qty=23
1 Lamp 3 feet task	F30T12/CW	Qty=21
Exit Sign	CFT7W	Qty=3
Exterior Lighting		
HID	HPS 100	Qty=9

9. Ceiling Types and Heights:
   a. Approx percentage for ceiling type - grid ceiling with 4 foot tiles for ceiling type in the entire building
   b. Approx percentage for ceiling heights -12 foot, 60%, 10 foot 40%

Summary

Heating

This building is heated by two 1,445 MBH natural gas fired hot water boilers. The hot water is pumped to the heating coils in the air handling units, the heating and ventilating units, the unit heaters in mechanical rooms, and the perimeter baseboard units throughout the building. The boilers were in installed in 1993 and a SRM contract was awarded on 14 July 08 to have cast iron section leaks repaired.

Cooling

This is cooled by a 150 ton chiller-cooled reciprocating chiller. A forced draft cooling tower cools the condenser water. The tower is located in the equipment room and is ducted to the outside. Both units are old, but appear to function properly. Chiller water is pumped to the coils in the air handling units. The low speed control tower fan moves the air.

Air Distribution

This building is served by four air handling units. One unit is a heating and ventilating unit serving the kitchen. Two of the units are variable volume serving office areas. The fourth unit provides constant volume unit serving the dining room. All units have 100% outside economizer capability.

Domestic Hot Water Heating

Domestic hot water is provided by two 670 MBH propane fired heaters located in the penthouse mechanical room. There is also an electric booster heater in the kitchen serving the dishwater area.

Retro-Commissioning Work Sheet

P.O.C. Name: Douglas Margelony Rank: SMSgt

Position: Facility Manager Comm. Phone #: 860-292-2596

1. Base: Bradley Air National Guard

2. Building Number and Using Organization; Bldg 24 Wing Operations

3. Square Footage; 34,768

Year Built and last renovation; 1982. Last renovation 1998 Has

CETSC ever done a TAB on this Facility Y/N — Yes, 1998.

4. Utilities: Electrical: Is Facility Metered? Yes

Does it have advanced Metering? Yes Is Monthly

Consumption for One Year available? Yes

5. Other: Are any of these Metered, Is Monthly Consumption for One Year available?

Natural Gas —Yes

Fuel Oil

Central Plant

Water — Yes

6. Equipment: Chillers; How Many and Size? 1 chiller, 150 ton

Boilers; How Many and Size? 2 boilers, Burham V912 Air

Handling Units; How Many?

Air Terminal Devices (VAV's), Fan Coil Units (FCU's), etc.

How Many?

Other Devices

Does the Building have Direct Digital Controls? Yes

Manufactures Name: ALC

7. Lighting Systems, Ballast type, switching, compact vs. led lamps, T12 vs. T8 etc.

Interior Lighting

2 Lamp, 4 feet	F32T8	Qty=35
2 Lamp, U-shaped	FB31T8/6	Qty=456
1 lamp, 4 feet task	F40T12/CW	Qty=35
HID Mercury Vapor	MV175	Qty=28
Track and Recessed	1150 R40	Qty=24
Exit Sign	CFT7W	Qty=16
Exterior Lighting		
HID HPS 150	HPS 150	Qty=9
Incandescent	150 PAR	Qty=21

8. Ceiling Types and Heights:
    a. Approx percentage for ceiling type - grid ceiling with 4 foot tiles for ceiling type in the entire building
    b. Approx percentage for ceiling heights -12 foot, 60%, 10 foot 40%

Summary

Heating

This building is heated by two 1,445 MBH natural gas fired hot water boilers. The hot water is pumped to the heating coils in the air handling units, the heating and ventilating units, the unit heaters in mechanical rooms, and the perimeter baseboard units throughout the building. The boilers were in installed in 1993 and a SRM contract was awarded on 14 July 08 to have cast iron section leaks repaired.

Cooling

This is cooled by a 150 ton chiller-cooled reciprocating chiller. A forced draft cooling tower cools the condenser water. The tower is located in the equipment room and is ducted to the outside. Both units are old, but appear to function properly. Chiller water is pumped to the coils in the air handling units. The low speed control tower fan moves the air.

Air Distribution

This building is served by four air handling units. One unit is a heating and ventilating unit serving the kitchen. Two of the units are variable volume serving office areas. The fourth unit provides constant volume unit serving the dining room. All units have 100% outside economizer capability.

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Retro-Commissioning Work Sheet

P.O.C. Name: Douglas Margelony Rank: SMSgt

Position: Facility Manager Comm. Phone #: 860-292-2596

1. Base: Bradley Air National Guard

2. Building Number and Using Organization; Bldg 78, MPF, Security Police, CATM, Recruiting, State Headquarters Administration, Base Training.

3. Square Footage: 30,700

Year Built and last renovation; 1982. Acquired by CTANG and converted in 1992.

Last renovation: 1999.

Has CETSC ever done a TAB on this Facility Y/N —Yes, 2000?

4. Utilities: Electrical: Is Facility Metered? Yes

Does it have advanced Metering? Yes

Is Monthly Consumption for One Year available? Yes

5. Other: Are any of these Metered, Is Monthly Consumption for One Year available?

Natural Gas —Yes

Fuel Oil

Central Plant

Water — Yes

6. Equipment: Chillers; How Many and Size? No

Boilers; How Many and Size? 2 Teledyne Laars

Air Handling Units; How Many? 4

Air Terminal Devices (VAV's), Fan Coil Units (FCU's), etc.

How Many? 24

Other Devices

Does the Building have Direct Digital Controls? Yes

Manufactures Name: RCMS

13. Lighting Systems, Ballast type, switching, compact vs. led lamps, 112 vs. T8 etc.

Interior Lighting

1 Lamp, 4 feet	F32T8	Qty=3
2 Lamp, 4 feet	F32T8	Qty=50
3 lamp, 4 feet	F32T8	Qty=34
4 Lamp, 4 feet	F32T8	Qty=74
HID Metal Halide	MH 175	Qty=4
HID Metal Halide	MH 250	Qty=33
Exit Sign	CFT7W	Qty=9
Exterior Lighting		
HID High Pressure Sodium	HPS 100	Qty=8
HID High Pressure Sodium	HPS 400	Qty=3

14. Ceiling Types and Heights:
    a. Approx percentage for ceiling type - grid ceiling with 4 foot tiles for ceiling type in the entire building.
    b. Approx percentage for ceiling heights -12 foot - 40%, 10 foot- 40%, 18 foot-20%.

Summary

Heating

This building is heated by two 405MBH natural gas fired hot water boilers. The hot water is pumped to the heating coils in the ducts, air handling units, to unit heaters in mechanical rooms, and to perimeter baseboard heating units throughout the building.

Cooling

The building is cooled by direct expansion through packaged units or spilt system units. There are also three supplemental cooling-only split units in the vault area, the telephone room, and the briefing room.

Air Distribution

Packaged units AC-1 and AC-2 are constant volume units that serve as a variable volume distribution system. A supply return bypass with damper is used to vary the volume to the space. The remaining units are constant.

AC-3 serves the classroom and the ACATM area in the center of the building with 15 diffusers and a design of 10,665 CFM. The air-cooled condensing side of this unit is constantly requiring repairs and maintenance.

AC-5 is a split system that serves the MPF with one diffuser and a design of 1000 CFM.

The building has rooms that are too hot and some too cool and there is poor air distribution throughout. Need to have commission and balance conducted to find rot cause. The CSC (Central Security Center) is located in the South corner of the building with Security Police and does not have a separate heat or air cooling system to control the temperature for the computer and camera equipment in the Central Security Center.

Recommend to have new two new Carrier package Air condition/Gas Heat Units, 30 ton each replace these units. Efficiency is below 85% for ANG ETL 01-1-1 and exceeded life cycle of these units is costing approximately 4k each year for both units for repairs and sustainment of systems.

Lighting System

The total connected lighting load serving building 78 is approximately 27,601 watts. Florescent lighting is in the majority of the interior fixtures. Most fixtures are 4 lamp fixtures that are 4 feet in length strips or 2-lamp fixtures four feet in length. All of the fluorescent lighting is produced by T8 fluorescent lamps with electronic ballasts. All interior lighting is manually controlled by the occupants. Approximately 90% of the interior lighting will be fully on during occupied hours. The exterior lighting is operated by photocell and time clock controls.

Domestic Hot Water Heating

Domestic hot water is generated by an 8 4gallon gas fired water heater.

Retro-Commissioning Worksheet

POC name: SMS Douglas Margelony Rank: E-8

Position: Facility Manager Phone DSN: 220-2596

Commercial: 860-292-2596

Base: Orange ACS

Building and using organization: Bldg 20 ACS Headquarters

Total building square footage: 47,292

Admin area square footage: 35,004

Bay/shop area square footage: 12,288

Year built and last renovation: 2002

Has CETSC ever done a TAB on this facility? Y/N: N

Utilities

(place an X in the boxes that apply)

	Electrical	Gas	Water	Fuel oil
Is the facility metered?	x	x	x	
Is it advanced metering “smart meters”?				
Is monthly usage for one year available?	x	x	x	

Other utility information:

Equipment

(Specify how many and what size, if applicable.)

Chillers: 1 Trane RTAA 90 ton

Boilers: 3 AO Smith Model LB-750

Rooftop / Package units: 4

Air handling units: 4

Air terminal devices *(VAV's, FCU's, etc.):* 28 VAV, 6 FCU's

Other devices:

Does the facility have direct digital controls (DDC)? Yes , Automated Logic Version 3

(If so please specify what brand and system.)

Other

Lighting systems: T-12 lighting in Maintenance bay area, T-8 lighting 4 foot lighting in Admin area

(Ballast type, switching, compact vs. LED lamps, T-12 vs. T-8 etc.)

Ceiling types and heights: 12 foot ceilings

(Approximate percentage of the total square footage of the facility.)

Comments: Recommend the following for Bldg 20 ACS Headquarters building: first, install advanced smart meters in this building so the data can be tracked and monitored from the DDC.

Second, install LED lighting in the Admin and Maintenance Bay sections that include motion sensors in the Admin Area. LED lighting is now being manufactured with 18 watt and this building would be an excellent test bed for

LED lights due to the Air Traffic Control mission.

Third, add the July 08 Lieber A/C unit on the first floor Room 125 to the DDC. Currently A/C temperature cannot be monitored, adjusted, and schedules be added to keep the room at the required temperature for the server and equipment located in the room.

Lastly, tint the windows on the front side of the building to prevent heat loss transfer that occurs on the windows. The tinting will decrease the amount of cooling required during spring and summer months and the opposite when for heating during the winter months.

Tinting will also eliminate .the security risk that exists for on the first and second floor when viewing sensitive 'materials.

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