

Bid Number: 40010-13001

Date: August 9, 2012

LOUISIANA DELTA COMMUNITY COLLEGE
Office of Facilities Management

Louisiana Delta Community College
7500 Millhaven Road
Monroe, LA 71203-6922
(318) 345-9000

INVITATION FOR BID: Sealed bid, subject to the conditions herein stated and attached hereto, will be received at this office until September 6, 2012 @ 2:00 P.M.CST and then publicly opened for furnishing the items and/or services described below for the Campus of Louisiana Delta Community College.

DESCRIPTION:

FACILITY & SUPPORT SERVICES:
HVAC PREVENTIVE MAINTENANCE
ENERGY MANAGEMENT SERVICES:
AS PER ATTACHED SPECIFICATIONS
PLEASE FILL IN ALL BLANK SPACES

Terms will be _____ and shipment will be received within _____ days after receipt of an order.

In compliance with and subject to the conditions thereof, the undersigned offers and agrees if this bid be accepted within 60 days from date of opening to furnish any or all of the items (or sections) at the price set opposite each item (or section).

Vendor Name

Signature Authority (RE: L.R.S. 39:1594)

Address

Title

City, State and Zip

Tax Identification Number

Telephone Number

Fax Number

Louisiana Contractor's Number

Date

Acceptance/Award

Date of Award and Execution

Recommendation: _____

Approved: _____

Gayle Doucet
CPO

NSTRUCTIONS TO BIDDERS

1. Bid Forms

All written bids, unless otherwise provided for, must be submitted on, and in accordance with, bid forms provided, properly signed. Bids submitted in the following manner will not be accepted.

- A. Bid containing no signature indicating intent to be bound;
- B. Bid filled out in pencil; and
- C. Bid not submitted on the state's standard forms.

Bids must be received at the address specified in the Invitation for Bids prior to bid opening time in order to be considered. Any bid received after bid opening time will be retained in bid file unopened. Telegraphic and fax alterations to bids received before bid opening time will be considered provided formal bid and written alteration have been received and time-stamped before bid opening time.

2. Special Envelope

Ensure consideration, all bids should be submitted in the special bid envelope if furnished for that purpose. In the event bid contains bulky subject material, the special bid envelope should be firmly affixed to the mailing envelope.

3. Prices

The bidder must state the prices (written in ink, in figures) for which he proposes to furnish each item and shall show the total extended amount for each based on the quantities shown. In case, however, of conflict between the unit price and the extended amount, the unit price shall govern. Unit prices should be inclusive of any freight charges.

4. F.O.B.

Bid should be FOB Destination/Agency, title passing upon acceptance of merchandise. Failure to comply with this requirement may disqualify your bid.

5. Standard of Quality

Any product or service bid shall conform to all applicable Federal and State laws and regulations and the specifications contained in the IFB. Unless otherwise specified in the IFB, any manufacturer's name, trade name, brand name, or catalog number used in specifications is for the purpose of describing the quality level and characteristic required. Bidder must specify the brand and model number of the product offered in this bid. Bids not specifying brand and model number shall be considered as offering the exact products specified in the IFB.

6. Descriptive Information

Bidders proposing an equivalent brand or model should submit with the bid information (such as illustrations, descriptive literature, and technical data) sufficient for LDCC Purchasing to evaluate quality, suitability, and compliance with the specifications in the IFB. Failure to submit descriptive information may cause bid to be rejected. Any change made to a manufacturer's published specifications submitted for a product shall be verifiable by the manufacturer. If item(s) bid do not fully comply with specifications (including brand and/or product number), bidder must state in what respect the item(s) deviate. Failure to note exceptions on the bid form will not relieve the successful bidder(s) from supplying the actual products requested.

Manufacturer's Numbers and Trade Names

Where manufacturer's product is named or specified, it is understood that "or equal" shall apply, whether stated or not. Such name and number is meant to establish the standard, type, quality, style, etc. LDCC shall be the sole judge as to whether or not the equipment/supply offered is equal to that specified.

7. Bid Opening

Bidders may attend the bid opening, but no information or opinions concerning the ultimate contract award will be given at the bid opening or during the evaluation process. Bids will be examined within 72 hours after opening. Information pertaining to completed files may be secured by appointment only to the Purchasing Dept. at LDCC. Written bid tabulations will not be furnished. Copies will not be furnished.

8. Award

Award will be made to the highest qualified responsible bidder, taking into consideration the price, quality of the products/service, their capabilities with specifications, their demonstrated resources, and the time for delivery. LDCC reserves the right to award items separately, grouped or on an all-or-none basis and to reject any or all bids and to waive any informalities.

9. Purchase Order

If any bid or bids are accepted, an initial purchase order or orders for the entire number of units or part thereof will be issued not later than thirty (30) days after receipt of bids by the Owner to the selected bidder offering products which, in the opinion of the LDCC, meet the requirements of these specifications.

10. Conditions of Purchase Orders

We will not in any manner be responsible for goods delivered or work done for our account without a written order. No allowance for boxing or crating. If you cannot fill order as directed, return for advice. Quantities in excess of the order may be returned or held subject to shipper's order, expense and risk. By accepting the order you hereby warrant that the merchandise to be furnished hereunder will be in full conformity with the specifications, drawing or sample and agree that this warrant shall survive acceptance of the merchandise and that you will bear the cost of inspecting merchandise rejected.

11. Inspection and Acceptance

Upon delivery of each item to the Agency, inspection of the item will be made by LDCC, or their representative, at the point of delivery, or in special cases, at point of origin. Acceptance of the item will be made after inspection determines that all requirements of the specifications and the proposal have been met.

12. Reject

All rejected goods will be at seller's risk and expense, subject to seller's prompt advice as to disposition.

Unless otherwise arranged all rejected goods will be returned and charged back including all transportation and handling costs. All packages must reflect the LDCC purchase order number or it will be refused and returned at vendor's expense.

13. Payment Terms

Cash discounts for less than 30 days or less than 1% or greater than 5% will be accepted, but will not be considered in determining awards. On indefinite quantity terms contracts, cash discount will be accepted and taken but will not be considered in determining awards. Bids containing "payment in advance" or "COD" requirements may be rejected. Payment is to be made within 30 days after receipt of properly executed invoice or delivery, whichever is later. Invoices shall be submitted to: Louisiana Delta Community College, Accounts Payable, 7500 Millhaven Road, Monroe, LA 71203. We must pay from ORIGINAL, ITEMIZED invoices as required by the State Legislative

14. U.S. Taxpayer Identification Number

Enter your taxpayer identification number in the appropriate space on the Specifications and Bid Form Page. For individuals and sole proprietors, this is your social security number. For other entities, it is your employer identification number. **PAYMENT CANNOT BE PROCESSED WITHOUT YOUR TAX I.D. NUMBER.**

15. Taxes

The State is exempt from sales/use tax. Vendor is responsible for including applicable taxes in the price.

16. New Products

Unless specifically called for in the IFB, all products for purchase must be new, never previously used, and the current model and/or packaging. No remanufactured, demonstrator, used or irregular product will be considered for purchase unless otherwise specified in the IFB. The manufacturer's standard warranty will apply unless otherwise specified in the IFB.

17. Contract Renewals

Upon Agreement of LDCC Purchasing and the contractor, an open-ended requirements contract may be extended for 2 additional 12-month periods at the same prices, terms and conditions. In such cases, the total contract term cannot exceed 36 months.

18. Contract Cancellation

LDCC reserves the right to cancel a contract with a thirty (90) days written notice. Cancellation can occur anytime, but will remain active until annual anniversary date.

19. Default of Contractor

Failure to deliver within the time specified in the bid will constitute a default and may cause cancellation of the contract. Where LDCC Purchasing has determined the contractor to be in default, LDCC Purchasing reserves the right to purchase any or all products or services covered by the contract on the open market and to charge the contractor with cost in excess of the contract price. Until such assessed charges have been paid, no subsequent bid from the defaulting contractor will be considered.

20. Davis Bacon Act

The Davis-Bacon Act, United States Code, Title 40, Chapter 3, Section 276(a) requires all laborers and mechanics employed by contractors and subcontractors who work on construction projects financed by federal assistance to be paid wages not less than those established by the Secretary of Labor for the locality of the project when required by federal grant program legislation.

21. Order of Priority

In the event there is a conflict between the Instructions to Bidders or General Conditions and the Special Conditions, the Special Conditions shall govern.

22. Applicable Law

All contracts shall be construed in accordance with and governed by the laws of the State of Louisiana.

23. EEOC COMPLIANCE

By submitting and signing this bid, bidder certifies that he agrees to adhere to the mandates indicated by Title VI and VII of the Civil Rights Act of 1964, as amended; The Vietnam Era Veteran's Readjustment Assistance Act of 1974; Section 503 of the Rehabilitation Act of 1973; Section 202 of Executive Order 11246, as amended; and The Americans with Disabilities Act of 1990. Bidder agrees to keep informed of any compliance with all federal, state and local laws ordinances and regulations which affect his employees or prospective employees.

24. ANTI-KICKBACK CLAUSE

The Contractor hereby agrees to adhere to the mandate dictated by the Copeland "Anti-Kickback" Act which provides that each Contractor or subgrantee shall be prohibited from inducing, by any means, any person employed in the completion of work, to give up any part of the compensation to which he is otherwise entitled.

25. CLEAN AIR ACT

The Contractor hereby agrees to adhere to the provisions which require compliance with all applicable standards, orders or requirements issued under Section 306 of the Clean Air Act which prohibits the use under non-exempt Federal contracts, grants, or loans of facilities included on the EPA list of Violating Facilities.

26. ENERGY POLICY AND CONSERVATION ACT

The Contractor hereby recognizes the mandatory standards and policies relating to energy efficiency which are contained in the State energy conservation plan issued in compliance with the Energy Policy and Conservation Act (P.L. 94-163).

27. CLEAN WATER ACT

The Contractor hereby agrees to adhere to the provisions which require compliance with all applicable standards, orders, or requirements issued under Section 508 of the Clean Water Act which prohibits the use under non-exempt Federal contracts, grants or loans of facilities included on the EPA List of Violating Facilities.

28. ANTI-LOBBYING AND DEBARMENT ACT

The Contractor will be expected to comply with Federal statutes required in the Anti-Lobbying Act and the Debarment Act.

29. Standard Preference

A. In accordance with Louisiana Revised Statutes 39:1595, a preference not to exceed 10% may be allowed for paper and paper products manufactured or converted in Louisiana of equal quality. For paper supplied in wrapped reams, each carton and each individual ream shall be clearly labeled with the name of the manufacturer or converter and the location within Louisiana where such paper is manufactured or converted. For paper and paper products supplied in bulk or in other forms, the smallest unit of packaging shall be clearly labeled with the name of the manufacturer or converter and the location within Louisiana where such paper or paper product is manufactured or converted.

Do you claim this preference? Yes _____ Specify Item Number(s): _____

Name and location within Louisiana where such paper or product is manufactured or converted _____

B. A preference may be allowed for products manufactured, produced, grown, or assembled in Louisiana of equal quality.

Do you claim this preference? Yes _____ Specify Item Number(s) _____

Specify location within Louisiana where this product is manufactured, produced, grown or assembled _____

If so, do you certify that at least fifty percent (50%) of your Louisiana business workforce is comprised of Louisiana residents? Yes _____ No _____

(Note: If more space is required, include on separate sheet. Failure to specify above information may cause elimination from preferences).

30. Scope of Contract

Furthermore submittal of any terms and conditions contrary to those of the State of Louisiana may cause your bid to be rejected. By signing this form, terms and conditions which may be included in your bid are nullified, and the contractor agrees that this contract shall be construed in accordance with and governed by the laws of the State of Louisiana.

(Members of firm or person authorized to sign bids for corporation)

**BIDDERS MUST SIGN IN INK
IMPORTANT**

Signature Authority: In Accordance with L.R.S. 39:1594 (Act 121), the person signing the bid must be:

1. A current corporate officer, partnership member or other individual specifically authorized to submit a bid as reflected in the appropriate records on file with the Secretary of State; or

2. An individual authorized to bind the vendor as reelected by an accompanying corporate resolution, certificate or affidavit; or

3. An individual listed on the State of Louisiana Bidder's Application as authorized to execute bids. By signing the bid, the bidder certifies compliance with the above.

WE ARE AN EQUAL OPPORTUNITY COLLEGE

COMPENSATION INSURANCE, PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE, AS OUTLINED BELOW ARE REQUIRED IN THIS BID.

CONTRACTOR'S LIABILITY INSURANCE:

Proof of insurance should be supplied with this Quotation and will be required before work can commence. Insurance coverage specified below shall be furnished with the following minimum limits:

Compensation Insurance:

The Contractor and Subcontractors shall take and maintain during the life of the contract Workman's Compensation Insurance for all of their employees employed at the site of the project. In case any class of employees engaged in hazardous work under the Workman's Compensation Status, the Contractor and Subcontractor shall provide Employer's Liability Insurance for the protection of their employees not otherwise protected.

PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE:

Comprehensive Public General Liability Insurance, including but not limited to bodily injury, property damage, contractual liability, products liability, completed operations and owner's protective liability with combined single limits of \$1,000,000 per occurrence with a minimum aggregate of \$5,000,000.

LICENSED AND NON-LICENSED MOTOR VEHICLES:

The Contractor shall take out and maintain during the life of the contract, Automobile Public Liability Insurance in an amount not less than combined single limits of \$1,000,000 per occurrence for bodily injury/property damage. If any non-licensed motor vehicles are engaged in operations within the terms of the contract on the site of the work to perform there under, such insurance shall cover the use of all such motor vehicles engaged in operating within the terms of the contract on the site of the work to be performed there under, unless such coverage is included in the insurance specified.

INDEMNIFICATION AGREEMENT

The _____ agrees to protect, defend,
(Contractor/Subcontractor/Lessee/Supplier) indemnify, save and hold harmless the State of Louisiana, all
State Departments, Agencies, Boards and Commissions, its officers, agents, servants and employees,
including volunteers, from and against any and all claims, demands, expense and liability arising out of
injury or death to any person or the damage, loss or
destruction of any property which may occur or in any way grow out of any act or omission of
_____, its agents, servants, and (Contractor/Subcontractor/Lessee/Supplier)
employees, or any and all costs, expense and/or attorney fees incurred by
_____, as a result of any claim, demands,
(Contractor/Subcontractor/Lessee/Supplier)
and/or causes of action except those claims, demands and/or causes of action
arising out of the negligence of the State of Louisiana, all State Departments,
Agencies, Boards, Commissions, its agents, representatives, and/or employees.
_____ agrees to investigate, handle, respond
(Contractor/Subcontractor/Lessee/Supplier)
to, provide defense for and defend any such claims, demand, or suit at its sole
expense and agrees to bear all other costs and expenses related thereto, even if it
(claims, etc.) is groundless, false or fraudulent.

Accepted by _____

_____ Company Name

Signature

Title

Date Accepted _____

Is Certificate of Insurance Attached? _____ Yes _____ No

PURPOSE OF CONTRACT: _____

SPECIAL CONDITIONS:

1. VENDOR SHOULD INSPECT JOB SITE TO VERIFY MEASUREMENTS AND/OR AMOUNT OF SUPPLIES NEEDED PRIOR TO BIDDING. IF VENDOR FINDS CONDITIONS THAT DISAGREE WITH THE SPECIFICATIONS THAT APPEAR TO BE IN ERROR, SAME SHALL BE BROUGHT TO THE ATTENTION OF THE PURCHASING DEPARTMENT PERSONNEL PRIOR TO THE BID OPENING. FAILURE TO DO SO WILL BE INTERPRETED THAT BID IS AS SPECIFIED.
2. THIS IS A BLANKET ORDER AGREEMENT FOR MAINTENANCE, SERVICE, AND REPAIRS TO HEATING, VENTILATION, AIR CONDITIONING, AND BUILDING AUTOMATION SYSTEMS AT LDCC CAMPUSES FOR THE PERIOD SEPTEMBER 1, 2012 THROUGH JUNE 30, 2015.
3. AT THE OPTION OF THE STATE OF LOUISIANA AND ACCEPTANCE BY THE CONTRACTOR, THIS CONTRACT MAY BE EXTENDED FOR TWO (2) ADDITIONAL TWELVE (12) MONTH PERIODS AT THE SAME PRICE, TERMS AND CONDITIONS. TOTAL CONTRACT TIME MAY NOT EXCEED SIXTY (60) MONTHS.
4. ANY INTERPRETATION OF THE DOCUMENTS WILL BE MADE BY ADDENDUM ONLY, ISSUED BY THE LDCC PURCHASING DEPARTMENT. YOU MAY FAX QUESTIONS TO THE PURCHASING DEPARTMENT AT 318/345-9507. ANY ADDITIONS, DELETIONS, OR VARIATIONS FROM THE SPECIFICATIONS SHOULD BE NOTED IN WRITING.
5. ALL SHIPPING AND HANDLING CHARGES MUST BE INCLUDED IN UNIT BID QUOTE PRICE AND FOR THE PURPOSES OF WARRANTY AND INTEGRATION WITH EXISTING SYSTEMS, ALL LINE ITEMS BID MUST HAVE A BRAND SPECIFIED.
6. UNLESS OTHERWISE SPECIFIED, BIDS ON THIS CONTRACT WILL BE ASSUMED TO BE FIRM FOR ACCEPTANCE FOR A MINIMUM OF 60 DAYS. IF ACCEPTED, PRICES MUST BE FIRM FOR THE SPECIFIED CONTRACT PERIOD.
7. SUCCESSFUL VENDOR TO FURNISH EQUIPMENT AND ALL TOOLS, LABOR AND SUPPLIES NECESSARY FOR ANNUAL HVAC AND BUILDING AUTOMATION UPGRADES AND SERVICES.
8. ANY CLAIMS OR CONTROVERSIES ASSOCIATED WITH THE CONTRACT ISSUED AS A RESULT OF THIS SOLICITATION WILL BE RESOLVED IN ACCORDANCE WITH THE LOUISIANA PROCUREMENT CODE, R.S. 39:1673.
9. COMPENSATION INSURANCE, PUBLIC LIABILITY, AND PROPERTY DAMAGE INSURANCE, AS OUTLINED BELOW, ARE REQUIRED IN THIS BID.
10. FAILURE TO COMPLY WITH THIS REQUEST MAY ELIMINATE YOUR BID FROM CONSIDERATION.

SPECIFICATION AND BID FORM

ONSITE PREVENTIVE MAINTENANCE SERVICES FOR HVAC EQUIPMENT AND ASSOCIATED DEVICES RELATED TO INDOOR COMFORT, ENVIRONMENTAL QUALITY, COMMISSIONING AND BUILDING ENERGY MANAGEMENT AND CONTROL SYSTEMS

LOUISIANA DELTA COMMUNITY COLLEGE (LDCC) MONROE, LOUISIANA

Louisiana Delta Community College LDCC is seeking qualified vendors to provide onsite HVAC facility services including HVAC controls, preventive maintenance, commissioning, indoor air quality, energy management, measurement & verification and performance reporting services for the HVAC Equipment and Systems for the LDCC Campuses listed below in this document.

This program will provide (2) onsite facility managers to provide full-time support and ensure delivery of efficiency gains from effective maintenance, energy management and continuous commissioning efforts at the campuses. This energy focused HVAC facility service agreement will include manufacturer's warranty, repair, preventive maintenance and energy measurement & verification services to meet efficiency criteria specified for the HVAC Equipment and Systems.

Contractor shall furnish all personnel, transportation test equipment (to include laptop computers and needed software), tools, services, labor and materials required to perform the preventive maintenance and system management services.

If a contract ensues, the contract will be issued from the date of award through June 30, 2015. At the option of LDCC and acceptance by the contractor, the contract may be renewed and extended for two (2) additional twelve (12) month periods, at the same terms, conditions and prices referred to in the specifications.

This contract will be awarded to the vendor who provides the most qualified, highest value and lowest responsive bid for the total amount. Quotations will be received for HVAC Maintenance and Management Services as specified.

The contract shall include annual, operating and preventive inspections as well as ongoing efficient operations of HVAC systems to be performed as specified here-in-after, and shall be scheduled at the college's discretion.

Contractor shall comply with all rules set forth in the Clean Air Act with regards to CFC refrigerants. A refrigerant management system shall be used to remove all liquid and vapor from any machine of which the refrigerant system will be opened to the atmosphere.

Vendor must inspect job site to verify measurements and/or amount of supplies needed prior to bidding. If vendor finds conditions that disagree with the physical lay-out as described in this bid, or other features of the specifications that appear to be in error, vendor should notify agency representative at time of job site visit. Failure to do so will be interpreted that bid is as specified.

During the site inspection, the Contractor will be required to demonstrate their competency in HVAC and TRANE Equipment and Building Automation Systems. The Contractor must also demonstrate their competency with the energy Conservation Systems and Measures (ECM's) in place and the maintenance and repair of these ECM's. They must demonstrate the ability to back up and perform a restore of each system. The potential service provider must provide their own computer and software for this demonstration.

*****A Job Site Inspection is Mandatory*****

Perspective Bidders shall attend mandatory job site inspections. These inspections and locations are tentatively scheduled for:

Monday, August 20, 2012: Monroe Main Campus, Winnsboro, Tallulah, Lake Providence
Tuesday, August 21, 2012: West Monroe, Ruston, Farmerville, Bastrop

Louisiana Delta Community College Locations

- **Monroe: 7500 Millhaven Road 71203-**
Mike Colvin 318/372-0415
- **West Monroe: 609 Vocational Pkwy 71292-9064**
Greg Groves 397-6100
- **Tallulah: 132 Old Highway 65 S 71282-**
Scott Cox – 1-800/215-3905
- **Lake Providence: 156 Louisiana 883-1 71254**
Scott Cox – 1-800/844-8711
- **Bastrop: 729 Kammell Street 71220**
Loe Dunn – 318/283-0836
- **Bastrop/Airport Extension: 6376 Airport Rd 71220**
Loe Dunn – 318/283-0836
- **Farmerville: 605 West Boundary Street 71241**
Shane Dykes - 318/368-9180
- **Ruston: 1010 James Street 71270**
Shane Dykes – 318/251-4159
- **Winnsboro: 1710 Warren Street 71295**
Debbie Price -1-888/320-6133

Inspection Location: _____

Time and Date: _____

This signed statement certifies that the vendor named below has visited the job site and is familiar with all conditions surrounding fulfillment of the specifications of this project. Failure to submit this certification shall cause the bid to be disqualified.

Vendor Company Name

LDCC Representative

Vendor Signature

LDCC Representative

Vendor Federal I.D.#

CONTRACTOR QUALIFICATIONS:

Contractor shall demonstrate a minimum of twenty (20) years in business as a commercial mechanical, temperature control, building automation, and components service. (Attach copies of state and local licenses and certificates). This experience should include, and be proven to have occurred at multiple customer sites, where service has been provided on Large tonnage HVAC systems and components to include Building Automation System installation , service , maintenance. The Contractor shall provide proof of having had successfully maintained/serviced TRANE HVAC equipment as well as TRANE HVAC control systems of the same models implemented in LDCC's Main Campus location within the last five (5) years. (Please provide a minimum of 10 customer references including contact information and brief description of services provided). Such proof will be verified through reference contacts provided by contractor.

TECHNICIANS REQUIREMENTS:

The Contractor shall employ a minimum of ten (10) full time, competent servicemen who are residents within fifty (50) miles of the LDCC Main Campus and who have been within their employ for a minimum of five (5) years. The servicemen assigned to maintain mechanical systems must be qualified to service the equipment type under contract as well as all associated electronic controls. The Contractor shall submit with their bid a list of these (10) technicians and their qualifications document (resume) that demonstrates their ability to provide commercial service to LDCC.

A site inspection by the Contractor will be required to demonstrate this competency by logging on to the Building Automation Systems and perform various basic functions including: adjust both temperature set point in a given space and at a given air handling unit, provide time of day schedule changes, initiate and edit night set back schedules, tune DDC loops, verify actuation of remote devices from the front end.

The Contractor must demonstrate this competency with the energy management systems and energy measures in place as well as the commissioning and maintenance of these measures. They must demonstrate the ability to back up and perform a restore data on each system, a variable air volume (vav) box controller and an air handler controller.

In addition to the qualification of the on-site technicians, the contractor must also provide a document of resume for the technical supervisor, their manager, the project engineer (PE) and the energy manager providing measurement and verification energy services.

ENGINEERING SUPPORT:

The Contractor is required to maintain an engineering department staffed with full time professionals in the fields of energy conservation, systems integration, refrigeration, boilers, water controls, pneumatic, electric and electronic controls and at least one (1) professional engineer (PE).

WORK SCHEDULING:

The Contractor shall provide site supervisory services to include scheduling preventive maintenance tasks by computer to assure a uniform and detailed method of scheduling work. This schedule must be approved by LDCC Facility Director. The Contractor's computer generated Maintenance Management System (CMMS) must capture PM tasks to perform, along with tools needed to perform each task. The CMMS must output work orders to the service technicians instructing of such. The system must store within a database the specific work performed and material used for management advisory regarding on-going issues and repairs. Additionally, the system must collect and hold all hours spent within facility around EMS, PM, Emergency, and Repair; as well as, any material used within facility. The Contractor must state the system/software they will be utilizing for these functions. Access to worldwide data with that system is desirable.

INVENTORY AND TEST EQUIPMENT:

The Contractor shall maintain within 100 miles of LDCC Central Office adequate inventory of replacement parts and components, and shall demonstrate they own the proper tools and test equipment to maintain all the systems under contract. The central warehouse's inventory shall include replacement parts for components in the system under contract to ensure fast availability in emergency situations. This includes temperature sensors, controllers, dampers, valves, actuators, and relays. The Contractor will maintain a partial parts stock on location for most frequently failing parts of the Systems. LDCC may (upon request) require inspection of parts warehouse of Contractor before award of contract.

TECHNICAL SUPPORT: The Contractor shall demonstrate their ability to interface with the TRANE CH530 chiller control panel utilizing Trane KrestelView diagnostic software. The Contractor will demonstrate their ability to configure set point, current limit, and will provide to the physical plant manager a KrestelView Report of the unit status, set point, and operating log during the site visit as a prequalification to bid this job.

LICENSING/CERTIFICATIONS:

The Contractor shall be fully licensed at the time of bid to do business at the job site and to provide complete service. The Contractor shall show proof of certified technicians that will be providing service.

ONSITE PERSONNEL:

The Contractor will provide two (2) qualified onsite technicians to operate all building HVAC and environmental systems. They will be responsible for HVAC Efficiency including technical and mechanical building systems integration, utilizing knowledge of energy management, refrigeration theory, and control systems, knowledge of pipe fitting and structural layouts. Personnel will report to LDCC Facility Director.

MAINTENANCE PROCEDURES AND RECORDS:

All preventive maintenance tasks shall be computer generated based on a programmed schedule, manufacturer's maintenance specifications, and a database of Contractor's maintenance experience to assure uniform, detailed and all inclusive method of defining preventive maintenance tasks. The Contractor will be required to provide electronic and/or hard copy data demonstrating energy management and computer preventive maintenance reports to demonstrate compliance to this requirement. The Contractor will further be required to provide online access to these electronic records.

The Contractor shall control scheduling the interval of preventive maintenance and task functions to be performed by a combination of calendar periods, operating hours (runtime), manufacturer's recommendations, and their own internal database of maintenance requirements as pertinent to each piece of equipment. This schedule must be approved by LDCC Facility Director.

As work is scheduled, the Contractor shall issue, to the mechanic on the job, a computer-prepared service report detailing exactly what tasks to perform, time required for completion, skill levels required and special tools and instrumentation needed to maintain the systems at optimum comfort and efficiency levels.

A comprehensive and detailed inspection report shall be provided to LDCC Facility Director upon completion of each inspection, on each and every piece of equipment for their review and signature.

After each inspection report is approved by LDCC Facility Director the Contractor shall enter the completed service report into the Contractor's data bank to assure closed-loop performance control and continuous program updating.

On a semi-annual basis, the Contractor shall advise and assist in the determination of improvements to the mechanical and control system that shall conserve energy and minimize utility expenditures. No improvement will be performed without prior written authorization from the LDCC Facility Director.

LDCC will provide reasonable means of access to all equipment covered by this agreement. Contractor will start and stop all primary equipment incidentals to the operation of the mechanical system(s) as arranged with LDCC Facility Director. All planned preventive maintenance under this agreement will be performed during LDCC's normal working hours defined as 7:00 a.m. to 4:00 p.m.

EMERGENCY SERVICE:

Every activity performed under this agreement should be designed to minimize the incidence of emergency situations. However, backup emergency service must be provided 24 hours a day, 365 days a year to minimize downtime and inconvenience. The Contractor shall provide emergency service on an as required basis. The Contractor shall be capable of responding to an emergency situation within one (1) hour after notification of system problems. The Contractor will have an on call procedure that will provide for a minimum of one (1) qualified service technicians available for dispatch within fifty (50) miles of LDCC. The Contractor is to include in his price all labor for these call outs, preventive and remedial maintenance. All parts supplied to repair the air conditioning units shall be manufacturer authorized parts.

****Exclusions:** It is understood that the following is not included in the specifications

- A) Service, repairs or replacement necessitated by misuse or improper operation of equipment.
- B) Inspections, alterations or replacements required by insurance companies, municipal or governmental authorities.

C) Replacement or servicing of equipment components (such as wiring conduit, pumps, motors, etc.) not specifically included in this specification.

For each emergency call out, contractor shall provide to LDCC Facility Director a written report of all work performed, readings taken, etc. by the technician.

REMOTE MONITORING CAPABILITIES:

The Contractor shall include remote monitoring of critical components and temperatures within the facility. This monitoring is intended to minimize response time and prevent catastrophic failure by alerting Contractor's service staff of alarm conditions within the facility and dispatching technician's to LDCC facility upon receipt of alarm. Contractor's integration capabilities and communication between systems and equipment will be critical for maximum system functional effectiveness.

ADVANCED SERVICE CAPABILITIES:

The Contractor must display ability to perform advanced maintenance techniques such as vibration analysis and laser alignment. Additionally the Contractor must prove (upon request) their ability to perform audit and analysis functions around energy use to insure that such services can be completed as part of this agreement. The Contractor shall demonstrate their ability to leverage and utilize Energy Management applications (example ABRAXAS Metrix diagnostic software). The Contractor must demonstrate ability to perform credentials described in the energy service company requirements and certified by the National Association of Energy Management Service Companies (NAESCO). The Contractor must provide energy management conservation measures as well as provide quarterly measurement and verification reporting that validates the effectiveness of energy conservation measures performed.

ENVIRONMENTAL CONTROL SYSTEMS MAINTENANCE:

EQUIPMENT INCLUDES:

The Contractor must display ability to implement effective BAS optimization strategies through integration and communication of systems to effectively manage temperature control specific equipment included within this specification include; thermostats, humidistats, pressure controls, relays, limits, valves, valve operators, damper motors, step switches, time clocks, contractors, controllers, capacity controls, safety controls, recorders, control panels, and gauges.

SERVICES INCLUDED:

The general maintenance services listed below shall apply to the environmental controls and equipment as described.

1. Examine each piece of equipment and device to see that it is functioning properly and is in good operational condition.
2. Clean all components of dust, old lubricants, etc. to allow the equipment to function as designed.
3. Lubricate all equipment where needed to permit bearings, gears, and all contact wearing points to operate freely and without undue wear.
4. Adjust all linkages, motors, drives, etc. that have drifted from the initial design settings and positions.
5. Calibrate all sensing, monitoring, output, safety, and readout devices for proper ranges, settings, and optimum efficiencies.
6. Test and cycle all equipment as a system after it has been cleaned, lubricated, adjusted and calibrated, to see that it is in good operational condition and at optimum efficiency.
7. Monitor critical alarms/temperature conditions and dispatch a serviceperson to correct any problem conditions.
8. Where the Contractor recommends repairs beyond routine maintenance, (except where provided for by manufacturer's warranty) a cost-estimate for the parts and labor will be provided by the Contractor to LDCC Facility Director. No repair without prior written authorization from LDCC Facility Director is authorized under this contract.
10. A comprehensive and detailed inspection report shall be provided to the LDCC Facility Director upon completion of each inspection, on each and every piece of equipment including preparation and submittal of a complete detailed equipment list.
11. This mechanical maintenance service is to be performed four (4) times a year.

WATER TREATMENT SERVICE:

Water treatment will be included and provided for by the Contractor.

INDOOR AIR QUALITY SERVICE:

The Contractor will be responsible for all maintenance of air distribution systems including labor and materials related to air filter changes as required to maintain system efficiency and cleanliness. In addition to the UL Class 2 MERV 8 Minimum Efficiency Rating Value on filter materials, the Contractor will also provide all coil maintenance, cleaning, washing and associated services associated with indoor environmental air quality.

BUILDING OPERATIONS:

The Contractor will provide two (2) qualified onsite building professionals to provide operations and maintenance of the HVAC systems and equipment. The Contractor will provide service and tools required to perform the required duties of the system operators. Essential Functions and Duties (including but not limited to)

- Responsible for servicing products and equipment on assigned projects and ensuring customer satisfaction.
- Assists in servicing products and equipment on assigned facility projects (ex. Electrical, lighting, plumbing, heating, air distribution, controls, thermostats etc...).
- Uses intelligent personal access devices (PAD), smartphones and laptop computers.
- Identifies, analyzes, and repairs equipment, instruments and products at LDCC facility.
- Performs preventive maintenance and modifications as needed or requested by LDCC Facility Director.
- Ability to work well and get along with LDCC team members.
- Ability to function as a team leader.
- Turn in all required paperwork and reports in a timely manner.
- Keeps trained and current on all Trane products concerning installation, operation, maintenance, service and repair.
- Provide technical support to LDCC.

EDUCATION

Associates Degree or equivalent from two-year College or technical school with a certificate in Heating, Ventilation, and Air Conditioning or equivalent experience.

- EPA approved Universal Technician Certification (Proof of certification required)
- Skills and Experience: Six (6) months to one (1) year related experience or training.
- Post Employment Training Required.
- Annual OSHA safety requirements.
- The Contractor will provide each technician a minimum of 40 hours formal continuing education in HVAC equipment application and repair service and 20 hours of onsite, remote webinar or other related HVAC/Energy related training.

TECHNICAL & MECHANICAL TRAINING AND CONTINUING EDUCATION

The Contractor will provide effective technical and mechanical HVAC Operation, Service and Maintenance Training to LDCC staff to improve the functional and efficient operation of systems with LDCC facilities. This training shall consist of a minimum of 80 hours of formalized manufacturer curriculum as well as ongoing onsite training on service and maintenance measures to improve operation of LDCC facilities. Contractor must display the capability to provide ongoing systems re-commissioning annually or as advances in technology and equipment changes dictate.

MECHANICAL SYSTEM MAINTENANCE SERVICE:

EQUIPMENT INCLUDED (20 tons and above):

All chillers, Air handlers, Pumps, Boilers, Motor speed controllers, Exhaust fans, Refrigerant monitors, and associated Controls for listed equipment. The preventive maintenance and the responsibility of the Contractor shall not be limited only to these major pieces of equipment as shown above, but shall also include all appurtenant devices and systems that are related to the heating, ventilating, and air conditioning systems such as:

a) HEATING SYTEM

Cleaning of heating coils, unit heaters, duct heaters, heat exchangers, humidifiers, etc.

b) COOLING SYSTEM

Air-conditioning compressor(s), evaporative condensers, air cooled condensers, pumps, water chillers, cleaning of cooling coils, etc.

c) AIR HANDLING SYSTEM

Fans, motors, air grills (cleaning), registers (cleaning), air filters, dampers, induction units, mixing boxes, fan coil units, electric heat elements, etc.

d) MISCELLANEOUS EQUIPMENT

Exhaust fans, manual valves, float valves, direct expansion valves, thermometers, gauges, magnetic starters, manual motor starters, pump and fan motor drives, belts, electrical wiring from motor starter to their respective motor and check valves.

EQUIPMENT NOT INCLUDED:

Maintenance services, including major repair labor and parts replacement, for portions of the systems and equipment that are non-maintainable or non-moving are not included as part of this specification. Excluded items shall be considered as: foundations, structural supports, domestic water lines, drains, plumbing, oil lines, gas lines, electrical lines and wiring, piping, oil storage tanks, air handling duct work, boiler shell and tubes, unit cabinets, boiler trim and reflector material, cooling tower structures, etc.

The Contractor shall provide a detailed report of any work that is outside the scope of this specification that is in need of attention to the LDCC Facility Director for review. No work shall be performed outside the scope of this contract without prior written authorization from the LDCC Facility Director. This specification covers only that equipment as listed herein, and in the event the system is altered, changed, or if any equipment is added, then that portion shall be added or deleted as required, and shall be in accordance with this specification.

SERVICES INCLUDED:

The services listed below shall apply to the systems and equipment as described in the section entitled EQUIPMENT INCLUDED. (This preventive maintenance work shall be provided no less than four times per year, including start-up and shut-down). The listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures inadvertently omitted from these specifications shall be included in the project scope.

- a) Examine each piece of equipment and device to see that it is functioning properly and is in good operational condition.
- b) Clean all components of dust, old lubricants, etc. to allow the equipment of function as designed.
- c) Lubricate all equipment where needed to permit bearings, gears and all contact wearing points to operate freely and without undue wear.
- d) Adjust all linkages, motors, drives, etc. that have drifted from the initial design settings and positions.
- e) Calibrate all sensing, monitoring, output, safety and readout devices for proper ranges, settings, and optimum efficiencies.
- f) Minor repair/replace the device by the addition of replacement parts, should the above maintenance not be adequate. Where the Contractor recommends repairs/replacement beyond the above maintenance, a cost-estimate for the parts and labor will be provided to the LDCC Facility Director. No work may be performed without written authorization from the LDCC Facility Director.
- g) The Contractor will be capable of providing tear down and overhaul service as required for major pieces of equipment such as refrigeration compressors, water chillers, etc. Equipment is to be overhauled periodically per manufacturer specifications based on accumulated operating hours, to prevent breakdowns and to improve operational efficiency. Contractor must have the capability to provide manufacturer incentives for major overhauls.

h) Test and cycle all equipment as a system after it has been cleaned, lubricated, adjusted and calibrated to assure that it operates to original design specifications.

i) Perform annual vibration analysis of the equipment to be maintained. This analysis shall be made on all equipment above ten (10) HP. The analysis shall provide as a written report showing the vibration measured.

j) An infrared temperature scanner shall be used for a site inspection semi-annually to evaluate the condition of all portions of mechanical system to include, but not limited to, all motors, pumps, chillers, boilers, motor starters, and electrical panels for proper predictive/preventive maintenance.

k) The Contractor shall perform spectrochemical analysis of refrigeration compressor oil to determine the concentration levels of each of the following chemicals:

Iron Silver Zinc

Lead Tin Calcium

Copper Silicon Barium

Chromium Barium Magnesium

Aluminum Sodium Titanium

Nickel Phosphorus Molybdenum

Cadmium Antimony

This analysis will consist on a minimum of the following four (4) tests:

1) Total Acid (ASTMD 664)

2) Viscosity (ASTMD 445)

3) Water Content (ASTMD 1744)

4) Total Solids (ASTMD 91)

Oil analysis shall be performed by an authorized Trane Company laboratory. The Contractor shall provide owner with a detailed written and electronically transmitted report.

k) The Contractor shall perform laser alignment of pumps and equipment as a predictive measure for preventive maintenance.

PARTS REPLACEMENT

- A. There will be a pre-existing condition inspection period of (120-days) for which contractor will be required to identify parts and major repairs needed to bring the system back to original or improved operating condition. All parts, components, or devices for the environmental system as listed above that are worn or are not in proper operational condition, will be repaired, and/or replaced with new parts, components, or devices at the expense of LDCC.
- B. All repair/replacement parts, components, or devices for the mechanical systems as listed above that are worn or are not in proper operational condition shall be repaired, and/or replaced at an additional cost to LDCC. Contractor will provide new parts, components, or devices for the HVAC and Control Systems as listed above as well as those covered by the manufacturers' warranty
- C. Contractor will provide needed replacement parts during the contract period with standard cost plus pricing model to include overhead profit on the lowest contractor cost. This cost based parts pricing model will remain in effect for the length of the Building Services Contract and does not extend beyond the point at which the contract is not renewed or to equipment

served outside of this contract. Contractor will remain open for review for parts pricing and markup under this agreement.

SPECIAL CONDITIONS

1. Vendor will not make any modification to the existing system that will violate the U.L. Listing as a system; thus, all repaired or replaced components will carry the UL Listing.
2. All work shall be scheduled and managed by the Facility Director. To assure accountability no subcontracts will be allowed without written approval of the on-site supervisor.
3. It should further be understood that, should any major components of the system fail, they must be replaced at the owner's expense by a qualified Building Service Installation/Repair technician.

All other parts, except where provided by the manufacturer's warranty will be provided by LDCC. Where the Contractor recommends repairs, in which neither the Contractor nor the Manufacturer is providing the parts/labor, a cost estimate for the parts and labor will be provided to the LDCC Facility Director. No work shall commence without prior written authorization from the LDCC Facility Director.

All miscellaneous supplies necessary to maintain the mechanical systems and equipment shall be supplied by the Contractor and shall be included in the cost of the contract (lubricants, tools, tape, wire nuts, test instruments, meters, etc.).

Exclusions It is understood that the following is not included in the specifications

- a) Service, repairs or replacement necessitated by misuse or improper operation of equipment.
- b) Inspections, alterations or replacements required by insurance companies, municipal or governmental authorities.
- c) Replacement or servicing of equipment or components (such as wiring conduit, pumps, motors etc.) not specifically included in this specification.

MAINTENANCE SCHEDULE SERVICE-ON GOING TEMPERATURE CONTROL:

Equipment Included: BAS

BAS Preventive Maintenance:

- a) Each preventive maintenance call will be scheduled by a computer-prepared service report detailing exactly what it takes to perform, time of performance, skill levels required and special tools and instrumentation needed to maintain the system at optimum comfort and efficiency levels. This schedule must be approved by LDCC Facility Director.
- b) Maintenance intervals will be determined by equipment run time, application, location, and successful bidder's computer data bank of maintenance experience and manufacturer's specifications.
- c) A comprehensive and detailed inspection report shall be provided to the LDCC Facility Director upon completion of each inspection, on each and every piece of equipment.
- d) After each inspection is signed off on by LDCC Director, details from completed inspection will be reentered in the data bank to assure closed-loop performance control and continuous program updating.

BAS Predictive Maintenance:

System analysis will be performed on the equipment covered under this contract to detect early signs of deteriorating performance and to predict potential equipment failures. After identifying potential problem areas, corrective action, will be taken. No action will be taken without prior written consent of LDCC Facility Director.

Component Replacement:

All controls must be replaced with current OEM replacement parts only. Where the Contractor recommends repairs, a cost-estimate for the parts and labor will be provided by the Contractor to LDCC Facility Director. No component may be replaced (except under manufacturer's warranty) without prior written authorization from LDCC Facility Director.

BUILDING AUTOMATION SYSTEMS AND CONTROLS

Equipment Included: BAS

The Contractor shall be required to maintain the entire Building Automation Systems including the Central Processing Unit, Video Display Terminals, Printers, Field Panels, and all end devices (i.e., sensors, relays, smoke detectors, etc.). The Contractor must have the capability and access to effectively operate, maintain, program and upgrade all applicable proprietary software.

SOFTWARE SUPPORT & MAINTENANCE:

As an integral component of the system, the Contractor must be capable of providing software maintenance on the Building Automation Systems.

1) First Response Service: Contractor will provide a toll free number for service & support of software applications and systems programming. Contractor is required to provide diagnostics and coordinate with onsite personnel and trades to resolve HVAC system problems.

2) Remote Software Support: The Contractor must provide the equipment and support needed to remotely tie into the Automation System. This is intended to provide remote support of the system for Preventive Maintenance purposes as well as improve trouble-shooting capabilities in emergency situations. Contractor will be responsible for providing the necessary equipment and software to provide this service. Contractor must perform remote analysis as required to support and prevent failures.

3) Software Upgrades: As factory provides new software revisions, the Contractor, as part of this contract, must provide and be able to install these revisions. The revisions should be provided to enhance current system performance and prevent system obsolescence. Contractor must install these revisions within Sixty (60) days of their release by factory.

4) Online and Local Support: Factory control and equipment specialists shall be available to assist via internet and telephony applications. Schedule changes, modifications, troubleshooting, or other various systems needs will be a required provision herein.

5) System Software Backup: Periodic system software backup will be required to enable rapid response to programming issues or losses.

TRAINING SUPPORT

To insure that the use of the Automation System is maximized, the Contractor must provide regularly scheduled formal training sessions covering system operation and system programming. The Contractor will provide as part of their contract, a curriculum of classes conducted in the last five (5) years. Contractor must have the resources to provide this training for personnel both onsite and off premises. Teaching instructors must be factory trained and certified in each respective area. The courses must provide continuing education and professional development hours (PDH) for those attending.

The Contractor must provide a documented curriculum, training site resources and any US DOE or LA DNR training credentials demonstrating training competency in mechanical, technical and energy systems management.

MAINTENANCE SCHEDULE FOR PKG AIR-COOLED SCREW CHILLER OPERATING INSPECTION CHECKLISTS FOR TRANE ROT-330:

Operating Inspections (Three Required) The listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures for these specifications shall be included in the project scope. Items to be inspected:

1. Check the general operation of the unit.
2. Log the operating temperatures, pressures, voltages and amperages.
3. Check the operation of the control circuit.
4. Check the operation of the control circuit.
5. Check the operation of the lubrication system.
6. Check the operation of the motor and starter.
7. Analyze the recorded data. Compare the data to the original design conditions.
8. Review operating procedures with operating personnel.
9. Provide a written report of completed work, operation log and indicate any uncorrected deficiencies detected.

Annual Maintenance The listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures for these specifications shall be included in the project scope. Items to be completed include:

- a) Adjust operating and safety controls. Record settings.
- b) Complete operating log of temperatures, pressures, voltages and amperages.
- c) Check operation of control circuit.
- d) Check operation of lubrication system.
- e) Check operation of motor and starter.
- f) A comprehensive and detailed final inspection report shall be provided to [LDCC](#) Maintenance Director, upon completion of each inspection, on each and every piece of equipment.

MAINTENANCE SCHEDULE FOR WATER COOLED COMMERCIAL SELF CONTAINED AIR HANDLERS:

Annual Maintenance The listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures inadvertently omitted from these specifications shall be included in the project scope.

1. Report in with the Customer Representative.
2. Record and report abnormal conditions, measurements taken, etc.
3. Review customer logs with the customer for operational problems and trends.
 - a. **General Assembly**
 - i. Inspect for leaks and report leak check result.
 - ii. Repair minor leaks as required (e.g. valve packing, flare nuts).
 - iii. Calculate the refrigerant loss rate and report the results to the customer.
 - iv. Check the condenser fans for clearances and free operation.
 - v. Check tightness of condenser fan motor mounting brackets.
 - vi. Check the set screws on the fan shafts.
 - vii. Visually inspect the condenser coil for cleanliness.
 - viii. Verify the performance of the fan control inverter VFD, if applicable.
 - ix. Grease bearings as required.
 - b. **Controls and Safeties**
 - i. Inspect the control panel for cleanliness
 - ii. Inspect wiring and connections for tightness and signs of overheating and discoloration.
 - iii. Verify the working condition of all indicator/alarm lights and LED/LCD displays.
 - iv. Test oil pressure safety device (as required). Calibrate and record setting.
 - v. Test the operation of the chilled water pump starter auxiliary contacts.
 - c. **Lubrication System**
 - i. Pull oil sample for spectroscopic analysis.
 - ii. Test oil for acid content and discoloration. Make recommendations to the customer based on the results of the test.
 - iii. Verify the operation of the oil heaters.
 - d. **Motor and Starter**
 - i. Clean the starter cabinet and starter components.
 - ii. Inspect wiring and connections for tightness and signs of overheating and discoloration.
 - iii. Check the condition of the contacts for wear and pitting.
 - iv. Check contactors for free and smooth operation.
 - v. Check all mechanical linkages for wear, security and clearances.
 - vi. Verify tightness of the motor terminal connections.
 - vii. Meg the motor and record readings.
 - viii. Verify the operation of the electrical interlocks.
 - ix. Measure voltage and record. Voltage should be nominal voltage $\pm 10\%$.

MAINTENANCE SCHEDULE FOR CENTRAL STATION AIR HANDLING UNITS:

Annual Inspection The listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures inadvertently omitted from these specifications shall be included in the project scope.

- a) Inspect coil.
- b) Inspect drain pan and drain line. Blow out condensate drain.
- c) Inspect fan wheels.
- d) Inspect drive sheaves.
- e) Inspect belt alignment and tension. Adjust as needed.
- f) Lubricate as required.
- g) Check bearing and motor mounting.
- h) Check motor operating voltage and amperages.
- i) Check dampers and adjust if necessary.
- j) Provide a comprehensive and detailed final inspection to LDCC Facility Supervisor, upon completion of each inspection, on each and every piece of equipment.

Operating Inspection (Three Required) The listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures inadvertently omitted from these specifications shall be included in the project scope.

- a) Check belt tension. Adjust as needed.
- b) Lubricate as required.
- c) Check bearing and motor mounting.
- d) Check any excessive vibration or noise and correct if required.
- e) A comprehensive and detailed final inspection report shall be provided to LDCC Facility Supervisor upon completion of each inspection, on each and every piece of equipment.

MAINTENANCE SCHEDULE FANS:

Annual Maintenance The listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures inadvertently omitted from these specifications shall be included in the project scope.

- a) Inspect fan housing
- b) Inspect blades.
- c) Inspect bearings and lubricate.
- d) Inspect blade pitch control mechanism.
- e) Check motor operating voltage and amperage.
- f) Lubricate as required.
- g) Check any excessive vibration or noise and correct if required.
- h) Clean as necessary.
- i) Provide a comprehensive and detailed final inspection report to LDCC Facility Supervisor, upon completion of each inspection, on each and every piece of equipment.

Operating Inspection (Three Required) The listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures inadvertently omitted from these specifications shall be included in the project scope.

- a) Check general operation.
- b) Lubricate as required.
- c) Check bearing and motor mounting.
- d) Check any excessive vibration or noise and correct as required.
- e) Adjust as required.
- f) A comprehensive and detailed final inspection report shall be provided to LDCC Facility Supervisor upon completion of each inspection, on each and every piece of equipment.

MAINTENACE SCHEDULE COOLING TOWER:

Annual Maintenance The listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures inadvertently omitted from these specifications shall be included in project scope.

- a) Clean debris from platform and surrounding area.
- b) Clean water sump and check condition.
- c) Clean float valve assembly and adjust for proper operation.
- d) Check and clean bleed off line and overflow.
- e) Clean tower strainers.
- f) Clean tower spray nozzles and eliminators.
- g) Flush cooling tower after cleaning.
- h) Check sump heaters and thermostats for calibration and operation.
- i) Check and adjust fan belts.
- j) Fill system after cooling tower has been cleaned.
- k) Check for leaks.
- l) Lubricate fan and motor bearings per manufacturer's recommendation.
- m) Check amperage on motors.
- n) Inspect electrical connections, contactors, relays and operating/safety controls.
- o) Check and adjust condenser water temperature regulator system.
- p) Check oil level in gear reducer. Add oil as needed.
- q) A comprehensive and detailed final inspection report shall be provided to LDCC Facility Supervisor, upon completion of each inspection, on each and every piece of equipment.

Operating Inspections (Three Required) The listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures inadvertently omitted from these specifications shall be included in the project scope.

- a) Inspect fan, motor and belts.
- b) Check oil level in gear reducer. Add oil as required.
- c) Check intake strainer, bleed and overflow.
- d) Check operating conditions. Adjust as required.
- e) A comprehensive and detailed final inspection report shall be provided to LDCC Facility Supervisor, upon completion of each inspection, on each and every piece of equipment.

MAINTENANCE SCHEDULE FOR PUMPS:

Annual Inspection The listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures inadvertently omitted from these specifications shall be included in the project scope.

- a) Clean pump strainers.
- b) Lubricate pump bearings per manufacturer's recommendations.
- c) Lubricate motor bearings per manufacturer's recommendations.
- d) Check motor mounts and vibration pads.
- e) Visually check pump alignment and coupling.
- f) Check motor operating conditions.
- g) Inspect electrical connections and contactors.
- eh) Check hand valve positions.
- i) Inspect mechanical seals or pump packing.
- j) Operate pumps and check efficiency.
- k) A comprehensive and detailed final inspection report shall be provided to LDCC Facility Supervisor, upon completion of each inspection, on each and every piece of equipment.

Operating Inspection (Three Required) The listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures inadvertently omitted from these specifications shall be included in the project scope.

- a) Lubricate pump bearings per manufacturer's recommendations.
- b) Lubricate motor bearings per manufacturer's recommendations.
- c) Check suction and discharge pressures
- d) Visually inspect packing or mechanical seal.
- e) Check motor voltage and amperage.
- f) A comprehensive and detailed final inspection report shall be provided to LDCC Facility Supervisor upon completion of each inspection, on each and every piece of equipment.

MAINTENANCE SCHEDULE FOR VARIABLE FREQUENCY DRIVE MOTOR SPEED CONTROLLERS:

Preventive Maintenance (Four Required) The listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures inadvertently omitted from these specifications shall be included in the project scope.

- a) Visually inspect for loose or damaged parts or connections.
- b) Verify correct input voltage/amperage.
- c) Check that drive ramps up & down properly.
- d) Run factory self-diagnostics (when units are so equipped)
- e) Record run time from U-11 & 12.
- f) Clean unit cabinetry & check for source of unusual dirt or moisture.
- g) A comprehensive and detailed final inspection report shall be provided to LDCC Facility Supervisor, upon completion of each inspection, on each and every piece of equipment.

MAINTENANCE SCHEDULE FOR REFRIGERANT MONITOR:

Preventive Maintenance (Two required) the listed procedures shall be considered to be the Contractor's minimum acceptable performance level. Manufacturer's accepted and recommended procedures inadvertently omitted from these specifications shall be include in the project scope.

- a) Verify air samples being drawn from zones.
- b) Check LED's for proper display.
- c) Insure proper current inputs.
- d) Check any air flow obstructions.
- e) Inspect probe filters.
- f) Inspect for bent, blocked or damaged tubing.
- g) Re-calibrate unit utilizing factory test sample annually.
- h) A comprehensive and detailed final inspection report shall be provided to LDCC Facility Supervisor, upon completion of each inspection, on each and every piece of equipment.

**Technical Specifications for
Niagara, Trending, Energy Management, Metering and Training**

Bidding and/or Negotiation Requirements, Conditions of the Contract, and pertinent portions of Division One of these specifications, apply to the Work of this Section as fully as though repeated herein.

The intent of this section is to define the Integration of the Facility Management and Control Systems. This system will allow for a consistent graphical display of control menu and functionality regardless of the control system vendor.

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Temperature Control System (TCS), utilizing Direct Digital Controls as described herein.
- B. All labor, material, equipment and software not specifically referred to herein or on the plans, that is required to meet the functional intent of this specification, shall be provided without additional cost to Louisiana Delta Community College (LDCC).
- C. It is the Louisiana Delta Community College's goal to implement an open system that will allow products from various suppliers to be integrated into a unified system in order to provide flexibility for expansion, maintenance, and service of the system. Louisiana Delta Community College (LDCC) shall be the named license holder of all software associated with any and all incremental work on the project(s).
- D. It is the responsibility of the controls contractor to provide any hardware, software, control devices, or supplementary or miscellaneous items not mentioned in this specification that are necessary for a fully function system of temperature controls. All site visits are to be coordinated with LDCC at least two days prior.
- E. Contractor shall coordinate all HVAC control outages with LDCC as applicable for installation of work. Most buildings will require HVAC control outages to be scheduled after-hours, on weekends, or during holidays.
- F. The control system described in this specification shall be installed in the following buildings on LDCC's campus:
 - 1. Delta Ouachita Technical College
 - 2. Bastrop Technical College Building I & II
 - 3. North Central Campus (Farmerville)
 - 4. North East Campus (Winnsboro)

5. Ruston Technical College
6. Tallulah Technical College
7. Lake Providence Technical College
8. Louisiana Delta Community College Campus

The controls contractor shall provide pricing on per building basis. LDCC may elect to install controls on any single building or group of buildings that it determines to be appropriate. However, all work associated with this project shall be awarded to a single manufacturer.

1.2 SYSTEM DESCRIPTION

1. The FMCS shall be comprised of Java Application Control Engine or Controllers (JACE) within each facility. The JACE shall connect to the local area network, depending on configuration. Access to the system, either locally in each building, or remotely from a central site or sites, shall be accomplished through standard Web browsers, via the Internet and/or local area network. Each JACE is capable communicate to LonMark/LonTalk (ILC) and/or BACnet (IBC) controllers and other open and legacy protocol systems/devices.
2. The FMCS shall be based on the Niagara^{AX} Framework (or “Niagara^{AX}”), a Java-based framework developed by Tridium. Niagara^{AX} provides an open automation infrastructure that integrates diverse systems and devices (regardless of manufacturer, communication standard or software) into a unified platform that can be easily managed in real time over the Internet using a standard Web browser. Systems not developed on the Niagara^{AX} Framework platform are unacceptable.
3. The entire Temperature Control System (TCS) shall be comprised of a network of interoperable, stand-alone digital controllers communicating via LonMark/LonTalk and/or BACnet communication protocols to Java Application Control Engines (JACE) which communicate BACnet TCP/ IP or OBIX TCP/IP to LDCCs Niagara AX Server.

1.3 PRIOR APPROVAL

- A. The materials, products and equipment described herein establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution. No substitutions shall be allowed after bidding.
- B. No substitution will be considered unless written request for approval has been submitted by the Vendor and has been received by the Engineer at least seven (7) days prior to the date for receipt of bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including model numbers, drawings, cuts, performance and test data and any other information necessary for evaluation. A statement setting forth any

changes in other materials, equipment or work that incorporation of the substitute would require shall be included. It shall be the responsibility of the Vendor to include in his proposal all changes required of the Contract Documents if the proposed product is used. Prior approval is given contingent upon Contractor being responsible for any costs that may be necessary to modify the space or facilities needed to accommodate the materials and equipment approved.

- C. Alternate building automation system prior approval requests shall consist of technical specifications on control devices, network architecture, communication protocols, software licensing documentation and any other information required by the consulting engineer to determine compatibility of the purposed control system with the requirements of this specification.
- D. If the Engineer approves any proposed substitution, such approval will be set forth in an addendum. Bidders shall not rely upon approvals made in any other manner.

1.4 SUBMITTAL

- A. Five copies of shop drawings of the entire FMCS shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog data sheets and installation instructions. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings.
- B. Submittal shall also include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media and protocol. In addition, the Control Contractor shall be responsible for diagrams displaying the overall trunk cable schematic for the entire Virtual Local Area Network (VLAN).
- C. Submittal shall also include a copy of each of the graphics developed for the Graphic User Interface including a flowchart (site map) indicating how the graphics are to be linked to one another for system navigation. The graphics are intended to be 80% - 90% complete at this stage with the only remaining changes to be based on review comments from the A/E design team and/or TPS.

1.5 CONSTRUCTION CLOSE OUT DOCUMENTATION:

- A. Upon completion of the work, provide a complete set of 'as-built' drawings and application software on compact disk. Drawings shall be provided as AutoCAD™ or Visio™ compatible files. Eight copies of the 'as-built' drawings shall be provided in addition to the documents on compact disk. The controls contractor shall be responsible for as-builts pertaining to overall FMCS architecture and network diagrams.

All as built drawings shall also be installed into the FMCS server in a dedicated directory.

B. Close out documents shall also include:

1. All applicable warranty documents.
2. All user manuals, operation & maintenance manuals, etc.
3. A copy of all approved submittals.
4. A copy of all approved field changes / directives.

1.6 SPECIFICATION NOMENCLATURE

A. Acronyms used in this specification are as follows:

FMCS	Facility Management and Control System
TCS	Temperature Control System
JACE	Java Application Control Engine
ILC	Interoperable Lon Controller
IBC	Interoperable BACnet Controller
GUI	Graphical User Interface
WBI	Web Browser Interface
POT	Portable Operator's Terminal
PMI	Power Measurement Interface
DDC	Direct Digital Controls
LAN	Local Area Network
WAN	Wide Area Network
OOT	Object Oriented Technology
LDCCA	Utility Load Manager Application
PICS	Protocol Implementation Conformance Statement

1.7 DIVISION OF WORK

- A. The controls contractor shall be responsible for all new controllers (IDC & IBC), control devices, control panels, controller programming, controller programming software, controller input/output and power wiring and controller network wiring. In addition, the controls contractor shall be responsible for the Java Application Control Engine(s) (JACE), software and programming of the JACE, graphical user interface software (GUI), development of all graphical screens, Web browser pages, setup of schedules, logs and alarms, LonWorks network management and connection of the JACE to the local or wide area network.
- B. LDCC will furnish and install CAT 5 cable to all new controllers. Consequently, all controllers installed under this scope of work shall reside directly on the LAN and shall have the ability to communicate all relevant information directly to a web supervisory server via the Bacnet IP communication protocol.
 - 1. The Local Area Network (LAN) shall be a 100 Megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and SOAP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Area Controllers (NACs), user workstations and, if specified, a local server.
 - a. Local area network minimum physical and media access requirements:
 - b. Ethernet; IEEE standard 802.3
 - c. Cable; 100 Base-T, UTP-8 wire, category 5
 - d. Minimum throughput; 100 Mbps.

1.9 AGENCY AND CODE APPROVALS

- A. All products of the FMCS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.
 - 1. UL-916; Energy Management Systems
 - 2. C-UL listed to Canadian Standards Association C22.2 No. 205-M1983 "signal Equipment"
 - 3. CE
 - 4. FCC, Part 15, Subpart J, Class A Computing Devices

1.10 SOFTWARE LICENSE AGREEMENT

- A. Software licensing for the JACE or Supervisor shall give LDCC the capability to control their system and determine which contractors can bid and engineer their system.
- B. It shall be possible to insure LDCC can prevent unauthorized partners from accessing the system for engineering changes.
- C. Software licensing shall have the freedom to individually manage authorized parties and independent parties.
- D. The software licensing shall have no restrictions on which brand of JACE, Supervisor or System Programming tools can interact with the system. Station Compatibility must = ALL and Tool Compatibility must = ALL.
- E. LDCC shall accept the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to LDCC as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

PART 2 MATERIALS

2.1 GENERAL

- A. The Facility Management Control System (FMCS) shall be comprised of a network of interoperable, stand-alone digital controllers, a computer system, graphical user interface software, printers, network devices and other devices as specified herein.
- B. The installed system shall provide secure password access to all features, functions and data contained in the overall FMCS.

2.2 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products and services by one of the following:

- 1) Trane- Building Logix

2.3 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

- A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate OBIX (XML), OPC, SNMP, Lon works, BACnet IP, BACnet MSTP, Modbus TCP/IP, Modbus RTU, or proprietary legacy communication protocols in one open, interoperable system.

- B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI / ASHRAE™ Standard 135-2001, BACnet and LonMark to assure interoperability between all system components is required. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file and a resource file for the device. For each BACnet device, the device supplier must provide a PICS document showing the installed device's compliance level. Minimum compliance is Level 3; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet (BACnet Ethernet/IP,) and/or RS-485 (BACnet MSTP) as specified. For each Modbus device supplier must provide a Registry of data points available on the system.
- C. All components and controllers supplied under The controls contractor shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.
- D. The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. An Open DataBase Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a server, provided by LDCC, for all database access. Systems requiring proprietary database and user interface programs shall not be acceptable.
- E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.
 - 1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.
 - 2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.4 NETWORKS

- A. The Virtual Local Area Network (VLAN) shall be a 100 Megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and SOAP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Java Application Control Engines (JACEs), user workstations and, if specified, a local server. The VLAN will be managed by the LDCC Facilities Information Management department. The LDCC Facilities Information Management department will control the access to the FMCS residing at each facility.

B. Local area network minimum physical and media access requirements:

1. Ethernet; IEEE standard 802.3
2. Cable; 100 Base-T, UTP-8 wire, category 5
3. Minimum throughput; 100 Mbps.

2.5 NETWORK ACCESS

A. Remote Access.

1. For Local Area Network installations, provide access to the VLAN from a remote location, via the Internet. The LDCC Facilities Information Management department shall provide a connection to the Internet to enable this access via high speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the customer's Intranet to a corporate server providing access to an Internet Service Provider (ISP). Customer agrees to pay monthly access charges for connection and ISP. The LDCC Facilities Information Management department shall provide client software to the users they wish to have access to the VLAN.

2.6 JAVA APPLICATION CONTROL ENGINE (JACE)

- A. The Controls contractor shall supply one or more Java Application Control Engines (JACE) as part of this contract. Number of area controllers required is dependent on the type and quantity of devices provided under this specification.
- B. The Java Application Control Engine (JACE) shall provide the interface between the VLAN and the field control devices, and provide global supervisory control functions over the control devices connected to the JACE. It shall be capable of executing application control programs to provide:
1. Calendar functions
 2. Scheduling
 3. Trending
 4. Alarm monitoring and routing
 5. Time synchronization
 6. Integration of LonWorks controller data, BACnet controller data, or other open standard or legacy protocol data

7. Network Management functions for all LonWorks based devices
- C. The Java Application Control Engine must provide the following hardware features as a minimum:
1. One Ethernet Port – 10/100 Mbps
 2. One RS-232 port
 3. One LonWorks Interface Port – 78KB FTT-10A
 4. One BACnet port
 5. One RS-485 ports (configured for Modbus RTU)
 6. Battery Backup
 7. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
 8. The JACE must be capable of operation over a temperature range of 32 to 122°F
 9. The JACE must be capable of withstanding storage temperatures of between 0 and 158°F
 10. The JACE must be capable of operation over a humidity range of 5 to 95% RH, non-condensing
- D. The JACE shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the JACE shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.
- E. The JACE shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 32 simultaneous users.
- F. Event Alarm Notification and actions
1. The JACE shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
 2. The JACE shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up telephone connection, or wide-area network.

3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to:
 - a. To alarm
 - b. Return to normal
 - c. To fault
 4. Provide for the creation of a minimum of eight of alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc.
 5. Provide timed (schedule) routing of alarms by class, object, group, or node.
 6. Provide alarm generation from binary object “runtime” and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.
- G. Control equipment and network failures shall be treated as alarms and annunciated.
- H. Alarms shall be annunciated in any of the following manners as defined by the user:
1. Screen message text
 2. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:
 - a. Day of week
 - b. Time of day
 - c. Recipient
 3. Pagers via paging services that initiate a page on receipt of email message
 4. Graphic with flashing alarm object(s)
 5. Printed message, routed directly to a dedicated alarm printer
- I. The following shall be recorded by the JACE for each alarm (at a minimum):
1. Time and date
 2. Location (building, floor, zone, office number, etc.)
 3. Equipment (air handler #, accessway, etc.)
 4. Acknowledge time, date, and user who issued acknowledgement.
 5. Number of occurrences since last acknowledgement.

- J. Alarm actions may be initiated by user defined programmable objects created for that purpose.
- K. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.
- L. A log of all alarms shall be maintained by the JACE and/or a server (if configured in the system) and shall be available for review by the user.
- M. Provide a “query” feature to allow review of specific alarms by user defined parameters.
- N. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.
- O. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.
- P. Data Collection and Storage
 - 1. The JACE shall have the ability to collect data for any property of any object and store this data for future use.
 - 2. The data collection shall be performed by log objects, resident in the JACE that shall have, at a minimum, the following configurable properties:
 - a. Designating the log as interval or deviation.
 - b. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
 - c. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
 - d. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
 - e. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.
 - 3. All log data shall be stored in a relational database in the JACE and the data shall be accessed from a server (if the system is so configured) or a standard Web browser.

4. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.
5. All log data shall be available to the user in the following data formats:
 - a. HTML
 - b. XML
 - c. Plain Text
 - d. Comma or tab separated values
6. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.
7. The JACE shall have the ability to archive its log data either locally (to itself), or remotely to a server or other JACE on the network. Provide the ability to configure the following archiving properties, at a minimum:
 - a. Archive on time of day
 - b. Archive on user-defined number of data stores in the log (buffer size)
 - c. Archive when log has reached it's user-defined capacity of data stores
 - d. Provide ability to clear logs once archived

2.7 AUDIT LOG

- A. Provide and maintain an Audit Log that tracks all activities performed on the JACE. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the JACE), to another JACE on the network, or to a server. For each log entry, provide the following data:

1. Time and date
2. User ID
3. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

2.8 DATABASE BACKUP AND STORAGE

- A. The JACE shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.
- B. Copies of the current database and, at the most recently saved database shall be stored in the JACE. The age of the most recently saved database is dependent on the user-defined database save interval.
- C. The JACE database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

2.9 WEB BROWSER CLIENTS

- D. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™ or Netscape Navigator™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.
- E. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall not be acceptable.
- F. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.
- G. The Web browser client shall support at a minimum, the following functions:
 - 1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
 - 2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
 - 3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
 - 4. Storage of the graphical screens shall be in the Java Application Control Engine (JACE), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
 - 5. Real-time values displayed on a Web page shall update automatically without requiring a manual “refresh” of the Web page.
 - 6. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
 - a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
 - 1. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.

2. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
 - b. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
 - c. View logs and charts
 - d. View and acknowledge alarms
 - e. Setup and execute SQL queries on log and archive information
7. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
8. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

2.10 SYSTEM PROGRAMMING

- A. The Graphical Development Tool (GDT) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GDT shall be through password access as assigned by the system administrator.
- B. The GDT shall be available in two versions; a thick-client version licensed to the computing platform on which it is installed and a thin-client version, capable of providing the complete set of engineering functions through a standard Web Browser. Programming and development tools that are not capable of providing all engineering and application development functions with a standard Web Browser are not acceptable.
- C. A library of control, application, and graphic objects shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the desired control objects from the library, dragging or pasting them on the screen, and linking them together using a built in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide "real-time" data updates. Any real-time data value or object property may be connected to display its current value on a user display. Systems requiring separate software tools or processes to create applications and user interface displays shall not be acceptable.

D. Programming Methods

1. Provide the capability to copy objects from the supplied libraries, or from a user-defined library to the user's application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-to-one, many-to-one, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in color depending on the type of link; i.e., internal, external, hardware, etc.
2. Configuration of each object will be done through the object's property sheet using fill-in the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.
3. The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.
4. All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database objects shall not be allowed.
5. The system shall support object duplication within a customer's database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

2.11 OBJECT LIBRARIES

- A. A standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.
- B. The objects in this library shall be capable of being copied and pasted into the user's database and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.
- C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated objects and applications as they are developed.
- D. All control objects shall conform to the control objects specified in the BACnet specification.

E. The library shall include applications or objects for the following functions, at a minimum:

1. Scheduling Object. The schedule must conform to the schedule object as defined in the BACnet specification, providing 7-day plus holiday & temporary scheduling features and a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on-off events.
2. Calendar Object. . The calendar must conform to the calendar object as defined in the BACnet specification, providing 12-month calendar features to allow for holiday or special event data entry. Data entry to be by graphical “point-and-click” selection. This object must be “linkable” to any or all scheduling objects for effective event control.
3. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals
4. Temperature Override Object. Provide a temperature override object that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling etc.) to maintain occupant comfort or for equipment freeze protection.
5. Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un-occupancy time just far enough ahead to take advantage of the building’s “flywheel” effect for energy savings. Provide automatic tuning of all start / stop time object properties based on the previous day’s performance.
6. Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of sheddable equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the users screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be

selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.

F. The library shall include control objects for the following functions. All control objects shall conform to the objects as specified in the BACnet specification.

1. Analog Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. Allow high, low and failure limits to be assigned for alarming. Also, provide a time delay filter property to prevent nuisance alarms caused by temporary excursions above or below the user defined alarm limits.
2. Analog Output Object - Minimum requirement is to comply with the BACnet standard for data sharing.
3. Binary Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. The user must be able to specify either input condition for alarming. This object must also include the capability to record equipment run-time by counting the amount of time the hardware input is in an “on” condition. The user must be able to specify either input condition as the “on” condition.
4. Binary Output Object - Minimum requirement is to comply with the BACnet standard for data sharing. Properties to enable minimum on and off times for equipment protection as well as interstart delay must be provided. The BACnet Command Prioritization priority scheme shall be incorporated to allow multiple control applications to execute commands on this object with the highest priority command being invoked. Provide sixteen levels of priority as a minimum. Systems not employing the BACnet method of contention resolution shall not be acceptable.
5. PID Control Loop Object - Minimum requirement is to comply with the BACnet standard for data sharing. Each individual property must be adjustable as well as to be disabled to allow proportional control only, or proportional with integral control, as well as proportional, integral and derivative control.
6. Comparison Object - Allow a minimum of two analog objects to be compared to select either the highest, lowest, or equality between the two linked inputs. Also, allow limits to be applied to the output value for alarm generation.
7. Math Object - Allow a minimum of four analog objects to be tested for the minimum or maximum, or the sum, difference, or average of linked objects. Also, allow limits to be applied to the output value for alarm generation.

8. Custom Programming Objects - Provide a blank object template for the creation of new custom objects to meet specific user application requirements. This object must provide a simple BASIC-like programming language that is used to define object behavior. Provide a library of functions including math and logic functions, string manipulation, and e-mail as a minimum. Also, provide a comprehensive on-line debug tool to allow complete testing of the new object. Allow new objects to be stored in the library for re-use.
 9. Interlock Object - Provide an interlock object that provides a means of coordination of objects within a piece of equipment such as an Air Handler or other similar types of equipment. An example is to link the return fan to the supply fan such that when the supply fan is started, the return fan object is also started automatically without the user having to issue separate commands or to link each object to a schedule object. In addition, the control loops, damper objects, and alarm monitoring (such as return air, supply air, and mixed air temperature objects) will be inhibited from alarming during a user-defined period after startup to allow for stabilization. When the air handler is stopped, the interlocked return fan is also stopped, the outside air damper is closed, and other related objects within the air handler unit are inhibited from alarming thereby eliminating nuisance alarms during the off period.
 10. Temperature Override Object - Provide an object whose purpose is to provide the capability of overriding a binary output to an "On" state in the event a user specified high or low limit value is exceeded. This object is to be linked to the desired binary output object as well as to an analog object for temperature monitoring, to cause the override to be enabled. This object will execute a Start command at the Temperature Override level of start/stop command priority unless changed by the user.
 11. Composite Object - Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering, or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the "contained" application that are represented on the graphical shell of this container.
- G. The object library shall include objects to support the integration of devices connected to the Java Application Control Engine (JACE). At a minimum, provide the following as part of the standard library included with the programming software:
1. LonMark/LonWorks devices. These devices shall include, but not be limited to, devices for control of HVAC, lighting, access, and metering. Provide LonMark manufacturer-specific objects to facilitate simple integration of these devices. All network variables defined in the LonMark profile shall be supported. Information

(type and function) regarding network variables not defined in the LonMark profile shall be provided by the device manufacturer.

2. For devices not conforming to the LonMark standard, provide a dynamic object that can be assigned to the device based on network variable information provided by the device manufacturer. Device manufacturer shall provide an XIF file, resource file and documentation for the device to facilitate device integration.
3. For BACnet devices, provide the following objects at a minimum:
 - a. Analog In
 - b. Analog Out
 - c. Analog Value
 - d. Binary
 - e. Binary In
 - f. Binary Out
 - g. Binary Value
 - h. Multi-State In
 - i. Multi-State Out
 - j. Multi-State Value
 - k. Schedule Export
 - l. Calendar Export
 - m. Trend Export
 - n. Device
4. For each BACnet object, provide the ability to assign the object a BACnet device and object instance number.
5. For BACnet devices, provide the following support at a minimum
 - a. Segmentation
 - b. Segmented Request
 - c. Segmented Response
 - d. Application Services

- e. Read Property
- f. Read Property Multiple
- g. Write Property
- h. Write Property Multiple
- i. Confirmed Event Notification
- j. Unconfirmed Event Notification
- k. Acknowledge Alarm
- l. Get Alarm Summary
- m. Who-has
- n. I-have
- o. Who-is
- p. I-am
- q. Subscribe COV
- r. Confirmed COV notification
- s. Unconfirmed COV notification
- t. Media Types
- u. Ethernet
- v. BACnet IP Annex J
- w. MSTP
- x. BACnet Broadcast Management Device (BBMD) function
- y. Routing

2.12 Lon Works NETWORK MANAGEMENT

- A. The Graphical User Interface software (GUI) shall provide a complete set of integrated Lon works network management tools for working with Lon works networks. These tools shall manage a database for all Lon Works devices by type and revision, and shall provide a software mechanism for identifying each device on the network. These tools shall also be capable of defining network data connections between Lon Works devices,

known as “binding”. Systems requiring the use of third party Lon Works network management tools shall not be accepted.

- B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.
- C. The network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices, and to view health and status counters within devices.
- D. These tools shall provide the ability to “learn” an existing Lon Works network, regardless of what network management tool(s) were used to install the existing network, so that existing Lon Works devices and newly added devices are part of a single network management database.
- E. The network management database shall be resident in the Java Application Control Engine (JACE), ensuring that anyone with proper authorization has access to the network management database at all times. Systems employing network management databases that are not resident, at all times, within the control system, shall not be accepted.

2.13 MODBUS SYSTEM DEVICES

- A. The Java Application Control Engine shall support the integration of device data from Modbus RTU, ASCII, or TCP control system devices. The connection to the Modbus system shall be via an RS-232, RS485, or Ethernet IP as required by the device.
- B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the Modbus system data into the FPMS. Objects provided shall include at a minimum:
 - 1. Read/Write Modbus AI Registers
 - 2. Read/Write Modbus AO Registers
 - 3. Read/Write Modbus BI Registers
 - 4. Read/Write Modbus BO Registers
- C. All scheduling, alarming, logging and global supervisory control functions, of the Modbus system devices, shall be performed by the Java Application Control Engine.
- D. The FMCS supplier shall provide a Modbus system communications driver. The equipment system vendor that provided the equipment utilizing Modbus shall provide documentation of the system’s Modbus interface and shall provide factory support at no charge during system commissioning

2.14 LEGACY SYSTEM INTEGRATION

- A. The Java Application Control Engine shall support the integration of device data from the existing control system. The connection to the existing system shall be via an RS-

232 or RS-485 connection between the Java Application Control Engine and the existing control system.

- B. The controls contractor shall ensure that the existing system's database is setup to make all data to be integrated into the FMCS available at the RS-232 or RS-465 port. Any modifications to the existing system database to accomplish this shall be the responsibility of the controls contractor.
- C. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the existing system data into the FMCS. Objects provided shall include at a minimum:
 - 1. LEGACY SYSTEM Generic AI Object
 - 2. LEGACY SYSTEM Generic AO Object
 - 3. LEGACY SYSTEM Generic BO Object
 - 4. LEGACY SYSTEM Generic BI Object
- D. All scheduling, alarming, logging and global supervisory control functions (demand limiting, etc.), of the existing system devices, shall be performed by the Java Application Control Engine. Integration of the existing system's schedules, alarms, logs, etc. is neither required nor desired.
- E. The FMCS supplier shall provide a legacy system communications driver. A site visit shall be required to verify the existing system's communication protocol to facilitate the development of this driver.

2.15 GRAPHICAL USER INTERFACE COMPUTER HARDWARE (DESKTOP) in Maintenance Office

- A. The browser workstation shall be an Intel Pentium based computer (minimum processing speed of 2.4 GHz with 1.0 GB RAM and a 100-gigabyte minimum hard drive). It shall include a DVD-ROM/CD-RW Combination Drive, 2-parallel ports, 2-asynchronous serial ports and 2-USB ports. A minimum 17"flat panel color monitor, 1280 x 1024 optimal preset resolution, 25 ms response time, shall also be included.
- B. Connection to the FMCS network shall be via an Ethernet network interface card, 10 Mbps.

2.17 ENERGY MANAGEMENT AND VERIFICATION SOFTWARE APPLICATION

The Systems Integrator shall segregate the necessary points required to execute the functionality of the system described in this specification section and download those points to a Microsoft Database. Database provided shall be of sufficient size to store 2 Years of data. All Points required shall be downloaded to the Database once every 30 minutes. All information written to and drawn from the Database shall be the responsibility of the Systems Integrator and the Building Automation System.

- A. All reports and displays output by the Energy Monitoring & Reporting Software shall utilize the Adobe Flash Platform Technologies – Flash Player, Adobe AIR, FLEX, FLEX Builder, Flash Professional, Flash Media Server, Blaze DS.
- B. The Building Menu Tree - Each Building currently residing on the Building Automation System shall be displayed in a menu tree and provide the user the option to select any or all following information for each building:
 - 1. Total Building Electric Load
 - 2. HVAC System Electric Load (Future)
 - 3. Lighting System Electric Load (Future)
 - 4. Building General Electric Load (Future)
 - 5. Water Consumption (Future)
 - 6. Gas Consumption (Future)
- C. In addition, the Building Menu Tree shall be organized to select buildings based on LDCC's different units and allow users to compare consumption data based on those different business units.
- D. Each Individual Building in the Menu Tree will also contain a link to an "In-Depth Energy Reporting Dashboard". This "In-Depth" Dashboard shall contain more detailed information about each individual building. The "In-Depth Energy Reporting Dashboard" is described in further detail in the specification.
- E. Users shall have the ability to "Hide" the Building Menu Tree.
- F. Consumption Graph – Once the user has selected the Buildings and their respective systems to be viewed from the Building Menu Tree, the Energy Dashboard will display the information selected by the user on a Line Graph. The Line Graph shall show the specified Data Type (kW, kWH, etc) on the Y Axis and Time on the X Axis.
- G. A legend of the data type and color shall be created automatically by the Energy Monitoring & Reporting Dashboard and shown at the top of the graph. Each line of data shall be displayed using contrasting colors. The legend shall also allow the user to "hide" the data selected on the Line Graph by clicking on the color within the legend.

- H. Dragging the mouse over any part of the Line Graph shall display the data of the specific point that mouse is positioned on. This “pop-up” display for the data points will show the following info:
1. Building Name
 2. Point Type (Total Load, Water, Gas, Etc.)
 3. Actual Data (kW, kWh, ect.)
 4. Time Stamp for the Data point including Day, Month, Year, & Time.
- I. If any of the following items are selected to be viewed by the user, the user shall also have the capability to choose between KW & KWH.
1. Total Building Load
 2. HVAC System Load (Future)
 3. Lighting System Load (Future)
 4. Building General Load (Future)
- J. The user will be able to change the time period of the X Axis based on the following categories:
1. By Day (30 Minute Increments) – User shall be able to select a specific day utilizing a Calendar Pop-Up showing all days available.
 2. Daily (1 Hour Increments) – User shall be able to select a specific day utilizing a Calendar Pop-Up showing all days available.
 3. Monthly (1 Hour Increments) – User shall be able to select a specific month and year utilizing drop down menus.
 4. Monthly (Daily Increments) - User shall be able to select a specific month and year utilizing drop down menus.
 5. Yearly (Daily Increments) - User shall be able to select a specific year utilizing drop down menus.
 6. Yearly (Monthly Increments) - User shall be able to select a specific year utilizing drop down menus.
 7. Date Range - All Dates residing in the Database
- K. The Line Graph will contain a slide bar that allows the user to segregate a specific period of time within the time range selected above. The slide bar will then allow the user to view that specific period of time by moving it along the total time selected. The Dashboard will redraw the graph dynamically to show only the time period shown on the slide bar.
- L. The Data Table - All categories selected by the User in the Building Menu Tree shall not only be displayed on Line Graph, but will also be displayed in Data Table Format so that the user can view the data set numerically.
- M. The Pie Chart - The display shall also show the selected data set in a Pie Chart Format. The Pie Chart shall break down the data set and show the percentages of the category versus the Total.
- N. Dragging the mouse over any part of the Pie Chart shall display the data of the specific point that mouse is positioned on. This “pop-up” display for the data points will show the following info:

1. Building Name
 2. Point Type (Total Load, Water, Gas, Etc.)
 3. Actual Data (kW, kWh, etc.)
 4. Numerical Percentage versus Total
- O. Users shall have the ability to “Hide” the Data Table and/or Pie Chart.
- P. Exporting Data – Users shall have the ability to export all data currently selected in the Dashboard to CSV File.
- Q. Additional Dashboard Functionality – Users will have the ability to print the current view at any time by right clicking over the Line Graph and selecting the Print Option.
- R. In Depth Energy Reporting Dashboard – When the user chooses the In Depth Energy Reporting from the Building Menu Tree, the system shall open up a separate window for the building chosen. This window will contain the following details for the selected building:
1. Summary Statistics
- S. This Dashboard is a display capable of displaying the following information:
1. Total Energy Usage
 2. Total Weekday Energy Usage
 3. Total Weekend Energy Usage
 4. Weekday Maximum Demand
 5. Weekend Maximum Demand
 6. Power Factor at Maximum Demand
 7. Load Factor
 8. On Peak Total Energy
 9. On Peak Maximum Demand
 10. On Peak Time of Maximum Demand
 11. Off Peak Total Energy
 12. Off Peak Maximum Demand
 13. Off Peak Time of Maximum Demand
- T. Total Weekday Energy Usage versus Total Weekend Energy Usage
- U. Weekday Maximum Demand versus Weekend Maximum Demand
- V. Total On Peak Energy Usage versus Total Off Peak Energy Usage
- W. On Peak Maximum Demand versus Off Peak Maximum Demand
- X. The Summary Statistics Dashboard will allow the users to select the Time Period of the data to be summarized based on the following options:
1. By Day - User shall be able to select a specific day utilizing a Calendar Pop-Up showing all days available.
 2. By Month - User shall be able to select a specific month and year utilizing drop down menus

3. Year - User shall be able to select a specific year utilizing a drop down menus
 4. Last 30 Days
 5. Custom range - User shall be able to select a specific day utilizing 2 Calendar Pop-Ups showing all days available
 6. Average Profiles
- Y. This Dashboard shall have the ability to display 3 separate Line Graphs:
1. Weekday Demand versus Weekend Demand over Time
 2. Weekday Power Factor versus Weekend Power Factor over Time
 3. Weekday Reactive Power versus Weekend Reactive Power over Time
- Z. The Average Profiles Dashboard will allow the users to select the Time Period of the data to be shown based on the following options:
1. By Day - User shall be able to select a specific day utilizing a Calendar Pop-Up showing all days available.
 2. By Month - User shall be able to select a specific month and year utilizing drop down menus
 3. By Year - User shall be able to select a specific year utilizing a drop down menus
 4. Last 30 Days
 5. Custom range - User shall be able to select a specific day utilizing 2 Calendar Pop-Ups showing all days available
 6. Load Duration Curves
- AA. This Dashboard shall have the ability to compare data as a percentage of time and display 3 separate Line Graphs:
1. Demand over Percentage of Time
 2. Power Factor over Percentage of Time
 3. Reactive Power over Percentage of Time
- BB. The Load Duration Curves Dashboard will allow the users to select the Time Period of the data to be shown based on the following options:
1. By Day - User shall be able to select a specific day utilizing a Calendar Pop-Up showing all days available.
 2. By Month - User shall be able to select a specific month and year utilizing drop down menus
 3. By Year - User shall be able to select a specific year utilizing a drop down menus
 4. Last 30 Days
 5. Custom range - User shall be able to select a specific day utilizing 2 Calendar Pop-Ups showing all days available
 6. Load Profiles
- CC. This Dashboard is one Line Graph showing the following data over a period of time:
1. Demand
 2. Power Factor

3. Reactive Power
 4. Outside Air Temperature
 5. Outside Relative Humidity
- DD. The Load Profiles Dashboard will allow the users to select the Time Period of the data to be shown based on the following options:
1. By Day - User shall be able to select a specific day utilizing a Calendar Pop-Up showing all days available.
 2. By Month - User shall be able to select a specific month and year utilizing drop down menus
 3. By Year - User shall be able to select a specific year utilizing a drop down menus
 4. Last 30 Days
 5. Custom range - User shall be able to select a specific day utilizing 2 Calendar Pop-Ups showing all days available
- EE. A legend of the data type and color shall be shown at the bottom of the graph. Each line of data shall be displayed using contrasting colors. The legend shall also allow the user to “hide” the data selected on the Line Graph by clicking on the color within the legend
1. Weather Normalization
- FF. This report compares the performance of the facility in objective terms by normalizing the outside weather conditions.
- GG. Thus seasons and years can be compared on a more level basis because the swinging variable of ambient conditions has been normalized.
- HH. This report is most effective when baseline data is present, period of 6 months or greater, and then energy conservation measures are installed. The report quickly shows the effectiveness of the energy conservation measures that were installed.

2.18 DATA TRENDING AND CONTINUOUS COMMISSIONING APPLICATION

- A) Overall Purpose:
1. TrendView provides a single source of operational data collection and storage along with a dynamic user interface.
 2. Provide central point for viewing building operations and trend data. The data is visible in a multi-format display and requires no prior setup to access historical trends or queries.
 3. All data is viewable via standard Internet browser on any PC. No special workstation software is required to view the reports or display information.
 4. The TrendView database makes it easy to diagnose system issues and commission systems because all of the required information is automatically stored in the TrendView database on an ongoing basis and can be analyzed at a later date.

B) Data Storage

1. TrendView is designed to store points from any building automation system in a MS SQL Server database. Specifically any data that can be viewed as a Niagara Common Object
2. The frequency at which data is collected is adjustable

C) Trends & Displays

1. TrendView trends and queries can be saved as templates and viewed at a later date over any range of time.
2. Trend Chart Characteristics
 - (a) When the mouse is dragged over a trend line, the respective data name pops up as a highlight for that section
3. Granular Display – scalable to nearly any level
 - (a) The time frame for comparison is adjustable from a range of many months down to a few minutes span
4. All Data – All the Time
 - (a) All data stored in the database can be referenced for any relevant report
5. Data is exportable to CSV for manipulation or application with Microsoft Excel or other such program

D) Architecture

1. Scalability
 - (a) TrendView can store all or just some of the building automation system points.
 - (b) Multiple buildings can be “recorded” by the TrendView application
2. Analysis
 - (a) The building automation system data is accepted into the Niagara Framework
 - (b) TrendView resides inside the Niagara Framework
 - (c) TrendView exports data to Data Server for storage
 - (d) BuildingLogiX XD Data Miner is the preferred data storage device
 - (e) XD Data Miner stores data in a Microsoft SQL Server Database
3. Queries
 - (a) All user queries are executed via standard internet browser
 - (b) The web query initiates TrendView to pull the requested data
 - (c) Then TrendView builds the requested data table and trend graph, and serves up the display onto the web page where it is viewable via the Internet

E) Security

1. Access to TrendView is password protected
1. Each password is setup by the user during application setup
2. Trendview resides in the Niagara Framework, which means it rests comfortably on a secure private network, and therefore can be protected and accessed through a VPN.

2.19 OTHER CONTROL SYSTEM HARDWARE

A. Temperature Sensors and Transmitters

1. General Sensor & Transmitter Requirements

- a. Provide sensors and transmitters required as outlined in the input/output summary and sequence of operation, and as required achieving the specified accuracy as specified herein.
- b. Temperature transmitters shall be equipped with individual zero and span adjustments. The zero and span adjustments shall be non-interactive to permit calibration without iterative operations. Provide a loop test signal to aid in sensor calibration.
- c. Temperature transmitters shall be sized and constructed to be compatible with the medium to be monitored. Transmitters shall be equipped with a linearization circuit to compensate for non-linearities of the sensor and bridge and provide a true linear output signal.
- d. Temperature sensors shall be of the resistance type and shall be 10K or 20K Ohm Thermistor type.
 1. Thermistors are acceptable provided the mathematical relationship of a thermistor with respect to resistance and temperature with the thermistor fitting constraints is contained with the controllers operating software and the listed accuracy's can be obtained. Submit proof of the software mathematical equation and thermistor manufacturer fitting constants used in the thermistor mathematical/expressions. Thermistors shall be of the Thermistor (NTC) Type with a minimum of 50 ohm/°C. resistance change versus temperature to insure good resolution and accuracy. Thermistors shall be certified to be stable $\pm 0.13^{\circ}\text{C}$. over 5 years and $\pm 0.2^{\circ}\text{C}$. accurate and free from drift for 5 years.
 2. The following accuracy's are required and include errors associated with the sensor, lead wire and A to D conversion.
 3. Point Type
Accuracy
Outside Air
+/-3%
Chilled/Hot Water
+/-1%
Room Temperature
+/-1%
Steam
+/-5%
Duct Temperature
+/-3%
 4. Sensors Used in Energy Water (BTU) or Process Calculations +/-1%

5. Sensors used in energy or process calculations shall be accurate to $\pm 0.10^{\circ}\text{C}$ over the process temperature range. Submit a manufacturer's calibration report indicating that the calibration certification is traceable to the National Bureau of Standards (NBS) Calibration Report Nos. 209527/222173.
2. Thermowells
 - a. When thermowells are required, the sensor and well shall be supplied as a complete assembly including well head and greenfield fitting, except where wells are to be installed under separate contract.
 - b. Thermowells shall be pressure rated and constructed in accordance with the system working pressure
 - c. Thermowells and sensors shall be mounted in a threadolet or 1/2" NPT saddle and allow easy access to the sensor for repair or replacement.
 - d. Thermowells shall be constructed of the following materials:
 1. Chilled and Hot Water; brass.
 2. Steam; 316 stainless steel.
 3. Brine (salt solutions): marine grade stainless steel.
3. Outside Air Sensors
 - a. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.
 - b. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate surrounding the sensor element.
 - c. Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.
 - d. Solar load sensors shall be provided in locations shown. The use of a thermistor combined with a solar compensator is acceptable. Provide calibration charts as part of the O&M Manual.
4. Duct Type Sensors
 - a. Duct mount sensors shall mount in a hand box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement. A neoprene grommet (sealtite fitting and mounting plate) shall be used on the sensor assembly to prevent air leaks.
 - b. Duct sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate. Duct sensors probe shall be constructed of 304 stainless steel.
 - c. For outdoor air duct applications, use a weatherproof mounting box with weatherproof cover and gasket.
5. Averaging Duct Type Sensors

- a. Where called out on the drawings and points lists, provide averaging type duct sensors. Thermistor sensors are acceptable. The sensor shall be multi-point sensitive through the length of the temperature conducting tubing. The thermistors shall be configured in a series / parallel method which create an end result of total average resistance equal to the same span as a standard thermistor.
- b. Provide capillary supports at the sides of the duct to support the sensing element.

B. RELATIVE HUMIDITY SENSORS/TRANSMITTERS

1. The sensor shall be a solid state, resistance type relative humidity sensor of the Bulk Polymer Design. The sensor element shall be washable and shall resist surface contaminations.
2. Humidity transmitter shall be equipped with non-interactive span and zero adjustments, a 2 wire isolated loop powered, 4-20ma, 0-10.0 VDC linear proportional output.
3. The humidity transmitter shall meet the following overall accuracy including lead loss and A to D conversion.
 - a. Room Type Sensor $\pm 2\%$ RH
 - b. Duct Type Sensor $\pm 2\%$ RH
4. Outside air relative humidity sensors shall be installed in a rain proof, perforated cover. The transmitter shall be installed in a NEMA 3R enclosure with sealtite fittings and stainless steel bushings.
5. Provide a single point humidity calibrator, if required, for field calibration. Transmitters shall be shipped factory pre-calibrated.
6. Duct type sensing probes shall be constructed of 304 stainless steel and be equipped with a neoprene grommet, bushings and a mounting bracket.

C. DIFFERENTIAL PRESSURE TRANSMITTERS AND ACCESSORIES

1. General Air and Water Pressure Transmitter Requirements:
 - a. Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage and to hold calibrated accuracy when subject to a momentary 40% over-range input.
 - b. Pressure transmitters shall provide the option to transmit a 0 to 5V dc, 0 to 10V dc, or 4 to 20 mA output signals.
 - c. Differential pressure transmitters used for flow measurement shall be sized to the flow sensing device and shall be supplied with shutoff and bleed valves in the high and low sensing pick-up lines (3 valve manifolds).
 - d. Provide a minimum NEMA 1 housing for the transmitter. Locate transmitters in accessible local control panels wherever possible.
 - e. Low air pressure, differential pressure transmitters used for room pressurization control (i.e. laboratories, OR's clean rooms, etc.) shall be equipped with a LED display indicating the transmitter output signal.

- f. Duct sensing pressure applications where the velocity exceeds 1500 fpm shall utilize a static pressure traverse probes.
 2. Low Air Pressure Applications (0 to 125 Pa)
 - a. The pressure transmitter shall be capable of transmitting a linear electronic signal proportional to the differential of the room and reference static pressure input signals with the following minimum performance specifications.
 1. Span: Not greater than two times the design space DP.
 2. Accuracy: Plus or minus 0.5% of F.S.
 3. Dead Band: Less than 0.3% of output.
 4. Repeatability: Within 0.2% of output.
 5. Linearity: Plus or minus 0.2% of span.
 6. Response: Less than one second for full span input.
 7. Temperature Stability: Less than 0.05% output shift per degree C change.
 - b. The transmitter shall utilize variable capacitance sensor technology and be immune to shock and vibration.
 3. Medium to High Air Pressure Applications (125 Pa to 2500 Pa)
 - a. The pressure transmitter shall be similar to the Low Air Pressure Transmitter except the performance specifications are not as severe. Provide differential pressure transmitters which meet the following performance requirements.
 1. Zero & span: (% F.S./Deg. C): .05% including linearity, hysteresis and repeatability
 2. Accuracy: 1% F.S. (best straight line)
 3. Static Pressure Effect: 0.5% F.S. (to 700 KPa)
 4. Thermal Effects: $\pm 0.05\%$ F.S./Deg. C. over 5°C. to 40°C. (calibrated at 22°C.)
- D. LOW DIFFERENTIAL, WATER PRESSURE APPLICATIONS (0 KPa to 5 KPa)
1. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20mA output in response to variation of flow meter differential pressure or water pressure sensing points.
 2. The differential pressure transmitter shall have non-interactive zero and span adjustments adjustable from the outside cover and meet the following performance specifications.
 - a. 0 – 10 KPa input differential pressure range
 - b. 4 - 20 mA output
 - c. Maintain accuracy up to 20 to 1 ratio turndown
 - d. Reference Accuracy: $\pm 0.2\%$ of full span
 - e. Provide a two year warranty for each transmitter. Replace all transmitters found to be defective at no cost to LDCC during the warranty period.
- E. MEDIUM TO HIGH DIFFERENTIAL WATER PRESSURE APPLICATIONS (5 KPa to 700 KPa)

1. The differential pressure transmitter shall meet the low pressure transmitter specifications except the following:
 - a. Differential pressure range 5 KPa to 700 KPa.
 - b. Reference Accuracy: $\pm 1\%$ of full span (includes non-linearity, hysteresis, and repeatability)
 - c. Warranty: 1 year.
2. Bypass Valve Assembly: Mount stand-alone pressure transmitters in a bypass valve assembly panel. The panel shall be constructed to NEMA 1 standards. The transmitter shall be installed in the panel with hi and low connections piped and valved. Air bleed units, bypass valves and compression fittings shall be provided

F. ELECTRONIC VALVE AND DAMPER ACTUATORS

1. General Requirements
 - a. Electronic actuators shall be electric, direct-coupled type capable of being mounted over the shaft of the damper. They shall be UL listed and the manufacturer shall provide a 2 year unconditional warranty from the date of commissioning. Power consumption shall not exceed 8 watts or 15 VA of transformer sizing capacity per high torque actuator nor 2 watts or 4 VA for VAV actuators. Sound level shall not exceed 45 dB for high torque nor 35 dB for VAV actuators.
 - b. Electronic overload protection shall protect actuator motor from damage. If damper jams actuator shall not burn-out. Internal end switch type actuators are not acceptable. Actuators may be mechanically and electrically paralleled on the same shaft to multiply the available torque. A reversing switch shall be provided to change action from direct to reverse in relation to control signal as operation requires.
 - c. Warranty must be two years by manufacturer on actuator as a whole and all components.
2. Control Damper Actuators
 - a. OA (outside air), RA (return air), and EA (exhaust air) actuators shall be spring return type for safety functions. Individual battery backup or capacitor return is not acceptable.
 - b. The control circuit shall be fully modulating using 2 - 10 volt or 4 - 20 mA signals. Accuracy and repeatability shall be within $\pm 1/21$ of control signal. A 2 - 10 v or 4 - 20 mA signal shall be produced by the actuator which is directly proportional to the shaft clamp position which can be used to control actuators which are paralleled off a master motor or to provide a feedback signal to the automation system indicating damper position. Accuracy shall be within $\pm 2.5\%$.
 - c. Face and bypass dampers and other control dampers shall be modulating using the same control circuit detailed above but shall not be spring return.
3. Miscellaneous Damper Actuators
 - a. OA combustion and ventilation air intake and EA damper actuators shall be 2 position spring return closed if any water piping, coils or other equipment

in the space which the damper serves needs to be protected from freezing. Otherwise drive open, drive closed type 2 position may be used. The minimum torque for any actuator shall be 5 N-m.

- b. Provide auxiliary switches on damper shaft or blade switch to prove damper has opened on all air handling equipment handling 100% outside air and greater than 6 KPa TSP.

4. Air Terminals

- a. Air terminal actuators shall be minimum 5 N-m torque and use fully modulating floating (drive open, drive closed) 3 wire control or use control circuit as detailed in control dampers depending on the controllers requirements.

5. Inlet Vanes Actuators

- a. Inlet vane actuators shall provide at least 150% of the minimum torque specified by the manufacturer as necessary to operate vanes properly. Either direct coupled or gear train with linkages is acceptable as required. The control loop for static control of the actuator shall operate slowly enough to avoid hunting and maintain stable control. See automation system specifications for details.

G. VALVE ACTUATORS

1. Control Valves Actuators (3 inch and smaller)

- a. Actuators shall have a gear release button on all non-spring return models to allow manual setting. The actuator shall have either an insulating air gap between it and the linkage or a non-conducting thermoplastic linkage. Care shall be taken to maintain the actuator's operating temperatures and humidity within its specifications. Pipes shall be fully insulated and heat shields shall be installed if necessary. Condensation may not form on actuators and shall be prevented by a combination of insulation, air gap, or other thermal break.
- b. The control circuit shall be fully modulating using 2 - 10 volt or 4 - 20 mA signals. Accuracy and repeatability shall be within 1/21 of control signal. A 2 - 10 v or 4 - 20 mA signal shall be produced by the actuator which is directly proportional to the shaft clamp position which can be used to control actuators which are paralleled off a master motor or to provide a feedback signal to the automation system indicating valve position.
- c. Valve body and actuators shall be shipped fully assembled and tested at the valve factory prior to shipment.

2. Control Valve Actuators (4 inch and larger).

- a. The valve actuator shall consist of a permanent split capacitor, reversible type electric motor which drives a compound epicycle gear. The electric actuator shall have visual mechanical position indication, readable from a distance of 8 meters, showing output shaft and valve position. Unit shall be mounting directly to the valves without brackets and adapters, or readily adapted to suit all other types quarter-turn valves.

- b. The actuator shall have an integral terminal strip, which, through conduit entries, will ensure simple wiring to power supplies. Cable entries shall have UL recommended gland stops within the NPT hole to prevent glands from being screwed in too far and damaging cable.
- c. The actuator shall be constructed to withstand high shock and vibrations without operations failure. The actuator cover shall have captive bolts to eliminate loss of bolts when removing the cover from the base. One copy of the wiring diagram shall be provided with the actuator.
- d. The actuator shall have a self-locking gear train which is permanently lubricated at the factory. The gearing shall be run on ball and needle bearings. Actuators with 70 N-m or more output torque shall have two adjustable factory calibrated mechanical torque limit switches of the single-pole, double-throw type. The motor shall be fitted with thermal overload protection. Motor rotor shaft shall run in ball bearings at each end of motor.
- e. The actuator housing shall be hard anodized aluminum for full environmental protection.
- f. The environmental temperature range of the actuator shall be -30°C to +60°C.
- g. For intermittent on/off service, the actuator shall be rated at a 20% duty cycle (i.e., 12 minutes extended duty in every hour, or alternatively; one complete cycle every 2 minutes). For more frequent cycling and modulating service, an actuator shall be rated for continuous duty. The actuator rated for continuous duty shall be capable of operating 100% of the time at an ambient temperature of 40°C.
- h. The actuator shall have an integral self-locking gear train. Motor brakes shall not be required to maintain desired valve position. Levers or latches shall not be required to engage or disengage the manual override. Mechanical travel stops, adjustable to 15° in each direction of 90° rotation shall be standard, as well as two adjustable travel limit switches with electrically isolated contacts. Additional adjustable switches shall be available as option.
- i. Single Phase Motor: The motor shall have Class B insulation capable of withstanding locked-rotor for 25 seconds without overheating. Wiring shall also be Class B insulation. An auto-reset thermal cut-out protector shall be embedded in the motor windings to limit heat rise to 80°C in a 40°C ambient. All motors shall be capable of being replaced by simply disconnecting the wires and then removing mounting bolts. Disassembly of gears shall not be required to remove the motor.
- j. Materials of Construction: The electric actuator shall have a pressure die-cast, hard anodized aluminum base and cover. The compound gear shall be made of die-cast, hard anodized aluminum or steel. An alloy steel worm gear shall be provided for manual override and torque limiting. Bearings for gears shall be of the ball and needle type; bronze bearings shall be used on the shafting parts.

k. Accessories:

1. Potentiometer for providing continuous feedback of actuator position at the controller (for valves specified position feedback).

H. CONTROL VALVES

1. Control valves shall be 2-way or 3-way pattern as shown constructed for tight shutoff and shall operate satisfactorily against system pressures and differentials. Two-position valves shall be 'line' size. Proportional control valves shall be sized for a maximum pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Valves with sizes up to and including 2 inches shall be "screwed" configuration and 2-1/2 inch and larger valves shall be "flanged" configuration. Electrically controlled valves shall include spring return type actuators sized for tight shut-off against system pressures and furnished with integral switches for indication of valve position (open-closed). Three-way butterfly valves, when utilized, shall include a separate actuator for each butterfly segment.

I. SWITCHES

1. Differential Pressure Switches

- a. All pressure sensing elements shall be corrosion resistant. Pressure sensing elements shall be bourdon tubes, bellows, or diaphragm type. Units shall have tamper-proof adjustable range and differential pressure settings.
- b. Pressure sensor switch contacts shall be snap action micro-switch type. Sensor assembly shall operate automatically and reset automatically when conditions return to normal. Complete sensor assembly shall be protected against vibration at all critical movement pivots, slides and so forth.
- c. Differential pressure switches shall be vented to withstand a 50% increase in working pressure without loss of calibration.

2. Electric Low Limit Thermostat (Freeze Stat)

- a. Duct type, fixed 3 degrees Celsius differential, range 0 to 15 degrees Celsius. Sensing element shall be a 7 meter long capillary tube responding to the lowest temperature sensed along any 30 cm of bulb length. Switch shall be SPDT 120/240 volts AC, rated for 10 amps at 120 volts full load. Unit shall be manually reset. Provide one low limit thermostat for each 2 square meter or fraction thereof of coil surface area.
- b. Provide DPST switches, 1 NO, 1 NC contact.
- c. Provide manual type low limit thermostat set at 2 degrees Celsius on each air handling unit.
- d. Provide thermostat override on air handling units for smoke control in area being served.

3. Water Flow Switches

- a. UL listed, suitable for all service application conditions. Body minimum working pressure rating shall equal or exceed service pressure. Switch electrical rating shall be 230 volts AC 3.7 ampere, 115 volts AC 7.4 ampere, and 125 VAC 115-230 VAC AC Pilot duty. Unit shall have two SPDT

switches. Actuating flow rated shall be field adjustable for the specified and indicated service. Switch location shall preclude exposure to turbulent or pulsating flow conditions. Flow switch shall not cause pressure drop exceeding 2 psi at maximum system flow rate.

4. Strap-On Aquastat
 - a. UL listed, provided with a suitable removable spring clip for attaching aquastat to pipe and a snap-action SPDT switch. Switch setpoint shall be as indicated. Electrical rating shall be 5 amperes, 120 VAC.
5. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point.

L. FLOW, PRESSURE AND ELECTRICAL MEASURING APPARATUS

1. Traverse Probe Air Flow Measuring Stations
 - a. Traverse probes shall be a dual manifolded, cylindrical, type constructed of 3003 extruded aluminum with an anodized finish to eliminate surface pitting and unnecessary air friction. The multiple total pressure manifold shall have sensors located along the stagnation plane of the approaching air flow and without the physical presence of forward projecting sensors into the airstream. The static pressure manifold shall incorporate dual offset static tips on opposing sides of the averaging manifold so as to be insensitive to flow-angle variations of as much as $\pm 20^\circ$ in the approaching airstream.
 - b. The air flow traverse probe shall not induce a measurable pressure drop, nor shall the sound level within the duct be amplified by its singular or multiple presence in the airstream. Each airflow measuring probe shall contain multiple total and static pressure sensors placed at equal distances along the probe length. The number of sensors on each probe and the quantity of probes utilized at each installation shall comply with the ASHRAE Standards for duct traversing.
 - c. Traverse probes shall be accurate to $\pm 25\%$ of the measured airflow range down to 60 Pa static pressure.
 - d. Each flow measuring station shall be complete with its own dedicated microprocessor with a 4-line, 80 character, Alpha Numeric display and full function key pad. The panel shall be fully programmable and display calculated liters per minute directly on a LED monitor on the panel face.
 - e. Provide 24 volt 1 phase power to each flow measuring station.
2. Shielded Static Pressure Sensor
 - a. Provide for each zone where required a shielded static pressure sensor suitable for ceiling surface mounting, complete with multiple sensing ports, pressure impulse suppression chamber with minimum volume of 800 cubic centimeters, airflow shielding, and 3/8" compression takeoff fittings, all contained in a welded stainless steel casing, with polish finish on the exposed surfaces.

- b. These probes shall be capable of sensing the static pressure in the proximity of the sensor to within 1% of the actual pressure value while being subjected to a maximum airflow of 300 meters per minute from a radial source.
 - c. The shielded static sensing devices shall be used for both reference and space pressure sensing.
 - d. Pressure sensors used for outside air pressure reference purposes shall be equipped with a conduit seal for pneumatic tubing and bushings for a weather tight installation.
3. Static Pressure Traverse Probe
- a. Provide multipoint traverse probes in the duct at each point where static pressure sensing is required.
 - b. Each duct static traverse probe shall contain multiple static pressure sensors located along the exterior surface of the cylindrical probe. Pressure sensing points shall not protrude beyond the surface of the probe.
 - c. The duct static traverse probe shall be of 304 stainless steel construction and (except for 3/4" dia. probes with lengths of 60 cm or less) be complete with threaded end support rod, sealing washer and nut, and mounting plate with gasket and static pressure signal fitting. The static traverse probe shall be capable of producing a steady, non-pulsating signal of standard static pressure without need for correction factors, with an instrument accuracy of 21.

K. RELAYS AND CONTACTORS

- 1. Relays other than those associated with digital output cards shall be general purpose, enclosed type and protected by a heat and shock resistant duct cover. Number of contacts and operational function shall be as required.
- 2. Solid State Relays (SSR): Input/output isolation shall be greater than $10E^9$ ohms with a breakdown voltage of 1500V root mean square or greater at 60 Hz. The contact life shall be $10 \times 10 E^6$ operations or greater. The ambient temperature range of SSRs shall be -28 to +60°C. Input impedance shall not be less than 500 ohms. Relays shall be rated for the application. Operating and release time shall be for 100 milliseconds or less. Transient suppression shall be provided as an integral part of the relay.
- 3. Contactors: Contactors shall be of the single coil, electrically operated, mechanically held type. Positive locking shall be obtained without the use of hooks, latches, or semipermanent magnets. Contractor shall be double-break-silver-to-silver type protected by arcing contacts. The number of contacts and rating shall be selected for the application. Operating and release times shall be 100 milliseconds or less. Contactors shall be equipped with coil transient suppression devices.

L. TEMPERATURE CONTROL PANELS

1. Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. Panels shall conform to NEMA 1 standards, unless otherwise indicated.
2. Control panels shall meet all requirements of UL508A and shall be so certified.
3. All external wiring shall be connected to terminal strips mounted within the panel.
4. Provide engraved phenolic nameplates identifying all devices mounted on the face of control panels and the identification number of the panel.
5. A complete set of 'as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.

M. ENERGY SUB-METERS

1. Energy Meters shall be E-Mon D-Mon Class 5000, or approved equal, and shall contain the following options.
2. Meter shall be fully electronic with 8-digit LCD display showing kwh.
3. Meter shall utilize 0-2 volt AC output current sensors to allow paralleling and/or mounting up to 500 feet from the meter. Sensors shall be of split-core configuration to allow installation without disconnecting cabling, etc.
4. Sensors shall be available from 100 amps to 3200 amps. Sensors shall be optionally available in solid-core configuration (100 & 200 amp.)
5. Meter shall provide current sensor installation diagnostics indicator on display.
6. Meter shall be enclosed in a heavy-duty JIC steel enclosure suitable for indoor installation (gray-standard, green-optional). Meter enclosure shall provide a method of locking to prevent unauthorized access.
7. Meter shall be optionally available in NEMA 4X outdoor enclosure.
8. Meter shall be UL/CUL Listed to latest applicable standards for safety.
9. Meter shall meet or exceed ANSI C12 accuracy standards.

10. Meter shall provide non-volatile memory to maintain reading during power outages.
11. Meter shall store interval data for kW and kVAR for up to 36 days in first-in first-out format. (Standard EZ-7 firmware).
12. Meter shall provide two external inputs for external pulse output meters (i.e. gas, water, electric, etc.) (E-Mon Energy protocol recognizes only input #1.)
13. Meter shall be capable of daisy-chain or star connection using RS-485 communications in combinations of Class 5000s, IDR-8s, IDR-16s not to exceed 52 devices. (IDR-16s count as two devices.) Cabling shall be available through RJ-11 modular jack (4-conductor) or terminal block (3-conductor), 24-26 AWG, up to 4,000 cable feet total.
14. Meter shall be available with the following communication:
 - A. Bacnet IP

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.
- B. Drawings of FMCS network are diagrammatic only and any apparatus not shown, but required to make the system operative to the complete satisfaction of LDCC shall be furnished and installed without additional cost.
- C. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by the controls contractor.

3.2 WIRING

- A. All electrical control wiring and power wiring to the JACE, computers and network components shall be the responsibility of the controls contractor.
- B. All wiring shall be in accordance with the National Electrical Code and any applicable local codes. All FMCS wiring shall be installed in the conduit types specified by the National Electrical Code or applicable local codes. Where FMCS plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.

- C. All exposed indoor wiring shall be in EMT conduit, and all exposed outdoor wiring shall be in rigid metal conduit.

3.3 QUALITY ASSURANCE

- A. The control system contractor shall be a factory authorized representative. The controls contractor must have at least 5 Niagara AX certified programmers working in the local office with at least five years of experience installing control systems of this scope. Systems provided by wholesalers or dealers shall not be acceptable.

3.4 WARRANTY

- A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of two years from the time of system acceptance.
- B. Within this period, upon notice by LDCC, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by the controls contractor at no expense to LDCC.
- C. To ensure a timely response to warranty claims or other service related issues, the installing contractor shall maintain an office located no further than 200 miles from the site.

3.5 WARRANTY ACCESS

- A. LDCC shall grant to the controls contractor, reasonable access to the FMCS during the warranty period. LDCC shall allow the contractor to access the FMCS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

3.6 ACCEPTANCE TESTING

- A. Upon completion of the installation, the controls contractor shall load all system software and start-up the system. The controls contractor shall develop the written test plan and perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with the contract drawings sequence of operations and these specifications.
- B. The Controls contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the TC/FMCS system operation.
- C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of LDCC's Representative, as

required. Properly schedule these tests so testing is complete at a time directed by LDCC's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

- D. System Acceptance: Satisfactory completion is when the controls contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of LDCC's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.7 OPERATOR INSTRUCTION, TRAINING

- A. During system commissioning and at such time acceptable performance of the FMCS hardware and software has been established the Control contractor shall provide on-site operator instruction to LDCC's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.
- B. The Controls contractor shall provide 24 hours of instruction to LDCC's designated personnel on the operation of the FMCS and describe its intended use with respect to the programmed functions specified. Operator orientation of the FMCS shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation.
- C. The training shall be in three sessions as follows:
 - 1. Initial Training: One day session (8 hours) after system is started up and at least one week before first acceptance test. Manual shall have been submitted at least two weeks prior to training so that the TPSs' personnel can start to familiarize themselves with the system before classroom instruction begins.
 - 2. First Follow-Up Training: One day (8 hours) approximately two weeks after initial training, and before Formal Acceptance. These sessions will deal with more advanced topics and answer questions.
 - 3. Warranty Follow Up: One half day (8 hours total) in no less than 4 hour increments, to be scheduled at the request of LDCC during the one year warranty period. These sessions shall cover topics as requested by LDCC such as; how to add additional points, create and gather data for trends, graphic screen generation or modification of control routines.
- F. The Controls contractor will provide a 1 week manufacturer taught orientation and systems operation course at the local manufacturer representative's office or a the

factory training center for two (2) LDCC representatives as scheduling permits. This training is at “no cost” all expenses paid to TPS other than providing time and wages for the representative who attends.

- E. The Controls contractor must provide (40) hours of general HVAC course off-campus training for two (2) LDCC representatives. The course must cover the basic refrigeration cycle, the principles of heat generation, transfer and rejection in four modules, each scheduled a week apart (i.e. Monday the 1st, Monday the 8th, Monday the 15th, etc.). Attendees will discuss in-depth system components, types of heat exchanges, system accessories and controls, compressors, the cooling load estimate, Psychrometry, variable air volume, fans, centrifugal refrigeration, absorption refrigeration, scroll compressors, helical rotary systems, and the concepts of automatic and microelectronic controls. Attendees will also receive the latest information on refrigerants and blends, to include long-term theories in all environmental concerns. This training is at “no cost” all expenses paid including lunch to TPS other than providing time and wages for the representative who attends.

3.8 ONE YEAR WARRANTY INSPECTION:

- A. The design team, LDCC, and contractor shall conduct a one year warranty inspection. The inspection shall be conducted approximately thirty days prior to one year completion date. The inspection shall document all deficiencies covered under the contractor’s one year warranty. Contractor shall be responsible for correcting deficiencies associated with Contractor’s scope of work.

PART 4 Scope of work

- A. All Buildings listed below must have a single common Niagara front-end. All page layouts and graphics will be the same building to building. Floorplan graphics must be created with space temperatures posted for each space. Below is a list of buildings with their respective equipment that must be controlled. All window or “Bard Style” units must have a new programmable thermostat installed.

Delta Ouachita Technical

- Main Building
- Multizone AHU’s
- Chiller Plant
- Boiler Plant
- Smart power meter
- Barbershop
- RTU’s
- Smart power meter
- Trades Building
- Split systems
- Smart power meter

Bastrop Main Campus I

- Air Cooled Chiller
- Boiler
- Constant Volume AHU's
- RTU
- Smart power meter

Bastrop Airport Campus II

- Air Cooled Chiller
- Boiler with pumps
- VAV AHU with VFD
- VAV Boxes with hot water reheat
- Siemens Apogee System
- Smart power meter

Ruston Campus

Main Building

- Fan coils above Ceiling , 4 pipe
- Air Cooled Chiller with pumps
- Boiler with pumps
- Smart power meter

A Building

- Split with Gas heat
- Smart power meter

B Building

- Splits with Gas heat
- Smart power meter

C Building

- Splits with Gas heat
- Smart power meter

Farmerville Campus

- RTU
- Split Systems
- Smart power meter

Farmerville annex

- RTU's
- Smart power meter

Winnsborro Vo-Tech

Building I

- RTU's
- Smart power meter

Building II

- RTU
- Smart power meter

Building III

- RTU's
- Split System
- Smart power meter

Tallulah Campus

- RTU's
- Exhaust fans
- Smart power meter

Lake Providence

- RTU's
- Smart power meter

Louisiana Delta Community College

Building I

- All existing equipment
- Smart power meter
- Trane Tracer Summit system

Building II

- All existing equipment
- Smart power meter
- Trane Tracer Summit System

BID FORM

Bid Response: For Annual Contract to perform maintenance, service, and repairs to heating, ventilation, air conditioning, and building automation systems for all buildings owned, leased, or rented by Louisiana Delta Community College, I/We bid as follows:

Total Base Bid with Two (2) Onsite Service Technicians (80 hrs per week): _____

Parts, Materials, & Supplies Pricing (Cost-Plus maximum presented in Mark-Up format): For bid tabulation purposes, \$50,000 of parts at list price will be used. _____

Additional Service Hourly Rate: (Supplemental rate applies as base rate for overtime, weekend, holidays, etc.) For bid tabulation purposes, 100 supplemental hours will be used. _____

LDCC HVAC FACILITY SERVICES PRICING BID TABULATION SHEET

BUILDING	CAMPUS LOCATIONS	SQUARE FOOTAGE	ONSITE HVAC PM MAINTENANCE	INTEGRATION AND CONTROLS	SOFTWARE SUPPORT ENERGY MANAGEMENT	IEQ, FILTER & COIL SERVICES	UVC LIGHTING
1	DELTA OUACHITA WEST MONROE	142,000	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
2	BASTROP/AIRPORT EXTENSION	44,000	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
3	NORTH CENTRAL/FARMERVILLE	28,000	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
4	NORTHEAST LA/WINNSBORO	30,000	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
5	RUSTON	32,000	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
6	TALLULAH	45,000	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
7	LAKE PROVIDENCE	27,000	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
8	LDCC MAIN CAMPUS	156,000	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____
TOTAL HVAC AND MAINTENANCE			\$ _____	\$ _____	\$ _____	\$ _____	\$ _____

****Bid Prices may be adjusted accordingly if a campus listed is closed at a later date****

NAME OF FIRM OR JOINT VENTURE: _____

ADDRESS OF BIDDER: _____

LOUISIANA CONTRACTOR'S LICENSE NUMBER: _____

NAME OF AUTHORIZED SIGNATORY OF BIDDER: _____

TITLE OF AUTHORIZED SIGNATORY OF BIDDER: _____

AUTHORIZED SIGNATURE OF BIDDER *: _____

DATED: _____

TECHNICAL DEMONSTRATION REQUIREMENTS FOR BID

To be scheduled at jobsite inspection meeting

COMMUNICATIONS:

1. Demonstrate (using appropriate hardware and software) how to establish a field connection with Comm 5 devices.
2. Demonstrate (using appropriate hardware and software) how to establish a field connection with Comm 4 devices.
3. Demonstrate (using appropriate hardware and software) ability to establish a field connection with a UPCM and protocols required to communicate, diagnose and troubleshoot.
4. Demonstrate (using appropriate hardware and software) ability to establish a connection with a PKG AIR-COOLED SCREW CHILLER **ROT-330**
5. **ROT-330** chiller module and how to take electronic log, diagnose and troubleshoot using software tool.

TRACER SUMMIT:

1. Demonstrate ability to log on and off Tracer Summit.
2. Create a user name and password.
3. Demonstrate ability to back up and restore a site, graphics and reports.
4. Make set point changes to individual VAV's, AHU discharge air set points, and static pressure set points from front end.
5. Demonstrate ability to create and modify existing time of day scheduling including exceptions and holidays.
6. Demonstrate ability to use pass through feature in Tracer Summit.
7. Demonstrate ability to remotely connect off-site with Tracer Summit.
8. Initiate and edit night setback schedules.
9. Verify actuation of remote devices from front end.
10. Calibrate and verify airflow of a VAV from front end.

PROGRAMMING:

1. Demonstrate familiarity with Custom Programming Language (CPL), Tracer Graphical Programming (TGP) and Process Control Language (PCL).
2. Demonstrate familiarity with Energy Conservation Measures (ECM's)

CONTROLS:

1. Demonstrate ability to tune a DDC loop.
2. Demonstrate ability to calibrate a temperature control.
3. Demonstrate ability to program a replacement a MP581 controller including reference file and TGP and binding procedures.

EQUIPMENT:

1. Demonstrate binding procedures for LLID replacement on a ROT-330 chiller.
2. Demonstrate programming, operation and bypass procedures for Trane and Fuji variable frequency drives (VFD's).

OTHER REQUIREMENTS:

1. The Contractor shall employ a minimum of five (5) full time, competent servicemen who are resident within fifty (50) miles of the job site and who have been within their employ for a minimum of five (5) years.
2. The servicemen assigned to maintain Building Automation Control Systems and refrigeration systems will be factory trained and authorized to provide TRANE warranty service. A letter of authorization shall be submitted with the bid.

3. The servicemen assigned to maintain mechanical systems will be qualified to service the equipment type under contract as well as all associated electric and electronic controls. The Contractor shall submit with their bid a list of ten (5) technicians and their qualifications to provide commercial service to LDCC.

LDCC TECHNICIAN REQUIREMENTS FOR CHECK LIST

COMMUNICATIONS:	Date:	Time In:
Total HVAC System:		Time Out:
1. Demonstrate (using appropriate hardware and software) how to establish a field connection with Comm 5 devices.		
2. Demonstrate (using appropriate hardware and software) how to establish a field connection with Comm 4 devices.		
3. Demonstrate (using appropriate hardware and software) ability to establish a field connection with a UPCM and protocols required to communicate, diagnose and troubleshoot.		
4. Demonstrate (using appropriate hardware and software) ability to establish a connection with a Trane Chiller module and how to take electronic log, diagnose and troubleshoot using software tool.		

HVAC:	Date:	Time In:
		Time Out:
1. Demonstrate ability to log on and off HVAC Application Software.		
2. Create a user name and password.		
3. Make set point changes to individual VAV's, AHU discharge air set points, and static pressure set points from front end.		
4. Demonstrate ability to create and modify existing time of day scheduling including exceptions and holidays.		
5. Demonstrate ability to use pass through feature in Rover HVAC Software.		
6. Demonstrate ability to remote connect offsite with HVAC.		
7. Initiate and edit night setback schedules.		
8. Verify actuation of remote devices from front end.		
9. Calibrate and verify airflow of a VAV from front end.		

TRACER SUMMIT:	Date:	Time In:
		Time Out:
1. Demonstrate ability to log on and off Tracer Summit.		
2. Create a user name and password.		
3. Make set point changes to individual VAV's, AHU discharge air set points, and static pressure set points from front end.		
4. Demonstrate ability to create and modify existing time of day scheduling including exceptions and holidays.		
5. Demonstrate ability to use pass through feature in Tracer Summit.		
6. Demonstrate ability to remotely connect off-site with Tracer Summit.		
7. Initiate and edit night setback schedules.		
8. Verify actuation of remote devices from front end.		
9. Calibrate and verify airflow of a VAV from front end.		

PROGRAMMING:	Date:	Time In:
		Time Out:
3. Demonstrate familiarity with Custom Programming Language (CPL), Tracer Graphical Programming (TGP) and Process Control Language (PCL).		
4. Demonstrate familiarity with Energy Conservation Measures (ECM's)		

CONTROLS:	Date:	Time In:
		Time Out:
4. Demonstrate ability to tune a DDC loop.		
5. Demonstrate ability to calibrate a temperature control.		
6. Demonstrate ability to program a replacement a MP581 controller including reference file and TGP and binding procedures.		

EQUIPMENT:	Date:	Time In:
		Time Out:
3. Demonstrate binding procedures for LLID replacement on a CH530 chiller.		
4. Demonstrate programming, operation and bypass procedures for Trane and Fuji variable frequency drives (VFD's).		

Contractor Name: _____

Contractor Technician _____ (Must be one of techs to reside at LDCC for contract fulfillment)

Micheal Colvin, LDCC _____

MAIN CAMPUS EQUIPEMNT LIST “B” BUILDING

SCAC#1

M# SCWFP3843MOA0107085

S# T09J20337

Filters

(4) 20x20x2 pleated, (8) 18x20x2

SCAC#2

M# SCWFP3843MOA0107085

S# T09J20338

Filters

(4) 20x20x2 pleated, (8) 18x20x2

Cooling Tower

FXV-433-LM (Baltimore Air Coil)

U096202101

Cooling Tower Drive

TR200P11KT4E21H2 (Installed 7/9/12)

007907H262

AHU#1

M# TWE150E300AA

S# 9442YKCHD

Filters

(8) 15x20x2 pleated

Condensing Unit#1

TTA150E400AA

9443MJNAD

AHU#2

M# TWE240E400BA

S# 9424WD7HD

Filters

(4) 16x25x2 pleated, (4) 16x20x2 pleated

Condensing Unit#2

TTA240E400AA

9441YXGTD

CDWP#1

Pump# FI2509E2FAJ1LOA (Taco)

Motor Cat# EM3311T (Baldor)

CDWP#2

Pump# FI2509E2FAJ1LOA (Taco)

Motor Cat# EM3311T (Baldor)

VAV Boxes

34 VAV boxes

8/9/2012

LTC Delta Ouachita Facilities Equipment Inventory

Administration Building - S08958

Equipment Type	Room Number	Equipment Manufacturer	Model Number	Serial Number
Air Handler	1st Floor - East	Trane	CCBA255ELAO	K80C00935
Air Handler	1st Floor - South	Trane	CCBA255ELAO	K80C00936
Air Handler	2nd Floor - East	Trane	CCBA255ELAO	KV0C00937
Air Handler	2nd Floor - West	Trane	CCBA255ELAO	KV0C00938
Air Handler	2nd Floor - North	Trane	CCBA255ELAO	K80C00939
Air Handler	Cafeteria - North	Trane	CCBA315ELAO	KB0C00940
Air Handler	Cafeteria - South	Trane	CCBA175ELAO	KB0C00941
Chiller	Mech Room	Trane	RTAA1254XQ01A3C0BPGK	U03L02994
Chiller	Mech Room	Trane	RTAA1254XQ01A3C0BPGK	U03L02994
Air Compressor	Mech Room	Manchester	298648	T85540
Water Heater	Mech Room	Rheem	22V30F	RHLN1106507648
Boiler	Mech Room	Peerless	211-13-V-W	211-5111

8/9/2012

LTC Delta Ouachita Facilities Equipment Inventory

Trades Building - S08959

Equipment Type	Room Number	Equipment Manufacturer	Model Number	Serial Number
Air Handler	B107	Trane	2TEC3F60A1000AA	61425AE1V
Air Handler	B103	Trane	TWE060D150B0	3145CLS2V
Air Handler	B112	Trane	TWE060D150B0	3145LJ2V
Air Handler	B108	Trane	2TGB3F48A100AA	60538J86V
Air Conditioner	B112	Trane	2TT0060A3000AA	3031N1S3F
Air Conditioner	B107	Trane	2TT0060A3000AA	602ABP3F
Air Conditioner	B108	Trane	2TT0060A3000AA	6225LG3F
Air Conditioner	B103	Trane	2TT0060A3000AA	3231WNC3F
Air Conditioner	B109	Tempstar	Temp 10/CAC060HCA	V03508004426
Air Compressor	B103	Champion	URS-8	247295A38826
Hot Water Tank	Janitor Closet	GE	GENG1199A38826	PG40538

8/9/2012

LTC Delta Ouachita Facilities Equipment Inventory

Transportation Building - S08960

Equipment Type	Room Number	Equipment Manufacturer	Model Number	Serial Number
Air Compressor	CVO	Ingersall-Rand	A253-7E2	30T-449673
Hot Water Heater	Body shop	Rheem	22V40F1	RHLN1008412178
Hot Water				
Pressure Washer	CVO	Marathon	TXN184TCFR7071BN	XTME-3-1-184T
Air Compressor	Body Shop	Ingersall-Rand	7100E15	0106110093
Water Heater	Body Shop	Rheem	22V40F1	RHLN1008412178
Shop Heater	Automotive	Bettcher Mfg.	CR-63T-5	BA5777
HVAC Unit	Automotive	Trane	RAUC-506-B	80A-204A
HVAC Unit	Automotive	Goodman	CK24-10	0007488219

8/9/2012

LTC Delta Ouachita Facilities Equipment Inventory

Barber/Diesel Building - S08961

Equipment Type	Room Number	Equipment Manufacturer	Model Number	Serial Number
Furnace	Barber Mech Room	Tempstar	N8MPN100J22A1	A850701184
Furnace	Barber Mech Room	Tempstar	N8MPN100F20B1	A054045132
Furnace	Barber Janitor Closet	Tempstar	N8MPN100F20A1	A051702602
Air Conditioner	Barber SE Extension	Fedder	1060CBD3V	CS330755066X
Air Conditioner	Barber NE Extension	Tempstar	CAC048HCA	E053310481
Air Conditioner	Barber NE Extension	Tempstar	CAC048HCA	E054323941
Water Heater	Barber Janitor Closet	Ruud	PE40-2	049511051-3B
Furnace	Diesel Hallway	Borg-Warner	P2UGB30N18031A	MFNM171897
Air Compressor	Diesel Shop	Rand	2475	905329
Air Compressor	Diesel SW Extension	Goodman	CK60-3	106404888